



## BACKGROUND NOTE

# e-Mobility – a Promising Option for Reducing GHG in Transport Sector

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# E-MOBILITY - A PROMISING OPTION FOR REDUCING GHG IN TRANSPORT SECTOR

Ki-Joon Kim<sup>1</sup>

Mobility is an essential instrument of social and economic development. The mass production of fossil fuel-based internal combustion engines (ICEs) in the early 20th century revolutionized mobility by extending travel distances and reducing travel times. As a result, motorized vehicles played a key role in shaping human settlement and activity patterns.

Despite the convenience and contribution of motor vehicles to social and economic development, their negative externalities, such as pollution and increased greenhouse gas emissions, have not been fully acknowledged nor consistently factored into all level of policy or personal decisions when a mode of transport is chosen. Transport affects the global climate through its emissions, and pollutants reduce air quality and have negative impacts on human health and ecosystems. In 2015, the transport sector emitted around 7.5 billion tons (t) of carbon dioxide (CO<sub>2</sub>) representing 18% of all man-made CO<sub>2</sub> emissions. The International Energy Agency projects 50% higher transport emissions by 2060, with strong growth especially in trucks and buses, while cars, small buses, and trucks with less than 3.5 t would remain at current emission levels. The key question is how can the need for mobility be met with minimal impact to human health and the environment?

Electrification of transport modes is offering a promising future for reducing emissions from the transport sector. Electric vehicles are rapidly emerging and offer a promising solution for alleviating the health and environmental burdens caused by the transport sector in what is called a “clean disruption.” Electric vehicles are gaining momentum in light of recent announcements by several major car manufacturing countries to ban ICE car sales in the near future, and the plans of major cities to restrict cars using diesel engines from their urban centers. In contrast to these bans, there is increased enthusiasm for electric vehicles, with many developing countries and cities committing to electric vehicle deployment to varying degrees and business communities stepping in to provide business models to promote their adoption.

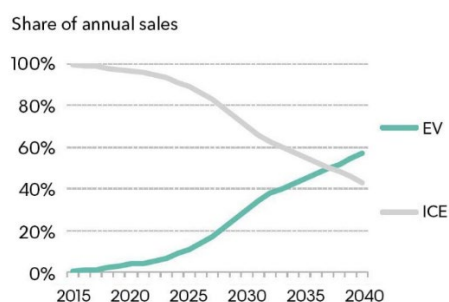
BloombergNEF<sup>2</sup> estimated that annual passenger electric vehicle sales to rise from 2 million in 2018 to 10 million in 2025, 28 million in 2030, and 56 million by 2040. Which means that, by 2040, 57% of all passenger vehicle sales and over 30% of the global passenger vehicle fleet will be electric. Electrification of bus fleet has already been progressed with over 400,000 units on the road and the commercial electric van and truck sales are to be accelerated in the 2020s.

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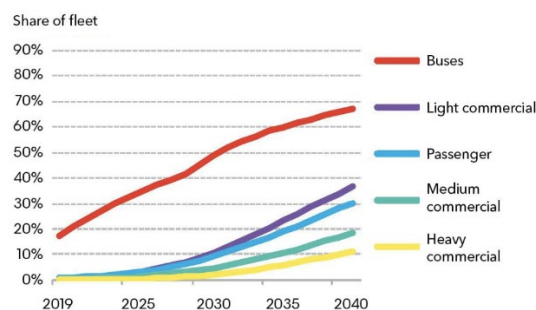
<sup>2</sup> The Electric Vehicle Outlook 2019, BloombergNEF.

**Figure 1: Global Electric Vehicle and Internal Combustion Engine Share of Long-Term Passenger Vehicle Sales**



EV = electric vehicle, ICE = internal combustion engine.  
Source: BloombergNEF.

**Figure 2: Electric Vehicle Share of Global Vehicle Fleet by Segment**



Note: Commercial vehicle adoption figures include the main markets of the People's Republic of China, Europe, and the United States.  
Source: BloombergNEF.

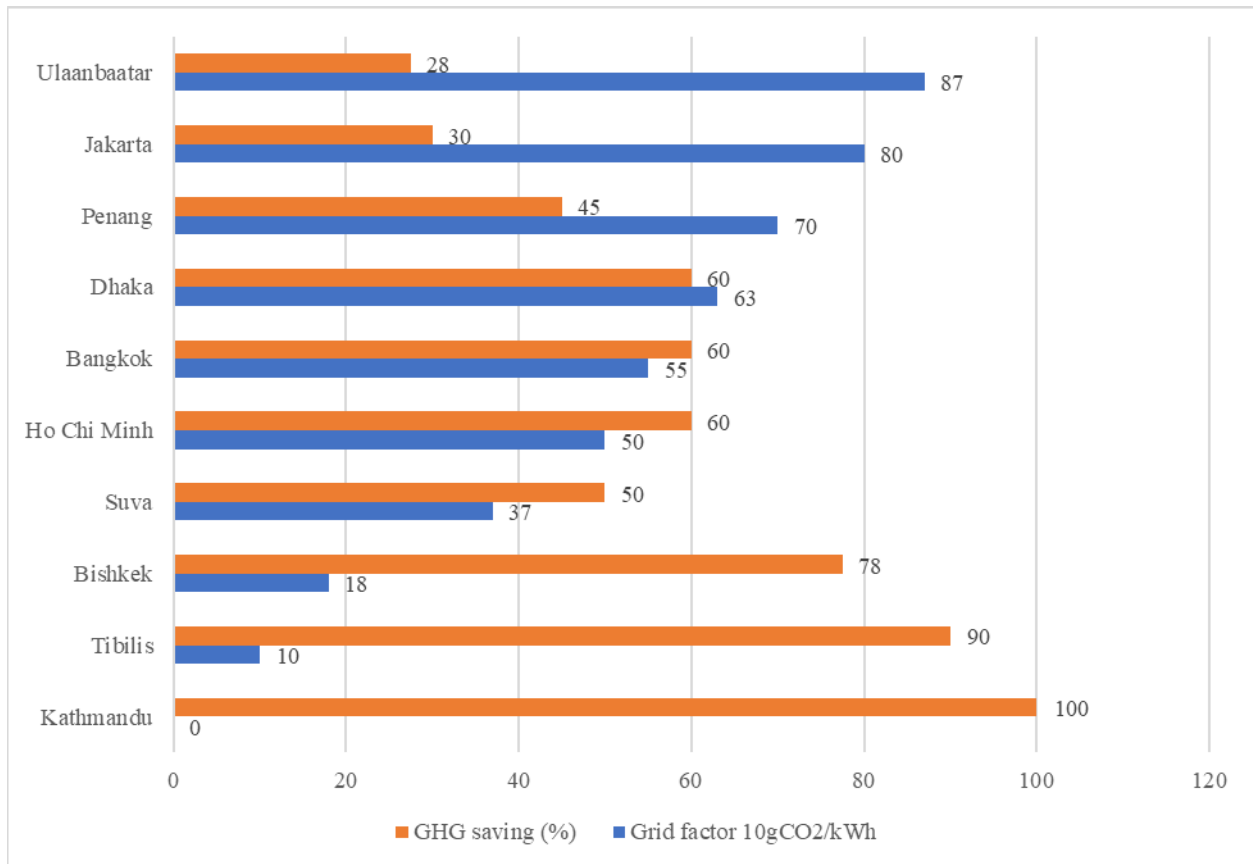
Despite the growing sales of electric vehicles and announcements of policy and deployment plans by many countries and cities, the current number of electric vehicles is still too small to produce any meaningful impact on emissions reduction. Electric vehicles are projected to reach a competitive pricing compared with ICE cars by the 2020s, resulting in a significantly higher share of electric car sales globally.

Based on the e-Mobility studies of the Asian Development Bank (ADB)<sup>3</sup> for developing member economies), the governments' reaction to the electric vehicle trend has been accelerated in very recent years with issuing various electric vehicle promotion policies such as exemption or reduction of vehicle import tax, value-added tax, and vehicle excise tax. The most immediate actions for e-Mobility were taken by the countries with high renewable energysuch as Nepal, the Kyrgyz Republic, Georgia, and Armenia. Those countries recognize the e-Mobility as an opportunity to reduce oil import and improve energy security as well as reduce emissions (CO<sub>2</sub> and pollution). Some countries, such as the People's Republic of China, India, Thailand, and Indonesia, consider the electric vehicle industry as a new economic development opportunity.

CO<sub>2</sub> reduction by electric vehicle is dependent on the electricity grid factor of the country. Countries with high renewable energy, such as Nepal, Georgia, and the Kyrgyz Republic, can reduce CO<sub>2</sub> emission substantially, but countries with high grid factor such as Mongolia still can reduce CO<sub>2</sub> emission by 28% by replacing diesel buses with electric hybrid buses. The range of CO<sub>2</sub> reduction by electrification can be considered significant compared with the other transport investments for shifting passenger car drivers to public transport or non-motorized transport.

<sup>3</sup> ADB. 2019. E-Mobility Options for ADB Developing Member Countries. *ADB Sustainable Development Working Paper Series* No. 60. Manila.

**Figure 3: Grid Factor and GHG reduction by e-bus**



CO<sub>2</sub> = carbon dioxide, GHG = greenhouse gas, kWh = kilowatt-hour.

Source: Implementation of Sustainable Transport for All - Electric Mobility Policy and Strategy for ADB DMC Cities, Transport Sector Group, Sustainable Development and Climate Change Department, Asian Development Bank.

Economy of electrifying transport is determined by the capital cost and operating and maintenance cost. Capital cost of the electric vehicles are still higher than those of ICEs as battery cost is still high (\$200 per kilowatt-hour). When the battery cost becomes around \$120 per kilowatt-hour, electric vehicle price will par with that of ICE vehicles without tax incentives. The relative advantage of electric vehicle is low maintenance cost as electric vehicles have much less moving parts than ICE vehicles. The relative advantage of electric vehicle operating cost depends on the price difference between fuel price and electricity tariff.

The electrification of transport is no longer in doubt, but an ongoing global trend. We must choose the right path to enable electrified transport and help prevent and arrest increasing pollution and higher greenhouse gas emissions. Doing this requires concerted efforts and strategic decision-making at multiple levels of government and industry that are involved in the policies and manufacturing of electric vehicles, the construction of charging stations, the provision of mobility services, the mix of the energy supply, and interactions with financial institutions.