Critical Transition 7.
Building Local Loops and Linkages

	Better Futures Additional Investment Requirements 2030 *(USD billions)*	Better Futures Business Opportunity *(USD billions)*	Economic Prize from Hidden Cost Reductions *(USD billions)*	
Local Loops & Linkages	2030	2030	2030	2050
	$30	$215	$240	$585

By 2050, 68 percent of the global population is expected to live in cities and urban dwellers will eat 80 percent of food consumed.[141] What urban dwellers choose to eat and how their needs are supplied will largely shape food and land use systems. Urban demand for locally grown and seasonal agricultural products is steadily rising across developed markets. In the United States, the number of urban farmers' markets selling local products increased five-fold from 1994 to 2017, to 8,600.[142] There is a similar movement in favour of traceable local food in Japan, where it is not uncommon to see a farmer's photo on the label of fresh supermarket vegetables.[143]

However, local urban food economies remain highly linear and in general highly inefficient (Exhibit 26). Of the 7.1 billion tonnes of global agricultural production that goes into food each year, roughly 2.9 billion tonnes or 40 percent is directed to cities. Of this amount, 500 million tonnes or 17 percent is wasted through distribution and consumption losses. Cities generate 2.8 billion tonnes a year of organic waste which ends up in waterbodies, landfills or potentially hazardous dump sites rather than being mined for nutrients that can be looped back into local food systems.[144] The volume of solid organic waste (food and human) is expected to double between 2016 and 2025, with 70 percent of the increase occurring in emerging economies with limited waste management infrastructure.[145] Today, less than two percent of the valuable nutrients in food by-products and human waste generated in cities is captured and recycled safely and productively.[146]

This critical transition highlights the opportunity to strengthen and scale efficient and sustainable local food economies in towns and cities. Stronger local food economies are a common thread running through all ten critical transitions. Convergence on healthier diets will increase demand in all regions for fresh food products, especially perishable goods (critical transition 1). Urban food retailers of all sizes will seek to meet this demand through local sourcing because shorter supply chains reduce loss and waste when transporting perishable foods (critical transition 6). Productive regenerative farmers will create a market for nutrients recovered from circular urban food production (critical transition 2). Expanding urban and peri-urban supply will open up opportunities for young, skilled rural entrepreneurs (critical transition 9). And intensifying food production using regenerative agricultural practices in peri-urban areas will reduce pressure on forests (critical transition 3).

Goals and benefits

This transition will have multiple benefits.

- **Environment.** Expanding local supply will mean shorter distribution networks. These in turn will reduce transport-related greenhouse gas emissions, food loss and waste, and the use of synthetic fertilisers and pesticides owing to increased nutrient recycling of solid organic waste.

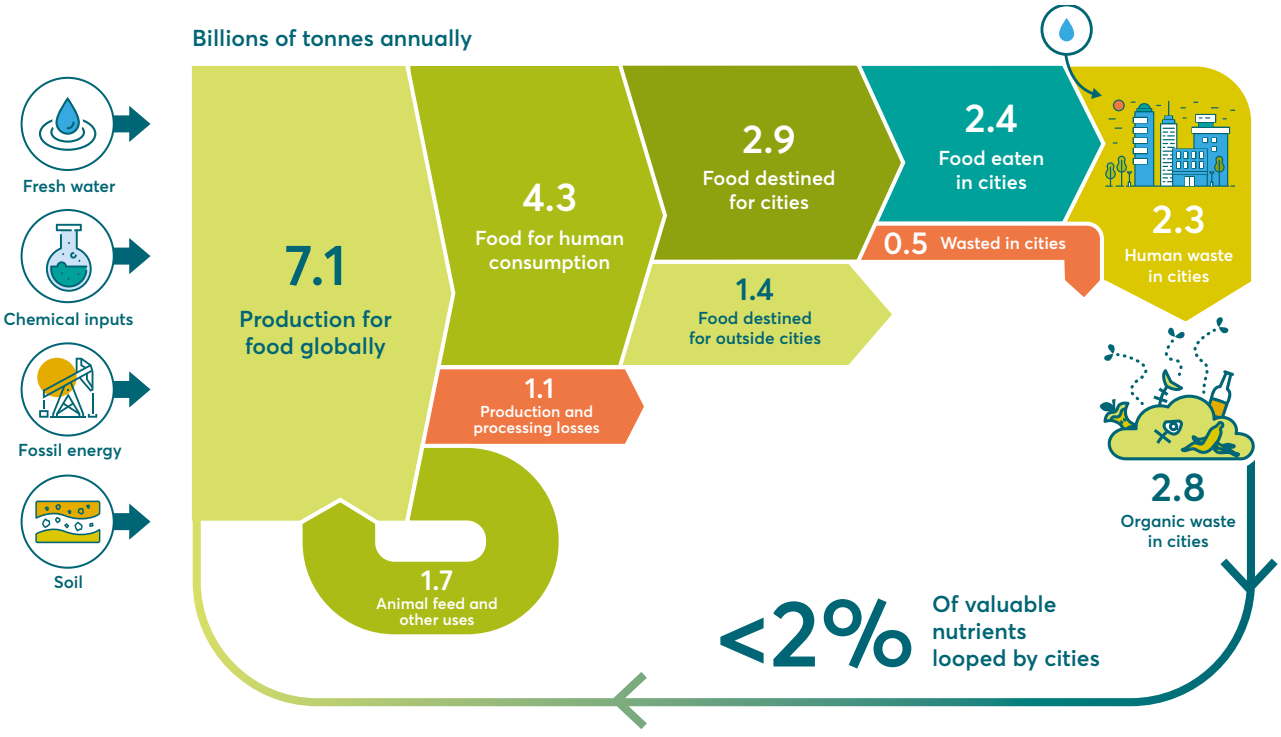
- **Health.** Wider availability of nutritious fresh food in urban and peri-urban environments will help to tackle obesity and under-nutrition.[147]

- **Inclusion.** Economic gains will come from the lower transport costs of shorter supply chains and direct sourcing from local farmers, from higher farm incomes resulting from more direct access to end markets with fewer intermediaries, and from the creation of new jobs through product and service innovation in circular food systems and urban farming.

- **Food security.** Global agricultural production today is focused on a few regions and crops. This genetic and geographical concentration heightens the risk of multiple breadbasket failures resulting in global disruptions to food supplies (see Chapter 2). And at least 80 percent of the population depends on imports for at least part of its food and nutrition security. Expanding local supply to meet local demand will diversify the number of crop varieties grown at a global level, reducing the world's growing vulnerability to staple crop failures. It will also strengthen local food security by reducing local import dependency. That said, long-distance and cross-border trade will remain critical to food security by filling gaps in local supply and helping to smooth spikes in local food prices.

EXHIBIT 26

Efficiency losses in food and land use systems



Source: Ellen MacArthur Foundation. 2019. Cities and Circular Economy for Food.

Left: Farmers from the Kalataima community in Colombia follow an agroecological approach in producing organic coffee, plantain and cacao, as well as vegetables and fruits at times. Here they are transporting their fresh goods sell at an organic food market in Armenia, the provincial capital close to the farm. Right: Homestead Farmer, Tilahun Gelaye, a beneficiary of The Debre Yacob Watershed Learning Restoration Project in Bahir Dar, Ethiopia. He says, "I have been involved with the project for 8 years now. In the past I used to live in a small hut, now I live in a house with corrugated iron roof."

The annual economic gain from this transition is an estimated $240 billion by 2030, and $580 billion by 2050. A reduction in public health costs of $155 billion a year by 2030 would be the biggest driver of the gain.

Significant momentum is gathering already. Entrepreneurs are developing business models that shorten supply chains between farmers and urban consumers. For instance, through its e-commerce platform, agri-tech start up Twiga Foods is connecting farmers to small and medium-sized vendors in Nairobi, giving urban consumers access to fresher products at more affordable prices (see Box 34).

Some companies are seizing opportunities presented by the scale of organic waste available in cities.[148] In London, used coffee grinds from cafés are being used to make high-quality fertiliser for mushroom farms located in the storage rooms of office buildings.[149] The international company AgriProtein is using fly larvae fed on organic waste from food factories, supermarkets, farms and restaurants to create insect-based protein feed.[150] The Nutrient Upcycling Alliance, led by Yara International and Veolia, estimates the potential market for recycled nutrients in fertilisers in Europe at more than $2.2 billion.[151]

Where food waste and nutrients cannot be looped back into the food cycle, they can be repurposed and sold into other systems. Fulcrum Bioenergy, for example, has spent $100 million over the past decade to develop technology which allows it to convert municipal solid waste, including food waste, into low-carbon transport fuels, including jet fuel.[152] UK-based company Bio-bean is also collecting spent coffee grounds from coffee shops, offices, transport hubs and coffee factories and recycling them into sustainable and high-performance conventional fuels and chemicals.[153]

BOX 34

Twiga Foods connects local farmers to urban markets

Agri-tech start-up Twiga Foods is working with 8,000 farmers and over 5,000 vendors to supply fresh fruit and vegetables from Kenyan smallholder farmers to small-and medium-sized vendors, outlets and kiosks in the capital, Nairobi. Through its e-commerce platform, Twiga Foods is connecting local farmers to urban markets. The farmers get higher prices than other buyers offer and a guaranteed market. Vendors get a reliable supply that they can offer to consumers at lower prices because the e-platform lowers transaction costs. Consumers also benefit from accessing fresher products at more affordable prices owing to the more efficient supply chain. By matching demand to supply, the platform is also able to reduce post-harvest losses and waste.[154]

Municipal authorities are recognising the economic opportunity of strengthening local food economies. The city of Amsterdam estimates that by improving the recycling of high-value organic residue streams it could generate $170 million in added value per year, create 1,200 new jobs in the long run and save 600,000 tonnes of carbon dioxide equivalent (tCO_2e) annually.[155] Other cities are experimenting with different models of urban farming to increase supplies of locally sourced food.

Consumer awareness of the downsides of long food supply chains is fuelling demand for circular, traceable, resource-efficient systems. Traceability technology can inform consumers of food sources and support advocates for locally sourced, sustainably produced food.[156]

Barriers to progress

Despite the proliferation of initiatives, there are still major barriers to achieving circular, resource-efficient local food economies. Major retailers rarely have local sourcing strategies. Foods and processed food products are developed to meet standard specifications, so they can be transported in bulk in long global value chains. Public policies on issues ranging from trade to public waste disposal promote standardisation. Foods sourced from small local suppliers are unlikely to meet the standards. Local food economies are also less developed in lower-income countries due to weak local infrastructure. In sub-Saharan Africa, for example, low intra-regional trade, and export-oriented commodity production, leave countries highly dependent on imports of processed foods.[157]

Agricultural inputs derived from converting food waste and recycling nutrients cannot yet compete commercially with products on the long-standing large market for synthetic inputs. A particular barrier here is contamination in urban organic waste. To create a circular nutrient loop, all food by-products generated during the production and consumption of food, from food processing side-streams to human waste, need to be safe to use as inputs for new products in the bioeconomy. This kind of enterprise may need government support to scale, in the way early government support for renewable energy helped that sector to become established. Public investment is also needed to support the market for emerging technologies that can close the local food system loop. China has been giving fiscal support to a pilot initiative for recovering food waste across 100 cities, from collection through to treatment and final disposal.[158]

Competition for the land surrounding cities represents a further barrier. Urban expansion must be managed, since 40 percent of the world's cropland is located within 20 kilometres of cities.[159] In Africa, nearly one-third of the expansion in urban areas between 2000 and 2014 spread on to what was formerly cropland.[160] At the same time, urban food production is still low and in many cases, restricted to informal production for subsistence.

Priority actions

Overcoming these barriers and reaping the benefits of this transition will require cooperation between business, public policymakers and municipal leadership. These actors need to work on the following priority actions:

Commit to increase share of local procurement

Businesses and local and national governments should commit to procuring more food and other biomaterials within cities and peri-urban areas. These commitments should be set out in purchasing guidelines and procurement policies. Larger food companies will need to change their behaviour and negotiate longer-term off-take agreements with local food producers. For example, Heineken, as part of its commitment to increase local sourcing, has signed a three-year partnership agreement in Nigeria that guarantees the purchase of cassava from a local factory that buys from smallholder farmers.[161]

Local government could use the procurement power of schools, hospitals and other municipal bodies to create a market for food entrepreneurs, favouring those that supply healthier food, source it more locally and find better ways to minimise waste and close the nutrient recycling loop. In São Paulo, for example, public procurement alone could generate enough demand for 71,500 hectares of regenerative cropland (equivalent to 73 percent of total peri-urban cropland) if the city were to adopt purchasing guidelines favouring local and regenerative production.[162]

Such commitments to local procurement would increase the availability of indigenous foods, which in turn could help drive consumer demand for them.

Limit competition for land in peri-urban areas from urban encroachment

Municipal zoning and regional spatial and economic planning policies are needed to discourage building on peri-urban farmland and encourage urban and peri-urban food production. There are increasing examples of urban farming systems, including those that combine indoor aquaculture with hydroponic vegetable production in local loops. Singapore, for example, is experimenting with rooftop gardens, hydroponics and vertical farms as part of its commitment to source more food locally.[163]

Invest in local infrastructure to support local loops

National and local governments can support the development of infrastructure for nutrient recycling, especially by redirecting public finance to support new technologies. Emerging economies have a particular opportunity to build organic material collection and separation into the design of waste management infrastructure. This also presents an opportunity for business. Emerging technologies and innovations have an important role to play in closing the food system loop. For example, digital platforms can help in getting organic resources from where they are produced to where they are needed. Organix is a digital marketplace for organic resources, developed by a company called SUEZ, that allows organic producers to find waste management solutions, such as locating anaerobic digestion recovery centres.[164]

Design out pollution and close the loop

All food by-products generated during the production and consumption of food – from food processing side-streams to human waste – should be safe to return to soils as organic fertiliser or as inputs for new products. The European Bioeconomy Strategy, updated in October 2018, supports circular economic activities related to nutrient looping in this way.[165]

Food companies can drive this through the development of recipes and products that replace traditional ingredients with food-processing by-products, helping to ensure that valuable nutrients in by-products do not go to waste. For example, Canvas, a New York City-based company, uses the spent grains (a by-product of the beer making process) from AB InBev's beer brewing to create a high-fibre nutrient-dense beverage.[166] Similarly, International Flavors and Fragrances works with partners to collect spinach which is not harvested due to insufficient quality for sale in the supermarket and to turn it into a nutrient rich powder which can be used in nutritional beverage powders and snack bars (see Box 35).

BOX 35

Drying technology turns otherwise-lost spinach into viable new products

International Flavors and Fragrances (IFF) produces and markets flavors and fragrances that can be used in a range of products from food to personal care. In 2018, IFF launched the EcoEffective+ initiative, where they set a series of environmental goals designed to reduce emissions, eliminate waste sent to landfill and improve water stewardship. As part of this initiative, IFF has a pipeline of pilot projects to explore what can be achieved with regards to food loss and waste. One of these is focused on spinach. A lot of spinach is not harvested because it is of insufficient quality to make it to supermarket shelves. IFF works with its partners to collect this spinach, dry it using PowderPure technology and turn it into a nutrient-rich powder that can be used in its nutritional beverage powders and snack bars.

Farmers generally sell such post-harvest material cheaply or give it away, forgoing the potential revenue opportunities. During IFF's pilot program, 400 metric tonnes of raw spinach were collected, processed and incorporated into various products. This created additional revenues of $1.3 million. IFF is now committed to increasing the number of pilot programmes designed to tackle food loss and waste.

Consumer pressure for more circular and resource-efficient systems will help focus private and public sector attention on delivering them. Civil society can help ensure transparency in supply chains and accelerate the use of technology to support consumer information about local food choices. For example, apps such as Locavore, HarvestMark Traceability and Farmstand all help consumers connect to purchase locally grown, seasonal foods.[167]

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