EU-ASEAN BUSINESS COUNCIL
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CLEAN JOURNEYS AHEAD

Charting ASEAN's path towards a decarbonised transport sector

AN EU-ASEAN BUSINESS COUNCIL REPORT

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Introduction

With 310 million tonnes of CO_2 emissions, transport is the second biggest contributor to Southeast Asia's total energy consumption. But not only does this have averse impacts on global climate change, it also kills - more than 350,000 premature deaths in the region are linked to air pollution, a large part of which is from transport emissions.

With its rapid economic growth, urbanisation, and burgeoning population, ASEAN is uniquely positioned to lead a transformative shift toward sustainable transport solutions across land, maritime, and air modes. By investing in cleaner technologies and green infrastructure, ASEAN has the potential not only to meet ambitious climate goals, but also to enhance regional supply chain resilience, improve urban air quality, and uplift the quality of life for its citizens.

However, decarbonising the region's transport sector is a complex challenge. The demand for transportation has surged, leading to increased carbon emissions [1]. Recent data from the 7th ASEAN Energy Outlook reveals transportation energy demand in ASEAN could increase by 4.4% annually through 2050.

Fortunately, ASEAN has demonstrated vast potential to advance decarbonising strategies and efforts: various strategies have been explored to reduce emissions from land transport, particularly with electric vehicles (EVs). The shift towards EVs is gaining momentum, with ASEAN Member States (AMS) offering incentives and setting ambitious targets for EV adoption. In the maritime sector, the focus has been on green fuels, with countries piloting projects and R&D into green fuel options. Finally, air transport has been an emerging priority. In fact, some AMS have made progress on adoption targets of sustainable aviation fuels and exploring ways to increase its supply.

However, for ASEAN to effectively decarbonise its entire transport sector, countries will need comprehensive policy frameworks at both the local and regional levels, including incentives, harmonised standards, and boosting R&D and investments in sustainable infrastructure.

For businesses, the potential benefits of transitioning to low-carbon transport options are clear: while there may be upfront costs, this shift will help companies meet their decarbonisation targets, aligning with both regulatory requirements and growing consumer and investor demand for sustainability. In the long term, adopting efficient transport systems can also lead to reduced delays, improved logistics, and enhanced operational efficiency, potentially resulting in cost. savings, European businesses are making the effort to stay ahead of the curve, and with many well advanced in producing cutting-edge technologies, they are well-positioned to lead this transition.

ASEAN continues to be an attractive market for European companies, and there is a strong desire to see the region harmonise transport standards in order to boost foreign investment, facilitate technology transfer, and develop high-quality and safe transport solutions that benefit both businesses and ASEAN citizens.

Recommendations at a glance

Land transport

#	Recommendations	Priority
1	Extending the ASEAN Automotive Products Mutual Recognition Arrangement to ease the transition towards harmonising standards	IMMEDIATE
2	Leverage ATIGA to lower or eliminate tariffs on EV components and finished vehicles within the region, thus increasing EV affordability	IMMEDIATE
3	Enhance financial incentives for consumers (rebates/subsidies at point of sale, tax break extensions, favourable leasing of EVs) and end fuel subsidies	IMMEDIATE
4	Provide non-financial incentives for consumers (preferential road access, exemption from road tolls, dedicated parking spaces for EVs)	IMMEDIATE
5	Offer financial incentives on supply-side (grants/loans to stimulate investments, subsidies for charging infrastructure, tax exemptions/adjustments to boost domestic EV production)	IMMEDIATE
6	Use biofuels as interim solution to EVs	IMMEDIATE
7	Expand battery-swapping infrastructure for delivery and logistics sectors	IMMEDIATE
8	Harmonised approach to EV production via regional value chain	MEDIUM-TERM
9	Standardise plug types and install charging stations that can accommodate different plug types or adopting a standard plug type	MEDIUM-TERM
11	Enhance domestic grid capacity to support DC charging stations	MEDIUM-TERM
12	Offer non-financial incentives like support for R&D and upskilling workers, reducing barriers to entry for foreign ownership	MEDIUM-TERM
13	Develop roadmap to transition to Euro V and VI for ICE vehicles	MEDIUM-TERM
14	Establish robust digital infrastructure including encouraging common data format across all EV ecosystem players	MEDIUM-TERM
15	Increase the number of charging stations across borders	LONG-TERM
16	Cross-border exchange of information on location of charging stations - ideally, users should have access to ASEAN-wide map	LONG-TERM

Recommendations at a glance

Maritime Industry

#	Recommendations	Priority
1	Establish and implement a global fuel standard and GHG emissions pricing by 2025	IMMEDIATE
2	Encourage investments in regions near key maritime trade routes to minimise transportation costs of green fuels and promote interim policy support to kickstart green fuel projects	IMMEDIATE
3	Develop ASEAN roadmap on decarbonising shipping industry and eventually implement regulations to complement voluntary agreements	MEDIUM-TERM

Aviation Industry

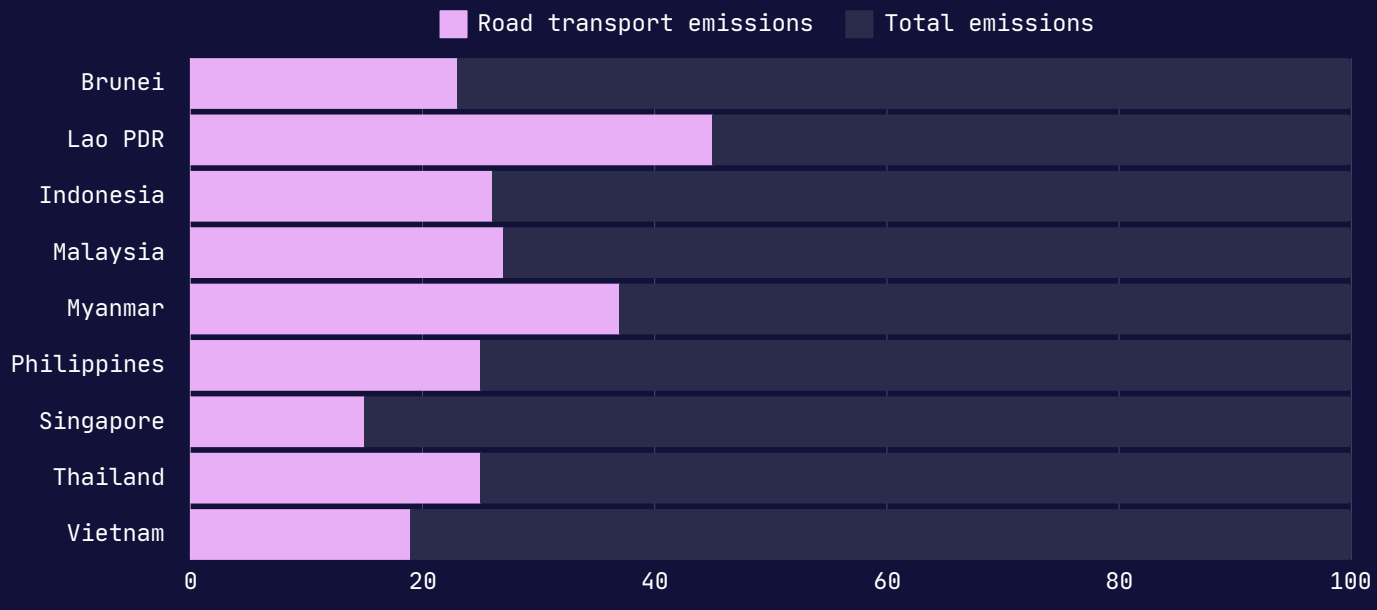
#	Recommendations	Priority
1	Partnerships with sustainable aviation fuel producers to expand collaboration and R&D	IMMEDIATE
2	Push implementation of ASEAN-EU Comprehensive Air Transport Agreement to consider a convergence on environmental standards of feedstock for SAF	MEDIUM-TERM
3	Establish a unified regional policy framework on SAF, exploring the introduction of minimum SAF adoption targets at a timeline agreeable among countries and airlines	MEDIUM-TERM

Decarbonising land transport with Electric Vehicles (EVs)

Overview

Land transport is a significant contributor to ASEAN's economic connectivity and integration. Road freight, for example, is the dominant mode of domestic transport, accounting for 64.6% of total freight transport revenues in 2019 [2].Land transport's importance is further cemented in key projects such as the ASEAN Strategic Transport Action Plan (2016-2025) [3], which underscores the importance of developing robust land transport infrastructure to enhance connectivity within the region and with neighbouring dialogue and trade partners like China, South Korea, and Japan.

However, land transport contributes greatly to carbon emissions. The latest figures from the International Energy Agency (IEA) on land transport and carbon emissions in Southeast Asia show that as of 2022, road vehicles continued to account for a significant portion of energy-related carbon dioxide emissions in the region. Transport still represents about 30% of energy-related CO2 emissions, with the road sector responsible for approximately 90% of these transport emissions [4].



Source: International Energy Agency, 2017

Given this urgent environmental challenge, promoting sustainability in land transport across ASEAN is essential not only for enhancing public health but also for bolstering ASEAN's economic competitiveness. A coordinated shift towards Electric Vehicles (EVs) aligns with these goals by reducing emissions and fostering efficient cross-border trade. Reflecting a global trend, EV sales in ASEAN jumped from less than 5% of new car sales in 2020 to 14% in 2022 [5]. EV penetration could also decrease oil consumption in the transportation sector by up to 73% (if the deployment of EVs in the region is assumed to increase by 14 times of the baseline value, a target set by the region) [6].

The potential of EV market in ASEAN

EVs are becoming increasingly important in ASEAN's land transport market as members strive to decarbonise their transportation sectors and meet climate goals. The ASEAN EV market, particularly in Indonesia, Malaysia, Thailand, the Philippines, Vietnam, and Singapore (ASEAN-6), is expected to hit USD80-100 billion by 2035, commanding a sales volume of 8.5 million units [7]. Sales growth is expected to grow in all three major EV segments: passenger vehicles, commercial vehicles (light-goods vehicles, heavy-duty vehicles, buses), and two- and three-wheelers (motorcycles, scooters). Alongside India and China, ASEAN countries are the biggest two- and three-wheeler (2/3W) markets worldwide, with sales reaching 14 million units in 2023 [8].

This is thanks to favourable government policies and increasingly positive consumer sentiments towards EVs: a survey [9] found that 71% of respondents in Singapore and 89% in Vietnam had positive impressions of electric cars; 61% in Singapore and 57% in Malaysia would consider purchasing Hybrid cars (HEVs) for their next purchase. These forward-looking sentiments have manifested in various roadmaps being drawn up, detailing EV targets for EV procurement, EV charging infrastructure, and tax incentives to encourage EV uptake.

Reduced Value Added Tax (VAT) from 11% to 1% for EVs meeting 40% minimum domestic content requirement. Indonesia's goal to produce 600,000 EVs by 2030 includes incentives for foreign investment, especially in EV manufacturing and battery production.

Offers tax exemptions on imported EVs and aims to build robust charging network – part of its Low Carbon Mobility Blueprint, which includes financial incentives for EV infrastructure expansion and boost demand for private and public EVs.

Introduced "BEV 3.5 policy," offering subsidies and excise-tax reductions for battery electric vehicles (BEVs). Government also approved incentives for hybrid vehicle manufacturers, including excise tax reductions for investments meeting specific criteria.

Offers 0% registration fee for BEVs for 3 years from 2022 and 50% reduction for subsequent 2 years compared to petrol cars with same seating capacity. Special consumption tax rate for BEVs significantly reduced to 1-3% until 2027.

As an economic bloc, ASEAN has expressed intent [10] to develop an EV ecosystem with the ASEAN Leaders' Declaration on Developing Regional Electric Vehicle Ecosystem, covering a range of issues from trade liberalisation to improving EV infrastructure and strengthening EV supply chains. ASEAN has also shown interest to harmonise regional EV regulations, ensure interoperability and seamless cross-border mobility in their ASEAN Plus Three Leaders' Statement on Developing of Electric Vehicle Ecosystem Nonetheless, progress towards such harmonisation has been lagging.

EV targets across ASEAN

ASEAN countries have established targets for their respective EV markets, with specific drawn up for the three major EV segments (see Table 1).

Establishing EV targets is crucial for AMS to drive the transition towards sustainable transportation and meet their climate goals. By setting clear EV adoption targets, countries can create a roadmap for reducing greenhouse gas emissions from the transport sector, a significant contributor to air pollution and carbon emissions in the region. These targets provide a framework for policymakers to develop comprehensive strategies, including tax incentives, infrastructure development, and industry support, to accelerate EV uptake.

Table 1: Targets for Passenger Vehicles, Commercial Vehicles and 2/3W by AMS

Country	Passenger Vehicles	Commercial Vehicles	2-/3-Wheelers
Brunei		Development Policy aims to boost electrification of public bus transportation system by 22% in 2035	
Cambodia	Aim to electrify 40% of cars by 2030	Aim to electrify 40% of urban buses by 2050	Aim to electrify 70% of motorcycles by 2050
Indonesia	Aim to commence electric car production in 2024 & deploy 2 million electric four-wheelers by 2030 EVs to make up 20% of all car sales by 2025 Aim to export 200,000 electric cars by 2025	TransJakarta fleet aims to have 10,000 electric buses by 2030 & will add 200 electric buses to its fleet in 2024	Aim to deploy 13 million electric 2-wheelers by 2030
Lao PDR	No national-level roadmap or strategy developed; government of Lao PDR announced target to increase the share of EVs to 1% in 2025 and over 30% in 2030		
Malaysia	HEVs and EVs to make up 50% of car sales by 2040, 80% by 2050	Rapid Bus Malaysia targets to increase its EV fleet to 30% by 2030 and 100% by 2037. Aim to have 100 units by 2026	Aim to have 125,000 electric motorcycles by 2030

Table 1: Targets for Passenger Vehicles, Commercial Vehicles and 2/3W by AMS

Country	Passenger Vehicles	Commercial Vehicles	2-/3-Wheelers
Myanmar	Implemented a 1-year EV pilot project in 2023 to import 40 electric cars from China Banned imports of gas-powered cars in 2022	To introduce electric buses and commence operations in 2024	
Philippines	If 50% of EV fleet is achieved by 2040, should be made up of >1 million sedans, SUVs, and utility vehicles	If 50% of EV fleet is achieved by 2050, aim to have 5300 electric buses	If 50% of EV fleet is achieved by 2050, aim to have 5300 electric buses
Singapore	Taxi fleet operators set targets to electrify fleet with at least half to go electric by 2030 New diesel cars and taxi registration to cease from 2025, with all new registrations to be of cleaner-energy models by 2030	Aim to electrify half of bus fleet by 2030 and achieve 100% by 2040. 60 electric buses have been deployed, 400 diesel buses to be replaced by 2025	Singapore Post will replace all lighter vehicles with electric ones by 2026. Pilot started for electric scooters and vans
Thailand	Aim to produce 725,000 electric cars annually by 2030	Aim to achieve 300% increase in electric buses by 2035 compared to 2025	Aim to produce 675,000 electric motorcycles annually by 2030
Vietnam	Aim to cease production, assembly, and importation of fossil-fuel cars by 2040	Nha Trang Green Growth Strategy aims to have 200 e-buses in circulation by 2025 in the city Aim to replace diesel-powered buses with electric ones from 2031-2035 period	Aim to cease production, assembly, and importation of fossil-fuel motorcycles by 2040

Achieving EV Targets: Challenges and recommendations

The current issue that ASEAN faces is not necessarily the production of more EVs, but ensuring that EVs are available and affordable across all classes to meet local adoption targets. Currently, the lack of availability and high costs hinder adoption, particularly for commercial EVs. For example, courier companies seeking vans with a 1,500-2,000kg payload often face limited options in the market.

✸ **We recommend** AMS leverage their strengths and cooperate on EV adoption and production as a bloc. Adopt a coordinated approach to manufacturing, and set up regional value chains on the back of ASEAN's FTAs to increase EV supply regionally. Leverage on ASEAN Trade in Goods Agreement (ATIGA) and Mutual Recognition Agreements (MRAs) on technical standards for vehicles and parts to create efficiencies and cost savings, leading to affordable EV options including commercial vehicles which are currently scarce. This regional value chain would consist of AMS producing different EV components to boost efficiency and capitalise on cost savings, complementing each other to create a sustainable supply chain (Table 2).

Table 2: Proposed harmonised approach to EV production

Country	Strength	Component
Indonesia	Possesses enormous domestic reserve of nickel and cobalt, minerals crucial for battery production. Southeast Asia's first EV battery plant has begun operations in Indonesia.	EV batteries
Vietnam	VinFast has experience in EV production, having begun EV offerings in 2021	Car engines
Singapore	Land Transport Authority (LTA), SkillsFuture Singapore (SSG) and Workforce Singapore have worked with industry partners and training providers to establish the National EV Specialist Safety (NESS) certification and the Career Conversion Programme (CCP) for Sustainability Professionals (EV Specialists) for the industry.	EV safety specialists

EV infrastructure

AMS have varying set targets and plans on EV charging infrastructure, reflecting the different stages of EV adoption and government priorities in each nation. Singapore is leading the way with an ambitious target of 60,000 EV charging stations (EVCS) by 2030, and already has an estimated 3800 points. Thailand, too, has installed more than 2000 EVCS throughout the country and is expanding its network with support from a USD48 million green loan, while Malaysia aims to build 10,000 EVCS by 2025, with more than 2000 installed to date.

Standards on charging infrastructure also differ across AMS. On one hand, countries such as Singapore and Malaysia have developed national plans regarding EVCS standards, specifying requirements of charging supplies and parts. For example, Singapore mandates that EV charger models must be type-approved by LTA; Malaysia too recommends that EVCS be type tested for compliance with the relevant International Electrotechnical Commission. On the other hand, some AMS do not have a national standard on EVCS yet.

In the ASEAN Leaders' Declaration on Developing Regional Electric Vehicle Ecosystem, AMS have committed to explore cooperation and collaboration on the development of the EV ecosystem, like improving infrastructures and charging stations. The declaration also encouraged the harmonisation of regional standards for the EV ecosystem to: (1) strengthen regional value chain for the EV industry, (2) enhance trade facilitation, and (3) ensure interoperability and seamless cross-border mobility. There is ambition. There now needs to be action.

Challenges and recommendations for standardised EV charging infrastructure

To achieve mass EV adoption, there is a need for both the physical infrastructure e.g. EV charging, as well as the digital infrastructure which provides information data to users to enable a reliable EV service.

AMS have made commendable progress on plans and targets for EVCS, and should continue to implement the action plans outlined in the abovementioned Declaration. A harmonised standard on EV infrastructure is essential to drive the next level of EV adoption across the region. This consists of three components: range, data flows, and interoperability.

Range

Research suggests that the core reasons why people hesitate buying EVs are range and charging infrastructure. The availability of charging infrastructure is a key factor in one's confidence to use EVs and overcome "range anxiety." This is already the case: a Rakuten Insight survey found that 35% of respondents felt that charging stations were insufficient in Singapore despite the country being at the forefront of EV adoption in the region [11].

Presently, insufficient charging infrastructure within each AMS is also an issue, exacerbated by a lack of space in cities. Amongst existing charging stations, most of them are alternating current (AC) which, although cheaper than direct charging (DC), are slower in charging EVs: charging with DC can be ten or more times faster than with AC. Inadequate charging stations disincentivises EV adoption as the additional downtime for charging becomes an acute cost. With charging stations being run by small operators, insufficient charging infrastructure becomes particularly concerning to users. This manifests in a reluctance to adopt EVs, further exacerbating the difficulty of small operators to invest in building more EV charging stations.

An important first step to addressing such concerns is to encourage AMS to ensure that their electricity grids have sufficient kilowatts capacity for the installation of multiple charging infrastructure in a location. This means that energy grids need to be augmented to accommodate this modification, incurring a cost which needs to be borne by respective governments. This step feeds into the bigger picture of regional interoperability to encourage EV adoption: sufficient infrastructure domestically neatly translates into enhancing the regional EV charging ecosystem as a robust network of local charging stations facilitates efforts to standardise such infrastructure with the groundwork having been laid.

Getting charge points installed gets the EV ball rolling, but what also contributes to range anxiety is losing trust in the charging network if chargers are often down or not working. In North America, it has been found that 20-25% of charge points are not working at any given time. Incentives after a charge point is installed should be considered not just to encourage charge point growth, but solid maintenance of those charge points.

We recommend:

- AMS enhance their domestic grid capacities to support more EVCS. ASEAN should also determine the number of EVCS to support long-distance and cross-border travel.
- Collaborate with private sector and harness data to map out most optimal location for EVCS and how many charging points are needed.
- Consider providing incentives to encourage maintenance of charge points.

Data flows

EVs are connected. Connected services can show users information like where the nearest charge point is and the right connecter type. It doesn't replace the need to improve infrastructure, but it does take the pain out of planning. EV drivers want to:

- **Plan and find**: See the charging options along the route and at the destination that suit the car and needs (e.g. plug type, power, amenities, operability, safety)
- **Navigate**: Be guided to the EV charge point with sufficient charge left. Quality data for users to navigate requires real time, probe and historic data of driver behaviour, battery performance, weather, traffic and other contextual data
- **Have availability**: Be guided to a connector that is available and working
- **Charge and pay**: Know in advance how and how much to pay for the charging

Currently, datasets are siloed, owned and managed by multiple stakeholders. Data needs to be accessible for all, in a normalised, secure, intuitive and safe manner. To do that, players within the EV ecosystem like automotive manufacturers, charging technology and map providers must employ the same format of data to enhance the overall EV driving experience.

It is also essential for Charge Point Operators (CPOs) to provide high-quality, real-time data about their charging stations, and ASEAN should make this a standard practice. This includes clear information on whether a charging point is occupied or available, as well as transparent pricing details. Treating this dynamic, real-time data as a common resource, similar to public infrastructure information, would allow EV users to better plan their routes and charging stops. With accurate data, EV drivers could avoid the inconvenience of arriving at a full station—especially critical for those with low battery who may not have the range to reach another charger. Additionally, for EVs to access and exchange this information seamlessly, affordable data connectivity is necessary to support effective communication between vehicles and the charging infrastructure.

Finally, data flows in terms of a regionwide EVCS mapping system would further facilitate and ease cross-border travels as user convenience is enhanced when they know where EVCS are located exactly throughout their journey.

We recommend:

- ASEAN to encourage a common data format across all EV ecosystem players, ensuring that data is accessible, normalised, secure, and user-friendly.
- CPOs should be required to provide high-quality, dynamic, real-time data on charge point status (occupied/open), pricing, and location. This data should be treated as essential infrastructure, accessible as a shared public resource.
- AMS should collaborate to exchange information on domestic EVCS and create a unified ASEAN-wide mapping system.
- Ensure EVCS data is freely available to third-party developers under a non-restrictive license. This allows integration into navigation systems, mapping applications, and other tools that enhance the charging experience for users across ASEAN.

Interoperability

A harmonised system on EV charging would boost the region's attractiveness to investors as consistent regulation will facilitate market access for companies, thus promoting investment in EV infrastructure and manufacturing within the region.

Having systems that talk to one another across borders will also give EV users access to an expanded charging network in different countries and across different operators, ensuring seamless cross-border travel, which is logical given how close ASEAN countries are to each other. This integration is vital for enabling EV users to travel without concern about incompatible charging stations, promoting greater EV adoption.

ASEAN has already taken steps towards such harmonisation: in 2023, Malaysia's Yinson GreenTech and Singapore's ComfortDelGro Engie have signed a partnership agreement to offer motorists on both sides of the Causeway access to over 1000 EV charging points [12]. Continuous efforts should be undertaken for more ASEAN countries to work towards harmonising EV charging infrastructure.

There is also an important role for battery swapping infrastructure, particularly in sectors with high operational vehicle demand, such as heavy-duty vehicles (HDVs), and delivery fleets utilising two- and three-wheelers. Battery swapping can offer significant benefits, providing a rapid, cost-effective alternative to traditional charging in such high-usage context. It allows these vehicles, which are affected by charging downtime, to simply swap out depleted batteries for fully charged ones at compatible stations, minimising delays and maintaining operational efficiency.

For instance, Shell has established battery-swapping partnerships to meet the unique needs ot the delivery and logistics sectors, which cannot afford prolonged downtime. The expansion of similar battery-swapping options across ASEAN could greatly facilitate EV adoption in commercial and operational fleets in the region, especially in urban areas where limited space may hinder the development of traditional EV charging infrastructure.

We recommend:

- Standardise the plug system across ASEAN. For example, AMS can agree to either install EVCS with Types 1, 2, and 3 plugs, or agree to use one of the three plug types.
- Enhance battery-swapping infrastructure.

EV incentives

Key to encouraging EV adoption is EV tax incentives, which are designed to bridge the price gap between EVs and conventional vehicles, thereby accelerating EV adoption through increased affordability and attracting foreign investment in local EV manufacturing for ASEAN to position themselves as key players in the global EV market.

That said, while tax incentives are a critical initial driver of market demand, it is important to approach incentives as part of a broader strategy for reducing the total cost of ownership gap between traditional ICE vehicles and their zero-emission counterparts. Tax incentives are one effective part of the solution, but other policies, such as financing support, infrastructure grants, and operational incentives, are also necessary to create a comprehensive support framework.

Policies and incentives can be highly effective in kickstarting market development, but should eventually phase out as the market matures, allowing private investment to take a more prominent role. This phased approach, which encourages initial EV adoption and gradually moves toward market-driven growth, can help ensure long-term viability and sustained investment in ASEAN's EV sector.

Challenges and recommendations to boost EV uptake through incentives

Despite the array of tax incentives, ASEAN's EV penetration remains low. As of 2022, ASEAN's EV car sales as a share of total vehicle sales were 2.1%, compared to the EU where EVs accounted for roughly 20% of new car registrations [13]. This is due to consumer perception that the switch to EVs is expensive due to higher battery cost contributing to higher purchase price of EVs [14]. This is indeed the case: subsidies in ASEAN are insufficient to lower upfront costs of purchasing EVs over Internal Combustion Engine (ICE) Vehicles [15].

To boost EV adoption, we recommend spurring demand- and supply-side factors. On the demand side (Table 3), AMS can boost financial and tax incentives for end users and extend the range of incentives beyond taxes with more coordinated trade and investment policies for EV manufacturing and regional supply chains to enhance affordability and availability. Specifically, ASEAN can set common goals and aspirations for more domestically oriented policies.

On the supply side (see Table 4), AMS can boost production capacity through enhanced financial and tax incentives for EV manufacturers, tax exemptions or adjustments to boost domestic production, support for R&D and training, and reducing barriers to entry by relaxing foreign ownership restrictions.

Table 3: Demand-side incentives

Incentive type	Details	Case study
Financial and tax incentives for end-users	Offer rebates or subsidies at the point of sale; extend tax breaks, structure taxes in the form of rebates, rates, deductibles; look into what market conditions would allow for favourable leasing of EVs	**China** 8.1 million new electric cars were registered in 2023, representing a 35% increase compared to 2022. Over 90% of EVs are eligible for tax breaks with some of the most affordably priced models, like the BYD Seagull hatchback model (produced in China) which costs US$10,7000. China's incentive package is worth USD72 billion. On average, EVs cost an average of US$53,800 in China, compared to up to US$100,000 in ASEAN. Fuel tax increases: emissions restrictions on ICE vehicles in urban areas; city driving bans for certain ICE vehicles.
Non-financial incentives	Preferential road access, exemption from road tolls (or reduced), dedicated parking spaces	**Norway** Highest EV adoption rate in the world, with EVs making up around 82% of new car sales in 2023. Norway also plans to prohibit sales of fossil fuel-powered vehicles by 2025 and provided extensive non-financial incentives to boost adoption: 1. 1996-2021: No annual road tax 2. 1997-2017: No charges on toll roads 3. From 2023: Maximum 70% of the total amount of toll roads 4. 1999-2017: Free municipal parking 5. From 2005: Access to bus lanes

Table 4: Supply-side incentives

Incentive type	Details	Case study
Financial and tax incentives for EV manufacturers	Provide grants or loans to stimulate investments in the EV value chain, including subsidies for charging infrastructure on DC charging	**Japan** Subsidies include government support covering USD22.2 billion for battery production and USD1 billion for manufacturers to boost EV supply chain security. **Poland** Has a dedicated fund of PLN870 million to construct or upgrade 17,760 EV charging stations from 2021 to 2028. Of it, PLN630 million is allocated to build DC charging stations.
Support for R&D and training	Upskilling workers, training them on EV standards and EV engineering skills	**Singapore** Government partnered with 21 organisations to develop training opportunities for automotive technicians, and collaborating with training providers to develop and implement foundational training courses. Government will subsidise up to 70% of the baseline course fee.
Reducing barriers to entry	Relaxing foreign ownership restrictions to encourage manufacturers and operators to enter the market	**China** Abolished restrictions on maximum foreign ownership in new energy vehicle (NEV) automakers, which were previously at 50%. By 2023, all restrictions on foreign ownership in the auto sector were removed.

Maersk has ambitions to expand green solutions across all transport modes by 2040. Maersk has already deployed electric trucks across India, America, and Germany. In Southeast Asia, a pilot project in Vietnam is slated to go live in 2024. Maersk is also planning to explore the possibility of carrier haulage EVs, first in Singapore and Manila, and in Malaysia and Indonesia thereafter.

Vietnam Pilot Project

Project Scope

- USD $2.5 million in capital investments
- The pilot will commence in two phases: (1) importing electric trucks, commercialising and operating road freight transport services for Maersk' customers on certain corridors in the North & South of Vietnam, and (2) invest in additional vehicles and extending the scope of operation nationwide
- Phase I : 12 EV trucks imported from China and Thailand + 2 EV Vans & 10 EV prime movers for first- and middle-mile operations
- Phase II : Intent to scale up to 100+ units by 2030 and more by 2040
- Pilot will last the entire duration of an EV truck's depreciation period - estimated to be 10 years - and all trucks will operate under 100% FDI from Maersk
- Charging stations will be installed at Maersk-leased warehouses located in the South (Binh Duong provinces) and North (Hai Phong & Bac Ninh provinces)
  - Thai Binh shoes (TBS) warehouse
  - Maersk OCF warehouse (VSIP II)
  - Hai Thanh (HTM) & Bac Ninh warehouse

Projected Outcome

- Solicit support from policymakers and stakeholders
- Reduce fuel costs and maintenance expenses, which in turn lowers operating costs
- Reduce oil imports dependency to increase energy security, and impact of oil price volatility
- Encourage green technology development and advancements in local expertise on the matter
- Allow policy leaders to show commitment to sustainable transportation and set example for other Asian countries
- Reduce GHG & air pollution, and therefore Maersk's carbon footprint and protect public health
- Increase job opportunities and boost the local economy

Singapore and Manila EV Carrier Haulage Project

This project is currently in an exploratory phase. Preliminary views indicate interest in operating on a leased strategy or purchased through vendors in Singapore and Manila, which have the existing infrastructure to support operation of heavy trucks for haulage of containers. The project team is currently collecting data, to get a sensing of pricing and viabilities in Singapore and Manila. Maersk is also looking to explore viability of EVs operations in Malaysia and Indonesia.

HERE Technologies tackles range anxiety to drive EV adoption in Southeast Asia

Consumer studies continue to show that range is a key barrier for EV adoption in the mass market. Range is inextricably linked to other information about the roads, including weather conditions. Batteries last longer in some temperatures than others. There is a need for data accuracy and quality to enable a reliable service on where and how to charge. Quality data for users requires real time, probe and historic data of driver behaviour, battery performance, weather, traffic and other contextual data.

HERE provides location technology for EV users' needs:

- **EV Charging:** For worldwide visibility into EV charge points, including availability and specifications
- **EV Routing & Range:** For optimised EV guidance that considers relevant vehicle factors, driving efficiency and applicable charging points along the route, with the ability also for multi-stop planning
- **EV Navigation:** For end-to-end EV driving that incorporates range forecast, routing and charging into one seamless experience

With over 1.3M charge points in 130+ countries, and >80% dynamic coverage, HERE has one of the most extensive EV datasets in the world. 180M+ vehicles worldwide run on HERE map data.

In Southeast Asia, HERE provides information on EV charge points in Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam. In Indonesia, Singapore, Thailand and Vietnam, HERE provides over 90% static coverage of EV charge point information to enable users to drive at ease.

HERE's routing technology uses several inputs — distance, energy consumption, topography and terrain — to direct the vehicle to the most efficient route, leading to longer ranges and fewer charging stops. The technology will also help drivers plan charging stops for longer journeys. By providing information about charging stations and enabling users to plan more efficient routes, users can drive with a peace of mind.

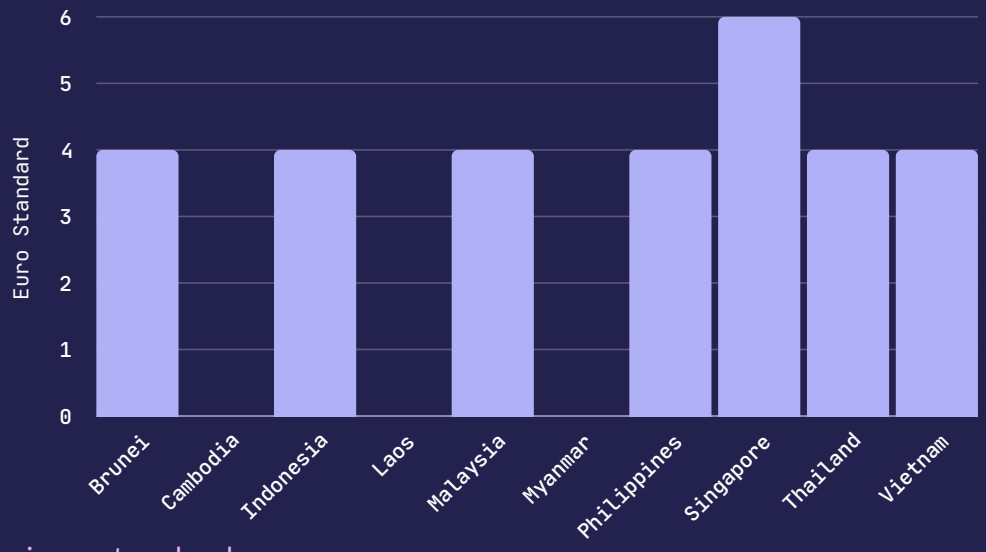
Finally, HERE's location technology is crucial for city planners and electricity system operators to decide where to place EV charging stations throughout the city. Many variables – traffic trends, congestion level, weather, topography and terrain, to name a few – impact range and need for access to a charging station. When EV charging stations are available and always within reach, users can better plan their travel routes and reduce anxieties about running out of charge.

Advancing decarbonisation: Optimising ICE vehicles & using biofuels

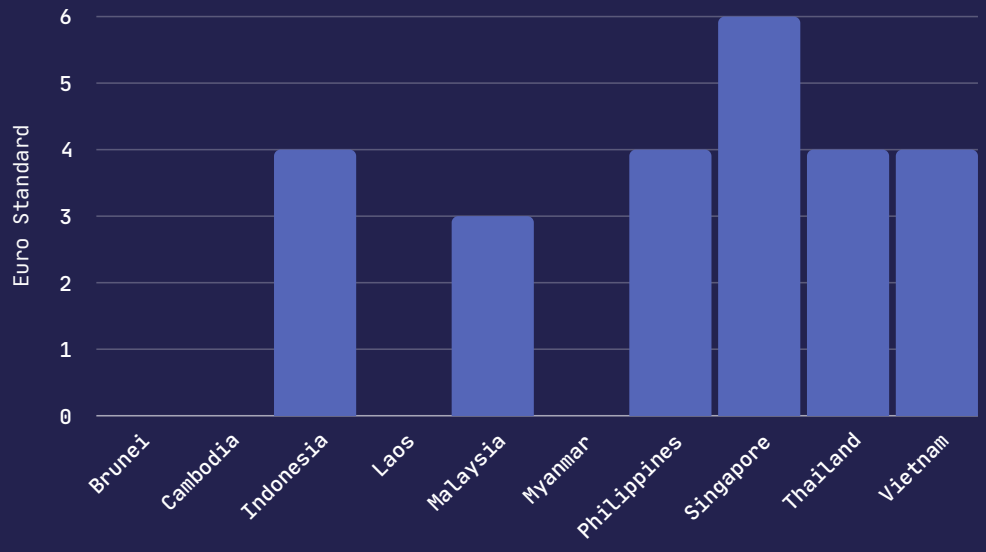
Current landscape of emissions standards

While emphasis should be placed on EVs, the reality is that an overwhelming proportion of vehicles in ASEAN are still ICE vehicles. For instance, 97% of private vehicles in Singapore are ICE [16], with HEVs and BEVs comprising a mere 4.9% of total four-wheeled vehicle sale in 2023 [17]. Likewise, Vietnam has 70 million ICE two-wheelers [18]. A shift to optimising ICE vehicles would complement EV plans by supporting efforts to improve air quality and meeting climate targets. As of 2022, emission standards adopted across ASEAN varies, with most adopting Euro 4 for light-duty vehicles (Table 8).

LDV emissions standards



HDV emissions standards



Recommendations

The EU-ABC would like to recommend the adoption of Euro 5 standards for ICE vehicles which precipitates the need for technology adoption and investment in cleaner, more efficient technologies to meet the Euro 5 standards which hold countries to a higher standard.

Concretely, AMS should develop a roadmap for transition to Euro 5 or even leapfrog to Euro 6, especially if vehicles on the market are already at Euro 5. This not only propels ASEAN towards individual net-zero targets but also supports the harmonisation of vehicle standards and fuel quality imports across AMS.

Additionally, to align the optimisation of ICE vehicles with broader air quality improvement goals and environmental sustainability target, we also suggest investing in monitoring technologies to ensure air quality levels across ASEAN do not reach dangerous levels contributed by the transport industry.

Biofuels as a decarbonisation avenue

Biofuels form a crucial part of ASEAN's energy transition strategy and present a viable pathway to reduce transport-related carbon emissions, particularly for heavy transport and other hard-to-abate sectors such as aviation and shipping. Biofuels are significantly less carbon-intensive than petroleum-based fuels and can achieve carbon neutrality if sustainably sourced.

ASEAN's abundant biomass resources, including palm oil, support a robust biofuel sector, which is a critical component in national decarbonisation policies across Indonesia, Malaysia, the Philippines, and Thailand. Beyond that, biofuels for these AMS are also a means of strengthening fuel security and supporting their agricultural sector. For example, blending biofuels into diesel and jet fuel for heavy transport can reduce reliance on imported oil and provide immediate emissions reductions without requiring significant changes to infrastructure.

In heavy transport, where electrification remains challenging due to the size and weight of batteries, biofuels are an ideal interim solution. They are compatible with existing engines and fuel distribution networks, making adoption cost-effective and scalable. And, together with a higher adoption of EVs, biofuels can potentially slash the transport sector's energy consumption by 53% in 2050. In the recent ASEAN Green Transport Rally, biodiesel vehicles were found to emit less CO2 than BEVs due to the current electricity generation mix, demonstrating biofuels' potential as a viable, lower emission alternative for the region's existing vehicle fleet. Further, projections from the 7th ASEAN Energy Outlook indicate that a 10% biofuel blend could reduce oil imports by up to 7%.

Ultimately, transitioning to EVs will remain the long-term solution for ASEAN's decarbonisation targets. However, biofuels provide an immediate and scalable option for decarbonising existing ICE vehicles and heavy transport. A combined strategy - emphasising EVs, biofuels, and energy efficiency - can accelerate ASEAN's carbon neutrality goals while addressing the realities of infrastructure, investment, and the diverse energy landscapes across AMS.

Challenges and recommendations

Despite their potential, biofuels face several barriers that could affect their long-term scalability and environmental impact.

- **Sustainable feedstock production**
  Ensuring that biofuel feedstocks are sustainably produced is crucial to avoid deforestation, land-use conflicts, and food security issues.
- **Technological and infrastructure limitations**
  While biofuels can integrate with existing ICE vehicles, improving conversion efficiency and aligning infrastructure compatibility across ASEAN remains essential for scaling biofuel adoption.
- **Market viability**
  While biofuels reduce reliance on imported oil, they often require supportive policies and subsidies to remain competitive with fossil fuels, which could strain public finances.

- **Sustainable production and certification**
  Introducing regulations and certification schemes for sustainable biomass production would help ensure that biofuels contribute to emissions reductions without exacerbating environmental harm.
- **Enhanced collaboration and standardisation**
  AMS could benefit from harmonised biofuel standards and a shared biofuel market, facilitating cross-border trade and reducing regulatory inconsistencies.
- **Investment in advanced biofuels**
  Research and development funding for non-food-based and waste-derived biofuels can help scale sustainable alternatives, minimising the impact on agricultural land use.
- **Energy efficiency measures**
  Complementing biofuels with energy efficiency policies—such as fuel economy standards and incentives for efficient vehicles—can further reduce energy consumption and emissions in the transport sector.

While EVs remain a crucial long-term solution for ASEAN's decarbonisation targets, biofuels offer a realistic pathway for existing ICE vehicles in the near term. Transitioning to EVs is complex, as it requires substantial infrastructure investments in charging stations and grid improvements. Biofuels, by contrast, leverage existing fuel infrastructure and support energy security, potentially reducing oil imports by up to 7% with a 10% biofuel blend, according to projections in the 7th ASEAN Energy Outlook.

Ultimately, ASEAN's path to a low-carbon transport sector requires a multifaceted approach. A strategy incorporating both biofuels and EVs, supplemented with energy efficiency measures, can accelerate decarbonisation and support ASEAN's carbon neutrality goals by mid-century. This balanced approach mitigates emissions while accommodating current infrastructure and economic realities across ASEAN.

Greening the maritime industry with green fuels

Current landscape of emissions standards

Achieving a zero-emission future for shipping is key to meeting Paris Agreement climate targets. The shipping industry facilitates global trade by moving over 11 billion tonnes of goods along deep-sea routes annually [19].

However, shipping contributes to nearly 3% of global greenhouse gas emissions and is one of the hard-to-abate industries [20]. This is because these massive ships cannot run on renewable energy directly as many land-based industries will be able to, instead the energy will need to be converted into a dense form that is light and easy to handle on ships. This not only complicates the shipping industry's path to decarbonisation, but also makes the cost higher. While the industry is working to reduce fuel consumption and improve energy efficiency, fuel is by far its largest expense at around 30-50% of a vessel's operating costs, and bunker fuels (heavy fuel oil) and distillates currently make up 99% of shipping's energy demand.

There is a growing market for green and lower-carbon fuels and for ships that run on those fuels. They are produced from hydrogen and electricity from renewable sources or use gases from biogenic sources, both of which are low carbon in nature [21]. AMS have made progress in greening their maritime sector: the Maritime and Port Authority of Singapore (MPA) launched an expression of interest (EOI) for the supply of methanol as a marine fuel [22]. The EOI received 50 submissions, with these projects having the potential to supply over one million tons per annum of low-carbon methanol by 2030. Likewise, Malaysia aims to achieve 40% low-carbon fuel penetration for marine transport by 2050 [23]; the Philippines, during the 45th Maritime Transport Working Group Meeting in 2023, shared that hydrogen is bring considered to be used in power generation and looking for the possibility for use in maritime transport [24].

However, the production of these green fuels is currently limited, with production capacity projected to reach 8 million tonnes a year by 2027. This is insufficient to meet global shipping industry needs of 550 million tonnes by 2050 to replace oil. Additionally, green fuels are about three to four times more expensive, hindering widespread adoption.

Recommendations

Recommendation	Details
Support development of IMO regulations	Engage in the International Maritime Organisation (IMO) processes to finalise global fuel standards and a GHG emissions pricing mechanism by 2025 Advocate for ambitious targets that encourage swift action in reducing emissions and incentivise green fuel use.
Promote the Green Balance Mechanism	Support the proposal by Maersk and the World Shipping Council for a Green Balance Mechanism, which aims to equalise the costs between green and fossil fuels AMS encouraged to back this global policy instrument to foster a level playing field for green fuels in maritime shipping
Bridge cost disparity between green and fossil fuels	mplement policy measures such as subsidies, tax incentives, or funding for green fuel infrastructure to make green fuels more financially viable compared to fossil fuels Collaborate with private and public sectors to secure investments for green fuel production, especially in regions with strong maritime trade presence
Capitalise on strategic trade routes	Develop green fuel hubs in ASEAN nations that lie along major trade routes, leveraging their strategic locations to reduce green fuel transport costs Consider partnerships with regional ports to build shared green fuel infrastructure, potentially reducing costs through economies of scale
Establish an ASEAN Roadmap for greening the shipping industry	Create a unified ASEAN roadmap with clear targets and milestones for reducing emissions in maritime shipping Encourage regulatory convergence within ASEAN to ensure cohesive and enforceable policies across member states Promote regional agreements to standardise emissions regulations, which can foster a predictable investment climate for green technologies in the maritime sector

Maersk initiatives with low carbon fuels

Methanol vessels

Maersk currently has 25 green methanol-enabled vessels in service or on order through 2027 – Laura Maersk, the world's first container vessel with a dual-fuel engine able to run on green methanol, 6 vessels with a capacity of 9,000 TEU each and 18 vessels with a capacity of 16,000/17,000 TEU. The 18 large green methanol-enabled vessels are slated to be delivered throughout 2024 and 2025.

Since the order of Laura Maersk was announced in 2021, the industry has joined the green journey. Today, over 260 new methanol-capable vessels are on order or being retrofitted. Beyond green methanol, biofuels are becoming an industry-standard sustainable fuel option due to its compatibility with existing engine technology, allowing Maersk and other ship liners to sustainably operate today with little to no retrofitting. As decarbonisation efforts intensify, Maersk intents to ramp up utilization of biofuels in Maersk's operations in the coming years. The growing number of Green and Digital Shipping Corridors, which are shipping routes that are dedicated to the deployment of zero-emissions vessels, also facilitate the creation of a favourable ecosystem for decarbonisation initiatives, the success of which rely exclusively on the availability of sustainable fuels. With nearly 60% of liner capacity on order for delivery before 2030 are designed to run on green fuels, future demand of sustainable fuel within the industry will certainly increase.

Green Balancing Mechanism

Maersk and the World Shipping Council (WSC) proposed a Green Balance Mechanism that would help even out the cost differences between green and fossil fuels via a global policy instrument. The Green Balance Mechanism is designed to bridge the economic gap between fossil fuels and green fuels, thus fostering an environment where the adoption of low-emission technologies becomes financially viable. By redistributing fees from fossil fuel users to subsidise green fuel users, the GBM ensures that the average cost of fuel usage remains balanced across the shipping industry.

This approach incentivises immediate investments in green technologies and accelerates the production of the cleanest fuels through economies of scale. Importantly, the GBM achieves this with very limited inflationary effect as the fee is spread over large quantities of fossil fuels, and rewards are only given for fuels with deep GHG reductions. Maersk believes that such strong regulations are essential to addressing the scarcity and high cost of green fuels. As such, Maersk encourages stakeholders and policymakers alike to advocate for the standardise emission reduction in shipping through the establishment a global fuel standard: the Green Balancing Mechanism.

Maersk initiatives with low carbon fuels

Methanol bunkering

Singapore: Maersk Solstice

Singapore's green fuel bunkering infrastructure readiness is one of the most advance in Southeast Asia. The Maritime Post Authority (MPA) is working diligently to support the uptake of low carbon fuels like green methanol, but more policy support is still needed.

In July 2023, Maersk carried out the world's first ship to ship/ container methanol bunkering exercise in Singapore. This involved refilling Laura Maersk with 350 tonnes of methanol produced in central Louisiana. Maersk worked closely with MPA and Hong Lam Marine for the success of the bunkering, in addition to Hazard Identification (HAZID) and Hazard and Operability (HAZOP) workshops carried out with various Singaporean authorities to ensure the safety of the operation. While the operation was a success and a step in the right direction, more needs to be done to scale green fuel bunkering capabilities.

Malaysia feasibility study for a pilot project at Port of Tanjong Pelepas (PTP)

Several findings were made during this project. First, methanol is a potential green fuel option in the short term, with Ammonia and Hydrogen in the longer term. Second, it is commercially unlikely an operator would step in to develop methanol bunkering operations in short term without industry and government support. This is due to operators requiring external support from shipping liners to de-risk commercial operations. They also require financial support from governments to subsidise the required capital investment and/or incentivise the use of new bunkering operations.

As for its socio-economic impact, green fuels are extremely beneficial as they create employment opportunities, profit, and value to the economy which could add up to USD103 million to Malaysia's GDP during construction and up to USD52 million to the GDP annually once operational. This amounts to up to 280 ongoing jobs.

Key benefits of green bunkering include maintaining competitiveness for the Malaysian Port Sector. Without green bunkering, Malaysia loses out on the opportunity for value-add services: as methanol and ammonia are less dense, they would probably require more bunkering stops per journey, translating into higher demand for ports and stops. Additionally, without green bunkering, Malaysia might lose out on business and competitiveness as the industry moves towards sustainable fuels to meet IMO and international regulations. Bunkering is also a catalyst for the low carbon fuel supply chain in Malaysia.

The path to a low-carbon aviation industry

The aviation industry is crucial to the ASEAN economy: estimates indicate that nearly half of the world's air traffic growth will be driven by travel to, from, and within the Asia-Pacific region, with the Southeast Asian market expected to soar between 2023-2042 [25]. Aviation has already displayed massive potential to support economies: for example, as of 2018, the aviation industry contributed to 11.8% of Singapore's GDP[26] and 15.5% of Thailand's [27].

However, aviation is a significant contributor to air pollution in ASEAN. In Thailand, commercial aviation is one of the highest carbon dioxide emission sources in the transport sector, with emissions rising from 10.2 million tons in 2014 to 12.3 in 2018, a 29% increase [28]. Likewise, Singapore's aviation fuel usage in 2023 translates to about 28 million tonnes of carbon dioxide emissions [29]. In order for countries to achieve their respective net zero targets, they need to turn to more sustainable fuel sources to power commercial planes with the properties of traditional jet fuel to ease the transition to decarbonising air transport.

Sustainable aviation fuel (SAF) has become a viable solution to decarbonise air transport [30]. There are a number of sources from which SAF can be produced: Neste, the world's largest SAF producer, uses renewable waste and residue raw materials as feedstock [31]. Better yet, SAF are chemically similar to traditional jet fuels, meaning it can be integrated into existing aircraft engines and airport infrastructure.

ASEAN has recognised the importance of decarbonising the aviation sector in their ASEAN Sustainable Aviation Action Plan (ASAAP) [32]. The ASAAP details a timeline from 2023-2032 to achieve four goals: sharing best practices on aviation decarbonisation, facilitating information exchange, developing an ASEAN Sustainable Aviation Roadmap, and supporting the Kuala Lumpur Transport Strategic Plan 2016-2025 [33] and the Post-2025 Vision Roadmap for ASEAN Transport Cooperation [34].

In line with ASEAN's acknowledgement of sustainable aviation's importance, Singapore, Indonesia, Malaysia, Thailand, and the Philippines have made progress in their adoption of SAF. Overall, the five AMS have either finalised roadmaps or are on track to, and have explored options to increase SAF supply in their country.

At a glance: Progress in SAF adoption

- Finalising National Energy Plan by September 2024, which includes the Alternative Energy Development Plan (AEDP). AEDP proposed blend rate target for SAF with conventional jet fuel to reach 8% by 2036
- First SAF production facility to be operational in the first quarter of 2025, with a daily production capacity of one million litres only using used cooking oil as the feedstock
- Thai Airways operated first flight using Neste MY SAF in 2023, and signed MOU with Bangchak Corporation to exchange technical knowledge and expertise on SAF usage

- Finalising SAF roadmap by 2024
- Department of Transportation in talks to build SAF plant
- Cebu Pacific (CEB) started using SAF in its aircraft - to date, it has 55 Airbus planes that can be fuelled with SAF. In 2022, it signed an MOU with Shell Eastern Petroleum to supply at least 25,000 tonnes of SAF annually
- Philippine's Prime Infrastructure Capital Inc. has partnered with US-based SAF start-up, WasteFuel Global, to have its first biorefinery in the Philippines. This biorefinery will convert one million metric tons of municipal waste in 30 million gallons of SAF annually

- Malaysia Airlines flew first passenger flight on Neste's MY SAF in 2022 and aims to achieve 10% SAF uptake level by 2030
- National Energy Transition Roadmap (2023) sets out target of 47% SAF blending target by 2050
- National Blueprint for Green Aviation will establish comprehensive policies governing operational procedures in aviation, including minimising fuel consumption
- Malaysia Aviation Group signed agreement with Petronas for 230,000 tonnes of SAF to its airlines starting 2027

- Reduce domestic aviation emissions from airport operations by 20% in 2030 compared to 2019 levels
- Flights departing Singapore must use SAF from 2026
- Raise SAF target beyond 1% in 2026 to 3-5% by 2030
- Singapore Airlines (SIA) Group to use SAF for 5% of total fuel requirements by 2030
- SIA Group and Neste signed agreement to purchase 1000 tonnes of neat Neste MY Sustainable Aviation Fuel

Challenges and recommendations

The SAF market is still nascent. As a result, SAF comes with a high price tag. The cost of generating SAF is three to five more than producing conventional aviation fuel [35]. While airlines typically make fuel sourcing decisions, the competitive nature of the aviation industry makes customer price sensitivity a key consideration. Any fare increases, such as an additional SGD16 for an economy class passenger on a direct flight from Singapore to London, could influence travellers' willingness to pay [36]. Given the tight profit margins in aviation, airlines may struggle to absorb these costs and pass some of the increases onto passengers, potentially affecting demand.

The uptake for SAF has also been slow: despite the region possessing massive potential to supply 10.4 million metric tons of organic waste and residue oil annually for SAF [37], there are but a few airlines and airports actively using SAF, and the region produces less than 1% of global SAF [38].

Harmonising SAF feedstock standards is a way for ASEAN to cut down reliance on traditional jet fuels. It would also enable the region to explore its potential of becoming a key supplier of raw materials in SAF production. ASEAN possesses abundant biomass resources, including waste oils, agricultural residues and non-food crops [39] amounting to an estimated 500 million tonnes per year [40]. Uniform feedstock sustainability would facilitate the seamless integration of feedstocks from different ASEAN countries, ensuring consistency in quality and sustainability - crucial for international market acceptance. To achieve this, harmonising efforts should focus on certifying locally produced SAF and SAF feedstocks in alignment with internationally recognised standards for sustainability and carbon emissions reduction. This approach would prevent ASEAN countries from duplicating the work of established international bodies, such as ASTM (American Society for Testing and Materials), and creating fragmented sustainability and technical standards.

Positive examples already exist within the region: Pertamina recently obtained ISCC CORSIA and ISCC EU certification for SAF distribution, while Indonesia is working with the EU and Japan to secure recognition of ISPO certification for feedstocks. These initiatives demonstrate how ASEAN can leverage internationally recognised frameworks to enhance SAF production and trade, ensuring consistency in quality and sustainability for both regional integration and international market acceptance.

Further, we recommend AMS to develop adequate and coordinated support frameworks to increase SAF supply. Various agreements have been signed to increase SAF production: Neste expanded their refinery capacity in Singapore to provide 1.25 billion litres; PETRONAS will supply over 230,000 tonnes of SAF to MAG airlines from 2027; Bangchak and Japan's Sumitomo Corp. will produce SAF from used cooking oil [41]; Wastefuel Global and Prime Infrastructure Capital Inc. will convert one million metric tons of municipal waste in 30 million gallons of SAF annually. Continued collaboration and R&D are necessary to grow SAF production capacities and capabilities in ASEAN.

To boost SAF production in ASEAN, it is essential to leverage the region's diverse array of unique feedstocks. These include used cooking oil, vegetable oil wastes and residues, animal fat waste, and more. Before scaling up regional SAF production, these feedstocks and their associated pathways must be thoroughly assessed, developed, and certified to comply with international standards.

Among these feedstocks, it is important to address the reputational challenges linked to palm oil, including its wastes and residues, which hold significant potential for SAF production. ASEAN nations are already exploring methods for utilising sustainably produced and sourced palm oil by-products in their SAF initiatives.

Challenges and recommendations (continued)

Singapore supports all feedstocks under Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) and advocate for a pragmatic, science and evidence-based approach to consider palm oil and its by-products in SAF production [44]; Indonesia flew its first commercial flight using palm-oil blended jet fuels [45]; Thailand is conducting research to convert palm-oil based biodiesel into SAF [46].

While the EU prohibits the use of palm oil for SAF production under the Renewable Energy Directive II (RED II) regulation, waste products derived from palm oil production that meet the allowed feedstock criteria in Annex IXA and IXB are recognised as valid feedstocks.

One channel to address and converge on feedstock environmental analysis methodology and results is the ASEAN-EU Comprehensive Air Transport Agreement (AE-CATA). Signed in 2021, the AE-CATA promotes bloc-to-bloc air transport to bolster air connectivity between two regions. Crucially, it strives to promote cooperation on air traffic management, aviation safety, and environmental matters. The latest update on the agreement was during the 31st ASEAN-EU Joint Cooperation Committee in May 2024, where both parties welcomed progress on its implementation.

Pushing for its full implementation would provide a framework for ASEAN to align aviation regulations between the two regions. This alignment can also extend to environmental standards. Both regions can, through the AE-CATA, look at means of expanding the availability of feedstock for the production of biofuels and SAF. In doing so, it is our view that there needs to be an open discussion about expanding the use of sustainably produced and sourced regional feedstocks as a means of increasing supply and the availability of SAF, and ensuring that SAF can support air connectivity between the EU and ASEAN.

Doing so will provide clear guidance to ASEAN on how to navigate the landscape as a collective economic bloc.

AE-CATA's full implementation can also expand the air transport market: by allowing airlines more opportunities to operate passenger and cargo services, the agreement can increase the demand for SAF across a larger market. This increased scale can help drive down production costs, making SAF more economically viable to facilitate increasing SAF supply.

Finally, to promote the adoption of SAF among airlines in the ASEAN region, we recommend that AMS establish a unified regional policy framework. It should explore the introduction of minimum SAF adoption targets, supported by a phased timeline created in collaboration with key stakeholders, including airlines and fuel producers. Such a timeline should be both practical and adaptable, accounting for the varying levels of preparedness of AMS while aligning with the region's sustainability objectives. Within its Sustainable Aviation Blueprint, Singapore has implemented targets from 2026 for flights departing from Singapore, introducing a levy to be collected from passengers, and the notion of central purchase. International flights departing Indonesia will also be required to use 1% SAF in their fuel mix.

While SAF adoption may seem challenging due to its early stage of development, establishing a regional policy framework is a practical first step. This approach fosters dialogue and facilitates the exchange of critical knowledge, enabling AMS to collectively agree on a feasible timeline that supports the gradual and effective adoption of SAF across the region. As an example, the Association of Asia Pacific Airlines, which includes ASEAN airlines, have collectively set a target to strive for 5% SAF utilisation by 2030. [47]

Conclusion

Decarbonising ASEAN's transport sector presents a compelling opportunity for both environmental sustainability of the region, and business growth for European companies.

The analysis outlined in this paper highlights the importance of a harmonised approach towards electric vehicles, the acceleration of higher Euro standards for ICE vehicles and using biofuels as a short- to medium-term solution for decarbonising the land transport sector, the adoption of green and low carbon fuels in the maritime sector, and transforming the aviation sector using sustainable aviation fuels.

Each of these strategies addresses a critical component of ASEAN's transport sector that hopefully can contribute towards the region's efforts to reduce its carbon emissions. **For European MNCs operating in Southeast Asia, championing these recommendations is not only a strategic business opportunity, but also an environmental imperative.**

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References

[1] https://www.imf.org/en/Publications/fandd/issues/2018/09/southeast-asia-climate-change-and-greenhouse-gas-emissions-prakash
[2] https://www.asean-competition.org/file/post_image/WEB-oecd-competition-assessment-reviews-asean-2021-s.pdf
[3] https://www.aseanbriefing.com/news/2016-2025-asean-strategic-transport-action-plan/
[4]https://www.virta.global/global-electric-vehicle market#:~:text=EV%20sales%20exceeded%2010%20million,a%2060%25%20uptake%20from%202021.
[5]https://www.ey.com/en_sg/news/2023/12/electric-vehicle-sales-expected-to-see-sharp-growth-across-asean-6-markets-ey-parthenon-study
[6] https://www.iea.org/reports/global-ev-outlook-2024/trends-in-other-light-duty-electric-vehicles
[7] https://technode.global/2021/11/30/uncovering-consumer-sentiments-on-electric-vehicle-ownership-in-southeast-asia/
[8] https://asean.org/wp-content/uploads/2023/05/07-ASEAN-Leaders-Declaration-on-Developing-Regional-EV-Ecosystem_adopted.pdf
[9] https://www.channelnewsasia.com/singapore/electric-vehicles-ev-charger-infrastructure-costs-big-read-4477561
[10] https://www.businesstimes.com.sg/international/asean/two-operators-team-offer-largest-ev-charging-network-covering-both-sides
[11] https://carput.my/ev-charging-malaysia-types-of-ev-chargers/
[12]https://www.scs.org.sg/articles/ev-charging-stations-singapore#:~:text=Singapore's%20common%20EV%20charging%20standards,found%20in%20Japanese%20EV%20models.
[13] https://www.maybank.com/iwov-resources/documents/pdf/blogs/2023/20230728-ASEAN-Mobility.pdf
[14] https://www.cetjournal.it/cet/21/89/105.pdf
[15] https://www.maybank.com/iwov-resources/documents/pdf/blogs/2023/20230728-ASEAN-Mobility.pdf
[16] https://bolt.earth/blog/ev-landscape-in-singapore
[17]https://www.iseas.edu.sg/articles-commentaries/iseas-perspective/2024-33-a-study-of-the-emerging-electric-vehicle-ev-supply-chain-in-malaysia-by-tham-siew-yean-and-neo-hui-yun-rebecca/
[18]https://www.techinasia.com/road-vietnams-netzero-future-paved-electric-vehicles#:~:text=Vietnam%20is%20the%20fourth%2Dlargest,The%20market%20potential%20is%20staggering.
[19] https://www.ics-shipping.org/shipping-fact/shipping-and-world-trade-driving-prosperity/#:~:text=Some%2011%20billion%20tons%20of,ultimately%20consumed%20underpins%20modern%20life.
[20] https://www.nytimes.com/2023/10/30/business/economy/shipping-climate-change-green-fuel.html#:~:text=The%20effect%20of%20global%20shipping,those%20emissions%20has%20been%20tricky.
[21] https://theconversation.com/green-fuels-in-shipping-face-major-challenges-for-2050-net-zero-target-211797
[22] https://www.mpa.gov.sg/media-centre/details/singapore-gears-up-to-meet-net-zero-needs-of-shipping
[23] https://www.nst.com.my/news/nation/2023/10/970763/malaysia-targets-40-pct-low-carbon-fuel-penetration-marine-transport-2050
[24] https://marina.gov.ph/2023/10/24/philippines-shares-efforts-on-green-shipping-decarbonization/
[25] https://investasean.asean.org/air-travel
[26] https://www.iata.org/en/iata-repository/publications/economic-reports/singapore--value-of-aviation
[27] https://www.iata.org/en/iata-repository/publications/economic-reports/thailand--value-of-aviation/#:~:text=The%20air%20transport%20industry%2C%20including,totaling%20to%20US%20%2463.7%20billion.
[28]https://www.sciencedirect.com/science/article/pii/S2405844024002378#:~:text=Commercial%20aviation%20is%20one%20of,sources%20of%20Thailand's%20transport%20sector.&text=emissions%20resulting%20from%20international%20commercial,million%20tons%20of%20in%202018.
[29] https://www.channelnewsasia.com/commentary/sustainable-aviation-fuel-levy-changi-airport-flight-carbon-emissions-offset-4227796#:~:text=A%20POLLUTING%20INDUSTRY&text=According%20to%202023%20data%20from,the%20country's%20size%20and%20population.
[30] https://www.channelnewsasia.com/sustainability/sustainable-aviation-fuel-cna-explains-levy-carbon-emissions-4141226
[31] https://www.channelnewsasia.com/singapore/sia-scoot-neste-sustainable-aviation-fuel-changi-supply-4316121#:~:text=SAF%20is%20jet%20fuel%20made,waste%20and%20residue%20raw%20materials.
[32] https://asean.org/wp-content/uploads/2024/04/ANNEX-07-29th-ATM-ASEAN-Sustainable-Aviation-Action-Plan-ASAAP_final-adopted_rev.pdf
[33] https://asean.org/wp-content/uploads/2021/08/KUALA_LUMPUR_TRANSPORT_STRATEGIC_PLAN_2.pdf
[34] https://www.asean.org/wp-content/uploads/2015/12/ASEAN-2025-Forging-Ahead-Together-final.pdf
[35] https://www.avbuyer.com/articles/aircraft-ownership/the-sustainable-aviation-fuel-pricing-challenge-113860
[36] https://www.mot.gov.sg/news/Details/written-reply-to-parliamentary-question-on-impact-of-sustainable-aviation-fuel-levy-on-singapore-s-aviation-sector-and-tourism-industry#:~:text=As%20an%20indication%2C%20we%20estimate,classes%20will%20pay%20higher%20levies.
[37] https://www.apicalgroup.com/articles/charting-the-course-for-southeast-asia-as-a-global-hub-for-sustainable-aviation-fuel/
[38] https://illuminem.com/illuminemvoices/scaling-sustainable-aviation-fuel-in-asean-part-1-challenges-and-opportunities
[39] https://www.weforum.org/agenda/2023/07/how-singapore-can-lead-the-way-on-scaling-up-sustainable-aviation-fuels/
[40] https://asean.org/wp-content/uploads/2021/12/FAFD-53.-Biomass-Energy-Strategy-ASEAN-2020-2030-Final-Draft-210820.pdf
[41] https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/agriculture/040324-thailands-bangchak-japans-sumitomo-join-forces-for-green-uco-to-saf-supply-chain
[42]https://wwf.panda.org/discover/our_focus/food_practice/sustainable_production/palm_oil/asia_programme/
[43] https://www.grupobbf.com.br/en/releases/palm-oil-is-the-most-efficient-raw-material-for-the-production-of-second-generation-biofuels/#:~:text=In%20addition%20to%20the%20positive,in%20oil%20production%3A%20palm%20produces
[44] https://www.businesstimes.com.sg/international/asean/singapore-supports-use-palm-oil-sustainable-aviation-fuel-production
[45] https://www.reuters.com/sustainability/indonesia-conducts-first-commercial-flight-using-palm-oil-blended-jet-fuel-2023-10-27/
[46] https://www.ofimagazine.com/news/thailands-energy-absolute-conducts-research-to-convert-palm-oil-based-biodiesel-into-saf
[47] https://www.caas.gov.sg/docs/default-source/default-document-library/annex-2---saf-factsheet.pdf