Africa Clean Mobility Week

Fuel Economy Policy Impact Tool FEPIT

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Content

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- Fuel Economy Policy Impact Tool – FEPIT
- Practical Example

GFEI target – Maximizing the benefits of improved fuel economy

- Reduce new passenger light-duty vehicle fuel consumption (Lge/100km) by 50% until 2030 globally

- Reduce passenger light-duty vehicle stock fuel consumption (Lge/100km) by 50% until 2050 globally

The goal can be achieved by putting the right policies in place: regulation, fiscal incentives, consumer information

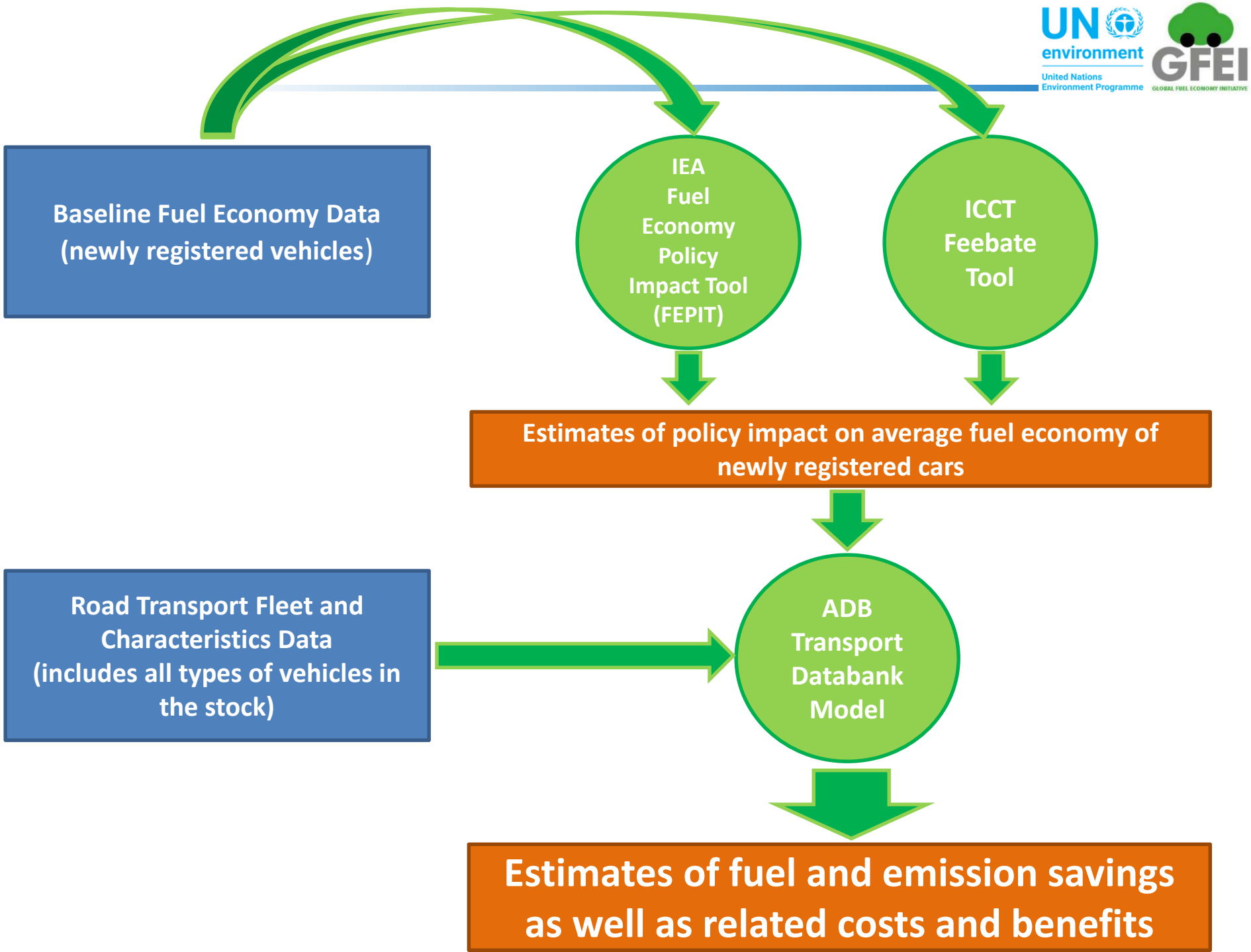
Fuel Economy Policy Analysis Toolbox

Why are we using FEPIT?

Goal: What are the costs and benefits of FE policies?

1. Understanding the past: FE baseline
2. Analysing the impact of FE policies on future new vehicle fuel economy: IEA FEPIT
3. Quantifying the impact of improved vehicle fuel economy on future transport energy use, emissions and costs: ADB Transport Databank Model

Selection and implementation of adequate fuel economy policies


Baseline Fuel Economy Data
(newly registered vehicles)
IEA
Fuel
Economy
Policy
Impact Tool
(FEPIT)
ICCT
Feebate
Tool
Estimates of policy impact on average fuel economy of newly registered cars
Road Transport Fleet and
Characteristics Data
(includes all types of vehicles in
the stock)
ADB
Transport
Databank
Model
Estimates of fuel and emission savings
as well as related costs and benefits

Policy target: Newly registered vehicles vs. existing vehicle fleet

What do you want to control:

1. **Vehicles (new and used) entering the market - Vehicles which are registered in the country for the first time**
   - → FE policies such as registration taxes, import duties, feebate schemes target newly registered cars
   - → FE data is easier to find
2. **Existing vehicle stock - Vehicles which are already running in the country**
   - → FE policies such as circulation tax and fuel tax target the running fleet

Impact is very different from consumer perspective, option 1 is much easier to be accepted

Introduction to FEPIT

Data requirement – FE baseline & additional info

- **New registrations by fuel economy segment for at least one past year**
- **Average fuel economy by fuel economy segment of all newly registered cars for at least one past year**
- **Additional Information on:**
  - Vehicle taxation (registration and circulation tax/feebate)
  - Fuel price and fuel taxation
  - Fuel composition of newly registered cars (gasoline/diesel)

Policy measures 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

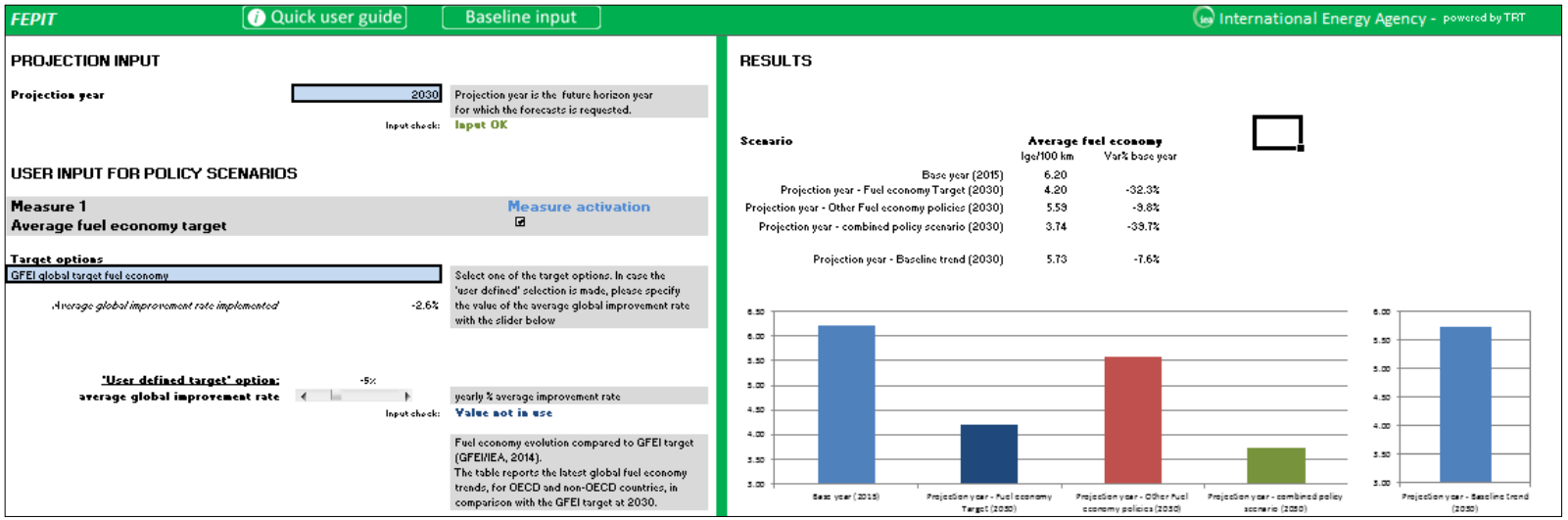
Use of FEPIT

1.) Baseline input

- Filling the baseline input fields

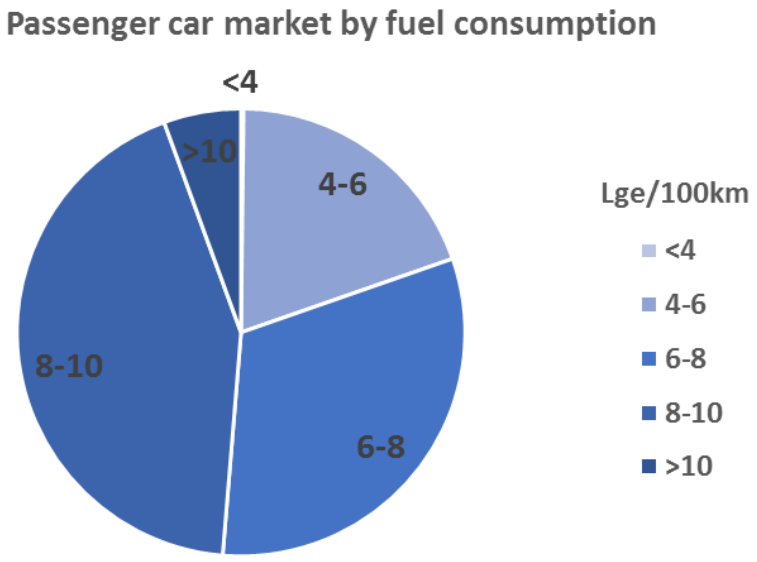
2.) Projection input and results worksheet:

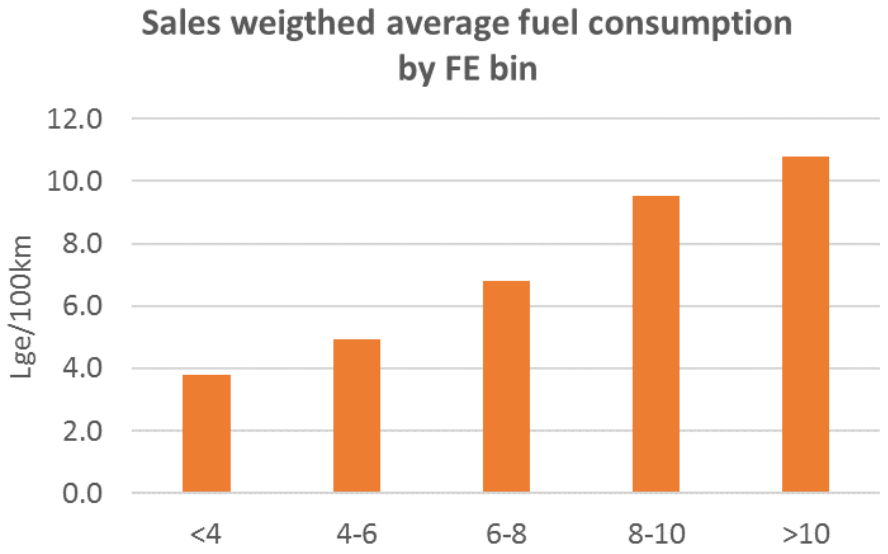
- Setting the assumptions for the policy scenarios
- Reading the results of the calculations



Let’s open the tool!

Example Philippines: Data preparation





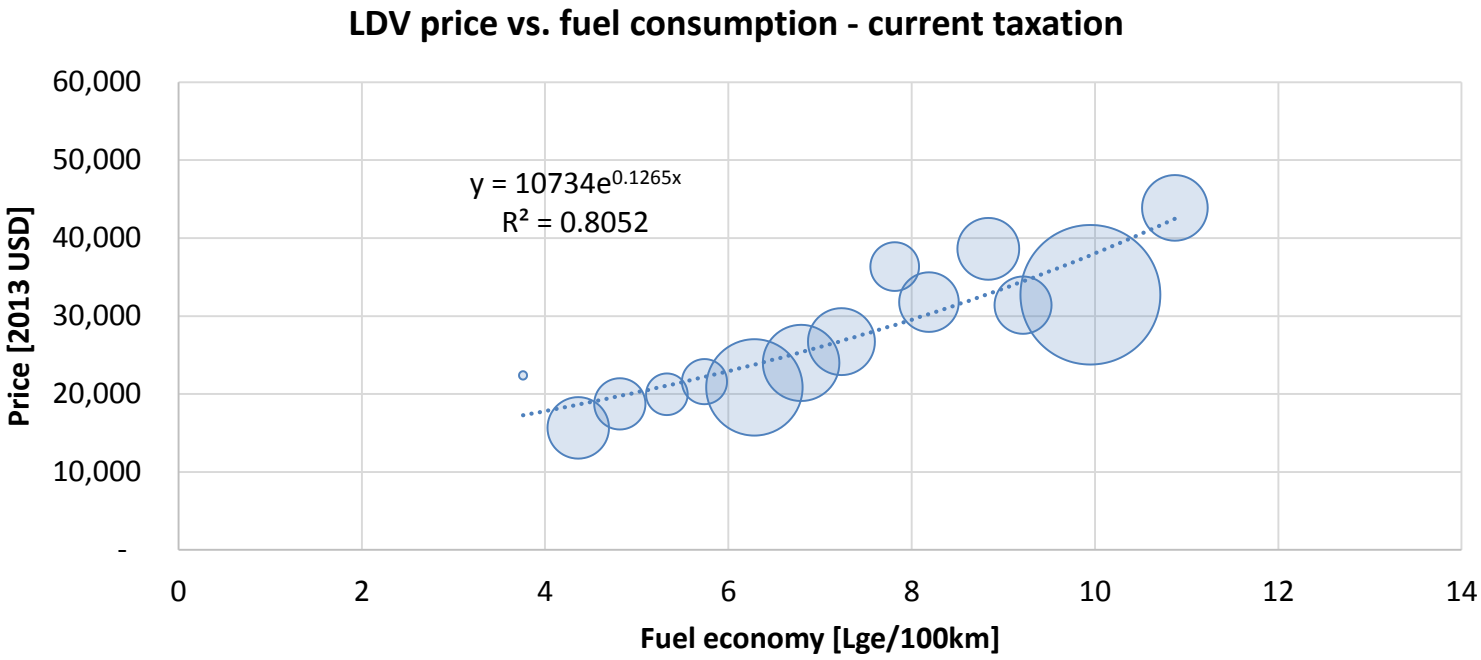
- **The fuel consumption bins need to be selected in a way to represent the market distribution**

Philippines: Current and proposed vehicle registration tax

Bracket	Net manufacturing/ importation price	DoF Current price based vehice excise tax	DoF proposed price based vehice excise tax	GFEI proposal: FE based and price based vehicle excise taxation
1	14,102	2%	4%	FE based tax component
2	Over 14,102 to 25,854	300 plus 2% in excess of 14,102	24,000 plus 40% in excess of 14,102	FE based tax component plus 40% in excess of 14,2012
3	Over 25,854 to 49,357	2,600 plus 40% in excess of 25,854	5,300 plus 100% in excess of 25,854	FE based tax component plus 80% in excess of 25,854
4	Over 49,357	12,000 plus 60% in excess of 49,357	24,100 plus 200% in excess of 49,357	FE based tax component plus 120% in excess of 49,357

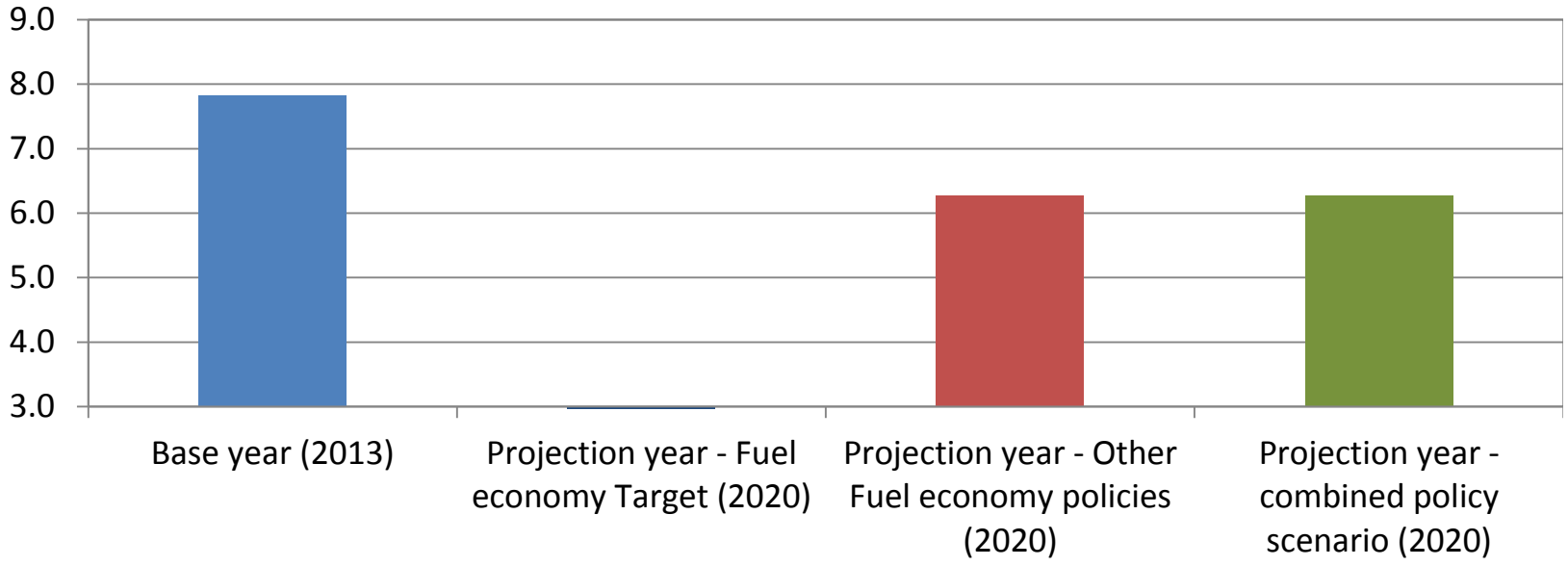
- **The GFEI fuel consumption and price based vehicle registration tax proposal provides similar tax revenues to the government while setting a strong incentive to consumers to but more efficient vehicles at the same time**

Regression of vehicle price versus fuel consumption



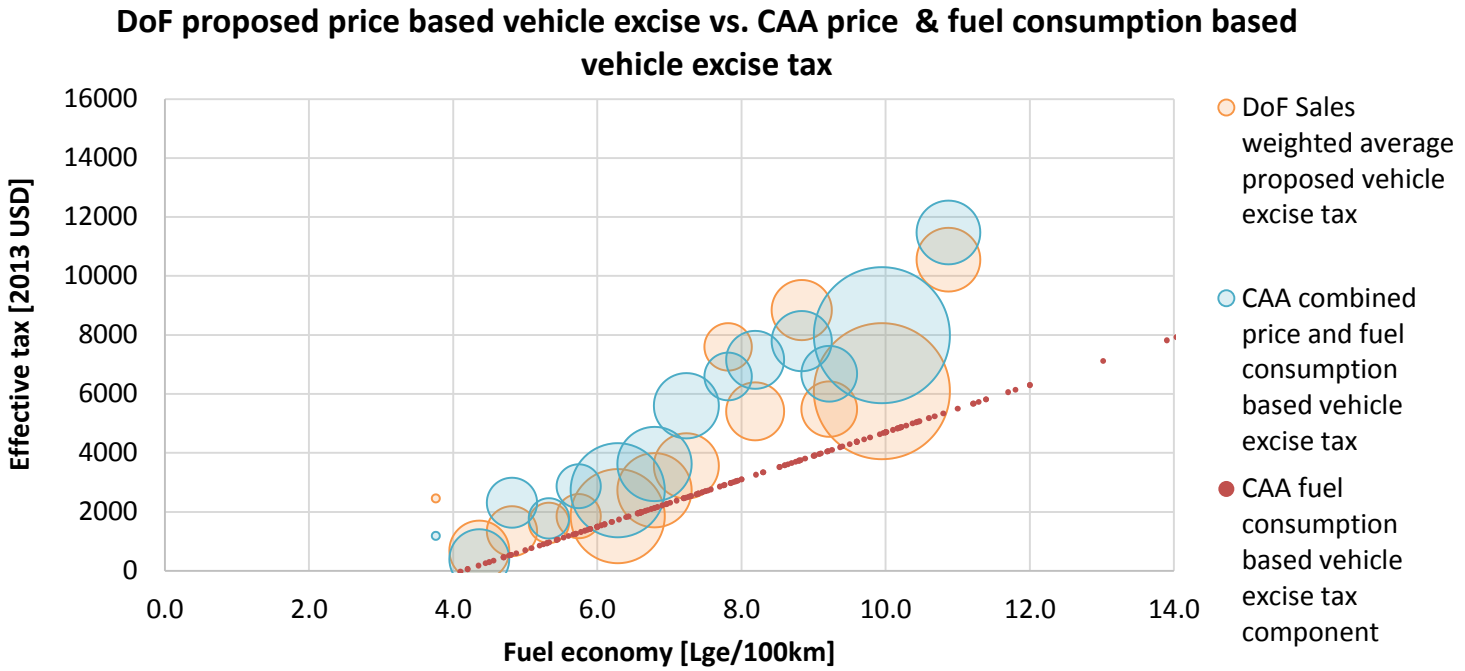
- **The regression confirmed the relationship between vehicle price and fuel consumption: the higher the price, the bigger the car, the higher the fuel consumption**

Results



- **The proposed change in registration tax would *theoretically* result in a 20% fuel economy improvement**

GFEI registration tax proposal



- GFEI proposal based on FEPIT result: Introduction of a linear fuel consumption based tax component with a slope of USD 800 per Lge/100km
- Combination with price based scheme to ensure similar tax revenues to the government

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4	Over 49,357	12,000 plus 60% in excess of 49,357	24,100 plus 200% in excess of 49,357	FE based tax component plus 120% in excess of 49,357

- **Question: What is the impact of a proposed registration tax change on future FE improvement (base year**
- **The price based tax scheme needs to be converted to the fuel consumption based FEPIT input**

Cautious interpretation of results

- The introduction of a stringent fuel economy standard in combination with strong fiscal incentives can lead to very low average fuel consumption values in the target year
- In reality, average fuel consumption values of the new vehicle fleet < 4 Lge/100km can only be reached by strong hybridization and electrification
- FEPIT results needs to be interpreted with care, the evaluation of fiscal incentives in isolation is the strongest ability of the model

FEPIT download

- The tool is available for download at the following link: http://www.iea.org/gfei/FEPIT2015.xlsb
- It is accompanied by a user guide and a methodology report.
- FEPIT - User guide: http://www.iea.org/gfei/FEPITUserGuide.pdf
- FEPIT – Methodology report: http://www.iea.org/gfei/FEPITMethodologyReport.pdf

Thank you very much!

FEPIT input – New car registrations

Baseline input worksheet

- **New cars registrations by FE segment**

NEW CARS REGISTRATIONS

New registrations classes

Fuel consumption thresholds

	(lge/100km)
ICE <	4.0
ICE 4-	5.0
ICE 5-	6.0
ICE 6-	7.0
ICE >	7.0

Input check: Input OK

These values define the segments used by the tool to represent the registration mix of conventional Internal Combustion Engine cars.
CO2 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

New registrations composition

Composition for Base year (2015)

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

Input check: Input OK

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%.

FEPIT input – FE by segment

Baseline input worksheet – fuel economy

NEW CARS FUEL ECONOMY

Average fuel consumption

Fuel consumption by segment for Base year (2015)	(lge/100km)	
Battery electric	1.50	
Hybrid Plug-in electric	3.00	
Hybrid electric	4.50	
ICE <4 lge/100km	3.86	
ICE 4-5 lge/100km	4.71	
ICE 5-6 lge/100km	5.54	
ICE 6-7 lge/100km	6.47	
ICE >7 lge/100km	8.35	
	Input check:	Input OK

The average fuel consumption has to be defined according to the new registrations classes defined above. It is expressed in terms of lge/100 km (litre-gasoline-equivalent per 100 kilometre).

Past year		
	Input check:	Past year not in use

This is a past year for which data on fuel consumption by car segment is available.

Fuel consumption by segment for Past year ()	(lge/100km)	
Battery electric		
Hybrid Plug-in electric		
Hybrid electric		
ICE <4 lge/100km		
ICE 4-5 lge/100km		
ICE 5-6 lge/100km		
ICE 6-7 lge/100km		
ICE >7 lge/100km		
	Input check:	Input OK

Data related to past year is used to estimate the endogenous changing fuel consumption of new registrations according to past trend.
If past year data is not available cells should be empty

FEPIT input – Vehicle taxation

Baseline input worksheet

- Vehicle taxation in the base year
  - Level of registration tax for each car segment, net of any value added tax
  - level of circulation tax for each car segment

VEHICLE TAXATION

Average REGISTRATION tax in the base year

Tax level by segment for Base year (2015)	($)
Battery electric	0.00
Hybrid Plug-in electric	0.00
Hybrid electric	0.00
ICE <4 lge/100km	150.00
ICE 4-5 lge/100km	500.00
ICE 5-6 lge/100km	1000.00
ICE 6-7 lge/100km	2000.00
ICE >7 lge/100km	3000.00
Input check:	Input OK

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

The tax/rebate level has to be defined according to the registration classes defined above.
Taxes should be coded as positive values, rebates should be coded as negative values.
The values of the registration tax should be provided in US Dollars
If registration tax does not exist in the base year all values should be set to zero

FEPIT input – Fuel price

Baseline input worksheet

- **Fuel price in the base year**
  - Average fuel price at the pump (pump price), in $/liter
  - Average share of fuel taxes on pump price
  - Split of newly registered cars between gasoline and diesel

FUEL PRICE

Average fuel price

	($/litre)	
Average pump price	2.00	This is an average price across all fuels sold in the country. Preferably a weighted average where weight is the share of each fuel on total transport fuel consumption
Input check:		Input OK
Fuel taxes (% of pump price)	50%	This is an average across all fuels sold in the country. Preferably a weighted average where weight is the share of each fuel on total transport fuel consumption
Input check:		Input OK

Average fuel composition of new registrations

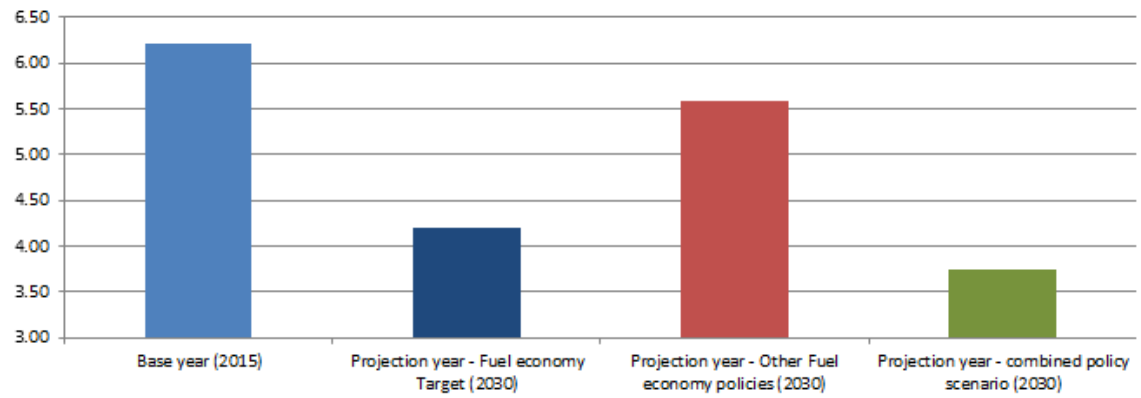
gasoline	57%	Share of gasoline and diesel cars in new registration. cars otherwise fuelled should not be considered
diesel	43%	
Input check:		Input OK

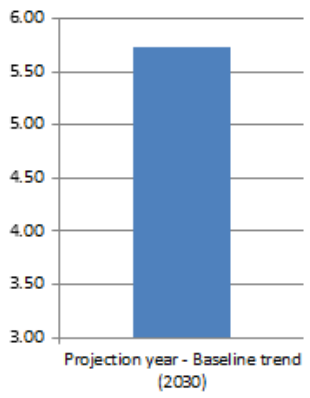
FEPIT results

Projection input and results worksheet

Reading results: average fuel economy

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%



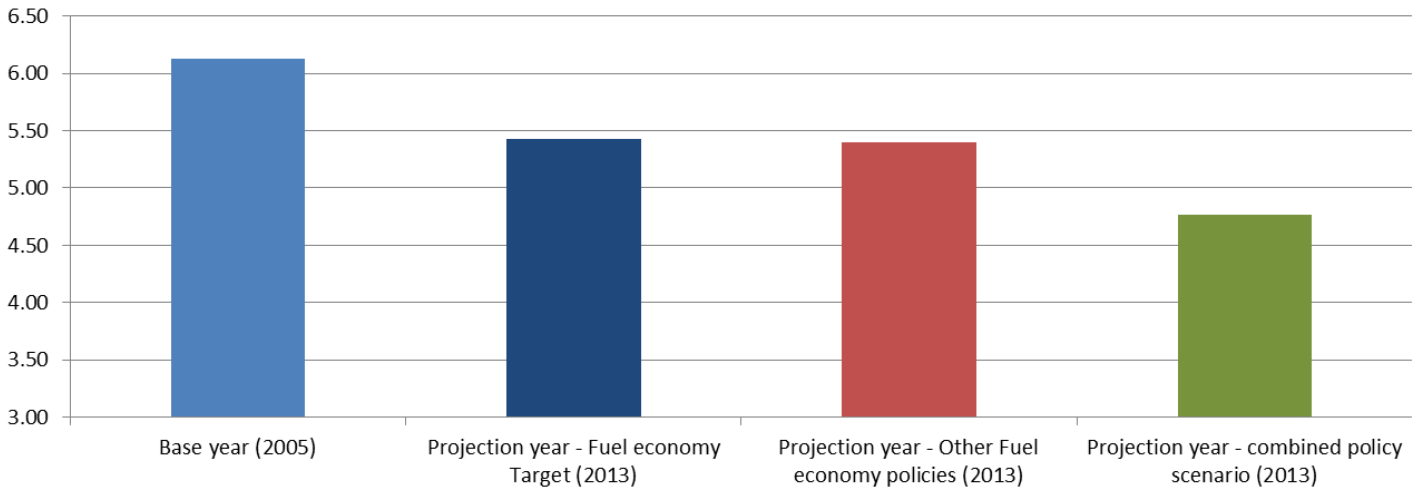


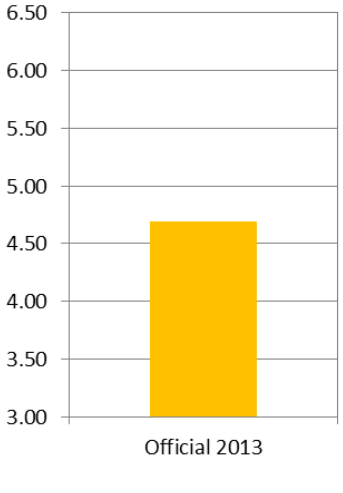
Backup

FEPIT validation

France: back casting exercise 2005 to 2013

- GFEI data for 2005 as baseline
- Projection year: 2013
- Comparison of results: 2% deviation projection vs. 2013 data



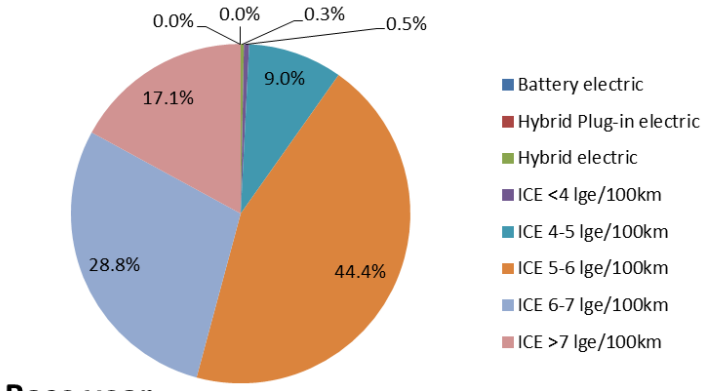


FEPIT – Methodology

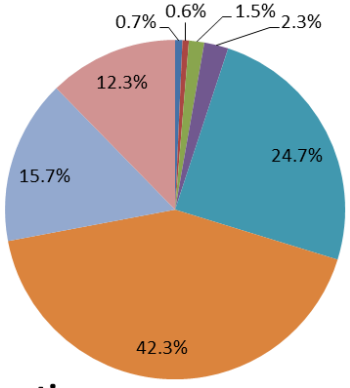
Methodological approach

Theoretical approach

- New vehicles registrations segmented into fuel consumption classes
- Each segment represented by the related average fuel consumption
- Policies affect both
  - the new registration composition, and
  - the average fuel consumption by segment
- Context factors and interaction between policies affect the size of final impacts



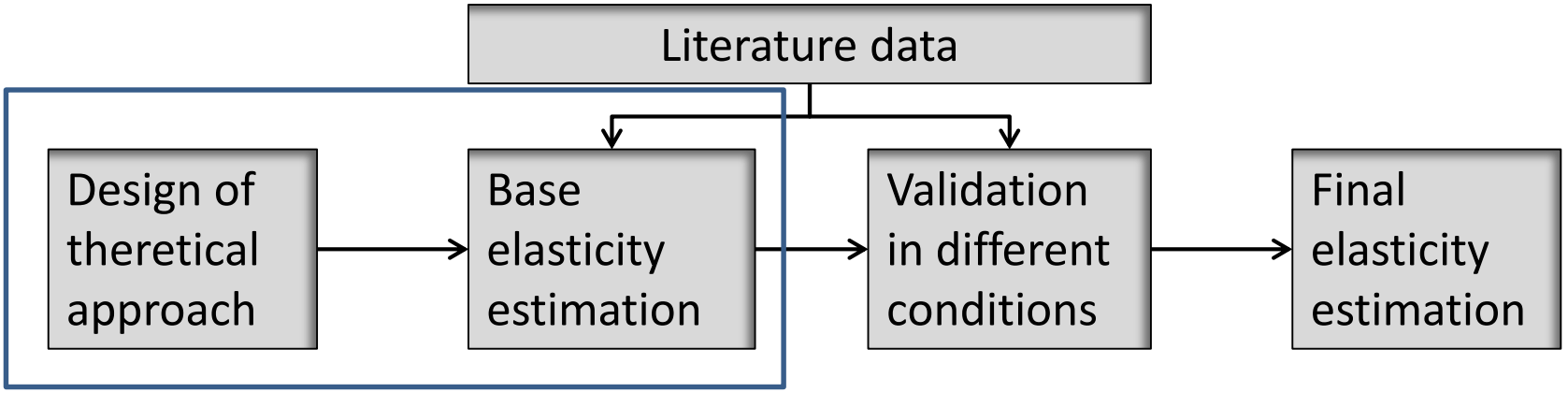
Base year



Projection year

Methodological approach

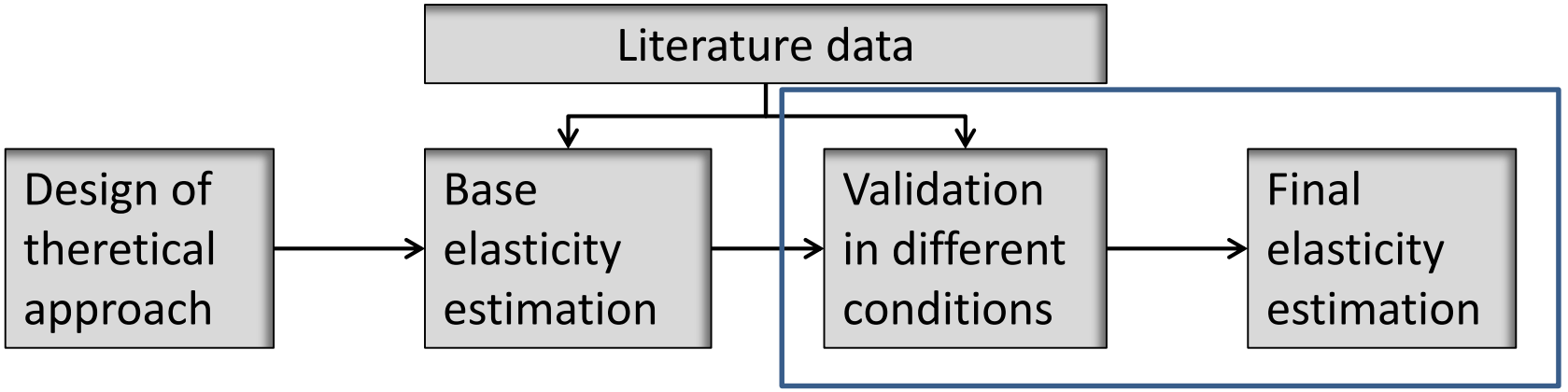
- **Elasticity parameters estimated on the basis of literature data to provide realistic responses in different conditions**



Methodological approach

Validation in different conditions:

- Simulating various case studies
- Revision of the elasticity parameters



Methodological approach

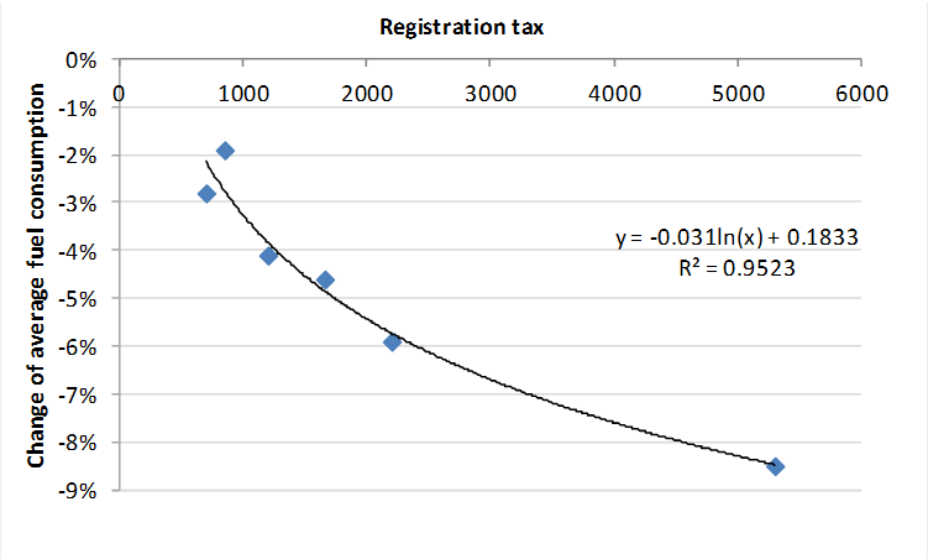
Theoretical approach

- Impact on new registrations composition by segment
  - Direct change of the natural logarithm in car registrations in a given segment in response to a 1000 Euro tax/rebate (registration share of segment s change by x%) *[D'Haultfœuille et al. (2012), Klier and Linn (2012)]*
  - Compensation of direct change by changes in the other segments (for instance, if the most energy intensive class loses 2% of share, this 2% is gained by less energy intensive segments, proportionally to the relative shares they had in the base year)

Methodological approach

Theoretical approach

- Impact on the average fuel consumption by segment
  - Due to changes of the distribution of the registrations within the segments and the deployment of technical improvements *[COWI (2002), Bunch, Greene et al. (2011)]*



  - Function estimated on COWI (2002) data, generated by registration tax under a fleet neutrality assumption

Methodological approach

Theoretical approach

- Base elasticities drawn from studies based on the experience of vehicle taxation in Europe.
- The effect of vehicle taxation may potentially be quite different in other contexts
- Taking into account context factors influencing the base elasticities: effect of the baseline fuel price
  - Comparing the effect of feebate scheme related to registration tax in US *[Bunch, Greene et al. (2011)]* and France *[Klier and Linn (2012)]*
  - reduction of the elasticity parameters to simulate lower responsiveness in US with respect to the EU reference case (assumed to be related to baseline fuel price differences)

Methodological approach

Theoretical approach

- **Interaction between measures:**
  - **Circulation and registration taxes: the effect is larger when combined *[COWI (2002)]***
  - **Fuel consumption target and other policies: responsiveness to other measures is reduced assuming that, as vehicle efficiency gradually improves, the incentive to choose a more fuel efficient car also gradually declines**
- **Electric vehicles segments**
  - **Comparing the effect of incentives *[Mock, P. and Yang, Z. (2014)]***
  - **Smoothing the elasticities**
  - **Estimating shares at projection year based also on an exogenous increasing trend from 2012 onward**