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Background study on Two-wheeler Last-Mile Delivery Services toward Inclusive, Low-carbon Transport Transformation in Indonesia

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ITDP Indonesia works on all aspects of sustainable transport throughout the country and the region. From women-focused programs on participatory planning, sustainable urban development projects in Jakarta's urban villages, transition to electronic vehicles for public transportation and ride-hailing apps, implementation of protected bike lanes in Jakarta and other cities, pedestrian facilities standardization and development, and the opening of new bike-share systems in Jakarta and beyond. Outside of Indonesia, our office works in other cities in the region, such as Ho Chi Minh City, Manila, Langkawi, Phuket, Peshawar, Penang, Patong, and Karachi.

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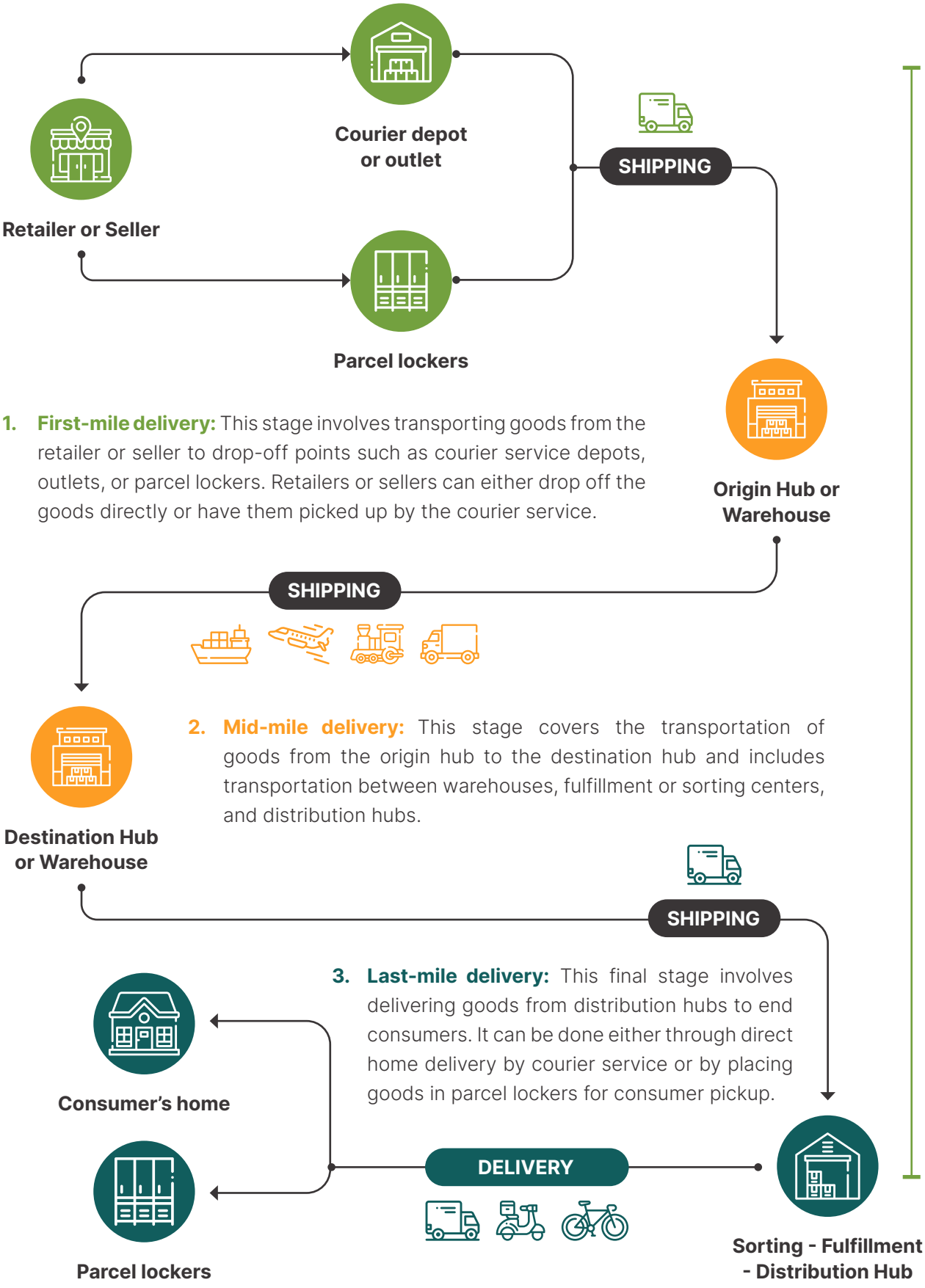
Background Study on Indonesia's Two-Wheeler Delivery Companies (Last-Mile Delivery Services) Toward Inclusive, Low-Carbon Transport Transformation

E-commerce as a Key Driver of Logistics Services

In recent years, Indonesia's e-commerce sector has experienced rapid growth and is projected to generate approximately USD 160 billion in online retail sales by 2030 (Statista, 2023), making it the largest e-commerce economy in Southeast Asia. This projection is driven by key factors such as increased purchasing power and widespread internet access, with the COVID-19 pandemic accelerating the shift to online shopping due to social distancing measures. Consequently, the number of internet users in Indonesia is expected to grow to 284.43 million by 2029 (Statista, 2024), while the number of e-commerce users is anticipated to reach about 99.1 million by the same year (Statista, 2024).

This surge in e-commerce has also encouraged significant demand for logistics services, which play an important role in the efficient delivery and distribution of goods. Indonesia's logistics market, valued at USD 122.2 billion, is projected to reach USD 178.1 billion by 2030 (Mordor Intelligence, 2024). However, Indonesia's logistics sector faces notable inefficiencies because of its archipelagic geography, with logistics costs accounting for 24% of the total GDP—much higher than those in other ASEAN countries. To address these inefficiencies, the government is investing heavily in infrastructure, including road and rail networks, seaports, airports, and logistics centers, aimed at enhancing connectivity and accessibility across the country.

The logistics process in the context of e-commerce can be broken down into several key stages:



1. **First-mile delivery:** This stage involves transporting goods from the retailer or seller to drop-off points such as courier service depots, outlets, or parcel lockers. Retailers or sellers can either drop off the goods directly or have them picked up by the courier service.

2. **Mid-mile delivery:** This stage covers the transportation of goods from the origin hub to the destination hub and includes transportation between warehouses, fulfillment or sorting centers, and distribution hubs.

3. **Last-mile delivery:** This final stage involves delivering goods from distribution hubs to end consumers. It can be done either through direct home delivery by courier service or by placing goods in parcel lockers for consumer pickup.

Among these stages, last-mile delivery is often the most critical and complex. It must be timely and accurate but is costly and challenging. Last-mile delivery alone accounts for up to 53% of the overall delivery cost and is known for its inefficiencies and environmental impact. Efficiency in last-mile delivery is influenced by factors such as customer density, delivery time windows, traffic congestion, delivery fragmentation, and the size and type of goods. These factors also influence the determination of distribution hubs. If the daily volume of deliveries exceeds capacity, a new branch of a hub is opened.

Last-Mile Delivery and Its Environmental Impact

Last-mile delivery contributions to urban environmental and public health issues are concerning. The emissions generated by delivery vehicles have been linked to respiratory problems due to air pollution. In Indonesia, motorcycles make up 60% of logistics activities and are frequently used for last-mile delivery because of their flexibility and ability to navigate narrow streets in residential areas. Based on industry averages, the average courier travels approximately 60–80 kilometers by motorcycle daily. The courier delivery range per city varies. In Greater Jakarta, couriers mostly deliver within a radius of 5 kilometers. Meanwhile, the delivery range in other cities can reach 10–20 kilometers.

While comprehensive data on the mode share of motorcycles for last-mile delivery and their specific impact on greenhouse gas (GHG) emissions and air pollution in Indonesian cities are limited, a study conducted by the University of Indonesia on one delivery company in Jakarta provides some insights. The study analyzed that the emissions generated by 30 couriers using motorcycles are approximately 160.82 kilograms of carbon dioxide (CO2) per motorcycle. These emissions are derived from factors such as route length of a maximum of 92 kilometers, a total of 15 roundtrip deliveries, 1,362 kilometers traveled, and fuel consumption.

These environmental externalities seemingly affect consumer behavior, which is shifting toward eco-friendly products and services, with 17.5% of consumers preferring logistics companies that prioritize environmental issues (MarkPlus Quick Survey, 2023). This shift is particularly observed among individuals aged 25–35 years, who consider sustainability as an important value in their purchasing decisions. As climate change concerns grow and the environmental impact becomes apparent, some delivery companies have started to increasingly adopt sustainable practices, including service optimization and the use of zero-emission vehicles for their last-mile deliveries.

Key Players

Shopee, Tokopedia, and Lazada stand out as the top three e-commerce platforms in Indonesia, according to visitor data from January to December 2023 provided by Databoks. In response to the growing demand for package delivery, these platforms have not only partnered with third-party logistics (3PL) providers but have also developed their own in-house logistics services, including warehousing solutions.

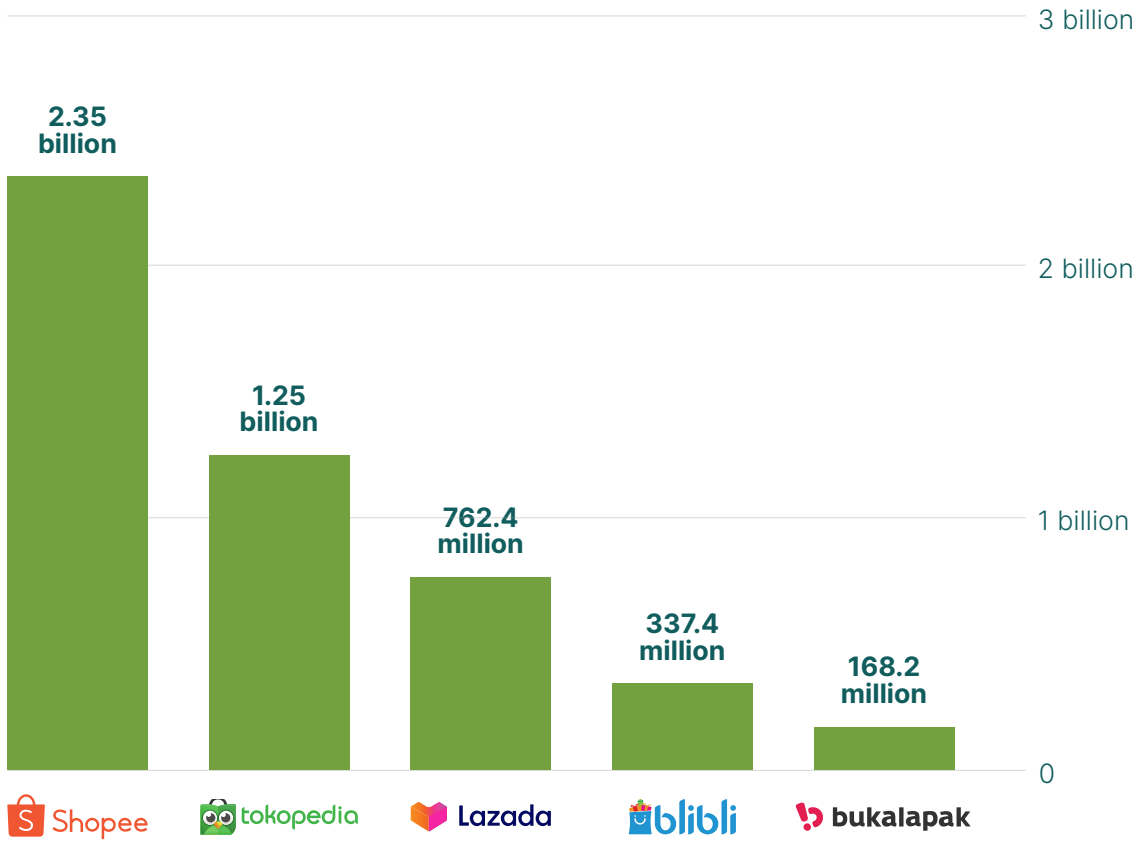
E-commerce platforms typically utilize three main types of last-mile delivery options:

1. **In-house logistics:** These services are managed directly by e-commerce platforms. They handle their own delivery operations. Examples include SPX Express (SPX) by Shopee, GoTo Logistics (GTL; GoSend) by Tokopedia, Lazada Logistics by Lazada, and Blibli Express Service by Blibli. In-house logistics services also offer instant and same-day delivery options through their on-demand logistics partners.

2. **3PL:** These companies provide outsourced logistics services such as pick-up and drop-off (PUDO), storage, packing, and shipping. Notable examples include J&T Express, JNE Express (JNE), SiCepat Ekspres (SiCepat), TIKI, Ninja Express, Anteraja, and Pos Indonesia.

3. **On-demand logistics:** These services provide instant and same-day delivery within and between cities. Major players include GoSend, GrabExpress, Paxel, and RARA NOW. GoSend from GoTo and GrabExpress from Grab are currently dominating the on-demand delivery courier market despite their primary business being passenger ride-hailing services.

Top 5 Most Visited E-Commerce in Indonesia
(January - December 2023)



In-house Logistics

This section examines the last-mile delivery services provided by the in-house logistics operations of Indonesia's two of the top three e-commerce platforms: GTL and Lazada Logistics. SPX is excluded because of insufficient data.

GTL Logistics

GTL is one of the business units in GoTo Group, a leading technology company offering a diverse range of on-demand services, including e-commerce, financial technology, and logistics. GoTo was formed through the merger of ride-hailing giant Gojek and e-commerce firm Tokopedia in 2021, with the goal being to create the largest digital ecosystem in Indonesia, integrating logistics and fulfillment to enhance delivery experiences. GTL's services are divided into GoSend, primarily used for last-mile delivery in e-commerce; GoBox, which focuses on larger parcel deliveries; and GoShop, a platform for shopping, with parcel deliveries using GoSend. As of May 2024, GTL operates 10 warehouses across Indonesia, located in Cawang, Cilincing, Logos, Pancoran, Pluit, Rungkut, Makassar, Osowilangun (Surabaya), Bandung, and Medan.

GoTo's workforce is composed of 74.57% male and 25.43% female employees. As of December 31, 2023, approximately 3.1 million driver-partners are registered with GoTo, and many of them are organized in a workers' union known as the Online Courier Work Union or Serikat Kerja Kurir Daring (Sejaring) to advocate for their rights.

GTL is committed to sustainability through GoTo's Three Zeros goals: Zero Barriers, Zero Emissions, and Zero Waste. GoTo's 2023 Sustainability Report highlights several actions that have been undertaken to achieve these goals:

Carbon Emissions Calculation

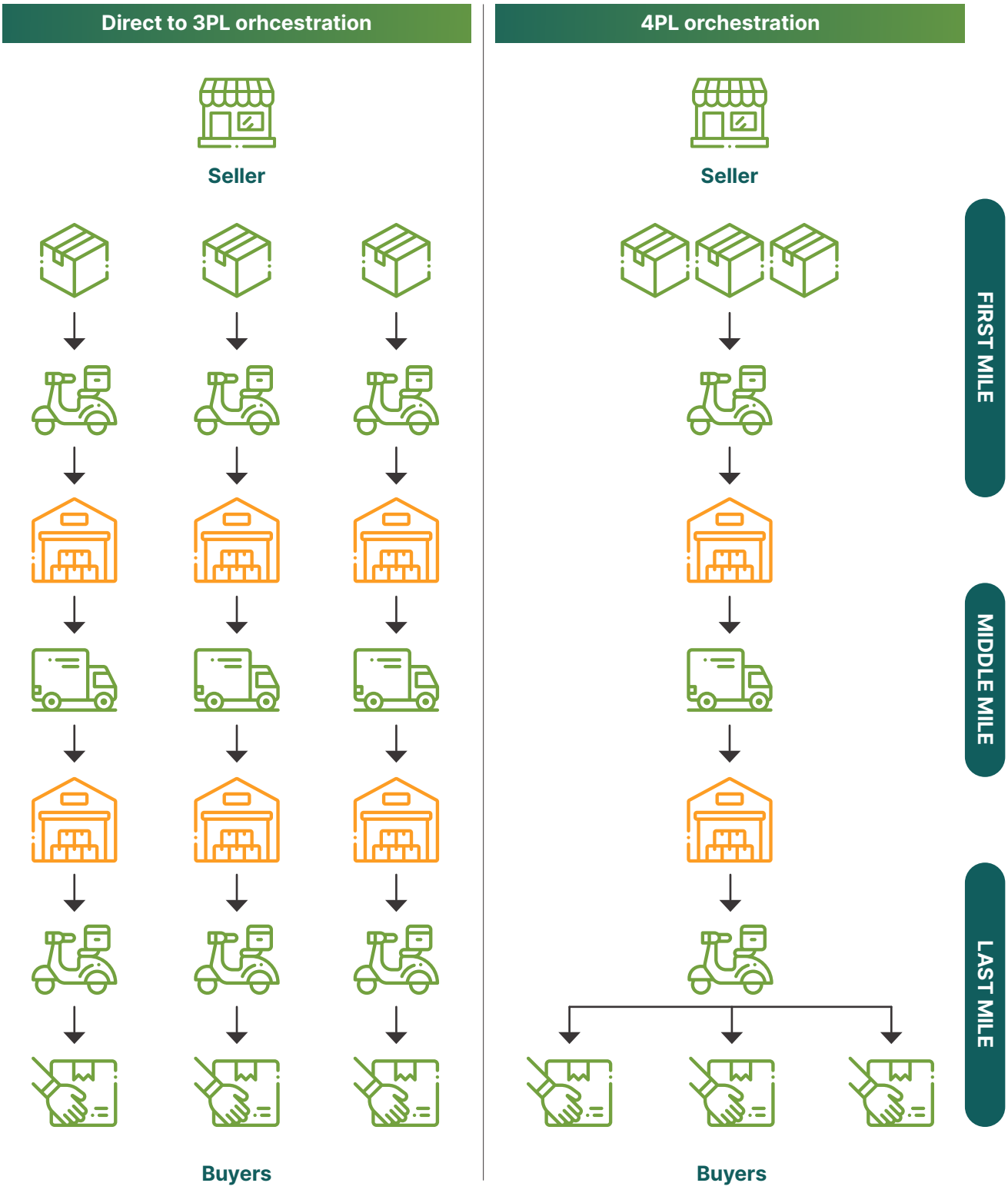
Although specific calculations for logistics, particularly last-mile delivery, are not detailed, GoTo has assessed overall carbon emissions for all business units. In 2023, GoTo's carbon emissions totaled 872,632.56 metric tons of CO2 equivalent (tCO2e), representing an 11% reduction from 2022, which is largely attributed to improved routing and operational efficiencies for Tokopedia. Over 98% of GoTo's carbon emissions come from indirect sources, including downstream transportation and distribution and use of sold products, and were calculated using distance- and spend-based data from shipping of Tokopedia deliveries.

Delivery Efficiency Optimization

GoTo has made significant steps in optimizing delivery efficiency, primarily through improved volume allocation and the implementation of fourth-party logistics (4PL) orchestration known as Kurir Rekomendasi or recommended courier. This system aims to reduce shipping redundancies and total distance traveled from e-commerce deliveries.

For instance, GoFood order pooling combines orders from the same restaurant to be delivered by a single driver. This approach has reduced delivery distances by an average of 20% and up to 43% for some deliveries. This 4PL orchestration is also applied to optimize GTL's last-mile delivery services.

What is 4PL orchestration?



Fleet Electrification

Recognizing that the significant portion of GoTo's emissions comes from on-demand and logistics services, GoTo set a target in 2021 to transition to a fully electric vehicle (EV) fleet. By 2023, the number of EVs in their fleet had quadrupled to over 2,000, and GoRide Electric (Gojek's electric two-wheeler for passenger ride-hailing) had expanded its service area in Greater Jakarta. GoTo, through Electrum—a joint venture with TBS Energi Utama, a renewable energy company—aims to scale the use of electric two-wheelers and support the broader transition to electric mobility in Indonesia. Electrum is working with Pertamina (Indonesia's state-owned oil company), Gogoro, and Gesits to provide electric motorcycle rental services to Gojek's driver-partners. The rental costs vary from 35,000 rupiah to 45,000 rupiah per day. GoTo's 2023 Sustainability Report highlights several challenges in transitioning to electric two-wheelers, including the need for advancements in battery standardization and the development of charging and swapping infrastructure, as well as the lack of government incentives and policies.

Lazada Logistics

Founded in 2015, Lazada Logistics is part of Lazada, a leading digital commerce platform in Southeast Asia under the Alibaba Ecosystem & Infrastructure that operates across six countries (Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam). In Indonesia, Lazada Logistics has established an extensive network across 1,515 cities and records about 10 million packages per day. Lazada Logistics has 10 warehouses spread across Medan, Balikpapan, Jakarta, Surabaya, Bandung, and Makassar, supported by over 130 delivery hubs and centers. The workforce consists of more than 15,000 employees and courier partners across 80 cities. Notably, 44% of the total workforce are women, reflecting the company's efforts to promote diversity and equal opportunities in its operations.

Since 2016, Lazada Logistics has adhered to a comprehensive Health, Safety and Environment Management System, designed to address the specific needs of logistics operations across Southeast Asia. This system ensures the integration of safety and environmental considerations into all logistics activities, supported by detailed internal standard operating procedures. Lazada Logistics is committed to building a sustainable e-commerce ecosystem. The key aspects of Lazada's low-carbon efforts include the following.

Carbon Emissions Calculation

According to the 2023 Lazada ESG Impact Report, Lazada Logistics has achieved a 10% reduction in overall GHG emissions compared with previous reports. The primary contributor to emissions is Scope 3, which accounts for 53% of the total GHG emissions. In Indonesia, this category includes emissions from indirect activities such as purchased goods and services related to logistics and warehousing, upstream transportation and distribution, 3PL providers, and business travel. Scope 1 emissions, representing 44% of direct GHG emissions, are calculated based on the total distance traveled by Lazada's owned or controlled vehicles. Meanwhile, Scope 2, which accounts for 3% of the total emissions, covers indirect emissions from the electricity consumed in Lazada's global facilities, including offices, warehouses, fulfillment centers, sortation centers, and hubs.

Clean Transportation

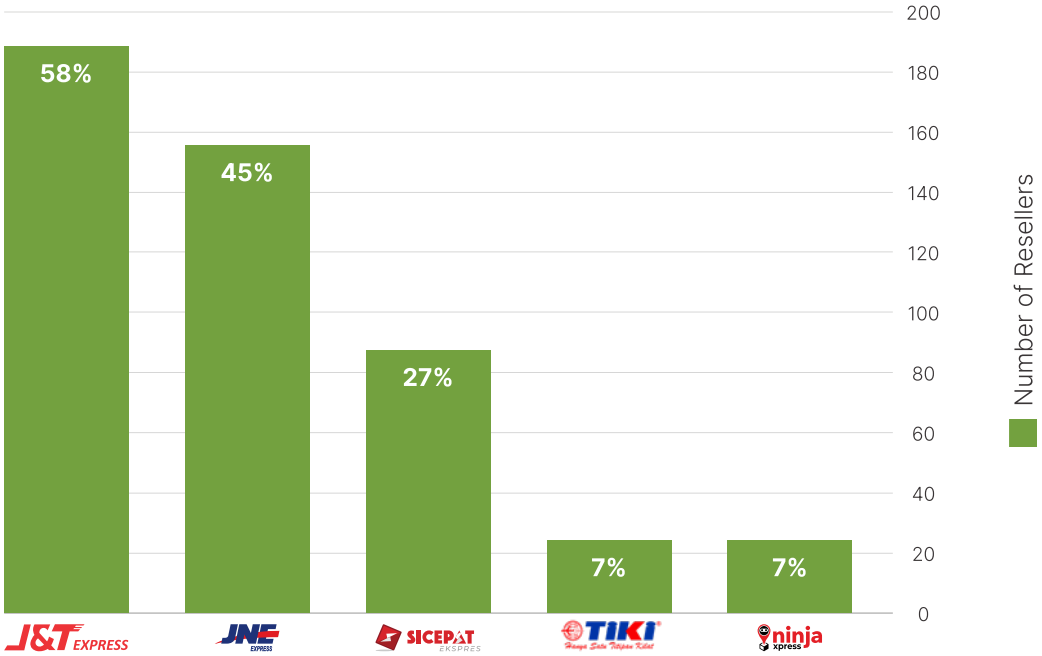
Lazada Logistics in Indonesia is transitioning its of over 1,500 vehicles to a more sustainable model. Key initiatives include collaborating with Grab to deploy an electric motorcycle fleet in Greater Jakarta and working with Smoot Motor Indonesia to offer accessible battery swapping stations at convenience stores and gas stations. Lazada is also partnering with Aizen and Sunindo Kookmin Best Finance, a South Korean artificial intelligence-based fintech company, to provide financing options for EVs. This effort includes a vehicle ownership program that allows courier partners to own their EVs after completing the installment period. Currently, Lazada Logistics courier partners who are already using EVs are spread across Jakarta, Bogor, Depok, Tangerang, and Bekasi. Lazada is partnering with Westbike Messenger Service (WMS) in providing bike courier services, including the use of pedal assist bikes and cargo bikes. The bike courier services are available in Jakarta, Bandung, Yogyakarta, and Malang.

Despite these advancements, several challenges remain, and they include insufficient charging infrastructure, the fluctuation in renewable energy sources that affects the overall sustainability of operations, and the upfront investment required for transitioning to EVs that poses a financial challenge.

Third-Party Logistics (3PL)

A study by Populix (2023) shows J&T Express as the most favored 3PL provider among e-commerce sellers in Indonesia, with JNE and SiCepat following closely behind. The study further highlights how consumers prioritize factors such as free delivery charges, delivery time, and online tracking features when selecting logistics services. This section explores J&T Express, JNE, and SiCepat as the leading 3PL providers in Indonesia.

Top 5 Preferred 3PL Services by Sellers on E-commerce
(N=322, June 2023)



J&T Express

J&T Express or J&T, established in 2015 in Indonesia, has rapidly evolved into a leading global logistics service provider. Operating in 13 countries, including major markets such as China and Southeast Asia, J&T is expanding into Latin America and the Middle East. As of December 31, 2023, J&T has over 19,600 outlets, 237 sorting centers, and more than 8,500 network partners. In Indonesia alone, J&T operates a fleet of 2,500 vehicles, owns automatic sorting machines with a capacity to handle up to 30,000 packages per hour, and over 70 distribution centers across the country. J&T's facilities in China and Saudi Arabia are certified under ISO 14001 Environmental Management System until June 21, 2025, and all new employees receive environmental protection awareness training.

As of December 31, 2023, J&T employs 149,186 full-time staff across 13 countries (over 47,000 individuals in Indonesia), with women making up 23.31% of the workforce and 28.6% of the board members. The company provides support for female employees by signing a Special Collective Contract for Female Employees with the labor union. The contract outlines benefits such as maternity leave, nursing leave, parental leave, and dedicated facilities such as mommy cabins. Currently, in China, J&T employs 62 individuals with disabilities, providing them with accessible work environments, training, and support.

J&T has also developed a comprehensive courier training program designed to enhance the skills of its delivery couriers. The program includes training and assessments for new couriers, with 150,000 trainees participating annually. The J&T Express Master & Apprentice Management Measures have been established to facilitate this process, allowing experienced couriers to mentor new employees efficiently. This approach provides a standardized training system, aiming to improve service capabilities and maintain high operational standards.

J&T is committed to sustainability focusing on green and low-carbon development across its operations. The company is also dedicated to reducing carbon emissions and contributing to global sustainability with the following efforts.

Carbon Emissions Calculation

In 2023, J&T's global express delivery operations, which include office areas and sorting centers across 13 countries, produced 994,559.95 tCO2e. The majority of these emissions were from direct emissions at J&T facilities, followed by indirect emissions, including upstream transport and distribution. Additionally, J&T reported total exhaust gas emissions of 4,923.85 tons for the same year.

Green Transport Initiatives

J&T's green transport strategy includes vehicle standards based on J&T's Construction Standards for Green and Standardized Outlets, mandating all pick-up and delivery vehicles to be new energy or clean energy vehicles, including electric tricycles that meet the requirements. J&T also implemented the Regulations for Management of Fuel

Consumption on Routes and the Energy Consumption Assessment Regulations to manage fuel consumption effectively. This includes setting fuel consumption standards based on vehicle models, routes, and terrains and providing incentives to drivers for energy-efficient driving. J&T also utilizes mapping tools to optimize routes, thereby reducing fuel consumption.

PUDO for Last-Mile Delivery

To enhance parcel delivery efficiency and service standardization, J&T is establishing self-branded PUDO stations. These stations aim to optimize delivery timeliness. The parcels stored in PUDO stations are tracked, and customers are reminded via phone message to pick them up promptly. These PUDO stations also help J&T address issues of non-standard operations and ensure consistent service quality through regular training and operational standardization. Within the PUDO stations, J&T has implemented mechanisms to protect user data, including Data Processing Agreements and Privacy Protection Agreements with partners. As of late 2023, J&T had developed branded PUDO stations such as "J&T Neighborhood" and "YoYi Station" across China, Thailand, Malaysia, Indonesia, Singapore, and the Philippines.

JNE Express

JNE is Indonesia's largest logistics technology player, with over 32 years of experience, more than 8,000 outlets, and 83,000 destination points nationwide. To improve last-mile efficiency, JNE has established Smart Points (SPs) located 3–7 kilometers from customer's homes, with typically one SP per district area and two in a city center or dense area. JNE's outlets are mostly operated by third-party agents on a "cooperation partners" basis, leading to diverse branding and marketing strategies. While package deliveries can peak at over 1.5 million daily, current packages range from 800,000 to 1,000,000 due to heightened market competition.

JNE's fleet consists of nearly 11,000 vehicles, which include motorcycles, vans, trucks, and two aircraft capable of carrying 40–60 tonnes per shipment. Approximately 90% of motorcycles are owned by couriers. Although JNE previously offered motorcycle leasing for couriers, this was discontinued due to risk management and cost efficiency reasons.

The workforce at JNE comprises over 50,000 employees nationwide, with 80%–90% of couriers on fixed-term contracts and the remainder outsourced or project-based partners. JNE also operates a unique service called JESIKA (Jemput Asi Seketika) for delivering mother's milk by female couriers. Additionally, JNE ensures job opportunities for people with disabilities (PWDs) in various roles, such as operators, customer service, cleaning staff, and car washers.

Currently ISO 2400 certified, JNE is committed to low-emission operations, although a timeline for achieving zero emissions has yet to be established. Nevertheless, the company has recently adopted a go-green policy that includes the following efforts:

Transition to Electric Vehicles

The Ministry of Communication and Informatics has subsidized JNE with approximately 7 million rupiah to pilot 20 electric motorcycles, and JNE collaborated with EV companies such as Gesit, Electrum, and Volta to provide the vehicles primarily limited to urban areas, including installment plans for couriers.

Other initiatives

JNE conducts regular emissions testing, ensuring compliance with regulations for its logistics vehicles. Additionally, JNE has introduced pick-up locker services called @BOX operating in premium areas, such as apartments. Previous implementation in stations and shopping centers has faced challenges due to public concerns about safety and theft. JNE is also exploring partnerships with WMS for cargo bikes, although the research team could not find further details on this initiative.

SiCepat Ekspres

SiCepat is a leading last-mile delivery company in Indonesia, partnering with numerous e-commerce platforms. Since 2020, daily delivery volumes have surged from 300,000 parcels to 800,000, with peaks reaching 3 million during major sales events. SiCepat operates over 4,300 PUDO outlets across Indonesia, ensuring extensive coverage from urban centers to remote areas. Motorbikes comprise 80%–90% of SiCepat's delivery fleet, and couriers are generally required to own a personal motorcycle or participate in installment plans. The workforce is diverse, with women holding many leadership and managerial roles, while most couriers are men. SiCepat promotes an inclusive work environment that values gender, ethnicity, and race, offering maternity and paternity leaves as well as social activities for employees. The company is committed to sustainable practices aligned with ISO 14000 standards.

Transition to Electric Vehicles

SiCepat has partnered with PT Volta Indonesia Semesta (Volta) to facilitate the transition to EVs, starting with the acquisition of 10,000 units of electric motorcycles in December 2021. SiCepat encourages couriers to transition to electric motorcycles through installment plans and by offering incentives. This initiative has led to a 25% reduction in fuel costs—equivalent to 9 million rupiah—and over 12,000 tons of carbon emissions reduction, which is comparable to saving 5.4 million on fuel consumption over six months. The expansion of the battery swapping station, known as Sistem Ganti Baterai, has also been implemented, with over 118 stations located at SiCepat outlets in Greater Jakarta, Karawang, Semarang, Solo, and Bali.

Drop-off Point

SiCepat has introduced a shared drop-off point system, Drop Poin Bersama, to optimize facilities and reduce emissions and kilometers traveled, with 1,500–2,000 points established nationwide.

On-demand Logistics

Instant and same-day delivery services are primarily dominated by regional giants such as Grab and Gojek. Both companies hold advantages from their extensive ride-hailing infrastructure, with one motorcycle or driver-partner being adaptable for transporting passengers, packages, and food. While Gojek's delivery service, GoSend, has been covered in the In-house Logistics section because of its integration within GoTo Logistics, this section focuses specifically on GrabExpress. Similar to GoSend, GrabExpress is a significant player in the last-mile delivery sector despite Grab's core business being passenger ride-hailing.

GrabExpress

As a prominent player in the ride-hailing industry, Grab has significantly expanded its services beyond passenger transportation and food delivery. Grab has since ventured into logistics and e-commerce. GrabExpress, the company's package delivery service, contributed approximately half of Grab's total revenue as of 2023.

At Grab, about 36% of its leadership positions are held by women, and over 3,100 PWDs are actively earning through Grab. The company is on track to achieving its goal of having more than 4,200 PWDs engaged by 2025.

Grab has outlined a comprehensive strategy to achieve carbon neutrality by 2024, with a key focus on transitioning to low-emission vehicles. To achieve this goal, Grab has undertaken several initiatives.

GTL is committed to sustainability through GoTo's Three Zeros goals: Zero Barriers, Zero Emissions, and Zero Waste. GoTo's 2023 Sustainability Report highlights several actions that have been undertaken to achieve these goals:

Carbon Emissions Calculation

Over 96% of Grab's GHG emissions are from indirect sources, primarily from vehicles operated by driver-partners. Grab has reduced emissions by around 71,000 tCO2e through the use of low and zero-emission modes, achieving a 2.1% reduction in carbon intensity for mobility and an 8.2% reduction for deliveries. Approximately 6.3% of distance traveled involves electric and hybrid vehicles, cyclists, and walkers.

Transition to Electric Vehicles

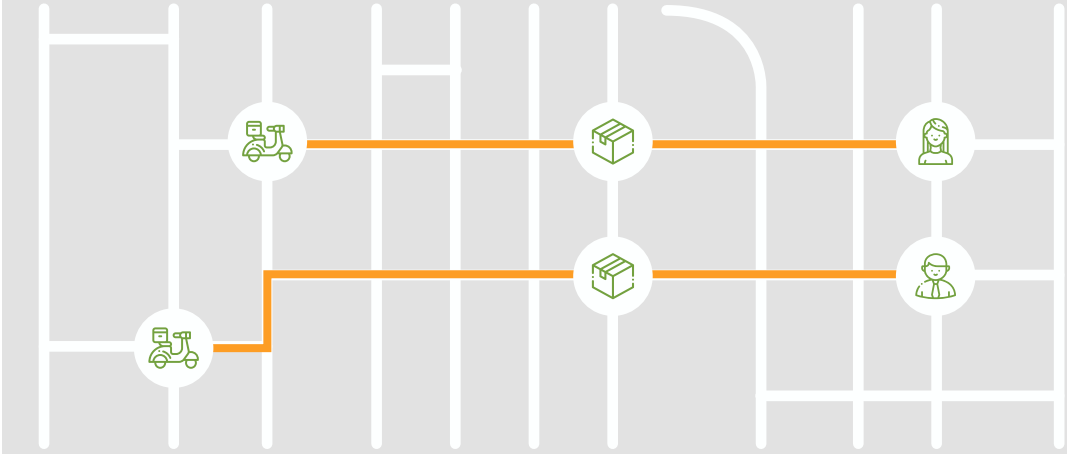
In 2023, GrabElectric expanded its fleet from 8,500 to over 10,000 electric motorcycles, covering 3% of the distance traveled on the platform. Grab also offers driver-partners affordable access to EVs through its "Drive to Own" program, which covers affordable daily rental rates, maintenance support, zero down payment, and flexible loan options based on driving records that facilitate ownership through installment payments. In collaboration with Kymco and SWAP Energy, Grab has expanded over 1,200 battery swap stations across eight cities in Indonesia, reducing the range anxiety faced by many driver-partners. Grab has publicly acknowledged challenges related to the resale value of EVs and the associated costs that discourage drivers from making the transition to low and

zero-emission vehicles. Grab has also highlighted the need for EVs to be more inclusive and affordable on a mass scale for widespread adoption.

Delivery Efficiency Optimization

Grab is improving its machine learning algorithms to improve delivery efficiency, reduce travel time and distance traveled, and lower GHG emissions. In 2023, approximately 27,000 tCO_{2e} were saved through batching and sharing systems, with one-third of all food delivery orders being batched.

Without batching



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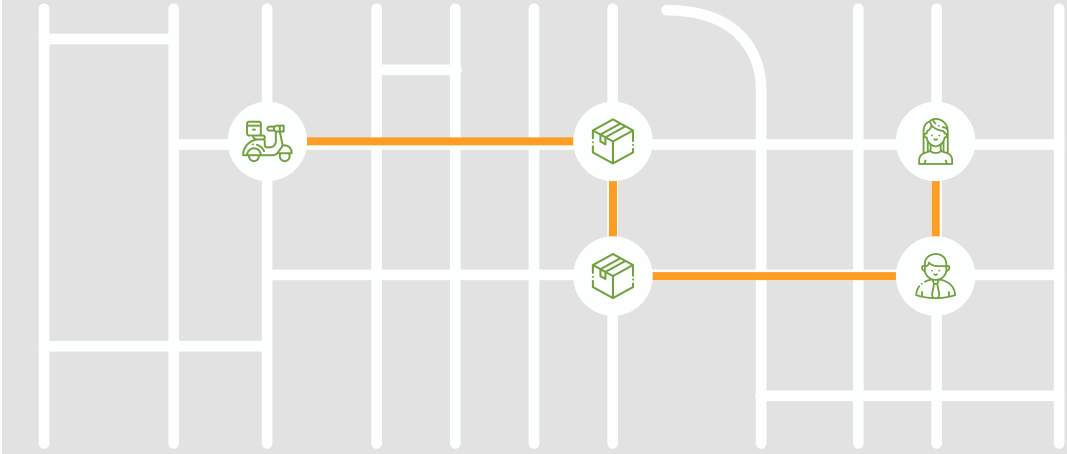


The Importance of the Last-Mile Delivery Sector

E-commerce is significantly driving demand for logistics, particularly last-mile delivery services. Despite this growth, Indonesia's logistics sector remains inefficient, characterized by high cost and environmental pollution. As these sectors expand, the focus on sustainable last-mile delivery is becoming increasingly important. Many delivery companies are setting ambitious sustainability targets and adopting low-carbon initiatives to reduce their environmental impact.

Strategies such as route optimization improve delivery efficiency and reduce emissions and fuel consumption. Transitioning to bike couriers or electric motorcycles and partnering with manufacturers for battery swap infrastructure mark a big step toward more sustainable last-mile logistics. Innovative solutions such as expanding parcel lockers and PUDO points in densely populated areas further enhance convenience and reduce vehicle trips, thereby reducing pollution levels. Research suggests that strategically located lockers, especially when located within a 1-kilometer radius of public activities and residential areas, can minimize overall vehicle usage. These initiatives not only help companies meet environmental targets but also attract eco-conscious customers and result in long-term cost savings.

Regulatory Gap

Despite positive initiatives from companies, significant challenges, particularly the lack of government regulations on sustainable last-mile delivery, remain in Indonesia's logistics sector. Existing regulations primarily focus on licensing and permits for courier businesses and lack specific targets and guidelines for sustainable practices. This regulatory gap may hinder the wider adoption of green logistics. While some companies are already implementing low-carbon initiatives, others may be reluctant to adopt greener methods without a regulatory push to encourage such transitions. Although the Indonesian government has set ambitious targets to adopt 13 million electric motorcycles and 2 million electric cars by 2030, as stated on the Presidential Regulation No. 55/2019 on the Acceleration of the Battery Electric Vehicle Program, these efforts mainly address EV targets in general without specifically targeting logistics and last-mile delivery.

Indonesia's logistics landscape is further complicated by a dual regulatory framework. The registration and operations of logistics services fall under different ministries based on the Indonesian Business Classification. Courier and postal delivery companies affiliated with the Indonesian Association of Express, Postal, and Logistics Service Companies (ASPERINDO), such as J&T Express, JNE Express, and SiCepat, are regulated by the Ministry of Communication and Information Technology (MoCIT). Meanwhile, broader logistics services not linked to ASPERINDO are overseen by the Ministry of Transportation, which also manages warehousing and on-demand services. To address these complexities, future government regulations and initiatives on low-carbon logistics must involve both ministries to ensure cohesive and comprehensive oversight. Additionally, a unified regulatory framework must be established to help streamline compliance for logistics and last-mile delivery companies.

Future Opportunities

Several opportunities to advance the low-carbon transition for last-mile delivery are as follows:

ESG Assessment

Many logistics companies in Indonesia lack the capacity to assess environmental, social, and governance (ESG) and sustainability reports, struggling particularly with carbon emission calculations. According to ASPERINDO, regulations for a low-carbon transition are in development, but specific targets and implementation details remain unclear. The MoCIT and ASPERINDO plan to integrate ESG measurements into their framework, potentially formalizing them as government regulations. The International Council on Clean Transportation will assist by developing standardized carbon calculation metrics applicable to all logistics companies and facilitating workshops.

Durability of Electric Motorcycles

Electric motorcycles are generally more efficient than conventional motorcycles, improving fuel efficiency and reducing downtime for couriers and ultimately enhancing productivity and benefiting the company. However, trials conducted by SiCepat, JNE, and Volta show that conventional motorcycles still outperform electric motorcycles in durability for transporting goods, and the challenges include the following:

Battery Life:
Couriers working 12-hour shifts struggle to meet key performance indicators due to the 3–4 hours required for charging.

Cargo Weight:
Electric motorcycles are typically designed for passenger transport and can only handle loads of approximately 80 kilograms, whereas couriers often manage up to 100 kilograms, depending on daily shipments and service type.

Charging Infrastructure:
The existing charging infrastructure is inadequate, lacking distribution and fast-charging options.

Future electric motorcycles designs should address these limitations, potentially creating electric motorcycles specifically for logistics with prolonged battery life and enhanced cargo capacity.

Charging Infrastructure and Battery Standardization

Couriers are reluctant to switch to electric motorcycles because of insufficient charging stations and the risk of reduced battery life during deliveries. Currently, charging and battery swapping stations are mainly located in city centers, causing risks for longer delivery distances of 10–20 kilometers. Additionally, battery standardization is lacking as couriers use different motorcycles and battery types. The government must establish accessible charging infrastructure and standardized batteries, ensuring that public charging stations or battery swaps are available every 2–5 kilometers to accommodate delivery distances. While some delivery companies have started collaborating with the government on battery swap stations, concerns about battery standardization and investment costs remain.

Incentives for Green Logistics

Most motorcycles are owned by couriers, making it difficult for them to afford the higher upfront costs of electric motorcycles. In addition, insufficient support for green logistics incentives is received from the government. To encourage couriers to switch to electric motorcycles, companies offer self-funded incentives. However, this initiative is challenging to fulfill without government intervention as companies have financial and resource limitations. While transitioning to low-carbon operations can benefit companies, the lack of government incentives keeps costs a concern. The same principle applies to bike couriers and parcel lockers. While these methods can reduce carbon emissions, their efficiency is hindered by the physical demands on couriers and the costs associated with rental.

Courier Association Involvement

Engaging courier associations is important for advocating low-carbon initiative and incentives because these groups often represent regional communities and encompass workers from various delivery or logistics companies.

Low Emission Zone (LEZ) and Transit-Oriented Development (TOD)

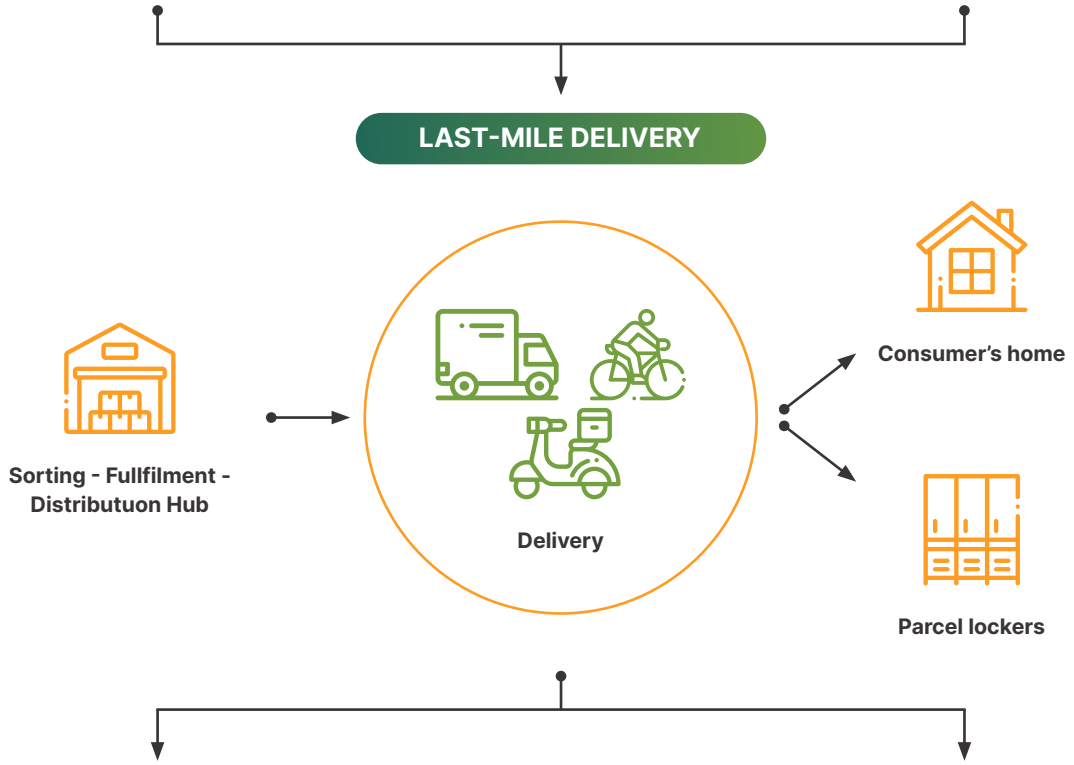
The implementation of low emission zones (LEZs) and transit-oriented development (TOD) can help restrict high-emission vehicles and encourage low-carbon transport. The government should develop targeted regulations and policies that integrate sustainable logistics practices. By fostering collaboration among last-mile delivery and logistics companies and providing clear guidance, the government can facilitate the adoption of cost-efficient and environment-friendly practices, including the use of EVs and spatial solutions such as parcel lockers and shared last-mile hubs.

Integrating parcel lockers within a 500-meter to 1-kilometer radius of residential areas can enhance last-mile delivery efficiency, reduce carbon emissions, and shorten delivery distances. Collaboration among logistics players is also essential to optimize shared last-mile hubs, ideally serving a 5-kilometer buffer. Instead of investing in separate hubs, companies can share resources to create centralized last-mile hubs in LEZ and TOD areas, improving sustainability and efficiency. Although this initiative may increase costs and complicate quality control, these disadvantages can be mitigated by transparency in pricing, integrated technology, and clear tracking.

Benefits for Indonesia's Logistics Sector

Governments regulation, policies, and incentives that encourages collaboration from delivery and logistics companies for the transition to sustainable logistics practices.

Spatial regulation on Low-Emission Zone (LEZ) and Transit-Oriented Development (TOD) that incorporate last-mile delivery operations.



- More companies adopt greener options.
- More couriers own fully electrified vehicles.
- More battery swap stations with standardized batteries
- More bike couriers.

- More parcel lockers within a 500-meter to 1-kilometer radius of residential areas.
- More shared last-mile hubs.
- Incorporation of urban spatial solutions, such as LEZ and TOD measures.

Indonesia

- Accelerate the Battery Electric Vehicle Program and the target of 13 million electric motorcycles adoption by 2030.
- Improve national logistics efficiencies.
- Improve air pollution.

Companies

- Improve delivery efficiency, reduce travel time and distance traveled, and lower greenhouse gas emissions.
- Stabilize investment costs.
- Improve customer's preference for sustainable delivery

The establishment of government regulations, policies, and incentives that encourage collaboration among delivery and logistics companies is crucial for transitioning to sustainable practices. Coupled with spatial regulation on LEZs and TOD that integrate last-mile delivery operations, these efforts can lead to a cleaner environment and a more efficient last-delivery network. A clear government vision and strategic direction will not only expedite the EV program and achieve the target of electric motorcycle adoption by 2030 but also enhance national logistics efficiency and improve air pollution. Companies benefit from cost savings through reduced fuel expenses and optimized logistics operations. Ultimately, these efforts can drive economic growth and contribute to a more sustainable future for Indonesia.

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