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The Second Conference of the Emerging Economies Research Dialogue

Brazilian perspective on the roles of governments and innovation in improving efficiency in energy supply and consumption, equity and ecological sustainability

Jose Roberto Moreira

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Beijing, China

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Road Map

- **Provide a view of the energy supply and demand sectors in Brazil.**

- **Discuss the major issues related with their future growth and impacts on the environment, mainly the ones related with climate changes.**

- **Describe some government actions taken by the government to promote fast use of innovations and climate change mitigation while creating better living conditions for the poor.**

- **Based in some results already obtained, present lessons learned and that can be of interest to other countries.**

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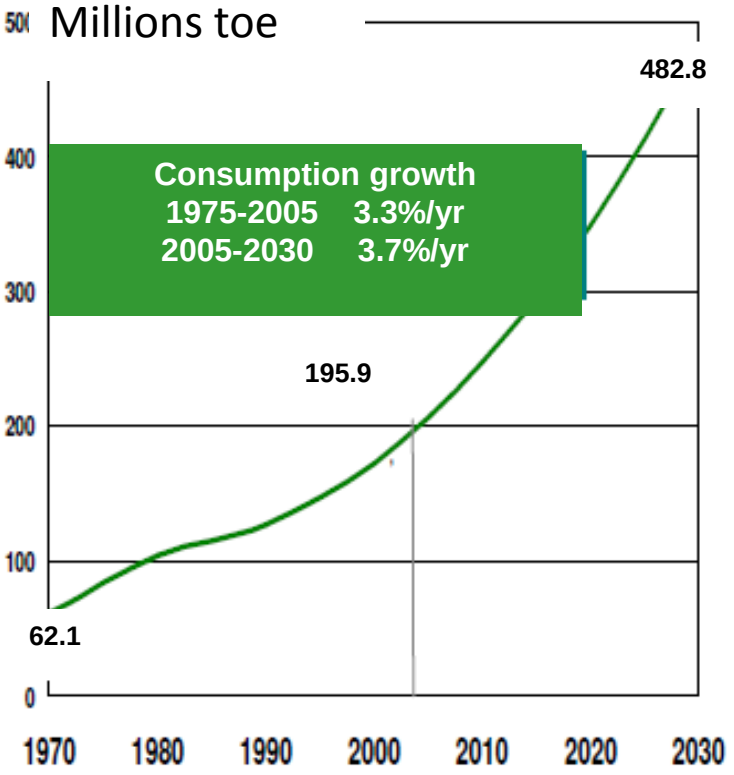
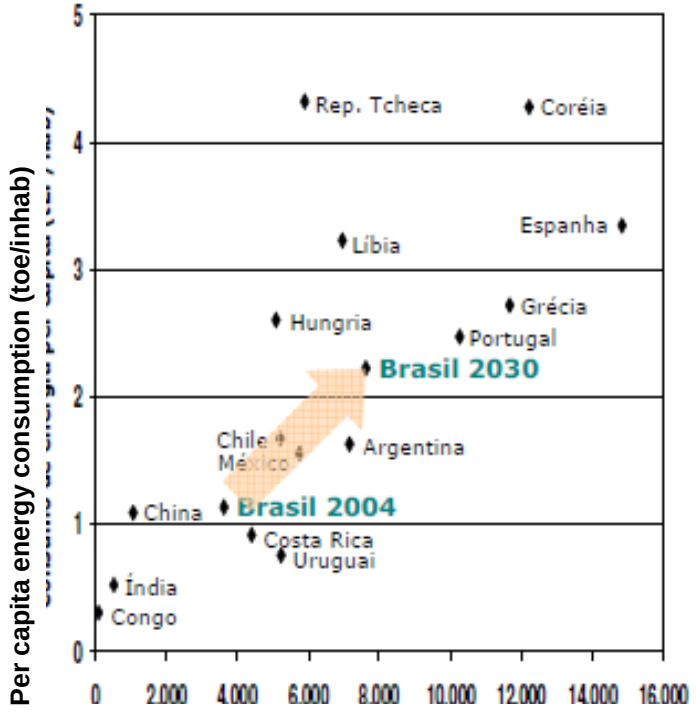
Expected Energy Consumption Growth as Viewed by 2007 Official Planning Body

- Future growth rate even larger than past
- Concern with country energy consumption relative to others



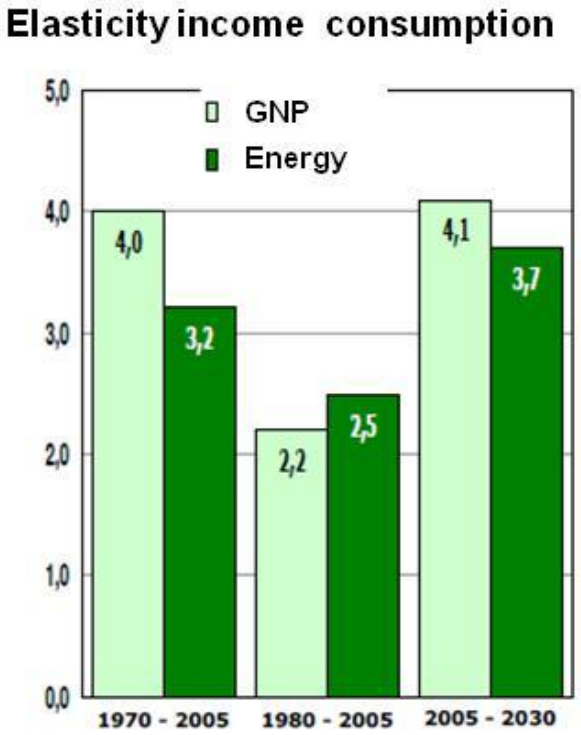
Source: EPE,2007

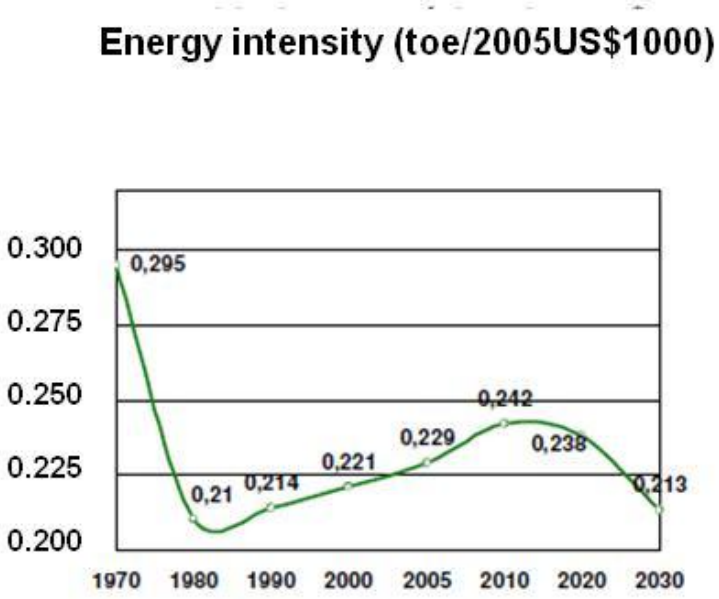


Per capita income (2000US$/person)
Data for the year 2003
Source: IEA, 2005

Expected Energy Consumption Growth as Viewed by 2007 Official Planning Body

- Keeps tight correlation between GNP and electricity consumption growth
- Energy intensity by 2030 equal 1980





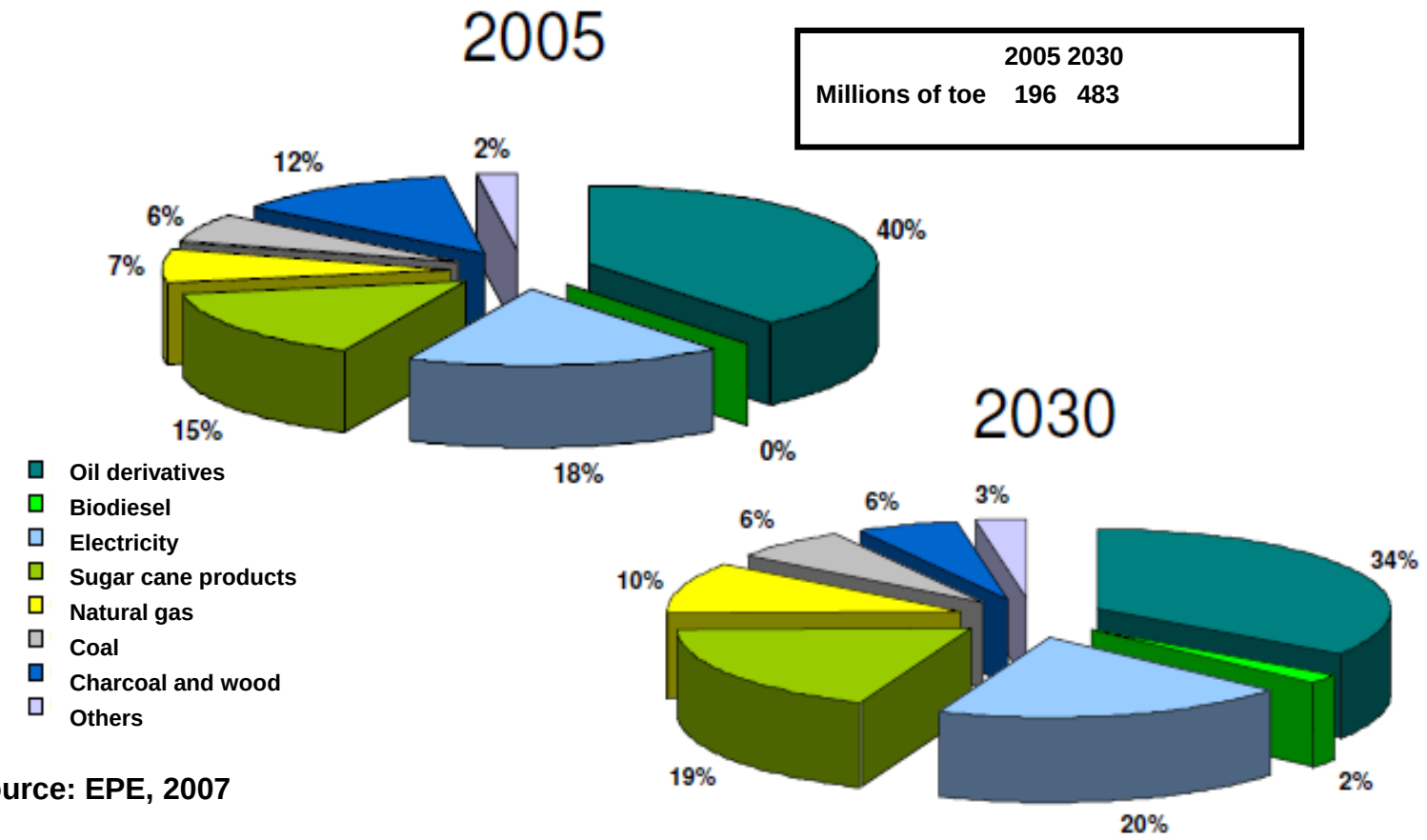
Expected Energy Supply Portfolio as Viewed by 2007 Official Planning Body

- Oil share reduced by 6%
- NG share increases by 3%
- New reneables share increases 2+4=6%
- Charcoal&Firewood reduces 6%

Little net change

Renewables stable

	2005	2030
Millions of toe	196	483



Source: EPE, 2007

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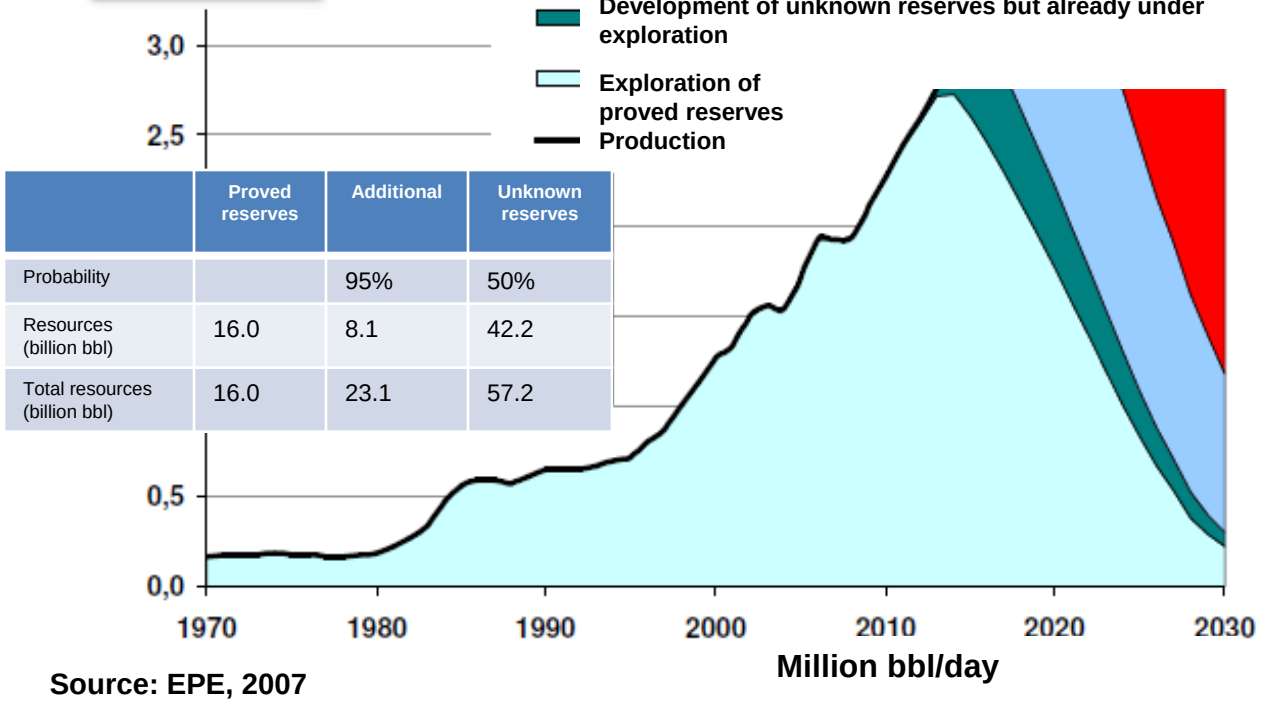
Oil Availability -2007 View

Efforts to preserve production at consumption level of 2015
Self- sufficiency policy pursued for many years
Target achievable only up 2015
Net oil importer after 2015



	Proved reserves	Additional	Unknown reserves
Probability		95%	50%
Resources (billion bbl)	16.0	8.1	42.2
Total resources (billion bbl)	16.0	23.1	57.2

Source: EPE, 2007

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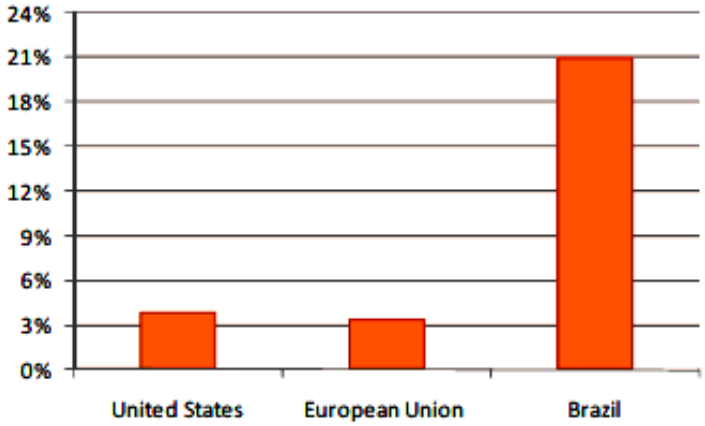
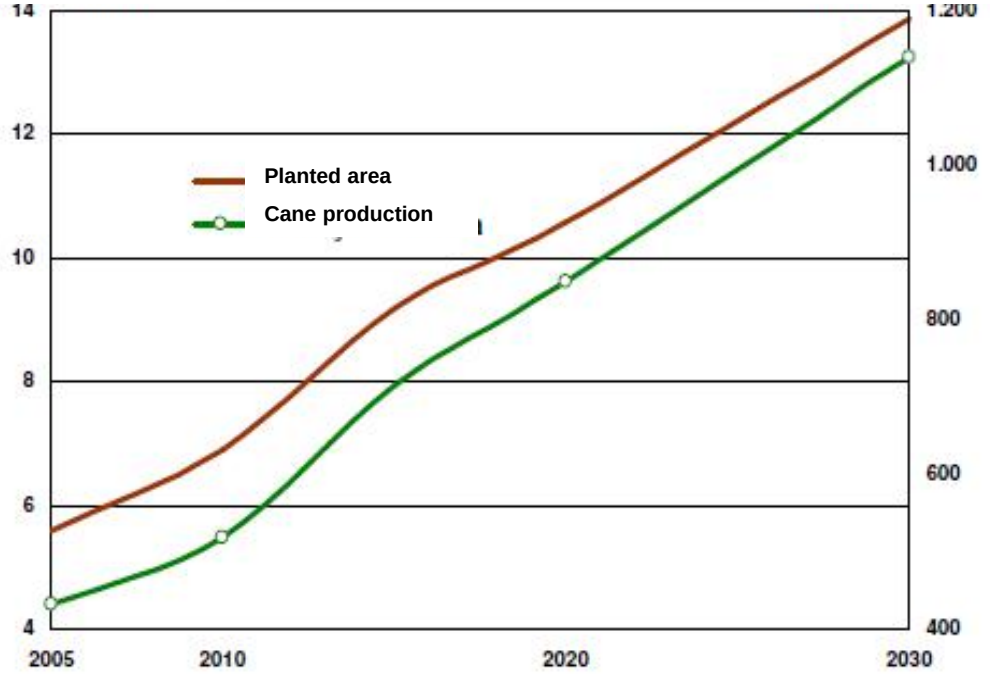
Biofuel Availability – 2007 View

- Significant growth in ethanol/bioelectricity
- Country will continue to be an ethanol exporter

	2005	2030
Planted area (Mha)	5.6	13.9
Sugar cane production (Mt/yr)	431	1140

Share of biofuels energy in road transport (2008)





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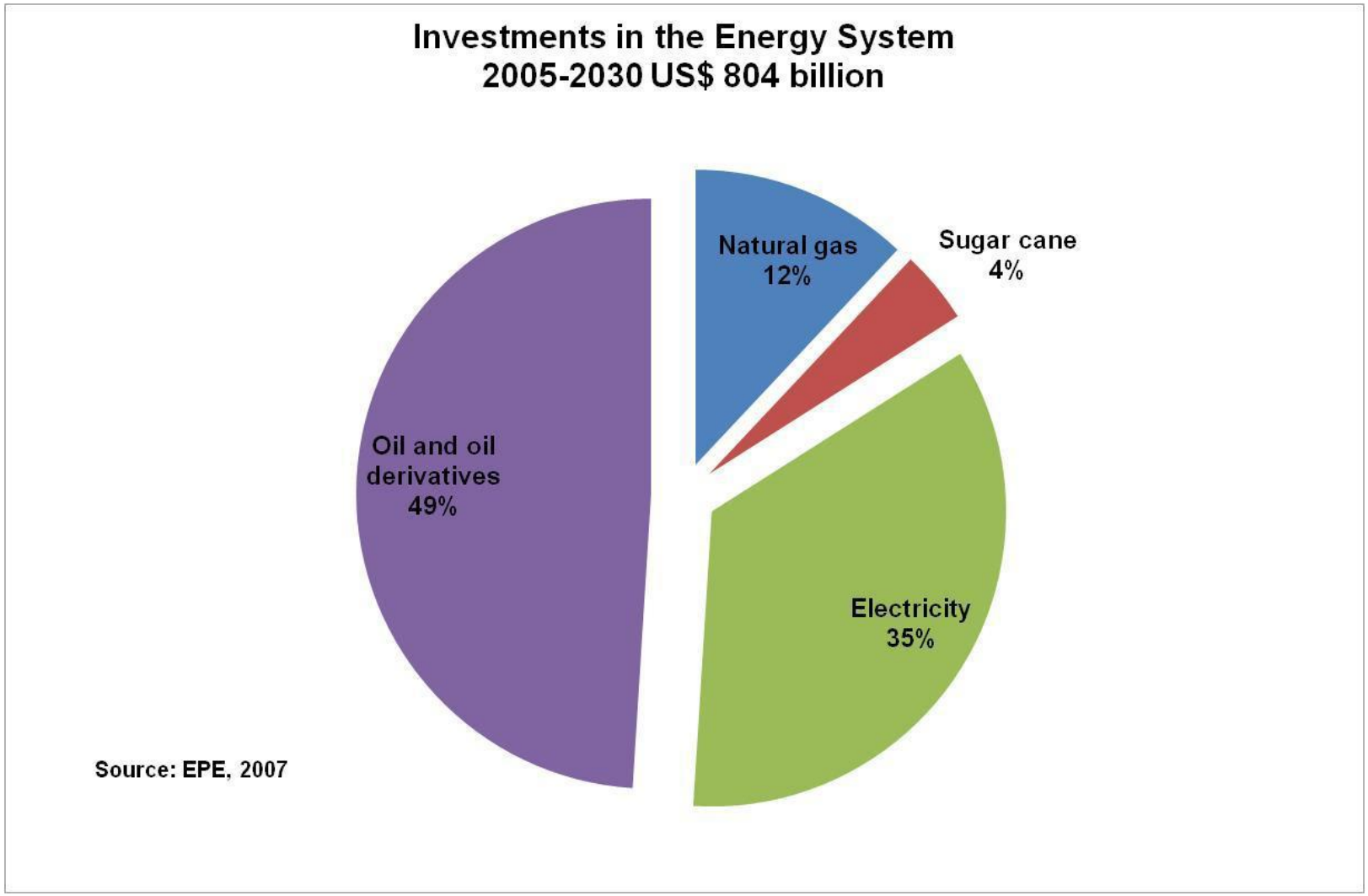
- Surprising enough is the volume of investments in the oil sector
- Such investments surpass electricity investments; very unusual at globe level



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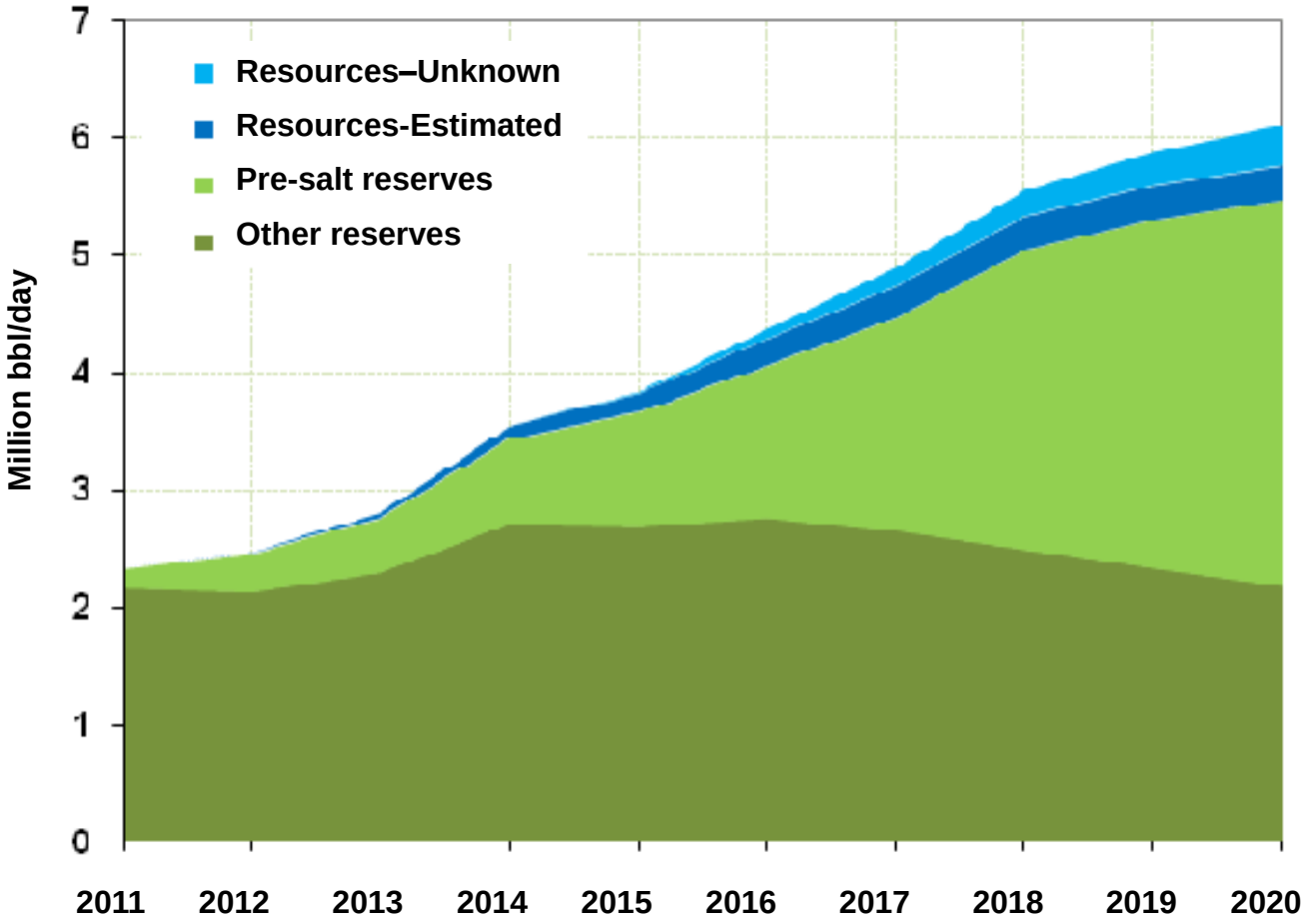
Oil Availability - 2011 View

- Production will increase to 6 Mbbl/day and above by 2020
- Country will be an important oil exporter



Oil Availability - 2011 View

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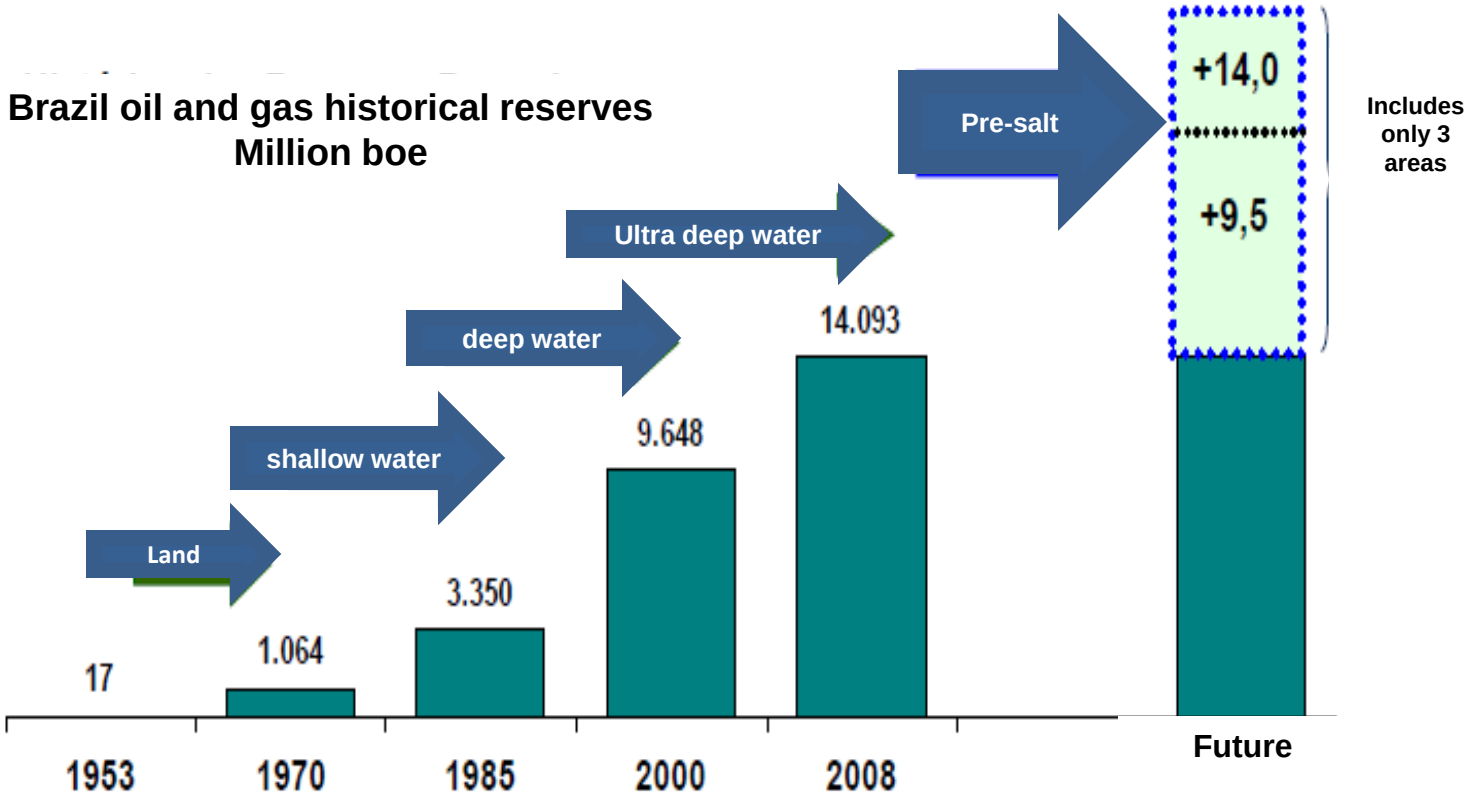
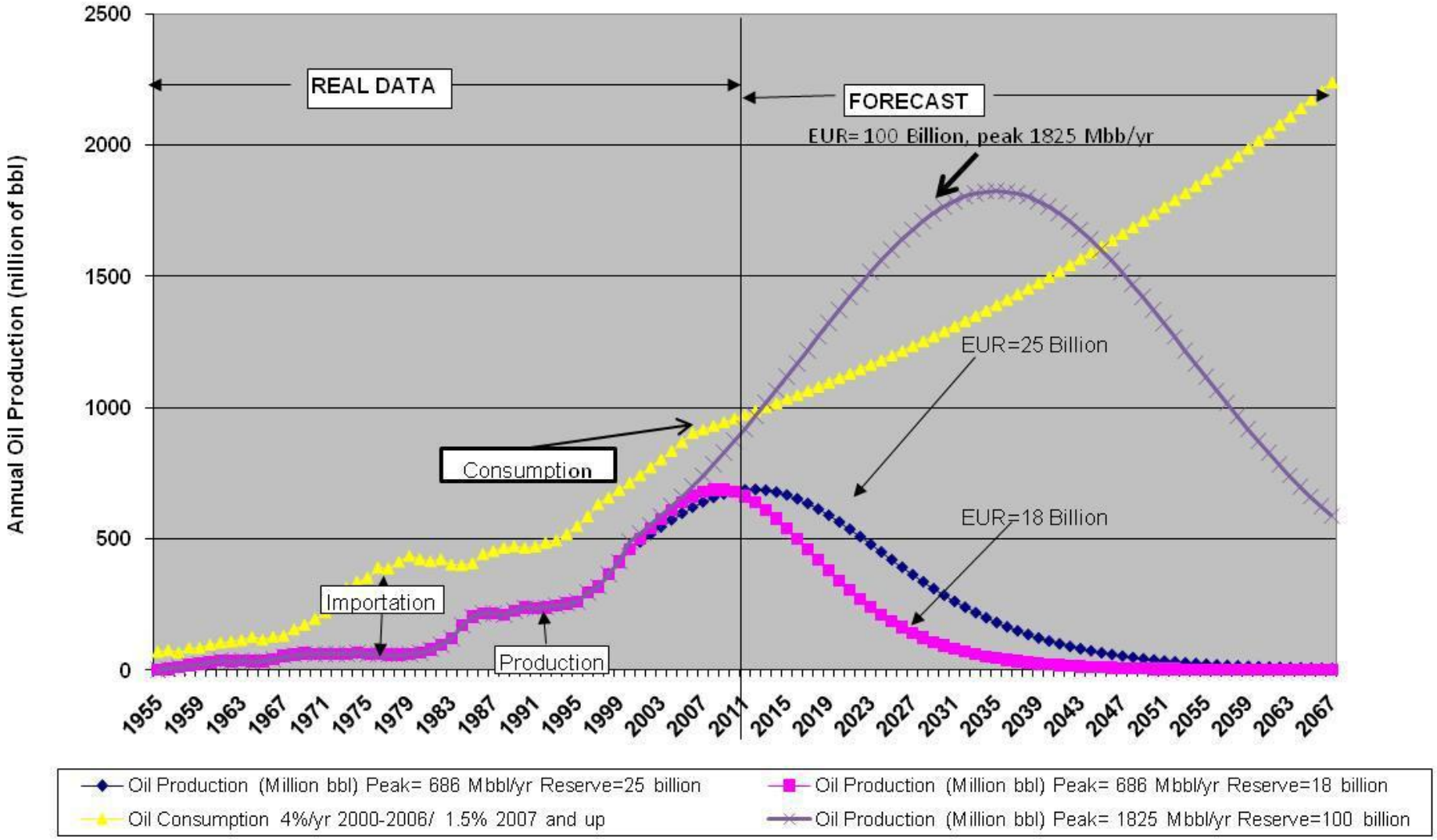
- Nevertheless, reserves shown are too small
- No reference to available total reserves and resources provided



•Assuming Hubbert Model the only way to reach 6 million bbl/day production is if available oil reserves are at least 100 billion bbl . Even so the target only by 2035
•Even so, country will be net importer already by 2045
•For private investors excellent business. For society there are other opportunities



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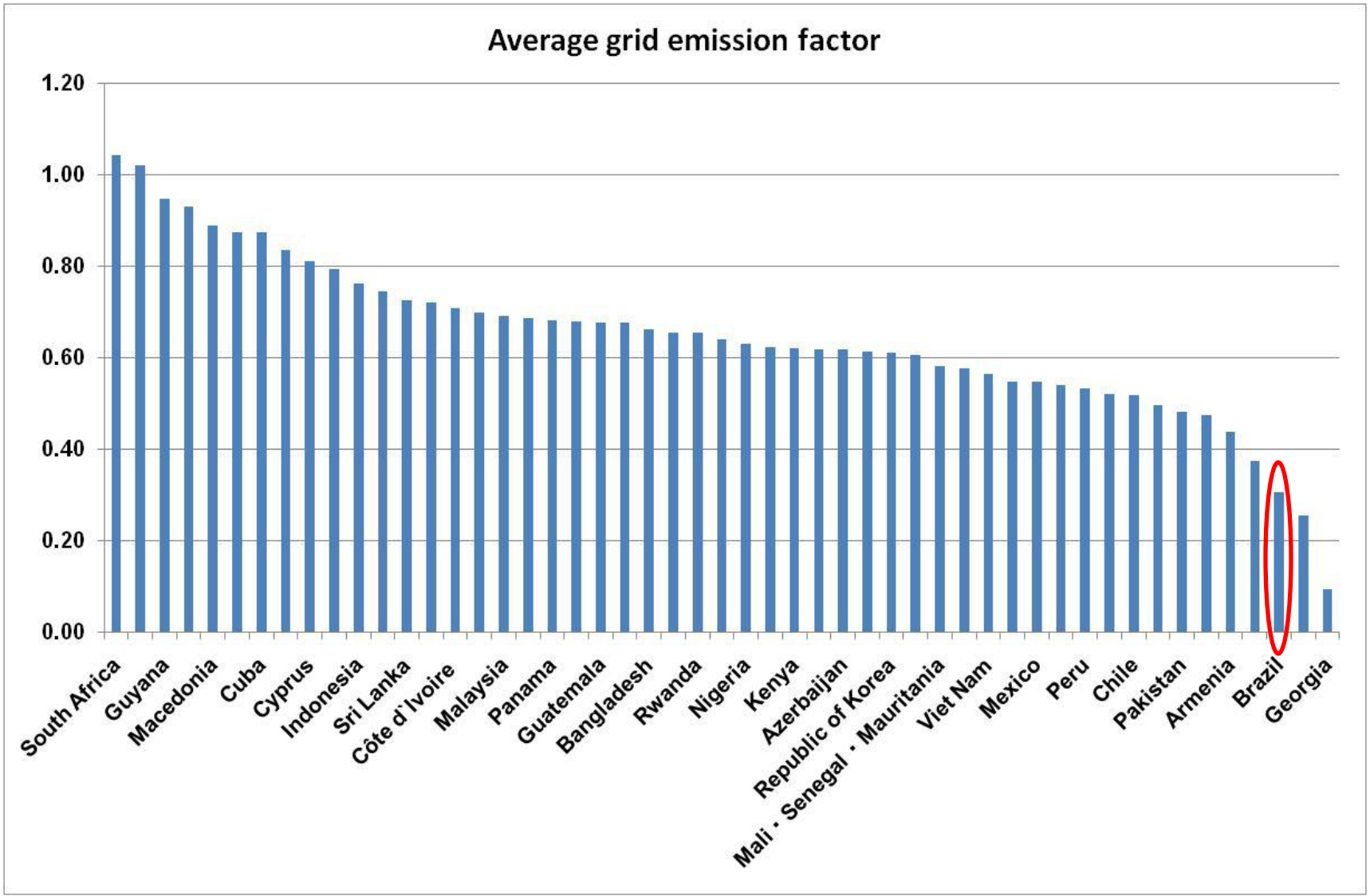
Electricity Supply – 2011 View

- Very low grid emission factor today due large hydroelectricity supply
- Installed hydro capacity already uses 40% of economic potential
- Remaining reserve in Amazon area. Strict environmental barriers



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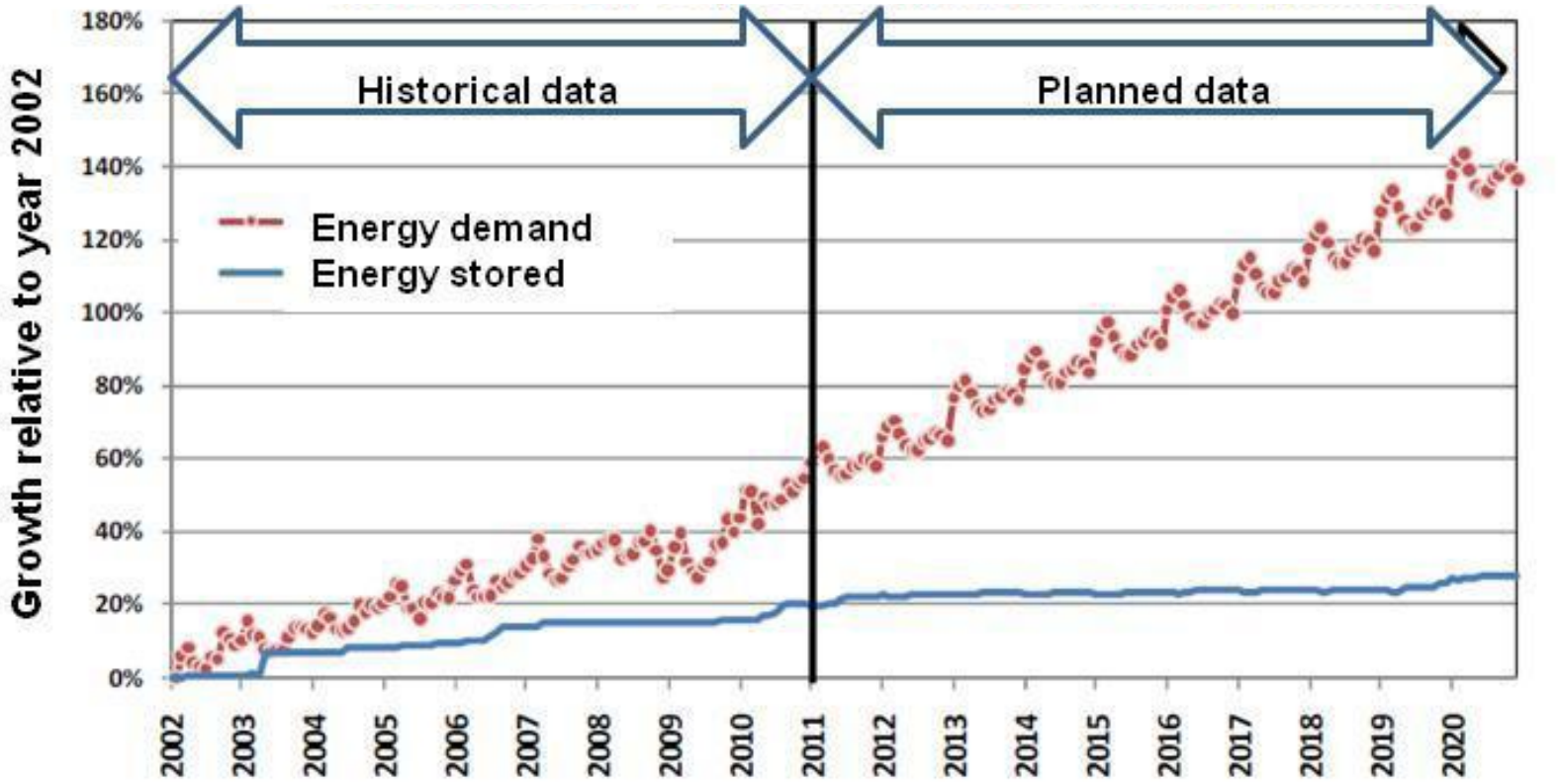
Electricity Supply

Stored Energy in Water Reservoirs can't anymore provides backup electricity
Back-up electricity from fossil fuels and renewables
Sugar cane biomass is an excellent complement for hydro. Sugar cane is harvested in dry periods

Load Growth and Maximum Stored Energy



Source: EPE, 2011

Fossil Thermal Plants Additions in the Period 2011-2020

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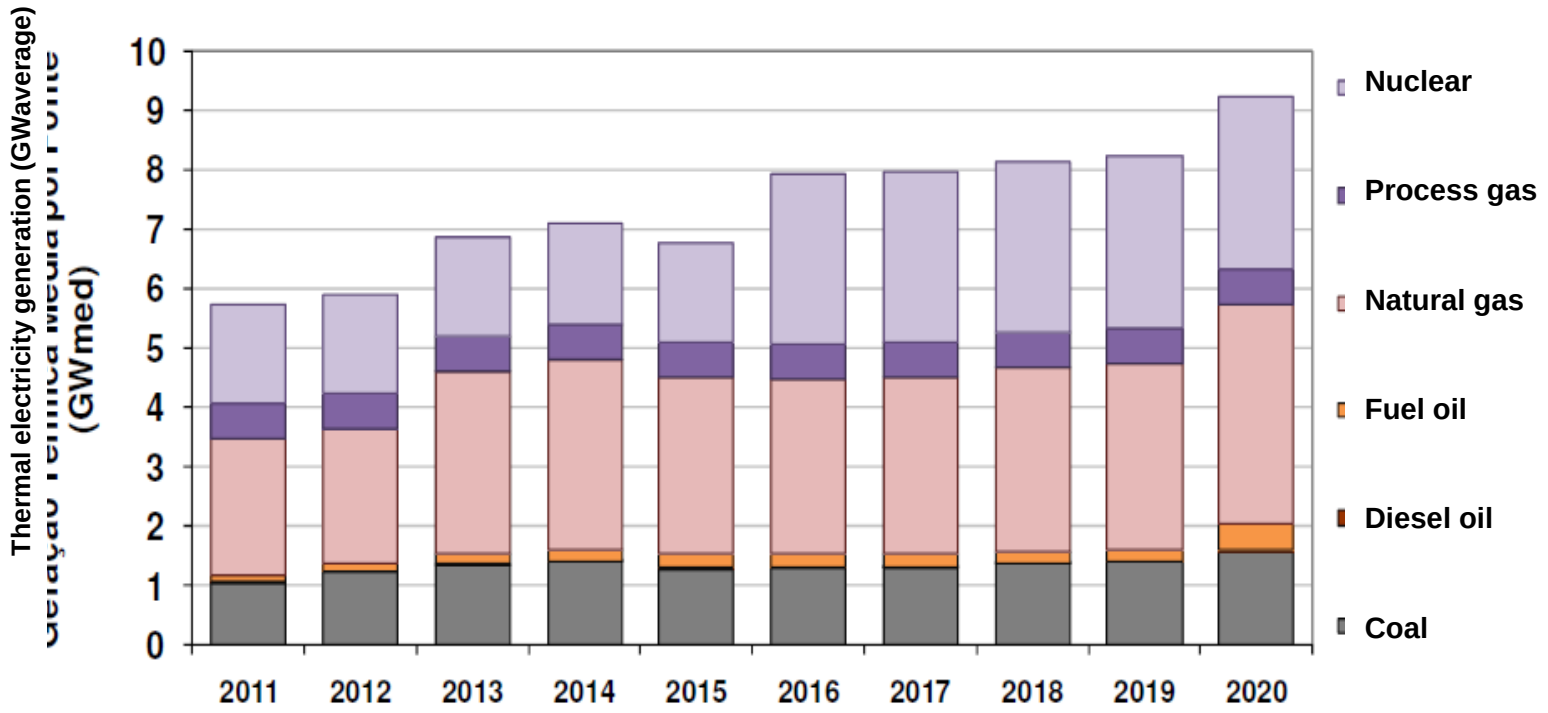
- New thermal plants are being constructed
- They are essentially based in Nuclear and Fossil Fuel
- Grid emission factor may increase. Some expectation that by 2020 grid emission lowers to 2010 level
- Then RE must significantly increase

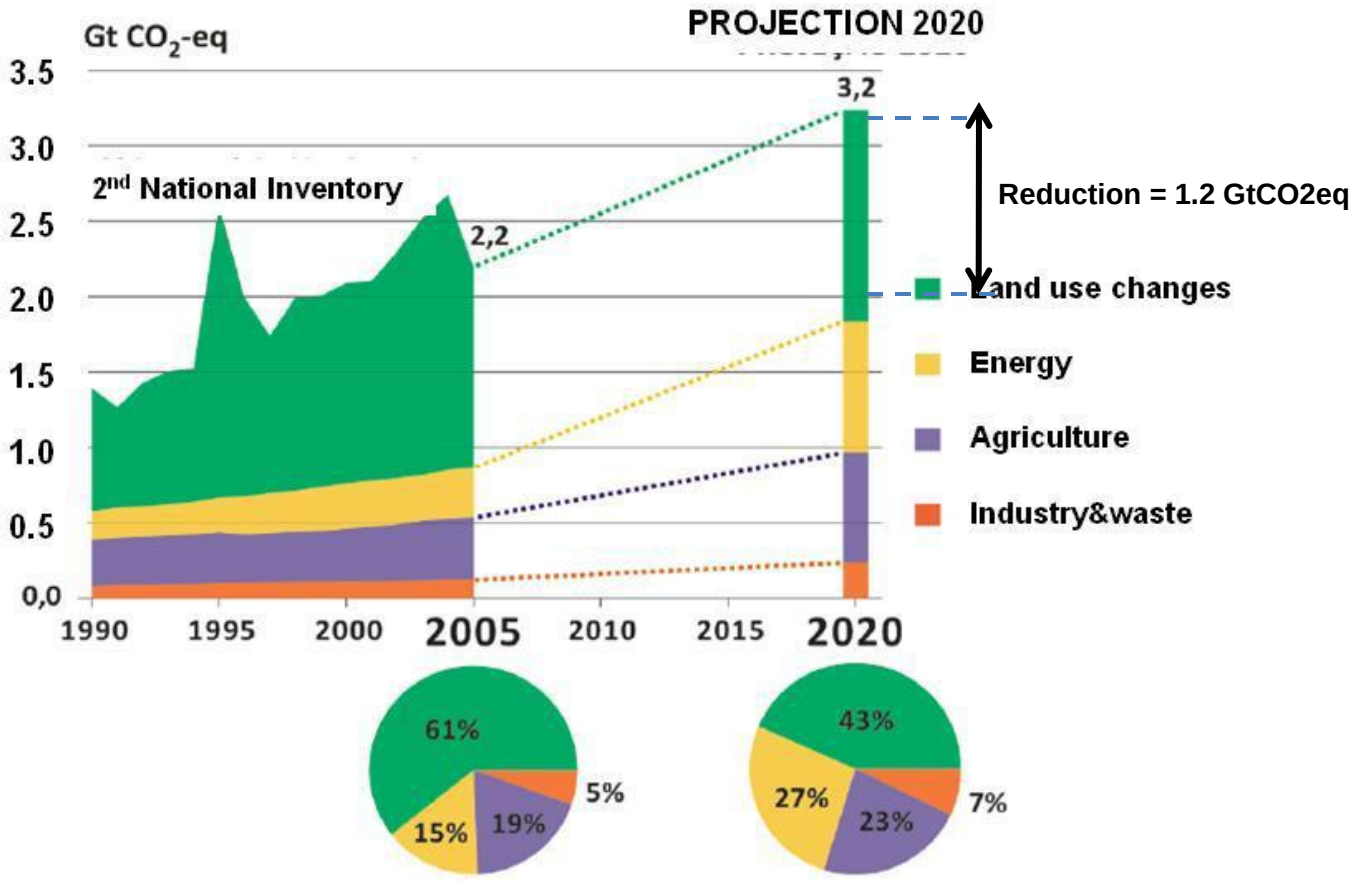


Source: EPE, 2011

Total generation in 2010 = 55 GWaverage

Country International Commitments on Climate Change

- Reduction based in BAU dynamic baseline
- Amount of emission reduction can be achieved just by significant decrease in deforestation by 2020. But mitigation actions supposed to occur in the energy sector also
- Even so, energy use will increase and likely emissions



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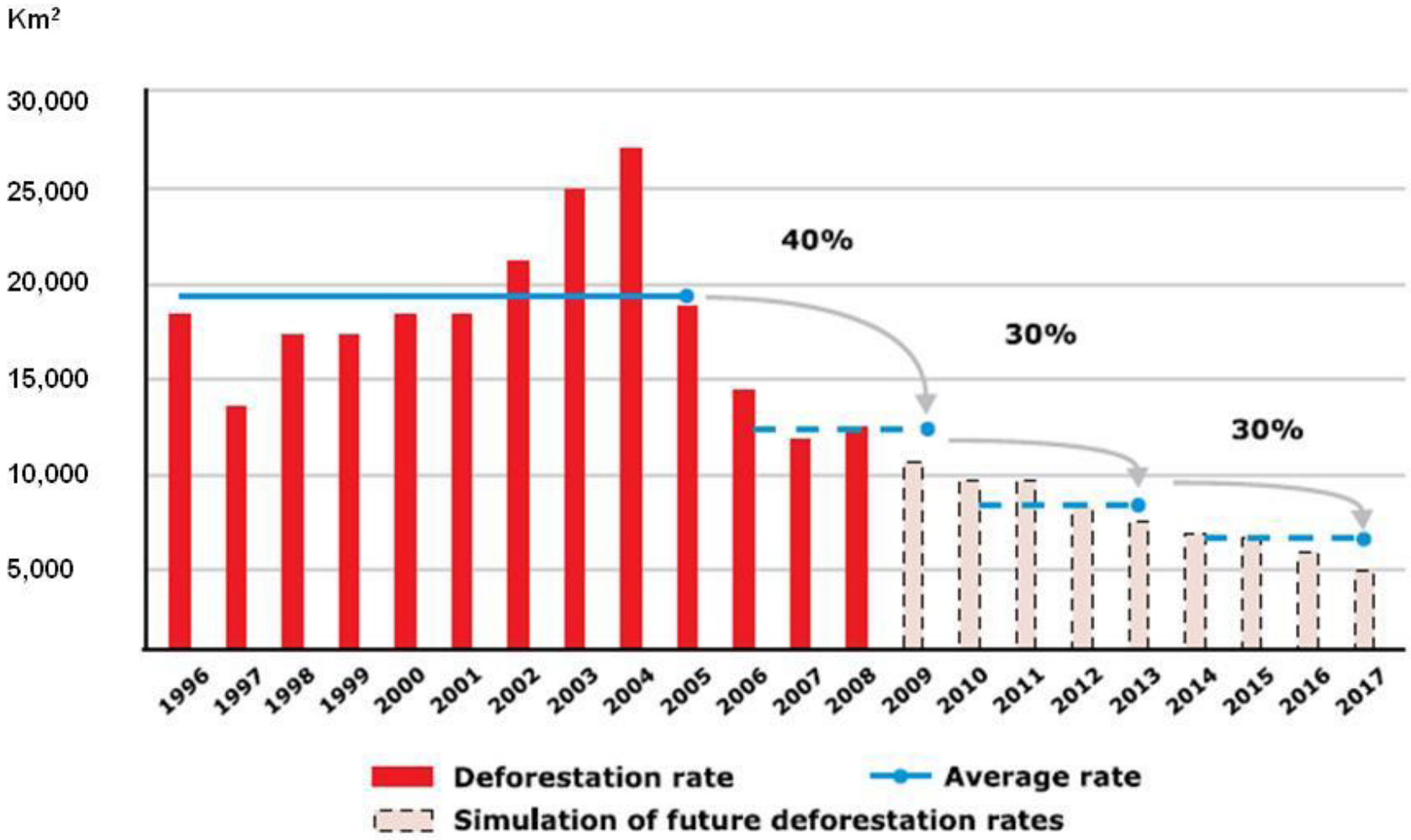
Amazon Deforestation

- But may not be so simple. Commitment is to reduce Amazon deforestation by 80% of the average value between 1996-2005.
- There are other areas than the Amazon where land-use changes must be controlled



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National Plan on Climate Change incorporated the following actions:

-Plan of Action for Prevention and Control of Deforestation in Legal Amazon – PPCDAm;

-Plan of Action for Prevention and Control of Deforestation and Vegetation Burning in Savannas – PPCerrado, targeting 40% reduction in the rate of deforestation in relation with the average rate observed in the period 1999-2008

-Energy Expansion Plan – PDE, which shall prioritize hydroelectricity, alternative energy sources (wind, SHP and bioelectricity), biofuels and energy efficiency

-Plan for the Establishment of a Low Carbon Emission Agricultural Economy – Plan ABC.

- Plan of Emission Reduction on the Iron and Steel Industry through fostering the use of charcoal from planted forest in the sector as well as improvements in the efficiency of the carbonization process.

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Voluntary actions presented in Brazilian NAMA in Copenhagen-2009

Mitigation Actions (NAMAs)	2020 BAU	Amount of reduction in 2020		Relative reduction	
Land use	**1084**	**669**	**669**	**61.72%**	**61.72%**
RED Amazon deforestation		564	564	52.03%	52.03%
RED Cerrado deforestation		104	104	9.59%	9.59%
Agriculture	**627**	**133**	**166**	**21.21%**	**26.48%**
Pasture recovery		83	104	13.24%	16.59%
Integration Agriculture and Pasture		18	22	2.87%	3.51%
Direct seeding		16	20	2.55%	3.19%
Biological nitrogen fixation		16	20	2.55%	3.19%
Energy	**901**	**166**	**207**	**18.42%**	**22.97%**
Energy efficiency		12	15	1.33%	1.66%
Increase in the use of biofuels		48	60	5.33%	6.66%
Increase on hydro-based electricity		79	99	8.77%	10.99%
Alternative energy sources (SHP, biomass, wind)		26	33	2.89%	3.66%
Others	**92**	**8**	**10**	**8.70%**	**10.87%**
Iron and ore sector- charcoal from native forest		8	10		
Total	**2704**	**976**	**1052**		

Note: Absolute values in MtCO2eq
Source: Camina, 2011

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To construct and approve Brazilian international commitment was necessary a significant government effort.

Only the National Council of Energy Policy (CNPE - Conselho Nacional de Política Energética) which reports directly to the President, but is only an advisory body, has the competence to formulate energy policies and guidelines designed to:

a. preservation of national interest;
b. promotion of sustainable development, expansion of the labor market and recovery of energy resources;
c. environmental protection and promotion of energy conservation;
d. use of renewable energy by taking advantage of available resources and applicable technologies;
e. promotion of free competition;
f. attraction of investment in energy production;
g. expansion of the country's competitiveness in international market

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Other bodies, including Eletrobras and Petrobras have only mandates to guarantee the supply and demand side for electricity and for fossil fuels. The government create small organizations to promote energy efficiency long time ago

The Electricity Efficiency Program - PROCEL

PROCEL
PROGRAMA NACIONAL DE CONSERVAÇÃO DE ENERGIA ELÉTRICA

The Oil and Gas Efficiency Program – CONPET

conpet

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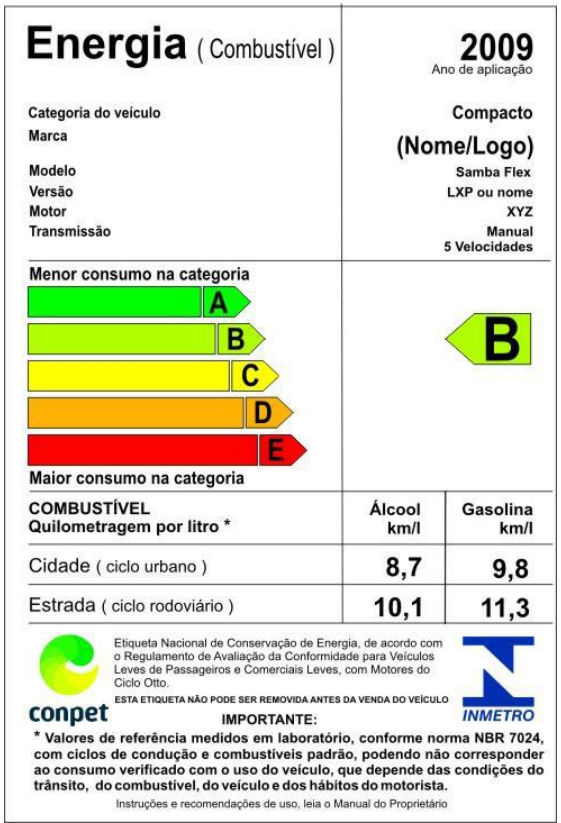
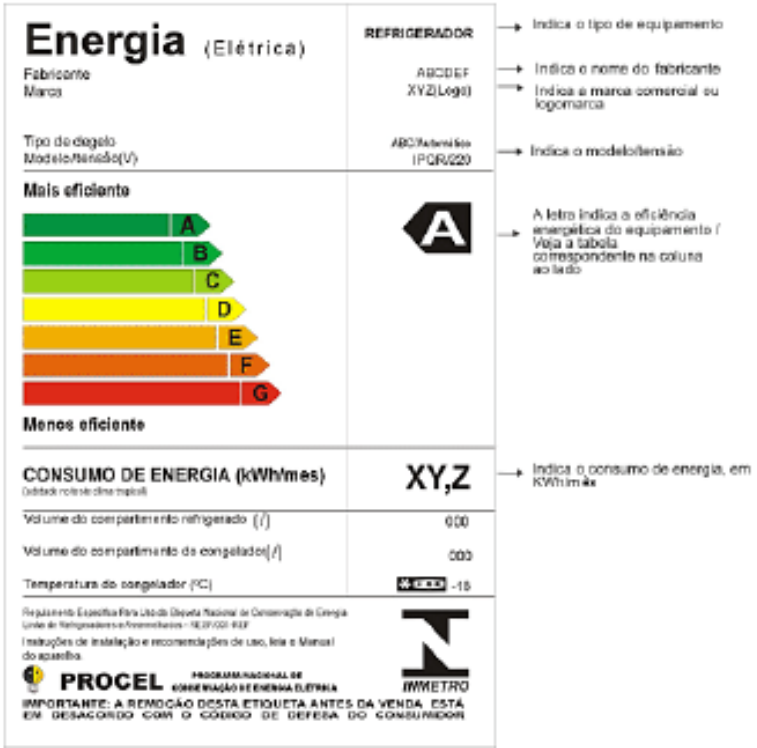
Other Initiatives - 1

Already in 2000, a law established the obligation for investment in energy efficiency programs in the final use by the Brazilian companies distributing electricity. This law initially designed for distribution utilities was extended to all electric utilities and also to oil utilities. The law requires that 1% of the revenue be reserved for energy efficiency programs either directly or indirectly through R&D and appropriate energy planning

CARS



HOME APPLIANCES



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Other Initiatives – 2 Green Agricultural Policy

With increasing attention on its sugar cane ethanol and palm oil diesel biofuels programs, a combination of global and home-grown pressure led the federal government to re-think its role in the agricultural advancement of this sector in mid 2007. These programs became reality through presidential decrees in June of 2009 and May of 2010, respectively.

With the introduction of agroecological zoning for sugarcane, globally the first of its kind, the stakes have been raised to include significant new ecological criteria together with a nationwide requirement for all financing institutions to evaluate the loans essential for large farming endeavours based on their compatibility with new agroecological zoning.

The new zoning framework for sugarcane establishes that sugarcane cultivation is forbidden in:

- **areas with more than 12% declivity, incentivizing mechanical harvesting for both efficiency and humanitarian reasons (due to labor conditions of cane field workers);**
- **the entire Amazon region (totaling 59% of the country) including previously deforested areas;**
- **areas with any kind of natural vegetation, to prohibit new deforestation**
- **the enormous Pantanal wetland and its hydrographic basin; and 36**
- **all high conservation-value areas.**

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Other initiatives - 3 Palm Oil Agroecological Zoning

The areas allowable for Palm oil plantations are the ones considered with low climate risks and belong to the following categories:

- **Antropic areas located in the states of Acre, Amazonas, Amapá, Maranhão, Mato Grosso, Pará, Rondônia e Roraima;**

- **Antropic areas of the states of Alagoas, Bahia, Espírito Santo, Pernambuco, Rio de Janeiro e Sergipe.**

From all these areas are excluded lands with native vegetation, protected areas (conservation areas, the ones considered as indigenous habitat, urban and areas registered for public use.

Legislation and Incentives not yet defined

Criticism About the National Plan on Climate Change

WWF has criticised the Amazon Fund: - it would still result in the deforestation of more than 5,000 square kilometres per year (Lang. 2009)

Other serious concerns and questions:

1.Brazil continues extracting oil and looking for new oil fields. While the government is keen not to create carbon credits for the North through avoided deforestation, will the government trade off emissions from oil against the emissions saved by reducing the rate of deforestation?
2.There are plans for vast increases in the area of biofuel crops in Brazil. Are these plans compatible with attempts to reduce deforestation?
3. Is the government really serious about addressing the causes of deforestation? The National Plan on Climate Change gives a figure of 34,460 MW to be generated from new hydropower dams to be built between 2007 and 2016, meaning more forest flooded and more greenhouse gas emissions. Will the government scrap plans for new roads through the Amazon? Will it abolish subsidies to the pulp and paper industry
4. The government talks about —net deforestation|| and eliminating —net loss of forest. The National Plan on Climate Change includes a proposal to double the area of plantations in Brazil, an increase of 5.5 million hectares.

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DETECTABLE CONFLICTS

-**Energy Expansion Plan – PDE, which shall prioritize hydroelectricity, alternative energy sources (wind, SHP and bioelectricity), biofuels and energy efficiency. As discussed the Plan foresees doubling energy consumption by 2030.**

-**Large availability of oil and NG will reduce interest in Energy Efficiency**

-**Large availability of conventional energy sources may reduce the interest in RE**

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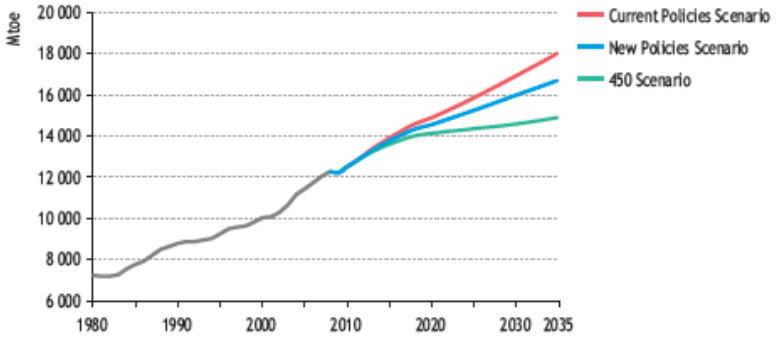
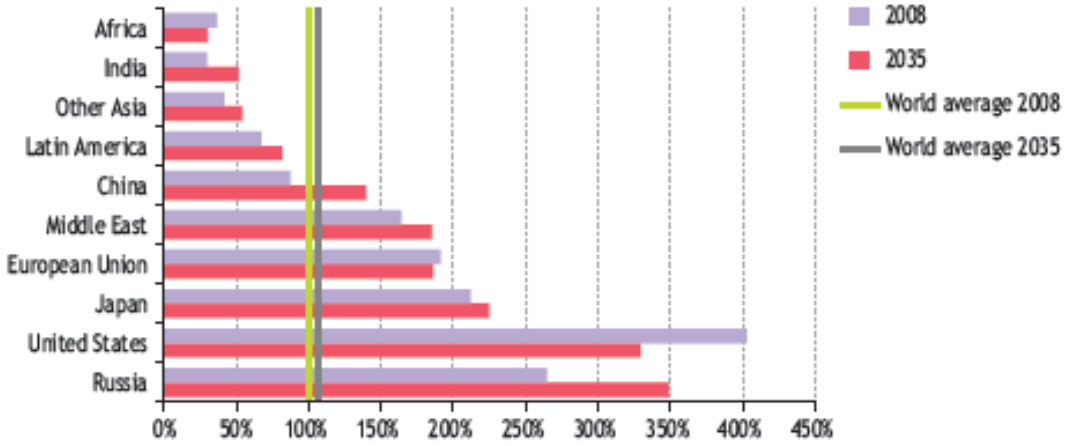
Climate Change Conflict at Global Level

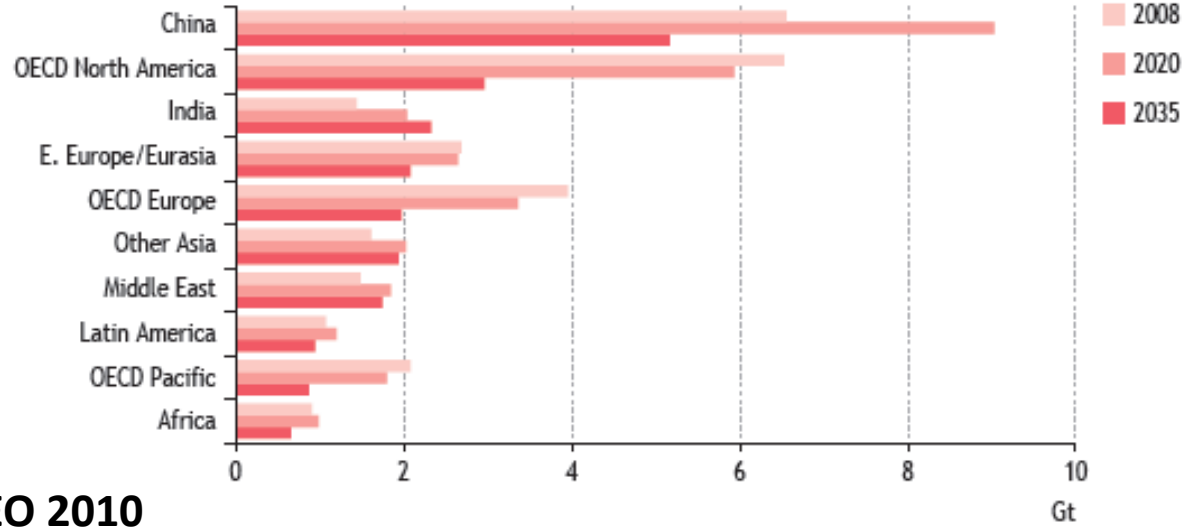
World primary energy demand by scenario



Per-capita primary energy demand by region as a percentage of 2008 world average in the New Policies Scenario



Energy-related CO2 emissions by region in the 450 Scenario



Source: IEA/WEO 2010

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States Policies

São Paulo state - It has been set through a State Law # 13,798 issued in 2009 and establishes emission reduction on CO2 emissions of 20% by the year 2020 quantified relative to the reference emission on the year of 2005. The legislation is only concerned with CO2 emissions

	Sãp Paulo		Brazil		SP/BR
Sector	Emission		Emission		
	$GgCO_{2eq}$	(%)	$GgCO_{2eq}$	(%)	
Energy	80,017	57.2	323,808	15	24.7%
Industry	20,610	14.7	77,939	3.6	26.4%
Agriculture	29,818	21.3	415,754	19	7.2%
Waste	9,366	6.7	41,048	1.9	22.8%
Land use change	0	0	1,329,053	60.6	0.0%
Total	139,811	100	2,192,602	100	6.4%

Source: CETESB, 2010

•No Land-use changes mitigation opportunities

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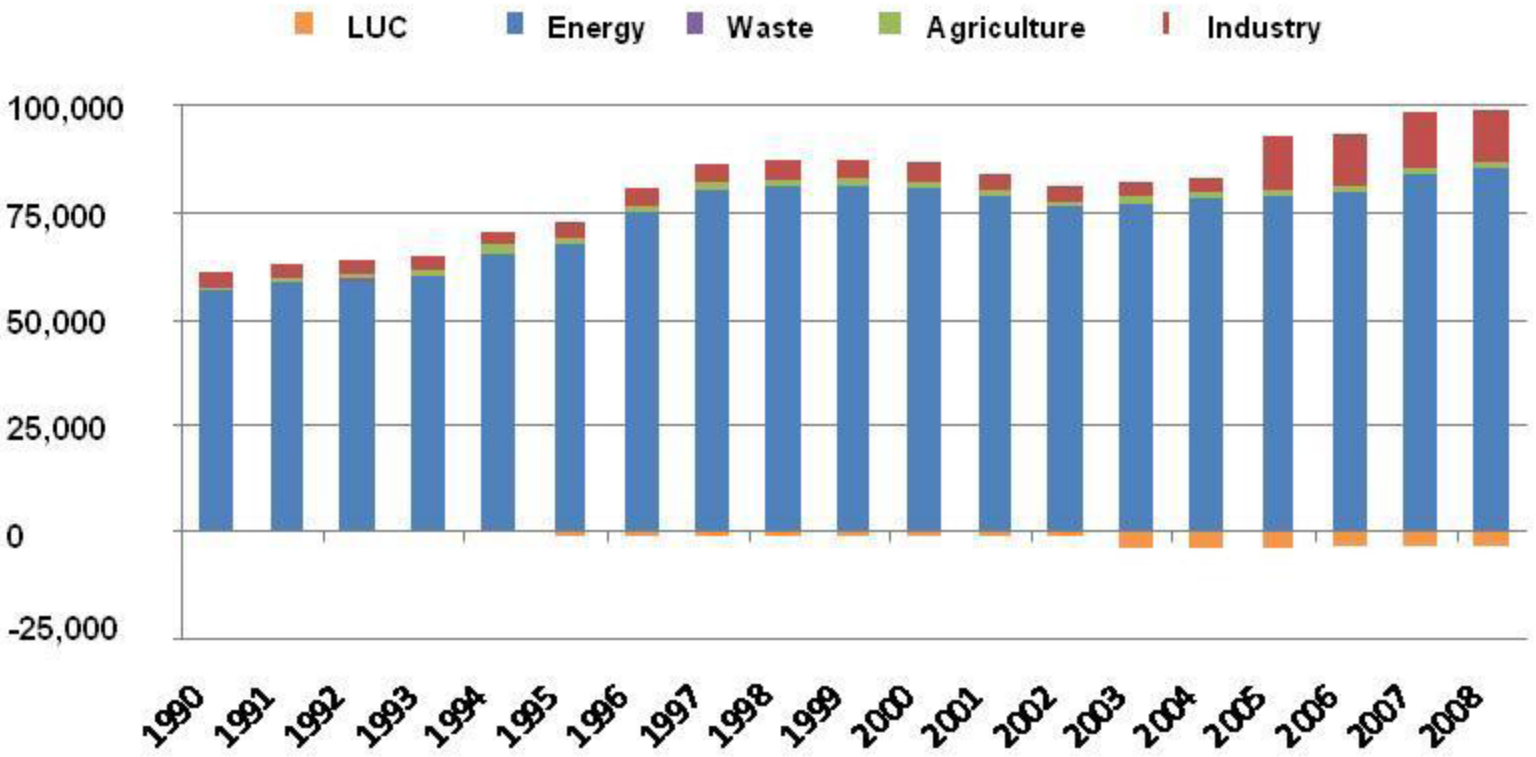
DETECTABLE CONFLICTS



- Already 7% growth with respect to 2005
- Major emission source is transportation sector
- In the last years negative contribution from land-use change emission due reforestation
- Already half the automobile fleet uses ethanol

Conclusion – Lessons Learned

International cooperation on an unprecedented scale is required. The country designed efficient policies which pushed bioethanol, bioelectricity and bioplastics in the national market. Bioethanol is used as a fuel for automobiles, buses, motorcycles and airplanes. Thus, other countries interested in relying on biofuels could take advantage of Brazilian know-how abbreviating their learn curve.

Significant adjustments to energy supply policies and demand management are critical . Sudden electric blackout due shortage of rainfall .planning occurred in 2001. The problem was faced with strong rationing policies applicable to all users, instead of selling scarce electricity to the ones that afford to pay more.

International alignment on policies tackling climate change and a more consistent approach across regions are critical. In a hurry to demonstrate political commitment with the environment, politicians decided to set very strong caps for GHG emissions. For the country, by 2020 emissions should be 36 % less than in BAU) For the state of São Paulo 20% reduction by 2020 with respect to emissions occurred in 2005.

Stronger decision-making processes are needed to resolve trade-offs resulting from the increasing demands of national economic, social, environmental, and security agendas. Examples are the successful implementation of the Bioethanol and Biodiesel programs through appropriate policies.

Greater efforts to address the barriers to policy implementation will help to solve issues such as the siting of new infrastructure, market regulation, and the provision of (dis)incentives. In the country this applies mainly to oil sector overexpansion, hydroelectricity under expansion and feasible CC targets.

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Thank you very much for your attention

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