GLOBAL FUEL ECONOMY INITIATIVE
FOR ZERO CARBON VEHICLES BY 2050

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Overview of Global Fuel Economy Initiative (GFEI) and e-mobility policy work; and policies and impacts in low- and middle-income countries

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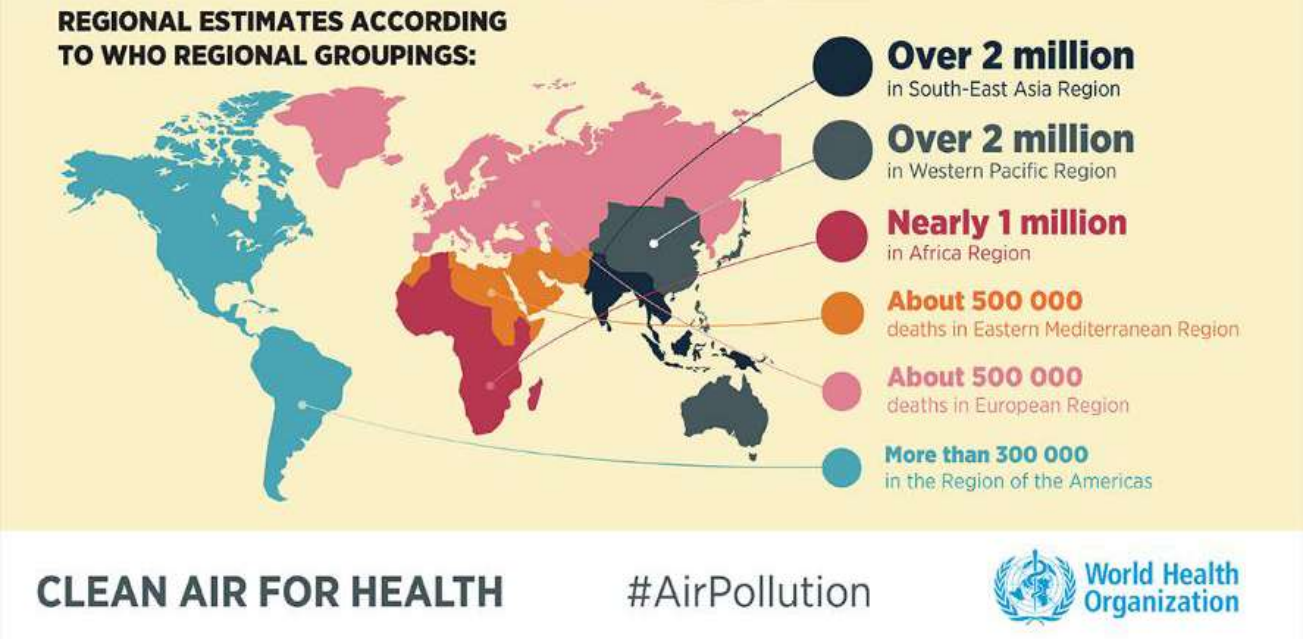
UNEP

November 2020

Air pollution: a serious health crisis in Asia Pacific

WHO (2018) estimates that exposure to ambient air pollution causes **4.2 million** premature deaths, and **103.1 million** DALYs* every year, while exposure to smoke from dirty cookstoves and fuels causes **3.8 million** deaths, and **85.6 million** DALYs every year.**

More than 2/3 of the deaths occur in **Western Pacific and South East Asian regions**.



**** DALYs are the sum of life years lost due to premature mortality and years lived with disability adjusted for severity.***

***** Cohen AJ, Brauer M, Burnett RT. Estimates and 25-year trends of the global burden of disease attributable to ambient air pollution: An analysis of data from the Global burden of Diseases Study 2015. Lancet 2017; 389:1907-18.***

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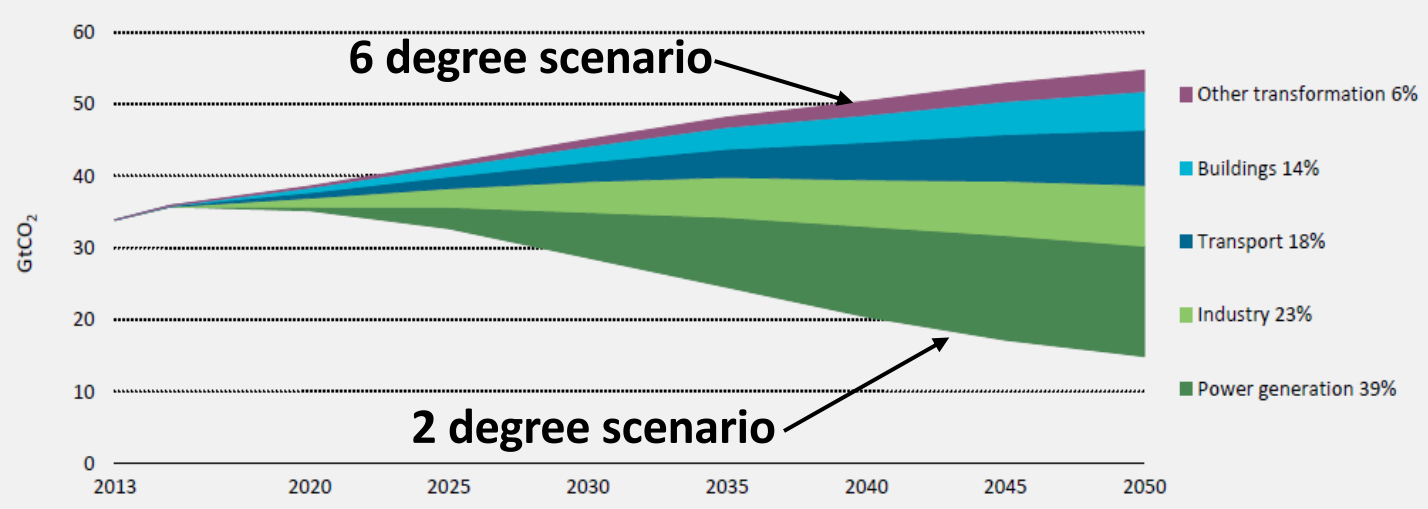
Rising CO_2 emissions from transport especially in non-OECD countries

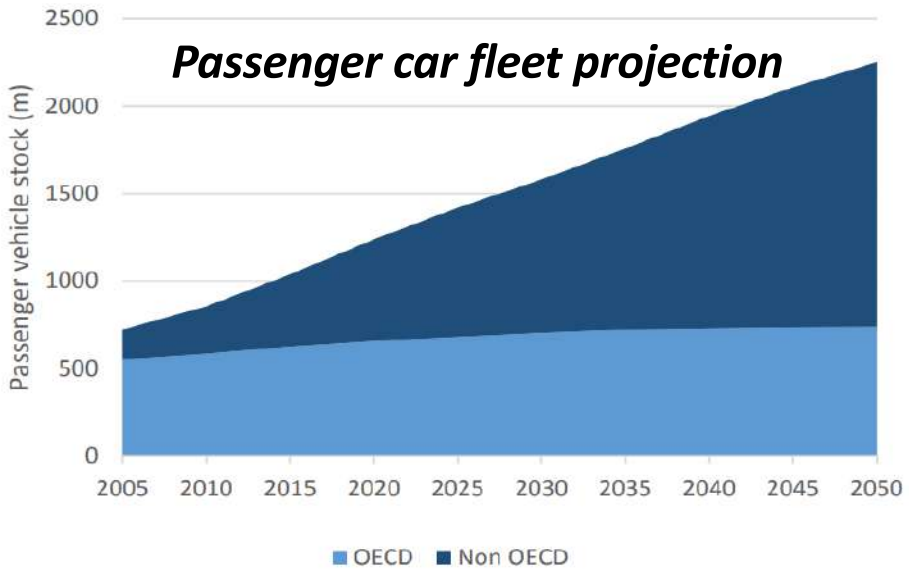
Climate change mitigation by sector



Source: ETP 2016 (IEA 2016)

- Most of the vehicle fleet growth will take place in non-OECD countries
- IPCC (Oct 2018) *"High growth rates are now appearing in electric vehicles, electric bikes and electric transit, which would need to displace fossil-fuel powered passenger vehicles by 2035-2050 to remain in line with 1.5ºC consistent pathway"*

Transport needs to contribute ~20% to global carbon emission reductions to limit global warming



Source: ETP 2016 (IEA 2015)

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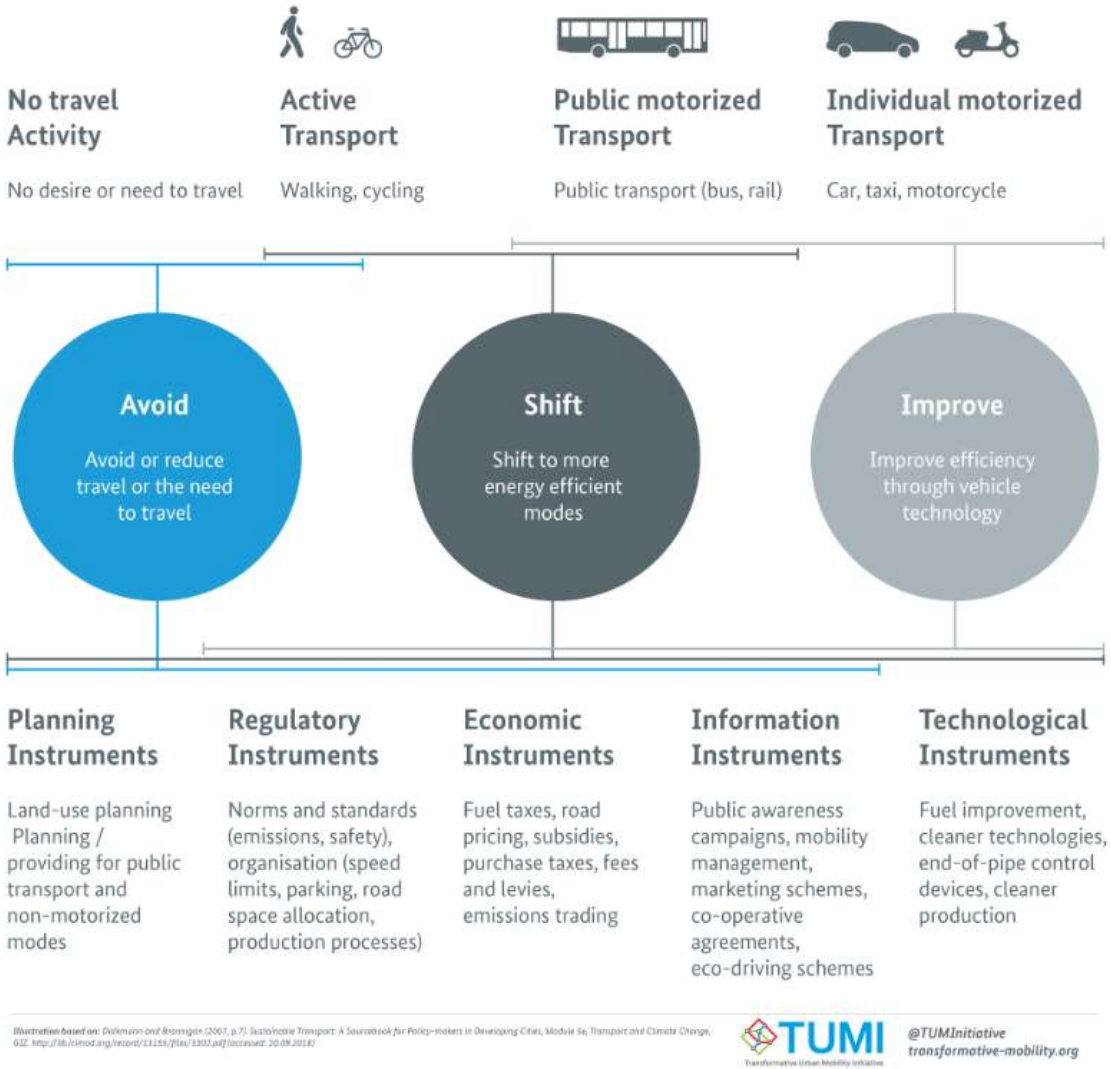
Acknowledging the need to focus on improving movement of people and goods over vehicles



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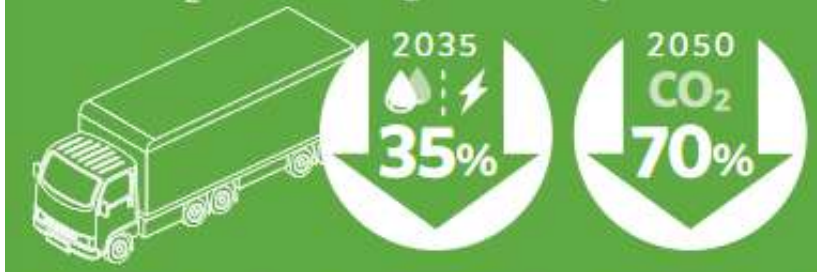
GFEI 2.0 Targets

Passenger light-duty vehicle targets
Double global fuel economy of new vehicles by 2030, reduce CO_2 emissions by **90%** by 2050

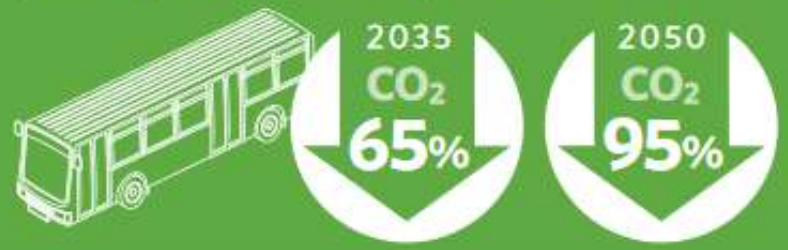
Two & three wheel vehicle targets
Improve fuel economy to reduce CO_2 emissions by **80%** by 2035 and **95%** by 2050

Heavy-duty vehicle targets
Improve new vehicle fuel consumption **35%** by 2035 - CO_2 reduction target of **70%** by 2050



Decarbonising road transport to tackle climate change
A new fleetwide CO_2 reduction target of **65%** by 2050 compared with 2005. To comply with the Paris Agreement's less than 2 degree scenario, better fuel efficiency of conventional vehicle technologies; a faster transition to electric vehicles; a faster decarbonisation of the electricity grid; and additional 'avoid' and 'shift' measures eg more non-motorised mobility, are all needed

Transit bus targets
Improve fuel economy to reduce CO_2 emissions by **65%** by 2035 and **95%** by 2050



To achieve these targets, the carbon intensity of the global electricity grid will need to decrease by at least 90% between 2020 and 2050

Source: GFEI Working Paper 20 - Data based upon 2005 baseline

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Not enough improvement in some advanced and emerging countries

		2005	2010	2015	2017	2030
Advanced Countries (Gasoline price ≥ USD 1/L)	average fuel economy (Lge/100km)	7.4	6.5	5.8	5.8	4.4
	annual improvement rate		-2.40%	-2.50%	-0.10%	
		-2.00%				
Advanced Countries (Gasoline price < USD 1/L)	average fuel economy (Lge/100km)	11	9.5	8.6	8.6	
	annual improvement rate		-2.90%	-1.90%	-0.40%	
		-2.00%				
Emerging Countries	average fuel economy (Lge/100km)	8.6	8.5	7.8	7.5	
	annual improvement rate		-0.20%	-1.60%	-2.30%	
		-1.20%				
Global	average fuel economy (Lge/100km)	8.8	8	7.4	7.2	
	annual improvement rate		-2.00%	-1.50%	-1.40%	
		-1.70%				
GFEI target for LDVs	Required annual improvement rate	2005 base year	**-2.80%**			
	(% per year)	2017 base year				**-3.70%**

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Regional and country support focus on developing policies, standards, and information measures

VEHICLE FUEL EFFICIENCY STANDARDS	• Introduce and regularly strengthen mandatory standards • Establish and harmonize testing procedures for fuel efficiency measurement.
FISCAL MEASURES	• Fuel taxes and vehicle taxes to encourage the purchase of more fuel-efficient vehicles. • Infrastructure support and incentive schemes for very fuel-efficient vehicles.
MARKET-BASED APPROACHES	• Voluntary programs such as U.S. SmartWay and other green freight programs
INFORMATION MEASURES	• Vehicle fuel economy labels • Improving vehicle operational efficiency through eco-driving and other measures.

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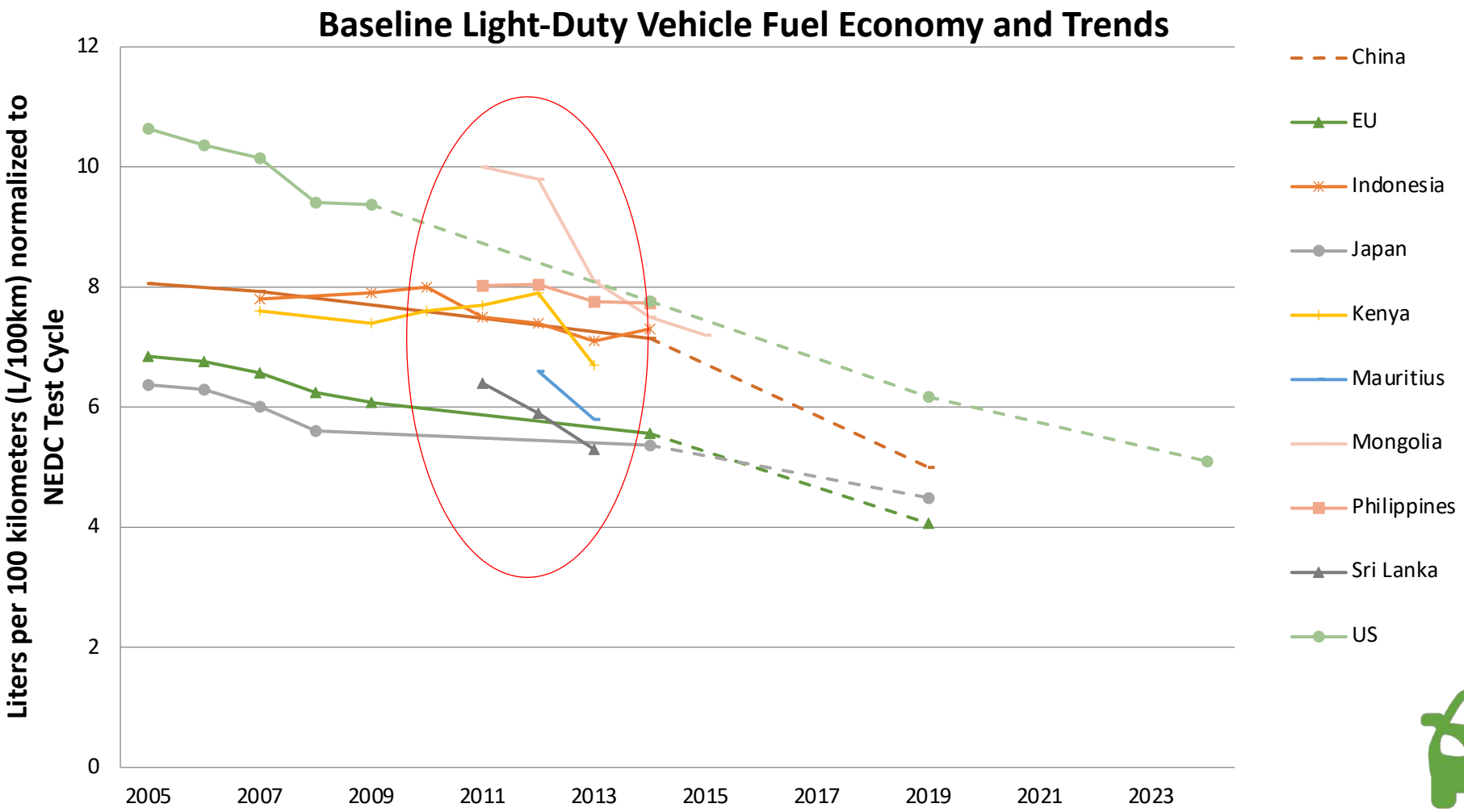
Fuel economy policies work!



Source: UNEP, 2018 (unpublished).

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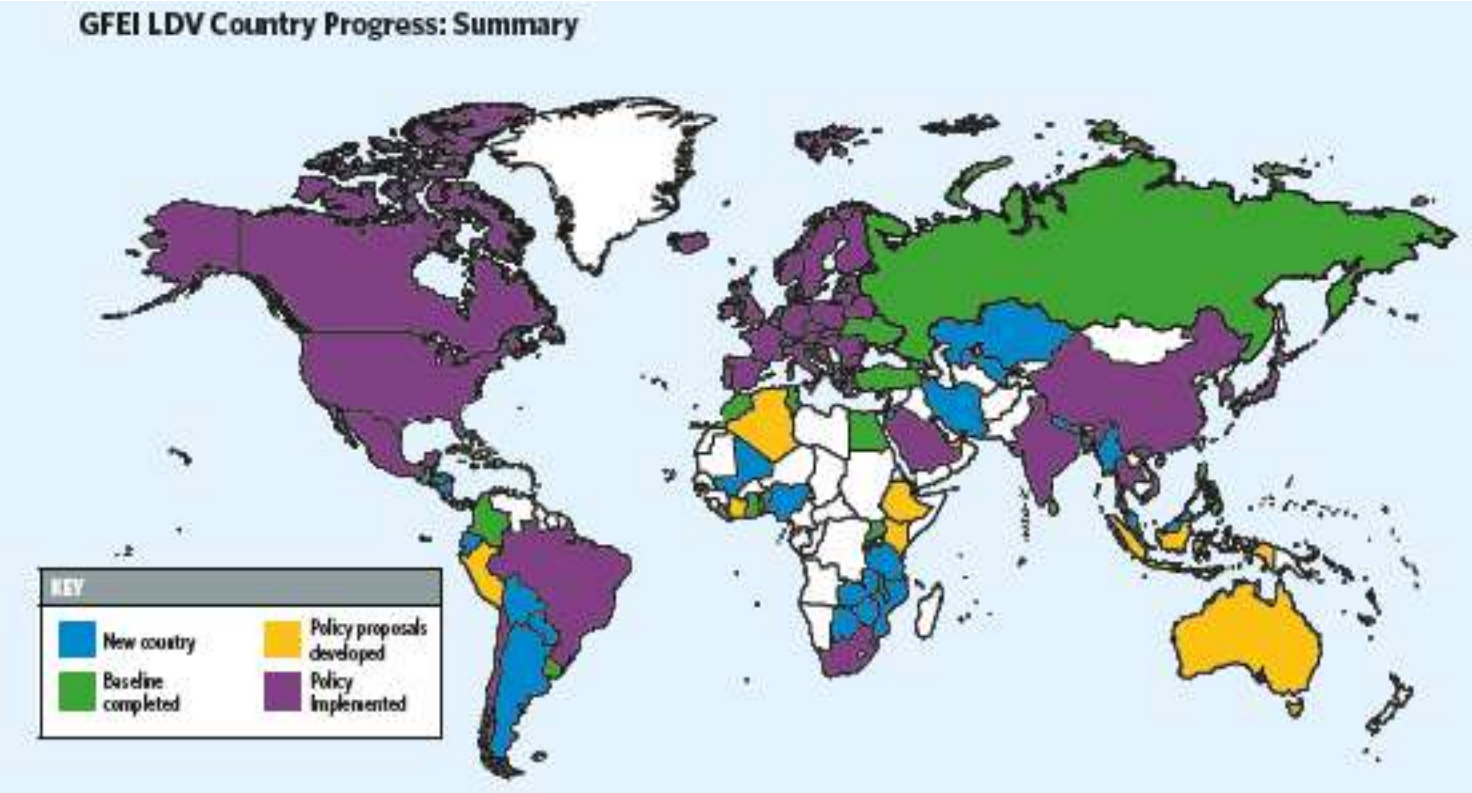
Supporting policies to promote light-duty e-vehicles (1/1)

Integrated **EV specific policy measures** with the Global Fuel Economy Initiative (GFEI) national activities supporting the fuel economy policy development in 65+ countries



Dedicated EV policies:

- Tax breaks on registration, import & circulation tax as part of FE policy development
- Inclusion of EVs in regulatory measures i.e. in form of credits in FE standards, quotas, bans
- Information campaigns
- Dedicated soft measures: parking policies, exemption from access restrictions etc.

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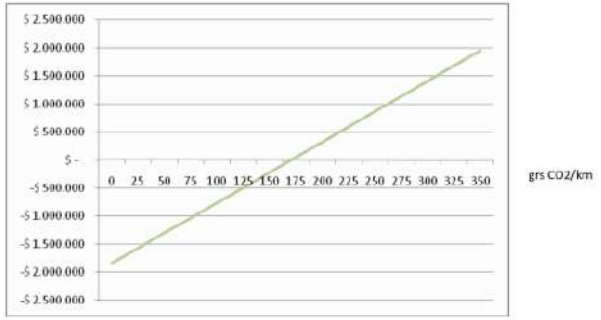
Supporting policies to promote light-duty e-vehicles (1/2) – Chile

- 2010: Development of fuel economy baseline
- 2012: Introduction of mandatory fuel economy label
- Drafting of CO_2 emission-based vehicle registration tax
- Originally, the registration tax was intended to become a feebate scheme: EVs would have been eligible for substantive rebates
- 2014: A vehicle registration tax based on fuel consumption and air pollution has been implemented
- 2015: EVs are exempt from paying an annual vehicle registration tax for a period of 4 years

1 US$= 500 Chilean $

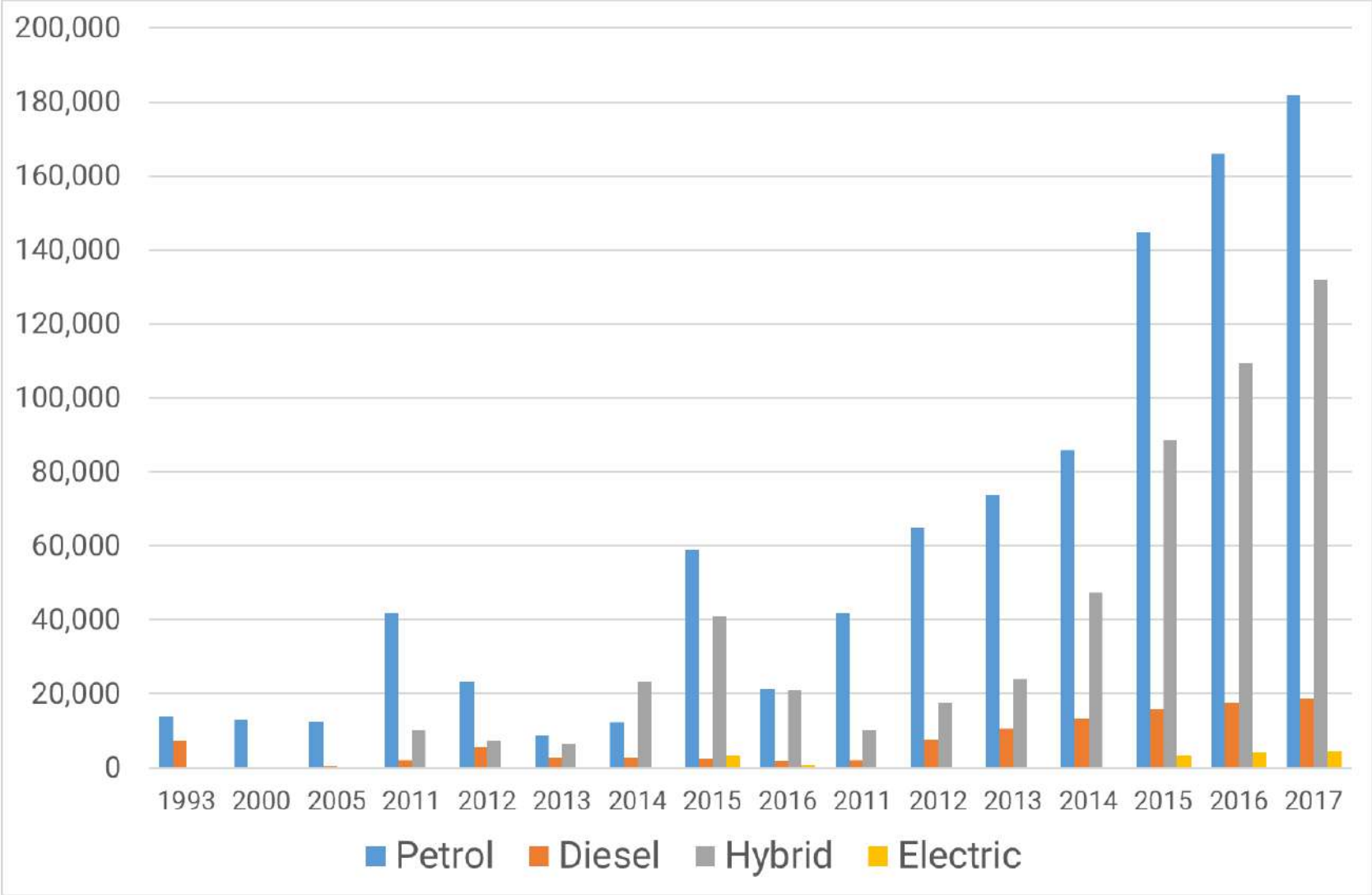


For a vehicle with a footprint equal to market average

Next steps:

Introduce dedicated EV policies
Develop recharging infrastructure projects
Foster local manufacturing

Supporting policies to promote light-duty e-vehicles (1/3) – Sri Lanka



Source: Sugithapala, 2019

High vehicle excise taxes for conventional vehicles in Sri Lanka influenced the adoption of cleaner and more efficient vehicles

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Supporting policies to promote light-duty e-vehicles (1/4) – Thailand

APPROVED
Dec 2012
for implementation
on 1 Jan 2016

Thailand Vehicle excise tax structure

Categories Of Vehicle	Tax Structure Before Jan'2016				Current Tax Structure			
	Engine Capacity (Horse Power)	Tax Rate (%)			CO_2	Tax Rate (%)		
		E10	E20	E85		E10/E20	E85/NGV	Hybrid
Passenger Vehicles -Passenger Vehicles and, Vans less than 10 seats	≤2,000 CC	30	25	22*	≤ 100 g/km	} 30*	} 25	10
	2,001-2,500 CC	35	30	27	101-150g/km			20
	2,501-3,000 CC	40	35	32	151-200 g/km	35	30	25
					>200 g/km	40	35	30
	>3,000 CC (Pw 220 HP)	50	50	50	>3,000 CC	50	50	50
PPV / DC /Space Cab/Pick Up	≤3,250 CC	20/12/ - /3,18			≤ 200 g/km	25*/12/5/3,18		
					>200 g/km	30/15/7/5,18		
	>3,250 CC	50			>3,250 CC	50		
Eco Car (Benzine/Diesel) / E85	1,300/1,400 CC	17			≤100 g/km	14*/12		
					101-120 g/km	17/17		
Electric Vehicle /Fuel Cell/ Hybrid	≤ 3,000 CC	10				10		
		10				**		
	>3,000 CC	50			>3,000 CC	50		
NGV-OEM	≤ 3,000 CC	20				**		
	>3,000 CC	50			>3,000 CC	50		

NEW: HEV-PPV ≤75 g/km= 23%; HEV-DC ≤75 g/km= 10%; Updated on 20 June

NEW: EV tax=2%; Hybrid tax ÷ 2; Updated on 20 June

Remarks * : Assign safety standard for Active Safety (ABS+ESC) for Passenger Vehicles and, Vans less than 10 seats must obtain CO_2 ≤150 g/km / PPV must obtain CO_2 ≤200 g/km / Eco Car must obtain CO_2 ≤100 g/km

Source: http://www.ratchakitcha.soc.go.th/DATA/PDF/2560/E/166/1.PDF

** Depend on CO_2 emission

* less than 1,780 CC but not over 2,000 CC

28/02/2018 ASEAN German Technical Cooperation – Transport and Climate Change Page 16

CO_2-based vehicle excise tax structure in Thailand

Source: GIZ, 2018

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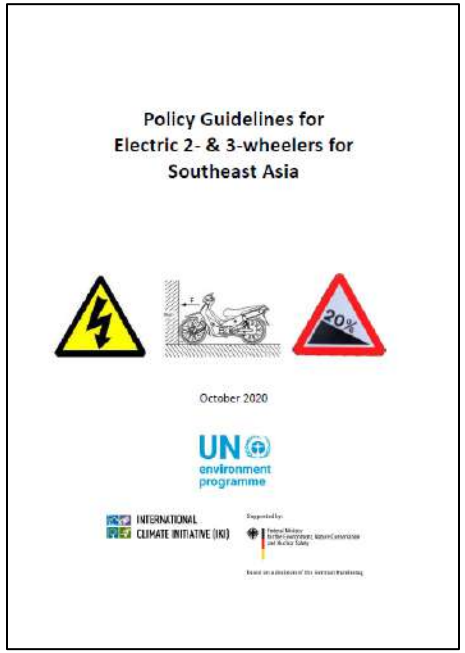
Supporting policies, regulations and pilots to promote electric 2&3 wheelers (1)

- **8 ongoing projects in East Africa and Southeast Asia**
  - Morocco, Kenya, Uganda, Ethiopia and Rwanda
  - Philippines, Thailand and Vietnam; (Indonesia and Myanmar starting 2021)
- **3 main components**
  - Planning and project baseline setting
    - Local manufacturing potential, electric demand modeling, financing gaps etc.
  - Piloting / policy design
  - Knowledge management & policy replication

<u>Getting the policies right:</u>

- Fiscal – Registration tax exemption, tax breaks on corporate income for industry etc.
- Regulatory – Industry standards (e.g. with respect to batteries)
- "Soft measures" – City centre access only for electric 2&3 wheelers
- Consumer information – Fuel economy labelling labels for 2&3 wheelers



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Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

Sida

WILLIAM + FLORA Hewlett Foundation

مؤسسة محمد السادس لحماية البيئة
FONDATION MOHAMMED VI POUR LA PROTECTION DE L'ENVIRONNEMENT

Supporting policies, regulations and pilots to promote electric 2&3 wheelers (2) – Philippines

- The Philippines is one of the earliest to pilot electric 3-wheelers and *jeepneys* in Southeast Asia starting in 2008 – there are now 4,318 registered electric 3-wheelers
- The Department of Energy has delivered 3,000 e-trike units to 33 local government units and 4 national government agencies with ADB support

PHLPost Green Delivery vans and bikes are now delivering relief goods and medical supplies. Photo from PHLPost.

- Supporting development of regulations for electric 2&3 wheelers with the Land Transportation Office, and Bureau of Product Standards
- UNEP/BMU-IKI pilot project supporting urban electric freight launched in Nov 2019 with PhilPost and Pasig City
- Supporting more demonstration projects and setting up charging network in Pasig City with EC Solutions plus

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Supporting policies, regulations and pilots to promote electric 2&3 wheelers (3) – Thailand

- UNEP/BMU-IKI supporting the development of standards and regulations on electric 2&3 wheelers
- Demonstration project to support electric motorcycle taxi/ electric motorcycle deliveries

2 Energy Efficiency : Develop EE standard for EV & Charger

EGAT

Electric Motorcycle Label no.5

Electric Motorcycle separate categories to 3 type (Regulation Eu 168 2013)

L1e-A (Powered cycle)
- Pedal equipped with auxiliary propulsion
- Speed ≤ 25 km/h
- Electrical motor size ≤ 1 kW

L1e-B (Two-wheel moped)
- Speed ≤ 45 km/h
- Electrical motor size ≤ 4 kW

L3e (Two-wheel motorcycle)
- Exclude from L1e type
- Electrical motor size 11 kW (L3e-A1)
- Speed > 45 km/h

(Can be registered with Department of Land Transport)

Testing Standard

Type	L1e	L3e
Energy Efficiency Testing Standard	REGULATION (EU) No. 134 /2014	
Driving Cycle	ECE R47	World Harmonized Motorcycle Test Cycle (WMTC), stage 2

Label No.5 Energy Efficiency Criteria

Type	Energy consumption
L1e-A	≤ 20.4 Wh/km
L1e-B	≤ 26.4 Wh/km
L3e	≤ 36.8 Wh/km

ROADMAP : THAILAND SMART MOBILITY 30@30

2026-2030 ขยาย 400,000 → 750,000

6. Eco-EV รองรับ Zero Emission & Sharing Mobility Zoning ใน กทม. และหัวเมืองใหญ่ 400,000 คัน

2021-2025 เร่ง 100,000 → 250,000

4. ECO EV (2021 – 2025) 100,000 → 250,000
5. Smart City Bus 1,000 → 3,000

2020 - 2022 เริ่ม 60,000 → 110,000

1. รถราชการ 3,000 + 5,000 + 8,000
2. xEV ประชารัฐ 5,000 + 25,000 + 20,000
3. วินสะอาด 3,000 + 20,000 + 30,000

เป้าหมาย ปี 2030

xEV 30%

ของปริมาณผลิต 2.5 ล้านคัน

(750,000 คัน)

PAGE 15

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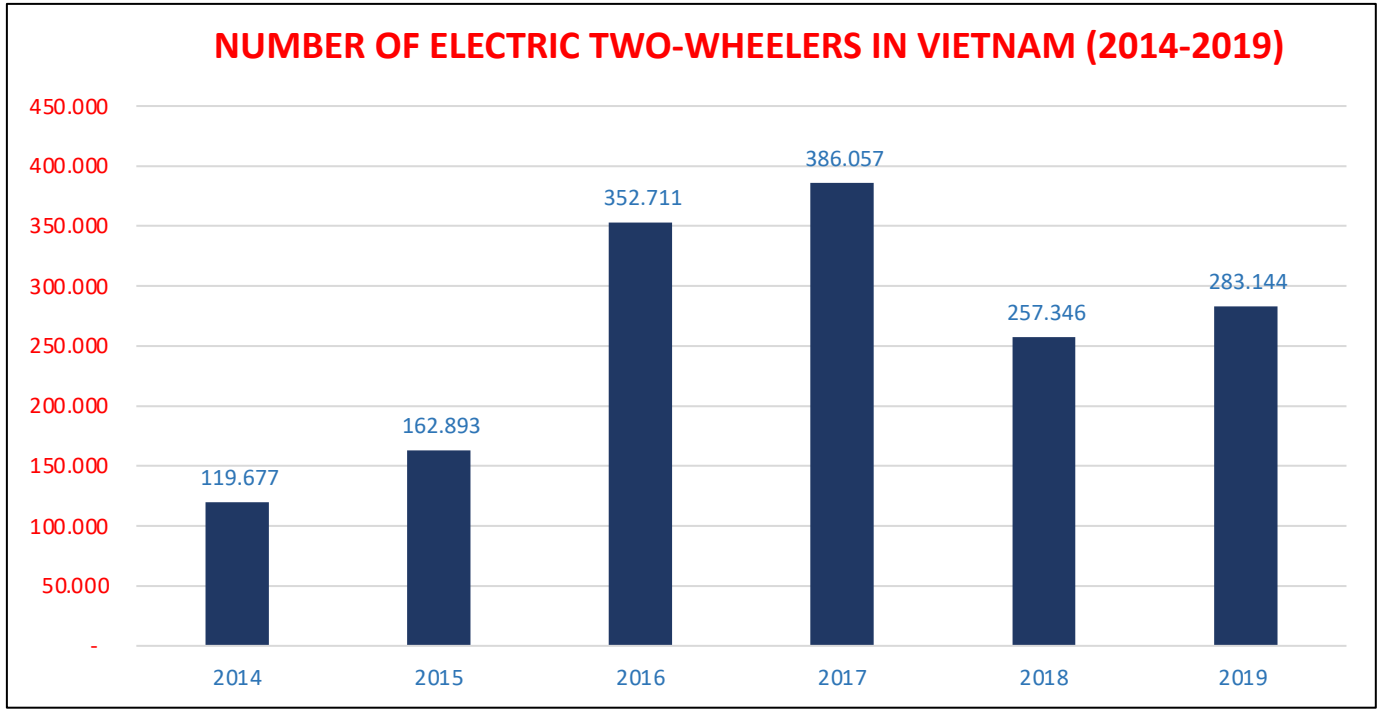
Supporting policies, regulations and pilots to promote electric 2&3 wheelers (4) – Vietnam

- 1.35 million registered electric 2-wheelers as of June 2020
- UNEP/BMU-IKI is supporting standards and regulations development and demonstration projects on electric 2-wheelers for personal use and for urban freight



Source: complied by Vietnam University of Transport Technology

Supporting development of policies, regulations and pilots to integrate e-buses (1)

- CCAC Soot-Free Bus Fleet Project
  - Urban buses account for approximately 25% of the black carbon emitted by the transportation sector
  - Urban bus activity is predicted to increase by nearly 50% by 2030
  - In 2030, this will translate into an estimated additional 26,000 tons of black carbon

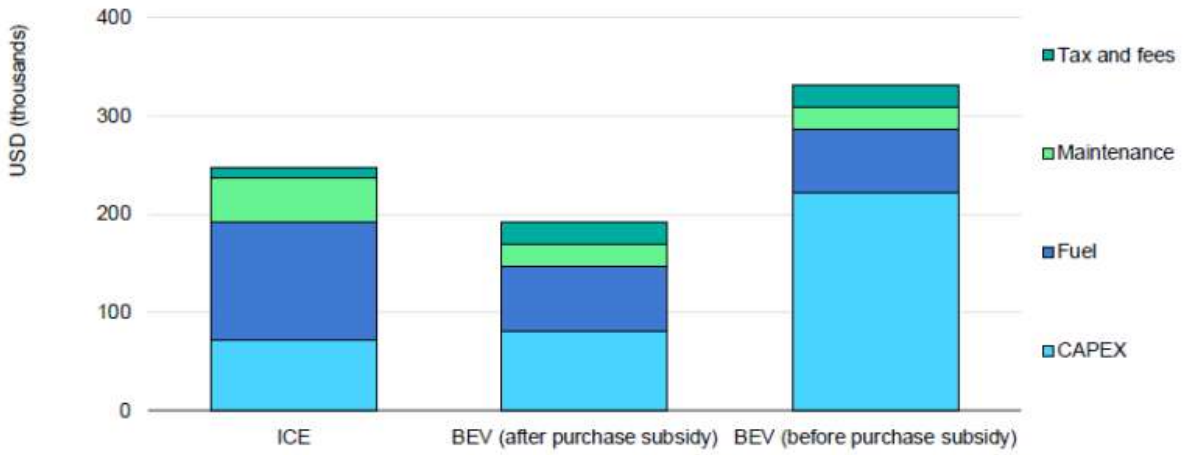
- Electric buses are a logical step to curb pollutant emissions and can already be cost effective on high-capacity lines
- Many low and middle-income countries invest now in high-capacity public transport – lock-in with polluting technology for the next 15+ years needs to be prevented

Supporting development of policies, regulations and pilots to integrate e-buses (2)

- Integrating electric buses in the Transjakarta bus system supported by UNEP-CTCN and implemented by ITDP

- Many countries in the GEF 7 Global Electric Mobility Programme include a focus on electric buses – although financing is a main issue
- Interest to electrify and better integrate intermediate public transport modes, like *angkots, seongtaws, jeepneys,* in addition to three-wheelers

Figure 2.1 Total cost of ownership for various bus types in Shenzhen



Notes: Capex = capital expenditure; ICE = internal combustion engine; BEV = battery electric vehicle. Conversion rate: CNY 1 = USD 0.14. The figure shows the TCO for the operations over the vehicle lifetime, which typically is eight years in Shenzhen. While the capital costs for e-buses in Shenzhen appear to be high relative to their ICE counterparts, the cost of Euro VI 12 metre diesel bus is around USD 300 000 to 400 000, far exceeding these prices and also higher than the non-subsidised BEV costs in Shenzhen. Costs of battery replacement (if any) have not been explicitly considered as part of this comparison.

Source: Case study on Shenzhen by Berlin, Zhang and Chen (2020).

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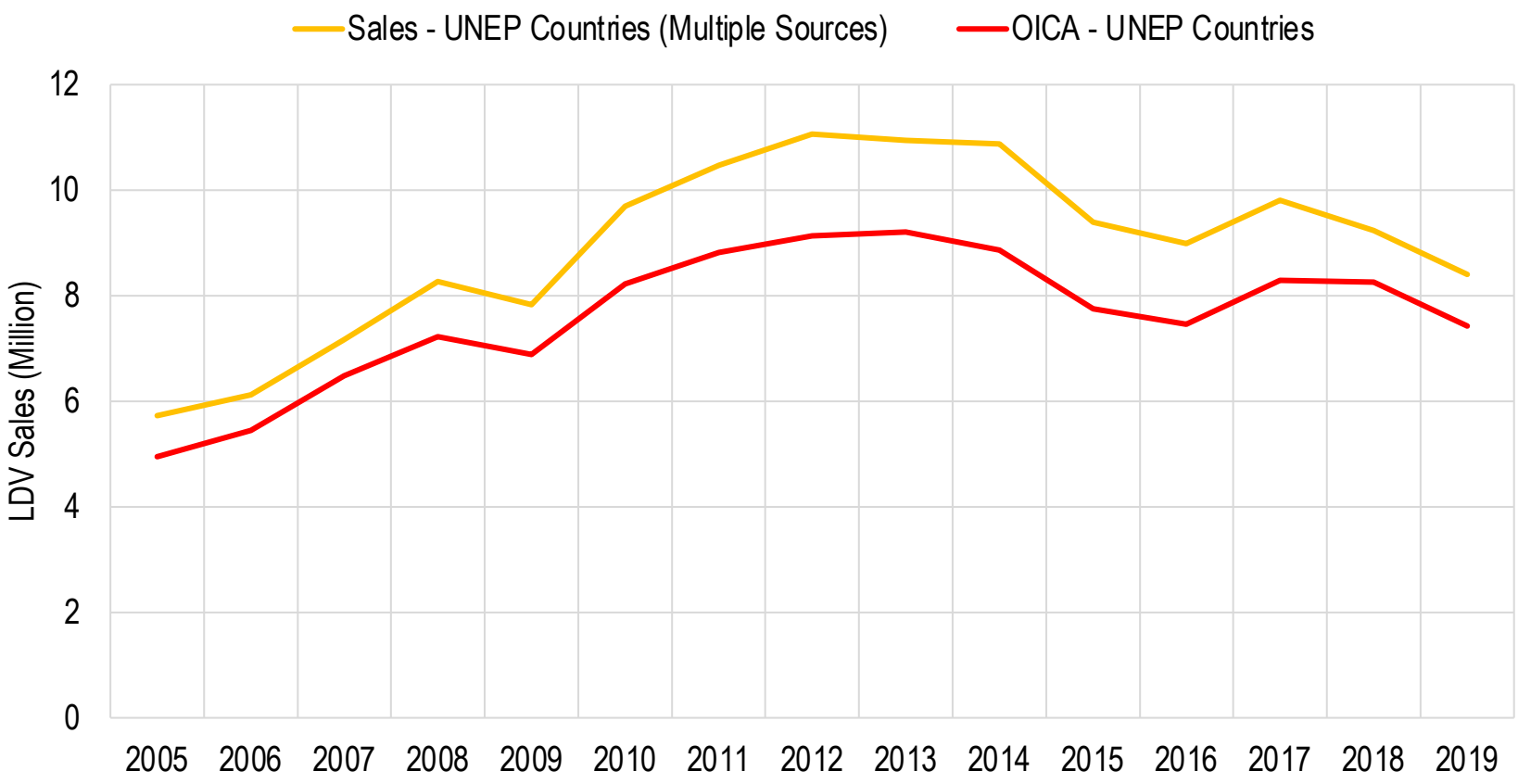
Assessing the fuel economy impact of GFEI country projects on LDVs (1)

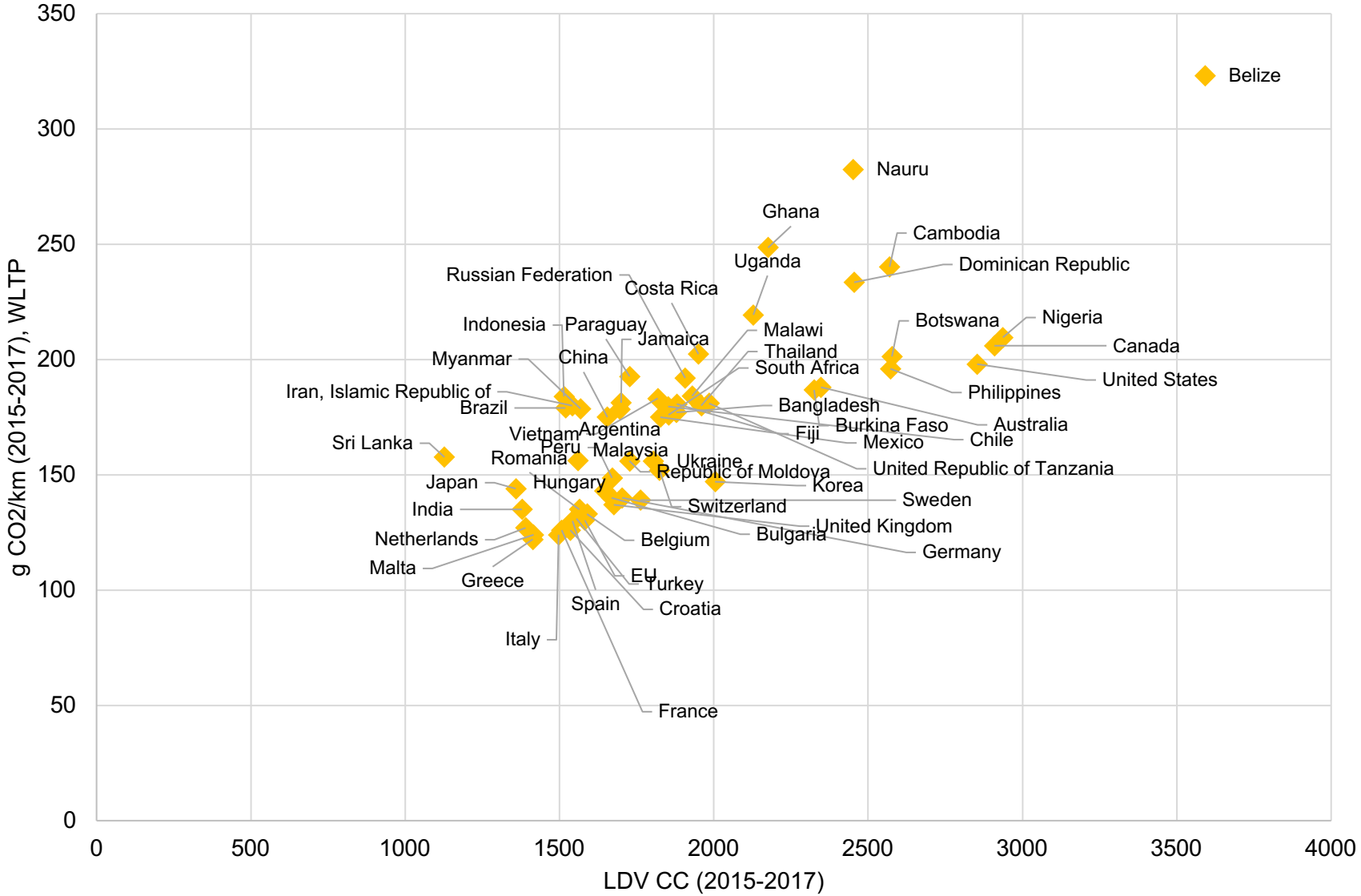
- With EC, GEF, and the FIA Foundation, UNEP has been supporting 65+ developing countries to develop fuel economy policies as part of the Global Fuel Economy Initiative as of Aug 2020
- Used first-time registered LDV's based on current fuel economy baselines and vehicle sales data (LDV sales between 2005 to 2030). The Lge was converted to CO_2-based on gasoline & diesel share of 82% & 18%; and the average life of LDV was assumed as 12 years and average annual travel of 15000km
- Integrated the UNEP GFEI data into the IEA GFEI datasets for comparison e.g. average fuel consumption (WLTP), average CO_2 emissions per km, average displacement, average power, average kerb weight, age, etc..
- The fuel economy baselines (for missing years) were adjusted through interpolation and using growth from similar income countries to determine a trend series from 2005-2020
- The impact assessment considers the following scenarios:
  - The Pre-GFEI scenario considers fuel economy baseline for the first time registered LDVs based on 2005-2010 growth, i.e. the 2030 projections were carried out using 2005-2010 growth rates.
  - The Post-GFEI scenario considers fuel economy baseline for the first time registered LDVs based on 2010-2017 trend, i.e. the 2030 projections were carried out using 2010-2017 growth rates.
  - The GFEI-Target scenario considers 2020-2030 trend based on fuel economy target of 4.4 Lge/100km by 2030

Assessing the fuel economy impact of GFEI country projects on LDVs (2)



- LDV sales data were based from OICA, automotive websites, country statistics and UNEP country reports
- The LDV sales for individual countries was projected to 2030 using elasticity values from UNEP E-Mob tool and GDP per capita projections

Average engine size and gCO_2 emissions/km in the GFEI-UNEP countries



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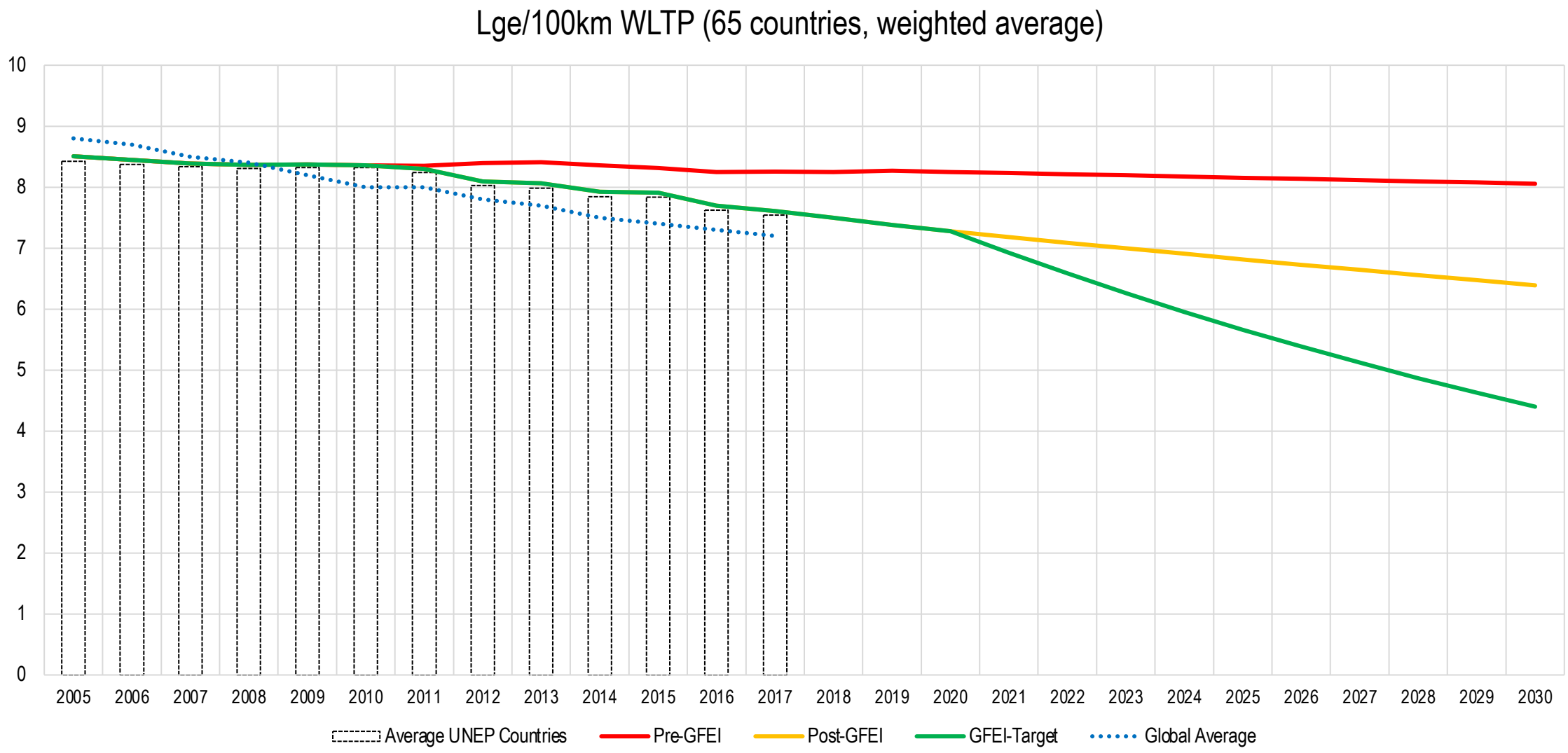
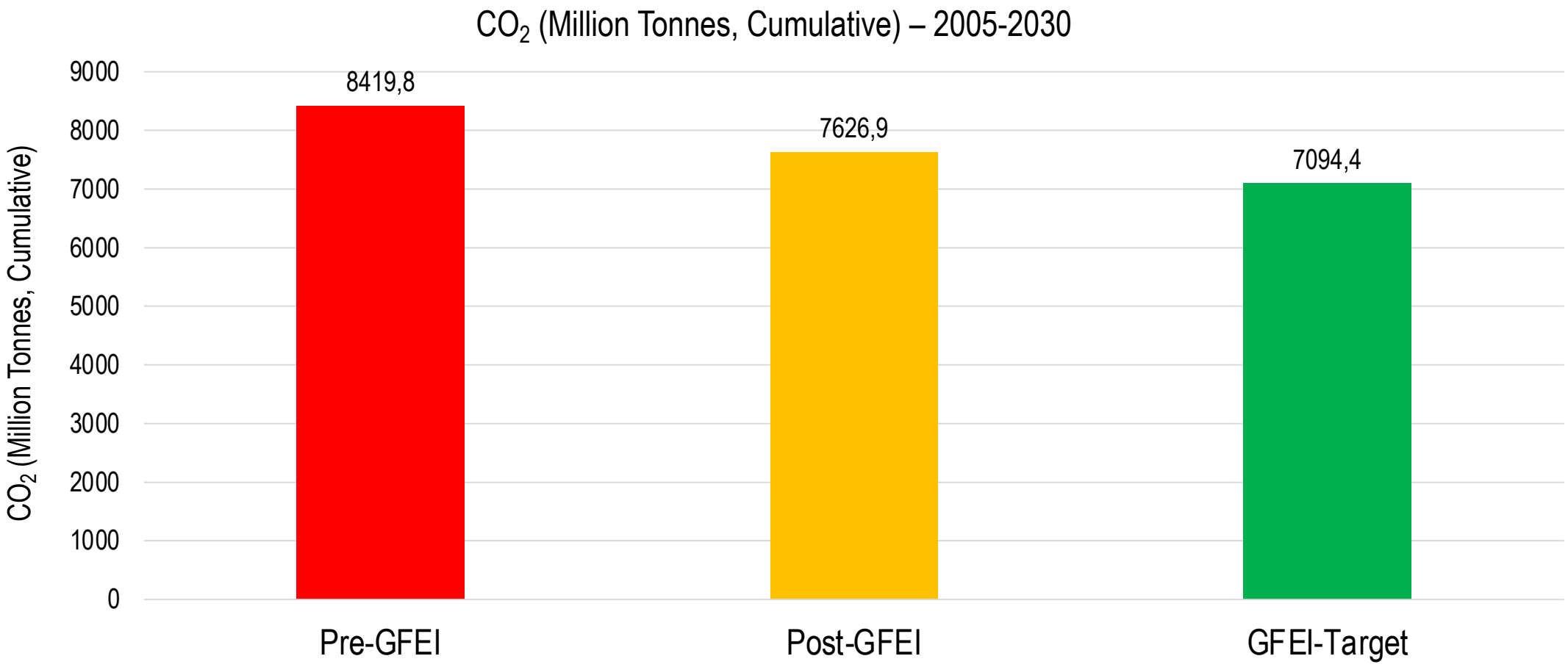
Fuel economy impact assessment results and scenarios



Fuel economy impact assessment – initial CO_2 savings estimates from GFEI-UNEP country projects



Key issues and recommendations

- Integrate fuel economy and e-mobility policies into national policies, e.g. National Environmentally Sustainable Transport, NDCs, energy efficiency and renewable energy policies
- Develop integrated framework to promote e-mobility – standards and technical regulations, road-use policies, local manufacturing, fiscal and non-fiscal incentives, renewable energy
- “Localize” policies, e.g. local transport planning and regulations, building regulations to include provisions of charging, etc.
- Prioritize inherently low carbon modes – walking, cycling (plus e-bicycles), and electrification of public transport (buses, intermediate public transport, light-rail, heavy-rail, etc.)
- Support electrification of urban freight and waste management (including use of electric 2&3 wheelers, e-cargo bikes)

But let’s not forget! Electric vehicles alone is not the answer to solve our unsustainable and unequitable transport systems!

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