

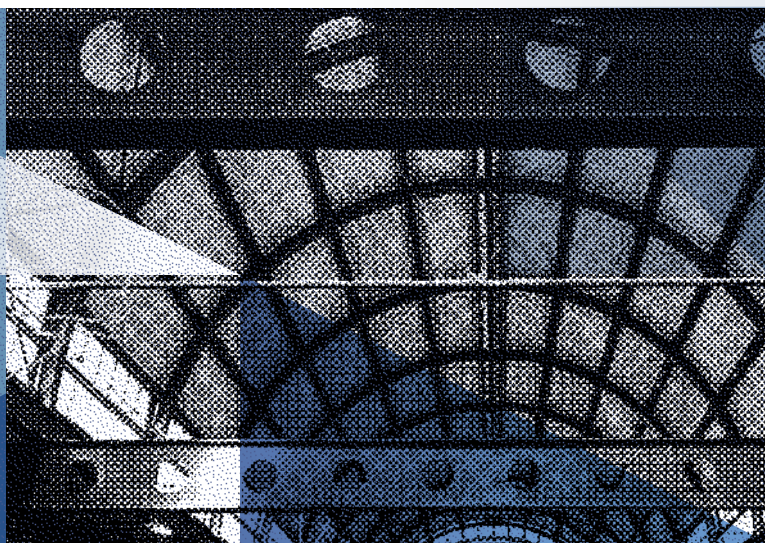


**Food and Agriculture
Organization of the
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European Bank
for Reconstruction and Development

BUILDING RESILIENCE IN URBAN FOOD LOGISTICS SYSTEMS



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BUILDING RESILIENCE IN URBAN FOOD LOGISTICS SYSTEMS

Berkin Şafak Şener
Florent Tomatis

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Contents

Foreword	V
Acknowledgements	VI
Abbreviations	VII
Executive summary	IX
Introduction	1
CHAPTER 1	
Lessons learned from the COVID-19 pandemic on urban food systems and logistics	5
1.1 Implications for urban consumers	8
1.2 Implications for food retailers: the food e-commerce acceleration	8
1.3 Implications for urban food logistics and logisticians	10
1.4 Implications for cities and emerging challenges	10
CHAPTER 2	
Major trends in support of urban food logistics transformation	17
2.1 Increasing linkages with the green belt for resilience	19
2.2 Improving food logistics in urban areas	24
2.3 Legislation and regulation to facilitate urban food logistics transformation	34
2.4 Participatory food policy planning and dialogue	36
CHAPTER 3	
Areas for support and investment	41
REFERENCES	47
ANNEX	59

Tables, figures, and boxes

Tables

1	Recommended areas for investments and municipal policy interventions at regional, city-scale, and neighborhood levels	43
2	Selected indicators and cities that show heterogeneity in urban profiles	59

Figures

1	Illustration of urban logistics spaces	25
2	Investment focus areas for cities in the post-COVID-19 stage for efficient and sustainable food logistics	42

Boxes

1	Definitions	2
2	Ideal characterization of sustainable and resilient city region food systems	6
3	Curbing farmland loss in a large metropolis: the case of Ontario, Canada	20
4	New infrastructure to tap the agricultural potential of Ile-de-France	22
5	Upgrading Rome's wholesale food market	28
6	A state-of-the-art urban food logistics centre: La Chapelle logistics hotel	29
7	Use of metros for food distribution in wartime: the case of Kharkiv	30
8	Delivery pooling in French cities: the case of Urby	32

Foreword

The COVID-19 pandemic changed the way food is moved, sold and bought in urban areas worldwide. Navigating the challenges posed by this new reality, as well as an ever-evolving consumer demand, sparked innovations and new business models in the urban food distribution landscape.

Supermarket chains and open-air markets, for example, began connecting with pick-up and delivery services. Farmers keen to move their fresh produce quickly used digital technologies and platforms to sell their fruits and vegetables directly to urban consumers.

Understanding how these and other trends shaped urban food logistics around the world is the subject of this new Directions in Investment by the Food and Agriculture Organization of the United Nations (FAO) and the European Bank for Reconstruction and Development (EBRD). It is part of the COVID-19 technical assistance package we launched in 2020 to help agrifood value chains in the Bank's countries of operation cope with pandemic-related disruptions.

This report looks closely at the strategies urban authorities and the private sector used to strengthen rural-urban linkages and to improve the resilience of food logistics infrastructure – from participatory food policy planning to legislation and regulations to an uptick in e-commerce.

It highlights case studies in nine cities – Belgrade, Casablanca, Istanbul, Kyiv, London, Paris, Rome, Tashkent, and Tbilisi – as well as good practices from around the world. The report builds on a mix of data analysis and interviews with key players such as retailers, big chains and smaller shops alike, wholesale and retail markets, urban authorities, e-commerce companies and logistics management.

Events in recent years, especially the pandemic and the war in Ukraine, have taught us that our global supply chains need to be ready to respond better to shocks and disruptions. That means redoubling our efforts to build greener, more inclusive, more efficient and more resilient agrifood systems – a goal that has guided our FAO/EBRD partnership and work for nearly 30 years and counting.

We hope these examples of how different urban distribution systems have adapted and innovated provide valuable insights to policymakers, industry leaders, public and private investors and other stakeholders involved in improving urban food logistics. Together, we can build a future where everyone has reliable access to enough high-quality food to lead healthy, active lives.

Mohamed Manssouri
Director
FAO Investment Centre



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Head of Food and Agribusiness –EBRD



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This report has been prepared within the framework of the “Technical cooperation package to support the agribusiness sector during the COVID-19 crisis” established between FAO and the European Bank for Reconstruction and Development (EBRD) and is part of the Directions in Investment series under the FAO Investment Centre's Knowledge for Investment (K4I) programme.

The authors also wish to thank Luigi Baldassari and the Centre's communications team for their support to the report's production, as well as Laurie Olsen for her editing work and Naz Naddaf for the report's design.

Abbreviations

CAR	Centro agroalimentare di Roma
CFPAC	Chicago Food Policy Action Council
EBRD	European Bank for Reconstruction and Development
EUDR	European Union Deforestation Regulation
FAO	Food and Agriculture Organization of the United Nations
HORECA	hotels, restaurants, and catering
MFC	micro-fulfilment centre
RUAF	Resource Centres on Urban Agriculture and Food Security
UCC	urban consolidation centre
ULF	urban logistics facility
WFM	wholesale food market



Executive summary

This Directions in Investment report – *Building resilience in urban food logistics systems* – addresses the significant transformations and challenges in urban food logistics systems that have emerged in recent years. This comprehensive report is framed within the context of the COVID-19 pandemic and the war in Ukraine, both of which have significantly disrupted global supply chains and reshaped food demand. These disruptions underscore the critical need for resilient urban food logistics systems that can ensure food and nutrition security for growing urban populations.

In recent years, consumer demand has evolved toward convenience, healthier options, locally produced foods, and affordable, budget-conscious options. This shift has catalyzed diversification within the food retail sector, seeing new players emerge and traditional ones adapt through omnichannel strategies and expanding food e-commerce. The trends and challenges identified in this report have broad implications for urban food distribution, urban environments, and the relationships among food logistics actors. This report tackles several pressing challenges:

- 1 Supply chain disruptions:** The pandemic and geopolitical tensions have caused major supply chain issues, impacting food availability and prices in cities.
- 2 Polarizing consumer demand:** Some consumers have sought lower prices from discount and traditional food retailers, while others demanded premium, healthier, and more convenient and sustainable options from supermarkets and specialty food stores.
- 3 Environmental concerns:** Climate change awareness is pushing for greener logistics solutions.
- 4 Urbanization and infrastructure needs:** Rapid urban growth requires modernized infrastructure to support efficient food logistics.
- 5 Regulatory barriers:** Existing policies often lag behind the needs of modern urban food logistics systems.

KEY THEMES AND TERMS

Urban logistics: Optimizing the movement of goods within cities.

Proximity logistics: Managing goods flow through smaller facilities located in dense urban areas.

Modern vs. traditional retailers: Comparing highly integrated supply chains of modern retailers with the more fragmented systems of traditional ones.

E-commerce and omnichannel marketing: The rise of online shopping and integrated shopping experiences across various platforms.

Last-mile delivery: The final step in the delivery process to the consumer.

Micro-fulfillment centres (MFCs): Small, urban-based logistics hubs designed for quick order processing.

This report aims to analyze how urban authorities can enhance the resilience and sustainability of urban food logistics systems. To this end, the report seeks to answer key questions such as: "How can urban areas strengthen their supply chain resilience in the face of global disruptions?" and "What role does modern infrastructure play in supporting efficient urban food logistics?" The report cites global best practices and trends in municipal-level investments and regulatory measures that improve food and nutrition security in cities. The report is aimed at urban authorities and policymakers, food retailers and logisticians, researchers and academics working on urban food systems, and international organizations and development agencies focusing on food security and urban development.

The report is organized into several insightful sections. Chapter 1 sets the stage by discussing the lessons learned from the COVID-19 pandemic for urban consumers, retailers, logisticians, and local authorities, highlighting the critical need for resilience and adaptability. Chapter 2 identifies major trends supporting the transformation of urban food logistics, such as increased linkages with rural areas and improvements in urban food logistics infrastructure. It then explores legislative and regulatory measures that facilitate this transformation, underscoring the importance of supportive policies. Participatory food policy planning is also discussed, emphasizing the role of inclusive dialogue in shaping resilient and sustainable urban food systems. Real-life examples are provided from across Europe, North America, Central Asia, the Near East and North Africa offering practical examples and lessons learned from various global contexts.

The report concludes with specific areas for support and investment, providing actionable insights into where resources should be directed to build stronger urban food logistics systems.

Strengthen urban-rural linkages: Encourage connectivity to reinforce food and nutrition security in cities.

Improve logistics infrastructure: Invest in the interconnectivity between existing logistics facilities, upgrading and repurposing urban public spaces, promoting the shared use of logistics assets and services, and enhancing last-mile delivery.

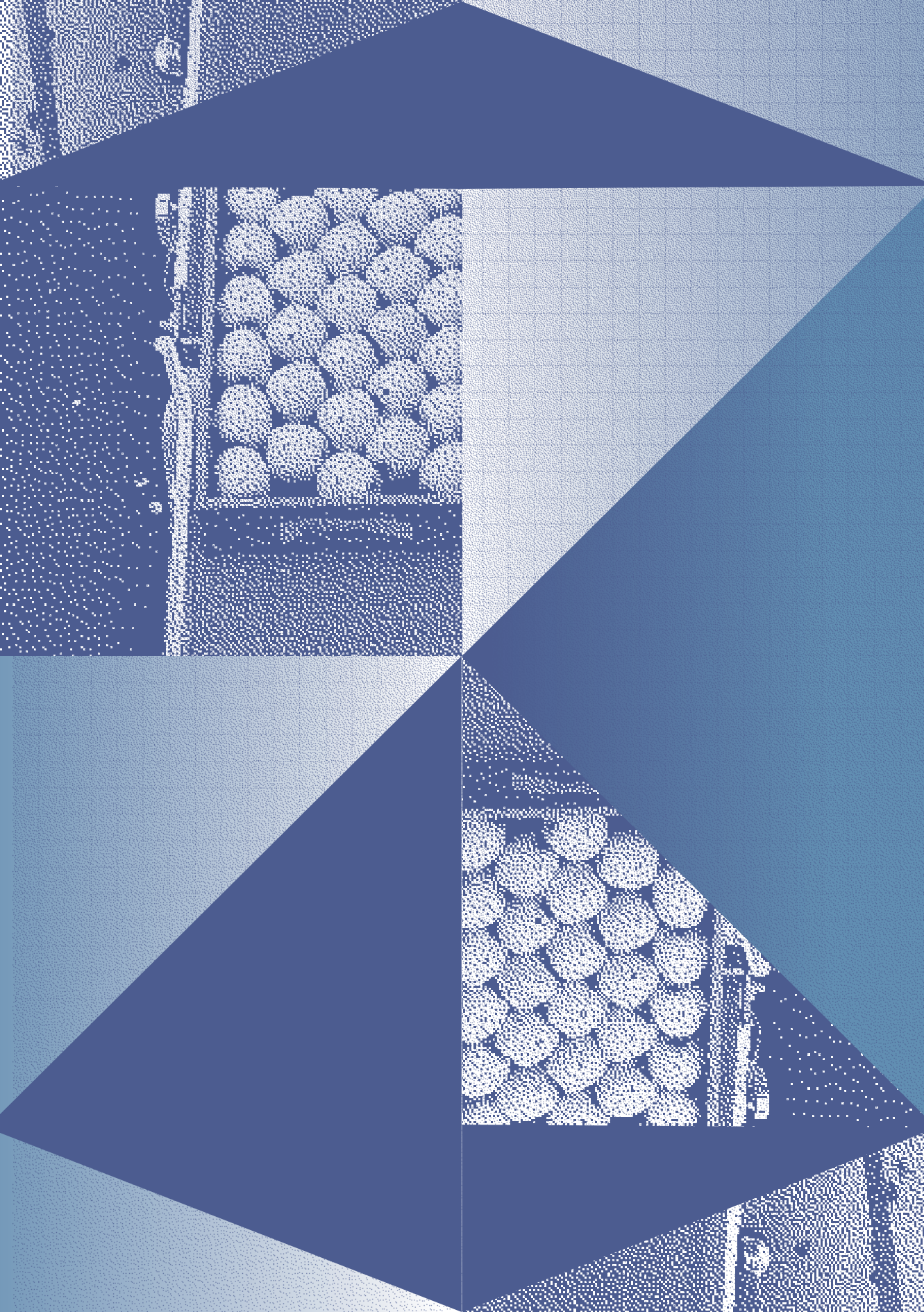
Undertake regulatory reforms: Update policies to support urban food logistics, including land use and environmental standards.

Participatory planning: Foster inclusive dialogue to ensure stakeholder engagement in decision-making.

This report from the FAO Investment Centre offers a comprehensive analysis of the current state and future directions of urban food logistics systems. By addressing the challenges and leveraging the opportunities presented by recent global disruptions, urban authorities can build more resilient and sustainable food logistics systems that ensure food security and nutrition for their populations. The policy recommendations and investment areas outlined in the report provide a roadmap for stakeholders to navigate the complex landscape of urban food logistics and contribute to the overall well-being and sustainability of urban environments.

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Introduction

The COVID-19 pandemic and the war in Ukraine have had profound impacts on fresh food logistics around the world – disrupting global supply chains and accelerating changes in food demand, including for fresh products. Urban food logistics systems faced challenges to ensure food and nutrition security for urban populations. The acceleration of consumer demand for greater convenience, healthier and locally-produced food, and rising concerns about climate change, have led to diversification of the food retail sector with new players, as well as the consolidation of omnichannel strategies and expansion of food e-commerce. This is providing consumers with diverse purchase and delivery options. Transformation of the food retail sector has had strong implications for urban food distribution, the urban environment – including logistics-related congestion and noise – and the interaction between food logistics actors.

This Directions in Investment report analyses how urban authorities have improved resilience and sustainability in the face of emerging challenges by strengthening linkages with rural areas, improving urban food logistics infrastructure and regulations, and engaging in participatory policy planning and dialogue. After reviewing global good practices and conducting in-depth consultations with agrifood logistics actors, the authors are able to present municipal-level investment and regulatory trends evident in the post-pandemic landscape of urban food logistics systems. The report is based on case studies of nine cities (Belgrade, Casablanca, Istanbul, Kyiv, London, Paris, Rome, Tashkent, and Tbilisi); each study included literature review, data collection and interviews with public authorities, researchers, retailers and logistics operators. This report also discusses the role of urban authorities in building strong governance of urban food logistics systems in collaboration with modern and traditional retailers, logisticians, and other urban, peri-urban and rural stakeholders, as well as how urban authorities can improve food and nutrition security in cities. Like the case studies upon which it is based, this report has been prepared within the framework of the FAO/European Bank for Reconstruction and Development (EBRD) COVID-19 Package, which focuses on EBRD countries of operation, with urban practices showcased from around the globe, including mature and transitional food economies.

DEFINITIONS

Urban logistics: The optimized flow of goods into, within and outside urban settings (Teschendorf *et al.*, 2022), taking into account economic, environmental, and social externalities.

Proximity logistics: The flow of goods through smaller fulfilment facilities that are situated in cities' dense, mixed-use areas where goods are consumed (Rai, 2022a). Last-mile operations are often handled using lower-emission vehicles and in the form of scheduled or instant deliveries.

Modern retailer: Supermarkets, hypermarkets, discounters, and convenience stores with highly integrated and digitalized supply chains they themselves organize on a large scale. Since the 1960s, modern retail has expanded more rapidly for processed and semi-perishable foods than for fresh fruit and vegetables. In mature food economies, modern retail channels account for more than half the total fresh produce retailed, in terms of volume and value (FAO and EBRD, 2022).

Traditional retailer: Relies on multiple and highly fragmented supply chain actors working at a small scale. Even in mature food economies such as France and Italy, traditional retail remains an important distribution channel for fresh fruits and vegetables.

Mature food economy: Characterized by strong household income, population that is more urban than rural, and many modern retailers; i.e. generally Western Europe and the United States of America.

Transitional food economy: Characterized by lower household incomes, growing share of urban population, and fewer modern retailers.

E-commerce: Purchasing done online by computer, laptop, tablet or smartphone. Product is delivered to the consumer by the retailer or third-party delivery service or may be picked up by the consumer.

Omnichannel marketing: Business model that strives to create a seamless shopping experience across physical stores, websites and mobile apps with customer interaction via phone, email, webchat and social media.

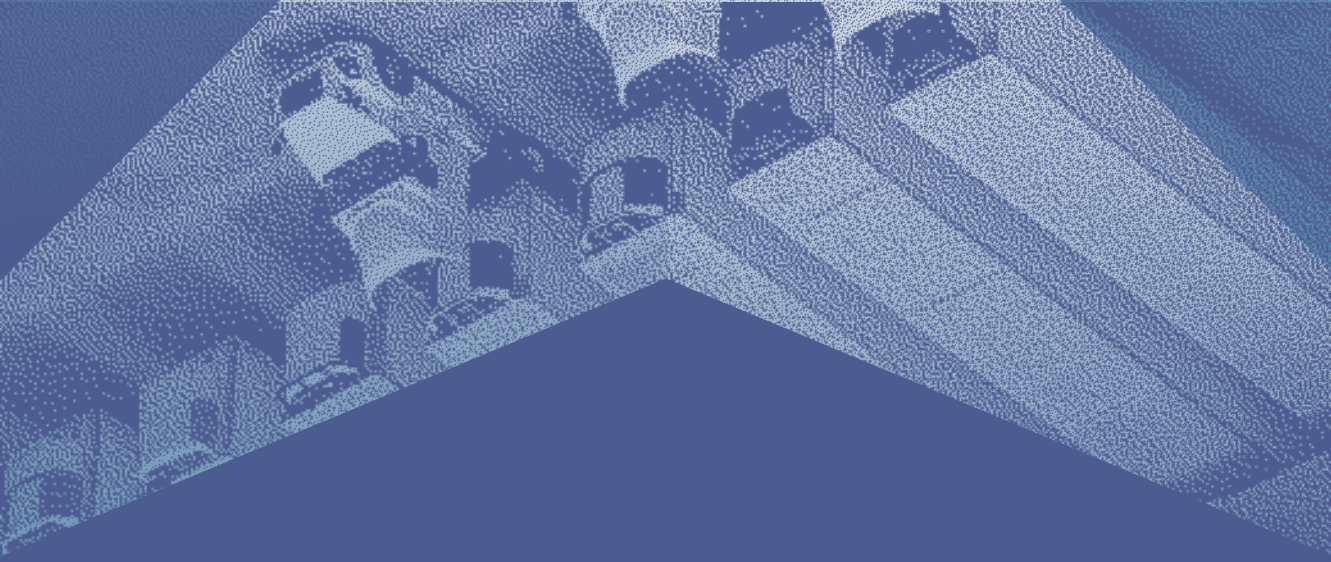
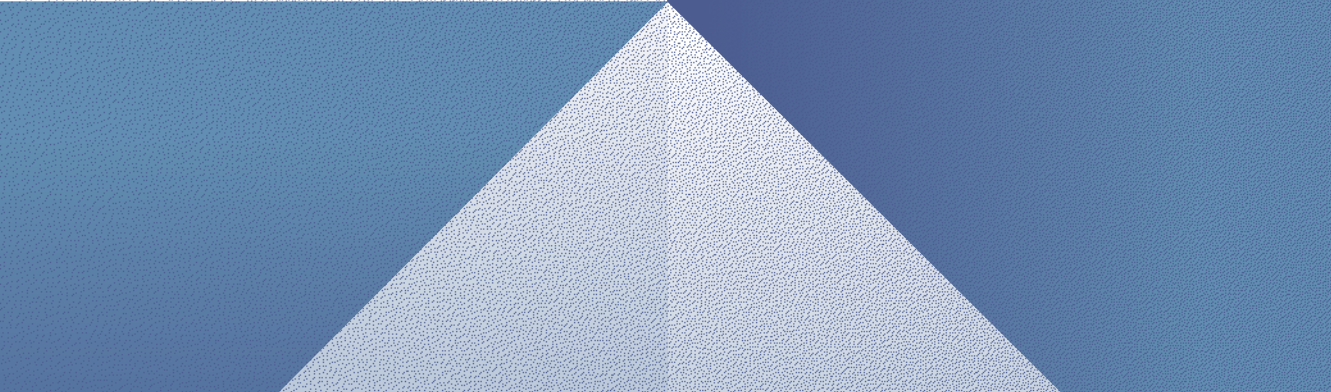
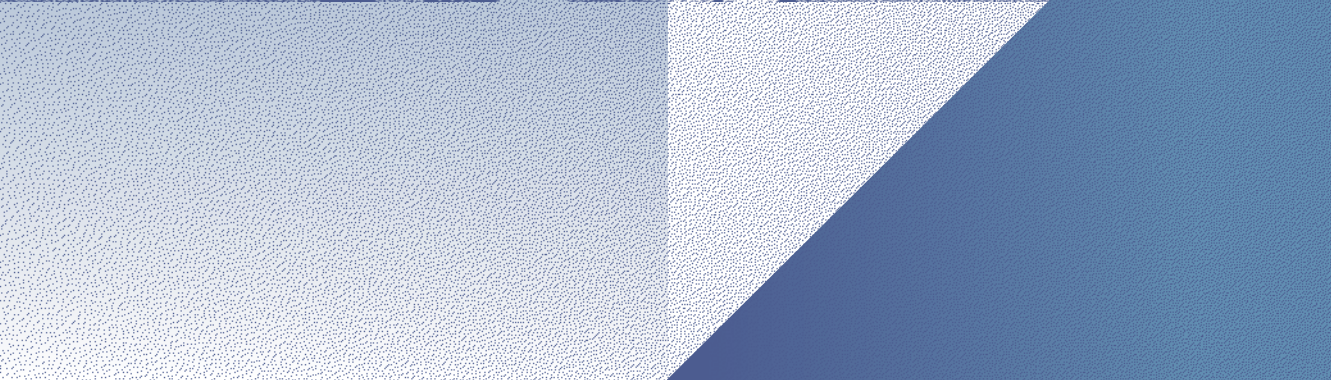
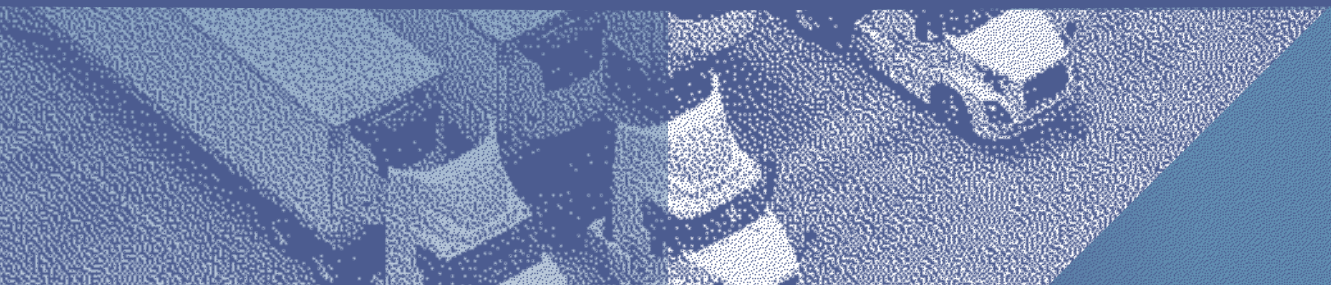
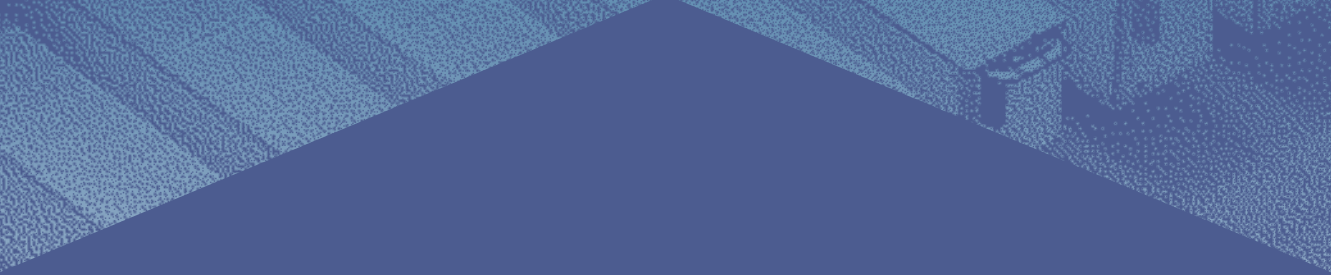
Dark store/micro-fulfilment centre (MFC): Mini-logistics hub in high-density urban area used to quickly prepare/fulfil customers' online orders, better enabling same-day delivery or pick up.

Last-mile delivery: Final leg of an elaborate fulfilment process to transport an item from a central hub to the customer.

SOURCE: Authors' own elaboration.

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Chapter 1

Lessons learned from the COVID-19 pandemic on urban food systems and logistics

Urban food systems consist of various means of food provisioning and consumption in the urban environment. These systems affect and are affected by all constituents from farm to fork, including adjacent and distant rural communities and ecosystems. These impacts are notable in land use, environmental and natural resource management, transport and distribution, marketing and consumption (FAO and Resource Centres on Urban Agriculture and Food Security, RUAF, 2015). Box 2 illustrates an ideal characterization of sustainable and resilient urban food systems.

IDEAL CHARACTERIZATION OF SUSTAINABLE AND RESILIENT CITY REGION FOOD SYSTEMS

- Provide rural and urban residents with access to sufficient, nutritious, safe and affordable food.
- Provide a vibrant and sustainable food economy with fair and decent jobs and income-generation opportunities for small-scale businesses in food production, processing, wholesale and retail marketing, and other related sectors (such as input supply, training and services) in rural, peri-urban and urban areas.
- Improve resilience to shocks and lower dependence on distant supply sources.
- Connect food, nutrient and resource flows across urban and rural areas (for example, the use of urban organic waste and wastewater as resources in the urban agrifood system) and prevent/reduce food waste.
- Improve urban-rural linkages, strengthen social relations between consumer and producers, and promote the inclusiveness of smallholder farmers and vulnerable groups across the supply chain.
- Reduce the ecological footprint of urban food systems from production to consumption, including food transport, processing, packaging and waste management.
- Foster participatory policymaking and appropriate food related regulations in the context of urban and territorial planning by promoting transparency and ownership of the food chain.

SOURCES: FAO and Resource Centres on Urban Agriculture and Food Security (RUAF). 2015. *A Vision for city region food systems*. Rome. www.fao.org/3/a-i4789e.pdf

The pandemic and its accompanying restrictions affecting mobility and trade had profound impacts on how cities interacted with food systems. These can be grouped into four areas, in light of the urban food systems framework.¹

1 RURAL-URBAN LINKAGES WERE DISRUPTED

as a result of lockdowns, which caused temporary suspension of logistical operations. Cities with greater dependence on food transported from distant locations/countries were affected more significantly.

2 SOCIOECONOMIC INEQUALITIES WIDENED

and social exclusion of vulnerable communities deepened in ways that affected their food and nutrition security. While those in higher socioeconomic circumstances drove up demand for healthy and sustainable diets (McKinsey & Company and Eurocommerce, 2022),² the incidence of hunger and malnutrition rose among the most disadvantaged communities due to the inability to afford adequate and nutritious food (FAO, 2021a).

3 RESILIENCE AND SUSTAINABILITY OF URBAN FOOD SYSTEMS WERE TESTED ON MULTIPLE LEVELS

The rise in the consumption of unhealthy and unsustainable diets (Picchioni, Goulao and Roberfroid, 2022), increased pressure on natural resources (e.g., soil, water, air, plant seeds and fish stocks) and ecosystem services because unsustainable diets typically generate higher emissions per calorie and per gram of food consumed.

4 INTERCONNECTIONS BETWEEN FOOD SYSTEMS DOMAINS WERE CHALLENGED

including linkages with such areas as public health, social protection and welfare systems, agriculture, environment, commerce, infrastructure, transport, energy, and land use.

- 1 The FAO urban food systems framework serves as a corporate strategy to address emerging calls from countries. Seven comprehensive areas of support (CAS) form an approach in which FAO, with partners, assists governments to: i) enable improved policy environments through diverse laws, regulations, governance and empowerment of institutions; ii) execute actions according to context-specific realities, delivered through, inter alia, shorter supply chains, inclusive public food procurement, innovative agrifood business, healthier food and green environments, and optimized supply chains and sustainable bioeconomy; iii) expand good practices through the exchange of information and trans-local cooperation, and form a basis for an independent global forum that promotes participation of different government levels to effectively promote good practices on food governance. This threefold strategy to enable-execute-expand is called the 3E approach (FAO, 2019).
- 2 Sustainable diets are nutritionally balanced, environmentally friendly, culturally sensitive, economically fair, and accessible, ensuring food security and promoting healthy lives for current and future generations while preserving biodiversity and ecosystems. See FAO and WHO. 2019. Sustainable healthy diets – guiding principles. Rome. www.fao.org/3/ca6640en/ca6640en.pdf

1.1 IMPLICATIONS FOR URBAN CONSUMERS

The pandemic impacted consumer behaviour in multiple ways: what they buy, where they buy, how much they buy, and how frequently (Rai and Touami, 2022). During and after the pandemic, widening income disparities and food price volatility created a duality in food consumption patterns: some consumers sought lower prices from discount and traditional food retailers, while others demanded premium, healthier, and more convenient and sustainable options from supermarkets and specialty food stores (McKinsey & Company and Eurocommerce, 2022). For those who could afford it, the pandemic accelerated consumers' quest for convenience, proximity and flexibility in accessing food. They sought a more sophisticated shopping experience compared to conventional shopping at brick-and-mortar stores.³ In addition, nutritional value, regional origin of food, and its environmental footprint have been increasingly factored into purchasing decisions (Tomatis, Pedersen and Sener, 2023).

1.2 IMPLICATIONS FOR FOOD RETAILERS: THE FOOD E-COMMERCE ACCELERATION

Modern food retailers grappled with their workers' and consumers' immobility during lockdowns and with supply chain disruptions. Several national governments responded swiftly amid households' increased food demand. In the United Kingdom of Great Britain and Northern Ireland, for instance, workers in food production, processing, distribution, sales and delivery were included on the critical workforce list during the pandemic (Wood, 2022). Supply chain disruptions affected food availability and affordability – two key factors critical in food retail performance. It was also imperative for modern retailers to be closer to consumers – either through city stores or home delivery. Smaller city supermarket formats with fewer stock-keeping units (SKUs) gained further traction, such as Carrefour City, Intermarché Express, and Franprix in Paris (Saint Vincent, 2022).

E-commerce and development of scheduled and/or instant home delivery services became key for modern retailers. Existing brick-and-mortar retailers introduced e-commerce and home delivery services while new, purely e-commerce players emerged. From 2019 to 2021, the value of global food and beverage e-commerce increased by 86 percent. In 2021, online purchases accounted for 18 percent of total retail purchases globally – the highest share ever (Reardon, Tomatis and Pedersen, 2023). The pandemic consolidated online grocery shopping habits among those already shopping online, and accelerated its adoption by e-commerce novices and slower adopters, elderly people and those living in rural areas (Rai and Touami, 2022). In mature food economies, including in Europe, the penetration of e-commerce among companies has progressed regardless of the company size (Rai, 2022b). Sector representatives, such as modern retailers and food e-commerce operators, expect that the growth in food e-commerce observed during the pandemic has brought about a lasting change in food retail. The coexistence of brick-and-mortar and e-commerce fresh food sales has led to more sophisticated omnichannel marketing. Customers are increasingly

³ Brick-and-mortar stores are retail locations where business owners showcase their products using a physical storefront.

expecting intuitive online and mobile shopping experiences, convenience and consistency, as well as adequately priced, customizable, trackable and rapid delivery (Tomatis, Pedersen and Sener, 2023).

Modern retailers have taken comprehensive measures to respond to changing retail needs. They have: (i) reoriented their product portfolios to include both affordable and premium options, such as private label products; (ii) increased their control of operations upstream (production, processing) and downstream (last-mile delivery) through digital solutions to monitor and better cater to customer preferences; (iii) optimized their supply chain and distribution networks to remain price-competitive; (iv) adopted omnichannel strategies to offer a seamless customer journey across marketing channels, including e-commerce; and (v) diversified their supply chains with greener and local products (McKinsey & Company and Eurocommerce, 2022; Bringg, 2022). Belgrade provides an example of the latter, where import disruptions during the pandemic encouraged retail chains to switch to local providers (Stojkovic, 2022). In addition, food retailers underwent operational reforms such as equipping their workforces with new skills and employment modalities in line with the transition to omnichannel marketing and e-commerce. Retailers also introduced value-added services for product traceability, circularity and sustainability, often by brokering partnerships with service providers (Tomatis, Pedersen and Sener, 2023).

Traditional food retailers were often comparatively less equipped than modern retailers to cope with the impacts of the pandemic and to adapt to accelerating food retailing trends such as e-commerce and home delivery. The most vulnerable, such as street vendors and those selling daily harvests from their backyard or home gardens in open-air markets, had to cease operation during lockdowns. Traditional retailers who survived the lockdowns leveraged healthy, local, fresh and affordable assortments and capitalized on social distancing opportunities that open-air bazaars could offer. Some traditional retailers found a niche in premium, local, organic products for high-income customers; others competed through lower prices. In certain cases, traditional retailers also adopted multichannel marketing through instant messaging apps, by joining online marketplaces, partnering with last-mile delivery service providers, and introducing home delivery with their own two-wheelers. In Istanbul, for instance, Yemeksepeti and Getir, two Turkish digital platforms offering quick commerce and home delivery services, introduced Yemeksepeti Mahalle and Getir Çarşı respectively, to offer online marketplace and home delivery services for local traditional retailers (Sener, 2022). Similarly, Daje App connected local retailers with consumers in Rome (Cortoni, 2022), and the City of Paris introduced the “Acheter à Paris” online mapping service to geolocate all local businesses offering home delivery (Ville de Paris, 2021). The latter two digital platforms gradually faded away as they were emergency responses to the COVID-19 crisis. Similarly, several food delivery start-ups have not succeeded in building profitable and resilient business models (e.g. Gorillas stopped its activity in Italy in 2022 and Getir discontinued all of its operations outside of Türkiye in 2024) and suffered from both the rising costs of home delivery resulting from high energy costs and the deterioration of high segment food demand due to food price inflation.

1.3 IMPLICATIONS FOR URBAN FOOD LOGISTICS AND LOGISTICIANS

Urban food logistics is the art of routing food products within and between urban and rural areas with the best possible economic, environmental and social outcomes (Teschendorf *et al.*, 2022). Changes in the food retailing landscape – such as the rise of e-commerce and home delivery, replacement of hotels, restaurants, and catering (HORECA) with increased household food demand, and mobility restrictions – brought about major changes for urban food logistics players.

Logisticians in urban food systems faced labour shortages, operating restrictions due to lockdowns, shortages of warehouse/cold-storage space, and food loss resulting from transport disruptions. New business opportunities emerged in urban logistics which required new investments in warehouse and micro-fulfilment centres, fleet diversification (e.g. two-wheelers and electric vans), human resources (e.g. personnel skilled in software engineering), and partnerships with interconnected sectors such as transport, energy, architecture, information and communication technologies, and construction. New partnerships entailed, for example, commissioning charging stations for electric last-mile delivery vehicles, initiating van-sharing software solutions for consolidated deliveries and crowd logistics. A key challenge has been the increasing appetite among logisticians for micro-fulfilment centres to use in proximity logistics. Limited areas built for such purposes, and high pressure on land in dense urban areas, led to soaring prices for logistics real estate (Rai, 2022a). Logisticians thus sought to optimize the use of space in existing inner-city facilities, to repurpose existing buildings as new logistics centres, and to collaborate with wholesale food markets (WFMs) that had previously catered only to traditional retailers. Because 70 percent of the costs in food retail concerned the final leg of grocery distribution (Savills, 2021), logisticians favoured flexibility and innovation in finding cost-minimizing solutions during this leg.

The changing landscape in urban food logistics also had important implications for cities. Urban authorities monitored food systems in terms of food availability, affordability, and effectiveness of distribution (FAO, 2020). They coped with the disruptions to urban food logistics by supporting stakeholders and introducing new regulations and policies. **The pandemic showed urban authorities that strengthening urban food logistics is key to building more resilient urban food systems, considering anticipated future shocks.**

1.4 IMPLICATIONS FOR CITIES AND EMERGING CHALLENGES

The pandemic has had varying implications on urban food systems. These are based on: (i) a city's pre-pandemic vulnerabilities; (ii) the central and local policy measures that were taken in response to the pandemic; and (iii) other additional pressures such as war, internal conflict, climate change, human displacement, and economic crises. Multiple urban food system assessment tools exist that cities can use to determine its strengths and weaknesses (FAO, RUAF and Wilfrid Laurier University, 2018; FAO, 2014; Raza *et al.*, 2022; World Bank and FAO, 2018). Some cities assessed their food systems and published urban food strategies, including London (Greater London Authority, 2018), Paris (Mairie de Paris, 2018), Istanbul (Istanbul Metropolitan Municipality, IBB, 2021), and Rome (Comune di Roma, 2021). Common policy targets and key

performance indicators include food and nutrition security, equity and social inclusion, environmental impact, and public awareness – reflecting the intersectionality of urban food systems.

Every city is unique and the implications of crises – including the COVID-19 pandemic – vary widely. Morocco's Casablanca-Settat region is an example. A transitional food economy with a mix of modern and traditional food distribution (through weekly souks and open markets scattered around the city), it boasts 80 percent self-sufficiency in food production in Morocco. Yet, it could not guarantee universal food and nutrition security for all urban inhabitants (Reddouane, 2022). Similarly in Tbilisi, Georgia, food and nutrition insecurity remains a significant issue even though modern retail has more than 60 percent of the market share in fresh food, offering a mix of domestic and imported produce through vertically integrated supply chains (Urushadze, 2022).

Though necessary for deriving conclusions, comparable city-level data on urban food systems is limited. Nevertheless, it can be reasonably argued that **there is no single enabler of food and nutrition security in cities** (Annex Figure 1). Especially in transitional food economies, higher penetration of modern retail does not, on its own, automatically lead to higher food and nutrition security for all city-dwellers. In mature food economies with adequate public transport networks and car ownership, availability of nutritious food in inner-city convenience stores or suburban supermarkets is not guaranteed in cases of logistical disruption between cities and countryside. What is more, the convenience and flexibility offered by modern retailers – including through e-commerce – does not necessarily guarantee reduced CO2 emissions per capita in the city, especially in mature food economies (Rai, Touami and Dablanc, 2022). Indeed, online grocery shopping does not simply replace consumers' personal trips to grocery stores (Rai and Dablanc, 2022) and quick commerce encourages additional impulse purchases, especially of fresh produce (Tomatis, Pedersen and Sener, 2023). Given the interplay of multiple factors, the pandemic has had asymmetrical implications for urban food systems which cannot be solved with a single solution.

With the pandemic, the surge in online orders and home delivery caused local negative transport side effects, such as delivery vehicle traffic, air pollution, noise, infrastructural damage (Rai and Dablanc, 2022) and increased packaging waste, especially in cases of recurrent small-value orders (Tomatis, Pedersen and Sener, 2023). E-commerce companies' quest for inner-city micro-fulfilment centres increased warehouse real estate prices in cities. The number of home delivery workers soared, and fatal traffic accidents increased as pressure for fast delivery led to the violation of traffic rules. Against this background, urban authorities prioritized the continuity of food delivery activities, especially during curfews and lockdowns, while leaving e-commerce and home delivery with poor regulation.

The pandemic amplified the greater vulnerability of the urban poor. Socioeconomic and sociospatial inequalities are defined in terms of the four dimensions of food and nutrition security: (i) availability of sufficient quantities of nutritious food; (ii) access by individuals to resources for acquiring appropriate foods; (iii) utilization of food through other non-food inputs such as clean water, sanitation and healthcare; and (iv) stability of food access at all times – regardless of sudden shocks and seasonality (FAO, 2006). The

pandemic accentuated the role of food swamps (areas with a high density of establishments selling high-calorie fast food and junk food) and food deserts (areas with limited access to affordable and nutritious food), which characterize the lack of access to nutritious food particularly in underserved neighbourhoods, for example, in the United States (Cooksey-Stowers, Schwartz and Brownell, 2017) as well as in relatively affluent neighbourhoods in the United Kingdom (Aiello *et al.*, 2019). In addition, the pandemic disrupted vital services upon which poorer communities have relied, including poverty alleviation and health and nutrition programmes, such as school-feeding and work-for-food schemes (Swinnen, McDermott and Yosef, 2021; FAO, 2020). That said, in Istanbul, the municipality expanded food relief to vulnerable households by procuring food from local agricultural producers, whom the municipality had supported with inputs such as seed, plants and fertilizers (Sener, 2022).

Large cities with no or weak linkages with rural towns, or those over-reliant on a limited number of food-producing cities or countries, faced food shortages, panic buying and price fluctuations that resulted in affordability challenges during the pandemic. Cities with higher population density (facing stricter public health measures), weaker links to production areas, and longer food supply chains, were more vulnerable to disruptions of food distribution networks and thus less resilient to shocks (FAO, 2020). In mature food economies, where food retail is dominated by a few retail chains, these large-scale retail companies had to manage the risk of food availability and affordability.

Urban administrations revisited and repurposed existing public spaces and infrastructure for emerging needs. Where WFMs became epicentres of COVID-19 contagion, as was the case in Lima, the local governments decentralized their operations to other public spaces, e.g. mobile markets held in large area parks (FAO, 2020). In other cases, such as Rome, WFMs were expanded to welcome emerging players such as e-commerce retailers and urban food communities procuring produce directly from farmers. There were also cases where the location, timing and operations of weekly open-air markets were rearranged. In Istanbul, for example, WFMs were shut down only one day during the first nationwide lockdown, but then remained open throughout the pandemic, reflecting the prioritization of business continuity (Sener, 2022).

In order to holistically monitor and regulate urban food logistics, urban administrations had to expand their service scope and interact with new stakeholders, such as last-mile delivery companies, software developers, and geographic information system service providers. Evolving urban food systems required new technical expertise, political will and budget reallocations in urban governance.

Considering the above key implications for cities, three major trajectories can be observed for the future of urban food logistics systems (Roland Berger, 2022):

1 LARGE-SCALE FOOD RETAILERS WILL PREVAIL IN RESHAPING FOOD LOGISTICS OF CITIES

where they will compete for the most profitable business avenues, leaving urban, peri-urban, and rural poor people underserved, with uncertain environmental impacts.

2 PUBLIC AUTHORITIES WILL TAKE THE LEAD IN RESHAPING FOOD LOGISTICS OF CITIES

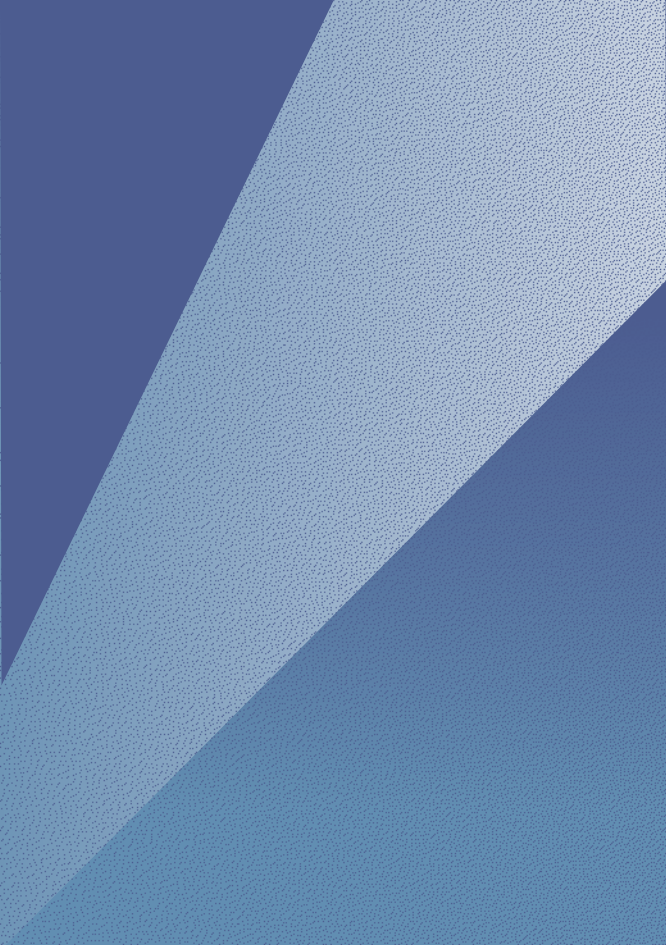
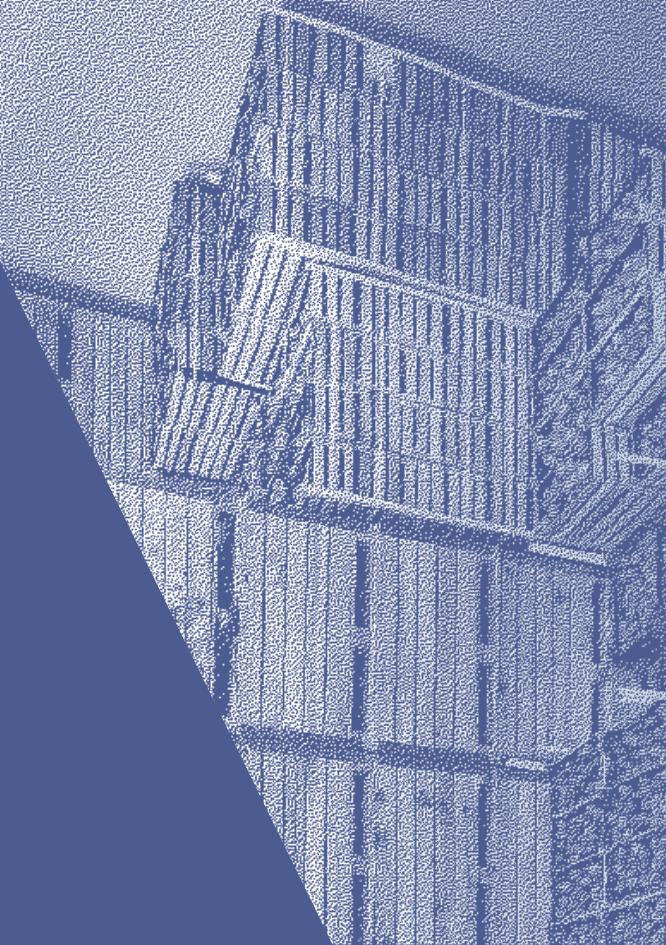
through extensive regulations, for example taxing ultra-fast deliveries for environmental impact, subsidizing urban consolidation centres, expanding low-emission or pedestrian zones, limiting logistical operation timeframes, and licensing service providers based on strict criteria.

3 FOOD ECOSYSTEM STAKEHOLDERS WILL COLLABORATE

through sharing of information (e.g. about vehicle locations, utilization rates, routes and orders), transportation assets (e.g. personnel, vans, trucks and bikes), and infrastructure assets (e.g. warehouses, parking spaces and delivery boxes). Transparency and dissemination of data and information enable food systems actors – including public authorities, logisticians, retailers and consumers – to shape their decisions by factoring in cost implications as well as environmental and social footprints in the city.







Chapter 2

Major trends in support of urban food logistics transformation

All this requires cities to make major improvements in their urban food logistics systems, using regulations and investments to build resilient and sustainable urban food systems. Urban food logistics systems horizontally connect product and service systems and play an important role in transforming lifestyles, households, grocery stores, and the HORECA sector, which combine to constitute urban nutritional systems (Tochtrop *et al.*, 2022). Urban food logistics actors, including urban administrations, retailers and logisticians, have responded in various ways to the challenges and opportunities that cities experienced during the pandemic. In mature and transitional food economies, **a set of cross-cutting issues has shaped cities' responses.**

Food and nutrition security

Ensuring that nutritious food is available for all, convenient access is guaranteed, food is utilized through non-food items such as clean water, sanitation, and health services, and that there is stability in food access and availability.

Innovation

Using food logistics 4.0 applications such as big data analytics, system integration,⁴ and traceability through internet of things and blockchain technologies (Jagtap *et al.*, 2020).

Decarbonization

Measuring, monitoring and considering the environmental footprint of food systems operations while formulating optimal urban policies.

Cost minimization

Optimization of workflows, routes, and asset use to maintain and expand companies' profit margins in the food value chain – especially in mature food economies with higher market saturation and stiff competition.

Diversification

Hedging against risks through diversifying products, services, workflows, suppliers, service providers and strategies.

Socioeconomic inclusion

Ensuring that urban food systems create more, better, and inclusive jobs; urban social protection measures entail food relief for vulnerable households; spatial and socioeconomic inequalities are alleviated.

Governance

Adopting participatory processes in forming and implementing policies with transparency measures, feedback loops, accountability procedures, and cooperation mechanisms among food systems stakeholders, including citizens (farmers and consumers), companies, producer organizations, NGOs, and urban authorities.

The overarching goal for policymakers has been to boost resilience.

Enhancing the resilience of urban food systems entails investing in capacities for mitigation, anticipation, and absorption of shocks that cities currently or potentially face (Swinnen, McDermott and Yosef, 2021). Four major groups of actions have been identified to improve cities' capacities to mitigate, anticipate and absorb shocks:

⁴ System integration is the process of connecting various subsystems into one system with all components cooperating to deliver overarching functionality. This may require an Integration Platform as a Service (iPaaS), a set of automated tools that integrate software applications.

2.1 INCREASING LINKAGES WITH GREEN BELT FOR RESILIENCE

2.2 IMPROVING FOOD LOGISTICS IN URBAN AREAS

2.3 LEGISLATION AND REGULATION TO FACILITATE URBAN FOOD LOGISTICS TRANSFORMATION

2.4 PARTICIPATORY FOOD POLICY PLANNING AND DIALOGUE

Each group is presented in detail.

2.1 INCREASING LINKAGES WITH THE GREEN BELT FOR RESILIENCE

Lack of food supply diversity has made cities vulnerable to food and nutrition insecurity (Urban Food Futures, 2018). Especially in larger cities, with weaker connections to peri-urban and rural production centres, food availability, affordability and stability were confined to the capacities and agility of a small number of modern retail chains dominating the market. Moreover, the pandemic has boosted modern retailers' quest for local and shorter supply chain alternatives for fresh food, in order to diversify their sourcing in times of shocks (Tomatis, Pedersen and Sener, 2023).

Urban authorities have tackled the urban-rural disconnect through protecting agricultural land in urban, peri-urban and adjacent rural areas and connect with rural communities to understand their needs (Urban Food Futures, 2018). For example, Rome protects 65 percent of its territory as green land, half of which is used for agricultural activity despite its growing urbanization (Fusilli Urban Food Planning, 2023; Perpiña Castillo *et al.*, 2018). In Rosario, Argentina, agroecological urban and peri-urban initiatives emerged in response to the economic crisis in 2001 and officially became part of city plans and policies. With this approach, the city is committed to protecting spaces for food production through urban planning and to providing urban farmers with technical and financial assistance (FAO, 2021b). If designed and implemented with vulnerable communities, urban farming schemes can contribute to economic, social and environmental goals,⁵ but they are limited in scope. In addition, ambitious urban planning initiatives can address the massive farmland losses created by urban expansion (Box 3).

⁵ For example, see Blay-Palmer *et al.*, 2021.

CURBING FARMLAND LOSS IN A LARGE METROPOLIS: THE CASE OF ONTARIO, CANADA

The Greater Golden Horseshoe (GGH) area of Ontario hosts 10.2 million residents living on 3 percent of Ontario's land area. From 1996 to 2021, the GGH population increased by 57 percent; it is forecast to reach 14.8 million by 2051. This densely populated area produces one-quarter of Canada's annual gross domestic product. The region is also home to Canada's most productive agricultural lands and ecologically sensitive areas, such as the Greenbelt, Oak Ridges Moraine, and Niagara Escarpment. Forty percent of the GGH land area is quality productive farmland, and the regional agricultural industry provides 38 000 jobs. The rapid urbanization in Southern Ontario has underlined the need for effective land-use planning policies to protect prime agricultural land.

In 2005, the Provincial Policy Statement (PPS), an urban planning policy document, indicated that prime agricultural areas must be protected for agriculture. The PPS also designated specialty crop areas for the highest protection measures. In 2014, the Government of Ontario updated the PPS to provide further guidelines for identifying, designating and protecting prime agricultural land within official plans. In addition, the Greenbelt Act of 2005 and the associated Greenbelt Plan created a 7 200 km² permanently protected "greenbelt area" in the GGH – further protecting the agricultural land in the region. In Central Ontario, the most urbanized area of Canada, the province's Greenbelt Plan has reduced the rates of farmland loss remarkably since 2005.

SOURCE: Caldwell, W., Epp, S., Wan, X., Singer, R., Drake, E., Sousa, E.C. 2022. Farmland Preservation and Urban Expansion: Case Study of Southern Ontario, Canada. *Frontiers in Sustainable Food Systems*, 6. <https://doi.org/10.3389/fsufs.2022.777816>

Farmland and farming protection policies have promoted agricultural activity, integrated social data into spatial modelling, involved farmers through participatory processes, implemented monetary and non-monetary compensation programmes to improve stakeholders' acceptance of farmland protection,⁶ and strengthened agrifood value chains and market development (Perrin et al., 2020). For example, Istanbul released its food strategy document during the COVID-19 pandemic and expanded its public procurement from agricultural input subsidies to Istanbul's local farmers (Sener, 2022). Turin Italy is rolling out a metropolitan food strategy in which the city promotes shorter supply chains by using public procurement to purchase locally produced food, and by connecting farmers and consumers via food markets (Berretta, 2022).

⁶ Farmland protection policies usually entail restrictive zoning. This impacts property rights where landowners or tenants waive certain rights in order to maintain farmland and farming. Compensation schemes can help improve social acceptability of such policies (Perrin et al., 2020).

Urban authorities have strengthened rural-urban linkages in addition to ensuring the continuity of regional agricultural production. Short food supply chains that link regional producers with urban consumers face many challenges in their creation and operations,⁷ leading to limited performance, sustainability, and difficulties of upscaling. These include inadequate access to logistical infrastructure, urban markets (and thus retailers, HORECA sector, consumers), local consolidation centres such as WFMs, and local processing and packaging facilities. In addition, short food supply chains can lead to inefficient and costly distribution, consumer awareness of local options may be inadequate, and product availability in terms of quantity, quality and variety may not meet urban market demand. Short food supply chains may also not be able to compete with longer supply chains because shorter chains have higher standards and legal requirements concerning food logistics (Bayir *et al.*, 2022) such as cold chain management and sustainable packaging.

To strengthen urban-rural linkages, urban authorities have invested in new infrastructure to meet regional food producers' needs. Examples include:

1. WFMs that allow small producers to pool, handle, and store their products. WFMs could be dedicated solely to regional producers or designate special quotas to include regional producers.
2. Collaborative, not-for-profit drop yards for urban freight in megaregions, which can reduce logistical costs for regional producers.
3. Regional food trucking cooperatives that pool and transport regional producers' products between farms, processors, packagers, WFMs, and farmer's markets in metropolitan areas. Less-than-full truck loads are the main cause of transportation inefficiencies for regional producers (Miller *et al.*, 2016).
4. Agrifood compounds in suburban areas that perform the same services found at regional food hubs (e.g. aggregation, processing, distribution, marketing of local produce grown by regional farmers to support their access to large number of buyers such as the HORECA sector and small retail chains) (Barham *et al.*, 2012).
5. Information systems that map agrifood intermediaries for specific crops to improve value chain transparency and market competition that would benefit regional food producers.

Municipal facilities and assets, such as WFMs, have been used and repurposed to enhance urban food logistics system resilience. An example of a WFM focusing on local produce is the Ontario Food Terminal in Canada, which works with 400 local farmers and 20 large distributors (Ontario Food Terminal Board, 2023; Miller *et al.*, 2016). A more sophisticated agrifood infrastructure project in Ile-de-France seeks to connect regional production with the Parisian food scene (Box 4).

⁷ Short food supply chains are defined as “networks of connected and interdependent actors mutually and cooperatively working together to control, manage and improve the flows of information-embedded products, services, resources, and/or information, from farm to fork, seeking a reduction of intermediaries and physical distance between producers and consumers” (Michel-Villarreal *et al.* 2021).

NEW INFRASTRUCTURE TO TAP THE AGRICULTURAL POTENTIAL OF ILE-DE-FRANCE

Agoralim is a public-private partnership project between the local and regional authorities of Plan Val d'Oise and Semmaris, the semi-public company developing the Rungis International Market in Paris. The project envisages setting up in the northern part of the Ile-de-France region a sustainable system to add value to fresh food products at all levels: production, processing and distribution. The project responds to the need for a more sustainable food supply in Paris and to offer new urban logistics capacity to balance freight flows between areas north and south of Paris.

The project represents three key opportunities for public authorities and for Semmaris. First, it works in conjunction with the Rungis International Market and will ensure better distribution of supply flows at the regional level. Second, it capitalizes on shorter food supply chains by tapping the agricultural potential of north Ile-de-France, which has a long history of agricultural activity. Third, it anticipates growing demand for fresh produce. Northern Ile-de-France is currently facing higher population growth and concentration of demand for fresh produce, which will result in an increase in supply flows in coming years.

1 SUPPORT THE DEVELOPMENT OF AGRICULTURE IN ILE-DE-FRANCE

through a 100-hectare agricultural site with a comprehensive agricultural programme based on agro-ecology. Agoralim will support local producers and sustainable agricultural projects through producers' markets and value-added services to meet the requirements of high-end outlets.

2 CREATE LOCAL FOOD PROCESSING AND DISTRIBUTION PLATFORMS

on different sites within a 10 km radius of the Triangle de Gonesse. These include provision of services from production (e.g. preparation, cutting and processing of fresh products) to distribution in northern Paris.

3 CREATE JOBS AND TRAINING OPPORTUNITIES FOR THE REGION

through 3 000 to 5 000 direct jobs in the food, agriculture, catering and logistics sectors. Training programmes, partnerships with specialized institutions, and accommodation solutions for students and young workers are envisaged.

4 RAISE AWARENESS ABOUT THE BENEFITS OF A BETTER DIET

through information campaigns and events.

5 **SUPPORT INNOVATION**

by serving as a centre of food excellence at all levels including agriculture, food and logistics. The centre will promote synergies between stakeholders to build and incubate new, sustainable business models for food distribution.

6 **PROMOTE SUSTAINABLE SOLUTIONS AND REDUCE CARBON FOOTPRINT OF FOOD DISTRIBUTION.**

Agoralim will be designed to satisfy sustainability requirements to optimize and preserve water and energy resources, and to limit and recover the waste and co-products generated by its activities. Circularity will be complemented by an ecodesign approach for its buildings, particularly in terms of energy production and mobility around the site, to limit the impact of the project on the ecosystem.

7 **CO-CONSTRUCTION AND DEVELOPMENT OF THE PROJECT WITH ALL PUBLIC AND PRIVATE STAKEHOLDERS OF THE TERRITORY:**

consultation, public workshops, and calls for proposals.

SOURCE: Rungis Marché International. 2024. La SEMMARIS. In: *Rungis Marché International*. Paris. [Cited 12 April 2024.] www.rungisinternational.com/raison-d-etre

IMPROVING FOOD LOGISTICS IN URBAN AREAS

Food systems actors, including private companies, local authorities, and communities have revisited urban food logistics systems during and following the pandemic. **Four major sets of actions have been identified:** (A) improving the interconnectivity between existing logistics facilities; (B) adapting current logistics infrastructure to emerging needs and regulations in the market; (C) sharing logistics assets; and (D) last-mile delivery enhancements for operational efficiency. Each is presented in detail.

A

IMPROVING THE INTERCONNECTIVITY BETWEEN EXISTING LOGISTICS FACILITIES

Cities host multiple logistics facilities that fulfil cross-docking, storage or both functions simultaneously. Contemporary urban logistics spaces are broadly categorized as follows (Afilog, 2017):

1. Entry point warehouses connecting national and international flows on the city outskirts. In traditional food logistics, WFMs usually fulfil this function.
2. Urban distribution platforms allowing for multimodality (rail, road, sea, river, tram, freight) and massification of parcels. These are also called “logistics hotels” (Box 6).
3. Urban distribution spaces in existing multi-purpose buildings for inner-city flows.
4. Urban delivery spaces to undertake final distribution, such as lockers, dark stores, or pick-up stores.

The rise of e-commerce and home delivery have sophisticated the urban logistics landscape. First, conventional distributional patterns, extending from WFMs or distribution centres to stores, changed as new distribution requirements emerged such as delivery to homes, lockers, or pick up points. Second, real estate attention shifted from store spaces to distribution facilities such as dark stores. Third, new logistical facilities emerged such as e-fulfilment, sorting centres, and automation of inventory management. Lastly, new actors in vertical integration emerged, such as third- and fourth-party logistics services⁸ and other carriers (Rodrigue, 2020).

⁸ Third-party logistics (3PL) providers undertake the entire fulfilment process, from warehousing to shipping. Fourth-party logistics (4PL) providers coordinate contracted 3PLs on behalf of the customer. The 4PL actors do not own logistics assets, but coordinate transportation, warehousing and shipping with designated logistics companies.

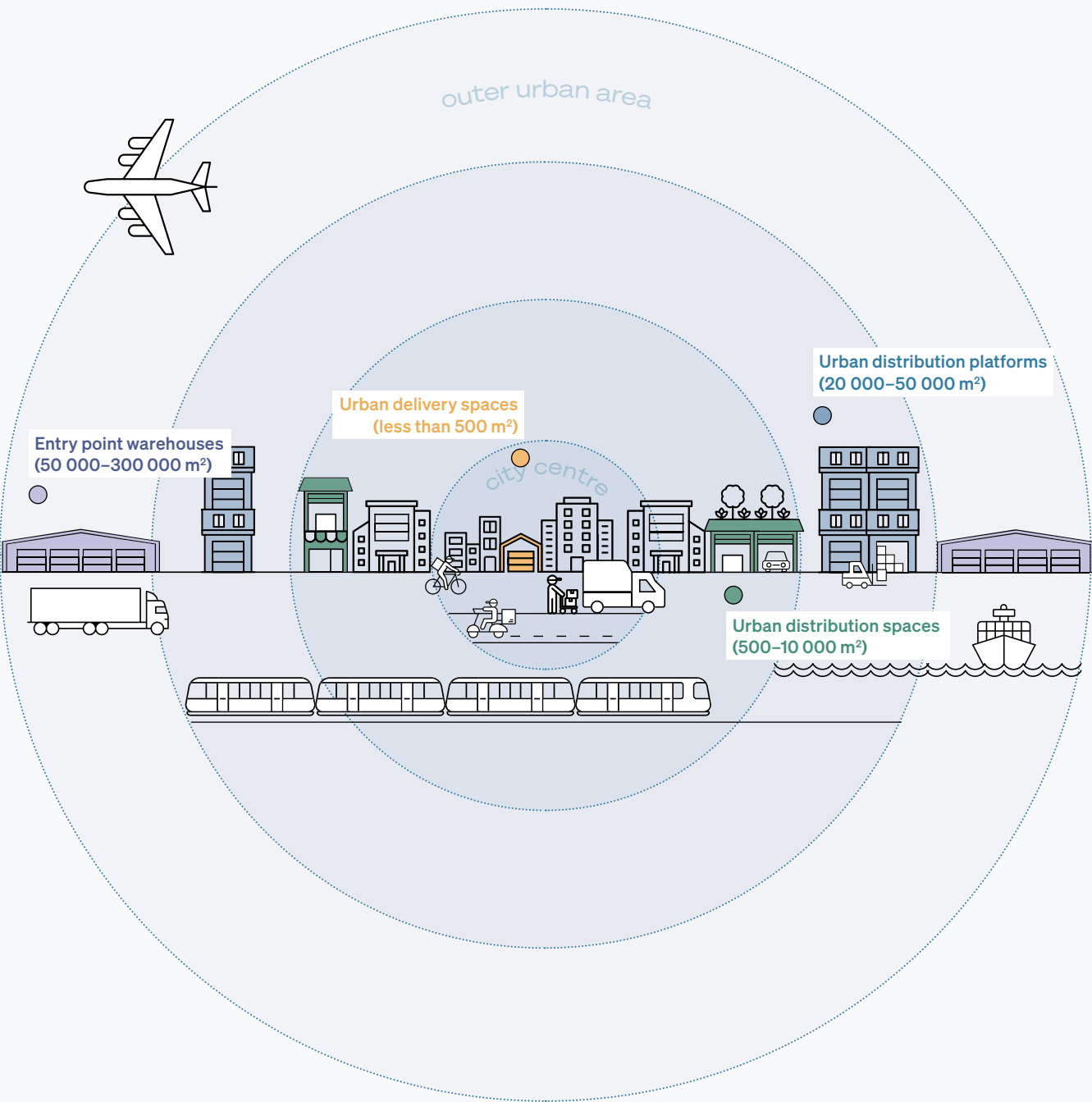


Figure 1
Illustration of urban logistics spaces

SOURCE: Author's own elaboration.

Urban authorities have improved the interconnectivity between urban logistics spaces to address potential adverse environmental, social, and economic impacts. Interconnection can be achieved in five major ways:

1 SUSTAINABLE URBAN LOGISTICS MASTER PLANNING

that maps and connects existing urban logistics facilities.⁹

2 MONITORING AND REGULATING THE QUANTITY AND QUALITY OF LOGISTICS FLEETS

and logistics business models that circulate between urban logistics facilities.

3 MANAGEMENT OF URBAN VEHICLE ACCESS REGULATIONS IN LOW- AND ZERO-EMISSION ZONES

or limited traffic zones that incentivize the interconnected use of existing urban logistics facilities.

4 DATA-SHARING PLATFORMS

involving public and private data providers and users to support urban freight decision-making for an optimized use of the interconnected urban logistics infrastructure.¹⁰

5 MANAGEMENT OF URBAN FREIGHT TAXATION

to incentivize optimal and interconnected use of urban logistics facilities, e.g. massification/bundling of deliveries to businesses and households.

9 See exemplary plans from Bologna and Brescia, Italy; Budapest, Hungary; Rijeka, Croatia; Stuttgart, Germany; Poznan, Poland; and Maribor, Slovenia (Interreg Central Europe, 2020).

10 See examples from Rotterdam, Kingdom of the Netherlands Netherlands; Paris and Lyon, France; London, United Kingdom; and Gothenburg, Sweden (Taniguchi, 2021).

B**ADAPTING AND UPGRADING CURRENT AND PROSPECTIVE LOGISTICS INFRASTRUCTURE**

The real estate inventory of cities lags behind the requirements of evolving urban food logistics systems. Urban authorities have sought alternative solutions and more efficient use of spaces such as buildings, parking lots, public parks, abandoned facilities, and even shaded spaces beneath viaducts. Stakeholders have also upgraded and adapted built environments to meet emerging urban food logistics needs. For example, in France, the P4, a shared urban distribution hub for last-mile deliveries, has transformed unused space beneath the Paris ring road. The hub has 864 m² of space, refrigerated storage areas, 30 employees, a dozen electric light vehicles and about 20 electric cargo bikes (Villeroy, 2021). The Amazon Prime hub in Berlin is located in a former consumer electronics store on the main shopping street Kurfürstendamm (Bulwiengesa, 2017). And in Spain, Amazon is using the headquarters of publishing house Editorial Gustavo Gili in central Barcelona to serve customers in the city centre with 20 000 fast-moving products delivered within two hours (Savills, 2019). Urban authorities are investing in upgrading WFM (Box 5) and building integrated urban food logistics centres (Box 6) to enhance the competitiveness and compatibility of public food infrastructure in achieving logistical efficiency, greenhouse gas emission reduction targets including through the use of renewable energy and greener intra-urban transport fleets.

UPGRADING ROME'S WHOLESALE FOOD MARKET

Rome's WFM, Centro Agroalimentare di Roma (CAR), is owned by a consortium of public and private entities including Roma Capitale, Regione Lazio, Roma Metropolitana, and three financial Institutions (Unicredit SpA, BNL SpA, Banca Monte dei Paschi di Siena SpA).

Due to rising consumer demand during the pandemic and the existing WFM's 97 percent occupancy rate, CAR approved a 100-hectare extension project, primarily for e-commerce agrifood operators. The planned investment is EUR 250 million. The extension will be completed through a build-operate-transfer model, with funding from CAR itself as well as the Lazio region and subsidized loans. In the first phase, some 62.5 ha will be developed, one-third of which will be dedicated to logistics and value-added activities.

CAR aims to strengthen its role in urban food systems and compete with logistics and e-commerce companies such as Amazon, given its expansion into fresh produce marketing. The extension project is expected to benefit both CAR and new vendors looking to enhance their logistics, aggregation capacity and diversification of fresh products to meet consumer preferences. The objective of CAR's extension is to strengthen the mission of the CAR as a food hub for local and national fresh food through value chain and territorial integration, to green WFM operations through solar energy and promote circular economy practices. The market seeks to offer innovative approaches to logistics, value-added activities and a wider variety of products, while reducing costs through economies of scale.

SOURCE: Authors' interview with CAR management in 2022.

A STATE-OF-THE-ART URBAN FOOD LOGISTICS CENTRE: LA CHAPELLE LOGISTICS HOTEL

An ambitious urban logistics project has emerged in Paris: La Chapelle logistics hotel, a public-private partnership between the City of Paris and the sustainable urban logistics solutions company Sogaris. Created in 1960, 80 percent of Sogaris's capital is owned by Paris' local governments. The logistics hotel is built on 2.4 hectares of land, with 41 500 m² of warehousing. The facility, inaugurated in 2018, will create up to 350 jobs and the total investment for the project is EUR 65 million.

The facility is designed as an urban consolidation centre with motorway and railway connections, including two urban rail shuttles to Dourges (200 km) and Bruyeres-sur-Oise (80 km) located in north Ile-de-France region. Each shuttle will carry 60 swap bodies containing 15 pallets. Urban rail shuttle

services will also be available in cooperation with EURORAIL and XPO Logistics, using urban swap bodies to deliver food to Parisian stores. Besides logistics services, the facility includes offices (4 500 m²), a fitness centre (2 600 m²), a restaurant and a business school (1 300 m²). The basement hosts a data centre (2 030 m²) for the City of Paris and the Paris hospitals, the district heating system's biogas boiler, technical premises (2 000 m²), a parking lot and delivery areas (5 100 m²), and premises of Metro Cash and Carry (10 500 m²). The roof is occupied by an urban farm – at 6 000 m² the largest in Paris – with a heated greenhouse (1 200 m²) using energy recovered from the data centre. The roof farm will produce 52 tonnes of aromatic plants and vegetables per year.

SOURCE: Sogaris. 2020. Fiche site chapelle international. In: Sogaris. Paris. [Cited 7 February 2024.] www.sogaris.fr/fiche/chapelle-international/

Several European cities have conducted pilots to use public spaces more effectively for urban food logistics. Local authorities have transformed parking garages into temporary city distribution hubs during hours of low occupancy, at night in the city centre or in the morning on the city periphery. A pilot application, “Park_up,” was implemented by TÜV Rheinland in collaboration with Fraunhofer IAO, evopark, and veloCARRIER in Stuttgart, Germany, in 2017–2019 (Roland Berger, 2022). The project aimed to attract motorists and logistics organizations to use temporarily free spaces in conventional parking garages for vehicle parking and temporary storage. The project has developed digital utilization concepts for parking garages and algorithms that calculate garage usage prices based on environmental, weather and traffic data. Another scheme in Germany is the Smart Delivery and Loading Zones (SmaLa) project in Hamburg, applying a similar approach to roadside parking areas. SmaLa is a virtual booking system, through which delivery vehicles can reserve a delivery area for 15 to 60 minutes. Reserved spots have ground sensors and light markings. This allowed delivery vehicles to avoid double parking, parking on pedestrian walkways or circulating unnecessarily while trying to find a clear spot. By October 2023, the number of SmaLa spaces had increased from four to 20, particularly in the busiest places, including bollards that can be lowered (City of Hamburg, 2022; Logistik-Initiative Hamburg, 2023).

Box 7

USE OF METRO STATIONS FOR FOOD DISTRIBUTION IN WARTIME: THE CASE OF KHARKIV

Kharkiv, the second-largest city in Ukraine, was one of the first cities to come under shelling and air raids following the invasion of Ukraine by the Russian Federation in February 2022. Under war-time conditions, Kharkiv metro stations have been turned into bomb shelters for the most vulnerable 15 000 city residents. The main task of the city authorities and volunteers was to provide food, medicine and essential necessities to people through

the metro network. City authorities and volunteers stored staple food items, arranged underground field kitchens, and supplied ready mixtures for soups and cooked food within the metro stations. The case of Kharkiv underlines the importance of adaptability/versatility of logistics infrastructure, planning and management of urban food systems, taking into account different crisis scenarios.

SOURCE: Fusilli Urban Food Planning. 2022. Kharkiv's metro food system. In: *Fusilli Urban Food Planning*. Stuttgart, Germany. [Cited 7 February 2024.] <https://fusilli-project.eu/general/kharkivs-metro-food-system/>

C

SHARING LOGISTICS ASSETS AND SERVICES

Customized delivery expectations of recipients, such as end-consumers, food retail stores, and HORECA operators, have challenged conventional network efficiency and increased logistical complexity in terms of data, fleet and warehouse management. This change has been called “atomization” of logistics operations, which makes it difficult for logistics companies to maintain high and stable utilization of assets such as vehicles, warehouses and other infrastructure (Roland Berger, 2022). Proliferation of vehicle entry and emissions restrictions in inner-city zones add to this complexity. Pooling orders and sharing logistics assets and services is an emerging option to help tackle this challenge.

An urban consolidation centre (UCC), which can also be a WFM, enables order pooling and asset sharing, which help to reduce the number of delivery vehicles and distances travelled in urban areas – leading to more efficient use of logistics assets. In multiple case studies, however, researchers concluded that a UCC did not result in lower logistics costs for suppliers – at least in the short-term – if some recipients in the city refuse to use UCC services and opt for individual deliveries (Dreischerf and Bujis, 2022). UCCs can deliver the intended economic, social and environmental results, however, if there is collective action between logistics parties.

To ensure collective action, the municipality of Parma, Italy, implemented the “Ecocity project” in collaboration with the city’s wholesale food market. The project upgraded the existing WFM into an urban distribution centre, offered cooperative-led intra-urban wholesale food distribution services using low-polluting refrigerated vehicles, and optimized truck loading and routing. In parallel, to incentivize logisticians’ use of UCC services, the municipality issued a regulation restricting distribution activities in the city based on size, technological equipment, type of engine and load factor of light commercial vehicles (Morganti, 2011). Another successful business case based on collective action is Urby, an urban delivery pooling service in France (Box 8). Sharing logistics assets and services through collective data platforms can also enable urban food stakeholders (including urban authorities) to trace food movements in the city, understand patterns, generate evidence-based urban policymaking and urban planning to streamline food logistics in the city.

DELIVERY POOLING IN FRENCH CITIES: THE CASE OF URBY

Urby is a subsidiary of La Poste group dedicated to urban logistics, currently operating in 23 cities in France. Serving logisticians, traders, and local authorities, the Urby system is based on pooling and optimizing deliveries. Rather than delivering goods separately in small vehicles, Urby pools deliveries from other carriers, who drop off their loads at Urby pooling centres (2 000 to 4 000 m²) on the outskirts of the city. Urby's trucks (compressed natural gas or electric), including refrigerated vehicles, are optimally loaded and routed to

transport the goods to city retailers and businesses directly or through Urby's urban logistics centres (200 to 400 m²) in the city centres. Urby also offers cargo-bike delivery in the heart of the city. Introducing new services and the recruitment of 100 employees in 2022, Urby expects to reach EUR 100 million in turnover by 2025. It is 40 percent owned by the Banque des Territoires, a subsidiary of the Caisse des Dépôts, a French public sector financial institution.

SOURCES: Radio Supply Chain. 2022. Urby vis les 100 millions d'euros de chiffre d'affaires d'ici 2025. In: *Radio Supply Chain*. Ile de France, France. [Cited 7 February 2024.] www.radiosupplychain.fr/urby-vise-les-100-millions-deuros-de-chiffre-daffaires-dici-2025/

La Poste Groupe. 2019. Issues in urban logistics. In: *La Poste Groupe*. Paris. [Cited 7 February 2024.] www.lapostegroupe.com/en/news/le-groupe-la-poste-faces-the-challenges-of-urban-logistics

Optimizing truck load capacities through sharing can reduce the number of urban freight vehicles on the streets. To this end, one common practice has been using auxiliary transshipment points to complement existing private and public consolidation centres. Intermediary logistics platforms use these transshipment points to pool orders from multiple suppliers and deliver them to retail stores. Another alternative has been digital cooperative action platforms that enable receivers, suppliers and carriers to see, plan, price and consolidate orders to achieve efficiency in terms of delivery truck load capacity, delivery costs, and delivery time/freshness. For example, the SMILE project in Sweden developed a web-based food logistics system to connect 50 small food producers in the region with five purchasers in the city of Malmö. Through the SMILE project, producers do not individually hire vehicles to transport produce to their clients, but use a common food logistics system owned and operated by both the producers and the purchasers. Through the system, a single carrier is hired to transport the produce. Similar cooperative approaches have been observed among carriers aiming to minimize the use of vehicles that are only partially loaded. TeamTrans, for instance, is a collaboration of 13 Dutch carriers who divided the the Kingdom of the Netherlands into 13 service areas, based on postal codes, to deliver parcels for each other in their zone of responsibility. Local governments can encourage cooperative behaviour through incentivising improved load rates in city

freight distribution. In a pilot project, the city of Göteborg, Sweden, required distribution vehicles entering the inner-city zone to: (i) have at least 65 percent load factor; (ii) observe a balance between stop time and running time; and (iii) to comply with the emission restrictions of the environmental zone (Verlinde, Macharis and Witlox, 2012).

Logisticians have also supported massification of deliveries by seeking new design solutions that transform purpose-built vehicles into “containers on wheels.” Such vehicles are designed to transport small, modularized containers filled with parcels. These containers facilitate mutualization of volumes because last-mile delivery agents are better able to use vehicle capacities (Roland Berger, 2022).

D ENHANCING LAST-MILE DELIVERY

Client expectations for customized delivery modes in terms of time window, human contact, delivery location, and delivery vehicle have brought about last-mile delivery enhancements by logisticians as well as urban authorities.

Quicker home deliveries have required logisticians and retailers to operate within a shorter delivery radius. This has been made possible through intra-urban micro-fulfilment centres (MFCs), urban warehouses often positioned to the rear of retail stores, in malls or basements. Installation of such MFCs is expected to grow more than twentyfold by 2030, and more than 80 percent of new MFCs established in 2022 were in North America. The United States is expected to be the main market for such installations through 2030, followed by the United Kingdom, Japan, France and China (The LogisticsIQ, 2022). Urban authorities, therefore, need to integrate MFCs and other dark store types into urban planning processes.

Pick-up lockers have been a growing solution in last-mile delivery. Several major innovations have been deployed to enhance the pick-up locker experience. First, carrier-agnostic smart lockers enable multiple delivery companies to use networks of lockers. Such smart lockers offer more efficient use of space, as delivery companies can monitor vacant lockers, and reserve spots in advance. Denmark-based SwipBox, is a prominent example, operating 30 000 parcel lockers in 32 countries. Second, urban pop-up parcel hubs are emerging for quick responses to rising consumer demand. For example, Rytle in Germany has developed a system to drop off movable containers on demand at any possible point within a city (Roland Berger, 2022). Third, the use of refrigerated smart lockers is another solution to bring fresh food pick-up points closer to customers. Refrigerated smart lockers ensure: (i) the cold chain remains intact while perishable food is stored, awaiting customer pick-up; and (ii) unbundling of last-mile delivery and, if requested, additional locker-to-doorstep delivery for customers who pay for this separately. Left unregulated, smart lockers could present challenges to urban authorities, such as blocking access or occupying public spaces such as busy sidewalks or public parks. Smart lockers can also, however, encourage urban authorities to repurpose underused areas such as parking lots, metro stations or spaces underneath viaducts as pick-up points.

LEGISLATION AND REGULATION TO FACILITATE URBAN FOOD LOGISTICS TRANSFORMATION

Urban authorities can play a catalytic role in transforming urban food logistics through legislation and regulation, in consultation with food policy councils and similar platforms that bring together food system stakeholders. Major regulatory interventions can include the following (Roland Berger, 2018):

1. Taking urban planning measures to authorize, for example, the instalment of short-stay parking bays and special lanes for cargo bikes to support commercial logistics operators.
2. Defining and categorizing logistics spaces in the city to authorize the establishment of shared fulfilment centres.
3. Introduction of an updated catalogue of rules and fines vis-à-vis traffic disruptions.
4. Building up municipal staffing and technological capacity, e.g. through sensors, to enforce the rules.
5. Introducing a dynamic city toll (e.g. higher charges during peak commuting times) and restricting time windows when logistics providers may circulate within the city.
6. Creating incentives for companies to invest in lower-emission logistics and to expand the scale of their logistics operations at night.
7. Developing common delivery standards in collaboration with sector stakeholders, other city authorities, national governments, and international organizations.
8. Legislating on data-sharing protocols and facilitating data integration platforms through public-private partnerships.

A key area for regulation has been zero or low-emission delivery zones. Thus far, urban authorities have introduced various forms of zero-emission zones to alleviate traffic, pollution and greenhouse gas emissions in urban areas. Designation and operation of zero-emission delivery zones, however, require extensive stakeholder engagement, supportive policies and infrastructure (such as charging networks and cargo-bike lanes), as well as legal adaptations (Steimer and Kothari, 2022). A leading example is Rotterdam in the the Kingdom of the Netherlands, which is implementing a plan to transition to zero-emission city logistics by 2025 (City of Rotterdam, 2019), encouraging urban carriers to invest in electric fleets.

Last-mile delivery enhancements have also included equipping new vehicles and urban spaces with sensors and crowdsourcing relevant data such as air quality, noise pollution, greenhouse gas emissions, and parking space availability. Rotterdam is an example here too, along with Suzhou, China, and Aburrá Valley in Colombia, where urban authorities are developing open data platforms for urban logistics stakeholders to monitor real-time data and sync it with their route optimization software for more efficient decision-making (ICLEI, 2021).

Urban authorities that provide food for school cafeterias, retirement homes, or soup kitchens have adopted procurement policies that favour shorter supply chains, sustainable delivery methods, or cooperative suppliers to strengthen green belt linkages and maximize the social and environmental outcomes of public procurement. For example, Milano Ristorazione, a municipal company that provides catering services to educational, health, and social care institutions, adopted a purchasing policy to increase the use of organic and local food, as well as food produced with integrated pest management (Comune di Milano and Fondazione Cariplo, 2018).

Urban authorities have also been concerned about maintaining decent work conditions within the city. The rapid expansion of home delivery during the COVID-19 pandemic has made the position of short-distance couriers more precarious in many cases, with deteriorating employment status, working conditions, and safety. E-commerce start-ups, such as Getir in Türkiye, usually prefer self-employed couriers or offer zero-hour contracts.

If left unregulated, non-standard forms of employment can cause job insecurity, lower remuneration, loose observance of occupational safety and health measures, and erosion of other rights such as unionization and collective bargaining (Parwez, 2022). During the pandemic, cities witnessed increased courier traffic, and under rising time pressure, traffic rules are poorly observed, which results in a greater number of fatal accidents. In Istanbul, for instance, between 9 March 2020 and 27 May 2021, 222 motorcycle couriers died in traffic accidents – a tenfold increase from the previous year (Gültekin, 2021). In this working environment, cases of sexual harassment of women couriers were also reported in the city (T24, 2021).

To improve working conditions, some cities have been taking action. The city of Paris, for example, has committed in its urban logistical plan (2022–2026) to improve the working conditions of delivery workers in the French capital. This is being implemented through the creation of courier houses, where delivery workers can rest and find administrative and legal support; the construction of a network of amenities across the city (e.g. sanitary facilities, water fountains and charging stations); and developing a social and environmental charter with and for the delivery platforms (Ville de Paris, 2022).

PARTICIPATORY FOOD POLICY PLANNING AND DIALOGUE

City authorities have committed to work towards fairer and more sustainable urban food systems through several pacts and initiatives in recent years. These include the 2015 Milan Urban Food Policy Pact, bringing together more than 200 cities for developing sustainable urban food systems; the 2015 Seoul Declaration for sustainable cities; the 2016 HABITAT III New Urban Agenda; the 2019 C40 Good Food Cities Declaration; and more recently the Glasgow Food and Climate Declaration. These declarations promote a participatory and multisectoral governance for urban food systems policy planning involving indigenous communities, women, and youth whose futures are the most at risk from the effects of climate change and biodiversity loss. In the context of the COVID-19 pandemic and other crises facing cities, community involvement in food policy dialogue has gained importance because wide networks of food system actors were needed to facilitate coordination and swift responses (Carey, Murphy and Alexandra, 2020).

Multilevel multi-actor participatory mechanisms have brought together all actors in urban food systems on an equal footing, including farmers, food entrepreneurs, logisticians, civil society groups, and public authorities. One such bottom-up community organization in the United States of America is the Chicago Food Policy Action Council (CFPAC), which has been co-developing, facilitating, advocating for, and supporting policies that advance food justice and food sovereignty for all Chicagoans, irrespective of race, class, gender, and social identity (CFPAC, 2023). A similar grassroots food partnership in the United Kingdom is Good Food in Greenwich, a network of communities, organizations and businesses promoting fair, healthy, safe, affordable and accessible food for all in this part of southeast London.

In a similar vein, a collaborative effort to design urban logistics systems has been underway in Paris. In 2018, the city administration and urban logistics stakeholders in the French capital developed and signed a Metropolitan Logistics Pact, which sets out specific goals and pilot actions, the distribution of roles and a timeline (Metropole du Grand Paris, 2018). The pact seeks to optimize logistic flows and deliveries, encourage a transition to lower emission and silent delivery vehicles, incorporate logistics into urban planning documents and development projects, and sensitize consumers for the transformation of logistics with eco-responsible solutions.

Academia has also helped promote collaborative design approaches. A recent study brought stakeholders together to design sustainable urban logistics for Berlin. The study revealed stakeholders' strong interest in: consolidation of their parcel deliveries; intermodal transport (e.g. trains, vans, boats, and cargo bikes); better connectivity between IT applications (i.e. data sharing); and autonomous transportation systems (Teschendorf *et al.*, 2022). Through multisectoral and multi-actor approaches, urban authorities have been able to recognize each party's priorities and cultivate local ownership of urban food systems policies.

Urban authorities are well positioned to locally implement national policies that support food systems transformation. National governments have collaborated with urban authorities and allocated necessary budgets to implement targeted policies at the local level. For example, "France Relance,"

a EUR 100 billion support package that seeks to accelerate France's ecological, industrial and social transformation, allocated EUR 1.2 billion to urban authorities and local agrifood stakeholders to: (i) strengthen food sovereignty; (ii) accelerate the agro-ecological transition to deliver access to healthy, sustainable and local food for all; and (iii) adapt agriculture and forestry to climate change (Ministère de l'Agriculture et de la Souveraineté Alimentaire, 2022).

Urban authorities have interacted with and mobilized consumers for urban food logistics transformation. Consumers may be in a position to trigger demand-side pull factors, but they often lack sufficient information while making their decisions. They need access to adequate information on the environmental, social, economic, and health impacts of urban food distribution systems. For instance, the city of Paris conducted a “*Consumm'acteur*” challenge in 2019 and 2020 as part of the Metropolitan Logistics Pact to raise consumer awareness of logistical issues. The challenge brought together urban residents to self-diagnose their consumption habits and logistical impact and identify daily actions that could reduce the impact of consumption. Participants focused on four challenges: (i) consume lower amounts of packaged products to reduce waste production; (ii) reduce the distance products have to travel by buying local products and promoting shorter supply chains; (iii) modify delivery requirements to help optimize delivery flows; and (iv) reduce purchases of new products, preferring to buy second-hand goods, or to rent or borrow what is needed (Metropole du Grand Paris, 2023).







Chapter 3

Areas for support and investment

Guaranteeing sustainable access to adequate and nutritious food for all urban residents is a fundamental responsibility of urban authorities, an obligation recognized by the New Urban Agenda (HABITAT III) and endorsed by the United Nations General Assembly in 2016 (FAO, 2021c). The COVID-19 pandemic, climate change and the war in Ukraine have further exposed urban food systems' vulnerabilities. Urban authorities can fulfill their mandate of ensuring food and nutrition security in the cities in a sustainable manner through a comprehensive investment and support agenda. In the post-COVID-19 phase, urban authorities should develop and implement new municipal policies, attract private investment, and make municipal investments to better respond to the emerging needs of urban food systems and food logistics stakeholders.

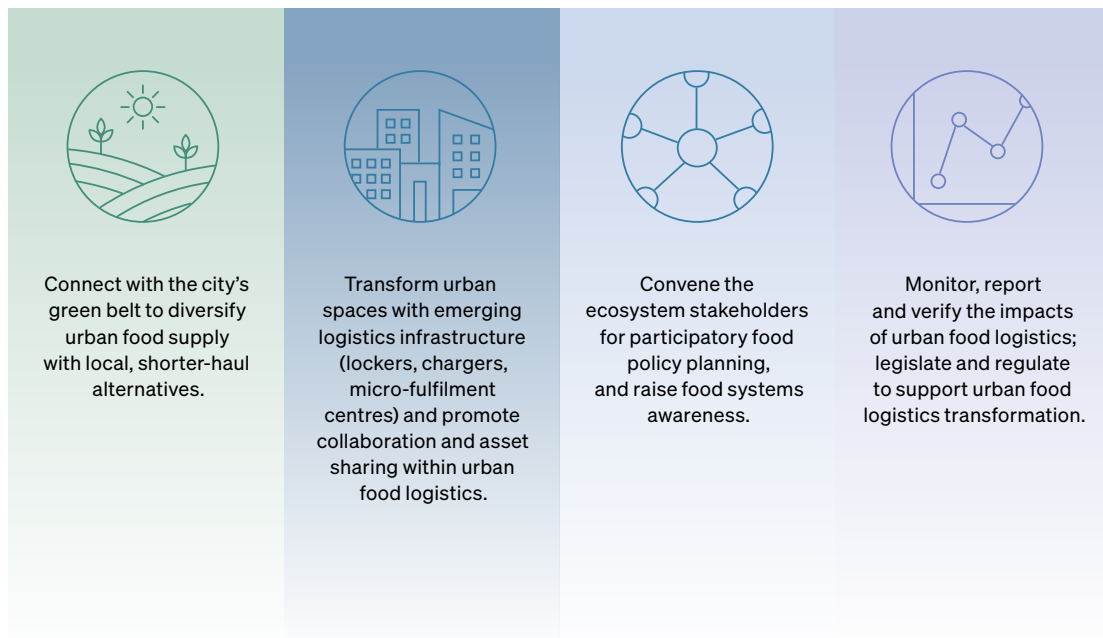




Figure 2
Investment focus areas for cities in the post-COVID-19 stage for efficient and sustainable food logistics

SOURCE: Authors' own elaboration.

Investment and support are mostly shaped by the city's size, topography, population density, distance to green belt, food and nutrition security status, municipal policy priorities, and budget. Table 1 lists key areas of investment that will help cities transition to the new urban food logistics landscape. These areas are interconnected and integral to achieving resilience and sustainability in urban food logistics. They focus on urban settings and should be complemented by peri-urban and rural investments such as collective storage facilities and refrigerated fleets that serve rural suppliers and facilitate their access to the urban market. Each city must consider the relevance of the suggested investments, conduct social, economic, and environmental feasibility, and assess their level of readiness for investment. As elaborated above, urban food logistics is interlinked with multiple domains including public health, social protection and welfare systems, agriculture, environment, commerce, infrastructure, transport, energy, and land use. Urban authorities must consider potential synergies or trade-offs that each investment generates vis-à-vis these interconnected domains.

Table 1

Recommended areas for investments and municipal policy interventions at regional, city-scale, and neighborhood levels

Type of action	Areas of investment
 <p>Municipal policy intervention</p>	<p>Connect with the city's green belt to diversify urban food supply with local, shorter-haul alternatives.</p>
	<p>Protect farmland and farming. This can be achieved through promoting agricultural activity in rural and peri-urban areas, integrating social data into spatial modelling and planning, implementing monetary and non-monetary compensation schemes to ensure stakeholders' acceptance of farmland protection.</p> <p>Improve regional producers' access to local markets and agrifood logistics infrastructure by incentivizing short supply chain alternatives in both public and private food procurement, and making urban food logistics infrastructure, such as WFMs, aggregation centres, trucking services, accessible, affordable, and conducive for local producers.</p>
	<p>Equip WFMs with facilities serving the needs of local producers such as sorting, grading, packing lines, producers area.</p>
<p>Public/municipal investment</p>	<p>Support the development of local logistics cost-saving solutions. This includes investing in local food logistics cooperatives, logistics asset-sharing platforms, digital solutions mapping regional agrifood intermediaries to improve value chain transparency and competition, and business-to-consumer marketing platforms.</p> <p>Encourage private investments on food terminals, drop yards, food processing, cold storage and transport fleets that give better access to regional producers and regional products.</p>
 <p>Municipal policy intervention</p>	<p>Transform urban spaces with emerging logistics infrastructure and promote collaboration and asset sharing within urban food logistics.</p>
	<p>Improve the connectivity between existing urban logistics facilities (ULFs) through: (i) urban food logistics master planning; (ii) monitoring logistics fleets and business models in the city; (iii) leveraging low-emission zoning to incentivize interconnected use of ULFs; (iv) data sharing platforms that connect ULFs; and (v) dynamic taxation for massification of deliveries within and across ULFs.</p> <p>Repurpose public spaces such as parking garages or abandoned buildings as ULFs and promote shared use of logistics assets (e.g. vehicles, lockers) through regulation and digital solutions.</p> <p>Promote shared/cooperative last-mile delivery services, and delivery pooling for massification of food delivery flows within the city.</p>
	<p>Improve the competitiveness and diversify the clientele of WFMs with emerging food distribution players such as e-commerce, third- and fourth-party logistics services, and direct delivery from regional farmers including through introducing on-site value-added services.</p>
<p>Public/municipal investment</p>	<p>Invest in the interconnectivity between food logistics facilities, e.g. entry point warehouses (WFMs) at city outskirts, urban distribution platforms close to city centres, urban distribution spaces in inner cities, and urban delivery spaces at the last mile through multimodal green transport options (rail, road, sea, river, tram, freight).</p> <p>Invest in sensor-driven smart-city applications, such as bookable roadside parking and delivery areas as well as congestion and emission trackers to serve logistics players while contributing to the city's environmental targets.</p> <p>Invest in data dashboards/platforms involving public and private data providers as decision support systems for food logisticians in order to ensure an optimized use of the interconnected urban logistics infrastructure.</p>
<p>Private investment</p>	

 <p>Municipal policy intervention</p>	<p>Convene the ecosystem stakeholders for participatory food policy planning and raise agrifood systems' stakeholders awareness.</p> <hr/> <p>Support multilevel multi-actor participatory mechanisms such as urban food councils for short- and long-term planning and executing urban food policy system reforms.</p> <p>Inform decision making bodies, including food councils, with urban food systems dashboards involving key data and indicators to facilitate evidence-based policymaking.</p> <p>Conduct awareness-raising events among consumers and promote urban food logistics transparency initiatives (e.g. through carbon footprint labelling) to help shape demand side pull factors in urban food systems.</p>
 <p>Municipal policy intervention</p>	<p>Monitor, report and verify the impacts of urban food logistics; legislate and regulate to support urban food logistics transformation.</p> <hr/> <p>Prepare an inventory of public and private logistics spaces in urban and peri-urban areas to ensure transparency and effective use of these spaces by logisticians. This can also entail legislating the terms and incentives for establishing and operating shared fulfilment centres by various private logisticians.</p> <p>Legislate data-sharing protocols and operate open data platforms. Defining legal requirements for sharing data among public and private logisticians as well as standard operating procedures for crowdsourcing data can facilitate collaboration in this field.</p> <p>Designate zero or low-emission delivery zones in the city through extensive stakeholder engagement in order to alleviate traffic, pollution and greenhouse gas emissions in urban areas. Restrictive zones, along with tax incentives, can encourage companies to transition to lower emission logistics.</p>
<p>Public/municipal investment</p>	<p>Invest in municipal staffing and technological capacity (e.g. through sensors) to monitor, verify, and report on urban food systems targets.</p> <p>Co-invest in facilities and services that can improve delivery workers' welfare in compliance with decent employment terms in collaboration with delivery companies. This can entail the construction of a network of amenities across the city (e.g. sanitary facilities, water fountains and charging stations).</p> <p>Adopt public procurement policies in support of urban food logistics transformation. This can include sourcing from shorter supply chain providers, logisticians using sustainable delivery methods, or cooperative suppliers in catering food for school cafeterias, retirement homes, or other social facilities.</p>

SOURCE: Authors' own elaboration.





References

- Afilog.** 2017. Typologie des espaces logistiques urbains. In: *Afilog*. Paris. [Cited 7 February 2024.] <https://afilog.org/logurbaine/typologie/index.html>
- Aiello, L.M., Schifanella, R., Quercia, D. & Del Prete, L.** 2019. Large-scale and high-resolution analysis of food purchases and health outcomes. *EPJ Data Science*, 8(14). <https://doi.org/10.1140/epjds/s13688-019-0191-y>
- Barham, J., Tropp, D, Enterline, K., Farbman, J., Fisk, J. & Kiraly, S.** 2012. *Regional food hub resource guide*. U.S. Department of Agriculture (USDA), Agricultural Marketing Service. Washington, DC, USDA. <http://dx.doi.org/10.9752/MS046.04-2012>
- Bayir, B., Charles, A., Sekhari, A. & Ouzrout, Y.** 2022. Issues and challenges in short food supply chains: a systematic literature review. *Sustainability*, 14(5). <https://doi.org/10.3390/su14053029>
- Berretta, D.** 2022. When opposites attract: bringing down urban-rural walls. In: *Eurocities*. Brussels. [Cited 7 February 2024.] <https://eurocities.eu/latest/when-opposites-attract-bringing-down-urban-rural-walls/>
- Blay-Palmer, A., Santini, G., Halliday, J., Malec, R., Carey, J., Keller, L., Ni, J., Taguchi, M. & van Veenhuizen, R.** 2021. City region food systems: building resilience to COVID-19 and other shocks. *Sustainability*, 13(3). <https://doi.org/10.3390/su13031325>
- Bringg.** 2022. *2022 Bringg Barometer. The State of Retail Delivery & Fulfillment*. [Cited 19 November 2022.] https://f.hubspotusercontent10.net/hubfs/4604917/2022/Bringg_Barometer_2022.pdf
- Bulwiengesa.** 2017. *Logistics and real estate 2017. City Logistics with New Ideas in the City*. Berlin, Bulwiengesa. https://archiv.bulwiengesa.de/sites/default/files/bulwiengesa_logistikstudie_2017_en_studie_screen_einzelseiten.pdf
- Caldwell, W., Epp, S., Wan, X., Singer, R., Drake, E. & Sousa, E.C.** 2022. Farmland Preservation and Urban Expansion: Case Study of Southern Ontario, Canada. *Frontiers in Sustainable Food Systems*, 6. <https://doi.org/10.3389/fsufs.2022.777816>
- Carey, R. Murphy, M. & Alexandra, L.** 2020. COVID-19 highlights the need to plan for healthy, equitable and resilient food systems. *Cities and Health*, 5: S123–S126. <https://doi.org/10.1080/23748834.2020.1791442>
- Casa Transports.** 2017. *Projet de la ligna T2 du Tramway de Casablanca. Etude d'impact Environnemental et Social*. Casablanca, Casa Transports, SA. www.eib.org/attachments/registers/75035190.pdf
- Chicago Food Policy Action Council (CFPAC).** 2023. Who we are. In: *Chicago Food Policy*. Chicago, Illinois. [Cited 7 February 2024.] www.chicagofoodpolicy.com/overview

- Città Metropolitana di Roma Capitale.** 2017. *La Mobilità il Pendolarismo*. Rome. Città Metropolitana di Roma Capitale. www.comune.roma.it/web-resources/cms/documents/Capitolo4_La_Mobilita_e_il_Pendolarismo_2017.pdf
- City of Hamburg.** 2022. *SmaLa – smarte liefer und ladezonen in Hamburg*. In: *City of Hamburg*. Hamburg, Germany. [Cited 7 February 2024.] www.hamburg.de/bwi/smarteladezonen/
- City of Rotterdam.** 2019. *Zero emissie stadslogistiek*. In: *City of Rotterdam*. Rotterdam, the Netherlands. [Cited 7 February 2024.] www.rotterdam.nl/zero-emissie-stadslogistiek
- Comune di Milano & Fondazione Cariplo.** 2018. *The food system in Milan – five priorities for a sustainable development*. Milan, Italy, Milano Food Policy. www.foodpolicymilano.org/wp-content/uploads/2015/04/Milan_food_system_EN1.pdf
- Comune di Roma.** 2021. *Agrifood Roma 2030 – piano strategico agricolo e alimentare di Roma capitale*. Rome, Comune di Roma. www.comune.roma.it/web-resources/cms/documents/Agrifood_Piano_Strategico_completo_Maggio_2021.pdf
- Cooksey-Stowers, K., Schwartz, M. & Brownell, K.** 2017. *Food swamps predict obesity rates better than food deserts in the United States*. *International Journal of Environmental Research Public Health*, 14(11). <https://doi.org/10.3390/ijerph14111366>
- Cortoni, A.** 2022. *City case study: Rome*. In: *FAO. Supporting the Evolution of Food Distribution Systems*. Rome, FAO (unpublished).
- Dreischerf, A. & Buijs, P.** 2022. *How urban consolidation centres affect distribution networks: an empirical investigation from the perspective of suppliers*. *Case Studies on Transport Policy*, 10(1). <https://doi.org/10.1016/j.cstp.2022.01.012>
- European Commission Joint Research Centre.** 2015. *Global Human Settlement Layer*. In: *European Commission*. Brussels. [Cited 7 February 2023.] <https://ghsl.jrc.ec.europa.eu/>
- FAO (Food and Agriculture Organization of the United Nations) & EBRD (European Bank for Reconstruction and Development).** 2022. *COVID-19 pandemic package: evolution of food distribution systems – The resilience pathway*. Rome, FAO (unpublished).
- FAO & RUAF (Resource Centres on Urban Agriculture and Food Security).** 2015. *A Vision for City Region Food Systems*. Rome. www.fao.org/3/a-i4789e.pdf

- FAO, RUAF & Wilfrid Laurier University.** 2018. *City Region Food System Toolkit Assessing and planning sustainable city region food systems*. Rome, FAO. www.fao.org/in-action/food-for-cities-programme/toolkit/introduction/en/
- FAO & WHO (World Health Organization).** 2019. *Sustainable healthy diets – guiding principles*. Rome. www.fao.org/3/ca6640en/ca6640en.pdf
- FAO.** 2006. *Food Security*. Policy Brief June 2006, Issue 2. Rome, FAO. www.fao.org/fileadmin/templates/faoitally/documents/pdf/pdf_Food_Security_Cocept_Note.pdf
- FAO.** 2014. *Developing sustainable food value chains – guiding principles*. Rome, FAO. www.fao.org/3/i3953e/i3953e.pdf
- FAO.** 2019. *FAO framework for the urban food agenda*. Rome, FAO. <https://doi.org/10.4060/ca3151en>
- FAO.** 2020. *Cities and local governments at the forefront in building inclusive and resilient food systems*. Rome, FAO. www.fao.org/3/cb0407en/CB0407EN.pdf
- FAO.** 2021a. *Impacts of COVID-19 on food security and nutrition: developing effective policy responses to address the hunger and malnutrition pandemic*. Third edition. Rome, Committee on World Food Security High Level Panel of Experts on Food Security and Nutrition. <https://openknowledge.fao.org/server/api/core/bitstreams/0b6045e6-ebe8-4569-b383-eafdc51b27f8/content>
- FAO.** 2021b. *City Region Food Systems Programme: Resilient cities in practice*. In: *FAO*. Rome, FAO. [Cited 7 February 2024.] www.fao.org/in-action/food-for-cities-programme/news/detail/ru/c/1457179/
- FAO.** 2021c. *Evaluation of FAO's contributions to Sustainable Development Goal 2 – urban food agenda*. Rome, FAO. <https://www.fao.org/3/cb7610en/cb7610en.pdf>
- FAO.** 2022. *Suite of Food Security Indicators*. In: *FAOSTAT*. Rome. [Cited 7 February 2024.] www.fao.org/faostat/en/#data/FS
- Le Figaro.** 2022. *Le nombre de voitures en diminution pour la première fois en Île-de-France*. In: *Le Figaro*. Paris. [Cited 7 February 2024.] www.lefigaro.fr/conjoncture/le-nombre-de-voitures-en-diminution-pour-la-premiere-fois-en-ile-de-france-20220422
- Fusilli Urban Food Planning.** 2022. *Kharkiv's metro food system*. In: *Fusilli Urban Food Planning*. Stuttgart, Germany. [Cited 7 February 2024.] <https://fusilli-project.eu/general/kharkivs-metro-food-system/>
- Fusilli Urban Food Planning.** 2023. *Rome*. In: *Fusilli Urban Food Planning*. Stuttgart, Germany. [Cited 7 February 2024.] <https://fusilli-project.eu/cities/rome/?cn-reloaded=1>

- Gazeta.uz.** 2022. Figures: The number of personal cars in Uzbekistan has increased 1.5 times over 6 years. In: *Gazeta.uz.* Tashkent. [Cited 7 February 2024.] www.gazeta.uz/ru/2022/12/26/personal-cars/
- Gültekin, D.A.** 2021. İşsizliğin mecbur bıraktığı meslek: motokuryelik. In: *Evrensel.* Ankara. [Cited 7 February 2024.] www.evrensel.net/haber/434376/issizligin-mecbur-biraktigi-meslek-motokuryelik
- Greater London Authority.** 2018. *The London food strategy: healthy and sustainable food for London.* London, Greater London Authority. www.london.gov.uk/sites/default/files/final_london_food_strategy.pdf
- IBB (Istanbul Metropolitan Municipality).** 2021. *Istanbul gıda strateji belgesi.* Istanbul, IBB. https://tarim.ibb.istanbul/img/1551435102021__7928277850i.pdf
- ICLEI.** 2021. The future of urban freight transport: enabling data sharing to support decision-making. In: *ICLEI.* Bonn, Germany. [Cited 7 February 2024.] <https://sustainablemobility.iclei.org/the-future-of-urban-freight-transport-enabling-data-sharing-to-support-decision-making/>
- Interreg Central Europe.** 2020. Sulpiter output library. In: *Interreg Central Europe.* Vienna. [Cited 7 February 2024.] <https://programme2014-20.interreg-central.eu/Content.Node/SULPiTER.html>
- Jagtap, S., Bader, F., Garcia-Garcia, G., Trollman, H., Fadiji, T. & Salonitis, K.** 2021. Food logistics 4.0: opportunities and challenges. *Logistics*, 5(2). <https://doi.org/10.3390/logistics5010002>
- Kolesnichenko, A.** 2022. Klitschko counted the total number of cars in Kyiv. In: *Ukrainska Pravda.* [Cited 7 February 2024.] www.epravda.com.ua/rus/news/2022/02/11/682305/
- La Poste Groupe.** 2019. Issues in urban logistics. In: *La Poste Groupe.* Paris. [Cited 7 February 2024.] www.lapostegroupe.com/en/news/le-groupe-la-poste-faces-the-challenges-of-urban-logistics
- Logistik-Initiative Hamburg.** 2023. Fachkreis Urbaner Lieferverkehr: Flächenbedarf für die Letzte Meile: Ansätze und Potenziale. In: *Logistik-Initiative Hamburg.* Hamburg, Germany. [Cited 11 April 2024.] www.hamburg-logistik.net/blog/urbane-logistik-transport-mobilitaet/fachkreis-urbaner-lieferverkehr-flaechenbedarf-fuer-die-letzte-meile-ansaeetze-und-potenziale/
- Mairie de Paris.** 2018. *Strategié de Paris pour une alimentation durable.* Paris, Mairie de Paris. www.api-site.paris.fr/paris/public/2018%2F9%2FStrat%C3%A9gie_Paris_Aliment_Durable_Version%20Web.pdf
- Makroekonomija.** 2021. Registrovana putnička vozila u Srbiji i Evropi 2002–2019. In: *Makroekonomija.* Belgrade. [Cited 7 February 2023.] www.makroekonomija.org/0-miroslav-zdravkovic/registrovana-putnicka-vozila-u-srbiji-i-u-evropi-2002-2019/

- McKinsey & Company & EuroCommerce.** 2022. State of grocery Europe: Navigating the market headwinds. In: *McKinsey & Company*. San Francisco, USA. [Cited 25 August 2022.] www.mckinsey.com/~media/mckinsey/industries/retail/our%20insights/state%20of%20grocery%20europe%202022%20navigating%20the%20market%20headwinds/state-of-grocery-europe-navigating-the-market-headwinds.pdf
- Metropole du Grand Paris.** 2018. *Pacte pour une logistique métropolitaine*. Paris. Metropole du Grand Paris. www.metropolegrandparis.fr/sites/default/files/media/document/Pacte_logistique_metropolitaine_0.pdf
- Metropole du Grand Paris.** 2023. Logistique métropolitaine: Le Challenge Consomm'acteur. In: *Metropole du Grand Paris*. Paris. www.metropolegrandparis.fr/fr/logistique-metropolitaine#le-challenge-consomm'acteur
- Michel-Villarreal, R., Vilalta-Perdomo, E.L., Canavari, M. & Hingley, M.** 2021. Resilience and digitalization in short food supply chains: a case study approach. *Sustainability*, 13(11): 5913. <https://doi.org/10.3390/su13115913>
- Miller, M., Holloway, W., Perry, E., Zietlow, B., Kokjohn, S., Lukszys, P., Chachula, N. Reynolds, A. & Morales, A.** 2016. *Regional food freight: lessons from the Chicago region*. Project report for USDA-AMS, Transportation Division. Washington, DC, USDA. www.researchgate.net/publication/312213704_Regional_Food_Freight_Lessons_from_the_Chicago_Region/link/5876aa3508ae329d62260db0/download
- Ministère de l'Agriculture et de la Souveraineté Alimentaire.** 2022. France Relance, les mesures «Transition agricole, alimentation et forêt» encore accessibles en 2022. In: *Ministère de l'Agriculture et de la Souveraineté Alimentaire*. Paris. [Cited 7 February 2024.] <https://agriculture.gouv.fr/france-relance-les-mesures-transition-agricole-alimentation-et-foret-encore-accessibles-en-2022>
- Moran, D, Kanemoto, K., Jiborn, M. Wood, R., Többen, J. & Seto, K. C.** 2018. Carbon footprints of 13 000 cities. *Environmental Research Letters*, 13(6): 064041. <https://iopscience.iop.org/article/10.1088/1748-9326/aac72a>
- Morganti, M.E.** 2011. *Urban food planning, city logistics and sustainability: the role of the wholesale produce market – the cases of Parma and Bologna food hubs*. Dissertation thesis. Alma Mater Studiorum Università di Bologna. Dottorato di Ricercar in Cooperazione internazionale e politiche per lo sviluppo sostenibile, 23 Ciclo. <https://doi.org/10.6092/unibo/amsdottorato/4186>
- Morganti, M.E.** 2019. Food and urban logistics: a fast changing sector with significant policy and business implications. In: Browne, M., Behrends, S., Woxenius, J., Giuliano, G. & Holguin-Veras, J., eds. 2019. *Urban logistics – management, policy and innovation in a rapidly changing environment*. London; New York, Kogan Page Ltd.

- Ontario Food Terminal Board.** 2023. Welcome to the Ontario Food Terminal Board. In: *Ontario Food Terminal Board*. Ontario, Canada. [Cited 7 February 2024.] www.oftb.com/
- Parwez, S.** 2022. COVID-19 pandemic and work precarity at digital food platforms: A delivery worker's perspective. *Social Sciences & Humanities Open*. Volume 5(1): 100259. <https://doi.org/10.1016/j.ssaho.2022.100259>
- Perpiña Castillo, C., Kavalov, B., Diogo, V., Jacobs, C., Batista E Silva, F. & Lavalle, C.** 2018. *Agricultural Land Abandonment in the EU within 2015–2030*. European Commission Policy Insights JRC113718. Ispra, Italy, European Commission. <https://joint-research-centre.ec.europa.eu/system/files/2018-12/jrc113718.pdf>
- Perrin, C., Camille C., Romain M. & Brigitte, N.** 2020. Preserving Farmland on the Urban Fringe: A Literature Review on Land Policies in Developed Countries. *Land* 9(7): 223. <https://doi.org/10.3390/land9070223>
- Picchioni, F., Goulao, L.F. & Roberfroid D.** 2022. The impact of COVID-19 on diet quality, food security and nutrition in low and middle income countries: a systematic review of the evidence. *Clinical Nutrition*, 41(12): 2955-2964. <https://pubmed.ncbi.nlm.nih.gov/34535329/>
- Radio Supply Chain.** 2022. Urby vis les 100 millions d'euros de chiffre d'affaires d'ici 2025. In: *Radio Supply Chain*. Ile de France, France. [Cited 7 February 2024.] www.radiosupplychain.fr/urby-vise-les-100-millions-deuros-de-chiffre-daffaires-dici-2025/
- Rai, B.H.** 2022a. From sprawl to proximity. In: *Chaire Logistics City*. Paris. [Cited 7 February 2024.] www.ecommercemobilities.com/from-sprawl-to-proximity
- Rai, B.H.** 2022b. B2C e-commerce. In: *Chaire Logistics City*. Paris. [Cited 7 February 2024.] www.ecommercemobilities.com/b2c-e-commerce
- Rai, B.H. & Dablanc, L.** 2022. E-commerce and goods mobility. In: *Chaire Logistics City*. Paris. [Cited 7 February 2024.] www.ecommercemobilities.com/goods-mobility
- Rai, B.H. & Touami, S.** 2022. COVID-19. In: *Chaire Logistics City*. Paris. [Cited 7 February 2024.] www.ecommercemobilities.com/covid-19
- Rai B.H., Touami, S. & Dablanc, L.** 2022. Not all e-commerce emits equally: systematic quantitative review of online and store purchases' carbon footprint. *Environmental Science and Technology*, 57(1): 708–718. <https://doi.org/10.1021/acs.est.2c00299>
- Raza, A., Jaacks, L., Ganpule-Rao, A. Pandey, H. & Lobo, A.S.** 2022. *Urban food system assessments for nutrition and healthy diets – Technical guidance note*. Rome, FAO. <https://doi.org/10.4060/cb8612en>

- Reardon, T., Tomatis, F. & Pedersen, E.** 2023. *Evolution of food e-commerce during the COVID-19 pandemic*. Investment Brief. Rome, FAO. <https://doi.org/10.4060/cc3650en>
- Reddouane, Y.** 2022. City case study: Casablanca. In: FAO. *Supporting the Evolution of Food Distribution Systems*. Rome, FAO (unpublished).
- Rodrigue, J.P.** 2020. The distribution network of Amazon and the footprint of freight digitalization. *Journal of Transport Geography*, 88: 102825. <https://doi.org/10.1016/j.jtrangeo.2020.102825>
- Roland Berger.** 2018. *Urban logistics 2030 in Germany – stronger together: keep the wild west scenario at bay with cooperation*. Bremen, Germany, Bundesvereinigung Logistik (BVL International). www.rolandberger.com/publications/publication_pdf/roland_berger_urban_logistics.pdf
- Roland Berger.** 2022. From atomization to massification – urban logistics must make a U-turn to achieve a sustainable future. In: *Roland Berger*. Munich, Germany. [Cited 7 February 2024.] www.rolandberger.com/en/Insights/Publications/Urban-logistics-From-atomization-to-massification.html
- Rungis Marché International.** 2024. La SEMMARIS. In: *Rungis Marché International*. Paris. [Cited 12 April 2024.] www.rungisinternational.com/raison-d-etre
- Rytle.** 2024. Your all-in-one solution for the highest uptime on the market. In: *Rytle*. Bremen, Germany. [Cited 11 April 2024.] www.rytle.com/en.html
- Saint Vincent, M.F.** 2022. City case study: Paris. In: FAO. *Supporting the Evolution of Food Distribution Systems*. Rome, FAO (unpublished).
- Savills.** 2019. Impacts. The future of global real estate (2nd ed). In: *The Savills Blog*. 9 May 2019. London. [Cited 10 May 2023.] www.savills.co.uk/blog/article/282173/us-articles/impacts-2019.aspx
- Savills.** 2021. *European food and groceries sector. European Commercial – April 2021*. Spotlight Savills Research. London, Savills. <https://pdf.euro.savills.co.uk/european/europe-retail-markets/spotlight---european-food-and-groceries-sector---2021.pdf>
- Sener, B.S.** 2022. City case study: Istanbul. In: FAO. *Supporting the Evolution of Food Distribution Systems*. Rome, FAO (unpublished).
- Sogaris.** 2020. Fiche site chapelle international. In: *Sogaris*. Paris. [Cited 7 February 2024.] www.sogaris.fr/fiche/chapelle-international/

- Statistica.** 2023. Number of licensed cars in London, England from 1995 to 2020. In: *Statistica*. New York. [Cited 7 February 2024.] <https://www.statista.com/statistics/314980/licensed-cars-in-london-england-united-kingdom/>
- Steimer, H. & Kothari, V.** 2022. Zero-emission delivery zones: a new way to cut traffic, air pollution and greenhouse gases. In: *World Resources Institute*. Washington, DC. [Cited 7 February 2024.] www.wri.org/insights/zero-emission-delivery-zones-traffic-pollution
- Stojkovic, D.** 2022. City case study: Belgrade. In: FAO. *Supporting the Evolution of Food Distribution Systems*. Rome, FAO (unpublished).
- Swinnen, J., McDermott, J. & Yosef, S.** 2021. Beyond the pandemic: Transforming food systems after COVID-19. In: IFPRI. 2021. *Global food policy report: Transforming food systems after COVID-19*. Washington, DC. https://doi.org/10.2499/9780896293991_01
- SwipBox.** 2023. Products. In: *SwipBox*. Sonderborg, Denmark. [Cited 7 February 2024.] www.swipbox.com/#product
- T24.** 2021. *Hız baskısı altında çalışan moto kuryeler: "Çabuk gelsin" notlarından ölümler arttı, günde 10 kez kaza atlatıyoruz, üstüne bir de dayak yiyoruz.* T24, 19 April 2021. Istanbul, Türkiye. [Cited 9 May 2023.] <https://t24.com.tr/haber/hiz-baskisi-altinda-calisan-moto-kuryeler-cabuk-gelsin-notlarindan-olumler-artti-gunde-10-kez-kaza-atlatiyoruz-ustune-bir-de-dayak-yiyoruz,946825>
- Taniguchi, E.** 2021. City logistics for sustainable and liveable cities. *Fondation France-Japon de l'Ehess FFJ Discussion Paper 21-03*. Kyoto, Japan. <https://hal.science/hal-03313187/document>
- Taktakishvili, N.** 2023. How many cars were registered in Georgia in 2022? Statistics. In: *Business Media*. Tbilisi. [Cited 7 February 2024.] <https://bm.ge/en/news/how-many-cars-were-registered-in-georgia-in-2022---statistics/128102>
- Teschendorf, R., Engelhardt, M., Malzahn, B., Husemann, M., Butz, C. & Seeck, S.** 2022. Sustainable urban logistics concepts – a collaborative design approach considering stakeholder perspectives. In: Kersten, W., Jahn, C., Blecker, T., Ringle, MC. (eds.). 2022. *Changing Tides: The New Role of Resilience and Sustainability in Logistics and Supply Chain Management – Innovative Approaches for the Shift to a New Era*. Proceedings of the Hamburg International Conference of Logistics, 21 September 2022, No. 33. Hamburg, Germany. www.econstor.eu/handle/10419/267179
- The LogisticsIQ.** 2022. Micro fulfillment market. In: *LogisticsIQ*. St. Louis, Missouri, USA. www.thelogisticsiq.com/research/micro-fulfillment-market/

- Tochtrop, C., Bickel, M.W., Hennes, L., Speck, M. & Liedtke, C.** 2022. Principles and design scenarios for sustainable urban food logistics. *Frontiers in Sustainable Cities*, 4. <https://doi.org/10.3389/frsc.2022.896313>
- Tomatis, F., Pedersen, E. & Sener, B.S.** 2023. *Supporting modern retail adaptation to a post-COVID-19 context – how modern retail can contribute to urban food distribution resiliency*. Rome, FAO (unpublished).
- UN Habitat.** 2022. Urban Transport. In: *UN Habitat Urban Indicators Database*. Nairobi. [Cited 7 February 2024.] <https://data.unhabitat.org/pages/urban-transport>.
- Urban Food Futures.** 2018. The subtle equation of sustainable urban food logistics. In: *Urban Food Futures*. Paris. [Cited 7 February 2024.] <https://urbanfoodfutures.com/2018/06/07/food-freight/>
- Urushadze, D.** 2022. City case study: Tbilisi. In: FAO. *Supporting the Evolution of Food Distribution Systems*. Rome, FAO (unpublished).
- Verlinde, S., Macharis, C. & Witlox, F.** 2012. How to consolidate urban flows of goods without setting up an urban consolidation centre? The Seventh International Conference on City Logistics, 7–9 June 2011, Mallorca Spain. *Procedia - Social and Behavioral Sciences*, 39. www.sciencedirect.com/science/article/pii/S1877042812006076
- Ville de Paris.** 2021. Acheter à Paris: la carte des commerçants. Actualité. In: *Ville de Paris*. Paris. [Cited 7 February 2024.] www.paris.fr/pages/livraison-alimentaire-a-domicile-les-commerçants-parisiens-mobilises-7685
- Ville de Paris.** 2022. *La ville logistique - repenser la logistique urbaine à Paris stratégie 2022 – 2026*. Paris, Ville de Paris. <https://cdn.paris.fr/presse/2022/06/16/729667fcd192c69293fbc5328c7da15.pdf>
- Villeroy, E.** 2021. P4, une plateforme de distribution miniature sous le périphérique parisien. In: *Voxlog*. Paris. [Cited 7 February 2024.] www.voxlog.fr/reportage/99/p4-une-plateforme-de-distribution-miniature-sous-le-peripherique-parisien
- Wood, R.** 2022. City case study: London. In: FAO. *Supporting the Evolution of Food Distribution Systems*. Rome, FAO (unpublished).
- World Bank.** 2016. *Sustainable Urban Transport for Kyiv. Towards a Sustainable and Competitive City Built Upon the Legacy System and Innovations*. Washington, DC, World Bank. <https://documents1.worldbank.org/curated/en/640531472066198963/pdf/107108-REVISED-PUBLIC-Sustainable-Urban-Transport-for-Kyiv-June-27-2016-REV.pdf>

World Bank & FAO. 2018. Urban Food Systems Diagnostic and Metrics Framework. Roadmap for future geospatial and big data analytics. Washington, DC, World Bank and Rome, FAO. www.fao.org/3/CA1428EN/ca1428en.pdf

Yeni Safak. 2023. İstanbul'daki kayıtlı araç sayısı 23 ilin toplam nüfusu kadar. In: *Yeni Safak*. İstanbul, Türkiye. [Cited 7 February 2024.] www.yenisafak.com/ekonomi/istanbuldaki-kayitli-arac-sayisi-23-ilin-toplam-nufusu-kadar-istanbuldaki-arac-sayisi-4502283.





Annex

Table 2

Selected indicators and cities that show heterogeneity in urban profiles

	Population density in the city (population per km ²)	Prevalence of moderate or severe food insecurity in the country's total population (percent) (3-year average)	Penetration of modern retail in fresh food in the respective country (percent)	Motorization rate (number of passenger vehicles per 1000 inhabitants)	Proportion of population that has convenient access to public transport	CO2 emissions per capita (tonnes)
London	53 722	4	90	309	95	11
Istanbul	2 716	NA	53	320	91	7
Tbilisi	2 272	39	60	440	NA	4
Rome	2 028	6	70	803	96	7
Paris (Ile-de-France)	1 001	6	60	440	98	8
Belgrade	516	14	50	353	92	6
Casablanca - Settat	350	32	31	151	66	2
Tashkent	168	24	5	178	23	3
Kyiv	63	23	57	473	94	5

SOURCES:

Population density

European Commission Joint Research Centre. 2015. Global Human Settlement Layer.

In: *European Commission*. Brussels. [Cited 7 February 2023.] <https://ghsl.jrc.ec.europa.eu/>

Country-level food and nutrition security

FAO. 2022. Suite of Food Security Indicators. In: *FAOSTAT*. Rome. [Cited 7 February 2024.]

www.fao.org/faostat/en/#data/FS

Country-level modern retail penetration

FAO and EBRD. 2022. *COVID-19 pandemic package: evolution of food distribution systems - The resilience pathway*. Rome, FAO (unpublished).

Motorization rates

Statistica. 2023. Number of licensed cars in London, England from 1995 to 2020. In: Statistica. New York. [Cited 7 February 2024.] www.statista.com/statistics/314980/licensed-cars-in-london-england-united-kingdom/

Città Metropolitana di Roma Capitale. 2017. *La Mobilità il Pendolarismo*. Rome. Città Metropolitana di Roma Capitale. www.comune.roma.it/web-resources/cms/documents/Capitolo4_La_Mobilita_e_il_Pendolarismo_2017.pdf

Le Figaro. 2022. Le nombre de voitures en diminution pour la première fois en Île-de-France. In: *Le Figaro*. Paris. [Cited 7 February 2024.] www.lefigaro.fr/conjoncture/le-nombre-de-voitures-en-diminution-pour-la-premiere-fois-en-ile-de-france-20220422

Yeni Safak. 2023. Istanbul'daki kayıtlı araç sayısı 23 ilin toplam nüfusu kadar. In: *Yeni Safak*. Istanbul, Türkiye. [Cited 7 February 2024.] www.yenisafak.com/ekonomi/istanbuldaki-kayitli-arac-sayisi-23-ilin-toplam-nufusu-kadar-istanbuldaki-arac-sayisi-4502283.

Taktakishvili, N. 2023. How many cars were registered in Georgia in 2022? Statistics. In: *Business Media*. Tblisi. [Cited 7 February 2024.] <https://bm.ge/en/news/how-many-cars-were-registered-in-georgia-in-2022---statistics/128102>

Gazeta.uz. 2022. Figures: The number of personal cars in Uzbekistan has increased 1.5 times over 6 years. In: *Gazeta.uz*. Tashkent. [Cited 7 February 2024.] www.gazeta.uz/ru/2022/12/26/personal-cars/

Kolesnichenko, A. 2022. Klitschko counted the total number of cars in Kyiv. In: *Ukrainska Pravda*. [Cited 7 February 2024.] www.epravda.com.ua/rus/news/2022/02/11/682305/

Makroekonomija. 2021. Registrovana putnička vozila u Srbiji i Evropi 2002–2019. In: *Makroekonomija*. Belgrade. [Cited 7 February 2023.] www.makroekonomija.org/0-miroslav-zdravkovic/registrovana-putnicka-vozila-u-srbiji-i-u-evropi-2002-2019/

Casa Transports. 2017. *Projet de la ligna T2 du Tramway de Casablanca. Etude d'impact Environnemental et Social*. Casablanca, Casa Transports, SA. www.eib.org/attachments/registerers/75035190.pdf

Access to public transport

UN Habitat. 2022. Urban Transport. In: *UN Habitat Urban Indicators Database*. Nairobi. [Cited 7 February 2024.] <https://data.unhabitat.org/pages/urban-transport>

World Bank. 2016. *Sustainable Urban Transport for Kyiv. Towards a Sustainable and Competitive City Built Upon the Legacy System and Innovations*. Washington, DC, World Bank. <https://documents1.worldbank.org/curated/en/640531472066198963/pdf/107108-REVISED-PUBLIC-Sustainable-Urban-Transport-for-Kyiv-June-27-2016-REV.pdf>

Per capita CO2 emissions for the whole economy

Moran, D, Kanemoto, K., Jiborn, M. Wood, R., Többen, J. & Seto, K. C. 2018. Carbon footprints of 13 000 cities. *Environmental Research Letters*, 13(6): 064041. <https://iopscience.iop.org/article/10.1088/1748-9326/aac72a>



Building resilience in urban food logistics systems by the FAO Investment Centre explores the transformative impact of recent global disruptions on urban food logistics. Set against the backdrop of the COVID-19 pandemic and geopolitical tensions, this report addresses critical challenges such as supply chain resilience, evolving consumer demand, and the need for sustainable infrastructure. It presents best practices and trends in municipal investments and regulatory measures, aimed at enhancing food security in urban areas. Through in-depth case studies and actionable policy recommendations, this comprehensive analysis offers a roadmap for urban authorities, policymakers, and stakeholders to navigate and improve the future of urban food logistics, ensuring resilient and sustainable food systems for growing urban populations. This publication is part of the Directions in Investment series under the FAO Investment Centre's Knowledge for Investment (K4I) programme.

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