

Beyond Excess to Access: Visualizing Regional Foodscapes

By
Delaney Gobster

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List of Acronyms

Food value chain (FVC)

Food Loss and Waste (FLW)

Natural Resources Defense Council (NRDC)

The Economics of Ecosystems and Biodiversity for Agriculture and Food (TEEBAgriFood) initiative

United Nations Environment Programme (UNEP)

United States Environmental Protection Agency (EPA)

United States Department of Agriculture (USDA)

United States Food and Drug Administration (FDA)

Wisconsin Department of Natural Resources (WDNR)

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Community Partners

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Project Overview

As 2030 draws near, local to international targets for halving food loss and waste (FLW) approach their deadlines (United Nations, 2015; EPA, FDA, & USDA, 2015; City of Madison, 2021). With food systems contributing significantly to issues of climate change, environmental degradation, social inequity, and public health, it is imperative that we as consumers, producers, planners and policymakers gain a better understanding of the loss and waste within these systems (Müller & Sukhdev, 2018, p.4). As anthropogenic activities push planetary resource boundaries to their tipping points, vulnerable communities are already beginning to grapple with the effects of a changing global environment (Müller & Sukhdev, 2018, p.20). Though progress has been made toward waste prevention and excess food redistribution on many scales, extensive research, policy, and stakeholder engagement is needed to ensure access to food provisioning resources for communities now and into the future. The following report will review disciplinary methods to assess foodscapes, the spatial and relational distribution of food systems resources and activities across a region (Vonthron et al., 2020). It will then take an transdisciplinary-systemic foodscape approach to observe food excess and accessibility dynamics within the Wisconsin region, with focused case studies on the local level of Dane County and community levels of the City of Madison and the University of Wisconsin-Madison (UW-Madison) campus.

Before discussing resource flows in modern food systems, a number of clarifications must be made as to what is constituted as “waste” within food value chains. Food loss and food waste (FLW), which combined may be referred to as food wastage, are separate, though often conflated, processes. Food loss generally includes production-side wastage within food systems, where product is not consumed by humans due to unintended harvesting, processing, or distribution complications resulting in product not making it to market. Food waste on the other hand refers to edible products available for human consumption that were disposed of rather than eaten, referring to wastage on the consumption end of the food value chain (ReFED, 2016). FLW will be viewed here as residual output flows that are emitted or discarded by stakeholders throughout the food value chain. Food excess flows are then considered as food available for human consumption, excluding FLW and final product outputs that have been made available to stakeholders within the food value chain through direct distribution processes (Müller & Sukhdev, 2018, p.51-54). Food excess therefore refers to surplus products available as nutritional resources that would otherwise go to waste if not recovered for redistribution or repurposing (Finn, 2018).

Using food waste as an entry point, this report will discuss the flow dynamics within food systems and the spatialized accessibility barriers that stakeholders experience to resources within foodscapes. In the first chapter, food waste prevention and food security enhancement efforts will be framed in an asset-based systems approach to examine efforts connecting excess food opportunities to create more accessible food resource landscapes. The review will then position this excess-to-access

mindset within a framework that more holistically supports regional circular economies by suggesting a transdisciplinary-systemic approach to foodscape assessment.

The second chapter will contextualize the research surrounding foodscape development and food excess within a case study of the Wisconsin region. The case study will develop as a review of movements and metrics within nested scales of foodscapes, as international sustainability agendas have directly influenced national and regional policies and practices. Beginning with a global overview of recent FLW reduction progress, the case study will gradually zoom in on the local foodscape of Dane County and the City of Madison community. While the narrowing nested focus will exclude certain complexities of the global food excess conversation, this report has been developed as an educational guide and curriculum planning tool to be used at the community level in question. Furthermore, due to the quantity, visibility, and variability in available data related to food excess and resource accessibility, public engagement and community data collection has become a vital part of this project, necessitating the case study data focus be tailored to the community levels in which it was developed. The report will then conclude with the third chapter summarizing the creation process of the Wisconsin Food Access project, which was developed as a student response to the UW-Madison community case study presented.

To explore the root causes of food excess and access within the Dane County community and the greater Wisconsin foodscape, the Wisconsin Food Access (WiFA) project was founded at the start of the Spring '23 semester. As a campus-community collaborative, WiFA integrates Community-based Learning within UW-Madison coursework, while supporting organizations within the local food system. WiFA was developed as part of a UW-Madison Agroecology Public Practice master's project, coordinated by Delaney Gobster and advised by Dr. Holly Gibbs and Dr. Tyler Lark in the Global Land Use and Environment lab. Undergraduate student involvement was facilitated via the creation of the Nelson Institute's Envir St 600 006 course *Scaling Back Food Excess: Local to Global Solutions in Food Recovery, Redistribution, and Recycling*, instructed by Gobster. During the Fall '23 semester, a new iteration of the capstone will be taught as *Food Excess to Access: Empowering Regional Resource Distribution*. Over the course of the semester, students will engage with regional organizations to take a deeper look at grassroots efforts enhancing food sovereignty and promoting the agroecological development of circular food economies. During class guest discussions, students will gain perspective from professionals and community leaders within the food industry. Through the capstone curriculum, students will expand their views beyond the walls of the classroom, integrating the lenses of systemic, behavioral, socio-cultural, and spatial foodscape approaches with stakeholder narratives to observe food resource flow dynamics from a transdisciplinary perspective.

Chapter 1: From Food Waste to Foodscapes

Resource Flows in Modern Food Systems

By positioning food loss, waste, and excess as resource flow metrics within modern food systems, proactive and reactive strategies to prevent FLW and manage excess can be analyzed. Historically, modern industrial practices have been developed as linear processes, assuming infinite input availability and capacity to dispose of outputs. The push toward sustainable development then rose in popularity in the era of the United Nations' Brundtland Commission report *Our Common Future*, published in 1987 (Matthews et al., 2014, p.14). More recently, the concept of circularity has been applied to food systems development, transforming the idea of “waste” from a sanitary nuisance to be disposed of, toward a resource flow to be cycled back into a system. The concept of circular economies was advanced in the early 2010s as a pathway to move from extractive linear processes toward economies that promote product reprocessing, repair, reuse, and recycling. This perspective was inspired by the earlier work of William McDonough and Michael Braungart within the industrial manufacturing and design sphere, as discussed in their book *Cradle-to-Cradle: Remaking the Way We Make Things* (Wiskerke, 2018, p.140). As disciplinary perspectives evolve that complement the concept of circularity, the central premise lies in creating materials flow analyses in order to promote the cycling of output flows back into the system in question as inputs.

When discussing food systems in this report, a holistic approach toward the global food value chain (FVC) (figure 1) is adopted from the ‘The Economics of Ecosystems and Biodiversity for Agriculture and Food’ (TEEBAgriFood) initiative of the United Nations Environment Programme. In their 2018 report *Measuring What Matters in Agriculture and Food Systems*, TEEBAgriFood defines the term “eco-agri-food systems” in order to refer to entire value chains in addition to the ecological, economic, social and human dimensions of food (Müller & Sukhdev, 2018 p.17). For the purpose of this report, the same framing will be applied to the term “food system” for simplicity.

As seen in figure 1, food systems dependencies and impacts are characterized by these invisible ecological, economic, social, and human dimensions of food that are necessary for balance within a system. Activities along the FVC are both dependent upon the value provided by these system characteristics, and directly impact their continued functioning. Broad examples of these phenomena would be the ecosystem services, economic market stability, as well as global health and social wellbeing within a region (Müller & Sukhdev, 2018). Activities along the FVC are then reliant upon the capital stocks driven by these dependencies, where environmental quality within a foodscape will determine the functioning of ecosystem services that provide natural capital inputs for food production. As resources flow along the FVC, excess food can move between stakeholder use stages (e.g. agricultural production,

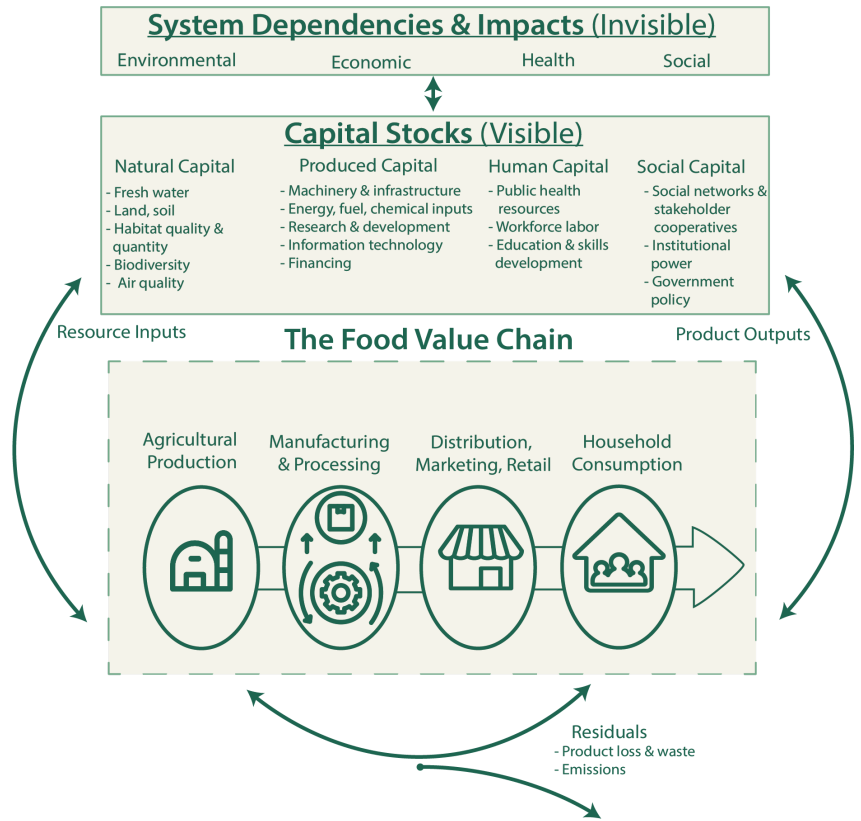
processing) as redistributed byproducts to be cycled back into the system as inputs. However, when stakeholders face barriers to accessing opportunities for food excess use, these resources become stranded between use stages and are likely to become production-side loss or consumer-side waste. When considering brewery processing systems, grain is used as an input product with spent grain returned as a processing byproduct (NETZRO, 2023). Though spent grain can be dried out and used as an input in a variety of food products, proper processing equipment and space, human labor, and a final product market are required in order to leverage this excess use opportunity and prevent the byproduct loss.

Moving from food systems to incorporate the places linked to food, systemic foodscape approaches consider values of human and social capital beyond the produced and natural capital foci that characterize most FVC life cycle assessments. Within this framing, a nexus of socio-environmental food systems challenges comes to light. While different academic disciplines and FVC stakeholders take varying approaches to address the challenges of modern food systems, these approaches have historically been siloed and exclude the consideration of capital stocks and value flows not captured by disciplinary methodology or individual stakeholder experiences. While foodscape frameworks have only recently emerged in the realm of food systems studies, there have already been a number of approaches and research area subgroupings identified for transdisciplinary methodology development (Vonthron et al., 2020, p.7).

The theory adopted for this project and explained in this chapter aligns closest with a “local and ethical food network” subgroup focus of what Vonthron et al. characterizes as systemic approaches to foodscape studies (2020, p.11). Stakeholder perspectives of barriers to food accessibility and opportunities for excess food distribution can be understood from a systemic foodscape approach that uses FLW as an entry point to evaluate food systems dynamics, promoting resilient regional food systems.

Figure 1: Circular Food Systems Dynamics

The flow of resources across stakeholder stages of the food value chain, facilitating the use of capital inputs and production of outputs. All within the broad-scale food systems context that activities along the value chain both impact and are dependent upon. (Adapted from: Müller & Sukhdev, 2018, p.54)



This framework will be used in the following sections to examine the root causes of how FLW is created throughout the FVC and how different stakeholders can leverage opportunities to transform excess. Chapter 2 then considers transdisciplinary approaches to foodscape research, planning, and practice, looking at excess reporting and estimation metrics at nested foodscape scales within FLW reduction movements. Beginning from top-down international FLW policy, the chapter will narrow to a local-level foodscape case study focused on Dane county and the City of Madison Community. Lastly, chapter 3 will highlight the sub-community of the UW-Madison campus and apply the lessons learned about food resource dynamics to a Community-based Learning project. By relying on a systemic approach to interrogate the root causes of FLW generation, the accessibility barriers to transforming food excess flows can be holistically understood from varying stakeholder perspectives. However, depending upon the scale at which food provisioning activities are conducted within a foodscape, varying methodology is needed. Therefore, integrated transdisciplinary approaches should be taken for regional foodscape intervention to support resilient food systems development.

Approaches to Food Systems Development

Nexus of Food Systems Challenges

While conceptualizations of the challenges facing modern food systems and the global environment vary, urgent action must be taken in order to address the issues related to food provisioning activities. The author of *Flourishing Foodscapes* positions food systems at the center of a seven-fold nexus of food related challenges, a similar framework paralleled by others within food systems planning. Wiskerke describes a “water- energy- environment- waste- climate change- social inequality- health” nexus, wherein food provisioning activities both contribute to and suffers from the impacts of:

- Resource depletion and scarcity of capital stocks that food provisioning is reliant upon, especially in terms of fresh water and fossil fuels.
- Environmental degradation, in part caused by energy and chemical intensive agricultural practices, reduces both the quantity and quality of available agriculturally productive land.
- Waste in terms of food production and packaging compounds the effects of resource use and environmental degradation within the FVC. Wastage increases the resources needed to deliver the same amount of consumer-end calories due to inefficient distribution and consumption practices, with further environmental impacts seen when waste is disposed of in landfills.
- Climate change, which is advanced through food provisioning-related greenhouse gas emissions. Food provisioning activities are directly impacted by and exacerbate extreme weather events, with altered seasonal dynamics seen in differential patterns across agricultural regions.

- Social inequality in terms of urban and rural accessibility to food provisioning resources, the treatment of essential food industry workers, and the inequitable impacts of FVC-related pollution.
- Public health concerns associated with diet-related diseases, decreasing global biodiversity that enhances the potential for pandemic diseases, and health consequences of pollution caused by activities along the FVC.

This seven-fold nexus is echoed by others throughout the realm of food systems scholarship. In their review of foodscape studies, authors Vonthron et al. discuss the complex people-food-territory nexus of modern foodscape issues that requires combined people-based and place-based approaches to address (2020). The TEEBAgriFood initiative of the United Nations Environment Programme further emphasizes the triple challenge of achieving global nutrition security for a growing population, enhancing the regenerative nature of eco-agri-food systems to bolster environmental integrity, all while ensuring social equity at all levels in the process (Müller & Sukhdev, 2018, p.4). In an urbanizing world that will reach a population of around 10 billion people by 2050, these challenges cannot be viewed in isolation, nor can their solutions (Müller & Sukhdev, 2018, p.4).

Food Systems Perspectives

Transdisciplinary perspectives must be considered and developed within a regional context-dependent nature in order to holistically address the challenges facing modern food systems. Though a myriad of food systems perspectives exist across and within disciplines, the dominant narratives have been summarized by TEEBAgriFood into five core viewpoints (Müller & Sukhdev, 2018, p.3). These academic disciplinary perspectives influence the ways in which research and outreach is conducted within food systems, and more recent foodscape scholarship (table 1). Therefore, the intentions that come with each perspective direct the research agendas and further FVC stakeholder support and/or engagement that comes with such research.

Disciplinary scholarship further varies in its participatory nature and how stakeholder perspectives and first-hand knowledge of foodscape dynamics is integrated into research and potential policy. If researchers, planners, and policymakers are not directly embedded within the systems which they are studying, direct engagement with FVC stakeholders is needed to better inform food systems work. While food policy and programs may structure a foodscape, in the end it is the stakeholder networks themselves that determine the resource dynamics within them.

Table 1: Disciplinary Perspectives on Modern Food Systems Challenges

Five core areas of scholarship and their respective approaches to addressing issues at the nexus of food systems challenges.

(Adapted from: Müller & Sukhdev, 2018, p.3-11)

| Discipline | Focus | Description |
|-------------------|---|--|
| Agronomist | Feeding a growing population | Perspectives focus on the issue of feeding a growing global population, experiencing a dietary transition increasing the rate of meat consumption globally. Sustainable intensification is necessary to double the rate of global food production by 2050 based upon 2012 levels, especially in light of deteriorating growing conditions due to climate change and historic environmental degradation. Green Revolution era technological advances have increased yields globally, though with inequitable regional effects. Further advancements in public policy and technology, particularly related to genetic manipulation and target agricultural input practices (e.g. precision agriculture), are needed to overcome the yield gap in feeding a growing population. With agricultural specialization, commodity and landscape diversity has narrowed significantly, prioritizing efficiency over agroecosystem resilience. However, ecosystem-specific practices are gaining popularity, as the need for regenerative agroecological approaches is increasingly recognized. |
| Environmentalist | Saving the planet | Perspectives rely primarily on conserving ecological resources, reinforcing the need to respect the “safe operating space” for humanity within planetary boundaries. Scholarship reinforces agriculture as a major contributor to climate change, and a main driver of biodiversity loss. While protecting the environment is seen as a long-term societal good, conservation approaches tend to overlook the interplay between people, food, and ecosystems. On occasion, leading to top-down approaches in creating protected areas that have excluded local communities and native groups. |
| Sociologist | Sustainable rural livelihoods and social equity | Perspectives promote social equity with a focus on rural livelihoods. While poverty rates have fallen drastically over the past two centuries, 767 million people live in extreme poverty worldwide. With the main employer in low-income countries being agriculture, access to agricultural markets and development services have been traditionally pursued as aid pathways toward economic growth. However, policies that subsidize increasing agricultural yield through technological advancements, without accounting for local contexts and resource constraints, have primarily supported agribusiness interests and left behind smallholder producers. |
| Economist | Efficient markets for cheap food | Perspectives aim to enhance the affordability of food for all, while reducing food price volatility by scaling-up food subsidies. However, increasing cheap food availability does not directly correspond with enhanced nutrition. Economic cost-benefit analyses have further failed to properly account for the provisioning of natural resources and the resilience of agroecosystems that the food economy is reliant upon. |
| Health specialist | Healthy diets | Perspectives are centered on treating the double burden of diseases related to food systems, balancing both undernutrition and obesity. Scholarship reinforces nutrition related non-communicable diseases as responsible for almost half of all deaths in low to mid-income countries. However, dietary guidelines do not always account for local conditions and cultural foodways. Holistic promotion of health and sustainability within agroecosystems has historically been overlooked in favor of more reactive dietary treatment approaches. |

The core of a sustainable food system lies in its innovative ability to perpetuate resources and services into the future, adapting in the face of changing global environmental conditions (Pretty, 1995). In order for stakeholders within a food system to act on their vision of a sustainable foodscape though, they must have the power to influence resource distribution dynamics (Kok, 2021). Perspective and resource power can therefore shape the development of a foodscape in the direction of whatever motivates those with power in a dominant food regime at the expense of niche actors. For example, Ament et al. applies Polanyi’s concept of embeddedness, as the complex social processes and institutional contexts in which food systems are developed, to structure a sustainable food systems policy making tool called the Embeddedness Type Matrix (ETM). The ETM gauges stakeholder decision making factors, via survey input, as it relates to their motivations due to self-interest (instrumentalism) as well as market factors

(marketness)(Ament et al., 2022). While this is only one tool that exists to evaluate consumer and producer motivations influencing foodscape development, it exemplifies broad scale methodologies that could be used to guide more local participatory input gathering for policy development.

Foodscales incorporate linked stages throughout the FVC and develop in nested scales which mutually influence one another (Wiskerke, 2018, p.31). While there is a wide diversity of foodscales, two extreme interpretations of foodscape development are presented below (table 2). These extremes demonstrate the potential characteristics that can be ascribed to foodscales, as well as how stakeholders within a food system can influence the socio-spatial nature of their foodscape through the perspectives with which they value food resources. Perspectives gleaned from the agro-industrial foodscape model can be understood as influenced by the productionist- agronomist views mentioned previously (table 1), though with a distinct preference toward industrial models characteristic of the globalized corporate food regime. In comparison, the agro-ecological model blends themes from both environmentalist and sociologist perspectives. In reality, all foodscales exist as hybrids between and beyond the agro-industrial and agro-ecological paradigms (Wiskerke, 2018). However, conceptualizing these two models exposes the nature of how foodscales are constructed, based upon how food resources are valued by dominant stakeholders.

Deconstructing these narratives as they relate to food resource distribution and accessibility dynamics sheds a light upon management of food flows and capital stocks, leading to the development of regional foodscales. By filling in the gaps between contrasting stakeholder and disciplinary perspectives, more holistic pathways toward addressing challenges in modern food systems can be forged. Shifting toward circular use practices has the potential to support the triple bottom line of “sustainable” food production and consumption that balances the economic, social, and environmental tradeoffs of resource use, while ensuring the availability of such resources into the future (Pretty, 1995). These pathways can lead to a more regenerative approach that supports food production within our planetary boundaries for feeding a growing global population, instead of furthering the extractive resource use practices of the corporate industrial food regime that degrades the ability for communities to generate or access food provisioning resources.

Table 2: Agroindustrial and Agroecological Foodscapes

Comparison of two extreme foodscape manifestations, guided by agroindustrial versus agroecological perspectives, determining the spatiality of food provisioning. (Adapted from: Wiskerke, 2018)

| Dimension | Agro-industrial foodscape | Agro-ecological foodscape |
|--------------------------------|--|--|
| Vision on food and food system | Commodity: seeds/ planting materials and food are owned by entrepreneurs and transnational companies; food system benefit from free global trade | Human right (right to food); emphasis on food sovereignty; rights of people and regions preserve their agriculture and food culture |
| Food security | Matter of production and logistics (efficient distribution systems) | Focused on improving availability, access, affordability and adequacy; a matter of production and distribution |
| Vision on primary production | Cost-efficient production through scale enlargement, mechanization, specialization and spatial concentration | Product diversification, broadening of economic basis, retain more value added, labor intensive, embed agriculture in terroir |
| Sustainability | Improving technical efficiency by minimizing inputs per unit of output | Place-based approach: economic (employment, income), social (accessible food), environmental (closed loops, seasonal/local varieties, minimal transport) |
| Producer-Consumer relations | Quality/safety assurance schemes; industry and retail labels; tracking and tracing | Personal, trust-based relations; origin labels; transparent food networks |
| Value/Quality | End-of-chain diversification by food processing industry and standardized primary production | Created by farmers and artisanal processors; quality linked to region/tradition (terroir) |
| Health | Nutritionism: nutritionally engineered functional foods | Lifestyle, dietary pattern and eating habits; diversified production |
| Spatial Implication | Monofunctional urban and rural landscapes; urban-rural divide | Multifunctional urban and rural landscapes; diversity of urban-rural interactions |

Foodscape Development

To address the inequitable experience of modern food system challenges across space, the notion of foodscapes has recently entered the realm of urban planning and design (Wiskerke, 2018). While it has previously been applied in the fields of nutrition and public health, the nature of foodscape development can be a powerful analytical lens through which to examine food resource and accessibility dynamics.

There are slight contrasts in the definition of a foodscape, depending upon the disciplinary approach applied. For the intentions of this report a foodscape will be defined by the comprehensive stakeholder networks and food value chain processes that constitute a food system, and their spatialized patterns within a region (Vonthron et al., 2020). Inherent in this definition is the idea that foodscapes exist within nested regional scales, and vary in circularity of their resource flows due to the values held by stakeholders within a FVC. Supplementing this definition is the notion that:

“Food landscapes are shaped, influenced, transformed by social practices, by political and legal institutions, by economic decisions, and by relations of power within foodsystems. ‘Foodscape’... [acknowledges] how food landscapes are perceived differently by each of us according to our ‘historical, linguistics and political situatedness.’” (Vonthron et al., 2020, p.16)

According to the scoping review of foodscape scholarship conducted by Vonthron et al., the term first appeared in academic literature in 1995, with its use growing in popularity since 2007 (2020, p.3). The review analyzed 140 publications and identified four core approaches to foodscape scholarship. While subgroupings (table 3) of each approach have evolved around disciplinary research questions, the literature is collectively centered around issues of public health, social justice, and sustainability as it pertains to spatialized food systems development.

To understand the context-dependent nature of foodscapes at varying scales and from varying stakeholder perspectives, these disciplinary approaches should be integrated, with a focus toward the systemic nature in which stakeholders leverage capital stocks and value flows to shape a foodscape. Stakeholder motivations and the power they wield to pursue them can formulate foodscapes, with values manifesting physically through capital stock development within a food system. More often than not, certain communities receive privileged access to such resource stocks, while marginalized communities or those otherwise divested in have experienced systemic extraction of their resource bases (Odoms-Young, 2018).

Spatiality of Food Provisioning

As societies have industrialized, so have their food systems, distancing the spatial relationships between food provisioning activities along value chains. Agricultural subsidies combined with the comparatively low cost of fuel have caused resources within food systems to be transported over ever increasing distances, or food miles, without the full cost of production being reflected in the final consumer price (Paxton, 2011, p.7). The globalized food trade has grown to prioritize the needs of industrialized and specialized producers, allowing transnational corporations to concentrate power and resources. The allocation of capital resources for food export rather than for local needs continues to feed extractive production practices on a global scale, creating economic dependency between countries that undermines the social, environmental, and economic wellbeing of producers primarily in developing nations (Paxton, 2011, p.8).

Table 3: Approaches to Foodscape Assessment

Categorization of existing publications of foodscape research, based on comprehensive literature review. (Adapted from: Vonthron et al., 2020)

| Approaches | Foodscape Definition | Methods | Main research questions | Subgroups | Main academic fields |
|--------------------------------|--|--|---|--|---|
| Spatial approaches | Spatial distribution of food outlets. Community nutrition environment | Statistics, (participatory) GIS, cross-sectional surveys, observations, store audits | How are food outlets spatially distributed? What are their dynamics? | Characterizing the diversity of foodscapes (Subgroup 1.1) | Public health, health geography, urban geography, sociology |
| | | | Do foodscapes impact diet and health? Is healthy food less accessible for disadvantaged groups or neighborhoods? | Foodscape effects on diet (Subgroup 1.2) | Public health, health geography, urban geography |
| | | | How does error risk affect food environment measurements? | Methodological suitability of foodscape databases (Subgroup 1.3) | Public health, health geography, geomatics |
| Social and cultural approaches | Representations and material form of places and spaces linked to food, a socially constructed landscape | Interviews, focus group, observations, photos, drawings, maps | How do social and cultural factors (e.g. gender, race, socio-economic status migrations) shape food provisioning practices? How do people access food, perceive it and experience it? | Food access and structural inequalities (Subgroup 2.1) | Radical and social geography |
| | | | How do culture-based food habits shape foodscapes? | Cultural and ethnic foodscapes (Subgroup 2.2) | Sociology, cultural geography, anthropology |
| | | | How are everyday food practices social constructions? | Everyday food practices as routines (Subgroup 2.3) | Ethnology, sociology, behavioral sciences |
| Behavioral approaches | The foodscape as physical, organizational, and sociocultural spaces in which clients/guests encounter food | Observations, interviews, focus group, reverse life-cycle analysis, document analysis, (advertisements, cook books), cross-sectional surveys, photos | What are the determinants of food behaviors in institutional out-of-home foodscapes? | Institutional foodscapes (Subgroup 3.1) | Education, behavioral sciences |
| | | | How is food behavior affected by characteristics of domestic foodscapes? | Domestic foodscapes (Subgroup 3.2) | Architecture, sociology, marketing |
| | | | How do children become food consumers? | Retail foodscapes (Subgroup 3.3) | Sociology, marketing |
| | | | | No specific | Food sciences |
| Systemic approaches | The foodscape as a systemic concept close to the food system but pertaining to places linked to food | Interviews, phone surveys, internet searches, focus groups, ethnographic observations, document analysis (press releases and policies), photos, videos | How do alternative food networks shape foodscapes? | Local and ethical food networks (Subgroup 4.1) | Economic and political geography, rural sociology, environmental sciences |
| | | | How do urban food policies shape foodscapes? | Urban food policies (Subgroup 4.2) | Economic and political geography |
| | | | How do foodscapes contribute to the identity of an event or a place? | Territorial marketing (Subgroup 4.3) | Tourism management, anthropology |

As the physical distance between food production and consumption has grown, so too has the distance between producer and consumer. Corporate and industrialized supply chains lack visibility, distancing consumers from the knowledge of where their food comes from and the values with which it was produced (Wiskerke, 2018, p.21). Though local and alternative food systems, and even marketing from transnational corporations, have begun to highlight regional producers, lack of consumer education remains a salient factor contributing to issues of FLW behaviors (Quested, 2013).

Due to the disconnect between rural and urban food planning practices and food provisioning becoming increasingly privatized, the spatial design of food systems has not been a public planning priority in past decades. However, the multifunctionality of food provisioning has been increasingly recognized for its importance beyond the activities of FVC stakeholders, as a key factor in environmental and public health issues (Wiskerke, 2018, p.276). Within the U.S., discussion of explicit planning for food systems began in the early 2000s within the American Planning Association, with the formalizing of their Food Systems Planning Interest Group as an official division in 2020 (APA). As geographic information systems (GIS) technologies develop, new tools and open-source alternatives are emerging with the capacity to support comprehensive urban planning efforts. The advancement of these new tools expands the potential for grassroots Public Participation GIS efforts for locally-driven data collection efforts and spatial foodscape analysis (Drummond & French, 2008, p.170).

Nested Scales of Foodscapes

In evaluating the dynamics of food value chains, food systems boundaries can be drawn at geopolitical and relational scales to assist in the curation of context-dependent regional resource stock inventories and system assessments. From micro to macro-scale food systems dynamics, each food network region is nested within a larger foodscape and is itself composed of functional subsystems. There are various frameworks from which to view the scales of food systems dynamics, from micro-meso/mezzo - macro food systems, to individual production through global distribution tiers corresponding to the producer-to-consumer distribution level relationships (Bower et al., 2010, p.1).

Foodscape scholarship typically considers multi-scaled system dynamics, with the four core disciplinary approaches ranging in perspective from the individual behavioral scale and indoor consumer environments, to regional socio-cultural dynamics, to the impacts of a globalized food regime (Vonthron et al., 2020, p.14). However, research characterized by the systemic foodscape approach tends to represent stakeholder perspectives throughout the FVC, whereas behavioral, social/cultural, and even spatial approaches have tended toward the assessment of individual or consumer-based foodscapes. Food policy and trade can also be regulated differently at varying geopolitical scales, with stakeholder relationships and capital stocks also varying with economies of scale (Müller & Sukhdev, 2018). Therefore, it is

necessary to apply a multi-scalar systemic approach that considers all stakeholders throughout the FVC when assessing dynamics of food resources.

When considering scaled foodscapes, the concepts of city-region, community-regional, and local-regional food systems (LRFS), as well as alternative food networks have been considered as preferable substitutes to reliance upon the dominant corporate globalized food regime (Wiskerke, 2018, p.278; Whitley et al., 2019; Vonthron et al., 2020, p. 12). The COVID-19 pandemic highlighted the advantage of shortened and decentralized supply chains, countering the global industrial model, which provided flexibility to regional systems and tighter knit stakeholder networks to rely on when adapting to times of crisis (Thilmany et al., 2020). However, it is important to acknowledge the dangers of assuming localized systems are inherently more sustainable (Wiskerke, 2018). A local-regional perspective is thus preferred to the idea of isolated hyper-localized food systems because urban centers are dependent upon their surrounding regions to support food provisioning resource availability. While urban populations may drive demand for food resources, the local-regional perspective is more appropriately understood as “an urban- rural continuum in all regions, with mutually reinforcing and reciprocal relationships, and flows of resources, people, and information” (Wiskerke, 2018, p.44). The continuum framing discourages planning that reinforces urban-rural divides and, instead, promotes regional circularity. In the case study that follows, the Wisconsin region and local area of Dane County will together be considered a LRFS, with the City of Madison and UW-Madison communities nested within the local foodscape.

Socialized Foodscape Development

Regardless of the approach to foodscape analysis, public participation and stakeholder engagement is imperative for understanding resource dynamics within foodscapes. For application of systemic and spatial foodscape approaches to policy and planning, community engagement should be sought at increasing depth the more localized the scale. While community food advocates have been able to organize collectively to transform regional food procurement practices, supply chain development, and food policy to better reflect their values; policy interventions should be designed to better support LRFS (Whitley et al., 2019, p.211). Without a firm understanding of food system power dynamics and access to local decision makers, it can be difficult for community members to influence the development of their own foodscape due to limited resourcing and authority. Without developed community ties, local governments with such resources and power may waste their capacity to positively shape regional foodscapes in a way that supports their constituents (Whitley et al., 2019, p.213).

While policy and planning may dictate foodscape development on a broad scale, individualized consumer behavior and producer motivations can aggregate to create considerable influence over food systems dynamics (Whitley et al., 2019). Those with less power and access to capital resource stocks have

less control over resource flow dynamics, and therefore are more vulnerable to the impacts of resource scarcity (e.g. consumer food insecurity, lack of access to market and/or production infrastructure for producers) (Müller & Sukhdev, 2018). To better understand the individual and community experiences within a foodscape and how food policy can better support marginalized groups, systemic foodscape research should be integrated with social/cultural and behavioral approaches.

The fields of cognitive cartography and environmental psychology have developed the concept of social spatial cognition as it relates to the individual and collective experiences of conceptualizing an environment (Eichenbaum, 2015). In comparison to the use of physical distance in navigation, social navigation has been defined here by the psychological and social distance of one's proximity to another and has been measured in terms of power and affiliation. Where power is determined by dominance within a social hierarchy, affiliation being a sense of kinship or familiarity with others, and the strength of the variables' impacts being interdependent upon one another (Tavares et al., 2015, p.231).

Human social spatial cognition not only influences group social network development and spatial behavior, but the affiliation and power within stakeholder networks has the ability to transform foodscapes and determine community resource accessibility. Social cognition and the spatialized development of social networks influence the development of social and produced capital infrastructure (figure 1) within a foodscape. Group affiliation and behavior dynamics further determine regionalized resource allocation (Tavares et al., 2015), which can be observed at the community-level through the development of mutual aid networks (Sustainable Economies Law Center).

The increasing concentration of power within the globalized foodscape has resulted in the steady decline in the total share of midscale farm operations in the U.S. in recent decades (Stevenson et al., 2011, p.28). This is influenced by large scale producers and corporate stakeholders supported by a dominating regime experiencing higher concentrations of dispositional, structural, and relational power in modern food systems (Kok, 2021, p.5). The systemic and generational accumulation of resource wealth enhances the dispositional power of regime actors, while they tend to benefit more from the structural socio-economic advantages of their relationships with financial and political institutions.

Yet in instances of crisis, it becomes evident that empowering localized resources is essential for community health, especially in times of scarcity. Through the development of capital resources, such as food processing and distribution capacities infrastructure, that directly support small to midsize food systems stakeholders, food resources can be localized and more readily distributed to spaces to be consumed or transformed (Elliott et al., 2023). With a more holistic idea of the socio-spatial cognition of foodscapes, urban design and public policy can improve the planning and development of the physical and social capital infrastructure needed to support equitable access to food provisioning resources.

Food Excess and Accessibility Dynamics

Food excess, or surplus product fit for human consumption that would otherwise be wasted if not redistributed or repurposed, is generated throughout the food value chain (Finn, 2018). Within linear food economies, preventative approaches toward FLW generation and support for food excess redistribution opportunities are greatly needed in order to transition food systems from an extractive resource use and disposal paradigm to a circular framework that proactively manages its input/output flows. Stakeholders throughout the FVC experience variable accessibility barriers to capital resource stocks, depending upon the scale at which they operate and the power that they have at that scale. Oftentimes it is the access to these capital stocks and how they are leveraged that determines the fate of food resources, whether it is excess that is repurposed or redistributed, or it is discarded as a residual FLW output (Müller & Sukhdev, 2018).

For the purpose of this report, a generalized food value chain will be simplified to the four stages of agricultural production, manufacturing-processing, distributing-marketing-retail (including consumer-facing businesses and foodservice operations), and household consumption (Müller & Sukhdev, 2018). However, these four delineated categories can be broken down extensively into specialized stakeholder groupings. Individual operations or stakeholders may also not fit neatly within a specific category, and food resources may flow through the FVC in various circular or linear pathways. Within the generalized FVC, the allocation of excess products to points throughout the FVC varies based upon the scale and industrialization of the operation and/or geographic region and food system boundaries the operation is housed.

On a global scale, industrialization and operating scale factors contribute to excess food aggregation being allocated toward the production versus consumption ends of linear food economies. Often this is generalized toward excess in developing communities being seen more on the agricultural production level where produced capital infrastructure barriers may lead to stranded product that becomes wasted (Lipinski et al., 2013). As food systems industrialize and expand in scale, waste may be reduced through streamlining production efficiencies and infrastructure investments. However, centralized industrial production facilities face unique barriers to recycling waste products and upcycling or redistributing excess food resources. Unless excess and waste food has secured sustainable resource cycling outlets, these feedstocks have the potential to create aggregate waste, creating disposal issues at scale.

In the U.S., though 80% of food waste is generated in-home and from consumer-facing businesses, significant waste reductions can be brought about throughout the food supply chain (ReFED, 2016, p.12). However, within U.S. FVCs there are a multitude of systemic barriers and opportunities toward food waste prevention and excess distribution. During the pandemic, consolidation within the

meat processing industry created a 25-43% production capacity loss for United States beef slaughterhouses as COVID-19 passed through the concentrated labor force (Ijaz, 2021, p.2). The dairy industry on the other hand was faced with increasingly variable demand for its products as food service operations began shutting down. Specialized processing plants found themselves without a market as the demand for bulk and specialty products dried up with consumers confined to their homes and the fragile supply chain unable to shift production according to demand (Stevenson et al., 2011). While there had been an increase in milk dumping practices prior to the pandemic, according to Federal Milk Marketing Orders, seasonal peaks never reached beyond 50-100 million lbs. nationally compared to the 349 million lbs. dumped in April 2020 (Stevenson et al., 2011).

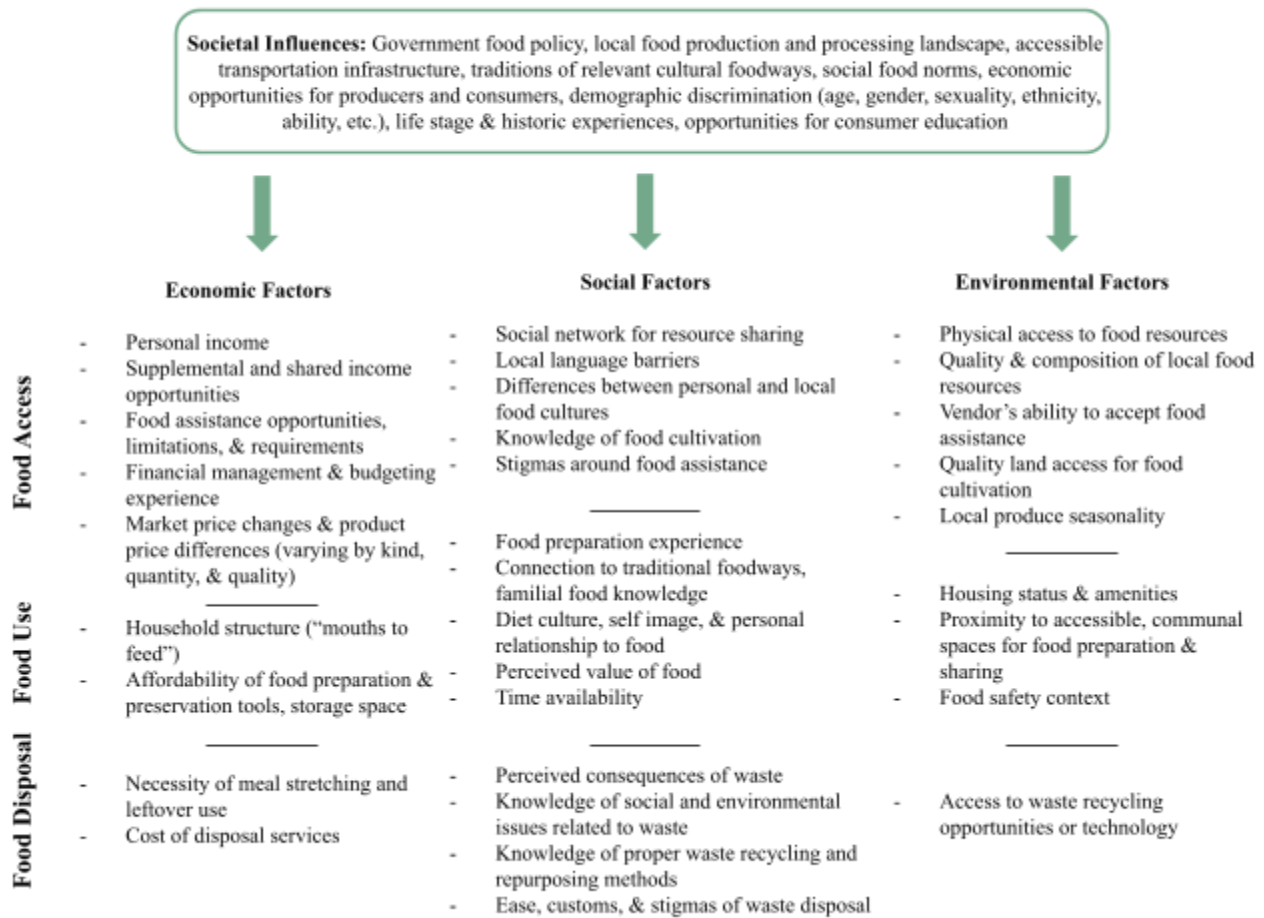
With the concentration of agrifood input and processing services being provided by a dwindling number of corporate suppliers, small to mid-scale agricultural operations often face increased capital infrastructure barriers to food processing, storage, and distribution. Therefore, bottlenecks in regional supply chains should be addressed through supporting processing and distribution infrastructure for small to mid-scale producers (Stevenson et al., 2011). This would aid in reducing aggregation points that can cause food excess issues, and provide an entry into value added and secondary product markets so that producers can support themselves as well as a regionally resilient food value chain.

Depending upon the concentration of capital infrastructure and distribution of resources within a food system, differential spatialized patterns can form that privilege and/or divest resources in certain areas, or for certain communities or stakeholder groups. From a consumer perspective, this pattern formation can be seen through the development of what has been called “food deserts,” otherwise known as “food apartheid,” or areas experiencing systemic barriers to food access and nutritional security reinforced by structural racism (Sevilla, 2021). Stemming from historic and ongoing redlining practices, the significant public and private capital divestment in these areas has created landscapes where food provisioning resources are largely inaccessible (e.g. grocery stores, public transit routes, etc.) (Odoms-Young, 2018).

Socio-cultural foodscape approaches have been used to assess the complex factors contributing to community and individual consumer access to nutritional resources. However, foodscape approaches tend to focus on consumer nutritional security, without extending their evaluation to their resource waste behaviors, which can be similarly constructed and equally as complex (figure 2).

Figure 2: Consumer Food Behavior Framework

Societal influences and combined factors that determine the individual food behaviors of consumers, for varying stages of food provisioning activities. (Adapted from: Quedsted, 2013)



Excess to Access

While often relying on linear FVC pathways, stakeholders in modern food systems have been able to connect excess food resource flows to promote the use and accessibility of food products while preventing the generation of FLW (ReFED, 2016). However, these resource redistribution and repurposing activities face unique struggles due to existing socio-political and capital structures within their foodscape that promote a linear resource economy. Significant infrastructure, communication, and/or education barriers exist that systemically inhibit potential generators of food excess from distributing products directly to consumers or to secondary organizations for continued food redistribution. Further hurdles exist complicating the sustainable disposal of organic waste once it is no longer fit for human consumption (ReFED, 2016).

When there are few opportunities for food producers to sell or process their product, donating excess as appropriate can be a very valuable outlet for preventing food from being wasted while increasing healthy resources for those in need. In terms of agricultural production, nutrient cycling practices like composting and tilling or spreading waste tend to minimize on-farm food waste. While these are valuable practices that reduce the input cost of operations, if barriers to recovering agricultural excess were reduced, roughly 10 million tons of produce could find its way into people's homes instead of being left in fields within the U.S. each year (ReFED, 2016, p.12). On-farm food recovery efforts have the potential to double their current rate if the practice were more viable for producers, amounting to over 1.8 billion meals annually (ReFED, 2016, p.6). Though systemic socio-political determinants of food accessibility are extensive and often inequitable, this increased recovery rate could have a meaningful impact for the roughly 13.5 million U.S. households facing food insecurity as of 2021 (USDA ERS, 2022).

Though excess is commonly donated to support food assistance programs, not all food excess suits the consumer needs or organizational capacities for its redistribution. Furthermore, the emergency food system and nutrition assistance programs are critical but reactionary responses to improving community food security. Economic security and accessibility to affordable and healthy foods are imperative for taking proactive, systemic action to address food security (Heckman, 2016, p.6). If this concept is extended to include all stakeholders within a foodscape, food resource security would further include equitable access to capital resources supporting all activities along the FVC, not just consumption. For producers this would address issues such as equitable land access, as well as capital resources for small to mid-scale food processors (Stevenson et al., 2011). By empowering equitable access to food provisioning resources across foodscapes, systemic causes of FLW and food security can begin to be addressed.

Often, it can be unviable for small to mid-scale agricultural producers to donate when they may be struggling with their own financial burdens. The time and labor required to harvest and distribute on-farm food excess often encourages farmers to instead turn to nutrient cycling and livestock feeding practices as sustainable excess disposal methods that support farm production (ReFED, 2016). Lowering agricultural input costs and keeping resources on-farm can therefore become the automatic solution for producers even when other valuable excess outlets exist in their communities. Considering for the U.S. in 2021 only 7.4 cents per dollar of the average food item was allocated toward the farm production value, producer financial stability will often be prioritized over gleaning crops for donation (USDA ERS, 2022).

While various food access assistance programs have become recipients of food excess as a waste prevention strategy, food banks/pantries and their consumers often face capital capacity barriers to using excess products. For food pantries, bulk format items must be broken down to individual or family

serving sizes, and raw items may benefit from further processing before reaching their end consumer for them to become realistically accessible meals. Though larger food banks may have an on-site kitchen or food safe repackaging facility, many pantries do not (Bartfeld et al., 2021). Food safe transportation, cold/dry storage capacity, and skilled, reliable volunteer support are common necessities required for transforming excess food into accessible meals for those experiencing barriers to food security. Without adequate capacity, while food excess may get redistributed to sites serving those who could use it, there is still a high likelihood that it will be wasted (Bartfeld et al., 2021). Knowing these barriers, food assistance programs may reject items unsuitable for their service format and it can become difficult for producers and retailers with excess to find appropriate locations for redistributing excess food products.

Without streamlined regional communication systems for donation matching, by the time donation logistics are confirmed there may be significantly less shelf life for the product to be used. Furthermore, many food service operations without experience donating food tend to waste product without looking into redistribution opportunities for fear of food safety liability (ReFED, 2023). Though federal and state legislation protects all non-negligent food donations, food handling/ liability knowledge barriers and corporate policies or brand restrictions often prevent food service staff from redistributing excess (ReFED, 2023). Regardless of the stakeholder operation type or excess generation point in the food supply chain— the time and labor requirements necessary for staffing food recovery and redistribution programs frequently prevent excess generators from donating food even when they possess adequate skills and knowledge to do so.

Through fortifying local small to mid-scale food distribution and processing infrastructure, producers would have increased access to value-added processing opportunities for excess product and therefore increased markets to support their operations. Additionally, food donation education and communication efforts could be improved to ensure food that cannot be sold or processed by producers and retailers can be consumed instead of going to waste (ReFED, 2016). Though on-farm food excess can easily be converted into agricultural inputs onsite, non-farm food producers and most consumers do not often have that ability. Without significant community coordination supporting the flow of wasted food from non-farm stakeholders to on-farm compost use, individuals and organizations must rely on local sustainable disposal infrastructure, which is often limited (Sumner et al., 2022).

It is the overall accessibility of human, social, produced, and natural capital that therefore determines the flow of food products throughout a foodscape, creating FLW from excess resources in absence of opportunities for resource circularity within a FVC. Issues of equity within food systems create spatialized barriers for stakeholders throughout a foodscape in accessing the resources they need as well as their ability to take advantage of opportunities to transform excess products. The dynamics of food

excess and accessibility across a foodscape will be observed in the following chapters, as it relates to the nested international to community-level scales of the Dane County and UW-Madison foodscapes.

Chapter 2: The Scale of Food Excess

Movements within a Scaled Foodscape

The contemporary movement to reduce FLW coincides with the urgency to curb the effects of climate change and environmental degradation associated with food production and consumption. International and national regulation of activities related to FLW have largely been reliant upon top-down policies and metrics, which have recently come to recognize the importance of community-led movements needed to inspire local change (USDA et al., 2022).

The scale and stage at which FLW occurs largely determines the metrics by which it can be evaluated and addressed once measured. While food excess is often referred to as a combination of FLW along with recycled or donated food (ReFED, 2016), this report considers excess to be the precursor resource flow to FLW. The intervention point determining the fate of food excess can then be considered as the stage along the food value chain where a stakeholder faces a barrier to accessing adequate capital resources needed to leverage the excess as an input.

Within the following sections, global/international, U.S./national, Wisconsin/regional, Dane County/local, and City of Madison/community-scaled food movements will be reviewed as they pertain to their FLW and resource accessibility policies and practices. The final chapter of this report will then take a deeper dive into the sub-community of the UW-Madison campus and its institutional movements. The scaled approach will connect how large scale, top-down approaches create policy and develop metrics that structure the public understanding of FLW. Current policy and practices will then be assessed through a transdisciplinary-systemic foodscape lens to determine how they can better support grassroots efforts creating resilient local-regional food systems.

Global Scale

The United Nations 2030 Agenda for Sustainable Development, adopted by member states in 2015, outlines a framework of 17 Sustainable Development Goals (SDGs) to guide action in areas of critical importance to the future of humanity and the planet (United Nations, 2015). When looking at the 2023 progress report conducted by the UN regarding Goal 12 of the SDG framework, “ensuring sustainable consumption and production patterns,” the international community is described as “seriously off track” in the effort to halve per capita FLW by 2030. Though awareness of FLW increased during the COVID-19 pandemic, consumer waste behaviors remain largely unchanged, with food loss also largely

unchanged from 2016 levels (United Nations, 2023, p.19). While private sector reporting and government policy development related to FLW has increased significantly across the globe since 2016, the report furthers the call for enhanced visibility in international waste streams and in support for decoupling economic growth from resource consumption.

As the official custodian of assessments related to SDG indicators for responsible consumption (SDG 12), the Food and Agriculture Organization (FAO) of the United Nations has developed an international food loss index. A complementary food waste index has also been developed by the UN Environment Programme (UNEP) (UNEP, 2021). Both indices have national reduction methodology and respective FLW datasets available for member country use and national program development, including a region-specific report *Waste Not, Want Not: Reducing Food Loss and Waste in North America Through Life Cycle-Based Approaches* (UNEP, 2019). The FAO has further compiled the world's largest collection of literature related to FLW on their *Technical Platform on the Measurement and Reduction of Food Loss and Waste* (FAO, 2023). In coordination with a collective of international organizations, the UNEP and FAO additionally developed the Food Loss and Waste Protocol that suggests a set of estimation metrics to create targeted reduction strategies for meeting the UN SDG 2030 goal (Tran et al., 2016, p.1).

Expanding the foundation of FLW research to cover circular resource dynamics, the UNEP's initiative, The Economics of Ecosystems and Biodiversity for Agriculture and Food (TEEBAgriFood), published a synthesis report of methodological recommendations, *Measuring What Matters in Agriculture and Food Systems* (Müller & Sukhdev, 2018). The TEEBAgriFood report frames food systems dynamics in a holistic sense, going beyond the standard economic and statistical estimation approaches that conventional production-minded food systems evaluations take. In order to capture the complexity of modern food systems, circular life cycles of capital stocks and value flows are analyzed in order to incorporate sociocultural aspects and invisible systems dependencies of the FVC that are left out in yield-based approaches (Müller & Sukhdev, 2018). Due to its comprehensive and transdisciplinary nature, that lends itself toward a systemic interrogation of food excess dynamics, the TEEBAgriFood framework has been used as a guiding document for the language development around methodological approaches discussed within this project report.

Though unlikely, if the global initiative of halving FLW by 2030 were to succeed, the FAO estimates that humanity's carbon footprint would be reduced by 1.4 Gt CO₂e per year. Furthermore, if FLW is halved with the extended timeline of 2050, not only would the global health damage caused by that waste be spared, but it would close about 22% of the gap in food availability needed for the increasing global population (Müller & Sukhdev, 2018, p.35). With global temperatures already having risen 1.1°C due global warming and greenhouse gas emissions reaching a record high in 2021, global consumption patterns are in dire need of transformational change to protect the health and safety of the

planet for current and future generations (United Nations, 2023, p.20). The following sections will demonstrate how the international standards mentioned here have been adapted and implemented on national and regional scales. As with the following food systems scales, government-related programs aimed to reduce FLW have combined with the work of various NGOs and stakeholder groups to address food systems challenges. On the international level this includes programs such as the Champions 12.3 coalition, referring to the SDG Goal 12.3 and its FLW target, which is composed of policy, research, and stakeholder groups involved in waste prevention work (Champions 12.3). No matter how urgent the need and how tight the timeline, it is only through combined action and increased visibility at all food systems scales that progress toward reducing global FLW will be made.

National Scale

In 2021, the U.S produced 91 million tons of food that went unsold or uneaten, with the vast majority becoming FLW (ReFED, 2021). With virtually no progress made toward domestic waste reduction over recent years, national FLW rates have exacerbated the cradle to consumer environmental impacts of food production, further contributing to consumer-side waste remaining the single most landfilled item in the nation (figure 3) (ReFED, 2023)(USDA, 2021).

Building upon international FLW movements, in 2015 the U.S. Environmental Protection Agency (EPA), Department of Agriculture (USDA), and Food and Drug Administration (FDA) signed a formal agreement to halve national FLW by 2030 (EPA, FDA, & USDA, 2015). This agreement was renewed in 2018, and was complemented by a 2019 (renewed in 2021) partnership agreement with ReFED, Inc. As a national nonprofit group, originally called “Rethink Food Waste through Economics and Data,” ReFED was founded to research the technical implementation of data-driven strategies for reducing FLW and redistributing food excess (EPA, FDA, & USDA, 2021). The development of the ReFED Insights Engine released in 2021 has now become the most comprehensive estimation of U.S. FLW, structured as an online data hub with policy and stakeholder solution provider identification tools (ReFED, 2023)(ReFED, 2021). To support the reduction of national FLW, the ReFED Policy Finder further suggests (ReFED, 2023):

- Federal regulation and standardization of date labeling
- The reinforcement of food donation liability protections
- The expansion of tax incentives for food donations
- Food safe but non-restrictive regulation of animal feed policies
- Support for organic waste bans and waste recycling laws

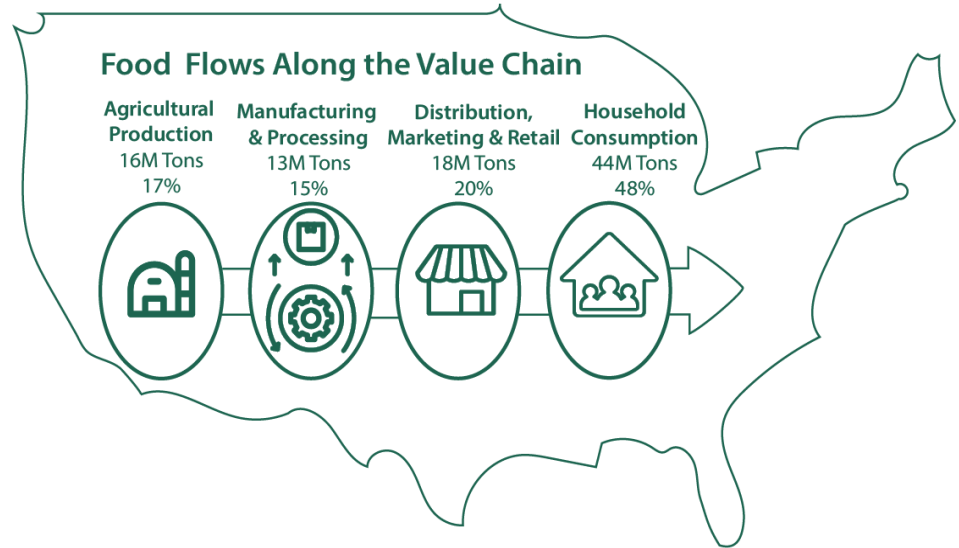
Figure 3: United States Food Resource Statistics

Most current data available for U.S. FLW, food excess, & access. (Data sources: ReFED, 2023; USDA, 2021)

While states can prescribe stricter FLW policies, federal leadership and standardization around the five core policy areas mentioned could set a stronger standard to encourage a more circular national food system. The same year the Insights Engine was released, ReFED coordinated with other national FLW reduction leaders, such as the Natural Resources Defense Council (NRDC), to call on Congress and the Biden Administration to follow their collective U.S. FLW Policy Action Plan. Along with the policy action suggested through the Insights Engine, the Plan outlines the federal need to (2021):

Food Excess, Loss, & Waste in the United States

U.S. (2021): 241M Tons of Food Produced for Human Consumption
91M Tons (38%) Unsold or Uneaten: 80M Wasted - 9.4M Recycled - 1.8M Donated



U.S. Annual Cradle to Consumer Environmental Impacts:

Food Supply Chain Total | Food Loss & Waste (FLW) %

| | |
|------------------------------------|--------------------------------------|
| - 140M ac of agricultural land use | - 664B kWh energy use |
| - 16% (FLW) | - 20% (FLW) |
| - 5.9T gal freshwater use | - 170M MT _{CO₂e} |
| - 17% (FLW) | - 16% (FLW) |

Food Disposal

U.S.: Among the largest global municipal solid waste (MSW) generators

- MSW landfills = 3rd largest source of U.S. anthropogenic methane emissions
- FLW = 24% of U.S. MSW landfills

U.S. Food Access:

2021: 10.2 % (13.5 million) of U.S. households were food insecure
2001-2016 trends: food insecurity rates for Black & Hispanic households were at least twice that of White households

- Invest in infrastructure to measure, rescue, recycle, and prevent organic waste from entering landfills and incinerators
- Strengthen regional supply chains by establishing new positions for regional supply chain coordinators and the continued creation of alternative market channels for producers and consumers
- Educate and activate consumers via private and public food waste behavior change campaigns
- Assert the U.S. Government's leadership on FLW globally and domestically

Prior to, and later in coordination with, ReFED's involvement, the interagency collaboration had created a host of data-driven tools to reduce FLW, notably, the EPA's Food Excess Opportunities Map (EPA, 2023), the Food Access Research Atlas (USDA, 2019), and Food Environment Atlas (Rhone, 2023). These tools created respective inventories of stakeholder generators and recipients of food excess with sector level quantity resource flow estimates, areas experiencing income and transportation barriers to food accessibility, and combined food environment factors of resource accessibility and provider locations.

Though national level FLW estimation tools continue to be refined, the economic input/output and lifecycle assessment basis with which they are created can only be applied to broad-scale policy due to the rough annual estimates provided and the fast pace at which they become outdated (ReposiTrak, 2020). To better inform LRFS planning, the Local and Regional Food System (LRFS) Recovery and Resilience project was developed by the USDA in collaboration with Colorado State University, the University of Kentucky, and the University of Maine in response to the COVID-19 pandemic. Recognizing the context-dependent nature of food systems, the collaborative developed the project as a way to engage stakeholder networks, develop case study based LRFS resilience playbooks, and collect and publicly communicate data and metrics about local level details (USDA et al., 2022, p.2).

While most applicable to local food systems, online platforms that go beyond estimation of FLW to track excess resource flows and support the coordination of redistribution logistics in real time are the practical tools needed to take action to prevent FLW by promoting the cycling of excess resource flows. Though redistribution work conducted through nationally-scaled organizations like Feeding America, and their respective software platforms, approximates this function, these supply chains are not visible to the public (Bartfeld et al., 2021). On a national level, ReposiTrak's FoodSourceUSA system attempted to develop a tool to this technological capital capacity gap, aiming to create visibility within supply chains and facilitate excess redistribution, while fairly compensating producers for their excess (ReposiTrak, 2020). Though pilot tests were developed in two states following its 2020 launch, the system was unable to transition stakeholders from their current practices toward the platform and is no longer available.

Direct federal collaboration with stakeholder groups for FLW prevention was developed to supplement national data collection efforts, and in 2016 led to the USDA and EPA's formation of the U.S. Food Loss and Waste 2030 Champions program. Though organization Champions, such as Amazon, Kroger, Walmart, and Wendy's, have all committed to reducing their FLW footprint by 50% by 2030, there is no verification or auditing done upon the progress of Champion organizations. Furthermore, the metrics with which companies measure their progress is up to their individual discretion, though they are "encouraged to consult" the UN and FAO related Food Loss and Waste Protocol measurement tools (EPA, 2023b).

Tangentially related to the federal interagency partnership efforts to reduce FLW, the NRDC has expanded their national FLW reduction efforts to create their Food Matters Regional Initiative, founded in 2020 (NRDC, 2021). With cohorts currently established in the mid-Atlantic, Southeast, and Great Lakes regions, the Regional Initiative partners with individual cities to provide technical assistance for resilient food systems planning and support in estimating their baseline food waste generation and food rescue potentials (NRDC). Using peer-to-peer learning and network development for knowledge sharing, the Food Matters program directly engages local-level stakeholders in creating actionable change toward FLW reduction. With the City of Madison being one of the Initiative's local partners, examples of the program's progress will be included later in this chapter. The NRDC is also known for their landmark 2012 report *Wasted; How America is Losing 40% of Its Food from Farm to Fork to Landfill*, one of the first national studies on the topic (Gunders, 2017). The report's author, Dana Gunders, former Senior Scientist and current Executive Director of ReFED, is also recognized as one of the initiators of the U.S. movement for FLW reduction (Gunders).

Regional to Community Scales

Policy perspectives and community initiatives vary throughout the Wisconsin regional foodscape, with local FLW regulations occasionally being stricter than the state's (ReFED, 2021). With Dane County housing the state capital and flagship state university, the area is supported by a deep network of food policy makers, researchers, and advocates who have long since been pushing for food systems resilience. Due to the lack of state-wide momentum surrounding FLW, and the variance between local areas, this section will begin with a regional-level overview of food policy and resource dynamics and then transition to a local county and city community level foodscape review.

In terms of state FLW regulations, the 2021 *Wisconsin Food Waste Policy Gap Analysis and Inventory*, facilitated by the NRDC through their Food Matters Regional Initiative, examined the state-wide food policies across ten categories related to FLW. The assessment tool's rubric evaluates states on a scale ranging from no policy, through weak, moderate, and strong policies currently being implemented, with Wisconsin's ratings determined as (NRDC, 2021):

- Organics Disposal Bans and Recycling Laws - no policy
- Date Labeling - weak policy
- Food Donation Liability Protections - weak policy
- Tax Incentives for Food Rescue - no policy
- Organics Processing Infrastructure Permitting - moderate policy
- Food Safety Policies for Share Tables - strong policy

- Food Systems Plans, Goals, and Targets - weak policy
- Plans Targeting Solid Waste - strong policy
- Climate Action Goals - weak policy
- Grants and Incentive Programs Related to Food Waste Reduction - weak policy

Regarding the seventh policy category related to food systems planning, the state does have a food systems plan developed by the Wisconsin Department of Health Services as part of its Nutrition, Physical Activity, and Obesity Program. However, the plan specifically addresses the accessibility of adequate nutritional resources for consumers and does not venture into any discussion of FLW within the state system (NRDC, 2021, p.20). Additionally, the cities of Madison and Milwaukee have commitments to develop a regional food systems planning process. Due to the variability in local initiatives, the state perspective also does not capture the complex history of organics processing programs that occur at the county and community levels.

The Wisconsin regional foodscape is characterized by an impressive network of food value chain stakeholders whose passion and innovation for food provisioning have created a rich local foods market. In 2002 the nonprofit REAP Food Group, formerly known as the Dane County Research, Education, Action and Policy on Food Group, developed their *Farm Fresh Atlas* in partnership with the UW Center for Integrated Agricultural Systems (CIAS) and the Dane County Farmers' Market (REAP, 2023a). The community-engaged ethical sourcing guide began solely-based in Southern Wisconsin though now has six regional publications and a statewide online version, launched in 2017 (REAP, 2023b). With the Atlas expanding its reach across Wisconsin counties in 2023 (REAP, Spring 2023, p.2), it is considered one of the most comprehensive and up-to-date regional producer-focused foodscape inventories reviewed for the purpose of this report. Other regional stakeholders such as Second Harvest Foodbank of Southern Wisconsin and their sixteen-county pantry partner network have created their own platforms such as the Foodbank's Find Food Near You tool, showing local food resources that promote consumer food accessibility and food excess redistribution (SHFB, 2023).

Bringing food policy down the local scale, the recent *Dane County Pandemic Food System Study*, commissioned by the County, has combined social-cultural and systemic foodscape approaches to assess the state of the regional food system and suggest pathways toward a more sustainable, equitable, and resilient food system (Elliott et al., 2023). The report summarizes the state of the County's food production network, its infrastructure needs, and consumer-end accessibility barriers, while noting local lessons learned from the pandemic and food planning needs going forward. The top county priorities resulting from the report are listed as follows (Elliott et al., 2023, p.7):

- Fund three food system community connectors
- Develop a 10-Year Food Plan for Dane County
- Decenter White voices, White professional norms, and other ways we explicitly and implicitly perpetuate White supremacy culture
- Examine the relevance and tactics of the Dane County Food Council and reaffirm the role of the council within the community
- Host a local food summit to bring together food system stakeholders
- Fund the creation and ongoing maintenance of a Technical Assistance Hub
- Audit County land use policies through the lens of encouraging and incentivizing small- to mid-sized food production in both rural and urban areas
- Include local purchasing and equity mandates in all government food purchasing contracts
- Increase transparency, tracking, and the public availability of information pertaining to County food contracts
- Reassess and reconfigure current County grant funding opportunities for food system participants to ensure they are maximizing their potential.

While the study notes the intention to decenter White voices in its research process, Sift Consulting, who was commissioned to conduct the report, emphasizes distinct barriers to doing so. The firm references factors such as the predominantly White food systems leadership and the need for more relationship building between groups like the Dane County Food Council and local BIPOC communities as reasons for the lack of representation in their foodscape narrative, urging inclusive action be taken to address systemic racial equity gaps within the LRFS (Elliott et al., 2023, p.35).

Even though the County report highlights equitable and accessible food initiatives, like the Hmong Institute Food Care Box Program, Tribal Elder Food Box Program, and the Farms to Families program, pandemic-era funding barriers often determined the success and longevity of these local initiatives. It was further noted though that external funding and grant opportunities were critical for the survival of many LRFS programs, the financial support provided through federal and regional programs were “filled with confusing and exorbitant paperwork, a lack of transparency, and little comprehensive reporting,” (Elliott et al., 2023, p.6). While the expanding federal efforts designed to bolster LRFS, many extending to solutions for preventing FLW, have the potential to inspire grassroots change, local and community-level stakeholders may experience significant barriers to accessing these opportunities.

Reinforcing the importance of LRFS capital stock empowerment, the consultants from Civic Economics recently conducted an analysis on the economic impact of locally-owned businesses within

Dane County, as a part of their national Indie Impact Series (Civic Economics, 2022). Released in partnership with Dane Buy Local, the report compares the open books of participating area businesses with the public records of chain competitors (Civic Economics, p.2). The categories of local foodscope assessment included (1) profits paid out to local owners, (2) wages paid to local workers, (3) procurement of goods services for internal use, and (4) Procurement of local goods for resale, and (5) Charitable giving within the community. Focusing specifically on the local sample of restaurants, excluding other retailers, the estimated return of revenue recirculated into the county economy was 60.7%, compared to the 30.4% return of national chain revenue into the local economy (Civic Economics, p.6).

In an effort to expand the local upcycling market and processing capacity for transforming excess resource flows into value added products, the Dane County Department of Waste and Renewables has recently launched plans to develop a Sustainability Campus on their soon-to-be-capped Municipal Solid Waste (MSW) landfill (County of Dane, 2023). With the landfill ten years out from its full capacity, the business and education campus will begin their stakeholder engagement and community planning process in the fall of 2023. Though there is exciting local movement toward FLW reduction, the State and County-wide area still has a long way to go in terms of public engagement and education about wasteful food management. To assess regional disposal infrastructure, the Wisconsin Department of Natural Resources (WDNR) took part in a statewide waste characterization study (WDNR, 2021a). Through sampled sorting of Wisconsin landfill sites, giving insight into state level waste streams, it was found that in 2020-2021 food was landfilled at statewide MSW sites at a rate 193% higher than in 2009 (WDNR, 2010, p.34). Similar to national trends, the largest component of state landfills is food-related inputs. The most recent data shows that 6% of state MSW landfills inputs were food scraps, defined as “not traditionally edible food waste such as peels,” with an additional 14.5% being wasted food, defined as “food items that are traditionally edible,” (WDNR, 2009, p.34). Through the WDNR study, the Dane County Rodefeld MSW site

Figure 4: Local Food Waste & Access

Most recent available data regarding Municipal Solid Waste landfill rates of Dane County food waste, county-wide food security rates, and annual food scrap collection rates for the City of Madison. (Keating, 2021; Heckman, 2016; WDNR, 2021)

Local Food Waste & Access

Dane County:

- 2020 : MSW landfill at full capacity in 10 yrs
 - 34% organics (20.7% wasted/scrap food)
- 2016 : 11.8% of all people and 17.5% of children were food insecure in Dane County

City of Madison:

- 2021: 10,000 tons of food scraps collected annually
 - ~40% of food waste is from households

was found to have similar landfill rates of food waste and scrap inputs (figure 4) (WDNR, 2021a; WDNR, 2021b).

To address the impacts of local FLW, the 2020 Dane County Climate Action Plan, put together by the County Office of Energy and Climate Change, cites the need for food waste to be at the top of the County's landfill waste diversion priority list (County of Dane, 2020, p.126). In an effort to curb FLW and promote the development of a circular economy, the report recommends the Office develop the following (County of Dane, 2020, p.128):

- A model local, low-carbon farms act promoting low-carbon, LRFS
- In coordination with the Department of Waste and Renewables and municipalities, develop a plan for collection and diversion of potential food waste resources for digestion, composting, and other management methods
- Assess the feasibility of a wholesale food terminal that keeps fresh food cold so that more food may flow through our region
- Provide matching funds for food projects through the Partners in Equity grants program

Coincidentally, after the April 2020 publishing of the Office's report, that summer Madison of Madison released a feasibility study, the *Madison Terminal Market Final Report* (City of Madison, 2020). Increasing the collaboration between community and local policy scales, the Madison Food Policy Council and Dane County Food Council both restructured in May of 2020 in response to the pandemic, creating a mutually supportive organizing framework (MFPC & DCFC, 2020). With the County council established in 2005 (DCFC, 2023), and the City council established in 2021 (MFPC, 2023), both bodies are still relatively young in terms of their development. As of their restructuring, the policy councils had the combined working groups of (MFPC & DCFC, 2020):

- Community Engagement (City)
- Food Waste and Recovery (Joint)
- Healthy Retail Access (City)
- Healthy Marketing and Procurement (City)
- Pollinator Protection and Integrated Pest Management Policy Review Task Force (City)
- State Economic Engagement and Development Grants (City) and Partner in Equity Grants (County)
- Urban Agriculture (Joint)
- Equity and Access (County)

Due to their apparent needs during the pandemic, the dual councils established the three additional work teams of Food Access, Relief, and Economic Support, Food Systems Recovery and Resilience, and Regional Agriculture and Food Sovereignty (MFPC & DCFC, 2020). Though Madison formerly had a Food Policy Director to coordinate community-level initiative, the position was filled from 2016-2020, but has been vacant since 2021 with the councils collaborating to fill in the gap of responsibilities (MFPC, 2023).

Taking direct action to address FLW, in 2021 the Madison Common Council, supported by the Sustainable Madison Committee and the Madison Food Policy Council, committed Madison to the goal of diverting 50% of its food waste from the landfill by 2030 (City of Madison). The commitment further identifies the community's need to create metrics for tracking the community's progress, and strengthen their related public education on the topic. In coordination with the NRDC's Regional Initiative, Madison created a multi-year work plan around five core strategies (City of Madison, 2023). With the Common Council resolution accomplishing the plan's first policy intervention goal, Madison has since launched their "Plan, Use, Create, Scrap," consumer education campaign (Sustain Dane, 2023a). Furthering public engagement, Madison has also been working to increase its food scrap (consumer waste) dropoff sites. The USDA and County funded program has been collaborating with community groups Neighborhood Food Solutions, Sustain Dane, and UW-Madison's Farm2Facts program to collect waste at two City farmers markets. From these sites alone, 10,766 total lbs. of food waste was collected in 2022 (Sustain Dane, 2023a). However, Madison has been working since 2011 to offer a municipal food waste collection program (Sumner et al., 2022), facing constant barriers. Lack of engagement with consumer source separation education has long been a primary concern, since creating clean feedstocks at a scale useful for contracted disposal companies has been a determining factor of program continuation (Sumner et al., 2022). Community and private compost subscription services have further developed in response to the growing public push to compost consumer-end waste, creating a patchwork of areas with access to disposal sites. However, Madison is not alone in its struggle to provide sustainable disposal services. Only 3% of the nation's consumers have access to municipal curbside compost services accepting food waste, with only 7% of the 1,000 largest cities in the U.S. having their own program (Sumner et al., 2022).

The community partnership with Sustain Dane has further initiated an area Restaurant Sustainability Network, engaging businesses for FLW reduction, Madison's fourth NRDC initiative strategy (Sustain Dane, 2023b). The final strategy further provides a food industry focused guide for safety and community program information on food donation resources (City of Madison, 2023b). While Madison's initiatives have momentum toward FLW reduction, with greater outreach toward established stakeholder networks, broader community engagement could be achieved to curb landfill waste. With

groups such as the Dane County Food Collective (Dane County Food Collective, 2023), Culinary Ladies Collective (Culinary Ladies Collective, 2023), and a host of other organizing bodies representing food industry workers, there is no lack of organizing around local food. However, none of these groups have a focus toward FLW reduction. As consumers themselves, food industry staff work at a unique intervention point where they can influence the FLW reduction practices at the foodservice and retail level of over 1,632 restaurants and 2,566 farms in addition to personal action related to their own household consumer-waste practices (Elliott et al., 2023). Effective engagement of this demographic has the potential to significantly impact the 40% of local landfill waste coming from the residential sector in addition to on-farm losses and waste within consumer-facing food businesses (Keating, 2021). However, food industry workers often face their own barriers to food access and economic security, and any efforts to focus on these individuals as local FLW reduction leaders should both respect community cultural foodways and be mindful of their capacity so as not to contribute to burnout and these frontline workers (Bloedorn, 2022).

Though funding expanded for food assistance programs during the pandemic (Elliott et al., 2023), over 11% of all County residents and 17.5% of all local children faced food insecurity in 2016 (figure 3). Adding to local equity issues, Hispanic and African American households, and households with a disabled person, led by a single-mother, or below the poverty level see three times the local rate of food insecurity on average (Heckman, 2016). Based on the information provided by the USDA's Food Access Research Atlas, using data from the American Community Survey, Madison has developed a Food Access Improvement Map series (MFPC, 2023). Though broader scale data was used, the spatial foodscape assessment identifies a roughly crescent shaped patchwork of neighborhoods on the north and south sides determined to have significant barriers to food access. Consumer food resource accessibility in this study is defined by the combined effects of high household rate of average distance to a grocery store, high rate of poverty by census tract, and low vehicle ownership (MFPC, 2023). Offering support to stakeholders, there is a strong network of local food pantries and assistance programs, including the Double Dollars and Partner Shares programs within the regional FoodShare branch of the USDA's Supplemental Nutrition Assistance Program (Elliott et al., 2023). However, the network still struggles with FLW and capital capacity issues that are common in the food recovery realm, as discussed previously. Especially when it comes to smaller community-led programs and mutual aid initiatives, financial and labor support can be large hurdles to overcome, making support for food excess donation tracking and logistics coordination platforms all the more necessary. A pilot project addressing this local and community-level need was developed as a Community-Based-Learning (CBL) project, discussed in chapter 3.

From policy to practice, there are a plethora of FLW reduction and food access improvement initiatives throughout the Wisconsin regional foodscape. However, capital capacity building and equitable

inclusion among stakeholders across the FVC remain salient barriers in creating a resilient regional food system. In order to achieve the planning goals set by the regional to community-level food policy makers, there must be a continued push toward transdisciplinary-systemic foodscape approaches that target the root causes of waste-behaviors and highlight the long-silenced voices of marginalized communities for increased LRFS empowerment.

Chapter 3: The Wisconsin Food Access Project

The UW-Madison Foodscape

Just like the foodscapes it is nested within, institutional stakeholder networks at the UW-Madison have increasingly been organizing around resilient food systems action and planning (Extension Dane County, 2023; Whitley et al., 2019). However, most food-related initiatives have not centered around FLW prevention. When they have, food recovery programs have rarely gone beyond an excess to access framework. Additional administrative approaches to zero waste initiatives have complemented these recovery programs, though have not fully captured the social and cultural dimensions through their life cycle assessments (UW-Madison, 2023, p.13).

The recently released *2022 Strategic Vision for Institutional Zero Waste: University of Wisconsin Madison*, coordinated by the Office of Sustainability, considers food, packaging, and daily consumable waste under the “soft goods” scope of campus waste reduction (UW-Madison, 2023, p.1). With the previous anaerobic digestion service the University contracted with switching feedstocks, refusing UW’s consumer-food waste starting in 2021, the campus has been left without a reliable institutionally-scaled outlet to send its waste to. Having experienced similar consumer source separation and disposal contract barriers to compost collection programs as the City, the University switched to an exclusively “back of house” waste collection pilot, composting from select non-consumer-facing campus locations (Sumner et al., 2022). While this subset of University food waste is taken to the West Madison Agricultural Research Station compost facility, the University as a whole is reliant upon a potential future partnership with the County’s upcoming Sustainability Campus project to address its FLW needs (UW-Madison, 2023, p.14). Although the majority of the University’s Zero Waste approach concerns food packaging and non-food waste, it does outline exciting plans for the future expansion of campus consumer-facing composting, including increased University staffing, required trainings for students, faculty, and staff, supplemented by student waste courses and leadership opportunities (UW-Madison, 2023, p.15).

The University’s Zero Waste plans are not discussed in depth, yet they do recognize the prominence of student leaders in the development of campus and community food recovery programs. There have yet to be any concrete plans made or steps taken, but the administration acknowledges the

need to fortify student organizations at the forefront of institutional excess to access work with paid positions to create accessible opportunities and reduce turnover, in addition to supporting the physical space and cold storage infrastructure needs required to safely maintain and expand these programs (UW-Madison, 2023, p.13). Beyond its campus community, the University further cites the need to develop closer relationships with area food recovery organizations, and to increase the capacity of FLW tracking and partner relationship management within these partnerships.

To address both campus FLW and food insecurity issues, student-led initiatives such as the Campus Food Shed (CFS) have created University Registered Student Organizations (RSO) to create collective action to transform their foodscape. In 2023, a cohort of former CFS directors and their faculty advisor, Irwin Goldman, published a brief discussing their campus efforts in the *Journal of Agriculture, Food Systems, and Community Development* (DePorter et al., 2023). The main barriers the authors and student leaders reference for maintaining and expanding programs like theirs includes the longevity of student involvement and community engagement due to the high turnover rates that come with a student-based initiative, a lack of financial and volunteer capacity, the surrounding culture of food security stigmatization, and gap in understanding differences in waste versus recovered excess resources (DePorter et al., 2023). Access to capital resources such as cold storage, transportation resources, and food safety training were listed as additional needs. Similar to groups like the Madison Community Fridges (Geiger, 2023), CFS has found social media platforms to communicate with their network base. However, the student directors have referenced the need for a more comprehensive food recovery tracking and communication tool and have been in collaboration with Coding For Good, another UW RSO, to develop one from scratch for their campus community (DePorter et al., 2023, p.33). Beyond the work of CFS, the work of other food-related RSOs like Slow Food UW, UW Frozen Meals, and the UW Food Recovery Network branch has built a passionate campus community foodscape around recovery excess resources and increasing food accessibility to their peers in need, often working in collaboration with one another (UW-Madison, 2023, p.13)(DePorter et al., 2023, p.30).

While the UW-Madison administration has taken steps to support the food and economic security of its student base, much of the direct campus outreach related to food security has been led by the students themselves. Building upon existing student collaborations, the UW Office of Sustainability is planning the distribution of a campus food security survey to gain a better understanding of needs on campus. Recent research has brought to light the silent national crisis of campus food insecurity (DePorter et al., 2023). Studies of U.S. student life have now proved food insecurity directly impacts GPA and overall quality of campus life (Maroto et al., 2014), particularly for low-income students without family support resources, BIPOC, and first-generation students (Dubick et al., 2016). In order to address campus food security needs, more direct support services from the administration are needed across the

UW-Madison campus to reduce its food access and equity gaps. Though the campus food security demographics and culturally-relevant food resource needs have not yet been extensively studied, current events and historic structural injustices have demonstrated the deeply racist experiences minority students have faced at the predominantly White institution (Hernandez, 2023)(Kantowitz & Rose, 2018). As the flagship University within the extensive state system, as well as a major regional employer, research network, and institutional food procurer, the UW-Madison administration has significant power to influence stakeholders and shape capital infrastructure of the campus to regional foodscapes it operates within.

The Wisconsin Food Access Project: A Community-Based Learning Initiative

To explore the root causes of food excess and access issues within the Wisconsin regional foodscape, the Wisconsin Food Access (WiFA) project was founded at the start of the Spring 2023 semester. As a campus-community collaborative, the project uses UW-Madison's Community-based Learning (CBL) course framework to support organizations within the local food system. The UW defines CBL as “A credit-bearing educational experience that integrates meaningful community engagement with guided reflection to enhance students’ understanding of course content as well as their sense of civic responsibility while strengthening communities,” (Morgridge, 2017). WiFA was originally developed as part of this UW-Madison Agroecology Public Practice master’s project, coordinated by Delaney Gobster. Undergraduate student involvement was facilitated via the creation of the Nelson Institute’s Environmental Studies 600 006 course, *Scaling Back Food Excess: Local to Global Solutions in Food Recovery, Redistribution, and Recycling*, instructed by Gobster. As a Nelson Institute capstone course exclusively for junior and senior undergraduates within the Institute’s Environmental Studies major, enrollment is capped at 15 students to support a hands-on learning environment. In Fall 2023, a new iteration of the capstone will be taught as *Food Excess to Access: Empowering Regional Resource Distribution*.

To gain stakeholder perspective upon the Dane LRFS and Madison foodscape, community project partners were engaged throughout the duration of this project. Both the Spring and Fall ‘23 capstone curricula feature a guest speaker series, bringing the voices of the community into the classroom. Through highlighting the work of local leaders at the forefront of equitable and sustainable food movements, students learn about the historic development and future trajectory of Wisconsin’s regional foodscape. During the spring semester, the WiFA project engaged the capstone cohort in the development of a project website that will be published summer 2023, along with the @wisconsinfoodaccessproject Instagram account in order to further its campus-community outreach. The Fall semester will continue the WiFA

media outreach through website blog and Instagram post foodscape projects throughout the semester, highlighting the community and volunteer events they are required to attend in the process.

WiFA organizational partners and guest speakers were identified based on their prominence in community efforts within the local foodscape and for their prior working relationship with project members. The Fall speakers were further selected to complement the existing partner network, providing diverse perspectives beyond those already involved. The eleven organization representatives introduced to the WiFA project during the 2023 Spring through Fall semesters will be compensated at the rate of \$230 per organization, with funding provided by a Center of Integrated Agricultural Systems 2023 Summer Mini-Grant, with the WiFA project website development supported through the same grant. Speaker sessions from the Spring 2023 capstone and follow-up interviews from Summer 2023 include representatives from the following organizations: Healthy Food for All of Dane County, Feeding the Youth, The Madison Area Food Pantry Gardens, REAP Food Group, Slow Food-UW, and The River Food Pantry.

The foodscape framework described in the first chapter of this report, as well as the scaled case studies developed in the second chapter, lay out the curriculum development for the Spring and Fall 2023 semesters. Additional CBL engagement and project development are discussed by semester in the sections that follow. Though the future beyond the Fall 2023 semester remains uncertain, the WiFA project is designed as a student-led campus-community collaboration that furthers the conversation to promote a sustainable, equitable foodscape. So long as it is useful, the WiFA project will continue to evolve with and be adopted as a resource for students and community members.

Spring '23 Capstone

Throughout the Spring semester, capstone students learned about key issues and solutions related to food excess throughout the supply chain, with a focus on food recovery, redistribution, and recycling efforts. Aligning with Nelson capstone course requirements, the course was designed around the following learning objectives:

- Identify key barriers and opportunities in food excess reduction and food access improvement, and evaluate their connection to broader environmental and social issues
- Examine the role of education and communication in advancing food excess “solutions,” and demonstrate their knowledge of course themes to a public audience through the completion of course projects
- Design and complete a semester-long capstone project that draws on course content to address a local food excess issue

- Collaborate constructively in student project groups and with community partners to investigate the local food excess and access landscape, and fulfill capstone project requirements
- Recognize how positionality impacts community work and an individual's experience of food excess and access issues
- Identify personal "solutions" to consumer food waste issues, and examine how individual action can collectively impact local food system issues and sustainability

The spring curriculum featured 75-minute biweekly semi-structured class discussions over a 14-week period, with alternating lecture-focused background content and guest speaker sessions. Students in all sections of Nelson capstone courses were required to participate in an end-of-semester celebratory showcase, where each class presented their semester projects in lieu of a final exam. During the Spring semester, students within the Food Excess capstone worked with three community organizations on a semester-long capstone project:

- Slow Food UW (SFUW), a campus branch of the international Slow Food movement and RSO providing accessible biweekly meals on campus
- Feeding the Youth (FTY), a food recovery nonprofit operating a number pop-up event and grab and go pantries locally
- Madison Area Food Pantry Gardens (MAFPG), a group of eleven community gardens that produce crops for donation to local food assistance organizations

Students were divided into groups to partner with each organization, with each group having the same set of deliverables, a project webpage, final report, and draft community stakeholder survey. The SFUW team collaborated with on and off campus organizations to organize a Family Dinner Night food recovery meal with support of the instructor. This meal corresponds to the international Slow Food movement's World Disco Soup Day (WSDS) celebration. The student group additionally drafted a UW campus accessible food resource pamphlet for distribution at the event. The FTY and MAFPG groups created unique food recovery distribution projects with their respective organizations, targeting local food recovery and donation-matching barriers. The MAFPG group used their survey assignment to target the education and outreach barriers the organization faces with respect to establishing partners for their garden gleaning and donation work, as well as toward directing others to pantry resources they are affiliated with. Finally, the FTY group also coordinated with Forward Madison, the City's professional soccer team, to pilot a pantry essentials drive at one of their seasonal games to develop an ongoing relationship with the nonprofit.

The semester projects were designed to create student volunteer opportunities with the partner organization, culminating with a multimedia narrative piece highlighting the partner's work in the community that were published on the project website following the course's conclusion. The course-to-community project connection is aimed to foster collective community learning for the students and partners involved while simultaneously creating publicly available educational projects that spread awareness about the research issue themes in a localized context. Through providing a platform for local food industry leaders to connect with students and share their vision of a just food system, students were able to ground their learning in real-world experiences while developing semester projects to further spread the messages of WiFA partners. By compensating partners for their time, UW-Madison was able to make space for community members to reflect on the historic injustices that have built our modern foodscapes, while building connections to work toward a more equitable future together.

Going beyond the life of the Spring 2023 semester, the edited and partner-approved audio recordings from the past course's discussion sessions will be posted to the WiFA project website at the end of the 2023 summer, to be used as course and community resources for the Fall. Facilitating the collection of community foodscape narratives, initial topics were co-developed between the capstone instructor and community partners. Topics were selected based upon themes observed from conducting the background research included in earlier chapters of this report and aimed at more qualitative aspects of the partners' experiences working with issues of food excess and accessibility. Examples include perceptions of food-related culture, community, health, labor, policy, communication, education, and human/consumer behavior. The intention was to go beyond the available public research mentioned previously to gain insight on the less quantifiable social and cultural aspects of the Dane County foodscape. The discussions were semi-structured to maintain consistent topics across speaker sessions but were open-ended to allow speakers the opportunity to explore what they felt were the core issues surrounding their mission, and concluded with a student Q&A period. Zoom interviews were also offered as options for partners to reduce any participation burden.. A consolidated schedule of the two-module courses is provided below. It does not include the final week of presentation development and features group project work throughout the curriculum.

Module 1: Food Excess throughout the Supply Chain

- Week 1: Course Overview | On-farm Food Production Sustainability
- Week 2: Manufacturing/Retail Production and Sustainability | Foodservice and Consumer Waste
- Week 3: Food Recovery and Redistribution | Organics Disposal and Waste Auditing
- Week 4: Food Access and the Dane County Food Network | Community Engagement Workshop
- Week 5: Feeding the Youth Partner Discussion | Processing and Distribution Infrastructure

- Guest speaker: Jazzman Brown, Founder of Feeding the Youth
- Week 6: Madison Area Food Pantry Gardens Partner Discussion | Slow Food UW Partner Discussion
 - Guest speakers: Matt Lechmaier, Farm Manager for MAFPG, and Angelina Mico and Jenna Rethman, SFUW Co-Executive Directors
- Week 7: Project Planning Workshop | Food Excess and Access Policy
- Week 8: Project Check-in and Exam Review | Midterm Exam

Module 2: Sustainable Food Systems Case Studies

- Week 9: Food Ethics and Policy | Project Proposal Workshop
 - Guest speaker: Chef Odessa Piper, Executive Chef and Founder of L'Etoile
- Week 10: COVID-19 Impacts and Mutual Aid Case Studies | Regional Case Studies
- Week 11: Food Systems Planning | National Case studies and Project Workday
 - Guest speaker: Noah Bloedorn, Farm Fresh Atlas Manager at REAP Food Group, Founder of the Dane County Food Collective
- Week 12: Earth Day Case Study | Dane County Landfill and City of Madison Recycling
 - Guest speakers: Sujata Gautam, Sustainability Engagement Coordinator for the Dane County Department of Waste and Renewables, and Bryan Johnson, Recycling Coordinator for the City of Madison Streets Division
- Week 13: International Case Studies | Project work day

Fall '23 Capstone

Though the Fall capstone curriculum is primarily an iteration of Spring, minor details around lecture-discussion topics have been changed and partner projects have been revised to improve the facilitation of CBL engagement and expand the scope of narratives included within the WiFA project. Additionally, for the new semester, a larger classroom space has been acquired that allows for additional student groups to attend guest speaker sessions, promoting the exchange of community knowledge. With speaker content and student projects being featured on the public project website, educational outreach will continue beyond the life of the course, being made available for interested campus and community members for years to come. Since the course is still in the final stages of being redesigned for the Fall '23 semester, the official speaker dates have yet to be confirmed due to partner schedule variability. However, an outline of the semesters' topics has been provided below with the list to be finalized based upon guest speaker availability.

- Dane County Food Excess/Access
- Morgridge Community Engagement Workshop
- Intro to Foodscapes and Regional Resource Distribution
- The Evolution of Food Excess and Introduction to Upcycling
- Upcycling Within the Food Industry (Guest Speaker)
- Gleaning Workshop (with Madison Area Food Pantry Gardens)
- Policy and Planning for Food Systems
- Local Food Organizing (Guest Speaker(s))
- Advocacy and Organizing for Food Sovereignty
- Dane County and Food Systems Planning (Guest Speaker(s))
- (UW Student Panel) Campus Food Excess/Access
- (UW Student Panel) Identity and Campus Food Access
- Foodscape Project Planning Day
- Cultural Foodways and Advocacy (Guest Speaker)
- Food Matters Regional Initiative (Guest Speaker - Nrdc)
- Infrastructure for a Circular Food Supply Chain
- Power and Capital Concentration
- Food Systems Scales and Circularity
- Local Accessibility and Mutual Aid Efforts (Guest Speaker)
- Foodscapes Peer Review
- Cooperative Development (Guest Speaker)
- Local Recycling Initiatives (Guest Speaker)

At the start of the semester the capstone class will host a community engagement preparation workshop with the Morgridge Center. This training will provide students with helpful perspectives to consider when engaging with our community partners and ways to interrogate their positionality as a student researching local equity and redistribution work that supports diverse populations. The previous version of the Excess to Access capstone taught Spring '23 hosted a similar workshop with Morgridge focused on equitable Community-based Learning. The fall capstone workshop will be similarly designed featuring topics such as active listening for relationship building, asset-based framing, reflecting on social identity and cultural humility for self-aware service-learning, and understanding intersectionality and systemic oppression. Following the community engagement workshop students will submit an introductory reflection drawing upon the workshop's topics and connecting them to their personal experiences and course themes.

Early course lessons for the fall semester are designed to provide students with additional local context and history for the development of the Wisconsin regional foodscape highlighting factors like redlining and corporate power aggregation as influences in equitable resource distribution. While a final foodscape blog will act as a culminating assignment for what the students have learned over the course of the semester, each student will also submit a final reflection as an introspective analysis of power and privilege within their food environment and the impacts that an individual can have within a community.

During class guest discussions, students will gain perspective from professionals and community leaders within the food industry. Course lessons will then be used to tie together key themes from guest discussion sessions providing learning opportunities for students to delve into the background research related to food excess and access issues. Before each guest discussion session, students will submit a set of potential discussion questions based on their background research of the partner organizations. These will be used to prompt the guest Q&A portions, helping facilitate class discussion. For the final capstone foodscape project, students will draw upon what they learned during course lessons and guest discussions to create a blog post series published on the WiFA website highlighting local food resources/ partners and researching their impact. Collectively the blog series and guest speaker media will act as the student cohort's narrative of their campus-community foodscape, using community input to analyze the social and physical landscape of local food resource accessibility. Beyond the capstone project-based community engagement, students will have the opportunity to attend a community event hosted by a partner organization as well as contribute time toward a local gleaning volunteer event(s). Following the completion of these activities, students will submit a write-up of the event for posting on the WiFA Instagram page.

As part of their grade in the course, students will be required to engage in ten hours of volunteer service with partner organizations supporting community gleaning and food distribution work. Students will be provided with a list of opportunities to choose from. One gleaning session with the Madison Area Food Pantry Gardens will be organized during class time to increase accessibility to the volunteer opportunities. Students will be able to propose additional opportunities for credit as well, with further accommodations being made on a case-by-case basis to ensure accessibility regardless of student ability or personal circumstances. Similarly, students will be provided with a list of partner organization events (e.g., public meetings, farm tours, etc.) occurring throughout the semester. They will be required to attend a 1-2 hour event with a corresponding draft and final write-up submitted following the event.

Students within the capstone course will have two formal reflection opportunities with themes from their reflections being integrated into the course lessons/discussions throughout the semester. The introductory reflection for the course will follow a class community engagement preparation workshop with the Morgridge Center. Students will be asked to draw from the topics discussed in the workshop to

analyze their own power and positionality as it relates to their knowledge of and access to food resources and cultural foodways. As the semester progresses, students will be introduced to background research and guest speaker knowledge related to the historic inequities within the food industry that have been fed by power and privilege. After exploring the role that identity has in shaping one's experience within foodscapes through their time in the capstone, students will submit a final reflection building off their introductory submission, integrating what they have learned from the course lessons and partners. The goal of the successive reflections is to show student growth in their self-awareness as a member of a food community.

Formal student input related to the course structure will be assessed through an end of semester course evaluation. Student learning outcomes will further be evaluated through their completion of the final reflection, exam, and foodscape class project. The three components, respectively, will gauge student progress in reflective growth, comprehension of course content and background research, and integration of community knowledge with personal and academic experiences. Attendance and participation in community-based discussions/events will also be evaluated as part of the course grade.

From the perspective of the community partners involved in the capstone, expectations for their involvement will be co-created during individual pre-semester partner discussions with the course instructor. Depending upon the terms of the partner's involvement, there will be open communication between the organization representatives and the capstone instructor regarding the needs of the partner. After their respective guest discussions, partner representatives will have the opportunity to discuss course feedback, resulting community impact, and/or future involvement with the WiFA project in a follow up conversation with the course instructor.

Through partnering with local food businesses, nonprofits and organizing groups, the capstone class will further our community partners' outreach and advocacy efforts. Guest discussions will center community partner efforts with student projects highlighting their work and resources for a public audience. The community-campus partnerships built as a part of the capstone will also directly engage students in supporting partner organizations through dedicated volunteer time and event attendance. The gleaning event attendance alone will contribute fifteen students for ten hours each to volunteer work, supporting organizations redistributing excess produce to communities in need of improved access to healthy food resources. Past capstone partners have also collaborated with the WiFA project to disseminate information for additional volunteer and hiring opportunities, especially those geared toward student populations. Advocating for equitable food distribution through the WiFA project therefore supports education and engagement opportunities related to the ongoing efforts of community leaders. The WiFA project further aims to provide honoraria to all involved partners, contributing additional funds

toward partner nonprofits for materials/operations support of capstone campus-community events when possible.

Community-Based Learning for Foodscape Visualization

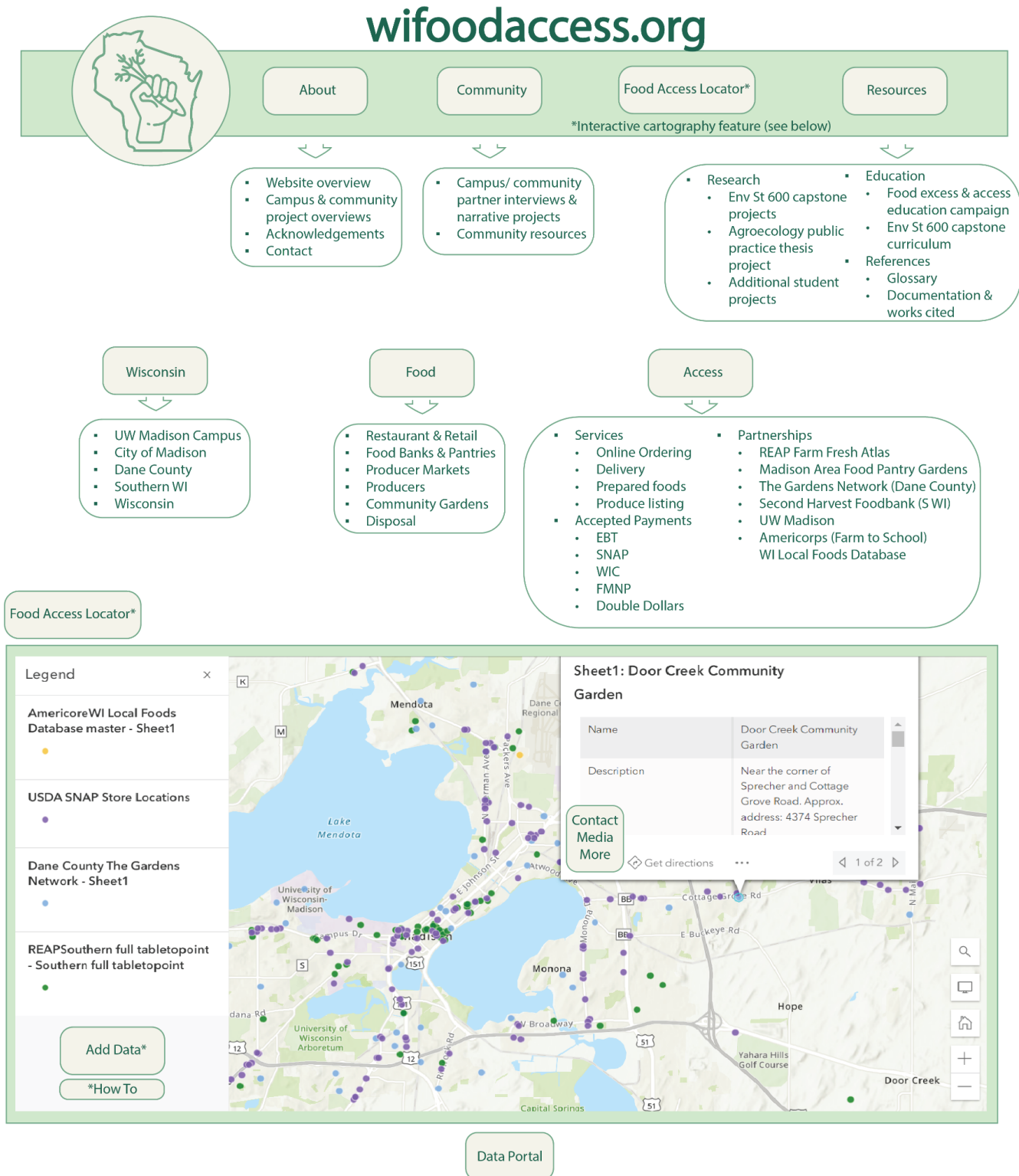
Though a diverse assortment of CBL and related opportunities are available through UW-Madison course offerings, extending supportive partnerships through the CBL framework has the potential to create mutually beneficial learning experiences for all involved. For example, through the literature review process involved in creating this report, the need for community-level food donation support services was identified. While the Campus Food Shed has begun developing a platform with Coding for Good to communicate community fridge updates to their consumers, and similar regional-scale tools like Second Harvest's Find Food Near You tool exist, the need for a niche community-level tool was identified by multiple organizations that partnered with the Spring '23 capstone course.

In an effort to explore the potential for such a tool, this report has reviewed similar platforms that fit the need of community stakeholders and/or that could provide helpful complementary datasets that could be used in the creation of a new tool. To support this work, students within the Spring capstone course researched and compared a variety of phone apps that approximate this function. However, it was observed that the majority of existing platforms either did not support the stakeholder donation outreach and inventory tracking use-cases envisioned, the platform's network had little to no prior engagement with stakeholders within the Wisconsin region, and/or it had fees or other accessibility barriers associated with it that could potentially impede adoption among community members. Therefore, the WiFA project developed a pilot open-web Food Access Locator tool with a student group within the Geography 575: Interactive Cartography Geovisualization course.

The Locator does include data throughout the Wisconsin region, though due to the inspiration for it as a partner-focused community-level tool, it is primarily a county-level map. The tool was designed to facilitate the location and visualization of stakeholders throughout the FVC according to the services their organizations provide related to food excess distribution and their relevance to the broader food access landscape. Though the Locator is based off of a sample of related public data, it was designed to support the integration of stakeholder survey details, promoting community self-reporting of food assistance programs for connection to consumers and food recovery organizations. A wire-frame outline of the intended Locator tool is pictured below (figure 5), set within a frame of the original WiFA project website design. While the final project can be found hosted on the UW Cartography Lab website (UWCL, 2023), further revisions of the tool have been paused until stakeholder feedback is received for the ongoing maintenance support needs that would be required to facilitate the tool's future use. As the Locator's

Figure 5: Draft Website Wireframe of wifoodaccess.org

Original draft of the website wifoodaccess.org wireframe layout, designed for the Spring 2023 Geography 575 Food Access Locator Project.



development continues to be explored this Fall, relevant datasets will be published on the project website to act as a public resource for spatial foodscape assessment of the Wisconsin region. While this is just one

example of additional CBL outreach that could be integrated into the curricula of courses across campus, the University is full of rich opportunities to engage students in experiential learning that engages with and builds the capacity of community organizations.

Conclusion

College-aged students in the 2020s have had a tumultuous experience of pandemic-era learning. In the environmental sphere, they also have been presented with an overwhelming array of global issues that their generation will soon be responsible for addressing. Food exists at the nexus of these systems challenges and provides an accessible entry point for students to take hands-on action through Community-based Learning to ground their education in creating real-world change. By simplifying the complexity of food resource dynamics to a circular system of flows, areas where food excess is stranded within the FVC and becomes FLW is a key intervention point where action can be taken. By increasing accessibility of the capital resources needed to redistribute or transform stranded excess product, intervention opportunities can be leveraged to prevent the environmental damages of FLW while supporting stakeholders along the FVC.

Although global to community-level policy has reinforced the need to change societal waste behaviors, the goals established at all food system levels to halve FLW by 2030 are far from being met. Top-down programs that do not address the unique needs of regional foodscapes have resulted in a lack of progress made towards governmental goals in recent decades (United Nations, 2023). Given the urgent need for action, capital resource support for grassroots regional to community-level programs should be made more accessible in order to facilitate transdisciplinary-systemic foodscape change. By integrating the various disciplinary foodscape assessment methodology, unique spatial patterns of equitable resource distribution can be addressed while going beyond academic perspectives to incorporate the voices of directly impacted stakeholders through participatory approaches. While LRFS research and planning has informally begun taking such an approach, efforts often remain siloed. Furthermore, minority stakeholder voices continue to be silenced, and planning often does not holistically address FLW prevention needs. However, with increased capital capacity to invest in the community-engaged recommendations outlined in the previous case study, and with increased diversity in stakeholder representation, meaningful systems-wide progress can be made.

The WiFA project was developed in Spring '23 to collectivize the power that exists within the student-affiliated UW-Madison network and advance Community-based Learning toward a more circular and accessible campus-community foodscape. Through the combined efforts of the Nelson Institute undergraduate capstone students, their instructor and Master's student researcher, and partnered community leaders, the WiFA project seeks to engage campus and community members in transforming

their local food system. While the WiFA project is only the focus of one capstone class, CBL approaches should be supported across UW-Madison courses to increase campus-to-community collaboration to envision a more resilient Wisconsin.

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