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Background study on Two-wheeler Last-Mile Delivery Services toward Inclusive, Low-carbon Transport Transformation in Southeast Asia: Regional Highlights

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Executive Summary

The rise of the e-commerce sector has not only transformed the retail industry in Southeast Asia but has also put the spotlight on how goods are being delivered right to our doorsteps in this urbanizing region. This has been ushered not only by improved purchasing power and greater internet access, but also by global disruptions such as COVID19 pandemic, during which travel restrictions were imposed.

Last-mile delivery (LMD)– the final step of transporting goods from a distribution hub to the end consumer– is considered the most critical stage in the delivery of goods and the e-commerce sector. It is where customer trust is built through convenient and timely delivery, influencing the overall growth of the sector. However, LMD is also complex and challenging, given Southeast Asia region's diverse geographies and disparities in urban infrastructure connectivity. Additionally, it is regarded as costly, accounting for around 53% of the delivery costs.

In Southeast Asia, where two-wheeler vehicles make up roughly 80% of all vehicles, they have become the backbone of LMD services– adept at navigating congested cities and reaching customers quickly. However, convenience has its downsides. Two-wheelers are considered among the main contributors of urban air pollution, particularly carbon monoxide, nitrogen oxides, and particulate matter.
The Clean Mobility Collective - Southeast Asia, the regional network of organizations pushing to achieve fossil-free, healthy, and safe cities for all, embarked on collaborative research in 2024 and 2025 to scope the landscape of LMD sector in the region with focus on key countries: Indonesia, Vietnam, Thailand, and the Philippines. The country studies further identified existing national policy frameworks governing two-wheeler transport logistics, as well as several LMD companies and their innovations in transitioning to cleaner modes of delivery fleets. Beyond environmental sustainability, a number of country studies included labor, inclusivity, and diversity practices, highlighting their role in making a more equitable workforce in the LMD sector, and maximizing the benefits of a greener logistics system for all stakeholders.

This study report provides an initial analysis of Southeast Asia's LMD landscape, focusing on the dominance of two-wheeled vehicles in the region's growing e-commerce markets, specifically Indonesia, Thailand, Vietnam, and the Philippines. It highlights the actions and promising innovations being undertaken by various LMD companies to decarbonize their two-wheeler fleets, including efforts to address affordability issues when transitioning to low-carbon transport modes.

The study offers recommendations to key stakeholders—including ASEAN communities, national governments, and logistics companies—to support the transformation of the sector toward low-carbon and sustainable solutions. These include:

- **ASEAN governments must prioritize integrated transport and climate planning, incentivize green mobility, and enforce forward-looking logistics regulations. A robust policy framework** is critical to accelerating this transformation. Member States can convene and develop regional policies or embed them within existing regional frameworks, such as the Avoid-Shift-Improve (ASI) framework endorsed by the ASEAN Guidelines on Urban Freight Transport. This involves reducing unnecessary freight trips, shifting to sustainable transport modes, and improving logistics efficiency.

- **ASEAN countries can learn from member state's best practices, and among LMD providers with the governments.**

- **For the private sector, businesses must accelerate investment in low-carbon fleets, digital infrastructure, and inclusive financing schemes.**

    - LMD companies must strengthen regional collaboration with EV manufacturers, and the integration of real-time data for route optimization are keys to improving operational efficiency and sustainability across the LMD sector.

    - Strengthening public-private partnerships and deploying innovative financing solutions will be central to advancing an equitable and climate-aligned logistics transformation across the region.

    - Another critical area is the inclusivity of green mobility transitions, designing policy and business models that support marginalized groups, such as low-income riders and women, in accessing sustainable transport opportunities.

- **Multi-stakeholder collaboration is key.** Successful scaling of green LMD solutions, particularly in two- and three-wheelers, requires stakeholder collaboration among industry players and stakeholders.

- **Future research should explore the economic and operational feasibility of large-scale adoption of green LMD fleets, especially considering ASEAN's diverse urban landscapes.**

ASEAN stands out as a logistics leader in the Global South, underscoring its potential to lead a transition toward low-carbon, resilient, and sustainable transport systems. To fully realize this potential, coordinated strategies are needed to integrate urban freight, especially the two-wheeled LMD sector into the broader climate, infrastructure, and mobility agendas of businesses, cities, countries, and the ASEAN region.

Background Study on Two-Wheeler Delivery Companies Toward Inclusive, Low Carbon Transport Transformation in Southeast Asia: Regional Highlights

Overview

Urban logistics play a crucial role in the economic growth of Southeast Asia's rapidly urbanizing cities, facilitating the transport of goods—from raw materials to consumer products—to households and businesses. Despite its significance, this sector often receives less attention than passenger transport, leading to an underappreciation of its complexities and challenges.

The rapid rise of e-commerce is a major driver of logistics growth in the region. Increasing internet access, mobile phone usage, and improved e-payment systems have made online shopping more accessible and convenient for consumers. This surge in demand has expanded last-mile delivery (LMD) services but also amplified challenges such as high emissions, urban congestion, and labor shortages.

LMD accounts for up to 53% of total delivery costs (Moradi, N., Sadati, İ., & Çatay, B., 2023). It requires high accuracy and timeliness, making it the most complex and expensive logistics segment.

The emission footprint of LMDs is rising. Google's e-Conomy SEA 2022 report pointed out that C02e emissions from transportation, food delivery, and e-commerce, which is estimated to be at 6 million tons in 2022, could reach 20 million tons by 2030.

The analysis of this report is based on information gathered from published reports by national ministries, companies (including annual and environmental, social and governance (ESG) reports), and in-depth interviews with key industry stakeholders. However, there are several limitations, such as insufficient public data and the difficulty in standardizing data across different countries. The logistics sectors in the selected countries are diverse and fragmented, with varying levels of data availability and quality.

LMD Landscape Across Geographies of Southeast Asia

Projections from the Asian Transport 2030 Outlook indicate that freight activity across Asia, including last-mile delivery, is expected to grow by 60% between 2020 and 2030. Road freight is set to become the largest contributor to transport-related CO_2 emissions, increasing from 48% in 2000 to 57% by 2030.

ASEAN stands out as a logistics leader in the Global South. The World Bank (2023) ranks ASEAN highest in the 2023 Logistics Performance Index (LPI) with a regional average of 3.20, outperforming the Middle East (3.09), Africa (2.98), South America (2.80), South-Central Asia (2.75), the Caribbean (2.70), and the Pacific (2.45).

Singapore tops the global list with a score of 4.3, while Malaysia (3.5), Thailand (3.4), Vietnam (3.3), and the Philippines (3.3) reflect ASEAN's strong investment in supply chain modernization. Indonesia, despite its logistical complexity as an archipelagic nation of over 17,000 islands, scored 3.0. These figures underscore ASEAN's potential to lead a transition toward low-carbon, resilient, and sustainable transport systems.

In Southeast Asia, the rise of e-commerce market share estimated to be at US$133.62 billion in 2025 (statista,2024), is also driving the growth of the LMD sector. As it is, Indonesia leads the region's e-commerce market, followed by Thailand, Vietnam, and the Philippines, with market sizes of USD 82 billion, USD 36 billion, USD 30 billion, and USD 24 billion, respectively (Bledsoe, n.d.).

LMD is an expanding and important segment in the logistics industry. Marketresearch.com (2025) estimates that the ASEAN LMD Market is poised to grow significantly with a compound annual growth rate (CAGR) of 8.4% to 2031 (USD 7.3611 billion) from 2024 (USD 4.1857 billion).

Two-wheeler vehicles have become the preferred mode of transport for LMD in Southeast Asia due to their affordability, agility, and ability to navigate narrow urban streets, particularly in congested areas.

- In **Indonesia**, motorcycles account for 60% of logistics activities, with couriers traveling an average of 60-80 km per day.

- In **Thailand**, they are widely used for food delivery, with approximately 250,000 riders in 2020 (USDA Foreign Agricultural Service, 2020).

- A study in the **Philippines** estimated that over 300,000 delivery partners are engaged in the courier sector (Soriano et al., 2022).

- In **Vietnam**, LMDs are part of the country's postal sector with a total of 655 operators; 94% of which are non-state owned companies (Vietnam Ministry of Information and Communications, 2022);

Common LMD options that are operating in the four country studies come in different types:

1. **In-house logistics** are managed directly by the e-commerce platforms, these e-commerce platforms have their own delivery operations. The largest e-commerce platforms across the four countries include: SPX Express (SPX) by Shopee, GoTo Logistics (GTL; GoSend) by Tokopedia and Lazada Logistics by Lazada.

2. **Third-party logistics (3PL)** are companies that handle outsourced logistics services including pick-up and drop-off, storage, packing and shipping services, and in some cases, extend doorstep delivery. Among the growing 3PL companies that employ two- or three-wheeler LMD are: J&T Express, Ninja Van, Flash Express and Ahamove. Notably, there are also local brands operating within individual countries.

3. **On-demand logistics** and **same-day delivery services** are expanding in urban areas. Grab, primarily known for ride-hailing, also operates GrabFood and GrabExpress, offering fast and flexible delivery solutions for food and goods. Other companies also include Lalamove, Xpress and Food Panda.

Key LMD Players in each country are the following

- **Indonesia:** Top 3 in-house logistics: SPX Express (SPX) by Shopee, GoTo Logistics by Tokopedia, Lazada Logistics (Lazada), Blibli Express Service (Blibli). Major 3PL companies include J&T Express, JNE Express (JNE), SiCepat Ekspres (SiCepat), TIKI, Ninka Express, Ateraja and Pos Indonesia. On demand logistics include: Go Send (Tokopedia), Grab Express, Paxel and RARA NOW.

- **Thailand: Top 8 LMD service providers:**
  - **3PL:** Kerry Express, Flash Express, SCG Express, Thailand Post, DHL, Lalamove, Ninja Van and Best Express.
  - **On demand logistics:** Line Man, Grab Food, Shopee Food, Foodpanda, Robinhood and all involved in food delivery services.

- **Vietnam: Key postal operators were:**
  - **3PL:** Giao Hang Tiet Kiem, VNPost, Viettel Post, Thuan Phong, and SPX Express, the in-house delivery company owned by Shopee is also the largest e-commerce platform in Vietnam.

- **Philippines:** Leading LMD companies engaged in 3PL are: J&T Express and LBC Express, followed by Shopee Express (in-house logistics) and Ninja Van. Foodpanda and Grab Express lead the on-demand delivery segment. Additional key players include JRS Express (3PL), Lalamove (on-demand delivery), and Angkas (on-demand delivery).

Regional and National Frameworks Governing Last Mile Delivery

While the e-commerce industry is expanding rapidly, the absence of specific government regulations and guidelines for the LMD sector in Indonesia, Vietnam, Thailand, and the Philippines presents a significant challenge to the growth and sustainability of LMD operations. The lack of a structured regulatory framework for LMD in general, and two-wheeler LMDs in particular, means companies often operate without standardized rules regarding traffic management, emissions, labor conditions, and infrastructure development.

Most companies do not disclose country-specific Environmental, Social, and Governance (ESG) data, making it difficult to assess their sustainability impact at a national level. Exceptions can be in the Philippines wherein publicly listed companies are mandated to submit sustainability reports on a "comply or explain" basis before the country's Securities and Exchange Commission.

This regulatory gap creates inconsistencies in how companies operate across these countries, making it difficult to ensure uniform service quality, standards, and sustainability practices.

While LMD companies operate across multiple Southeast Asian countries, their policies, operational strategies, and sustainability initiatives vary within each country. Aside from differing market demographics and demand for LMD in each country, a key factor is that within ASEAN, member states have multiple agencies overseeing LMD services (see Box 1). Better policy coordination and collaboration among these agencies are needed to develop effective sustainability and decarbonization policies.

National Regulatory Agencies Overseeing Last Mile Delivery Services in Vietnam, Indonesia, Philippines.

In Vietnam, four agencies have regulatory oversights on two-wheeler LMD services, namely: Ministry of Industry and Trade on energy, green and new energy development, and green logistics; Ministry of Natural Resources and Environment on air pollution control, climate change and greenhouse gas (GHG) emissions; Ministry of Transport on GHG reduction in transport, two-wheeler emissions, green transport and logistics; and department equivalents of these agencies reporting to the Provincial People's Committee.

In Indonesia, the government has set a target to adopt 13 million electric motorcycles by 2030 to advance the Acceleration of Battery Electric Vehicle Program for Road Transportation (Presidential Regulation No. 55/2019). The Ministry of Communication and Information Technology oversees the express, postal and logistic service companies, while the Ministry of Transportation manages warehousing and on-demand services.

In the Philippines, four agencies have regulatory oversight on logistics: Department of Trade and Industry (DTI) for freight forwarders and non-vessel operating common carriers; Civil Aeronautics Board (CAB) for air freight forwarders; Department of Information, Communication and Technology (DICT) for express delivery and messengerial services; and Department of Transportation's Land Transportation Office (LTO) for registration of motorcycles.

Within the ASEAN region, policy framework guidance related to LMD are being covered in the ASEAN Guidelines on Urban Freight Transport, which was developed in 2024. This can potentially inform ASEAN cities on how to transition toward more sustainable, resilient, and efficient urban freight systems.

Emerging initiatives towards Decarbonizing 2W Fleets in Southeast Asia: Sustainable LMD Innovations in Indonesia, Vietnam, Thailand, and Philippines

Reporting on companies' carbon emissions is a key step in decarbonizing fleets. Key players operating in multiple Southeast Asia countries, such as J&T, Grab, and Lazada Logistics, regularly calculate their carbon emissions each year, which are stated on the companies' annual reports or ESG reports. However, these calculations are often accumulated emissions of the entire companies' operations and are not typically broken down by country.

Despite the lack of an overarching guideline governing two-wheeler delivery fleets, LMD companies in Southeast Asia have adopted various practices aimed at making delivery operations more energy efficient through route optimization and making use of common pick-up and drop-off points. To

varying degrees, these companies are also transitioning towards cleaner transport modes, including the adoption of electric two-wheeler fleets, integration of active transport options within their delivery fleets. These efforts target to reduce costs, and advance sustainability goals. Examples of these initiatives are further elaborated in each country's studies and are summarized in Table 1.

Among on-demand LMD companies demonstrating notable promise towards decarbonizing two-wheelers through electric two-wheelers and other low-carbon transport modes are the following:

- **GrabExpress**
    - Grab Express Vietnam has partnered with Selex Motors to pilot e-scooters in Hanoi in 2022, which covered over 30,000km on e-bikes and reduced 3.4 tonnes of CO2e. Grab continued working with Selex Motors to roll out two initiatives that support their driver-partners switching to e-scooter via a 12-month installment loan with a deposit of 2 million VND (equivalent to approximately USD 80).
    - Grab Thailand is in partnership with seven companies to accelerate electrical vehicle (EV) adoption not only within its ride-hailing fleets, but also among its delivery partners. As it moves to have 10% of its fleet electrified by 2026, the company aims to make EVs more accessible and affordable through "Grab EV-LUTION". Several partnerships include a revenue-based financing model called Drive-to-Own, End-to-End EV Bike Rental which offers EV options, and flexible financing options. Non-financing models to support EV use include expanding the charging network and extending expert assistance and maintenance services for its EV fleets.
    - In Indonesia, Grab Express expanded its Grab Electric fleet from 8,500 to over 10,000, covering 3% of the distance travelled on the platform. Similar to Thailand, it offers affordable access to EVs through its Drive to Own program and has expanded over 1,200 battery swap
- **Xanh Express** - In Vietnam, the most notable low-carbon two-wheeler initiative was adopted by Xanh Express, part of the Xanh SM transport company, which uses 100% Vinfast e-scooters for delivery. Xanh SM has reportedly reduced 52,000 tonnes of carbon emissions in one year by using 100% electric vehicles. The company is eyeing expansion in neighboring Laos.

For third party logistics (3PLs), J&T Express has adopted parcel delivery efficiency and service standardization through branded pick-up, drop-off (PUDO) stations such as "J&T Neighborhood" and "Yoyi Station" in Thailand, Indonesia, Philippines, Malaysia, Singapore, and China. J&T implements a green transport strategy based on J&T's Construction Standards for Green and Standardized Outlets, which mandates that all pick-up and delivery vehicles must be new energy or clean energy vehicles, including electric tricycles that meet the requirements. However, implementation in Indonesia has become inconsistent, and is not yet observed in the Philippines.

Meanwhile, among in-house logistics LMD companies:

- Indonesian-based GoTo Logistics, a merger between ride-hailing company Gojek and e-commerce Tokopedia, has made significant strides to optimize delivery efficiency. Through volume allocation and engagement of fourth-party logistics (4PL) called Kurir Rekomendasi (recommended courier), the system aims to reduce shipping redundancies and cut delivery distances travelled. Likewise, GoTo has set-up Electrum, a joint venture with a renewable energy company TBS Energi Utama, to scale the use of electric two-wheelers, and support broader efforts to transition to e-mobility in Indonesia. Electrum Joint venture is working with state-owned oil company Pertamina, Gogoro, and Gesits to provide e-2Ws rental services to Gojek's driver-partners.

- Lazada Logistics in Indonesia is transitioning its fleet of over 1,500 vehicles to more sustainable models (e-motorcycles, pedal-assist bikes, and cargo bikes), while providing battery swap stations and rental options for couriers. It has collaborated with Grab to deploy electric two-wheelers in Greater Jakarta and with Smoot Motor Indonesia to offer accessible battery swapping stations at convenience stores and gas stations. It has also partnered with Aizen and South Korean fintech company Sunindo Kookmin Best Finance to provide best financing options for EVs to its courier partners. Additionally, it has partnered with Westbike Messenger Service (WMS) to provide bike courier services, including the use of pedal-assist bikes and cargo bikes.

Table 1. Summary of Low-Carbon Initiatives and Practices adopted by key LMD Companies in Indonesia, Philippines, Thailand and Vietnam.

Types of Low Carbon Practices	Identified Practices reported	Adopted by Key LMD companies			
		Indonesia	Philippines	Thailand	Viet Nam
Integration of low-carbon transport	Electrification of two -wheelers (e-motorbikes, e-bikes, e-scooters)	GoTo Lazada Logistics JNE SiCepat GrabElectric		Grab Thailand Food Panda (e-bikes)	Vietnam Post Viettel Post Ahamove GrabExpress LEX Gojek Xanh SM Be
	Other forms of EVs (cars)			DHL Thailand Post Kerry Express J&T Express Grab Thailand	
	Engages bicycle couriers	Lazada Logistics	J&T Express Philippines Food Panda		

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Types of Low Carbon Practices	Identified Practices reported	Adopted by Key LMD companies			
		Indonesia	Philippines	Thailand	Viet Nam
Integration of low-carbon transport (cont.)	Engages walking delivery neighborhood couriers	Grab Indonesia	J&T Express Philippines		
Route Optimization and Other Energy Efficient measures	Automated route planning				Viettel Post Ahamove J&T Express
	Installing smart lockers	JNE			Vietnam Post Viettel Post LEX
	Grouping multiple orders	Grab Indonesia			Grab Express
	Volume allocation and fourth-party logistics (4PL)	GTL (GoTo Group)			Grab Express
	Pick-up and Drop Off Delivery (PUDO) stations	J&T SiCepat Ekspres	J&T Express		Grab Express
Carbon offsetting	Purchasing Carbon Credits				Grab Express
	Carbon offset options for Customers				Grab Express
Packaging			LBC Express		Vietnam Post Viettel Post J&T Express SPX Tiki Now Ninja Van
	Offers opt-out option on single-use cutlery		Food Panda	Grab Thailand	

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Types of Low Carbon Practices	Identified Practices reported	Adopted by Key LMD companies			
		Indonesia	Philippines	Thailand	Viet Nam
Use of renewable energy	Delivery Hubs and/ or warehouses		LBC Express	Thailand Post DHL	Viettel Post
	Purchasing Energy Attribute Certificates (EACs)				Grab Gojek
Expressed public commitment to contribute to net-zero goals		GoTo JNE	Food Panda	Grab Thailand	
Other Green Transport Initiatives		J&T			
Published carbon emissions calculation in annual / ESG reports		GoTo, Lazada Logistics, J&T Express	Grab		

The Roadblocks to a Sustainable Last Mile Delivery: Overcoming Challenges in Decarbonization efforts

Despite promising initiatives from companies in four case study countries of Indonesia, the Philippines, Thailand, and Vietnam, there are remaining challenges in the logistics sector, especially last-mile delivery involving 2Ws.

1. **Lack of overarching regulatory frameworks on sustainable last-mile delivery**
   Existing regulations primarily focus on licensing and permits for courier businesses, however, there are still limited specific targets and guidelines for sustainable practices in these countries. While some companies are already implementing low-carbon initiatives (i.e., Grab, J&T, DHL, etc), others may be reluctant to adopt greener methods, as there is no regulatory push to encourage such transitions. In Indonesia, for example, although the government has set ambitious targets to adopt 13 million electric motorcycles and 2 million electric cars by

2030, as stated on Presidential Regulation No. 55/2019 on the Acceleration of the Battery Electric Vehicle Program, these efforts mainly address electric vehicles targets in general without specifically targeting logistics and last-mile delivery.

2. **Policy coherence among different regulatory frameworks involving multiple agencies**
   As business models of LMD companies are continuously evolving (i.e. in-house logistics opening on-demand services), demarcation among different agencies (see Box 1) involves better inter-agency coordination to address potential policy overlaps among different agencies at different levels. For example, in the Philippines, efforts to adopt electric two-wheelers and pedal-assisted electric bikes are hampered by travel restrictions being imposed by subnational agencies responsible for traffic management along major roads. This discourages uptake of driver-partners to transition to low-carbon transport modes.

3. **Financial and organizational constraints**
   One of the barriers for LMD companies is limited funding, which undermines their ability to sustain initiatives. While some organizations address this challenge by promoting social enterprises, the diversification of funding sources remains crucial for financial sustainability.

4. **Most of the LMD companies have only pilot programs or plans of EV promotions in delivery services without specific plans for full-scale programs**
   For example, a limited number of electric motorcycles are being piloted for LMD by companies in Vietnam, such as Giao Hang Nhanh (GHN), AhaMove, Vietnam Post, and Viettel Post. Vietnam Post, according to its press releases, has a fleet of 200 electric motorcycles dedicated to LMD services between 2022 and 2024. In 2023, GrabElectric expanded its fleet from 8,500 to over 10,000 electric motorcycles, covering 3% of the distance traveled on the platform in Indonesia.

5. **Most of the companies lack information about emissions estimation from last-mile delivery services.**
   Most of the last-mile delivery companies in four case study countries still rely on gasoline-fueled motorcycles for their services which can emit substantial emissions of greenhouse gases and air pollutants, especially in urban areas where the delivery demands and needs are high.

Recommendations and Conclusion

Transitioning the ASEAN LMD sector to inclusive, low-carbon solutions requires a multifaceted approach, including policy support, scaling of regional initiatives, and industry collaboration through capacity building and sectoral partnerships.

ASEAN governments must prioritize integrated transport and climate planning, incentivize green mobility, and enforce forward-looking logistics regulations. A robust policy framework is critical to accelerating this transformation. Member States can convene and develop regional policies or embed them within existing regional frameworks, such as the Avoid-Shift-Improve (ASI) framework endorsed by the ASEAN Guidelines on Urban Freight Transport. This involves reducing unnecessary freight trips, shifting to sustainable transport modes, and improving logistics efficiency.

ASEAN countries can learn from member state's best practices. For instance, the adoption of low-emission delivery zones and EV infrastructure in Indonesia and Vietnam can guide similar efforts in the Philippines and Thailand. Conversely, Indonesia and Vietnam could adopt the Philippines' mandatory ESG reporting for publicly listed companies to improve data transparency. LMD providers operating across multiple countries can also scale successful models regionally—for example, Grab Thailand's "Drive to Own" program could be replicated by Grab Philippines.

For the private sector, businesses must accelerate investment in low-carbon fleets, digital infrastructure, and inclusive financing schemes.

- LMD companies must strengthen regional collaboration with EV manufacturers and the integration of real-time data for route optimization are keys to improving operational efficiency and sustainability across the LMD sector.

- Strengthening public-private partnerships and deploying innovative financing solutions will be central to advancing an equitable and climate-aligned logistics transformation across the region.

- Another critical area is the inclusivity of green mobility transitions, designing policy and business models that support marginalized groups, such as low-income riders and women, in accessing sustainable transport opportunities.

Multi-stakeholder collaboration is key. Successful scaling of green LMD solutions, particularly in two- and three wheelers, requires **stakeholder collaboration** among industry players and stakeholders.

- Governments, LMD service providers, associations, vehicle manufacturers, research or academic institutions, and other key stakeholders must work together to implement sustainable practices effectively.

- Capacity-building initiatives, such as training programs and workshops, can help industry players understand the benefits of low-carbon technologies and develop the necessary skills and corporate values for adopting them.

- Research or academic institutions can provide technical support on monitoring, reporting, and verification (MRV) implementation and policy design.

- Associations representing logistics, delivery, postal, and express companies can facilitate knowledge-sharing through community practice initiatives. These platforms allow LMD stakeholders to exchange best practices, discuss emerging technologies, and collectively address challenges related to low-carbon delivery.

- Consumers, too, play a pivotal role—by supporting sustainable delivery options and demanding greener e-commerce practices.

Future research should explore the economic and operational feasibility of large-scale adoption of green fleets of LMDs, particularly in the context of ASEAN's diverse urban landscapes. Key areas for further study include evaluating the effectiveness of various financing models in improving affordability for LMD partners and fleet operators.

Conclusion

The rapid rise of e-commerce across ASEAN—led by Indonesia, followed by Thailand, Vietnam, and the Philippines—has significantly increased demand for urban transport and logistics, particularly LMD services dominated by two- and three-wheelers. This surge is straining already-congested urban infrastructure, exacerbating traffic congestion and air pollution (ASEAN Secretariat, 2024). Projections from the Asian Transport 2030 Outlook indicate that road freight is on the course to become the largest contributor to transport-related CO_2 emissions by 2030.

A review of the LMD landscape in Indonesia, Thailand, the Philippines, and Vietnam highlights the need to scale regional sustainable transport best practices and drive digital transformation. Strengthening MRV systems is essential to ensure service providers meet regulatory and sustainability standards. Governments are also encouraged to implement market-based incentives—such as tax breaks, subsidies, or grants—to encourage investment in low-carbon vehicles. Integrating urban mobility policies with LMD regulations, such as establishing low-emission zones and expanding logistics infrastructure including increased charging stations and shared last-mile hubs, can further support the green transition.

Despite these challenges, ASEAN stands out as a logistics leader in the Global South, underscoring ASEAN's potential to lead a transition toward low-carbon, resilient, and sustainable transport systems.

To fully realize this potential, coordinated strategies are needed to integrate urban freight, especially the two-wheeled LMD sector into the broader climate, infrastructure, and mobility agendas of businesses, cities, countries and the ASEAN region.

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