

Executive Summary

Demand for automobiles to transport passengers and freight has been rapidly increasing amongst members of the Association of Southeast Asian Nations (ASEAN), giving rise to traffic congestion and air pollution. As demand for petroleum increases, the region's oil self-sufficiency has declined greatly and CO₂ emissions have increased. Automobile penetration is expected to rise as ASEAN economies grow, further increasing energy insecurity and environmental concerns.

To tackle these issues, ASEAN countries have announced policies to promote electric vehicles (xEVs),¹ which reduce oil consumption and air pollution but increase demand for electricity; depending on its power generation sector, a country might not solve its environmental problems. On the other hand, countries are also trying to promote industry in the field of xEVs. There are also movements to attract overseas companies and domestic production of automobiles and batteries.

The study analyses the effects of xEVs on the economy, energy, and environment (3Es) – the basic principle of energy policy. Through analysing qualitative and quantitative information on energy supply and demand structures, impacts on CO₂ emissions, and the macroeconomy and employment, the study delivers the following outcomes.

1. Indonesia, Malaysia, Thailand, and Viet Nam may face challenges in the 3Es in the following reference scenario, which assumes continued historical trends without strengthening policy measures:
 - ✓ The number of cars increases 2.3 times by 2040 due to high economic growth. Motorbikes, which are over three times more numerous than cars, increase 1.5 times.
 - ✓ Total primary energy demand increases by 2.6% annually in Indonesia, 5.1% in Viet Nam, 1.6% in Thailand, and 2.1% in Malaysia. Coal demand grows at higher rates in each country to meet rapidly increasing electricity demand.
 - ✓ High fossil-fuel dependency leads to increasing CO₂ emissions, which increase annually by 2.9% in Indonesia and 5.8% in Viet Nam – rates that are higher than energy-demand growth, meaning that their energy mix becomes more carbon-intensive. In Thailand and Malaysia, CO₂ emissions grow at almost the same rate as energy demand.

We set scenarios for xEV penetration and look at their respective impact on energy and the economy. The battery electric vehicle (BEV) Ambitious scenario sets that BEVs will rapidly penetrate and get almost 100% market share by 2040. Meanwhile, the hybrid electric vehicle (HEV) Bridge scenario is assumed to start with low-cost HEVs, with BEVs being gradually introduced starting after 2030 when their cost starts to decline.

- ✓ BEV penetration's ability to reduce CO₂ emissions is limited unless the power generation

¹ Including hybrid, plug-in hybrid and battery electric vehicles.

sector is decarbonised. ASEAN countries largely depend on coal-fired power generation.

- ✓ xEV penetration may need large subsidies to realise both of the scenarios. The total subsidy for the BEV scenario is several times that for the HEV scenario and puts pressure on government finances.
 - ✓ Governments should calculate the cost-effectiveness of subsidies with respect to the amount of CO₂ reduction.
2. It is necessary to pay attention to other economic activities affected by xEV penetration. The production of BEVs with a small number of material parts might reduce automotive industry employment compared to the production of internal combustion engine vehicles (ICEVs) and HEVs.
- ✓ The ripple effects of xEV-related expenditure on production and employment are almost negative in the four countries. The negative effects will be even greater if they rely on importing xEVs / battery packs.
 - ✓ If people use daily fuel savings for other goods and services, xEV penetration would bring job creation, especially in the E-Motorcycle Advanced scenario, where the e-motorcycle share is assumed to reach almost 100% by 2040.
 - ✓ The BEV Ambitious scenario has negative effects on employment because expensive xEVs curtail other expenditures, but they turn to positive effects by 2040 due to larger fuel savings.
3. Introducing xEVs into ASEAN countries would fulfil various policy purposes, but their massive deployment might have negative economic side effects. xEV penetration needs realistic and affordable policies. We recommend the following:

I. Decarbonise power generation

It is important to decarbonise the power supply along with the penetration of xEVs, considering the overall effects of well-to-wheel. Promoting HEVs can reduce CO₂ emissions without depending on the power supply mix, until it becomes clean. It is critically important to coordinate policy goals.

II. Consider the cost required for penetration

Vehicle electrification must be affordable for consumers, businesses, and governments. The subsidies needed to promote xEVs might be enormous, until their prices fully decrease, but which, especially battery cost, are still uncertain due to the international mineral prices. Fuel price policy would be also important for giving economic incentives to xEV users, leading to smaller subsidies.

III. Pay attention to xEV ripple effects

The production of BEVs with a small number of material parts might reduce the employment of the automotive industry compared to the production of ICEs and HEVs. However, promoting e-motorcycles may stimulate job creation in the whole economy, if the savings in daily fuel

expenditure can be diverted into other goods and services.

IV. Consider appropriate country-specific pathways

Appropriate pathways to vehicle electrification vary by country and region.

- ✓ In Indonesia, none of the xEV scenarios contributes significantly to CO₂ reduction due to the power generation mix. Regarding reducing fuel import bills, the BEV Ambitious scenario is the most effective, even though fuel demand for power generation increases. In view of subsidy costs and the economic/employment ripple effect, the HEV Bridge scenario should be adopted for passenger light-duty vehicles (PLDVs) rather than the BEV Ambitious scenario. In addition, it is desirable to promote e-motorcycles at the same time where motorcycles are popular.
- ✓ In Malaysia, the BEV Ambitious scenario has a greater CO₂ reduction effect than other scenarios. The cost-effectiveness of subsidies is significantly higher than in the HEV Bridge scenario because the total subsidy amounts are larger due to the relatively low gasoline price. Furthermore, the BEV Ambitious scenario has a big negative effect on employment, so the HEV Bridge scenario should be adopted. On the other hand, the E-Motorcycle Advanced scenario has small effect on both CO₂ reduction and employment since the number of motorcycles on the road is not large.
- ✓ In Thailand, the BEV Ambitious scenario has a greater CO₂ reduction effect than other scenarios, but the total amount of subsidies is also large. It will bring better effects by 2040; however, it needs to cope with the large subsidy expenditures and the negative effects on employment around 2025–2030. It is desirable to promote e-motorcycles at the same time due to their higher cost-effectiveness.

In Viet Nam, where many motorcycles are on the road, the E-Motorcycle Advanced scenario should be promoted for its superior CO₂ reduction effects and cost-effectiveness. Further, its positive effects on employment are much larger than the other PLDV scenarios. Given the current situation of complete knockdown (CKD) producing and importing most PLDVs, production effects are not great in the BEV Ambitious scenario, but positive employment effects can be seen by diverting fuel cost savings into consumption on other goods and services. However, achieving this scenario requires large subsidies.