

GEAN EV Forum with iEVTech 2019
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ELECTRIC VEHICLE POLICY AND STRATEGY FOR ASIAN AND PACIFIC COUNTRIES

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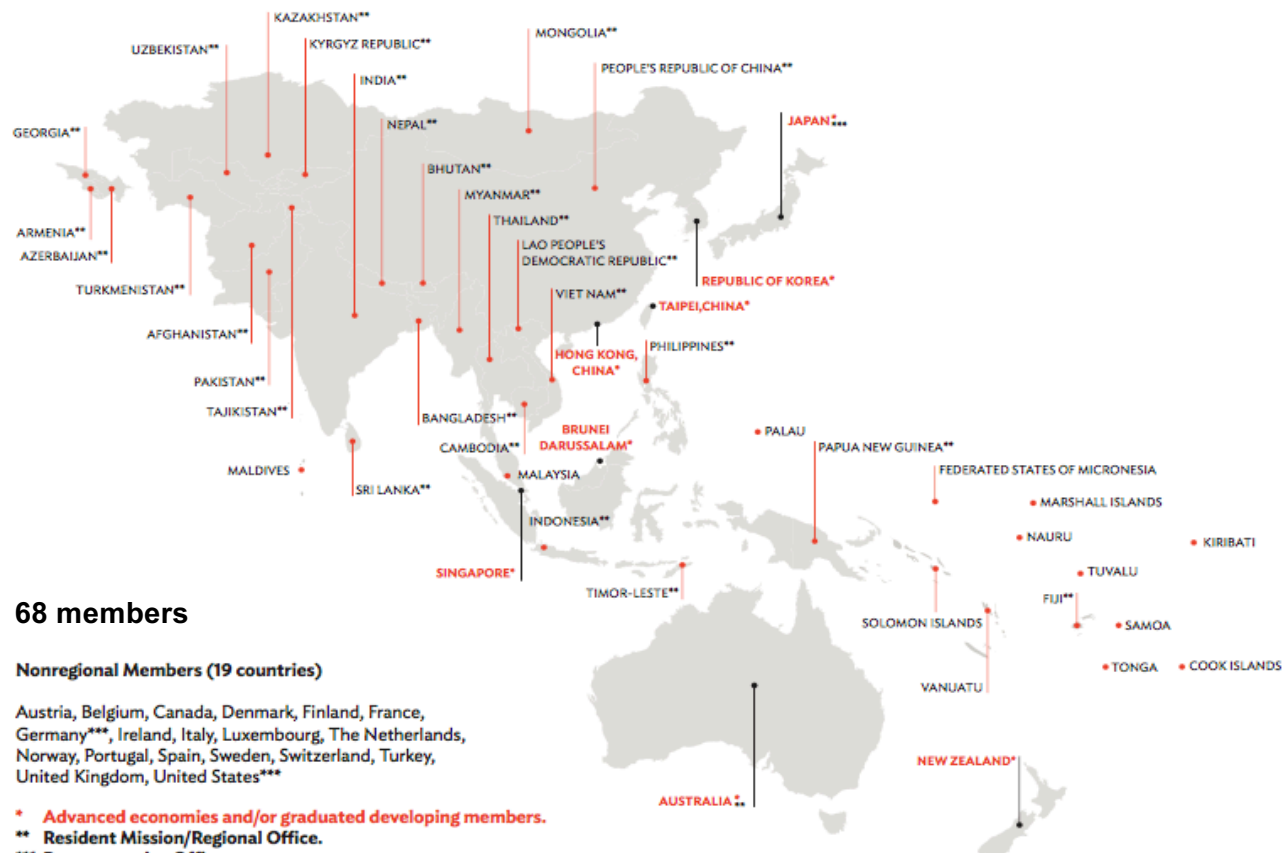
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Asian Development Bank
FIGHTING POVERTY IN ASIA AND THE PACIFIC

Asian Development Bank (ADB)



- International development finance institution (**since 1966**)
- Dedicated to reducing poverty in Asia and the Pacific through loans, grants, research and technical assistance to its member countries, as well as investments in private companies.
- Operations: \$35.82 B in 2018
- HQ in Manila Philippines

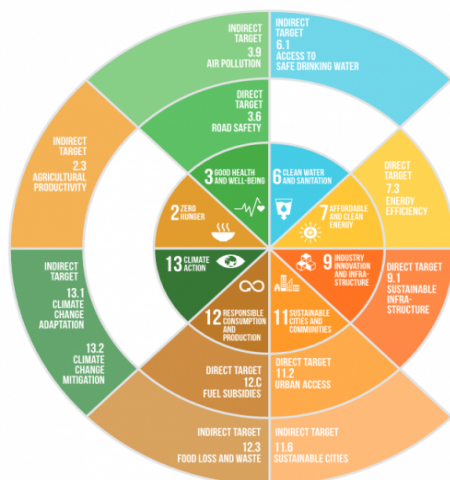


Transport in SDG Targets, Paris Agreement on Climate Change, ADB Strategy 2030

Goal 11.

Make cities and human settlements inclusive, safe, resilient and sustainable

Goal 13. Take urgent action to combat climate change and its impacts



Transport contributes to *indirectly* to seven SDG targets on:

1. agricultural productivity (Target 2.3)
2. air pollution (Target 3.9)
3. access to safe drinking water (Target 6.1)
4. sustainable cities (Target 11.6)
5. reduction of food loss (Target 12.3)
6. climate change adaptation (Target 13.1)
7. climate change mitigation (Target 13.2)



United Nations
Climate Change



STRATEGY 2030

PROSPEROUS
INCLUSIVE
RESILIENT
SUSTAINABLE
ASIA AND THE PACIFIC



Contribution of Transport Sector to Livable Cities : Urban Transport

- Integrated approach to improve access and mobility and the provision of safe, reliable, and economic urban transportation choices.
- Integrated land use and transport planning will be promoted
- Renewable energy powered mass transit and non-motorized transport in an integrated access and mobility system.
- Capacity development support to plan, implement, manage and finance urban transport systems

Asian Development Bank's EV Study and Loans

1. Loans (selected list)

- Shandong Trolleybus Demonstration Project Sustainable Transport Solutions (USD150M)
- Guizhou Guiyang ITS Project (e-buses and Charging Stations)
- Davao Public Transport Improvement Project, Philippines
- E-tricycle Project for Manila
- Policy-Based Lending and Facility for Air Quality Management for Beijing-Tianjin-Hebei Province
- Private Sector Loan for Chinese Cities

2. Coordination with International Institutions

- GEF Regional Hub (Proposed)
- Other MDBs, GCF and bi-lateral support

3. Electricification of Feeder Services for Metro Projects

- Covers electrification of Feeder bus, para-transits and two/three wheelers especially in South Asian Countries;
- Analyze environmental, economic, financial, and institutional impact and business models. Short overview of relevant national EV, energy and transport policies;

4. Knowledge Sharing and Capacity Building

- Workshops and Trainings (Regional/Country Specific)
- Publications

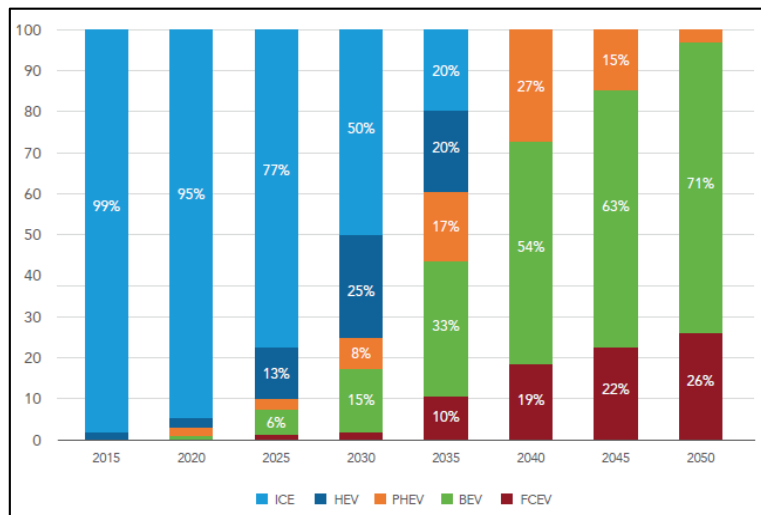
5. Funding for Implementation

- Funding Identification (Loan, Grants)
- ADB Loan : Sovereign, Sub-sovereign Loan
- Private Sector Loan through DMCs' Financial Intermediaries

Electrification of Transport Modes :Forecast

99% ICB in 2015, 50% ICB in 2030, 0% ICB in 2040

Projected Vehicle Sales per Powertrain

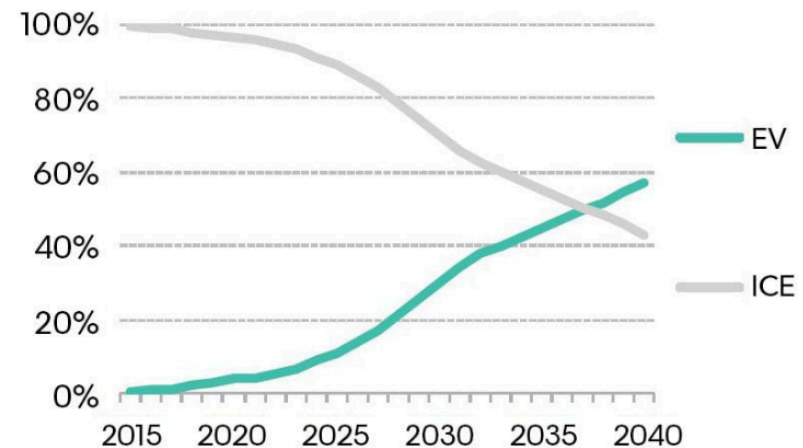


Source:

P. Harrison. 2018. Fueling Europe's Future: How the transition from oil strengthens the economy.

Global EV and ICE share of long-term passenger vehicle sales

Share of annual sales

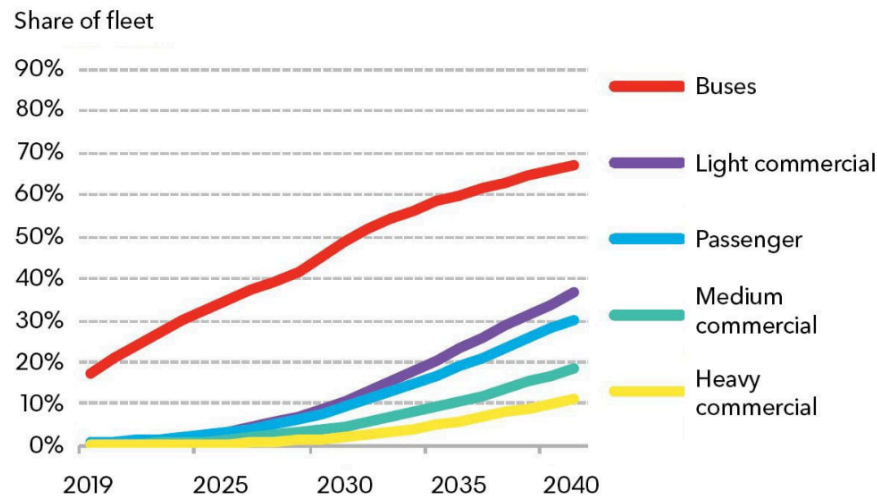


Source: BloombergNEF

Electrification of Transport Modes :Forecast

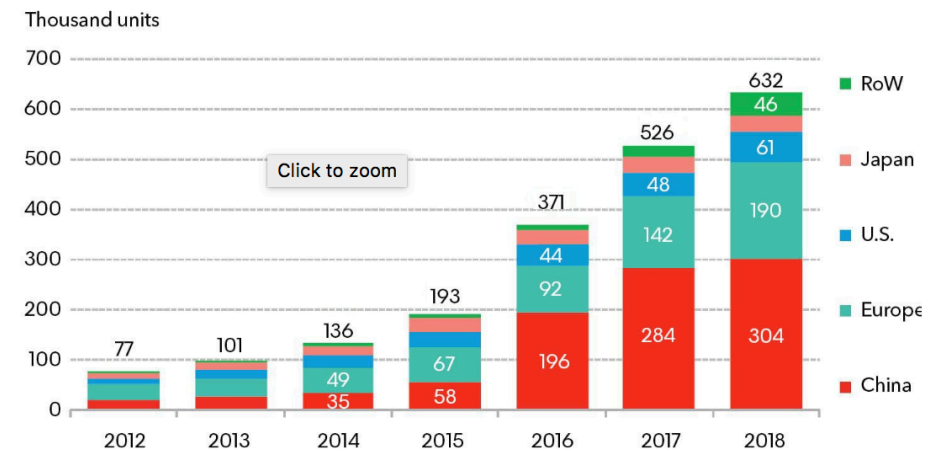
Bloomberg NEF Electric Vehicle Outlook 2019

EV share of global vehicle fleet by segment



Source: BloombergNEF. Note: Commercial vehicle adoption figures include the main markets of China, Europe, and the U.S.

Public charging outlets installed globally



Source: BloombergNEF. Note: Data current as of January 1, 2019. Data will be updated on the BNEF data hub at the end of 1H 2019.

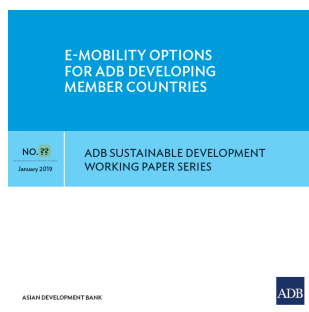
Asian Development Bank's EV Study and Loans

Studies

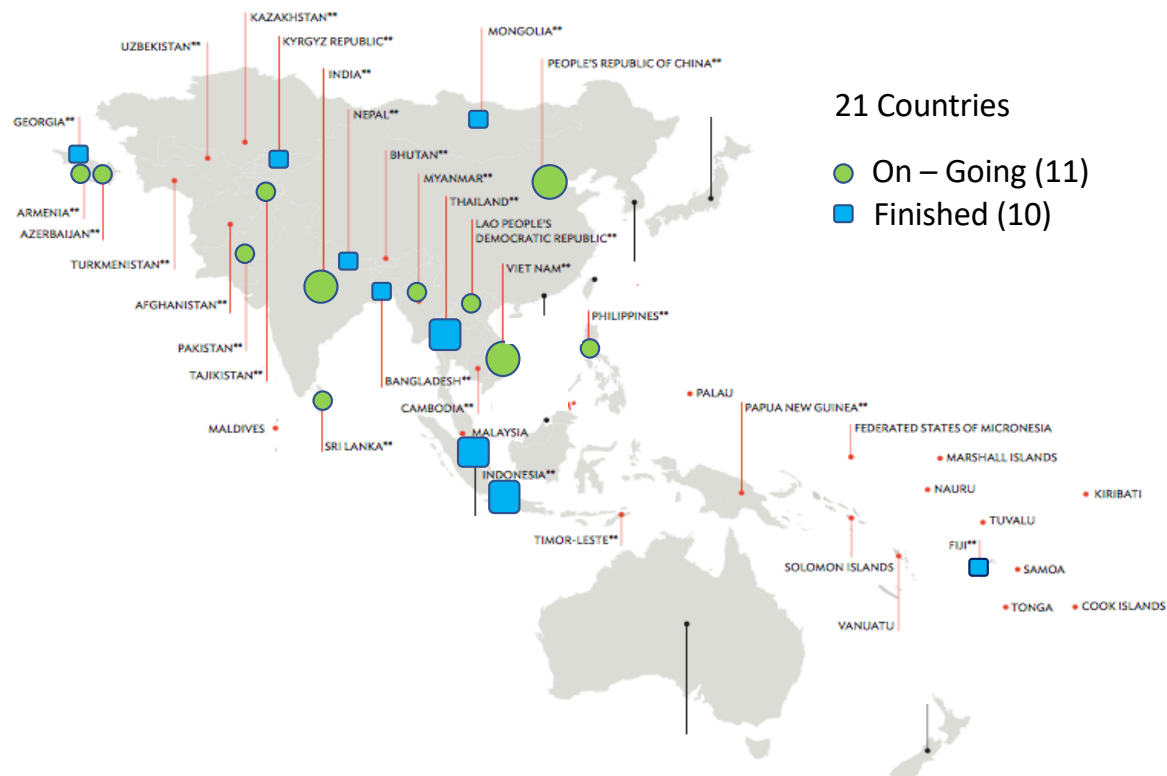
Nov. 2018



March 2019



2019 EV Study (On-going) + feeder line electrification (planned in 2019)



EV Viability Deciding Factor

Environmental Factor

- Grid Factor
- Existing Fuel Use
- Emission Regulation
- GHG Target
- Pollution Management Regulation

Policy Factor: National and Local

- National EV Policy Direction
 - NDC, Industry Policy, Energy Security, Balance of Payment
- Local EV Policy Direction
 - Local Transport Plan/Policy

Economic Factor:

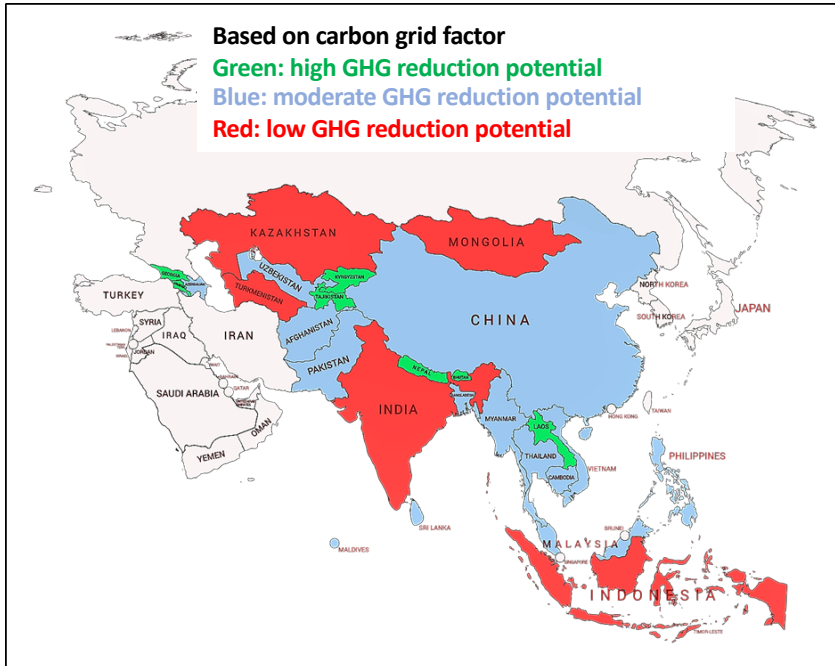
Comparative CPEX/OPEX

- Fuel Price (Fuel Subsidy)
- Electricity Price (Demand/Power)
- Tax Incentives
 - Import/VAT/Vehicle Excise Tax

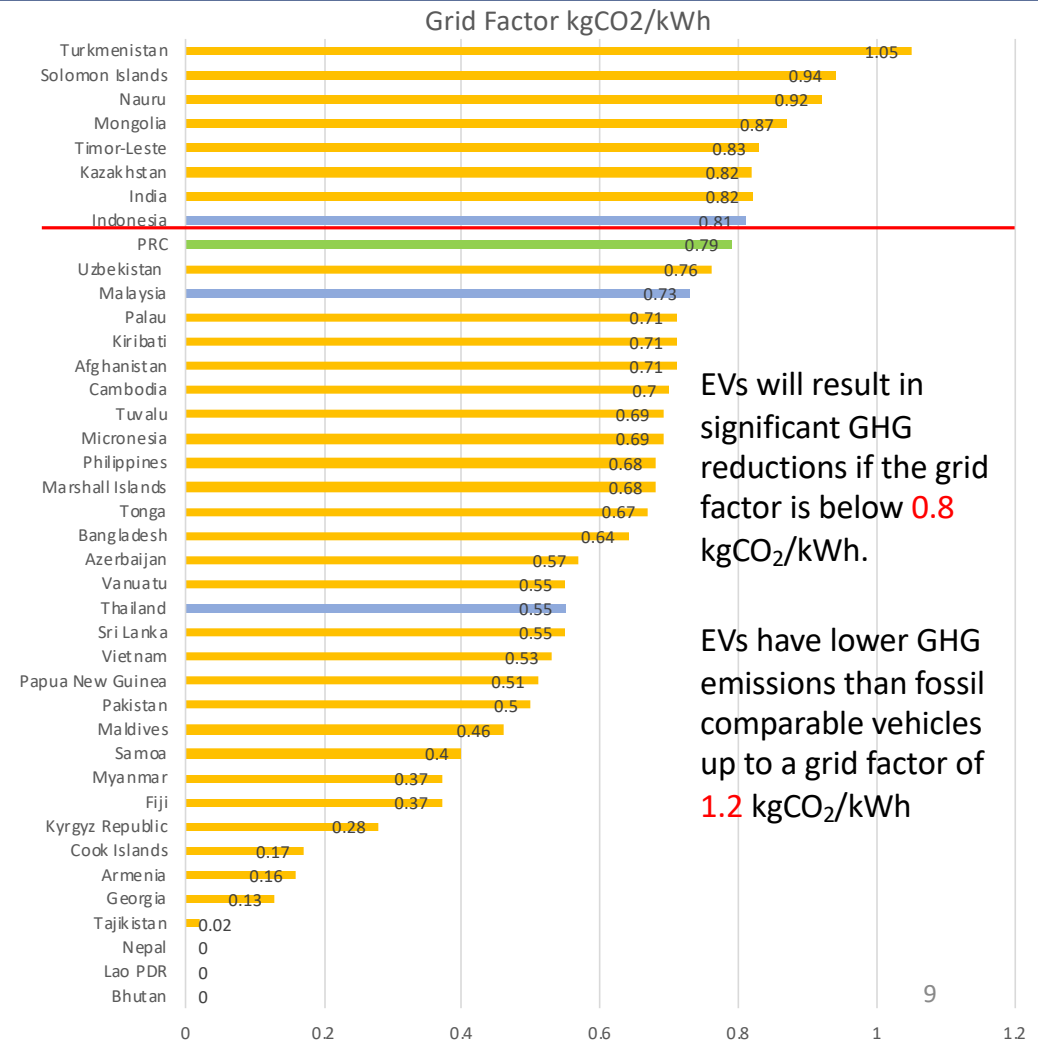
Financing

- Loan : MDB, Bi-lateral, International Inst.
- Government Budget
- New Mobility Service (MaaS, Sharing, etc.)
- Business Models

GHG Reduction Potential with EVs



- Largest GHG impact by EVs: high share of renewable electricity - Armenia, Bhutan, Georgia, Kirgizstan, Laos, Tajikistan and Nepal
- Countries with a high carbon factor in electricity production - India, Indonesia, Kazakhstan, Mongolia and Turkmenistan will only result in limited GHG reductions by deploying EVs.



E-Mobility Policies of DMCs of ADB as of July 2018

China

- “New energy vehicles” (EVs including hybrids) have been promoted by the PRC since 2009 at different levels.
- Massive upfront subsidies and fiscal incentives for all types of EVs from national, provincial, and local governments
- The PRC has established a recycling policy of batteries for EVs

Thailand

- Vehicle excise tax for domestic produced EVs are 2-10% whilst for conventional vehicles they are 10-30%; tax breaks for charging stations.
- Government offices shall devote 20% of their budget to buy EVs and Bangkok Mass Transit Authority must buy 200 BEBs.
- Thailand is specifically promoting the production of EVs with import exemptions for equipment and tax breaks.

India

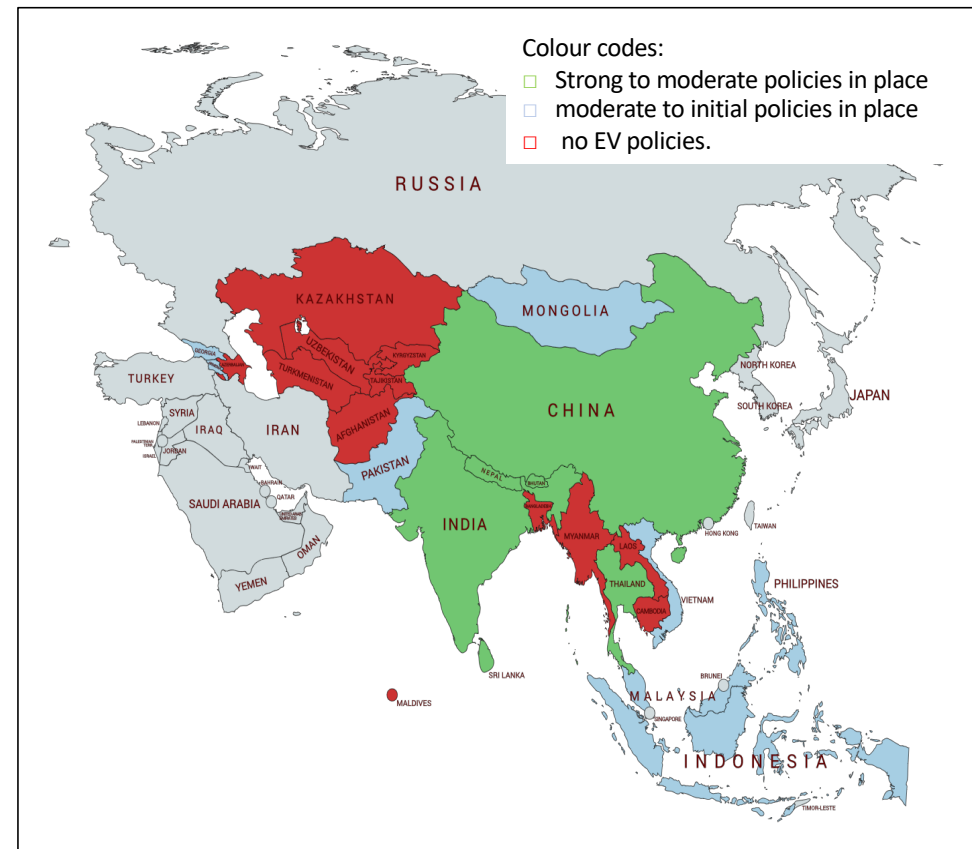
- India has a National Electric Mobility Mission Plan to 2020 and a Faster Adoption and Manufacturing of Hybrid and Electric Vehicle scheme in place.
- Significant financial incentives (especially for buses and comparative to price for motorcycles and 3-wheelers) are given. The strategy is to initially penetrate the EV market in public transport (taxis, buses, rickshaws) and with fleet operators. By 2030, 30% of all vehicles will be electric.

Indonesia:

- The government has set a target of 20% of new vehicles sold by 2025 to be hybrid or electric.
- An EV roadmap is under discussion, e-Bus implementation is on its way.

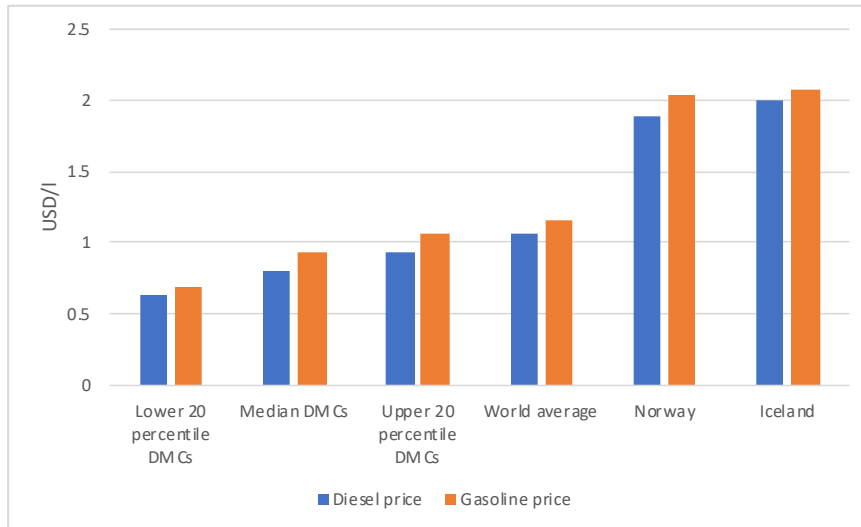
Malaysia

- intends to position itself as electric mobility marketplace for 2030 in the region. In 2015 Malaysia set as target for 2020 100,000 electric cars, 100,000 electric motorcycles, 2,000 electric buses and 125,000 charging stations.
- Target achievement by 2018 is 1% or less. The target has been shifted to 2030. Tax breaks on imported EVs have been stopped in 2017



EV Economy

**Fossil Fuel Prices in ADB Developing Member Countries
as of June 2018 (\$/liter)**



Fossil Fuel Prices

Low gasoline and diesel prices
(lower 20% of countries):

average price < 0.65 \$/liter

Moderate gasoline and diesel
prices: average price > 0.65

\$/liter and < 0.96 \$/liter

High gasoline and diesel prices
(upper 20% of countries):

average price > 0.96 \$/liter

Countries

Azerbaijan, Kazakhstan, Malaysia, Myanmar, Turkmenistan,
Uzbekistan

Afghanistan, Armenia, Bangladesh, Bhutan, Fiji, Indonesia,
Kyrgyz Republic, Mongolia, Nepal, Pakistan, Philippines, Sri
Lanka, Tajikistan, Viet Nam

Cambodia, PRC, Georgia, India, Lao PDR, Thailand



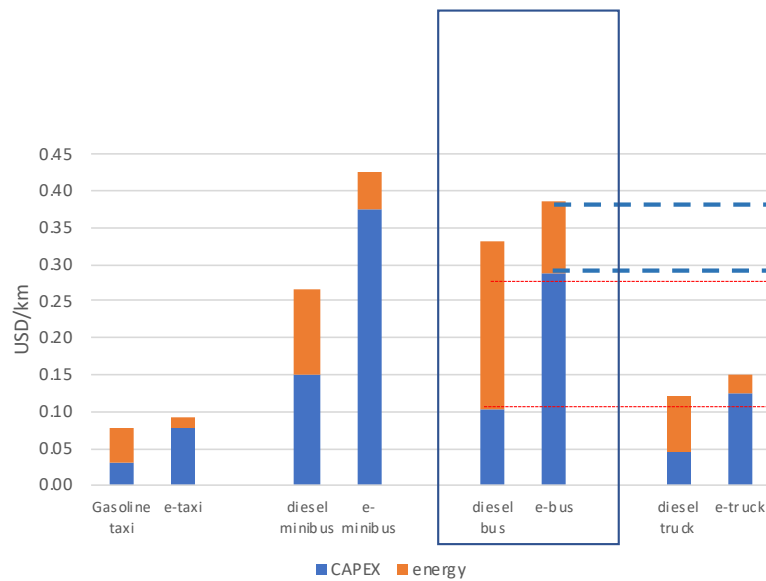
Colour codes:

- high fuel prices (upper 20 percentile; price > 0.96 USD/l)
- moderate fuel prices (price between 0.65 USD/l and 0.96 USD/l)
- low fuel prices (lower 20 percentile; price < 0.65 USD/l)

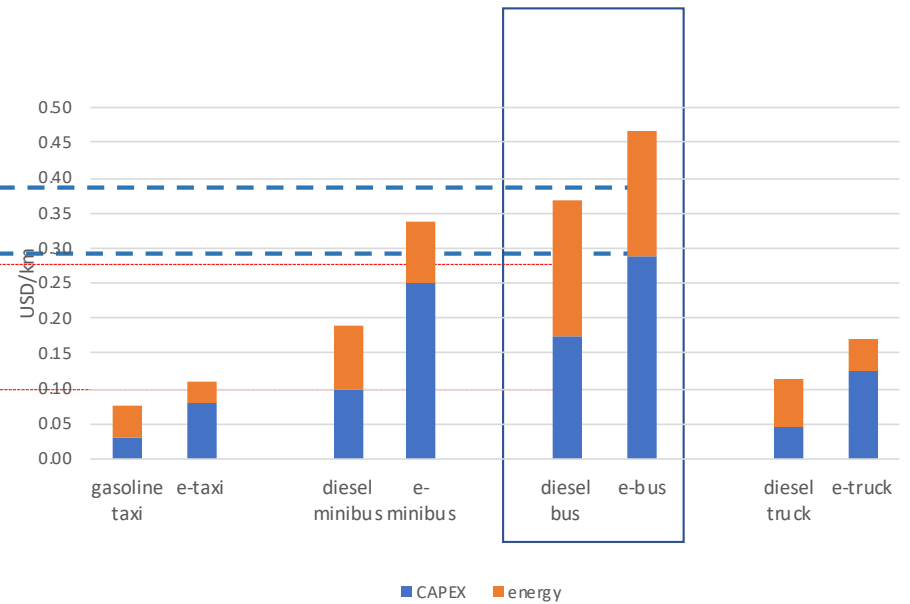
EV Economy Example

Total Ownership Cost by Vehicle Type per Vehicle km

Bishkek, Kyrgyz (200 Buses)



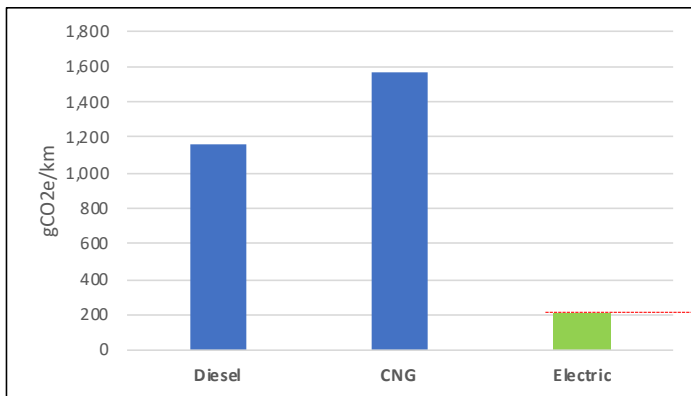
Penang, Malaysia (200 Buses)



EV Environment : GHG

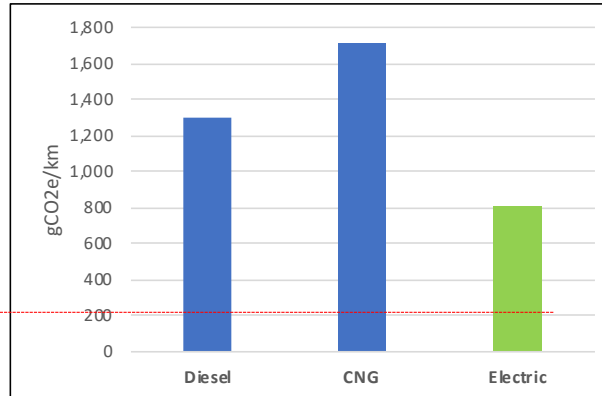
Bishkek

GHG Impact Urban Buses Kyrgyzstan (gCO_{2e}/km WTW)

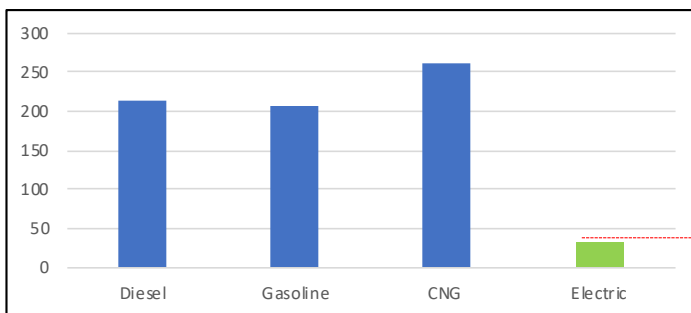


Penang

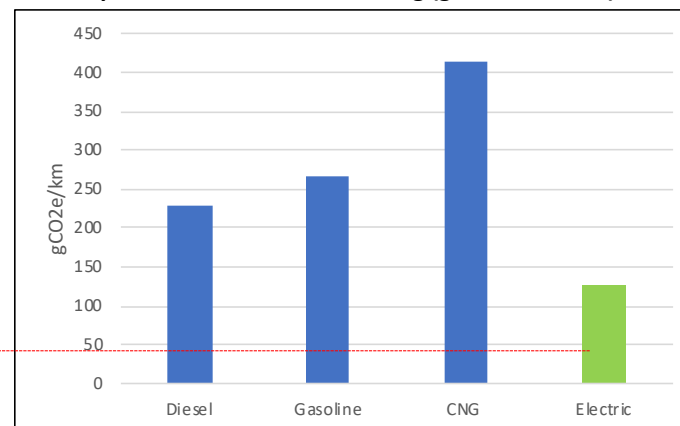
GHG Impact Urban 12m Bus Penang (gCO_{2e}/km WTW)



GHG Impact of Electric Taxis in Kyrgyzstan (gCO_{2e}/km WTW)



GHG Impact of Electric Taxis in Penang (gCO_{2e}/km WTW)



Option Analysis

Bishkek (200 Buses)

Financial Comparison of Options (all figures in USD)

Parameter	Diesel	Trolley	Hybrid trolley	Slow-charged BEB	Fast-charged BEB	Opportunity charged BEB
CAPEX bus	130,000	170,000	250,000	320,000	250,000	260,000
CAPEX infrastructure per bus	0	350,000	105,000	10,000	17,500	42,500
Battery replacement cost	0	0	8,750	70,000	35,000	17,500
Energy usage per km	0.35	1.30	1.30	1.30	1.25	1.25
Energy cost per annum	14,788	2,704	2,704	2,704	2,600	2,600
Maintenance cost bus per km	0.05	0.03	0.03	0.03	0.03	0.03
Maintenance cost bus per annum	3,250	1,625	1,625	1,625	1,625	1,625
Maintenance cost infrastructure per annum	0	1,750	525	100	175	425
OPEX per annum	18,038	6,079	4,854	4,429	4,400	4,650
TCO per km	0.29	0.53	0.37	0.38	0.31	0.33

Penang (200 Buses)

Financial Comparison of Options (all figures in USD)

Parameter	Diesel	Slow-charged BEB	Fast-charged BEB
CAPEX bus	130,000	320,000	250,000
CAPEX infrastructure per bus	0	10,000	21,667
Battery replacement cost	0	70,000	35,000
Energy usage per km	43	1.40	1.35
Energy cost per annum	13,794	11,375	14,040
Maintenance cost bus per km	0.11	0.07	0.07
Maintenance cost bus per annum	7,800	4,680	4,680
Maintenance cost infrastructure per annum	0	100	217
OPEX per annum	21,594	16,155	18,937
TCO per km	0.33	0.50	0.45

EV Policy Recommendation

Common Recommendations

- Regulations on EV target for operators with incentives
- Free or subsidized charging stations
- City center access control over polluting vehicles
- Leasing scheme for large fleet entities

Bishkek : 1 M population

Grid Factor : 0.18kg CO₂/kWh

EV can reduce 70-85% of GHG compare to ICE

Fuel price: \$0.65/l

Electricity Tariff : \$0.03 kWh

- Recommend 200 BEV + Fast Charging over Hybrid Trolley Bus
- Reform Bus Industry : Bus vs mini bus
- Bus, mini bus, taxi sequence
- Apply Concessional Loan or GCF

Penang : 1.7 M population

Grid Factor : 0.70kg CO₂/kWh

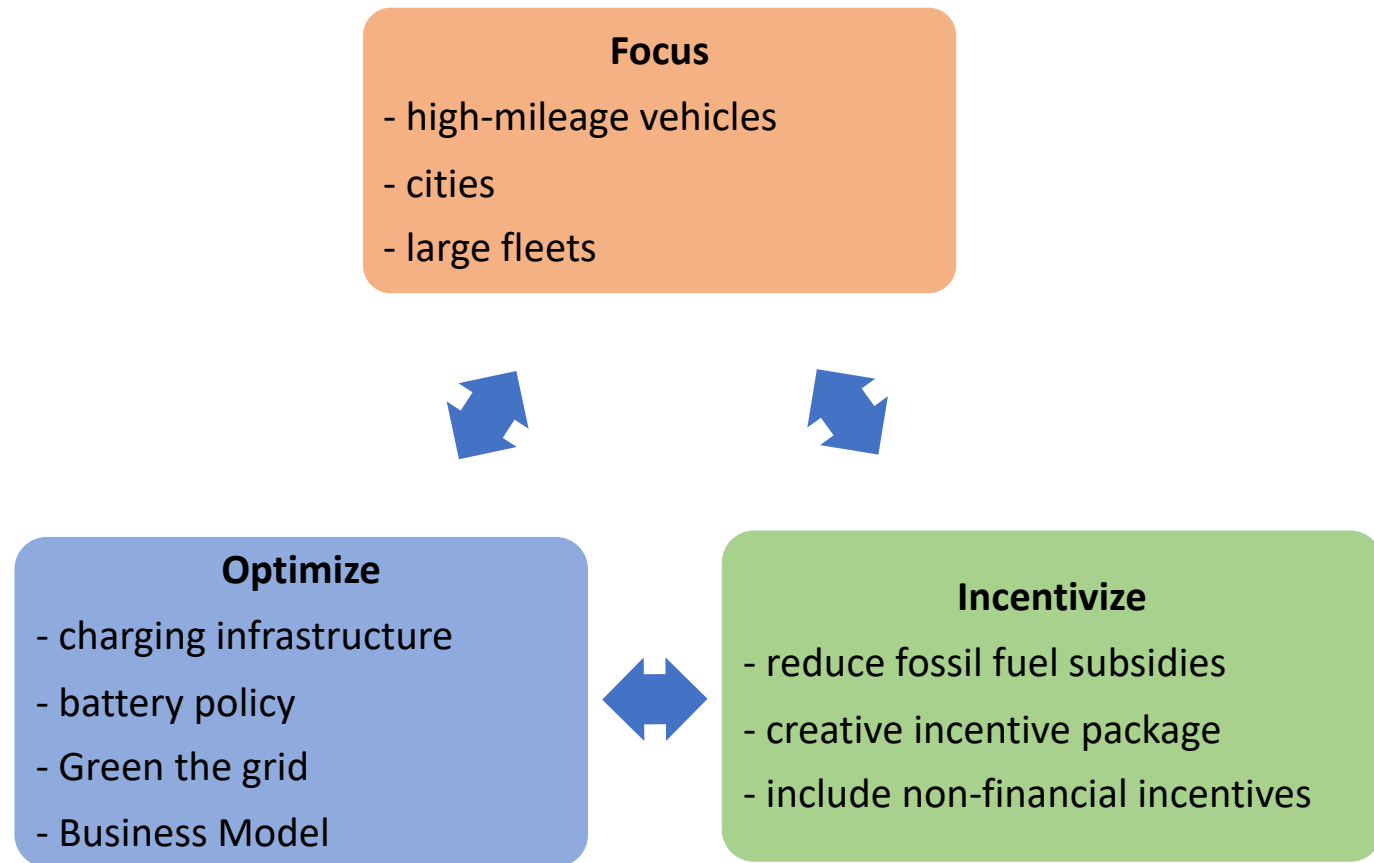
EV can reduce 70-85% of GHG compare to ICE

Fuel price: \$0.46/l

Electricity Tariff : \$0.14-0.08 kWh

- 200 BEB with Fast Charging Recommend but need higher incentives
- Remove demand charge for EVs
- Reduce electricity tariff 50% for 5 years
- Reduce fuel subsidy

Policy Actions Recommended



Concluding Remarks

- Electrification of Transport modes is already the global trend
- EV is the immediate solution for reducing GHG and pollution
- EV with battery cost reduction, smaller vehicles will decrease the EV CPAX and may increase the vehicle ownership
- EV study and financing by international institutions are growing fast
- Energy demand for electric vehicle is not a imminent issue
- EV will restructure motor manufacturing industry : ICE will die out and early EV starters will win
- Car assembly industry may have less value-addition by EV than ICE but EV maintenance and service will grow
- EV and Charging Infrastructure development, national & local policy need to together

Thank You

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