



EcoLogistics in East Asia

The frontier for
sustainable urban mobility

Authors:

Sin Yi Beatrice Chng, Senior Officer,
ICLEI World Secretariat, Bonn, Germany
Hyungrim Suh, Senior Officer, ICLEI East
Asia Secretariat, Seoul, South Korea
Professor Zhifang Yin, Assistant
Director, China Academy of
Transportation Sciences, Beijing, China

30 June 2021

Contents

Introduction	2
ICLEI's EcoLogistics Framework: Drivers for sustainable urban logistics	4
Taoyuan City: Mainstreaming EcoLogistics development through demonstration projects and long-term planning	6
Seoul Metropolitan Government: Environmentally-friendly, smart and equitable logistics after the pandemic	14
Suzhou Municipal Government: Efficient and environmentally-friendly urban logistics system	24
What policymakers can do to facilitate sustainable and efficient EcoLogistics	30
Outlook to the future: Trends and a case for sustainable urban logistics	32
Key takeaways for policymakers	33





Introduction

Asia is home to about four billion people accounting for almost 60 percent (%) of the world's population. The process of urbanization in East Asia is strongly linked to economic transition. These urban economies are hubs for investments, innovations, competitiveness and are the backbone for the national economies. By 2050, 96% of urban growth will occur in East Asia's less developed regions, particularly in China, with 255 million new urbanites. The new urban centers will see the sharpest increase in carbon emissions corresponding to the burgeoning demand from new consumers for goods and services. The increased demand for goods and service trading will require excellent logistics hubs and infrastructure.

EcoLogistics: The missing link in sustainable urban mobility

Freight movement is intrinsically linked to East Asian cities' economic development, but most East Asian cities do not proactively plan and integrate logistics and freight into sustainable mobility planning. The transport sector accounts for more than 40% of total energy use and greenhouse gas emissions (GHG) in Asia. According to the International Transport Forum (ITF 2017), the ton-kilometers from surface freight will increase by 261% from 2015 to 2050, accounting for more than two-thirds of surface freight globally. Chinese carriers handled more than 29% of the total freight traffic in the East Asian region and registered a growth of 8.3% in 2018 (ESCARP 2015¹), which is projected to continue growing. The East Asian cities maintain the busiest ports and international airports worldwide, such as Taoyuan International Airport, Incheon International Airport, and Shanghai Pudong Airport.

Freight transport is still generally propelled by oil-based engines led by the private sector. However, sustainable passenger transport shows much progress in East Asian cities with various exemplary examples of investment in electric mobility, active mobility, and efficient public transport network. Globally, freight emissions account for 40% of the 23% transport emissions. Road freight transport in Asia is expected to increase a staggering percentage (645%) from 2000 to 2050 compared to 241% globally. Therefore, without addressing freight transport in cities, cities cannot achieve the Paris Agreement and Sustainable Development Goals (SDGs).

The rise of e-commerce economies and digitalization will exacerbate freight transport's externalities, such as low air and noise quality in cities; traffic congestion and road accidents; and public space competition with other road users, which compromise the livability of a city. The impacts influence different spheres of societies and stakeholders with different aspirations that can be paradoxical. The urban fabric will be further disrupted with the rise of the e-commerce market and digitalization rate and will radically transform consumer behavior and business models. The digital transaction increased in Korea during the COVID-19 period, which raised health and safety concerns from overworked delivery drivers. Despite the need to regulate this sector, many laws and regulations are still outdated. For example, Taiwan bans cargo bikes on the road.

This paper will explore the following, drawing learnings from three East Asian cities, one of the most vibrant regions globally:

- How trends and innovations shape urban freight?
- How can local governments plan for a sustainable urban logistics system?
- What regulatory and institutional environment required for cities to plan for sustainable logistics?

The case studies will present and analyze the logistics situation, policies and institutional framework, strategies, and challenges of three East Asian cities, namely Taoyuan City, Seoul Metropolitan and Suzhou City. This study is collected through desktop research, interviews with city representatives, city policy documents, and open-source data.

1 World Bank. 2015. East Asia's Changing Urban Landscape: Measuring a Decade of Spatial Growth. Urban Development Series.

Washington, DC: World Bank. doi: 10.1596/978-1-4648-0363-5. License: Creative Commons Attribution CC BY 3.0 IGO



ICLEI's EcoLogistics Framework: Drivers for sustainable urban logistics

Sustainability as policy goals

Most of the efforts to improve logistics performance are centered around optimizing delivery efficiency, reliability, and profitability. Even in France, sustainable passenger mobility is 30 years ahead of sustainable logistics planning². However, the case is clear: without incorporating the sustainability considerations, higher freight volumes will disrupt the urban fabric, aggravate the negative impacts, and affect local communities' livability. The three pillars of sustainability must be considered.

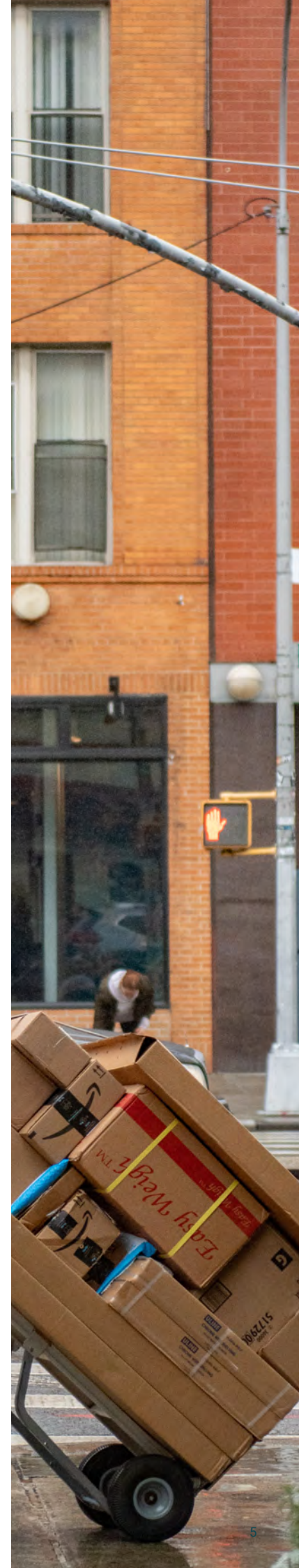
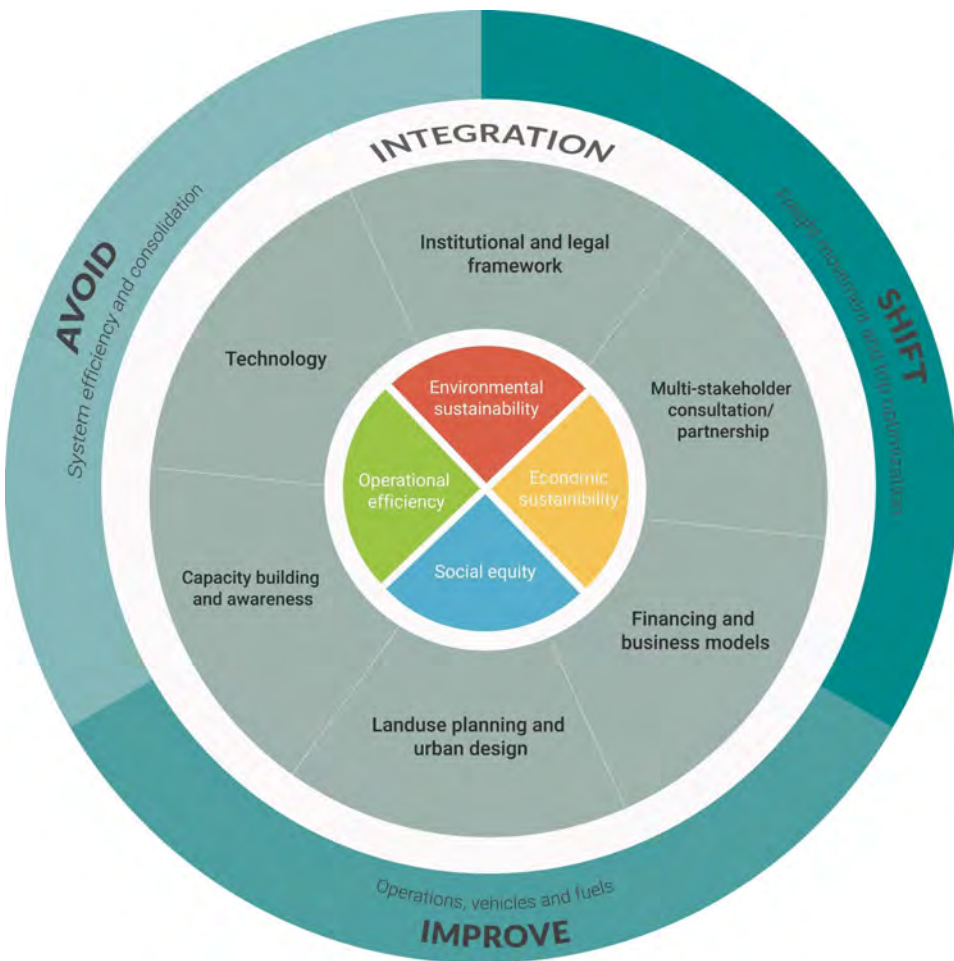
ICLEI's EcoLogistics Framework outlines four policy goals that balance the interests of different stakeholders while achieving the city's overarching goal in sustainability:

- **Environmental sustainability** refers to reduced air and noise pollution, GHG emissions, energy consumption from freight operations
- **Social equity** ensures safety, public participation in city policies, and overall quality of life of the local communities to minimize disturbances to the communities resulting from logistics operations
- **Economic sustainability** maintains the economic competitiveness of the city and addresses energy efficiency and overall freight sector efficiency and affordability
- **Operational efficiency** is a coefficient of delivery productivity (e.g., average payload), utilization (e.g., fleet), and reliability (e.g., timeliness).

² Patier D. and Routhier J.L. 2020. Urban Logistics in the light of sustainable development: still a long way to go. Lyon, France. DOI: 10.1016/j.trpro.2020.03.168

The Avoid-Shift-Improve-Integrate (ASII) strategies

How can cities manage and plan for sustainable urban logistics to achieve the four policy goals? The Avoid-Shift-Improve approach is common in the transport sector. In addition to the ASI approach, integration is vital to enable the sustainable urban logistics system's useful and practical transformation. Therefore, ICLEI adopts the ASII strategies in categorizing strategies and intervention measures, namely the Avoid-Shift-Improve-Integration, as there are cross-cutting strategies in nature and pivotal in framing the institutional and innovation conditions.





TAOYUAN CITY

Mainstreaming EcoLogistics development through demonstration projects and long-term planning

Governing institution : EcoLogistics Community Chair office

Population | 2,254,363 inhabitants (2020)
Population Density | 1,900 inhabitants/km²

Logistics situation

In Taiwan, the logistics industry is a 971.9 billion New Taiwanese Dollar (NTD, about 28.2 billion euros) industry (2016), of which road-based freight's share is 19.17%, second to only air logistics 19.27%. Located in the northwestern part of the island, Taoyuan city has an industrial value of 84 billion euros (17.5% of the Gross Domestic Product (GDP), Taoyuan houses the largest industrial park attracting many young and highly educated populations. The economic system's backbone is a vital logistics hub and network that supports the electronic and medical industries. Taoyuan is home to 1,800 logistics operators, including international enterprises such as UPS, FedEx. Trucking represents almost 50% of the share and another 10% auxiliary service supporting it, while water logistics represents 70% of Taiwan's share³.

3 Taoyuan City 2018. Assessment of the logistics industry in Taoyuan

The city houses one of the largest and busiest airports for passenger and freight transport in East Asia, known as the Taoyuan International Airport. Other significant transport infrastructure includes the intra-city highway network, intercity corridors, an elaborate railway system, and an existing industrial (Taipei) port nearby. Taking full advantage of Taoyuan's industrial resources and transport infrastructure, it forms the logistic system's backbone.

E-commerce market and policy

Fueled by digitalization and smartphone penetration (92%), the e-commerce market in Taiwan is a 38.92-billion-dollar industry with a five-year growth rate of an average of 7%. In 2019, it had the highest percentage of online shoppers in Asia at 65.2%. About 24 billion NTD (69 million Euro) of the online transaction was made in 2019 for the IT system, food, and tobacco. The expectations for quick delivery and high-quality products continue to increase the demand for sourcing products and services, particularly from China (72.7%), Japan (40.1%), and the United States (22.9%), where Taoyuan city is the main port of entry for imported and exported goods. The cross-border e-commerce retailing per capita is about 445 Euro in 2017, a 6% increase from 2016⁴.

4 Export Gov. 11 Aug 2019. Taiwan – e-commerce. Retrieve from <https://www.export.gov/apex/article2?id=Taiwan-ecommerce>

Due to the rising popularity, an ecosystem evolved for online retailing provided by third-party logistics providers servicing B2B and B2C platforms. The Electronic Signature Act 2001 is promulgated to govern the e-commerce industry and protect consumers. However, local regulation and management are weaker as individuals' proliferation, and smaller drivers are difficult to regulate. The leading market players are shippers, brand owners, and the e-commerce platform. Most of the online sellers are small-scale provid-

ers (81.6%), capitalizing on the two largest platform providers, PChome and Momo, headquartered in Taoyuan.

Distribution channels have also varied to accommodate different consumer lifestyles. Convenience stores (7-eleven, Family Mart) are abundant in Taoyuan, available in every nook and corner, are used as pick-up ports. Besides home deliveries, consumers can pick up their deliveries at these stores 24/7.

5 Ministry of Economic Affairs
2020. Financial report 2020

Due to COVID-19, online retail sales between January to June grew by 17.5% in 2020 (NTD158.8 billion, 46 billion Euro⁵) compared to 2019. The surge in online shopping caused by the COVID19 created new partnerships to enhance consumers' convenience further. Food panda and Family Mart recently formed a partnership to deliver goods directly to the consumers' doorstep. Meanwhile, the new alliances between 7-eleven and Chunghwa Post, the national post station, also allow consumers to drop off and pick-up postages from the convenience stores, functioning as a quasi-post office.

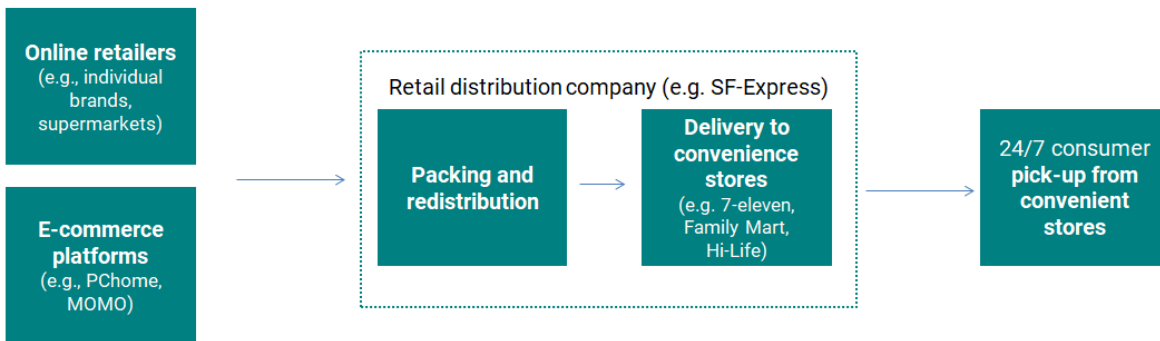


Figure 1: Distribution channel from online retailers to end consumers

The impact of e-commerce is more than just a logistics issue as it impacts the urban environment and properties. The rise of e-commerce risks increased traffic loads at distribution areas, occupying limited urban space, and traffic congestion. The externalities' social costs are often not accounted for as consumers demand and expect "cheap and fast" deliveries and free return if the goods are not suitable. The logistics system is large carbon-based. The transport sector accounts for 12.5% of 30.84 million tons of CO2 equivalent in Taoyuan (2016).

Strategies to improve EcoLogistics in Taoyuan

The municipality enacted the 2017 Autonomous regulations to develop Taoyuan City as low carbon emission and green city (LCGC). The initiatives focus on decarbonizing the transport infrastructure, improving air quality, and recycling materials for road construction. Responsibilities for freight management and planning are diffused to different city departments as there was no central and coordinated department to manage the logistics system until 2019. An overview of the preliminary strategies is described below.

Taiwan Logistics Alliance (Economic Development Bureau)

The Green Alliance, established in 2016, aims to improve freight partnerships and consists mainly of private companies and stakeholders. The City's Alliance is formed and represents the logistics operators and private sector to enhance partnerships, share resources, and communicate with the city for troubleshooting and long-term planning.

Air quality protection zone (Environmental Bureau)

A voluntary labeling system is established to inspect and rate diesel vehicles. Polluting vehicles are prohibited from entering the air quality protection zone (or low emission zone). There are two certified plants in Taoyuan (Swire Commercial Vehicles Zhongli Plant and Yongdefu Automobile Pingzhen Plant) to inspect and issue the labels. As of July 2019, 1,672 units have failed inspection.

The regulation prohibits vehicles at parking lots, roads (excluding expressways), and transfer station from idling for more than three minutes. This does not include freezer and refrigerated trucks during loading/unloading operations.

Incentives and subsidies (Economic Development Bureau)

Under the Taoyuan City Service Industry, Smart Power Adoption and Green Transportation program subsidizes the businesses to invest in high-efficiency electric vehicles certified by the Ministry of Economic Affairs. The LCGC Implementation Plan allocates subsidies to replace two-stroke vehicles and incentivize electric two-wheelers.

On-street loading unloading (Urban Planning Department)

Centralized planning layout for loading/unloading is done to increase loading turnover and improved safety. To meet the loading/unloading demand, dual-use public parking lots and transfer stations are established to collect and redistribute freight. The lack of warehousing space and redistribution space due to the high land cost and regulatory prohibitions result in illegal warehouses' proliferation.

If the land zone is changed for transportation land use, it is mandated to provide a portion of the space for freight purposes.

Living labs and demonstration projects

Against this background of increasing freight demand driven by e-commerce and the need to have a coherent and cross-departmental approach in addressing freight issues as

part of the transport decarbonization strategy, the city decided to establish the EcoLogistics Community Chair Office since 2019. The office was set up with representatives from different city departments, a concerted effort to implement pilot projects and strategic long-term EcoLogistics planning. In the past, there is no department in charge of logistics except for the Taiwan Logistics Alliance, an independent partnership program. One of mandates is to pioneer demonstration projects. Living labs and demonstration projects are useful for cities to test innovative solutions and the potential for scalability and replication. The EcoLogistics Community Chair office is piloting five demonstration projects in Taoyuan. Simultaneously, a series of workshops and consultations with the stakeholders are held to collectively set vision and objectives for the long-term Sustainable Urban Logistics Plan.

An overview of the demonstration projects is presented in Figure 2. Through the ongoing demonstration projects (2020 – 2021), the city can proactively identify and collaborate with the stakeholders in data collection and facilitate conversations for resource sharing among logistics providers. Most of them focus on streamlining and automation of the warehousing and distribution process; developing renewable energy (wind and solar energy) to power the consolidation center or the warehouse; building stakeholder alliances for resource sharing and collaboration; and creating self-labeling tool. The tool aims to incentivize low emission and electric vehicles; and optimizing warehousing process.



Figure 2: Demonstration projects in Taoyuan City as part of the EcoLogistics Community

Daxi commercial district: Efficient and low emission last-mile delivery

Daxi is a vibrant district of historical and commercial importance. The small alleyways are filled with shophouses and tourist activities. The city held a series of consultations with the logistics providers (e.g., HCT Logistics, Kerry Logistics) and the shop owners. The needs assessment highlighted that the commercial and private vehicles collide with the pedestrians in the small and congested alleyways, making loading and unloading challenges.

As a result, the demonstration package includes the following improvements:

- Establishment of a solar-powered consolidation center at the periphery of the Daxi district to collect incoming shipments from more giant trucks and redistribute with small electric scooters
- Demarcation of a silent and low-speed zone that only allows electric scooters, giving priorities to pedestrians and cyclists to also ensure safety
- Adoption of automated technology within the consolidation center and warehousing for more efficient storage and delivery
- Collaboration with convenience store owners to set up smart lockers around the districts

In the process of implementing these demonstration projects, some of the fundamental challenges were highlighted. The national regulation forbids cargo bikes from using the street space. Therefore, the city can only resort to electric scooters. Warehousing is an insignificant shortage, with many illegal warehouses on abandoned agricultural land. There are discussions on converting agrarian land for transportation services, including space for logistics activities to avoid unlawful warehouses. Lastly, data sensitivity issue makes it hard for the city to enforce data sharing and collection for better planning.

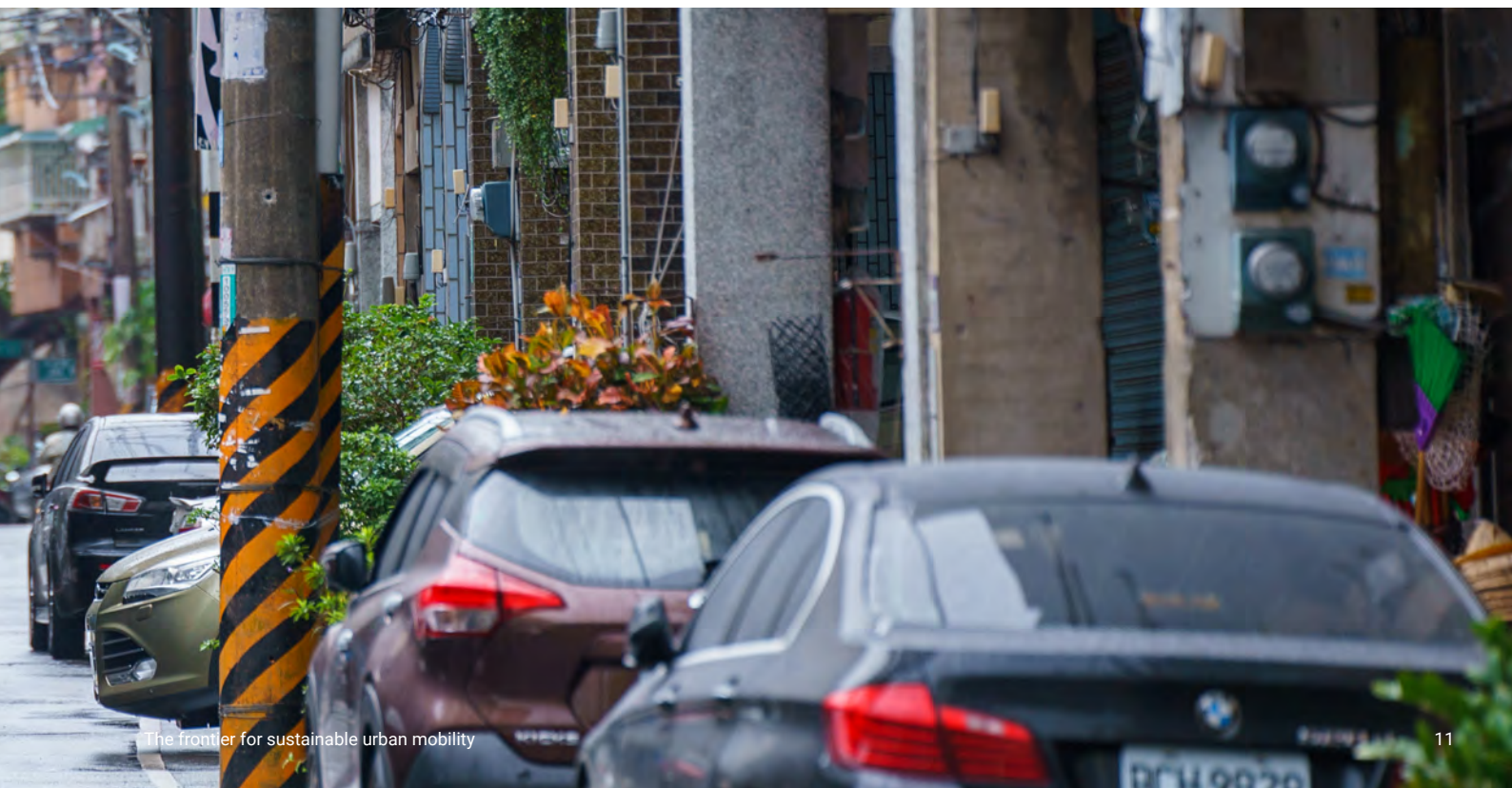


Observations and recommendation

Just as in many Asian cities, there is no single authority to govern logistics issues and leave the private sectors to self-regulate. The establishment of the EcoLogistics office in Taoyuan supported the city to be more systematic in data assessment and implement demonstration projects. Some learning for other local governments is as follows:

- Urban freight delivery is efficient and convenient but strengthening sustainability goals is fundamental to achieve climate goals and improve livability.
- Fueled by COVID-19 and changing consumer behavior, the e-commerce trend will continue to accelerate and disrupt the current supply chain. Future requirements for urban logistics facilities and capacity will be different from today, but actions must be taken to ensure sustainable development.
- The legal and regulatory framework needs to be up-to-date and favorable to innovations and sustainable development. EcoLogistics must be a high priority in the local and regional political agenda for long-term urban and EcoLogistics planning.
- Multi-stakeholder partnerships can be enabled if stakeholders look beyond the present boundary and interests and search for solutions through collaboration and resource-sharing.

Demonstration projects are excellent for cities with little experience to test solutions, connect with different stakeholders for replication, scalability, and long-term transformation.



Daxi commercial district: Efficient and low emission last-mile delivery

Daxi is a vibrant district of historical and commercial importance. The small alleyways are filled with shophouses and tourist activities. The city held a series of consultations with the logistics providers (e.g., HCT Logistics, Kerry Logistics) and the shop owners. The needs assessment highlighted that the commercial and private vehicles collide with the pedestrians in the small and congested alleyways, making loading and unloading challenges.

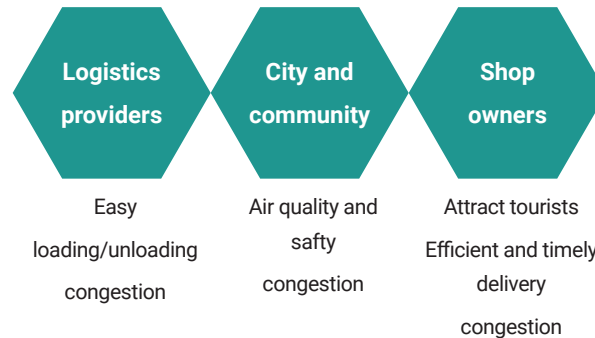


Figure 3: Interests of different stakeholders in Daxi

As a result, the demonstration package includes the following improvements:

- Establishment of a solar-powered consolidation center at the periphery of the Daxi district to collect incoming shipments from more giant trucks and redistribute with small electric scooters
- Demarcation of a silent and low-speed zone that only allows electric scooters, giving priorities to pedestrians and cyclists to also ensure safety
- Adoption of automated technology within the consolidation center and warehousing for more efficient storage and delivery
- Collaboration with convenience store owners to set up smart lockers around the districts

In the process of implementing these demonstration projects, some of the fundamental challenges were highlighted. The national regulation forbids cargo bikes from using the street space. Therefore, the city can only resort to electric scooters. Warehousing is an insignificant shortage, with many illegal warehouses on abandoned agricultural land. There are discussions on converting agrarian land for transportation services, including space for logistics activities to avoid unlawful warehouses. Lastly, data sensitivity issue makes it hard for the city to enforce data sharing and collection for better planning.

Observations and recommendation

Just as in many Asian cities, there is no single authority to govern logistics issues and leave the private sectors to self-regulate. The establishment of the EcoLogistics office in Taoyuan supported the city to be more systematic in data assessment and implement demonstration projects. Some learning for other local governments is as follows:

- Urban freight delivery is efficient and convenient but strengthening sustainability goals is fundamental to achieve climate goals and improve livability.
- Fueled by COVID-19 and changing consumer behavior, the e-commerce trend will continue to accelerate and disrupt the current supply chain. Future requirements for urban logistics facilities and capacity will be different from today, but actions must be taken to ensure sustainable development.
- The legal and regulatory framework needs to be up-to-date and favorable to innovations and sustainable development. EcoLogistics must be a high priority in the local and regional political agenda for long-term urban and EcoLogistics planning.
- Multi-stakeholder partnerships can be enabled if stakeholders look beyond the present boundary and interests and search for solutions through collaboration and resource-sharing.
- Demonstration projects are excellent for cities with little experience to test solutions, connect with different stakeholders for replication, scalability, and long-term transformation.



SEOUL METROPOLITAN GOVERNMENT

Environmentally-friendly, smart, and equitable logistics after the pandemic

Governing institution : City Transportation Office

Population | 10,013,781 inhabitants (2020)

Population Density | 16,000 inhabitants/km²

Logistics in Korea at a glance

6 The Act on Development of Life-Logistics Service Industry Bill (#2104473) refers life logistics as the act of delivering small-sized goods through a system procedure such as collecting, packaging, storing, classifying etc. by using information technology at the request of consumers.

7 Life Logistics Statistics. 2020. Nlic.go.kr. Retrieved from: <https://www.nlic.go.kr/nlic/parcelServiceSales.action>

8 Life Logistics Statistics. 2020. Nlic.go.kr. Retrieved from: <https://www.nlic.go.kr/nlic/parcelServiceLogistics.action>

9 Legislator Kang Joon Hyun. 2020. Number of parcel delivery increased to a maximum. Retrieved from here

10 MOLIT Statistics. 2018. Retrieved from here

South Korea ranks as one of the largest trading countries and hosts the fifth-biggest e-commerce industry globally. Logistics and freight have long played an integral role in leading the country's economic development and molding online and offline infrastructure. Even before this year's pandemic, online shopping, express delivery services (3-hr and the next morning services), 24/7 food delivery platforms and the number of single households have grown so much in the last five years in the country that the nation's key logistics sector 'life logistics'⁶—mainly B2C, C2C, M2C — had an average annual growth of 10%⁷ in profit and 11%⁸ in the number of cases between 2015-2019, according to the National Logistics Information Centre (NLIC).

The advent of a pandemic in 2020 boosted e-commerce sales. In 2019, the life logistics sector alone was a 5.8 billion USD industry with 2.79 billion deliveries. Catalyzed by the pandemic, the demand increased by 18% between January and September 2020 compared to 2019.⁹

Growth of the logistics industry brings positive impacts in terms of digitalization and domestic economic development. However, the lack of sustainable infrastructure to accommodate this rapid expansion surface new challenges and exacerbate current urban problems, such as air pollution, greenhouse gas emissions, packaging waste, traffic jams, general public safety, lack of urban area hubs. Seoul and its Metropolitan Area house over 50% of the national population, where 41% of the country's logistic traffic occurs¹⁰. The speed of current urban development is challenging to keep up with the change of goods transportation, thus requiring immediate systematic changes to ensure residents' well-being and sustainable and equitable development. Hence, understanding the current urban logistics issues in this area and strategizing their policies to align the residents' needs, market and environment could be a pioneering move to set and lead other metropolises and the central government's direction logistics and to reduce GHGs.

This case study focuses on Seoul, the capital city of South Korea, a leading advocate for changing the nation's policy. This brief aims to capture the current logistics situation and provide insight into its policy toward sustainable development.

Legal framework and policy

As logistics is a crucial enabler for driving the nation's economy, there are several legislations and policies at both the national and local levels to protect and promote the industry. The first key law to be introduced is the Framework Act on Logistics Policies, which prescribes fundamental matter concerning logistics, including the importance of EcoLogistics and requires the national and local governments to formulate a Masterplan. Following suit, the Seoul Metropolitan Government (SMG) developed the 2018-2027 Masterplan, focusing on (1) the development of city logistics hubs by using effective IT technology and eco-friendly resources; and (2) the strengthening of citizens' support and engagement in the overall offline logistics system establishment. The Plan also explores proactive utilization of the existing metro system for a sustainable life-logistics system. However, as this Plan covers the general logistics and transportation agenda, the sustainability elements are rather sporadically presented, which could be improved in the next Plan.

The Sustainable Transportation Logistics Development Act ("Act") explicitly addresses climate change, energy crisis, and environmental protection while contributing to the national economy. However, as sustainability was a relatively new concept when the Act was introduced in 2009, the National Basic Plan for Sustainable Transport-Logistics Development ("Plan") was general and diluted. For example, the 2012 Plan's GHG targets on transportation were not well-aligned with reality. Until now, the transportation-related emissions are more aligned to the business-as-usual (BAU) projected than the Plan aimed to achieve. Besides, when the first Local Plan was to be submitted, the local governments could use its existing transportation master plan (which was also Seoul's case), so the Sustainable Transportation Logistics Development Act could not be effectively exercised.

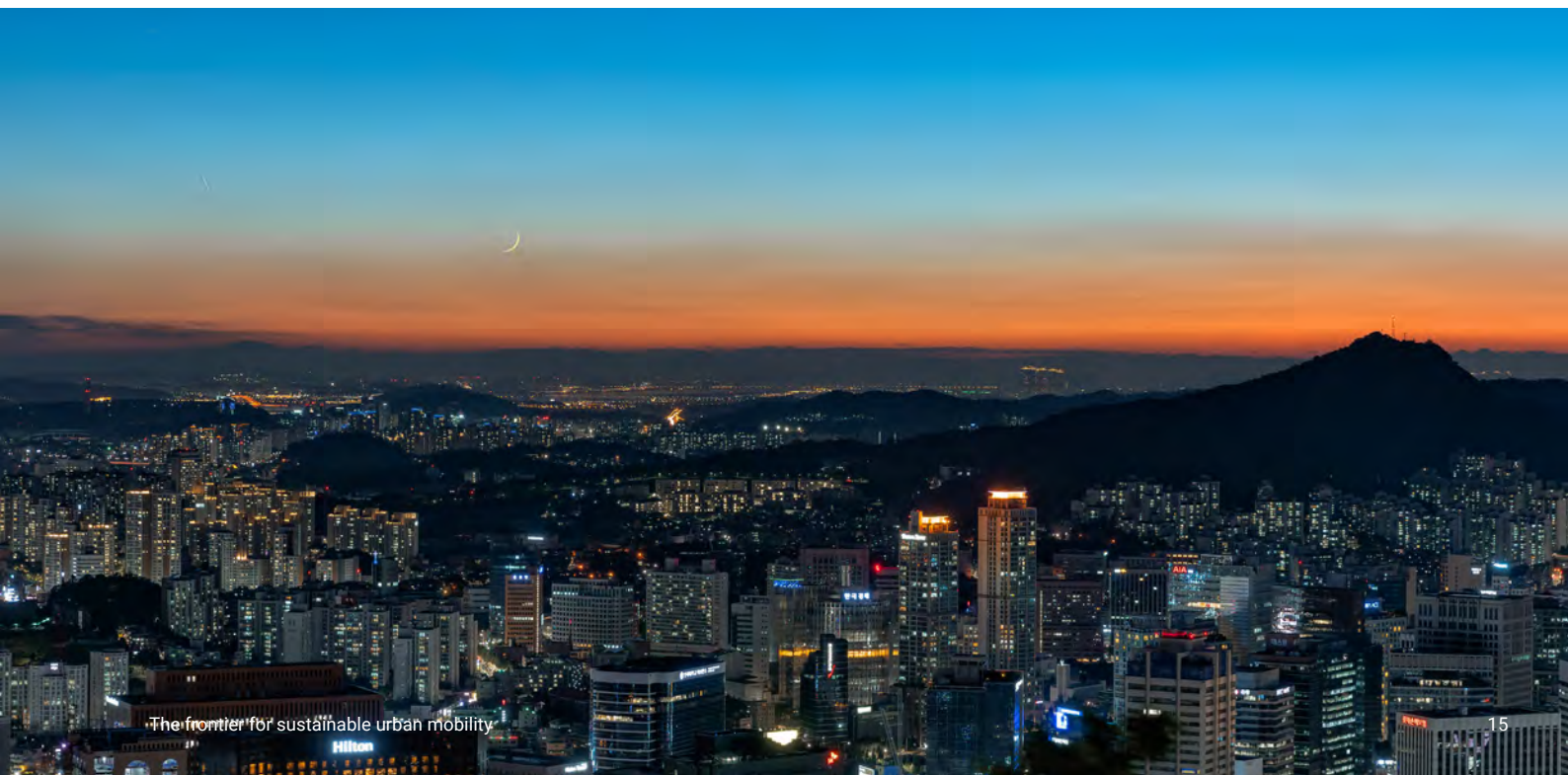


Table 1: Logistics Laws and Regulations of Korea and related Master Plans by ICLEI

Key Logistics Laws	Related Master Plan (National)	Related Master Plan (Local – e.g. Seoul)
Framework Act on Logistics Policies	National Logistics Basic Plan (2016-2025) *New Plan to be released in 2021	Local Logistics Basic Plan (2018-2027)
	Both Plans are drafted every five years covering the next ten years; sub-plans are released annually.	
Sustainable Transportation Logistics Development Act	National Basic Plan for Sustainable Transport-Logistics Development (2012-2021) * New Plan to be released in 2021	Local Plan for Sustainable Transport-Logistics Development (2012-2021)
	Both Plans are drafted every ten years covering the next ten years; only the population of 100,000 or more are required to establish the Local Plan.	
Act on Development and Management of Logistics Facilities	Comprehensive Plans for Development of Logistics Facilities	N/A

	New Deal (2020-2030)	Seoul's Green New Deal (2020-2030)
<p><i>There are other related regulations, such as the Act on the Allocation and Trading of Greenhouse Gas Emission Permits, the National Transport System Efficiency Act, Trucking Transport Business Act, Urban Railroad Act, Railroad Logistics Industry Development and Support Act, Road Act, Passenger Transport Service Act, Clean Air Conservation Act and ratifications of new legislations, for example, the Act on Development of Life-Logistics Service Industry is now under review</i></p>		

Despite the relatively unambitious movement toward EcoLogistics in the last decade, 2020 seems to be a momentous year to shift sustainable logistics to the next level. First, COVID-19 boosted the residents' online shopping usage and reshaped the retail and logistics industries. Second, both Seoul and the national government announced their Green New Deals in July 2020, committing to the efficient and eco-friendly transportation of goods. In particular, the National New Deal selected logistics as one of its 28 program areas and set a specific target to reduce the GHG emissions by 15%. This also means that there will be several rounds of consultations amongst stakeholders to draft implementations until next year for sustainable and smart logistics. Third, the National (Local) Plan for Sustainable Transport-Logistics Development, the master plan for EcoLogistics, will adapt the above changes and the logistics workers' working environment's rising issues. Hence, drawing from the current societal and political dialogues, reshaping the logistics industry into a more sustainable way is inevitable and should be immediate to sustain a resilient and competitive logistics industry. As the following section demonstrates, policy-makers' attention to sustainable transportation and logistics plans seems to have grown significantly to find solutions to meet this trend both at the local and national levels.

Highlights of Seoul's efforts for EcoLogistics & Green transportation

Between 2010 and 2018, logistics emitted an average of 53,965 Gg CO₂eq annually, contributing to over 33% of Seoul's GHG emissions every year¹¹. Air pollution caused by transportation has long been a challenge to the city, compelling the capital to announce the 'emergency response to air pollution' in 2018 with strict measures to combat it. Therefore, creating sustainable logistics and transportation plans have always been a critical priority to ensure the residents' well-being and protect the city from environmental threats that may also cause economic downfalls. Thus, with one-fifth of the city's national population, Seoul has decided to strategically focus on reshaping the transportation system (including households' passenger cars) and pedestrian-friendly roads and encouraged the logistics industry to adapt to the city's transportation/logistics plan. Below are a few examples of successful policy implementations led by the SMG and other movements initiated by different sectors.

Policy Approach 1:

Introduction of Low-Emission Zone and Green Transportation Zone (led by SMG)

Since 2017, SMG banned low-grade vehicles – a total of 400,000 nationally and 100,000 within Seoul – from driving in Seoul, considered the Low Emission Zones (LEZ) during severe air pollution episodes for emission control and public health¹². Since 2018, the LEZ has been extended to other adjacent local governments – Gyeonggi Province and Incheon Metropolitan City – to collectively control the impact of emissions and air pollution in the metro area. According to the SMG's internal report, the combination of the LEZ, the responsive EMRAP announcements, both decisions are made daily in events of heavy pollution; as well as regional partnerships allowed the metropolitan area to reduce Grade 5 vehicles (old diesel vehicles) by 19% during heavy pollution days¹³.



Figure 4: Green Traffic Zone of Seoul (Source from AURUM 2017)

Furthermore, Seoul designated the Seoul City Wall's inner area as the Green Transportation Zones (GTZ) in March 2017 and built an ICT system restructuring roads and limiting Grade 5 vehicles' operation in congested areas on weekdays from 6 am to 9 pm. The SMG offered financial support for residents living in the GTZ and work-related vehicle owners to upgrade their vehicles' pollutant reduction device. The effort reduced the number of Grade 5 vehicles with a diesel particulate filter (DPF) by 41.6% and the Grade 5 vehicles without a filter by 68.9% compared to the pre-implementation phase (before 2019)¹⁴.

11 Greenhouse Gas Inventory and Research Center of the Ministry of Environment of Korea. Local GHG inventory (1990 – 2018). Retrieved from: <http://www.gir.go.kr/home/board/read.do?pagerOffset=0&maxPageItems=10&maxIndexPages=10&searchKey=&searchValue=&menuId=36&boardId=52&boardMasterId=2&boardCategoryId=>

12 Climate and Environment Headquarters, 2020. Basic Document of Seoul's Climate and Environment Policy For Bilateral Report. 단일보고서 작성을 위한 서울시 기후환경 정책 기초 자료. Seoul: Seoul Metropolitan Government.

13 Ibid.

14 Ibid.

Policy Approach 2:

Subsidies for Environmentally Friendly Vehicles (led by SMG)

Electric Vehicles

Seoul started deploying electric vehicles (EVs) in 2009. By the end of 2019, a total of 20,083 electric cars and two-wheeled vehicles were deployed¹⁵. As part of the mayor's pledge during the election in 2018, the SMG now targets the deployment of 80,000 electric vehicles by 2020, which accounts for 17% of the central government's goal of 480,000 electric vehicle deployments. In the public transportation sector, electric taxis and city buses were piloted in 2018, and there has been a significant increase, as seen in Table 2¹⁶.

Table 2: Electric vehicle numbers in the public transportation sector in Seoul provided by SMG

EV Type	2018	2019	2020
Taxis	100	417	Aiming for 80,000 of more electric vehicles in the city including individuals' cars (17% of the national target, 480,000).
City Buses	29	89	
Trucks	2	451	
2-wheeled	511	3384	

Further, for businesses, the SMG also suggested 16 January 2019 to the central government to add a new tax exemption clause when a passenger vehicle transportation business purchases EV or HV to use them for business purposes directly. The central government accepted the recommendation and enacted the updated Article 70, Paragraph 4 of the Local Tax Exemption Restriction Act created on 15 January 2020, which allows acquisition tax waiver for these businesses.

Seoul allocated its budget for deploying electric cars alongside the financial support of the central government. In particular, electric trucks' subsidies have been exceptionally robust, allowing lower price than comparable diesel trucks through Seoul and the central government's subsidies. Seoul also provides fast tracks for receiving a transportation business license.

Hydrogen vehicles

Seoul plans to establish hydrogen fueling stations and, based on such facilities, aims to convert commercial vehicles in the transportation sector such as taxis and buses to run on hydrogen. The capital city provides purchase subsidies as well as an array of tax reduction benefits similar to EV. While the private sector is encouraged to apply for subsidies, the city also puts more responsibility by requesting to fulfill two years of an obligatory driving period for the industry's actual transition.

15 Climate and Environmental Headquarters, op. cit.

16 Ibid.

Partnership Approach 1:
Excavating New Logistics System in City via Seoul Metro
(led by Seoul Metro Corporation)

Since 2017, the SMG has been researching to establish the logistics system tailored to Seoul and develop the subway infrastructure's alternative use for logistics. Despite the efforts, the logistics facilities and businesses cannot be advanced due to the national laws categorizing the train facilities as restricted development areas. With Seoul's support, Metro Corporation could amend and reshape the law partially.

To adapt to the city's concern and develop a new business model, the Seoul Metro Corporation, one of the chief subway operators owned by the SMG, partnered with a private logistics company, CJ Logistics, in 2017 implement a pilot. The pilot aims to assess further the subway infrastructure, such as train depots, stations, and passenger trains, to function as logistics hubs and a transport medium.

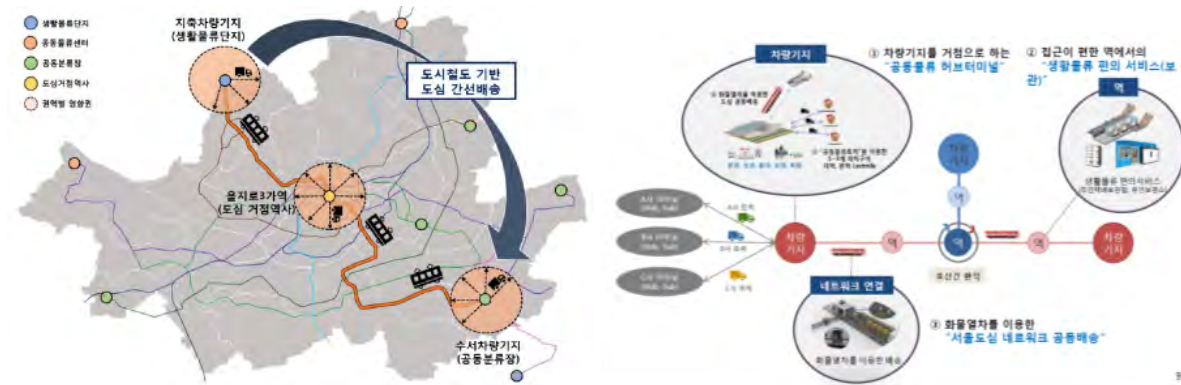


Figure 5: Concept Diagrams of Logistics Hubs and Goods Transportation via Subway System by Seoul Metro¹⁷

The results of the pilot program were shared by the Seoul Metro in 2019. It demonstrated successful goods transport using one coach on a subway train, resulting in reduced traffic jams and accidents, air pollution while securing important logistics hubs in the city center using train depots.

Due to the satisfactory pilot results and proactive partnership between SMG and Seoul Metro, the Ministry of Land, Infrastructure, and Transport announced the Life-Logistics Development Agenda in September 2020. The agenda permits train depots to use logistics hubs and its commitment to expand such hubs up to 10 by 2025¹⁸. Furthermore, Seoul Metro's existing logistics programs, such as pick-up lockers in subway stations and carrier delivery from city centers to airports, will be expanded.

17 Jang, K. of Seoul Metro, 2020. Establishing Seoul's Urban Logistics System by Utilizing Urban Railway Infrastructure.

18 Ministry of Land, Infrastructure, and Transportation, 2020. Life-Logistics Development Agenda. [online] Available at: <https://www.molit.go.kr/LCMS/DWN.jsp?fold=koreaNews/mobile/file&fileName=200924%2811%EC%8B%9C%EC%9D%B4%ED%9B%84%29%EC%83%9D%ED%99%9C%EB%AC%BC%EB%A5%98+%EB%B0%9C%EC%A0%84+%EB%B0%A9%EC%95%88+%EB%B0%9C%ED%91%9C%28%EB%AC%BC%EB%A5%98%EC%A0%95%EC%B1%85%EA%B3%BC%29.pdf>

Partnership Approach 2:
Bridging Investment Opportunities to Sustainable Logistics Business
(led by Seoul Investment Center)

While this is still a new concept to many local governments in South Korea, the SMG recently has established the Invest Seoul Center in February 2020 to draw foreign investment funds into ambitious start-ups to incubate sustainable businesses aligned with the city’s policy.

Interestingly, despite the unprecedented economic crisis caused by COVID-19, the SIC’s largest-ever investment success so far is with the logistics and food delivery company, Market Kurlly, securing \$150 million worth of global private investment fund in June 2020. The SMG played a significant role in this via the ISC, explicitly supporting its legal services to re-register as a foreign-invested firm for easier investment transactions. By selecting and promoting a logistics company that employs eco-friendly packaging and a socially responsible distribution chain, the SMG mainstreamed sustainable logistics aligned with the city’s policy. (Beyond the project level, the SMG seems to have shown a new governance model to other local governments how cities can implement their policies by effectively utilizing market resources).

Seoul always seeks creative solutions to boost the local economy and sustainable urban development. This case is an excellent win-win example where one of the fastest-growing grocery/logistics company has a breakthrough with Seoul’s help while meeting its policy ambition.

Private sector-led approach 1:
Eco-packaging (led by online shopping malls with inclusive logistics chains)



Figure 6: Sustainable Packaging by E-Commerce Companies—Kurlly, E-Mart, and Coupang— in Seoul (photos from each company’s website)

Unlike some other policies, logistics-related policy changes and project implementations require strong support from the market. This also means that no matter how great a policy is, it needs a strong endorsement from the private logistics companies to penetrate people’s lives and successfully integrate into the system. E-commerce giants in Seoul, which have their own logistics infrastructure, have started taking action to build more

sustainable logistics to meet residents' needs.

First, Market Kurly uses paper-based material for packaging and even picks up the used boxes at its next visit. It also partnered with eco-farms to create a sustainable business chain and expand within the sustainable market. For packaging, E-Mart and Coupang, which are more prominent players in e-commerce, opt for reusable eco-bags to reduce waste and pick up the next delivery bags. In addition, E-Mart, partnered with Hyundai Glovis, started using electric cars for cold-chain delivery in some areas in Seoul to expand its electric vehicle usage to reduce carbon footprint. The company was applauded for its automated logistics center management during COVID-19, which increased productivity without putting workers at risk.

Lastly, Coupang, which runs its fulfillment service, has recently signed a joint MOU with Hyundai Motors and the Ministry of Environment to replace their vehicles with hydrogen-fueled trucks. The company expects its pilot project to be co-beneficial to Hyundai Motor and Coupang to test environmentally friendly freight trucks and fine-tune its market competitiveness.

This year, Seoul has experienced significantly low COVID-19 cases compared to other mega-cities in the world despite its high population density. Many experts believe that the city's success owes much to the local e-commerce businesses and life-logistics companies for their reliable services to help residents access goods safely and without panic. While this seems right and both the public and the private sector have benefited from such mature infrastructure, there has been a blind spot—the delivery workers and drivers work long hours to fulfil the demand. Through welfare guidelines and education in logistics companies, local governments can provide a platform where the workers could openly communicate their concerns for improvement. If Seoul could indeed offer such a safety-net for those frontiers, the logistics industry would grow as an equitable industry that fulfils the true meaning of sustainable development in the city.



Observations and recommendation

The growth and maturation of the urban logistics system in Seoul has brought benefits to the city, especially during this global pandemic crisis. However, the industry’s rapid expansion also introduces the city to more environmental (e.g., air pollution, GHG emissions, noise) and social challenges (congested traffic, accidents, workers’ welfare) are also closely linked to the city’s economy. Seoul has actively explored creative solutions to these challenges, reflecting its commitment to establishing a sustainable logistics industry pathway. The following are key approaches in strategic policy planning and accelerate policy ambition.

Communicate	<ul style="list-style-type: none"> • Invite diverse stakeholders, such as private logistics companies, residents, and logistics workers to the city’s Logistics Policy Committee to understand the needs and concerns more effectively
Excavate	<ul style="list-style-type: none"> • Identify the missing ‘cob’ that may improve the urban logistics (through stakeholder meetings)—be a charging station for commercial electric vehicles or a temporary worker’s lounge for logistics workers in Seoul’s district office • Find synergetic partnerships in the market, such as logistics-power-vehicle industries, and bridge these actors’ sustainable cooperation • Research ideal locations, time, and resources in the existing urban infrastructure to efficiently accommodate EcoLogistics
Demonstrate	<ul style="list-style-type: none"> • Actively disclose its policy implementation process and findings to stakeholders for their participation and useful feedback • Demonstrate and promote successful EcoLogistics models to the public, other local governments, and related industries to effectively learn the lessons and reinforce the idea for better replication and further dissemination

With the New Deal policies of Seoul and Korea, the logistics will undergo a significant transformation to build a greener, more innovative, and people-centered industry in the next ten years. Having learned the city’s policy commitment and campaign efforts, it seems that Seoul has the capacity and commitment to realize the ambition and accelerate EcoLogistics to grow and immerse into the city’s sustainable development.





SUZHOU MUNICIPAL GOVERNMENT

Efficient and environmental-friendly urban logistics system

Governing institution :
Transport Department

Population | 10,013,781 inhabitants (2020)
Population Density | 16,000 inhabitants/km²

Background

Suzhou is a prefecture-level tourist city in Jiangsu Province, about 100 km northwest of Shanghai. It is also one of the major central cities in the Yangtze River Delta and a national high-tech industrial base. Suzhou's gross domestic product (GDP) hit 1,923.580 billion Chinese Yuan in 2019, ranking first in the province and sixth in the country. Its permanent resident population registered 10.75 million at the end of 2019, the largest in the region. With an urbanization rate of 77%, Suzhou is currently transitioning from a moderately urbanized society (61% to 75%) to a highly urbanized society (76% to 90%). New urban clusters appeared. A total of 3,840,400 people live in the urban areas of this city (Gusu, Wuzhong, Xiangcheng, and Wujiang Districts, as well as the Industrial Park and the High-tech Zone), according to Suzhou Urban Construction Yearbook. Urban construction and development keep gaining ground, with a built-up area of 477.63 km² and a construction land area of 476.2 km² by the end of 2019. A T-shaped urban spatial structure consisting of "one center, two districts and two clusters" has taken shape in the central urban area, including the main axis of east-west urban development and the secondary axis of north-south urban development. Given that the number of motor vehicles in Suzhou reached

4.28 million at the end of 2019, the resulting problems of urban traffic congestion and air pollution urgently need to be addressed.

Logistics development in Suzhou

The logistics industry has always been the lifeline and catalyst in urban development and regional economic cooperation for Suzhou, a central regional city in the Yangtze River Delta. With the rapid growth of e-commerce in recent years, the supporting role of logistics in economic development has become more apparent. Since 2012, the freight industry has been the backbone of the fast growth of Suzhou's economy. It paved the way for industrial transformation and innovation. Suzhou also improved the freight hub system, adopted information technology to tighten in-process and ex-post supervision, and adopted sustainable transport planning principles, such as multimodal transportation and car-free transportation. As urban and economic growth catches up, freight vehicles begin to find difficulties in entering the city, parking, loading and unloading due to urban road resource constraints and severe traffic congestion.

Innovative measures

In order to solve the problems of traffic congestion and air pollution in urban development, as well as difficulties facing freight vehicles, Suzhou Municipal People's Government has actively explored new measures and new experiences in the development of urban green logistics since 2018 by taking the opportunity of green logistics demonstration projects launched by the Ministry of Transportation and strived to build an intensive, efficient, green and smart urban logistics service system. In February 2019, Suzhou Municipal People's Government issued the Work Plan for Building Suzhou into a Green Logistics Model City. It introduced 24 measures for urban logistics optimization in three years, including node network construction, vehicle travel facilitation policy, promotion and application of standardized new energy vehicles, information sharing, and innovative organization models. The city will add at least 1,000 new energy vehicles and 50 temporary parking lots in the central urban area for urban logistics purposes.

To promote new energy vehicles in the field of logistics, Suzhou Municipal People's Government released the Measures on Awards and Subsidies for the Operation of Green Logistics Vehicles in Suzhou in October 2019. According to travel mileage, the regulation stipulated that the city will provide awards and subsidies to eligible green logistics vehicles. These vehicles are divided into four categories: (1) enclosed micro-trucks; (2) enclosed midsize trucks; (3) light vans; and (4) refrigerated trucks. Model enterprises of urban green logistics in Suzhou are entitled to maximum awards and subsidies of 8,000 Yuan (about 1,000 €); 12,000 Yuan (about 1,500 €); 20,000 Yuan (2,549 €); and 28,000 Yuan (3,565 €) per year for each vehicle, respectively.

The Suzhou Leading Group for Urban Green Logistics published the Measures on Recognition and Assessment of Model Enterprises of Urban Green Logistics in Suzhou to explain matters such as recognition rules, assessment criteria, and management measures.



Development effectiveness

Through a series of measures, Suzhou's urban logistics vehicle utilization efficiency has been raised by 21%, while urban logistics costs have been slashed by 12.6%.

Strategy 1:

Promote new energy logistics vehicles through cultivation of eco-friendly enterprises



As of November 2020, there are 22 model enterprises of urban green logistics with 2,446 new energy logistics vehicles, as a result of the subsidy support and cultivation from Suzhou Municipality. New energy vehicles grew by 5.3 times in logistics and represented 58.2% of the added and renewed operating logistics vehicles. The energy consumption per unit turnover of vehicles reduced by 19.2%.

Figure 7: Electric delivery vans in Suzhou

Strategy 2:

Focus on developing multimodal and efficient logistics to meet the different logistics demand and needs

The city encourages innovative organization models for urban logistics by supporting the development of advanced distribution models by enterprises, such as unified distribution, centralized distribution, and joint distribution. At present, 85.4% of supermarkets, stores, and chain stores in Suzhou's central urban area adopt the model of joint (night, centralized) distribution.

Diversified logistics models, such as leased logistics, cold chain logistics, and community logistics, are boosted to drive cost reduction and efficiency improvement of logistics and meet residents' personalized logistics needs. Everyone has access to better urban logistics services.

- **Leased logistics:** Since 2003, Suzhou began to explore freight leasing model for urban distribution. After years of development and improvement, leased logistics became an urban distribution organization model with Suzhou characteristics. With nearly 800 vehicles, it makes more than 7,000 tons of urban deliveries each day, representing the city's 15% of the total urban freight distribution volume. It is one of the leading carriers of urban distribution in Suzhou. Through new energy transformation and upgrading of freight rental capacity, it provides convenient right-of-way for freight taxis to deliver around-the-clock each day with the urban express roads to avoid peak traffic and improve urban efficiency distribution operations.

- **Cold chain logistics:** Suzhou implemented the “Opinions on Accelerating the Development of Cold Chain Logistics, Guaranteeing Food Safety and Promoting Consumption Upgrade” and other policy documents, focusing on supporting the construction of a full-process cold chain distribution system for agricultural products, food, pharmaceuticals and other industries, and promoting infrastructure construction, and vehicle and equipment transformation. The city also demarcated an agricultural logistics park, “First Batch of the Country’s Core Cold Chain Logistics Bases” to create the largest vegetable supply and demand chain. The city also encourages companies in the fresh food, pharmaceuticals, and dairy industries to carry out the whole process of cold chain transportation by establishing a cold chain service standard system and implement relevant facilities, equipment and technology applications complemented with digitalized information systems. A total of 2.8 million Yuan (about 356 €) was invested in subsidies and support funds. At present, the cold chain delivery vehicles in Suzhou accounts for 10.3% of the total urban delivery vehicles, and the cargo damage difference in the transportation of fresh products has dropped by about 15% to 30%.
- **Community logistics:** To improve last-mile logistics’ efficiency, Suzhou continues to innovate the end distribution link and provides community-based distribution services through smart express boxes and express supermarkets. The city deployed 9,331 smart express boxes and 1.046 million grids and established 1,465 public service stations at the end of express delivery. The average daily delivery volume of couriers increased from 150/200 tickets to 600 tickets, effectively improving the delivery efficiency of express delivery terminals. In terms of fresh food distribution, 1,239 fresh food self-pickup carriers launched an online reservation and offline self-service delivery model, covering more than 1,200 communities and providing food for more than 1 million households. To meet the needs of ordinary consumers for purchasing daily necessities and food and beverage delivery, we will orderly develop a “door-to-door” instant delivery model. This model increased in popularity amongst the general public to use home delivery during the COVID19 pandemic.

Strategy 3: Incentivize new energy logistics vehicles through green logistics demonstration zone and priority right-of-way

To ease logistics vehicles’ movement, government departments researched and released a right-of-way policy for new energy logistics vehicles in Suzhou’s urban areas. This policy delineates the ancient city (14.2 km², space within the dyke) as green logistics demonstration zone and the site from the prehistoric city to the middle ring as a green logistics control zone to facilitate the passage of new energy logistics vehicles. It allows new energy logistics vehicles to park temporarily on 4m-wide or wider non-motor vehicle lanes in the ancient city during off-peak hours for loading and unloading operations and creates more than 50 temporary parking lots loading and unloading operations of new energy logistics vehicles.

Strategy 4:

Establish an intelligent public information service platform for real life data collection and loading/unloading distribution management



Figure 8: Intelligent public information system platform to identify freight hotspots

The platform realizes intelligent and efficient monitoring of logistics vehicles and model enterprises and helps competent departments fully grasp urban logistics' overall picture. Because of errors in vehicle T-BOX's position information, which leads to a mismatch between vehicle trajectories and actual roads, a path optimization algorithm is specially developed to fit off-road delivery vehicles' position information to the existing roads. An electronic fence is erected within the urban area to improve the calculation accuracy of operating mileage further. A heat map of loading and unloading point distribution and a time-space heat map of vehicle charging demand can be formed with the parking and assessing big data analysis of delivery vehicles. They can effectively guide the spatial arrangement and time management of parking, loading and unloading lots and charging stations and provide a decision-making basis for the supporting facilities.

Through the implementation of green logistics demonstration projects, Suzhou has pushed forward the efficient development of urban green logistics, set up an intensive, efficient, green, reliable and smart logistics system with Suzhou's characteristics and fostered a group of urban green logistics enterprises featuring efficient operation and standardized service.

Observations and recommendation

Based on Suzhou's rapid development in modernizing and enhancing operational efficiency in EcoLogistics, there are some insights gleaned and recommendations for other policy-makers interested to kickstart the EcoLogistics planning process:

- **Innovative pathways to incentivize the use of new energy logistics distribution vehicles:** The Suzhou Municipal Government issued the "Green Freight Distribution Vehicle Operation Reward and Compensation Measures" and implemented a tiered approach in subsidies, which meets the policy goal while avoiding risk in financial subsidies with minimal value.
- **Set up a demonstration zone for green distribution.** Construct temporary docking and loading points to solve the challenge in competing for space for right-of-way, loading-and-unloading, and docking. The city's green distribution demonstration zone in the central city and cultural center allows city officials and carriers to provide feedback for new solutions.
- **Prioritize new energy distribution vehicles in the right-of-way.** Building on the city's existing vehicle pass system to control traffic congestion, the passes are only issued to new energy vehicles for urban delivery.
- **Break silo communication through urban freight distribution public information service platform.** This is particularly important to facilitate working together between administrative departments, and effectively integrate various information (e.g., pass management, public parking, charging infrastructure, electric tricycle data, and distribution enterprise information platform, new energy vehicle OEM data). Such initiatives can realize the integration and utilization of various information resources, promote the interactive sharing of information across the entire chain of urban freight distribution, and improve the big data calculation and additional decision-making capabilities. Optimized route will reduce the need for unnecessary trips, proven to be beneficial for planning and routing.



What policymakers can do to facilitate sustainable and efficient EcoLogistics

Sustainable transformation of the urban logistics sector is necessary to provide high-quality urban services and generate added value by complementing hard infrastructure with soft measures such as digitalization and partnerships. This section presents the drivers and trends observed in the urban logistics sector in East Asian cities. It draws the learnings from the three case studies as recommendations for policymakers to plan and replicate.

By adopting ICLEI's EcoLogistics framework, a summary of the cities' initiatives is presented in Table 3.

Table 3: Overview of the EcoLogistics strategies in the three East Asian cities

ASII	Strategies	Taoyuan City	Seoul Metropolitan	Suzhou City
Integrated strategies	Institutional and legal framework	EcoLogistics Community office establishment	<ul style="list-style-type: none"> National logistics laws and Masterplans (e.g., Sustainable Logistics Act) Local Plan for Sustainable Transport Logistics Development 2012-2021) 	Work Plan for Building Suzhou into a Green Logistics Model; Measures on Recognition and Assessment of Model Enterprises of Urban Green Logistics in Suzhou
	Multi-stakeholder partnerships and consultations	Taiwan Logistics Alliance	Public-private partnerships, the collaboration between Seoul Metro and CJ Logistics and the Ministry of Land, Infrastructure and Transport	Suzhou Leading Group for Urban Green Logistics
	Financing and business models	Subsidies to replace diesel vehicles under the Air Pollution Fund	<ul style="list-style-type: none"> Subsidies to replace diesel vehicles by SMG Private investments fund to promote sustainable packaging and responsible distribution chain 	Award and subsidies for new energy logistics vehicles
	Landuse planning and urban design	<ul style="list-style-type: none"> Landuse planning Loading/unloading zone evaluation 	Low emission zones in Seoul and Green Transportation Zones in the inner city of Seoul City Wall	Logistics demonstration zones: priority for new energy freight vehicles in the right-of-way
	Capacity building and awareness	Multi-stakeholder partnership	Invest Seoul Centre to attract start-ups to incubate sustainable and innovative businesses	N/A
	Digitalization and smart technology	<ul style="list-style-type: none"> Dynamic routing Automated technology 	<ul style="list-style-type: none"> ICT system to limited polluting diesel vehicles from entering the LEZ Development of hydrogen fueling and EV charging stations 	Intelligent public information service platform to map freight hotspots for better route planning

ASII	Strategies	Taoyuan City	Seoul Metropolitan	Suzhou City
Avoid	Avoidance or reducing the need for goods delivery by improving system efficiency	<ul style="list-style-type: none"> • Demarcation of silent and low emission zone • Consolidation center • E-commerce pick-up point network 	<ul style="list-style-type: none"> • Establishment of logistic hubs by using train depots • Self-pick-up lockers in subway stations 	Diversified logistics models, e.g., unified, centralized, and joint distributions
Shift	Changing the freight activity to be more efficient modes and optimizing trips	Use of electric scooters for delivery	Multimodal freight transport, e.g., metro for freight delivery	Big data analysis and logistics heat map to optimize parking, loading and distribution points, charging demand
Improve	Enhancing the energy efficiency of the vehicles and fuels and upgrading operations throughout the supply chain network	<ul style="list-style-type: none"> • Emission labeling • Electric vehicles • Fuel inspection and maintenance • Time access restrictions • Energy-efficient warehouses 	<ul style="list-style-type: none"> • Promotion of electric and hydrogen vehicles • Time access restrictions • Eco-packaging to reduce unnecessary wastage of plastics waste 	Promotion of new energy vehicles: enclosed micro-trucks; enclosed midsize trucks; light vans; and refrigerated trucks

Based on the three cities, a SWOT analysis is done to summarize the issues discussed in the case studies and provide an overview of the mutual situations.

Strengths	Challenges
<ul style="list-style-type: none"> • Innovative and advanced use of technology and digital platforms • Efficient urban logistics system in place • Promote electrification, including new energy vehicles 	<ul style="list-style-type: none"> • Lack of human resources and capacity to govern urban logistics • Responsibilities for urban logistics is diffused across city departments or at the national level • Governmental measures to regulate and manage the growth of e-commerce deliveries are limited • High demand caused tired drivers, imposing severe safety issues
Opportunities	Barriers
<ul style="list-style-type: none"> • Growing political understanding and awareness on the importance of sustainable urban logistics • National policies driving urban EcoLogistics • Funding for investments and subsidies exist • Major private actors endorse EcoLogistics policies and integrate in their business model 	<ul style="list-style-type: none"> • Legal framework or existing road infrastructure that is rigid to new types of efficient and clean vehicles on the road • Land scarcity to accommodate warehousing needs and costs of operations due to land price • Consumer demand for quicker and cheaper delivery does not account for the real cost of externalities

Outlook to the future: Trends and a case for sustainable urban logistics

East Asian cities are among the fastest-growing regions for e-commerce uptake with the broad penetration of smartphones, telecommunication, and efficient urban logistics networks. However, these come at a cost. There is occasional news highlighting the burden of the urban transportation system due to space conflict with other road users and headlines of tired drivers met with fatal accidents. Despite that, consumers expect goods to be delivered for free or at a low cost, not truly accounting for each delivery cost.

As air pollution is a crucial issue in many East Asian cities, the focus to electrify the transportation system, mainly road transport, is a primary policy focus and strategy of the cities to green the industry. All three cities actively promote electric vehicles and even new energy vehicles powered by hydrogen or newly designed vehicles that suit the local delivery needs.

Cities also focus on the automation of autonomous vehicles' operations and deployment to further improve operational efficiency. In China, JD and Meituan, E-commerce giants have piloted autonomous vehicles for last-mile deliveries around the Shangdi distribution center in Beijing¹⁹. Meituan-Dianping food delivery and lifestyle services platform pioneered the first smart AI retail store within Beijing's Shougang Park, known as the MAI shop, in October 2020. The AI technology cum robotics system is adopted to bring an unmanned delivery experience to maximize its takeout delivery capacity. Consumers can use an app to scan QR codes around the part or at the app to place orders for food or daily necessity items. The MAI Shop will process the order with the AI platform, and the robots will travel between the intelligent sorting shelves to collect the goods and offload at the delivery spot. The delivery cost reduced the delivery costs from 0.22 or 0.60\$ per order to less than 0.15\$ per order. In 2019, Meituan also tested a fully automated warehouse backed by big data to optimize inventory according to customer preferences and pack orders according to customers' preferences. The trend towards automation, use of big data and electrification will drive more consumer demand for e-commerce.

While private sectors in East Asia are no amateur in developing smart and digital platforms for business operations (B2B) and consumer-friendly (B2C) services, local governments need to be more dedicated to regulate and plan sustainable urban logistics to ensure equitable and livable cities for all.

19 <https://global.chinadaily.com.cn/a/201806/20/WS5b29ba00a3103349141dd40a.html>

Key takeaways for policymakers

Demonstration projects or living labs are useful to initiate the transformation process

Cities can begin the transformation process of EcoLogistics through demonstration projects or living labs. Living labs promise the opportunity to test innovative solutions in real-life environments to replicate and scale. Living labs and demonstration projects have been the cornerstone to embark on a longer-term transformative process in all three cities. The solutions or public-private initiatives started from pilots provided an excellent prospect for the local governments to learn and foster a mutual understanding among urban freight stakeholders. Taoyuan's case provided an example of how a city with fragmented logistics experience gather and collaborate amongst the city departments and private stakeholders. Seoul's pilot on integrating last-mile delivery and freight transport is an interesting example of how long-term plans can be nurtured through demonstration projects.

Long-term institutional framework with policies and financing schemes are fundamental

Urban freight transport is a complex and fluid system. The success depends on the relationship between the stakeholders, urban infrastructure available, and long-term planning charting the developmental pathway for sustainable urban logistics. Urban freight is not just affected by a closed metropolitan area but also the urban form and landuse patterns of a city, for example, where the commercial establishments are located, and the road network affects the freight supply and demand. Therefore, a long-term institutional framework with policies, such as the Sustainable Urban Logistics Plan (SULP) in Almada, Portugal, or the Zero Emission Freight Action Plan in Rotterdam, Netherlands.

A long-term planning vision delineates the city's visions and goals with support from the private stakeholders and community. As reflected in the EcoLogistics Framework, a sustainable urban logistics system addresses the system's social, environmental and economic impacts aside from operational efficiency. Since urban freight is interconnected with passenger transport, cities need to align the planning documents to achieve the same goal. Seoul Metropolitan Government serves as an excellent example for national and local governments to align sustainability goals for actual actions. The legal requirements for cities to create the Local Plan for Sustainable Transport - Logistics Development formation also coerced cities to work on EcoLogistics.

There are rooms for cities' improvements in designating freight personnel at crucial agencies and providing capacity building in EcoLogistics. Overcoming legal barriers is also essential to allow municipalities to test new solutions and light electric freight vehicles (LEFVs) for last-mile delivery. Taoyuan City encountered several issues in planning for the demonstration projects due to legal barriers. Hence it had to work with the national government and agencies to find common ground.

Financing sustainable urban logistics

Financing EcoLogistics is a pivotal policy instrument to translate policies and plans into reality. The three cities showcased public funding to finance the initiative (EcoLogistics

Community), projects or programs, as well as subsidies to incentivize electrification. There are different forms of public financing: subsidies; public loans or shared costs. Subsidies for electric vehicles are the most common financial support from the governments to deploy energy-efficient vehicles. In Taoyuan's case, the city funds the initial investments and covers part of the distribution hub's operational costs, while the private companies support the operating costs. This is done in many European cities, such as the KoMoDo micro-depot in Berlin for last-mile delivery with LEFVs. Funding for urban consolidation centers or micro-depots is currently the most commonly seen investments from cities.

Multi-stakeholder partnership as a lever to achieve a long-term EcoLogistics vision

Multi-stakeholder partnership is crucial to achieve a sustainable and long-term EcoLogistics vision in cities. The cities presented here presented how collaboration amongst public and private stakeholders kickstarted new investments, plans and pilots. As presented in Seoul's case study, communicate-and-excavate are essential strategies to find gaps and opportunities to sustain partnerships and impactful projects.

Strong freight partnerships enable successful collaboration and financing between public and private actors. Besides collaborating with the actors in a supply chain, SMG established the Invest Seoul Center to draw investments to incubate start-ups to work towards the city's goal and vision in sustainability. This long-term approach supports innovative solutions to flourish.

Smart transformation leverages the benefits of digitalization and new technologies to fulfill sustainable urban logistics goals

While digital platforms and technologies exist to enhance convenience for consumers and maximize profit, technology is not a panacea to all EcoLogistics issues. Looking at the e-commerce trend, reduced costs, and fast delivery exacerbated the demand while ignoring the associated social costs. A real smart transformation leverages technologies to support the city's sustainability goals. Suzhou's use of ICT allows the city to analyze big data and hotspots for more efficient and safer deliveries. For example, managing the loading and unloading time and area would reduce conflicts and is safer for pedestrians.

The Avoid-Shift-Improve-Integrate (ASII) is a bottom-line approach to manage supply and demand for EcoLogistics

Integrated and complementary strategies to avoid unnecessary deliveries, shift to more energy-efficient vehicles and operations, and improve vehicle fuels and technologies are keys to long-term transformative change. For example, improving air quality is about electrifying delivery vehicles and a combination of landuse measures, encouraging local consumption and consolidation efforts. There is no one-size-fits-all solution but cities may need to adapt the solutions according to the local context. There is a myriad of potential measures but it is not the aim of this paper to showcase all. Table 4 below provides a snapshot of interventions and potential impacts.

Table 4: Example of ASII interventions for sustainable urban logistics

Category	Examples of interventions	Potential impacts			
		Environment	Society	Economy	Operation
Avoid	Landuse and urban planning	Reduced GHG and air pollution	Better traffic flow	<ul style="list-style-type: none"> Local production and consumption/ Circular economy concepts 	<ul style="list-style-type: none"> Reduced traffic congestion Faster delivery
	Urban logistics distribution	N/A	Reduced congestion	N/A	Improved efficiency and payload
	Road pricing	N/A	Reduced congestion	Collected funds to improve EcoLogistics	Better route planning
Shift	Shift to smaller transport modes (e.g., from a van to cargo bikes)	Better air quality	Road safety	More profitable	Improved efficiency
	Shift to energy-efficient and clean vehicles	Better air quality	N/A	N/A	N/A
Improve	Technology retrofits and maintenance	Better air quality	N/A	N/A	N/A
	Load consolidation	Better air quality	N/A	N/A	Better vehicle payload
	Improvement in the work environment for urban logistics	Health and safety	Skilled workers are secured for the long-term	Reduced accidents due to tiredness	N/A

Looking ahead, sustainable urban logistics planning will only increase in importance and difficulty, given the growing urbanized population and land scarcity in many East Asian cities. As the freight sector is largely private-sector driven, the process to formulate strategies requires transparent dialogues between the public and private sectors. Long-term plans must evolve in keeping with changing needs and environments, particularly with the private sectors' rapid innovations. While East Asian cities are rapidly progressing in improving technology and plan to cater to logistics needs, ambitious actions and solutions led by the local governments are essential to meet the rising challenge and demand.

