



**Advancing ASEAN's Fuel
Economy & Emissions Standards,
Post Pandemic
June 2021**



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1. ASEAN's Mobility Sector at an Inflection Point

The automotive market in ASEAN has been growing rapidly. Taken collectively, ASEAN is the world's 5th largest automotive market, manufacturing over 4 million cars and trucks per year. ASEAN is also home to three major automotive hubs with Thailand as the dominant manufacturing centre.¹

ASEAN's position as an automotive hub is also set to grow, especially in a post-pandemic world. The increasing dependence on single-country sources of supply, especially China, has grown more visible due to the crisis. From 2000 to 2020, mainland China went from producing 5 to 30 percent of the world's manufacturing value added.² With industry leaders now looking to diversify away from China and build supply chain resilience, ASEAN now has the potential to emerge as a strong and viable alternative. This has also been reaffirmed in the EU-ABC's Annual Business Sentiment Survey³ in 2020 which found out that 49% of respondents were looking to re-organise their supply chains. Of those who indicated locations for relocating, ASEAN received 34% and Europe received 20% of the votes respectively, making Southeast Asia a top region for potential relocations.

There is no doubt that ASEAN has an opportunity to become a global manufacturing and consuming hub for the automotive industry, as long as the region acts collectively to put the right foundations in policies. According to PwC Autofacts, between 2017 and 2024, total light vehicle assembly volumes in ASEAN have been estimated to increase by 48%, from 3.9 million to 5.8 million units, for domestic and export markets.⁴ With Thailand being known as “the Detroit of Southeast Asia”, ASEAN already possess a strategic advantage as a global automotive manufacturing and consuming hub.

However, the predicted growth in vehicle sales in the ASEAN region over the next decade will offer both challenges and opportunities for a greener, more eco-friendly ASEAN. While in 2019, a total of 2.3 million passenger and 1.2 million commercial vehicles were sold, total sales in ASEAN are destined to grow further in the 2020s.⁵

For ASEAN to remain competitive there is a growing need for the region to modernise its approach to automotive production, especially with regards to moving to cleaner technology adoption: improving fuel economy and lowering emissions. There are both economic and social benefits in doing so.

Implementing higher fuel economy standards and improving emission standards, presents a robust business case for ASEAN governments. This is because adopting higher fuel economy

¹ <https://www.ipsos.com/en/asean-automotive-huge-potential>

² <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/reimagining-the-auto-industrys-future-its-now-or-never>

³ The annual EU-ASEAN Business Sentiment Survey is produced with the support of the European Chambers of Commerce throughout the ASEAN member states. Survey respondents submitted their responses either through on-line links from newsletters and/or websites from the EU-ASEAN Business Council and the respective European Chambers of Commerce in each ASEAN country, or via e-mail contact from those organisations from April 2020 to July 2020. In total, 680 responses were recorded.

⁴ <https://www.pwc.com/sg/en/publications/assets/healthcare-future-asean-2018.pdf>

⁵ http://www.asean-autofed.com/files/AAF_Statistics_ytd_nov2020.pdf

standards can boost the export competitiveness of ASEAN-made vehicles. It can also drive greater innovation in ASEAN's expanding automotive industry, while reducing the financial burden of costly yet necessary fossil fuel subsidy policies that many ASEAN governments have. Adopting higher emission standards is also feasible, as the costs of adoption and compliance are far outweighed by the positive benefits stemming from the cost-savings derived from improved public health and quality of urban environments.

Socially, pollution is a major concern across the region. According to Thailand Development Research Institute, the main cause of Bangkok's air pollution is the habit of using private vehicles instead of public transport with only 21% of Bangkok residents using public transport.⁶ Unsafe levels of PM2.5 has led to a rise in the number of people being admitted in hospital for PM2.5-related concerns. Similar trends can be seen in other parts of Southeast Asia. According to Air Quality Life Index (AQLI), Indonesia had the 5th highest loss of life-years lost due to particulate pollution in the world.⁷ High PM concentrations led to significant adverse health effects with 16 districts listing upper respiratory infections as the top cause of illness and an annual loss of at least 7,390 lives due to high levels of PM2.5.⁸

The urgency to adopt cleaner technology is also highlighted by ASEAN's international commitments to reduce carbon emissions. For example, all ASEAN member states have ratified the Paris Agreement and communicated their Nationally Determined Contributions (NDC). Indonesia intends to achieve an unconditional 29% reduction in greenhouse gas emissions by 2030.⁹ Singapore too recently launched The Singapore Green Plan 2030, a plan with multiple goals including increasing solar energy deployment to at least two gigawatt-peak (GWp) by 2030 and reducing reliance on the internal combustion engine for road transport.¹⁰

ASEAN member states specific commitments have also been laid out in the ASEAN Socio-Cultural Community Blueprint 2025¹¹. One of the key targets of the Blueprint is to reduce the average fuel consumption per 100km of new light-duty vehicles sold in ASEAN by 26% between 2015 and 2025, as well as to "strengthen fiscal policy measures based on fuel economy or on CO₂ emissions, incentivise consumers to purchase efficient vehicles; and promote the adoption of

ASEAN Socio-Cultural Community Blueprint 2025

Through the Declaration on Institutionalising the Resilience of ASEAN and its Communities and Peoples to Disasters and Climate Change adopted during the 26th ASEAN Summit in Kuala Lumpur, Malaysia on 27 April 2015, the Leaders committed "to forge a more resilient future by reducing existing disaster and climate-related risks, preventing the generation of new risks and adapting to a changing climate through the implementation of economic, social, cultural, physical, and environmental measures which address exposure and vulnerability, and thus strengthen resilience.

⁶ <https://www.bangkokpost.com/business/1619014/airing-their-grievances>

⁷ https://aqli.epic.uchicago.edu/wp-content/uploads/2020/07/AQLI_2020_Report_FinalGlobal-1.pdf

⁸ <https://www.lowyinstitute.org/the-interpreter/jakarta-s-air-quality-kills-its-residents-and-it-s-getting-worse>

⁹ <https://aseanenergy.org/policy-brief-the-paris-agreement-and-the-energy-policies-of-the-asean-member-states/>

¹⁰ <https://www.straitstimes.com/singapore/environment/singapore-green-plan-2030-outlines-many-existing-initiatives-some-new-ones>

¹¹ <https://asean.org/storage/2016/01/ASCC-Blueprint-2025.pdf>

national fuel consumption standards for light-duty vehicles in all markets, striving towards a regional standard in the long term.”¹²

In this publication, the EU-ASEAN Business Council takes a deeper look at the automotive market in ASEAN and evaluates potential solutions to enable ASEAN countries to lower pollution levels associated with the automotive industry and improve fuel-use efficiency both in order to help the region reduce pollution and make its automotive industry more competitive internationally. While the Council understands that 2-wheeler vehicles are popular in some ASEAN countries, this paper targets 4-wheelers to provide concrete and actionable recommendations that can be achieved within a realistic timeframe. Solutions include using better engine technologies through higher emission standards and fuel additives. By adopting more environmentally friendly options early, it would lead to lower pollution rates and hence ensure a more sustainable economic development for ASEAN in the long run, whilst also opening up more export markets for vehicles manufactured in the region. Moving forward, this paper may then serve as a launchpad to work on fuel economy and emission standards for 2-wheeler vehicles.

2.1 Economic Benefits of Improving Fuel Economy and Emission Standards

The automotive industry plays a significant role in ASEAN's economy. The export-oriented automotive industries in Thailand and Indonesia amount to 10% of their GDP.¹³ Malaysia, with its mature domestic-oriented automotive industry, recently announced its aspirations to boost automotive exports under its National Automotive Policy 2020.¹⁴ Vietnam, a relatively new entrant into the global automotive industry, also has aspirations to develop its own automotive industry through its first local auto brand, VinFast.¹⁵ The Philippines also holds aspirations to further boost its production capabilities for automobiles. Other ASEAN member states such as Cambodia and Laos also support the regional automotive value chain by providing labour to manufacture auto-parts.¹⁶

Given the economic and political significance of the automotive sector, it is crucial that ASEAN governments ensure their automotive sectors are well optimised in maximising benefits while minimising costs to reap as much economic gains as possible.

2.1.1 Enhancing Demand for ASEAN-made Vehicles

From a demand perspective, improving fuel economy and emission standards can enhance the export competitiveness of ASEAN-made vehicles to larger markets that have already imposed or are intending to impose higher fuel economy and emission standards. Key export markets like Australia, Japan, and New Zealand are already imposing higher fuel economy and emission standards than those in ASEAN (see table 1). Additionally, competition from other countries like Japan and South Korea are making ambitious plans to further strengthen their fuel economy and emission standards, while ASEAN continues to lag behind. Furthermore, with the new bilateral Free-Trade Agreement (FTA) between the EU and Vietnam, the ongoing ratification of the Regional Comprehensive Economic Partnership (RCEP), and the (partially) ratified Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), ASEAN governments must proactively ensure that ASEAN-made vehicles remain globally competitive

¹² <https://asean.org/storage/2019/09/AJSCC-to-UN-Climate-Action-Summit-2019-ADOPTED.pdf>

¹³ <https://www.bangkokpost.com/auto/news/1606570/automotive-industry-at-a-turning-point>; <https://bisnis.tempo.co/read/1074289/menperin-industri-otomotif-sumbang-1016-persen-ke-pdb/full&view=ok> [translated in English].

¹⁴ <https://www.miti.gov.my/index.php/pages/view/nap2020>.

¹⁵ <https://asiatimes.com/2019/07/vietnam-aims-for-thailands-auto-making-crown/>.

¹⁶ ASEAN-Japan Centre, “Automobiles,” Global Value Chains in ASEAN, January 2020, p. IV-V.

for their automotive industries to realise its export potential. Thus, by adopting higher fuel economy and emission standards, the improved competitiveness of ASEAN-made vehicles can drive a much-needed demand-led economic growth in ASEAN as the region recovers from the effects of the COVID-19 pandemic.

Table 1. Fuel economy standards in key AMS car exporters, key export destination markets, and competitor markets for 1,300kg light-duty vehicle (small family sedan).

	ASEAN Strategic Roadmap ¹⁷	Indonesia ¹⁸	Malaysia ¹⁹	Thailand ²⁰	Vietnam ²¹	Australia	New Zealand	Japan ²²	South Korea ²³
Fuel Economy Standards (L/100km)	7.3 (5.4 by 2025)	No standards	6.5	No standards	7.9	<5 ²⁴	<5 ²⁵	4.9 (3.95 by 2030)	4.15 (3.56 by 2030)

Additionally, setting higher fuel economy and emission standards should also drive greater research and innovation for new automotive technologies. This is because imposing higher fuel economy and emission standards, in the interest of public health and environmental protection, adds constraints that automakers need to overcome. To comply and remain competitive, automakers are forced to innovate and develop new technologies in their local manufacturing processes. A 2009 study conducted by the OECD, for the period of 1978-2005, found that the improvement of standards on engine efficiency and emission treatment technologies saw a significant increase in innovation in both the EU and APAC regions.²⁶ Innovation was quantitatively measured using the number of patents filed after the adoption of higher fuel economy and emission treatment standards. This increased level of innovation can have a spill over effect to benefit local companies and their manufacturing processes. The skill-level of local automotive employees can also increase as they get upskilled to manufacture higher-tech vehicles and parts. These effects proceed to further enhance the automotive ecosystem with relatively higher-tech manufacturing and higher-skilled labour, which then can attract more foreign direct investment (FDI) into ASEAN economies to the ultimate benefit of ASEAN citizens.

2.1.2 Using Fuel Economy to Streamline Government Spending

By improving fuel economy standards, more fuel-efficient cars use less fuel to travel the same distance. This would allow consumers to enjoy cost-savings in fuel expenditure, which means less government spending is required to provide fossil fuel subsidies. Currently, fossil fuel subsidies make up a sizeable amount of an ASEAN country's GDP (see table 2). Should fossil fuel subsidies continue, the projected increase in domestic demand for light vehicles by the growing middle class in ASEAN will further strain the budgets of AMS that are already in deficit due the

¹⁷ ASEAN Fuel Economy Roadmap 2018-2025, p 14.

¹⁸ Ibid, p 60.

¹⁹ <https://motiondigest.com/wp-content/uploads/2017/04/malaysia-national-automotive-policy-nap-2014.pdf>

²⁰ ASEAN Fuel Economy Roadmap 2018-2025, p 63.

²¹ <https://vanbanphapluat.co/tcvn-9854-2013-phuong-tien-giao-thong-o-to-con-gioi-han-tieu-thu-nhien-lieu>; <https://luattrongtay.vn/ViewFullText/Id/5775fbf0-ad65-4bd8-916f-07fba6a0fdae>

²² <https://dieselnet.com/standards/jp/fe.php#Id2020>

²³ <https://www.iea.org/reports/fuel-consumption-of-cars-and-vans>

²⁴ Australia does not make fuel economy standards compulsory but mandates fuel economy labels to encourage buyers to select more fuel-efficient vehicles, less than 5l/km is considered very good; <https://www.greenvehicleguide.gov.au/pages/Information/FuelConsumptionLabel>

²⁵ New Zealand uses a 6 Star rating for its Fuel Economy standards, with 6 stars being 2.8l/km, 5.5 stars being 4l/km; <https://energywise.dotnous.com/stars/>

²⁶ Ivan Hascic et al., "Effects of Environmental Policy on the Type of Innovation: The Case of Automotive Emission-Control Technologies," OECD Journal: Economic Studies 2009 (2009): pp. 11-12.

aggressive, yet necessary, governmental spending to combat the COVID-19 pandemic.²⁷ In ASEAN, Indonesia has spent the most on fossil fuel subsidies in 2018 at a total of around USD32 billion. On a per capita basis, Brunei has spent 4 times more than Indonesia on fossil fuel subsidies at USD537.58, despite having a fraction of Indonesia's population.²⁸

Table 2. Cost of Fossil Fuel Subsidies by ASEAN Country for 2018.

Country	Fossil Fuel Subsidy (% of GDP - 2018)	Actual Value - 2018 (in USD)	Actual Value per Capita - 2018 (in USD)
Indonesia	3.1	32.3 Billion	120.65
Brunei	1.7	230.6 Million	537.58
Malaysia	0.6	2.2 Billion	69.78
Thailand	0.3	1.5 Billion	21.63
Vietnam	0.3	735 Million	7.69

Fossil fuel subsidies incur significant opportunity costs that improved fuel economy standards can help reduce. Using Indonesia as an example to frame the opportunity costs of fossil fuel subsidies into perspective, Indonesia has spent the more on fossil fuel subsidies in 2018 than on their COVID-19 fiscal stimulus packages in 2020 (see table 2 and 3). The same amount spent on fossil fuel subsidies in 2018 can also provide a year's worth of primary school education to close to 100 billion children based on the average annual cost of USD35 as of 2020.²⁹

Table 3. Amount Spent on COVID-19 Fiscal Support by ASEAN Country in 2020.

	Country	Fiscal Support (USD - 2020)	% of GDP (2019)
1	Singapore	75 billion	20%
2	Thailand	49.69 billion	9.15%
3	Malaysia	27.81 billion	7.63%
4	Vietnam	12.03 billion	4.6%
5	Philippines	12.37 billion	3.3%
6	Brunei	337.24 million	2.5%
7	Cambodia	1.33 billion	5%
8	Myanmar	395.06 million	0.52%
9	Indonesia	504 million	0.045%
10	Laos	5.77 million	0.032%

Thus, with the pandemic-induced budget deficits, projected increase in spending for fossil fuel subsidies due to rising demand of vehicles by the growing middle class in ASEAN, and significant

²⁷ Analysis and Monitoring on Finance and Socio-Economic Issues Division of the ASEAN Integration Monitoring Directorate at the ASEAN Secretariat, "Economic Impact of COVID-19 Outbreak on ASEAN," April 2020.

²⁸ Clément Payerols, "Energy Transition Issues within ASEAN," August 2020; International Energy Agency, "Energy Subsidies," 2020, <https://www.iea.org/topics/energy-subsidies>.

²⁹ <https://www.edarabia.com/indonesia-school-fees/#:~:text=Each%20school%20in%20Indonesia%20charges,range%20from%20%24190%20to%20%24400.>

opportunity costs to greater developmental priorities like education, enhancing fuel economy standards is a smart and effective way for AMS to trim excessive spending on fossil fuel subsidies to free up much needed funds to invest in other areas of development.

2.1.3 Higher Emission Standards Enhances the Benefit-Cost Ratio of Vehicle Usage

Adopting higher emission standards produces benefits in terms of reduced health risks in the population. This would make vehicle usage more beneficial to ASEAN citizens. This was found by a G20 Briefing Paper in 2015 by the International Council on Clean Transportation who conducted a benefit-cost analysis of adopting higher emission standards in developed and developing countries, notably the USA, EU, China, and India. The paper found that the compliance costs of adopting higher emission standards are mainly related to research and development, certification, and manufacturing retooling, where these costs incurred can still be economically productive. Conversely, higher emission standards generate health benefits in the form of lowered risk of cardiopulmonary disease, stroke, lung cancer, child-asthma, and impaired lung function in infants. Climate benefits also include reducing carbon emissions that contribute to climate change, a global emergency that have been declared by over 1,800 local governments in 33 countries since 20 December 2020.³⁰ Given that ASEAN countries are particularly vulnerable to the effects of climate change, with a possibility of 11% annual loss in GDP by 2100 based on current trends, the climate benefits created by higher emission standards must not be taken lightly.³¹ Thus, by quantifying the compliance costs and health and climate benefits as described above, analysis shows that the benefits have consistently outweighed the costs manifold in both developed and developing countries (see table 4).³² Given that vehicle usage in ASEAN is expected to increase significantly, it is economically wise for AMS to maximise the benefit-cost ratio of vehicles, which in this case, can be achieved by adopting higher emission standards.

Table 4. Benefit-Cost Analysis of Emission Standards in Developed and Developing Countries.³³

Country	Fuel Economy Standards	Benefits (USD)	Costs (USD)	Benefit-Cost Ratio
USA	Tier 3	19bn annually (by 2030)	1.5bn annually (2030)	13:1
EU	Euro 5 & Euro 6	213bn	155bn	11:1
China	China 6	682.15bn	279.06bn	2.5:1
India	Bharat 6	107bn (by 2035)	14.2bn (by 2035)	8:1

To sum up, adopting higher fuel economy standards can enhance the export competitiveness of ASEAN-made vehicles. For example, developing powertrains with optimized CO₂ footprint is key for export to Europe which ASEAN can tap on. There is a fleet CO₂ regulation in Europe including considerable penalties if the limit is exceeded. Such regulations coming from ASEAN's top trading partners can drive greater technological innovation which can have significant positive spill over effects onto the economy and workforce. Adopting higher fuel economy standards can help ASEAN governments relieve some of the burden of costly fossil fuel subsidies.

³⁰ Margaret Hender and Philip Sutton, "Climate Emergency Declarations," cedamia, 2020, <https://www.cedamia.org/global/>.

³¹ Payerols, "Energy Transition Issues within ASEAN," p. 1.

³² Ibid.

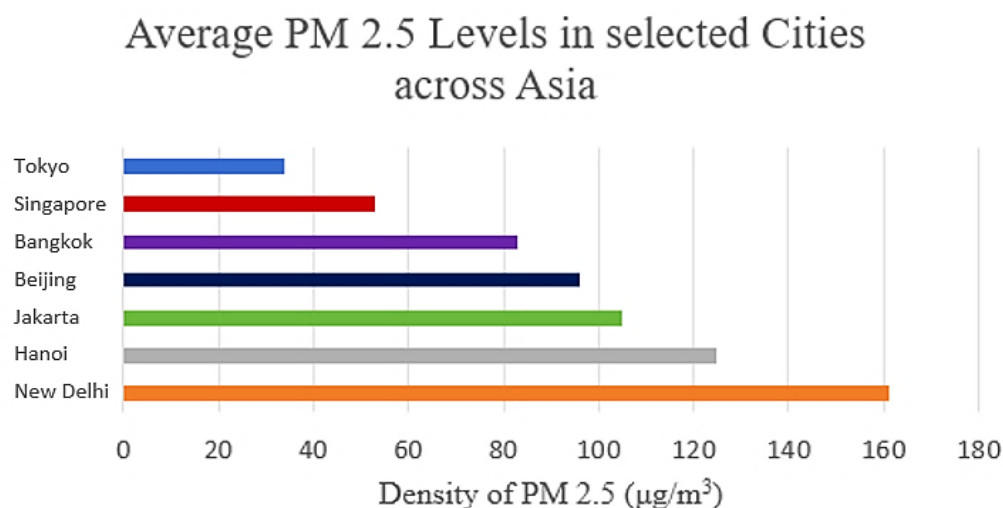
³³ Drew Kodjak, "Policies to Reduce Fuel Consumption, Air Pollution, and Carbon Emissions from Vehicles in G20 Nations," The International Council on Clean Transportation - G20 Briefing Paper, May 2015, p. 19.

Similarly, higher emission standards produce benefits that far outweigh the costs of adopting it. Thus, these reasons collectively present a highly convincing business case for ASEAN governments to adopt higher fuel economy and emission standards.

2.2 Social Benefits of Adopting Green Technology: Mobility and Citizen's Health

Persistently high air pollution levels in major cities in ASEAN call for swift action. Pollutants in the PM_{2.5} range are a cause of concern as they can travel deeply into the human respiratory tract due to their small size, thus affecting lung function and worsening conditions such as asthma. The World Health Organisation stipulates that for PM_{2.5}, the annual mean should not exceed 10 µg/m³ and the daily mean should not exceed 50 µg/m³. The average annual PM_{2.5} levels of selected cities in Asia are shown below.

Figure 1. Chart of PMI Levels in selected cities across Asia.



As indicated in figure 1, even in cities where air quality is comparatively good, such as in Tokyo and Singapore, PM_{2.5} levels are substantially above the WHO thresholds of 10 µg/m³. The same is true for major cities in ASEAN, such as Bangkok, Hanoi and Jakarta that are experiencing concerningly high PM_{2.5} levels almost all year long. This has proven to negatively affect resident's health and productivity. Consequently, reducing emissions has become an urgent political, environmental, and economic necessity. In Thailand, the safety limit set by the

government for PM2.5 levels is at 50 $\mu\text{g}/\text{m}^3$, however, the PM2.5 levels in Bangkok consistently exceeds the safety limit (146 $\mu\text{g}/\text{m}^3$ in Feb 2019).³⁴ The government has employed several measures such as school closures and banning big trucks from 4am to midnight to relieve traffic congestion in Bangkok.³⁵ Prime Minister Prayut Chan-o-cha also made a plea to its people to stop using or reducing their use of diesel engines in Bangkok and neighbouring provinces.³⁶

As such, in line with ASEAN's environmental commitments in the ASEAN Comprehensive Economic Recovery Framework and taking into account persistently high levels of air pollution, swift action has to be taken to reduce vehicle emissions.

The European automotive industry remains committed to engaging with ASEAN and its Member States in the implementation and adoption of appropriate measures towards this aim.

European automotive firms are particularly well placed to contribute to innovative and sustainable transport solutions as, for decades, they have had to comply with increasingly stringent environmental legislation in the European Union. Consequently, European automotive companies are innovation leaders in the field of efficient and sustainable powertrain solutions.

ASEAN Comprehensive Recovery Framework (2020)

The promotion of environmentally-conscious transport, which refers to the use of more **automation and smart mobility** that will facilitate the development of an environmentally-friendly transport system in the region. As the pandemic recedes, **a greater use of more environmentally conscious** modes of transport and the use of new technologies should be retained as much as possible.

ASEAN remains committed to:

The identification of specific measures within AMS **to support investments that deploy clean electricity sources**, expand and modernise power grids, improve the energy efficiency of appliances, buildings, and industrial equipment **and increase the spread of cleaner transport and use of sustainable biofuels and other clean energy innovations**, as well as generate green jobs and leveraging on the use of holistic tools and frameworks to assess the impact of relevant measures to cover not only the levelised cost of energy but also broader impacts in terms of emissions, water footprint, air quality and human health, job creation, energy access and resilience.

3. The Way Forward

To reduce emissions and mitigate the adverse effects of increasing car ownership, the EU-ASEAN Business Council thus recommends the adoption of different low-emission technologies across Southeast Asia. These include Battery Electric Vehicles (BEVs), electrified two- / three-wheelers, Plug-in Hybrid powered vehicles, as well as vehicles relying on Fuel Cells and advanced fuels

³⁴ <https://www.bangkokpost.com/business/1622042/pm-makes-plea-to-cut-diesel-use>

³⁵ <https://www.bangkokpost.com/thailand/general/1731499/big-trucks-face-20-hour-ban-in-bangkok>

³⁶ *ibid*

in the long-term. Meanwhile, the internal combustion engine will continue to power the majority of cars in the region for decades to come. However, this does not mean that action cannot be taken with these traditional powertrains to reduce polluting emissions by improving their fuel economy.

In an evolutionary scenario, based on current trends, we predict that in 2025, 94% of new cars across ASEAN will be equipped with internal combustion engines. In 2030, this figure is likely to be at 89%. Taking action on climate change and air pollution therefore requires further energy efficiency improvements for combustion engines and other measures to improve emission standards.

Substantial progress has, in fact, already been achieved: The most up-to-date combustion engines have only a negligible effect on urban air quality, as advanced engine technology reduces the emissions by a further 70% from the requirements of the most stringent Euro 6d norm. Meanwhile, there is no reason efficiency improvements need to stop there: The European automotive industry remains committed to research and innovation on the improvements of all engine types.

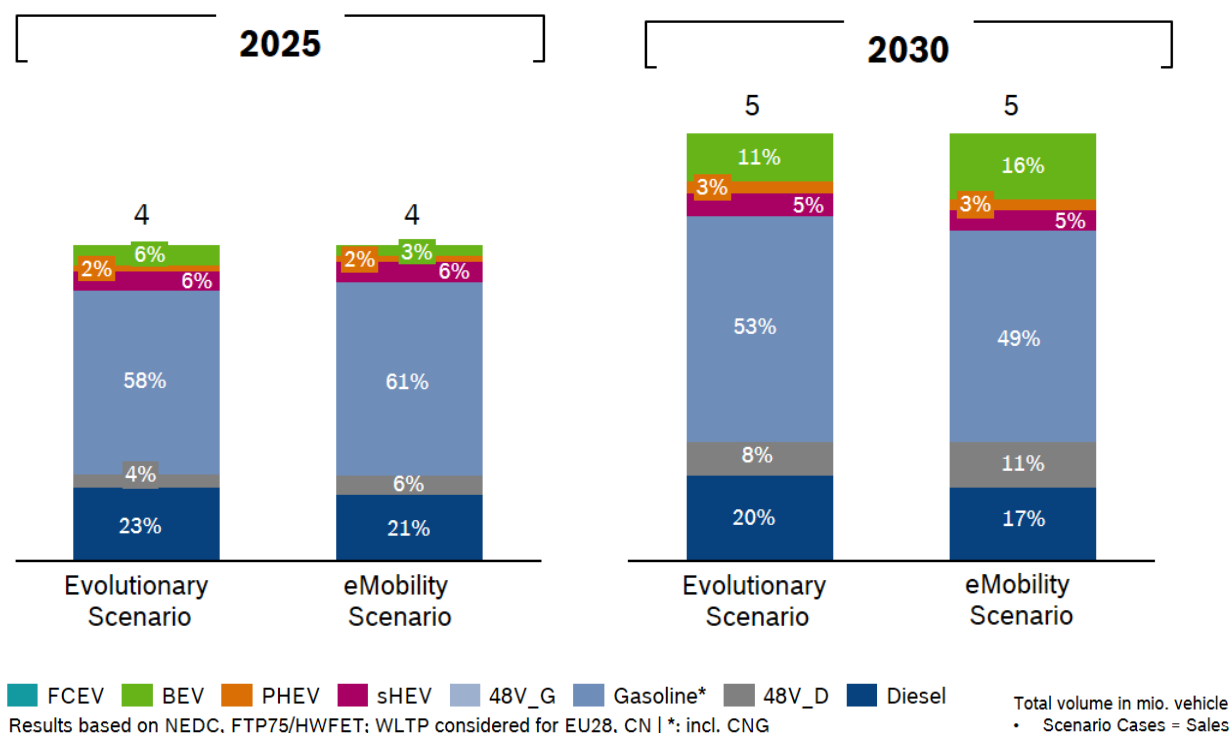


Figure 2. Powertrain scenarios. Predicted Vehicle sales in ASEAN incl. PC & LCV < 6 tons.

Technology neutrality must be a key principle of future policy decisions, enabling ASEAN to capitalise on the potential of all available technological pathways. As such, the future of powertrain technology must be open, as all modern powertrain technologies contribute to lower carbon mobility. Forward looking policy will, therefore, stimulate both investments into alternative powertrains, as well as ensure efficiency improvements of already established technologies.

To ensure the transportation sector contributes to ASEAN's fulfilment of environmental commitments, a holistic approach towards measuring the carbon footprint of vehicles is needed.

This necessitates the usage of a well-to-wheel methodology in passenger vehicle standards, thus allowing for the comparison of individual mobility options according to the lowest carbon impact of the entire value chain.

Defining the Vehicle Standards of Tomorrow

3.1 Emission Standards

Emission standards and limits have proven to play a key role in defining the car technology of tomorrow. Over the last decades it has become apparent that well-balanced regulation stimulates technological innovation, for instance further driving efficiency improvements for the internal combustion engine. In this process, European emission standards have become a trusted and widely used framework, globally, but also within ASEAN.

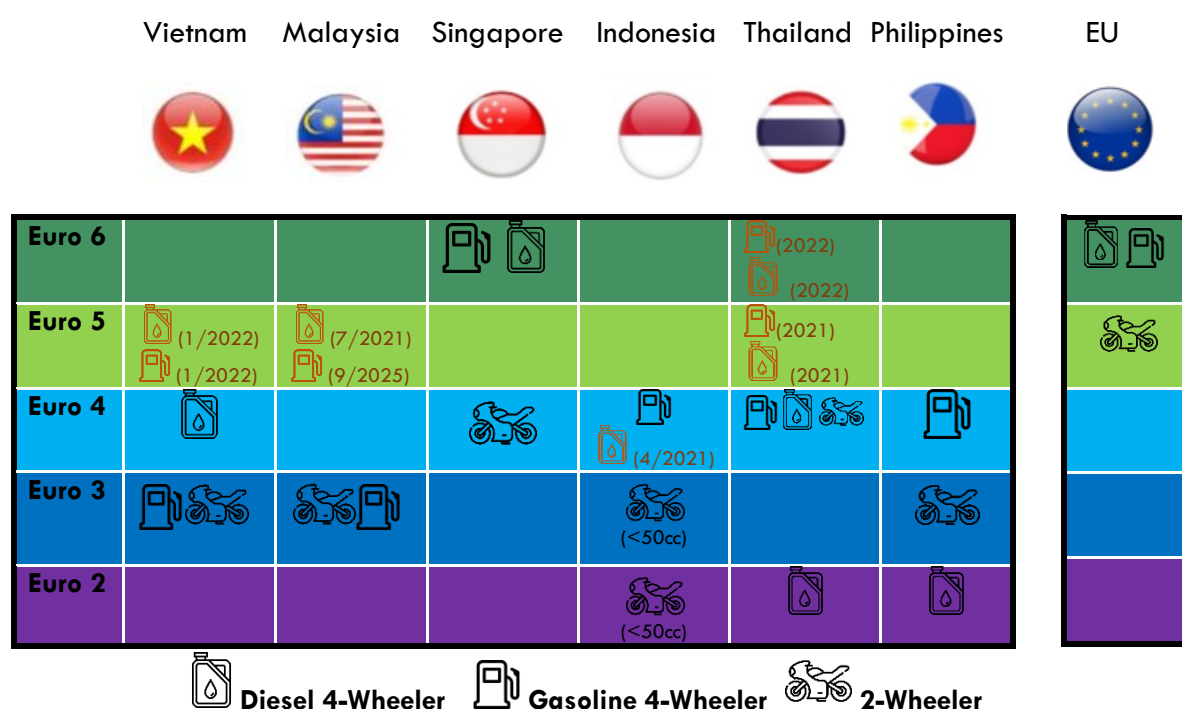


Figure 3. Standards throughout ASEAN for motorcycles, gasoline, and diesel. The EU is included to the right for comparative purposes.

As can be inferred from figure 3, most ASEAN countries are lagging behind other regions in terms of vehicle standards. This is for instance the case compared with the European Union, in which Euro 6 standards are applied for 4-wheelers, while for 2-wheelers Euro 5 applies. High emission standards based on Euro norms have been adopted in both developed and developing economies: Both Japan and India have implemented comparable emission standards to the EU. The case of India, which has set emission standards equivalent to the most stringent Euro 6d norm, proves that strong environmental commitments are possible even in countries where GDP per capita remains comparatively limited. The European automotive industry welcomes these efforts.

Within ASEAN, there is considerable variation. As of today, Singapore is the only ASEAN member that has adopted Euro 6 for 4-wheelers that run on both on petrol and diesel. Vietnam

has announced plans to upgrade standards for petrol and diesel run 4-wheelers to Euro 5 by 2022. Similarly, both Malaysia and Indonesia plan to upgrade diesel (and for Malaysia, petrol) standards to Euro 4 in 2022. While for the Philippines, further progress remains outstanding. The EU-ASEAN Business Council takes positive note of ongoing discussions in Thailand with the aim of upgrading to Euro 5 by 2021 and Euro 6 by 2022 respectively.

But ASEAN member states cannot stop there: To improve air quality for their citizens, as well as to live up to their international commitments, it will be necessary to upgrade standards further, along the internationally accepted and recognised Euro norm framework. Meanwhile, fuel standards must improve hand in hand with emission standards to minimise total emissions.

Euro Norms: Current Status in EU

Euro norms consist of six stages of increasingly stringent emission requirements, starting with Euro 1 and going up to Euro 6. The norms are embedded in an overall air quality improvement strategy and aim at reducing transport emissions. They encompass both two- and four- wheeled vehicles and heavy-duty vehicles. Euro 6d emission standards require the greatest emission reduction of all previous stages: For Diesel light vehicles for instance, particle mass limits represent a 96% reduction compared with Euro 1, whereas NO_x limits have been reduced by 56%.

Euro 7

Until November 2020, the European Commission was in the public consultation process for the new Euro 7 standard. After this period, the Commission will propose a regulation, setting out stricter emission standards for the European Union.

Emissions Regulation Comparison - Diesel PC Emission Limits (excerpt)

No legal advice - Provided for informational purposes
strictly on a non-reliance basis.



	EU adopted EU6d-TEMP / EU6d 09/17 / 01/20	USA adopted LEV III SULEV20 MY 2015 (Phase-In)	China* adopted CN6 a / b 07/20 / 07/23 for major cities earlier impl. possible	India adopted BS6 04/20 nationwide incl. metros
Test cycle	WLTC/P	FTP75	WLTC/P	MIDC 90km/h
Emission Limit				
NMHC	HC+NO _x = 170 mg/km	20 mg/mi (~12mg/km) (NMOG + NO _x)	35 mg/km	Same as EU6d
NO _x	80 mg/km		35 mg/km	
CO	500 mg/km	1000 mg/mi (622mg/km)	500mg/km	
N2O	-	10 mg/mi (option) (6mg/km)	20 mg/km	
HCHO	-	4 mg/mi (2.5 mg/km)	-	
PM	4.5 mg/km	10/3/1mg/mi (6.2/1.86/0.62 mg/km) (stepwise decrease until 2025)	3 mg/km	
PN	6*10 ¹¹ #/km	no limit	6*10 ¹¹ #/km	

Figure 4. Diesel PC Emission Limits in the US, EU (2-step introduction), India and China.

Emissions Regulation Comparison - Gasoline PC Emission Limits (excerpt)

No legal advice - Provided for informational purposes
strictly on a non-reliance basis.



	EU adopted EU6d-TEMP / EU6d 09/17 / 01/20	USA adopted LEV III SULEV20 MY 2015 (Phase-In)	China* adopted CN6 a / b 07/20 / 07/23 for major cities earlier impl. possible	India adopted BS6 4/20 AT nation. incl. metros
Test cycle	WLTC/P	FTP75	WLTC/P	MIDC 90km/h
Emission Limit				
NMHC	68 mg/km	20 mg/mi (~12mg/km) (NMOG + NO _x)	35 mg/km ~ 0.5*EU6d	Same as EU6d (Manufacturer can choose relaxed PM=6*10 ¹¹ limit until 04/23 for gasoline direct injection vehicles)
NO _x	60 mg/km		35 mg/km ~ 0.5*EU6d	
CO	1000 mg/km	1000 mg/mi (622mg/km)	500mg/km ~ 0.5*EU6d	
N2O	-	10 mg/mi (option) (6mg/km)	20 mg/km	
HCHO	-	4 mg/mi (2.5 mg/km)	-	
PM	4.5 mg/km (DI SI only)	10/3/1mg/mi (6.2/1.86/0.62 mg/km) (stepwise decrease until 2025)	3 mg/km (DI and PFI)	
PN	6*10 ¹¹ /km (DI SI only)	no limit	6*10 ¹¹ /km (DI and PFI)	

Figure 5. Gasoline PC Emission Limits in the US, EU (2-step introduction), India and China.

3.2 Encouraging the use of Fuel Additives

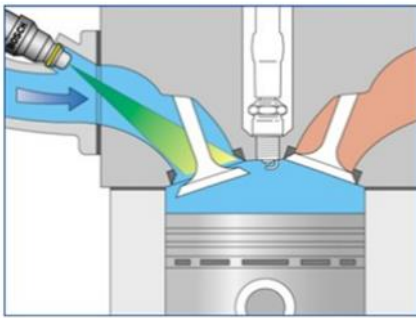
Another way ASEAN will be able to ensure that its mobility sector remains competitive while reducing carbon emission is by using fuel additives. Fuel additives can boost engine performance, restore lost horsepower while reducing petrol and diesel consumption. Other benefits include:

- **Enhanced Safety:** Greatly reduced risk of static discharge, which can cause fire and explosions
-
- **Improved Engine Operation:** Quality fuel additives can protect critical engine components against deposit build-up and corrosion, leading to improved reliability and lower maintenance costs.
- **Reduced Exhaust Emissions:** Deposit control additives reducing carbon build-up on valves and fuel injectors can help prevent increases in emissions including particulates and smoke.

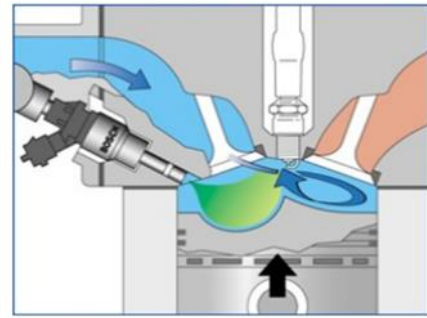
All fuels - even complying with strictest standards such as DIN EN 228 or DIN EN 590 – will leave deposits in engines. EN 228 is the standard describing specifications and properties of unleaded gasoline fuel, which is intended for use on the territory of European Union. EN 590 is the standard describing specifications and properties of diesel fuel, which is intended for use on the territory of European Union.

(See figure 6 below).

Port Fuel Injection (PFI)



Direct Injection Spark Ignition (DISI)



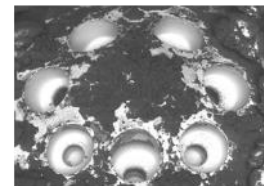
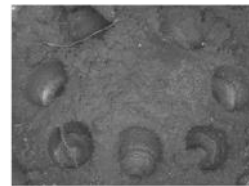
unadditized fuel

additized fuel



unadditized fuel

additized fuel



Modern fuel additives prevent deposits in PFI and GDI engines effectively. Dependent on the treat rate, the deposit control additives keep the engine clean from intake valve and injector nozzle deposits and reduce the negative effect of deposit accordingly. With the long-term use of additives, engines stay clean, which has beneficial effects on emissions, fuel economy, as well as on the catalyst performance.¹¹ Engine tests clearly show the negative effect of deposits on fuel economy. At the same time emission increases can be prevented, reducing long time stress of the catalytic converter.

4. Policy Recommendations

To improve air quality for its citizens and live up to its international commitments, it will be necessary for ASEAN to implement concrete policies:

Emission Standards:

- **An accelerated upgrade of emission standards towards Euro 6 in the medium term across the region is recommended.** This would further improve the environmental impact of vehicles and support the adoption of more efficient technologies. Similarly, the EU-ASEAN Business Council recommends the harmonisation of national standards across the region, based on recognised UN standards such as those provided by UNECE. This would facilitate both intra-ASEAN vehicle trade, as well as exports to international markets. As such, further harmonisation constitutes an essential part of the vision of ASEAN as a single manufacturing base. Against this backdrop, we explicitly support the adoption and further development of ASEAN Mutual Recognition Agreements;
- The use of **fuel additives should be encouraged.** With the long-term use of additives, engines stay clean, which has beneficial effects on emissions, fuel economy, as well as on the catalyst performance. Engine tests clearly show the negative effect of deposits on fuel economy. At the same time emission increases can be prevented, reducing long time stress of the catalytic converter.

Fuel Quality

- **An upgrade in vehicle standards must necessarily go together with an upgrade of fuel quality standards.** As well as contributing to harmful emissions directly (SO_x and PM), high fuel sulphur content can deteriorate the performance of components used in advanced emissions control systems such as catalysts, therefore it is important to address fuel sulphur when introducing such advanced systems. Fuel sulphur should be below 50ppm and ideally below 15ppm. This must however not delay the introduction of higher vehicle standards.
- We recognise the efforts of some ASEAN member states to decrease their dependency on fossil fuels by using more biofuels in the transportation system. We recommend that biofuels should meet international fuel standards. This ensures that they are produced in line with certain quality standards, do not harm engine technology and do not exceed the pollutant limits specified by the standards.

Taxation Systems

- **A technology-neutral CO₂ emission-based taxation system should be introduced.** This would constitute a fundamental pillar of ASEAN's efforts towards reducing vehicle emissions. Various studies have shown the positive effects of CO₂ emission-based taxation schemes, that increase incentives to upgrade technology. The scheme should recognise test results of relevant UN regulation certificates.

About the EU-ASEAN Business Council

The EU-ASEAN Business Council (EU-ABC) is the primary voice for European business within the ASEAN region. It is formally recognised by the European Commission and accredited under Annex 2 of the ASEAN Charter as an entity associated with ASEAN.

Independent of both bodies, the Council has been established to help promote the interests of European businesses operating within ASEAN and to advocate for changes in policies and regulations which would help promote trade and investment between Europe and the ASEAN region. As such, the Council works on a sectorial and cross-industry basis to help improve the investment and trading conditions for European businesses in the ASEAN region through influencing policy and decision makers throughout the region and in the EU, as well as acting as a platform for the exchange of information and ideas amongst its members and regional players within the ASEAN region.

The EU-ABC conducts its activities through a series of advocacy groups focused on particular industry sectors and cross-industry issues. These groups, usually chaired by a multi-national corporation, draw on the views of the entire membership of the EU-ABC as well as the relevant committees from our European Chamber of Commerce membership, allowing the EU-ABC to reflect the views and concerns of European business in general. Groups cover, amongst other areas, Insurance, Automotive, Agri-Food & FMCG, IPR & Illicit Trade, Market Access & Non-Tariff Barriers to Trade, Customs & Trade Facilitation and Pharmaceuticals.

Executive Board

The EU-ABC is overseen by an elected Executive Board consisting of corporate leaders representing a range of important industry sectors and representatives of the European Chambers of Commerce in South East Asia.

Membership

The EU-ABC's membership consists of large European Multi-National Corporations and the eight European Chambers of Commerce from around South East Asia. As such, the EU-ABC represents a diverse range of European industries cutting across almost every commercial sphere from car manufacturing through to financial services and including Fast Moving Consumer Goods and high-end electronics and communications. Our members all have a common interest in enhancing trade, commerce and investment between Europe and ASEAN.



To find out more about the benefits of Membership and how to join the EU-ASEAN Business Council please either visit www.eu-asean.eu or write to info@eu-asean.eu.



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