Centro Clima
CENTRO DE ESTUDOS INTEGRADOS SOBRE MEIO AMBIENTE E MUDANÇAS CLIMÁTICAS

Center for Integrated Studies on Climate Change and the Environment

Federal University of Rio de Janeiro – Brazil

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Brazil LCS Scenarios

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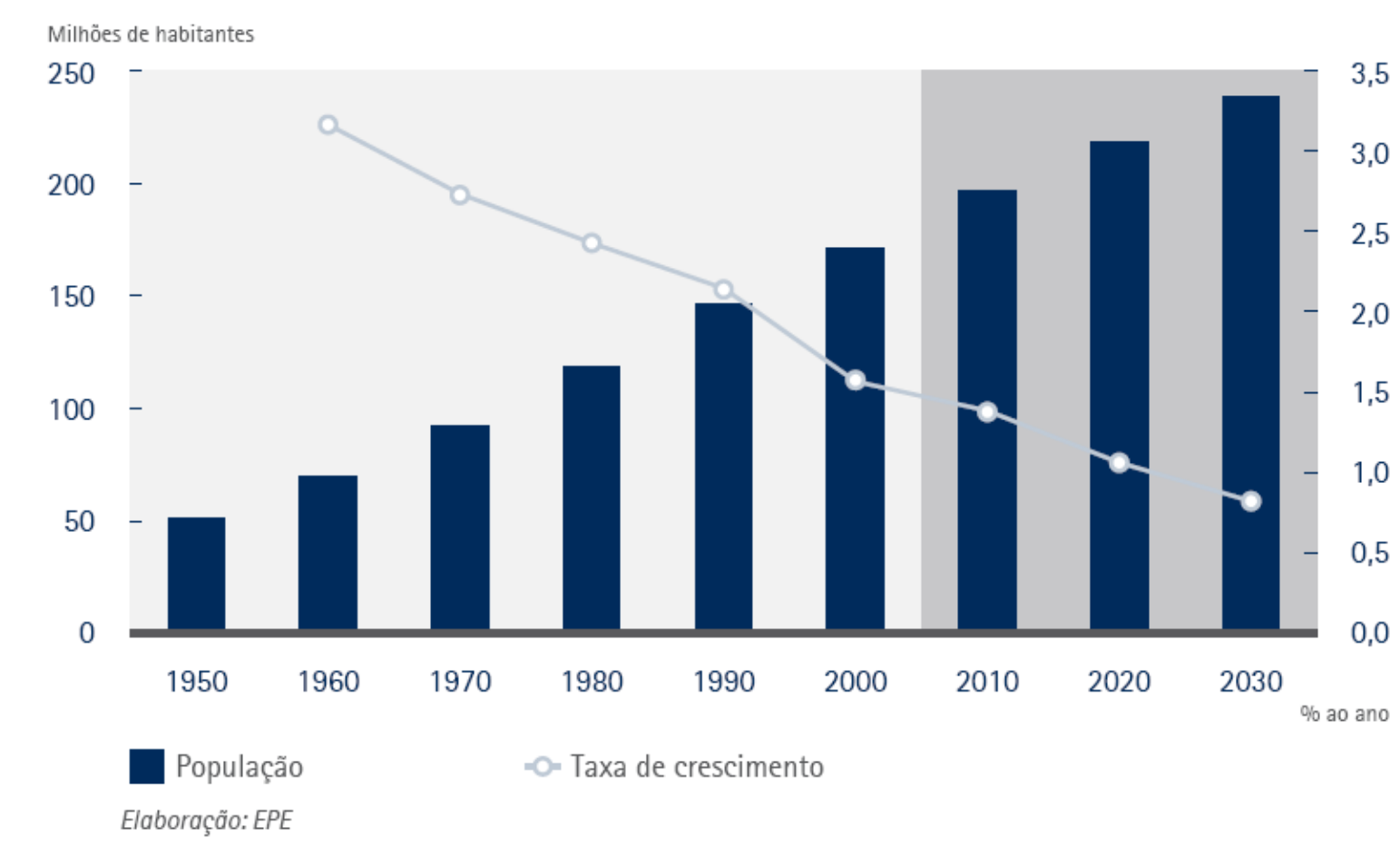
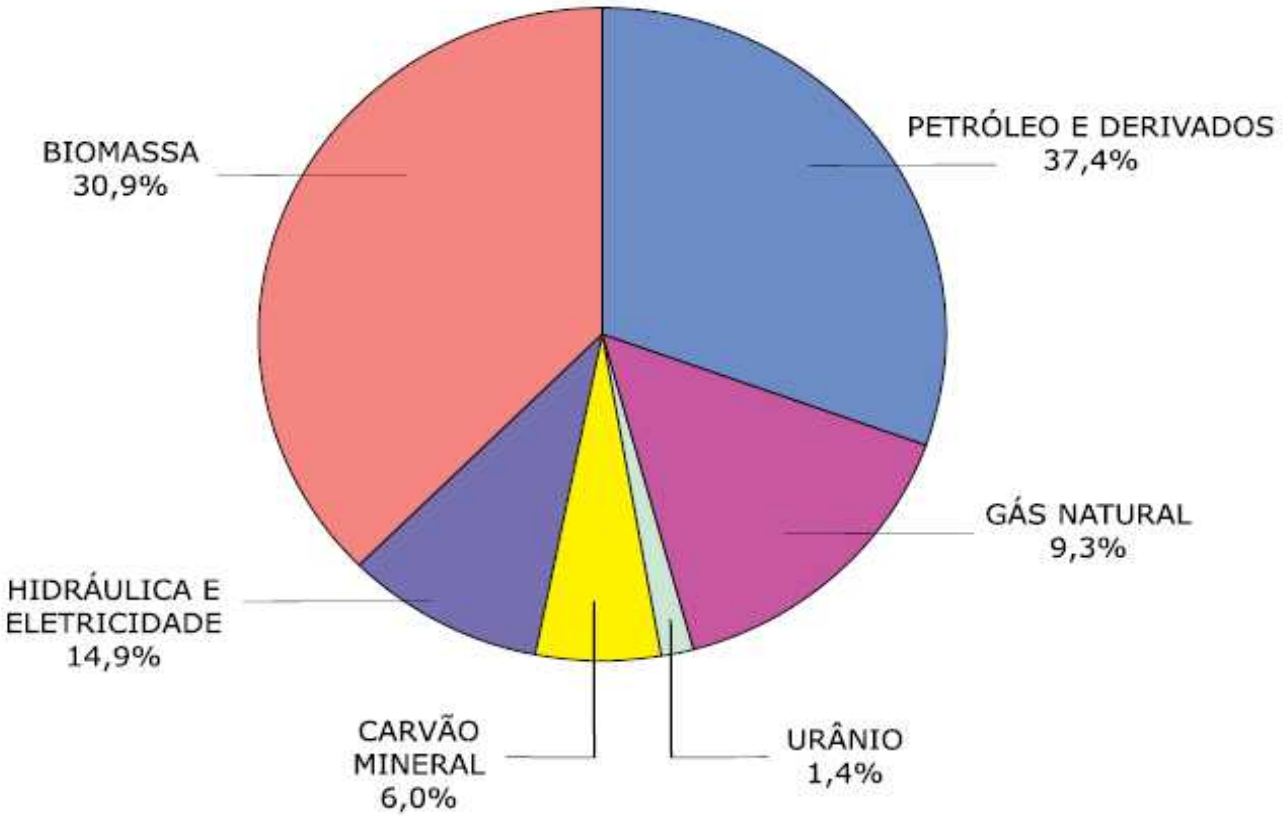
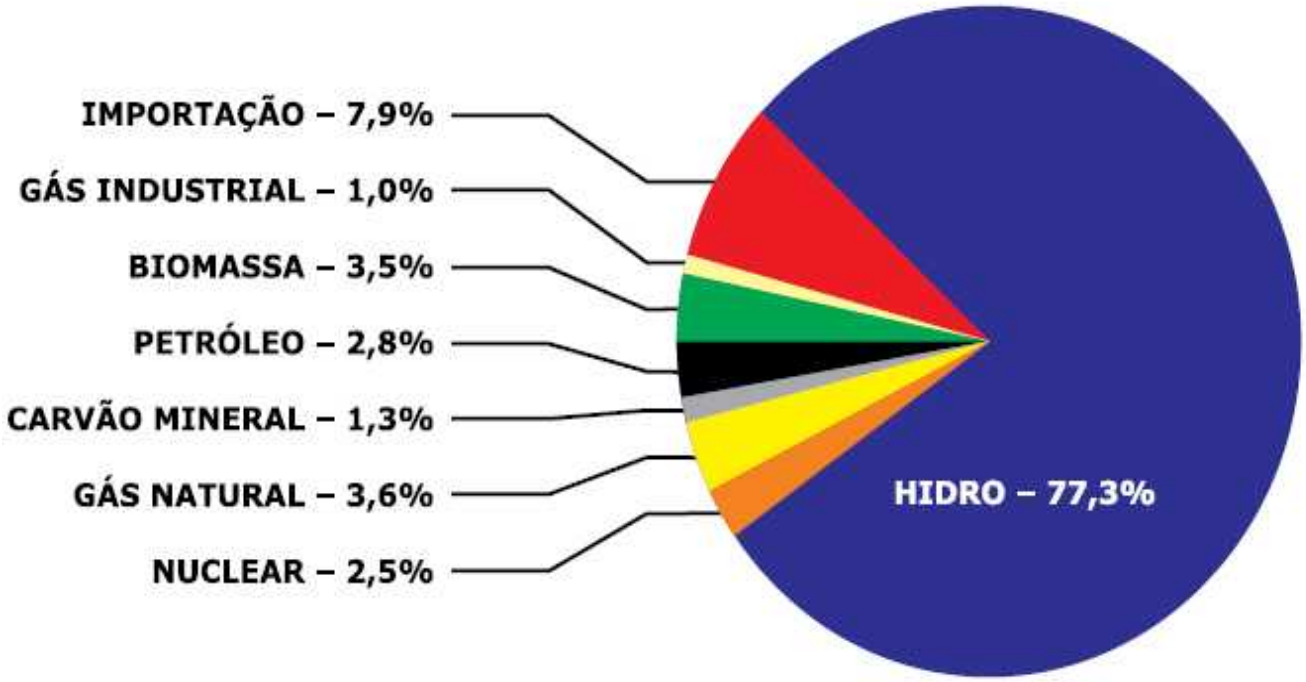
Population


Milhões de habitantes
250
200
150
100
50
0
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
1950
1960
1970
1980
1990
2000
2010
2020
2030
% ao ano
População
Taxa de crescimento
Elaboração: EPE

Energy


BIOMASSA
30,9%
PETRÓLEO E DERIVADOS
37,4%
GÁS NATURAL
9,3%
HIDRÁULICA E
ELETRICIDADE
14,9%
CARVÃO
MINERAL
6,0%
URÂNIO
1,4%

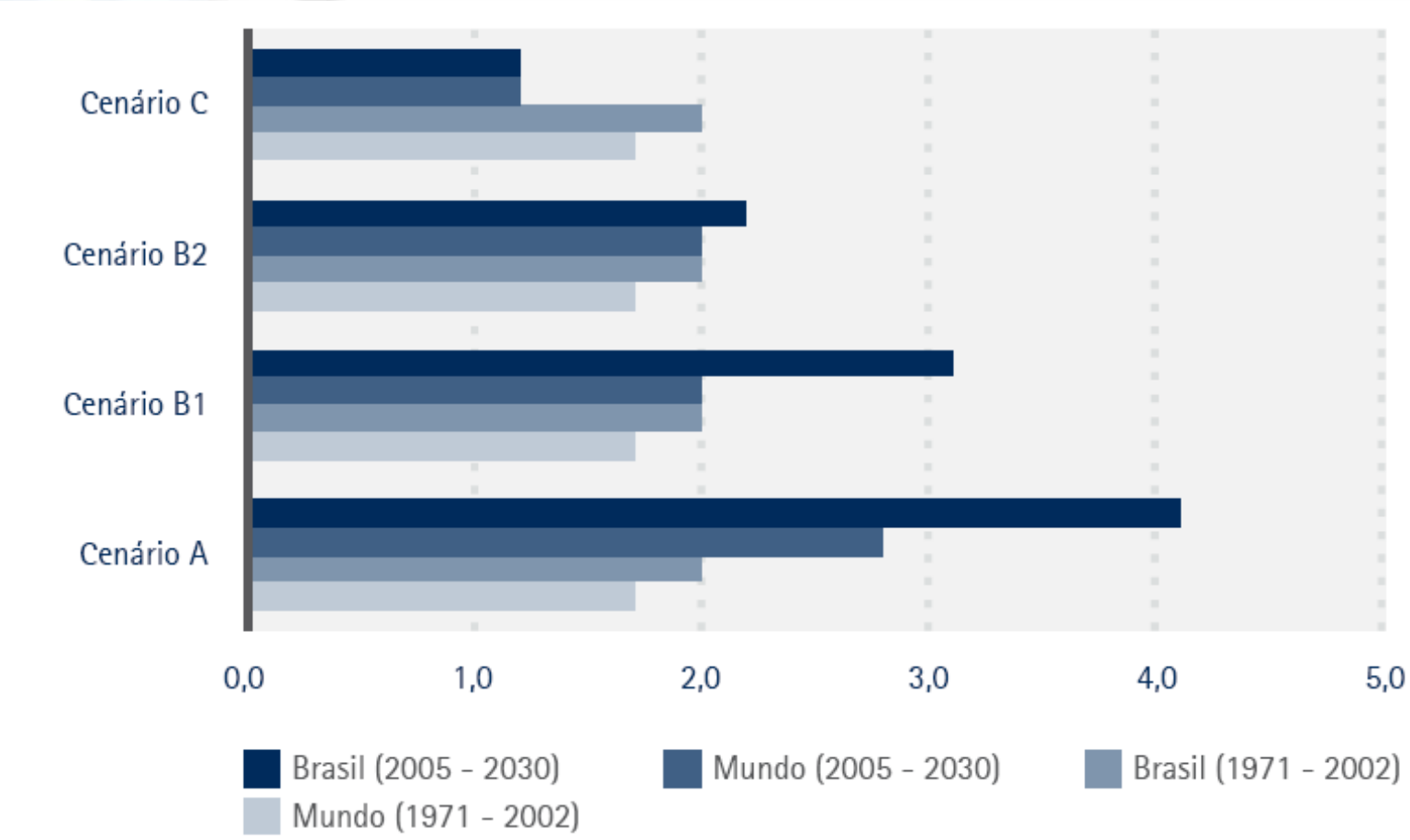
Electricity



	TWh
TOTAL	484,5
HIDRO	374,4
GÁS NATURAL	17,6
DER.PETRÓLEO	13,7
NUCLEAR	12,3
CARVÃO	6,5
BIOMASSA	16,8
GÁS INDUSTRIAL	4,8
IMPORTAÇÃO	38,5

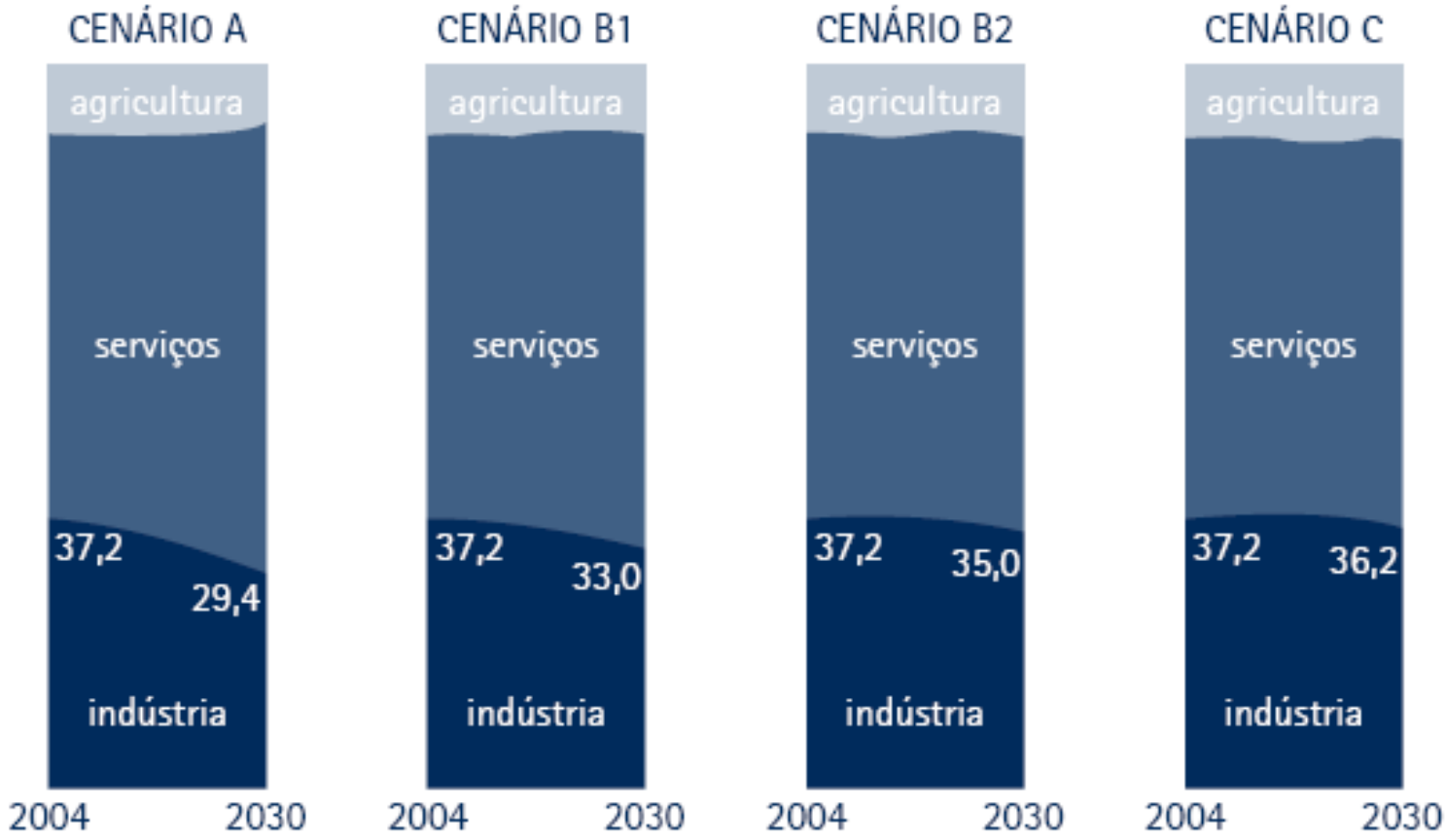
- 0,29 ton CO_2/MWh in 2008

GDP per Capita (% per year)



Elaboração: EPE

GDP Distribution (2004 – 2030)



Elaboração: EPE

Key information - 2007

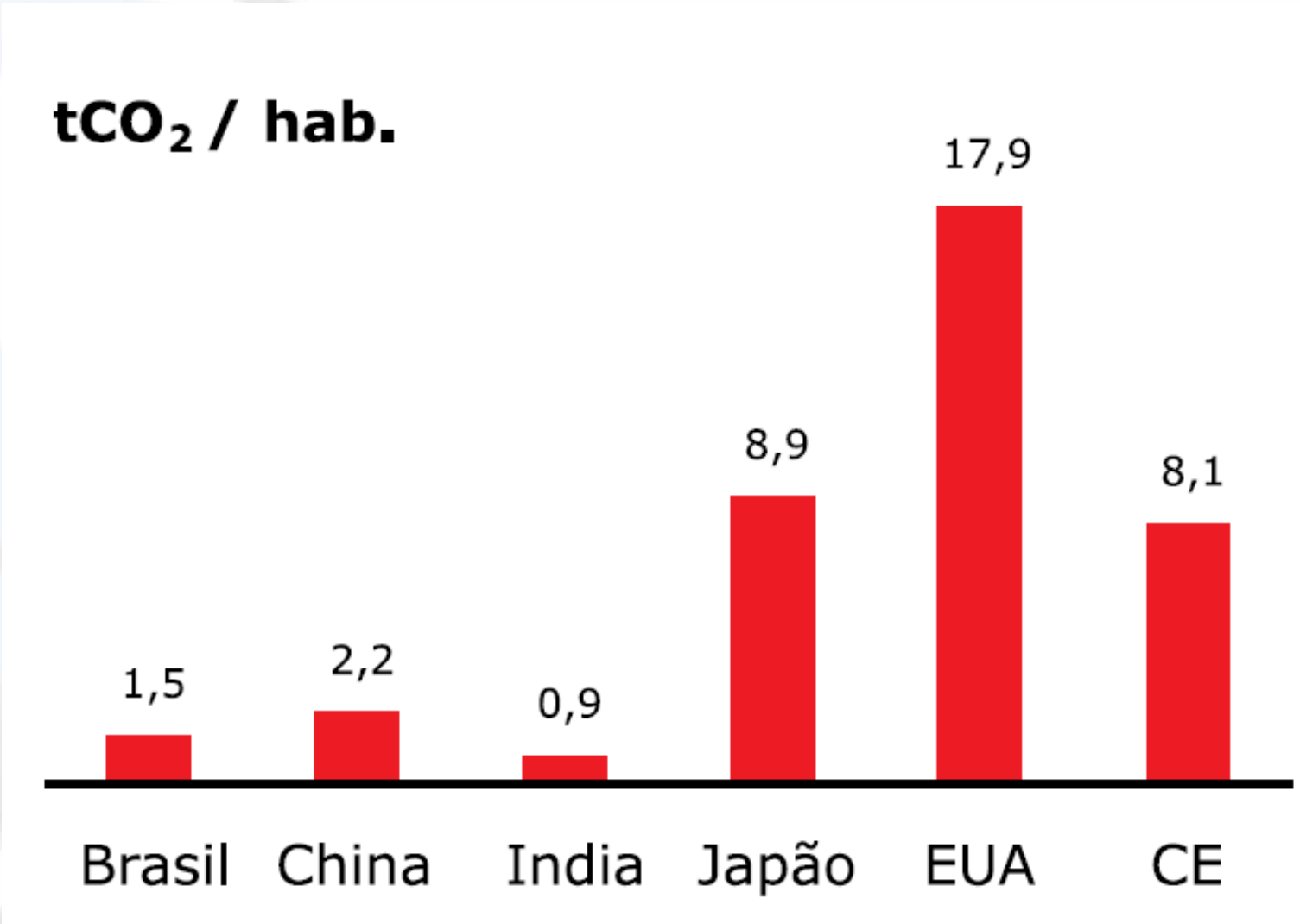
	2000	2006	2030
Population, total	173.9 million	188.7 million	238 million
Population growth (annual %)	1.5	1.2	0.8
GDP per capita, (current 1000 US$)	3.8	4.7	7.8 - 15
GDP (current US$)	644.5 billion	1.1 trillion	1.9 – 3.6 trillion
GDP growth (annual %)	4.3	3.7	2.2 – 5.1
Inflation, GDP deflator (annual %)	6.2	4.3	
Agriculture, value added (% of GDP)	5.6	5.1	8 - 12
Industry, value added (% of GDP)	27.7	30.9	29 - 36
Services, etc., value added (% of GDP)	66.7	64.0	63 - 52

Source: World Development Indicators database, April 2007

National Plan against Climate Change - NPCC

- Presented in december 2008;
- 15 ministries involved;
- Policies integration agains Climate Change;
- Big potential to reduce emissions;
- This plan can start wide discussions.

NPCC – Per capita CO2 Emissions (1994)



NPCC - Energy

- Hidro power increase :
  - Until 2016 more 34.460 MW
    - -27 Mton of CO_2 per year

- Renewable Energy Incentives Program
  - Wind: 1420 MW
  - Small hidro: 1200 MW
  - Biomass: 700 MW
  - -3 Mton of CO_2 per year

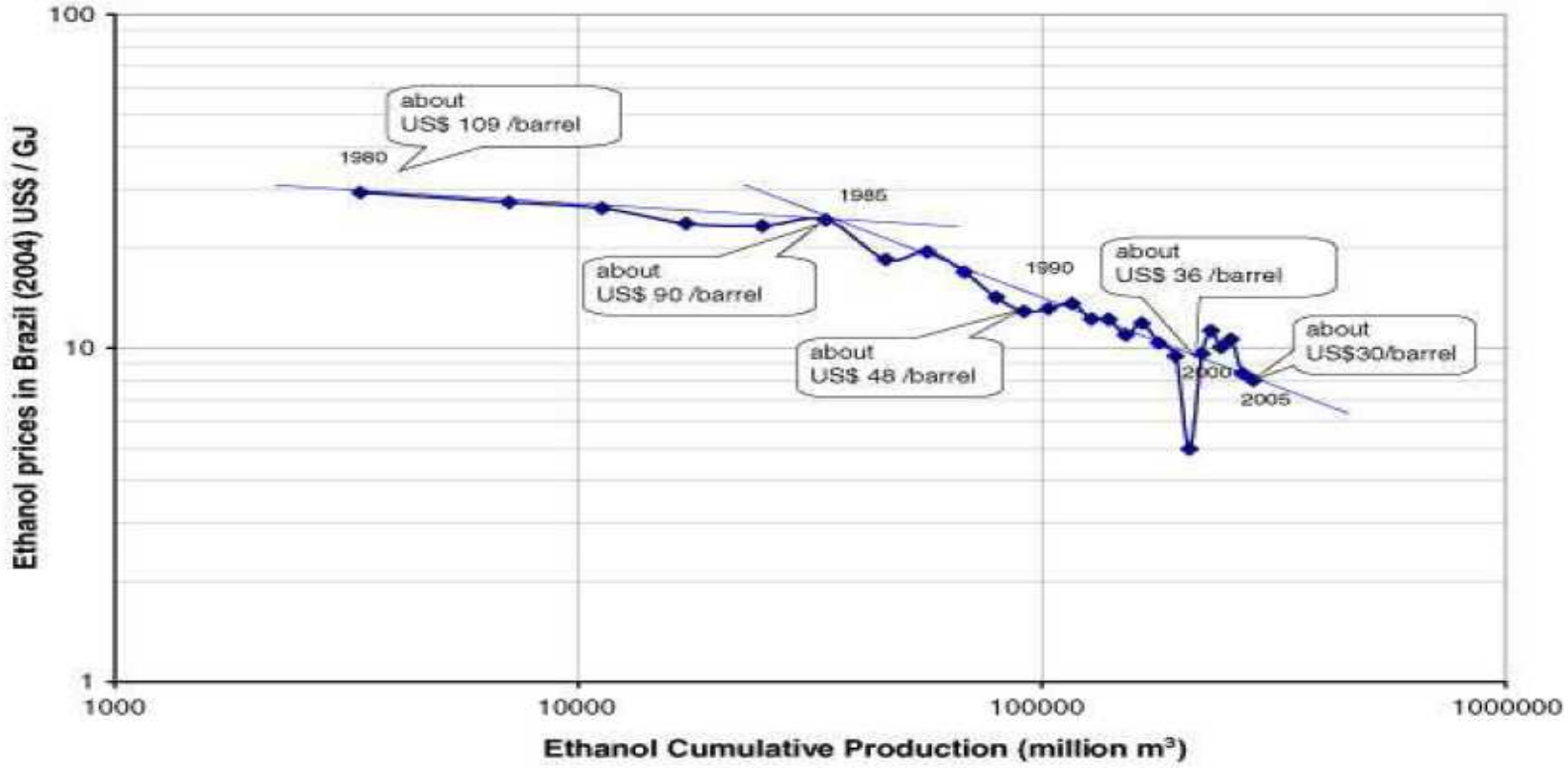
- Renewable Energy public sale: 2400 MW from biomass and residues

NPCC - Energy

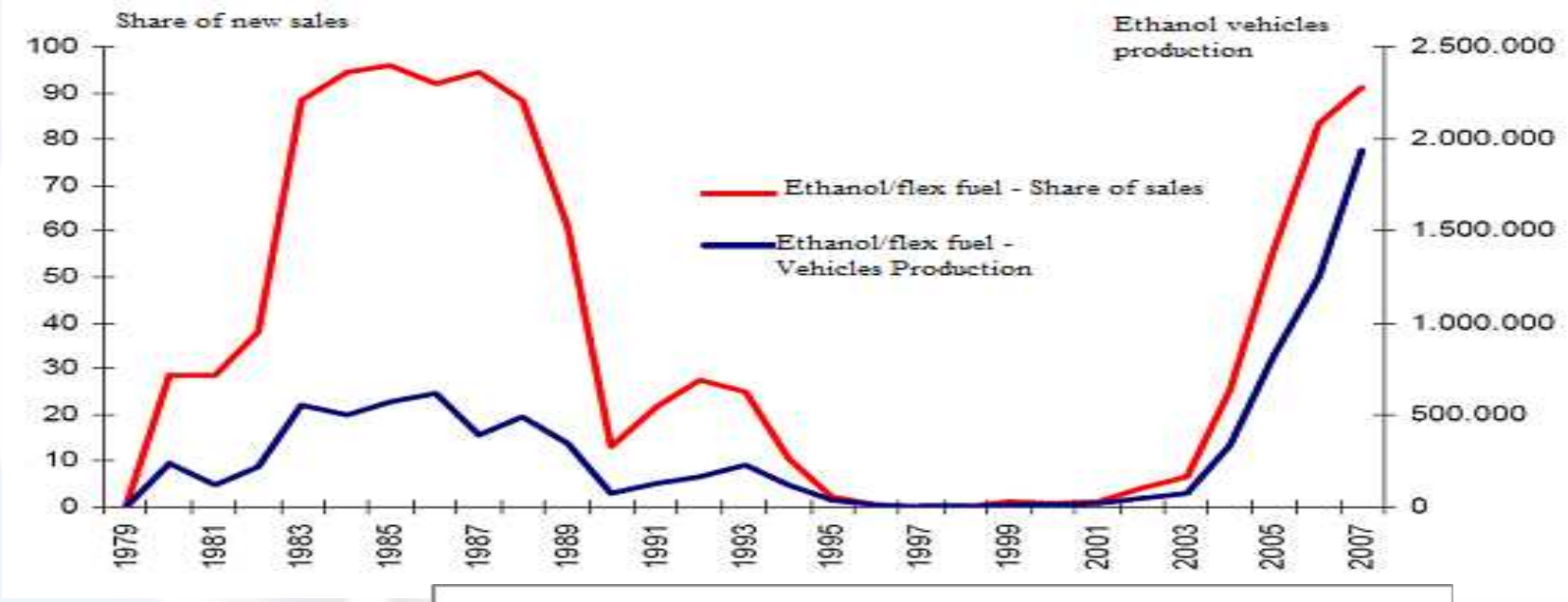
- Nuclear energy:
  - From 2000MW today to 3000MW in 2013;
  - More 4000 – 8000MW until 2030
- Solar Energy – is growing at 40%/y
  - 13 new projects for distant communities
- Waste – from 1200 to 8400MW until 2030

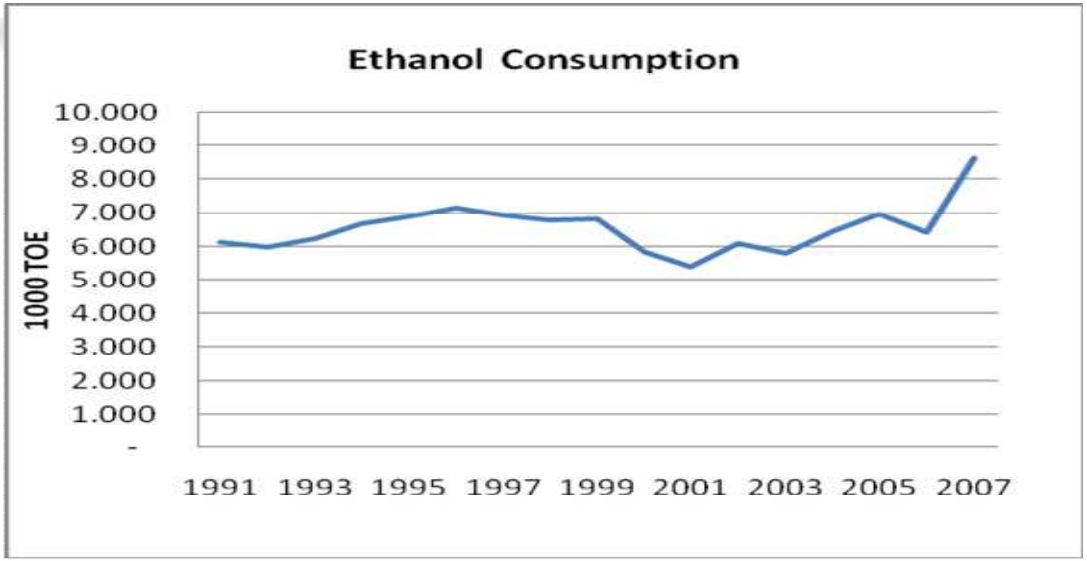
NPCC - Biofuels

- Ethanol: 22 billion liters in 2007 (+22%)
  - 3,5 billion liters export

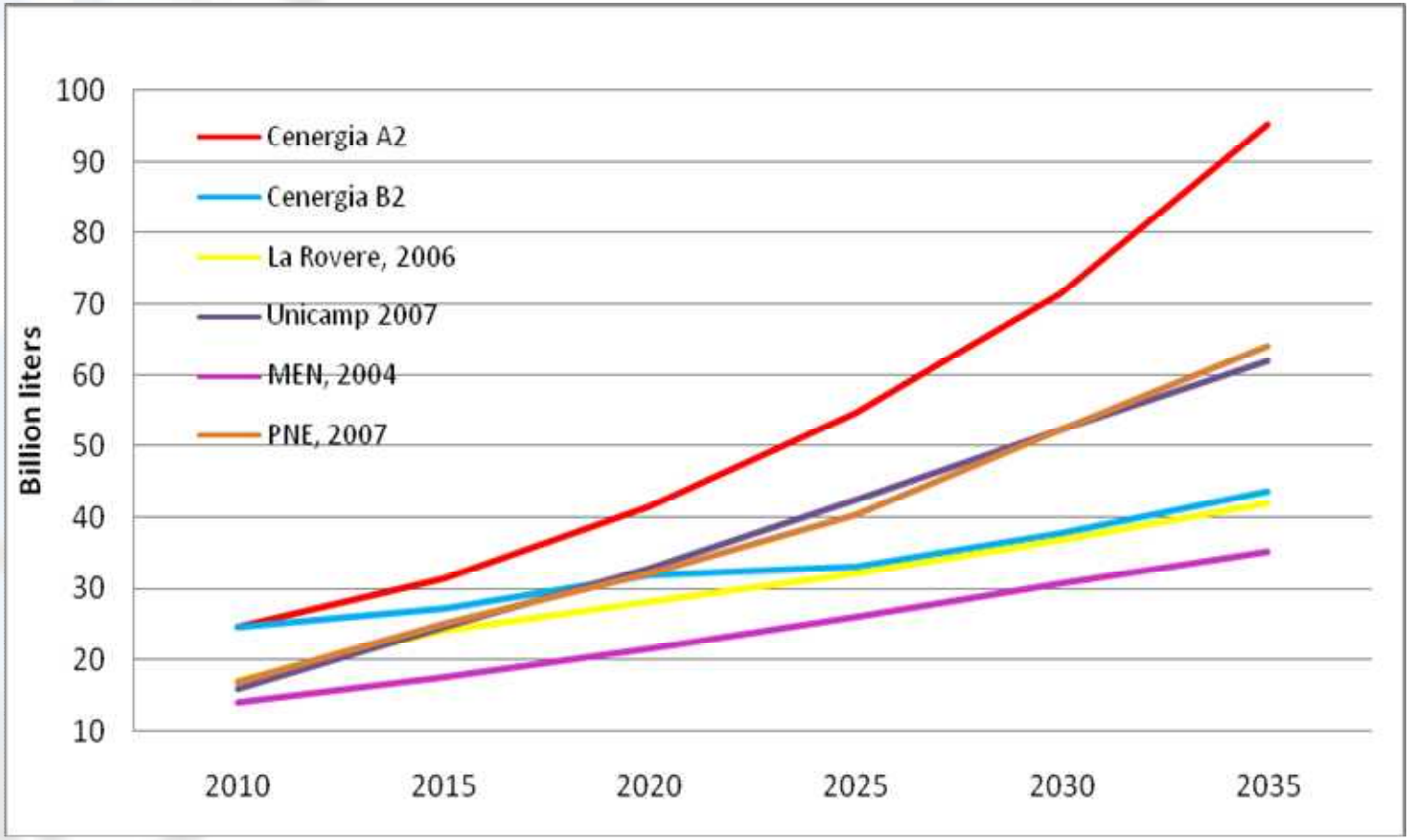


NPCC - Biofuels

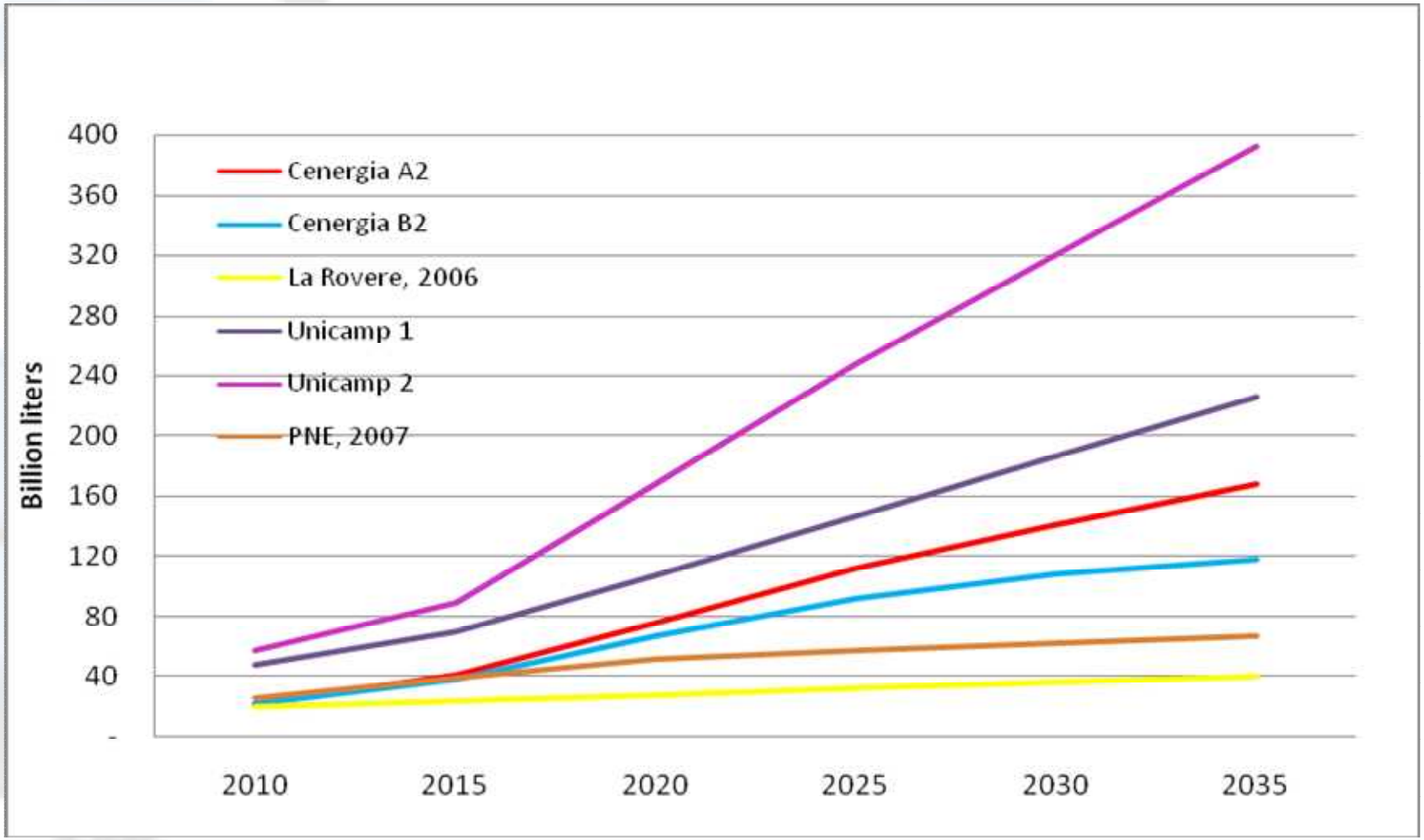




Projected Ethanol Consumption



Projected Ethanol Production



NPCC - Biofuels

- Biodiesel:
  - From 2005 to 07/2008 – 2% mix
  - From 07/2008 to 2013 – 3% mix
    - Today: 1,3 billion liters
  - After 2013 – 5% mix
    - Discussion for a 5% mix in 2010

NPCC – Energy Efficiency

- Energy efficiency + Economy of energy
  - Potential to reduce 32TWh of electrical energy plus 6 Mton of oil.

- Some programs:
  - Compet – efficiency for motor vehicles
  - Efficient refrigerators
  - Procel – 4TWh economy – efficient lamps
  - Vehicles labelling

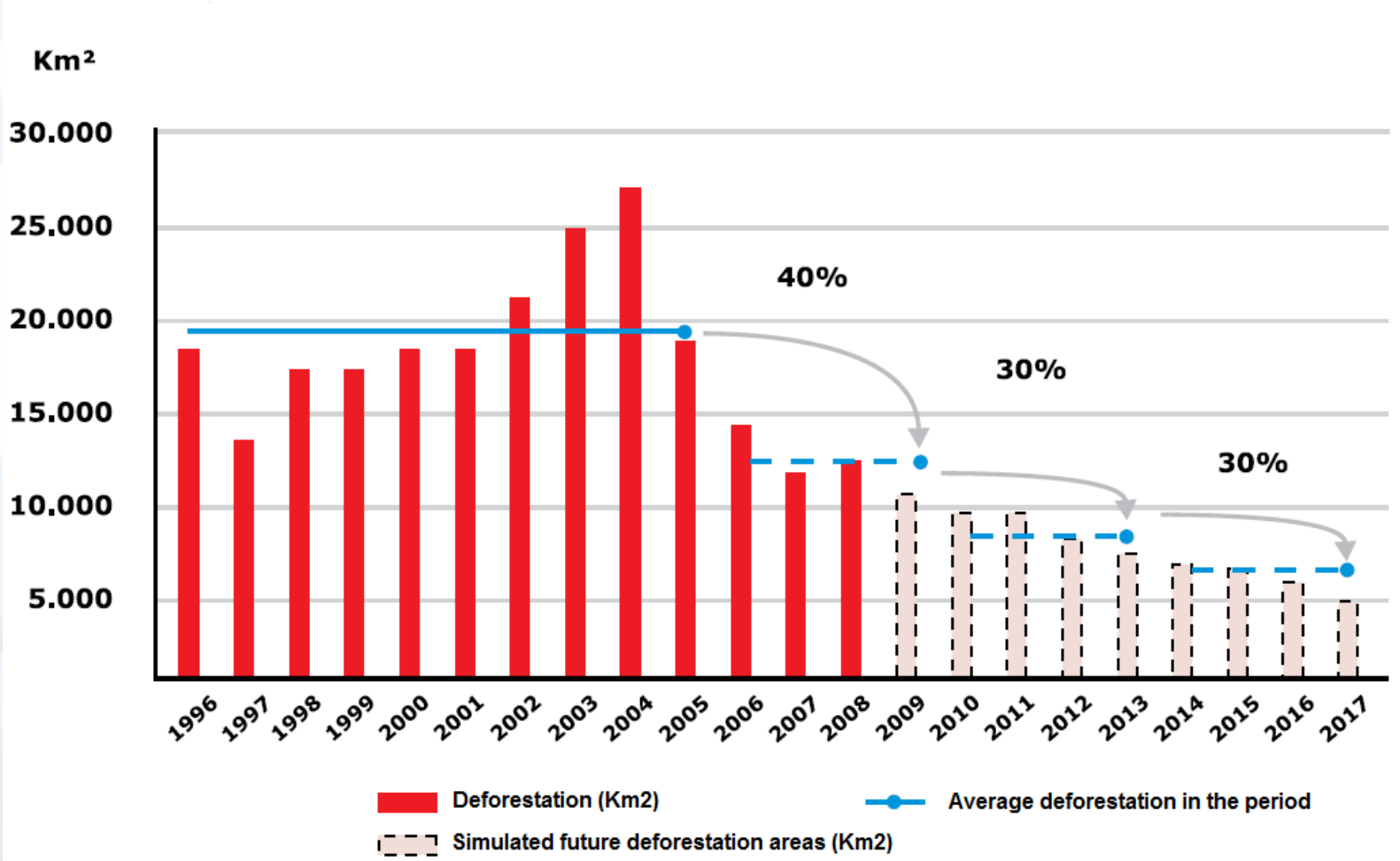
NPCC – Forests and agriculture

Land use in Brazil

Area (million ha)	Distribution in relation to	
	Agriculture areas (%)	Agriculture and pasture lands (%)
Soy (21)	35	7
Corn (12)	20	4
Sugarcane (5.4)	9	2
Other cultures (17)	36	6
Total agriculture (60)	100	20
Pastureland (237)	–	80
Agriculture+pastureland (297)	–	100

Source: CTC (2007).

NPCC – Forests and agriculture

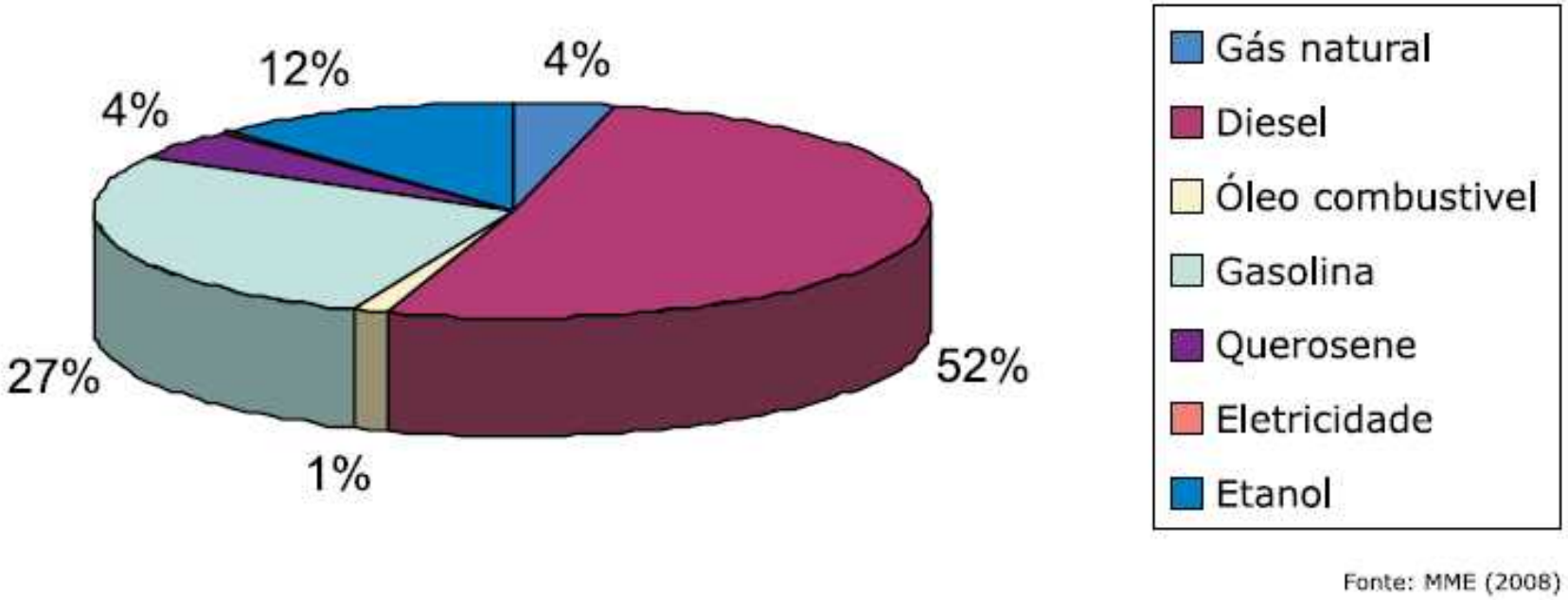


Historical deforestation rates of the Amazon Forest and future deforestation reduction goals.

NPCC – Industry

- Increase charcoal use in iron and steel industry
- Energy efficiency increase

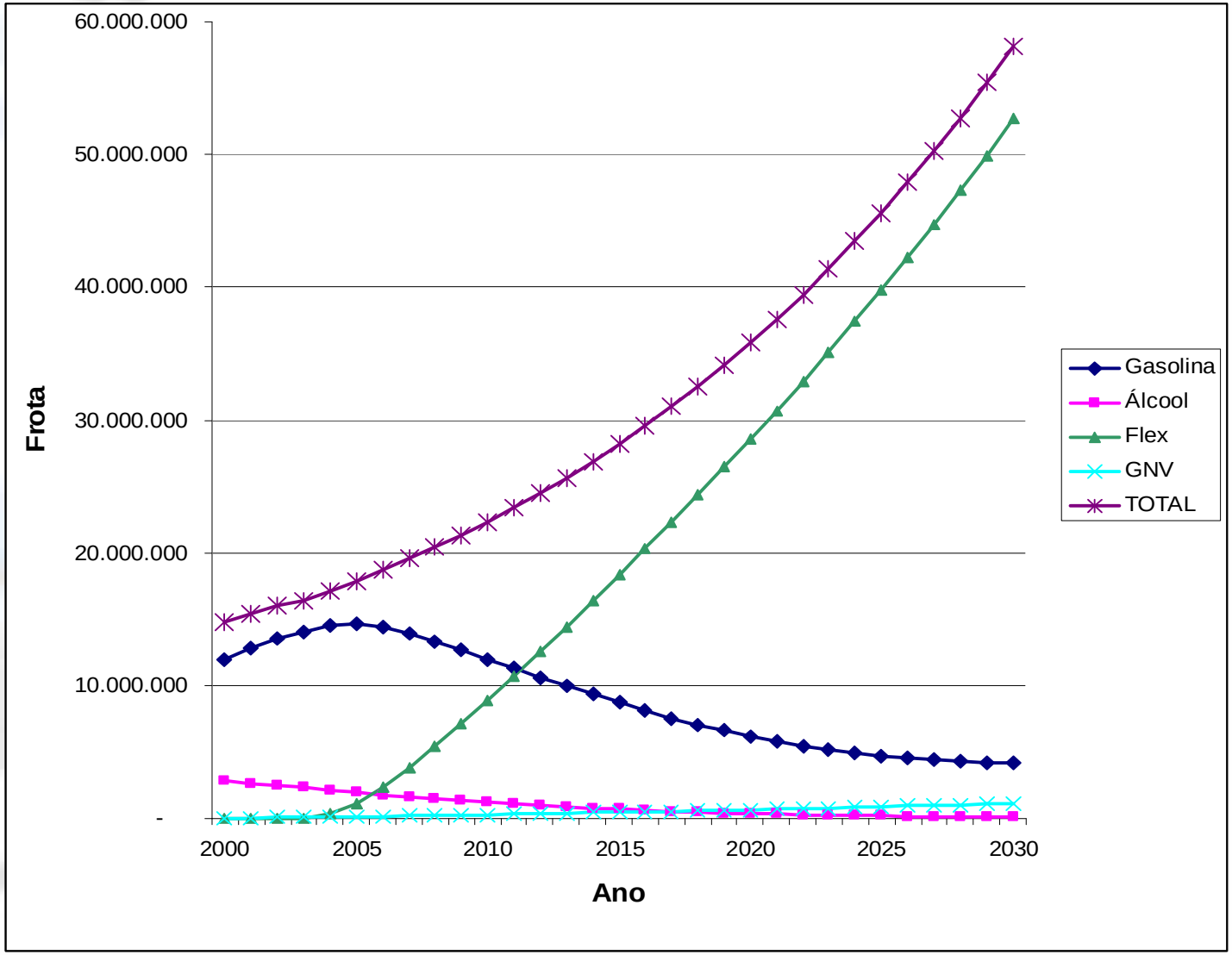
NPCC – Transport Sector



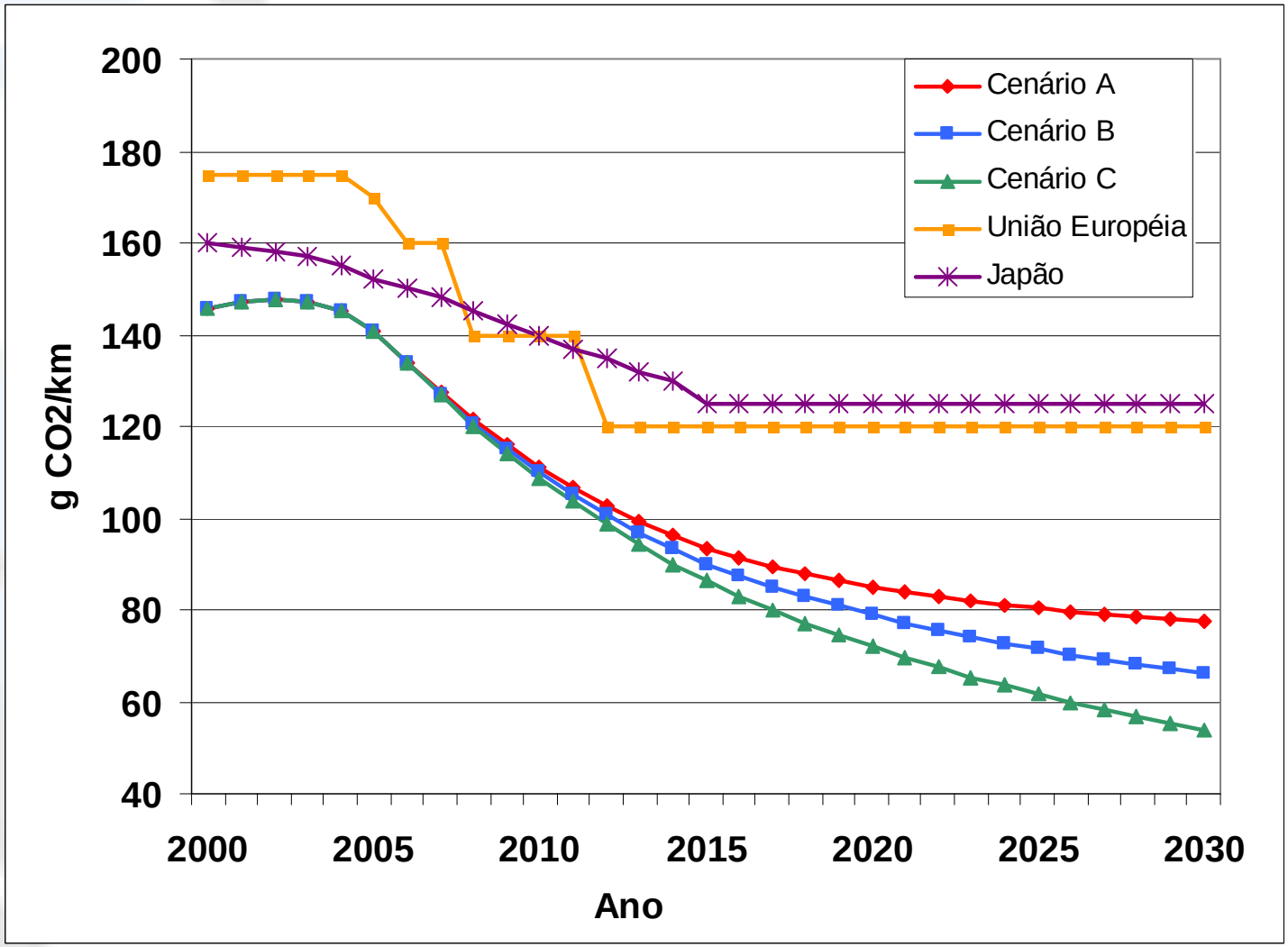
Fonte: MME (2008)

Transport sector energy use

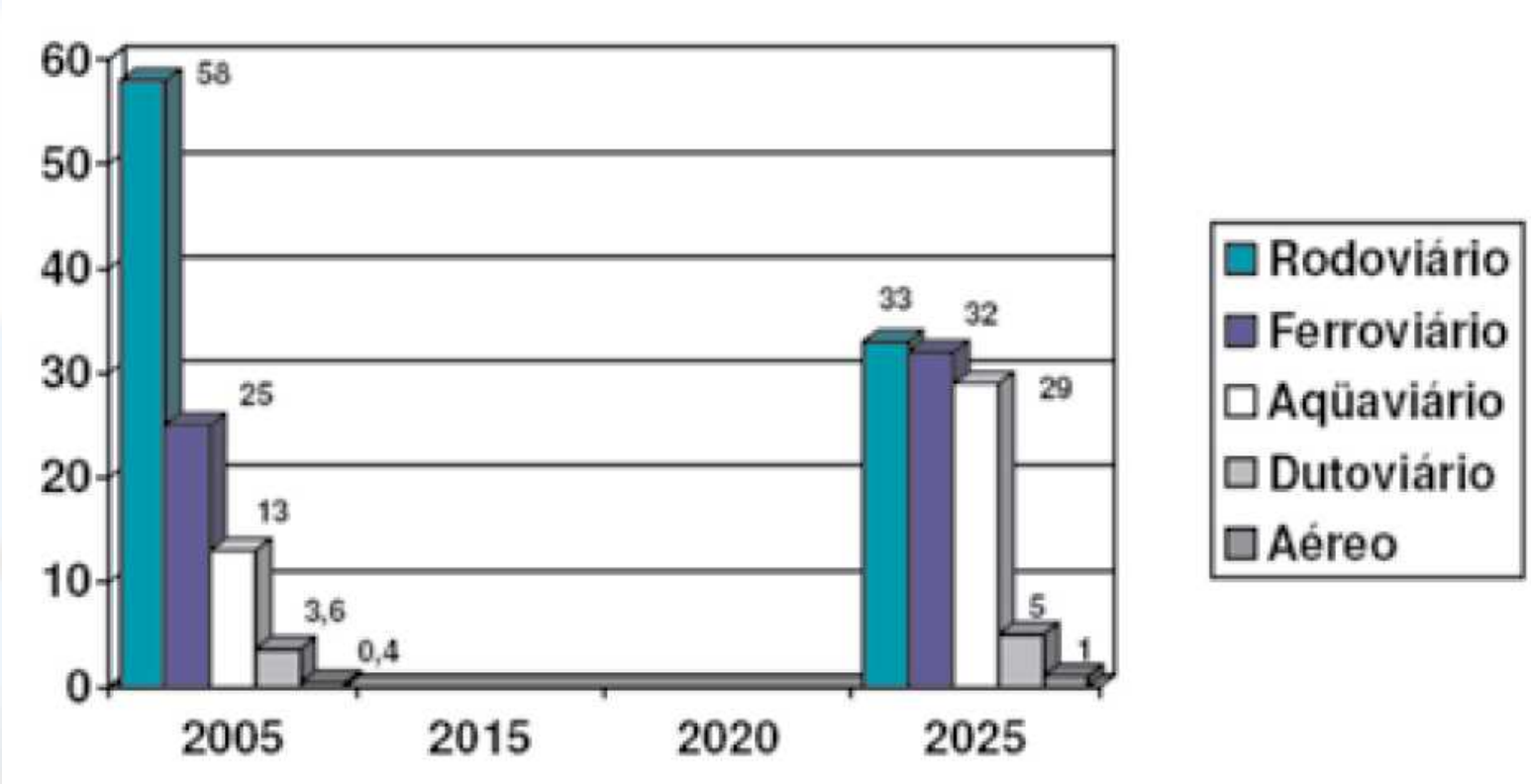
Light Transport Scenarios - Fleet



Light Transport Scenarios – Emission Factor



NPCC – Transport Sector - Freight



NPCC freight transport scenario for 2025

NPCC – Transport Sector

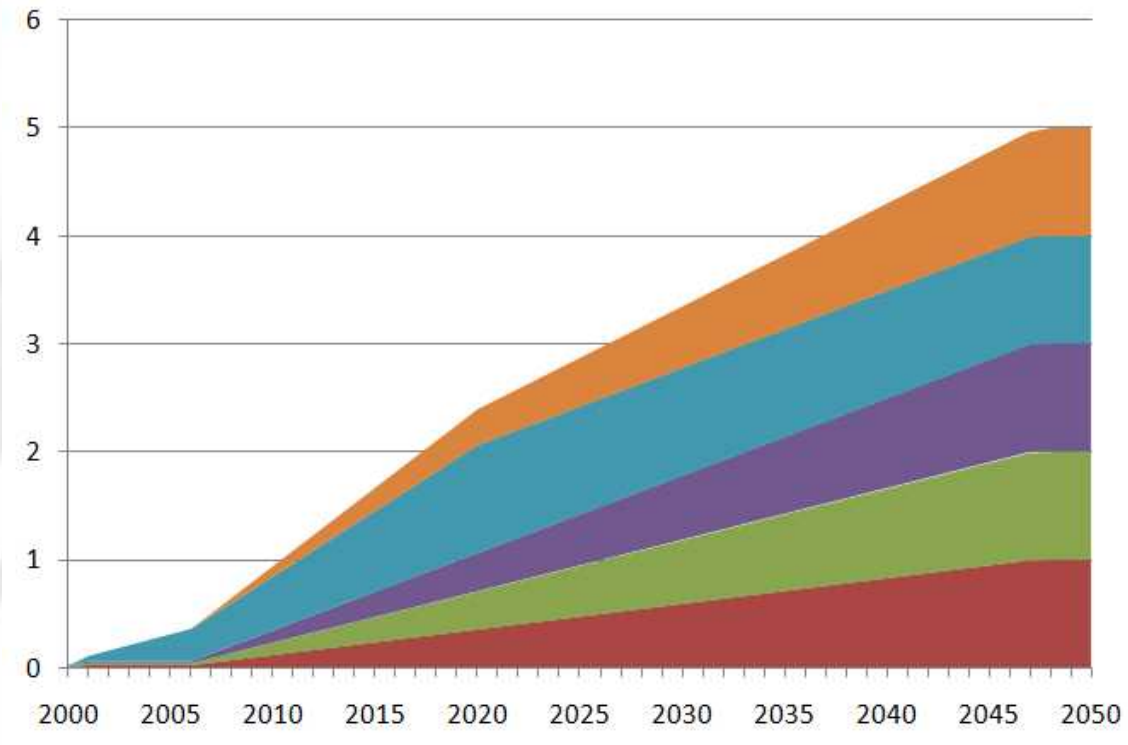
- Logistic National Plan - Freight
  - Railways -from 25 to 32%
  - Road - from 58 to 33%
  - Waterways – from 13 to 29%
- Increase mass transport quality
- Increase the use of bicicles and walking in big cities

Backcasting Model

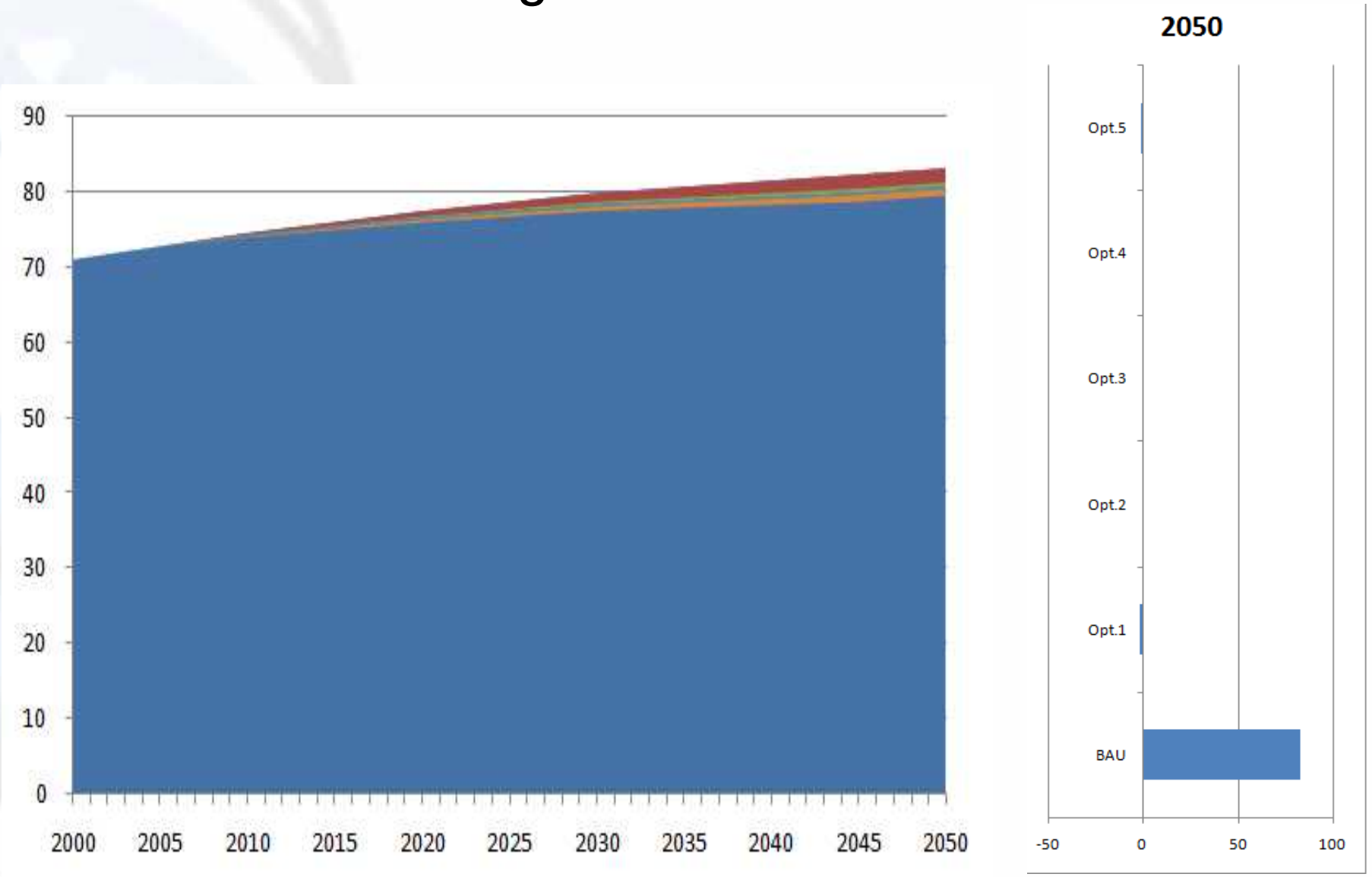
- 5 actions implemented
  1. Enhancing biodiesel use in small freigth
  2. Enhancing biodiesel use in large freigth
  3. Enhancing biodiesel use in buses
     - 2% biodiesel in 2005 to 100% biodiesel in 2050
  4. Enhancing energy efficiency in refrigerators
     - 50% efficiency increase until 2050
  5. Shifting from oil to biomas in the PWR sector
     - 6 Mtoe substitution (2/3)

Backcasting Model - Penetration

1	Enhance biodiesel use - MF											
		%	0%	2%	12%	23%	35%	47%	59%	71%	83%	95%	100%
2	Enhance Biodiesel Use - LF											
		%	0%	2%	12%	24%	35%	47%	59%	71%	83%	95%	100%
3	Enhance Biodiesel Use - Bus											
		%	0%	2%	12%	23%	35%	47%	59%	71%	83%	95%	100%
4	Energy efficiency - Refrigerator											
		%	0%	25%	50%	75%	100%	100%	100%	100%	100%	100%	100%
5	Shift from Oil to Biomass - PWR											
		%	0%	0%	10%	21%	33%	45%	57%	69%	81%	93%	100%

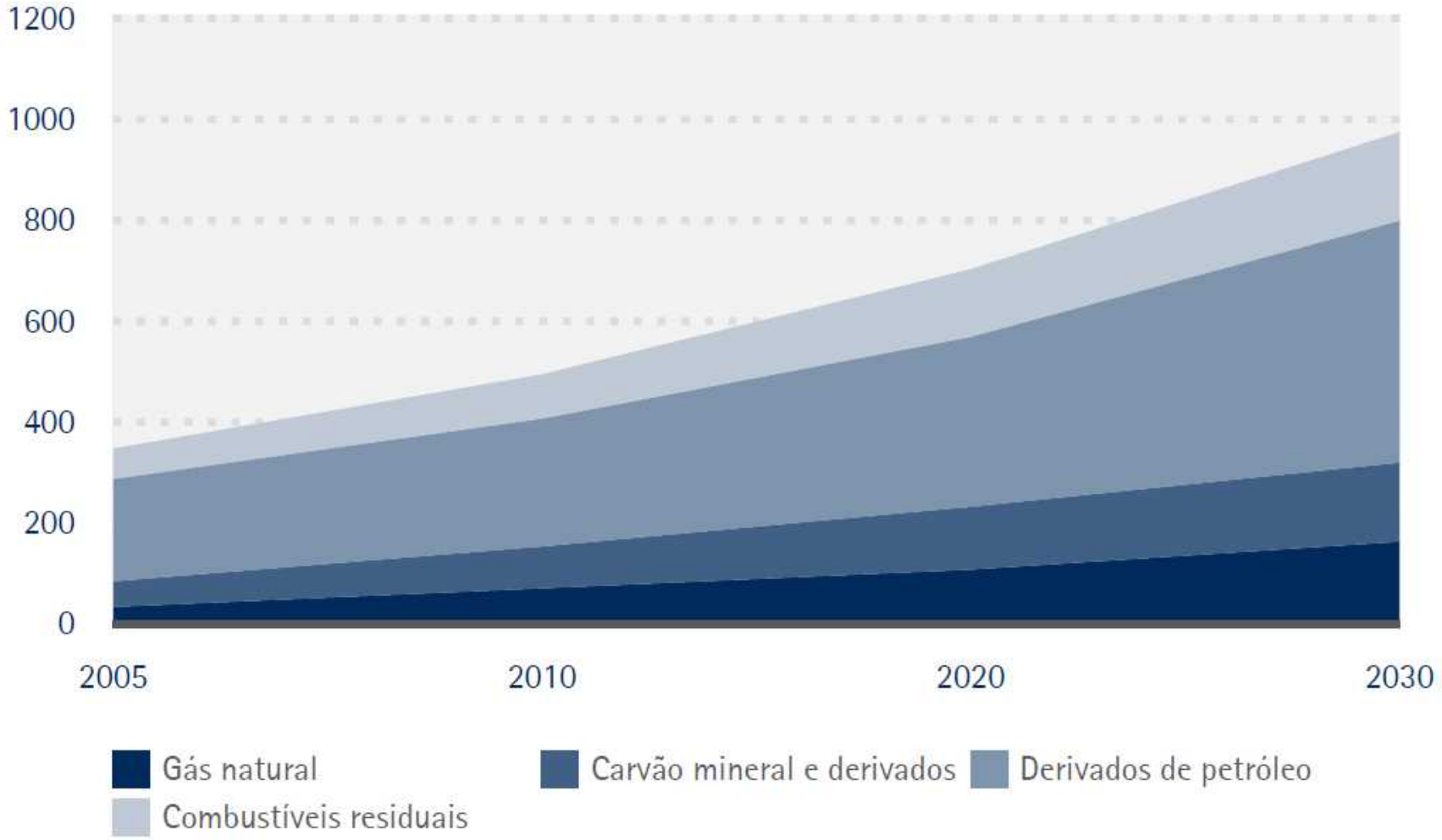


Backcasting Model - CO2 Results



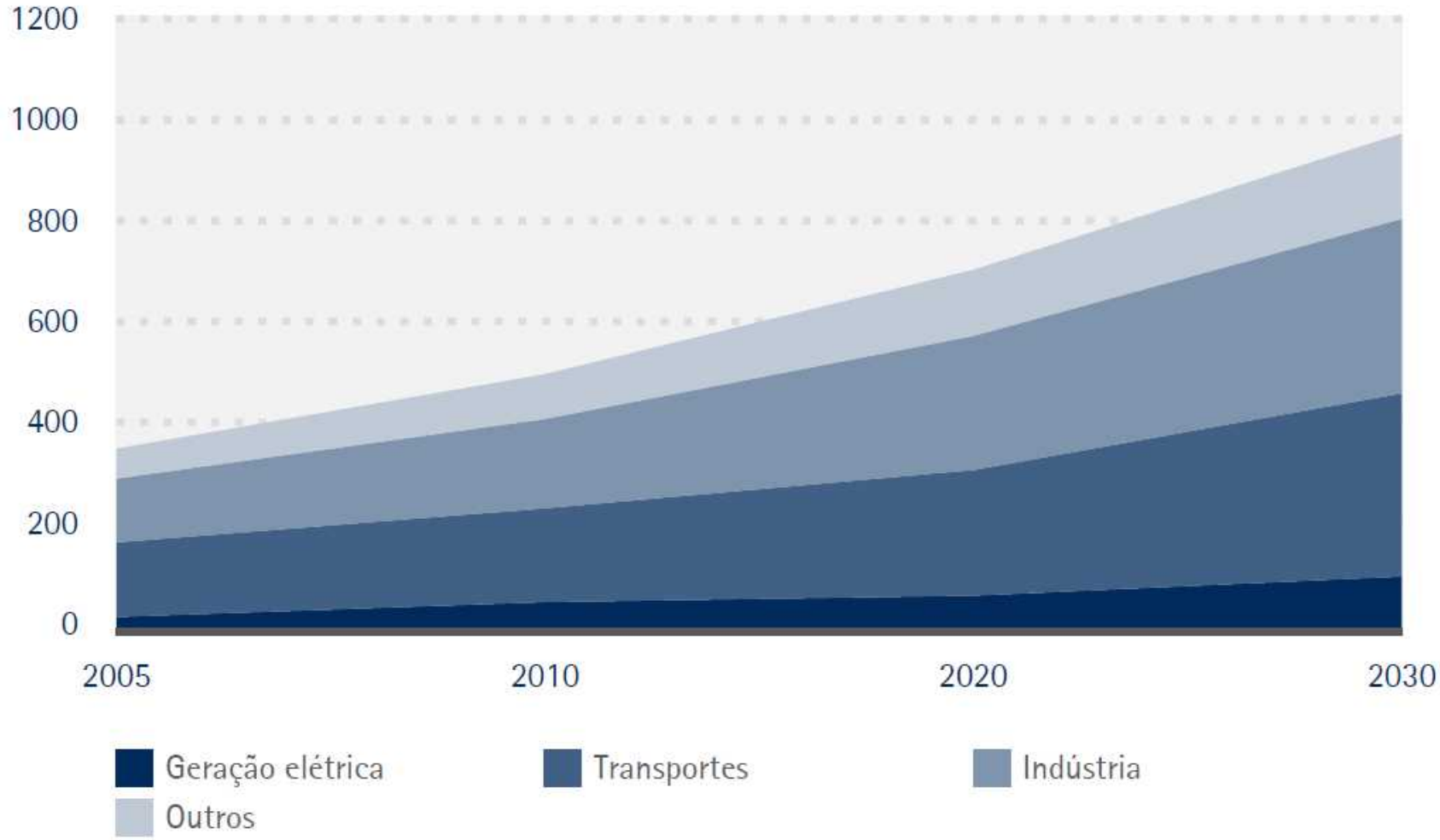
National Energy Plan 2030

Emissions per fuel (Mton CO_2)



National Energy Plan 2030

Emissions per sector (Mton CO_2)



Conclusions

- Comparing to developed countries, Brazil´s CO_2 emission per capita is low, and even in the BAU scenario it is projected to continue low.
  - 77% of Hidro in the PWR sector
  - 12% of ethanol in the transport sector
  - We can use more sugar cane bagasse in PWR sector
- Biggest emissions from deforestation – Decreasing (-40% in the last 3 years)
- Country is looking for energy efficiency
  - Refrigerators, air conditioners, and recently cars
- CDM projects are growing fast.

Future Work

- Implement other actions in the Backcasting Model;
- Check goals for energy eficiency in the National Energy Plan 2030;
- Check for new oficial data available to update BAU scenario;
- Assess other important trends and put them in CM scenario.
- Considering costs of actions
- Brazil is now preparing its Second National Comunication (2010)

THANK YOU!