



Status of E-mobility Roll-out in Asia

High Level 15th Regional Environmentally Sustainable Transport Forum in Asia

Plenary Session 10: The Role of E-mobility Solutions in Decarbonising Transport and Improving Air Quality in Developing Asia

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Alvin Mejia

Urban Electric Mobility Initiative (UEMI)
Mobility Hub of the Urban Living Lab Center (ULLC)
a UN-Habitat Collaborating Center

Asian Transport Outlook

Why E-mobility?

“Electric vehicles powered by low-GHG emissions electricity have large potential to reduce land-based transport GHG emissions, on a life cycle basis . Advances in battery technologies could facilitate the electrification of heavy-duty trucks and compliment conventional electric rail systems.”

- IPCC 6th Assessment Report

“Electrification is one of the most important strategies for reducing CO2 emissions from energy in the Net Zero Emissions by 2050 Scenario, where the majority of emissions reductions from electrification come from the shift towards electric transport and the installation of heat pumps.”

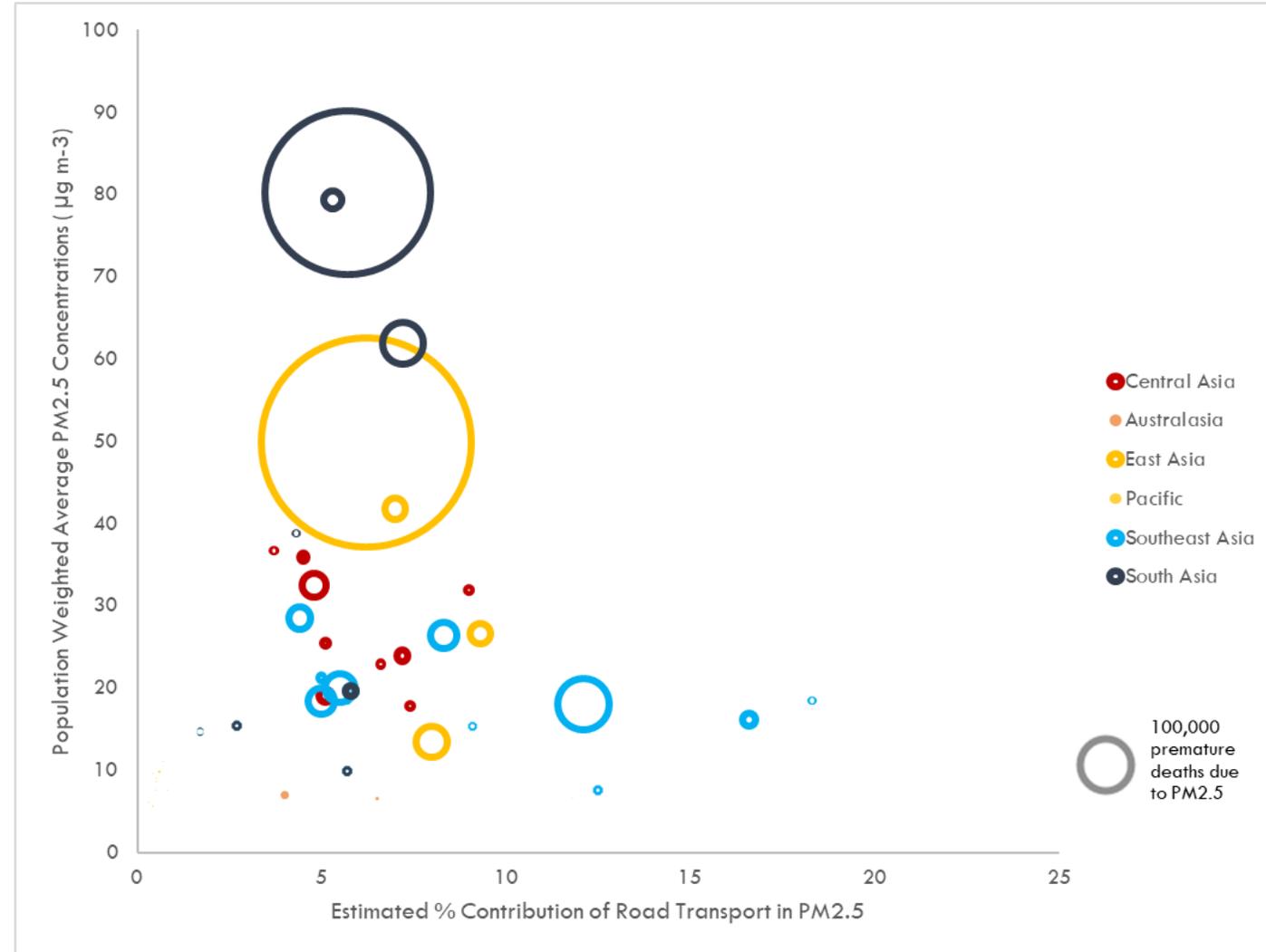
-IEA Net Zero Roadmap

“Electro-mobility coupled with investment in renewable energy is critical to carbon mitigation... EVs (micro-mobility, two/three-wheelers, passenger cars, mini buses, busses, trucks, etc.) offer multiple benefits: decarbonisation, cleaner cities, better road use and mobile energy supplies”

- High Level 14th Regional EST Forum in Asia



Transport and Air Pollution Contribution in Asia



Source: McDuffie Et. al



How E-mobility can Deliver Decarbonisation and Air Pollution Impacts

- **Direct replacement** of ICE vehicles
- Allows for the **utilization of EVs** to fill in gaps in use cases and provide higher levels/quality of services, for example
 - Promotion of biking through pedelecs
 - Utilization of light electric vehicles in urban freight
- Can strengthen **more efficient modes** (e.g. public transport support through last mile services)



Aichi 2030 Declaration – Recognizing the Contextualization of E-mobility

“Strategy 4: Achieve significant shifts from road-based transport to more sustainable modes of inter-city passenger and goods transport, through expansion of and improvements to **electrified rail**, and inland water transport infrastructure and services...

Strategy 6: Require the integration of dedicated walking and cycling infrastructure in transport plans in all cities and massively scale up investments in walking and cycling to realize widescale improvements to pedestrian and bicycle (including **electric bicycles**) facilities, adoption of “complete” streets design standards..

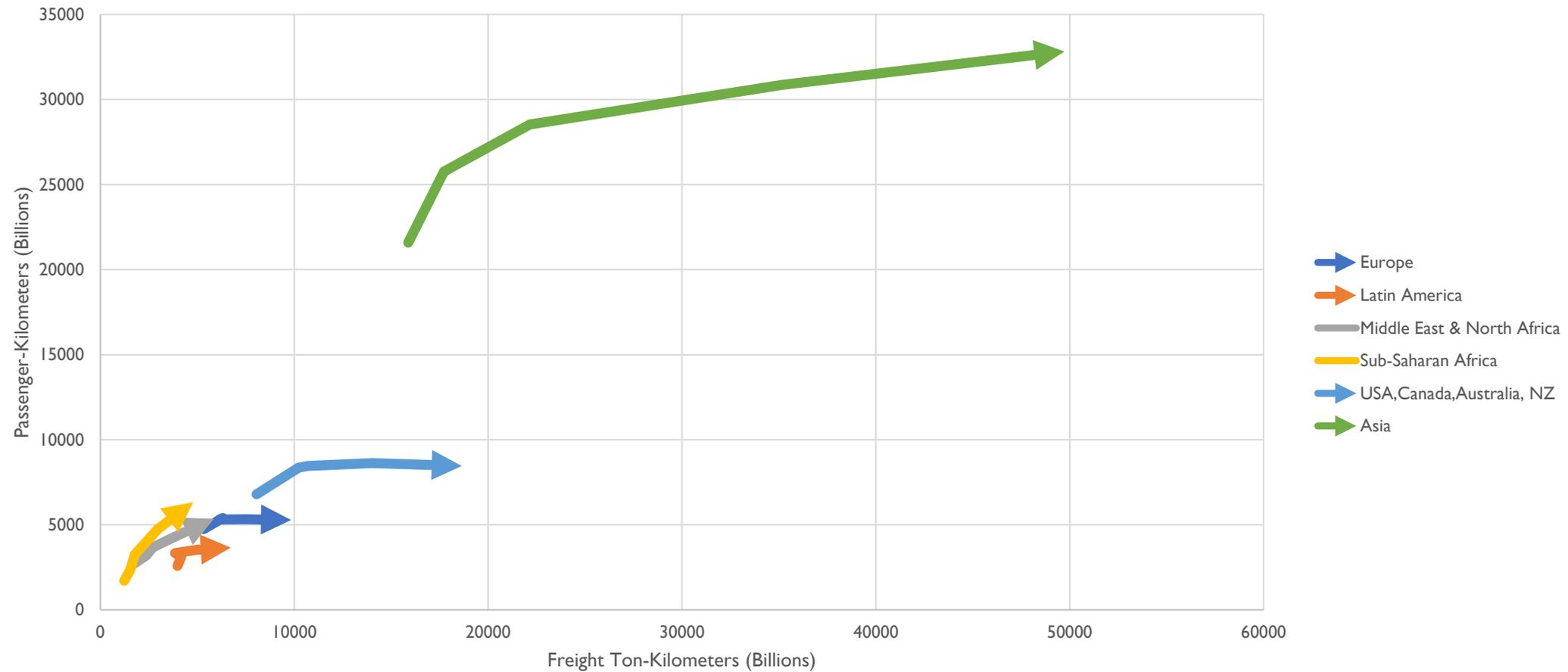
Strategy 8: Promote research in low carbon transport systems and encourage the shift towards the use of low-carbon fuels, eventually shifting to electricity or hydrogen, to power passenger and freight vehicles. In the medium term also using hybrid technology. Rapidly develop the infrastructure for **electric mobility** and/or hydrogen based mobility, both ultimately generated from renewable energy.”

-Aichi 2030 Declaration



Room for Growth and Opportunity for Transition

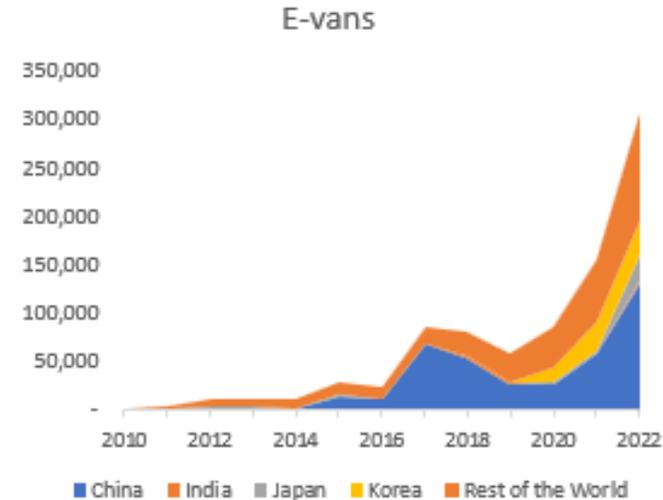
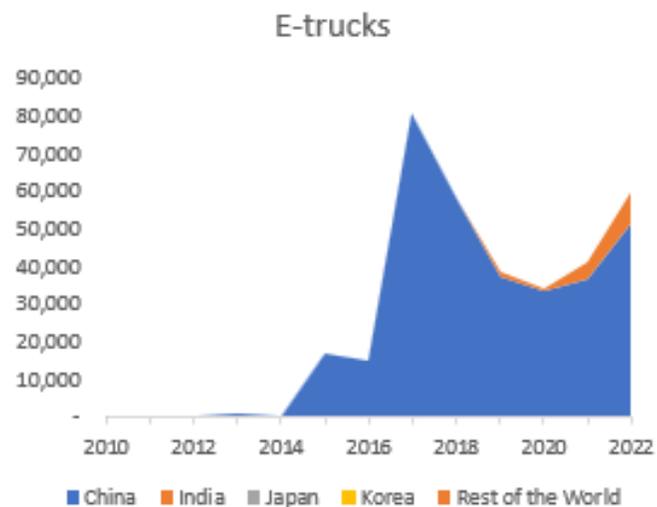
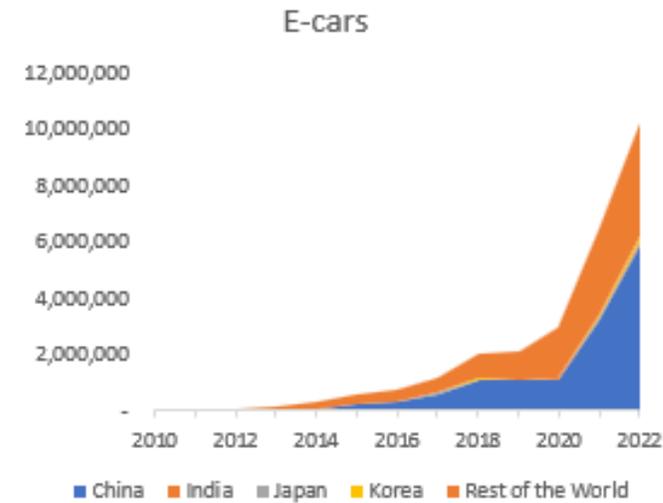
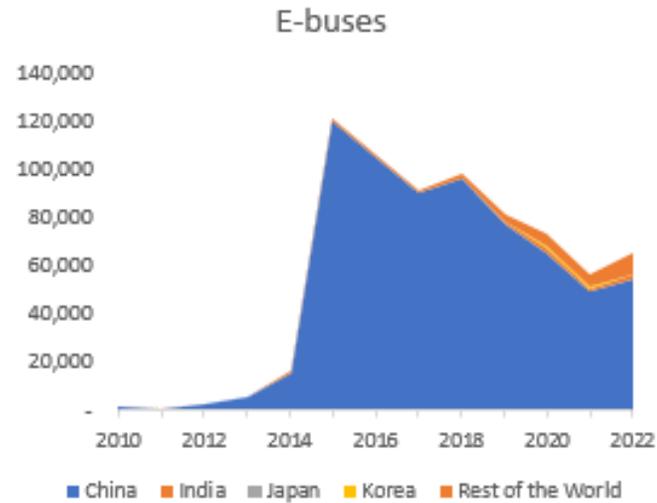
Estimated Growth in Domestic PKM and TKM (2020-2050)



Source: Data from ITF (2023)



Electric Vehicle Sales Estimates



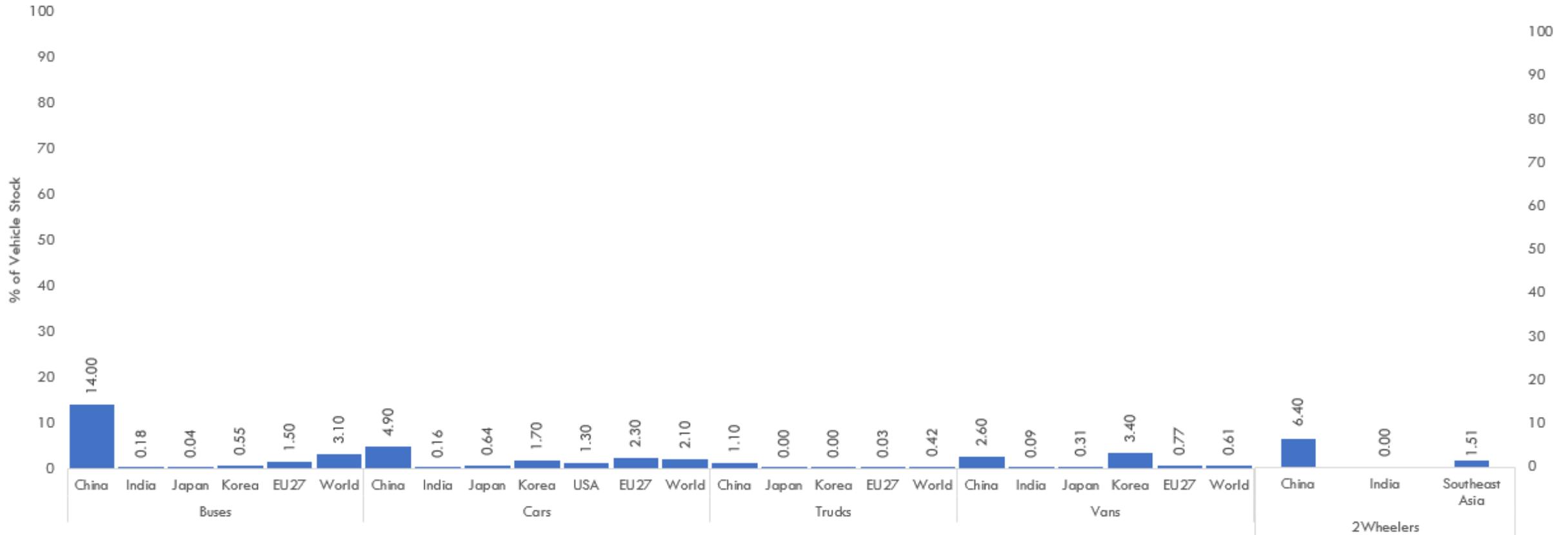
Source: IEA. (2023). GEVO.

Source: IEA. (2023). GEVO.



EV Share in Vehicle Stock

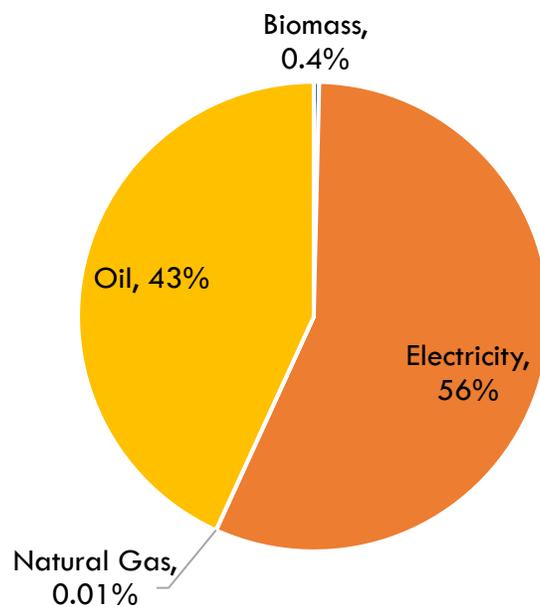
EV % Share in Vehicle Stock



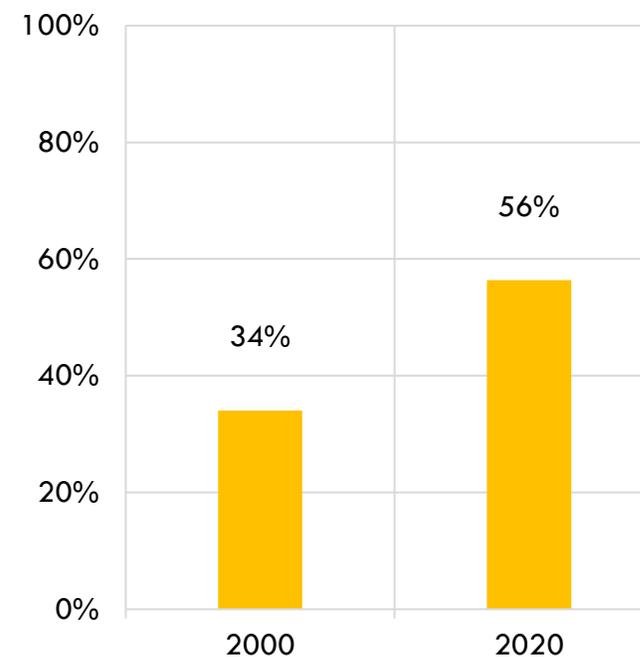
Transport energy consumption, Rail electrification and CO2 emissions

In 2018, Asian railways carried 6% and 16% of passenger and freight transport demand, but share only 3% of total transport energy consumption and emitted only 2% of fossil transport CO2 emissions

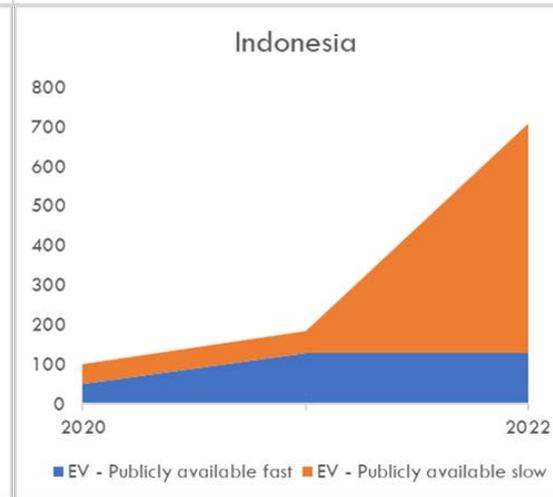
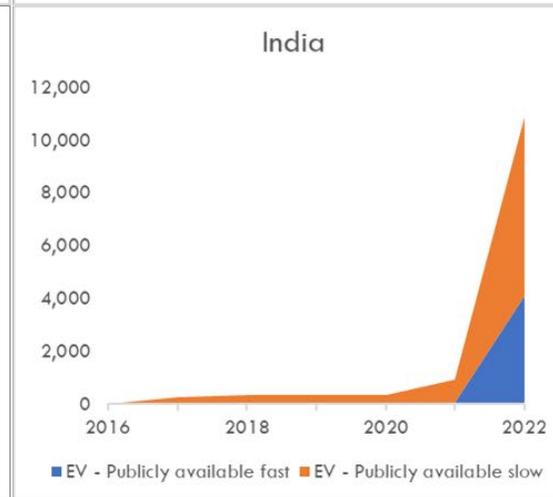
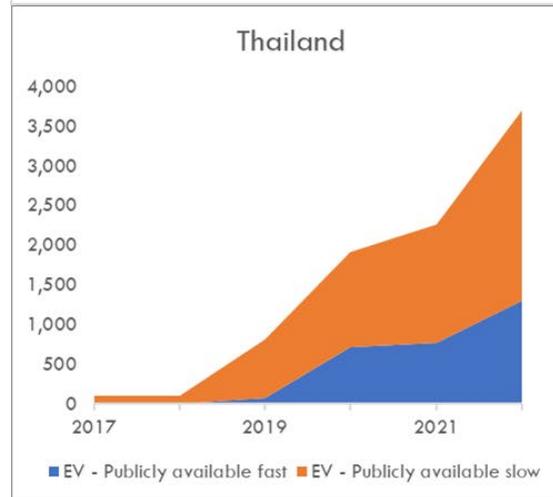
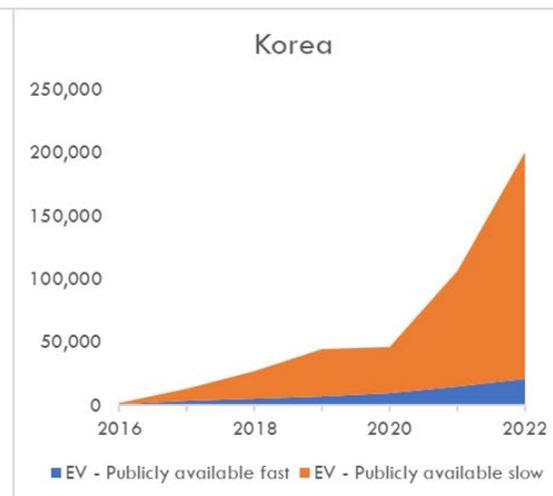
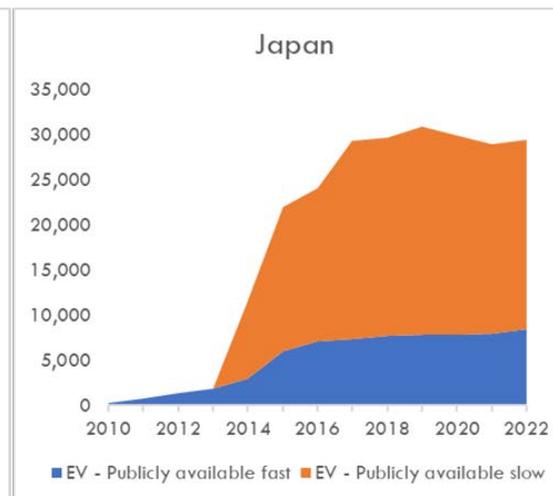
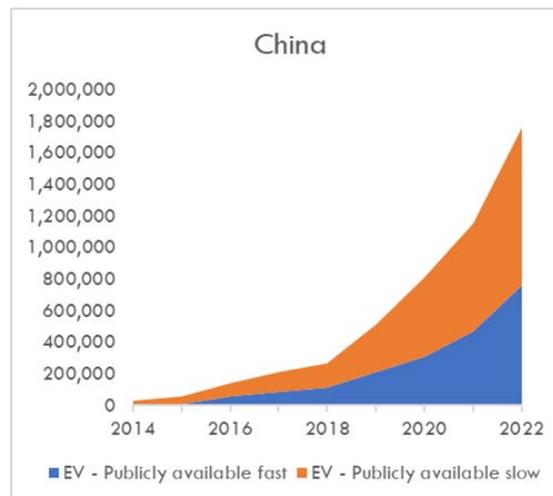
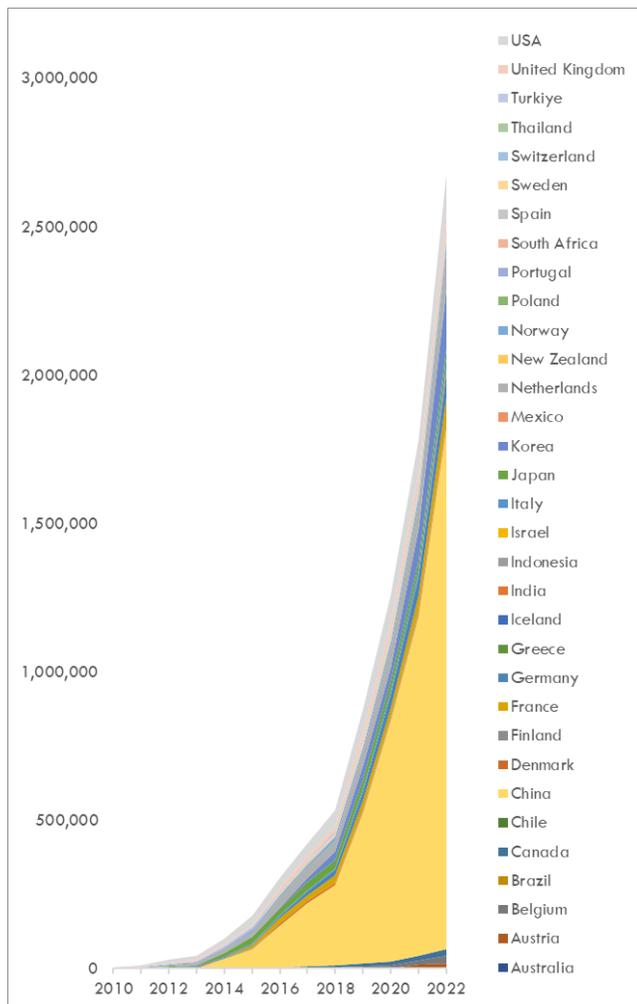
Transport Energy Consumption, 2022



Share of Electrified Tracks in Asia - Pacific



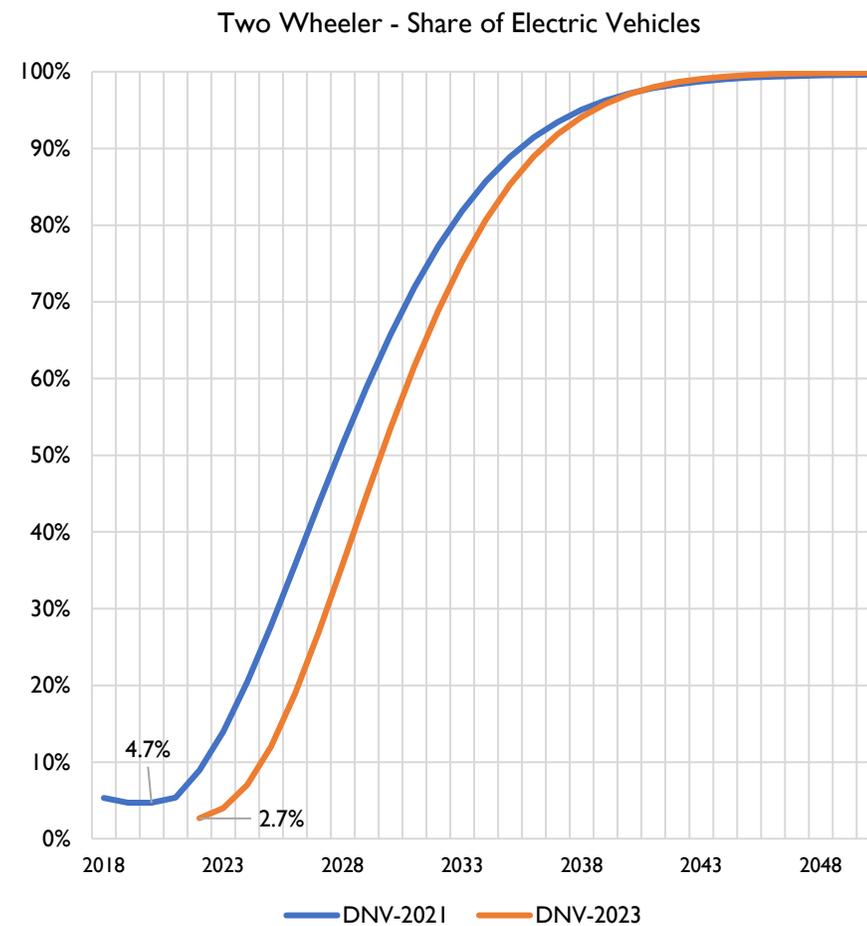
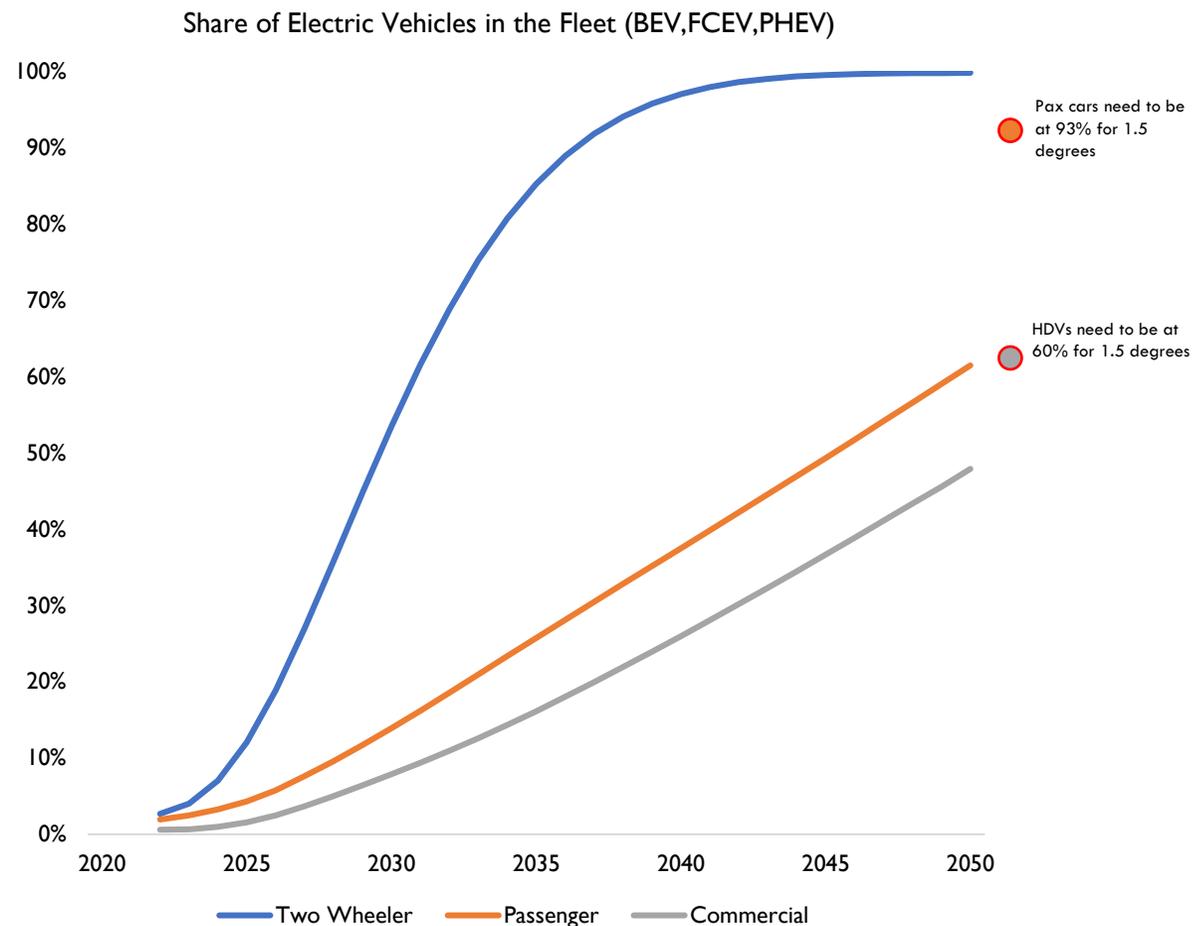
Public EV Charging Points



Source: IEA. (2023). GEVO.



Trajectories towards Electrification of the Transport Sector

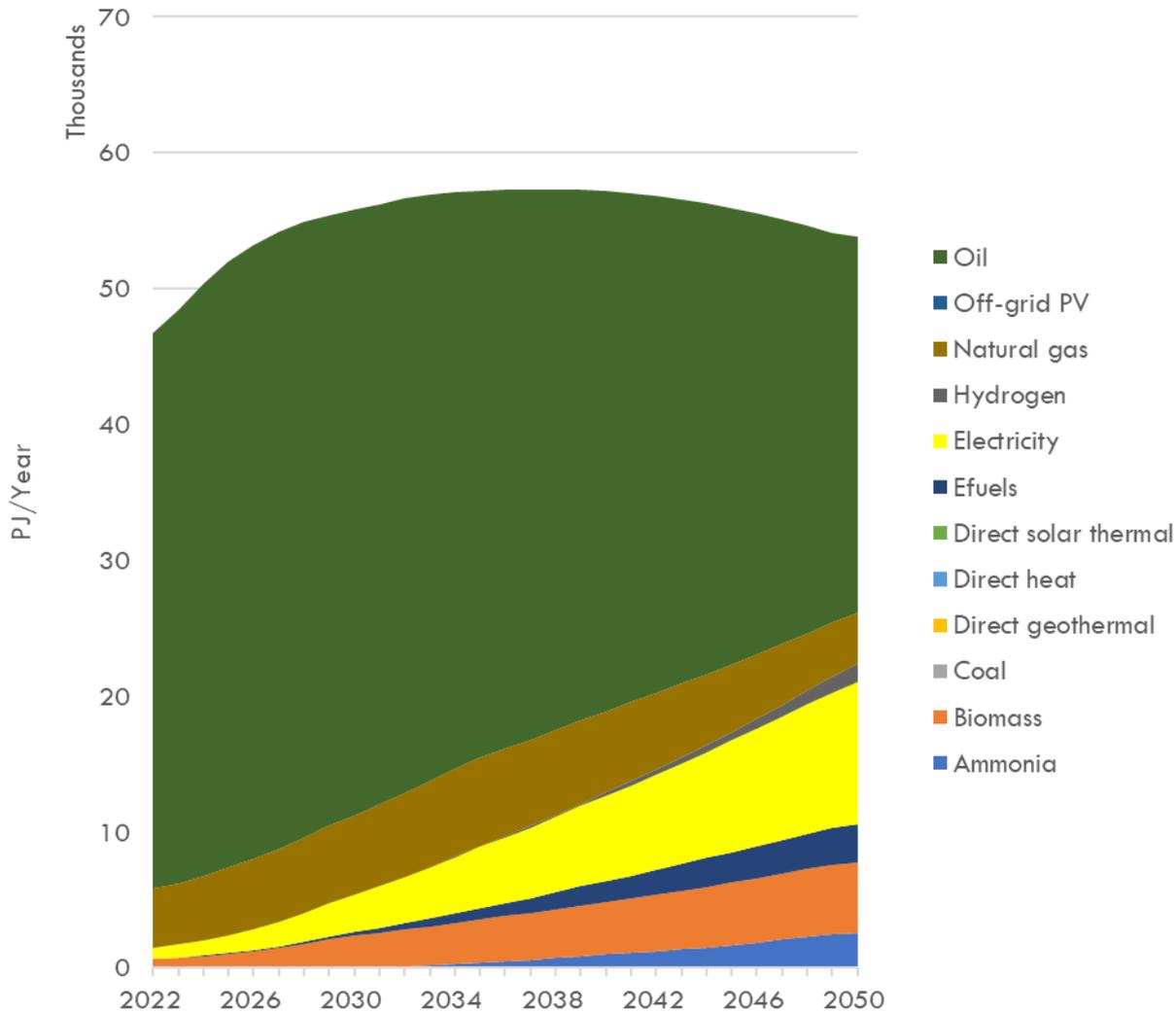


Source: DNV (2023) Energy Transition Outlook and IRENA (2023)

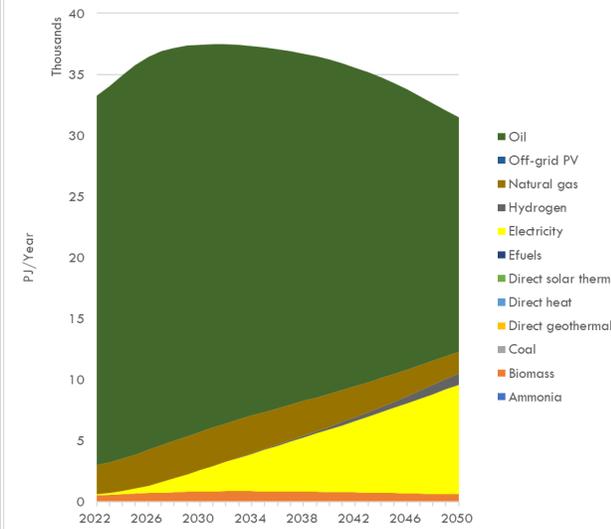


Electricity as an Energy Carrier for Transport

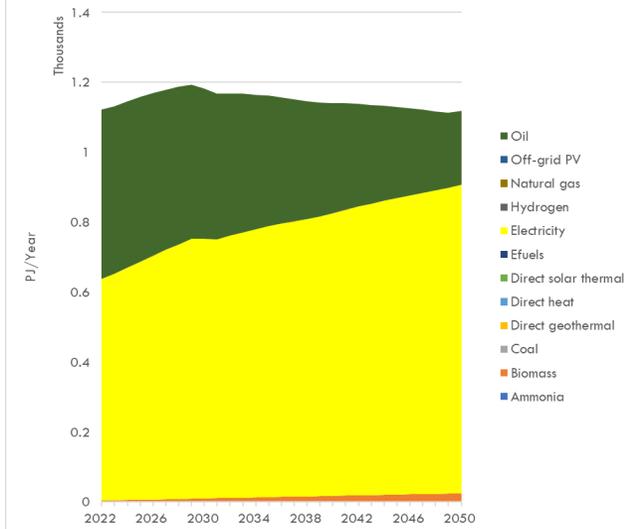
Transport Energy Demand-Asia



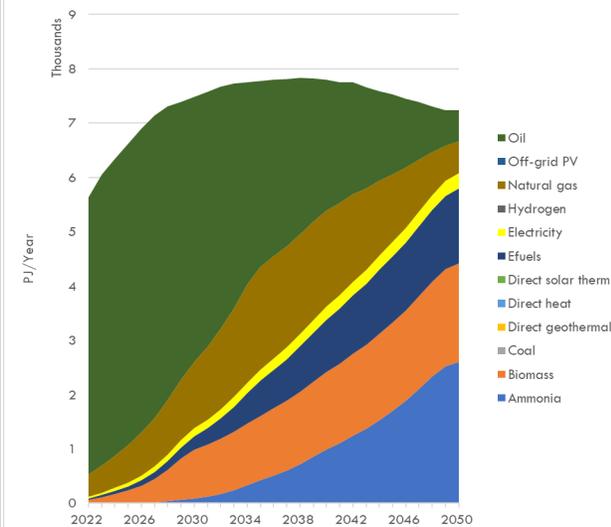
Road Sector Energy Demand-Asia



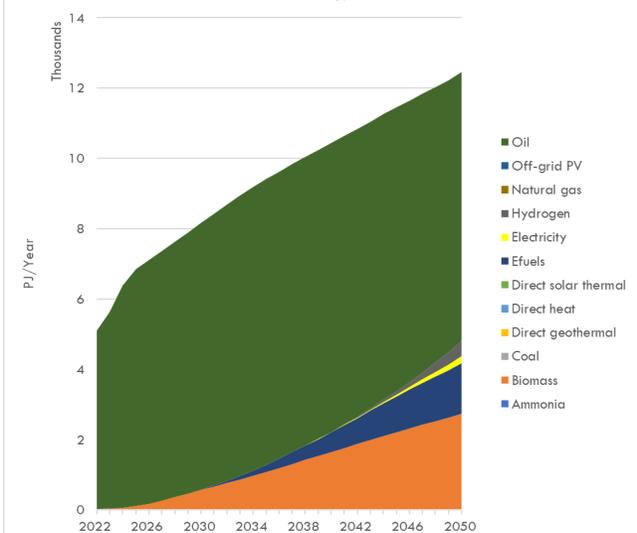
Rail Sector Energy Demand-Asia



Maritime Sector Energy Demand-Asia

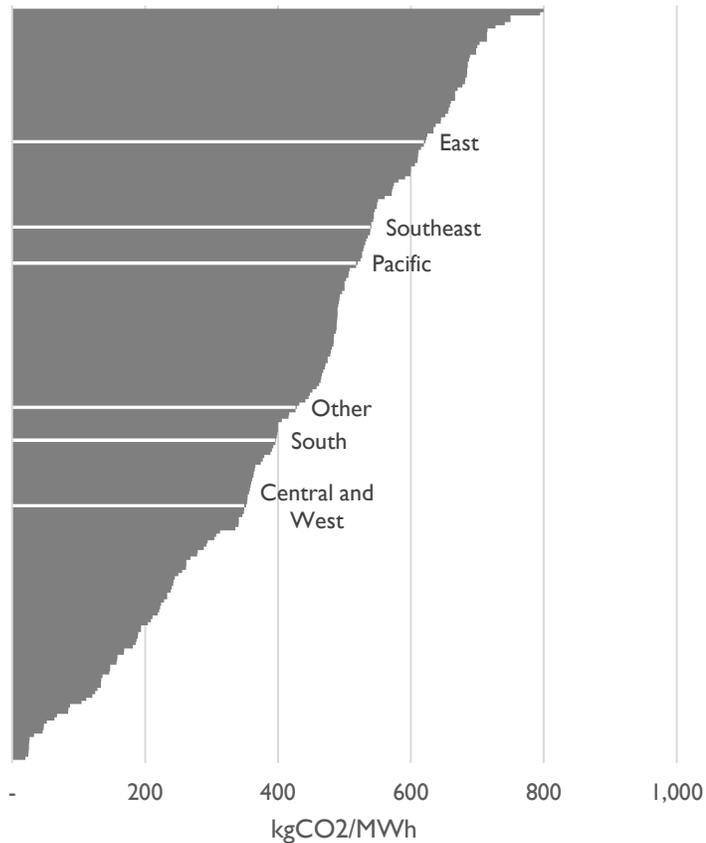


Aviation Sector Energy Demand-Asia

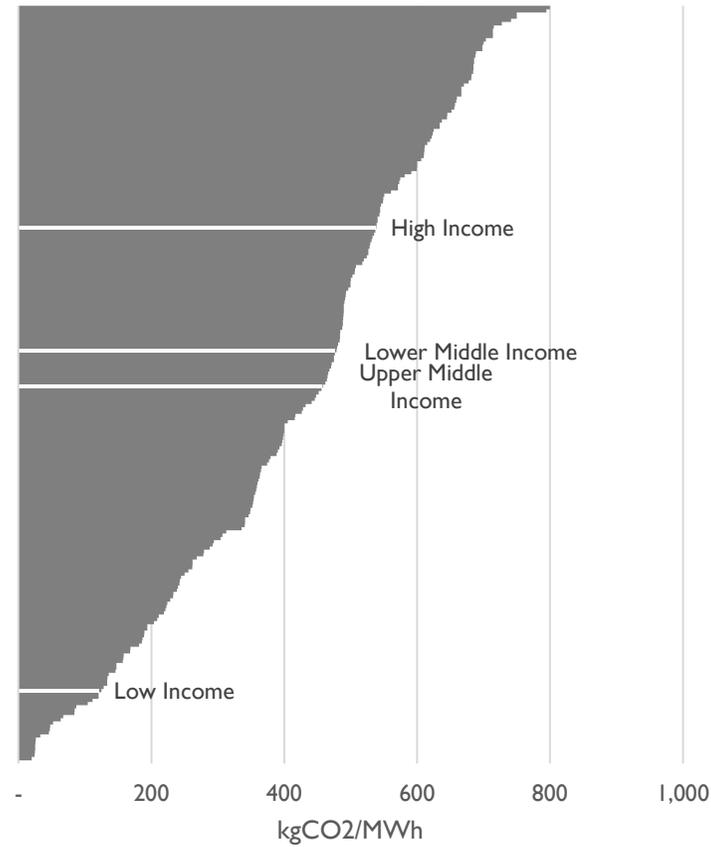


Asia at a Glance : Average CO2 Intensity of the Grid

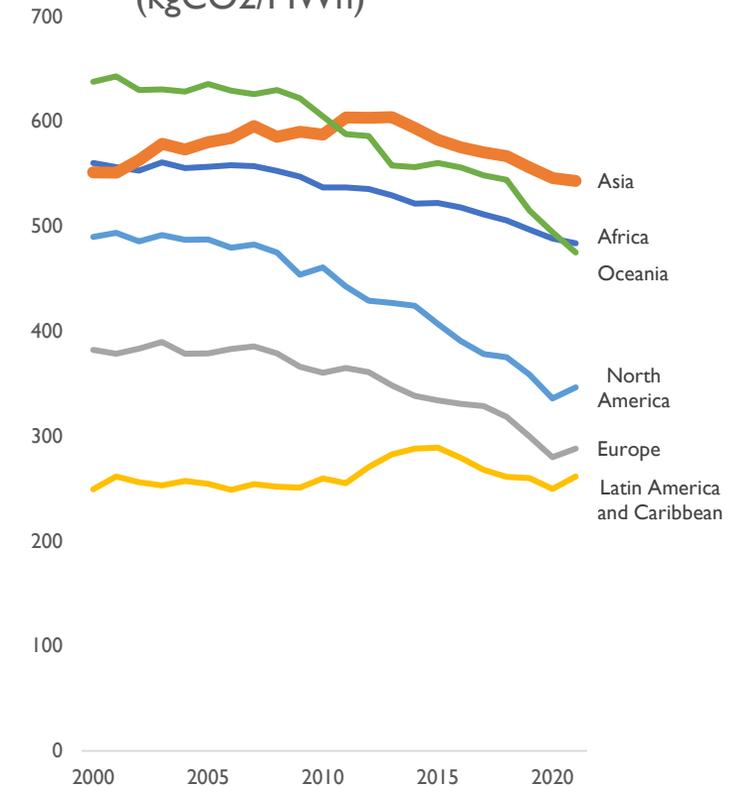
Asian Sub-regions



Asian Economies



Average Grid CO2 Intensity (kgCO2/MWh)



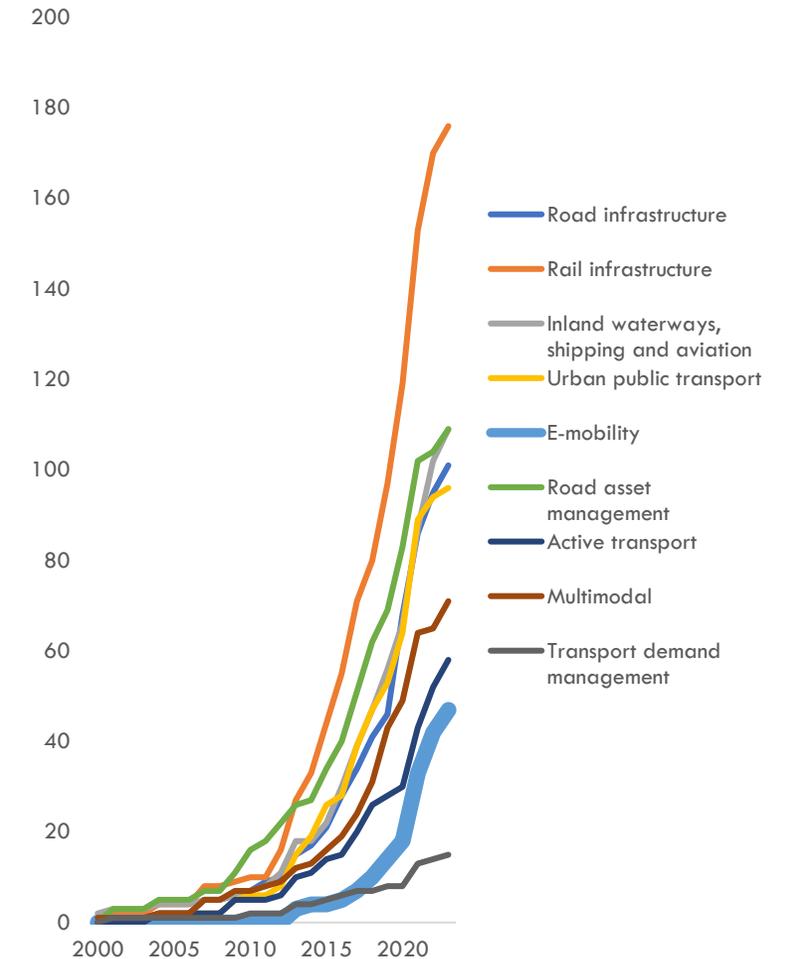
Source: Ember (2023)



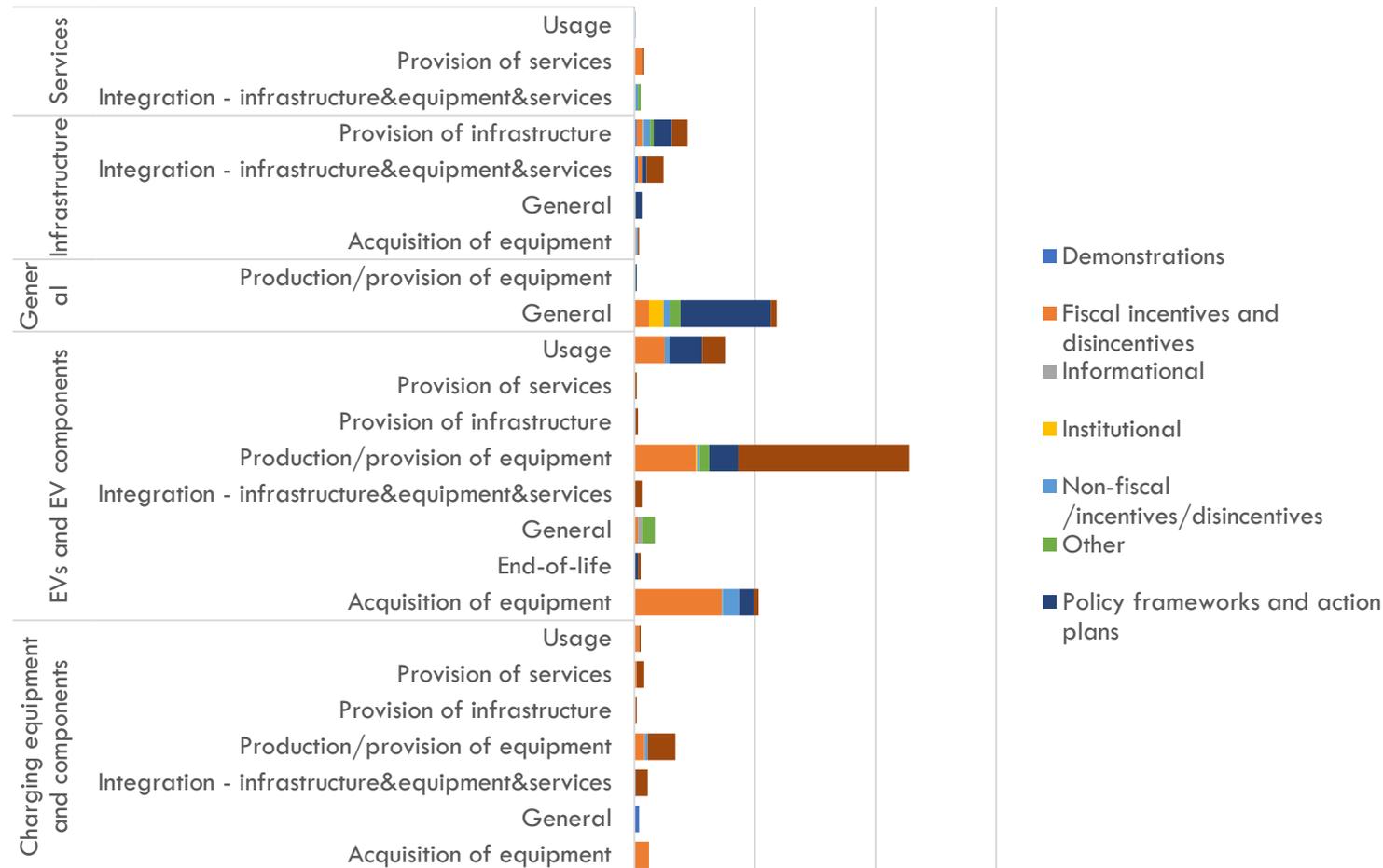
E-mobility Ambitions and Measures

Country	Target	Type	Type2
Afghanistan	By 2030 10% of all new light and heavy vehicles entering the fleet must be based on EV and alternative fuel technology	sales-based	percentage
Bangladesh	Mujib Climate prosperity plan also targets for 30% of registered vehicles will be EV by 2030	stock-based	percentage
Bhutan	50 percent of vehicle fleet in the country is converted to clean and eco-friendly technology by 2030.	stock-based	percentage
Brunei Darussalam	all passenger vehicles be electric by 2035	stock-based	percentage
	60% total vehicle sales target by 2035	sales-based	percentage
China	72% share of NEVs in national urban public transport stock and 20% in logistics distribution stock by 2025	stock-based	percentage
India	2030, it expects 70 percent of all commercial cars, 30 percent of private cars, 40 percent of buses, and 80 percent of two-wheeler and three-wheeler sales to be electric	stock-based	percentage
Indonesia	two million electric vehicles (EV) by 2025	stock-based	absolute
	50,000 ICE 2wheelers to be converted to electric by 2023	stock-based	absolute
	13 million electric 2Ws and 2.2 million electric cars by 2030,	stock-based	absolute
Japan	Green growth strategy aims to achieve 100% EV sales for passenger cars by 2035	sales-based	percentage
Lao PDR	30% vehicles (2-wheelers and passengers' cars) to be EVs	stock-based	percentage
Malaysia	125,000 EVs on the road by 2030	stock-based	absolute
Nepal	EV to comprise 25% of all private passenger vehicle sales by 2025 and 90% by 2030.	sales-based	percentage
	Similarly, it aims to reach a target of 20% for four-wheeler public passenger vehicles by 2025 and 60% by 2030.	stock-based	percentage
Pakistan	30% of all the passenger vehicle and heavy-duty truck sales by 2030, and 90% by 2040. It sets even more ambitious goals for two- and three-wheelers and buses; 50% of new sales by 2030 and 90% by 2040.	sales-based	percentage
Philippines	6.3M EVs until 2040	stock-based	absolute
Republic of Korea	By 2040, Korea plans to distribute 8.3 million electric vehicles and 2.9 million hydrogen vehicles by 2040	stock-based	absolute
Singapore	By 2050, these are the high scenario targets by type of vehicle : private (50%); taxis (60%); public buses (100%); private buses (50%); freight (50%); motorcycles and scooters (70%); BEV carsharing (100%)	stock-based	percentage
Sri Lanka	Replace all state-owned vehicles with electric or hybrid models by 2025 and all private vehicles by 2040	stock-based	percentage
Thailand	"30 by 30" policy, targeting 30% of the domestically produced vehicles to be zero-emission by 2030	production-based	percentage
Viet Nam	By 2030, the government aims for EVs to account for 10% of all new vehicles sold in Vietnam	sales-based	percentage

Policy Measures - Based on Sample



Tracking E-mobility Policy Measures



- Significant attention towards supporting the acquisition of EVs
- Policy measures on charging, and integration need to be bolstered
- End-of-life policy measures need to be instituted
- Measures targeting institutional capacities, set-ups for transition can be ramped up



Summary

- E-mobility can deliver significant benefits towards decarbonising + air pollution mitigation
- Progress at varying pace and magnitudes being observed in the region
- Need to contextualize e-mobility in sustainability hierarchy
- Various challenges from a socio-technical system standpoint need to be addressed
- E-mobility emphasizes the importance of an integrated approach



E-mobility Profiles



Background

Philippines, like many developing countries in the region, is geared towards achieving continued economic growth and social development. Leading up to 2050, it is estimated that 1.3 million people will be added to urban areas per year, and the GDP per capita is expected to grow at an annual average of 4.4%. Such growth in transportation activity drivers are estimated to result in an average annual growth of 3.0% in passenger transport activity (passenger-kilometers), and 3.6% average annual growth rate for freight transport activity.

Such growth in activity is estimated to result in increasing road vehicle fleets. For example, it is estimated that more than 8.1 million two and three-wheelers will be added between 2020-2050.¹ However, it must be noted that even such growth, overall motorization would still remain at relatively low levels by 2050, at 183 vehicles per 1000 people.²

The transportation sector is one of the major contributors to air pollution and greenhouse gas (GHG) emissions in the Philippines. It is estimated that the transportation sector contributes 20% of the fuel combustion GHGs in the country (total of 124 million tons in 2020). Seventy-five percent (75%) of the transport GHG emissions are estimated to be from the road sector.³

In terms of ambient air pollution, the road transport sector is estimated to contribute 5% of the total burden of disease related to air pollution—Particulate Matter 2.5 (PM_{2.5})—in the Philippines. Road transport air pollution is also deemed to have significant contributions to the burden of disease related to ischemic heart disease (18%), and chronic obstructive pulmonary disease (7%) in the country.⁴

PM_{2.5} concentrations in available data for sample cities in the World Health Organization's (WHO) open database was, on average, 18 µg/m³ in 2018. The World Health Organization's (WHO) guideline value for PM_{2.5} is 5 µg/m³. It is estimated that in 2019, more than 29 thousand people died prematurely due to PM_{2.5} in the Philippines.⁵



Background

Uzbekistan, a landlocked country in Central Asia, has made significant progress in its socio-economic development in recent years. The country's economy has grown steadily, averaging over 5% annual growth in the past decade.¹

This growth has been driven by a number of factors, including reforms to the business environment, investments in infrastructure, and a growing middle class. The country has a young and growing population, and the government is committed to improving the quality of life of its citizens at an

average annual growth rate of 3.0% in passenger transport activity (passenger-kilometers), and 3.6% average annual growth rate for freight transport activity.

Such growth in activity is estimated to result in increasing road vehicle fleets. For example, it is estimated that more than 8.1 million two and three-wheelers will be added between 2020-2050.¹ However, it must be noted that even such growth, overall motorization would still remain at relatively low levels by 2050, at 183 vehicles per 1000 people.²

The transportation sector is one of the major contributors to air pollution and greenhouse gas (GHG) emissions in the Philippines. It is estimated that the transportation sector contributes 20% of the fuel combustion GHGs in the country (total of 124 million tons in 2020). Seventy-five percent (75%) of the transport GHG emissions are estimated to be from the road sector.³



Background

Thailand is geared towards continued growth in transport activity drivers such as economic growth urbanization. Leading up to 2050, it is estimated that more than half a million people will be added to urban areas per year, and the GDP per capita is expected to grow at an annual average of 4.3%. Such growth in transportation activity drivers are estimated to result in an average annual growth of 1.0% in passenger transport activity (passenger-kilometers), and 2.7% average annual growth rate for freight transport activity.¹

Such growth in transport drivers and demand is expected to result in an

The transportation sector is one of the major contributors to air pollution and greenhouse gas (GHG) emissions in the Philippines. It is estimated that the transportation sector contributes 20% of the fuel combustion GHGs in the country (total of 124 million tons in 2020). Seventy-five percent (75%) of the transport GHG emissions are estimated to be from the road sector.³

In terms of ambient air pollution, the road transport sector is estimated to contribute 5% of the total burden of disease related to air pollution—Particulate Matter 2.5 (PM_{2.5})—in the Philippines. Road transport air pollution is also deemed to have significant contributions to the burden of disease related to ischemic heart disease (18%), and chronic obstructive pulmonary disease (7%) in the country.⁴

PM_{2.5} concentrations in available data for sample cities in the World Health Organization's (WHO) open database was, on average, 18 µg/m³ in 2018. The World Health Organization's (WHO) guideline value for PM_{2.5} is 5 µg/m³. It is estimated that in 2019, more than 29 thousand people died prematurely due to PM_{2.5} in the Philippines.⁵



BANGLADESH E-mobility Country Profile

Background

Transport demand drivers, particularly economic growth and urbanization are expected to continue to strengthen in Bangladesh. Leading up to 2050, it is estimated that 1.8 million people will be added to urban areas per year, and the GDP per capita is expected to grow at an annual average of 6.3%. Passenger transport activity is projected to grow at an annual average growth of 2.2% and freight transport activity projected to increase by 4.1% per annum.¹

Such growth in activity is estimated to result in increasing road vehicle fleets. It is estimated that more than 3.2 million two and three-wheelers will be added between 2020-2050.² However, it must be noted that even such growth, overall motorization would still remain at relatively low levels by 2050, at 97.3 vehicles per 1000 people.³

The transportation sector is one of the major contributors to air pollution and greenhouse gas (GHG) emissions in Bangladesh. It is estimated that the transportation sector contributes 14% of the fuel combustion GHGs in the country (total of 84 million tons in 2020). Seventy-five percent (75%) of the transport GHG emissions are estimated to be from the road sector.⁴

Air pollution has been ranked as the second largest risk factor for deaths and disability in Bangladesh.⁵ Particulate Matter 2.5 (PM_{2.5}) is a key pollutant that is both highly related to vehicle pollution, and has significant detrimental health impacts. City-level PM_{2.5} concentrations in 2018 were, on average, 72 µg/m³. Dhaka, the capital city, registered an average concentration of 108 µg/m³. The World Health Organization's (WHO) guideline value for PM_{2.5} is 5 µg/m³.

Road transport air pollution is estimated to contribute around 7% of the total burden of disease from PM_{2.5} in Bangladesh. Road transport is deemed to have significant contributions to the PM_{2.5} burden of disease related to ischemic heart disease (19%), and chronic obstructive pulmonary disease (15%) in the country. It is estimated that in 2019, more than 63 thousand people died prematurely due to PM_{2.5} in Bangladesh.⁶



INDONESIA E-mobility Country Profile

Background

Indonesia is committed to achieving sustained economic growth and social development in the coming years. Looking ahead to 2050, the nation anticipates a significant influx of people into urban areas, with more than 2 million individuals being added to these regions annually. The GDP per capita is projected to experience robust growth at an annual average rate of 5%.

This rapid urbanization and economic expansion are expected to drive growth in transportation activities. Forecasts indicate an average annual increase of 3% in passenger transport activity, measured in passenger-kilometers, and a 4% average annual growth rate for freight transport activity.¹

Consequently, there will be a notable rise in the number of vehicles on the road. It is estimated that between 2020 and 2050, approximately 98.7 million two and three-wheelers will be added, along with 24.73 million light-duty vehicles by 2050. It is projected that the motorization rate will reach 85.94 vehicles per 1000 people (mostly driven by two-wheeler motorization). It is essential to note that Indonesia is also experiencing demographic changes, with the aging population projected to double between 2015 and 2050. These demographic shifts will have implications for future transportation demand and supply.

The transportation sector is one of the major contributors to air pollution and greenhouse gas (GHG) emissions in Indonesia. It is estimated that the transportation sector contributes 21% of the fuel combustion GHGs in the country (total of 52 million tons in 2020). Ninety-six percent (96%) of the transport GHG emissions are estimated to be from the road sector.²

The average concentration of PM_{2.5} in Jakarta (2018) stood at 43.1 µg/m³. The World Health Organization sets a PM_{2.5} guideline value of 5 µg/m³. The road transport sector is estimated to contribute 12 % of the total burden of disease related to Particulate Matter 2.5 (PM_{2.5})—in Indonesia. Road transport air pollution is also deemed to have significant contributions to the burden of disease related to ischemic heart disease (20%) and chronic obstructive pulmonary disease (7%) in the country. In 2019, it is estimated that more than 931 thousand premature deaths were attributed to PM_{2.5} pollution in Indonesia.³



ARMENIA E-mobility Country Profile

Background

Armenia is a small, landlocked country in the South Caucasus region with a population of around 3 million people. It is a lower-middle-income country with a developing economy. The Armenian economy has experienced strong growth in recent years, with GDP growth of 15.6% in 2022. This growth was driven by several factors, including the influx of migrants and businesses. Armenia's economy is dominated by the services sector, which accounts for over 50% of GDP. The IT sector is particularly important, and Armenia has become a regional hub for tech companies. The industrial sector, which accounts for around 20% of GDP, is also significant, with production of goods such as machinery, electronics, and textiles.¹

Armenia's poverty rate is around 25%, and the unemployment rate is around 18%. Income inequality is also high, with the richest 10% of the population earning over 40% of the country's income.² Despite these challenges, Armenia is a country with a lot of potential. It has a young and educated population, and the government is committed to economic reforms. The GDP per capita is projected to experience long-term growth at an annual average rate of 4%.³

This rapid urbanization and economic expansion are expected to drive growth in transportation activities. Forecasts indicate an average annual increase of 2.5% in passenger transport activity, measured in passenger-kilometers, and a 1.9% average annual growth rate for freight transport activity.⁴

The transportation sector is one of the major contributors to air pollution and greenhouse gas (GHG) emissions in Armenia. It is estimated that the transportation sector contributes 36% of the fuel combustion GHGs in the country. The 8A estimates that 100% of the transport GHG emissions are generated by the road sector.⁵

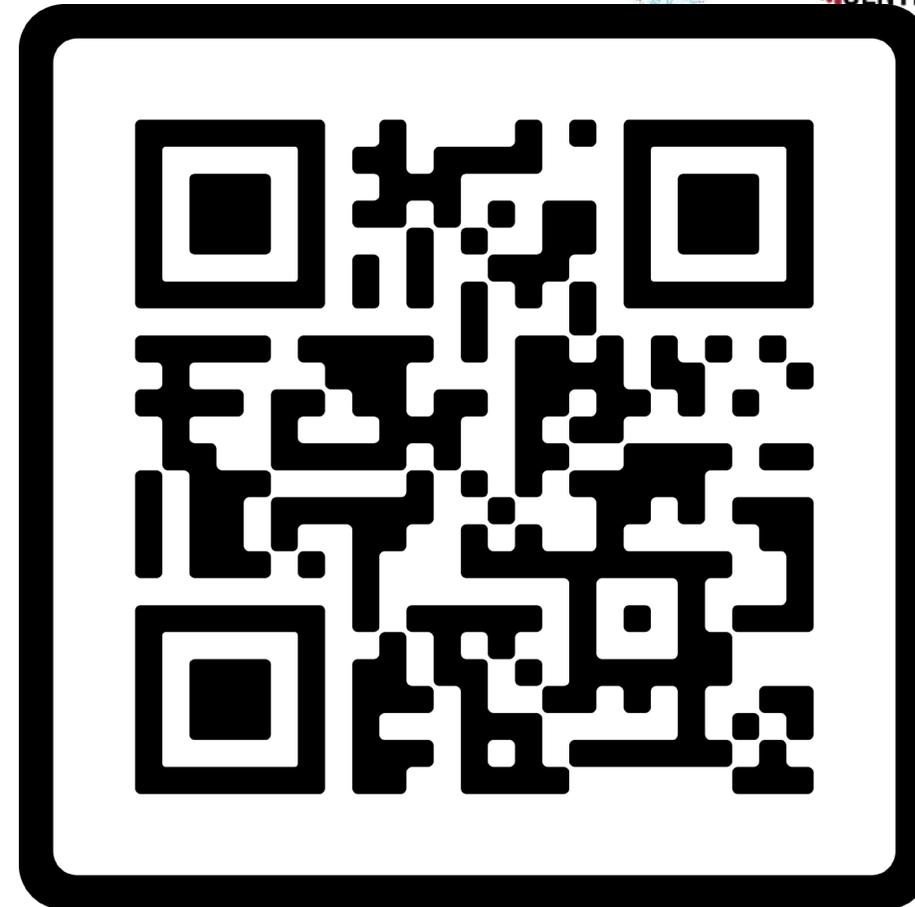
The transport sector is a significant source of Armenia's carbon emissions. Since 2000, the transport sector has been the fastest-growing source of carbon emissions in the energy sector despite large-scale efforts to convert vehicles to natural gas.⁶ The transport sector has been growing at an annual



ARMENIA E-mobility Country Profile



UNEP E-Mobility as a Driver for Change project - Towards a gender transformative and just transition to electric mobility.



The project is embedded in UNEP's [Global Electric Mobility Programme](#)

- The goal of the 10 minute survey is to map electric mobility stakeholders, players, and projects around the world and to compile resources on how to improve the gender inclusiveness of E-mobility projects.
- Looking to identify knowledge gaps on gender and E-mobility; enhance gender mainstreaming in global, national and local E-mobility initiatives and gather insights for an international Gender and E-mobility baseline report.

More information: heather@heatherallen.co





Alvin Mejia

Director, Analysis and Impact

UEMI Secretariat | Urban Electric Mobility Initiative (UEMI)

Main Office: Kopenhagener Straße 47 | 10437 Berlin, Germany

Mobility Hub of the Urban Living Lab Center (ULLC) a UN-Habitat Collaborating Center

ULLC Mobility Hub @UEMI | Gutenbergstr. 71-72, | 14469 Potsdam, Germany

www.living-lab.center | www.uemi.net | alvin.mejia@uemi.net

Transport Specialist/ Analyst

Asian Transport Outlook

emobility.tools



<https://asiantransportoutlook.com/>



***“ATO translates data into insights, policies,
and investments”***

asiantransportoutlook.com

ATO Team asiantransportoutlook@gmail.com

Jamie Leather jleather@adb.org

Andres Pizarro andres.pizarro@aiib.org

Cornie Huizenga ch Luizenga@cesg.biz

Sudhir Gota sudhirgota@gmail.com

Twitter [@transportATO](https://twitter.com/transportATO)

LinkedIn bit.ly/ATOlinkedin