**The ASEAN – German Technical Cooperation Programme
"Cities, Environment and Transport"**

**Transport and Climate Change**

# Move forward fuel efficiency policy in Vietnam

Alex Körner

alex_koerner@gmx.de

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# Content

- Introduction: Some definitions

- Why fuel economy policy?

- Policy measures and (some!) case studies

- Fuel economy policies – conclusions

- Short introduction to Fuel Economy Policy Impact assessment Tool (FEPIT)

# Fuel economy & fuel efficiency – Definitions

# Definitions: Fuel efficiency – fuel economy – fuel consumption

**Fuel economy units in the world**
- L/100 km
- mpg and L/100 km
- mpg
- km/L
- L/100 km and km/L
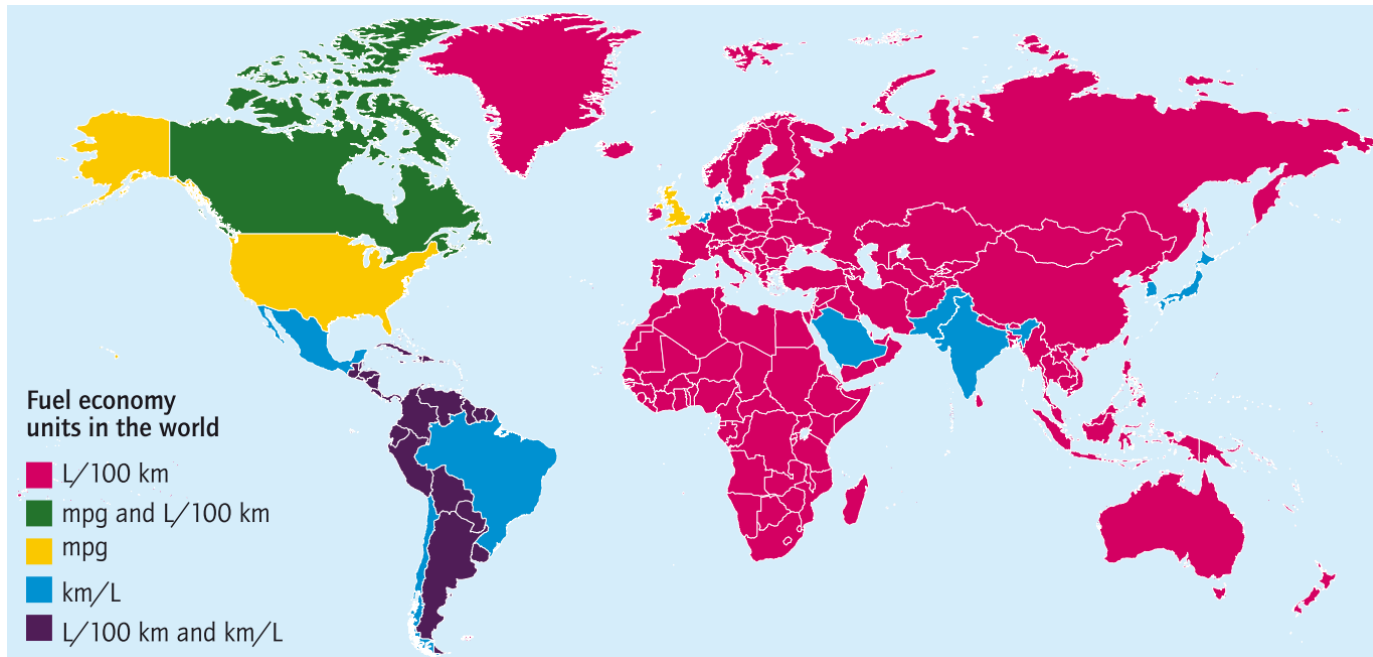
- Fuel economy: km/l
- Fuel consumption: l/100km
- Fuel efficiency: MJ/pkm or MJ/tkm

Source: IEA Technology Roadmap: Fuel Economy of Road Vehicles

# Fuel consumption, $CO_2$ emissions and pollutants

- Pollutant emissions include: CO, $NH_3$, $NO_x$, VOC, PM10, $SO_x$

- Fuel consumption/$CO_2$ emissions and pollutant emissions are two different things – a big car can have low pollutant emission (through use of catalytic converters) but high fuel consumption and $CO_2$ emission

- Fuel consumption (L/100km) and $CO_2$ emission (g$CO_2$/km) are interchangeable, the carbon intensity (g$CO_2$/L) of the fuel is the respective conversion factor

Fuel economy policies – Motivation

# Passenger travel and PLDV sales in the ASEAN region up to 2050
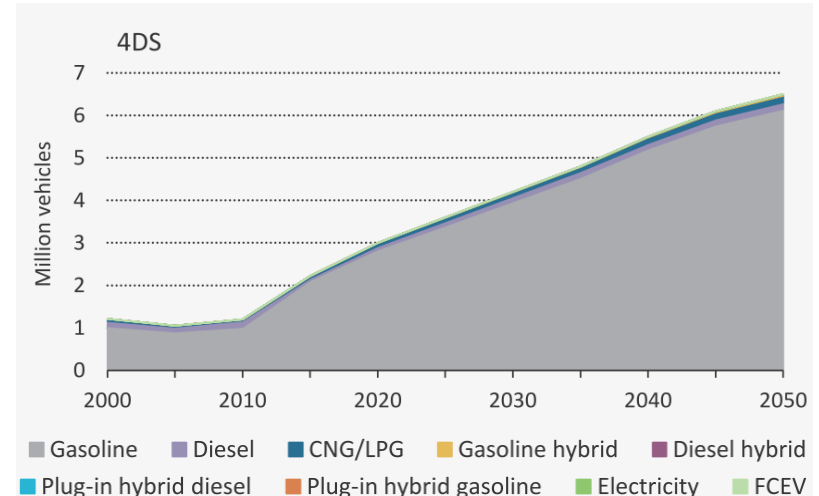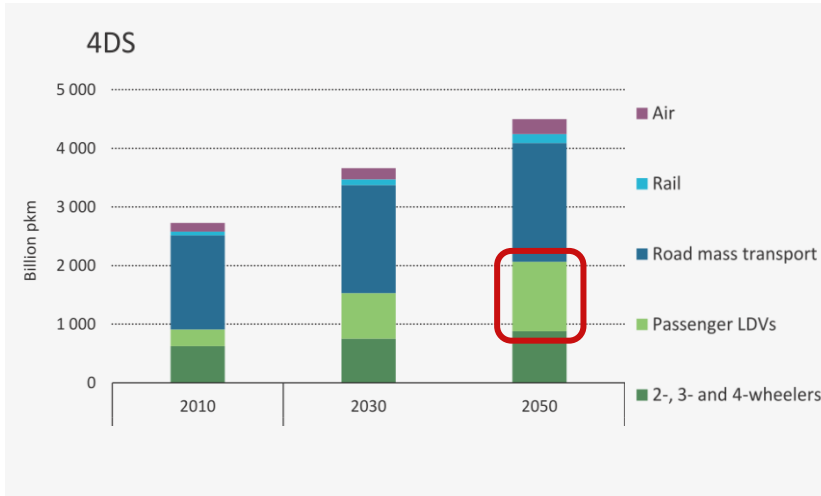


- Passenger car travel is projected to quadruple until 2050 in the ASEAN region (IEA ETP 2012 4DS)

- Sales of passenger cars are projected to increase by 500% in a business as usual scenario between 2010 and 2050

Source: IEA Energy Technology Perspectives 2012

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# Car fuel efficiency is a "low-hanging fruit" for GHG mitigation

**PLDV emissions 6DS - 2DS**
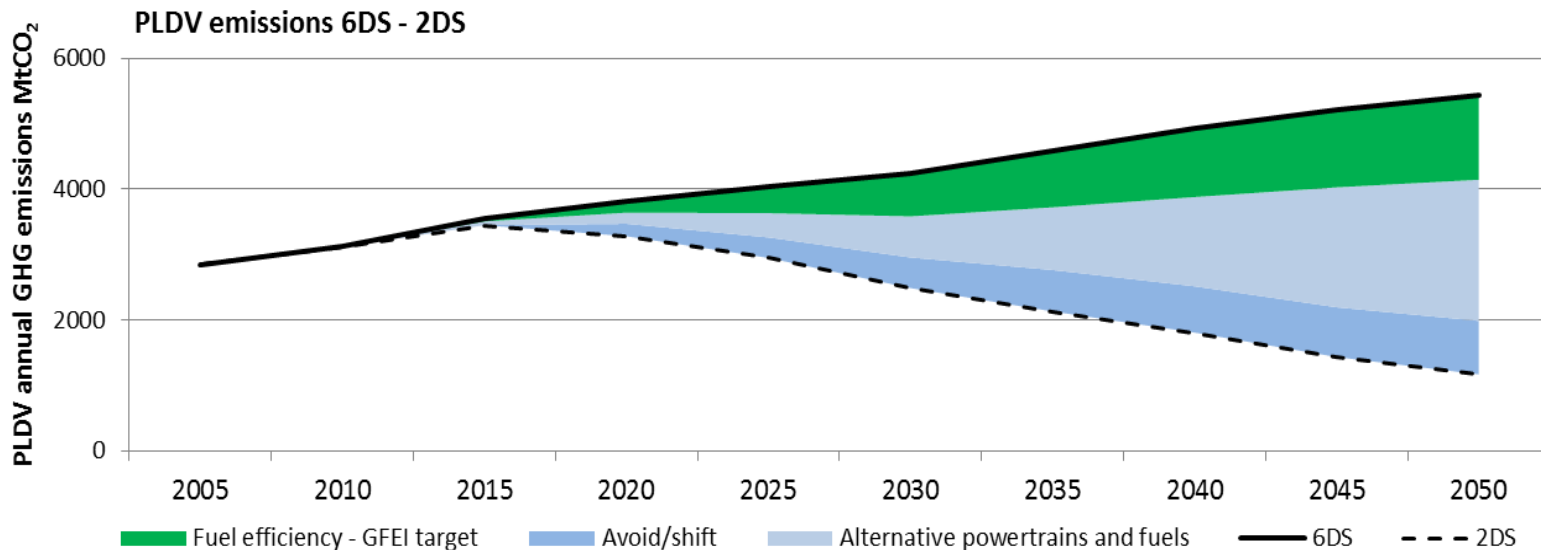


- Transport accounts for 23% of energy related carbon emissions

- Reducing fuel consumption (L/100km) by 50% until 2050 can save up to 33 Gt CO2 and up to USD 8 trillion globally
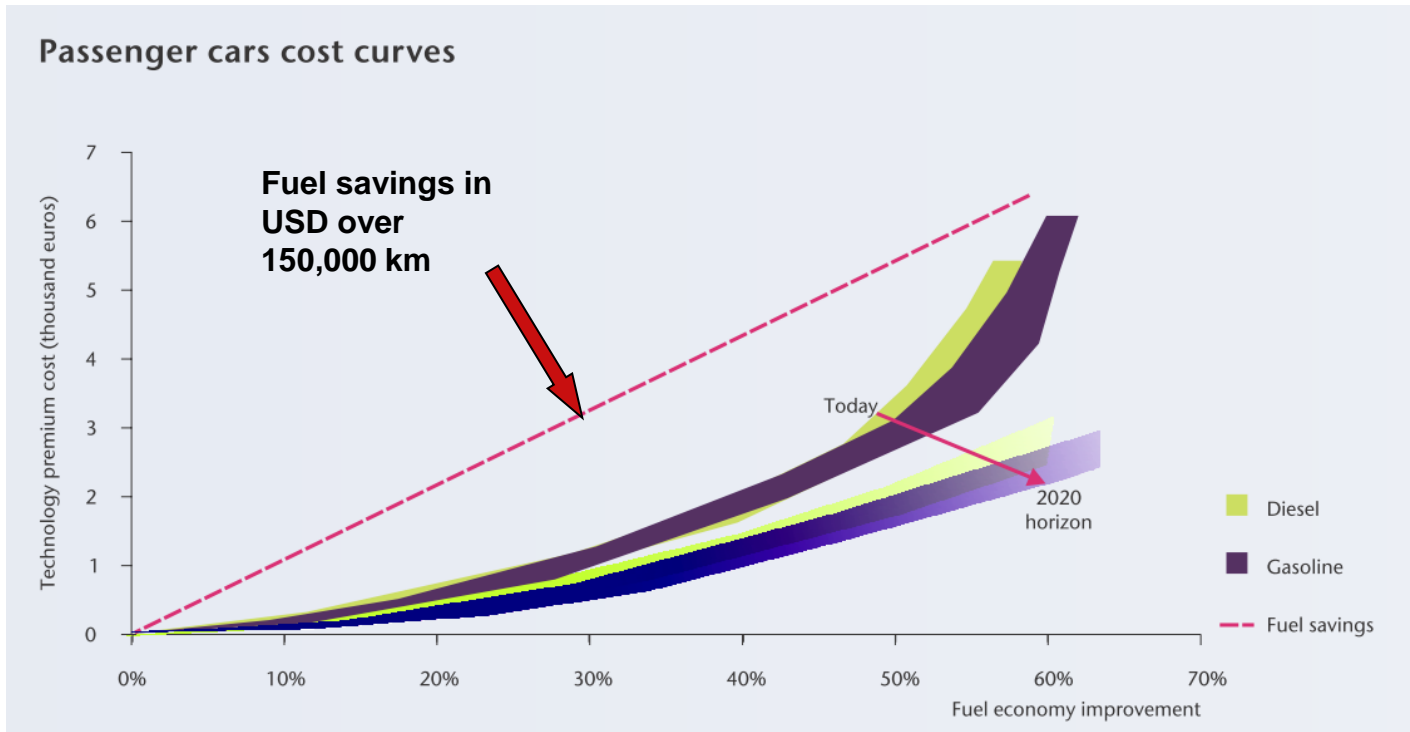
Source: GFEI State of the World 2016

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# Fuel efficiency pays back



Passenger cars cost curves

- 30% fuel consumption reduction pays back after 3.5 years (44,000km, USD 1.1/L, 8L/100km base FE, no discounting, today's technology cost)

- 50% fuel consumption reduction pays back after 6 years (75,000km, USD 1.1/L, 8L/100km base FE, no discounting)

Source: IEA Technology Roadmap: Fuel Economy of Road Vehicles

# Fuel consumption of new cars – Status quo

# Fuel economy policies around the world



Policy in Place

FE Policy in Progress

The label "Policy in place" is given when countries are implementing or have already implemented the policies. The label "Policy in Progress" is attributed when concrete activities are undertaken by government and stakeholders to develop these measures.

The map shows countries that have adopted policies such as specific $CO_2$ emission or fuel economy standards, fiscal measures (for example feebate systems or tax incentives for fuel efficient vehicles) or information campaigns (for example labelling schemes).

- More than 80% of the global PLDV market is regulated

- Vietnam, Thailand have fuel economy policies in place, Philippines, Malaysia, Indonesia are on the way to develop FE policies
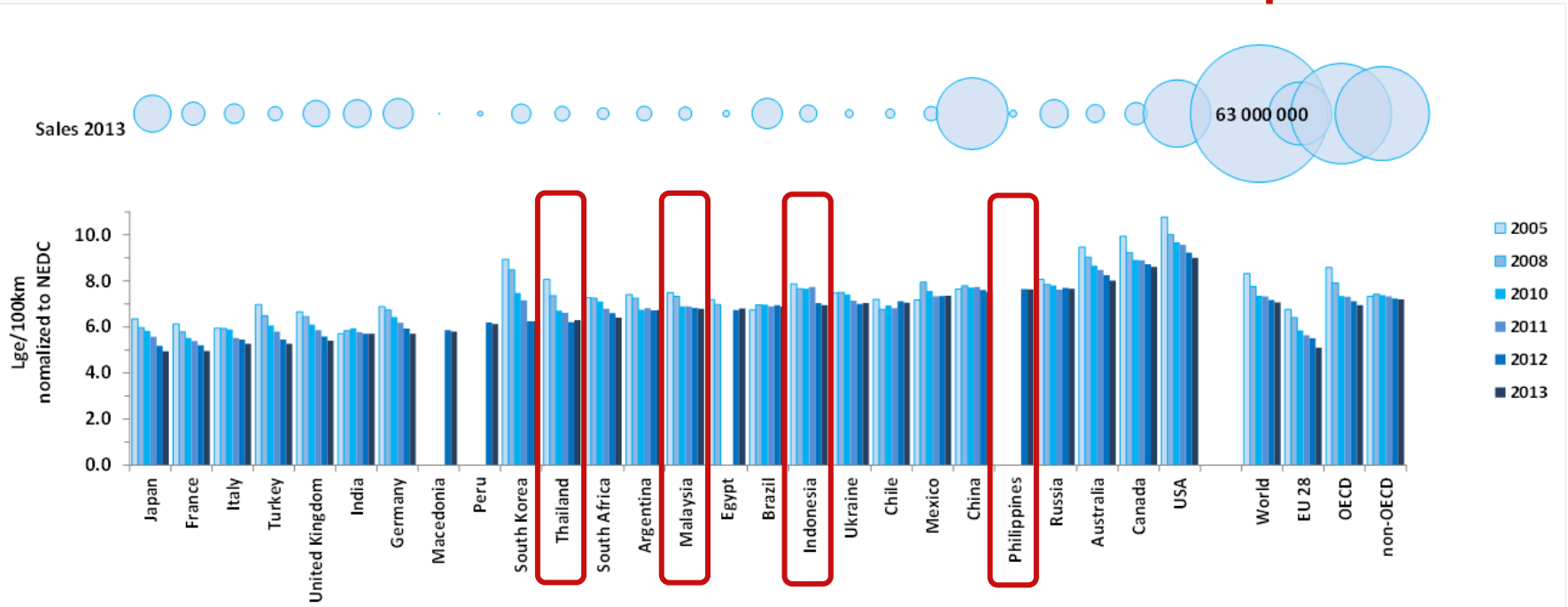
Source: GFEI State of the World 2016

# New PLDV fuel consumption in selected ASEAN countries – GFEI/IEA FE report



- Countries with FE policies in place show encouraging efficiency improvement rates
- Size shift vs. technology evolution moderates non-OECD improvement
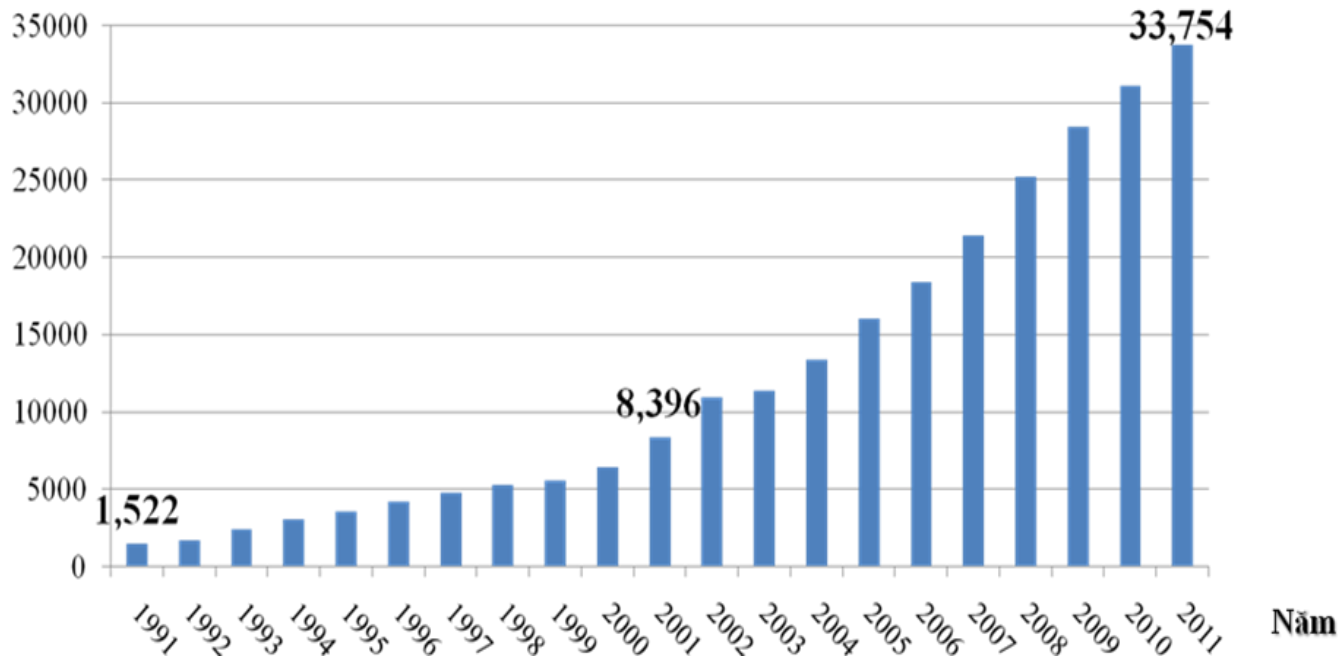- Fuel consumption (L/100km) of new sold LDVs shows a wide spectrum in ASEAN

# Vietnam: Two-wheeler fleet exploded in the last 20 years

Số lượng xe (x1,000)



- In 2011 almost 34 million two wheelers were on the road in Vietnam

Source: Vietnam Register

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# Vietnam: Can two-wheelers get more efficient?

*Table 1 – Number of motorcycles locally manufactured and assembled and imported*

| Year / Quantity | 2005 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|
| Manufactured and assembled (units) | 2,187,870 | 3,141,698 | 3,671,441 | 3.282.220 | 3.268.228 | 2.916.689 |
| Imported (units) | 45,716 | 92,516 | 66,839 | 36.528 | 19.037 | 20.713 |

*Source: Vietnam Register*

- Less than 1% of all newly registered two wheelers are imported

- Based on data from 5 biggest manufacturers, the state of the art of two-wheeler fuel economy can be determined → **2.6 L/100km** (preliminary result)

Source: Vietnam Register

Policy measures and case studies

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# Fuel economy policies & instruments

1. Regulatory – Fuel economy/$CO_2$ emission standards

2. Monetary – Fiscal instruments and road pricing
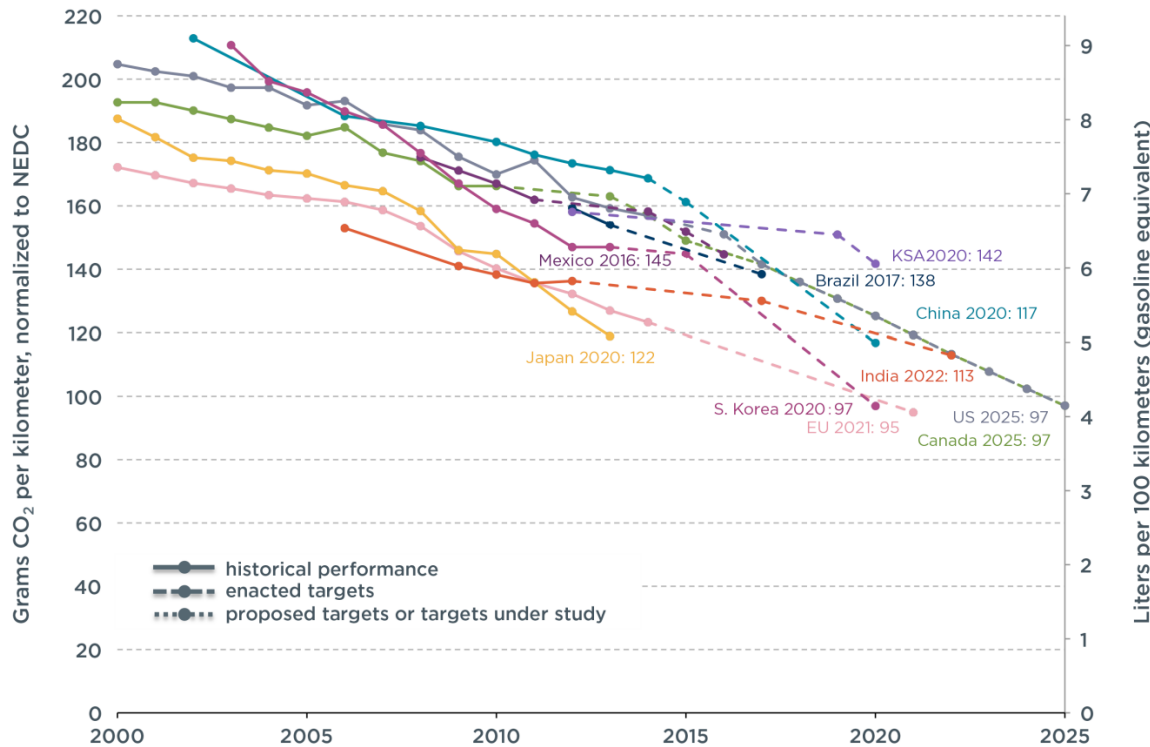
3. Consumer information

# Fuel economy/$CO_2$ emission standards

Passenger car $CO_2$ emissions and fuel consumption, normalized to NEDC



Source: ICCT 2016

Regulation of **corporate average** fuel economy/$CO_2$ emission **of new cars** - based on sales weighted average (EU) or harmonic mean (US)

Inclusion of super-credits for alternative fuel vehicles – e.g. multiplier on BEVs sales

**Standards are an efficient measure for countries with own car manufacturing and/or a big LDV market**

# Monetary measures

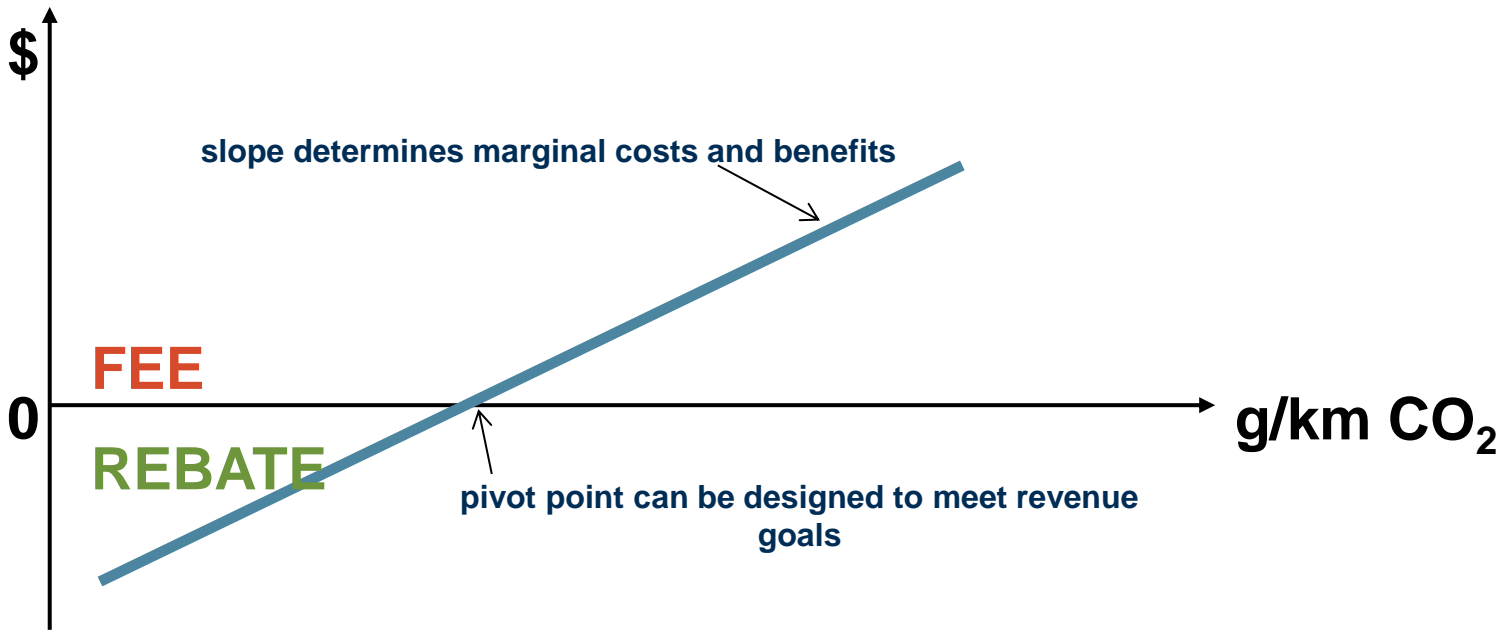| Fiscal policy type | Characteristics |
|---|---|
| Vehicle purchase tax/feebates | Paid at time of purchase; can be differentiated by fuel economy or $CO_2$ |
| Vehicle circulation tax | Typically paid at annual registration; can be $CO_2$-adjusted |
| Fuel tax | Set by fuel type; paid upon refueling |
| **Other monetary measures** | |
| Road pricing | Paid by km of driving or when passing a cordon line |

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# Feebate = Fee + Rebate



$ 

slope determines marginal costs and benefits

**FEE**

0

**REBATE**

g/km $CO_2$

pivot point can be designed to meet revenue
goals

- Market-based policy that shifts consumer purchases (and potentially manufacturer production) to lower emission vehicles by placing a fee on higher-emitting vehicles and providing a rebate to lower-emitting vehicles

- Based on fuel economy or $CO_2$ differential between vehicles

- Could also take into account vehicle attributes like size or weight

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# Case study: Singapore

| CEVS BANDINGS | | | | | |
|---|---|---|---|---|---|
| **Band** | **Carbon emission ($CO_2$ g/km)** | **REBATE (FROM 1 JAN 2013)** | | **SURCHARGE (FROM 1 JULY 2013)** | |
| | | **Cars** | **Taxis** | **Cars** | **Taxis** |
| A1 | 0 to 100 | $20,000 | $30,000 | | |
| A2 | 101 to 120 | $15,000 | $22,500 | | |
| A3 | 121 to 140 | $10,000 | $15,000 | | |
| A4 | 141 to 160 | $5,000 | $7,500 | | |
| B | 161 to 210 | $0 | $0 | $0 | $0 |
| C1 | 211 to 230 | | | $5,000 | $7,500 |
| C2 | 231 to 250 | | | $10,000 | $15,000 |
| C3 | 251 to 270 | | | $15,000 | $22,500 |
| C4 | 271 & above | | | $20,000 | $30,000 |

- Singapore introduced feebate scheme in January 2013

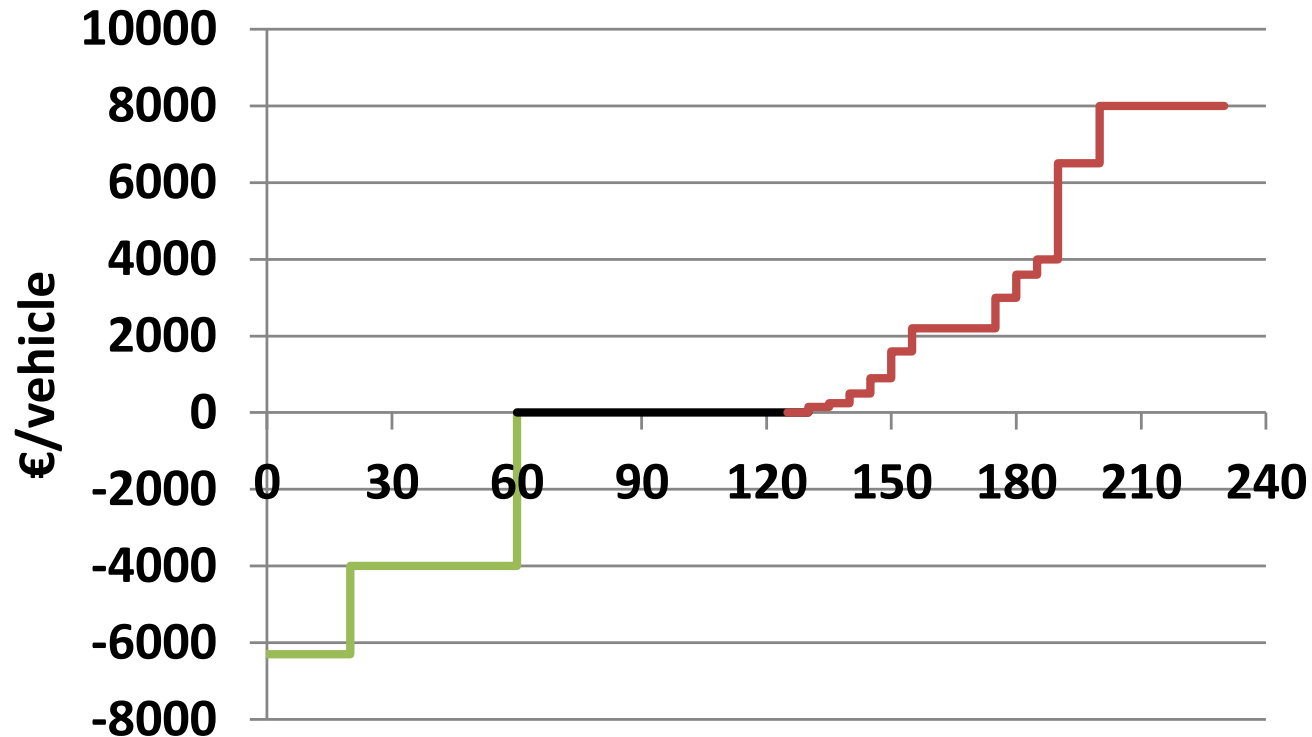Source: http://www.lta.gov.sg/apps/news/page.aspx?c=2&id=12e099d1-e037-450b-80e3-5cb6b8293c4a#1

# Case study: France



- Fees have risen and the rebates declined over time in order to achieve cost neutrality

# French feebate system led to significant drop in $CO_2$ emissions
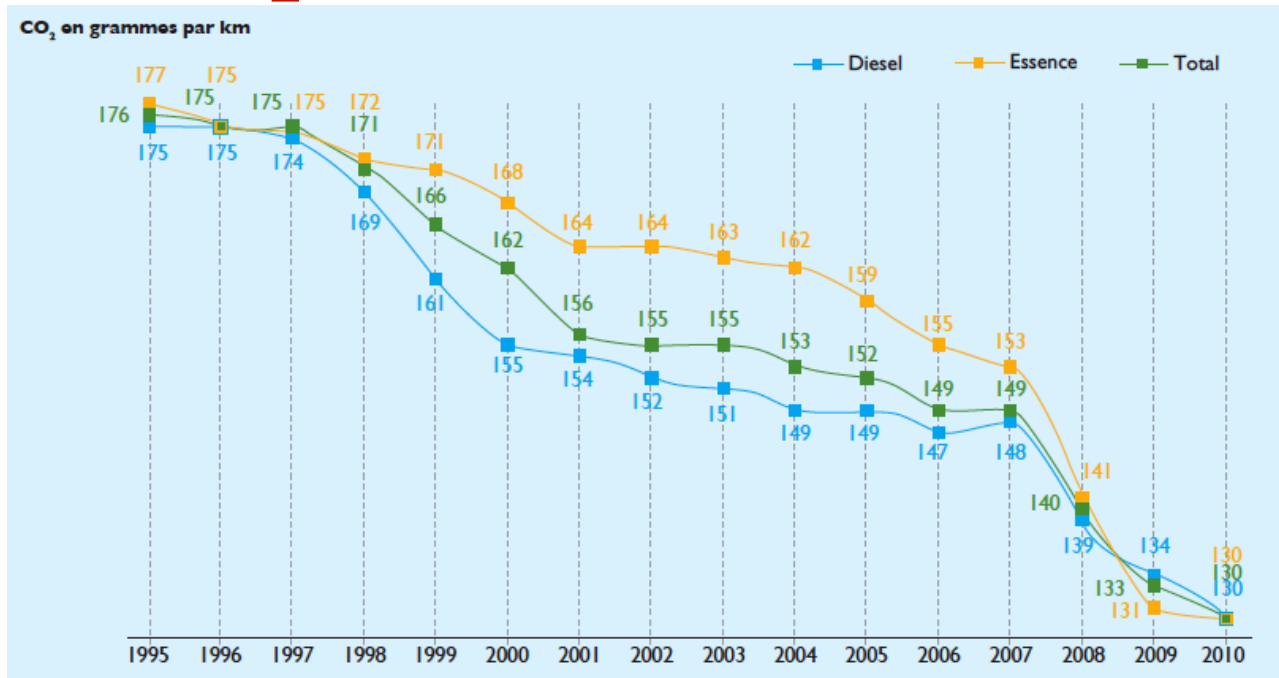


- 2001–2007 avg. reduction new vehicle $CO_2$ = 1 g/km per year

- 2008: emissions drop 9 g/km and 2009 by 7 g/km, Ministry of Transport attributes to introduction of bonus/malus system

- Cost 2008: 225 Million EUR – not cost neutral! → Changed 2010/2011
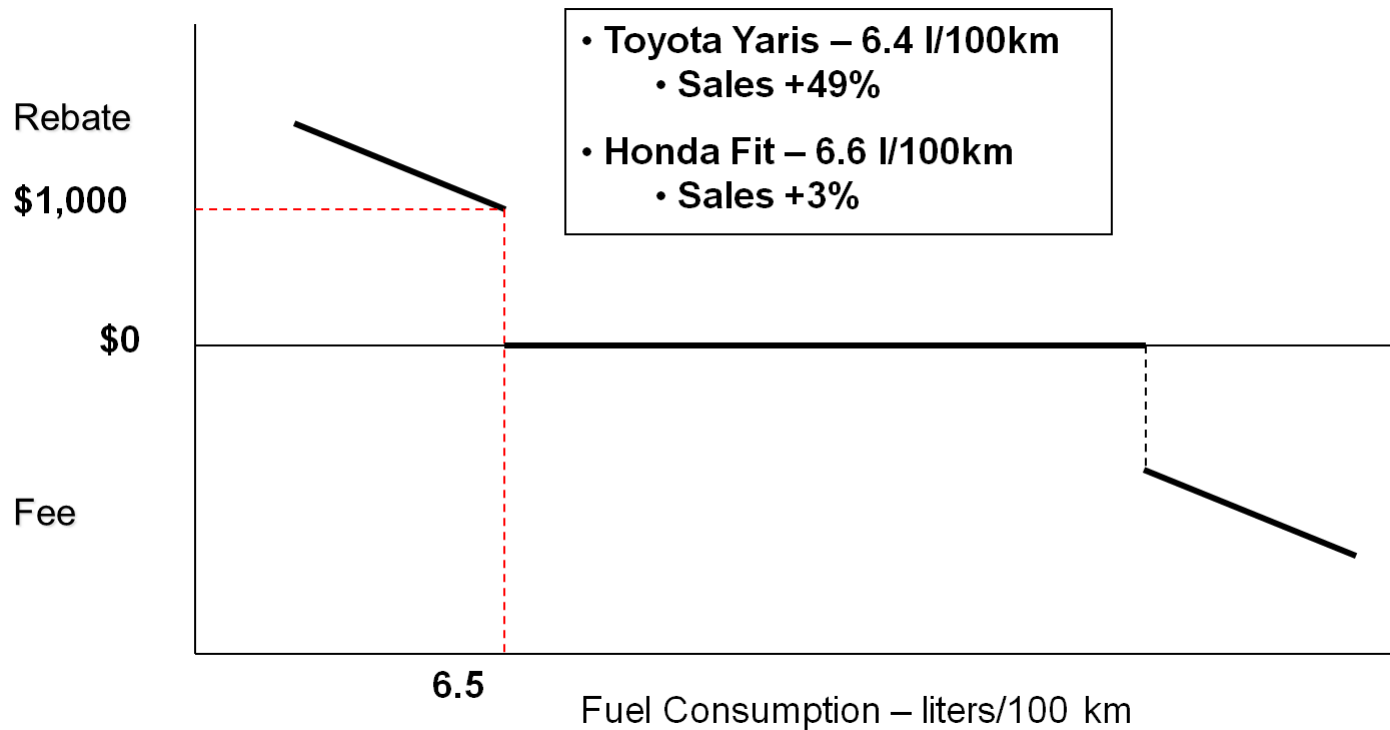
Source: Les véhicules particuliers en France (Ademe), March 2011

# Important to have a continuous slope, no steps – example: Canada

- Toyota Yaris – 6.4 l/100km
  - Sales +49%

- Honda Fit – 6.6 l/100km
  - Sales +3%

Rebate

$1,000

$0

Fee

6.5

Fuel Consumption – liters/100 km

- Ill-defined step function for feebate scheme distorted car market in Canada

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# Labelling

**Thailand**

**Singapore**
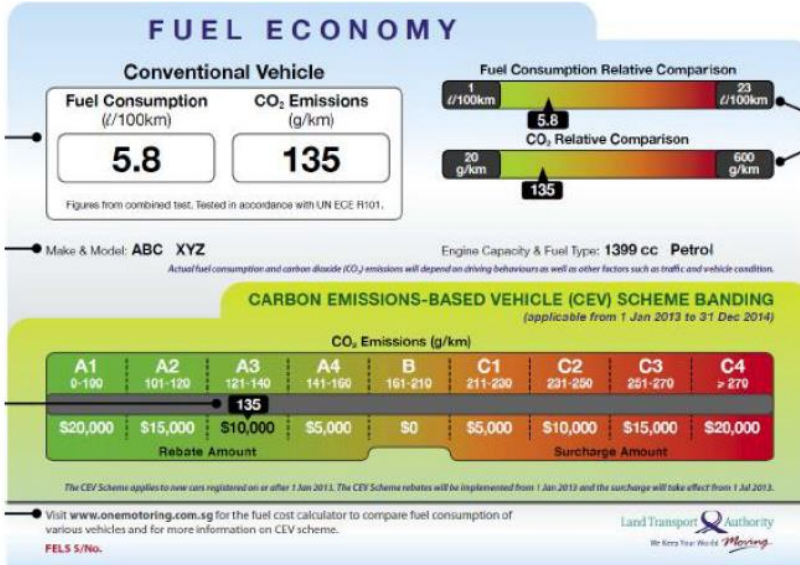
**Vietnam**



- Data is a prerequisite for emission/fuel economy based policy measures

- Information should be shown to consumers to guide their purchase decision

- FE labelling is compulsory in many countries/regions: Brazil, Canada, Chile, China, EU, Japan, Korea, New Zealand, Singapore, Thailand, United States, Vietnam
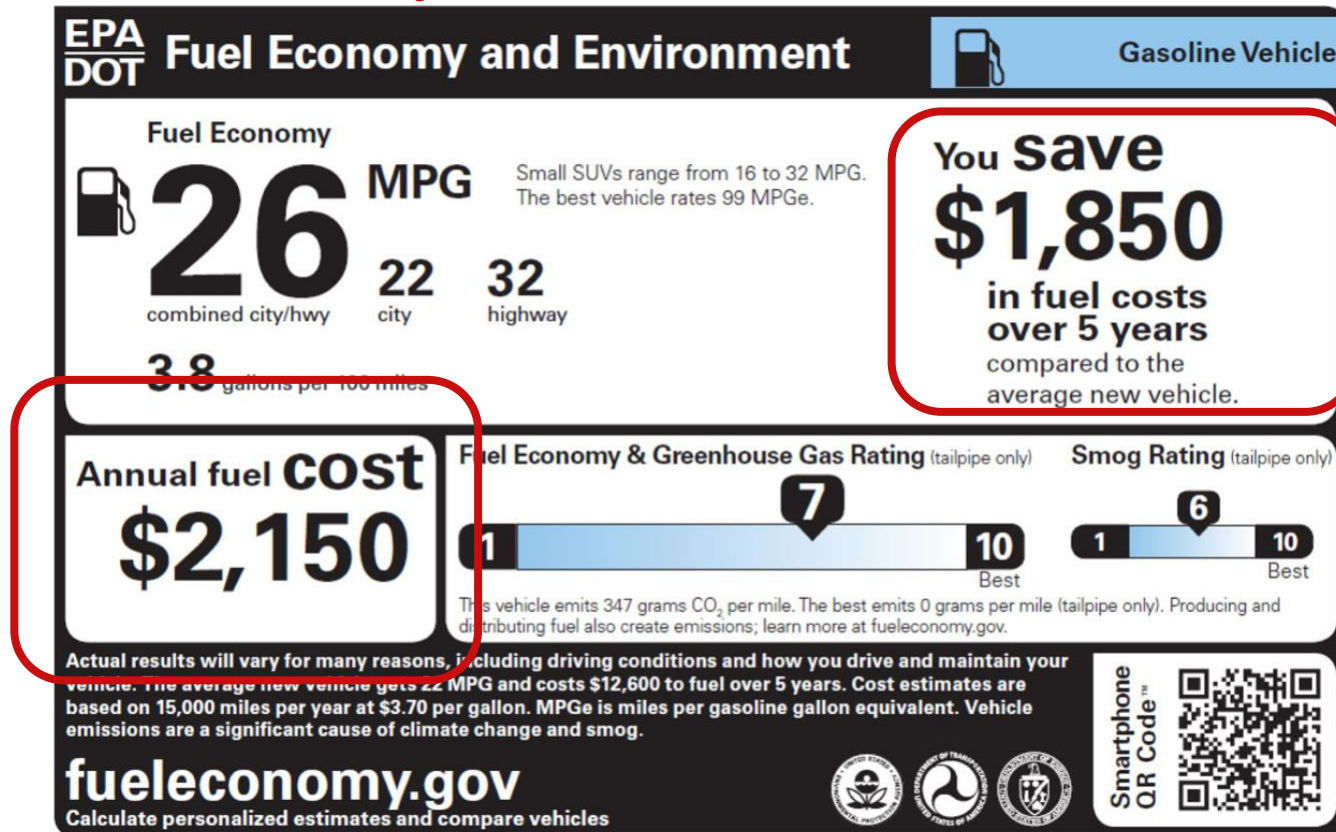
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# Fuel economy label: US



- Additional information on annual fuel cost and savings/additional costs compared to the average vehicle explains the impact of fuel economy very clearly to the consumer

Fuel economy policies – Conclusions

# Policy design – defining appropriate targets – designing appropriate measures

**Preliminary findings from new IEA/GFEI study "Technology and policy drivers of the fuel economy of new light duty vehicles" (soon to be published):**

- Regulatory targets and monetary incentives have a major influence on the development of vehicle fuel efficiency

- The adoption of combined regulatory and fiscal measures appears to be the best path to achieve energy savings from light duty vehicles

- Fuel economy standards tend to guarantee effective results in big markets

- Differentiated vehicle taxation demonstrated to be effective especially in markets with lower purchasing power

- Differentiated vehicle taxation easier to set up than fuel economy regulations

# Fuel Economy Policy Impact assessment Tool FEPIT

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# Technical steps to introduce FE policies and the use of FEPIT

- <u>Baseline</u> – What is the average fuel economy of new passenger vehicles sold today in your country?

- <u>Target – Where will fuel economy need to be in the future?</u>

- <u>Identification of policies</u> – Which measures are appropriate to reach the target?

- <u>Quantification of policy measures</u> – regulatory and monetary measures and information campaigns

# Purpose of FEPIT

- Simple tool to **estimate the impact of selected policy measures** on the average fuel economy of newly registered cars in a given year in the future

- **Support for decision makers** to implement policy schemes to achieve region specific fuel economy targets in the light of the GFEI target

- **Light application** running in MS EXCEL with limited data requirements and with a simple and user-friendly interface

- Does not replace in-depth policy study: **magnitude of the impact of the policy measures rather than exact forecast**

# Policy measures analysed in FEPIT

- Fuel economy regulation/standard

- $CO_2$-Based Vehicle registration tax/feebate scheme

- $CO_2$-Based Vehicle circulation tax

- Fuel taxation

Eco-labelling not explicitly considered: it is assumed to be a pre-requisite for the application for all other policies
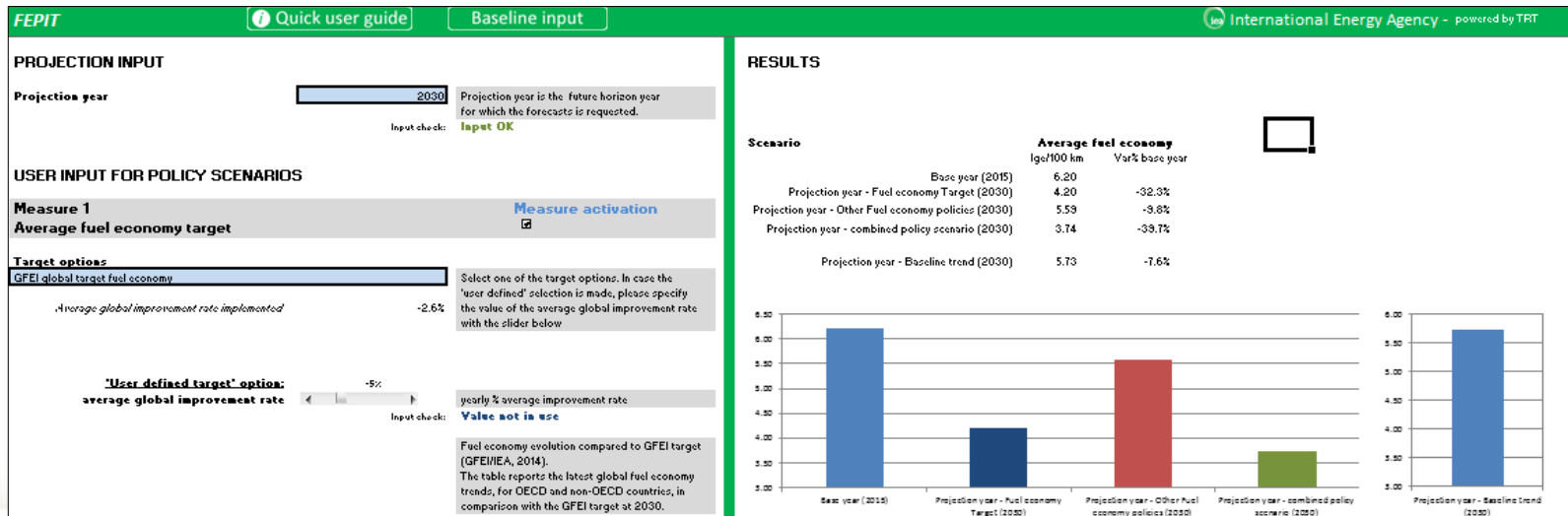
# Use of FEPIT

1.) <u>Baseline input</u>

- Filling the <u>baseline input</u> fields

2.) <u>Projection input and results worksheet:</u>

- Setting the assumptions for the <u>policy scenarios</u>

- Reading the <u>results</u> of the calculations

# Example of FEPIT input: Vehicle sales by FE segment

**NEW CARS REGISTRATIONS**

**New registrations classes**

*Fuel consumption thresholds*

( Ige/100km )

| | |
|---|---|
| ICE < | 4.0 |
| ICE 4- | 5.0 |
| ICE 5- | 6.0 |
| ICE 6- | 7.0 |
| ICE > | 7.0 |

These values define the segments used by the tool to represent the registration mix of conventional Internal Combustion Engine cars.
$CO_2$ based vehicle taxation policies are described in the tool by applying taxes differentiated according to these segments.
See the user guide for more details on the choice of the thresholds

Input check:     Input OK

**New registrations composition**

*Composition for Base year (2015)*

| | |
|---|---|
| Battery electric | 0.0% |
| Hybrid Plug-in electric | 0.0% |
| Hybrid electric | 0.3% |
| ICE <4 Ige/100km | 0.5% |
| ICE 4-5 Ige/100km | 9.0% |
| ICE 5-6 Ige/100km | 44.4% |
| ICE 6-7 Ige/100km | 28.8% |
| ICE >7 Ige/100km | 17.1% |

The composition of new registrations is defined in terms of share of cars registered in each segment (according to the classes defined above).
Hybrid (electric and plug-in) and battery electric cars are kept separeted.
The sum of the shares has to be 100%.

Input check:     Input OK

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# Example of FEPIT input: vehicle registration tax scheme



**VEHICLE TAXATION**

**Average REGISTRATION tax in the base year**

| Tax level by segment for Base year (2015) | ($) | |
|---|---|---|
| Battery electric | 0.00 | The REGISTRATION tax is a tax paid only once when the vehicle is purchased and registered. It does NOT include any VAT or similar tax applied to the purchase price |
| Hybrid Plug-in electric | 0.00 | |
| Hybrid electric | 0.00 | The tax/rebate level has to be defined according to the registration classes defined above. |
| ICE <4 lge/100km | 150.00 | |
| ICE 4-5 lge/100km | 500.00 | Taxes should be coded as positive values, rebates should be coded as negative values. |
| ICE 5-6 lge/100km | 1000.00 | The values of the registration tax should be provided in US Dollars |
| ICE 6-7 lge/100km | 2000.00 | If registration tax does not exist in the base year all values should be set to zero |
| ICE >7 lge/100km | 3000.00 | |
| Input check: | Input OK | |

# FEPIT results



| Scenario | Average fuel economy | |
|---|---|---|
| | lge/100 km | Var% base year |
| Base year (2015) | 6.20 | |
| Projection year - Fuel economy Target (2030) | 4.20 | -32.3% |
| Projection year - Other Fuel economy policies (2030) | 5.59 | -9.8% |
| Projection year - combined policy scenario (2030) | 3.74 | -39.7% |
| Projection year - Baseline trend (2030) | 5.73 | -7.6% |
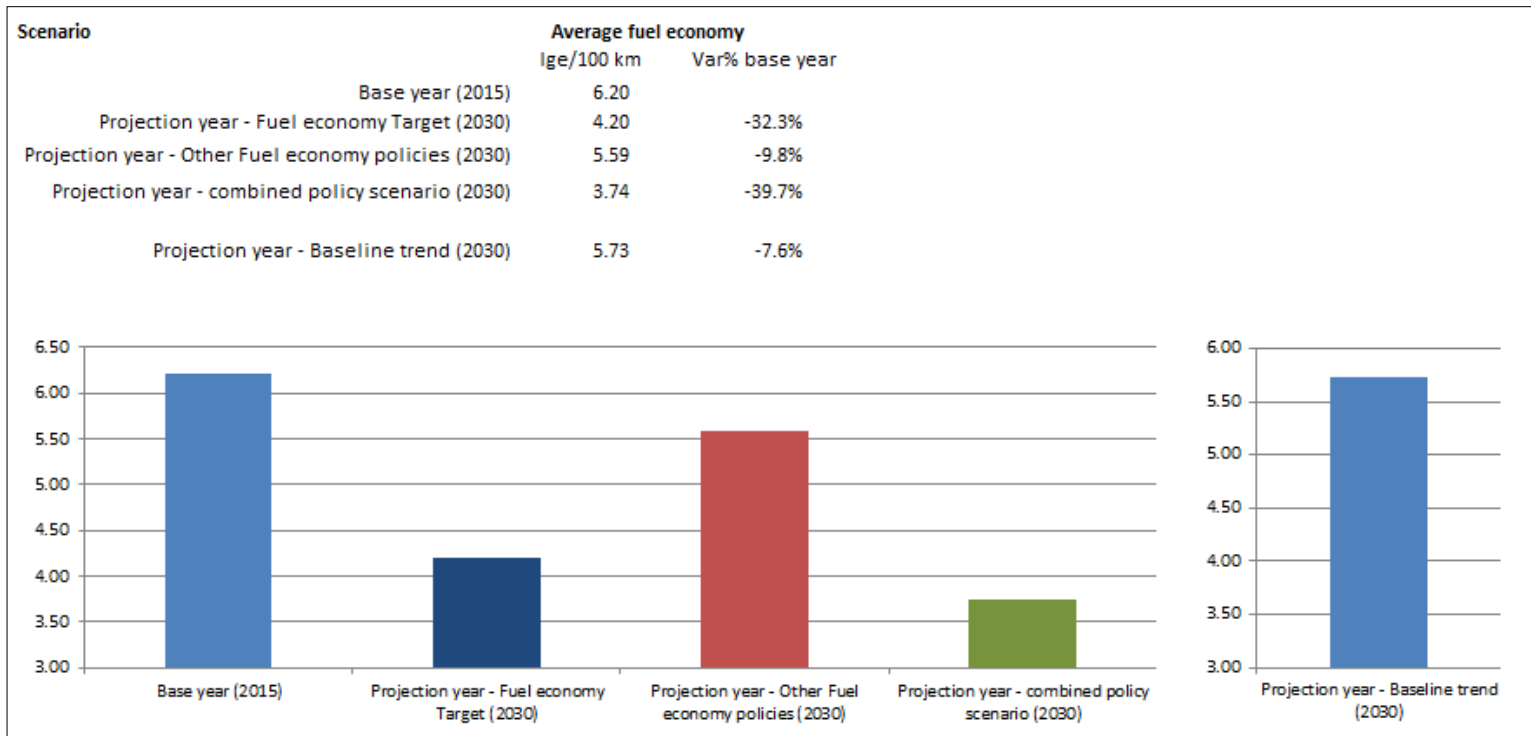
- FEPIT can be downloaded for free from:
  http://www.iea.org/gfei/FEPIT2015.xlsb

- User guide and methodology report:
  http://www.iea.org/gfei/FEPITUserGuide.pdf
  http://www.iea.org/gfei/FEPITMethodologyReport.pdf

Thanks!