A PUBLIC GOOD?

Reintroducing agriculture production into the design of cities

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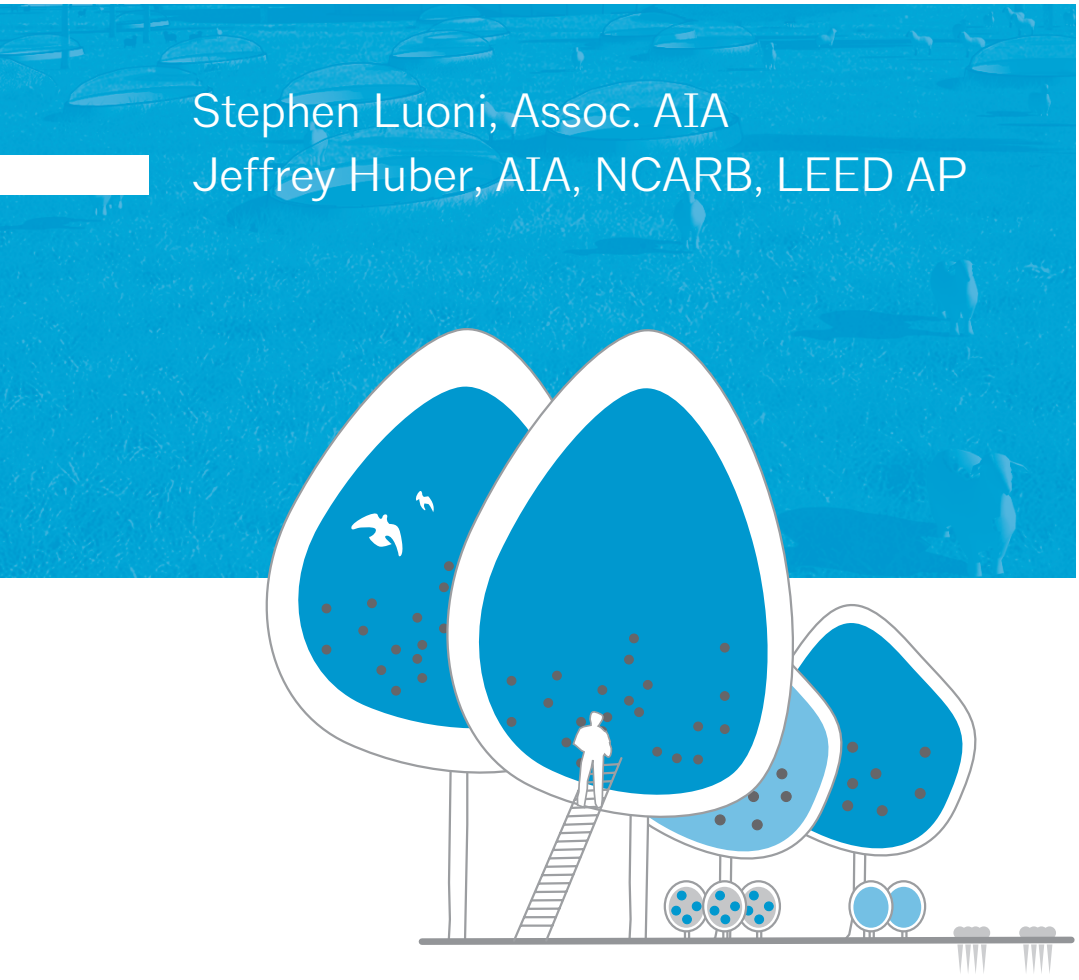

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> "We have never seen food's true potential, because it is too big to see. But viewed laterally it emerges as something with phenomenal power to transform not just landscapes, but political structures, public spaces, social relationships, and cities." —Carolyn Steel, *Hungry City: How Food Shapes Our Lives*

Fayetteville 2030: Food City Scenario Plan asks how Fayetteville's explosive growth might be planned to sustain its food budget through a localized food system. Sponsored by the Clinton Global Initiative and the American Institute of Architects under their Decade of Design Program, *Food City* envisions a future based upon resilient and recuperative forms of urbanism in an area with high food insecurity. The City of Fayetteville is located in Northwest Arkansas—the state's most prosperous region despite having its highest child hunger rate. Arkansas already has one of the highest child hunger rates nationally with over 28 percent of children food insecure compared to North Dakota's rate of 10 percent—the nation's lowest. But Arkansas is awash in food! Arkansas produces most of the nation's rice, ranks 2nd for chicken production, 3rd for catfish and turkey, 5th for sweet potatoes, 6th for grain sorghum, 9th for soybeans, 10th for chicken eggs and pecans, and is a top-25 producer for beef cows, tomatoes, blueberries, grapes, watermelons, wheat, corn, oats, peaches, and pigs. Northwest Arkansas is home to Tyson Foods—the world's second-largest protein producer—and Walmart, the nation's largest grocer.

While concentrated and industrialized agriculture are established market forces, localized food economies can address public needs unmet by the market which are related to resiliency, equity, access, quality, health, and economic self-sufficiency. Hence, the challenge to the public health policy and urban planning disciplines alike is formulation of a shared development vocabulary toward reclaiming the option of urban food production.

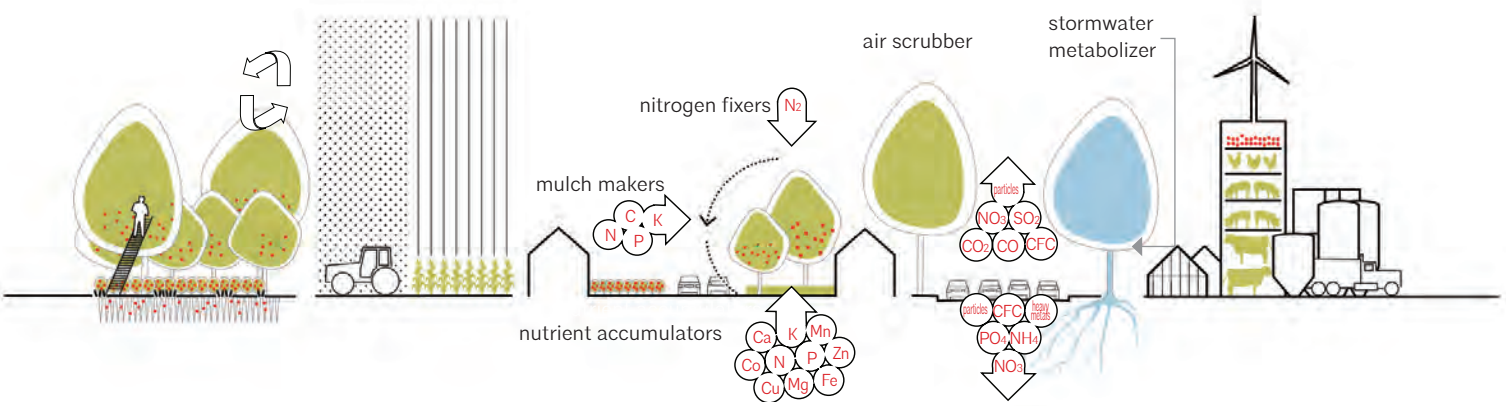
Design, Health, and the Public Good

Food City explores the structural connections between urbanism and the growing of food (farming), including the processing, distribution, marketing, and waste systems (agriculture) that frame food as a public health good. Public goods are commonly accessible products or services that typically fall outside of market dynamics, characterized by non-excludability and non-rivalry. Public goods include clean air, water, knowledge, education, law and order, parks, roads, and disease immunity through vaccination. By definition, their individual consumption does not prevent nor compromise the ability of another to do so. Public goods, however, can be subjected to overuse, under-production, or degradation, leading to characteristic negative externalities described as a "tragedy of the commons" by economist Garrett Hardin (e.g., overgrazing in common pastures by individual herders acting rationally to maximize gain, or traffic congestion as an overuse of roads). Public goods, then, are not only foundational in the material production of cities, but also shape the social and biophysical reproduction of space. The impact of urban food production cuts across many of these systems, holding substantial potential to advance public health through multiple pathways unforeseen by many planning and policy decision-making communities.

In his *The Impact of Inequality: How to Make Sick Societies Healthier,* Richard Wilkinson outlines recent insights in the "social determinants of health" and the "way we are affected by our social environment and the social structures in which we live." This is best understood through the concept of epidemiological transition,

FIGURE 1: The Five Urban Growing Guilds

- fortress plants protect from invasive flora and fauna
- insectary plants attract insect pollinators
- repellent plants secrete compounds to repel pests



1. PERMACULTURE AND FORAGING
Permaculture and foraging landscapes, like edible forest farms, are related to successive perennial landscapes and existing woodlands.

2. FARMING AND GARDENING
Farming and gardening requiring management of annual landscapes.

3. GROW STREET
GROW streets (Gardened Right-of-Way) are associated with public right-of-ways involving orchard-lined streets, fruit and nut boulevards, and edible front yards.

4. POLLUTION REMEDIATION
Pollution remediation landscapes support safe urban growing, primarily through low impact stormwater management, and carbon sinks for air pollution.

5. WASTE-TO-ENERGY
Waste-to-energy districts recycle concentrated production and consumption waste streams from some operations as energy for others.

used to understand changing disease trends in the developed world. Whereas industrial societies have mostly overcome the material causations of infectious disease (unsanitary water, unmanaged waste, malnutrition, and the like) through the provision of public goods, so-called preventable lifestyle diseases from stress, lack of physical activity, and other poor health habits now dominate modern epidemiological trends. Wilkinson chronicles relationships between cascading setbacks caused by institutionalized stressors in social structures and chronic unhealthiness among individuals. His analysis draws particular attention to three interconnected stressors common within uneven environments: low social status, lack of a social network or support, and unfavorable early childhood conditions. Despite debate within the health-policy community over the alleviation of inequality in solving for public health—i.e., is equality a public health good?—we have come to better understand the built environment's role in shaping less-visible longitudinal public health narratives with multiple causations. Accordingly, *Food City* argues that urban food production based on sustainable practices can instigate a health reset through its impacts upon social stressors operating within particular demographic health profiles.

Why Relocalize Food Production Within the City?

Notwithstanding the design professions' dedication to public health, safety, and welfare, agriculture is absent from American urban planning. *Food City* does not aim to replace concentrated agricultural production (many love tea and coffee but few can grow either locally), but rather to address the holistic systems driving urban food production as an option for meeting the majority of a city's nutritional needs. Four multiplier benefits impacting public health and well-being derive from relocalized food production.

First, agricultural urbanism presents new economic development opportunities in the substitution of local food products for those produced in the global industrial system. Known as import substitution, local supply chains support new trade networks aligning area growers with consumers, including large-scale institutions with predictable consumption patterns like schools and hospitals. Income tends to be recirculated within strong locally-oriented economies, leveraging all areas of community life especially in the enhancement of social capital and public goods.

Second, urban land costs and niche markets compel investment in the growing of value-added nutritious food products within dense plant guilds. A re-emergent and intelligent growing model known as SPIN (small plot intensive) farming based upon permaculture techniques optimizes economic return through advanced biodiversity and companion planting. With yields up to $80,000 per acre (vs. a $7,000-10,000/acre average for commodity crops like rice and corn) agricultural uses demonstrate returns rivaling land uses with building improvements, making small-scale agriculture feasible once again.

Third, agriculture based upon ecological approaches to food production—agroecology—delivers community-wide ecosystem services including conservation and regeneration of urban landscapes fragmented by hard-engineered infrastructure. In establishing valuations for ecosystem services, ecological economist Robert Costanza outlines the 17 essential ecosystem services delivered by healthy ecosystems. Agroecology's soft engineering restores those life-affirming ecological services in urban riparian corridors, legacy prairies and meadows, forest canopies, and wildlife habitat. Besides delivering ecosystem services related to food and water supply, nutrient exchange, pollination, and climate regulation, agroecology mitigates negative externalities in conventional farming associated with pollution, toxicity, noise, and odor. *Food City* addresses the greatest ongoing challenge in planning—how to design for human-dominated ecosystems, a phenomenon so global and transformative geologists refer to this present condition as the Anthropocene.

Fourth, agricultural urbanism fosters healthy lifestyles through land development patterns that expand access to affordable nutritious food while supporting agricultural and food literacy, and promoting physical activity. Food production landscapes not only contribute toward open space requirements that many cities struggle to meet, but also provide new and unexpected urban livability venues through community harvesting, foraging, recreation, and wildlife watching.

American cities have disassembled their rail transit systems and razed countless walkable neighborhoods over the past 80 years, diminishing the role of physical activity in everyday routines. Likewise, food production infrastructure and landscapes have been systematically dismantled within cities, limiting access to affordable healthy food. *Food City* reclaims a "missing middle" scale of urban agricultural land use between the garden and the industrial farm, raising the chances that a broad-based food culture may support improved general health awareness and habits.

Reconstituting a Missing Middle Scale in Urban Food Production

Local governments provide public goods such as potable water supply, police and fire protection, sewage treatment, waste management, and transportation infrastructure. Similarly, how might a sustainable foodshed become an ecological utility scaled to community needs rather than an industrial economy? The missing middle urban foodshed functions like an ecological municipal utility featuring green infrastructure, public growscapes, and urban spaces for food processing and distribution. Since growing food in the city entails greater reconciliation with multiple land uses and scales, *Food City* formulates an agroecology of urban growing guilds (Figure 1) associated with niche functions: 1) **permaculture/ foraging landscapes** related to perennial landscapes hosted by existing woodlands; 2) **farming and gardening** requiring intensive management of annual landscapes; 3) **GROW Streets** (Gardened Right-of-Ways) associated with street orchards and edible front yards; 4) **pollution remediation landscapes** that support safe urban growing; and 5) **waste-to-energy districts** which upcycle concentrated agriculture and urban waste streams. Besides delivery of ecological services, local food utilities enhance urban services related to clean air and water, transportation, energy and waste management, and open-space networks.

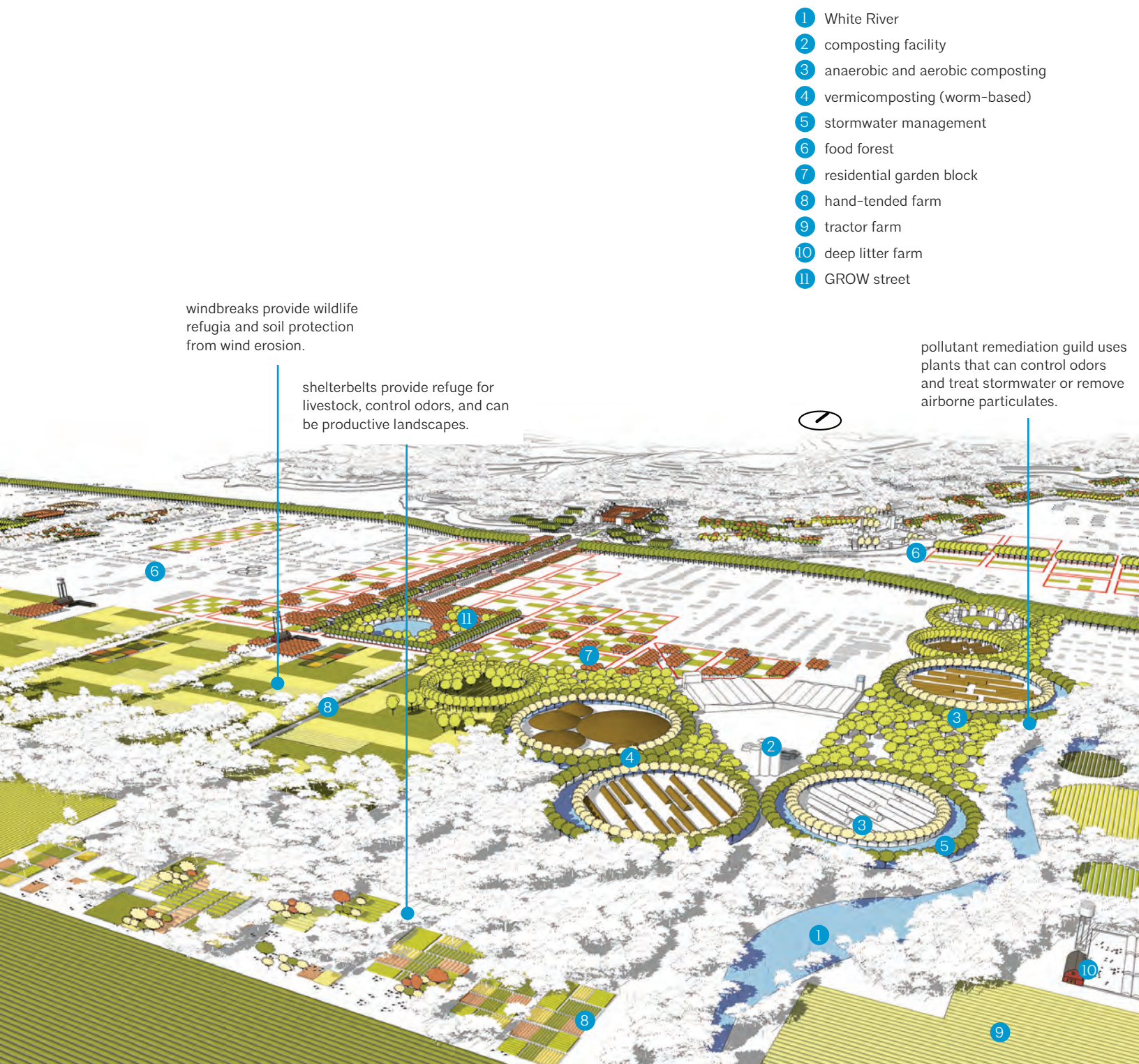
While the urban growing guilds provide a transferable vocabulary of growing technologies, feeding the city from middle scale production requires four infrastructural formats embedded within urban contexts—nutrient management infrastructure, organic growing media, waste recovery infrastructure, and food processing and distribution formats. Despite the unfamiliarity of these infrastructural formats to the contemporary American city, they have been formative in other cultural contexts, including the late 19th century American city. Their recall entails recapturing lost intelligence and holistic practices rendered obsolete by the singularity of industrial food systems.

NUTRIENT MANAGEMENT INFRASTRUCTURE

Soil is everything. In *The Upcycle: Beyond Sustainability—Designing for Abundance,* William McDonough and Michael Braungart predict that "the next green revolution may come from optimizing the soil". Scientists are already acknowledging "peak soil" among other resource collapses, meaning that the world is losing productive soil at a faster rate than it can replenish it. Healthy soil structures with robust microbial communities are the determining biophysical factor in plant production and of food's nutrient content, the latter a particular ongoing concern even among the largest industrial food companies.

Food City houses composting districts, territories structured around citywide resource recovery and upcycling to reclaim essential biological macronutrients—phosphorous, nitrogen, and potassium—from waste (Figure 2). Nutrient management of organic

FIGURE 2: Nutrient management infrastructure reclaims essential biological macronutrients



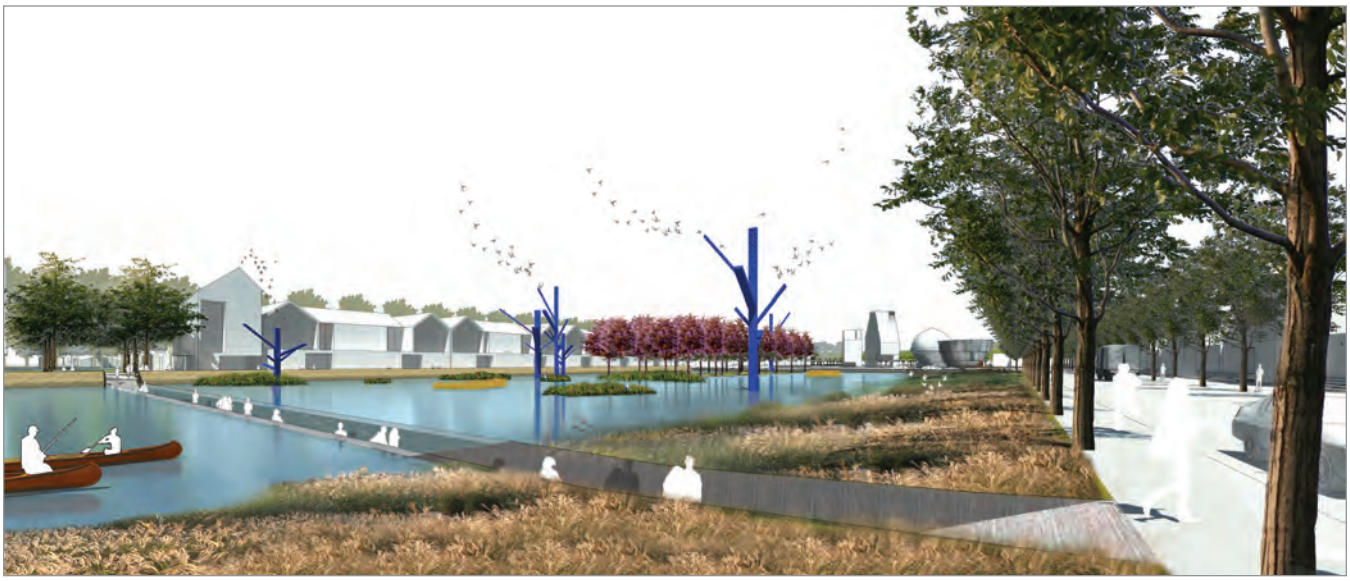


FIGURE 3: Organic growing media infrastructure doubles as a development amenity for neighborhoods

material in foodstuffs, plant biomass, yard clippings, and animal manure involves composting and rebroadcast across neighboring farms, gardens, and parks to rebuild community soil structure. Composting eliminates the need for synthetic fertilizers that destroy topsoil and its organic matter, leach essential nutrients, and reduce absorptive capacity and drought tolerance, eventually eliminating farming capacity altogether. Nutrient management entails a renewed value for the circulation of organic outputs, particularly animal manure and night soils that were indispensable to the development of early America's first large-scale commercial agricultural sector.

ORGANIC GROWING MEDIA INFRASTRUCTURE

Besides soil and plant tissue, other growing medium include air (aeroponics) and water (hydroponics and aquaculture), as well as innovative planning formats like GROW Streets and the ancient agricultural practice of *espalier* for maximizing woody fruit-bearing plant productivity in limited urban space. Aquaculture, for instance, represents an untapped potential since water systems can generate a higher level of protein production per square foot compared to the same land area in terrestrial systems. By the end of this decade world output of farmed fish will overtake cattle ranching as a primary protein source according to the Worldwatch Institute. McDonough and Braungart remind us that: "In traditional soil farming, the key limiting factor is the active

FIGURE 4: Wast recovery infrastructure at the city's Westside Wastewater Treatment Plant

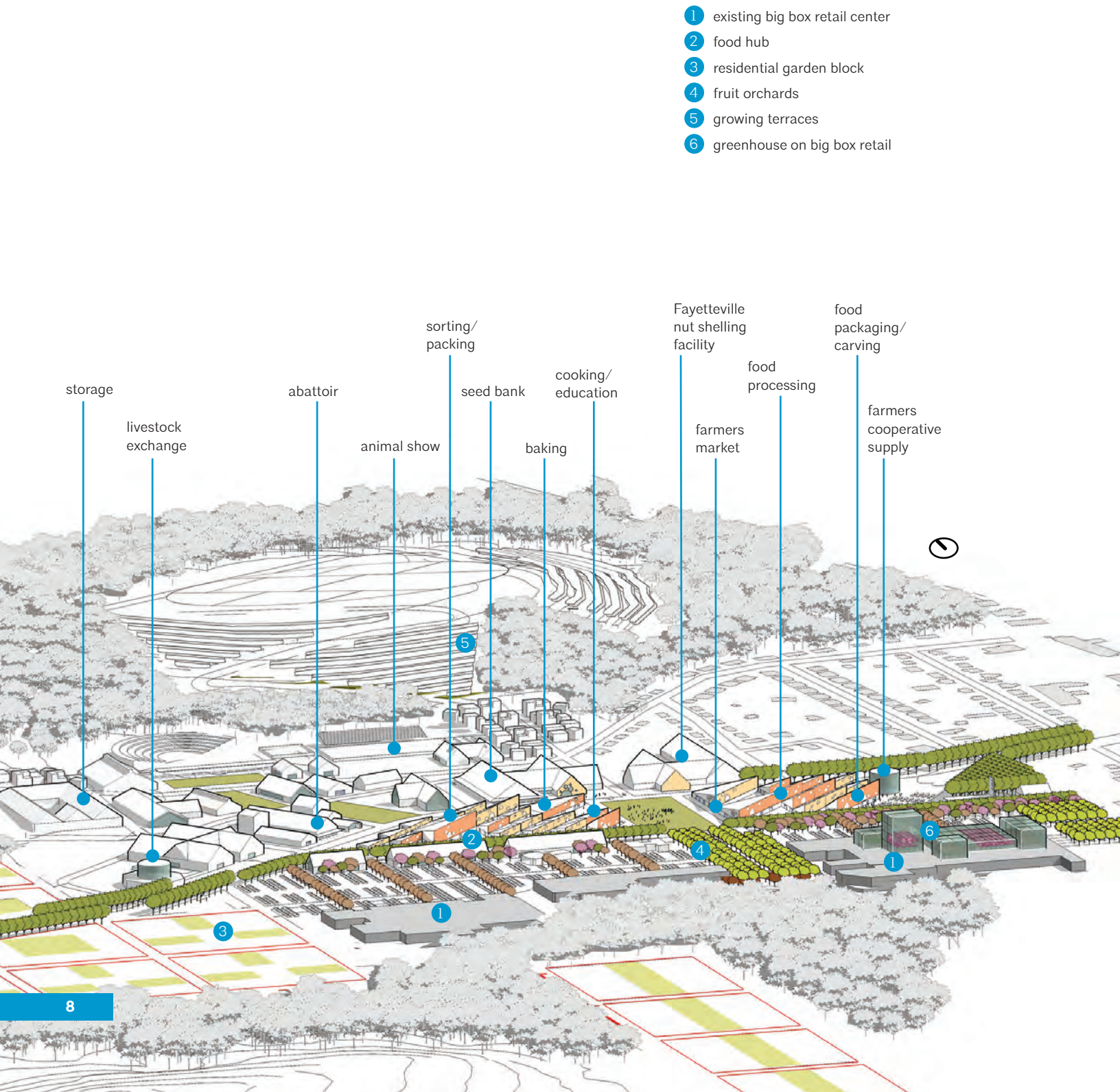
transportation of nutrients to the roots. Freshwater aquatic systems are ideal media for vegetation."

Food City proposes the harnessing of local water bodies as new food-producing neighborhood commons (Figure 3). Aquaculture technologies range from intensive (e.g., commercial hatcheries) to extensive, the latter being pond systems integral to enveloping urban or agricultural land uses and open to foraging. Production components, including broodstock holding, hatchery, nursing, grow-out, and quarantining for acclimation and disease control, become place-making assets. While much research is still needed to determine the scalability of aquaculture and its fit within urban land uses, along with more understanding of fish-growing structures, ponds have traditionally served as productive neighborhood landscapes. Urban watersheds can be regenerated through community participation in the nutrient management of habitat by feeding food wastes to fish or submerging used Christmas trees in ponds for habitats, for instance.

WASTE RECOVERY INFRASTRUCTURE

We now expend ten calories in fossil-fuel energy to secure one calorie of food energy, the inverse from just 50 years ago. Philip Ackerman-Leist in *Rebuilding the Foodshed: How to Create Local, Sustainable, and Secure Food Systems* sums up the current dilemma: "The vast majority of our local food systems are not self-reliant or self-sustaining in terms of fertility inputs, much less energy...Resource recovery drives regenerative food systems." Keeping in mind that farming is foremost an

FIGURE 5: Food processing, distribution, and planning infrastructure support *Food City*'s agroeconomy



energy system, local food systems elevate a city's resiliency or adaptability to systemic disruptions and shocks from "black swan" events—an often overlooked public health good.

Food City situates waste recovery facilities that sort, reclaim, and upcycle nutrients in waste streams at the city's wastewater treatment plants (Figure 4). Biosolids are recovered for fertilizer, gas from biodigestion and for energy supply, and clean effluent for greenhouse irrigation, hydroponics, and aquaponics. Closing the loop mitigates a problematic resource transfer locally where municipal water supply drawn from the White River Watershed is discharged as treated effluent to the Illinois River Watershed. *Food City's* sustainable farming rebalances both urban and watershed metabolisms through nutrient management and the creation of manageable closed energy loops.

An adjacent Microgeneration Park aggregates heavy energy users to co-generate heat and power where inputs and outputs are exchanged and upcycled as a supplement to central grid-connected power. Breweries, distilleries, greenhouses and vertical farms for growing plants and animals are combined with the municipal wastewater facility using appropriately-scaled technologies in anaerobic digestion, fermentation, distillation, and mechanical biological treatment. These "appropriate technologies" better align the scale and power intensity of a technology to an intended outcome for a given location. Cross-programming these land uses moves us closer toward a zero-waste production ecosystem.

FOOD PROCESSING, DISTRIBUTION AND PLANNING INFRASTRUCTURE

The rising demand for local food has a rippling effect, as Peter Ladner attests in his *The Urban Food Revolution: Changing the Way We Feed Cities*. "The more consumers insist on fresh, local food, the more businesses will spring up to supply local seeds, test soil, package and sell compost, manage temporary land leases, supply local processing, grow indoor greens, develop farm-centered subdivisions, invest in technological innovations—and a lot more." Community-scaled food processing and distribution facilities, which include local abattoirs, have disappeared with the consolidation of industrial agriculture. Relocalized food economies require processing infrastructure scaled to the algorithms of small to mid-size farming. Here, *Food City's* hub aggregates facilities for food processing, preparation and packaging, distribution, and marketing at a big box district into town forms (Figure 5). These agricultural urbanism real estate products constitute special community "third places"—neither home nor workplace—given the powerful social force of food.

Conclusion

Far beyond a simple land-use, agricultural urbanism is an energy system that supports healthy cities by restructuring the city's relationship to its ecosystems, natural resources, food production, and social capital. With growing demand for alternatives to industrial food production, urban food production will necessarily embrace holistic permaculture strategies while providing public goods (e.g., resiliency, ecosystem services, access, improved nutrition, health, literacy, and equity) to secure its viability. The focus on public goods highlights the niche opportunities in framing food production as a local utility that can solve for myriad challenges confronting cities. *Food City* in particular provides a framework for building prosperity and security back into placemaking in an area where a significant portion of the population experiences compounded stress from combined economic and social factors. The challenge ahead for the public health policy and design communities is to forge a shared work vocabulary that connects the dots among evidence-based practices.

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