



Original Article

Global Regulations on Zero-emission Vehicles and Lessons for Vietnam

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Abstract: The environment on Earth has become seriously degraded. Thus, to avoid catastrophic climate change, almost all developed economies has committed to halving their greenhouse gas emission in international agreements such as the Paris Agreement. To fulfill these commitments, the concrete step which the Governments of countries around the world takes is to enact laws and policies on zero-emission vehicles (ZEVs) to cut emission as quickly as possible. This study reviews the concept of zero-emission vehicles and the policy of zero-emission vehicles. Most importantly, the in-depth analysis shows some international experience for Vietnam to enact the involving policy, therefore, protecting the environment.

Keywords: Net-zero emission, transport vehicles, climate change.

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1. Introduction

The growth of the economy leads to an improvement in the quality of life and an increase in employment. But this comes at a cost. More greenhouse emissions are being released, they come from infrastructure constructions and operations such as intensive agriculture, vehicle transportation, industrial processes, and power plants [1]. These affect the environment in the long term, for example, ice melt, ocean warming, sea level rise, and natural diseases. The 26th Conference of the parties (COP26) to the United Nations Framework Convention on Climate Change was held in 2021, in which every country agreed to take national action and collaborate to tackle climate change, and also reaffirmed the continuation of key principles from the Paris Agreement and previous Conferences of the parties, that it to limit the rise of in global temperature to 1.5 degrees [2]. This requires greenhouse gas emissions to be reduced until the environment of the Earth is back in balance again. As a matter of fact, the demand for transport is growing across the world in recent decades because of overpopulation and the rise of income and more and more people can afford to buy transport vehicles [3]. In 2020, global transport emissions accounted for 7.2 GtCO₂ out of the 36.3 GtCO₂ of global energy-related CO₂ emitted. The major parts come from light-duty vehicles which contribute 45.8% to the total emission and heavy trucks account for 25%. The others come from aviation, shipping, rail, bus and minibus, two and three-wheelers [4]. Therefore, part of the solution to reducing greenhouse emissions lies in low-and even zero-carbon emission vehicles. Governments in leading production auto markets, including the biggest atmosphere polluters such as China, the United States, and the European Union, have committed to reaching net zero emissions by 2050. To achieve this target, many ZEVs laws have been enacted. These laws along with the

adoption of stringent CO₂ standards¹ and grid decarbonisation² are expected to achieve game-changing greenhouse gas reductions from the transport sector. According to the International Council on Clean Transportation, ZEVs provisions can accelerate the shift to electric and drive necessary CO₂ reductions from conventional vehicles [5]. As a result, we can slow down the speed of climate change and protect our planet.

2. Conceptualisation of “Net-zero Emission Vehicles”

2.1. The Net-zero Emission Concept

According to the United Nations (UN), net zero means “cutting greenhouse gas emissions to as close to zero as possible, with any remaining emissions re-absorbed from the atmosphere, by oceans and forests for instance” [6]. The Intergovernmental Panel on Climate Change, the United Nations body for assessing the science related to climate change, considers net zero emissions achieved “when anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period” [7]. Simply worded, at the global level we need to balance the amount of emissions we put into the atmosphere with the amount we take out. In the same vein, Australia’s leading climate change communication organisation, the Climate Council refers to “Net-zero emissions” as the achievement of an overall balance between greenhouse gas emissions produced and greenhouse gas emissions taken out of the atmosphere,... which means no more greenhouse gas can be added to the atmosphere in any given year than is taken out [8]. Getting to net zero means human beings can still produce some emissions, as long as they are offset by

¹ CO₂ standards mean legal requirements of CO₂ emission level (g/km) for a transportation vehicle. For instance, EU set CO₂ standards of 130g/km for new passenger cars and 175g/km for light commercial vehicle.

² Grid decarbonisation means reducing CO₂ emissions resulting from human activities.

processes that reduce greenhouse gases already in the atmosphere. In order to achieve net-zero emissions, we must either generate no greenhouse gases or compensate for those emissions in some other way, for as by planting trees or using carbon-capture technology. Therefore, we can understand that net-zero emission means that the whole amount of greenhouse gas released is balanced by an equivalent amount being removed from the atmosphere.

2.2. Definition of “Net-zero Emission Vehicle”

Net-zero emission vehicles typically refer to transportation means that do not result in any harmful emission³ during operation. Electric cars and hydrogen-fueled vehicles are typical examples of net-zero emissions vehicles. These vehicles still produce some emission but it is now classified as harmful. Different legislations use different terminology to describe net-zero emissions vehicles. It is also referred to as “low-emission vehicles” or “zero low-emission vehicles” (ZLEVs) in EU norms, as “zero-emission vehicles” (ZEVs) in U.S. regulations, and as “new-energy vehicles” (NEVs) in Chinese laws. The author of this article proposes a definition of a zero-emission vehicle as follows:

A zero-emission vehicle is a vehicle that is operated by electricity, fuel cell, or hydrogen from an external source and emits low or zero greenhouse gases.

Zero-emission vehicles include battery-operated electric vehicles, fuel-cell electric vehicles, plug-in or hybrid electric vehicles, etc. For background information, battery-operated electric vehicles do not have internal combustion engines, these run solely on battery power which needs to be charged. In contrast, plug-in or hybrid electric vehicles use internal combustion engines to help them run on battery power. Fuel-cell electric vehicles use a propulsion system similar to that of electric vehicles, with the fuel cell converting

hydrogen-stored energy into electricity. These automobiles do not emit any harmful exhaust emissions, unlike those powered by traditional internal combustion engines.

2.3. The Rationale for Net-zero Emission Vehicles

Using fossil fuels-coal, oil, and gas-can release carbon dioxide, which is the main contributor to climate change. Even when humans stop using the former, the latter will stay in the atmosphere for years and years and climate change keep continuing. To restore the global climate to pre-climate change levels, we need to cut down greenhouse gas emissions to zero and repair past harm by emissions which are existing in the air. The longer it takes to do so, the more the climate will change.

Replacing polluting coal, gas and oil-fired power with energy from renewable sources, such as electricity or hydrogen would reduce carbon emissions to a great extent. Thus, net zero emission vehicles play an important role in reducing greenhouse gas emissions as well as the level of air pollution. Many studies have also pointed out the lower operating cost in the long run of net zero emission vehicles, compared to conventional ones. Recent ZEV price analysis shows EV costs dropping below the price of conventional vehicles by 2027, with the lowest-range EVs reaching price parity in 2024. Buyers will also experience increased cost competitiveness due to reduced fuel costs, as well as purchasing incentives [9].

The technology could allow human beings to achieve net-zero emissions as a transportation system that runs primarily on electricity or hydrogen rather than gas will release less CO₂. Moreover, abating emissions from other sectors, such as cement industry, is more expensive than that from vehicles [10]. It is highly unlikely that emissions will be brought to zero in agriculture because plants give out CO₂ while they grow. They also take a much longer time to reach zero. Thus, decarbonising transportation is also the best way to tackle climate change by reducing global warming or limiting emissions discharged to the environment.

³ The harmful emission are those which have negative impact on the environment as well as human health.

3. Global Commitments and National and Regional Regulations Relating to Net-Zero Emission Vehicles

3.1. Global Commitments

3.1.1. Conference of the Parties of UN Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change (UNFCCC) entered into force on 21 March 1994. 197 countries that have ratified the Convention are called Parties to the Convention. The ultimate aim of the UNFCCC is to stabilise greenhouse gas concentrations “at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system”.

The COP, is the annual meeting of the United Nations with the participation of 197 nations that agreed to a new environmental pact, the United Nations Framework Convention on Climate Change. At the COP26 in 2021, parties (including 31 countries, 38 subnational governments, 11 vehicle manufacturers, 15 investors and financial institutions, and more) signed Glasgow Declaration on Zero-Emission Cars and Vans to collaborate and “work towards” selling only cars and vans that are zero-emission vehicles in 2035 in leading markets and 2040 for the rest of the world. Moreover, automotive manufacturers committed to selling only zero-emission new vehicles by 2035 or earlier. Fleet-owning businesses commit to achieving a fully zero emission fleet by 2030 or earlier.

Parties will support efforts to achieve the road transport breakthrough announced by world leaders which aims to make zero-emission vehicles the new normal by making them accessible, affordable, and sustainable in all regions by 2030. Alongside the shift to zero-emission vehicles, a more comprehensive system transformation is necessary for a sustainable future in road transportation, including support for active transportation, public transportation, and shared transportation, as well as

consideration of the whole value chain effects of car manufacture, usage, and disposal [11].

3.1.2. The Paris Agreement

The Paris Agreement is a legally binding international treaty on climate change that was adopted in 2015 by 196 Parties and entered into force on 4 November 2016. It was a fully global agreement to tackle climate change in which parties committed to “holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognising that this would significantly reduce the risks and impacts of climate change” [12]. The Paris Agreement shifted from the top-down approach⁴ of the previous Kyoto Agreement⁵ to a bottom-up approach, in which parties are required to determine their own national contributions and successively increase them to reflect their “highest possible ambition” [13].

Article 4 of the Paris Agreement stipulates that in order to achieve the Agreement’s long-term temperature goal, Parties commit to undertake rapid reductions of gas emissions to achieve “a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of the century”. As a contribution to the objectives of the agreement, countries have submitted comprehensive national climate action plans known as Nationally Determined Contributions (NDC) every five years.

Since the coming into force of the Paris Agreement, as of May 2021, 192 Parties had submitted their first NDCs to the Framework Convention on Climate Change secretariat.

⁴ Top-down and bottom-up approaches are methods used to analyze and choose securities. While the top-down approach goes from the general to the specific, and the bottom-up approach begins at the specific and moves to the general.

⁵ Kyoto Agreement was adopted on 11 December 1997 by 192 Parties. The Kyoto Protocol is based on the principles and provisions of the United Nations Framework Convention on Climate Change by committing industrialized countries and economies in transition to limit and reduce greenhouse gases (GHG) emissions.

Moreover, as of December 2020, 48 of them were submitted as new or updated NDCs, representing 75 Parties and accounting for 30 percent of global greenhouse gas emissions in 2017. Developed countries are stepping up their efforts to provide technical guidance and support to Least developed countries – which are particularly vulnerable to the effects of climate change – to develop and carry out plans to boost their efforts to adjust to a changing climate [14].

3.2. National and Regional Regulations on Net-zero Emission Vehicles

3.2.1. G7 Climate, Energy and Environment Ministers' Communiqué

G7 Climate, Energy and Environment Ministers' Communiqué was held by the G7 Ministers on 26th, 27th May 2022 in Berlin to address some crises including climate and environment. Ministers set up a wide range of actions to achieve deep emission cuts and reach net-zero greenhouse gas emissions by 2050 at the latest, halt and reverse biodiversity loss by 2030 and minimise pollution.

In road sectors, the leaders commit to a highly decarbonised road sector by 2030 including by, in this decade: significantly increasing the sale, share, and uptake of zero-emission light-duty vehicles, including zero-emission public transport and public vehicle fleets; accelerating the transition away from new sales of diesel and petrol cars; substantially reducing emissions from medium-duty and heavy-duty vehicles; investing significantly in charging and refuelling infrastructure; promoting innovation; and supporting sustainable and safe battery recycling. They also commit to spending more budgets on sustainable low or zero-carbon transport modes such as public transport, railways, shared mobility, cycling, and walking and on accelerating the adoption of electric vehicles by funding charging infrastructure. Regarding international aviation, the commitment is to deliver net zero emissions from international aviation no later than 2050 [15].

3.2.2. United States

In the United States, California has established a zero-emission vehicle (ZEV) mandate since 1990 [16]. Since then, nine other states have adopted the same mandate which accounts for more than a third of the total American-selling ZEV market. California zero ZEV mandate was issued as a part of the Low Emission Vehicle regulation by the California Air Resources Board in 1990. It has undergone many modifications.

Applicability of ZEV mandate to manufacturers

Based on the production volume status⁶ for each compliance year, the California ZEV Mandate classified manufacturers into three groups: Small-volume manufacturers (volume status < 4,500), Intermediate-volume manufacturers (volume status > 4,501 - 20,000 units) and Large-volume manufacturers (volume status > 20,000 units). Manufacturers who fall under the categories of “high volume manufacturers” and “intermediate volume manufacturers” must meet specific ZEV percentage credit requirements which are given when a ZEV is delivered for sale. For example:

ZEV percentage requirement

The intermediate-volume and large-volume manufacturers must comply with credit-based requirements⁷, not direct market-share targets⁸. Firstly, ZEV percentage credit requirements rise from 4.5% in 2018 to 22% in 2025. Secondly, the quantity of credits necessary for compliance is determined by multiplying the ZEV percentage credit requirement for a compliance year by the manufacturer's output volume. Thirdly, production volume for the compliance year is calculated as the yearly average of the

⁶ The volume status is calculated as the annual average of the manufactures' sale in California in the previous three years.

⁷ Credit-base requirements means a quality or qualification imposed to a manufactures base on the amount of ZEV credit they got.

⁸ Direct market-share targets means a group of potential customers that manufactures identify to sell products or services to.

manufacturer’s sales in California in the prior 2nd, 3rd, and 4th years.

Types of ZEV eligible to earn credit and credit allocation

According to the mandate, there are two main types of ZEV:

i) Pure ZEVs include battery-operated electric vehicles and fuel cell electric vehicles. Only vehicles with all-electric range more than 50 miles can receive credits.

ii) Transition ZEVs is a plug-in hybrid electric vehicles. Credits are allocated for vehicles having their equivalent all-electric range of at least 10 miles.

Trade and transfer ZEV credit

Manufacturers may save excess credits for later usage through 2025 compliance.

Excess credits from one manufacturer may be traded or sold to another manufacturer.

Penalty for ZEV credit deficit

If the manufacturers have ZEV credit deficit, they will be fined \$5,000 per ZEV credit deficit. Credit deficits are not eliminated by penalty payments; instead, they are carried over to compliance years that follow.

Many other states have adopted the ZEV mandate under Section 177 of the Clean Air Act (42 U.S.C. §7507) for example New York, Massachusetts, Vermont, Maine, Connecticut, Rhode Island, New Jersey, Oregon, and Maryland. California government has begun developing a set of standards for model years after 2025 known as Advanced Clean Cars II. By 2035, it is anticipated that all new light-duty vehicle sales will be electric vehicles (EVs), in which plug-in hybrid electric vehicles will account for 20%.

3.3. China

In 2017, China issued a New-Energy Vehicle mandate policy, namely the Parallel Management Regulation for Corporate Average Fuel Consumption and New Energy Vehicle Credits, which was updated in 2018 and in 2021. Like California, the policy is for New-Energy Vehicle (NEV) credit, instead of New-Energy Vehicle sale.

The Regulation specifies the application of NEV credit targets into two phases. Under Phase 1, The NEV credit target, which applies only to passenger cars, was 10% of the conventional passenger vehicle in 2019 and 12% in 2020 [17]. Based on factors including electric range, energy efficiency, and rated power of fuel cell systems, each NEV is given a certain amount of credits. A maximum of six credits per car are awarded for higher performance. The structure of Phrase 2⁹ is similar to Phrase 1, however, the target increases to 18% in 2023 and fuel vehicles are included. The table below shows the differences between the two phases.

Below are the details of the policy.

Applicability of ZEV mandate to manufacturers

Each NEV is assigned a specific number of credits ranging from one to six, depending on indexes such as electric range, energy efficiency, and rated power of fuel cell systems.

Table 1. NEV credits in two phrases

	Phrase 1	Phrase 2
Type of ZEV	BEV and PHEV ¹⁰	BEV and PHEV
Number of credits per vehicle	BEV: 6 credits PHEV: 2 credits	BEV: 3.05 credits PHEV: 1.6 credits
Energy multiplier consumption ¹¹	1-1.2	1-1.15
Range multiplier ¹²	No	Yes
Battery energy density multiplier ¹³	No	Yes

⁹ The phrase 2 started on January 1, 2021.

¹⁰ BEV means battery electric vehicles which are powered by rechargeable battery packs. PHEV means Plug-in hybrid electric vehicles which use batteries to power an electric motor and another fuel, such as gasoline, to power an internal combustion engine

¹¹ The proportion of produced electricity compare to electricity consumed.

¹² Range multiplier means a portion in the ohmmeter where the actual reading is multiplied by the range value

¹³ Battery energy density multiplier means to energy density determined by multiplying the maximum capacity of the battery for the mid-point potential (Potential of the battery when it is discharged to 50% of its capacity).

These NEV credit targets apply to all auto companies with annual production or import volume of at least 30,000 conventional passenger cars.

ZEV percentage requirement

Like California, the manufacturers in China are required to meet credit-based requirements, not direct market-share targets. The affected manufacturers must meet NEV percentage credit requirements of 16% in 2022 and 18% in 2023. Annual mandatory requirements are set for auto manufacturers on NEV credits, which need to be achieved by producing or importing enough new energy passenger cars.

Types of ZEV eligible to earn credit and credit allocation

In China, NEVs include battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), and fuel cell electric vehicles. According to the Policy, there are three types of NEVs that are eligible to earn credits, they are:

- Battery Electric Vehicles with an electric range of at least 100 km and a maximum vehicle speed of at least 100 km/h are capped at 6 credits per vehicle.
- Fuel Cell Electric Vehicles with an electric range of at least 300 km are limited to 2 credits per vehicle.
- Plug-in hybrid electric vehicles with electric range of at least 50 km are capped at 5 credits per vehicle.

Trade and transfer ZEV credit

China's government allows manufacturers to sell the excess credits to other manufacturers. The surplus credits are also applied to the corporate average fuel consumption's credit deficit.

Penalty for ZEV credit deficit

The Ministry of Industry and Information Technology of China has the right to deny approval for new models of NEVs for failure to meet the specific fuel consumption standards.

3.3. 1. European Union

In order to achieve climate neutrality by 2050, the European Commission (EU) adopted a number of legislative proposals, for example,

The European Climate Change 2021, Proposal for a Regulation of the European Parliament and of the Council on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU of the European Parliament and of the Council, and Proposal for a Regulation of the European Parliament and of the Council on the use of renewable and low-carbon fuels in maritime transport and amending Directive 2009/16/ EC. COM (2021) 562 final 2021/0210 (COD), etc. Current carbon dioxide (CO₂) emission performance criteria for new light commercial vehicles (vans) and new passenger cars are determined by Regulation (EU) 2019/631 as regards strengthening the CO₂ emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition, and the Fit for 55 legislative package which applies to the whole EU fleet. The Regulation will give customers advantages from the increasing use of zero-emission vehicles.

Applicability of ZEV mandate to manufacturers

The proposals are voluntary and non-binding to Member States. In other words, all manufacturers of Member States have the option to achieve the goals and get a compliance relaxation for the annual corporate average emission limits.

ZEV percentage requirement

The Commission proposes the following CO₂ emission reduction targets for new passenger car and van manufacturers [18]:

- i) From 2025 to 2029: 15% for cars and 15% for vans;
- ii) From 1 January 2030: 55 % for cars, and 50 % for vans;
- iii) From 1 January 2035: 100 % for cars, and 100 % for vans.

Specific emission targets are set annually for each manufacturer, based on the EU fleet-wide targets and taking into account the average mass of the manufacturer's new vehicles registered in a given year, using a limit value curve. Additionally, the Commission suggests

eliminating the incentive for zero- and low-emission cars starting in 2030.

Types of ZEV eligible to earn credit and credit allocation

EU legislation currently refers to zero-emission vehicles as full electric cars and fuel cell vehicles and low-emission vehicles as vehicles having tailpipe emissions below 50g/km. The ZEVs will get full credit while those with emissions between 0 g/km and 50 g/km count partially. Manufacturers responsible for less than 1000 cars or less than 1000 vans newly registered in the EU per year are exempted from meeting a specific emissions target unless they voluntarily apply.

Trade and transfer ZEV credit

EU allows manufacturers to sell the excess credits to other manufacturers. The excess credits also are used to offset a CAFC credit deficit.

Penalty for ZEV credit deficit

Because the proposed market share targets are voluntary and non-binding, there is currently no penalty for manufacturers which do not fulfil ZEV requirements. However, if the average CO₂ emissions of a manufacturer's fleet exceed its specific emission target in a given year, the manufacturer has to pay - for each of its vehicles newly registered in that year – an excess emissions premium of €95 per g/km of target exceedance.

4. Lessons for Vietnam in ZEV Regulations

Vietnam is one of the countries to be most seriously affected by climate change and the air quality is always at an alarming level. In 2014, transport vehicles emits about 27.5 million ktCO₂, accounting for 10% of the gas emission of the country [19]. At COP26, Vietnam had made a commitment to achieve net zero emissions by 2050 [20]. Immediate after that the Conference, the Vietnamese Government enacted various policies for renewable energy development and fossil fuel elimination to honour this commitment, as follows:

Decision No. 419/QD-TTg of the Prime Minister on approving the national program on reduction of greenhouse gas emissions through the mitigation of deforestation and forest degradation; conservation and enhancement of forest carbon stocks and sustainable management of forest resources through 2030. The aim is to cut down 37.5 million tons of greenhouse gas emissions in transportation from now to 2030 [21].

Decree No. 06/2022/ND-CP of the Government on mitigation of greenhouse gas (GHG) emissions and protection of the ozone layer.

Decision No. 01/2022/QD-TTg of the Prime Minister promulgating the lists of sectors and establishments emitting greenhouse gases subject to greenhouse gas inventory.

Currently, five types of fuels are used in transportation in Vietnam:

Table 2. Fuel consumption by different categories in the transport sector in Vietnam [22]

In million tons of oil equivalent

Type of fuel	2014	2020	2025	2030
Gas	4.86	7.05	9.33	12.33
Diesel	5.44	7.46	10.62	15.10
Fuel oil	0.23	0.23	0.29	0.38
Petroleum	0.37	0.93	1.16	1.44
Electric	0.00	0.01	0.02	0.02

It is clear that almost all vehicles in Vietnam are using gasoline which will release CO₂. It is a long and difficult path for Vietnam to change the habit of Vietnamese of using gasoline-powered vehicles. In long term, a policy on electric vehicles should be issued by the Vietnamese government to reach the commitment to net zero emissions. “Net Zero is not only about energy, but also about how we will develop agriculture, how to treat waste, how to convert means of transport. Instead of using petrol-fueled cars, we will look more at electric cars. It is also a tool to help regulate electricity demand in the future. At some points, the electric vehicle battery charged at peak hours can be pushed back to the grid” [23].

Vietnam can learn a number of lessons from other jurisdictions in ZEV regulations.

Firstly, the ZEV regulations of the above countries and regional organisations are based on credit requirements instead of sales targets to prevent manufacturers from using the low sale of cars as an excuse for non-compliance. Thus, Vietnam should also consider applying the credit requirement.

Secondly, manufacturers should be classified based on their production or selling volume. The Law should stipulate clearly which ones are subject to or exempted from ZEV credit requirements. Vietnam might also treat all impacted manufacturers equally without imposing any minimum requirements like China or providing flexibility in compliance for some manufacturers like the California system.

Thirdly, the typology of ZEV and how to classify a vehicle as ZEV should be considered. Almost all countries agree that ZEVs include BEVs and PHEVs. There are two different approaches for considering a vehicle as ZEV: e-range¹⁴ (California and China are examples) or total emission per kilometre like EU.

Fourthly, it is very important to reward manufacturers that meet their ZEV targets. Both California and China allow these manufacturers to trade or transfer the exceeded credits to other manufacturers. Therefore, this could be a useful policy and Vietnam should specify the trade or transfer credit provisions with sufficiently stringent over time.

Lastly, manufacturers who miss their ZEV credit requirements should be punished. While manufacturers in California have to face the financial penalty, those in China with their most polluting manufactured models are prohibited from entering the Chinese market until both corporate average fuel consumption criteria and ZEV requirements can be reached. In Vietnam, it is suitable to impose a financial penalty because the state agencies' ability to control

models sold on the market is still weak. Thus, the Chinese approach may not work.

5. Conclusion

Climate change is a serious threat to the well-being of our planet. There is no magic bullet for dealing with this problem. It requires a lot of effort from governments. From Paris Agreement to the COP21, governments have reaffirmed their commitment to reducing greenhouse gas emissions and made a stronger promise of net zero emissions. Moreover, governments are becoming more and more aware of how ZEV regulations can accelerate the market transition to electric vehicles. Thus, those in some leading markets had considered adopting different ZEV policies to achieve the goal of zero emissions.

Vietnam is going in the same direction. However, current efforts are not sufficient and the country needs to enact policies or regulations on ZEV to honour its commitments at COP26 by reaching the target of cutting down greenhouse gas emissions in the transport sector.

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¹⁴ E-range mean electric range which is the maximum driving range of an electric vehicle using only power from its battery.

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