cities 2030

WHITE PAPER

ETHICAL CITIES & REGIONS FOOD SYSTEMS

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ABSTRACT

The aim is to explore various aspects of creating a food system that is sustainable, equitable, and just for all considering the project Cities2030 setting, rooted in the Milan Urban Food Policy Pact (MUFPP), which is an international agreement on urban food policies signed by over 200 cities from all over the world. All-in-all, the white paper proposes to provide a roadmap for creating food systems via introducing a tentative concept (or model) of ethical CRFS, in particular via elucidation the current state of food systems. The present document outlines a set of ethical principles that should guide the development of food systems, such as sustainability, equity, and social justice via typifying case studies (examples of cities or region, highlighting best practices and lessons learned; via outlining policy recommendations (incentivising sustainable agriculture practices, promoting food access in underserved areas, etc.).
The White paper summarises key features of ethical CRFS and emphasises the importance of creating such systems for the health and well-being of communities and the planet.

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Legislation

Legislation H2020 Framework Programme – Regulation (EU) No 1291/2013 of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 - The Framework Programme for Research and Innovation (2014-2020) (OJ 347, 20.12.2013, p. 104).

Euratom Research and Training Programme (2014-2018) – Council Regulation (Euratom) No 1314/2013 of 16 December 2013 on the Research and Training Programme of the European Atomic Energy Community (2014-2018) complementing the Horizon 2020 – The Framework Programme for Research and Innovation (OJ L 347, 20.12.2013, p. 948).

H2020 Specific Programme – Council Decision 2013/743/EU of 3 December 2013 establishing the Specific Programme Implementing Horizon 2020 - The Framework Programme for Research and Innovation (2014-2020) (OJ L 347, 20.12.2013, p. 965).

Rules for Participation (RfP) – Regulation (EU) No 1290/2013 of the European Parliament and of the Council of 11 of December 2013 laying down the rules for the participation and dissemination in Horizon 2020 – the Framework Programme for Research and Innovation (2014-2020) (OJ L 347, 20.12.2013, p.81).

Financial Regulation (FR) – Regulation (EC, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the European Union (OJ L 298, 26.10.2012, p.1).

Rules of Application (RAP) – Commission Regulation (EC, Euratom) No 1268/2012 of 29 October 2012 on the rules of application of l Regulation (EC, Euratom) No 966/2012 of the European Parliament and of the Council on the financial rules applicable to the general budget of the Union (OJ L 298, 26.10.2012, p.1).

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Executive summary

The present White Paper propose to contribute to more ethical 'food systems' via a number of pathways structured to foster more resilient interlinks between the dimensions of environment, economics and society, whilst generating a more mutually supportive framework between them. The background of the present report outlines the project's Cities2030 overall proposal to address the barriers, lock-ins, vulnerabilities, enablers and drivers of implementing more sustainable CRFS. The present paper illustrates the complexity of food systems, which involves numerous actors, processes, and interdependencies across the entire food supply chain from "farm to fork," presents a significant challenge in developing a comprehensive and universally applicable ethical framework for sustainable food systems. To address this challenge, the project Cities2030 acknowledges it is essential to implement a dynamic, interactive, and participatory approach to the definition of ethics in CRFS.

Such an approach allows recognising that ethical considerations are not static and can evolve over time, involve engaging with diverse stakeholders in the food system to ensure a range of perspectives are considered, and empower communities to take ownership of their food systems by actively participating in decision-making processes. By adopting this approach, the resulting ethical frameworks for CRFS are more likely to be effective, equitable, and reflective of the values and needs of all stakeholders. The said background allows the delivery of tentative definitions and challenges correlated to CRFS which both constitute the platform upon which the project Cities2030 proposes to delineate the aforementioned pathways. Here, the paper connects ethics, CRFS and the FOOD2030 policy and agenda[1], thus focuses on definitions directly connected to the main policy framework e.g., FOOD2030, referred by the Horizon 2020 Programme topic 'FOOD 2030 - Empowering cities as agents of food system transformation' (ID: CE-FNR-07-2020), under which the project Cities2030 received a grant-based financial support. The current paper aims to identify and address key challenges within the three dimensions of food systems: environmental, economic, and societal. These challenges stem from a complex and interconnected web of factors, ranging from climate change and environmental degradation to social inequality and economic instability.

In the environmental dimension, the challenges include the depletion of natural resources, loss of biodiversity, pollution, and climate change. These challenges are exacerbated by unsustainable farming practices, food waste, and inefficient supply chains. To address these challenges, it is crucial to adopt sustainable agriculture practices, reduce food waste, and promote circular economy models. In the economic dimension, the challenges include market volatility, unequal distribution of wealth, and limited access to financial resources for small-scale farmers. These challenges hinder the development of a resilient and equitable food system. To address these challenges, it is necessary to support small-scale farmers, develop fair trade policies, and create a more diverse and resilient food economy. In the societal dimension, the challenges include food insecurity, malnutrition, and social inequality.

These challenges are often the result of unequal access to food, lack of education on healthy eating habits, and the concentration of food production and distribution in the hands of a few powerful players. To address these challenges, it is necessary to promote food sovereignty, ensure equitable access to healthy and nutritious food, and empower communities to take ownership of their food systems. Addressing these challenges requires a holistic and collaborative approach that involves multiple stakeholders, including farmers, policymakers, researchers, and consumers. By working together, it is possible to create a more sustainable, equitable, and resilient food system for all.

[1] FOOD2030, the European Commission, October 2016

Cities2030 proposes a tentative deployment framework for developing more ethical Community-Based Food Systems (CRFS). This framework is characterised by structured, ecosystem-enhancing, and quintuple helix pathways for action. The purpose of these pathways is to provide a basis for Research and Innovation Action (RIA) in various fields, including science, technology, policy, governance, and society as a whole, which are relevant to building upon the European Union and Associated Countries (EUAC) agendas and going beyond them. The structured pathway focuses on developing a comprehensive understanding of the food system's complexity and identifying key points of intervention to promote sustainability, equity, and resilience. This includes research on sustainable agriculture, food waste reduction, and circular economy models, among other areas.

The ecosystem-enhancing pathway aims to leverage the interconnectedness of the food system to create synergies and optimise outcomes. This includes promoting agroecological approaches, ecosystem-based adaptation, and integrated land-use planning.

The quintuple helix pathway emphasises the importance of multi-stakeholder collaboration and engagement. This includes fostering partnerships between farmers, policymakers, researchers, civil society organisations, and the private sector to create shared goals and values for the food system.

Summarising, the proposed deployment framework for more ethical CRFS aims to promote a holistic, collaborative, and innovative approach to addressing the complex challenges facing food systems today. By leveraging the strengths of different stakeholders and incorporating diverse perspectives, this framework may facilitate the creation of a more sustainable, equitable, and resilient food system for all.

In addition to the deployment framework, Cities2030 proposes a tentative roadmap for developing more ethical CRFS. This roadmap incorporates four key dimensions: teaching and training, quadruple helix cooperation mechanisms, participatory governance, and funding.

The teaching and training dimension emphasises the importance of education and capacity-building to promote sustainable food systems. This includes providing training for farmers on sustainable agriculture practices, educating consumers on healthy and sustainable eating habits, and promoting food literacy in schools and communities.

The quadruple helix cooperation mechanisms dimension emphasises the need for multi-stakeholder collaboration and engagement. This includes fostering partnerships between farmers, policymakers, researchers, civil society organisations, and the private sector to develop shared goals and values for the food system.

The participatory governance dimension emphasises the importance of empowering communities to take ownership of their food systems. This includes involving communities in decision-making processes, promoting food sovereignty, and creating more democratic and participatory governance structures.

Decisively, the funding dimension emphasises the need for more adequate and place-based financial resources to support the development of more ethical CRFS. This includes leveraging existing funding mechanisms, such as the European Union's Common Agricultural Policy, to support sustainable agriculture and food systems.

All-in-all, the tentative roadmap proposed by Cities2030 provides a comprehensive and holistic approach to developing more ethical CRFS. By incorporating these four key dimensions, the roadmap aims to contribute to promote a more sustainable, equitable, and resilient food system for all.

1. BACKGROUND

Urban food systems and ecosystems are facing urgent and complex challenges that require immediate action. Cities2030 proposes that citizens must be at the core of solutions, recognising that more than 7.7 billion consumers have the power to shift consumption patterns and create a more sustainable future. These challenges are driven by population growth, rapid urbanisation, vast migration phenomena, climate change, and resource scarcity.

Despite advances in technology and productivity, 9 billion people, mostly living in cities, continue to face a food system that is characterised by overconsumption, malnutrition, and waste. Without action transitioning towards sustainable urban food systems and ecosystems, the environment will continue to degrade, diminishing the world's capacity to produce quality food for all while decreasing capacities to provide food to all.

Urban food systems pose a planetary challenge that requires a systemic, pragmatic, and actionable approach to generate small steps towards sustainable solutions. The project Cities2030 is a new initiative that addresses these challenges at the local and regional levels, promoting collaboration between stakeholders and generating transferable solutions that can lead to a more sustainable, equitable, and resilient food system for all. The concept of food systems is a complex and multifaceted one, encompassing all aspects of food production, distribution, consumption, and waste management.[2]

The current state of the art in defining food systems is that they are a series of interrelated and interdependent processes that involve the production, processing, distribution, consumption, and disposal of food.[3] Food systems encompass a range of activities and actors involved in producing and delivering food from farm to table, as well as managing waste and by-products. The food system also includes the social, economic, and environmental factors that shape and are impacted by food production and consumption. It is worth noting that the definition of food systems is constantly evolving as our understanding of their complexity and impact on society and the environment deepens.[4]

This understanding has led to the recognition of the need for a more sustainable and equitable food system that ensures food security for all while minimising negative environmental and social impacts.[5] In recent years, there has been growing recognition that our current food systems are unsustainable, with negative impacts on the environment, human health, and social equity. As a result, there has been increasing interest in developing an ethical framework for sustainable food systems.[6]

One key aspect of such a framework is the idea of food sovereignty, which refers to the right of people to define their own food systems and to control the resources and policies that shape them.[7] Another important aspect is the recognition of the interconnectedness of environmental, social, and economic factors in shaping food systems, and the need to develop integrated solutions that address all of these factors.[8]

[2] Sustainable food systems – Concept and framework, Nguyen H. et al., the Food and Agriculture Organisation of the United Nations (FAO), October 2018
[3] Synthesis of existing food systems studies and research projects in Europe, the European Commission, May 2019
[4] Rethinking Food Systems, the United Nations Environment Programme (UNEP), June 2021
[5] Can agroecology improve food security and nutrition? A review, Kerr B. R. et al. in *Global Food Security*, June 2021
[6] Sustainable agro-food systems for addressing climate change and food security, Wijerathna-Yapa A. et al. in *agriculture*, September 2022
[7] Food sovereignty and rights-based approaches strengthen food security and nutrition, Sampson D. et al. in frontiers *Sustainable Food Systems*, September 2021
[8] Reimagining the food system through social innovations, the European Environment Agency (EEA), the European Union, October 2022

Other important considerations in developing an ethical framework for sustainable food systems include the need to promote agroecological farming practices that are environmentally and socially sustainable, to ensure fair and equitable access to food, and to reduce food waste and loss.[9] Summarising, the current state of the art in defining food systems and developing ethical frameworks for sustainable food systems is still evolving, with ongoing research and debate on these complex and interconnected issues.

2. DEFINITIONS

The consortium Cities2030 proposes a series of questions to facilitate the discussion about food ethics, outlined next.

What is food ethics? From global to place-based frameworks and the project Cities2030 approach. Food ethics refers to the moral principles and values that guide our choices and actions related to food production, consumption, and distribution. It involves examining the ethical implications of our food choices, including the impact of food production on the environment, animal welfare, social justice, and human health.[10] Food ethics also encompasses the cultural and social aspects of food, such as the role of food in community and identity, and the ethical considerations of food marketing and advertising. It raises questions about the responsibility of individuals, corporations, and governments in ensuring that food is produced and distributed in a way that is fair, sustainable, and respectful of human and non-human life.[11] All-in-all, food ethics is a multidisciplinary field that draws on philosophy, ecology, sociology, and public health to address the complex ethical issues related to food and agriculture.

Who decides what's ethical food? Determining whether food is ethical or not can be a complex process that involves a variety of factors, including environmental impact, animal welfare, labor practices, and health considerations. There is no single authority or organisation that decides whether food is ethical, but there are a number of different groups that play a role in shaping ethical food practices.[12] Consumers can make ethical food choices by doing their research and selecting products that align with their values. Some consumers may choose to look for food that is certified organic, fair trade, or certified humane, for example.[13] Food producers and retailers can also play a role in promoting ethical food practices. Many companies have started to implement sustainability initiatives, reduce waste, and prioritise animal welfare in their operations. There are also organisations such as the Rainforest Alliance, the Marine Stewardship Council, and the Global Animal Partnership that offer certifications and standards for ethical food production.[14] In addition, government agencies may regulate certain aspects of food production, such as food safety, environmental impact, and labelling requirements.[15] They may also enforce labor laws and regulations to protect workers in the food industry.[16] Ultimately, determining whether food is ethical requires consideration of a range of factors, and different individuals and organisations may have different perspectives on what constitutes ethical food practices.

Which key questions on ethics for CRFS? For instance, how can cities and regions (CR) ensure that their food systems are sustainable and promote environmental responsibility? What are the ethical implications of relying on global food supply chains, and how can CR promote local and regional food production and distribution systems?

[9] From transition to domains of transformation, Anderson C. R. et al. in *sustainability*, September 2019
[10] What is food ethics?, Ethical Globe, September 2021
[11] Ethics in food and agriculture: 7 current challenges, unsustainable magazine, June 2021
[12] Consumers and the transition to sustainable food, the European Consumer Organisation (BEUC), June 2020
[13] Operationalising ethics in food choice decisions, Hepting D. et al. in *Journal of Agricultural and Environmental Ethics*, June 2014
[14] Sustainability Assessment of Food and Agriculture systems (SAFA), the Food and Agriculture Organisation of the United Nations (FAO), September 2014
[15] Food information to consumers - legislation, the European Commission, Food Safety, May 2023
[16] Protecting workers: health and safety at work, the Council of the EU and the European Council, May 2023

How can CR promote access to healthy and affordable food for all residents, regardless of income, race, or geographic location? What are the ethical implications of food waste, and how can CR reduce food waste through measures such as composting, food recovery programmes, and waste reduction policies? How can CR ensure that their food systems promote equity and social justice, and address issues of food insecurity and hunger? What are the ethical implications of animal welfare in food production systems, and how can CR ensure that animals are treated humanely throughout the food production process? How can CR promote cultural diversity and preserve traditional food practices and knowledge while also promoting healthy food choices? What are the ethical implications of the use of pesticides and other chemicals in food production, and how can CR promote organic and sustainable farming practices? How can CR promote the use of renewable energy in food production and distribution, and reduce the carbon footprint of the food system? How can cities and regions ensure that their food systems are resilient and able to withstand unexpected shocks, such as pandemics, climate-related disasters, or economic downturns? What are the ethical implications of genetically modified organisms (GMOs) in food production, and how can cities and regions ensure that consumers have access to accurate information about the food they consume? How can cities and regions promote the use of local and traditional food crops, and support small-scale farmers and local food producers? What are the ethical implications of the increasing corporatisation of the food system, and how can cities and regions ensure that the food system remains diverse and inclusive? How can cities and regions promote food sovereignty, and ensure that communities have control over their own food systems? What are the ethical implications of the privatisation of water resources in food production, and how can cities and regions promote responsible water use in agriculture? How can cities and regions promote food literacy and education, and ensure that consumers are informed about the health and environmental impacts of their food choices? What are the ethical implications of food labelling and advertising, and how can cities and regions ensure that consumers have access to accurate and transparent information about the food they consume? How can cities and regions promote community-based food systems, and ensure that communities have a say in how their food is produced, distributed, and consumed? What are the ethical implications of the use of antibiotics in animal agriculture, and how can cities and regions promote responsible antibiotic use in food production? How can cities and regions ensure that their food systems are inclusive and accessible to diverse communities, including immigrants, refugees, and low-income populations?

Can ethical CRFS trigger, accelerate and support FOOD2030 e.g., enable change? That is, can ethical cities and regions food systems trigger, accelerate and support the EU FOOD2030 policy e.g., enable change in the four pillars: nutrition for sustainable and healthy diets, climate-smart and environmentally sustainable food production, circular food systems, innovation and empowering communities? The four pillars of the FOOD2030 policy are closely aligned with the key ethical considerations in the food system, and an ethical food system can enable change in each of these areas.

Nutrition for sustainable and healthy diets: ethical food systems (EFS) can promote access to healthy and affordable food for all residents, regardless of income, race, or geographic location. This can be achieved through initiatives such as community gardens, farmers' markets, and food recovery programmes, which promote access to fresh and nutritious food, while also reducing food waste and supporting local food producers.

Climate-smart and environmentally sustainable food production: EFS can promote sustainable and regenerative agriculture practices that reduce the carbon footprint of food production, conserve natural resources, and protect biodiversity. This can be achieved through initiatives such as agroforestry, crop

rotation, and soil conservation practices, which promote long-term sustainability and resilience in the food system.

Circular food systems: EFS can reduce food waste and promote circularity in the food system through measures such as composting, food recovery programmes, and waste reduction policies. This can reduce the environmental impact of the food system and promote more efficient use of resources.

Innovation and empowering communities: EFS can promote innovation and empower communities through initiatives such as community-based food systems, which give communities a say in how their food is produced, distributed, and consumed. This can promote local economic development and support small-scale farmers and local food producers, while also promoting food sovereignty and community resilience.

Summarising, an EFS can provide a foundation for the implementation of the FOOD2030 policy, enabling change across each of the four pillars and promoting a more sustainable, healthy, and equitable food system for all.

Is ethical trade a tangible pathway to more ethical CRFS? That is, can ethical trade standards and responsible sourcing drive consumer behaviour and investment decisions towards more ethical CRFS? When consumers are provided with transparent and credible information about the social and environmental impacts of their food choices, they can make more informed decisions and support ethical food systems.

Ethical trade standards, such as Fair Trade or Rainforest Alliance certifications, provide consumers with assurance that the food they are purchasing has been produced using socially and environmentally responsible practices. These certifications may foster the creation of demand for ethical products and encourage investment in sustainable and ethical food systems.[17]

Responsible sourcing initiatives, such as the Sustainable Agriculture Initiative Platform (SAI) or the Roundtable on Sustainable Palm Oil (RSPO), also play a key role in promoting ethical food systems. These initiatives work with companies and supply chains to promote responsible sourcing practices and ensure that the food they produce is socially and environmentally responsible.[18] This may result in reducing the negative impacts of food production on local communities and the environment, while also promoting more sustainable and resilient food systems.

Investors are also increasingly looking for opportunities to invest in ethical and sustainable food systems, and ethical trade standards and responsible sourcing assist in providing transparency and credibility to these investments.[19] This may facilitate attracting more investment to sustainable and ethical food systems, supporting their growth and development. All-in-all, ethical trade standards and responsible sourcing may assist in driving consumer behaviour and investment decisions towards more ethical cities and regions food systems, promoting sustainability, equity, and social and environmental responsibility in the food system.

Can food data transparency assist in food ethics, linking to security and safety? By making information about the production, processing, and distribution of food more readily available, consumers can make more informed choices about the food they eat, and hold food producers and suppliers accountable for their actions.[20]

[17] Agri-food markets towards sustainable patterns, Borsellino V et al. in sustainability, March 2020
[18] Sustainable Agriculture Initiative Platform, May 2023
[19] What is the current offer in social certifications and how will it develop?, Centre for the Promotion of Imports from developing countries (CBI), April 2022
[20] Future of Food summit 2021, Randy Jagt, Deloitte's Future of Food platform, April 2022

Transparency in food data may assist addressing issues related to food safety, such as the presence of contaminants or allergens in food, by enabling consumers to easily access information about the ingredients and production methods used in food.[21] This may facilitate assistance to consumers to avoid foods that may pose a risk to their health, and encourage food producers to prioritise safety and quality in their operations.

Transparency may also promote food ethics by enabling consumers to make more informed choices about the social and environmental impact of the food they consume.[22] For example, consumers may be more likely to choose products that are produced using sustainable and ethical practices, such as fair labor standards, environmentally-friendly production methods, and humane treatment of animals.

In fine, food data transparency fosters building trust between consumers and food producers, improve food safety and security, and promote ethical and sustainable food production practices.

The project Cities2030 also explores key drivers of ethics e.g., Responsible Research and Innovation (RRI), gender, inclusion, Open and Citizen Science.

RRI in food refers to the ethical, social, and environmental considerations that should be taken into account throughout the entire process of food research and innovation, from conception to market. RRI involves engaging with stakeholders, including consumers, policymakers, and industry representatives, to ensure that research and innovation align with their needs and values.[23]

Some key considerations for RRI in food include: ethics as such e.g., innovators and operators (researchers, etc.) should consider the ethical implications of their work, such as animal welfare, the use of genetically modified organisms, and potential risks to human health. Sustainability: research and innovation in food should prioritise sustainability by reducing waste, minimising the use of resources such as water and energy, and promoting environmentally-friendly practices. Inclusivity: RRI in food should consider the needs and perspectives of diverse stakeholders, including those from underrepresented communities. Transparency: innovators and operators should be transparent about their methods and findings, and involve stakeholders in the decision-making process. Responsibility: innovators and operators should take responsibility for the potential consequences of their work, and work to mitigate any negative impacts.

Open science in food refers to the practice of making scientific research and data related to food more accessible and transparent to the wider public.[24] This may include making research findings and data freely available online, sharing research methods and protocols, and encouraging collaboration and communication among scientists and the general public. Open science also abides FAIR Data Principles e.g., Findable, Accessible, Interoperable and Reusable. Those principles were established to promote the discoverability, accessibility, interoperability, and reusability of research data. The principles aim to improve the efficiency and effectiveness of scientific research and maximise the benefits of publicly funded research. The principles are outlined next.

Findable: data should be easy to find by humans and machines, through the use of unique identifiers, metadata, and other descriptive information. Accessible: data should be openly accessible and available to researchers and other interested parties without undue barriers, such as registration or payment requirements. Interoperable: data should be structured in a standardised and interoperable format, allowing it to be easily integrated and

[21] Food safety assessment: overview of metrological issues and regulatory aspects in the European Union, Sorbo A. et al. in *separations*, February 2022
[22] Code of ethics and good practices, Naturcode, May 2023
[23] Conceptualizing responsibility in food research and innovation, Timotijevic L. et al. in Frontiers in *Sustainable Food Systems*, February 2021
[24] Solutions for FAIR Open Science in Europe: the FAIR-IMPACT project kicks-off, project FAIR-IMPACT, Horizon Europe (ID: 101057344), June 2022

reused by other researchers and tools. Reusable: data should be well-documented, with clear and accessible information about how it can be reused, and with permission to do so granted by the original data creators. The EU is committed to promoting open science practices across all scientific disciplines, including food science.[25] The European Commission has implemented a number of initiatives and policies to promote open science, such as the HORIZON EUROPE research and innovation programme, which includes a specific focus on open access to research publications and data.[26]

In the food sector, open science practices can include sharing data on food composition, nutritional values, and safety, as well as making research findings and methodologies openly available for peer review and replication. This may assist to ensure that scientific research is rigorous, transparent, and accountable, and can contribute to improving public trust in the food sector.[27]

The project Cities2030 fully integrates the pertinent components of the European Union (EU) policy framework on food, prominently the FOOD2030 policy as per the topic 'FOOD 2030 - Empowering cities as agents of food system transformation' (ID: CE-FNR-07-2020), and correlated key strategy e.g., 'Farm to Fork', biodiversity, bioeconomy, zero pollution etc. In the course of the project's implementation, the EU Green Deal was launch, encompassing a set of policy initiatives that aim to transform the EU into a climate-neutral, sustainable, and circular economy by 2050. Food and agriculture are significant parts of this plan, as they contribute to a significant portion of the EU's greenhouse gas emissions, biodiversity loss, and other environmental issues.

Consequently, the project Cities2030 integrates the EU Green Deal in all the project's pertinent developments. The EU Green Deal recognises the need to transition to more sustainable food systems that promote healthy diets and reduce the environmental impact of food production and consumption. To achieve this, the EU has set out several initiatives, including (non-exhaustive) the agendas outlined next.

The 'Farm to Fork Strategy' which aim is to make the EU food system more sustainable and environmentally friendly. The initiative proposes reducing the use of pesticides and fertilisers, promoting organic farming, and reducing food waste.

The Circular economy for food e.g., the EU is working to create a circular economy for food that reduces waste, improves resource efficiency, and promotes sustainable food production and consumption.

Sustainable agriculture e.g., the EU is also focusing on promoting sustainable agriculture practices, such as reducing soil erosion, improving water management, and promoting biodiversity in farmland.

Food labelling e.g., the EU has introduced new food labelling laws to improve transparency and provide consumers with more information about the environmental impact of the food they buy.

Summarising, the EU Green Deal recognises that food and agriculture are crucial sectors in achieving a more sustainable future, and the EU is taking significant steps to transform the food system into a more sustainable and environmentally friendly one.

The project Cities2030 also integrates the pertinent components of the United Nations' (UN) agenda and policy framework, such as the Framework Convention on Climate Change (UNFCCC) [28], UN Decades, UNIDO,

[25] Council provides political guidance on international cooperation, open science and European missions, Council of the European Union, June 2022
[26] Open Science, the European Commission, Research and innovation, May 2023
[27] Valuing the diversity of research methods to advance nutrition science, Mattes D. R. et al. in *Advances in Nutrition*, July 2022
[28] Protecting the climate and achieving food security, the UNFCCC, June 2021

UN World Food Programme (WFP), etc. Most prominently, Cities2030 integrates the Sustainable Development Goal n.º 11 (SDG-11) [29] e.g., "Make cities inclusive, safe, resilient and sustainable", and the UN's New Urban Agenda,[30] which is a global strategy for sustainable urban development adopted at the United Nations Conference on Housing and Sustainable Urban Development (Habitat III) held in Quito, Ecuador in October 2016. The document sets out a vision for cities that are inclusive, safe, resilient, and sustainable, and provides a roadmap for achieving this vision. The table 2 (below) outlines the project Cities2030's key CRFS features embodying the sphere within which ethics in CRFS is discussed.

Table 2 – Project Cities2030 key features of CRFS

Key feature	Short description	Reference
Production (primary)	Primary food production is defined as the major food sources and methods of agriculture, i.e., cultivation of animals, plants, and fungi, for food, fiber, biofuel, medicinal, and other products used to sustain and enhance human life, and includes farming animals, horticulture, commercial fishing, and aquaculture.	*Food Products and Ingredients: Primary Food Production*, by C.E. Devine in the book 'Reference Module in Food Science'
Processing	Food processing can be defined as the set of operations or techniques used to transform raw agricultural products, such as grains, fruits, vegetables, meat, and dairy products, into processed foods that are safe to eat, have a longer shelf life, and meet consumer demands for taste, convenience, and nutrition.	*Food processing and production facility overview*, Nathan Mahr, Study.com, February 2022
Distribution	Food distribution globally can be defined as the process of moving food from areas where it is produced or stored to areas where it is needed for consumption. The goal of global food distribution is to ensure that there is enough food available to meet the nutritional needs of people in different parts of the world, while also maintaining food security.	*A Brief Note on Food Distribution*, by Regina Nguyen, in Journal of Food: Microbiology, Safety & Hygiene, November 2022
Markets	The European food retail consumption market refers to the industry that includes the sale of food and beverages through various channels, including supermarkets, hypermarkets, discounters, convenience stores, online retailers, and others. This market encompasses both perishable and non-perishable food items and includes products such as fresh produce, dairy products, meat, bakery items, packaged foods, and beverages.	*Going forward! Europe's food retail sector in the corona-year 2020: the storm of the century*, CROSS Medien und Verlags GmbH, April 2021
Consumption	Food consumption refers to the amount and type of food that is consumed by the population of the continent. The food consumption patterns vary widely depending on factors such as cultural traditions, regional availability of ingredients, and personal preferences.	*Food consumption behaviours in Europe – Drivers and trends*, project VALUMICS, funded by the European Union's Horizon 2020 research and innovation programme under the grant agreement No 727243, June 2021
Waste	Food waste refers to the intentional or unintentional discarding of food that is still safe and edible for human consumption. In Europe, it is a significant issue, with an	*Food waste definition*, project FUSIONS, funded by the European Union's FP7 research and innovation

[29] SDG-11, The United Nation, June 2015
[30] New Urban Agenda, The United Nation, September 2016

Key feature	Short description	Reference
	estimated 88 million tonnes of food being wasted each year. This waste occurs via the food supply chain, from production to consumption, and can include food that is lost during harvesting, storage, processing, transport, and retail, as well as food that is thrown away by households and restaurants.	programme under the grant agreement No 311972, July 2016
Security	Food security refers to the condition where all people have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and preferences for an active and healthy life.	*Food security*, by Saskia de Pee et al. in Encyclopedia of Human Nutrition (Fourth Edition), March 2023
Ecosystem Services	Food ecosystem services refer to the benefits that humans derive from the natural ecosystems that support food production, such as forests, grasslands, wetlands, and oceans. These services include the provision of food, water, and raw materials, as well as the maintenance of soil fertility, pollination, pest control, nutrient cycling, and genetic diversity.	*Measuring what ecosystems do for us: new report on ecosystem services in the EU*, the European Commission, Energy, Climate change, Environment, May 2023
Livelihood, growth	A livelihood structure is the global combination of activities implemented by a standard household to ensure a living. For example, rural households often have numerous income entries, and practice a series of crop and livestock, farm, off-farm and non-farm occupations in several seasons to make a living.	*Engendering European alternative food networks through countertopographie*, by Renata Blumberg, in Anthropology of food, April 2022
Inclusion, equity	Food-based inclusion and equity refers to ensuring that everyone has equal access to nutritious and culturally appropriate food, regardless of their socio-economic status, race, ethnicity, gender, age, or any other factor that might affect their ability to access food.	*5 actions to promote equity and inclusion in our food systems*, by the Swedish International Agricultural Network Initiative (SIANI), April 2021

3. CHALLENGES

The recognition of the interconnectedness of environmental, social, and economic factors in shaping food systems is crucial in addressing the challenges facing our food systems today. Environmental factors such as climate change, land use, water availability, and biodiversity loss all have significant impacts on the production and distribution of food.

For instance, changes in weather patterns can affect crop yields, and deforestation can lead to soil erosion and degradation. Additionally, food production and transportation can also contribute to greenhouse gas emissions. Social factors such as poverty, inequality, and access to education and healthcare also play a significant role in shaping food systems.

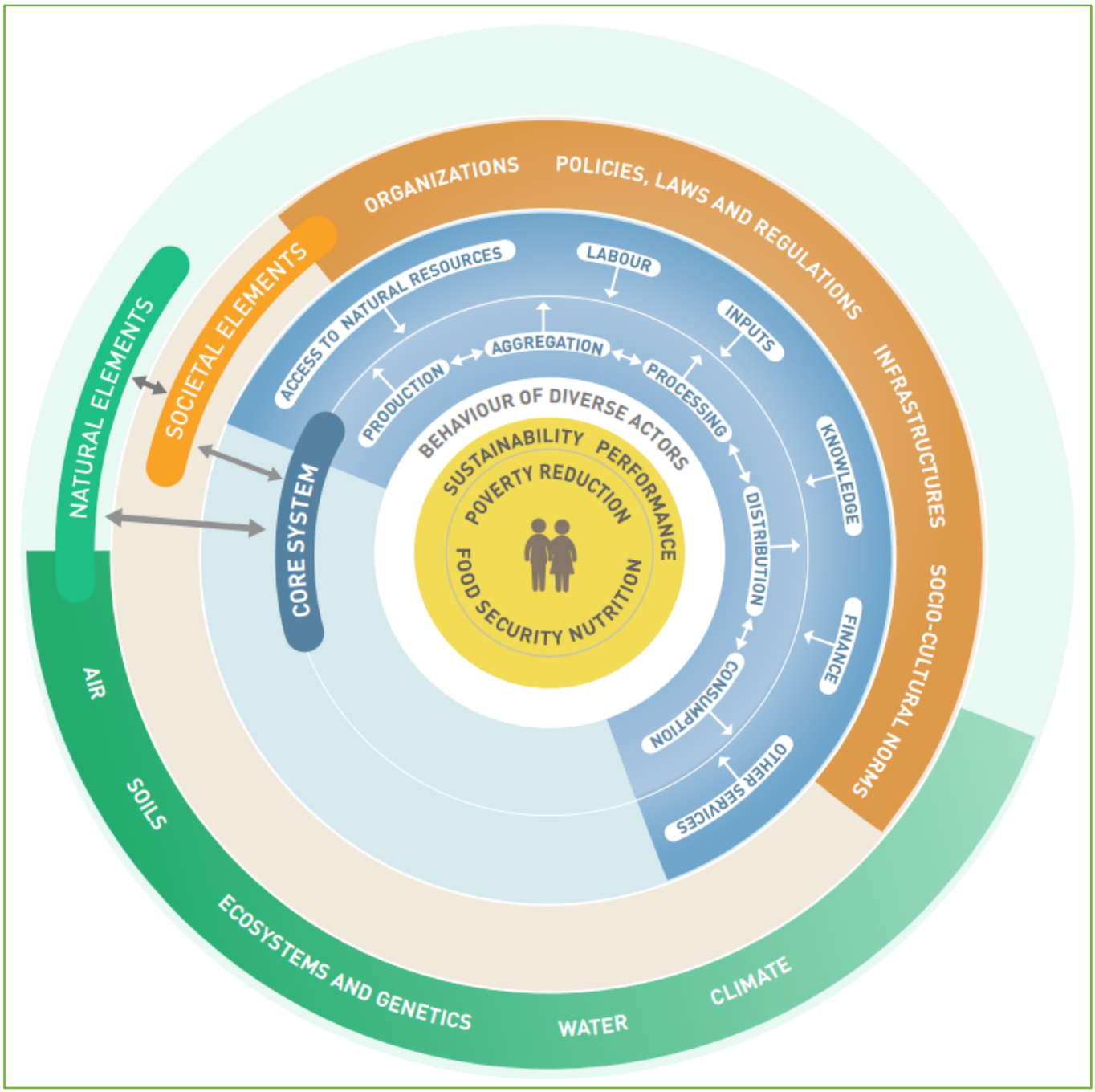
For instance, food insecurity is often closely linked to poverty and lack of access to healthcare. In addition, gender inequality can also affect access to resources and decision-making power in food systems. Economic factors such as market forces, trade policies, and subsidies also have significant impacts on food systems. For instance, trade policies can affect the availability and affordability of food, while subsidies can influence the production and consumption of certain types of food.

In October 2018, Hanh Nguyen, a Value Chain Development Consultant of the Sustainable Markets, Agribusiness and Rural Transformations Team at the Food and Agriculture Organisation of the United Nations (FAO), proposed a brief based on the training course "Introduction to sustainable food systems and value chains."[31].

The food system "wheel" framework, depicted in Figure 3a (below), part of the said brief and training course, is centered around FAO's main goals of poverty reduction, food security, and nutrition.

[31] Sustainable food systems – Concept and framework, Nguyen H. et al., the Food and Agriculture Organisation of the United Nations (FAO), October 2018

Figure 3a – The food system 'wheel' suggested by the FAO



The brief aimed to provide an overview of sustainable food systems and value chains and their importance in achieving global development goals, including those related to poverty reduction, food security, and environmental sustainability.

It highlighted the need for a systemic and collaborative approach to developing sustainable food systems and value chains, involving multiple stakeholders and taking into account the complexity of the food system.

The brief also provided practical guidance on how to analyse and design sustainable food systems and value chains, including identifying key actors and their roles, assessing market dynamics, and promoting inclusive business models. The brief was a valuable resource for policymakers, practitioners, and researchers working towards developing more sustainable food systems and value chains.

Developing integrated solutions that address all of these factors is crucial for creating sustainable and equitable food systems. In addition to the policies and actions you mentioned, it also involves promoting agroecological farming practices that prioritise biodiversity and ecosystem services, reducing food waste and inefficiencies in the food system, supporting research and innovation in sustainable food systems, and increasing access to renewable energy sources for food production and transportation. It also involves promoting circular economy approaches to waste reduction and resource recovery, as well as promoting inclusive governance and decision-making processes that focus on diverse perspectives and needs.

Addressing trade policies that enable corporate profits over sustainability and equity is also important. For example, trade agreements can include provisions that support small-scale farmers and sustainable agriculture practices, promote local food systems, and enable environmental and social standards in international trade. Additionally, promoting fair trade practices that facilitate equitable distribution of resources and power assisting to address these issues. Ultimately, a comprehensive and collaborative approach that involves multiple stakeholders is needed to create sustainable and equitable food systems that focus on the well-being of people, the planet, and the economy.

The project Cities2030 identifies a series of barriers, lock-ins, vulnerabilities, enablers and drivers to more sustainable CRFS.

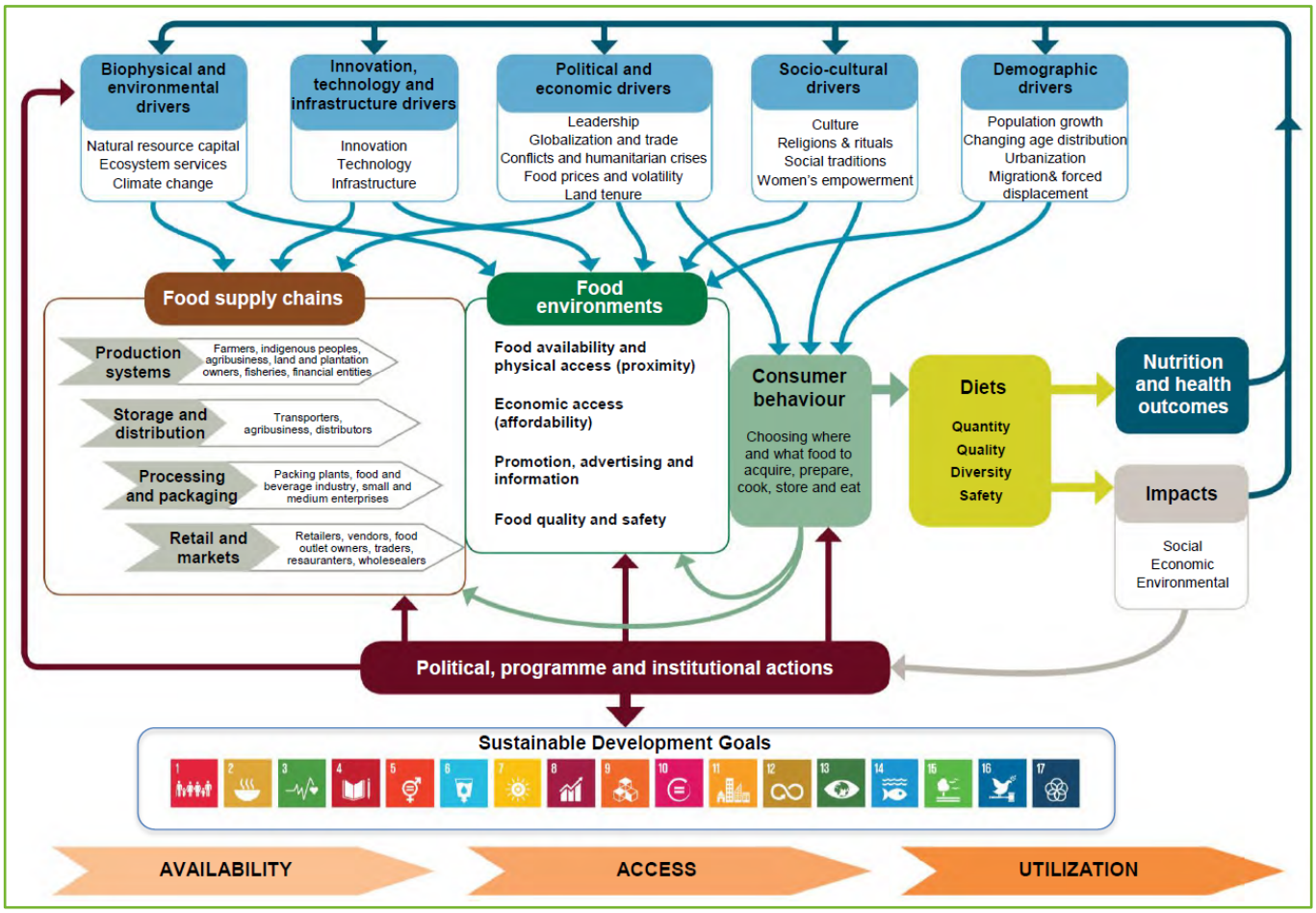
Among the barriers: climate change and its impact on crop yields and food security; dependence on fossil fuels for transportation and production; unsustainable water use and depletion of water resources, soil degradation and loss of soil fertility; unsustainable land-use practices, such as deforestation and urbanisation; overuse and pollution of water sources, including rivers, lakes, and oceans; unsustainable fishing practices and overfishing; pesticide and fertiliser runoff and contamination of soil and water sources; food waste and inefficiencies in the food system; unsustainable livestock farming practices and animal welfare issues Inadequate waste management and disposal of food waste and packaging; unsustainable supply chains and long-distance transportation of food; unsustainable food processing and packaging practices; air pollution from transportation and food processing; chemical pollution from industrial agriculture practices; loss of biodiversity and genetic erosion in crop and animal species; soil erosion and loss of topsoil; dependence on non-renewable resources, such as phosphorus and nitrogen; lack of recycling and circularity in the food system Inefficient use of energy and natural resources in the food system.

Among lock-ins: traditional and industrialised farming practices that focus on productivity over sustainability; dominance of large-scale industrial agriculture and food corporations in the food system; food system policies and incentives that favour industrialised agriculture over sustainable farming practices; societal values and expectations that focus on convenience and low-cost food over sustainability and quality; inadequate infrastructure for sustainable food systems, such as transportation and storage facilities; limited availability and access to locally produced and sustainably grown food; dependence on monoculture crops often vulnerable to pests and diseases; lack of access to financing for small-scale farmers and sustainable agriculture practices; limited access to markets for small-scale farmers and producers; resistance to change from traditional and industrialised food systems; lack of political will and investment in sustainable agriculture and food systems; limited public awareness and

education about the benefits of sustainable food systems; unsustainable land-use practices, such as deforestation and urbanisation; limited government support for sustainable agriculture and food systems; limited access to technology and innovation in sustainable food systems; limited diversity in crop and animal species due to industrialised agriculture practices; inequitable distribution of resources and power in the food system.

The Figure 3b (below) illustrates an example of conceptual framework of food systems by the High Level Panel of Experts (HLPE) on Food Security and Nutrition, which is a scientific body linked to the United Nations' Committee on World Food Security.[32]

Figure 3b – An example of conceptual framework of food systems by the HLPE



In terms of enablers and drivers: government policies and incentives that support sustainable agriculture and food systems; technological innovation and research in sustainable food systems; financial support for small-scale farmers and sustainable agriculture practices; public awareness and education about the benefits of sustainable food systems; collaborative partnerships and networks between stakeholders in the food system; sustainable farming practices that prioritise soil health and biodiversity; efficient and sustainable supply chains that reduce waste and emissions; incentives for local production and consumption of food; circular economy approaches to waste reduction and resource recovery; farm-to-table initiatives that focus on local, fresh, and

[32] Nutrition and food systems, HLPE Reports series, the United Nations' Committee on World Food Security, May 2017

sustainable food; sustainable and humane livestock farming practices; community-based food systems that enables local food production and distribution; agroecological farming practices that foster biodiversity and ecosystem services; consumer demand for sustainable and ethically produced food; fair trade practices that deliver on equitable distribution of resources and power; sustainable fisheries and aquaculture practices, access to renewable energy sources for food production and transportation; climate-smart agricultural practices that focus on resilience and adaptation; inclusive governance and decision-making processes that focus on diverse perspectives and needs; partnerships between producers, consumers, and policymakers to drive systemic change towards more sustainable food systems.

The case of current CRFS monitoring frameworks: 'ethics' and 'social justice' are not prominent indicators in most of food systems monitoring frameworks, compared to, for instance, those of the MUFPP. Traditionally, food systems monitoring frameworks have primarily focused on factors such as production efficiency, economic viability, and food safety.[33] However, there is a growing recognition of the need to incorporate ethics and social justice considerations into these frameworks.[34] Ethics in food systems involves questions about fair treatment, equity, and the impacts of food production and consumption on various stakeholders, including farmers, workers, consumers, and the environment. Social justice considerations address issues such as access to nutritious food, fair wages, workers' rights, and the well-being of marginalized communities. In recent years, there has been an increasing awareness of the importance of incorporating ethics and social justice into food systems monitoring frameworks.[35] This shift reflects a broader understanding that a sustainable and resilient food system should not only focus on economic and environmental aspects but also on the well-being and rights of individuals and communities involved in the system. Efforts are underway to develop more comprehensive monitoring frameworks that integrate ethics and social justice indicators.[36] This includes considering factors such as labor conditions, equity in access to resources and opportunities, the impact on vulnerable communities, and the promotion of sustainable and culturally appropriate food practices. It is worth noting that these considerations are often context-specific and can vary across regions and cultures. Therefore, it is essential to engage diverse stakeholders, including communities, activists, and policymakers, in the development of monitoring frameworks to ensure that they reflect the unique ethical and social justice concerns of each specific food system. Overall, while ethics and social justice have not traditionally been prominent indicators in many food systems monitoring frameworks, there is a growing recognition of their importance. Efforts are being made to integrate these considerations into monitoring frameworks to create more holistic and equitable approaches to food production, distribution, and consumption.

4. PATHWAYS

Cities2030 proposes a tentative deployment framework for more ethical CRFS, characterised by structured, ecosystem-enhancing and quintuple helix pathways for action. These pathways aim to provide a basis for Research and Innovation Action (RIA) in diverse areas of science, technology, policy, governance and the society as a whole, relevant to building up from the European Union and 'Associated countries' (EUAC) agendas, and beyond. The pathways represent key levers of change where RIA aim to have interlinked and mutually supportive impacts in realising a more ethical food system setting, incorporating participatory governance, to facilitate the transition to sustainable features. The relevance of each pathways impact and co-benefits to the four different EU

[33] A framework for examining justice in food system transformations research, Whitfield S. et al. in Nature Food, June 2021
[34] Viewpoint: rigorous monitoring is necessary to guide food system transformation in the countdown to the 2030 global goals, Fanzo j. et al. in Food Policy, October 2021
[35] Assessing sustainable food and nutrition security of the eu food system – An integrated approach, Zurek M. et al. in sustainability, November 2018
[36] Just transition principles and criteria for food systems and beyond, Tribaldos T. et al. in Environmental Innovation and Societal Transitions, June 2022

FOOD2030 priorities is delineated in Table 4.1.1, while the individual chapters for each pathway outlines the systemic challenges, the expected co-benefits, barriers, lock-ins, vulnerabilities, enablers and drivers of change, and highlights potential RIA areas calling for further consideration and investment.

4.1 Framework

4.1.1 FOOD2030

The Food2030 is a research and innovation policy framework of the European Union that aims to transform European food systems to become more sustainable, resilient, and inclusive by the year 2030. The policy framework was launched in 2016 by the European Commission and is based on five strategic priorities: nutrition for sustainable and healthy diets; climate-resilient and environmentally sustainable food systems; circularity and resource efficiency of food systems; innovation and empowerment of communities.

The Food2030 policy aims to create a more coordinated, holistic, and integrated approach to research and innovation in food systems, involving multiple sectors and stakeholders, including industry, academia, civil society, and policymakers. It emphasises the need for more sustainable and healthy food production and consumption, the importance of addressing the environmental and social impacts of food systems, and the role of innovation and research in driving systemic change. Ultimately, the goal of the Food2030 policy is to create a more sustainable, equitable, and resilient food system that can contribute to the achievement of the United Nations' Sustainable Development Goals. Naturally, the Food2030 research and innovation policy framework of the European Union is closely correlated to other EU policies and agendas, which are all taken into account by the project Cities2030, especially the Biodiversity Strategy, the Common Agricultural Policy (CAP), which is the EU's main policy for supporting agriculture and rural development, the EU Green Deal 'umbrella', which aims to make the EU's economy sustainable, reduce greenhouse gas emissions, and protect the environment, and ultimately the pertinent Sustainable Development Goals (SDG).

SDG-11 especially, titled "sustainable cities and communities", one of 17 Sustainable Development Goals established by the United Nations General Assembly in 2015, focused on making cities and human settlements inclusive, safe, resilient, and sustainable. While this goal does not directly address food systems, there are important connections between SDG 11 and sustainable food systems. One of the key connections is that urban areas play a significant role in food production and consumption. As more people move to cities, the demand for food in urban areas is increasing. This presents both opportunities and challenges for creating sustainable food systems as outlined next.

Creating sustainable food systems may assist achieving SDG 11 by promoting food security e.g., sustainable food systems ensure that people have access to safe, nutritious, and affordable food. This helps to address food insecurity and malnutrition in urban areas. Also, sustainable production, via practicing urban farming methods of food production that minimise the use of natural resources, reduce waste, and protect the environment. This assists reducing the environmental footprint of urban areas and create more sustainable cities. Resilience e.g., sustainable food systems are more resilient to shocks such as climate change, natural disasters, and pandemics. This assists urban areas to adapt and recover more quickly from these challenges. Local economies, via supporting local economies by promoting small-scale and community-based food production and distribution. This can create jobs and economic opportunities in urban areas. The Table 4.1.1 (below) outlines Relevance of the pathways for the FOOD2030 priorities.

Table 4.1.1 – Relevance of the pathways for the FOOD2030 priorities

Field	Pathway	Nutrition	Climate	Circularity	Innovation
Environment	Eco-system enhancing farming practices: EU new CAP eco-schemes	+	+++	+++	
	Nature-based solutions: *subtitle*	+	+++	+++	+++
	Integrate the Water Energy Food Ecosystem nexus	+	+++	+++	+
Economics	Food data transparency	+++	+++	+++	+++
	Ethical trade standards and responsible sourcing	+++	+++	+	++
	Sustainable urban farming: short food supply chains	++	+++	+	++
	Place-based food sharing economies:	+++	+++	+++	+++
Societal	Theory of change: from food 'system' to food 'environment'	+++	+++	+++	+++
	Third party certification programme: participatory governance	+++	+++	+++	+
	A common food policy for the EU: *subtitle*	+++	+++	+++	+++

4.1.2 The Milan Urban Food Policy Pact (MUFPP)

The MUFPP[37] is a global initiative that aims to promote sustainable food systems and address the challenges of urbanization, food security, and nutrition. It was launched in October 2015 at the Milan Expo, where mayors and representatives from cities around the world gathered to discuss and commit to sustainable food policies. The pact recognizes the significant role that cities play in shaping food systems, as more than half of the world's population lives in urban areas. It emphasizes the importance of collaboration and knowledge sharing among cities to develop innovative solutions for food-related issues. Key principles of the Milan Urban Food Policy Pact include those outlined next.

Food security and nutrition: ensuring access to safe, nutritious, and culturally appropriate food for all city residents. Sustainable diets and nutrition education: Promoting healthy and sustainable dietary patterns, as well as providing education on nutrition and food choices. *Social and economic equity:* addressing inequalities in access to food, reducing food waste, and creating opportunities for local food production and distribution. *Urban agriculture and biodiversity:* supporting urban agriculture and the preservation of biodiversity to enhance food production and strengthen local food systems. *Food waste reduction:* implementing strategies to reduce food waste and loss throughout the food supply chain, from production to consumption. *Climate change resilience:* developing strategies to mitigate the impact of climate change on food systems and promoting climate-smart agriculture. *Food governance:* strengthening governance systems and involving all stakeholders, including civil society organizations, in decision-making processes related to food policies.

Cities that sign the pact commit to implementing these principles and working towards sustainable food systems within their jurisdictions. The pact encourages cities to share best practices, collaborate on research and policy development, and monitor progress towards achieving the goals outlined in the pact. The Milan Urban Food Policy Pact has gained significant global support, with over 200 cities from around the world signing the agreement as of 2021. By mobilizing cities to take action, the pact aims to contribute to the United Nations' Sustainable Development Goals, particularly those related to eradicating hunger, promoting sustainable agriculture, and ensuring healthy lives and well-being for all.

4.1.3 Sustainable transition

There are a vast number of approaches to contribute to the transition towards more sustainable food systems and CRFS, suggested and led by a panoply of actors of food value chains, including structures supported by the

[37] The Milan Urban Food Policy Pact, May 2023

EU e.g., the European Institute of Innovation and Technology Food (EIT food) or the Directorate-General for Health and Food Safety. These approaches are often correlated to a 'theory of change' model which aim is to contribute to modelling sustainable food system development, and which may derive from different paradigms such as the "structure-conduct-performance" [38].

Cities2030 proposes a theory of change combining different Social Sciences and Humanities (SSH) where the definition of 'Simplified Urban Socio-Ecological Food Systems" is the key feature (see chapter 4.10).

Modelling approaches provide better knowledge on imperceptible features (costs, impact, etc.), whilst assisting the key actors in food systems in understanding how the said features impact on food systems, and it can also be used to influence decisions to escape from unsustainable path dependencies.

A 'Theory of Change' (TCh) provides the framework to pathways to implementation in correspondence with the holistic initiatives and pathways suggested by the project Cities2030. In addition, a TCh is defined as a foundation for planning intervention in a given programme or mission landscape. Developing a TCh enables to identify avenues within which actions can best achieve their intended objectives. The TCh approach also characterises prerequisites considered necessary to attain the projected goals.

The project Cities2030's TCh ambitions to answer to the prospect that knowledge and metrics on externalities, as assessed via valuation tools and the framework suggested by the project Cities2030, can be practiced to influence and encourage decision makers to redirect resources, products or practices so as to achieve greater sustainability in targeted food systems. The prominent preconditions or entry points to facilitate transition and change in the food system encompasses informed actors, well-suited authority relations, and enabling political and economic environments.

The cornerstones of the TCh proposed by Cities2030 is embodied by supportive participatory governance systems, and enabling institutions as building blocks (including rulebooks) and attitudes (both worldviews and values). However, the precise (e.g., place-based) composite of apropos entry points are context specific, consistent to city- and region-based value chain conditions and a corresponding constellation of actors.

Besides the said TCh, a series of evidence-based practices are suggested to promote more ethical CRFS e.g., farming practices, Nature-based Solutions, enhancement of the Water Energy Food Ecosystem nexus.

4.2 Labor work

The food industry relies heavily on labor, with numerous workers involved in various stages, from farming and harvesting to processing, packaging, and serving. Food ethics and labour work are interconnected topics that involve considerations of fairness, sustainability, and social responsibility within the food industry.[39] Labor work in the food industry can raise several ethical concerns, and among them those outlined next. *Fair wages and working conditions:* many food workers, particularly in low-skilled positions, face issues such as low pay, long hours, lack of benefits, and unsafe working conditions.

These concerns intersect with social justice and workers' rights movements. *Migrant labor:* migrant workers, often from disadvantaged backgrounds, may face exploitation, unsafe working conditions, and limited legal protections. *Child labor:* the use of child labor in certain regions or sectors of the food industry is a serious ethical concern that violates human rights and hinders children's development. *Forced labor:* in some instances, workers

[38] Sustainable food systems – Concept and framework, Nguyen H. et al., the Food and Agriculture Organisation of the United Nations (FAO), October 2018
[39] Social sustainability in the food value chain: what is and how to adopt an integrative approach?, Toussaint M. et al. in Quality & Quantity, September 2021

may be subjected to forced labor, human trafficking, or debt bondage, particularly in regions with weak labor laws and enforcement.

The project Cities2030 proposes that fair labor practices could integrate ethical trade standards to prioritise fair treatment of workers, including safe and healthy working conditions, fair wages, reasonable working hours, and the right to organise and bargain collectively. Also, this would discourage the use of child labor and any form of forced labor.[40]

Worker empowerment and collaboration could be a key factor of ethical CRFS pathways. Some organisations work directly with workers, labor unions, and communities to empower them, advocate for their rights, and promote transparency in the food system.[41] These efforts often involve educating workers about their rights, providing training programmes, and fostering collaboration between stakeholders.

4.3 Farming practices

The project Cities2030, which aligns with the EU Policy FOOD 2030, suggests that the eco-system enhancing farming practices promoted by the implementation of "eco-schemes" within the EU's new Common Agricultural Policy (CAP)[42], can play a significant role in promoting ethical food systems in cities and regions.[43]

The concept of eco-schemes within the CAP refers to voluntary agricultural practices that go beyond the basic requirements for receiving direct payments.[44] These practices aim to enhance environmental sustainability, biodiversity, and ecosystem services. By incentivising farmers to adopt such practices, eco-schemes contribute to more sustainable and ethical farming methods.

Food ethics refers to the moral considerations and values associated with food production, including issues such as animal welfare, fair trade, and the impact of agriculture on local communities. Eco-schemes, on the other hand, are measures aimed at enhancing the environmental performance of farming practices and promoting sustainability.

Within the context of the CAP, there have been efforts to integrate elements of food ethics and eco-schemes into agricultural policies. The latest reform of the CAP, which was agreed upon in 2020 and projected to be implemented from 2023 onwards, includes several provisions related to more ethical setting, outlined next, though ethical concerns are still in debate among experts' representative of food systems and value chains.

Environmental Sustainability: the CAP has been criticised for its historical focus on maximising production, which has led to negative environmental consequences such as soil degradation, water pollution, and biodiversity loss. In recent years, there has been a shift toward greener policies, with a stronger emphasis on sustainable farming practices, agroecology, and biodiversity preservation.

Animal Welfare: which is an important ethical concern in agriculture. The CAP includes measures to improve animal welfare standards, including regulations on housing conditions, transportation, and slaughter. However, critics argue that these standards are not always stringent enough, and more efforts are needed to ensure better treatment of animals.

[40] 7 million children are suffering in Europe's coffee supply chain, Fernando Morales-de la Cruz, EURACTIV, January 2021
[41] 15 Organizations supporting farm and food workers, Sophie Churchill, Foodtank, May 2023
[42] The common agricultural policy: 2023-27, the European Commission, agriculture and rural development, December 2021
[43] Making better policies for food systems, Organisation for Economic Co-operation and Development (OECD), January 2021
[44] Will CAP eco-schemes be worth their name?, Nyssens C. et al. BirdLife Europe, European Environmental Bureau, WWF European Policy Office, November 2021

Social justice: the CAP has implications for social justice and rural development. It aims to support farmers and maintain rural communities by providing financial assistance, promoting employment, and addressing regional disparities. However, there are concerns that the distribution of CAP funds may not always be equitable, with larger farms and wealthier landowners benefiting more than small-scale farmers or disadvantaged regions.

Food security and food sovereignty: the CAP plays a role in ensuring food security within the EU by promoting agricultural productivity and stable food supplies. However, there are ethical debates about the balance between supporting domestic production and considering the impact of CAP policies on farmers in developing countries. Critics argue that CAP subsidies can distort global markets and harm farmers in less developed regions, undermining their food sovereignty.

Health and food safety: the CAP also intersects with ethical considerations regarding public health and food safety. The EU has regulations in place to ensure the safety and quality of agricultural products, including standards for pesticide use, animal feed, and labelling. Ethical concerns arise when these regulations are not adequately enforced or when there are conflicts between agricultural practices and public health objectives.

Transparency and accountability: the CAP has been criticised for lacking transparency and accountability, particularly regarding the allocation of subsidies and the decision-making process. Calls for greater transparency aim to ensure that CAP funds are used efficiently and ethically, and that the policy is aligned with the broader public interest.

More practically, over the years, the European Union has been working to address these ethical concerns and reform the CAP to make it more sustainable, equitable, and socially responsible. The recent CAP reform for the period 2021-2027 includes more ambitious environmental objectives, a greater focus on climate action, increased support for rural development, and an emphasis on fairer distribution of subsidies.

Under the new CAP, Member States are required to dedicate at least 25% of their direct payments to farmers towards eco-schemes. These schemes incentivise and reward farmers for adopting environmentally friendly practices, such as organic farming, agroforestry, and the preservation of biodiversity. By linking financial support to sustainable practices, the CAP aims to promote more ethical and environmentally conscious approaches to food production.

Furthermore, the CAP reform encourages the integration of environmental considerations into farmers' management practices through a concept called "conditionality." This means that farmers will have to comply with certain environmental and climate-related standards to receive full direct payments. These standards include measures to protect water resources, reduce greenhouse gas emissions, and enhance soil health.

While the new CAP reform represents progress in integrating sustainability and environmental concerns into EU agricultural policies, some critics argue that it does not go far enough. They argue for more ambitious targets and stricter regulations to address issues such as intensive livestock farming, pesticide use, and the overall environmental impact of agricultural practices.

It's worth noting that the specific policies and regulations related to food ethics and eco-schemes may vary among Member States as they have some flexibility in implementing the CAP. Therefore, the practical implementation of these principles can differ across the EU. In the context of Cities2030, it is suggested that integrating eco-system enhancing farming practices (EFP) into CRFS may deliver several positive impacts. A few ways in which it can drive ethics in food systems are outlined next.

Environmental sustainability: EFP prioritise environmental sustainability by promoting soil health, reducing chemical inputs, preserving biodiversity, and conserving water resources. The CAP recognises the importance of environmental stewardship and promotes sustainable farming practices. It encourages farmers to adopt methods that reduce the environmental impact of agricultural activities, such as promoting organic farming, agroforestry, crop diversification, and the use of environmentally friendly techniques. By adopting these practices, cities and regions can support agricultural systems that are ecologically responsible and contribute to long-term environmental well-being.

Animal welfare: the CAP includes provisions and regulations to protect the welfare of farm animals. It emphasises the need for appropriate housing, feeding, and handling of animals, as well as measures to prevent unnecessary suffering and ensure their well-being.

Local food production: encouraging EFP in cities and regions can foster local food production. This reduces reliance on long-distance transportation and associated carbon emissions, leading to a lower carbon footprint for the food system. Additionally, promoting local food production can enhance food security and resilience, as it reduces dependence on external sources of food.

Food safety and quality: the CAP places significant importance on ensuring the safety and quality of food produced within the EU. It establishes standards and regulations related to food production, processing, labelling, and traceability to protect consumers' health and interests.

Access to healthy and nutritious food: by incorporating eco-system enhancing practices, food systems can focus on the production of diverse and nutritious food. This includes promoting organic farming, agroecological approaches, and sustainable aquaculture, which can improve the availability of healthy food options for urban and regional populations.

Social and economic benefits: supporting EFP can generate social and economic benefits. The CAP recognises the social and economic aspects of agriculture and rural communities. It aims to support rural development, improve living conditions, and create economic opportunities in agricultural areas. It also emphasises the need for fair and transparent market practices, including measures to address market imbalances and support small-scale farmers. The CAP is projected to deliver on employment opportunities in the agricultural sector, foster local entrepreneurship, and strengthen community ties through initiatives such as community-supported agriculture (CSA) or farmers' markets. The aforementioned practices also contribute to the preservation of cultural heritage and traditional farming practices.

Ethical trade: the CAP acknowledges the importance of ethical trade practices and fair conditions for agricultural workers. It supports fair trade initiatives, encourages responsible supply chains, and promotes social responsibility within the agricultural sector.

Biodiversity and landscape preservation: the CAP promotes the conservation of biodiversity and the preservation of cultural landscapes. It includes measures to protect and restore habitats, promote sustainable land management practices, and preserve traditional farming methods that contribute to biodiversity and landscape diversity.

Education and awareness: integrating eco-system enhancing practices into urban and regional food systems can serve as a platform for education and raising awareness about sustainable farming. It offers opportunities for citizens to connect with local food producers, understand the value of sustainable agriculture, and make informed choices as consumers.

The Common Agricultural Policy (CAP) is an important policy framework implemented by the European Union (EU) to support and regulate agriculture, including the production of food. While the CAP does not explicitly focus on food ethics or eco-schemes, it has undergone significant reforms in recent years to address sustainability and environmental concerns.

It's worth noting that the CAP has undergone significant reforms in recent years, and its ethical considerations continue to evolve. By embracing EFP, as advocated by the EU's new CAP and the Cities2030 project, cities and regions can create more ethical and sustainable food systems. These practices promote environmental stewardship, support local economies, enhance access to nutritious food, and foster community engagement, thereby contributing to a more sustainable and ethical future for food production and consumption.

4.4 Nature-based solutions

Nature-based solutions (NBS) in food refer to approaches and strategies that utilise and enhance natural ecosystems to address challenges related to food production, sustainability, and resilience.[45] These solutions aim to harmonise agricultural practices with ecological processes, fostering the conservation and restoration of natural resources while ensuring food security and improving livelihoods. NBS in food can encompass various aspects, including farming methods, land management, biodiversity conservation, and ecosystem services.[46] NBS in food not only address environmental challenges but also promote social and economic benefits. NBS enhance food security, promote sustainable livelihoods, mitigate climate change impacts, and support the preservation of cultural and traditional practices related to food production. A few examples are outlined next.

Agroforestry: this practice combines trees and crops or livestock in the same agricultural system. It promotes biodiversity, enhances soil fertility, conserves water, and provides multiple products, such as food, timber, and medicinal plants.

Sustainable land management: implementing practices like terracing, contour ploughing, and cover cropping can prevent soil erosion, improve soil health, and increase water retention capacity. These approaches help maintain agricultural productivity while minimising environmental degradation.

Conservation agriculture: this approach involves minimal soil disturbance, permanent soil cover through crop residues, and crop rotation to enhance soil health, water retention, and carbon sequestration. It reduces the use of synthetic inputs and improves long-term sustainability.

Wetland restoration and conservation: protecting and restoring wetlands like marshes, swamps, and floodplains can provide natural water filtration, flood regulation, and habitat for wildlife. These ecosystems also support the production of rice, fish, and other aquatic food resources.

Sustainable fisheries and aquaculture: adopting responsible fishing practices, implementing marine protected areas, and practicing environmentally friendly aquaculture techniques help maintain fish stocks, protect marine biodiversity, and ensure sustainable seafood production.

Pollinator conservation: encouraging pollinators, such as bees and butterflies, through the preservation of natural habitats and the reduction of pesticide use, supports crop pollination and promotes food production.

Urban agriculture and green infrastructure: cultivating food in urban areas, such as community gardens, rooftop farms, and vertical farming, contributes to local food production, reduces food miles, and enhances urban resilience.

[45] Nature-based Solutions, the International Union for Conservation of Nature and Natural Resources (IUCN), May 2023
[46] Nature-based Solutions for cities, the International Union for Conservation of Nature and Natural Resources (IUCN), May 2023

Green infrastructure, including urban parks and green spaces, helps regulate urban temperatures, improve air quality, and provide recreational areas. Promoting the cultivation of food within cities through rooftop gardens, community gardens, and vertical farming not only provides fresh produce but also improves food security, reduces food miles, and enhances social cohesion.

NBS use natural elements and processes to address various urban challenges while enhancing the resilience and sustainability of cities. Some examples of NBS in cities are outlined next, that can be combined with food production systems.

Green roofs and walls: installing vegetation on rooftops and vertical surfaces helps regulate temperature, reduce energy consumption, improve air quality, and mitigate stormwater runoff.

Urban parks and gardens: creating green spaces within cities provides recreational areas for residents, supports biodiversity, reduces the urban heat island effect, and enhances air quality.

Urban forests: planting and preserving trees in urban areas help combat air pollution, reduce heat, improve stormwater management, and enhance the overall aesthetic appeal.

Permeable pavements: using porous materials for pavements and sidewalks allows rainwater to infiltrate the ground, preventing runoff and replenishing groundwater supplies.

Constructed wetlands: building artificial wetlands in urban areas helps treat wastewater, filter pollutants, provide habitats for wildlife, and reduce flood risks.

Blue-green infrastructure: integrating natural water features such as ponds, swales, and rain gardens into urban landscapes helps manage stormwater, improve water quality, and create attractive recreational spaces.

Natural water systems: restoring and protecting natural water bodies like rivers, streams, and lakes in urban areas helps maintain aquatic ecosystems, regulate water flow, and provide recreational opportunities.

Biodiversity corridors: establishing interconnected green corridors and wildlife habitats across urban areas supports biodiversity, allows for species migration, and enhances the resilience of ecosystems.

Coastal and riverine ecosystem restoration: rehabilitating and protecting coastal areas and riverbanks through measures like mangrove restoration, dune stabilisation, and riverbank vegetation helps mitigate erosion, protect against storm surges, and maintain coastal and riparian ecosystems.

4.5 Water Energy Food Ecosystem nexus

The water-energy-food-ecosystem nexus (WEFE-Nexus) refers to the interdependencies and interactions between water, energy, food production, and ecosystems.[47] It recognises that these systems are interconnected and that changes or disruptions in one component can have significant impacts on the others.

Understanding and managing the WEFE-Nexus is crucial for sustainable development. Integrated approaches that consider the interactions between these components can help identify synergies, trade-offs, and potential solutions. Examples include adopting water-efficient agricultural practices, promoting renewable energy sources with minimal water requirements, and protecting and restoring ecosystems to enhance resilience and support food and water security.

[47] Implementing the water-energy-food-ecosystems nexus, the United Nations Educational, Scientific and Cultural Organisation (UNESCO), May 2021

By understanding the intricate interconnections among these systems, policymakers, researchers, and stakeholders can forge integrative methodologies that guarantee the optimal utilisation of resources, mitigate detrimental effects, and pave the way for sustainable long-term development.

Recognizing the interdependencies of these systems allows the said actors of food systems to adopt a comprehensive and interconnected approach. Instead of treating each system in isolation, they can develop holistic strategies that consider the intricate relationships and feedback loops between them. This system thinking approach enables a more nuanced understanding of how actions in one system can have cascading effects on others.

These holistic strategies prioritise the efficient use of resources by emphasizing their sustainable management and allocation across systems. By identifying opportunities for synergy and collaboration, policymakers can design interventions that maximise resource efficiency and minimise waste. This approach helps optimise resource allocation and ensures their availability for future generations.

Moreover, by acknowledging the interdependencies, stakeholders can actively work towards minimizing negative impacts on the interconnected systems. They can identify potential risks, unintended consequences, and trade-offs that may arise from their actions. Through proactive measures such as impact assessments, adaptive management, and effective governance structures, stakeholders can mitigate adverse effects and promote resilience within the systems.

The ultimate goal of recognizing interdependencies is to promote long-term sustainability. By taking a holistic approach, policymakers and researchers can better understand the complex dynamics of interconnected systems and design interventions that address root causes rather than symptoms. This can lead to more durable and sustainable solutions that have a positive impact across multiple systems.

In summary, recognizing the interdependencies of these systems empowers policymakers, researchers, and stakeholders to develop comprehensive strategies that optimise resource use, minimise negative impacts, and foster long-term sustainability. By adopting a holistic approach, we can navigate the complexities of interconnected systems and promote a more resilient and prosperous future.

A breakdown of each component of the WEFE-Nexus is outlined next.

Water: it is a fundamental resource required for various purposes, including agriculture, energy production, and human consumption. Water scarcity or pollution can affect food production, energy generation, and ecosystem health. Inefficient water management practices can strain resources and lead to conflicts over water allocation. Water is essential for agriculture, energy production, and ecosystem health. It is used for irrigation in agriculture, cooling and steam generation in energy production, and provides habitat and sustenance for various ecosystems. However, water scarcity, pollution, and mismanagement can affect food production, energy generation, and ecosystem health. Here, the project Cities2030 proposes that efficient and sustainable irrigation practices, water conservation, and fair distribution of water resources are vital considerations for ethical CRFS.

Energy: its production requires water for cooling power plants, extracting and refining fuels, and generating hydropower. Conversely, energy is needed to extract, treat, and distribute water for human consumption and agriculture. The energy-water relationship is known as the water-energy nexus. Energy is required for food production, processing, and transportation. It is also used to extract, treat, and distribute water. Different sources of energy have varying environmental impacts, such as greenhouse gas emissions and water consumption.

Unsustainable energy practices can deplete natural resources and harm ecosystems. Ethical issues related to energy use in the food system include climate change impacts, resource depletion, and social justice concerns. The reliance on fossil fuels and greenhouse gas emissions from energy generation contribute to climate change, which affects food security and disproportionately impacts vulnerable communities. The project Cities2030 acknowledges that transitioning to renewable and sustainable energy sources is essential to mitigate the said ethical concerns.

Food: agriculture depends heavily on water for irrigation, livestock, and crop production. Water availability and quality directly influence agricultural productivity. Similarly, food production requires energy inputs, such as machinery, fertilisers, and transportation, creating a link between the food and energy sectors. Agriculture accounts for a significant portion of water use and can contribute to water pollution through the use of pesticides and synthetic fertilisers, that can harm ecosystems, soil health, and human health, leading to ethical concerns regarding the impact on biodiversity, ecological balance, and food safety. Animal welfare is another important aspect of food ethics, as factory farming practices often involve cruelty and suffering. Furthermore, the conversion of natural habitats for agricultural purposes can lead to ecosystem degradation and loss of biodiversity. Here, the project Cities2030 proposes that promoting sustainable and ethical agricultural practices, such as organic farming and regenerative agriculture, can address these concerns.

Ecosystems: they provide essential services, such as water purification, nutrient cycling, and climate regulation, which are critical for agriculture and maintaining overall environmental health. Changes in water availability, pollution, or habitat destruction can disrupt ecosystems, impacting biodiversity and the provision of these services. Ecosystems provide essential services for human well-being, including regulating water quality and quantity, supporting pollination and pest control for food production, and sequestering carbon. Protecting and preserving ecosystems are fundamental ethical imperatives. Agriculture should be conducted in a way that minimises negative impacts on biodiversity, soil health, and ecosystem services. However, human activities such as deforestation, pollution, and habitat destruction can disrupt ecosystems, impacting their ability to provide these services. Here, the project Cities2030 encourages practices such as agroforestry, conservation agriculture, and land-use planning can help ensure the sustainable use of natural resources and protect ecosystem integrity.

Food ethics relates with the moral and ethical implications of food production, consumption, and distribution. Ethical considerations in the WEFE-Nexus include ensuring equitable access to water and food, minimizing environmental impacts, promoting sustainable farming practices, and addressing issues of social justice and animal welfare in food production. Some key ethical questions related to the WEFE-Nexus include those outlined next.

Equity: are water and food resources distributed equitably, and how can access to these resources be ensured for all individuals and communities?

Sustainability: are agricultural practices environmentally sustainable, minimizing water use, energy consumption, and ecosystem degradation?

Social justice: are workers involved in food production treated fairly and paid a living wage? Are the rights of indigenous communities and small-scale farmers respected?

Animal welfare: are animals raised for food treated humanely, and are their welfare needs considered in production systems?

Food waste: how can food waste be minimised throughout the supply chain to ensure efficient use of resources and reduce the environmental impact of food production?

Addressing the aforementioned ethical considerations requires collaboration among various stakeholders, including governments, businesses, civil society organisations, and consumers. Cities2030 confirms that sustainable and ethical food systems aim to balance the needs of people, the environment, and animals while ensuring long-term resilience and resource availability within the water-energy-food-ecosystem nexus.

The project Cities2030 explores concrete action plan to enhance food ethics via implementing interlinked and mutually supportive activities through the WEFE nexus, as outlined next.

Conduct a comprehensive assessment: assess the current state of water, energy, food, and ecosystems within a specific region or context, and identify key stakeholders and establish a multi-disciplinary task force to guide the implementation of the action plan.

Promote stakeholder engagement and collaboration: facilitate dialogues and workshops involving farmers, researchers, policymakers, industry representatives, and civil society organisations, and encourage collaboration and knowledge sharing to develop a shared understanding of food ethics and the WEFE nexus.

Develop sustainable agriculture practices: promote the adoption of agroecological approaches that minimise water and energy usage while preserving ecosystem health, and encourage sustainable soil management practices, such as organic farming, cover cropping, and agroforestry, to enhance food production while protecting ecosystems.

Enhance water management: implement efficient irrigation techniques, such as drip irrigation or precision irrigation systems, to reduce water waste and optimise water use in agriculture, and promote water recycling and rainwater harvesting techniques to mitigate water scarcity and improve water availability for food production.

Foster renewable energy integration: encourage the use of renewable energy sources e.g., solar or wind, in agricultural operations, food processing, to reduce greenhouse gas emissions, minimise environmental impacts.

Support sustainable food systems: promote local and regional food production to reduce the carbon footprint associated with long-distance transportation and advocate for fair trade practices, supporting small-scale farmers and ensuring equitable distribution of resources along the food supply chain.

Strengthen food waste reduction and management: develop strategies to minimise food waste at various stages, from production to consumption, through education, awareness campaigns, and infrastructure improvements, and establish partnerships with food banks, non-profit organisations, and relevant stakeholders to redirect surplus food to those in need.

Implement policies and regulations: advocate for policy frameworks that integrate food ethics and the WEFE nexus, considering the interconnectedness of water, energy, food, and ecosystems, and enforce regulations that ensure ethical labor practices, fair wages, and safe working conditions throughout the food supply chain.

Invest in research and innovation: allocate resources to support research and innovation in sustainable agriculture, food production, and technology development within the WEFE nexus context, and foster collaboration between research institutions, private sectors, and governmental agencies to drive technological advancements and solutions.

Educate and raise awareness: implement educational programmes that promote awareness of food ethics, sustainable consumption, and the interconnectedness of the WEFE nexus, and engage schools, universities, and community organisations to integrate food ethics into their curricula and outreach initiatives.

Monitor, evaluate, and adapt: establish monitoring systems to assess the impact of the action plan on food ethics, water, energy, and ecosystems, and regularly evaluate the effectiveness of implemented strategies and adapt them based on feedback and emerging research.

Foster international cooperation: collaborate with international organisations, governments, and NGOs to share best practices, lessons learned, and promote global cooperation in addressing food ethics and the WEFE nexus.

By implementing this action plan, we can enhance food ethics by considering the interconnectedness of the WEFE nexus. It promotes sustainable practices, responsible resource management, and equitable access to water, energy, and food resources, ultimately fostering a more ethical and sustainable food system.

4.6 Food data transparency

Food data transparency refers to the availability and accessibility of information about the production, sourcing, and composition of food products. It involves providing consumers with clear and accurate details about where their food comes from, how it is produced, and what ingredients it contains.[48]

The purpose of food data transparency is to empower consumers to make informed choices about the food they consume, taking into consideration factors such as nutritional value, sustainability, and ethical considerations.[49] Regrettably, too few consumers are fully aware of the wide-ranging implications associated with the food they consume on a daily basis.[50]

A few key features of food data transparency are outlined next.

Ingredient labelling: food products typically have ingredient lists that provide information about the components used in their production. Transparent labelling ensures that consumers can identify and understand what ingredients are present, including potential allergens or additives.

Nutritional information: food labels often include nutritional information, such as calorie content, macronutrient composition (fat, carbohydrates, protein), and sometimes vitamin and mineral content. This data allows consumers to assess the nutritional value of food items and make informed decisions based on their dietary needs.

Allergen information: clear labelling of common allergens, such as peanuts, tree nuts, dairy, eggs, gluten, and soy, is crucial for individuals with food allergies or intolerances. Transparent allergen labelling helps consumers avoid products that may pose a risk to their health.

Country of origin: providing information about the country of origin allows consumers to make choices based on factors like food safety standards, environmental impact, and support for local or domestic producers.

Animal welfare and sustainability: some consumers are concerned about the ethical treatment of animals and the environmental impact of food production. Transparent information about farming practices, animal welfare certifications, and sustainable sourcing enables consumers to align their food choices with their values.
Genetically modified organisms (GMO) labelling: GMO are a topic of interest for many consumers. Transparent labelling provides information about whether a food product contains GMO ingredients or is GMO-free.

[48] Data collection and analysis tools for food security and nutrition, the Food and Agriculture Organisation of the United Nations (FAO, HLPE), September 2022
[49] Consumers' expectations on transparency of sustainable food chains, Sabio P. R. et al. in *Frontiers in Sustainable Food Systems*, April 2022
[50] Information as an enabler of sustainable food choices, Ran Y. et al. in *Sustainable Production and Consumption*, May 2022

Production and processing methods: transparent food data may include details about production and processing methods, such as organic certification, use of pesticides or antibiotics, or information about food processing techniques. This information helps consumers understand how their food is produced and processed.

Food data transparency is crucial for building trust between consumers and food producers, promoting healthier food choices, and supporting sustainable and ethical practices in the food industry.[51] Governments and regulatory bodies play a role in establishing standards and regulations to ensure the accuracy and consistency of food labelling and data transparency.[52] Additionally, advancements in technology, such as blockchain and digital platforms, are being explored to improve the traceability and transparency of food supply chains.[53]

Implementing food ethics through food data transparency involves providing consumers with access to detailed information about the sources, production methods, and environmental impact of the food they consume.

The project Cities2030 proposes to address the aforementioned ethical concerns via concrete steps to implement food ethics through food data transparency, correlated to specific dimensions of food systems, as outlined next.

Establish clear standards: develop clear and comprehensive standards for ethical food production and sourcing. These standards should cover aspects such as animal welfare, fair labor practices, sustainable farming methods, and environmental impact.

Collect and analyse data: create a system to collect and assess data throughout the food supply chain. This includes gathering information about the origin of ingredients, farming practices, use of pesticides or additives, and the working conditions of farmers and food producers.

Data transparency platforms: build user-friendly online platforms or apps where consumers can access detailed information about the food they purchase. This platform should provide comprehensive data, including certifications, labels, and relevant indicators related to ethical considerations.

Labor standards and certification programmes: some certification programmes, such as Fair Trade, aim to ensure fair wages and improved working conditions for workers involved in food production. These programmes often require producers to meet specific labor standards and undergo regular audits to maintain transparency and accountability.

Labor audits and reporting: companies may conduct labor audits or assessments to evaluate working conditions, wages, and compliance with labor laws within their supply chains. This information may be shared through annual sustainability reports, corporate social responsibility initiatives, or dedicated labor-related reports.

Labor labels and certifications: similar to organic or fair-trade certifications, there have been discussions and proposals to develop labor-specific labels or certifications that provide information about labor practices. These labels can help consumers make more informed choices by indicating that the product meets certain labor-related standards.

Labelling and certifications: establish labelling systems and certifications that clearly indicate the ethical attributes of food products. These labels could include information on organic farming, fair trade, cruelty-free, sustainable fishing, carbon footprint, and more. Ensure that these labels are standardised and verified by independent certifying bodies.

Here, the project Cities2030 proposes to explore the elaboration of a 'stainable food label' framework that may assist consumers in making sustainable food choices.

[51] Impact of food sustainability labels on the perceived product value and price expectations of urban consumers, Kaczorowska J. et al. in *sustainability*, December 2019
[52] Consumer trust in food and the food system: a critical review, Wu W. et al. in *foods*, October 2021
[53] How blockchain technology improves sustainable supply chain processes: a practical guide, M. R. et al. in *Operations Management Research*, December 2022

Supply chain traceability: implement systems to track and trace the entire supply chain, from farm to fork. This allows consumers to understand the journey of their food and make informed choices based on transparency and accountability.

Collaboration with producers and retailers: work collaboratively with food producers, processors, and retailers to ensure that data is accurately collected and shared. Encourage them to adopt ethical practices and provide incentives for transparency.

Consumer education: educate consumers about the importance of food ethics and the significance of data transparency. Raise awareness about the potential impacts of their food choices on the environment, animals, and workers. Empower consumers to make informed decisions by providing them with the necessary tools and knowledge.

Policy and regulation: advocate for policies and regulations that promote food data transparency and enforce ethical standards throughout the food system. Engage with government bodies, industry associations, and NGOs to develop and enforce these regulations effectively.

Continuous improvement: regularly review and update data collection methods, standards, and transparency platforms to ensure ongoing improvement. Incorporate feedback from consumers, producers, and other stakeholders to refine the system and address any emerging challenges.

By implementing the aforementioned steps, it is trusted possible to promote food ethics via food data transparency, empowering consumers to make more informed and ethical food choices while fostering a more sustainable and responsible food system.

Especially, the project Cities2030 proposes to characterise three specific drivers for food data transparency considering the nature of the project e.g., innovation action, as outlined next.

4.6.1 Empowering food supply chain professionals

Empowering food supply chain professionals to drive ethical decision-making. Addressing transparency and traceability gaps via empowering food supply chain professionals can be an influential drive of ethical decision-making at multiple levels, from farm to fork, and, in particular, via businesses Corporate Social Responsibility (CSR) frameworks.[54] The food industry, encompassing manufacturers, processors, packagers, distributors, retailers, and more, grapples with significant blind spots concerning transparency and traceability, and has elevated CSR to a strategic imperative within the sector.[55] These issues have gained attention in recent years as consumers increasingly demand more information about the products they consume.

A few of the said blind spots and the efforts being made to address them are outlined next.

Supply chain complexity: the modern food supply chain is often complex and involves multiple stakeholders, including farmers, processors, distributors, and retailers. This complexity can create blind spots as products move through various stages, making it difficult to track the origin, quality, and handling practices.

Lack of standardisation: the absence of standardised systems and processes across the industry hampers transparency and traceability efforts. Each participant in the supply chain may have different record-keeping methods and technologies, making it challenging to integrate and share information effectively.

[54] Future of food: innovation in managing demand and supply disruptions, Confederation of Indian Industry (CII), Deloitte, November 2021
[55] Creating shared value and sustainability report 2022, Nestlé, Ernst & Young Global Limited, November 2022

Information sharing barriers: companies may be hesitant to share detailed information about their processes, ingredients and labour work settings due to concerns about proprietary knowledge, competitive advantage, or potential reputational risks. This lack of transparency may contribute to consumer mistrust.

Food fraud and counterfeiting: fraudulent activities, such as mislabelling, adulteration, or substitution of ingredients, pose significant challenges for traceability. These practices can deceive consumers, compromise food safety, and undermine trust in the industry.

Encouragingly, recent surveys highlight that the majority of supply chain professionals recognise the importance of supply chain ethics, with a substantial number of respondents considering it either extremely important or very important[56], though there exists a noticeable gap between these understanding and actionable steps.[57]

To address these blind spots, several initiatives and technologies are being developed and the project Cities2030 as identified very specific avenues, subject to developments in the project's platform, and which are outlined next.

Blockchain technology: blockchain provides a decentralised and immutable ledger system, enabling secure and transparent recording of transactions and data. It can enhance traceability by creating an unalterable record of every step in the supply chain, from farm to fork.

Internet of Things (IoT) and sensors: IoT devices and sensors can monitor and record critical parameters like temperature, humidity, and location during transportation and storage. These real-time data sources help in tracking and maintaining the quality and safety of food products.

Data standardisation and interoperability: industry-wide efforts are being made to establish common data standards and protocols that enable seamless information exchange between different stakeholders. This standardisation promotes transparency and facilitates traceability across the supply chain.

Certification and auditing: certifications, such as organic, fair-trade, or food safety standards, provide a level of assurance to consumers. Third-party audits and inspections help ensure compliance with these standards and provide transparency about production and handling practices.

Consumer-facing technologies: various mobile apps, QR codes, and online platforms allow consumers to access information about a product's origin, ingredients, and production processes. These tools empower consumers to make more informed choices and hold companies accountable.

The project Cities2030 acknowledges efforts are being made by governments, industry associations, and consumer advocacy groups to enhance transparency and traceability in the food industry. While challenges remain, the ongoing developments in technology and collaborative initiatives are gradually addressing the blind spots and paving the way for a more transparent and accountable food system. All-in-all, Cities2030 proposes food supply chain professionals must proactively transform their operational practices while simultaneously educating and empowering individuals to make more informed purchasing decisions.

4.6.2 Ethical business models

Cities2030 acknowledges the importance of ethical procurement in the food industry as a paramount driver to contribute to ensuring quality, sustainability, and reputation. The food industry has witnessed a growing trend towards ethical procurement practices, with consumers showing a strong inclination to support brands

[56] The ethical supply chain: definition, examples, stats, Sharon Goldman, The Future of Commerce provides news (USA), May 2023
[57] Why business leaders must make supply chain ethics a priority, the Association for Supply Chain Management (ASCM, USA), September 2019

that prioritise quality, fairness, and sustainability, even if it means paying a premium.[58] Beyond the financial incentives, there are practical reasons why ethical sourcing is crucial, particularly during uncertain times. Ethical and transparent procurement not only strengthens supply chains but also helps businesses avoid reputational hazards.[59]

Intertwined with strong supply lines, ethical procurement forms an essential part of a company's corporate social responsibility (CSR) strategy. Merely having good employment practices, utilizing green energy, or supporting local communities is insufficient if the ingredients sourced come from suppliers who neglect these principles.[60] In fact, CSR efforts should begin with ethical procurement, especially when sourcing materials from the developing world, where the highest risks of unethical practices are prevalent, and where monitoring and maintaining ethical procurement standards are most challenging.[61]

Ethical procurement considers both the social and environmental impacts of a product's journey to the shelf.[62] The food industry carries a substantial environmental footprint, accounting for a quarter of all greenhouse gas emissions and 73% of global deforestation.[63] Furthermore, the agricultural sector witnesses some of the worst abuses of workers, including underpaid farmers, laborers, and even cases of slavery. Shockingly, approximately 70% of global child labor occurs in agriculture alone.[64]

To truly embrace ethical procurement, comprehensive practices are necessary. This entails ensuring transparency throughout the entire supply chain, not just with ingredient suppliers but also conducting thorough audits of those involved in processing, packaging, and logistics.

By prioritizing ethical procurement, the food industry can safeguard quality, promote sustainability, uphold social responsibility, and protect its reputation. It is an integral step towards a more conscientious and sustainable future, addressing both the social and environmental dimensions of the industry's impact.

The project Cities2030 explores avenues for sustainable business models integrating ethical procurement within quadruple helix stakeholders' approaches, and a combination of evidence-based concepts, outlined next.

Green procurement: this model focuses on purchasing environmentally friendly products and services. It involves selecting suppliers who have strong environmental practices, such as using renewable materials, reducing waste and emissions, and implementing energy-efficient processes.

Fair trade: fair trade procurement ensures that producers and workers receive fair compensation for their goods and labor. This model promotes ethical sourcing, fair wages, safe working conditions, and community development. It often applies to industries such as agriculture, textiles, and handicrafts.

Local sourcing: this model emphasises purchasing goods and services from local suppliers. By sourcing locally, businesses reduce transportation-related emissions and support the local economy. It fosters community resilience, reduces supply chain risks, and builds strong relationships with local suppliers.

[58] Sustainability connects retailers & brands with conscientious consumers, Nielsen Consumer LLC, November 2021
[59] Shareholder value effects of ethical sourcing: comparing reactive and proactive initiatives, Kim S. et al. in Journal of Business Ethics, May 2021
[60] The relevance of corporate social responsibility in organizational sustainability, Amanawa E. D. in IJAMSR, January 2022
[61] What shall we eat? An ethical framework for well-grounded food choices, Anna T. Höglund in *Journal of Agricultural and Environmental Ethics*, March 2020
[62] A sustainable sourcing competence model for purchasing and supply management professionals, Schulze H. et al. in *Operations Management Research*, March 2022
[63] The OECD-FAO guidance for responsible agricultural supply chains, OECD-FAO, May 2021
[64] Migrant seasonal workers in the European agricultural sector, European Parliamentary Research Service (EPRS), February 2021

Circular economy: the circular economy model aims to minimise waste and maximise resource efficiency. Businesses adopt a closed-loop approach, where products and materials are designed for durability, reuse, repair, and recycling. Procurement decisions are made to support the use of recycled materials, extend product lifecycles, and minimise waste generation.

Social enterprise: social enterprises combine business goals with a commitment to addressing social or environmental issues. In this model, businesses procure goods and services from other social enterprises or organisations that have a positive impact on communities. The focus is on creating a social value chain that benefits disadvantaged groups or addresses specific social challenges.

Supplier code of conduct: implementing a supplier code of conduct ensures that procurement is based on ethical principles. This code outlines expectations related to labor rights, human rights, environmental sustainability, and fair business practices. Businesses establish criteria for supplier selection and ongoing monitoring to ensure compliance.

4.6.3 Artificial intelligence

The project Cities2030 aims to foster artificial intelligence (AI) in agri-food domain, in conjunction with other technologies such as blockchain. With growing consumer awareness about the intricacies of our food systems, there is a rising expectation for manufacturers and retailers to provide heightened transparency.[65] Within this background, the Cities2030 project explores the potential of AI in terms of natural language processing (NLP) and data mining, as a key feature to advance in the interplay between consumer demands, data governance, and CRFS transformation. Ethics in Cities2030 is then able to explore pathways for 'ethical resolution' on artificial intelligence[66], which refers to the process of reaching a consensus or agreement on ethical principles and guidelines that should govern the development, deployment, and use of artificial intelligence (AI) systems.

It involves identifying and addressing the ethical implications, concerns, and risks associated with AI technologies to ensure their responsible and ethical implementation. The goal of an ethical resolution is to establish a framework that guides the ethical behaviour and decision-making of AI systems, promoting transparency, fairness, accountability, privacy, and safety in their design and usage. AI is being increasingly utilised in the food system to enhance various aspects of food production, processing, distribution, and consumption, as illustrated in the diverse examples outlined next.

Precision agriculture: AI is employed in precision agriculture techniques to optimise crop management. It helps farmers make data-driven decisions by analysing factors like weather patterns, soil conditions, and crop health. AI-powered systems can provide real-time monitoring, automate irrigation, detect diseases, and optimise pesticide use, leading to increased crop yields and reduced resource waste.

Food quality and safety: AI enables the identification of quality issues and potential contamination risks in the food supply chain. Machine learning algorithms can analyze data from sensors, cameras, and other sources to detect anomalies, spoilage, or foreign objects in food products. This helps ensure food safety and prevent the distribution of substandard or contaminated goods.

Supply chain optimisation: AI technologies improve the efficiency and reliability of food supply chains. Predictive analytics and machine learning algorithms can optimise inventory management, demand forecasting, and

[65] Transforming food systems through artificial Intelligence (AI), Eness Paidamoyo Mutsvangwa-Sammie, UKRI-ARUA, July 2022
[66] The ethical dimension of artificial intelligence, Gökçe Karahan Adalı in *Journal of Data Applications*, April 2023

logistics. By analysing historical data and current trends, AI systems can anticipate demand fluctuations, optimise storage and transportation routes, reduce waste, and ensure timely deliveries.

Personalised nutrition: AI is used to develop personalised nutrition recommendations based on an individual's specific dietary needs, health goals, and genetic profile. Machine learning algorithms analyze vast amounts of data, including nutritional information, medical records, and genetic data, to provide personalised diet plans and dietary advice, leading to improved health outcomes.

Food processing and manufacturing: AI is employed in food processing and manufacturing to enhance productivity, quality control, and automation. Computer vision systems can inspect products for defects, sort items, and ensure packaging accuracy. AI-powered robots can perform repetitive tasks like ingredient mixing, cutting, and packaging. These technologies improve efficiency, reduce costs, and enhance product consistency.

Consumer insights and personalisation: AI helps food businesses gain insights into consumer preferences, behaviour, and trends. Natural language processing and sentiment analysis techniques can analyze social media, customer reviews, and feedback to understand consumer opinions and adapt marketing strategies accordingly. AI-powered recommendation systems can personalise food recommendations, menus, and shopping experiences based on individual preferences and dietary restrictions.

Food waste reduction: AI plays a crucial role in minimizing food waste at various stages of the food system. By analysing data such as expiration dates, temperature conditions, and historical sales patterns, AI can optimise inventory management, reduce overstocking, and identify perishable items at risk of spoilage. Additionally, AI-driven apps and platforms connect food businesses with surplus food to charitable organisations, reducing waste and improving food distribution to those in need.

It's worth noting that while AI offers significant opportunities in the food system, there are also challenges related to data privacy, ethical considerations, and the need for human oversight to ensure the technology is used responsibly and in line with societal values.

4.7 Ethical trade standards

Ethical trade standards in the food system are a specific feature part of other dimensions developed in separate chapters in the present study e.g., labor work (fair labor practices), environmental sustainability (farming practices), supply chain transparency, animal welfare, community development, food safety and quality, ethical sourcing, continuous improvement, etc. It refers to guidelines and principles that aim to ensure fair and responsible practices throughout the supply chain, from agricultural production to processing, distribution, and consumption.[67] These standards are designed to protect the rights and well-being of workers, promote environmental sustainability, and support local communities.

Besides key aspects of ethical trade standards in the food system developed in other chapters we emphasise here on the role that ethical trade standards play as an umbrella innovation framework for more sustainable CRFS. The project Cities2030 explores evidence-based measures to contribute to the co-creation of ethical trade standards, which features and corresponding rationale and background are developed in the present study, and specific features are outlined next.

[67] Guide to buying responsibly, the Ethical Trading Initiative (UK), September 2017

Fair trade practices: ethical trade standards commonly incorporate fair trade principles, which aim to ensure that small-scale farmers and producers receive fair prices for their products. Fair trade practices help create more equitable trading relationships, empower marginalised producers, and enable them to improve their living standards. This may assist achieving a positive impact on the livelihoods of farmers, reducing poverty and promoting social justice.

Food access and justice: highlights the unequal distribution of food resources and advocates for equitable access to nutritious food for all. Food access and justice are crucial aspects of ensuring equitable and sustainable food systems. They address the disparities and inequalities that exist in accessing healthy and affordable food, as well as the social, economic, and environmental factors that contribute to these issues. Here's some information on food access and justice.[68]

Fair trade standards: fair trade standards in Europe aim to promote equitable and sustainable trading relationships between producers in developing countries and businesses in Europe. These standards ensure that producers receive fair prices for their products, improve social and environmental conditions, and encourage responsible business practices. While fair trade standards may vary slightly among different certification organisations, there are some common principles and criteria followed in the pan-European landscape.[69]

Moral marketing: Europe, like many regions around the world, has seen a growing emphasis on food moral marketing in recent years.[70] Consumers in Europe are becoming increasingly conscious about the ethical and moral implications of their food choices, including the environmental impact, animal welfare, fair trade, and social responsibility. Food moral marketing in Europe often focuses on promoting products and brands that align with certain values and principles. This can include highlighting sustainable farming practices, organic and locally sourced ingredients, fair trade certification, and the absence of genetically modified organisms (GMOs) or artificial additives.

Local economies: empowering local food systems and economies to drive sustainable economic growth and employment opportunities. Empowering local food systems and economies may deliver a profound impact on driving sustainable economic growth and creating employment opportunities.[71] The said empowerment may be embodied by the practices outlined next. *Supporting small-scale farmers:* who play a crucial role in local food systems. Also, strengthening local supply chains via developing robust local supply chains which assists reducing dependence on imports and strengthens the local economy. This can involve improving transportation and storage infrastructure, establishing farmer cooperatives, and creating platforms for direct farmer-consumer interactions, such as farmers' markets or community-supported agriculture programmes. *Promoting sustainable farming practices* is another form of support to local food economies (see chapter 4.3). *Supporting food processing and value addition:* investing in food processing facilities and promoting value addition activities can add value to agricultural products, extend their shelf life, and create employment opportunities.

Encouraging entrepreneurship and innovation: fostering a culture of entrepreneurship and innovation within the local food sector can lead to the development of new businesses and job opportunities. Supporting aspiring entrepreneurs through mentorship, access to finance, and business development services can enable them to establish successful enterprises that contribute to the local economy. *Promoting local food consumption:* educating and raising awareness among the local population about the benefits of consuming local, seasonal,

[68] Social justice-oriented narratives in European urban food strategies, Smaal A. L. S. et al. in *Agriculture and Human Values*, November 2020
[69] What is fair trade? How does the European Union promote fair trade?, MET Group, July 2022
[70] Food ethics: moral marketing, Ralph Early, independent food scientist and food ethicist, March 2020
[71] The sustainability of "local" food: a review for policy-makers, Stein J. A. et al. in Review of Agricultural, Food and Environmental Studies, May 2021

and nutritious food can create a demand for locally produced products. This can be done through educational campaigns, cooking classes, and collaborations with schools, restaurants, and community organisations. *Collaboration and networking:* creating platforms for collaboration and networking among various stakeholders, such as farmers, processors, retailers, consumers, and policymakers, can foster knowledge sharing, resource pooling, and collective decision-making. This collaborative approach can help address challenges, identify opportunities, and create a supportive ecosystem for local food systems.

Food sharing economies: food sharing economies, also known as food sharing or food swap movements, are initiatives that aim to reduce food waste, promote sustainable consumption, and foster community engagement through the sharing and redistribution of surplus or unused food. These economies can take various forms, ranging from informal networks and grassroots initiatives to organised platforms and apps. Here are a few examples of food sharing economies: food banks and food rescue programmes, community gardens and allotments, food swaps, sharing economy platforms, community fridges, food co-ops, food buying groups, etc.[72]

4.8 Sustainable urban farming

Sustainable urban farming, also known as urban agriculture, is an approach to food production that takes place within urban areas, utilizing vacant lots, rooftops, vertical gardens, and other urban spaces to grow crops, raise animals, and produce food.[73] It aims to provide fresh, locally grown food while promoting ecological sustainability, community engagement, and food security. Some key aspects and practices of sustainable urban farming are outlined next. *Resource efficiency:* urban farming focuses on maximizing the efficient use of resources such as water, energy, and land. Techniques like drip irrigation, rainwater harvesting, and hydroponics can significantly reduce water consumption. *Vertical farming:* involves growing plants in vertically stacked layers or on vertically inclined surfaces. It utilises vertical space, making it suitable for urban environments where land is limited. *Rooftop gardens:* it utilises the available rooftop spaces of buildings for cultivating plants. They can help insulate buildings, reduce stormwater runoff, and provide urban dwellers with fresh produce. *Community involvement:* urban farming encourages community involvement and engagement by promoting local food production and establishing community gardens. Community-supported agriculture (CSA) programmes, where community members subscribe to receive regular produce shares from local urban farms, are also popular. *Waste management and composting:* sustainable urban farming can integrate waste management practices by utilizing composting systems. Organic waste from kitchens, gardens, and food processing can be composted to produce nutrient-rich soil amendments for urban farms. *Biodiversity and pollinators:* urban farming can contribute to biodiversity by incorporating native plants, creating pollinator-friendly habitats, and preserving green spaces. Attracting pollinators such as bees and butterflies enhances crop yields through improved pollination and fosters a more balanced urban ecosystem. *Education and awareness:* sustainable urban farming offers educational opportunities to raise awareness about food systems, sustainability, and healthy eating. It can be integrated into school curricula, community workshops, and outreach programs to educate individuals of all ages about the importance of locally sourced food and sustainable agricultural practices. *Local food production and food security:* urban farming reduces the distance between food production and consumption, resulting in fresher and more nutritious produce. It contributes to food security by providing access to affordable, locally grown food, particularly in underserved urban areas known as food deserts, where access to fresh food is limited.

[72] Understanding food experience in sharing economy platforms, Atsız o. et al. in *Journal of Tourism and Cultural Change*, February 2021
[73] Sustainable urban agriculture, types, principles, Agri Farming, May 2023

The project Cities2030 explores urban farming practices and, especially, proposes to focus on the most promising avenue for integrated sustainable urban farming practice: modern urban aquaponics, especially the evidence-based business cases of Brussels Aquaponic Farm - BIGH Anderlecht[74] (Belgium) and the ECF FARM Berlin[75] (Germany), combining aquaculture and agriculture.

Urban aquaponics is a sustainable farming method that combines aquaculture (fish farming) with hydroponics (growing plants in water) in an urban setting. It is a closed-loop system that integrates the cultivation of fish and plants in a mutually beneficial relationship.[76] In an urban aquaponics system, fish are raised in tanks or other suitable containers. The fish produce waste, which contains ammonia and other nutrients. Rather than disposing of this waste, it is converted into a valuable resource for plant growth. The nutrient-rich water from the fish tanks is circulated to the hydroponic component of the system, where plants are grown in a soilless medium, such as gravel or expanded clay pellets. The plants, which can be various types of vegetables, herbs, even flowers, utilise the nutrients present in the water to grow. As the plants take up the nutrients, they help purify the water by removing harmful substances. The cleaned water is then recirculated back to the fish tanks, completing the cycle.

The main advantage of urban aquaponics is its efficiency in resource utilisation. The system requires less water compared to traditional soil-based farming, as the water is continuously recycled.[77] Additionally, it minimises the need for chemical fertilisers, as the fish waste provides natural nutrients for the plants. The symbiotic relationship between fish and plants creates a balanced ecosystem that can be implemented in limited urban spaces, such as rooftops, warehouses, or unused buildings. Urban aquaponics promotes sustainable food production in urban areas, reducing transportation costs and carbon emissions associated with long-distance food supply chains. It also provides opportunities for local food production, education, and community engagement. By bringing agriculture closer to urban populations, it allows people to reconnect with the food they consume and promotes a healthier and more sustainable lifestyle.[78]

4.9 Food sharing economies

Food sharing economies are a component of ethical trade and social justice (see chapter 4.7). Food sharing economies, also known as food-sharing initiatives or platforms, refer to systems and networks where individuals or organisations share excess food resources with others who may need them. These economies aim to reduce food waste, promote sustainability, and address food insecurity by facilitating the redistribution of surplus food. In a food sharing economy, participants can be individuals, businesses, or community organisations.[79]

Food sharing may engage in various activities such as those outlined next. *Food recovery:* this involves rescuing surplus food from restaurants, grocery stores, farms, and other sources before it goes to waste. The food is then redistributed to individuals or organisations in need. *Food redistribution:* surplus food collected through recovery efforts is shared with community members facing food insecurity. This can be done through food banks, community fridges, or other distribution channels. *Community gardens:* these initiatives promote urban agriculture by creating shared spaces where individuals can grow their own food. Excess produce can be shared among participants or donated to local food banks. *Meal sharing:* individuals or groups can organise events where they cook and share meals with others. This encourages social interaction, cultural exchange, and reduces food waste

[74] BIGH Farm, Brussels Aquaponic Farm - BIGH Anderlecht, May 2023
[75] ECF FARM Berlin, ECF Farm Systems, May 2023
[76] Urban aquaponics farming and cities- a systematic literature review, Wirza R. et al. in *Reviews on Environmental Health*, June 2021
[77] Aquaponics: a promising tool for environmentally friendly farming, Calone R. et al. in *Frontiers for Young Minds*, April 2022
[78] Causal relations of upscaled urban aquaponics and the food-water-energy nexus: a Berlin case study, Baganz F. M. G. et al. in *water*, July 2021
[79] Causal relations of upscaled urban aquaponics and the food-water-energy nexus: a Berlin case study, Baganz F. M. G. et al. in *water*, July 2021

by utilizing ingredients efficiently. *Peer-to-peer sharing platforms:* online platforms and mobile applications have emerged to connect individuals who have excess food with those who need it. These platforms facilitate direct sharing between neighbours or within communities.

Benefits of food sharing economies include a series of dimensions as outlined next. *Reducing food waste:* by redistributing surplus food, these economies help prevent edible food from ending up in landfills, reducing greenhouse gas emissions and environmental impact. *Alleviating food insecurity:* by connecting excess food with individuals or organisations in need, food sharing initiatives help address hunger and improve food access for vulnerable populations. *Fostering community engagement:* food sharing economies encourage collaboration and community involvement, promoting social cohesion and collective responsibility. *Promoting sustainable practices:* these initiatives raise awareness about the importance of sustainable food consumption, encouraging individuals to make conscious choices and reduce their ecological footprint. *Supporting local economies:* food sharing can benefit local producers, farmers, and businesses by providing an outlet for surplus food and creating economic opportunities within the community.

The project Cities2030 proposes to further implement food sharing initiatives as a component of social innovation, linking with the establishment of CRFS Labs and building capacities in local communities.

4.10 Theory of change

The project Cities2030 proposes to demonstrate a new paradigm, shifting from the current conventional and inaccurate approach to food systems e.g., Cities Region Food System (CRFS), though its original concept has been improved via more integration of environment and socio-economics factors, are yet not satisfactory, to a more enhanced model e.g., "food environment", driven and supported by an enhanced cross-governmental and cross-sectoral cooperation: Cities Region Food Environment (CRFE).[80]

Cities2030 interlinks and integrates developed solutions in identified CRFS and explore CRFE considering novel EU-driven vocabulary/narrative e.g., "*Food, Bioeconomy, Natural Resources, Agriculture and Environment*"[81]. "System" indicates the key features of the production of food e.g., to summarise, production, transformation, distribution, retail and markets, consumption and waste. "Ecosystem" in the FOOD2030, Farm to Fork and the CRFS narratives liaise for instance (but not strictly) with "ecosystem-enhancing" to contribute more effectively to the transition considering the *EU Green Deal* as a whole, the *Farm to Fork Strategy*, the *EU Biodiversity Strategy*, the Zero Pollution Strategy, the *Long-term Vision for Rural Areas*, or the *European Pillars of Social Rights*, to name but these few.

This policy framework can be summarised by the statement "*Reducing the environmental burden of European diets, including but not limited to greenhouse gas (GHG) emissions, air pollution and impact on ecosystems, improving circularity (e.g., food waste and by-products), providing new, sustainable and healthy products made of alternative sources of proteins to consumers*".[82]
"Environment" liaises with "*physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food*".[83]

Cities2030 proposes citizens and communities must be at the core of solutions.

[80] Food environments & EU food policy, the EU Food Policy Coalition, September 2021
[81] Horizon Europe Work Programme, the EU Horizon Europe Programme, December 2021
[82] Topic HORIZON-CL6-2022-FARM2FORK-01-07, Horizon Europe Framework Programme (HORIZON), October 2021
[83] Nutrition and food systems, report, High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, June 2017

Shifting from a food system perspective to a food environment perspective represents a broader and more comprehensive approach to addressing the complex issues surrounding food, nutrition, and health. While the food system focuses on the production, distribution, and consumption of food, the food environment encompasses the broader context in which food choices are made, including the physical, economic, social, and cultural factors that influence those choices.

The concept of a food environment recognises that individuals' food choices are not solely determined by personal preferences or behaviours but are heavily influenced by the surrounding conditions and available options. It emphasises the importance of creating an environment that supports and promotes healthy eating habits, making nutritious food more accessible, affordable, and appealing.

Some key aspects of the food environment paradigm encompass those outlined next.

Physical environment: this aspect considers the availability and accessibility of food options within a community. It includes the presence of grocery stores, farmers' markets, and other food retail outlets that offer a variety of healthy food choices. Additionally, it encompasses considerations such as the proximity of food outlets to residential areas, transportation infrastructure, and the presence of food deserts (areas with limited access to affordable and nutritious food). Economic factors: the economic aspect of the food environment examines the affordability and affordability of healthy food options. It recognises that income disparities and food prices play a crucial role in determining individuals' ability to make nutritious choices. Efforts to address economic factors may involve initiatives such as subsidies for healthy foods, price incentives, and support for local food systems.

Social and cultural influences: social and cultural factors shape people's food preferences, dietary patterns, and eating behaviours. The food environment paradigm acknowledges the importance of these influences and seeks to create supportive social and cultural contexts for healthy eating. This can include promoting food education and literacy, encouraging social norms that prioritise healthful eating, and addressing cultural barriers to healthy food choices.

Policy and regulatory frameworks: an effective food environment paradigm requires supportive policies and regulations. This can involve measures such as implementing nutrition labelling, regulating marketing practices targeted at children, and enacting zoning laws that promote the establishment of healthy food outlets in underserved areas.

Behavioural interventions: while the food environment paradigm extends beyond individual behaviors, it also recognises the role of behavioural interventions in promoting healthier choices. This may include educational campaigns, interventions in school settings, workplace wellness programs, and community-based initiatives that aim to shift norms and attitudes toward healthier eating.

By adopting a food environment perspective, policymakers, researchers, and public health advocates can address the multifaceted factors that influence food choices and work towards creating an environment that facilitates and encourages healthier eating habits for all individuals.

4.11 Third party certification

Food third-party certification refers to the process of evaluating and certifying food products or food-related processes by an independent organisation or third party.[84] These certifications provide consumers with

[84] Supervising third-party control bodies for certification: the case of organic farming in Italy, Zezza A. et al. in *Agricultural and Food Economics*, November 2020

assurance that the food they purchase meets specific standards related to safety, quality, sustainability, and other factors. Some commonly known food third-party certifications are outlined next.

Organic certification: ensures that food is produced without synthetic pesticides, genetically modified organisms (GMOs), or irradiation. It guarantees that the product meets specific organic farming and processing standards set by organisations such as the European Union Organic Certification. *Fair trade certification:* aims to promote equitable trading practices and support farmers and workers in developing countries. It ensures that products like coffee, cocoa, tea, and bananas are produced under fair labor conditions, with fair prices paid to producers. *Genetically modified organisms (GMO):* Non-GMO Project Verified is a third-party certification organisation that verifies and labels products as free from GMO. This certification assures consumers that the product does not contain genetically engineered ingredients. *The Marine Stewardship Council (MSC) certification:* it is specific to seafood and ensures that the fish or seafood product is sourced sustainably from fisheries that meet certain environmental standards. *The certified humane certification:* it focuses on animal welfare in farming and ensures that animals are raised and handled according to specific standards that prioritise their well-being. *The Gluten-Free Certification:* it is essential for individuals with gluten-related disorders such as celiac disease. Organisations like the Gluten-Free Certification Organisation (GFCO) provide certification to products that meet stringent gluten-free standards.

The aforementioned practices are just a few examples of third-party certifications in the food industry. Different certifications serve different purposes and address various aspects of food production and consumption. The presence of a certification logo on a product provides consumers with confidence that the product has been independently verified to meet certain standards.

The Cities2030 project ambitions to actively engage in the development of a comprehensive and empowering food labelling framework, aligned with the FOOD2030 and Farm to Fork strategy, to enable consumers to make informed and sustainable food choices. As part of its innovation cycles, the Cities2030 project seeks to deepen our comprehension of consumer expectations and needs regarding sustainability across all three dimensions: environment, economics, and society. This includes an exploration of both conscious and unconscious factors, as well as external influences and socio-cultural aspects that drive and challenge these expectations.

While citizens' food choices are often seen as purely personal decisions, they are heavily influenced by food environments. It is crucial to comprehend the impact of marketing and media within these environments, as they can sometimes generate adverse effects on consumer choices.[85] Therefore, the Cities2030 project aims to identify the most effective methods of transmitting and presenting sustainability-related information in order to guide and transform consumer behaviour.

The envisioned sustainable food labelling framework aspires to empower consumers in making sustainable food choices. By enhancing understanding of the factors influencing food choices and the significance of sustainability, it is possible to optimise the utilisation of EU and national policy measures, government actions, and funding, ensuring the practice of efficient and effective approaches.

[85] What about the consumer choice?, Toussaint M. et al. in *European Research on Management and Business Economics*, November 2020

4.12 A common food policy for the EU

The project Cities2030 builds upon and leverage key findings from the MUFPP and the EUROCITIES Working Group Food[86], and its bedrock is rooted in the policy conceptual approach recently published "Towards a Common Food Policy for the EU" by the International Panel of Experts on Sustainable Food Systems (IPES Food)[87]. The report argues for a "Common Food Policy" for the European Union: "*a policy setting a direction of travel for the whole food system, bringing together the various sectoral policies that affect food production, processing, distribution, and consumption, and refocusing all actions on the transition to sustainability.*" It's important to note that the specific policy proposals and implementation strategies may vary within the IPES Food report or among different stakeholders.

The Common Food Policy (CFP) proposed by IPES Food aims to provide a comprehensive and integrated framework for transforming the European Union's food system. The CFP is designed to address the social, economic, and environmental challenges associated with food production, distribution, and consumption. A general overview of the key principles and objectives associated with the said common food policy are outlined next.

Sustainability and resilience: the CFP emphasises the need for a sustainable and resilient food system that minimises its environmental footprint, conserves natural resources, protects biodiversity, and mitigates climate change. It seeks to promote agroecological practices, reduce the use of synthetic inputs, and support organic farming methods.

Health and nutrition: the CFP prioritises public health and nutrition by promoting access to safe, nutritious, and affordable food for all EU citizens. It encourages a shift towards healthier diets, reduction in food waste, and increased support for local and regional food systems to improve food quality and dietary diversity.

Social equity and justice: the CFP aims to address social inequalities within the food system, ensuring fair incomes for farmers and food workers, reducing food poverty and food insecurity, and supporting small-scale and family farmers. It emphasises the importance of inclusive decision-making processes involving all stakeholders.

Circular economy and resource efficiency: the CFP promotes the principles of a circular economy by minimizing waste, promoting recycling and reuse, and reducing the environmental impacts of food production and consumption. It encourages innovative approaches to food processing, packaging, and distribution to optimise resource efficiency.

Food sovereignty and resilient local food systems: the CFP recognises the importance of food sovereignty, supporting local food production, and strengthening short supply chains. It emphasises the role of small-scale farmers, local food markets, and community-based initiatives in ensuring food security, preserving cultural heritage, and enhancing rural development.

Research, innovation, and education: the CFP emphasises the need for research and innovation to drive the transition towards a sustainable food system. It promotes the development and dissemination of knowledge, best practices, and technologies that support sustainable farming practices, food processing, and distribution. It also underscores the importance of food education and awareness-raising campaigns.

Governance reforms play a crucial role in promoting healthy diets and sustainable food systems.[88]

[86] EUROCITIES Working Group Food, EUROCITIES, MUFPP, EU Commission DG RTD and Food2030, September 2017
[87] Towards a common food policy for the EU, the International Panel of Experts on Sustainable Food Systems (IPES Food), February 2019
[88] Food governance for better access to sustainable diets: a review, del Valle M. et al. in Frontiers in Sustainable Food Systems, September 2022

The Cities2030 project introduces innovative policy frameworks, specifically through the CRFS Policy Labs, based on robust evidence that highlights the inadequacy of current EU governance structures in addressing the systemic nature of food system challenges such as climate change, biodiversity loss, and food poverty. This evidence exposes conflicting objectives and missed synergies among policy areas (agriculture, trade, health, environment, etc.) and governance levels (EU, national, local).

Concretely, the project Cities2030 implements ten steps towards exploring an EU common food policy framework, outlined next.

4.12.1 Explore and characterise the complexity of CRFS.

The Food and Agriculture Organisation of the United Nations (FAO) conceptual approach to structured sustainable FSE outlined by the food system wheel framework[89] and others from a series of influential bodies worldwide calls for the activation and engagement of all actors and stakeholders of CRFS (people-centric modus operandi). It is therefore imperative for all actors of CRFS to understand the vulnerabilities and obstacles of sustainable CRFS development, the risk of third parties and their third parties, from the perspective of sustainable, secure and resilient CRFS, and also how CRFS impacts on the society and the citizens.

This intelligence must support a food-systems approach to policy making[90] to foster transitioning towards sustainable CRFS. Cities2030 addresses this need via future-proofing CRFS. First, activities focus on generating actionable intelligence. Then, participatory and structured policy life cycle assessments are implemented in CRFS Policy Labs, and effectively deliver policy blueprints, in parallel with the production of innovation systems frameworks in CRFS Living Labs.

All three activities are supported by a digital platform. Finally, Cities2030 delivers a data-driven CRFS management platform to assist decision-making processes.

4.12.2 Characterise the need for CRFS resilience

CRFS are composed of complex, fragmented, dynamic, and extensive networks[91] which link already composite interactions among the biological elements to different entities in the value chain, including suppliers, manufacturers, regulatory bodies, public authorities and customers, on a global scale[92]. Therefore, progress on food policy analysis, governance, and programme delivery for CRFS transition to sustainable and resilient food and nutrition systems constitutes an immense endeavour[93], linked to a wide range of equally challenging socio-economic and environmental outcomes.

Advancing food policy analysis, governance, and program delivery for food systems transition to sustainability and resilience requires a comprehensive and multi-dimensional approach. The project Cities2030 considers and explores key steps to characterise mechanisms and measures for CRFS resilience, as outlined next.

Holistic systems thinking: adopt a holistic approach that recognises the interconnectedness of various components within the food system, including production, processing, distribution, consumption, and waste management. Understand the social, economic, and environmental implications of different policy choices and interventions.

[89] Sustainable food systems – Concept and framework, Nguyen H. et al., the Food and Agriculture Organisation of the United Nations (FAO), October 2018
[90] The need for a food-systems approach to policy making, Riaz Bhunnoo in The Lancet, March 2019
[91] Today's complex, fragmented, global food supply chains have led to an increase in food fraud, Jenny Eagle, Food Navigator Europe, William Reed Ltd, February 2019
[92] Market transparency in food supply chain: goals, means, limits, Joint research Centre (JRC113150, EC), June 2018
[93] The future of food and agriculture: Trends and challenges, October 2017

Integrated policy frameworks: develop and implement integrated policy frameworks that promote sustainability and resilience across the entire food system. Ensure that policies consider multiple dimensions, such as nutrition, environmental sustainability, social equity, and economic viability. Align policies across different sectors, including agriculture, health, environment, trade, and education.

Quadruple helix stakeholder engagement: involve diverse stakeholders, including farmers, consumers, civil society organizations, private sector actors, researchers, and policymakers, in the policy analysis and decision-making processes. Facilitate inclusive and participatory approaches that incorporate local knowledge and perspectives.

Evidence-based analysis: conduct rigorous research and analysis to generate evidence on the impacts of different policies and interventions. Assess the environmental, social, and economic outcomes of food system transitions. Utilise tools such as life cycle assessments, cost-benefit analysis, and scenario modelling to inform policy choices.

Data and information systems: improve data collection, monitoring, and information systems to support evidence-based decision-making. Enhance the availability, accessibility, and quality of data related to food production, consumption, nutrition, and environmental indicators. Develop platforms for data sharing and collaboration among stakeholders.

Capacity building: build the capacity of individuals and institutions involved in food policy analysis and governance. Provide training programs, workshops, and knowledge-sharing platforms to enhance technical skills and understanding of food systems dynamics. Foster collaboration between the said quadruple helix stakeholders.

Policy coherence: promote coherence and coordination among different policies and programs related to food systems. Ensure that policies are aligned and mutually reinforcing, rather than conflicting or counterproductive. Facilitate cross-sectoral collaboration and information exchange.

Innovation and technology: encourage the development and adoption of innovative technologies and practices that enhance sustainability and resilience in food systems. Explore opportunities for digital solutions, precision agriculture, agroecological approaches, and sustainable food processing and distribution systems.

Monitoring and evaluation: establish robust monitoring and evaluation mechanisms to track the progress and effectiveness of policies and programs. Regularly assess the impact of interventions on sustainability, resilience, and other desired outcomes. Use evaluation findings to inform policy adjustments and improvements.

Knowledge sharing and collaboration: foster knowledge sharing and collaboration among different stakeholders, both nationally and internationally. Engage in partnerships and networks that promote learning, exchange of best practices, and joint problem-solving. Support platforms for dialogue and policy exchange, such as conferences, workshops, and online communities.

4.12.3 Building and augmenting knowledge

The ability to learn from evidence in the real-time via data collection, either analog or digital, can make sustainable processes, responsive, proactive and predictive, thus avoiding operational interruptions, productivity issues, threats to critical infrastructure and loss of the information and resources of CRFS. The complexity of CRFS is growing e.g., heterogeneous structures, volume and variety of products, services, agents, new actors (digitalization, uberisation), and dynamic (not far from real-time) operations mean that cities must grip the next generation of sustainable development (possibly "sustainability 4.0"), to intelligently identify pathways for sustainable CRFS policy development and action to structure such complexity. Cities2030 proposes to provide CRFS decision support to policy decision makers, with fully explained system thinking reasoning (incorporating Life Cycle and Risk Assessments), which is underpinned by real-scale pilot cities' incorporating territorial scope,

and fully supported by accountable evidence. Cities2030 delivers an adjusted, tailored and comprehensive taxonomy for the CRFS arena incorporating state-of-the-art research, policy and innovation action frameworks, to facilitate the production of a compendium of definitions that is more representative of the CRFS realities, including novel terminologies from the digital and emerging technologies sphere. This material is developed with a cloud-based system that will facilitate real-time access and action, and secure long-term developments.

4.12.4 Laboratories

Cities20300 co-creates and establishes CRFS Policy Labs activities within which all agents of CRFS address the complexities of food systems with a participatory approach. Especially, the complexity of global food policy is broken-down and scrutinised to future-proof scenarios and impact. Here, the project Cities2030 proposes to start with the realisation of awareness-raising activities combined with capacity building to equip participants with the necessary knowledge allowing them to address identified CRFS challenges, incorporating their own perspective and considering their current and possible new roles in the food value chain. Then, Cities20300 system thinking methodology provides a solid and result-oriented instrument to facilitate co-creation processes.

As a result, Cities20300 combines system thinking activities with policy life cycle assessment, co-creation, co-production and real-scale piloting to deliver a policy brief. Cities2030 also generates CRFS Living Labs activities with the same setting as for CRFS Policy Labs. Here, the project starts with outlining a development plan to confirm concepts via ideation exercises, scientific knowledge and research findings, experimentation, technologies, equipment, transformation processes, exploration of business models and plans, trade and economics, cooperative mechanisms, management, regulations and more are examined to future-proof scenarios and impact.

Then, CRFS Living Labs are structured with available resources, provided by organisations engaged in the development, and supported by pertinent stakeholders identified during the first year of the project's activities. Policy and living labs develop in synergy together with back-to-back examination processes and life cycle assessments.

4.12.5 Future-proofing CRFS in pilot cities

Cities (e.g., policy-makers, regulatory bodies, etc.) have engaged a series of soaring objectives and outcomes in the current EU food policy framework, strategies and agenda. Confronted with a vast number of pledges, policymakers must consider addressing global food systems as a key pathways and opportunity to correct inadequacies. Cities2030 answers to the aforementioned need by engaging and activating cities and agents of CRFS to establish together a community of practice which mission is to create preconditions and mechanisms to foster and facilitate cities' adhesion to the MUFPP, but also to participate and contribute to the development of correlated initiatives outside the said MUFPP.

That way, Cities2030 generates a common mind-set and structured a shared commitment between participants, a sense of belonging and brand ownership via implementing co-creation and system thinking activities (policies, innovation), towards the production of policies together with innovation actions aligned with the MUFPP framework and related CRFS sustainable transition.

Cities2030 programme of activities incorporate pertinent enhancement from other key initiatives led by cities and regions e.g., Haarlem (Netherlands), Bruges (Belgium), Vejle (Denmark), Vidzeme (Latvia), Seinäjoki (Finland), and Vicenza (Italy), agents of the CRFS, civil society organisations, businesses, research bodies and EU funded structures.

Cities2030 explores pathways and mechanisms towards sustainable CRFS transition in the city (and region), with the city and for the city, incorporating a comprehensive number of identified CRFS-based factors. To implement urban food policies co-creation processes, front-runner cities initially engaged in Cities2030 are structured in specific categories according to the approach proposed by Nicolas Bricas' to facilitate situation analysis with specific parameters.[94]

4.12.6 Securing efficient learning environments

Education plays a pivotal role in both fostering and benefiting from the transition of the food system towards sustainable settings, with a particular focus on children and youth[95]. The vast majority of educational programmes on food tackles a specific part of CRFS e.g., production (agriculture, aquaculture and farming, dairy production, etc.), transformation, distribution and markets, consumption (e.g., nutrition, diets, etc.), food science and technology, health and wellbeing, waste management, safety and quality, the digital sphere, innovation and entrepreneurship, social sciences and humanities, business (hospitality, etc.), to name but these few[96]. Holistic educational programs that integrate various fields of proficiency, including policy and technology, within the context of CRFS are rapidly evolving and readily available at the tertiary level, offered by universities and research institutions., and are also led by food related worldwide covering bodies such as the Food and Agriculture Organisation of the United Nations (FAO)[97].

The European Union (EU) actively promotes education and training through a wide range of initiatives that specifically target CRFS. Notably, the EIT Food Academy[98] holds significant relevance as it centers on the transformation of the food system, making it particularly noteworthy among these endeavours. The Cities2030 project investigates the aforementioned educational programs by merging examinations with contemporary studies and research on transitioning CRFS mechanisms towards sustainable schemes. It encompasses policy, innovation, and related domains such as climate, transportation, energy, and natural resources management.

The primary objective is to develop comprehensive guidelines for educational programmes in this context. To implement the aforementioned guidelines, Cities2030 can leverage the educational frameworks established by EIT Food Latvia and collaborate with their digital learning platform, including MOOCs (Massive Open Online Courses) and SPOCs (Small Private Online Courses). Additionally, it is crucial to utilise practical tools such as co-creation Summer Schools, Workshops, and the RIS Venturing School.[99]

Cities2030 aims to develop a comprehensive and actionable educational package by leveraging both digital environments. The program focuses on enhancing empirical learning in real-scale environments, utilizing both policy and living labs. These labs serve as crucial components of Cities2030's educational programme, incorporating activities such as volunteering, job shadowing, apprenticeships, personal project development, and entrepreneurship ventures, with a specific focus on social enterprises. In addition to the existing MOOCs, SPOCs, and similar instruments, Cities2030 incorporates digital instructional engineering to generate virtual tools. Within the labs, whether in the context of policy outlines or innovation actions, Cities2030 explores and pilots augmented, virtual, and extended reality pathways to create the CRFS Virtual Mobility Space.

[94] Urbanization issues affecting food system sustainability, Nicolas Bricas in *Designing Urban Food Policies*, July 2019
[95] The EU school fruit, vegetables and milk scheme, the European commission, Agriculture and rural development, May 2017
[96] Educational programmes on food in Europe, Keystone Education Group, June 2020
[97] Sustainable Food Systems Masters Programme, the Food and Agriculture Organisation of the United Nations (FAO), October 2020
[98] The EIT Food Academy, EIT Food, EIT, the European Union, March 2018
[99] EIT Food educational programmes for co-creation, EIT Food, EIT, the European Union, November 2022

This immersive platform facilitates experiential learning and practical application. Furthermore, drawing inspiration from the partnership mechanisms practiced by the EIT Food Academy, Cities2030 benefits from its capacity to attract top researchers, students, and entrepreneurs, as well as significant funding from both private and public sector investments. Rather than establishing a new educational network, Cities2030 leverages the existing partner networks and synergies to encourage participation in the EIT Food ecosystem.

Ultimately, Cities2030 offers complementary tools that are openly accessible to all stakeholders engaged in CRFS.

4.12.7 Setting accurate CRFS indicators

Several indicators are available to support governing bodies, whether private or public, in monitoring and assessing food systems and CRFS. While many of these indicators are related to food security, they encompass a broader range of considerations.[100] A number of bodies actively contribute to delivering these indicators such as the UN-related World Food Programme, World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), the World Bank and most of nations' governing agencies[101]. The UN-related Food and Agriculture Organization (FAO) develops the Food Insecurity Experience Scale (FIES)[102] and the prevalence of undernourishment (PoU, SDG 2, indicator 2.1.1)[103]. The FAO together with aforementioned bodies delivers the Food Security Outcome Monitoring[104] and a series of supporting reports such as the yearly State of Food Security and Nutrition in the World (SOFI)[105].

The Cities2030 project takes inspiration from the mechanisms and approaches implemented by the aforementioned organizations to understand and define food-related requirements. This knowledge is utilised to develop a CRFS-based taxonomy that will contribute to the creation of the project's CRFS observatory.

In recent times, there has been a notable increase in the participation of various entities in the definition and structuring of food indicators, adopting a more comprehensive approach that encompasses a wide range of impact areas including production, behaviours, and waste. These entities are dispersed throughout society and encompass both government agencies and the private sector. Examples of such entities include, but are not limited to those outlined next. *IPES-Food:* an independent panel of experts dedicated to promoting sustainable food systems. *Local Governments for Sustainability (ICLEI):* an international organization consisting of local, regional, and national governments committed to sustainability. *The Economist Intelligence Unit (EIU):* in collaboration with the Barilla Center for Food and Nutrition: An initiative from the private sector that conducts research and analysis on food-related issues. *EUROCITIES:* a network of major European cities collaborating on various urban issues, including food sustainability. *Climate KIC and EIT Food hubs:* which are EU-funded structures and initiatives supported by the European Union that focus on climate innovation and food-related entrepreneurship. It is important to note that these examples are not exhaustive, as numerous other organizations and institutions also contribute to this collective effort.

Cities2030 collaborates with these organizations to foster synergies with ongoing and future initiatives. This collaboration involves analysing frameworks, approaches, and methodologies to incorporate relevant information and experiences. By doing so, Cities2030 ensures the precision and effectiveness of result-driven mechanisms in developing the project's system thinking framework.

[100] City Region Food System indicators, RUAF Global Partnership on Sustainable Urban Agriculture and Food Systems, November 2022
[101] Diet and nutrition, the Norwegian Institute of Public Health, June 2020
[102] The Food Insecurity Experience Scale, the Food and Agriculture Organisation of the United Nations (FAO), May 2023
[103] The prevalence of undernourishment, PoU, SDG 2, indicator 2.1.1, the Food and Agriculture Organisation of the United Nations (FAO), May 2023
[104] Food Security Outcome Monitoring – Q2 2022 – Communities Factsheet, the World Food Programme, September 2022
[105] The State of Food Security and Nutrition in the World 2022, the Food and Agriculture Organisation of the United Nations (FAO), November 2022

Cities2030 derives valuable insights from the MUFPP (Milan Urban Food Policy Pact) and leverages the evolving experiences of pilot cities to ensure precision and result-oriented approaches in co-creating policy and living labs. Additionally, Cities2030 focuses on the development of a blockchain-based CRFS monitoring platform called the Single Click CRFS Platform (S2CP). This platform aims to refine the existing framework by enhancing outcomes, impact, indicators, and recommendations, primarily through two structured pathways: nature-based solutions (NBS) and urbanization.

Drawing on existing evidence from various NBS approaches and the well-documented and piloted nature of urbanization, Cities2030 intends to maintain the current number and nature of categories while fine-tuning indicators and exploring new outcomes, impact measurements, and recommendations. Furthermore, the project proposes to digitise the MUFPP framework and deploy pilots in cities following the MUFPP approach, transforming it into an actionable mechanism through the utilization of the S2CP.

The primary function of the S2CP is to support governing bodies of cities in managing sustainable CRFS. It achieves this by delivering CRFS indicators presented in an adaptable dashboard format, accessible on smartphones, tablets, laptops, and digital monitors placed throughout the city. This real-time visualization ensures transparency and enables citizens to stay informed about the status of their city's food system.

The S2CP serves two essential purposes. Firstly, it aggregates collective information from all points of the CRFS, provided by various stakeholders along the value chains. Secondly, it serves as a data-driven management tool that aids decision-making processes for all stakeholders involved in the CRFS, including cities.

5. ROADMAP TO 2030

Cities2030 road mapping toward the integration of more ethics in CRFS proposes to focus on two key drivers: empower local communities and enhance local food supply. To strengthen sustainable cities and regions' food systems, it is imperative to restore the pivotal role of local communities as active protagonists. Emphasizing the traditional essence of communities, they should regain their influence and involvement in shaping sustainable food systems. By placing communities at the forefront, the project Cities2030 proposes to contribute to ensure their active participation and engagement via the main avenues outlined next. *Empowering local communities:* empower local communities by providing them with the knowledge, resources, and support necessary to actively participate in the development and implementation of sustainable food initiatives. This empowerment includes fostering a sense of ownership, responsibility, and pride in local food systems. *Collaboration and co-creation:* foster collaboration and co-creation between local communities, government bodies, businesses, and other stakeholders. By working together, these entities can collectively design and implement sustainable food strategies that address the unique needs and aspirations of the community. *Strengthening local food production:* support and promote local food production by providing access to land, resources, and training for community members interested in growing food. Encourage sustainable farming practices, urban agriculture, and the preservation of traditional farming knowledge and techniques. *Foster access to healthy and affordable food:* ensure equitable access to healthy and affordable food for all community members. This includes supporting initiatives like farmers' markets, food cooperatives, and community gardens, which provide fresh and locally produced food to residents, particularly those in underserved areas. *Accelerate food education and awareness:* promote food education and awareness programs within communities to enhance understanding of sustainable and healthy food choices. Educate community members about the environmental, social, and health impacts of their food decisions, empowering them to make informed choices.

Ensure cultural preservation: recognize and celebrate the cultural diversity within local communities and the significance of traditional food practices. Preserve and promote local food heritage, traditional recipes, and culinary traditions, as they are essential elements of community identity and contribute to sustainable food systems. *Promote policy advocacy:* encourage local communities to advocate for policies that support sustainable food systems. Foster community engagement in decision-making processes related to urban planning, food policies, and land use to ensure that community voices are heard and considered. *Enable solidarity and social cohesion:* foster solidarity and social cohesion within local communities through food-related initiatives. Encourage communal sharing of resources, knowledge, and surplus food. Support initiatives that address food insecurity and promote social justice within the community.

By re-establishing local communities as the driving force behind sustainable food systems, we can harness their collective wisdom, strengths, and resilience. This approach ensures that food systems are deeply rooted in the community's values, aspirations, and traditions, leading to more inclusive, resilient, and thriving cities and regions.

To foster the integration of ethics in CRFS by 2030, the project Cities2030 proposes several key steps via a structured roadmap that characterises the potential actions and strategies, outlined next.

Raise awareness and create a shared vision: conduct awareness campaigns to educate the public, policymakers, and stakeholders about the importance of ethical food systems, and facilitate discussions and engage diverse stakeholders to develop a shared vision for ethical food systems in cities and regions.

Develop and implement ethical food policies: establish local and regional policies that prioritize ethics in food production, distribution, and consumption; integrate ethical considerations into existing food policies, such as sustainability, health, and social equity; and encourage the adoption of ethical certifications and standards for food production and labelling.

Promote sustainable agriculture and local food production: support and incentivize sustainable farming practices, such as organic farming, permaculture, and agroecology; facilitate access to land and resources for small-scale farmers and urban agriculture initiatives; encourage the development of local food systems by promoting farmers' markets, community-supported agriculture (CSA), and farm-to-table initiatives.

Enhance transparency and traceability: implement systems to track and trace the origin, production methods, and supply chains of food products; promote the use of technologies like blockchain and Internet of Things (IoT) for transparent and accountable food systems; provide consumers with easy access to information about the ethical and environmental impact of food products.

Foster collaboration and partnerships: facilitate collaboration among local governments, NGOs, farmers, businesses, and consumers to develop and implement ethical food initiatives; create platforms for knowledge sharing, networking, and joint problem-solving among stakeholders; establish partnerships with academic institutions to conduct research and provide evidence-based recommendations for ethical food policies and practices.

Support education and awareness: integrate food ethics into educational curricula at schools and universities; organize workshops, training programs, and community events to raise awareness and build capacity for ethical food practices; promote consumer education about ethical food choices, including the impact of food waste, animal welfare, and fair trade.

Ensure social equity and inclusivity: address food insecurity and promote equitable access to healthy and ethically produced food; support initiatives that reduce food waste, such as food recovery programs and community food redistribution networks; promote fair trade and support the rights and well-being of workers throughout the food supply chain.

Monitor progress and adapt strategies: establish mechanisms to monitor the implementation and impact of ethical food initiatives; regularly assess the progress made and identify areas for improvement; adapt strategies based on feedback from stakeholders and emerging ethical concerns.

By following this roadmap, cities and regions can make significant progress in integrating ethics into their food systems by 2030. The collective efforts of policymakers, stakeholders, and consumers are crucial for creating a sustainable, equitable, and ethical food future.

5. ANNEX: Cities2030 Ethics, Gender and RRI Self-Assessment Tool

This annex includes the Self-Assessment Tool for Ethics, Gender and RRI applied in CRFS. The purpose of the tool, provided as a set of questions, is to provide a comprehensive framework for CRFS encompassing a range of aspects within ethical considerations, gender inclusivity, and research and innovation methodologies.

These questions were tested and validated by the project pilots during the last year of the project and are structured into three blocks: Ethical Considerations (corresponding to this white paper), Gender Inclusivity and Research and Innovation Methodologies. Each question includes examples of both quantitative and qualitative measures for assessment.

5.1 Ethical Considerations

A. Definitions
Rationale: What is food ethics?
Questions (tentative):
E1. What do you consider ethical when it comes to food?
E2. What values or principles do you think should guide how we produce, distribute, and consume food?

B. Institutional vs. individual
Rationale: institutional relates to, for instance, "Ethics and Food-Related Research"
Ethics and Food Scientists: Duties, Issues and Dilemmas | Food Science and Nutrition Cases
Questions (tentative):
E3. How do you think we should approach ethics in food-related research?
E4. What principles or guidelines do you believe researchers should abide by to ensure ethical practices in this field?
Rationale: individual relates to, for instance, "Ethics and Food-Related Research"
Ethical Food Production for Conscious Consumers | Dephna

Questions (tentative):
E5. Do you actively seek out food products that align with your ethical values, such as those produced sustainably, organically, or with fair labour practices?
E6. Do you believe that individuals have a responsibility to actively engage in the food system beyond being consumers, such as supporting local food initiatives, advocating for food justice, or participating in community gardens?

C. Obstacles, especially on the concept of food as a "human right"
Rationale: Challenges of implementing a human rights approach to food security and nutrition
Questions (tentative):
E7. What do you perceive as the main obstacles to effectively implementing a human rights approach to food security and nutrition?

D. Enabler, especially on the concept of "food environment"
Rationale: A participatory approach to model the neighbourhood food environment.
The food environment is seen as the physical, economical, political, and sociocultural context in which each consumer engages with the food system.
Questions (tentative):
E8. How do you perceive the influence of the physical, economic, political, and sociocultural factors in your food choices and consumption habits?

5.2 Gender Inclusivity

Instructions to self-evaluate the state of gender issues in your City Region Food System (CRFS).

1. **Collect a group** to evaluate the gender situation in your CRFS.
2. **Read** the descriptions of the different levels (1-2-3) of a gender topic.
3. **Choose the level** which is closest to the situation in your CRFS.
4. **Discuss and determine** the desired level (2 or 3) you want to reach in the future.
5. When finished all the questions, **determine the actions** needed to reach the desired levels.
6. **Evaluate yearly the proceeding** and if necessary, adjust the goals. It is a good idea to do this work when there are other yearly evaluations, such as the financial statements.

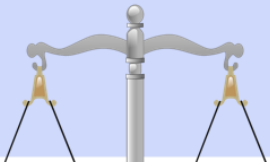
G1. Gender as a discussion topic

Gender as a discussion topic		
Level 1 Gender is rarely/never a discussion topic in the CRFS. At most, the topic is referred when there is an external input to the matter, i.g. news.	Level 2 Gender is monthly a discussion topic in the CRFS. The topic is referred when there is an external input to the matter, i.g. news, but also some experts bring the theme to discussions time to time.	Level 3 Gender is a weekly discussion topic in the CRFS. The topic is referred when there is an external input to the matter, i.g. news, but also some experts bring the theme to discussions actively and regularly.

G2. Gender representation

Gender representation		
Level 1 There is no or little attention paid to ares of CRFS where there is an clearly unbalanced gender representation within some groups of people.	Level 2 There is attention paid to ares of CRFS where there is an clearly unbalanced gender representation within some groups of people. 	Level 3 There is a good amount of attention paid to ares of CRFS where there is an clearly unbalanced gender representation within some groups of people. The issue is discussed, analyzed and if it is seen that needed, actions are taken to balance the gender representation.

G3. Gender as a determined in legislation

Gender as a determined in legistlation		
Level 1 Gender-related laws are not known or there is an foggy idea that there are some gender laws existing, but it is felt, that they do not obligate this CRFS. 	Level 2 Gender-related EU and national laws are known, and the obligations of the legislation are followed. For example, if the national law obligy an organization to create a gender equality plan, it is done and updated as required.	Level 3 Gender-related EU and national laws are well known, and the obligations of the legislation are followed often in higher leven than the mininum requirement is. For example, if the national law obligy an organization to create a gender equality plan, it is done and updated as required but also the actual actions are taken in a daily work to enhance the gender matters.

G4. Gender equality in the CRFS

Gender equality in the CRFS		
Level 1 There is a clear common understanding in the CRFS which jobs and roles fit the best to the sexes and it is written down and spoken freely. There are job announcement where there are seeking for a certaing sex for the job, e.g. "Seeking for a strong man to a farming job" or "Looking for a woman with a sensitive touch to decorate cakes". From the same food related job you can pay less to a women, because they are used to it. Also, there is a higher unemployment rate of youg women with food-related degrees: they are not hired because they may soon stop working for the baby leave.	Level 2 There is a common understanding in the CRFS that anyone interested can do any food-related job although there are unwritten laws that may have an effect to choices and treatement towars a person, who has chosen differently than the rest. There is understanding that in the job announcement the words need to put so that any skillfull person feels welcomed, but in speech there might be referation to men and women used. The statistics tell that the younger women are working, but their contracts are shorter than in average without any written explanation.	Level 3 There is a good understanding in the CRFS that anyone interested can do any food-related job ,and also unspoken cultural phenomenas are spoken up and anlyzed as well. There is understanding that in the job announcements but also in speech and meanings in between the rows, there is no attitude relevealed against genuine gender equality. The statistics tell that the younger women are working as are the rest without any significant difference of presense or length of the job contracts when comparing to others.

G5. Gender roles of food at home

Gender roles of food at home		
Level 1	Level 2	Level 3
The roles within the food issues in homes follow the sex of an person and are not determined by one's intrest. The children are tought to follow the traditional roles despite of their personal interests. There is no encouraging to find one's own intrests in food-related tasks e.g. who will be the next farmer of the family, who pays for the food or who usually cooks the meals at home.	The roles within the food issues in homes mostly follow the individual's intersts and capability, althoug there are some traditional role loads on different sexes. The children are tought to follow their interests but also not to forget their traditional roles determined by sex. There is openess to let one to find one's own intrests in food-related tasks e.g. who will be the next farmer of the family, who pays for the food or who usually cooks the meals at home.	The roles within the food issues in homes are follow the individual's intersts and capability, and it is understood that they might be against the tradional roles determined by sex. The children are tought to follow their interests and to understand what the traditional food roles determined by sex were to understand the food roles of others. Anyone interested can be the be the next farmer of the family, the one who pays for the food or the person who usually cooks the meals at home.

5.3 Research and Innovation Methodologies

R1. Innovation Integration:

- In what ways does your community encourage and integrate research and innovation practices in its food systems? How does the community evaluate the feasibility and impact of adopting new practices or technologies?

Quantitative Measures: (1) Number of community projects that have integrated innovative practices or technologies OR (2) Percentage of community members adopting new practices or technologies through innovation initiatives.
Qualitative Measure: Explore the perceived impact of innovation on community initiatives through interviews and case studies. Collect stories through interviews to understand the factors influencing the adoption or resistance to innovative practices.

R2. Data-Driven Practices:

- Does your community leverage data and information to inform decision-making in food-related activities? How are research findings and innovative approaches integrated into the community's practices?

Quantitative Measure: Increase in the use of data to inform decision-making within the community's food systems.
Qualitative Measure: Conduct interviews to understand how data-driven practices have influenced decision-making processes and outcomes.

R3. Knowledge Exchange Platforms:

- Are there platforms or initiatives within your community that facilitate the exchange of knowledge and innovative practices related to food systems? How are lessons learned and best practices shared among community members?

Quantitative Measure: Participation rates in knowledge exchange platforms and events.
Qualitative Measure: Gather insights through focus group discussions on the perceived value and effectiveness of knowledge exchange initiatives.

R4. Research Funding and Support:

- How does your community support and fund local research and innovation in the food sector? Are there mechanisms to encourage and recognize innovative approaches in food production, distribution, and consumption?

Quantitative Measure: Amount of funding allocated to local research and innovation projects.
Qualitative Measure: Explore the impact of funding on research and innovation through interviews with project leaders and participants.

R5. Community-Based Research:

- To what extent does your community engage in community-based research to address specific challenges or opportunities within the local food system? Are community members actively involved in shaping and conducting research?

Quantitative Measure: Percentage of research projects that actively involve community members in the research process.
Qualitative Measure: Conduct interviews with community members to understand their experiences and contributions to community-based research.

R6. Technological Accessibility:

- How does your community ensure that technological advancements and innovations in the food sector are accessible to all members, regardless of their technological literacy or economic status?

Quantitative Measure: Accessibility rates to technological tools and innovations within the community.
Qualitative Measure: Explore the experiences and challenges related to technological accessibility through interviews with community members.

R7. Partnerships with Educational Institutions:

- Does your community collaborate with local educational institutions to promote research and innovation in the food sector? Are there initiatives to involve students and researchers in addressing community-specific challenges?

Quantitative Measure: Number of formal collaborations with educational institutions supporting research and innovation.
Qualitative Measure: Explore the depth and impact of partnerships through interviews with educators, researchers, and community members.

R8. Feedback Mechanisms:

- How does your community collect feedback from its members regarding the effectiveness of research and innovation initiatives in the food system? Are there mechanisms for continuous improvement based on community input?

Quantitative Measure: Rate of community member participation in providing feedback on research and innovation initiatives.
Qualitative Measure: Analyse the content of feedback collected through surveys or suggestion boxes to identify patterns and areas for improvement.

R9. Ethical Considerations in Research:

- How does your community ensure ethical considerations are integrated into research activities related to the food system? Are there guidelines in place to address potential ethical challenges that may arise during the research process?

Quantitative Measure: Number of documented instances where ethical guidelines influenced the design or conduct of research projects.
Qualitative Measure: Conduct interviews with researchers and community members to understand the ethical considerations incorporated into research activities.