Energy Policies in the Transportation Sector

by

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Summary:

I. Overview of transportation sector in Brazil

II. Brief introduction of the project

III. Reviewing and classifying energy policies in the transportation sector

IV. Energy demand forecasting model

V. Policies scenarios

Transport in Brazil:

- 34,2% of the total energy consumption

Table 1. Final energy consumption by sector (%)

ENERGY SEGMENTS	2007	2015
ENERGY SECTOR	10,5	11,3
RESIDENTIAL	11,0	10,1
COMMERCIAL	3,0	3,5
PUBLIC	1,8	1,6
AGRICULTURE	4,5	4,7
TRANSPORTATION	28,9	34,2
INDUSTRIAL	40,4	34,6
TOTAL	100,0	100,0

Source: own elaboration, based on National Energy Balance (2017).

- 2007 – 2014: fleet size increased 61%

- Average age of circulating vehicle fleet

Table 3. Average age of brasilian circulanting fleet

Age	Year	Acumulated Fleet	% of Total
1 - 5 years old	2012 - 2016	14.388.209	34
6 - 10 years old	2007 - 2011	13.961.361	33
11 - 15 years old	2002 - 2006	6.726.977	16
16 - 20 years old	1997 - 2001	5.492.030	13
+ 20 years old	Under 1996	2.303.837	4
Total	-	42.872.414	100

Source: own elaboration, based on Circulating Fleet Outlook (2017).

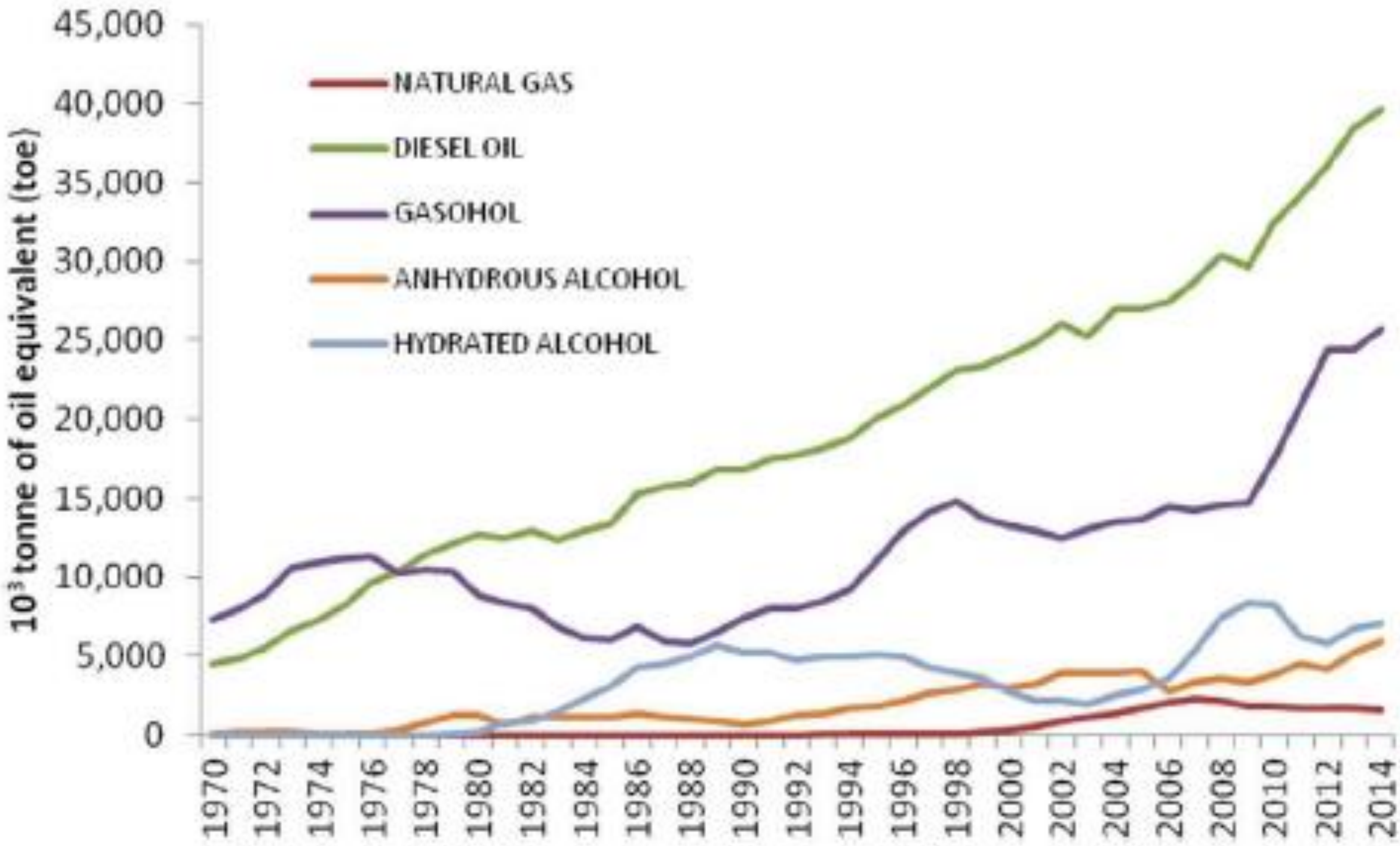
- 47% CO_2e emission in energy sector

Table 2. CO_2e emissions from Brazil transport sector in 2000 and 2015

Transportation	2000		2015		Change between 2000 and 2015
Subsector	**Gg of CO_2e**	**%**	**Gg of CO_2e**	**%**	**%**
Air	9605.043	7.4%	11,042.576	5.4%	15.0%
Railway	1402.508	1.1%	3163.404	1.5%	125.6%
Waterway	2991.155	2.3%	3124.031	1.5%	4.4%
Road	115,338.081	89.2%	187,029.033	91.5%	62.2%
Total transporta-tion	129,336.787	100.0%	204,359.044	100.0%	58.0%

Source: own elaboration, based on SEEG.

Fig. 1. Fuel consumption in road transport sector in Brazil



Source: EPE, 2016.

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General Objective:

- To develop a simulation model to help policymakers better design the energy policies and evaluate their importance, effectiveness and efficiency in transportation sector

- The purpose is to estimate the potential impacts of current and possible future energy policies in transportation sector in Brazil

Steps

- **Energy Police Review**
- **Classify Energy Policies**
- **Model Construction**
- **Policy scenarios**

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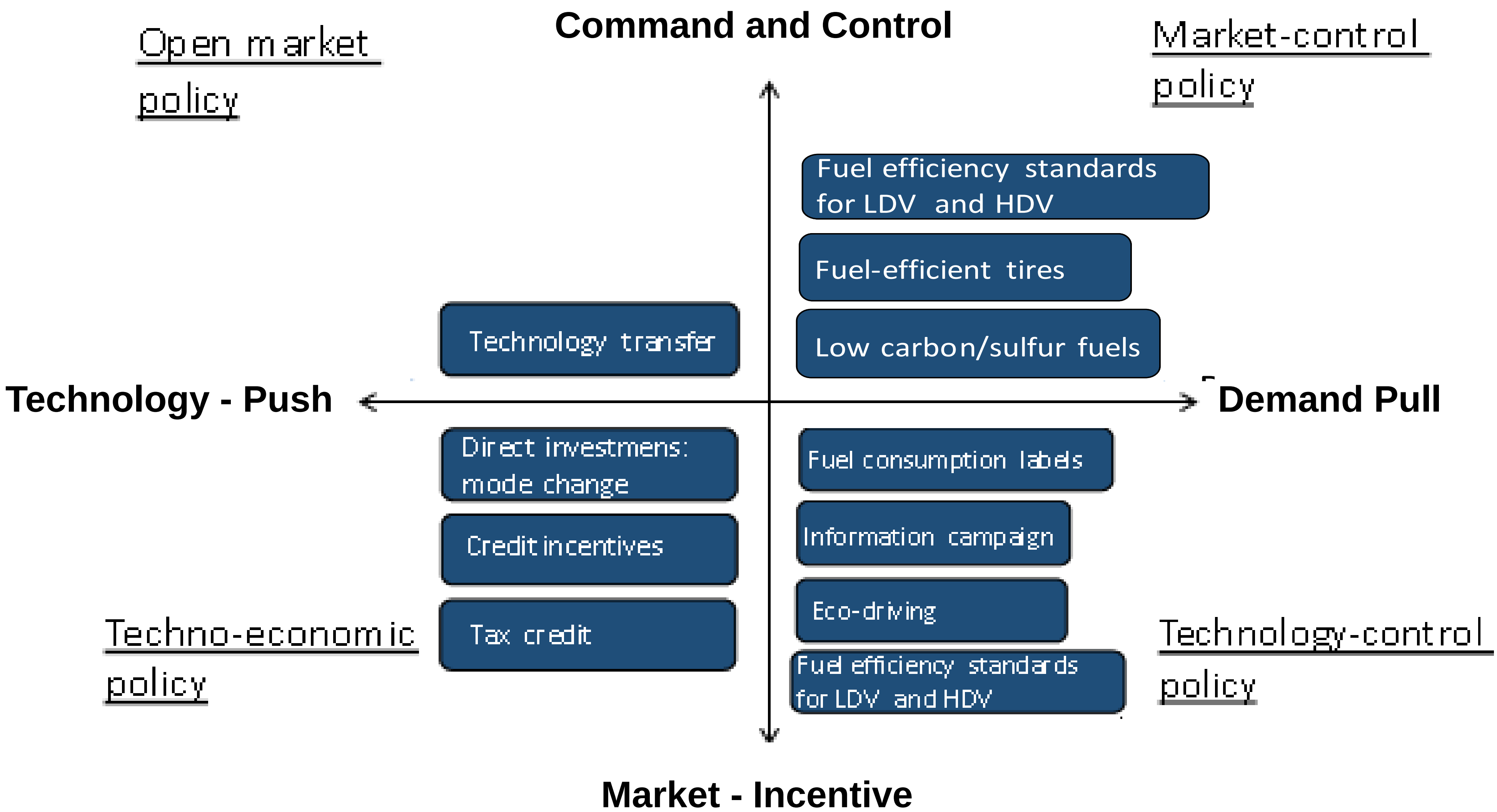
Figure 2. Selected countries and the estimated energy savings

Policies	Countries	Estimated energy savings
Fuel-efficient tyres	European Union, Canada, United States and Japan	5%
Fuel efficiency standards for LDV	Canada, European Union, South Korea, China, Brazil, United States, India, Russia, Japan, Mexico and Saudi Arabia	12 - 34%
Fuel efficiency standards for HDV	Japan, China, United Stated, Canada, South Korea, Russia, European Union	11 - 14%
Low carbon/sulfur fuels	United States, Brazil, China	10% carbon and 10-50 ppm limit sulfur content
Tax credit	Brazil	12-19%
Direct investments	China and Japan	2-14%

Source: adapted from ICCT (2014), IEA, 2008; Onoda, 2008; Wagner and Wang, 2009; IEA; 2011; Cheah and Heywood, 2011; Atabani et al., 2011; IEA, 2012.

Figure 3. Classification of energy policy mechanisms



Source: (Santana, 2017)

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Literature:

- It was not found a demand simulation model that embrace uncertainty analysis of fuel consumption from a stochastic approach

- The main long term models in Brazil are econometric ones, but they are most appropriate for short and medium term projections

Long term energy demand projection based on **sectorial disaggregation models** to then simulate different scenarios:

$$\frac{CE_{j,i}}{VA_i} = \frac{PKM_i}{VA_i} \bullet \frac{CE_i}{PKM_i} \bullet \frac{CE_{j,i}}{CE_i}$$

$$\frac{CE_{j,i}}{VA_i} = \frac{TKM_i}{VA_i} \bullet \frac{CE_i}{TKM_i} \bullet \frac{CE_{j,i}}{CE_i}$$

Where,

j: fuel type/electricity
i: transportation category
CE: energy consumption
VA: value added
PKM: passengers . km
TKM: tones . km

- This model will enable us to consider future ruptures that is likely to happen due sudden shifts in critical inputs (efficiency improvements, mode and fuel changes): **scenarios of rupture**
  - Historical time series will not be needed
  - Obtain data from a reference year (closest as possible from present) and then the model will project the chosen parameters in long term

- Create a **baseline scenario** built on econometric equations (simple regression)

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Energy Consumption (KWh)

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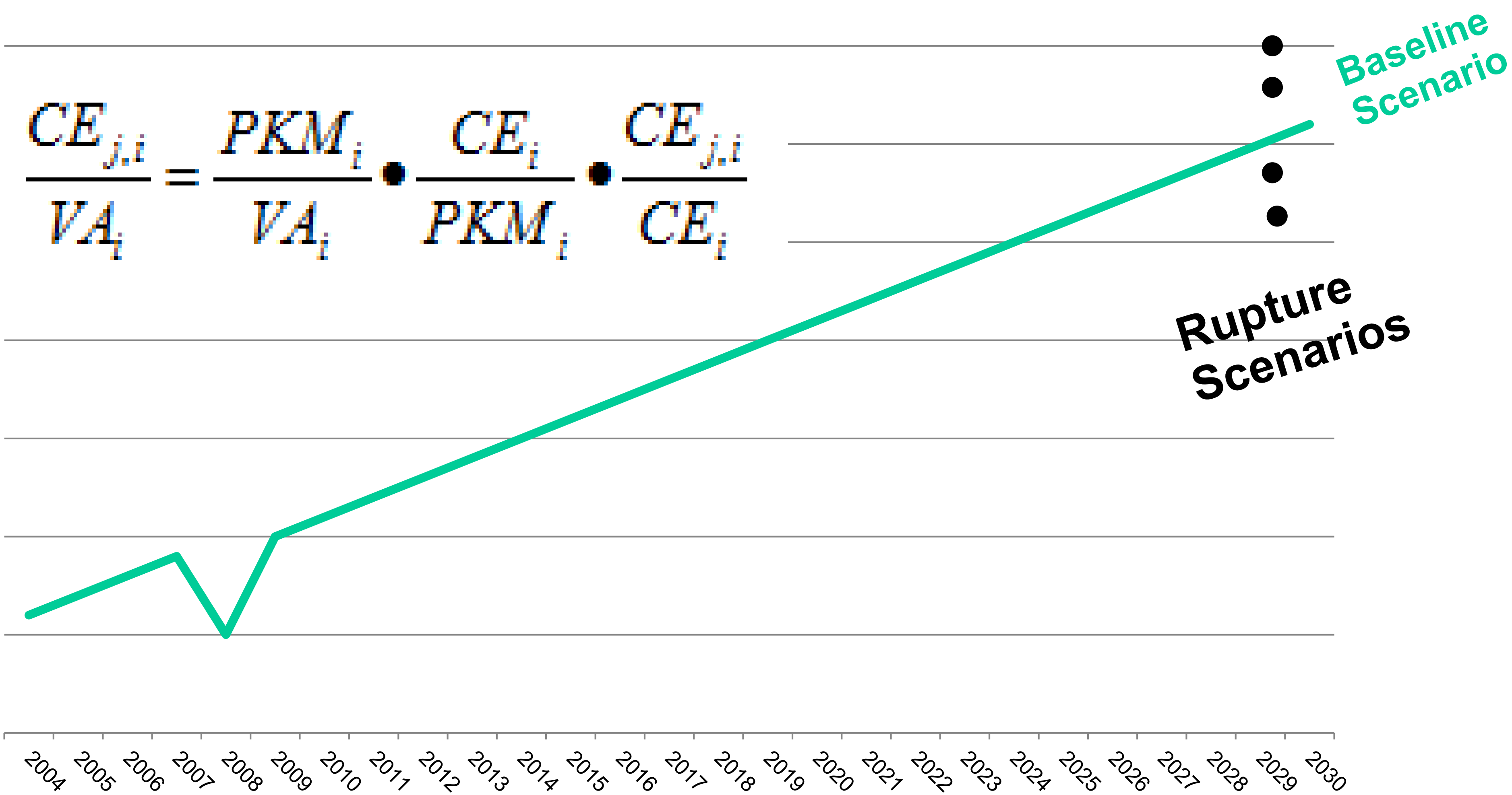

To develop a simulation software to help policymakers better design the energy policies in transportation sector in a long term planning.

Thank you!

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