The Global Fuel Economy Initiative

GFEI
GLOBAL FUEL ECONOMY INITIATIVE

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Podgorica, Montenegro
20 November 2015

- Why are we here?

  - ❑ Auto fuel economy
  - ❑ GFEI
  - ❑ Global view, COP21
  - ❑ Focus on Montenegro (tools, policy options, INDC's)

GFEI
GLOBAL FUEL ECONOMY INITIATIVE
www.globalfueleconomy.org

Global Fuel Economy Initiative

Six core partners: FIA Foundation, UNEP, IEA, ITF, ICCT and UC Davis, financial support from GEF and EU

GFEI recognized as leading initiative in energy and climate reports and discussions

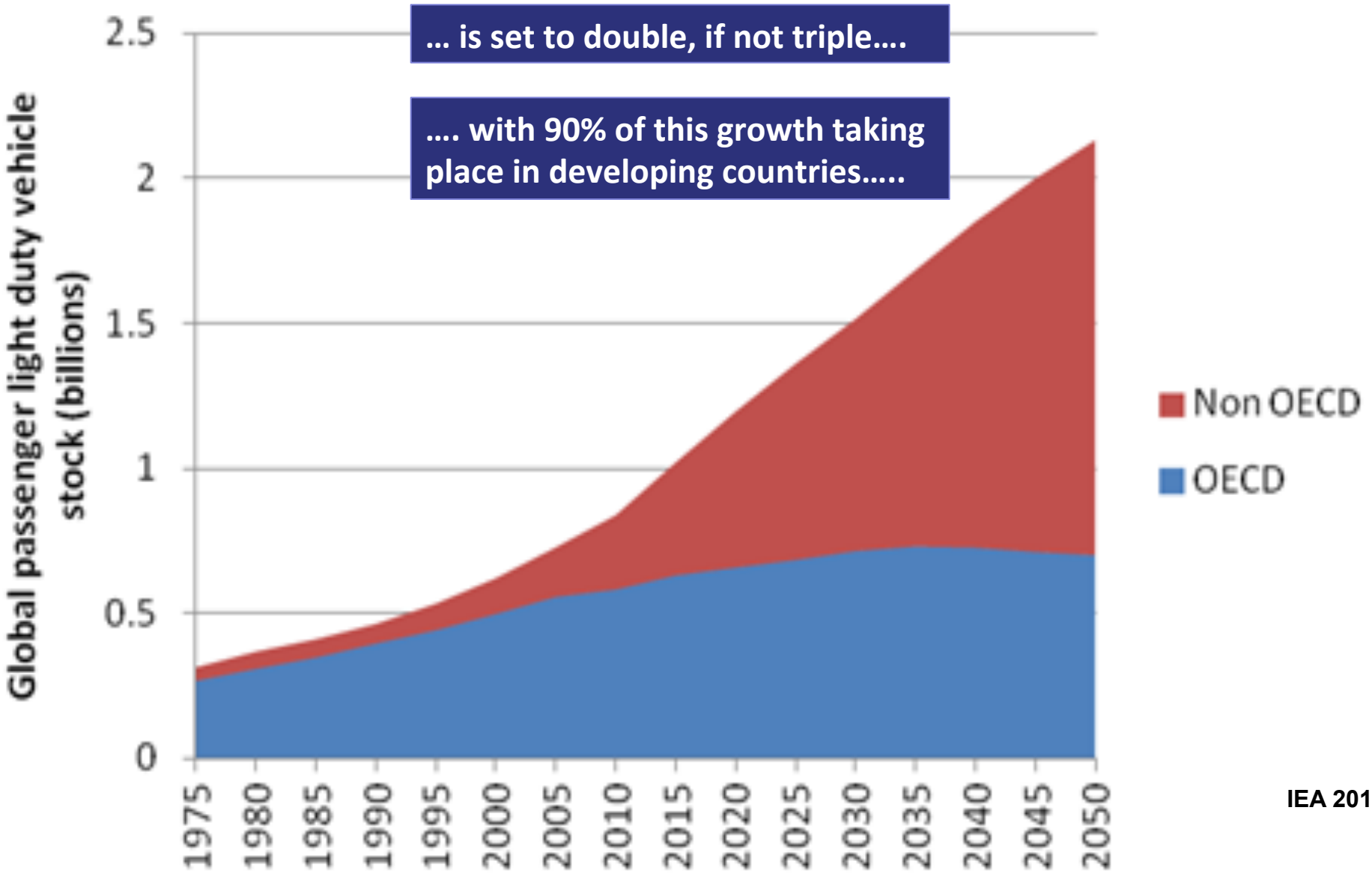
THE GFEI FUEL ECONOMY TARGETS

From 2005 baseline:

- **30%** reduction in L/100km by 2020 in all new cars in OECD countries
- **50%** by 2030 in all new cars globally
- **50%** by 2050 in all cars globally

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

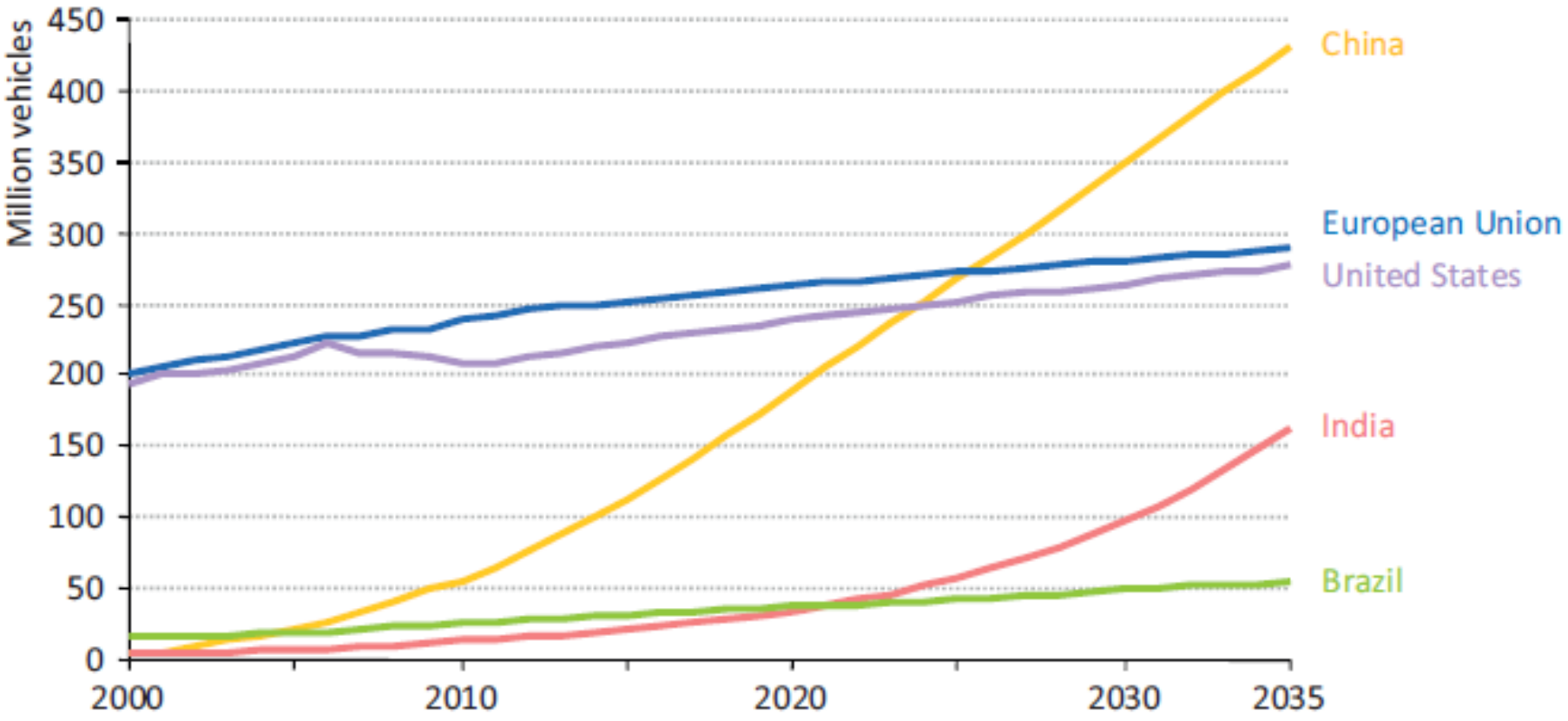
The Global Auto Fleet



IEA 2011

IEA WEO 2012: heading toward 2 billion cars

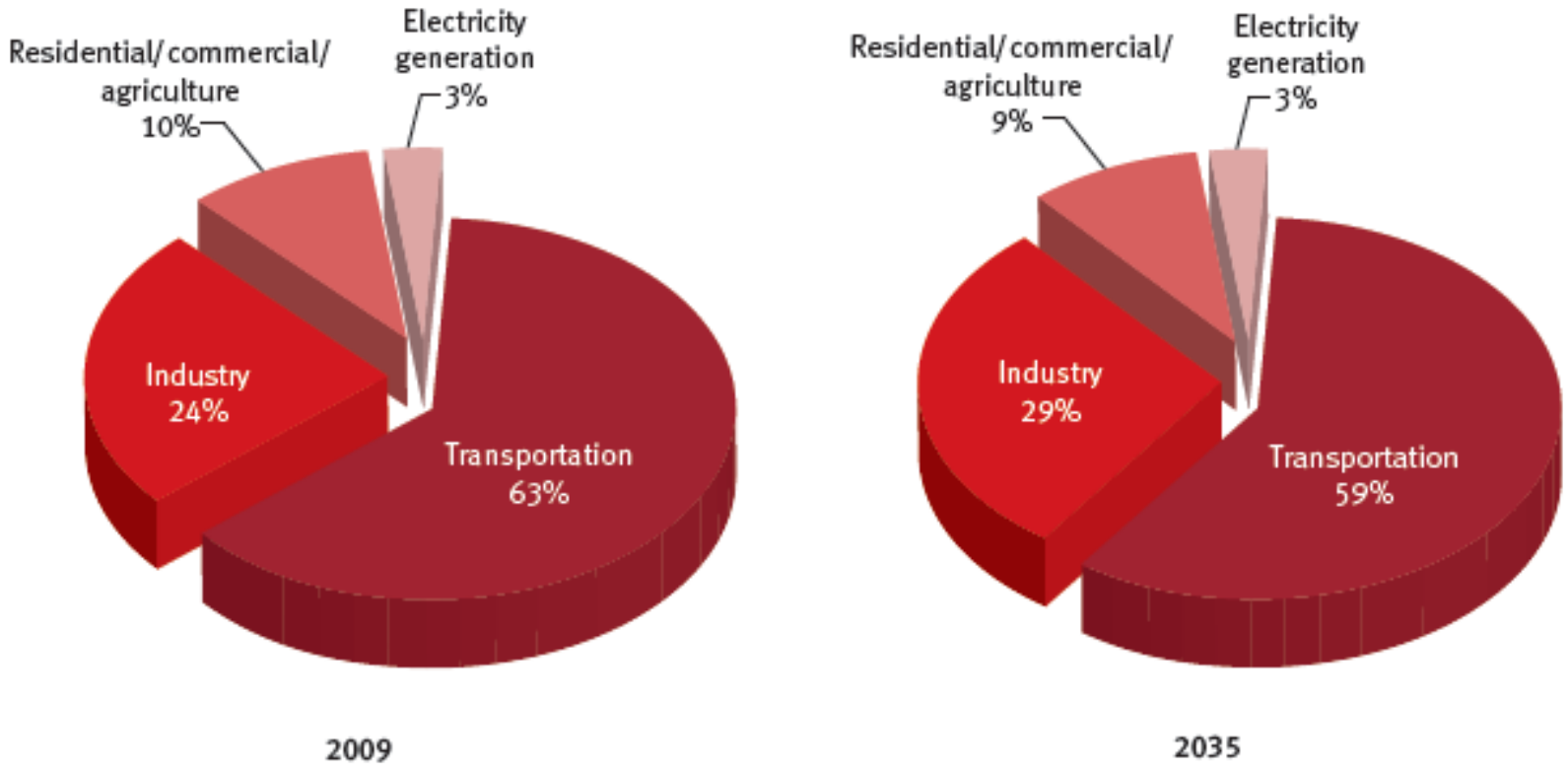
OECD is fairly saturated, but rest of the world is not:



Transport over ~60% global oil demand,

among fastest growing sectors of CO_2 emissions from fuel combustion, passenger transport 60% and freight transport 40% of transport energy demand

Percentage shares of oil demand by sector in 2009, 2035 – OECD

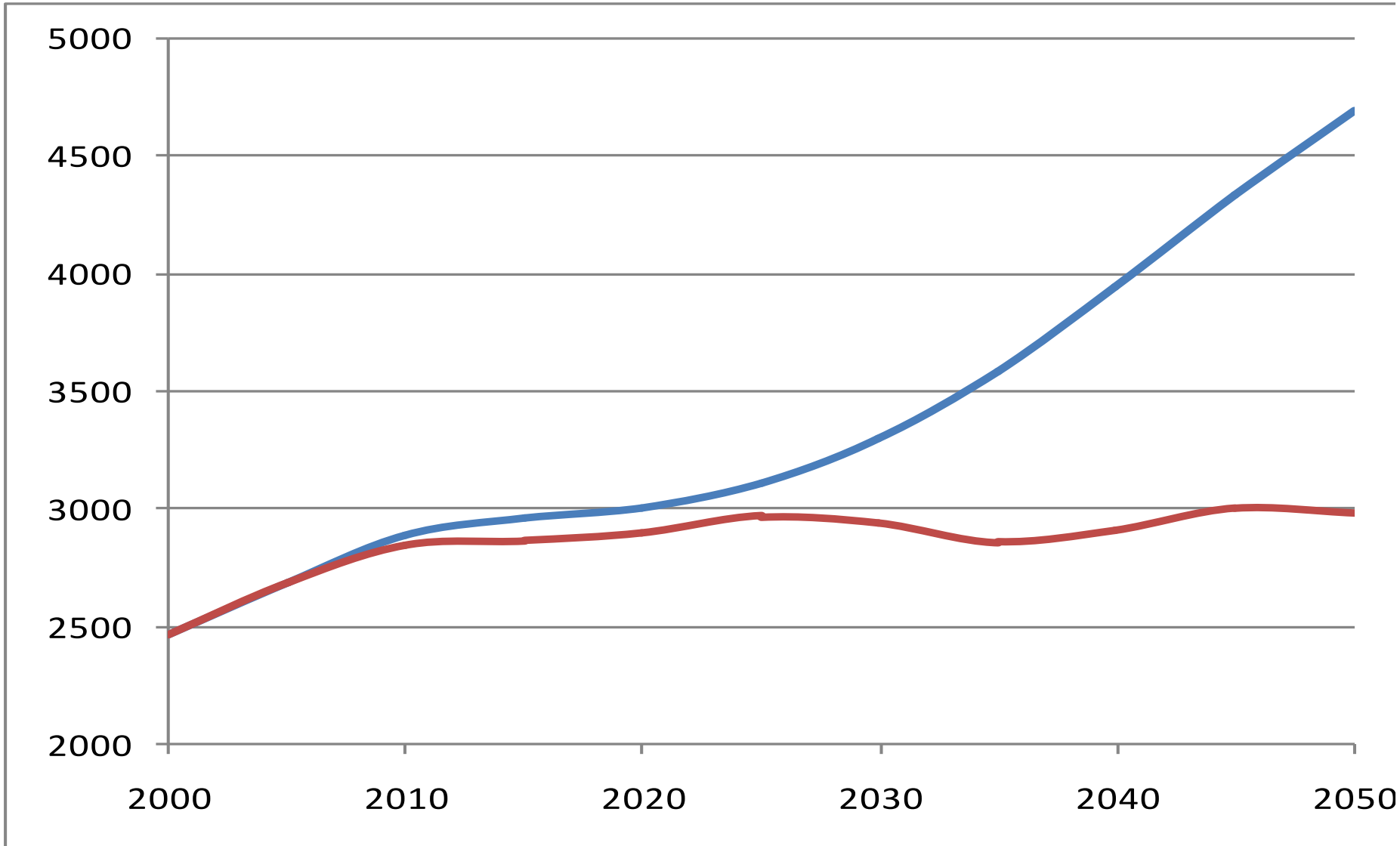


Source: OECD/IEA Energy Balances of OECD/non-OECD countries, 2011.

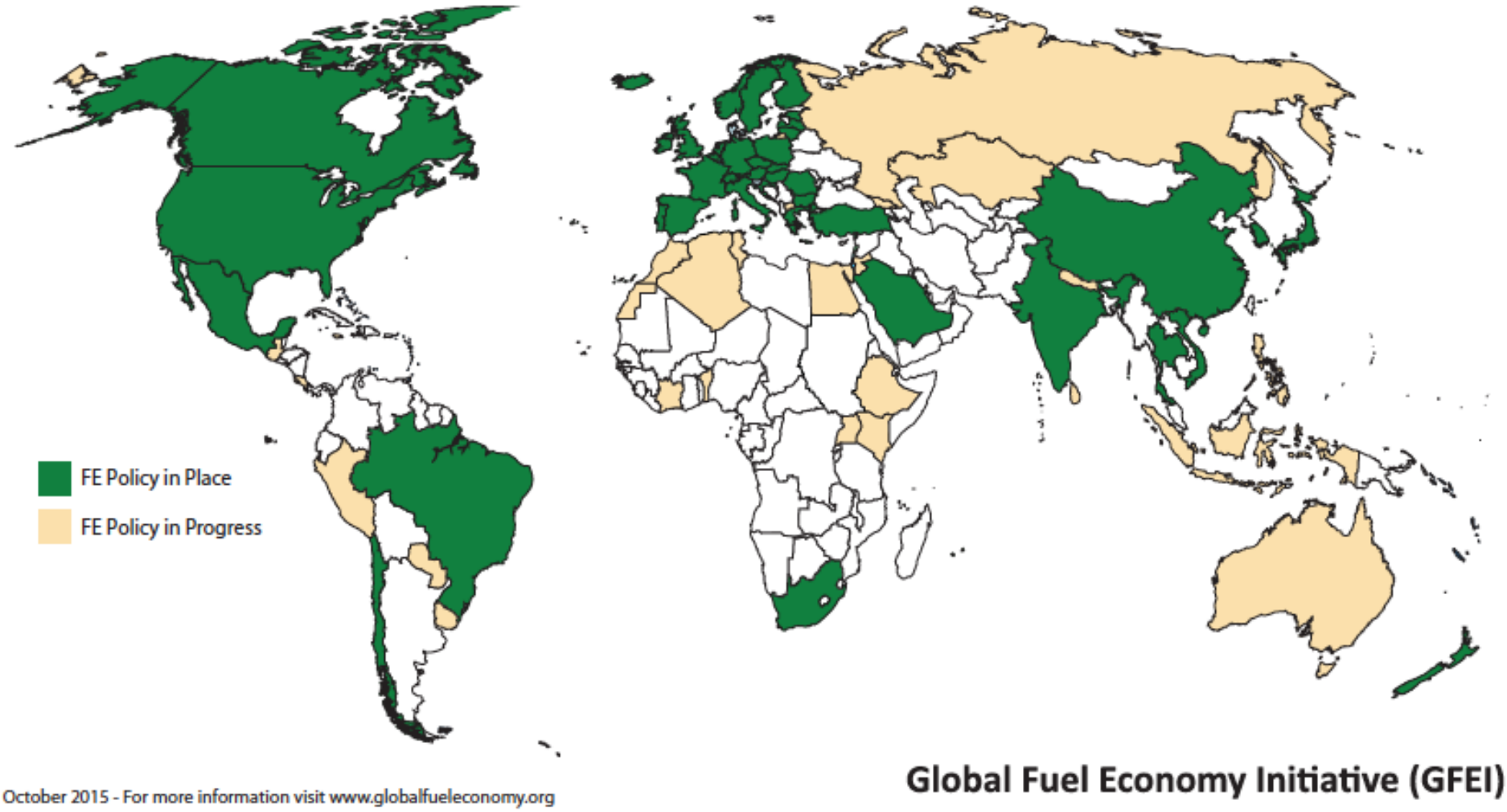
BAU vs. Stabilization:

fuel consumption, **CO2 from cars to double 2000-2050** (IEA)

World LDV CO2 emissions, business as usual vs GFEI, million tonnes (Mt) CO2, GFEI intervention (IEA 2009)



Fuel Economy Policy Globally



Source: GFEI August 2014

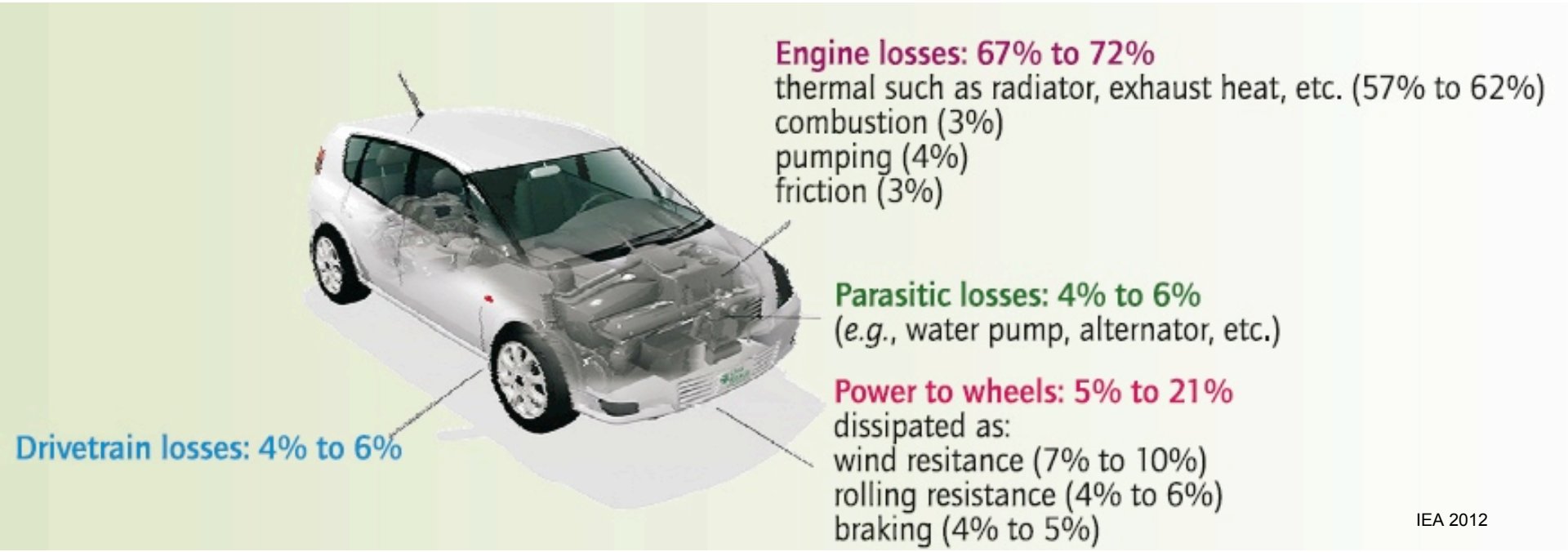
What is fuel economy?

- Vehicles use energy, and fuel economy measures energy per unit of vehicle travel. It is the RATE of energy use.
  - Litres per 100km (Europe)
  - Km per litre (Japan)
  - Miles per gallon (United States)

- Fuel economy, fuel efficiency, fuel intensity are all fairly interchangeable terms. But fuel economy always refers to fuel use relative to distance travelled.

Only 20% of the energy is converted into movement

- **Most energy lost as heat**



Countries around the world currently have an average new car fuel economy that *varies* by over 50%

e.g. United States about 9 L/100km, France below 6

What is fuel economy? (2)

- Fuel economy improvement can be achieved through
  - Technical changes to vehicles
  - Changing the types of vehicles bought (size, technology)
  - Improving vehicle maintenance
  - Changing the way vehicles are driven (eco-driving)
  - Reducing traffic congestion
- Fuel economy improvement to vehicles should be part of a broader strategy:
  - Traffic management
  - City and regional planning
  - Promotion of public transit
  - Etc.

EU Fuel Economy Regulations No 443/2009 & No 333/2014

- June 2007 Council of Environment Ministers adopts resolution to approve the shift to mandatory standards and an integrated approach to achieve 120 gCO_2/km (5.2 l/100km or 45.6 mpg), with carmakers achieving 130 gCO_2/km (5.6 l/100km or 42 mpg) through technical improvements and the remaining 10 g/km coming from complementary measures.
- April 2009 European Parliament and the Council approved Regulation (EC) No 443/2009 setting a target of 130 gCO_2/km (5.6 l/100km or 42 mpg) for the average emissions of new cars to be phased-in by 2015
- **Regulation (EU) No 333/2014 95 gCO_2/km (4.1 l/ 100km or 57.6 mpg) 2020**

Not same thing as Euro 1/I – 6/VI

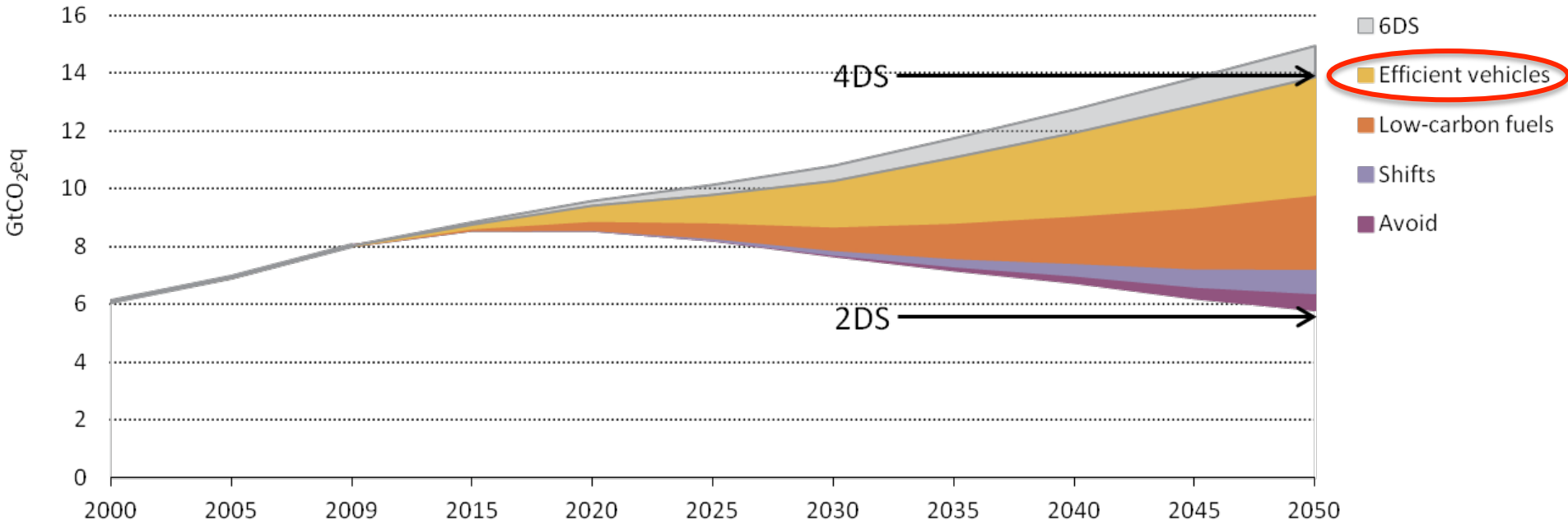
- European Union emission regulations for new light duty vehicles (passenger cars and light commercial vehicles) were once specified in Directive 70/220/EEC with a number of amendments adopted through 2004. In 2007, this Directive has been repealed and replaced by Regulation 715/2007 (Euro 5/6).

European emission standards for passenger cars (Category M*), g/km

Tier	Date	CO	THC	NMHC	NO_x	HC+NO_x	PM	P [#/km]
Diesel								
Euro 1†	July 1992	2.72 (3.16)	-	-	-	0.97 (1.13)	0.14 (0.18)	-
Euro 2	January 1996	1.0	-	-	-	0.7	0.08	-
Euro 3	January 2000	0.64	-	-	0.50	0.56	0.05	-
Euro 4	January 2005	0.50	-	-	0.25	0.30	0.025	-
Euro 5a	September 2009	0.50	-	-	0.180	0.230	0.005	-
Euro 5b	September 2011	0.50	-	-	0.180	0.230	0.005	6×10^{11}
Euro 6	September 2014	0.50	-	-	0.080	0.170	0.005	6×10^{11}
Petrol (Gasoline)								
Euro 1†	July 1992	2.72 (3.16)	-	-	-	0.97 (1.13)	-	-
Euro 2	January 1996	2.2	-	-	-	0.5	-	-
Euro 3	January 2000	2.3	0.20	-	0.15	-	-	-
Euro 4	January 2005	1.0	0.10	-	0.08	-	-	-
Euro 5	September 2009	1.0	0.10	0.068	0.060	-	0.005**	-
Euro 6	September 2014	1.0	0.10	0.068	0.060	-	0.005**	6×10^{11}***

Auto fuel economy improvement plays largest role, particularly through 2030, in cutting energy-related CO_2 emissions from transport by more than half in 2050

(compared with 2009). IEA 2012 2-degree scenario

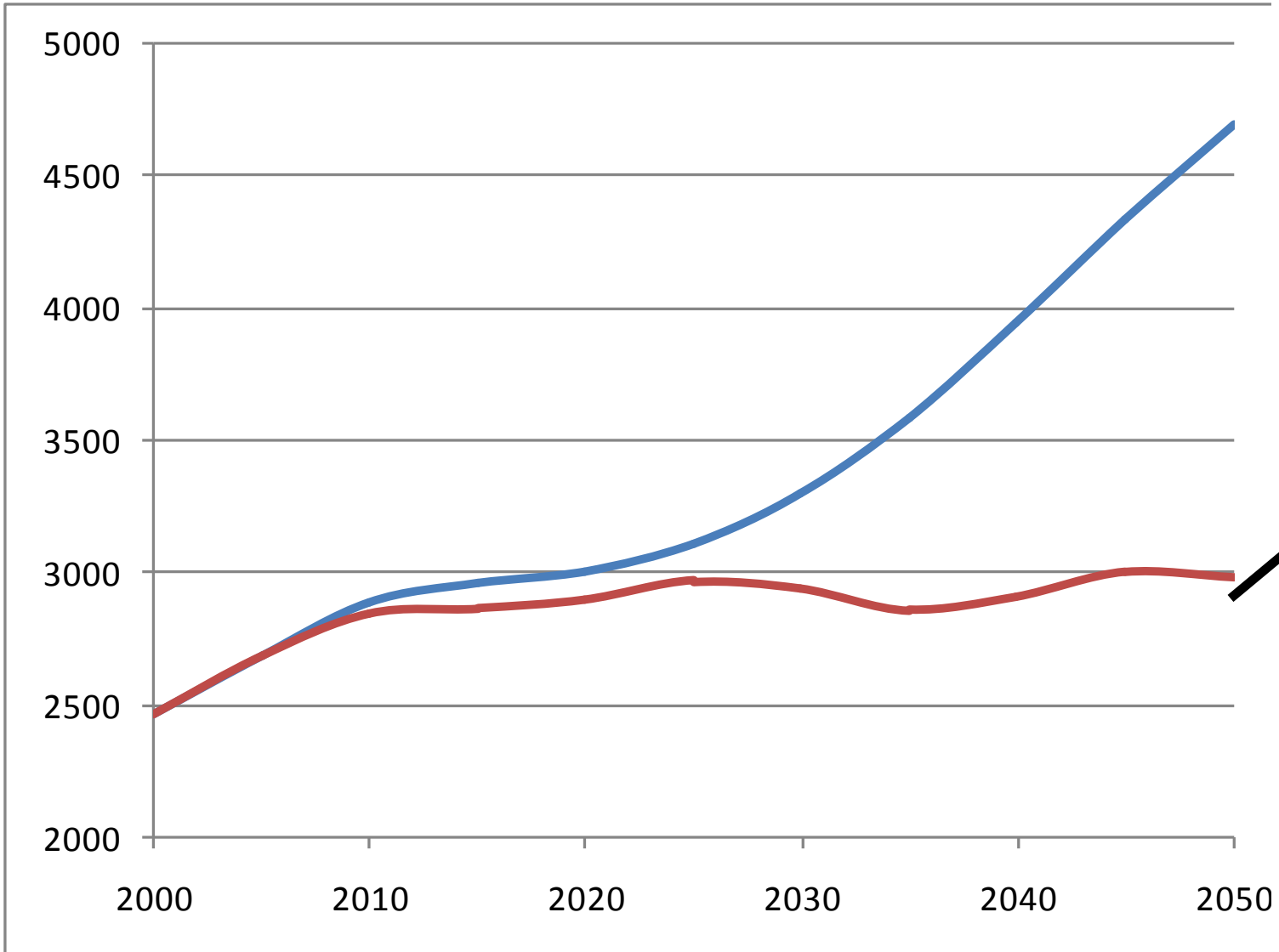


Source: Lewis Fulton, UC Davis & IEA Energy Technology Perspectives 2012

BAU vs. Stabilization:

fuel consumption, CO2 from cars to double 2000-2050 (IEA)

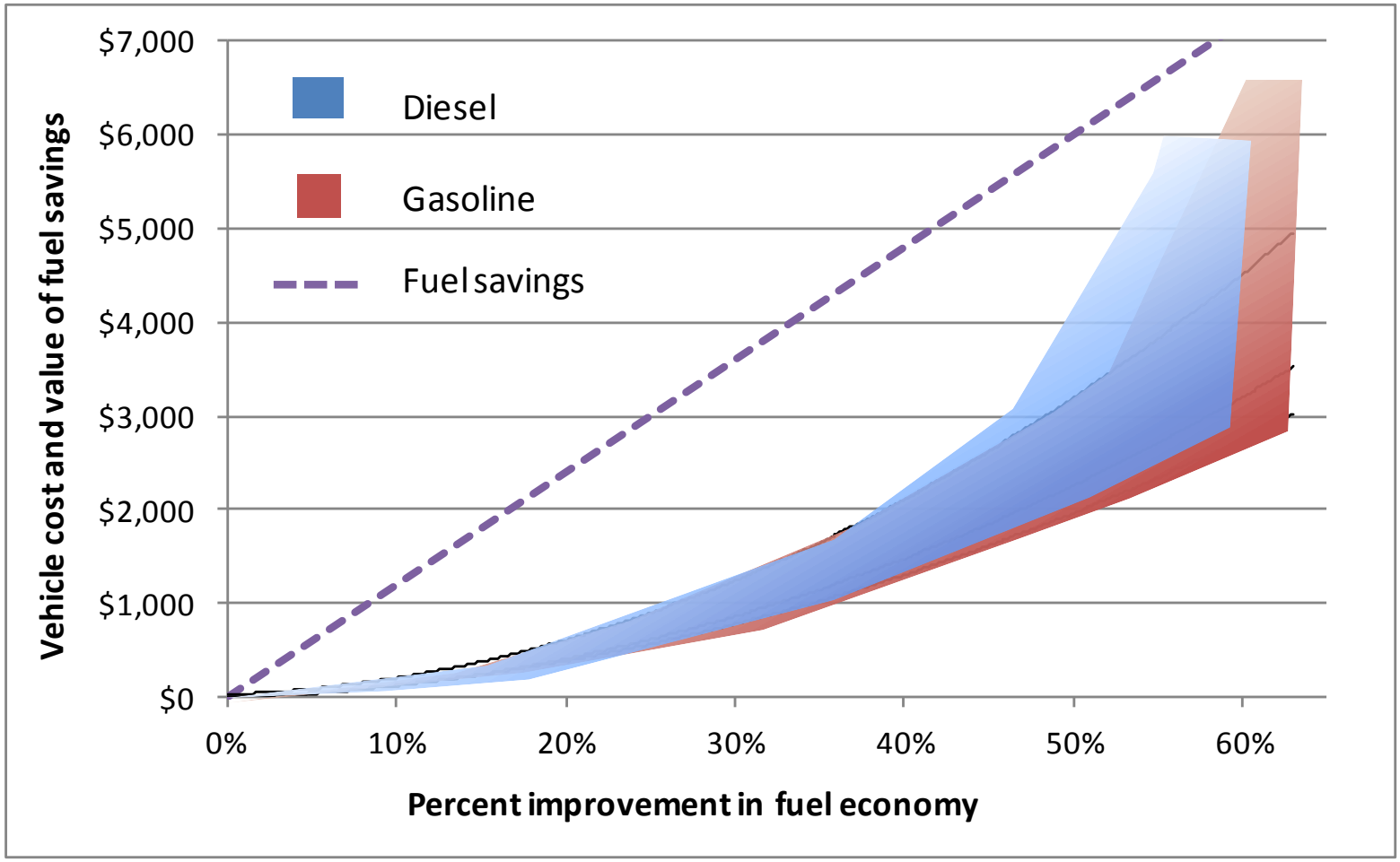
World LDV CO2 emissions, business as usual vs GFEI, million tonnes (Mt) CO2, GFEI intervention (IEA 2009)



double auto fuel economy by 2050 + flanking measures

Fuel Economy Improvements are Cost-effective

Fuel savings more than pays for fuel economy improvements in light-duty vehicles



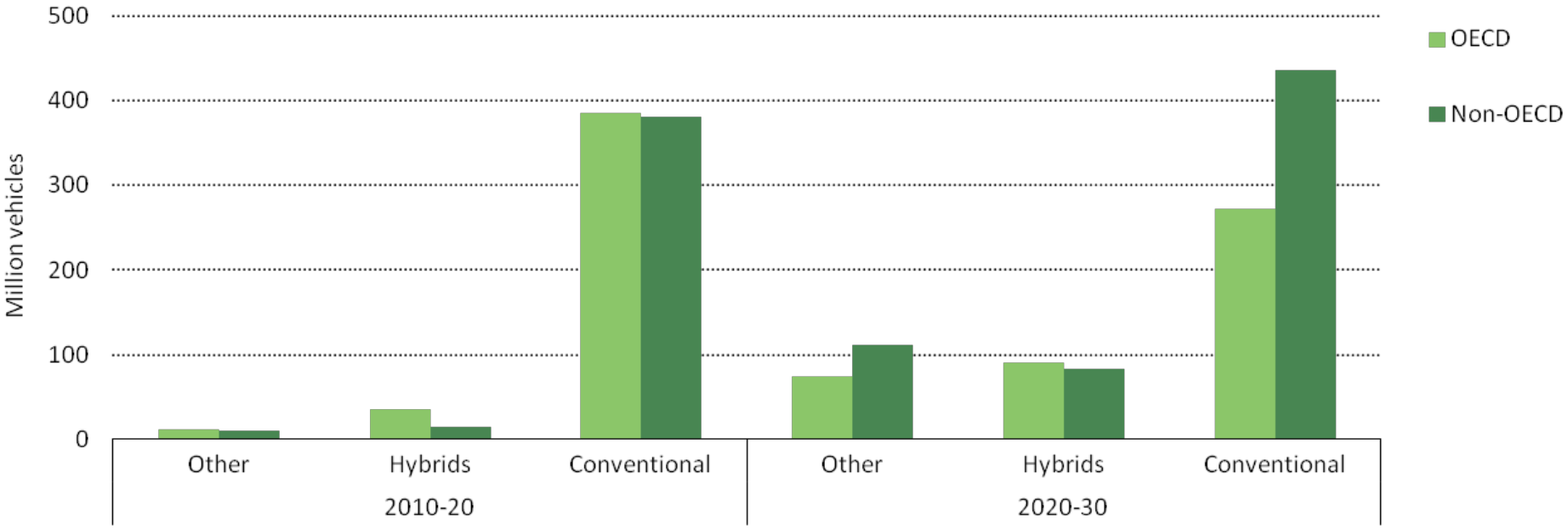
Source: IEA Fuel Economy Roadmap, July 2012

GFEI '50by50' or
8 Lge/100km to 4 Lge/100km

	2020	2030	2050
New Cars	**30%** reduction in L/100km in OECD: **engines, drive trains, weights, aerodynamics; PHEV, EV, FC not required**	**50%** average improvement globally: **full hybridisation of most models; PHEV, EV and FC not required**	**50% + (PHEV, EV, FC required)**
All Cars - Global	**20%** reductions with lag time for **stock turnover**; eco-driving, maintenance	**35%**	**50by50**

Next 2 decades will be ICE-driven

- Even in 2°C scenario, ICE-powered vehicles will dominate
- Electrification strategy matters most after 2030 in OECD, 2050 worldwide, but must begin now

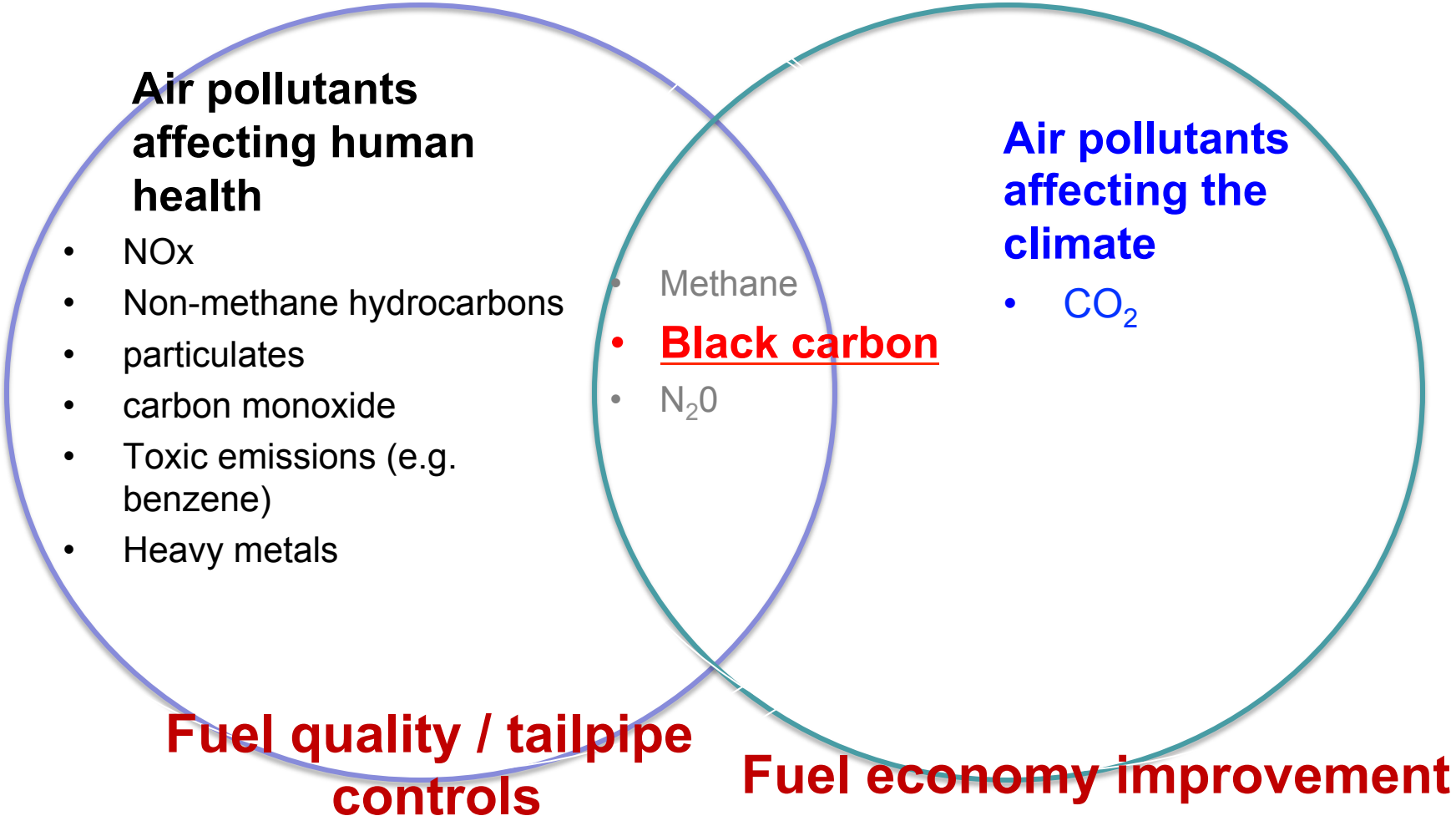


Source: Lewis Fulton, UC Davis ITS, IEA ETP 2012

What is fuel economy? (3)

- Note on diesel: there is about 2.4 kg of CO_2 emitted per litre of gasoline burned, 2.6 for diesel. Diesel fuel 10% more carbon and more energy than gasoline. Greater energy content, greater efficiency.
- If you improve vehicle fuel economy, you:
  - Save fuel
  - Reduce costs
  - Cut CO_2 emissions
  - **Don't** help air quality very much (though there are some links)

Fuel economy & Air Pollution



RESEARCH

IN-COUNTRY POLICY SUPPORT

GLOBAL CAMPAIGNS

globalfueleconomy.org

We face a near tripling of the number of cars on the planet from 2010 to 2050, the vast bulk in emerging economies. Improved fuel economy is essential if we are to address some of the negative implications of this growth, such as pollution, congestion, energy and resource depletion, and environmental damage.

The Global Fuel Economy Initiative is a partnership of the International Energy Agency (IEA), United Nations

GFEI

Research

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iea International Energy Agency

International comparison of light-duty vehicle fuel economy: Evolution over 8 years from 2005 to 2013

Working Paper 11

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icct
ITS UCDAVIS INSTITUTE OF TRANSPORTATION STUDIES

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GLOBAL FUEL ECONOMY INITIATIVE

GFEI In-Use Fuel Economy Seminar Summary and Conclusions

The GFEI launched its 'London Seminar Series' on July 16, 2014, with a high level gathering of fuel economy experts from research organizations, NGOs, industry and government. The one-day seminar covered recent research on the gap between tested and "in-use" fuel economy, implications of this gap, and steps that could be taken to address it. The discussion was particularly focused on the European Union situation, its test procedures and future plans, although the discussion was also broadened out to cover other vehicle markets and testing systems.

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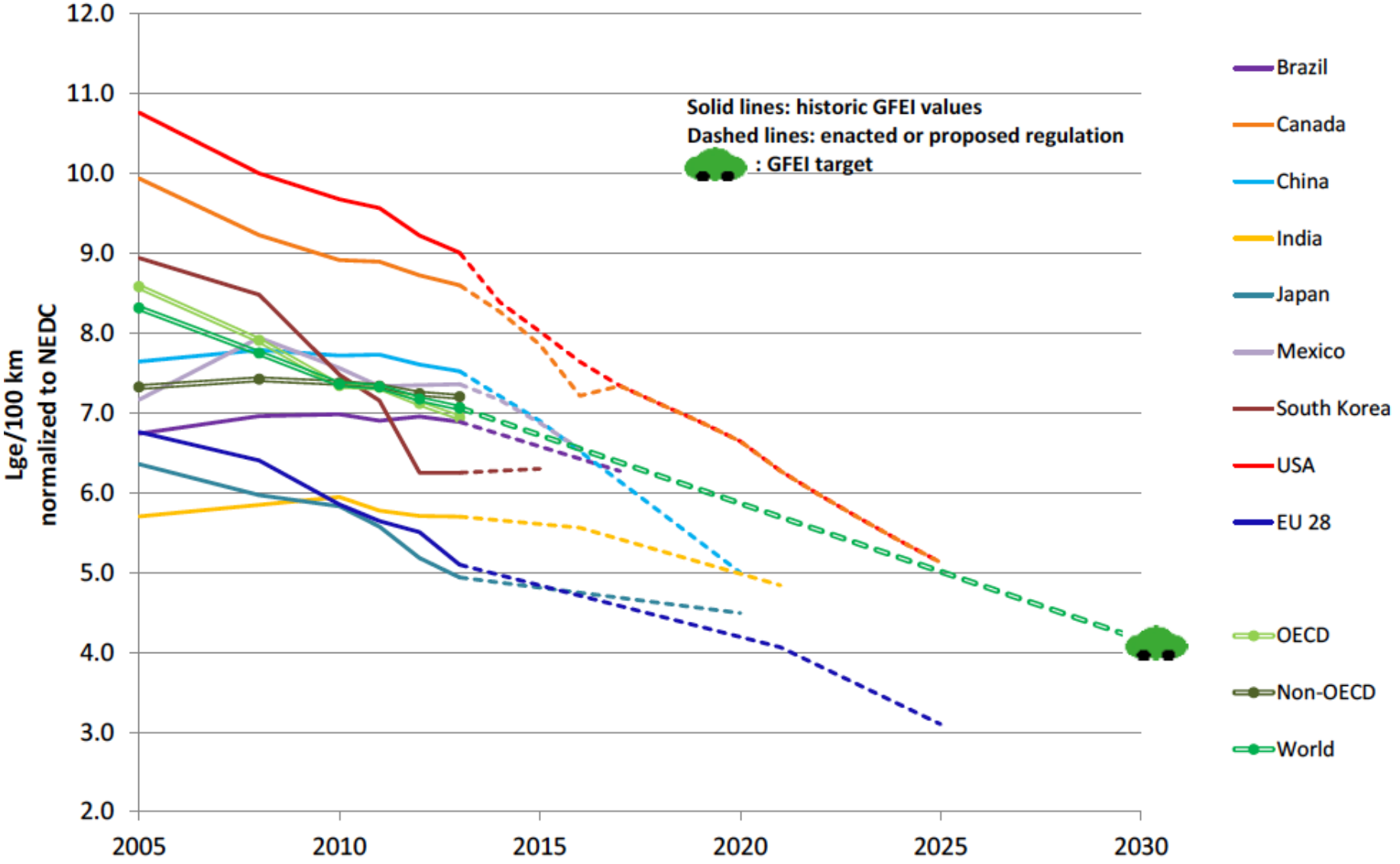
Evolution of Global Fuel Economy

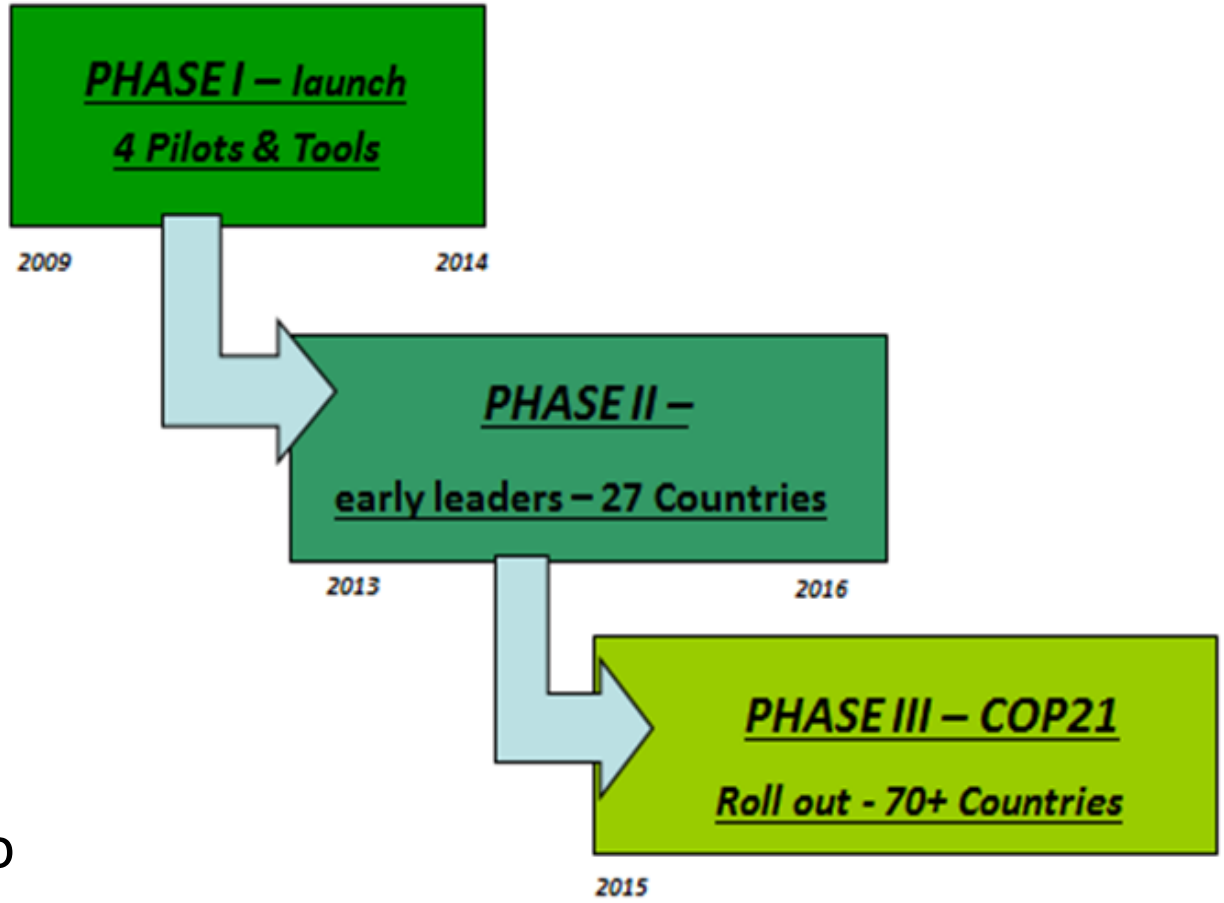


		2005	2008	2011	2013	2030
OECD average	average fuel economy (Lge/100km)	8.6	7.9	7.3	6.9	
	annual improvement rate (% per year)	-2.7%	-2.6%	-2.6%		
		-2.6%				
Non-OECD average	average fuel economy (Lge/100km)	7.3	7.4	7.3	7.2	
	annual improvement rate (% per year)	0.5%	-0.4%	-0.9%		
		-0.2%				
Global average	average fuel economy (Lge/100km)	8.3	7.7	7.3	7.1	
	annual improvement rate (% per year)	-2.3%	-1.9%	-1.8%		
		-2.0%				
GFEI target	average fuel economy (Lge/100km)	**8.3**				**4.2**
	required annual improvement rate (% per year) 2005 base year	**-2.7%**				
	2014 base year	**-3.1%**				

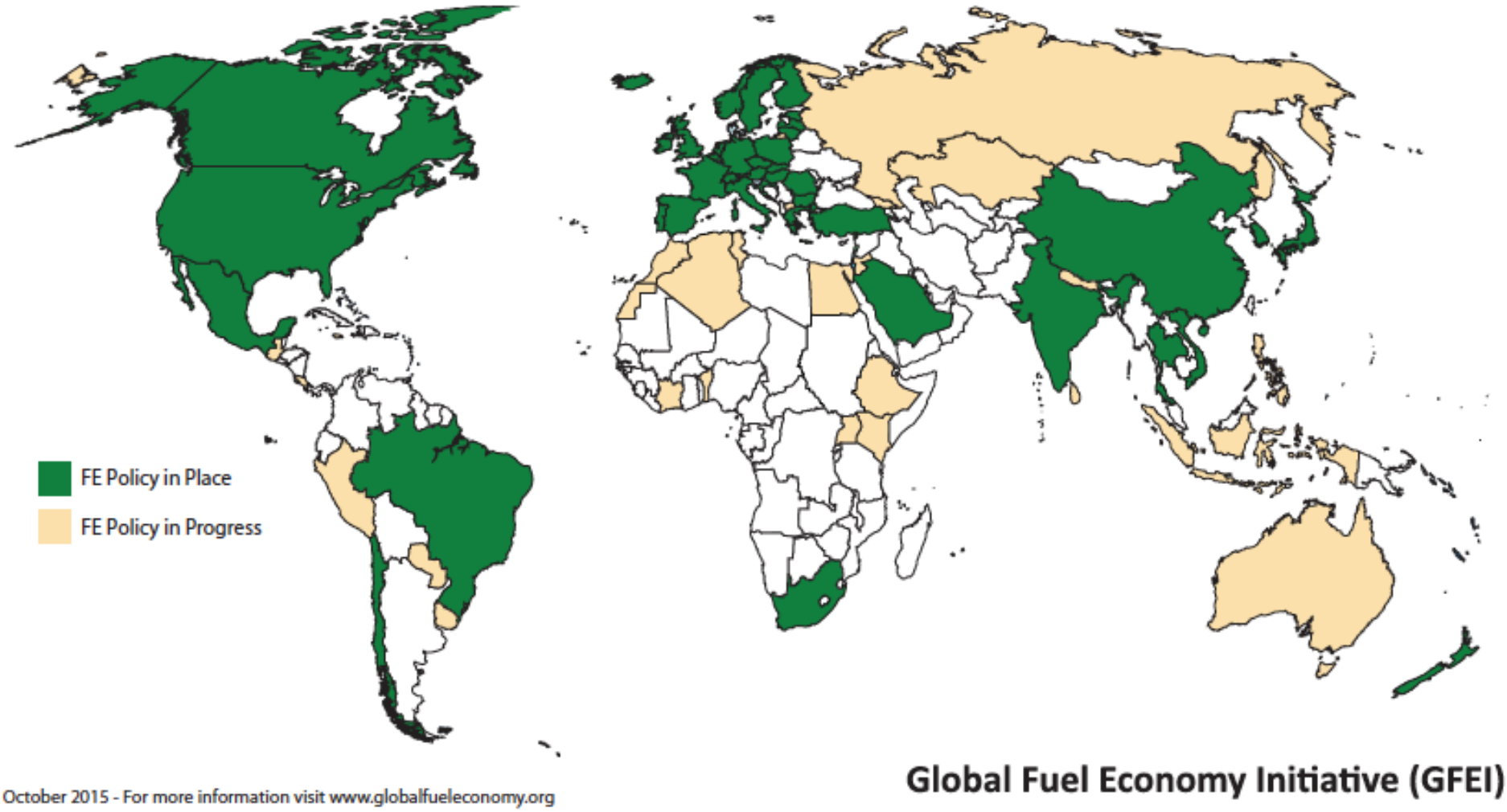
Source: GFEI 2014 International Fuel Economy Comparison, WP11

IN-COUNTRY POLICY SUPPORT

China
India
Australia
Chile
Peru
Indonesia
Philippines
Thailand
Vietnam
Ethiopia
Kenya
Macedonia
Montenegro
Georgia



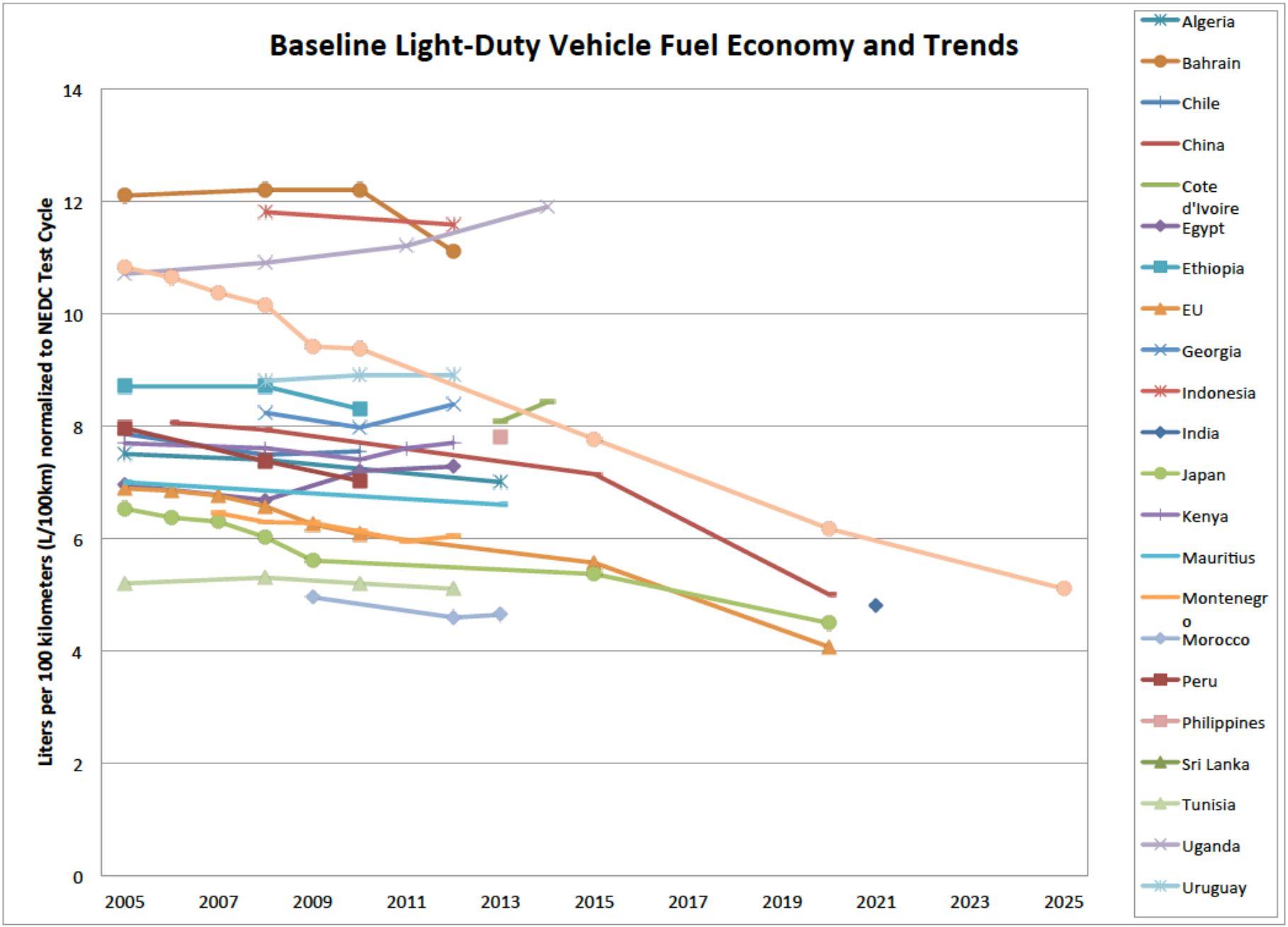
Fuel Economy Policy Globally

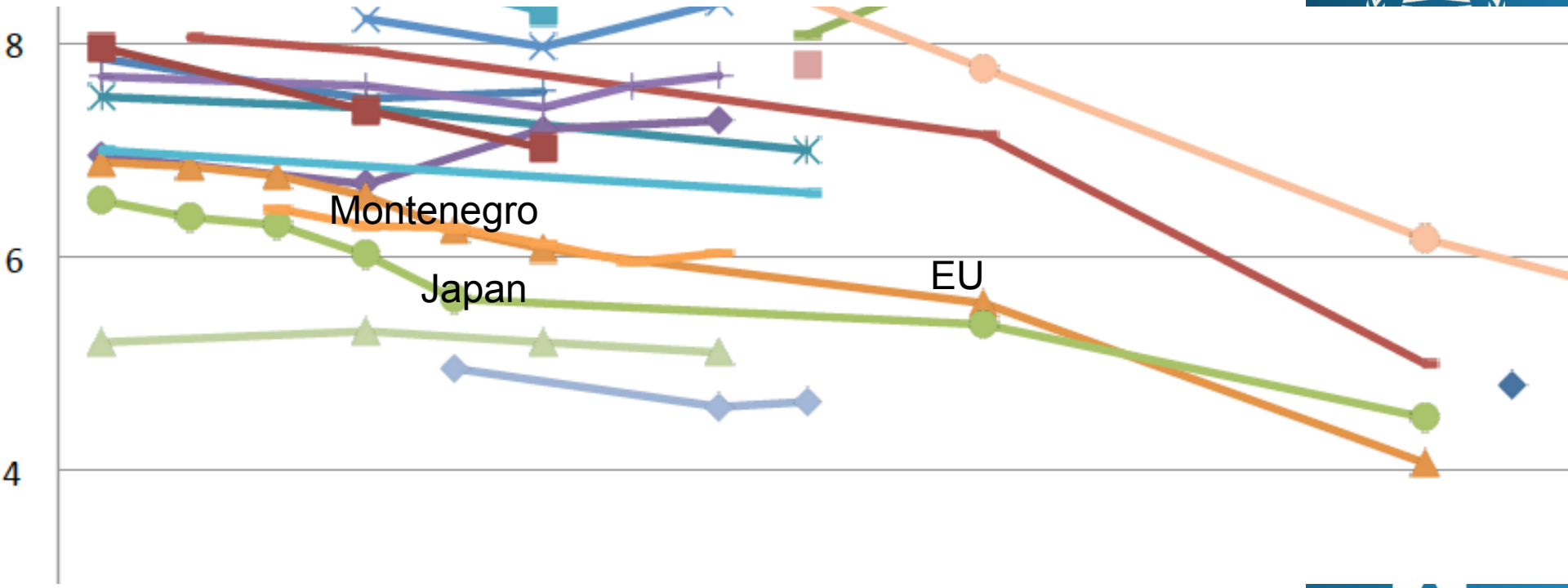


Source: GFEI August 2014

Chile

- First *mandatory* **labeling system** for LDV's in Latin America, March 2012 www.compraunautolimpio.cl
- **Feebate proposal** based on a bonus/malus system, including CO_2 and local pollutants became **First Tax for emission and fuel consumption in Chilean vehicle market**

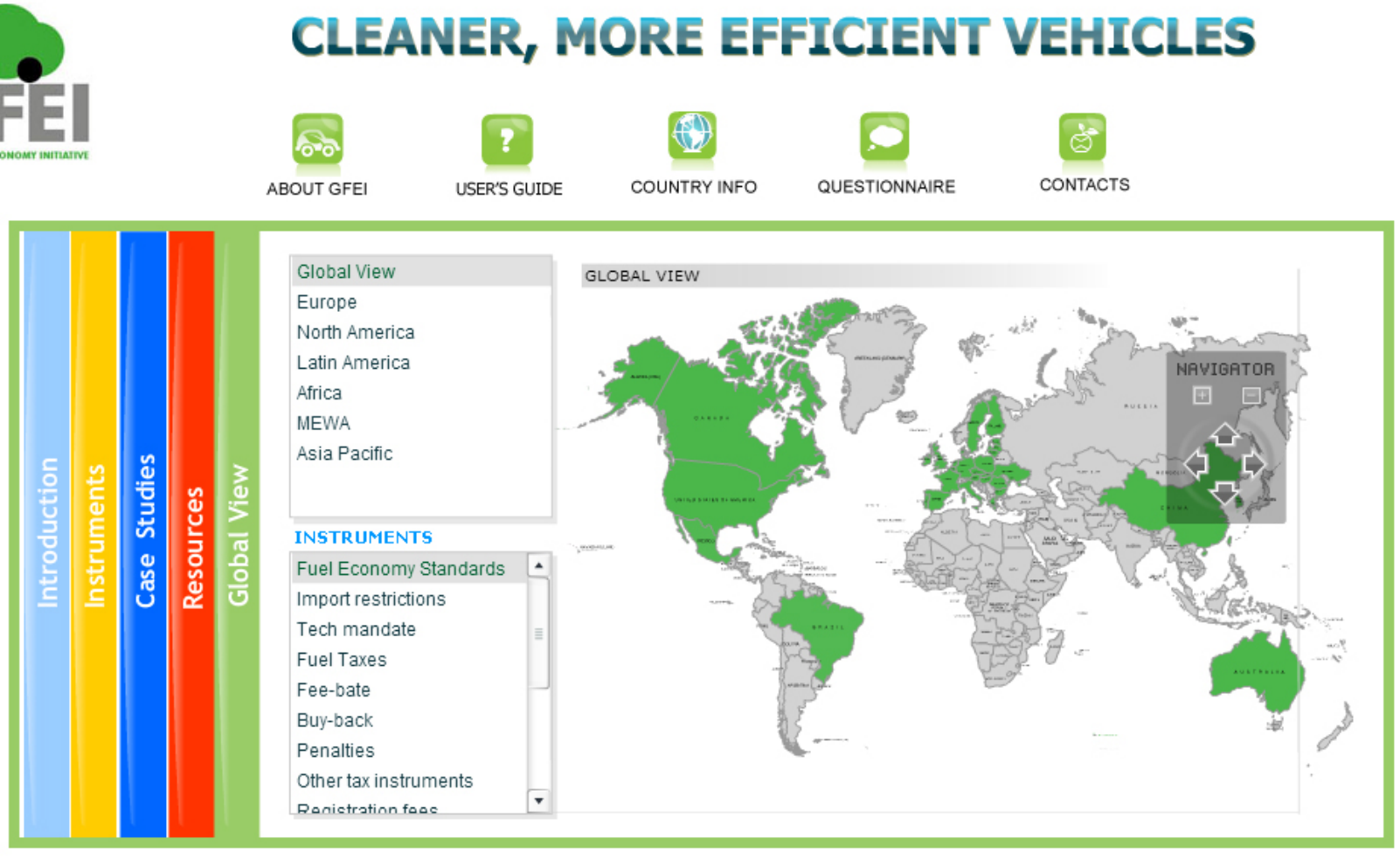

Baseline Light-Duty Vehicle Fuel Economy and Trends
Liters per 100 kilometers (L/100km) normalized to NEDC Test Cycle
0
2
4
6
8
10
12
14
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
Algeria
Bahrain
Chile
China
Cote d'Ivoire
Egypt
Ethiopia
EU
Georgia
Indonesia
India
Japan
Kenya
Mauritius
Montenegro
Morocco
Peru
Philippines
Sri Lanka
Tunisia
Uganda
Uruguay



Montenegro 2007-2012: 6.45 L/100km, 6.29 L/100km, 6.27 L/100km, 6.12L/100km, 5.95 L/100km, 6.03 L/100km; 6.5% improvement??

EU: 2005 6.89 L/100km, 2015 5.56 L/100km; 2020 4 L/100 km

Fuel Economy:
http://www.unep.org/transport/gfei/autotool/



GFEI annual training events

GLOBAL CAMPAIGNS

GFEI is now recognised as the leading global initiative on fuel economy globally, and is at the centre of discussions in the UN Climate process:

- COP20 and COP21
- Accelerator Platform in SE4ALL and Climate
- Summit

G20 – Transport Task Group implementing partner

GFEI at COP21: **‘100 FOR 50 BY 50’**

Thu 03 Dec (10:15-13:30)	Transport LPAA half day	Blue zone, Le Bourget	GFEI will highlight the impact in reducing emissions through fuel economy policy
Sat 05 Dec (11:30-13:00)	GFEI Side Event: Pathways to Sustainable Mobility through Local, National and Global Action (with Clean Air Asia, CTS Mexico, IPIECA)	Room 4, Blue zone, Le Bourget	GFEI launches new 'Fuel Economy State of the World 2016' report
Mon 07 Dec (15:00-18:15)	SE4ALL LPAA Energy Efficiency half-day	Blue zone, Le Bourget	Announcement of new GFEI resources and regional impact of GFEI

Montenegro INDC

- Transport included in INDC submission, part of national 30% reduction CO_2 by 2030 compared to 1990
- Reduce transport emissions by 1.7 Mt CO2-eq. in 2030
- Reduce fossil fuel subsidies and promote use of natural gas
- Among 120 INDCs submitted as of October 6, 2015, 76% explicitly identify the transport sector as a mitigation source

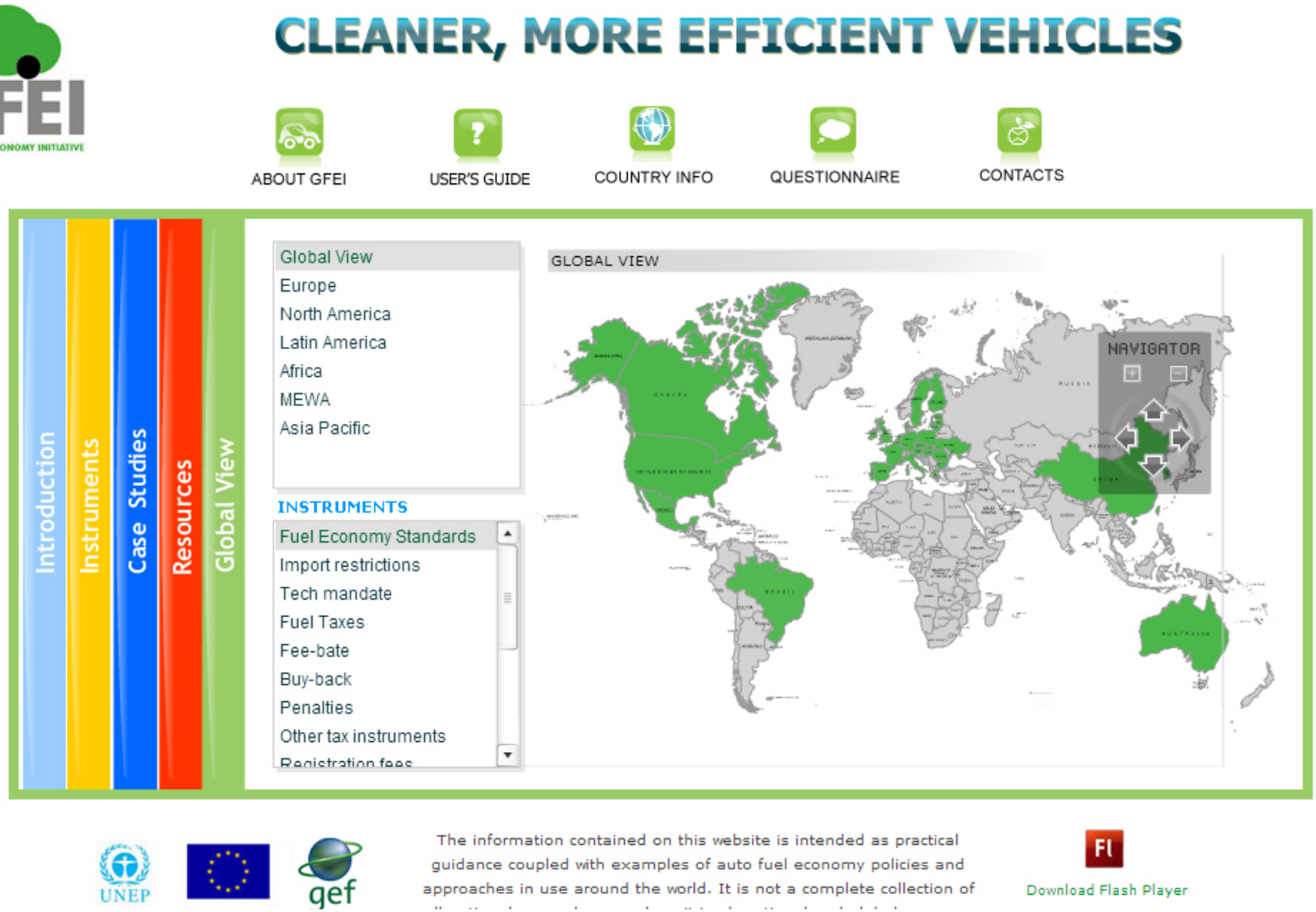
Thank you

Hvala

Elisa Dumitrescu
Focal Point, East Europe
elisa.dumitrescu[at]unep.org
www.unep.org/transport
www.globalfueleconomy.org

- Cleaner, More Efficient Vehicles Tool
- Feebate Tool

http://www.unep.org/transport/gfei/autotool/



Fiscal Instruments

- Registration (one-time) fee
  - Feebate
- Circulation tax (e.g. yearly)

Or combination…

Additional examples from European Automobile Manufacturers Association

- Croatia:
  - Registration tax is based on CO_2 emissions, price and the type of fuel used. The CO_2 component varies from 1.5% (up to 100 g/km) to 31% (above 300 g/km) for diesel cars and from 1% (up to 100 g/km) to 29% (above 300 g/km) for cars using petrol, CNG or LPG as well as diesel cars meeting Euro 6 standards.
- Luxembourg:
  - Annual circulation tax for cars registered since 1 January 2001 is based on CO_2 emissions. Tax rates are calculated by multiplying the CO_2 emissions in g/km with 0.9 for diesel cars and 0.6 for cars using other fuels respectively and with an exponential factor (0.5 below 90 g/km and increased by 0.1 for each additional 10 g of CO_2 /km).

Source: http://www.acea.be/publications/article/overview-of-co2-based-motor-vehicle-taxes-in-the-eu

Additional examples from European Automobile Manufacturers Association, ctd.

- Latvia:
  - Registration tax is based on CO_2 emissions. Rates vary from € 0.43 per g/km for cars emitting 120 g/km or less to € 7.11 per g/km for cars emitting more than 350 g/km.
- Malta:
  - Registration tax is calculated through a formula that takes into account CO_2 emissions, the registration value and the length of the vehicle. The annual circulation tax is based on CO_2 emissions and the age of the vehicle. During the first five years, the tax only depends on CO2 emissions and varies from € 100 for a car emitting up to 100 g/km to € 180 for a car emitting between 150 and 180 g/km.

Additional examples from European Automobile Manufacturers Association, ctd.

- Slovenia:
  - Registration tax is based on price and CO_2 emissions. Rates vary from 0.5% (petrol) and 1 % (diesel) respectively for cars emitting up to 110 g/km to 28% (petrol) and 31% (diesel) respectively for cars emitting more than 250 g/km.

CO_2	Gasoline	Diesel
0 - 110	0.5 %	1.0 %
111 - 120	1.0 %	2.0 %
121 - 130	1.5 %	3.0 %
131 - 150	3.0 %	6.0 %
151 - 170	6.0 %	11.0 %
171 - 190	9.0 %	15.0 %
191 - 210	13.0 %	18.0 %
211 - 230	18.0 %	22.0 %
231 - 250	23.0 %	26.0 %
> 250	28.0 %	31.0 %

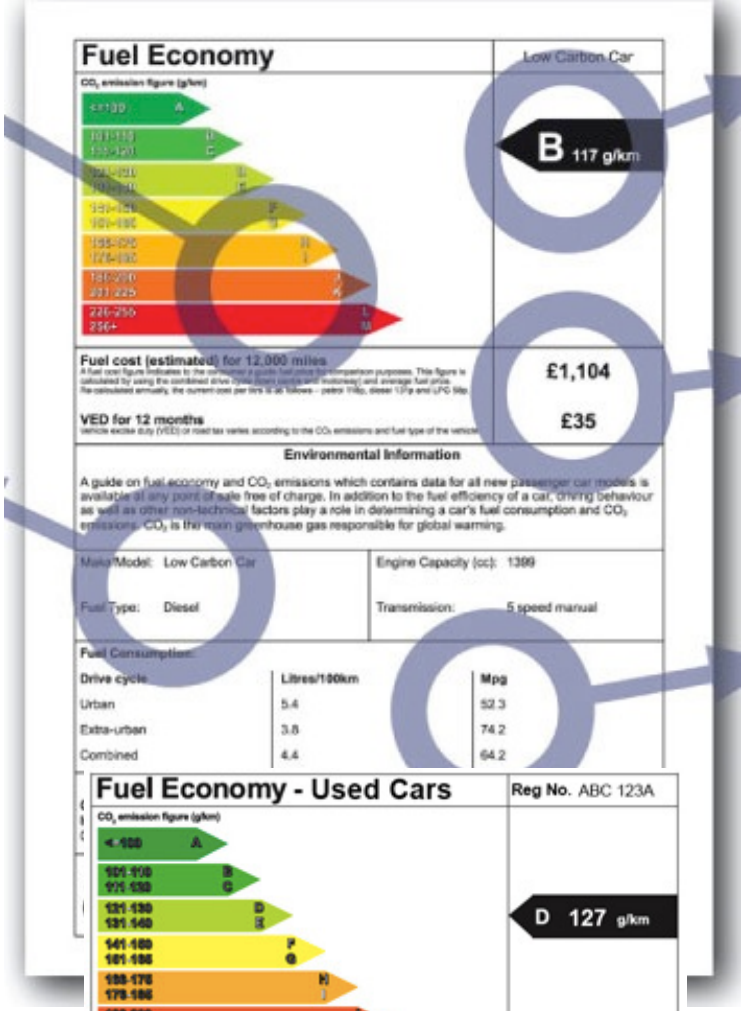
- France:
  - ✧Feebate bonus–malus system, a premium is granted for the purchase of a new electric or hybrid electric vehicle (car or LCV) when its CO_2 emissions are 110 g/km or less. The maximum premium is € 6,300 (20 g/km or less). An additional bonus of € 200 is granted when a vehicle of at least 15 years old is scrapped. A malus is payable for the purchase of a car when its CO2 emissions exceed 130 g/km. The maximum tax amounts to € 8,000 (above 250 g/km). Cars emitting more than 190gCO_2/km pay a yearly tax of € 160.

Additional examples from European Automobile Manufacturers Association, ctd.

- Finland:
  - The registration tax is based on CO_2 emissions. Rates vary from 5 to 50%. The annual circulation tax is based on CO_2 emissions for cars registered since 1 January 2001 (total mass up to 2,500 kg) or 1 January 2002 (total mass above 2,500 kg) respectively and for vans registered since 1 January 2008.
- Germany:
  - The annual circulation tax for cars registered as from 1 July 2009 is based on CO_2 emissions. It consists of a base tax and a CO_2 tax. The base tax is € 2 per 100 cc (petrol) and € 9.50 per 100 cc (diesel) respectively. The CO 2 tax is linear at € 2 per g/km emitted above 95 g/km. Cars with CO2 emissions below 95 g/km are exempt from the CO 2 tax component.

Directive 1999/94/EC stipulates that a fuel economy label must be attached to the windscreen of all new passenger cars at the point of sale, must contain an estimate of fuel consumption, expressed in liters per 100 kilometers or in kilometers per liter (or in miles per gallon), and of CO_2emissions.

- The requirements of EU Directive 1999/94/EC on fuel efficiency labeling of passenger cars are implemented differently in the Member States



UK new and used vehicle labels http://www.dft.gov.uk/vca/fcb/new-car-fuel-consump.asp

Reporting obligation for: Monitoring and reporting of average CO2 emissions (passenger cars)

The Regulation (EC) No 443/2009 requires Member States to record information for each new passenger car registered in its territory. Every year, each Member State shall submit to the Commission all the information related to their new registrations. In particular, the following details are required for each new passenger car registered: *manufacturer name, type approval number, type, variant, version, make and commercial name, specific emissions of CO2, mass of the vehicle, wheel base, track width, engine capacity, fuel type and fuel mode.*

UNEP/ICCT
Feebate simulation tool

- Uses pre-set or country-specific data of newly-registered vehicles (this can include both new and used vehicles) and their characteristics (including price) and the currency exchange rate.

	1	2	3	4	5	6	7	8	9	10	11
1	Year	Country	Segmen	Fuel	Quantity	Price	Emissions	Power	Weight	l/100km	Size
2	2011	Australia	A	Diesel	208,0	37875,0	122,0	110,0	1555,0	4,679	254,0
3	2011	Australia	A	Petrol	10249,0	35300,0	138,5	139,5	1367,5	5,404	144,0
4	2011	Australia	B	Diesel	2589,0	26190,0	132,5	109,0	1735,0	4,609	384,0
5	2011	Australia	B	Petrol	106770,0	26490,0	158,9	138,0	1587,5	6,382	275,0
6	2011	Australia	C	Diesel	16308,0	46930,2	143,5	154,5	1986,0	5,937	227,0
7	2011	Australia	C	Ethanol-Petrol M	73,0	57950,0	222,0	200,0	1587,5	9,300	262,5
8	2011	Australia	C	Hybrid/Petrol	2915,0	42990,0	98,0	93,5	1747,5	4,129	174,6
9	2011	Australia	C	Petrol	167632,0	57445,0	175,5	219,5	1876,0	7,585	134,5
10	2011	Australia	D	Diesel	15310,0	69945,0	172,5	200,5	2169,0	6,168	176,0
11	2011	Australia	D	Gas/LPG	3082,0	46312,5	217,0	240,5	2505,0	11,935	136,9
12	2011	Australia	D	Hybrid/Petrol	5206,0	38490,0	121,0	175,5	2110,0	5,200	183,7
13	2011	Australia	D	Petrol	140204,0	80995,0	216,5	276,5	2249,5	8,843	0,0
14	2011	Australia	E	Diesel	4045,0	135260,3	179,0	245,5	2525,0	6,766	190,0
15	2011	Australia	E	Hybrid/Petrol	30,0	188764,0	199,5	345,0	2542,5	8,167	165,4
16	2011	Australia	E	Petrol	60810,0	258699,5	254,0	384,0	2295,0	9,552	220,0

Choose country or upload new data

Back to Design

FEEBATE FUNCTION CONTROL PANEL

Modification options:	Adjustable by user	Fixed

QUICK START

y Germany

2015

Run

Change country or upload new data

View Results

PIVOT POINT CONTROL ?

? Annual adjustment based on observed changes

Revenue neutral system

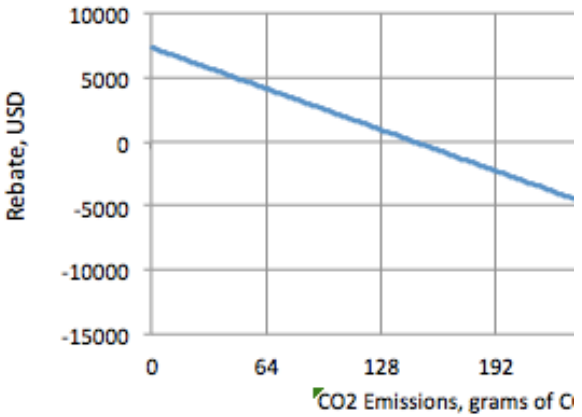
Revenue to the government [mUSD/year] 0

REBATE FUNCTION SHAPE CONTROL

es ? Linear

? Pivot Point = 147

tions?	1	1	
g of CO2 / Kilometer		0	384
ndividual sections		SLOPED	
lue	?	N/A	
g of CO2 / Kilometer	?	50	



ed Design Options

Update

Start Here | Input_Data | Feebate Design | Results | +

For guidance on feebate design and best practice

- http://www.theicct.org/best-practices-feebate-program-design-and-implementation

GFEI baseline data needs

- Vehicle make and model
- Model production year
- Year of first registration, if different from model year
- Fuel type
- Engine size
- Domestically produced or imported
- New or second hand import
- Rated Fuel Economy per model and test cycle basis. This can be done either by getting data from country of origin or manufacturer (see Resources section below for links), or by testing of a select sample of vehicles. For more information on vehicle emission test cycles, see the test cycle summary, here)
- Number of sales by model

http://www.unep.org/transport/gfei/autotool/nextsteps/developing_a_baseline.asp#p2

Feebate tool

- Number of vehicles
- **Vehicle size**
- **Vehicle weight**
- Vehicle engine size
- Vehicle engine power (kW)
  Vehicle fuel efficiency (LGE/km) or CO2 emission figures (gCO2eq/km)
- Vehicle age/year of production
- **Annual kilometers per year (km/year)**
- **Registration tax ($/litre) Ownership tax ($/vehicle) Fuel taxes ($/litre)**
- **Average purchase price ($/vehicle)**
- Number of vehicles by segment:

Segment A (Small car) Segment B (Small car) Small Truck
Segment C Medium Truck Segment D Segment E Segment F Large Truck

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