T20 INDONESIA 2022 THINK

Policy Brief

A PATH TO ZERO-EMISSION VEHICLES AND GREENER INFRASTRUCTURE DEVELOPMENT IN INDONESIA

Task Force 8
Inclusive, Resilient, and Greener Infrastructure Investment and Financing

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Abstract

The transport sector, particularly road transport, is a major contributor to air pollution and greenhouse gas (GHG) emissions in Indonesia. For both passenger and freight transport, many of Indonesia's vehicles run on old, heavily polluting technology. Adding to the problem, Indonesia's fuel quality policies still allow the distribution of high-sulphur fuels that have already been phased out in other Asian countries and in other G20 countries. Although far cleaner zero-emission vehicles (ZEVs) that generate no tailpipe pollution are receiving support from the national government in Indonesia, the market is still at a nascent stage and there are challenges to overcome before ZEVs can dominate. As this brief will outline, the role of the national and local governments can be significant in supporting decarbonisation in the transport sector, and doing so would help address poor air quality and help achieve Indonesia's net-zero emissions target by 2060. Focusing early efforts on fleets such as urban buses, taxis and ride-hailing vehicles could kickstart the transition to ZEVs. Although this policy brief uses Indonesia as the case study, the policies suggested are formulated so as to be applicable in other Group of 20 (G20) countries with similar issues and challenges. Importantly, improvements in Indonesia's automotive industry could contribute to the overall G20 Framework for Strong, Sustainable and Balanced Growth.

Challenges

We highlight Indonesia as a case study because it is an emerging economy and holds the presidency of the G20 in 2022. It had a population of more than 270 million in 2020 and has relied heavily on transportation to fuel its economic development. Indonesia's population is expected to further increase by approximately 20 percent by 2050 and the urbanisation rate is also expected to grow (World Bank, 2019). While transport emissions (CO_2e, excluding aviation) per capita are low in Indonesia compared with the G20 average—0.55 tCO_2e/capita for Indonesia versus 1.16 tCO_2e/capita for the G20 (Climate Transparency Report, 2020)—the country is noticeably lagging in terms of adopted policies for vehicle emission standards and fuel efficiency.

In 2020, there were more than 136 million motor vehicles registered in Indonesia, 84.5 percent of them two-wheelers (Indonesian Statistics Agency, 2022). In 2019, the transportation sector was responsible for 157.8 $MtCO_2e$ (Indonesia Third Biennial Update Report, 2021). Moreover, transport greenhouse gas (GHG) emissions are projected to increase to 53 percent above 2015 levels by 2030, and then almost double from 2030 to 2050 (Climate Transparency Report, 2020).

Indonesia has committed to achieving economywide net-zero emissions by 2060 or sooner (Ministry of Energy and Mineral Resources, 2021). A transition to zero-emission vehicles (ZEVs) will be one of the main agendas of the Indonesian government in achieving its net-zero emission target. Other measures to decarbonise the transport sector include the implementation of stringent fuel efficiency standards and using sustainable biofuels.

In the 2021 virtual meeting of the G20 Transport Task Group (TTG),[1] Indonesia stated that it had started to introduce battery-electric vehicles (BEVs) in urban and intercity bus fleets and government vehicles, and was hoping to continue innovating and improving the environmental performance of transportation. This brief will highlight how, for the best chances of maximum benefits from these efforts, Indonesia would benefit from support from the international community, especially other G20 countries.

[1] https://theicct.org/event/2021-annual-meeting-of-the-g20-transport-task-group/

Proposals for G20

1. Develop a national zero-emission vehicle pathway

1.1. Collaborate to accelerate the adoption of Euro 6/VI vehicle emission standards and carbon dioxide or fuel efficiency standards, as a first milestone

The most stringent vehicle emission standards and CO_2/fuel efficiency (FE) standards incentivise the uptake of the cleanest and most efficient technologies. Although most G20 countries already have the cleanest vehicle emission standards (e.g., Euro VI, Bharat VI and China VI), there are still countries that are well behind. International Council on Clean Transportation (ICCT) studies show that implementation of Euro VI standards for heavy-duty vehicles in all G20 economies in the 2023–2025 time frame would reduce nitrogen oxide (NO_x) emissions by 45–85 percent over the next two decades (Jin et al., 2021).

Similarly, only a handful of G20 countries have adopted new vehicle CO_2 emission or FE standards. These standards are designed to incentivise the adoption of technologies that help reduce fuel consumption, from six-speed transmissions and turbochargers to hybrid-power trains and more. Importantly, these standards can be designed with compliance mechanisms that accelerate ZEV adoption specifically. Such standards have improved the fuel efficiency of the average European passenger car by more than 35 percent since their inception in 2009.[2]

To achieve the implementation of Euro 6/VI-equivalent standards and expand the adoption of CO_2/FE standards, Indonesia could propose a collaboration with other members of the G20, in particular Japan, China, and the European Union, leaders in manufacturing automotive products. The aim of the collaboration could be to develop a strategy to adopt Euro 6/VI-equivalent and CO_2/FE standards for any G20 countries currently lagging behind. The three principal regions are

[2] According to ICCT data, the average CO_2 emissions level of a new European passenger car in 2009 was 146 g/km. The adoption of CO_2 emission standards for new cars drove that value down to 120 g/km in 2018 and it is expected to reach 95 g/km for 2021. https://theicct.org/pv-fuel-economy/

also home to many automotive industry corporations that operate vehicle assembly lines in Indonesia.[3] The principal countries could incentivise their automotive companies to provide technical support to the industry in lagging countries, to help develop their supply chains and accelerate Euro VI-equivalent implementation. Government officials should also work together to support adoption and implementation of these regulations.

Accelerating the adoption of the Euro 6/VI emission standards and pairing that with CO_2 or FE standards would better position Indonesia in the global automobile and auto parts industry. The harmonisation of vehicle emission standards would reduce trade barriers and should help reduce the manufacturing costs for cleaner vehicles across G20 economies. Technology upgrades to cleaner vehicles could be expected to alter the makeup of the global auto manufacturing sector and bring in new investment and business opportunities, and subsequently bring the G20 closer to the 2009 Pittsburgh Framework for Strong, Sustainable and Balanced Growth. Additionally, while the technologies required to meet vehicle-emission and efficiency standards could be manufactured in Indonesia and consumed within the local vehicle market, such parts might also be needed in other Southeast Asian countries that are also looking for a transition to cleaner vehicles, like Thailand, the Philippines and Vietnam.

1.2 Establish regulations for zero-emission vehicles

ZEVs, defined here as BEVs and fuel cell electric vehicles (FCEVs), produce no tailpipe emissions during operation. ZEV sales globally reached a high of 3 million in 2020, up 40 percent from 2019; however this strong growth was in contrast with a slowdown in car sales worldwide, down 16 percent from the 2019 level due to the COVID-19 pandemic (International Energy Agency, 2021). For BEVs in particular, the strong uptake was the result of sustained policy adoption and technology deployment, a decline in battery pack costs, and increases in public electric vehicle charger stock (Cui et al., 2021). Further, as of the end of 2020, more than 20 countries, provinces, and states globally, mostly in Europe and North America, had committed to phase out sales of new internal combustion engine passenger cars or to only sell new electric models in the 2025–2050 time frame (Wappelhorst, 2020).

[3] Daihatsu, Toyota, Honda, Isuzu, Suzuki, Mitsubishi, Nissan, Datsun and Hino are the automakers from Japan that assemble and distribute their products in Indonesia. BMW, Mercedes Benz, MG, Peugeot, Volkswagen, Renault and Mini are the automakers from the European Union that also assemble and distribute automobiles in Indonesia. Wuling and DFSK (China), Hyundai (South Korea) and Esemka (domestic automaker) also sell their products in Indonesia.

Accelerating zero-emission transport requires a combination of supply and demand policies. ZEV supply-side regulations (also called sales mandates) play a crucial role in ensuring that manufacturers offer ZEV models for sale. One example of such a mandate has been in place in California since 2008; vehicle manufacturers are required to sell a minimum percentage of BEVs, FCEVs, and/or plug-in hybrid electric vehicles (PHEVs) every year, and the state is aiming for 100 percent sales in 2035 in its latest mandate draft.[4] In addition, ZEV demand-side regulations such as fleet purchase rules can stimulate demand and help manufacturers comply with ZEV mandates (Hall et al., 2021). The Indonesian government already aims to electrify urban and intercity buses and government vehicles. While a good starting point, an important next step is to establish supply-side ZEV regulations covering all vehicle types, and the government could incorporate its transport electrification plan into its long-term national development plan for 2025–2045.

1.3 Strengthen domestic manufacturing capacity for zero-emission vehicles

Indonesia already has major auto manufacturers and rich deposits of raw materials for battery production (lithium, nickel and cobalt). Thus, the country has the potential to engage in battery and ZEV production and export. Through domestic production, Indonesia can reduce ZEV costs for domestic consumers compared with imported ZEVs (Khan et al., 2022). A strong domestic manufacturing capacity for ZEVs would also accelerate the country's progress toward its net-zero emissions target and create other social and economic benefits. Expert opinions and international experiences, particularly from G20 countries that have been successful in promoting such domestic manufacturing, such as the United States, China and the European Union, would provide a good basis from which the Indonesian government could start along its path. Such communication is essential because it allows market players to stay informed of opportunities and challenges, connect with like-minded businesses, and develop an understanding of the latest developments in the ZEV market.

1.4 Improve fuel quality and increase renewable energy generation

[4] The California Zero Emission Vehicle programme was designed to help the state achieve its emissions goals by requiring that a certain percentage of vehicle fleets use the cleanest available technologies (battery electric, fuel cell and plug-in hybrid). While it has been amended several times, it has the long-term goal of 1.5 million of such vehicles in California by 2025.

The decarbonisation of the transport sector will also require improved fuel quality, second-generation biofuels and reduced dependence on coal for electricity generation. Although Euro 4/IV vehicle emission standards were adopted by Indonesia in 2018, that policy has not been successfully paired with necessary fuel quality improvement. Euro 4/IV standards require a maximum of 50 ppm sulphur content in fuels. As of 2022, 50 ppm sulphur fuels are available in some parts of Indonesia, but these will only be available nationwide starting in 2026. Additionally, to support a future Euro 6/VI transition in Indonesia, ultralow-sulphur fuel of not more than 10 ppm sulphur is needed.

The Indonesian government has addressed energy independence concerns by incentivising local biofuel production, particularly palm oil-based biodiesel. This is reflected in the mandatory content of 30 percent palm oil in biodiesel, known as B30. Biofuel blending is listed as a measure to support GHG emissions mitigation in the energy sector in Indonesia's Third Biennial Update Report (2021). Indonesia could also produce second-generation or advanced biofuels. Second generation biofuels come from waste and residue feedstocks available in Indonesia such as used cooking oil, animal fats and agricultural residues. Indonesia has the potential to lead the world in cellulosic ethanol production with 2 billion liters of cellulosic ethanol produced annually from its palm residue alone (Zhou et al., 2020). Investment in these second-generation biofuels is needed, and the G20 members with experience producing cellulosic ethanol, such as Brazil, China, Germany, India, Italy, Japan and the United States, could support Indonesia (Baldino et al., 2019; Kristiana & Baldino, 2021).

To achieve net-zero emissions by 2060, and capture the full benefits of ZEV adoption, renewable electricity generation should be prioritised beyond current plans. Indonesia has the largest geothermal generation potential in the world, estimated at around 29,000 MW (Asian Development Bank, 2018; National Energy Board [DEN], 2019). However, in 2020, geothermal only accounted for 4.0 percent (2,442 MW) of the total power plants' installed capacity, and current plans are to increase this to 5.6 percent (5,798 MW) in 2030 (Business plan of electricity supply of the state-owned electricity company, abbreviated as RUPTL PLN, 2021). Geothermal is part of the strategic national project and the government's target is to install 9,300 MW of additional capacity by 2035.[5] With support from G20 countries, Indonesia could go beyond that target, considering its vast resources. Unlike many other forms of renewable energy, geothermal

[5] As declared in *Laporan Kinerja Dirjen EBTKE 2021*

can be a baseload for electricity generation and can be used to produce clean hydrogen, which is also important for Indonesia's refining, industrial and transport sectors.

1.5 Introduce fiscal policies that promote the adoption of zero-emission vehicles

Many countries and cities have used fiscal policy to mitigate the negative impacts of transport emissions on human health (United Nations Environment Programme, 2019). International examples that could be applied in Indonesia include: (i) subsidies or fiscal incentives for electric passenger vehicles, two- and three-wheelers, and buses; (ii) subsidies for vehicle scrappage; (iii) congestion charging and low-emission zones; (iv) fuel tax and carbon tax; and (v) road tolls to incentivise mode shift in the freight sector. Insights from other countries suggest that various fiscal instruments together with soft instruments such as a regulation for vehicle labelling and information could be very effective in addressing harmful emissions.

A wide range of these fiscal policies have been implemented in the G20. Direct subsidies and fiscal incentives have driven an increase in the number of ZEVs, in particular light-duty vehicles in the major markets, and especially in the European Union between 2010 and 2017. Each €1,000 of incentive value yielded a 5–7 percent relative increase in sales shares (Muenzel et al., 2019). A similar study in the United States calculated an 8 percent relative increase per US$1,000 of incentives (Clinton & Steinberg, 2019). Further, fiscal incentives are intended as a bridge policy to address the higher cost of ZEVs until cost parity with conventional vehicles is reached. While large subsidies have proven to be highly effective, including in Norway and the Netherlands, lower subsidies paired with other policies have also led to high uptake in places including China and the United Kingdom (Hall et al., 2021). The G20 could help to intensify the exchange of information and best practices between these major markets and emerging markets such as Indonesia.

1.6 Upskilling and reskilling workers in the transport sector

Transport is a labor-intensive sector and the automotive companies that have been established in Indonesia employ a large number of people with different skills and expertise. Public transport operators also employ many technicians and mechanics for the diesel buses in their fleets. Lastly, the number of workers doing vehicle maintenance at repair shops, gasoline stations and other maintenance facilities could be substantially more than are officially registered because there are many informal jobs involved.

BEVs have significantly fewer parts than combustion engine vehicles, and the main components are the battery, the electric motor and the controller. The use of lubricants and other fluids like radiator fluid are reduced significantly or completely removed in a BEV. Therefore technicians in maintenance facilities and service centers need to receive specific training and certification on vehicle maintenance. This upskilling and reskilling can happen through targeted public and private initiatives that can identify skills and knowledge gaps and provide training. Already several universities, including the Surabaya Institute of Technology (ITS) and the Bandung Institute of Technology (ITB) have a focus on developing vehicle technology and manufacturing processes and they can perform this function.

2. Role of local governments in supporting the adoption of zero-emission vehicles

Pollution has detrimental impacts on urban economies (Haines, 2009). This seems apparent when looking at certain cities in G20 countries, including Jakarta (Indonesia), New Delhi (India), Mexico City (Mexico), São Paulo (Brazil) and Johannesburg (South Africa), and many other cities globally.

Transferring power to local governments to implement particular policies can accelerate the transition to ZEVs at the city level. Establishing a mandate to only use zero-emission buses for urban transport is one example. In Indonesia, we already see a promising result: Jakarta has committed to introducing electric buses to serve its world-renowned TransJakarta Bus Rapid Transit (BRT) system. The year 2022 is the landmark of this initiative and 30 battery-electric buses are in service. The city also plans to replace most of the diesel buses that serve TransJakarta's 13 corridors with battery-electric buses, and Jakarta was the first to issue a regulation that exempted BEVs from traffic restrictions and from paying transfer tax. Other cities in Indonesia, including Bandung, have conducted several dedicated sharing sessions with Jakarta to learn about the promotion of ZEVs.

Global cumulative sales data show that 40 percent of BEVs, FCEVs and PHEVs (in the following paragraphs, these are referred to collectively as "electric vehicles") were sold in just 25 cities, highlighting the role of cities in electrification expansion (Hall et al., 2020). These cities have been successful thanks to a combination of supporting policies and programmes. These actions focus on four main areas: city planning, infrastructure, fleets and incentives.

> **City Planning**. Cities with high electric vehicle uptake have set strong goals for future growth that drive city planning and policy. A first step on the path toward eliminating emissions from cars in cities is phasing out the sale of petrol- and diesel-powered vehicles. Cities with a high share of electric vehicles have also begun implementing low-

and zero-emission zones that only allow cleaner vehicles based on specified eligibility criteria (Hall et al., 2020).

Infrastructure. One of the major challenges for the transition to electric mobility is the charging infrastructure network. Cities have an especially critical role in building charging infrastructure, as many urban drivers lack convenient home charging (Hall & Lutsey, 2020). The needs for charging infrastructure vary widely among cities due to underlying transportation, demographic and housing patterns (Hall et al., 2020). Charging strategies at the city level should ideally incorporate charging incentives. One example of a charging incentive is to give the lowest electricity rate for electric vehicle charging.

Fleets. Electrification of fleets, both public and private, often represents ideal applications for electric vehicles. Cities often have greater influence over fleets, especially municipal fleets. Jakarta has stated its intention to create a mandate for adopting ZEVs for its entire municipal fleet, particularly since the city is one of the signatories of the C40 Fossil Fuel Free Streets Declaration. Ride-hailing fleets have also increased in numbers, with motorcycles representing the largest share. There are already initiatives from ride-hailing providers to switch to battery-electric two-wheelers and build its supporting ecosystem in Indonesia (Gojek, 2022). This could be integrated further into a city-wide electrification plan.

Incentives. The national government is responsible for most of the fiscal incentives for battery-electric vehicles and fuel-cell electric vehicles, including direct financial incentives. However, city governments can also offer city-level financial and non-financial incentives for electric vehicles. As an example, Jakarta has exempted battery-electric vehicles from paying the transfer tax and also excludes them from traffic restrictions (Mahalana & Yang, 2021).

CONCLUSION AND SUMMARY OF POLICY RECOMMENDATIONS

ZEVs are among the keys to success in achieving a sustainable energy transition, as they shift one of the most energy-intensive sectors, the transport sector, away from fossil fuels. Indonesia served as a case study for this brief because the sustainable energy transition is considered one of the priority issues under its presidency of the G20, due to its pledge to become net-zero by 2060, and because of its national ambition to accelerate the uptake of ZEVs.

Given all the commitments that have been made and the targets that have been set by Indonesia, this brief explains that success will require support from other G20 countries in particular and

other countries globally. The following summarises our policy recommendations, and these could be considered by Indonesia and other G20 countries that are facing similar challenges.

Emission standards, vehicle efficiency and compliance monitoring

- Collaborate with other members of the G20, particularly the European Union, China and Japan, to adopt Euro 6/VI-equivalent emission standards and vehicle CO_2 or efficiency standards across all vehicle segments.
- Strengthen compliance with vehicle emission standards through various monitoring approaches, including remote sensing, with the main objective of capturing real-world emissions performance and supporting other policies such as low-emission zones.

Alternative fuel and renewable energy

- Develop second-generation biofuel from wastes and residues, such as cellulosic ethanol and renewable diesel from used cooking oil.
- Support renewable electricity generation beyond the current adopted plans. G20 countries could support Indonesia with the transfer of technology and expertise, and investment that can support or accelerate the target of net-zero emissions by 2060.

Promote zero-emission vehicles

- Work to establish a memorandum of understanding (MOU) or declaration among the G20 on transport electrification. This would be similar to the MOU signed by a broad range of nations and organisations to enable 100 percent zero-emission new truck and bus sales by 2040 (CALSTART, 2021), and the declaration led by the United Kingdom government to support the acceleration of zero emission cars and vans (UK Department for Transport, 2022) following the 26th Conference of Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC).
- Develop suppy-side ZEV regulations to make sure manufacturers introduce ZEV models in all vehicle types and segments.
- Build a strong domestic manufacturing capacity for ZEVs, with a highlight on vehicle and battery manufacturing. Indonesia possesses certain raw materials needed by battery manufacturers and this puts the country in a strategic position within the G20 to bring in expert opinions and new investment opportunities that lead to sustainable growth.
- Consider upskilling and reskilling the workforce, as the transport sector employs a large number of people. This can be done through a capacity building and training programme among ZEV manufacturers and research institutions across G20 countries.

Involve local governments

- Transfer some authority to local governments with respect to particular policies that can be used to accelerate the transition to ZEVs; one example would be to only use zero-emission buses for urban transport. This could also apply to other transport at the city level, such as taxis and ride-hailing.
- Generate more local incentives to promote ZEVs, both fiscal and non-fiscal, and at the same time introduce or expand low-emission zones or zero-emission zones.

Knowledge sharing

Establish a committee or venue for G20 countries to share experiences with various policies to accelerate the transition to ZEVs across the national and sub-national levels, and also invite philanthropic actors and development banks. The G20's TTG has facilitated knowledge exchange among G20 economies on transport policies since 2014.[6] The TTG can be used as platform for implementing these recommendations.

[6] https://theicct.org/initiatives-partnerships/ttg/

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