



URBAN INFRASTRUCTURE
LIM ENG HWEE

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How Singapore is Reinventing Itself in the New Era of Urban Logistics



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Image: Foodpanda

Singapore, a leading global logistics hub, has continued to improve its urban logistics system in response to the last-mile delivery boom since COVID-19, riding on public-private collaborations and lessons gleaned elsewhere. Lim Eng Hwee, Chief Executive Officer of the Urban Redevelopment Authority, details how.



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Sustaining the supply chain is key to Singapore's resilience and development. The urban logistics system forms the backbone of the supply chain. Every day, this complex system of urban logistics runs in the background, supporting Singapore's operations. Goods travel from ports, airports and land checkpoints to warehouses, factories, stores and more.

In working to optimise urban logistics, Singapore has to study and manage new trends. One such trend is the accelerated shift towards e-commerce during the COVID-19 pandemic due to demand for safe doorstep deliveries and other factors. Globally, e-commerce sales could rise from US\$4.9 trillion (S\$6.8 trillion) in 2021 to US\$7.4 trillion (S\$10.3 trillion) in 2025, a 2022 Statista report says. In Singapore alone, official figures show that from 2018 to 2021,

online sales more than doubled to 17.1% of total retail sales and is forecasted to reach US\$10 billion (S\$13.9 billion) by end-2026, said a report by Facebook and management consultancy Bain & Company forecast last year. Correspondingly, delivery volumes are expected to rise.

Today, delivery riders and vehicles are a common sight, providing services deemed essential. For these services to stay timely and affordable amid increasing delivery demand—and without increasing road traffic—delivery operations must be efficient, with sufficient suitable spaces and infrastructure. As we future-proof Singapore, we need to understand how e-commerce and other fast-changing trends impact the movement of people and goods as well as land use.

Introducing intermediate points to the delivery journey can reduce vehicle trips and distances.

Optimising Established Infrastructure

In view of the dynamically changing operating environment, the Urban Redevelopment Authority (URA) has been partnering public agencies and industry players to study these trends and increase Singapore's capabilities to meet future urban logistics needs.

1. Integrated and Data-informed Planning

As the national land use planning authority, the URA shapes land use activities and their impact on goods and people movement. Through reviews of the Long-Term Plan, a strategic land use and transportation plan that guides Singapore's development over the next 50 years, we study key trends and how they could impact land use and infrastructure needs. Combining ideas, insights, and data, we work closely with stakeholders to develop strategies and plans to meet Singapore's future needs. These are then incorporated into the statutory Master Plan that guides Singapore's medium-term development, that is, over the next 10 to 15 years, and identifies the allowable land use and development intensity for land parcels.

Through land use zoning, we guide the location of logistics and transportation facilities, including gateways and warehouses. By locating synergistic facilities close together, we optimise the location of Origin, Intermediate and Destination points in logistics networks to minimise delivery vehicle trips and

distances. For example, Tuas Port, with a capacity of 65 million Twenty-foot Equivalent Units once fully operational in the 2040s, has been sited near the key logistics and manufacturing clusters in the west of Singapore. This will allow businesses to tap the port's global maritime connectivity and benefit from faster production-to-market turnarounds in the future.

To identify opportunities to improve the siting of facilities and to increase trip efficiency, we have also carried out studies analysing delivery patterns such as the volume and types of goods delivered to different locations at different times. We can also identify linkages between certain industries and logistics or transportation facilities.

Introducing intermediate points to the delivery journey can also reduce vehicle trips and distances. Instead of having many vehicles making direct deliveries to multiple destination points across the island, localised distribution centres or offsite consolidation centres could provide space for the sorting and transfer of parcels to a smaller number of vehicles to make last-mile deliveries. Currently, we are working with researchers who are developing modelling and simulation tools that can estimate the costs of different location options for such intermediate points, facilitating better-informed deployment decisions.

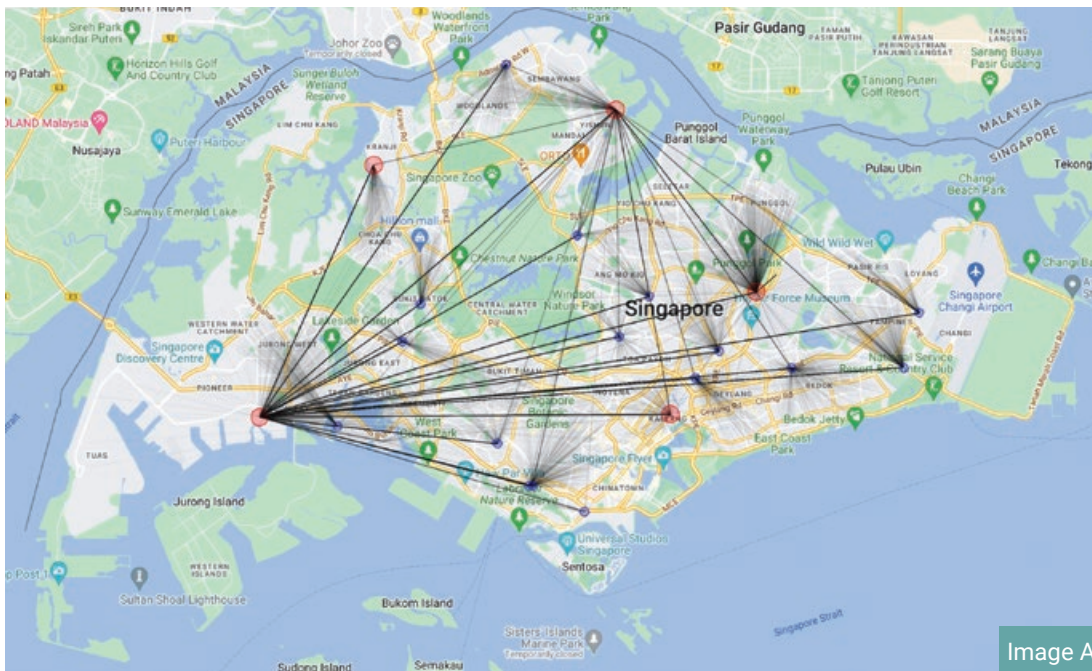


Image A

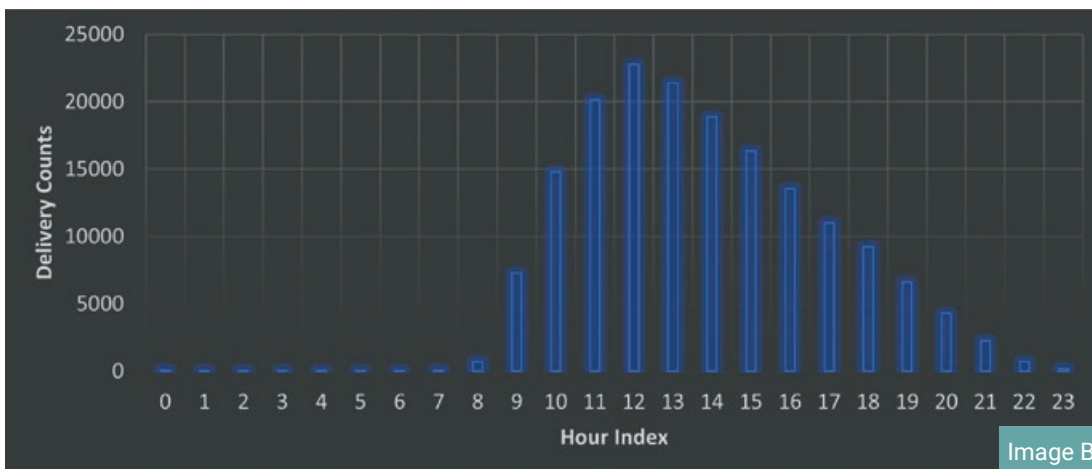


Image B

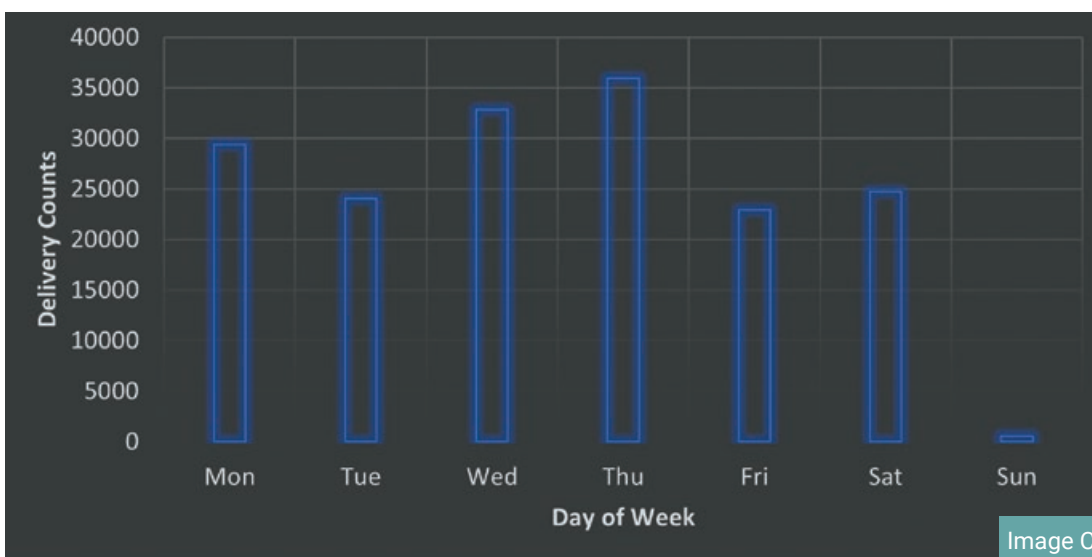
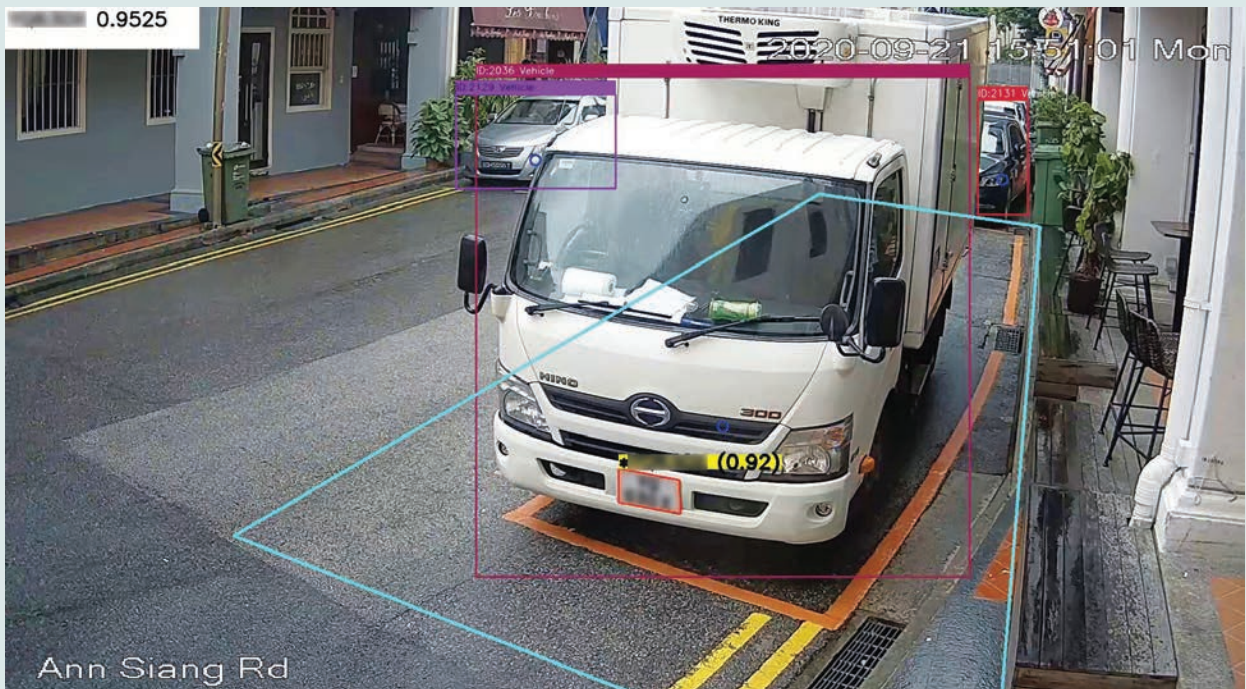


Image C

Modelling and simulation tools can be used to visualise delivery flows and simulate the impact of implementing freight management strategies. This simulation (image A) shows a logistics company’s parcel delivery flows from its main warehouses to localised distribution centres and delivery destinations. Studying the delivery patterns by day and time (images B and C) can generate insights to improve delivery operations. *Image: A*STAR Institute for Infocomm Research, Singapore*



To evaluate the effectiveness of Kerbside Loading Bays, GovTech developed a video analytics software that automated the process of identifying vehicle types and calculating each vehicle's dwell time within the Kerbside Loading Bay. The software detects and tracks vehicles entering and leaving the Region of Interest within the camera's field of view (marked as cyan boxes above), and recognises the license plates of these vehicles.
Image: GovTech, Singapore

To provide more spaces for loading and unloading, we piloted the conversion of kerbside parking lots into loading bays.

2. Repurposing Infrastructure

The URA and partner agencies are keen to explore and support new ways of improving delivery processes. We facilitate businesses' efforts to innovate by repurposing infrastructure to cater to changing logistics needs. For example, through industry and public engagement, we identified certain areas with high delivery volumes but insufficient loading facilities, such as Stanley Street, Arab Street, Amoy Street and Ann Siang Road. These are shophouse areas, which are usually historical neighbourhoods built when urban logistics operations were very different. To provide more spaces for loading and unloading, the URA and the Land Transport Authority (LTA) piloted the conversion of kerbside parking lots into loading bays. To assess

the Kerbside Loading Bays' effectiveness, we collaborated with the Government Technology Agency of Singapore (GovTech) to use video analytics to analyse camera footage to study utilisation rates and patterns. This analysis was complemented by fieldwork to observe delivery distances and feedback from delivery drivers on the ideal location of Kerbside Loading Bays. Overall, the pilot initiative was well received by delivery companies, and we are operationalising the model for deployment in other locations.

3. Collaborating with the Industry

To enhance the urban logistics ecosystem, public-private sector collaboration is crucial—government agencies may shape urban transportation, but industry players are often the ones running operations on the ground.



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In 2020, the URA published a best practice guide to encourage efficient design and operation of loading bays in commercial developments. The guide was based on insights distilled from conversations with developers, companies and agencies, as well as research studies. More efficient loading bays help delivery personnel make deliveries faster, hence reducing the vehicle queues outside developments. Providing ease of access to retail outlets is another good practice, using design features such as locating goods lifts next to loading bays, and implementing universal signage and dedicated corridors to guide the movement of goods from loading bays to lifts.

While the URA's work focuses on the design and use of spaces, the industry has been supported by Enterprise Singapore (EnterpriseSG) in implementing good practices in logistics, such as resource sharing for delivery efficiency. Logistics companies can tap on one another's vehicles to consolidate delivery trips for locations with low loads, freeing up vehicles and drivers for deployment to other transportation jobs. Fewer vehicles heading to logistics nodes help ease congestion in these areas.

|| Diverse and evolving activities require new strategies, initiatives, and regulatory flexibility.



Prepare for Future Shifts

Over the past few years, we have been studying the likely impact of emerging urban logistics trends on Singapore's future retail and warehousing spaces and transportation networks. Notably, more delivery activities are happening at the last mile and to customers directly. Businesses have innovated food delivery through mobile applications and cloud kitchens; grocery players have boosted deliveries from retail stores and "dark stores" dedicated to fulfilling online orders; couriers do doorstep delivery, and consumers self-collect parcels from lockers and pickup points in stores. These diverse and evolving activities require new strategies, initiatives, and regulatory flexibility.

1. Updating Policies

In 2021, the URA updated guidelines to provide greater clarity on the setting up of cloud kitchens. These changes were driven by conversations with industry players and studies showing the value of cloud kitchens. When planned well, cloud kitchens cut the number of delivery trips by efficiently aggregating orders, putting under-utilised or underperforming spaces to more productive uses, and supporting the needs of F&B businesses. Consumers living or working nearby also enjoy a wider variety of dining options.

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| Interior of a pandamart "dark store".
Image: Foodpanda



Over 1,000 parcel lockers have been installed in public housing estates, community clubs and transport nodes as part of Pick's nationwide locker network.

Image: Pick Network



A food delivery rider waits to pick up an order at a cloud kitchen.

Image: Smart City Kitchens

2. Piloting New Ideas

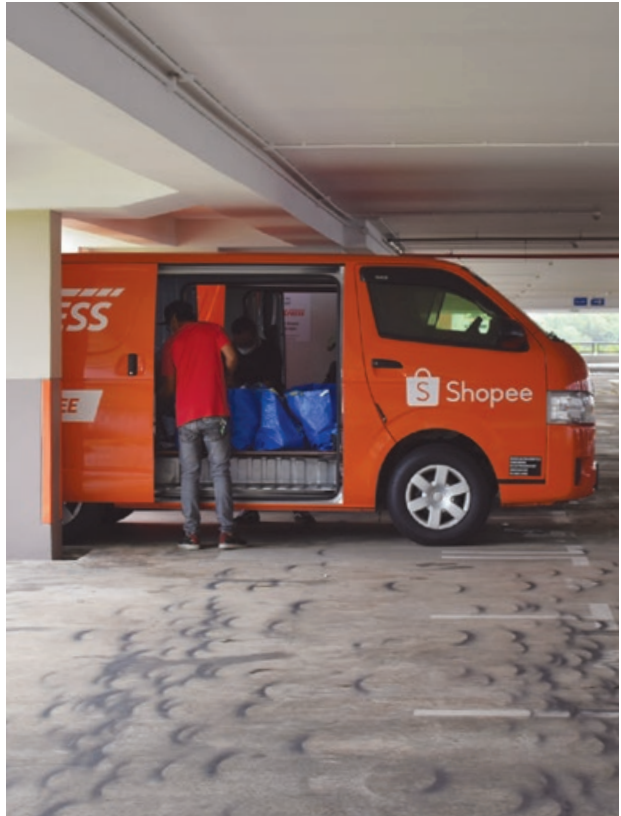
Higher delivery volumes require more space, including roads and paths for transporting goods, and areas for sorting and distribution. In view of Singapore's limited land area, innovation and testing of new ideas is important to meet these needs. In 2021, we worked with logistics companies, the Housing & Development Board (HDB), the Singapore Land Authority (SLA) and EnterpriseSG to pilot courier hubs in multi-storey carparks with under-utilised upper decks in public housing estates. The courier hubs have shown promise in facilitating the deployment of walkers to complete last-mile deliveries, which in turn, reduces the number of delivery vehicles needed. The delivery process is also smoother. At one courier hub, driver productivity improved fourfold. As the hubs are within walking distance from housing blocks, walkers can quickly

return to collect more parcels or re-attempt deliveries. They also have designated spaces at the under-utilised upper decks for unloading and sorting, addressing the parcel sorting in housing estates that has sometimes sparked friction between residents and couriers. Agencies are exploring how more companies could benefit from courier hubs.

3. Leveraging New Technologies

Looking ahead, autonomous vehicles (AVs) and autonomous robots, which can sense their environment and move with little or no human interaction, could revolutionise the future of urban logistics. While these technologies are still nascent, the URA and other agencies are tracking their progress and studying the necessary infrastructure provisions to facilitate future AV deployment. AVs can enhance delivery

efficiency and improve convenience. This is evidenced by recent pilots in several countries. In the UK, grocery retailer Co-op partnered Starship Technologies in on-demand, contactless and emissions-free delivery by autonomous robots. In China, e-commerce giant Alibaba's 200 autonomous robots delivered over a million parcels in 52 cities within their first year, with the fleet seen growing to 10,000 robots. In Singapore, the Infocomm Media Development Authority partnered the HDB, LTA, URA, CM Logistics PL and OTSAW to pilot using autonomous robots for parcel, grocery, and food delivery from Oasis Terraces mall to neighbouring residential blocks. Through such pilots, agencies can study infrastructure and safety requirements, derive technical standards and address challenges, paving the way for wider use of autonomous robots for on-demand deliveries.



| A pilot courier hub in operation—Shopee Xpress personnel tapped on the under-utilised upper deck of a multi-storey carpark space to sort and transfer parcels to walkers to complete last-mile deliveries to nearby residential developments.
Images: Urban Development Authority (URA), Singapore



A customer collecting his delivery order from an Autonomous Mobile Robot, during a recent pilot in Punggol.
Image: OTSAW, Singapore

Government agencies should see themselves as not just regulators but also innovators.

Dealing with change and taking an integrated approach to planning is not new to Singapore, and it is imperative that we continue to think in the longer term, for the future of living, working and moving around the island. We have learned from the past few years that co-creating solutions with the private sector is crucial to improving the urban logistics ecosystem to bring greater benefits to citizens, consumers and businesses.

To this end, government agencies should see themselves as not just regulators, but also

innovators alongside our industry counterparts. This way, new ideas and technologies can be tested in a timely manner, and infrastructure provision and regulatory guidelines can be developed in advance to prepare for future shifts.

While not without its challenges, the road ahead to building a more resilient and future-ready urban logistics ecosystem in Singapore is an exciting one that could greatly enhance the lives of our current and future generations. 🗣️