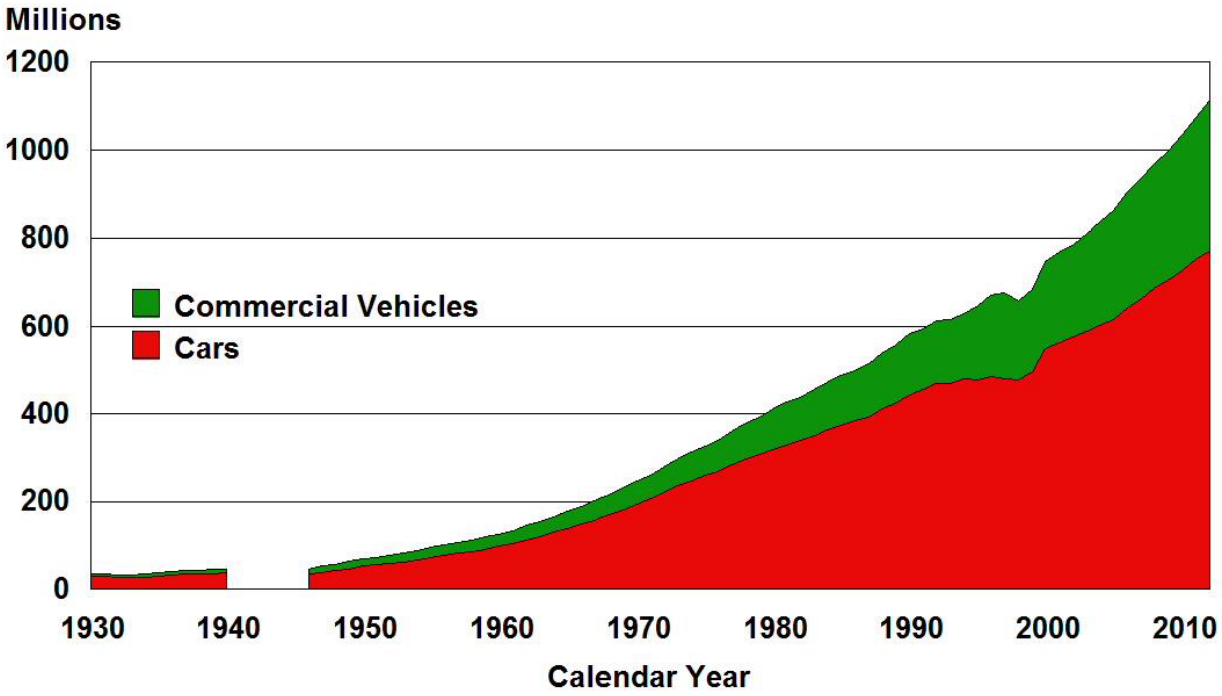
Introducing the Global Fuel Economy Initiative

Jane Akumu – UN Environment
Windhoek, Namibia 4 June 2019

GFEI
GLOBAL FUEL ECONOMY INITIATIVE

UN environment

World Population of Cars, Trucks and Buses



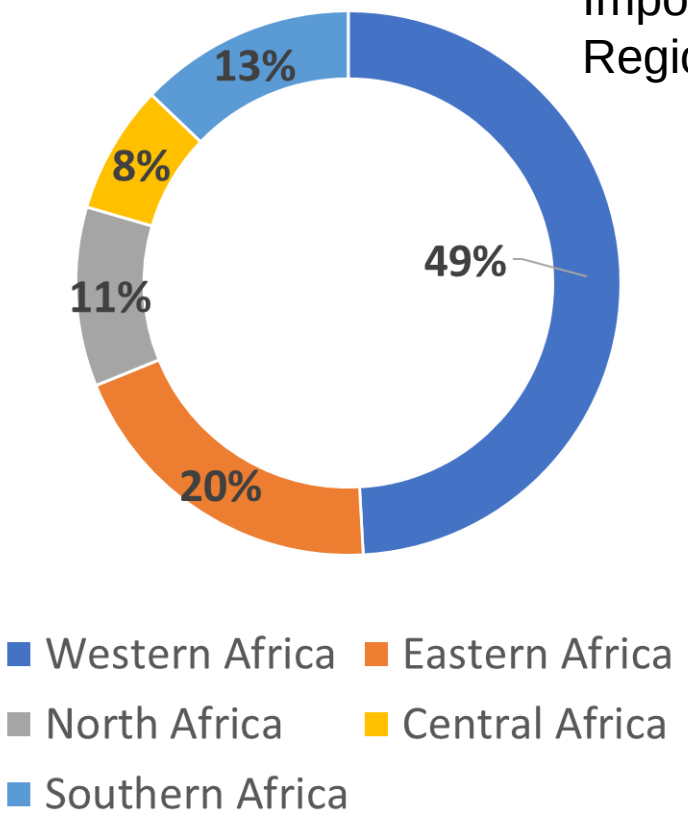
- Vehicle fleet to ***triple*** (from ~1 billion to ~3 billon 2050)
- 90%+ of growth in non-OECD countries
- Few non-OECD countries have FE policies

Source: Mike Walsh

Vehicles Status in Africa

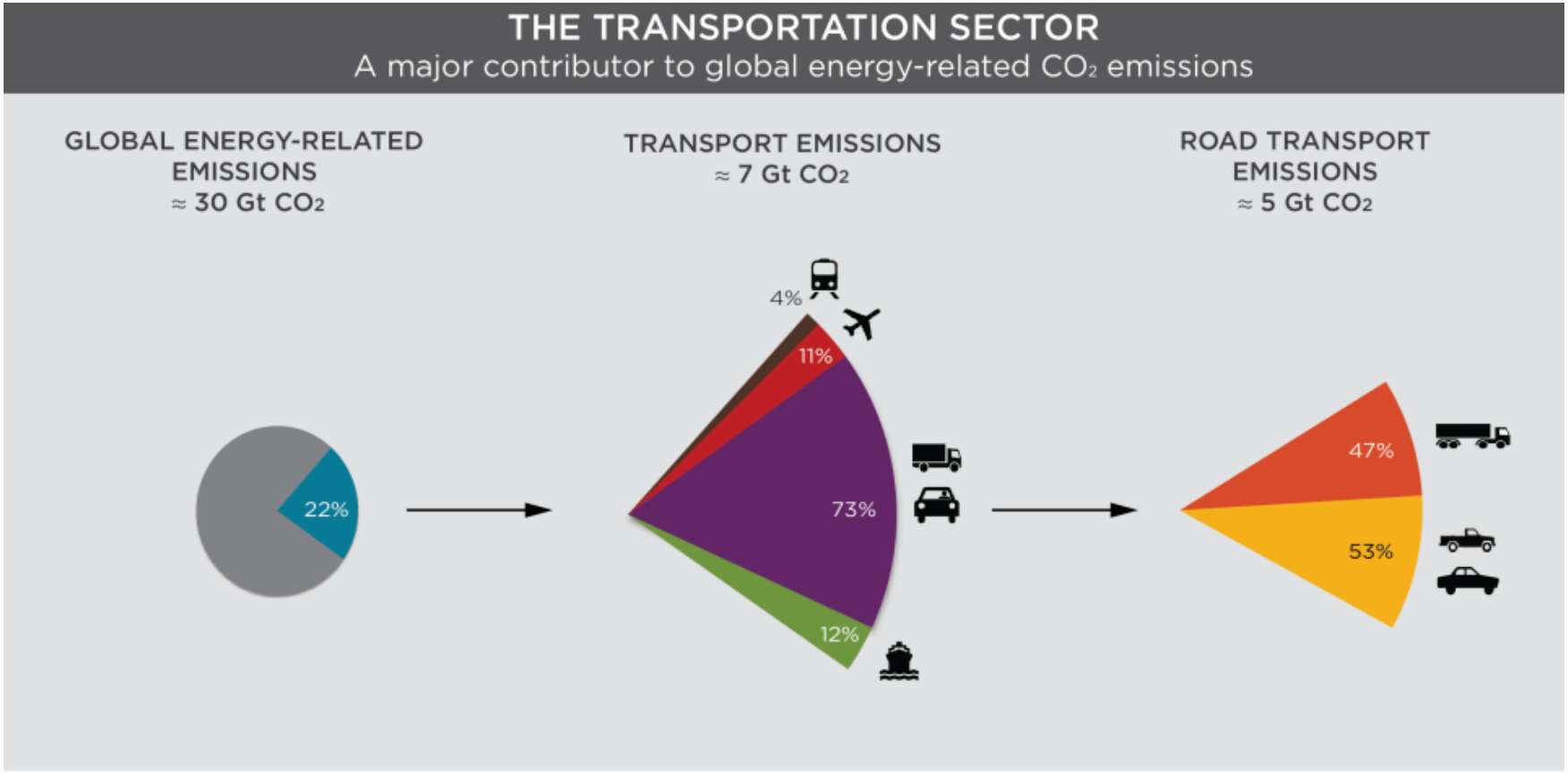
- 45 million Vehicles in Africa (2015) (OICA)
  - 27 vehicles per 1000 people in Sub Saharan Africa
- 2040, there will be nearly 137 million more light duty vehicles in Africa than in 2015, a growth of nearly 400% (World Bank,2018)
- 85-100% in most countries are used vehicles (LDVs & HDVs)
  - 90%+ Lesotho, Malawi, Tanzania, Zambia, Zimbabwe
- Africa has the highest per capita road traffic fatality rates – projected to increase by 112% by 2030 (WHO)
  - Road accidents account for up to 5% of GDP for several SADC countries
- 75% increase in transport emissions in Sub-Saharan Africa (2000 -2016)

Share of Used Vehicle Imports by Region (2017)



Japanese Export Vehicle Inspection Center (JEVIC)
Eurostat

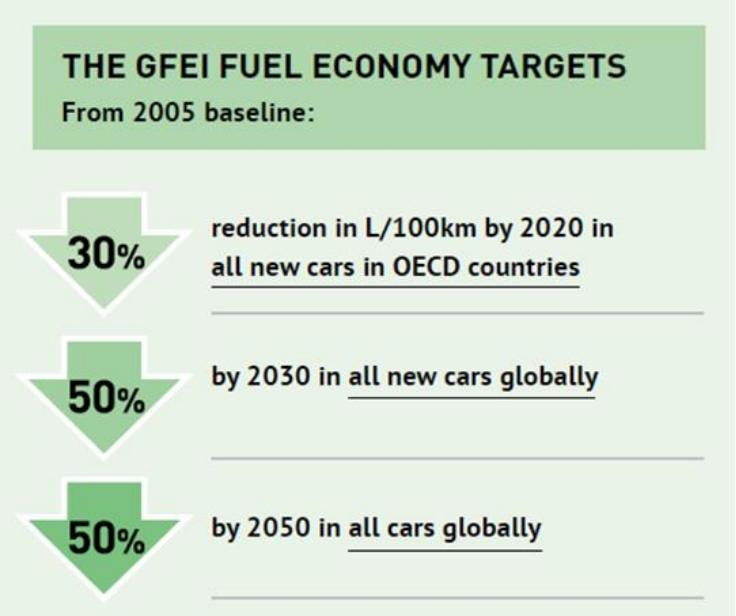
CO2 Emissions from Transport



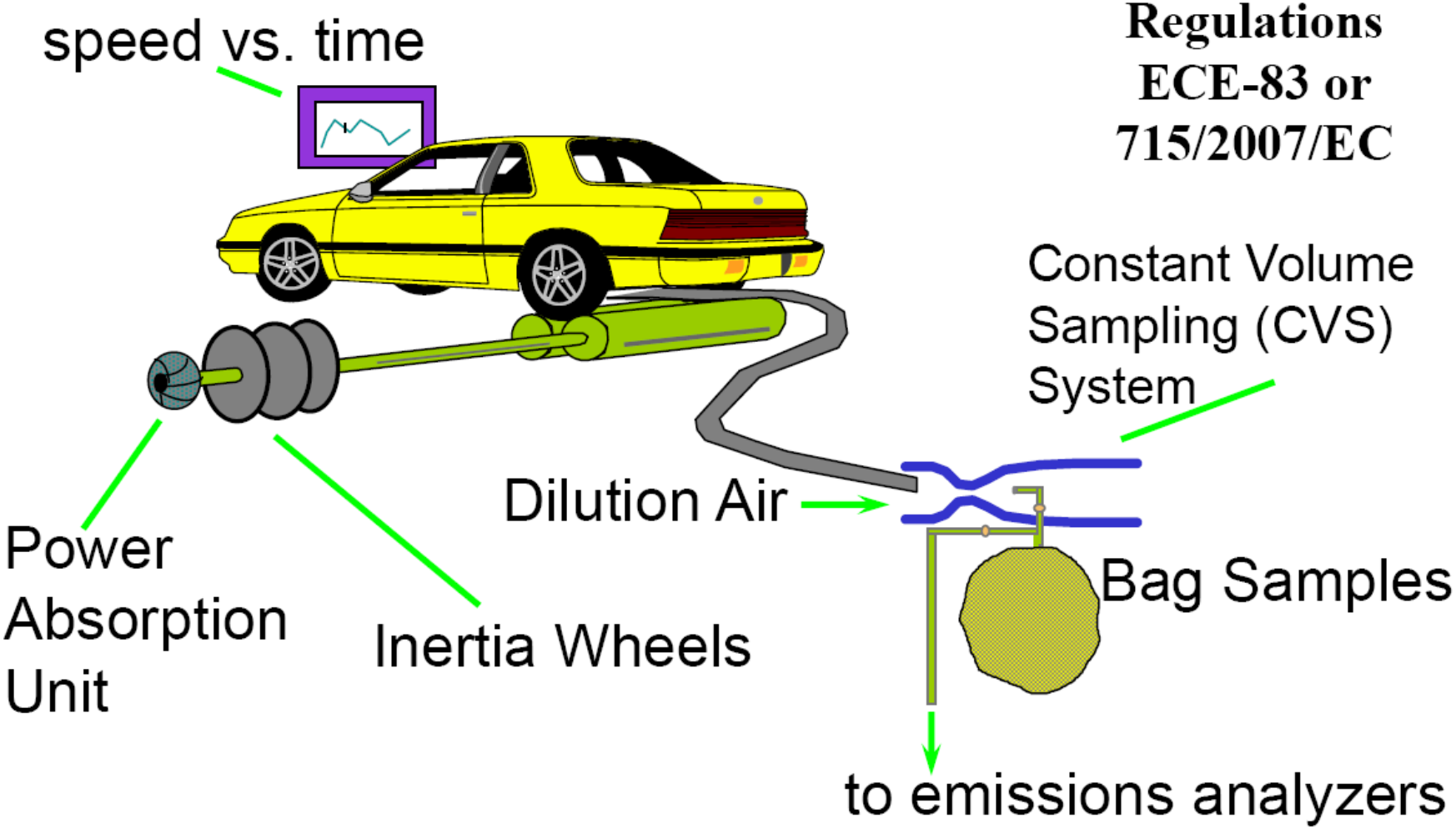
Sources:
ICCT (2014). Global Transportation Roadmap Model. Version 2.0. More information available at http://www.theicct.org/global-transportation-roadmap-model.
IEA (2012). CO2 Emissions from Fuel Combustion: Highlights. 2012 edition. Retrieved from https://www.iea.org/co2highlights/co2highlights.pdf.

What is fuel economy?

- Fuel economy measures energy per unit of vehicle travel
  - Litres per 100km (Europe)
  - Km per litre (Japan)
  - Miles per gallon (United States)
- Fuel economy, fuel consumption, fuel efficiency, fuel intensity are all fairly interchangeable terms.
- Also measured in CO_2 emissions
  - CO2 g/km
- Look for the tested fuel economy number for the vehicle



Typical Light Duty Vehicle Test Facility



- Measurements in g/km, mg/km or #/km

Source: Stuart Rayner, NAAMSA

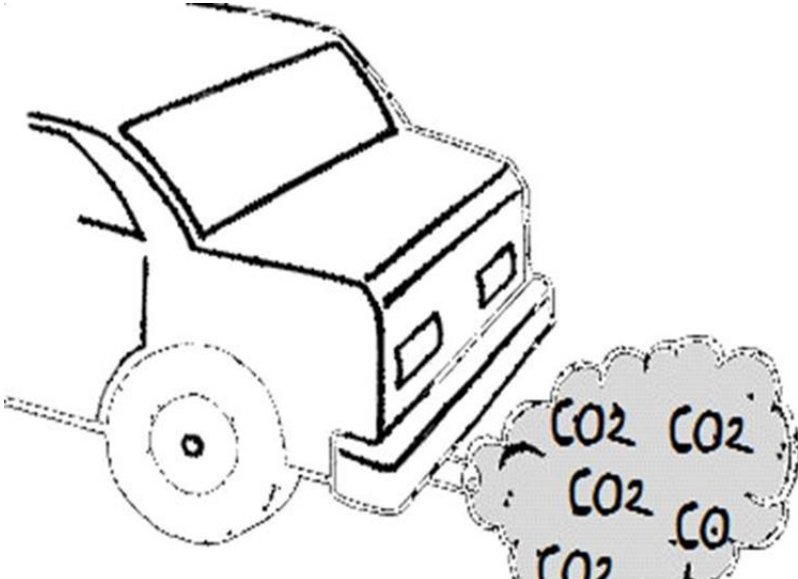
GFEI has set graduated global fuel economy improvement targets

Based on a 2005 Baseline:

30% by 2020: All new cars in OECD countries

50% by 2030: All new cars GLOBALLY, (**from 8 to 4 L/100km, on avg.)**

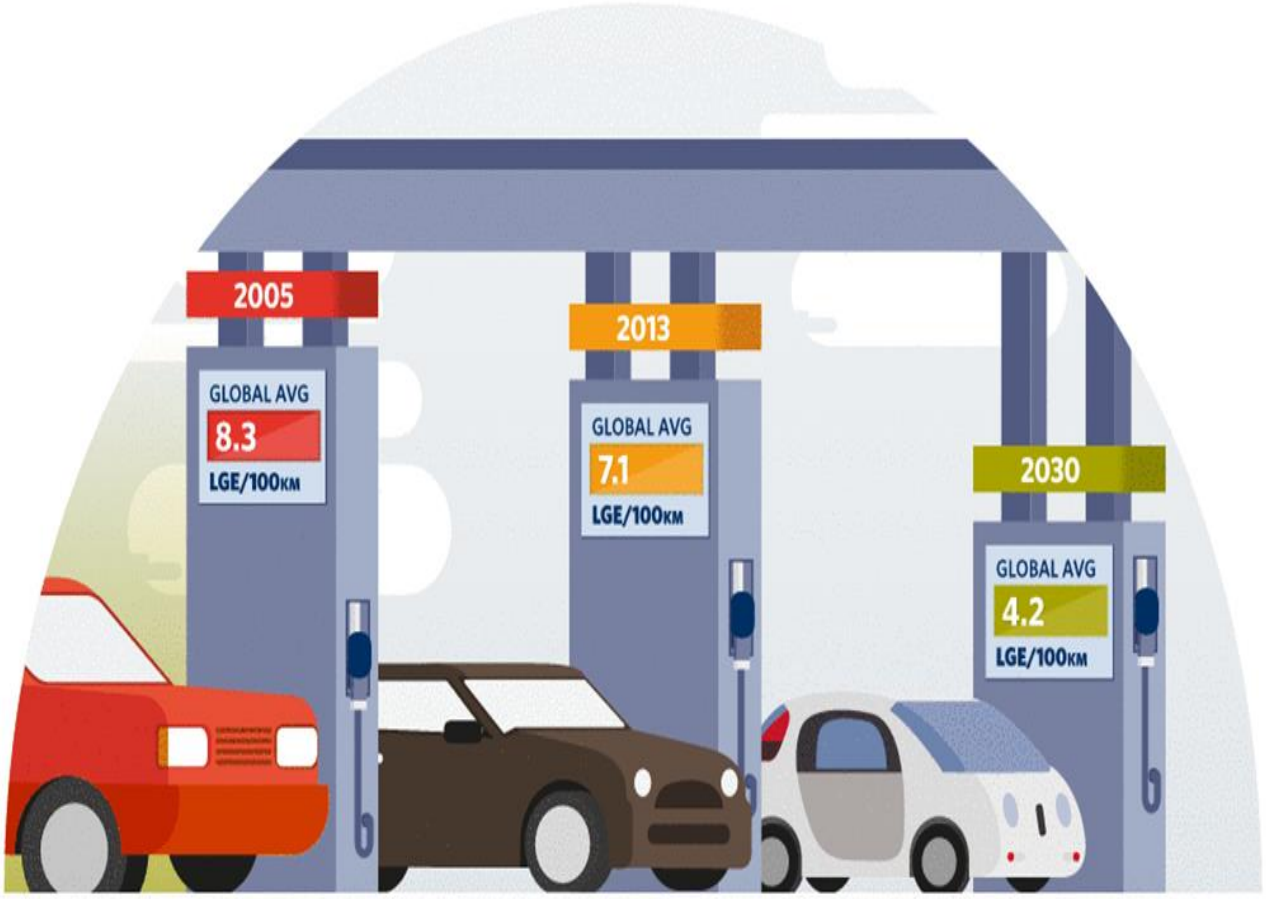
50% by 2050: All cars GLOBALLY



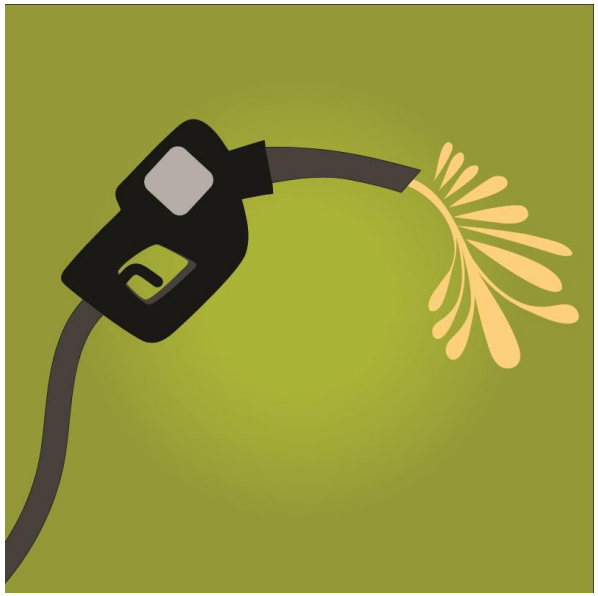
THE GLOBAL GOALS:
FUEL ECONOMY

DOUBLE AVERAGE FUEL ECONOMY

OF NEW CARS BY 2030 AND ALL CARS BY 2050



GFEI Benefits



- Reduced urban air pollution
- Fuel savings: estimated at over USD 300 billion in 2025 and 600 billion in 2050
- CO2 reduction: estimated at over 1 gigatonne a year by 2025 and over 2 gigatonnes by 2050

Partners:

FIA Foundation for the Automobile and Society

UNEP

UCDAVIS INSTITUTE OF TRANSPORTATION STUDIES

iea International Energy Agency

icct THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

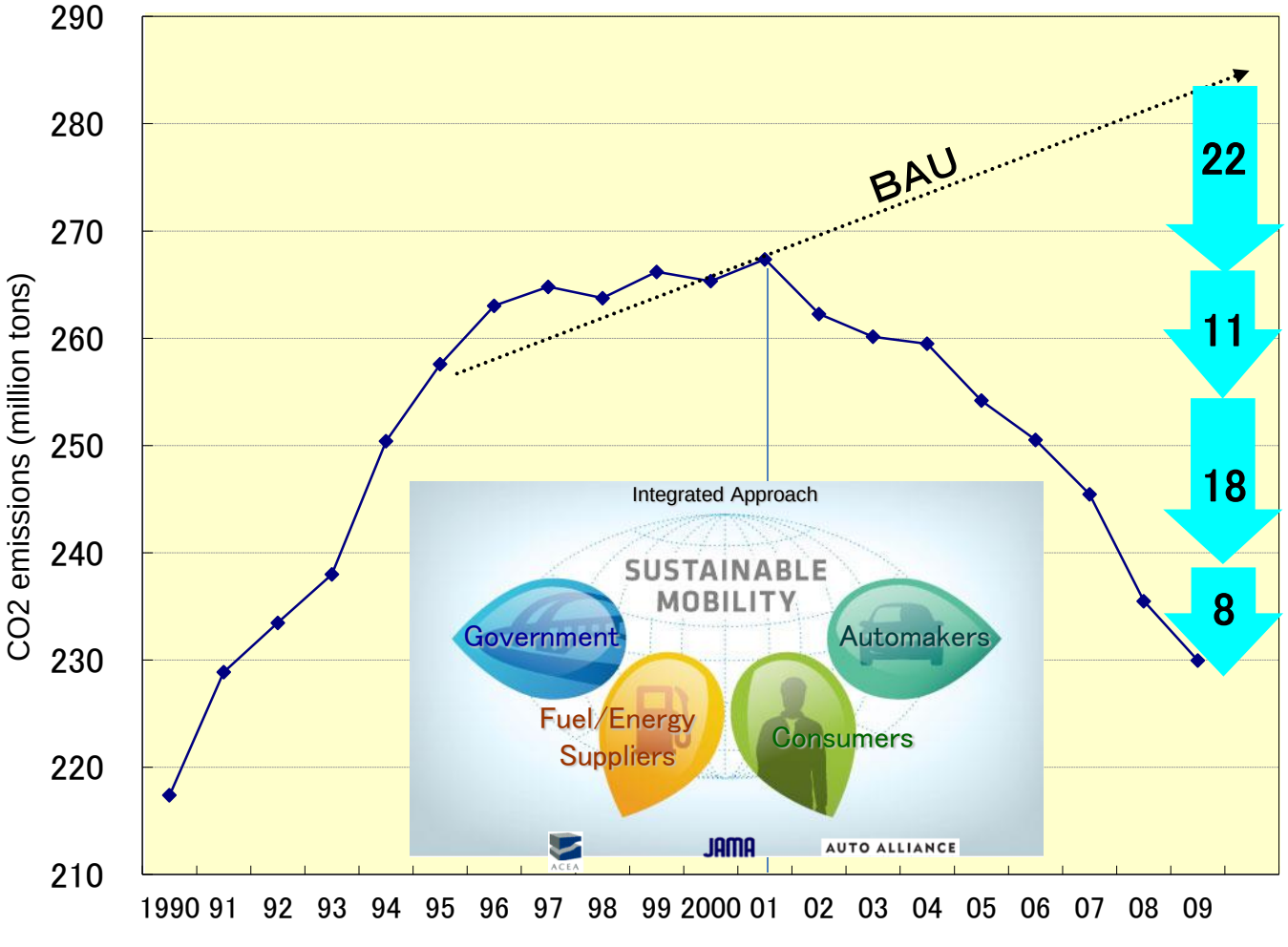
International Transport Forum

Donors:

FIA Foundation for the Automobile and Society

gef

CO_2 Emission Reduction in Japanese Transportation Sector



Fuel Economy

Traffic Flow

Eco-Driving

Alternative Fuels

Travel Distance (modal shifts, etc)

Others

source : JAMA

Doubling the efficiency of the global car fleet by 2050

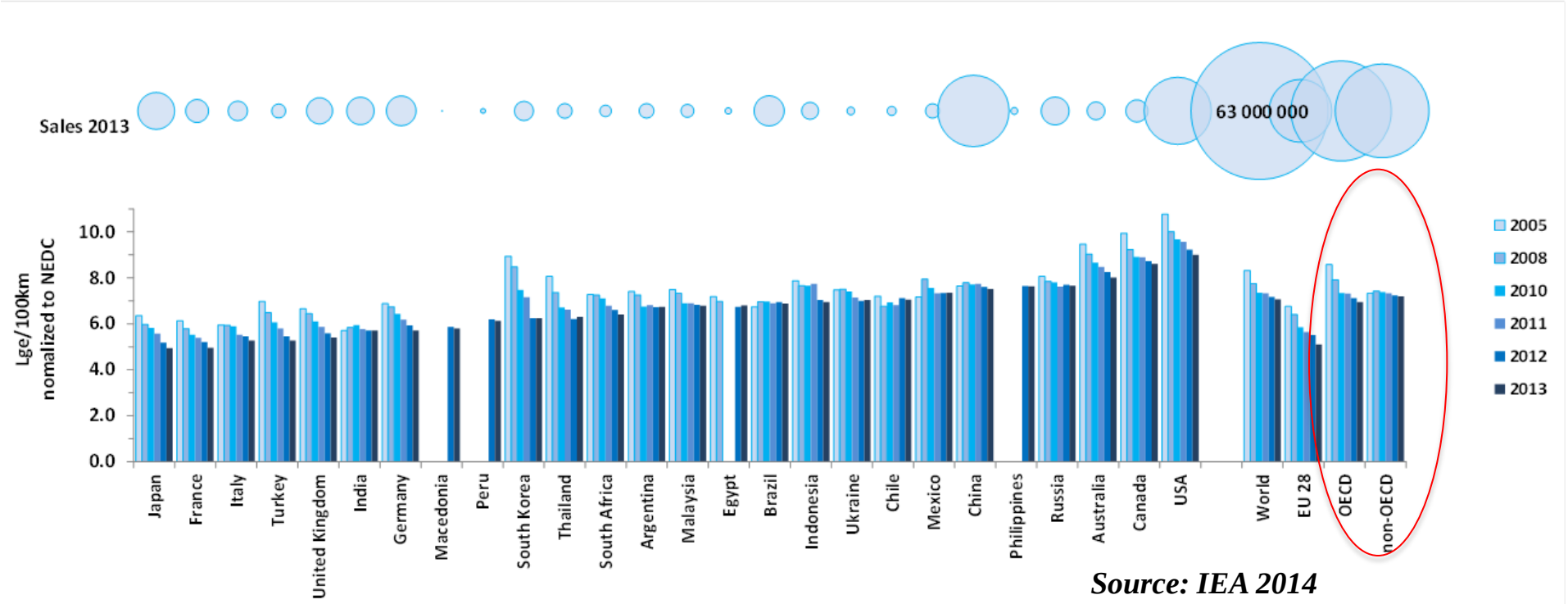
			2005	2008	2010	2012	2014	2015	2030
OECD & EU average	average fuel economy (Lge/100km)		8.8	8.2	7.8	7.6	7.4	7.3	
	annual improvement rate (% per year)			-2.3%	-2.8%	-1.6%	-1.3%	-0.5%	
					-1.8%				
Non-OECD average	average fuel economy (Lge/100km)		8.5	8.5	8.4	8.2	8.0	7.9	
	annual improvement rate (% per year)			-0.1%	-0.3%	-1.4%	-1.2%	-1.6%	
					-0.8%				
Global average	average fuel economy (Lge/100km)		8.8	8.3	8.1	7.8	7.6	7.6	4.4
	annual improvement rate (% per year)			-1.8%	-1.6%	-1.3%	-1.3%	-1.1%	
					-1.5%				
GFEI target	required annual improvement rate (% per year)	2005 base year	**-2.8%**						
		2015 base year							**-3.7%**

- ***Slowing improvement in OECD countries***
- ***Increasing improvement in non-OECD but not enough***
- ***Still far from meeting the GFEI target***

Source: IEA/ GFEI, 2017

Regional fuel economy trends

- Countries with FE policies in place show encouraging improvement rates
- Size shift vs. technology evolution moderates non-OECD improvement

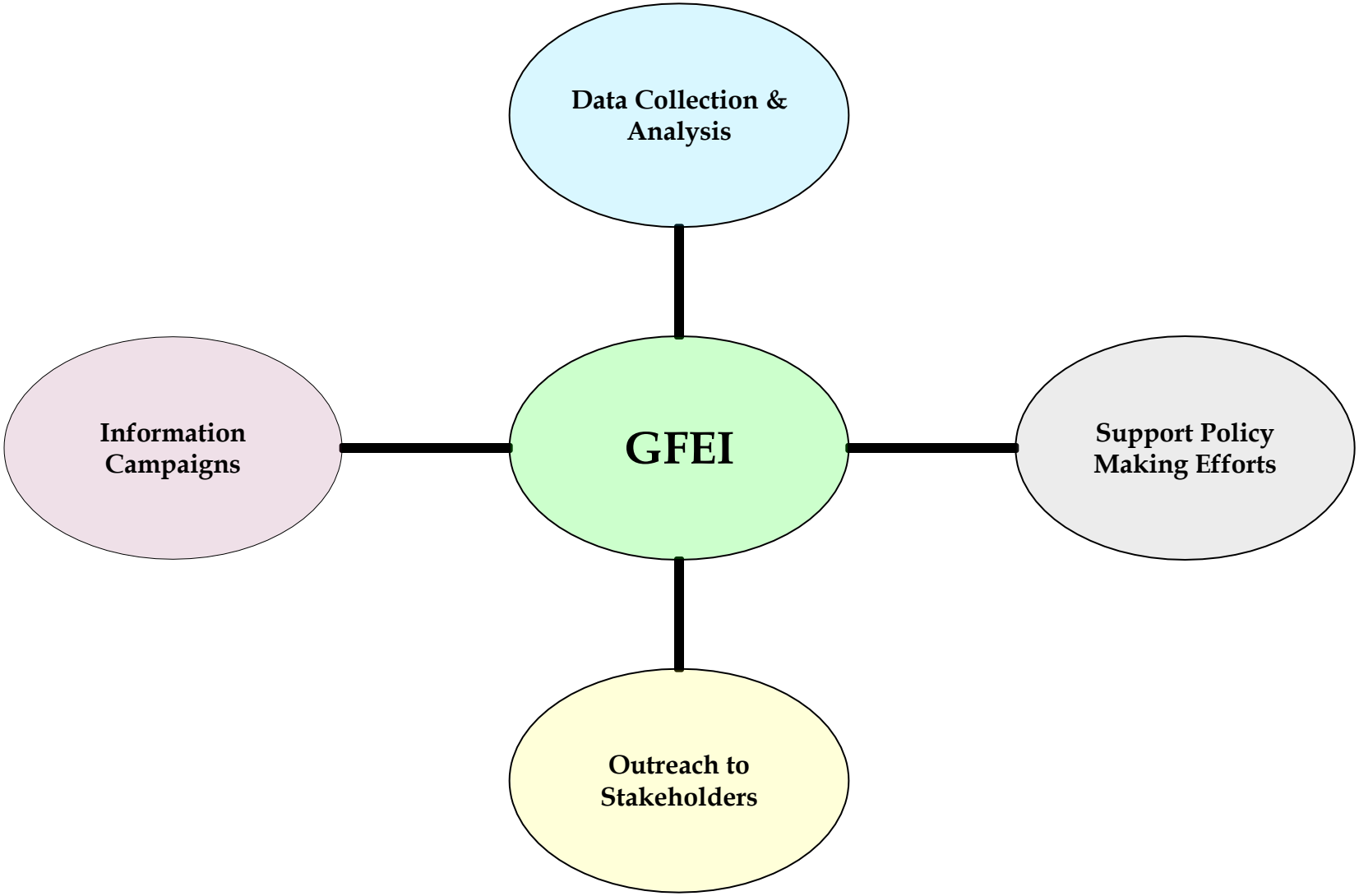


Source: IEA 2014

GFEI Country Engagement

countries with ongoing projects	new countries 2016/2017	Countries expressed interest
1Chile	28Malaysia	63Panama
2Ethiopia	29Bangladesh	64Iran
3Indonesia	30Kazakhstan	65Angola
4Kenya	31Mali	66Bhutan
5Georgia	32Nigeria	67Burkina Faso
6Ivory Coast	33Togo	68Burundi
7Mauritius	34Tanzania	69Cambodia
8Jamaica	35Rwanda	70Cameroon
9Montenegro	36Bolivia	71Cape Verde
10Macedonia	37Argentina	72D.R. Congo
11Costa Rica	38Ecuador	73Eritrea
12Vietnam	39Ukraine	74Fiji
13Morocco	40Jordan	75Guinea
14Bahrain	41Colombia	76Iran
15Tunisia	42Djibouti	77Kyrgyzstan
16Thailand	43Dominican Republic	78Laos
17Peru	44Guatemala	79Lesotho
18Russia	45Moldova	80Marshall Islands
19Benin	46Pakistan	81Mongolia
20Algeria	47Barbados	82Namibia
21Uruguay	50St. Lucia	83Niger
22Nepal	51Lebanon	84Papua New Guinea
23Paraguay	52Zambia	85Senegal
24Sri Lanka	53Ghana	86Sierra Leone
25Philippines	54Malawi	87Solomon Islands
26Uganda	55Zimbabwe	88South Africa
27Egypt	56Honduras	89Tajikistan
	57Nicaragua	90Turkmenistan
	58El Salvador	91Turkey
	59Botswana	92Armenia
	60Mozambique	93Azerbaijan
	61Myanmar	94Serbia
	62Liberia	95Samoa
		96Gambia
		97Uzbekistan
		98Bosnia-Herzegovina
		99Albania

Summary of GFEI Implementation



Why GFEI is important to African countries

- The project provides a good understanding of vehicles imported into the country e.g. models, sizes, technologies
- This will allow policymakers to choose the right combination of policy instruments to meet
  - national emission targets
  - energy security, and
  - efficiency goals

GFEI Implementation Steps

- Data Collection
  - Baseline Setting -2005
  - Trend (2008, 2011, 2013, 2016, 2018)
- Analysis of
  - Fleet composition
  - Vehicle regulations
  - Fiscal incentives
  - Fuel standards
- Policy Options
- National Consultations
- Regional Consultations

Vehicle data categories

- Data to be collected is for all vehicles entering a country for the first time:
  - new vehicles manufactured in the country
  - new vehicles imported
  - second hand vehicles imported into the country
  - car that is already in-country, but re-registered because re-sold should not be counted
- Useful to keep separate track of these three categories of vehicles, as well as creating a combined average set of information

Minimum information required

- Vehicle make and model
- Model production year
- Year of first registration
- Fuel type (petrol or diesel)
- Engine size
- Domestically produced or imported
- New or second hand import
- Rated Fuel Economy per model and test cycle basis
- Number of sales by model

Additional information

- Vehicle Information / Identification Number
- Injection system type
- Body type
- Transmission type and other vehicle configuration details, as available
- Vehicle foot print
- Vehicle curb weight
- Emissions certification level
- Use of vehicle (private, public, for hire, etc.)

Vehicle Type
Model
Manufacturer
Body type
Simplified Body Type
Segment
Axle configuration
Driven wheels
Engine cylinders
Engine ccm
CC Category
Engine kW
KW class
Engine horse power
Engine valves
Fuel type
Model year
Number of gears
Transmission type
Turbo
Gross vehicle weight
Height
Length
Number of seats

Estimating average fuel economy

- Look for the tested fuel economy number for the vehicle
- If not available the fuel economy figures for a given make, model and year can usually be retrieved from the vehicle manufacturers
- GFEI partners are compiling a list of fuel economies into a common database for use by countries undertaking baseline-setting exercise
- For the sake of comparison, all drive cycle data obtained be converted to the NEDC cycle
- Conversion factors can be downloadable from ICCT website www.theicct.org/info/data/GlobalStdReview_Conversionfactor.xlsx

Additional information

- http://www.carfolio.com/specifications/models; www.edmunds.com/toyota;
- http://www.carfolio.com/specifications/models/?man=4131
- http://www.epa.gov/fueleconomy/gas-label-1.htm; and
- http://www.carfolio.com/

- A Test Cycle Conversion Tool: www.theicct.org/info/data/GlobalStdReview_Conversionfactor.xlsx

- A global comparison of Vehicle Fuel Economy Standards: http://www.theicct.org/passenger-vehicles/global-pv-standards-update/

- South African Comparative Passenger Car Fuel Economy AND CO2 Emissions Data: http://www.naamsa.co.za/ecelabels/

- U.S. Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends (1975 through 2010): http://www.epa.gov/OMS/fetrends.htm

- U.S. Fuel Economy Policy: http://www.fueleconomy.gov/

- U.S. Fuel Economy Regulations: http://www.epa.gov/oms/climate/regulations.htm

- U.S. Auto Fuel Economy Database: http://www.fueleconomy.gov/feg/findacar.htm

Final Data

Make	Model	Condition	Body Type	Engine CC	Fuel Type	Model Year	Registration Date	L/100km	CO2
BMW	316I	Used	S.WAGON	1596	Petrol	1989	2005	7.5	176
CHEVROLET	OPTRA	Used	SALOON	1799	Petrol	2005	2005	6.2	145
CHEVROLET	NULL	Used	S.WAGON	1799	Petrol	2005	2005	6.2	145
NISSAN	SUNNY	Not Specified	SALOON	1970	Diesel	1998	2005	6.6	177
MITSUBISHI	LANCER	Used	SALOON	1600	Diesel	1998	2005	6.9	185
SKODA	OCTAVIA	Used	SALOON	1800	Diesel	2004	2005	7.0	188
SKODA	OCTAVIA	Used	SALOON	1800	Diesel	2005	2005	7.0	188
TOYOTA	COROLLA	New	S.WAGON	1970	Diesel	1998	2005	7.0	188
TOYOTA	COROLLA	New	SALOON	2000	Diesel	1998	2005	7.0	188
FORD	RANGER	New	VAN	2500	Petrol	2005	2005	8.1	170
HONDA	CR-V	NULL	S.WAGON	1970	Petrol	1998	2005	9.3	217

Average fuel economy

At the simplest level, taking a weighted average (by sales) of all new (including newly imported second hand) vehicles in the database will provide the average fuel economy of new vehicles sold in the country in the given year:

$$Harmonic\ average\ annual\ fuel\ economy = \frac{Total\ sales\ in\ the\ year}{\sum_1^n \frac{sales\ model\ i}{fuel\ economy\ model\ i}}$$

In a similar way, average CO_2 intensity can be obtained through weighted average with the sales of each model:

$$Average\ annual\ emission = \frac{\sum_1^n sales\ model\ i * emission\ model\ i}{Total\ sales\ in\ the\ year}$$

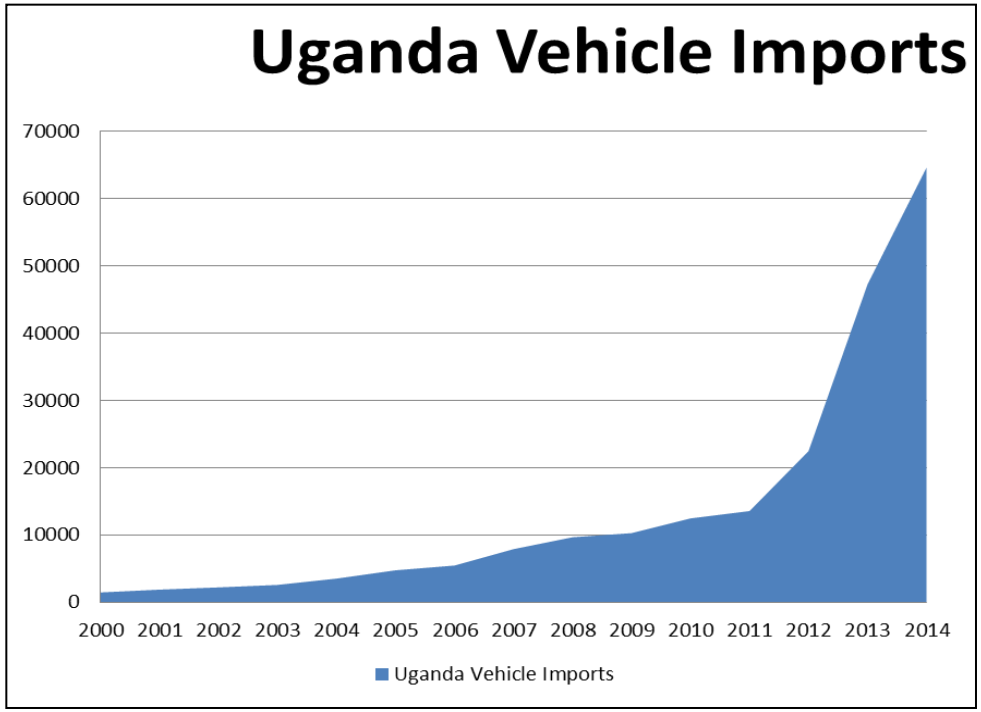
Fuel Economy Levels

Global	2005	2008	2011	2013
Average (l/100km)	8.07	7.67	7.2	7.1
OECD Average	8.1	7.6	7.0	6.9
Non-OECD Average	7.5	7.6	7.5	7.2

Zimbabwe	2005	2008	2011	2013	2016
Average (l/100km)	8	7.6	8.6	8.5	8.4

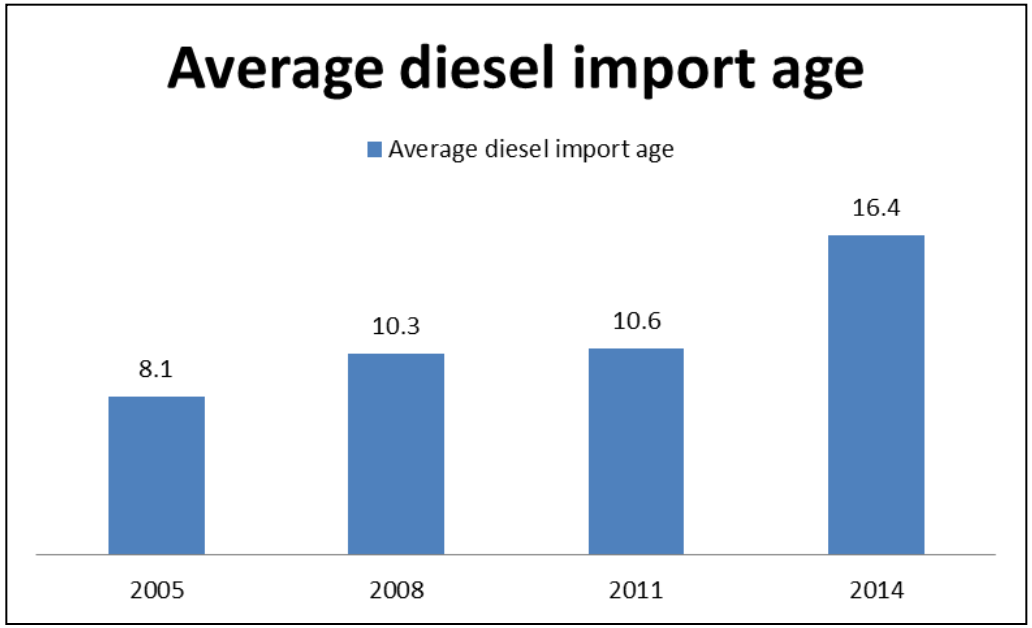
Kenya	2010	2011	2012	2013	2014	2015	2016
Average (l/100km)	7.4	7.6	7.7	7.5	6.7	7.4	7.3

Mauritius	2005	2013	2014	2015
LDV Average (l/100km)	7.0	6.6	5.8	5.9
HDV Average (l/100km)			19.5	17.8

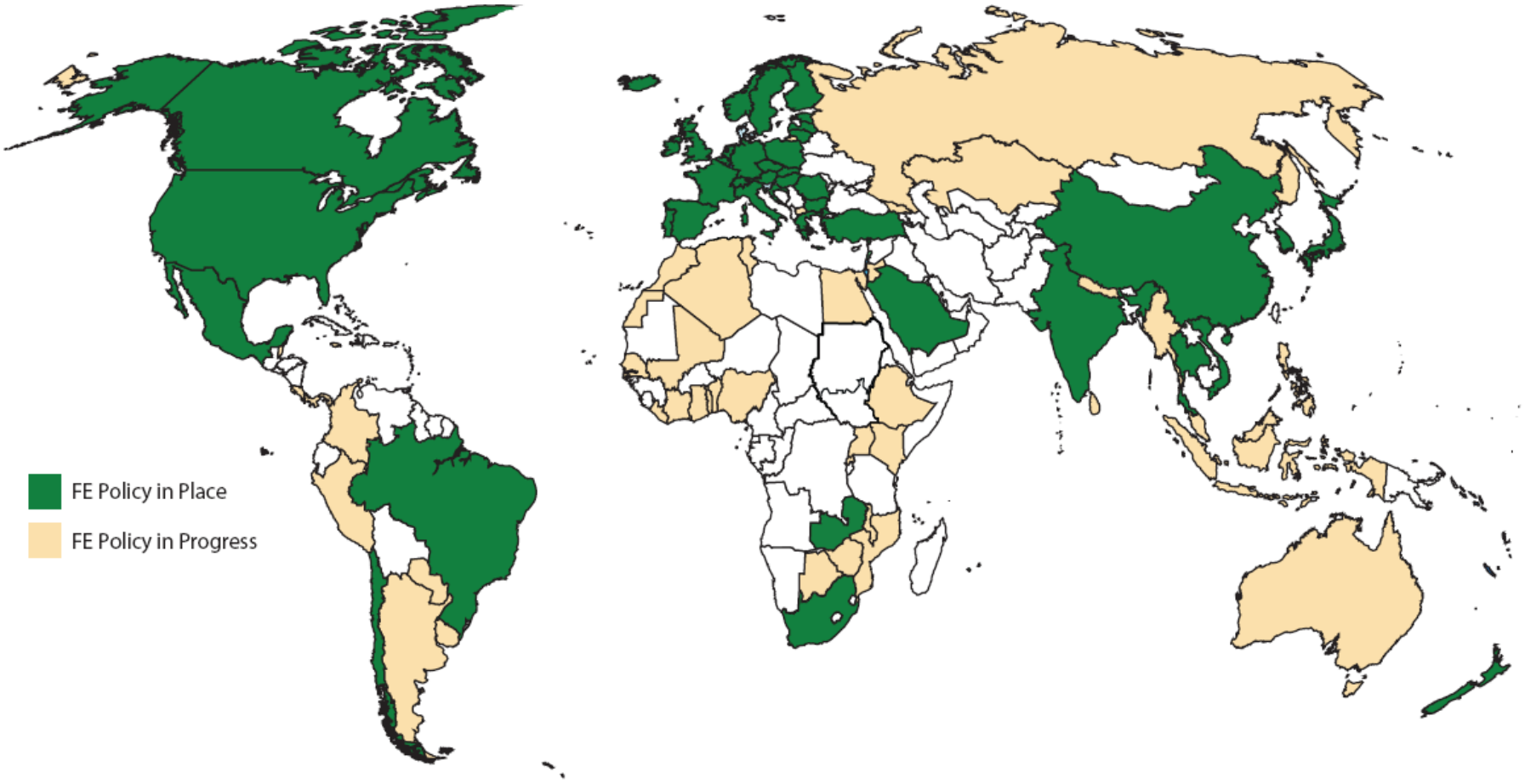


Example of Uganda

Uganda	2005	2008	2011	2014
Average (l/100km)	10.94	11.14	11.34	12.15



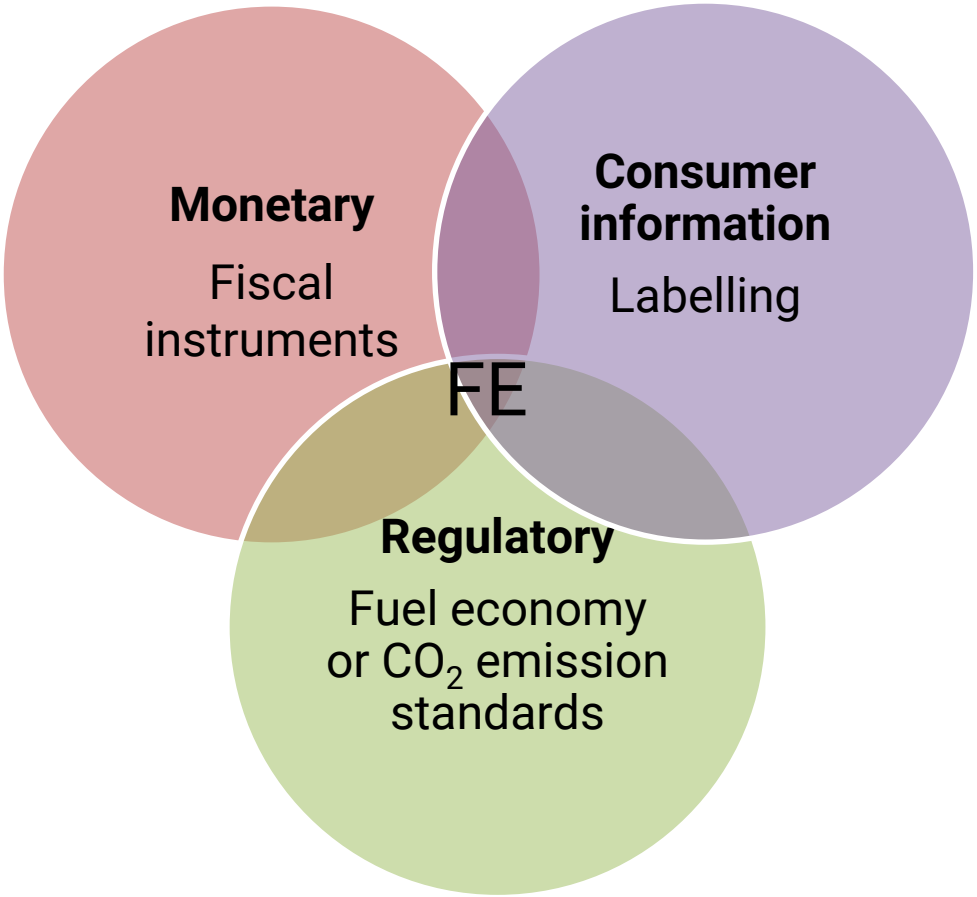
Global Progress on Fuel Economy Policy



For more information visit www.globalfueleconomy.org

Global Fuel Economy Initiative (GFEI)

Fuel economy policies & instruments



Target group:

Consumer

Manufacturer

Mauritius

- Adopted a feebate scheme in 2011 at 158 CO2g/km
- 2013 amended to 150 CO2g/km
- Fuel economy improved from 7l/100km in 2005 to 5.8l/100km in 2014
- 50 % excise duty waived on electric and hybrid cars and registration fee
- 2009 to 2014, hybrid increased from 43 to 1824 and electric cars from 0 to 8
- 2016 replace by a taxation system with additional incentives to electric vehicles

Type	Current	New
Conventional		
Up to 550 cc	15%	0
551-1000 cc	55%	45%
1001-1600 cc	55%	50%
1601-2000 cc	75%	No change
Above 2,000 cc	100%	No change
Hybrid		
Up to 1600 cc	55%	25%
1601-2000 cc	75%	45%
Above 2000 cc	100%	70%
Electric cars		
Up to 180 Kw	25%	0
Above 180 Kw	25%	No change

European Union

- 12% of total CO_2 emissions from transport
- average for all new cars is 130 grams of CO2 per kilometre (g/km) by 2015 and 95g/km by 2021
- reductions of 18% and 40% compared to 2007 -158.7g/km
- 2015 fuel consumption target
  - 5.6 l/100 km of petrol
  - 4.9 l/100 km of diesel
- 2021 target
  - 4.1 l/100 km of petrol
  - 3.6 l/100 km of diesel

Labeling and CO_2-based Tax in Thailand

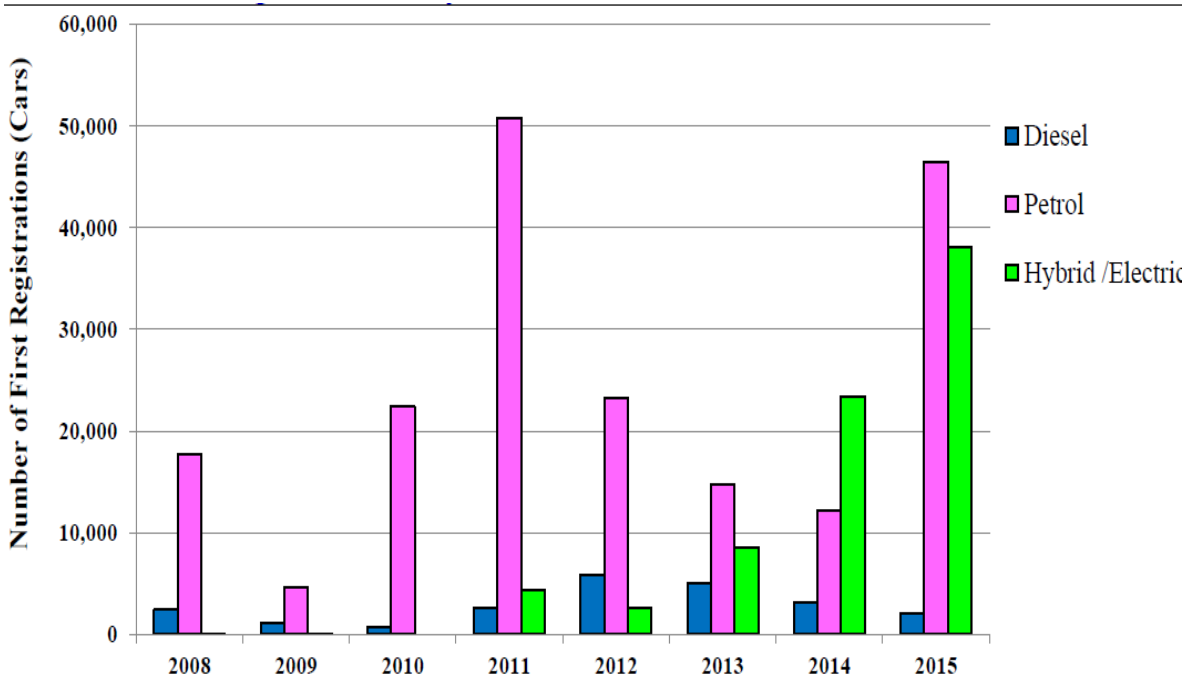
- Excise tax combines CO2 ratings/engine capacity/fuel type
- Mandatory eco-sticker

Types of Vehicles		Fuel type / Tax rates		
	CO2/ engine capacity	E10/ E20	E85/ NGV	Hybrid
Passenger vehicles – cars and vans with less than 10 seats	≤ 100 g/km	30	25	10
	101-150 g/km	30	25	20
	151-200 g/km	35	30	25
	>200 g/km	40	35	30
	>3,000 cc	50	50	50
~~				
Electric vehicle/ fuel cell	≤ 3,000 cc (180 Kw)	10		
	> 3,000 cc (180 Kw)	50		

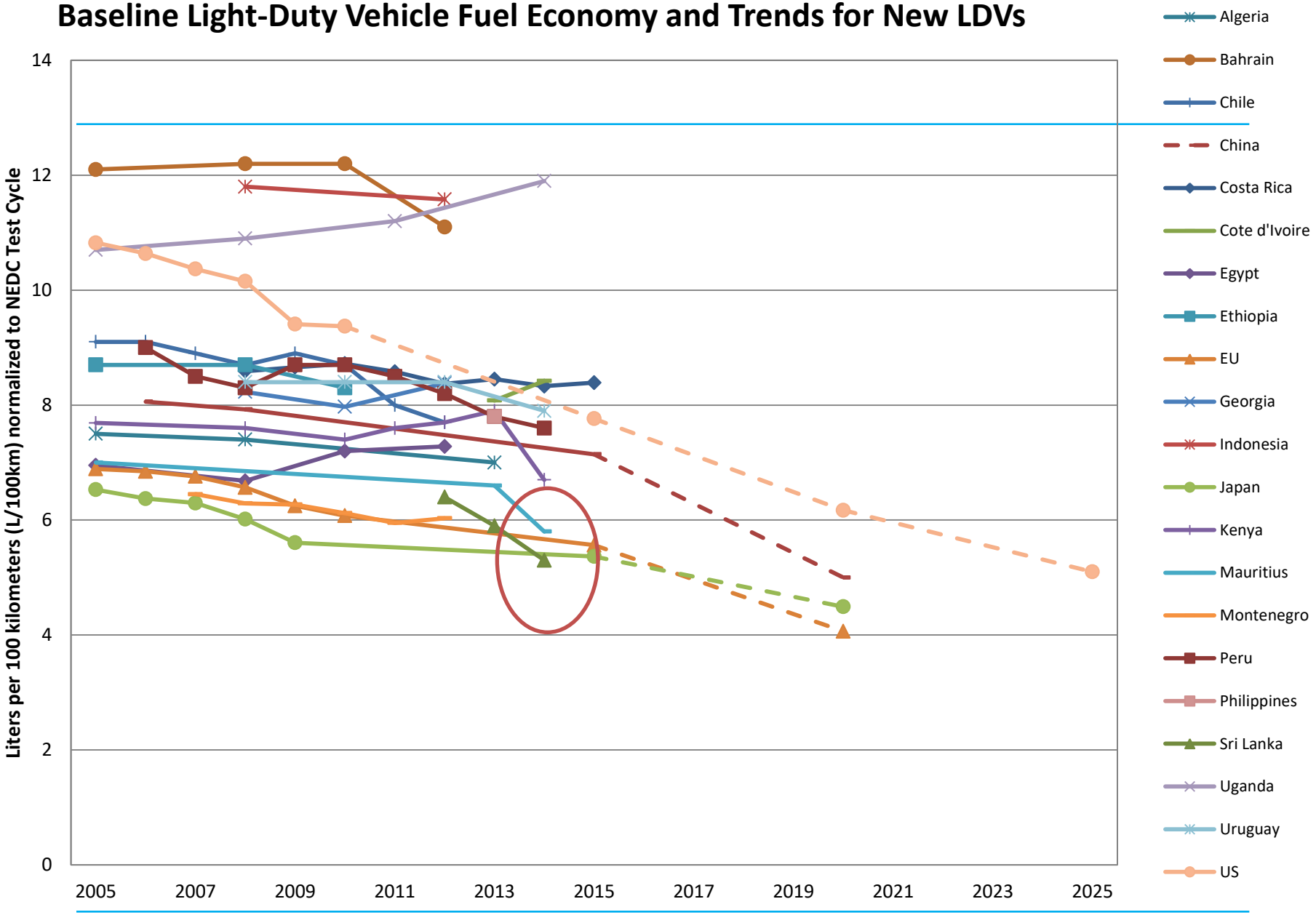
Source: Energy Policy and Planning Office and Department of Alternative Energy Development, 2015

Hybrid and Electric cars in Sri Lanka

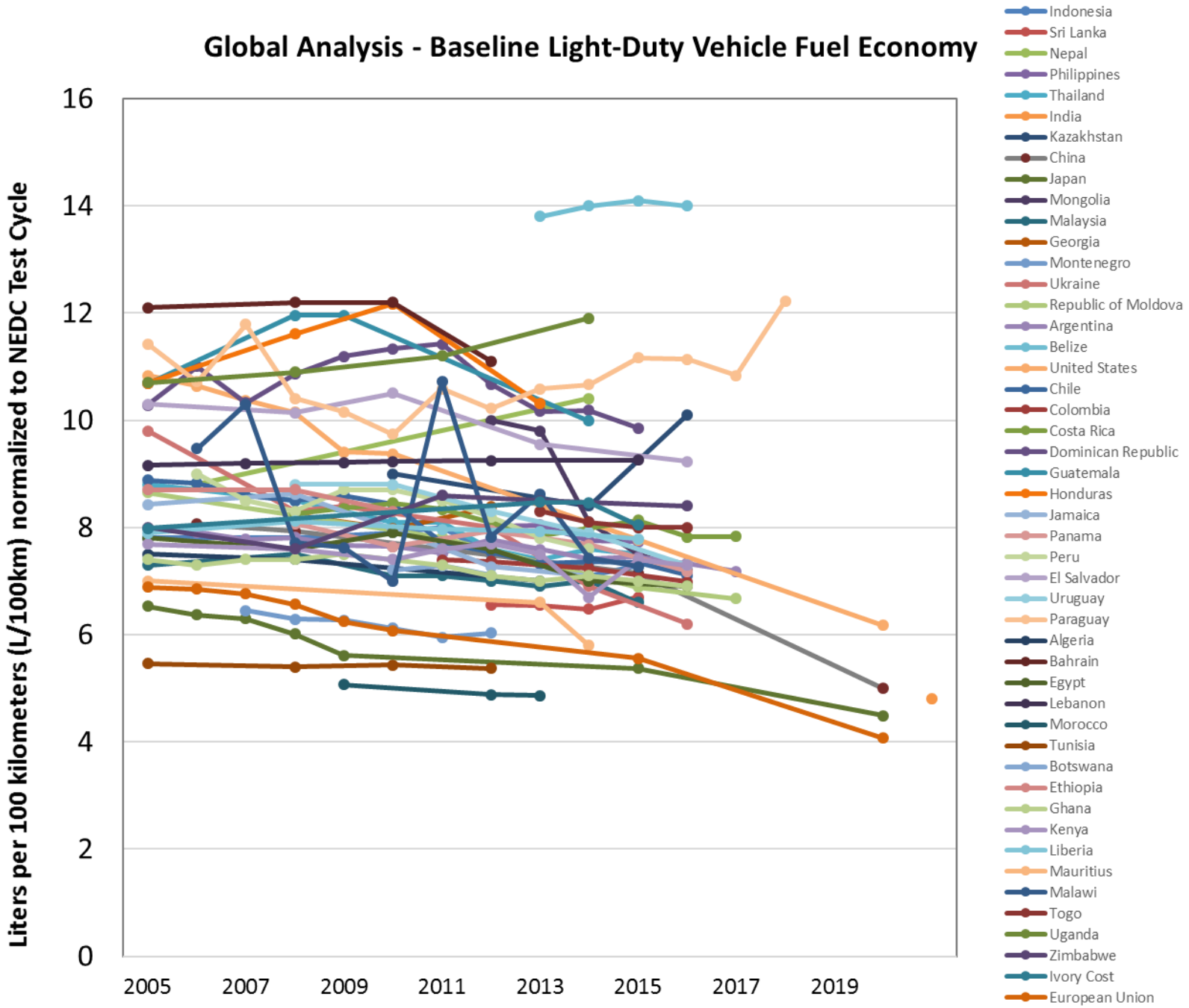
- Hybrid and electric cars in 2014 was 56% of the total number of cars
- Hybrid-petrol, petrol and diesel vehicles attract 58%, 253% and 345%, respectively, in excise tax
- Fully electric vehicles are levied at 25%.

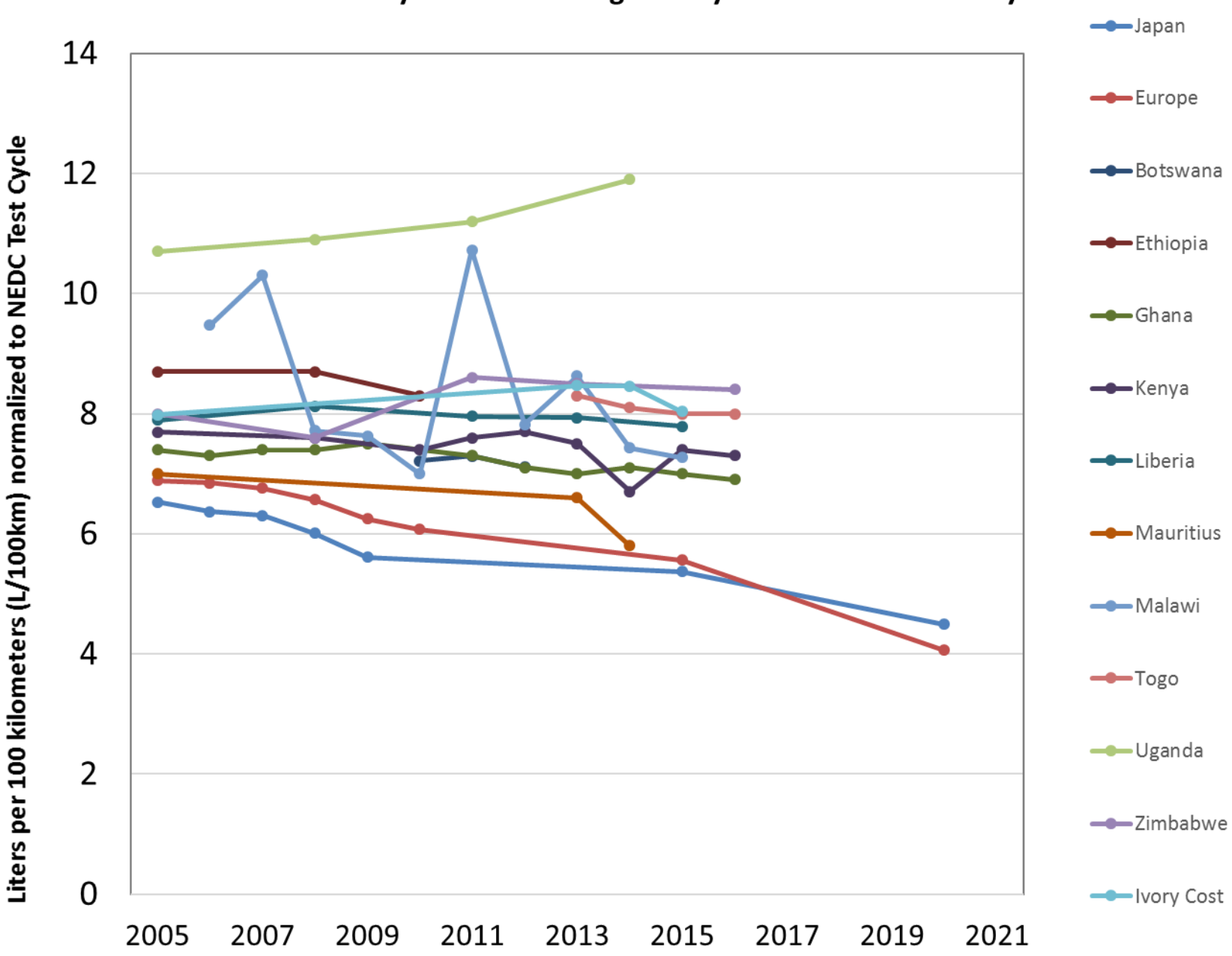


Baseline Light-Duty Vehicle Fuel Economy and Trends for New LDVs



Source: UNEP, 2017 (unpublished).


Global Analysis - Baseline Light-Duty Vehicle Fuel Economy
Liters per 100 kilometers (L/100km) normalized to NEDC Test Cycle
16
14
12
10
8
6
4
2
0
2005
2007
2009
2011
2013
2015
2017
2019
Indonesia
Sri Lanka
Nepal
Philippines
Thailand
India
Kazakhstan
China
Japan
Mongolia
Malaysia
Georgia
Montenegro
Ukraine
Republic of Moldova
Argentina
Belize
United States
Chile
Colombia
Costa Rica
Dominican Republic
Guatemala
Honduras
Jamaica
Panama
Peru
El Salvador
Uruguay
Paraguay
Algeria
Bahrain
Egypt
Lebanon
Morocco
Tunisia
Botswana
Ethiopia
Ghana
Kenya
Liberia
Mauritius
Malawi
Togo
Uganda
Zimbabwe
Ivory Cost
European Union


Sub-Sahara Africa Analysis - Baseline Light-Duty Vehicle Fuel Economy
Liters per 100 kilometers (L/100km) normalized to NEDC Test Cycle
0
2
4
6
8
10
12
14
2005
2007
2009
2011
2013
2015
2017
2019
2021
Japan
Europe
Botswana
Ethiopia
Ghana
Kenya
Liberia
Mauritius
Malawi
Togo
Uganda
Zimbabwe
Ivory Cost

Summary

- High growth rate of passenger car sales (and other vehicles) with relatively high fuel economy will persist without fuel economy policies
- Implementing fuel economy policies can substantially reduce CO2 emissions – supporting the Paris Agreement
- Also reduces fossil fuel consumption and national expenditures on fossil fuels
- Improves air quality through adoption of more advanced vehicles and technologies
- Even though countries need tailor made policy interventions, a regional roadmap will be important to have a common framework

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