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Pamela Koch, and Tania Schusler

Voices for Change: Community Action, Biodiversity, and the Future of Food

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Ledizioni

2026 Ledizioni LediPublishing
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Nunzia Borrelli, Karen Brown, Hellas Cena, Pamela Koch, and Tania Schusler, *Voices for Change: Community Action, Biodiversity, and the Future of Food*

First Edition: January 2026

PDF ISBN: 9791256006564

Cover art: photo by Karen Brown

Funder: Project funded under the National Recovery and Resilience Plan (NRRP), Mission 4 Component 2 Investment 1.4 - Call for tender No. 3138 of 16 December 2021, rectified by Decree n.3175 of 18 December 2021 of Italian Ministry of University and Research funded by the European Union – NextGenerationEU;

Award Number: Project code CN_00000033, Concession Decree No. 1034 of 17 June 2022 adopted by the Italian Ministry of University and Research, CUP H43C22000530001, Project title "National Biodiversity Future Center - NBFC"

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Prologue

The biodiversity crisis we have created in our history is a fact and, in the 21st century, shows no sign of slowing down. We live in a time of planetary environmental transformations that contribute to species decline (IPBES 2019). We cannot respond to this trend with scientific research alone. Integrated approaches are fundamental for the knowledge and classification of species and their interrelations, as well as for understanding the mechanisms of interaction with human activities — nor solely through environmental advocacy, which is essential for raising public awareness but can go unheard. What is developed through research and advocacy must become part of the collective societal heritage through widespread sharing efforts.

The causes of today's biodiversity crisis are systemic: degradation of terrestrial and aquatic forests, spread of invasive species, growth and urbanization, destruction of soil and aquatic habitats, pollution, indiscriminate exploitation of biological resources, climate warming and extremization, and as such, require systemic responses.

What we need are paradigm shifts: new ways of living and consuming, new awareness, new limits and regulations, and behaviours based on sustainability principles grounded in science, economics, and human sciences. What has to become clear is that there can be no "ecological transition" without a social commitment to a truly different way of living. Taking care of our home, an approach that in the last decades has been emphasized through the term "One Health", is the only option. Human beings are a part of biodiversity, not something external. The centrality of biodiversity is the core of our future. We cannot foresee a safe future for us without a strategic focus on biodiversity both as a value and as a guarantee of our survival (by providing resources and absorbing waste), as well as a source of ecosystem resilience and a resource for economic recovery.

To work on these issues, Italy has established NBFC, the National Biodiversity Future Center, funded by the Ministry of University and Research (MUR) through the EU's NextGenerationEU funds. It is a coordinating body, that combines and enhances research efforts while making knowledge and technologies accessible to various local actors.

NBFC's activities are organized around specific topics, each one corresponding to a Spoke. Spoke 7 is dedicated to biodiversity and society focusing on communication, education, and social impact. The main goals of this Spoke include fostering cross-sector relationships in society and promoting knowledge dissemination through new forms of language, teaching, and science communication.

Within the activities of Spoke 7 the research group coordinated by Prof. Nunzia Borrelli — largely composed of environmental and territorial sociologists and scholars in museums, art, and visual culture — has pursued three interrelated research lines: 1) Museums and ecomuseums on biodiversity: investigating their role in biodiversity work, including an in-depth study on how to analyze and measure the effectiveness of their actions. Specific indicators from the COP16 on biodiversity were revisited. 2) Biodiversity as nutrition: studying biodiversity as nutrition for cities (including urban biodiversity), people and animals, especially food production in low-income countries. 3) Emotional line: focusing on art, with a specific attention on photography, aiming to understand how these vital barometers of change and tools of social communication, narrates biodiversity and the risks associated with its loss.

The interdisciplinary nature of the center and its international vocation have facilitated the collaboration with a number of scholars coming from different institutions and countries, who are deepening the understanding of these same issues. The current publication is the result of this fruitful collaboration, which started an important ongoing conversation.

Biodiversity is in crisis. We are fully responsible, and it is clear that we are the problem. But in the meanwhile, we are also the only possible solution.

As shown in this publication, working together is the only way, because no one saves themselves alone.

Maurizio Casiraghi
Professor of Zoology, University of Milan-Bicocca
National Biodiversity Future Center (NBFC)

Introduction

This volume brings together different interdisciplinary contributions that explore the intricate and essential links between biodiversity, sustainable food systems, human health, cultural heritage, and community engagement. As the world struggles with converging crises — including climate change, biodiversity loss, food insecurity, and public health emergencies — these essays offer valuable insights into how integrated, place-based, and participatory approaches can foster ecological resilience, social equity, and collective well-being.

Contributions share a common commitment: to reframe the relationship between food, culture, and nature through the lenses of sustainability, justice, and health. By doing so, they each participate in the growing global discourse on how to reimagine food systems in ways that are locally rooted, ecologically sound, nutritionally adequate, and socially inclusive.

The first chapter, from Nunzia Borrelli and Giulia Mura, provides a concise overview of the research activities carried out by a subgroup within Spoke 7, composed mainly of sociologists specializing in territorial and environmental studies. The research unit investigated how biodiversity conservation and the sustainability of the food system can be integrated into community-based practices. The study focused particularly on the role played by dedicated institutions (municipalities, museums, etc.) and specific social groups — such as small-scale farmers — in promoting these practices, as well as on the contribution of art as a tool for community engagement and cohesion. Moreover, the chapter argues that addressing the biodiversity crisis requires a genuine paradigm shift: technical or scientific solutions alone are not enough, as the issue demands a deeply cultural, political, and relational understanding. It shows how research must engage with society through museums, ecomuseums, art, and participatory practices that make biodiversity tangible and meaningful in daily life. The chapter emphasizes that biodiversity is, above all, a web of relationships among people, species, environments, and forms of knowledge.

The second chapter underscores the fundamental role of biodiversity in shaping dietary quality, public health outcomes, and the resilience of food systems. Grounded in nutritional science and planetary health frameworks, the chapter lays out a compelling argument: the decline of biodiversity, exacerbated by climate

change and unsustainable agricultural practices, is directly undermining our ability to provide nutrient-rich diets. This trend not only increases the risk of malnutrition but also fuels the global rise in non-communicable diseases such as obesity, diabetes, and cardiovascular disorders. Hellas Cena and Maria Vittoria Conti highlight the interconnected nature of environmental degradation and human health deterioration, referencing frameworks like the Global Syndemic and the Planetary Health Diet proposed by the EAT-Lancet Commission. These approaches call for a transformation in dietary habits: reducing the consumption of resource-intensive foods such as red meat while embracing a plant-based alimentation and diverse diets that draw on local biodiversity. However, as the author points out, this transition cannot ignore the cultural and geographic specificity of food systems. Traditional and indigenous diets, often depending on a high level of biodiversity, are not only nutritionally superior but also culturally resonant. Preserving and revitalizing these systems is essential to ensure both dietary acceptance and ecological sustainability.

The third chapter expands the conversation beyond the nutritional and scientific dimensions of biodiversity, concentrating on the cultural and institutional actors that can champion sustainability. Museums — particularly community museums and ecomuseums — are presented here as emerging players in environmental advocacy and public engagement. Historically tasked with preserving material heritage, many museums are now embracing a "social turn," redefining their roles to include climate action, biodiversity education, and support for sustainable food systems. Drawing on case studies from Scotland and Costa Rica, Karen Brown examines how museums rooted in community partnerships are facilitating the intergenerational transmission of traditional ecological knowledge (TEK) and promoting ecological stewardship. These institutions act not only as custodians of culture but also as catalysts for sustainable development. The chapter argues that these localized, community-led approaches hold the potential to inform broader debates around climate justice, biodiversity preservation, and health equity.

The fourth chapter puts emphasis on the educational and advocacy roles of cultural institutions in fostering a change in the food system. Drawing on decades of research in nutrition education and public health communication, Pamela Koch outlines a structured framework composed of three core components: awareness, understanding, and action. This tripartite model is informed by psychosocial theories that identify the key determinants of behavioural change: perceived risks, values alignment, social norms, benefits, barriers, and individual

and collective efficacy. The author discusses how museums, ecomuseums, and similar cultural platforms can serve as effective spaces for civic education and grassroots mobilization. Through community-based exhibits, public programming, and participatory workshops, these institutions can help people see the relevance of food system sustainability in their daily lives. Increasing public understanding of health and ecological consequences of industrial agriculture and the systemic barriers to changing cultural institutions can help build the momentum needed for policy transformation and industry accountability. Importantly, this chapter does not advocate for individual responsibility alone. It emphasizes the need for both bottom-up and top-down strategies: individual behaviour change must be supported by collective action and institutional reform. Museums are uniquely positioned to bridge these levels, connecting personal narratives with global challenges and fostering a sense of agency among diverse publics.

The last chapter focuses on how communities and young people engage with sustainable food systems. Grounded in empirical research conducted during the COVID-19 pandemic in Chicago, the chapter illustrates how grassroots, community-based organizations played a vital role in responding to the disruptions and inequities exacerbated by the crisis. These local actors were often able to respond more quickly and meaningfully than government agencies and large nonprofits thanks to their deep social embeddedness and trusted relationships with marginalized communities. Tania Schusler articulates a clear vision for how participatory engagement — especially when including youth voices — can enhance food system resilience, equity, and sustainability. The chapter draws on theories from environmental education, youth development, and community psychology to outline effective strategies for fostering youth-adult partnerships. Through these partnerships, young people are not only educated but also empowered to take meaningful action, developing leadership skills while contributing to tangible improvements in local food systems. By connecting food justice with racial, economic, and environmental justice, Schusler reminds us that sustainability cannot be divorced from equity. Engaging diverse community members — across generations and social groups — is essential to building food systems that are just resilient and culturally grounded.

By placing biodiversity at the heart of their analysis and by foregrounding the role of local knowledge, cultural institutions, and community participation, the authors of those contributions invite us to imagine food systems that are not only

sustainable and a biodiversity that is not only conserved but also democratic, nourishing, and locally rooted. This volume aims to push for a broader movement for transformation that embraces the interdependence of human and planetary health and recognizes culture, education, and community as vital forces for change.

Chapter 1

Enhancing the Social Impact of Biodiversity Research

Nunzia Borrelli and Giulia Mura

Introduction

The current biodiversity crisis demands not only urgent scientific inquiry but also a radical rethinking of how knowledge, culture, and society interact to promote sustainable futures. This chapter is a short presentation of the work developed by the National Biodiversity Future Center (NBFC) within the context of the Spoke 7 subgroup, one that focused its work on biodiversity and society: communication, education, and social impact.

Spoke 7 played a key role in bridging scientific knowledge with cultural and civic engagement, seeking to foster cross-sector dialogue, explore new forms of communication, and integrate biodiversity concerns into public discourse and educational systems.

This chapter specifically reflects the contribution of the research group coordinated by Nunzia Borrelli at the University of Milano-Bicocca which has been active in Spoke 7. Composed mainly of scholars in environmental and territorial sociology, as well as experts in museums, art, and visual culture, the group has pursued three interwoven lines of research.

Firstly, the role of museums and ecomuseums in biodiversity education and protection has been explored, dedicating special attention to the creation of indicators to evaluate their impact. These institutions, situated between science and society, have shown an increasing potential as spaces for public engagement and ecological awareness.

Secondly, the group has investigated biodiversity in relation to nutrition, both in urban settings and in contexts of food production in the Global South. In this framework food becomes a nexus through which ecological, cultural, and nutritional dimensions of biodiversity intersect. Thirdly, the team has explored emotional and artistic representations of biodiversity, especially through

contemporary art and photography, as powerful tools for raising awareness and fostering effective connections to the natural world.

The chapter unfolds through an exploration of the research processes, public engagement activities, and theoretical reflections carried out by the whole group.

The synergy between academic inquiry and civic participation led to three core components: the identification of research paths, the organization, in November 2024, of a symposium titled "Biodiversity, Food, and Education", and the production of the public exhibition "DisSeminAzioni" which was inaugurated in June 2025. Together, these components illustrate how biodiversity can be narrated and disseminated across cultural, visual, and educational domains, activating multiple registers of experience — from analytical to emotional, from scientific to artistic.

The final section of the chapter consolidates the insights gained through these experiences and emphasizes the urgent need to reframe biodiversity as a relational issue. The notion of "never alone" becomes a guiding principle: biodiversity conservation must not be seen as an isolated endeavour by experts or institutions, but as a collaborative process that nurtures relations among people, species, places, and knowledge. Museums and cultural spaces are particularly well-positioned to cultivate these relations by offering inclusive, participatory, and emotionally resonant environments for learning and action. The conclusions reinforce these arguments by pointing towards the future.

Identification of Research Paths and Introduction at the Symposium and the Exhibition

To better explain how the group worked to develop a collaborative approach that considers biodiversity not solely as a scientific subject but as a cultural, political, and emotional concern, it is important to clearly describe the key steps and methodologies that shaped the research trajectory and the public engagement strategies developed.

Together, these components demonstrate how academic research, participatory practices, and artistic languages can intersect to foster public understanding, inspire action, and contribute to building a shared ecological culture grounded in responsibility, justice, and imagination.

The Different Research Paths Identified

The work developed by the research group presents a multifaceted exploration, seeking to understand how biodiversity is represented, experienced, and protected in different domains of contemporary life—from art and urban planning to agriculture and museum practices. One of the key areas investigated is the role of images and visual culture. Images are not neutral representations: they have the power to shape public awareness, influence emotional responses, and foster ecological sensibilities. When produced with care, they can reveal the complexity of ecological systems and encourage protective actions. But when images rely on stereotypes or simplifications, they may mislead or disengage the viewer. In this context, the research reflects on how visual archives, especially those focused on coastal and marine environments, can support new ways of narrating biodiversity that are participatory, sensorial, and politically aware. Contemporary art is another field in which biodiversity emerges as a crucial concern. Artistic practices can cultivate emotional connections with the more-than-human world, inviting audiences to experience nature not just as scenery or data, but as a living presence. Researchers have examined artistic projects that emphasize slowness, intimacy, and multisensory experiences. These works challenge the perceived boundary between human and non-human, proposing instead a web of entangled relationships. Importantly, such art does not simply portray ecological crises; it transforms how we feel and think about them. Art, in this sense, becomes a space for ecological imagination and a site for rethinking our affective and ethical orientation towards the living world (Addis, 2025; Borrelli *et al*., 2025).

Urban environments are also central to this investigation. While often viewed as antithetical to biodiversity, cities can in fact serve as laboratories of ecological regeneration. Through both quantitative tools, such as the Re-NATURE Index, which measures biodiversity and social inclusion in urban contexts and also qualitative approaches, the researchers analyzed how cities might foster sustainable living (Borrelli *et al*., 2025). Particular attention was paid to civic participation, local governance, and food justice movements. Initiatives such as urban gardens, community-supported agriculture, and the "Slow Food" and "Città Slow" networks offer concrete examples of how urban spaces can be transformed into ecologically vibrant and socially equitable environments (Borrelli *et al*., 2025).

Equally important is the connection between biodiversity, agriculture, and global justice. The group has dedicated specific attention to sustainable and regenerative farming practices, with a particular focus on the Global South. A case study from

Tanzania allowed to highlight how Community Seed Banks serve as vital resources for resilience, food sovereignty, and cultural continuity. These banks do more than protect genetic diversity: they safeguard traditional knowledge, local autonomy, and social dignity. In connecting these local practices to global agendas such as those advanced by the FAO, the research outlines a vision of food systems where biodiversity is fundamental to both ecological balance and human well-being (Borrelli *et al*., 2025).

Cultural institutions like museums and ecomuseums were also examined as key actors in the ecological transition. No longer confined to the role of passive custodians, these institutions are increasingly becoming active spaces for public engagement, environmental education, and collaborative governance. An extensive mapping and analysis of all the ecomuseums existing in the Mediterranean area allowed us to better understand how ecomuseums rooted in local contexts can support community-based sustainability. The study (Borrelli, Pigozzi & Mura, 2024a) of a sample of nearly 500 institutions, showed how more than 90 explicitly work on the topic of food and promote activities related to biodiversity, short supply chains, and local agri-food heritage. Initiatives like the "Ecomusei del Gusto" (Ecomuseums of Taste)[1] project or the "Sustainable Food Landscapes" network[2] highlight peasant knowledge, ancient crops, and typical products through experiential routes and local development strategies.

Projects involving citizen science, digital collection access, and participatory curatorship reveal how heritage institutions can bridge memory, place, and innovation to support ecological awareness. Sustainability is understood not only environmentally but also as an integration of ecological, cultural, social, and economic dimensions.

This multi-pronged investigation also acknowledged the importance of developing tools to evaluate the impact of biodiversity-related initiatives. Existing ecological indicators were adapted to cultural and institutional contexts to assess not only environmental outcomes but also social and relational dynamics. One of the innovations proposed is the Webpage Engagement Capacity tool, which measures how effectively museums activate ecological engagement through their digital platforms (Borrelli, Pigozzi, Mura, 2024a).

[1] More info at http://www.ecomuseidelgusto.it/

[2] More info at https://www.rikolto.org/issues/sustainable-food-landscapes

Ultimately, the work of the research group aimed to develop an integrated understanding of biodiversity as a key dimension of contemporary life. Rather than isolating it within the realm of biology or conservation, the work highlights its entanglement with politics, aesthetics, culture, and social justice. This systemic approach emphasizes the importance of building knowledge through a dialogue between disciplines, institutions, and communities. Biodiversity, as this research shows, is not just something to be protected: it is a lens through which we can rethink how we live, relate, and imagine a more sustainable and just future.

The Symposium and the DisSeminAction Exhibition

The activities of the sociology group within Spoke 7 combined field and documentary research with engagement events aiming at interested stakeholders.

A key moment was the "Symposium on Biodiversity, Food, and Education" held on November 25, 2024, which promoted an active dialogue and collaboration among a group of experts and practitioners. The event aimed to reflect on what museums and other cultural institutions can do to raise public awareness and promote participatory practices on biodiversity conservation and food system sustainability.

The day began with four short presentations that shared experiences on biodiversity, sustainable food systems, and community engagement, followed by three parallel discussion tables, later brought together in a plenary session. This book is the evolution of the presentations shared on that day by Pamela Koch, Karen Brown, Hellas Cena, and Tania Schusler. Three key themes guided the following discussion:

1) Bridging theory and practice: recent studies suggest that governance of local systems (e.g., food systems or biodiversity conservation) can benefit from hybridization processes that involve unconventional actors. Museums, through educational and participatory actions, stimulate social, cultural and environmental change. Although not directly involved in food policies, museums can support co-governance practices by using learning and capacity-building tools that engage local communities and national/international visitors.

2) Institutional collaboration: institutions nationally and internationally are addressing biodiversity conservation and food system sustainability in various

ways, including artistic productions and exhibitions (e.g., "Restoring Earth at the Field Museum" in Chicago, or "Food in New York: Bigger Than the Plate" at the Museum of the City of New York). Increasingly, cultural institutions are forming networks, such as the "Ecomuseums of Taste" in Piedmont or the "Museums of Food" in Parma. These networks promote knowledge sharing and best practices, involving museums, local authorities, schools, communities, and research institutions.

3) Impact assessment: the evaluation of those initiatives' impact is a growing concern for researchers, policymakers, and activists alike. In the context of the Sustainable Development Goals (SDGs) both conceptual (choice of indicators, theoretical definitions) and practical challenges (funding, responsible actors, training) emerge. Effective impact assessment is crucial to understand the long-term influence of such a project, but often exceeds the duration of the project itself, posing validation challenges.

The discussion tables held during the event helped integrate perspectives from both academics and professionals working on biodiversity, food sustainability, education, and museology. They emphasized the need to improve awareness and understanding of these interconnected themes and challenge outdated assumptions. As a result of the discussion, a list of proposed actions and tools was compiled and shared:

1) Publications, including multiple works on biodiversity, food systems, and education.

2) A policy brief targeted at policymakers and administrators.

3) Exhibitions, such as a temporary exhibition kit (cf. "DisSeminAzioni").

4) Collaborative initiatives among artists, museums, food systems, and rural communities.

5) Cooperation agreements, including university research agreements and mapping of food systems.

The Exhibition "DisSeminAzioni: Biodiversity as Beauty" was born from the Symposium to promote awareness of biodiversity's intrinsic value. The exhibition essentially aims to show and disseminate the idea of biodiversity as beauty, and to encourage actions that must, however, be guided by common sense and reason (Dante's "virtù e conoscenza")[3], but also by feelings, emotions, and therefore by art, which can often convey even complex messages more effectively than scientific texts.

The way in which the term "beauty" is used in this work is intentionally provocative. To borrow the words of Renzo Piano, beauty is never only aesthetic; rather, it is a fragile balance between ethics and poetry, between technique and lightness. It is something built with patience, respect, and listening: to the place, the light, the wind, the people, to nature, which is inherently biodiverse (Borrelli *et al*., 2025a).

The term beauty and the notion that biodiversity is a form of beauty goes far beyond aesthetic dimension in this context. It is more about harmony and balance. The aesthetic beauty of biodiversity — which undoubtedly exists and manifests itself in the vibrant colours of a coral reef, in the song of birds, or in the blooming variety of wildflowers — is not enough to fully comprehend what biodiversity truly is.

Biodiversity is not only something to admire, it is also an ethical value. Every living being has the right to exist, regardless of its usefulness to humans. Defending biodiversity means recognizing the deep bond between humans and nature and taking responsibility for its protection. It is an act of justice towards future generations and all forms of life. In an increasingly homogenized and distracted world, biodiversity is an irreplaceable source of inspiration, balance, and beauty.

The exhibition spreads and cultivates this idea by exploring the beauty of biodiversity. To achieve this aim, the exhibition explores the artistic and photographic world, with the goal of emotionally engaging the visitor. Then wide its exploration within certain scientific disciplines, such as environmental

[3] "Ye were not made to live as brutes, but to follow virtue and knowledge." (Dante, Canto XXVI of *Inferno* – our translation). In this famous verse Dante invites human beings to emancipate themselves from unreasonable instincts, often driven by self-interest, in order to cultivate what makes them fully human: the pursuit of goodness and knowledge. It is a powerful reminder of the moral and intellectual responsibility to recognize value, harmony and interconnectedness in what we experience. (Cfr. www.biodisseminazioni.it/en/)

sociology, with particular attention to urban biodiversity and the relationship between biodiversity and food production. At the same time, the exhibition examines what certain cultural institutions, especially museums and ecomuseums, are doing in the field of biodiversity conservation and protection. The exhibition concludes with a clear call to action aimed at all those interested in these themes, conveyed through the tools of participatory science.

In addition to the scientific corner established at the Department of Sociology, a digital version of the exhibition has been created, available for download at the following link: https://www.biodisseminazioni.it/en/. This resource will remain useful and accessible in the future.

The exhibition is accompanied by the publication *Disseminazioni: Raccontare la biodiversità* which inaugurates "Biodiversity, Food, Culture" an editorial series published with Ledizioni. Future volumes will include: *Places of Biodiversity: Cities and Landscapes of Contemporary Art and Architecture Between Nature and Artifice* written by Francesca Guerisoli, Andrea Rolando, and Nunzia Borrelli; *Bringing Nature Back to Cities. Governing, Communicating and Living with Urban Biodiversity in the Mediterranean* by Monica Bernardi, Nunzia Borrelli, and Pablo Gomez Iniesta; *Weavers of the Future. Empowerment of local actors for Heritage and Biodiversity Regeneration in Times of Climate Crisis* by Nunzia Borrelli, Giulia Mura, María Soledad González-Reforma, Victoria McMillan, and Raul Dal Santo.

Never Alone: the Relevance of Creating Relations

As we have discussed, in a global context marked by ecological crisis and the growing fragility of food systems, it becomes crucial to adopt an integrated approach to sustainability that acknowledges the interdependence between biodiversity, culture, education, and territorial governance (Morin, 1999; IPBES, 2019).

This chapter has offered an overview on a research that integrated various methodologies and theoretical perspectives in order to investigate the strategic role that museums and ecomuseums can play in promoting sustainable food systems by improving biodiversity, fostering collective awareness, and actively involving local communities (Davis, 2011; de Varine, 1996).

Drawing from research experiences within the NBFC framework (Borrelli, Pigozzi & Mura, 2024a; Borrelli, Mura & Agovino, 2024b; Terenzi & Borrelli, 2025), this

work shows how these cultural spaces can act as mediators between scientific knowledge and local wisdom, activating ecological imaginaries and transformative learning processes (Brown, 2023).

Biodiversity is not merely a biological issue; it also represents a layered cultural and political construct, the result of centuries of interaction between humans, natural environments, and productive systems (Altieri & Nicholls, 2020). It is expressed through local agricultural varieties, traditional food practices, peasant knowledge, processing techniques, and convivial rituals (Cena, Labra & NBFC Collaborator Group, 2024).

The crisis of biodiversity, exacerbated by intensive agro-industrial models, uncontrolled urbanization, and global standardization of consumption, is simultaneously an ecological, cultural, and nutritional crisis (The Lancet Commission, 2019).

The reduction in crop diversity not only weakens ecosystems' ability to adapt to climate change, but also simplifies diets, leads to the loss of micronutrients, and spreads standardized food models that are often hypercaloric and nutritionally poor (EAT-Lancet Commission, 2019). This homogenization contributes to the global increase in obesity, overweight, and chronic diet-related diseases, in stark contrast with the right to healthy and culturally appropriate food (Cena *et al*., 2024).

In this context, food becomes a crucial intersection for biodiversity: it encompasses genetic, ecological, symbolic, and nutritional dimensions. Enhancing local varieties and traditional food systems, as demonstrated by international experiences, promoted by movements like “Slow Food” and “La Via Campesina”, not only safeguards agricultural heritage, but also improves the nutritional quality of diets (La Via Campesina, 2021). These approaches promote a more varied, seasonal diet that is less reliant on industrially processed products and more responsive to environmental and cultural contexts.

Understanding food as a common good — rather than a commodity — means recognizing its role in promoting individual and collective health, as well as in protecting ecosystems (HLPE, 2017). Fair access to nutritious, just, and sustainable food is now a central issue of ecological, social, and health justice.

Moreover, food biodiversity is a strategic resource for addressing climate change and food security issues. Cultivating native varieties adapted to local contexts reduces the use of chemical and energy inputs, enhances agricultural resilience, and

strengthens food sovereignty, with positive impacts on community food habits and nutritional well-being (Altieri & Nicholls, 2020; Argumedo, 2013). However, promoting agroecological systems based on biological and cultural diversity requires a profound paradigm shift that involves not only technical aspects, but also symbolic, educational, and relational dimensions. In this perspective, cultural institutions play a key role as spaces for mediation, awareness-raising, and transformation (Brown, 2023;).

Education for sustainability is one of the key goals of the United Nations' 2030 Agenda (UN, 2015). Nevertheless, it often becomes a top-down transmission of content, losing sight of its transformative potential. Instead, education about biodiversity and food should mean promoting situated, dialogical, experiential learning that engages emotions, senses, and the body, as well as rationality. As Sterling (2010) reminds us, authentic sustainability education must be transformative, fostering critical reflection and new modes of thinking and being. Within this framework, museums, and particularly ecomuseums, emerge as strategic spaces for ecological education rooted in local territories (Davis, 2011; Borrelli *et al*., 2024a).

New museology has highlighted the potential of museums as institutions "at the service of society" (Davis, 2011). Ecomuseums, as described by Hugues de Varine, are based on a "pact with the community" that transforms the museum into a participatory process rooted in place and lived experience (de Varine, 1996). Various studies show that these institutions can activate environmental, food, and intergenerational education pathways that connect scientific and local knowledge, daily practices, and future visions (Borrelli, Pigozzi & Mura, 2024a). Food becomes a transversal theme, a "connector" that allows for discussions on biodiversity, agriculture, climate, health, economy, identity, and emotions. Through educational gardens, taste labs, agroecological walks, sensory maps, and memory archives, museums nurture a culture of sustainability conceived as coexistence among species and generations.

In the context of ecological transition, museums can play an active role in building sustainable, localized food systems. Far from the static image of "temples of knowledge," they can become "civic laboratories" where hybrid forms of governance are tested among institutions, citizens, the social economy, and research (Janes & Sandell, 2019). Studies conducted in New York (Borrelli, Koch & Burgos Guerrero, 2024c) show how science and climate museums have begun collaborating with networks of urban gardens, schools, artists, and food activists

to promote a sustainable and inclusive food culture. These experiences demonstrate that cultural institutions, due to their authority and narrative capacity, can facilitate participation, cross-sectoral dialogue, and behavioural change.

Museums, therefore, can be seen as nodes in an ecological network of culture, capable of connecting tangible and intangible heritage, education and social innovation, art and activism, research and territory. For this potential to be fully realized, political and institutional investment is needed to recognize the strategic role of culture in the ecological transition. European and national policies should promote collaboration among museums, schools, farmers, and local governments, supporting educational and research projects that place biodiversity and food as common goods at their core.

All of these experiences reinforce the idea that sustainability is not a simple goal to be reached, but a cultural process to be inhabited. Food, biodiversity, and education are not separate domains but interdependent forms of the same ecology of life. Only by keeping them together can we generate imaginaries and practices capable of transforming crisis into opportunity. Museums, as spaces for listening, storytelling, and connection, can become precious allies on this path towards shared ecological and cultural justice.

Conclusions

What emerged from this work is a crucial lesson: addressing biodiversity loss requires more than technical fixes or scientific data, it demands a paradigm shift. Biodiversity must be understood and treated as a complex problem, one that is ecological, political, cultural, and ethical all at once. This complexity calls for intersectoral and multidisciplinary approaches capable of integrating scientific knowledge with emotional engagement, community participation, and institutional innovation. In this sense, food and cities emerge as two strategic entry points. Food systems embody the tight interrelation between biodiversity, health, justice, and cultural heritage, while urban environments, often dismissed as hostile to biodiversity, can in fact serve as laboratories for ecological transition. Initiatives such as urban gardens, community-supported agriculture, and local food policies provide practical models for integrating biodiversity into everyday life and governance structures. Likewise, cities are home to cultural institutions — museums, science centres, ecomuseums — that can act as mediators between

scientific knowledge and public understanding, fostering imaginative and transformative ecological narratives.

In this perspective, the present chapter not only introduces the structure and contents of the volume but also provides its conceptual grounding. It affirms that the ecological crisis we face is inseparable from the ways in which we relate to knowledge, institutions, and each other. Biodiversity, far from being a niche concern for environmental science, must be at the center of our collective imagination, where food, culture, education, and the arts converge to build a more just and sustainable world.

By investigating the expressive power of culture, the symbolic and material intersections between biodiversity and food, and the civic potential of museums, the research reveals how cultural spaces can act as catalysts for systemic change. These institutions, when grounded in local contexts and empowered by participatory practices, have the capacity to shape new ecological sensibilities, foster the transmission of intergenerational knowledge, and activate communities around concrete actions for sustainability.

However, this is only one part of a broader constellation of efforts needed to confront the intertwined crises of biodiversity loss, food insecurity, and climate instability. The chapters that follow in this volume take up this challenge by expanding the dialogue between disciplines, geographies, and methods.

Hellas Cena's chapter further reinforces the importance of biodiversity in human health, highlighting the deep links between agrobiodiversity, nutrition, and the sustainability of food systems. Her work outlines the risks posed by dietary homogenization and the loss of nutrient-rich local varieties, while advocating for integrative approaches — such as the Planetary Health Diet — that align ecological goals with cultural and nutritional realities.

Karen Brown's contribution situates community museums within the framework of sustainable development, arguing for their transformative potential in preserving biodiversity, supporting traditional ecological knowledge, and fostering resilience in the face of climate change. Her focus on island communities in Scotland and the Caribbean highlights how localized heritage practices can inform global debates on ecological justice and intergenerational responsibility.

Pamela Koch deepens this discussion by addressing the educational dimension, offering a model of food system transformation rooted in awareness, understanding, and action. Her emphasis on advocacy, collective engagement, and

evidence-based educational strategies makes a compelling case for cultural institutions as platforms for democratic participation and change-making.

Finally, Tania Schusler underscores the importance of community engagement — especially the inclusion of youth — in building regional food systems that are based on equity, resilience and biodiversity. By linking environmental education, social equity, and youth empowerment, her chapter offers a participatory roadmap to reimagining food systems from the ground up.

Together, these chapters offer a relevant legacy for the potential of cultural and educational institutions to serve as agents of ecological transformation. They remind us that biodiversity is not only something to be studied or preserved, but something to be lived, narrated, tasted, remembered, and shared. The ecological transition we face cannot be achieved through science alone; it requires a collective cultural change that embraces biodiversity as a common good, a source of resilience, and a foundation for justice.

The future of biodiversity education lies in building alliances between researchers and communities, institutions and territories, knowledge, and emotion. It lies in recognizing the interdependence of all forms of life and cultivating the political and pedagogical tools to defend them. This volume is a step in that direction.

Chapter 2

Biodiversity and Health: Focus on Nutrition and Lifestyle

Hellas Cena, Maria Vittoria Conti

Introduction

Biodiversity is increasingly recognized as a foundational pillar of both planetary and human health. It encompasses the variety of life across all levels, genetic, species, and ecosystem diversity, and plays a crucial role in regulating environmental processes, sustaining food production, and ensuring the availability of diverse and nutrient-rich diets. However, despite its critical role, biodiversity is in sharp decline worldwide driven by anthropogenic pressures such as intensive agriculture, urban sprawl, climate change, and pollution. This loss is not only an ecological crisis, but also a public health emergency.

From a nutritional standpoint, biodiversity is essential for food quality, dietary adequacy, and metabolic resilience. Diverse ecosystems provide access to a wide array of plant and animal species, each with unique nutritional profiles, bioactive compounds, and functional benefits. The simplification of food systems, characterized by the replacement of traditional, regionally adapted diets with a narrow range of globally traded staples and ultra-processed foods has dramatically reduced dietary species richness, with direct consequences for human health.

Recent evidence demonstrates that reduced biodiversity in diets correlates with an increased risk of non-communicable diseases (NCDs), micronutrient deficiencies, and gut microbiota imbalance. In contrast, higher dietary species richness has been associated with better diet quality and improved health outcomes. A recent study conducted on the Italian adult population within the IV-SCAI survey found a significant association between dietary species richness and nutrient adequacy, supporting the role of biodiversity in enhancing diet quality and overall health (Kalmpourtzidou *et al*., 2025).

This chapter explores biodiversity as a nexus between environmental sustainability and nutritional well-being. It highlights how the erosion of agrobiodiversity,

cultural food traditions, and natural ecosystems compromises not only ecological integrity but also the resilience of food systems and the efficacy of clinical nutrition strategies. As we face the interconnected challenges of climate change, food insecurity, and the rise in diet-related chronic diseases, re-integrating biodiversity into nutrition and lifestyle frameworks becomes a strategic and ethical imperative.

The EAT-Lancet Commission's Planetary Health Diet (EAT-Lancet Commission, 2019) and the Global Syndemic Framework (The Lancet Commission, 2019) both underline the urgent need for integrated approaches that reconcile human health with environmental limits. Biodiversity emerges in this context as a unifying principle that connects sustainable agriculture, dietary diversity, chronic disease prevention, and cultural resilience.

Moreover, the integration of biodiversity into public health and clinical nutrition is gaining momentum. A recent position paper by Cena, Labra, and the NBFC Collaborator Group (Cena *et al*., 2024) emphasizes biodiversity as a critical component of planetary health and calls for systemic policies that embed biodiversity into food systems, healthcare strategies, and nutritional guidelines.

This chapter seeks to deepen the understanding of how biodiversity intersects with human nutrition and lifestyle, with a particular focus on clinical practice and public health implications. It frames biodiversity not merely as an environmental asset, but as a clinical and strategic determinant of health, prevention, and resilience in the Anthropocene.

Biodiversity directly influences the nutritional quality of the food we eat. Diverse ecosystems provide a variety of edible plant and animal species that contribute essential micronutrients, dietary fiber, and phytochemicals to the human diet. Micronutrient adequacy, especially for iron, vitamin A, and zinc, is heavily dependent on the diversity of consumed species.

The loss of biodiversity limits this variety, reducing access to vital nutrients. For example, the widespread replacement of indigenous crops with a handful of commercial staples, rice, maize, and wheat, has led to monotonous diets that lack essential nutrients. In contrast, diets that incorporate diverse plant and animal species are more likely to meet nutritional needs, improve gut health, and lower the risk of chronic diseases.

Biodiversity is also important for the composition and function of the gut microbiota, which plays a central role in immune regulation, metabolic health, and inflammatory processes. A diverse diet promotes microbial richness, which in

turn, contributes to a reduced risk of obesity, metabolic syndrome, and other non-communicable diseases.

Recent work by Cena and colleagues (Cena *et al*., 2024) emphasizes how integrating biodiversity into personalized nutrition and lifestyle interventions can contribute to more resilient health outcomes, particularly in the context of clinical nutrition and chronic disease prevention.

Biodiversity and Dietary Quality

Biodiversity directly impacts the nutritional quality of our diets. It provides access to a wide spectrum of edible plant and animal species, each contributing unique combinations of macronutrients, micronutrients, fibers, and bioactive compounds. This diversity is essential not only for nutrient adequacy but also for the physiological regulation of metabolism, immune function, and gut health. In clinical nutrition, ensuring variety in dietary intake is a foundational strategy to achieve balanced nutrient intake and reduce the risk of micronutrient deficiencies, particularly iron, vitamin A, zinc, magnesium, and essential fatty acids.

Monotonous diets, often dominated by ultra-processed foods and a handful of global staples such as wheat, rice, and maize, have replaced rich traditional diets in many parts of the world. This transition, known as dietary homogenization, not only reduces the diversity of species consumed but also narrows the range of bioavailable nutrients. Over time, such simplification contributes to chronic low-grade inflammation, oxidative stress, and metabolic dysregulation, all of which are key drivers of non-communicable diseases (NCDs) such as type 2 diabetes, cardiovascular diseases, and obesity.

In contrast, diets characterized by high dietary species richness (DSR) are more likely to support metabolic and immune health. Recent findings from the IV-SCAI survey in Italy demonstrated a positive association between DSR and higher adherence to national dietary guidelines, improved intake of vitamins and minerals, and better overall diet quality (Kalmpourtzidou *et* al., 2025). These results reinforce the importance of species diversity in dietary counselling and public health nutrition strategies.

A growing body of research has also highlighted the relationship between dietary diversity and the gut microbiota. The human gut hosts trillions of microorganisms that interact with the host through the production of metabolites, modulation of the immune system, and maintenance of gut barrier integrity. Diet is one of the

most influential modulators of microbial diversity. Consuming a wide variety of fiber-rich plant foods, including legumes, fruits, vegetables, whole grains, and herbs, nurtures a more diverse and resilient microbiota, which in turn contributes to a reduced risk of inflammation-related diseases and improved mental and metabolic health.

From a lifestyle medicine perspective, dietary biodiversity plays a preventive role not only in physical health but also in mental well-being. Nutritional psychiatry has begun to explore how a diverse diet — rich in phytochemicals, omega-3 fatty acids, and antioxidants — can support cognitive function and reduce the risk of mood disorders through its effects on neuroinflammation and gut-brain signaling. This line of evidence underscores how dietary diversity extends its benefits well beyond micronutrient sufficiency.

Moreover, many underutilized and forgotten foods, such as traditional legumes, leafy greens, edible flowers, wild fruits, and fermented preparations, have unique nutritional profiles and are rich in polyphenols, saponins, and other bioactive compounds with cardiometabolic, antidiabetic, and anti-inflammatory properties (Conti *et al*., 2021). These foods, deeply embedded in traditional diets, offer an opportunity to improve nutrient intake while also preserving culinary heritage and ecological sustainability.

In clinical settings, recommending diets that include a wide variety of minimally processed foods, especially those sourced from local biodiversity, can help patients meet their nutritional needs more effectively. This approach not only supports the prevention and management of chronic diseases but also promotes cultural acceptability and patient adherence to therapeutic diets. Thus, the integration of biodiversity into clinical represents a powerful, evidence-based strategy to improve individual and public health outcomes.

From Monocultures to Dietary Homogenization

The global expansion of industrialized agriculture and food systems has led to a dramatic reduction in the diversity of species cultivated, consumed, and preserved. This phenomenon, often referred to as the "monoculture paradigm," has replaced ecologically adapted and nutritionally diverse crops with a handful of high-yield staples such as wheat, rice, maize, and soy. The consequences of this shift extend far beyond agriculture: they influence food security, nutrition quality, public health, and cultural identity.

Dietary homogenization refers to the increasing global convergence of eating habits around a limited set of foods and ingredients, often dominated by ultra-processed products high in saturated fats, refined sugars, salt, and additives. This nutritional uniformity, driven by global food supply chains and aggressive food marketing, has coincided with alarming trends in the prevalence of chronic diseases, particularly in low- and middle-income countries undergoing rapid dietary transitions. As traditional, regionally adapted diets are abandoned, so too are the health-protective properties of diverse, minimally processed foods.

The reduction in agrobiodiversity also affects the nutritional resilience of populations. Traditional food systems once relied on a wide range of cultivated species, wild edibles, and seasonal ingredients that provided complementary nutrients and protected against periods of scarcity or crop failure. On the contrary, modern food systems are highly vulnerable to disruptions — whether due to climate change, economic instability, or geopolitical conflict — because they rely on a small number of crops grown under intensive, resource-dependent conditions.

This narrowing of the food base exacerbates multiple forms of malnutrition: undernutrition, micronutrient deficiencies, and diet-related chronic diseases. The Lancet Commission on the Global Syndemic has identified this convergence as one of the primary drivers of obesity, undernutrition, and climate change, three pandemics that interact in a complex, mutually reinforcing system (The Lancet Commission, 2019). These challenges require a radical shift in the food system governance, grounded in equity, sustainability, and health promotion.

In clinical practice, dietary homogenization presents as reduced dietary quality, poor adherence to nutritional recommendations, and greater reliance on supplements or fortified products to meet basic micronutrient needs. Patients often report difficulty accessing fresh, diverse, and affordable foods, particularly in urban or socioeconomically disadvantaged settings. These so-called “food deserts” further perpetuate nutritional inequities, disproportionately affecting children, the elderly, and those with chronic conditions.

Biodiversity loss also undermines food sovereignty, the right of people to define their own food systems. As multinational corporations control increasing portions of seed supply, food production, and distribution, local communities lose agency over what they grow, cook, and eat. This has significant implications for culturally appropriate dietary counselling, as patients may no longer have access to the traditional foods their therapeutic plans are based on.

The Planetary Health Diet proposed by the EAT-Lancet Commission offers a compelling vision to counter these trends (EAT-Lancet Commission, 2019). By emphasizing plant-based, minimally processed, and regionally adapted foods, it promotes both environmental sustainability and chronic disease prevention. However, for such a model to succeed in practice, it must be tailored to the specific biodiversity, food cultures, and economic realities of each population. In this context, clinicians and nutrition professionals play a critical role in translating sustainability principles into personalized dietary strategies that patients can realistically follow.

To address the health impacts of dietary homogenization, a multidisciplinary and multilevel approach is needed, one that integrates nutritional science, clinical medicine, public health, food policy, and agroecology. This includes strengthening local food systems, preserving culinary heritage, supporting small-scale farmers, and prioritizing diverse, whole foods in both public procurement and clinical nutrition guidelines.

Traditional and Indigenous Diets: Cultural Biodiversity as Nutritional Heritage

Traditional and indigenous diets are the living expression of biocultural diversity, the intersection between biodiversity and cultural knowledge that shapes food practices, health beliefs, and sustainable livelihoods. These dietary patterns have evolved over centuries through close interaction with local ecosystems and climatic conditions, offering nutritionally balanced, ecologically adapted, and culturally meaningful ways of eating. They are not only repositories of nutritional wisdom but also models of resilience in the face of environmental and health crises.

Diets such as the Mediterranean, Okinawan, Andean, Maasai, or traditional Indian are rich in plant-based foods, minimally processed ingredients, and seasonally available resources. They often incorporate legumes, whole grains, nuts, seeds, wild greens, fermented foods, herbs, and spices, many of which are underutilized or absent in modern industrial food systems. These components provide essential micronutrients, dietary fiber, and phytochemicals that contribute to reduced risk of chronic diseases such as type 2 diabetes, cardiovascular conditions, certain cancers, and neurodegenerative disorders.

For example, the Mediterranean diet, recognized by UNESCO as intangible cultural heritage, has been widely studied for its cardioprotective and anti-

inflammatory properties. It includes a wide range of biodiverse foods such as wild herbs, heirloom vegetables, pulses, and cold-pressed olive oil. The synergy of these components, combined with traditional food preparation methods, creates a dietary pattern that is both health-promoting and environmentally sustainable.

From a clinical nutrition perspective, the integration of elements of traditional diets into dietary counselling enhances not only nutritional adequacy but also patient adherence. Diets that reflect the patients' cultural backgrounds and familiar ingredients tend to have higher acceptability and long-term sustainability. This is particularly important in managing chronic diseases where behavioural change and lifestyle modification are crucial to therapeutic success. When nutritional plans resonate with a patient's cultural identity, they are more likely to be maintained over time.

Recent studies have highlighted the nutritional richness of traditional plant species and preparations. Legumes such as lentils, chickpeas, fava beans, and pigeon peas, central to many indigenous food systems, are rich in protein, iron, zinc, and a variety of non-nutrient bioactive compounds. Conti *et al*., (2021) emphasized the functional role of these legumes, particularly in aging populations, noting their contribution to gut health, glycaemic control, and chronic disease prevention (Conti *et al*., 2021).

Traditional food systems also embody the principles of sustainability and circularity. They rely on low-input agriculture, seasonal consumption, biodiversity conservation, and minimal food waste. Food is often shared within communities, prepared at home, and consumed in social settings that reinforce intergenerational knowledge and well-being. These practices, while often overlooked in clinical settings, have important implications for mental health, food literacy, and lifestyle interventions.

However, traditional diets are increasingly at risk. Globalization, urbanization, and shifting socio-economic dynamics have led to the erosion of indigenous food knowledge and the displacement of biodiverse ingredients by standardized, ultra-processed products. This nutritional transition is associated with higher rates of obesity, metabolic disorders, and non-communicable diseases, particularly in indigenous populations facing loss of land, food sovereignty, and cultural continuity.

To preserve the health benefits and cultural integrity of traditional diets, clinical nutrition and public health initiatives must engage with local food cultures in a respectful and evidence-based manner. This includes documenting and validating

traditional knowledge, supporting biodiversity-friendly food policies, and incorporating culturally relevant foods into institutional settings such as schools, hospitals, and community programs.

Ultimately, traditional and indigenous diets are not relics of the past, but dynamic, adaptive systems that offer powerful tools to promote health, equity, and sustainability. Their revitalization, supported by science, policy, and healthcare, can foster resilience not only in ecosystems but also in the people who rely on them.

The Planetary Health Diet offers a scientific framework for aligning human nutrition with ecological boundaries. Its recommendations, centered on plant-based foods and reduced animal product consumption, are designed to support both human health and environmental sustainability.

However, the global application of this model requires careful localization. In clinical nutrition, individualized recommendations must consider cultural food preferences, accessibility, socioeconomic constraints, and sustainability goals.

Recent findings by Cena *at al*., (2024) suggest that personalized nutrition strategies that leverage biodiversity, especially by including traditional and region-specific foods, can enhance adherence and effectiveness in managing NCDs.

This underscores the importance of integrating biodiversity not only in public health messaging, but also in clinical nutrition programs and dietary counselling.

Planetary Health Diet and Biodiversity-Based Transitions

The Planetary Health Diet, introduced by the EAT-Lancet Commission in 2019, represents a milestone in aligning nutritional goals with environmental sustainability. This model proposes a flexible dietary framework based primarily on plant-derived foods, such as fruits, vegetables, legumes, whole grains, nuts, and seeds, while recommending limited consumption of red meat, added sugars, and ultra-processed products. Its overarching goal is to simultaneously improve human health and reduce environmental degradation, particularly greenhouse gas emissions, biodiversity loss, and land overuse (EAT-Lancet Commission, 2019).

From a public health perspective, the Planetary Health Diet offers a science-based template for dietary transitions at the population level. It encourages dietary

diversity, nutrient density, and low ecological impact, making it a valuable reference for policy-making, food procurement, and educational initiatives. However, its success is highly dependent on regional adaptation, cultural contextualization, and socioeconomic feasibility. What works in a Scandinavian or Mediterranean setting may not be directly translatable to Sub-Saharan Africa, Southeast Asia, or remote Andean communities.

In this context, biodiversity becomes a crucial enabler of the Planetary Health Diet. Local ecosystems provide unique combinations of edible species, many of them underutilized, that can fulfill the diet's recommendations in ways that are culturally appropriate and nutritionally rich. Dietary species richness (DSR) supports not only nutritional adequacy but also ecological resilience and food sovereignty. This is particularly relevant in clinical and therapeutic nutrition, where personalized plans must consider food accessibility, affordability, preferences, and cultural habits.

A recent perspective by Cena and colleagues underscores the need to integrate biodiversity and planetary health into individualized nutrition strategies, particularly in lifestyle medicine settings (Cena *et al.,* 2024). The authors call for a shift from nutrient-centered approaches towards food-system thinking, recognizing the interconnectedness of food production, diet quality, and health outcomes. This aligns with the principles of lifestyle medicine, which emphasize sustainable behaviour change rooted in real-life food environments.

In clinical practice, the Planetary Health Diet can serve as a useful guideline to structure dietary interventions that are both health-promoting and environmentally responsible. However, clinicians must also navigate potential barriers, such as unfamiliarity with plant-based ingredients, lack of culinary skills, and limited availability of seasonal or local foods. Addressing these challenges requires collaboration with dietitians, community organizations, and educators to foster food literacy and support meaningful dietary change.

For instance, legumes are a cornerstone of the Planetary Health Diet due to their high protein content, low environmental footprint, and beneficial effects on glycaemic control and satiety. Yet, their consumption remains low in many industrialized settings, often due to cultural preferences or digestive concerns. Promoting traditional recipes, soaking and fermenting techniques, and gradual dietary inclusion can help reintroduce these foods into modern lifestyles.

Furthermore, the application of the Planetary Health Diet in clinical nutrition should emphasize flexibility and personalization. Not all patients will adopt strict

plant-based patterns, and prescriptive approaches may backfire if they neglect cultural, emotional, or economic dimensions of eating. Instead, clinicians can encourage patients to "diversify their plate" with locally available, nutrient-dense, and minimally processed options, many of which align with both planetary health goals and traditional food cultures.

The Planetary Health Diet also opens the door for interdisciplinary collaboration. Nutrition experts, agronomists, environmental scientists, public health professionals, and policy-makers must work together to identify region-specific solutions that protect biodiversity while supporting public health. This includes developing biodiversity-sensitive dietary guidelines, supporting sustainable food systems, and ensuring that healthy food is accessible to all segments of society.

In summary, the Planetary Health Diet offers a compelling vision for a healthier, more sustainable future. But its real-world implementation depends on our ability to translate global principles into local, biodiverse, and culturally rooted food systems. Clinical nutrition professionals have a key role to play in this transformation by guiding patients, shaping dietary environments, and advocating for policies that nourish both people and the planet.

The Global Syndemic: Interconnected Crises and the Role of Food Systems

The concept of Global Syndemic, introduced by the Lancet Commission in 2019, highlights the urgent need to recognize and address the interrelated pandemics of obesity, undernutrition, and climate change (The Lancet Commission, 2019). These crises do not occur in isolation; they share common systemic drivers rooted in how we produce, distribute, and consume food. The current food system, optimized for volume, profit, and uniformity, has inadvertently become a powerful contributor to disease, ecological degradation, and social inequality.

On the one hand, energy-dense but nutrient-poor foods have become the global norm. Ultra-processed products, rich in refined carbohydrates, unhealthy fats, and sodium, dominate modern diets across continents. These foods are aggressively marketed, often subsidized, and widely accessible, especially in urban and low-income environments. At the same time, nutritious and biodiverse foods such as legumes, leafy greens, seasonal fruits, and whole grains are frequently marginalized, economically, culturally, and geographically.

This nutritional imbalance fosters a paradox: rising rates of obesity and metabolic disorders coexisting with micronutrient deficiencies and undernutrition, particularly among vulnerable populations. Poor dietary quality is a leading risk factor for non-communicable diseases (NCDs), which now account for most of the global mortality. Meanwhile, agricultural practices that prioritize monocultures and industrial animal farming drive deforestation, greenhouse gas emissions, water depletion, and biodiversity loss, further compromising the ecological basis of food production.

Clinicians are increasingly confronted with the health consequences of this syndemic in everyday practice: patients with comorbidities such as obesity, type 2 diabetes, hypertension, and depression, often rooted in dietary and lifestyle patterns shaped by unhealthy food environments. Addressing these conditions requires not only individual-level interventions, but also systemic strategies to reshape the broader determinants of food choice and access.

Biodiversity offers a powerful, though underutilized, lever in this context. Diets based on a wide array of plant species, whole foods, and traditional preparations are not only nutritionally superior but also environmentally sustainable. Promoting dietary species richness (DSR) and reducing dependence on resource-intensive foods, especially ultra-processed and animal-based products, can help mitigate all three pillars of the Global Syndemic simultaneously. For example, increasing the availability and affordability of diverse legumes, grains, fruits, and vegetables can prevent chronic diseases, improve nutritional security, and reduce ecological impact.

Public health responses must therefore shift from treating the symptoms of the syndemic to transforming the systems that perpetuate it. This includes rethinking agricultural subsidies, food labelling, urban planning, and education. Policies that support local food systems, sustainable farming, and biodiversity conservation are critical to realigning health and environmental goals.

From a clinical standpoint, practitioners must broaden their lens to include environmental and societal factors in nutrition counselling. For example, lifestyle medicine can integrate planetary health principles by encouraging patients to adopt more plant-based, diverse, and seasonal diets.

However, these recommendations must be adapted to local contexts, patient preferences, and socioeconomic realities to ensure equity and adherence.

Importantly, food system transformation must centre on equity. Marginalized communities often bear the brunt of the syndemic's effects, through poor diet quality, higher exposure to environmental toxins, and limited healthcare access. Therefore, a just transition must ensure that all populations, regardless of income, geography, or background, can access the benefits of biodiverse, sustainable, and health-promoting diets.

The Global Syndemic framework challenges us to move beyond fragmented solutions. It calls for a unified, systems-based approach in which clinical care, public health, agriculture, and environmental protection are no longer treated as separate silos. At the heart of this transformation lies the imperative to restore balance, between people and planet, between culture and consumption, and between diversity and standardization.

Biodiversity in Clinical Nutrition and Lifestyle Medicine

In the context of clinical nutrition and lifestyle medicine, biodiversity emerges as a key yet underutilized tool in both disease prevention and management. While traditional medical models have focused on isolated nutrients and pharmacological interventions, a growing body of evidence supports the need for comprehensive, food-based strategies that consider the variety and quality of the foods we consume, not just their energy or macronutrient content.

Biodiversity contributes directly to the effectiveness of nutritional interventions by expanding the pool of bioactive compounds available through the diet. Polyphenols, flavonoids, carotenoids, fibers, and prebiotic compounds are often highly concentrated in underutilized plant species, wild edibles, and traditional preparations. These compounds exert anti-inflammatory, antioxidant, and metabolic regulatory effects that are increasingly relevant in the treatment of non-communicable diseases (NCDs) such as cardiovascular disease, obesity, type 2 diabetes, and certain cancers.

From a clinical perspective, diets rich in biodiverse foods are associated with improved glycaemic control, lipid profiles, and gut microbiota composition. For instance, integrating a wider variety of legumes, leafy greens, whole grains, nuts, seeds, and herbs into dietary plans can enhance nutrient density while also offering therapeutic benefits. Conti *et al*. (2021) emphasized the functional potential of

legumes in aging populations, noting their role in reducing systemic inflammation and supporting digestive health (Conti *et al*., 2021).

Lifestyle medicine, as a discipline, recognizes the role of dietary patterns, physical activity, sleep, stress management, and social connection in promoting long-term health. Within this framework, biodiversity supports two foundational pillars: food and connection to nature. Encouraging patients to consume seasonal, locally sourced, and culturally relevant foods not only enhances nutrient intake but also fosters environmental awareness and behavioral engagement.

Incorporating biodiversity into clinical practice can take many forms. Nutrition professionals may recommend dietary species richness (DSR) as a measurable goal, for example, consuming 30 different plant-based foods per week, a target linked to gut microbial diversity and overall metabolic health. Meal planning can emphasize variety over repetition, using simple tools such as food frequency checklists or biodiversity "scorecards" to help patients track and increase the diversity of their diet.

Moreover, biodiversity-based approaches align well with personalized nutrition. Instead of relying on one-size-fits-all models, clinicians can tailor dietary interventions to include culturally familiar and locally accessible foods, many of which have high nutritional and therapeutic potential. This enhances patient compliance, strengthens the therapeutic alliance, and respects food heritage.

The inclusion of biodiversity in nutrition care pathways is also consistent with the broader shift towards planetary health-oriented care. Cena *et al*. (2024) advocate for embedding biodiversity into clinical decision-making, noting that the health of patients cannot be separated from the health of ecosystems (Cena *et al*., 2024). This perspective invites clinicians to become not only prescribers of diets but also stewards of food systems.

There is also an educational opportunity embedded in biodiversity-centered care. Nutrition professionals can guide patients in rediscovering traditional ingredients, exploring new recipes, participating in community-supported agriculture (CSA), and even cultivating home gardens. These actions promote autonomy, engagement, and food literacy, factors that are essential in the long-term success of lifestyle interventions.

However, barriers remain. Lack of access to biodiverse foods, limited knowledge of preparation methods, and cultural disconnection from traditional diets can hinder their implementation. Addressing these barriers requires cross-sector

collaboration, with schools, municipalities, farmers, chefs, and the media, to rebuild a food culture that values diversity, simplicity, and sustainability.

In summary, biodiversity offers clinicians a powerful, evidence-based strategy to enhance the quality and effectiveness of dietary care. It bridges nutrition science, cultural identity, environmental stewardship, and behavioural change, all essential components of lifestyle medicine in the 21st century.

Recommendations: towards Biodiversity-Driven Dietary Guidelines

The transition to a biodiversity-informed nutrition model requires coordinated, multi-level action, from institutional policy to local communities and clinical practice. A paradigm shift is needed to reorient food systems towards health, sustainability, and equity by placing biodiversity at their core.

At the policy and governance level, the integration of biodiversity indicators into national dietary guidelines is an essential first step. Traditional guidelines often emphasize nutrient targets without taking into account the ecological origin or diversity of foods. Including biodiversity-sensitive metrics, such as dietary species richness or seasonal variation, can encourage a broader systemic change. In parallel, agricultural subsidies must be realigned to support producers who cultivate underutilized species, indigenous crops, and sustainable farming practices. This includes financial incentives for agroecological methods and disincentives for monoculture or ultra-processed commodity production.

Public procurement programs offer another high-impact intervention. School meals, hospital catering, and institutional food services can prioritize seasonal, locally sourced, biodiverse foods. Programs such as “farm-to-school” or “zero-mile” sourcing not only improve nutritional quality but also stimulate local economies and shorten food chains. These practices help preserve culinary heritage and normalize biodiversity in everyday diets from an early age.

In the health and education sectors, training health professionals in sustainable and biodiversity-based nutrition is critical. Most clinical curricula still lack formal education on food systems, sustainability, or traditional diets. Equipping future clinicians, dietitians, and public health practitioners with this knowledge will allow for more holistic patient care and better alignment with planetary health goals.

Nutrition counselling should include culturally relevant foods, biodiversity benefits, and practical tools to incorporate variety into daily routines.

Public awareness campaigns also play a pivotal role. Communication strategies, whether through social media, educational platforms, or community events, can spotlight underutilized species, explain their health benefits, and promote traditional culinary knowledge. This requires collaboration with chefs, influencers, scientists, and local storytellers to make biodiversity engaging, accessible, and aspirational.

At the community level, efforts to revitalize food cultures and empower citizens are indispensable. Supporting local food cooperatives, seed-saving initiatives, and urban gardens helps restore food sovereignty and diversify food environments. Involving indigenous and rural communities in food policymaking ensures that traditional knowledge systems are not only preserved but also embedded into future solutions. Creating platforms for dialogue between farmers, researchers, healthcare providers, and consumers encourages mutual learning and stronger, more resilient food networks.

In research, deeper investigation into underutilized species, their nutritional composition, bioactive compounds, and clinical impacts is urgently needed. There is a vast pool of edible biodiversity, estimated in tens of thousands of species, that remains largely unstudied in modern nutrition science. Investment in biodiversity-monitoring systems can help track the health consequences of biodiversity loss and inform public health responses. The use of biodiversity-related food system indicators, such as ecological integrity indices or agrobiodiversity scores, can bridge the gap between environmental science and clinical application.

These multi-level recommendations reflect and reinforce the urgent call issued by Cena, Labra, and collaborators for integrated global action that places biodiversity at the center of health and food system transformation (Cena *et al*., 2024). Without this shift, we risk the continued erosion of both ecological resilience and population health.

Conclusion: Reimagining Health through Biodiversity

Biodiversity is not a luxury; it is a biological and cultural necessity for human and planetary health. Its preservation must be central to strategies addressing nutrition, climate resilience, public health, and social equity. As demonstrated throughout this chapter, dietary diversity rooted in local ecosystems and cultural traditions is a powerful, actionable lever for improving individual well-being and supporting sustainable development.

Integrating biodiversity into nutrition policy, clinical guidelines, and public health frameworks can fundamentally transform food systems. By doing so, we not only safeguard ecological integrity but also improve dietary quality, enhance metabolic resilience, and create environments that support long-term health. These benefits are not abstract or distant — they manifest in better patient outcomes, stronger communities, and stronger healthcare systems.

For clinicians and nutrition experts, biodiversity remains an underexplored yet highly impactful asset in both prevention and therapy. Moving beyond nutrient-focused approaches, a biodiversity-centered strategy enables more holistic, culturally adapted, and environmentally responsible interventions. Re-centering biodiversity within clinical nutrition and lifestyle medicine fosters a culture of health deeply connected to nature, where food is not just fuel, but medicine, memory, and meaning.

Frameworks such as the Planetary Health Diet and the Global Syndemic offer valuable paradigms for guiding this transformation. They illuminate how health, environment, and equity are inextricably linked and how food systems can either drive or prevent disease. But the real engine of change lies in shared stewardship where farmers, educators, healthcare professionals, scientists, policymakers, and citizens all play a role in restoring and protecting biodiversity.

Ultimately, the future of health is intertwined with the future of the planet. A food system capable of nourishing both people and ecosystems must be diverse, equitable, and resilient. By embracing biodiversity as both as a clinical and cultural imperative, we can reimagine not only what we eat, but how we live, heal, and thrive together.

Chapter 3

The growing role of museums and community-led cultural organisations as agents of social and environmental change

Karen Brown

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (Brundtland 1987, 43).

"The projected decline in biodiversity will affect all people, but it will have a particularly detrimental effect on indigenous peoples and local communities, and the world's poor and vulnerable." (UN Global Biodiversity Outlook 5 – Summary for Policy Makers 2020, 12).

Introduction

The acceleration of the climate emergency and biodiversity loss are scientifically linked, creating negative impacts on food production and security, as well as human well-being. Decision-makers today stand at a crossroads between either sustaining Planet Earth for future generations while facing up to legacies of global inequality or continuing on a trajectory towards tipping points founded on growth at the expense of people and planet (Lambertini *et al*., 2025; Ritchie *et al*., 2022). One of the main rationales behind this collection of essays is to draw the attention of cultural policymakers to the fact that unsustainable food systems are the primary driver behind habitat degradation and loss (Benton *et al*., 2021; WWF 2020, 60), which, together with the climate crisis, are breaking down natural regulatory systems.

Food systems account for 70% of water use and over a quarter of greenhouse gas emissions around the world (WWF, 2020, 15), and yet the topics of food loss and waste, sustainable diets, and food consumption are largely absent from debates or targets featured in the Paris Agreement and Global Biodiversity Framework (WWF, 2020, 65). In response to this gap, COP28 in Dubai stressed in its concluding statement "that any path to fully achieving the long-term goals of the Paris Agreement must include agriculture and food systems. We affirm that agriculture and food systems must urgently adapt and transform in order to respond to the imperatives of climate change" (COP28 UAE Declaration, 2023).

Discussions about food security are also not often front and centre of emerging cultural heritage and policy reports, such as the landmark "The Future of Our Pasts: Engaging Cultural Heritage in Climate Action" ICOMOS report (2019). However, as this edited book demonstrates, museums and other cultural institutions have great potential to address the climate crisis and enhance sustainability in food systems in several ways beyond the traditional didactic exhibition. This action can take the form of collaborating with scientists or NGOs to enable citizen science projects (such as marine life monitoring) or running in-house grassroots initiatives (such as community and medicinal gardens), or facilitating inter-generational transmission of traditional ecological knowledge, or simply by encouraging bee life through native flowers. The purpose of this chapter is to present a number of short, salient case studies from Scotland, Central America and the Caribbean that illustrate this point, and to demonstrate for community practitioners and policymakers alike the potential and transferability of these initiatives for climate action and sustainable food systems. The selections have been made drawing on field work and interviews conducted by the author over recent years, and they reflect a range of museum types outside the National Museum model, such as local independent museums, community museums, ecomuseums, and community heritage organisations more broadly.

Case Studies from Scotland

Stromness Museum Orkney: Blue Space, Health, and Well-being

The World Wildlife Fund has recently reported a decrease of 73% in mammals, birds, reptiles, amphibians, and fish worldwide over a 50-year period (1970–2020), with the fastest declines being in the Latin America and Caribbean region (95%). Meanwhile, the UK has seen a 41% decline and has the lowest remaining levels of biodiversity of the G7 countries (it is also in the lowest 10% globally) (WWF Living Planet Report, 2024).[4] In Scotland, this fact has led to an urgent governmental call to restore and regenerate biodiversity loss by 2045, recognising that "protecting and regenerating biodiversity is the best chance we have to mitigate and adapt to climate change" (Scottish Biodiversity Strategy, 2024, 12). But what have museums and cultural institutions got to do with this urgent situation? Is there a role outside scientific and economic solutions for cultural institutions to have an impact on the future of Planet Earth? Stromness Museum in the Orkney Islands of northern Scotland serves as an excellent case study in how local independent museums can engage with health and well-being through collections that are in harmony with the sea life on its doorstep.

Recent discussion about the benefits of spending more time in "green space" is complemented by the concept of "blue space" (Kleinschroth *et al*., 2024; McKinley *et al*., 2019). Scotland has the largest area of coastline in Europe after Norway, meaning that through the COVID-19 pandemic, the coastline and the sea became vital resources for many people to manage stress – walking, running, sea swimming and so on. Concurrently, a small number of museum exhibitions and outreach programmes engaged with this concept of blue space, including the Scottish Fisheries Museum, which collaborated with a team of students doing our Museum and Gallery Studies course at the University of St Andrews. Together, they curated an exhibition and public engagement programme titled "By the Seaside" to engage the local communities (Alexander, 2021; McKinley *et al*., 2019). While conducting fieldwork and interviews at the Stromness Museum on Orkney Island after the lockdown ended, I discovered more about how museum Education Officer Katy Firth had also been working with blue space towards

[4] The Latin America and the Caribbean region are followed by Africa (76%) and the Asia and the Pacific (60%). Europe and Central Asia (35%) and North America (39%) (WWF Living Planet Report 2024).

environmental communication, training, and stewardship by fostering audiences' understanding of, and relationship with, their collections and the sea life.

Stromness Museum was formerly a family home called Tankerness House, located on the shore front of Stromness town. It was established by the Orkney Natural History Society in 1837 and is one of Scotland's oldest independent museums. It is well known for its archaeology collection, designated as of national significance, and its displays feature the island's social history and connections. The island's maritime natural and cultural heritage are showcased throughout the displays, and temporary exhibitions highlight themes associated with blue heritage, including seabed preservation. For example, in response to Orkney's Blue Carbon audit of 2020, the museum curated an exhibition entitled "Living Wrecks: The Marine Life of Scapa Flow", designed to raise awareness of local marine biodiversity and its role in carbon sequestration (Stromness Museum 2021). This exhibition raised public awareness that several shipwreck sites (including those at Scapa Flow) are designated as priority marine features within Scotland's natural heritage framework. The shipwreck sites are also habitats for diverse marine organisms functioning as carbon sinks. In the exhibition, interactive displays, underwater video footage and "virtual dives" communicated the ecological significance of Blue Carbon. Seaweed kelp is well known as a natural carbon sink, but horse mussels (biogenic reef builders) and marine species such as pink coralline algae were also shown to store carbon.

However, the museum did not stop at a bespoke exhibition; it initiated citizen science through marine wildlife recording. Building on local partnerships with community organisations and the local sub-aqua club, snorkel safaris departed from the harbour located in front of the museum. Firth also became a certified Sea Search volunteer, contributing, in 2022, to weekly snorkelling-based biodiversity data-gathering for national citizen science databases and organising a community sea safari involving 24 participants (Brown, 2022a). The tours, supported by the Museums Galleries Scotland Festivals Fund, involve a visit behind the scenes to the museum's historic seaweed collections (the museum holds 400 specimens of pressed seaweed collected between 1839 and 1962 by several key Orcadian naturalists), followed by a snorkelling expedition from the museum's pier. The initiative continued on a booking basis and, eventually, in partnership with an accredited dive school (Kraken Diving). One safari, for example, explored a seagrass bed, offering a chance to spotlight the work of Project Seagrass, a global charity collecting seeds in Orkney to restore seagrass beds in the River Forth by the

capital city of Edinburgh. "The safaris have helped position the museum as an environmentally conscious and community-focused institution," Firth commented. "Our experience has shown the value of reaching out to the community — from passionate volunteers to local businesses and environmental charities like the Marine Conservation Society" (MGS Report, 2023).

Building on this momentum, the museum planned a subsequent exhibition drawing on archival collections and natural history records dating back to the nineteenth century. This initiative aimed to contextualise current climate issues within Orkney's environmental heritage. Additionally, following COP26 in Glasgow in 2021, the museum hosted a series of themed "Climate Cafes: Changes in a Lifetime", involving local groups not always engaged with the local museum or normally associated with heritage protection, including the Orkney Men's Shed, Young Farmers, Scottish Women's Rural Institute Orkney, and the Orkney Youth Café. They spotlighted the region's rare and vulnerable fan mussels – a species protected under the Wildlife and Countryside Act due to their sensitivity to trawling, similar to horse mussels. This initiative won an Association for Heritage Interpretation Engaging People Award in 2023. Stromness Museum is continuing this commitment to climate education in 2025–2026 through a recent exhibition titled "Powered by the People" on renewable energy in Orkney, in collaboration with Orkney Renewable Energy Forum.

Stromness Museum exemplifies how a museum rooted in its local community can serve as a catalyst for environmental education, citizen science, and climate action through innovative programming and local engagement. However, small community-led heritage organisations could also serve as hubs for cultural preservation and public health, particularly in the context of climate change and community recovery. This was demonstrated during the COVID-19 pandemic by community heritage initiatives in the Outer Hebridean islands off the west coast of Scotland.

A growing body of scholarship foregrounds heritage landscapes as sites of well-being, drawing upon Indigenous epistemologies that break down divides between nature and culture (Davis *et al*., 2012; Harris, 2015). In museum studies, Kirsten Wehner introduces the concept of "ecological museology", a framework that integrates nature and culture to foster new understandings of the interdependence between "human" and "non-human" realms, particularly within the Australian context (Wehner *et al*., 2017). Given these postulations, well-being could be more systematically embedded as a cross-cutting theme within museum and heritage

policy and strategic planning as well as academic research (Brown, 2019). But achieving this integration requires developing clearer conceptual frameworks and robust methodologies for assessing well-being outcomes, aligned with broader governmental efforts.[5]

Across the UK, well-being is often associated with indicators of mental health and happiness, and new collaborations have formed between cultural institutions and the National Health Service (NHS). These partnerships reflect a growing recognition that, faced with an ageing population and increased pressure on healthcare systems, cultural engagement can serve as a preventative and therapeutic resource for public health. Consequently, heritage-based activities are now commonly included in "social" and "cultural" prescriptions aimed at improving individual well-being. This trend was further accelerated by the COVID-19 pandemic, which heightened public awareness of communal interdependence and the importance of fostering resilient, supportive communities. Scotland offers a compelling national example, having adopted a "well-being economy" model that reorients policy away from traditional GDP metrics towards holistic measures of societal health (following precedents such as Aotearoa New Zealand).[6] Within this context, the Scottish museum sector has pioneered initiatives such as the Happy (Cantie) Museum, which foregrounds community-based approaches to well-being by sharing ideas and best practice.

Recent research interviews conducted throughout the Inner and Outer Hebrides in the wake of COVID-19 demonstrated how small local museums can be hubs for this knowledge, and revealed that during the pandemic, some were acting as food bank suppliers for the community and contributing to recovery in meaningful ways by providing well-being activities for a range of ages (conversation, Heritage Officer and the author, Isle of Lewis 2021). One example of this is when Skye Ecomuseum *Druim nan Linntean* made use of its site Loch Shianta (known to hold medicinal properties) to offer natural shelter for outdoor educational activities and train local youth to lead Forest School sessions. This action provided both employment and community engagement opportunities

[5] Looking to Continental European examples, for instance, the European Green Deal explicitly prioritises sustainability and citizen well-being as central tenets of economic policy, placing the Sustainable Development Goals at the core of EU decision-making.

[6] For ideas on the "well-being economy", see the Scottish Government 2023b; the Happy (Cantie) Museum website; Scottish Government 2023a.

(Brown, 2022d).[7] Another example is the range of actions taking place on North Uist island in the southern Outer Hebrides, which evidences how heritage initiatives can be mobilised to enhance social cohesion and physical and mental health in remote contexts.

North Uist Community Heritage — COVID-19, Climate Change, and Community Recovery

"We are almost a drowning island anyway [...] I think we are on the edge here, so it is actually happening more quickly here than anywhere else." (Brown, 2022b).

When travelling from the north to the south of Scotland's Outer Hebridean islands, the landscape changes, opening up to low-lying drenched lands patterned and soaked by the winding sea inlets (fjards, lochs, and lochans) of the Uists.

Image 1 — Sea inlets and lochs, North Uist, Scotland. Photograph of the author

[7] Staffin, on the Isle of Skye, is home to Scotland's only ecomuseum. Opened in 2008 under the management of the Staffin Community Trust, it was originally named *Ceumannan* and is now known as *Druim nan Linntean* (Ridge of Ages).

This landscape is deeply entwined with traditional agriculture and the culture of the area, including the Gaelic language, place names, songs, music and myths, and the traditional practice of crofting (non-intensive croft farming occupies two-thirds of the land use) (Outer Hebrides Heritage Forum, 2025). Distinctive fishing punts were designed locally by the Stewart family of boat builders to navigate both these inlets for transporting goods and the high seas outside (Brown, 2022c).

A pivotal concept underpinning this context is the Scottish Gaelic notion of *dùthchas* — encompassing "sense of place", "collective heritage", and "homeland" — which articulates the profound ways in which island museums and heritage sites can cultivate enduring community relationships with land and sea through both tangible and intangible expressions, not least the intergenerational transmission of oral storytelling and poetry. Scottish community land buy-outs, enabled by legal instruments of the "Community Right to Buy" under the Land Reform (Scotland) Act 2003 and Land Reform (Scotland) Act 2016, offer a strong history of collective action on Uist and elsewhere (Brown and & Caesar, 2020)[8]. On the Uists, climate change and heritage are perceived as deeply interconnected, particularly because of the island's crofting traditions and close relationship with the land. Machair grass is a distinctive feature of this area, cultivated over centuries of crofting as well as through environmental processes, and it supports flowers, grasses, breeding birds, and invertebrates (NatureScot Report, 2025). In past times, farmers and fishers had diversified their practices to meet the challenging landscape and conditions, and traces can still be seen in the landscape, such as the *feannagan*, or "lazybeds", such as those seen on Harris.

[8] Recent initiatives around "bioregioning" will further enhance food security through community heritage pathways; see Bioregioning Tayside 2025; DROPS Platform 2025.

Image 2 — "Lazybeds" on the Isle of Harris, Scotland. Photograph of the author

These were dug into areas of poor drainage and built up with turf, seaweed and manure to create fertile growing areas for potatoes, root vegetables and, in particular, green vegetables. High winds in the autumn and winter months, together with rising sea levels, erode the coast and affect local biodiversity. Tough machair grassland growing around the sand dunes, particularly on the south-western side, helps to protect the coast from prevailing winds[9]. Coastal erosion and water saturation are pressing concerns, with residents — especially crofters — keenly aware of the accelerating environmental changes.

During fieldwork at the North Uist Heritage Society in 2021, two long-standing board members described how the organisation has engaged with local communities on climate change and post-pandemic community recovery. Established in 1994 through a collaboration between the *Comman Eichterie* (Local History Society) and the Uist Arts Association, the society has since evolved into an independent Scottish charity. Unlike many arts organizations, it does not receive regular state funding and relies on community fundraising and project-

[9] The machair erosion issue was also discussed at length with community heritage leaders on the island of Tiree (Brown, 2022d).

based grants. During COVID-19, the national support organisation, Museums Galleries Scotland, provided resilience funding that was described to me as both substantial and appropriately flexible. However, interviewees expressed concern that North Uist, despite its rich intangible heritage — particularly the Gaelic language and cultural distinctiveness — has been overlooked in national funding schemes, in comparison to neighbouring islands. Nevertheless, this autonomy has enabled the society to pursue locally meaningful initiatives, such as the planned repatriation of 120 artefacts from Benbecula to North Uist. The society's strength lies in its close consultation with the community, exemplified by a sponsored well-being walk and cycle event in April 2021, which raised nearly £2,400. The society also explored partnerships with organisations such as Macmillan Cancer Support to promote health and well-being through walking and social prescribing.

Collaborations with schools and universities, such as the SCAPE (Scottish Coastal Archaeology and the Problem of Erosion) project (Dawson *et al*., 2020), have engaged school students in exploring the machair grasslands, coastal erosion and local biodiversity. The society has worked with national youth programmes, including the John Muir Award and Heritage Heroes, not only to steward the local landscape but also to support young people's personal growth (as explored by Schusler *et al*., 2010). A notable example was the "Adopt a Beach" initiative in August 2019, which attracted 300 participants and combined beach cleaning, filmmaking and intergenerational activities, including a reminiscence lunch with the local dementia support group. Post-pandemic, the society has continued to prioritise well-being and sustainability. Plans include developing a community garden, a sensory garden for cancer and dementia care groups, and installing a rapid electric vehicle charger. Gaelic language classes and place-name research are also ongoing priorities, reflecting the community's commitment to preserving its linguistic and cultural heritage (Brown, 2022b).

A quarter of the global land area is traditionally owned, managed, used and/or occupied by Indigenous Peoples (WWF Report, 2020, 9), and there is increasing recognition of the value of Indigenous stewardship for a more balanced approach to biodiversity safeguarding in the face of the climate emergency (Garnett *et al.*, 2018). Lessons can therefore be learned internationally that are applicable to a range of landscapes and ecosystems in the nexus between local heritage, community identity and well-being. This sharing of knowledge was demonstrated in a recent youth exchange between Scotland and Costa Rica in Central America when young people from the Isle of Skye and from northern Portugal engaged in

a cultural and physical exchange with Indigenous young people from southern Costa Rica as part of the EU-LAC Museums research project (2016–2021) (Brown & Brown, 2023, 35–50). Through this exchange, community memory about landscapes, language, music, dance, poetry and other traditions showed parallels between Scottish *dùtchas* and the Costa Rican *bien estar* (well-being) or *pura vida* (pure life). Today, the Scottish islands are facing "the vernacular crisis" which is exacerbated by inward migration, for example, on the popular Isle of Skye as described by Scottish poet Peter Mackay (Shared Island Stories documentary, 2025). A shared problem that can therefore be explored in both Scotland and Indigenous lands is how to deal with the loss of native language owing to dislocation, cultural decimation and the exodus of local young people brought on by inward migration and housing scarcity. These themes were highly pertinent to the EU-LAC Museums youth exchange, and are linked to issues of local biodiversity loss and climate change.

Schulser has described elsewhere and in her chapter in this book how the process of youth environmental action co-creates social-environmental change, which in turn promotes continued participation of youth for personal and community transformation (Schusler *et al.*, 2009). This postulation is evidenced through ongoing EU-LAC Museums impact, including the involvement of an alumnus (now in their 20s) serving on the Skye ecomuseum steering committee. This theme of youth empowerment for local and global environmental action was also advanced through our most recent youth exchange, between the Scottish Hebridean islands and Barbados in the Caribbean.

Case Studies from Scottish and Caribbean Islands: The Shared Island Stories research project

Islands are conventionally associated with romantic ideas of local distinctiveness and isolation, and yet those situated off the west coast of Scotland and the Caribbean share the growing problem of coastal erosion through rising sea levels and storm intensification, as well as economic recession, depopulation and inappropriate tourism development. Shared Island Stories Between Scotland and the Caribbean: Past, Present, Future (2022-27)[10] is a 5-year research project that

[10] This research project was selected for funding by the European Research Council (ERC) and funded by UK Research and Innovation (UKRI) under the Guarantee Scheme, with reference: EP/X023036/1. It is coordinated by the School of Art History at the University of St Andrews.

this author is coordinating from the University of St Andrews in Scotland that aims to investigate relationships between the archipelagos.

Intrinsic links between Scottish land ownership and Gaelic language, loss, and restoration have been explored at length elsewhere outside museum and heritage studies (McIntosh, 2001; Cleary, 2024). On occasion, scholars have also drawn parallels between the Hebrides and Indigenous lands overseas concerning both spiritual feelings towards land connectedness (Gaelic dùtchas) and entitlement to native lands in relation to histories of dispossession (the Highland Clearances) (McIntosh, 2001)[11]. Of course, such a comparison becomes more layered and difficult to countenance when considering overseas lands colonised or settled by Scottish people, a history currently being explored through Shared Island Stories in bringing new archival evidence to light (Brown, 2024; Cateau, 2024; Cateau, 2025).

It goes without saying that global warming and biodiversity loss are affecting remote and island communities in disproportionate ways, making heritage conservation and preservation a critical issue for the twenty-first century. Islands such as those off the west coast of Scotland and the Caribbean archipelago share the global problem of coastal erosion through rising sea levels and storm intensification, as well as economic recession, depopulation and inappropriate tourism development. Increasingly, adaptation for sustainability is understood not only as adjusting to changes through innovations in climate science, but also as a human story owing to the fragility of cultural identities and memories at risk. Drawing on history, heritage studies, sustainable development, art history and memory studies, the project asks: Which collections from the islands tell unfinished stories of Empire? What is the role of heritage communities for sustainable development? How can island community museums partner with NGOs, policy and local organisations and businesses for climate action? How can health and well-being be understood in relation to community heritage, traditional ecological knowledge and island life? What does this new knowledge bring to debates on climate justice, especially as they relate to the role of youth?

This latter research question aims to foster cultural understanding among young people in Scotland and the Caribbean about their local areas by encouraging them to imagine positive futures, while acknowledging the sense of loss associated with

[11] For a history of the Scottish clearances, see Tom Devine, *The Scottish Clearances: A History of the Dispossessed*, 1600–1900 (Penguin Books, 2018).

over-tourism and climate change on both sides of the Atlantic. Through a bespoke youth exchange (2022–24) in collaboration with the West Harris Trust (a community buy-out) and Barbados Museum and Historical Society, the project is inspiring young people to engage in biocultural preservation through museums and other cultural institutions, meaning that traditional ways of life will not only be respected but also deployed towards more sustainable futures, as seen, for example, in the township of Ness in north Lewis (BBC Naidheachdan, 2023). In the words of Jamie Allan Brown, the transnational youth exchange, "sought to bridge traditional heritage practices, such as weaving, ecological land management, farming, rum and whisky production, and community celebrations like Crop Over in Barbados and ceilidh in Scotland." (Brown, J. A. 2025). A young person from Barbados reflected on their experience: "Talking with elders through this project made me realise that the struggles we're facing now aren't new, but they are getting worse. Our communities have always found ways to survive and adapt. Learning from our elders and their experiences gives us the strength and knowledge to face today's realities and protect our future." (Wallace 2024)[12]. Sharing stories between islands through team research across a range of Humanities and Social Science approaches in collaboration with museums and other cultural organisations, has therefore endeavoured to address the concern to sustain Planet Earth for future generations, while facing up to historic and systemic legacies of global inequality.

Case Studies from Costa Rica

Boruca and Rey Curré Community Museums – Food Security and Collective Memory

As the World Health Organisation has noted, biodiversity serves as the foundation of healthy, sustainable food systems, and yet it is being lost around the world at alarming rates (WHO Report, 2025). When Agenda 2030 called to "leave no one behind", policymakers were harking back to the ethos of the Brundtland Report quoted at the beginning of this chapter, as well as highlighting the role of Human

[12] Barbados Museum and Historical Society was awarded the inaugural ICOM Prize for Sustainable Museum Practice for their engagement in this exchange with the University of St Andrews in 2025: https://icom.museum/wp-content/uploads/2025/10/ICOM-Award-Finalists_Barbados-Museum-and-Historical-Society.pdf

Rights in the process. Costa Rica is classified by the UN as a middle- to upper-income country on the UK Overseas Development Assistance list and is renowned for its abundant nature and rich biodiversity. Costa Rica houses around 5% of the planet's biodiversity. It has a long history of environmental protection and is well known for having no army. However, the country has also visibly suffered from historic deforestation and extractive agriculture that have impacted natural ecosystems, including cattle ranching, as well as unsustainable practices such as banana and palm oil plantations (FAO Report, 2024). Moreover, some areas, including the Indigenous territories in this case study, lie outside nationally protected areas, making them more vulnerable to environmental impacts endemic to a changing climate, such as tropical storm-induced flooding.

Community museums are key spaces for local self-determination, cultural memory and preservation, and resilience; the Latin American *museos comunitarios* are vital examples of self-determined cultural institutions, particularly in Indigenous and marginalised communities, and contribute to decolonisation and the attainment of social justice (Morales Lersch 2019; Morales and Ocampo 2023). The Costa Rican "Museo Comunitario of Yimba Cajc", "Museo Comunitario de Boruca", and "Ecomuseo de la Cerámica Chorotega"[13] have collaborated with the University of St Andrews over the past decade and are focused, among other things, on the intergenerational transmission of Traditional Ecological Knowledge (TEK). Indigenous communities, in particular the Brunca people (Boruca and Rey Curré) located in southern Costa Rica, face increasing challenges due to climate change, socio-economic constraints and political marginalisation, which hinder the intergenerational transmission of TEK and cultural practices central to their resilience and identity.

[13] The network of community museums of Costa Rica is part of the wider Network of Community Museums of América coordinated through Mexico and led by Cuautémoc Camarena Ocampo and Teresa Morales Lersch; see http://www.museoscomunitarios.org.

Image 3 — Museo Comunitario Rey Curré, Costa Rica. Photograph of the author

Through participatory, practice-based methodologies — ethnobotany, ecotourism, slow food, and permaculture — a collaborative project with the University of St Andrews and the Museo Nacional de Costa Rica called Community Crafts and Cultures (CCC, 2017–2021) explored how TEK and cultural memory can be preserved, adapted and mobilised to support sustainable livelihoods and environmental stewardship. The research team asked: (1) What does Indigenous sustainability look like in the 21st century? (2) How can ethical heritage preservation support climate resilience? (3) What roles do youth and intergenerational knowledge transmission play in building adaptive capacity? (see Brown *et al*., 2023).

The concept of "ecological community museology" discussed elsewhere (Brown, *Introduction* in Brown *et al*., eds., 2023) advocates for a more active, ethical and mindful museum practice to respond to global environmental challenges, with small-scale community museums ideally placed to respond in a nimble way to disruptive change. Many activities during the CCC project centred around intergenerational transmission of traditional knowledge concerning food harvesting, cooking, and natural dyes, as well as ongoing workshops on traditional mask carving and ceramics, thus echoing the displays inside the community

museum of traditional crafts, medicine, and traditional plants that are communicated in the native Bruncan language.

When COVID-19 happened, it threatened the Bruncan communities with food shortages as they needed to patrol their borders in order to prevent the spread of infection among their community, which in turn resulted in a loss of craft sales. While in the Scottish Hebridean islands (some of which also closed their borders through the pandemic), museums acted as hubs for food distribution, in Rey Curré the community took a different path, electing to cultivate the paddock between the community museum and school as a family and communal garden and creating a small medicinal garden with didactic panels. During a consultation between Bruncan community leaders, the University of St Andrews and MNCR in 2020, their stated aim in this regard was to "use the principles of participation and Indigenous identity developed via the community museum to strengthen food security", and to enhance ancestral and cultural Indigenous memory through intergenerational workshops. The resulting garden of local fruit and vegetables, and a supply of hen eggs from their own flocks helped sustain the community through the pandemic and beyond, with some families developing their own gardens to produce food (CCC website, 2025).

This community-based adaptation is one example of how Indigenous knowledge systems can not only help them to define their own path towards sustainability, but also inform climate science and policy about the value of learning from traditional knowledge while supporting fragile ecosystems that draw on local cosmovision and collective memory. It aligns with observations by the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES) concerning the need for dialogue across communities of practice at local, scientific and policy levels (2019). While this approach differs from engagement in citizen science as observed at Stromness Museum in Orkney, both demonstrate agility in their initiatives to mitigate the worst effects of disasters and climate change and to raise local awareness of biodiversity loss through positive actions that can be taken at a local level.

Conclusion

This chapter has shown, through case studies from Scotland and Costa Rica, a number of ways in which the climate emergency and biodiversity loss are intrinsically linked, and how small-scale museums can harness innovation and

local capacity-building to address this crisis for the benefit of the communities they serve. While climate change has become a key topic for museums to grapple with in recent years, food security is an emerging issue for museums as key actors in local and global sustainable development. This chapter has focused on examples that go beyond the familiar role of museums exhibiting and interpreting displays of science, to them becoming integral actors in community self-empowerment whether that be enabling citizen science projects (such as marine life monitoring in Orkney, Scotland) or running in-house grassroots initiatives (such as community and medicinal gardens in Puntarenas region, Costa Rica). The Scottish and Costa Rican case studies therefore contribute to interdisciplinary scholarship in heritage studies, sustainability and community ecology, offering both conceptual insights and practical tools for addressing climate resilience and biocultural continuity in marginalised and Indigenous settings.

As this edited book demonstrates, a global approach to community museology that integrates historical, local and ecological considerations can be considered across a range of countries and territories. Taken together, the case studies in this chapter exemplify how local museums and heritage organisations can play a key role in addressing ecological emergencies and social isolation through display, education, public awareness and community engagement. Ultimately, the chapter provides further evidence for the agency of local independent museums, community museums, ecomuseums, and community heritage organisations more broadly to meet the museum's social role in relation to sustainable development.

Acknowledgements

Research for this chapter has been supported by the Shared Island Stories Between Scotland and the Caribbean: Past, Present, Future Project (2022–27). It was originally selected for funding as a European Research Council Consolidator Grant and subsequently converted to a UKRI Guarantee scheme in 2022, with reference EP/X023036/1.

Chapter 4

Education and Advocacy for Sustainable Food Systems

Pamela Koch

Introduction

"Food systems have the potential to nurture human health and support environmental sustainability; however, they are currently threatening both." (Willett *et al*., 2019, 447). We need agriculture and health policies to support food system change. Education can spur individual, community and societal change, especially through the public demanding policies to transform food systems towards nurturing human health and environmental sustainability.

This chapter discusses why we need education and advocacy and then outlines a three-component framework for education and advocacy for food system change. These three components are: 1) Increase awareness is to inspire people to see the need for food system transformation. 2) Increase understanding to provide the knowledge for why change is needed and how to overcome the systemic barriers we face in transforming food systems. 3) Increase action is for people to have the confidence and drive to make individual, community, and societal changes.

Education is typically defined as a process for developing knowledge through obtaining information. Yet, this one-way flow is simplistic. Education is also a field of study to understand the methods for "teaching" or providing knowledge and "learning" or acquiring knowledge. Since eating is essential for humans to live, everyone interacts with and has a knowledge base around food. However, few people have an understanding of food systems, particularly as the proportion of people in agriculture has dropped in many countries, with a particularly sharp decline from the 1950s to the present. Thus, people need enhanced awareness and knowledge about food systems, as well as an understanding of the consequences on ecological sustainability, social systems, and human health of various food system decisions.

When we have informed food citizens, who have awareness, understanding and a drive to move towards a more ecologically sustainable food system, we have primed people to be advocates. When people are willing to speak out for and demand policy makers take action, we can move towards sustainable food systems.

We need education for advocacy. The next three sections use what has been gained from psychosocial research on how education can propel people into advocates for food system governance. These are tailored from the key components of effective nutrition education as a learning progression so people feel that food system change is important, know what needs to be done and do something about it. For each component, there are determinants from psychosocial theories that can be addressed. (Contento and Koch, 2025).

How to Increase Awareness

This component focuses on inspiring people and helping them recognize the need for sustainable food systems and see transforming food systems as important – and relevant – in their lives. There are three effective psychosocial determinants that can increase awareness. First are perceived risks. This is for people to see the negative consequences to our current dominant food system. The second are values so people believe, "I care about having quality of life and quality of the planet." The third are social norms. This is to believe that many people want change and if we work together, we can make positive change.

Perceived Risks

The ecological, social, and health perceived risks related to the current global food system are well documented. In terms of human health and social equity, the current food system produces enough calories to feed our global population. However, over half of the population struggles to get access to healthy diets, despite overall declines in severe hunger, or famines in recent decades. However, famines are now increasing in many areas around the globe due to conflicts and climate change. At the same time, obesity rates continue to climb in many countries. (Rockströmm, 2025). Additionally, a study by the Food and Agriculture Organization of the United Nations found that the hidden costs of the global agrifood system are approximately $12 trillion annually with 70% or 8.1 trillion being for unhealthy dietary patterns leading to increasingly high rates of

non-communicable diseases such as heart disease, stroke, and type 2 diabetes. (FAO, 2024).

Yet, human health is only part of the issue. The ecological sustainability of the food system is exceeding planetary boundaries. It is exceeding the release of nitrogen and phosphorus into the atmosphere, changing land use and increasing carbon release into the atmosphere through deforestation, introducing novel entities into our fragile ecosystem through pesticides and excessive use of antibiotics, and compromising the integrity of the biosphere. (Rockströmm, 2025).

Education can have people confront these risks and see them as relevant and meaningful in their personal lives. This could be by understanding the increased prevalence of non-communicable diseases in their own families and communities. It could also be by exploring the inequitable access to health-promoting foods in their community. To appreciate the risk to our ecosystem, people can explore the specific changes to weather in their communities or the consequences of water pollution, soil contamination, or deforestation in the region, country, and around the globe.

Once people can see these risks and believe that there are real consequences that are affecting people today, and, more importantly, realize that there will be even worse and more severe consequences for future generations, they will be ready to learn more about food systems.

Values

The next determinant are the values. People's value systems can be seen as depending on their views of space and time. According to the book *Limits to Growth*, written in 1972, most of the earth's people views on space are concerned with matters of their family and community. In terms of their views on time, they are concerned about next week and maybe the next few years. Yet to understand the consequences of our current food system, our views on space need to be looking at the entire planet, and our views on time needs to be looking at our children's grandchildren's, and great-grandchildren's lifespan. (Meadows *et al*., 1972). Education can help people to value further out into the space and time continuum.

Additionally, researchers have looked at the spheres of moral concern that people have about food systems. They found that many people have an "egoistic" moral lens and are concerned for self. This can be expanded to have an "altruistic" concern for humanity and a biospheric: concern for the biosphere. (Arbit *et al*.,

2017). People can engage in changing values through dialogues and activities in which they imagine alternative futures.

Thinking about changing values is beautifully summed up by Barbara Ward in her 1973 piece, *There Is "A Morning's War"* (Ward, 1973) [edited to be gender neutral from male dominant].

"So, I think we must say in the end that the "morning's war" between hope and fear is not really a scientific, economic, or even a political debate. It transcends all of them. It concerns our judgement of people's ethical response and their ability to express their breathtaking and appalling energies from self-assertion — personal and collective — to a patient, cooperative search for the common good.

On their present course, humans are, in sober truth, an "endangered species." No planet can carry indefinitely the fright of population, aspiration, consumption, destruction, and exhaustion with which we threaten it. In fact, it is the planet itself that is desperately signaling to us the millennial lesson of all the world's prophets and poets — that "we must love each other or we must die. Survival is now simply the issue of whether we can learn to change in time."

Even though Ward wrote this over 50 years ago, it is still true today. This same sentiment of a struggle between hope and fear for the future was also argued by Charles C. Mann in his debate on if the planet could feed 10 billion people. (Mann, 2018).

Education has the potential to have people confront their values. Through education people can recognize why it is critical to expand their values beyond self to the biosphere. People can also realize why it is important to think not only about the immediate future, but also about the long-term. This will inspire people to believe that if we work together, we can transform the food system. This takes people a step closer to wanting to take action for food system governance.

Social Norms

The third determinant are social norms, which is the community-based aspect of food and food systems. People can have food experiences that help them see three important societal goals. First is that we can transform food systems to work in harmony with our ecosystem. Second is that when we eat from sustainable food systems, we are eating to promote health and decrease risk of both non-communicable and infectious disease. Third is that eating from sustainable food systems brings us closer to justice when all people, everywhere, having access to nourishing and culturally appropriate food. This is powerful and allows people to

believe change is possible and change is good — and that we need to work together. One way to address social norms is to have people appreciate the role of food in their own lives and in their community. The Foodlife Questions use ethnography to help people to do this through interviews that revolve around three key questions: 1) What food or flavors take you right back home? 2) What are your food rules? 3) How are you learning to care more about food in your life? (Lee *et al*., 2023).

Everyone, no matter where they live, should have the right to be the person that they want to be, which means enough nourishing food. This is because without a food system that allows all to reach their hopes and dreams, we remain unequal and divided. (Horton, 2025). When we raise awareness of the risks, values, and social norms, people care more about the food system. This makes people think and believe, "I am a person who wants to be part of the change for sustainable food systems," and they are ready for the second component, to increase understanding.

How to Increase Understanding

This is to have knowledge about how sustainable food systems will help the planet, and why change is hard and will take effort, it is worth it. There are three effective psychosocial determinants that can increase understanding. The first are the perceived benefits of transforming how we produce food so that we care for the planet and people's health and well-being. The second is recognizing barriers; that is why we have a food system that is threatening health and sustainability is the power of the companies profiting from the industrialized food system. The third is overcoming barriers by navigating through our current food system and advocating for change.

Perceived Benefits

People can understand the perceived benefits of changing food systems when they understand the structure of the system, and the benefits of changing each part of the system. While food systems are complex, we can think of food systems as four interacting parts: food production which is the agricultural methods used to grow and produce food, food processing which is how food gets changed from the time it leaves the farm until it is ready to eat, distribution which is how food gets moved from place to place, and food consumption which is the act of eating food as well as what we do with food scraps, food waste, and food packaging. (USDA, 2023).

There are many benefits in altering food production to methods that are in harmony with nature, such as organic farming and agroecology. This can benefit our climate, the health of farmer workers, prosperity of farm communities, and the health of everyone who eats. (Giller *et al*., 2021; Merrigan *et al*., 2022). This is due to increasing microorganisms in the soil, reducing run-off from fertilizers and pesticides, and reduced use of fossil fuels.

Food processing has increased exponentially over the last several decades. While processing has been used for thousands of years to preserve food and make it more palatable, only since the middle of the 20th century has our food supply had an abundance of ultra-processed foods (UPF), which are defined as "not simple foods that have been modified by processing, but rather edible products formulated from food-derived substances, along with additives that heighten their appeal and durability." (Global Food Research Program, 2021, page 1). UPFs account for over half of the calories consumed in countries such as Canada, United Kingdom, and United States and 20%-40% of the calories in other high and middle-income countries. (Global Food Research Program, 2021). Despite this rapid change in our food supply, there is increasing research on the benefits of diets that have more whole and plant-based foods with lower consumption of UPFs (Aramburu *et al*., 2024). This is exactly the type of diet people eat when we have sustainable food systems with diversified farms growing food using organic and agroecology practices.

Food distribution is a complex topic as it is not only how far food travels, but the mode of transportation, e.g., distributing food by ships is more energy efficient. However, one of the largest benefits of local food systems is that farmers and eaters can be connected. These relationships are valuable and also promote more foods that are in their whole form than UPFs. (USDA, 2023).

Food consumption is how people interact with food systems as eaters. People can see the benefits of connecting with farmers who produce their food, cooking, and eating in community and also finding ways to minimize food waste and also thinking about ways to have fewer food packages and to reuse and recycle food packages when possible.

Recognized Barriers

Despite these significant benefits to sustainable foods systems there are also recognized barriers. Corporations have been using sophisticated marketing for a

long time to entice people to eat foods engineered to peak the tastes human biology craves, such as sugar, salt, fat, as well as using food additives that make the foods hyper palatable. (Gussow, 1980). Systemic injustices have made inequitable access to health-promoting foods (Agarwal, *et al.*, 2023).

Overcoming Barriers

Thus, we need to overcome barriers and many solutions have been working. Several strategies can help to decrease purchases of less healthful foods. First countries and smaller jurisdictions can institute taxes on sugary drinks and UPF. There is evidence that these taxes reduce purchases of unhealthy projects and increase consumption of more health-promoting foods. (Global Food Research Program, 2021). A second successful strategy is front-of-packaging (FOP) warning labels on food. These can show high levels of sugar, salt, and saturated fat as well as other unhealthy ingredients. These often use a black octagon (stop sign) or a traffic light symbol with green (most health promoting), yellow (less health-promoting, and red (least health promoting). (Global Food Research Program, 2021). A study on FOP labels in Chile has found that for beverages high in sugar that after the FOP labels were introduced there were reductions in purchasing high sugar beverages at 12 calories per person per day, which was larger than the reduction seen from taxes. (Taillie *et al.,* 2020). Third, is marketing restrictions. Marketing works to increase purchases, which is why food corporations spend money advertising and promoting food. Reducing exposure to marketing, especially in children and adolescents, can change eating behaviors. This can be done by decreasing marketing in schools as well as outside of the school. (Global Food Research Program, 2021).

Other strategies have incentivized consumption of health promoting foods. First, there have been incentives with the government food assistant program, the Supplemental Nutrition Assistance Program (SNAP) in the United States. A study in 13 US states using a randomized control trial found that an incentive that doubled benefits increased purchases of fruits and vegetables at farmers markets and led to a .31 cup a day increase in consumption. (Karpyn *et al.,* 2022).

Second, improving school meals and enhancing food and nutrition education for school students has students get excited about eating well and better understanding food systems. (Koch *et al.,* 2023).

When people understand the food system and that is possible to make choices in regards to how food is produced, processed, distributed, and consumed, and they

can recognize the barriers to change and have confidence they can overcome these barriers. This increased understanding can move people into action.

How to Increase Action

People can take action at the personal and governance level. At the personal level, people can make personal choices that can support sustainable food systems.

This can be done through personal action through "action plans" in which people script out the change. (Contento & Koch, 2025). While individual change is important it is not enough, particularly with the inequities to access to sustainable and health-promoting foods. (Agarwal *et al*., 2023)

Governance is how action can be made into permanent change. There are many countries making meaningful change that can be used as models to advance sustainable food system governance.

The first is the 2005 Japan basic act "*shokuiku*" (food and nutrition education). (Act No. 63, 2005). This act builds prior acts to improve school meals by providing *shokuiku* embedded throughout students' schooling. School meals are managed by a food and nutrition teacher who leads the preparation and of meals to students and also provides information about food nutrition, and introduces foods from cultures from around the world. Additionally, over half of the foods served in schools' meals are locally produced. (Global Child Nutrition Foundation, no date). When people understand the success of *shokuiki* in Japan, they can demand healthful school meals and food and nutrition education in their own countries.

The second is Chile that has used FOP labels, as described above. These stemmed from the progressive Law of Food Labelling and Advertising passed in 2016 that made the FOP labels mandatory and also decreased food marketing to children. The results of these actions have decreased children's and adolescents' exposure to advertisements and diminished the purchases of foods high in sugar, salt, and fat. (Taillie, 2024). This shows that policies that restrict the marketing of UPF and increase people's knowledge about these foods can change eating patterns. People can demand these kinds of policies in their own countries.

The third is the European Union (EU) "Farm to Fork" strategy to build sustainable EU food systems and support the Green Deal of 2020. Some Strategies in Farm to Fork, such as common agricultural policies and contingency plans to ensure food supply in times of crisis, have moved forward. Others have been debated and have been more challenging to implement. In 2025 the EU presented a new Vision for

Agriculture and Food for 2025-2040. This roadmap will guide policy development from 2025-29. These include creating sustainability labels for food products, standards for food corporations to report their sustainability practices, and directives for green labels used on products. The goal is to reduce confusion and increase standardization. (AGRINFO, 2025). People can demand comprehensive visions for sustainable food systems practices and policies by following the Farm to Fork Initiative and the Vision for Agriculture and Food.

These examples show that governance can work. These initiatives have a greater chance of ongoing success when there is buy-in and support from the public.

Conclusion

With a global goal of governance for sustainable food systems to support our ecosystem, social systems, and public health, education for advocacy is critical. This can be more effective when it increases people's awareness of the importance of sustainable food systems, provides an understanding of how food systems work, and the benefits of transforming to a sustainable system while also recognizing the barriers to change and how these can be overcome. Finally, we can move people to action by individual change and, more importantly, through governance for sustainable food systems that leads to outcomes that benefit both the planet and people.

Chapter 5

Community Engagement towards Biodiverse, Equitable and Resilient Food Systems

Tania M. Schusler

Introduction

Centering biological and cultural diversity within food systems contributes to tangible benefits for human health, environmental sustainability, local economies, social equity, and the renewal of social traditions and place-based knowledge. Towards these ends, Borelli argues in Chapter 1 for a profound shift in agrifood paradigms that extends beyond scientific and technical aspects to also embrace symbolic, educational, and relational dimensions. In this chapter, I deepen understanding of these latter dimensions by discussing the importance and complexities of engaging communities in collectively re-imagining and re-creating food systems.

In the chapter's beginning portions, I apply a systems lens to discuss trade-offs in the dominant global food system, which is characterized by industrial agriculture, neoliberal economic policies, and vertical integration. While this system produces a large amount of food, it generates negative consequences for biodiversity and environmental sustainability (Chapter 1), human health (Chapters 2 and 4), cultural identity and traditional place-based knowledge (Chapter 3), local economies, workers' rights, and social equity. The dominant food system is also vulnerable to disruptions caused by changing environmental and political-economic conditions, as evidenced during the COVID-19 pandemic.

Towards producing better outcomes for food security, public health, cultural identity, social equity, and biological diversity, I apply a food justice lens to explore possibilities and limitations of strengthening local food systems. Community engagement plays a vital role in such efforts. Thus, in the chapter's latter sections, I examine the complexity of facilitating community participation and describe approaches for engaging youth in reimagining and recreating food systems from the ground up.

Throughout I illustrate with empirical research and cases from the United States (USA), the country in which I am located and so most familiar. Nonetheless, the conceptual frameworks that I apply reflect the knowledge generated by scholars and practitioners working in rural, peri-urban, and urban contexts around the globe. As such, the chapter offers theoretical insights and practical guidance transferable to a range of contexts in which museums and other cultural institutions engage communities towards biodiverse, equitable, and resilient food systems.

Food Systems, Biodiversity, and Social Equity

Food security refers to "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy lifestyle" (FAO 1996). Whether agriculture and related activities in the pursuit of food security exploit and degrade or support and enhance biodiversity — for example through regenerative or agroecological practices — depends on both biophysical (e.g., land use, water use, nutrient cycling) and socioeconomic drivers (e.g., culture, policy, economics). A systems lens helps to identify and analyze the interactions among these drivers, food system activities (e.g., production, processing, distribution, consumption, waste disposal), and outcomes related to food security, social welfare, and environmental sustainability. It also acknowledges food systems as complex, non-linear, and heterogeneous over space and time (Ericksen, 2008).

A worldwide shift has occurred from predominantly rural and traditional food systems to industrial and consolidated ones (Ambikapathi, 2022). The latter privilege centralization with fewer farmers and corporations controlling land and capital, dependence upon external inputs such as fossil fuels and credit, profit-driven competition that restricts cooperation, domination of nature, specialization (e.g., monocultures), and resource exploitation (Beus & Dunlap, 1990). The global shift towards industrialized and consolidated food systems has increased food supply and affordability but negatively affected nutrition and health, environmental security, climate stability, and social equity (Ambikapathi, 2022; Gliessman, 2015, Horrigan *et al*., 2002; Lynch *et al*., 2021).

We can apply the language of ecosystem services, or "the benefits people derive from ecosystems" (Millennium Ecosystem Assessment, 2005, v), to understand these trade-offs (Dr. Daniel Hayden, personal communication, September 25,

2025). Society's pursuit to maximize the "provisioning service" of food — or from a more critical perspective, agrifood corporations' pursuit of wealth and power (Gliessman, 2015) — depletes and degrades essential "regulating services" that affect water quality, floods, wastes, disease, and climate; "supporting services" like nutrient cycling and soil formation; and "cultural services," such as ceremony, intergenerational learning, and community capacity-building.

The concept of food system sustainability calls for implementing integrated practices that reduce trade-offs between provisioning and other categories of ecosystem services to attain food security, ecological integrity, and social equity. A sustainable food system "achieves and maintains food security under uncertain and dynamic social-ecological conditions, through respecting and supporting the context-specific cultural values and decision-processes that give food social meaning, and the integrity of the social-ecological processes necessary for food provisioning today and for future generations" (Eakin *et al*., 2017, 759). Importantly, this definition emphasizes the cultural, symbolic, and meaning-making aspects of food alongside the necessity to sustain social-ecological systems, which includes considering biological diversity.

As noted in the above definition, food system sustainability also requires resilience, or the "capacity over time [...] to provide sufficient, appropriate and accessible food to all, in the face of various and even unforeseen disturbances" (Tendell *et al*., 2015, 19). The global food system, on the other hand, is vulnerable to shocks arising from weather, disease and pests, sudden changes in economic conditions, and climate change (Tendell *et al*., 2015). The COVID-19 pandemic underscored this vulnerability. The direct impacts of the virus and indirect impacts of measures taken to reduce its spread disrupted food systems on supply and demand sides, negatively affecting food access among other impacts (Aday & Aday, 2020; Béné *et al*., 2021; Rivera-Ferre *et al*., 2021). In the USA, for example, abrupt cancellations by restaurants and institutional customers left food-service producers and distributors with excess supply (Felix *et al*., 2020), while food banks, food pantries, faith-based institutions, and mutual aid associations, among others, struggled to provide food to the increased number of people experiencing food insecurity (e.g., Winkler *et al*., 2023).

The COVID-19 pandemic magnified food system inequities. Persistent disparities in food security as well as access to productive resources such as land or capital reflect structural inequities related to socioeconomic class, country of origin, race, ethnicity, gender, and other intersecting social identities (Bowen *et al*., 2021;

Shostak, 2023). The pandemic's disproportionate impacts on marginalized social groups highlighted immense power asymmetries in the global food system (Gliessman, 2015). Yet, power is often overlooked in definitions of sustainability and resilience, such as those above.

Decentralizing power within the global food system is the key to achieve food sovereignty and justice. In response to global structural inequities affecting the world's rural poor, the grassroots peasant movement "La Vía Campesina" emerged in the 1990s and has organized since to resist the dominant narratives, neoliberal policies, and concentration of power within the global food system (McMichael, 2015). La Vía Campesina asserts peasant's food sovereignty, or "the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods and their right to define their food and agriculture systems" (La Vía Campesina, n.d.). Similarly, in the USA, food justice movements led by Black, Brown, and Indigenous peoples provide food for their communities while "imagining new ecological and social relationships." Food justice centers anti-racism in efforts to ensure communities' right to grow, sell, and eat nutritious, affordable, culturally appropriate, sustainably produced foods (Alkon & Agyeman, 2011, 5).

Applying a systems lens to analyze the interactions among food system drivers, activities, and outcomes can help identify opportunities for re-organizing food systems to achieve food security and ecological integrity, including supporting biological diversity. The concepts of "sustainability" and "resilience" highlight, respectively, the need to integrate across social, economic, and ecological goals and to design food systems that can withstand stressors and shocks. When analyzing interactions both within and across food systems at multiple scales, we also must ask who makes decisions that influence drivers, who controls agrifood activities, and who benefits from the outcomes — in other words, who has power. As evident from other chapters in this volume, museums and other cultural institutions can play important roles in re-imagining and re-organizing food systems to center biodiversity, cultural diversity, and social equity across spatial and social scales. I next turn to the possibilities and limitations of focusing such efforts on local food systems.

Possibilities and Limitations of Local Food Systems

Movements to re-localize food systems have increased through the latter decades of the twentieth century to the present (e.g., Lyson, 2004). Local food systems — also referred to as alternative food networks — tend to involve small- to mid-size farms focused mostly on fresh food products, direct marketing (e.g., farmers markets, CSAs, farm-to-school, farm-to-retail), small-scale processing and/or product aggregation, sourcing within a designated geographic boundary, self-provisioning activities like backyard and community gardens, and an emphasis on producer-consumer connections and community-building (Ruhf & Clancy, 2022).

Motivations for re-localizing food systems differ across actors and include ends related to food quality, producer livelihoods, rural development, cultural identity, and environmental protection, among others. But they also might involve parochialism and nationalism (Winter, 2003). Hinrichs (2003) distinguishes a reactionary, nativist politics of "defensive localization" from a "diversity-receptive localization." In the former, a socially homogenous locality emphasizes boundaries and cultural distinctions to exclude "non-local others". The latter involves an open, relational politics that embraces social and gustatory exchanges, keeping in mind the identity associated with a given place while remaining open to new meanings. Museums and other cultural institutions that facilitate knowledge exchange and meaning making around agrifood sustainability can contribute to inclusive local food systems governance, as Borrelli *et al*. (2024) document in New York City.

Many local food system actors are motivated by goals related to ecological integrity and social equity, but we cannot assume that local foods are inherently sustainable. Constrained by the political economy of national and global food systems, local producers often struggle to attain financial viability as they work to realize ecological and/or social aims (e.g., Berkey & Schusler, 2016; Sonnino, 2007). The power inequities of the global food system manifest in local food systems in exploitative labor practices or the lack of affordability for low-income consumers, for instance (Hinrichs, 2000). DuPuis and Goodman (2005) caution against an "unreflexive localism" that can reinforce local elites at others' expense, result in zero-sum outcomes due to interregional competition, and be coopted into the neoliberal global food system.

Inclusive, reflexive localism can fill an important niche in a transition to biodiversity-centered, culturally rich, resilient, and equitable food systems. Most local food systems provide a small portion of a locale's food needs yet offer additional social benefits. In cities, for example, efforts to build local food systems involving urban agriculture can increase food security, improve health, support education and skills-building, and build community capacity (Horst *et al*., 2017). Under favourable management and surrounding land use conditions, urban agriculture harbours a diversity of species (Royer *et al*., 2023); however, studies of urban agriculture's contributions to biodiversity are few and the results mixed (Clucas *et al.*, 2018). Greater attention to how urban agricultural practices under varied conditions affect biodiversity is warranted.

Local food systems also serve as an entry point to engage with food systems more broadly. For example, the food sovereignty movement has organized across locales to engage in international politics, reframing agrifood narratives and advocating policies and practices that support agroecological modes of production based on diverse forms of knowledge, social cooperation, and ecological restoration (McMichael 2015). Museums can foster visitors' and practitioners' engagement with both place-based and trans-local food systems governance (Borrelli *et al*., 2024).

Local Responses to Food Systems Disruptions during the COVID-19 Pandemic

The COVID-19 pandemic foregrounded the global food system's vulnerability and social inequities. While its impacts varied across contexts, its negative consequences for food security, health, workplace safety, and economic stability tended to disproportionately affect low-income households, food workers, ethnic and racial minorities, and other marginalized groups (e.g., Fitzpatrick *et al*., 2021; Klassen & Murphy, 2020; Smarsh *et al*., 2024). In the USA, far-reaching governmental responses were essential but insufficient to meet agrifood needs (e.g., Broad Leib *et al.*, 2021; Caspi *et al*., 2022). Below, I illustrate how local food system actors contributed to food system resilience during this public health crisis.

In the USA, local governments, Tribal Nations, philanthropic foundations (e.g., Finchum-Mason *et al.*, 2020), food assistance organizations (e.g., Wathen & Young, 2025; Winkler *et al*., 2023) and other nonprofits (e.g., Dahal & Schusler, 2025; Obach *et al*., 2023), mutual aid networks and community-led groups (e.g., Lunsford *et al.*, 2021; Schanbacher & Cavendish, 2023), and local farmers (e.g.,

Nichols *et al*., 2022; Wentworth *et al*, 2023) played critical pandemic response roles. These actors pivoted quickly to coordinate flexible, locally suitable responses (e.g., O'Connell *et al*., 2021) despite facing unprecedented operational and logistical challenges, such as staff and volunteer reductions, supply shortages, and social distancing requirements.

As elsewhere, pandemic-induced food system disruptions affected the metropolitan Chicago region. The third most populous USA city (2.7 million residents in 2020), Chicago has a high degree of racial, ethnic, and economic segregation that contributes to neighbourhood-based socioeconomic disparities (Metropolitan Planning Council, 2017), including in food access (Kolak *et al*., 2018). In June 2021, over a year into the pandemic, food insecurity remained above pre-pandemic levels with an overall food insecurity rate of 19%, 29% in Latine communities, and 37% in African American communities (City of Chicago, 2021a).

Chicago also is home to vibrant food justice movements working to transform the underlying power structures that deny investment, resources, and decision-making control related to food and agriculture, particularly in African American, Latine, Asian, and Indigenous communities (Block *et al*., 2012). The city adopted a Food Equity Agenda in 2021 articulating a multi-year plan to remove barriers to urban farming, support underrepresented food entrepreneurs, and better connect residents with healthy, affordable foods (City of Chicago, 2021b).

In this context, I conducted research in collaboration with scholars (Dahal & Schusler, 2025; Schusler *et al.* 2025) and philanthropic practitioners at the Chicago Region Food System Fund (https://chicagoregionfoodfund.org/) to explore how nonprofit organizations (n=104) interpreted and responded to the pandemic's food system disruptions. To understand patterns in these nonprofits' response efforts, we thematically analyzed stories from 127 organizational reports and focus groups with 26 representatives from 20 of the organizations. Most nonprofits worked in place-based communities or with specific communities of people, such as farmworkers or domestic violence survivors. Many were led by people of color and supported groups experiencing high rates of food insecurity, such as racial and ethnic minorities, elders, people with disabilities, or undocumented immigrants. The organizations facilitated myriad agrifood initiatives within their pandemic responses. For many, their work included both emergency food assistance and initiatives to strengthen local food systems (Table 1).

Table 1. Nonprofits responded to the increased demand for food assistance caused by the COVID-19 pandemic through myriad strategies, including many designed to strengthen local food systems.

Emergency Food Assistance	Local Food Systems
Distributed food boxes in parks, school grounds, parking lots, and other outdoor locations, following public health measures.	Produced food in farms and gardens to expand food access, increase green space, and support education and community-building.
Delivered food boxes, meal kits, or prepared meals to homes, including to elders, people immuno-compromised, and others unable to go out.	Coordinated farmers markets, pop-up markets, and mobile grocery bus to expand food access and support local farmers and vendors.
Organized mutual aid networks through which neighbours helped one another access food.	Implemented strategies to make foods affordable at farmers markets and other outlets, such as accepting governmental nutrition assistance benefits or pricing foods on a sliding scale.
Operated community food pantries (after lockdowns lifted), often using a "client choice model" where people select their food.	Facilitated education on growing food, culturally-relevant food traditions, nutrition, cooking, and reducing food and packaging waste.
Sourced food from local farmers and vendors to increase the variety and nutritional quality of the food distributed while providing local growers and food businesses with an outlet for their products.	Educated youth about agriculture, nutrition, and workforce skills, such as culinary arts or carpentry, in community gardens, farms, or in collaboration with schools and park districts.
Provided foods suitable for the cultural traditions, staple diets, dietary restrictions, and physical cooking resources of the community members.	Assisted small food businesses with planning, licensing, fundraising, marketing, etc. and provided workforce training.
Created online systems that allowed consumers to order food for delivery or that connected growers with excess food to food assistance organizations.	Provided capacity-building grants and advocated for governmental funds to local farmers for labor, equipment, and transportation to maintain or expand food production and distribution.
Repurposed food waste, connected local farms to food pantries, coordinated gleaning, and encouraged composting.	Invested in infrastructure development (e.g., greenhouse, community kitchen, refrigeration), land for food production, and retail spaces to strengthen community food systems.
Provided direct financial and material assistance and/or connected people to governmental assistance programs.	Organized food industry workers to advocate improving unsafe work conditions; coordinated COVID-19 awareness and vaccination campaigns.

We observed a common pattern across the organizations' diverse pandemic response stories: their embeddedness (Granovetter, 1985; Bradlow, 2022) within the communities with whom they worked enabled them to adapt and innovate context-specific response strategies. Specifically, the concrete interpersonal interactions and networks of social relations of organizational leaders, staff, and volunteers with community members — that is, their community embeddedness — created three conditions that influenced how they responded to food insecurity, agrifood business disruptions, and other pandemic impacts. First, embeddedness afforded them local knowledge, which enabled them to build on community assets and develop practical solutions tailored to community members' cultures and material conditions. Second, embeddedness opened opportunities for nonprofits to integrate food into community initiatives promoting physical and mental health, housing stability, worker safety, LGBTQ+ rights, or economic development, for example. This intersectional approach was important because many organizations worked with communities experiencing health, education, housing, employment, environmental, and other disparities. Third, many nonprofits also had external social ties, and these connections, alongside local knowledge, allowed them to mobilize resources (e.g., food, volunteers, equipment, funds) from governments, corporations, consulting firms, or larger nonprofits to address community priorities. In some cases, organizations engaged in policy advocacy to influence the systemic drivers of agrifood disparities affecting community members (Schusler *et al.*, 2025).

Our study and others demonstrate the importance of local actors in food systems resilience in the face of external shocks. In our own study, nonprofits working in marginalized communities often approached that work in ways intended to dismantle structural inequities and promote food justice or food sovereignty. Yet, pivoting in response to the pandemic created an undue emotional toll, stress, and exhaustion, as Nichols (2022) documents in a study of local farmers in Iowa. Furthermore, in the USA (and other countries such as the United Kingdom), food insecure households increasingly rely on civil society organizations as the government has abdicated its food security responsibilities (Beck & Gwilym, 2023; Long *et al*., 2020). Because food security varies with a country's social welfare regime (Berkowitz *et al*., 2024), eliminating food insecurity will require national policies and practices that ensure safe, nutritious, culturally relevant, and sustainably produced foods for all. Acknowledging this need for systemic transformation, our research nonetheless highlights the necessity of engaging

communities at a local scale in re-creating food systems to be resilient, socially just, and ecologically sustainable.

Community Participation

According to the International Council of Museums, museums "operate and communicate ethically, professionally, and with the participation of communities, offering varied experiences for education, enjoyment, reflection, and knowledge sharing" (ICOM, 2022). As spaces of dialogue and knowledge exchange between diverse actors, cultures, and generations, museums can engage communities in reimagining and recreating food systems (Borrelli *et al*., 2024). As museums and cultural institutions plan and implement community engagement, they can draw upon extant knowledge about participation from the fields of biodiversity conservation, environmental education, and youth development.

The conservation field has expanded its focus from preserving biodiversity to aims that integrate biodiversity preservation with strategies to promote livelihoods and ensure cultural vitality. A paradigm shift has occurred since at least the 1990s from top-down approaches led by international conservation organizations and nation-states to a mix of institutional arrangements (Claus *et al.*, 2010), including community-based conservation and co-managerial approaches that recognize local peoples' ability to collectively manage and sustain common pool resources (Borrini *et al*., 2004; Dietz *et al.*, 2003).

Importantly, communities are not homogenous but composed of individuals and groups holding diverse, even conflicting, values and interests. Furthermore, local actions are influenced by, and can influence, actions at broader geographic and sociopolitical scales. In conservation more broadly and agrifood contexts specifically, it is necessary to recognize how cultural, political, and economic institutions — collections of formal rules and informal social practices and norms — mediate people's interactions with one another and biophysical environments (Agrawal & Gibson, 1999; Claus *et al*., 2010). This nuanced understanding of communities is essential to develop nested institutions across scales that support sustainable, equitable food systems that generate food security while focusing on biological and cultural diversity.

Several scholars describe community participation as a continuum along which participants' extent of decision-making influence varies. In the seminal article "A Ladder of Citizen Participation," Sherry Arnstein (1969) distinguishes between

"empty rituals" of participation, such as manipulation and placation, and genuine forms of participation involving the redistribution of power. Power comprises not only control and coercion but also the narratives that influence our values, beliefs, desires, and actions (Lukes, 1974, as cited in Bodenhamer, 2016; Gaventa, 2006). Arnstein observed, ". . . participation without redistribution of power is an empty and frustrating process for the powerless. It allows the powerholders to claim that all sides were considered, but makes it possible for only some of those sides to benefit. It maintains the status quo" (Arnstein, 1969, 216).

To avoid reinforcing the status quo, facilitators of community participation can intentionally design engagement processes to redistribute power[14] by ensuring opportunities for marginalized groups to participate in ways that genuinely recognize their lived experiences and heed their perspectives in subsequent actions (Schusler & Krings, 2025). Seattle's use of an equity lens, "an additional step in a decision-making process akin to an environmental impact statement that examines the justice-related impacts of policy, funding, and program decisions" in its urban agriculture planning and programming provides one such example (Horst *et al*., 2017, 289).

Youth Participation and Critical Youth Empowerment

Populations frequently overlooked in community engagement processes are children and youth. Food system drivers and activities determine whether young people can access and utilize nutritious, culturally relevant foods, which impact their health and development. Furthermore, unless we re-organize our food systems to be sustainable, children and youth will inherit a future depleted of biodiversity and related ecosystem services. Aligning with the UN Convention on the Rights of the Child (1989), museums and other cultural institutions can engage children and youth in food systems education and action. To illuminate

[14] Arnstein (1969) notes "significant roadblocks to achieving genuine levels of participation," including powerholders' "racism, paternalism, and resistance to power redistribution" as well as the limited "political socioeconomic infrastructure" within marginalized communities and challenges in organizing communities "in the face of futility, alienation, and distrust" (p. 217). These barriers persist today.

the possibilities and challenges of involving youth[15] in reimagining and recreating food systems, I draw on scholarship on youth participation, youth-adult partnerships, and critical youth empowerment.

In the seminal book *Children's Participation: The Theory and Practice of Involving Young Citizens in Community Development and Environmental Change*, Roger Hart (1997) demonstrates children and youths' capacity to contribute to environmental stewardship, as suitable given their interests, culture, and developmental capabilities. Adapting Arnstein's participation ladder, Hart differentiates non-participation (e.g., manipulation, decoration, tokenism) through which adults use young people to promote their own agendas from genuine participation (e.g., consultation, social mobilization, children-in-charge, shared decision-making) that allows children and youth varying degrees of power to influence social-environmental change. The Growing Up in Cities initiative similarly demonstrates youths' capacity to assess and act to improve environmental conditions in cities around the globe (Chawla, 2002; Driskell, 2002).

Such youth environmental action involves youth in making meaning of a particular environmental problem, contributing to joint knowledge construction, and envisioning and enacting possible solutions (Simovska, 2013). When young people have a genuine opportunity to address environmental concerns, they can develop personal assets that support their physical, intellectual, psychological, and social well-being (Schusler & Krasny 2010, Schusler 2016) while expanding their capabilities to participate in democratic society (Chawla, 2002; Driskell, 2002; Hart, 1997; Jensen & Schnack, 1997). Thus, youth environmental action involves a process of co-creating social-environmental change that builds youths' capabilities for continued participation contributing to personal and community transformation (Schusler *et al*., 2009). Inspiring examples of youth environmental action exist in rural, peri-urban, and urban settings around the globe (Hart, 1997; Chawla, 2002). Here I highlight examples of young people's contributions improving local environments in cities with respect to biodiversity, culture, and food justice.

The Field Museum in Chicago fosters participation in biodiversity conservation through approaches that connect nature, culture, the arts, and place-making,

[15] *Youth* refers to the "period between childhood and adulthood," which is defined by biological characteristics of adolescence and culturally constructed (Eccles & Gootman, 2002, 1).

particularly in historically disinvested communities with limited access to green space (Campbell, 2015). Within its "Roots and Routes Initiative" and "Youth Conservation Action" program, the Field Museum facilitates the "Green Ambassadors", a program developed in collaboration with community-based organizations. Youth ages 15-24 from Chinatown, Bronzeville, Little Village, Pilsen, and surrounding communities can become Green Ambassadors through paid summer internships. Interns learn about urban ecology, participatory action research (PAR), and local organizations. They also conduct PAR projects exploring real-world environmental and community issues. The youth report their findings and recommend actions to deepen community members' connections to the Burnham Wildlife Corridor, an important habitat for migratory birds along Chicago's lakefront (Field Museum, 2025; Montambault *et al*., 2017). Similarly, in southeast San Francisco, the nonprofit Literacy for Environmental Justice facilitates youth environmental action integrating ecological restoration and community development (www.lejyouth.org/).

Nonprofit organizations in multiple cities coordinate youth programs centered on urban agriculture, community food systems, and food justice. Operating in Boston for over 30 years, The Food Project's mission is "to create a thoughtful and productive community of youth and adults from diverse backgrounds who work together to build a sustainable food system" (The Food Project, n.d.). The organization annually employs 140 youths, who alongside adult staff and volunteers, cultivate land on 70 acres of urban and peri-urban farms. They grow 200,000 pounds of produce each year that reaches local communities through food assistance organizations, farmers markets, and neighbourhood stores (The Food Project, n.d.). The Food Project's curricula (Coblyn, 2001; Gale & DeVoe-Talluto, 2001) and scaffolded programs encourage young people's critical reflection on food systems and promote their development of agricultural, entrepreneurial, and leadership skills.

Other examples of youth sustainably producing food and expanding food access in their communities while developing their own critical consciousness and leadership can be found at the Urban Growers Collective in Chicago (www.urbangrowerscollective.org/), the Massachusetts Avenue Project (www.mass-ave.org/) in Buffalo, and East New York Farms! in the Brooklyn neighbourhood of New York (www.cypresshills.org/east-new-york-farms). Delia and Krasny (2018) document how East NY Farms! — whose mission is to organize youth and adults to address food justice through local sustainable agriculture and

community-led economic development — provides youth "somewhere to belong, to be pushed, to grapple with complexity, to practice leadership, and to become yourself." Interns described that adults created a sense of belonging yet challenged them to perform complex tasks at the organization's urban farm, community gardens, and farmer's markets and to grapple with complex and contested issues related to environment, health, community development, and social justice (Delia & Krasny, 2018, 1).

The above and other examples of youth environmental action can be conceptualized as a youth-adult partnership in which adults involve youth in responsible, challenging action that addresses genuine needs and includes decision-making opportunities with impacts that extend to others in the community (Camino, 2000). The conceptual framework of critical youth empowerment (Jennings *et al*., 2006) also applies when youth-adult partnerships encourage critical reflection on one's own identities and experiences, structural oppression, and possibilities for collective liberation.

Empowerment refers to a multi-level construct in which youth gain ability and control — within the social, economic, and political contexts of their lives — to improve equity and quality of life. Six key dimensions comprise critical youth empowerment: (1) a welcoming, safe environment where youth can be free, express creativity, and feel ownership; (2) meaningful engagement with opportunities for youth to contribute as they learn and practice new roles and skills; (3) equitable power-sharing between youth and adults that affords youth leadership roles and influence in organizational or community decision-making; (4) critical reflection on interpersonal and sociopolitical processes to understand the social values, structures, processes, and practices that participants seek to alter; (5) participation in sociopolitical processes to effect change through action addressing injustice; and (6) integrated individual and community-level empowerment (Jennings *et al*., 2006). This framework aligns with Ginwright and James's (2005) social justice youth development model, which emphasizes analyzing power in social relationships, making identity central, promoting systemic social change, encouraging collective action, and embracing youth culture.

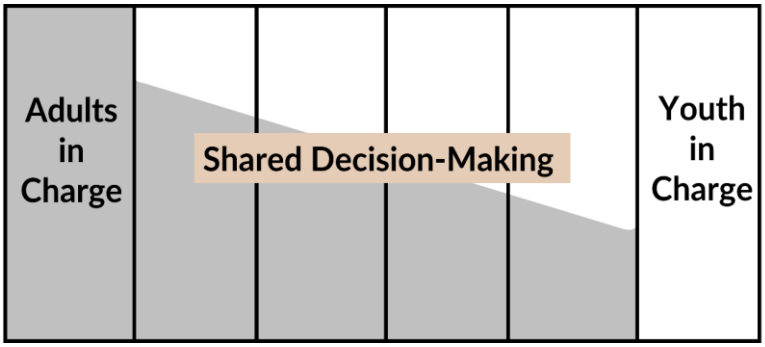

Figure 1. Shared decision-making is central to youth-adult partnerships. Within youth environmental action, the extent of shared decision-making will vary depending on the cultural context, young people's interests and developmental capabilities, and adults' openness to and skills supporting youth leadership

For adults, the shared decision-making central to youth-adult partnerships (Figure 1) might feel challenging, even uncomfortable, due to the unpredictability inherent within mutual dialogue, knowledge co-construction, and joint action (Simovska, 2007; 2013). Adults might experience tensions like balancing youth freedom with adult-provided structure or integrating youth interests with organizational goals. To navigate such tensions, adults can provide structure and support tailored to youths' capabilities, foster reciprocal learning that values young people's knowledge, and transparently communicate to share their own wisdom (Schusler *et al*., 2017). Adults should also incorporate evidence-based practices that promote positive youth development into their work with youth and be prepared to offer psycho-emotional support when youth encounter roadblocks or projects fail (Eccles & Gootman, 2002; Schusler & Krasny, 2010; Schusler, 2016). Finally, those facilitating critical youth empowerment must be mindful of risks involved when challenging oppressive social structures (Krasny *et al*., 2024).

Conclusion

A systems lens helps us understand the complex relationships among drivers, activities, and outcomes within food systems across multiple scales. Globally, transitions to industrial, consolidated food systems have increased food supply at the expense of nutrition, health, ecosystems, and social equity. Across multiple

social and spatial scales, people are re-envisioning and re-organizing food systems towards sustainability, resilience, food sovereignty, and food justice. Inclusive, reflexive approaches to re-localizing food systems can generate social and ecological benefits, although these efforts are constrained by broader political economic forces. Local food systems can contribute to resilience, as evidenced by the COVID-19 response efforts of mutual aid groups, nonprofits embedded within communities, local farmers, and others who pivoted their operations to address food insecurity, livelihood loss, and other pandemic impacts.

Museums, science centers, eco-museums, nature centers, and other cultural institutions serve as spaces of dialogue and knowledge exchange about food, its meanings, and practices across time, geographies, cultures, and generations. Through their exhibits, educational programs, operations, and community engagement, museums support people to participate individually and collectively in place-based and trans-local food systems governance (Borrelli *et al*., 2024). Community participation is essential for shaping ecological sensibilities within food systems in ways that value diverse knowledge traditions. Facilitating community engagement requires acknowledging the heterogeneity of communities and redistributing decision-making power through genuinely inclusive participatory processes. In "recognizing the interdependence of all forms of life and cultivating the political and pedagogical tools to defend them" (Chapter 1), it is essential to engage youth in imagining and implementing our future food systems. Museums and other cultural institutions can facilitate youth environmental action and critical youth empowerment that addresses agrifood issues. By doing so, museums create spaces for young people to develop their capabilities as they wrestle with social-ecological complexity to envision and engage in collective action towards biodiverse, equitable, and resilient food systems.

Final remarks

This volume offers an interdisciplinary reflection on the intricate relationship between biodiversity, food, culture, and social justice. In these final pages, we want to focus our attention of the unique role that food can play as a gateway to work on biodiversity. The contributions collectively argue that food systems are not merely technical or economic mechanisms, but deeply cultural and political spaces where the health of people, societies, and ecosystems intersect. Together, the chapters invite us to rethink the act of producing, distributing, and consuming food as a relational practice that connects humans to each other and to the living world, revealing the potential of food as a vehicle for social transformation, ecological awareness, and collective well-being.

The theoretical foundation is a proposal for a paradigm shift towards a conception of food systems as biocultural networks. In such a paradigm shift, biodiversity is presented not only as a source of ecological resilience but also as a symbolic and ethical framework through which humanity can reconstruct a sense of belonging and care for the planet. By interpreting food as a cultural expression and a relational act, the authors call for integrating scientific, educational, and moral dimensions into the governance of biodiversity and food systems (Chapter 1).

Moreover, biodiversity is considered an essential condition for human health. The biological and cultural diversity of foods forms the basis for nutrient-rich, resilient diets capable of preventing chronic diseases. When biodiversity is lost — in fields, markets, and food traditions — human health also weakens, because nutritional quality, microbiota balance, and the resilience of food systems decline. Placing biodiversity back at the center of nutritional and clinical choices means protecting both the planet and public health, recognizing that these two dimensions are inseparable (Chapter 2).

The cultural dimension of biodiversity is discussed highlighting the transformative role of museums and community-based organizations. Through diverse examples — from Scotland's Stromness Museum to Costa Rica's Museos Comunitarios — it is shown how cultural institutions can act as agents of ecological awareness and social cohesion. Museums emerge as civic platforms where environmental knowledge, cultural memory, and community engagement converge, translating complex global issues into local, lived experiences (Chapter 3).

The pedagogical and social framework adopted to investigate biodiversity and food systems is also linked to psychosocial theories of change. The real understanding of food systems requires both cognitive and emotional engagement, and that meaningful transformation arises when individuals connect personal values with collective action.

Education and advocacy are fundamental levers for transforming food systems: meaningful behavioural change occurs only when knowledge, awareness, and the capacity to act develop in an integrated way. The transition towards more sustainable food systems rich in biodiversity therefore requires critical education that supports collective action. In this process, cultural institutions can become strategic spaces where new forms of awareness emerge and democratic participation is strengthened (Chapter 4).

Focusing on community engagement and food justice, food system is situated within broader structures of power and inequality. Where non-profits, farmers, mutual aid groups responded to crises with creativity and resilience. Inclusive and participatory communities are essential for building food systems that are equitable, resilient, and rich in biodiversity. Engaging young people is crucial: not only as recipients, but as true co-protagonists in shaping the future of food. A food justice approach makes it possible to weave together biodiversity, rights, and racial and economic equity, showing how these dimensions are inseparable. Sustainable food systems emerge from active communities that take part in decision-making processes and help drive change (Chapter 5).

Across all chapters, several common conclusions emerge. The first concerns the interdependence between biodiversity, food, and social justice: sustainability cannot be achieved without addressing inequalities in access, representation, and decision-making. The second highlights education as a transformative force that links knowledge, ethics, and action. The third recognizes cultural and civic institutions as mediators between science and society, capable of fostering ecological citizenship and shared responsibility. Finally, all contributions converge on the need for a systemic paradigm that bridges disciplines, scales, and communities to foster planetary health.

The perspectives that emerge from this work point towards an agenda of interdisciplinary research, participatory governance, and cultural innovation. Future directions should include the development of transdisciplinary frameworks that integrate natural and social sciences; educational programs that combine critical reflection with experiential learning; participatory processes that empower

communities and youth to co-design sustainable food systems; and a renewed role for museums and cultural institutions as civic infrastructures for sustainability. At the ethical level, the authors call for a shared responsibility towards life in all its forms, based on care, solidarity, and interdependence.

In conclusion, this volume articulates a vision of biodiversity and food as a biocultural common good — an arena where ecological integrity, social justice, and cultural creativity converge. Through the integration of research, education, and community action, it opens pathways for collective transformation. The work does not close with definitive answers but with an invitation: to imagine and cultivate regenerative food systems that nourish both people and the planet.

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In an era marked by intertwined environmental, food, and social crises, Voices for Change explores the crucial role of communities, culture, and biodiversity in shaping more just and sustainable food systems. Adopting an interdisciplinary perspective that brings together nutrition, social sciences, museum studies, and education, the volume highlights how food is simultaneously an ecological, cultural, and political issue.

The contributions collected in this book show how biodiversity loss directly affects human health, social inequalities, and the resilience of territories, while also demonstrating how local practices, traditional knowledge, cultural institutions, and educational initiatives can become powerful drivers of transformation. From community museums to food policies, from traditional diets to youth-led activism, the international case studies presented here illustrate how collective action can turn crises into opportunities.

Voices for Change invites readers to rethink the future of food by placing biodiversity, participation, and social justice at the center. It offers a vision in which human and planetary health are inseparable, addressing scholars, policy makers, educators, and engaged citizens who seek to imagine and build a more equitable, democratic, and locally grounded food future.

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