Climate Change Positive Agenda in Brazil

Opportunities for low carbon transition in Africa

The Rising Powers, Clean Development and the Low Carbon Transition in Sub-Saharan Africa

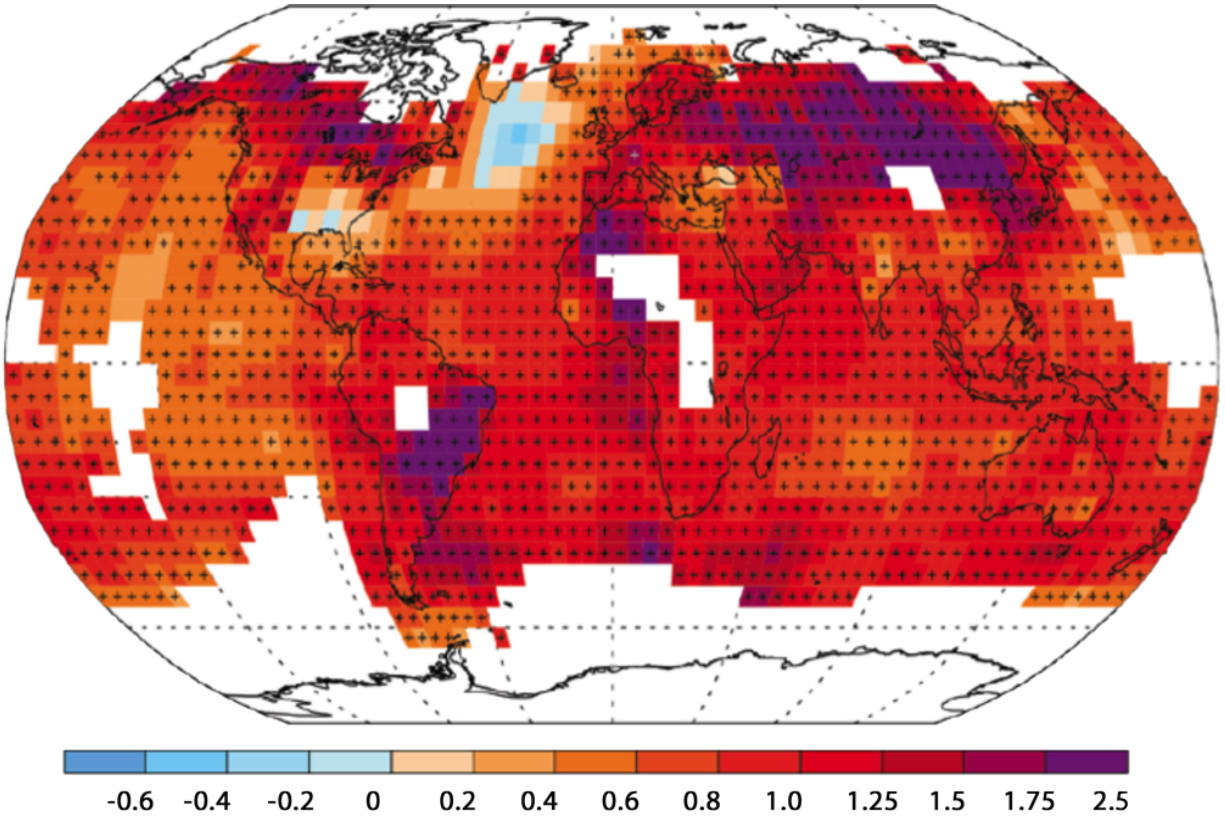
Durham University and University of Sussex

Workshop at the Royal Society, London, February 3rd 2015

cgee
Centro de Gestão e Estudos Estratégicos
Ciência, Tecnologia e Inovação

Climate Change

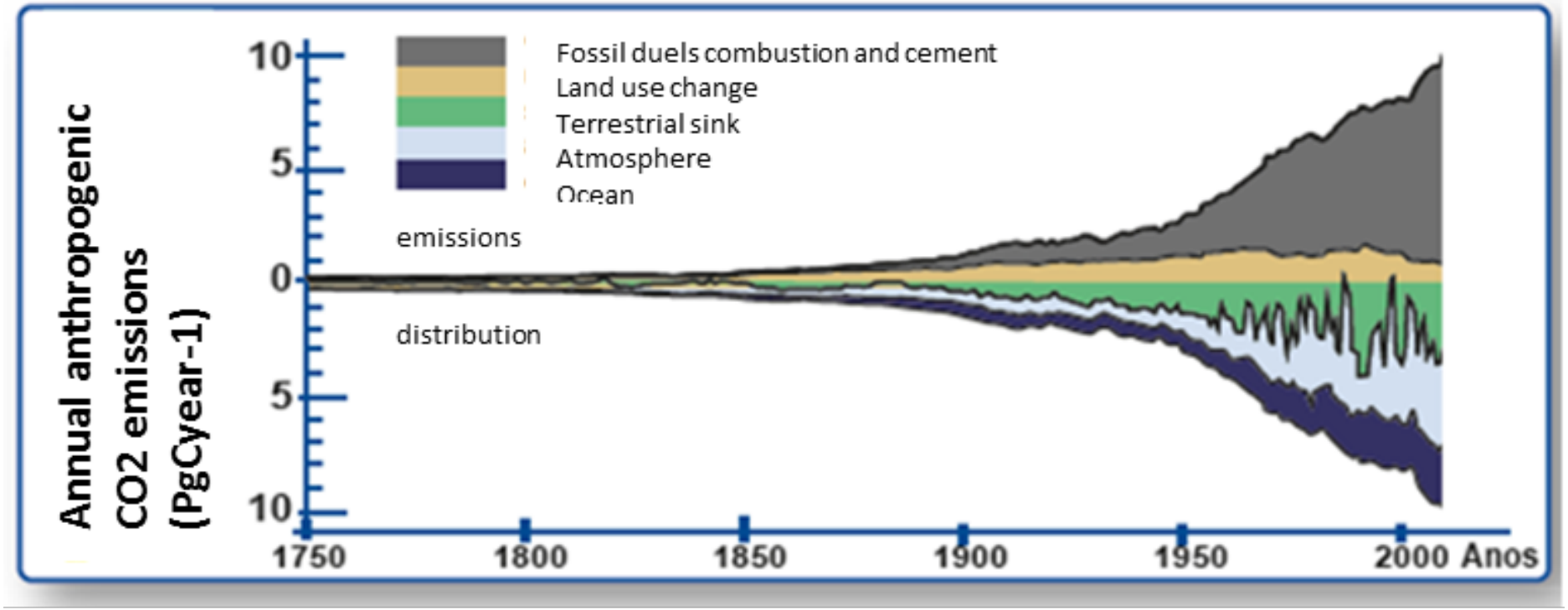
Change in average surface temperature 1901-2012



Source: IPCC Fifth Assessment Report, 2013

Brazil is among the regions with the largest observed temperature increases

Climate Change

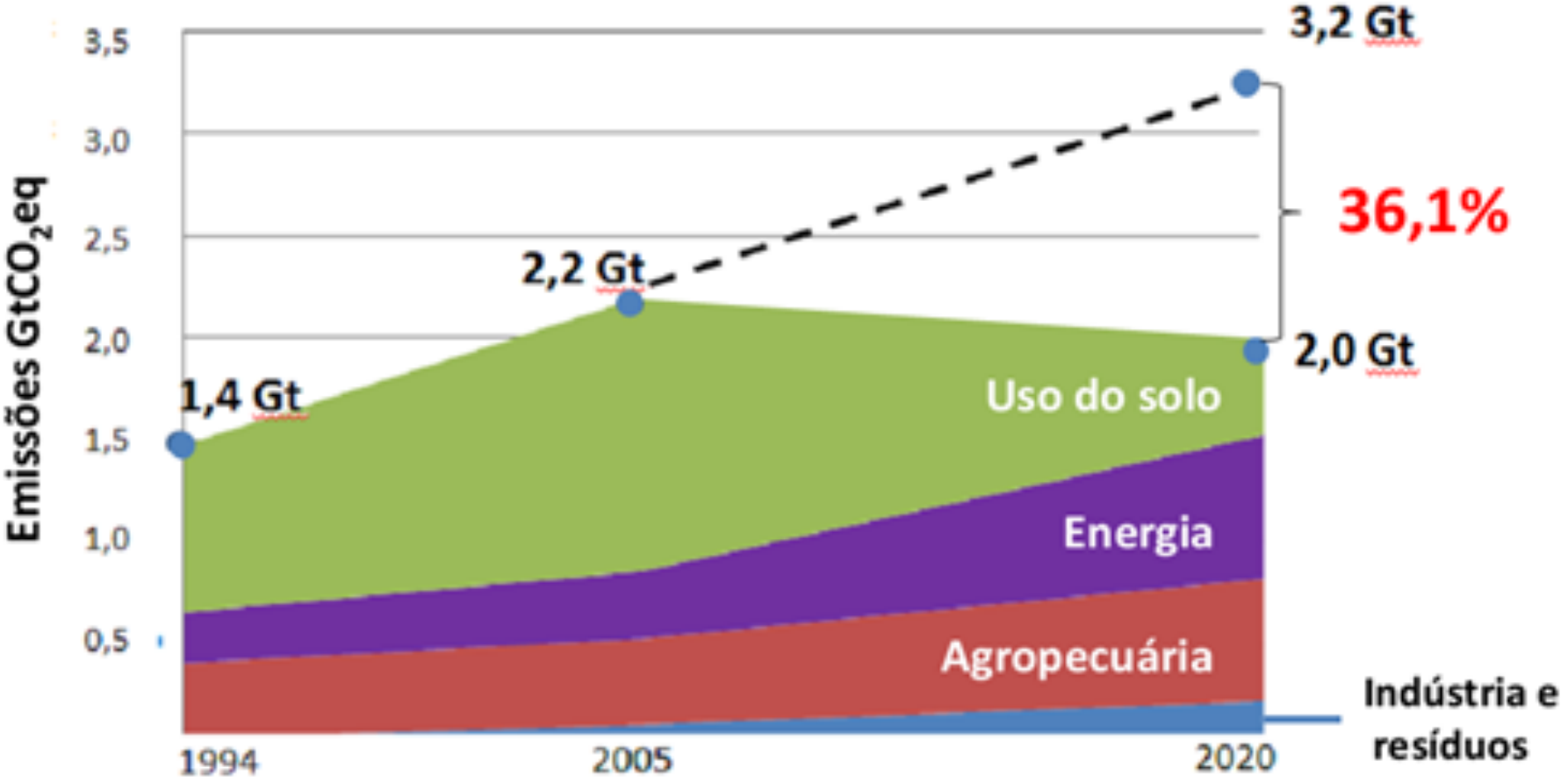


Fonte: IPCC Fifth Assessment Report, 2013

GHG emissions continue to rise because of human activities, especially from intense and growing fossil fuel combustion, followed by deforestation, whose contribution decreases and can be virtually absorbed by terrestrial sink.

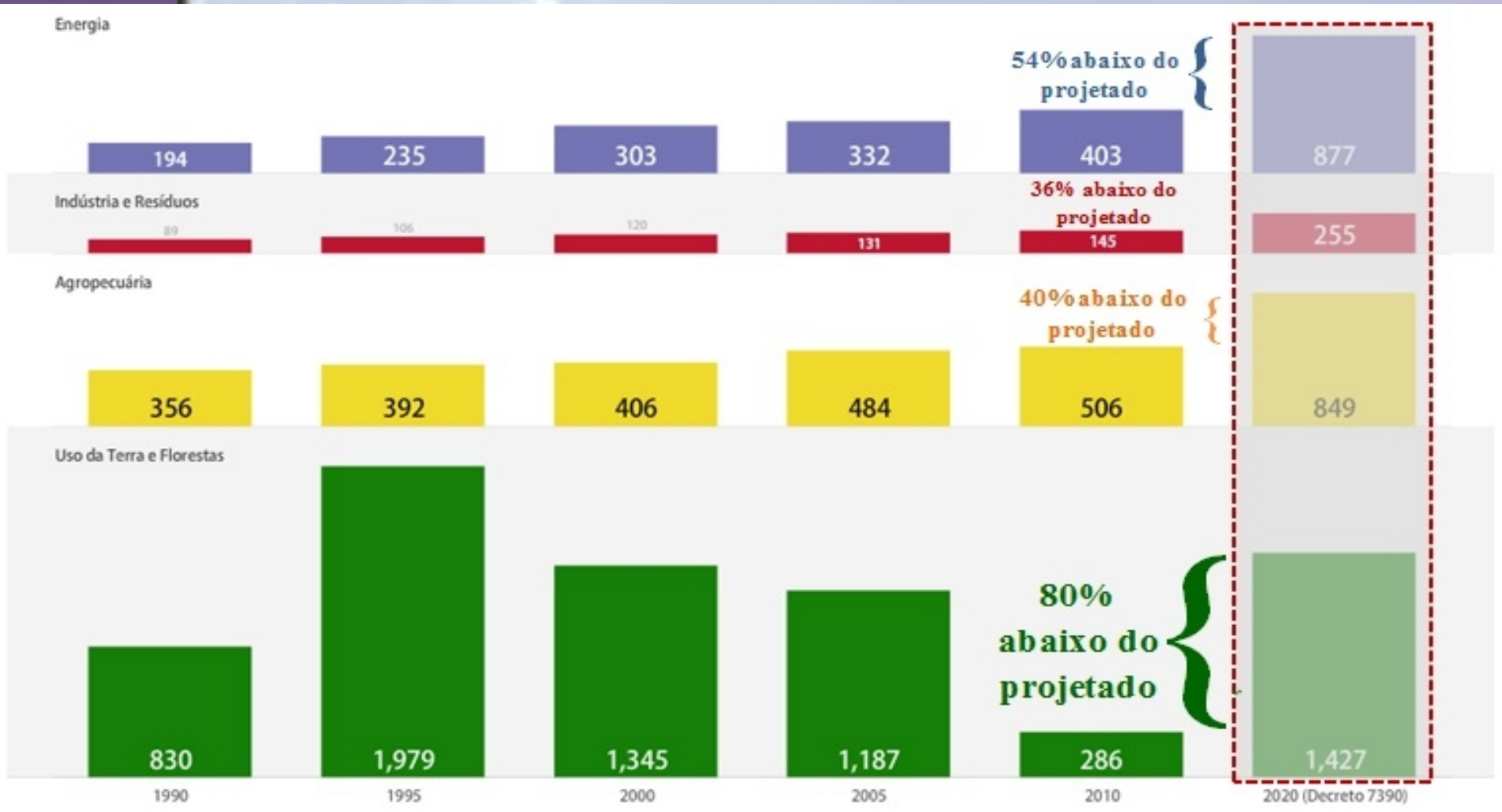
Brazilian Voluntary Commitment

to reduce between 36.1% and 38.9% of its projected GHG emissions by 2020, through National appropriate mitigation actions



Source: Brazilian Ministry of Environment, 2014

Brazilian GHG emissions - 1990-2010



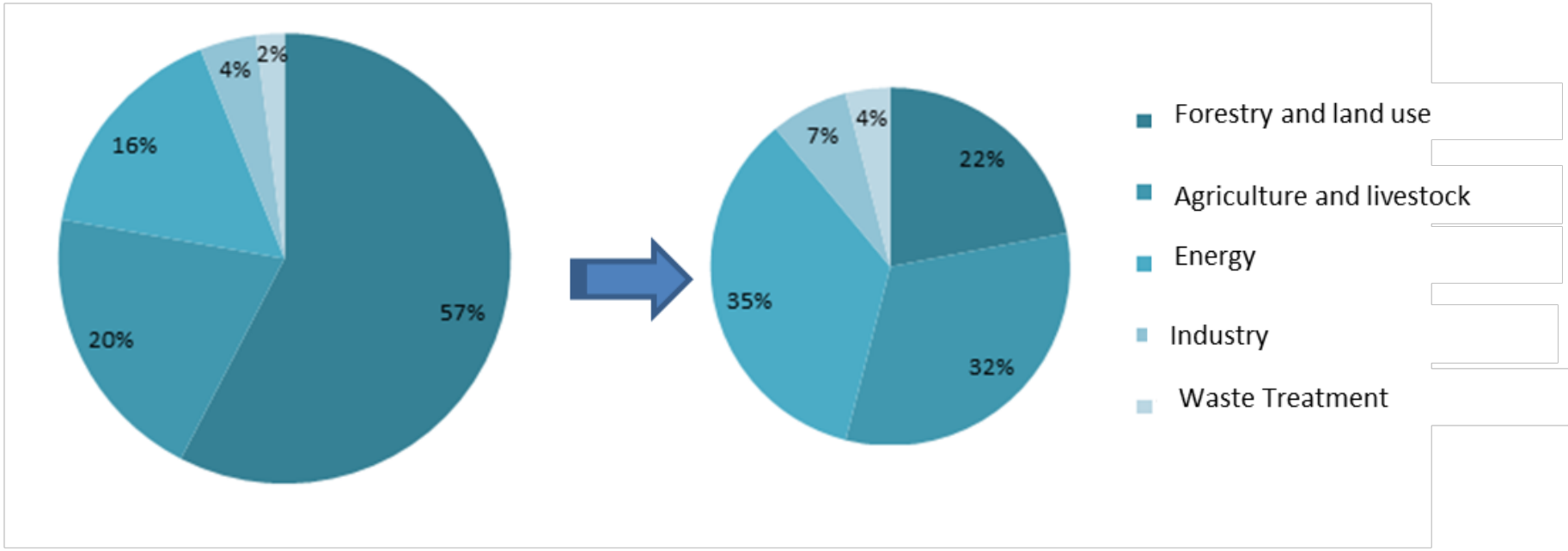
Source: Brazilian Ministry of Environment, 2014

Total emissions in 2010 were 60% below emissions projected for 2020

Brazilian GHG emissions - 2005-2010

2,20 Gt CO_2 eq.
Emissions in 2005

1,25 Gt de CO_2 eq.
Emissions in 2010



Source: MCTi, 2013.

Forestry and land use sector showed a great decrease, but emissions from other sectors have increased, either if they are far below what was projected for 2020.

Brazilian mitigation & adaptation plans

Savannah

Amazon forest

Energy

Health

Agriculture

We emphasize the relevance of a cross-sectional analysis of the Action and Sector Plans to identify their complementarities and synergies. This mainstreaming is a challenge to be faced jointly by the different ministries and institutions involved with the plans.

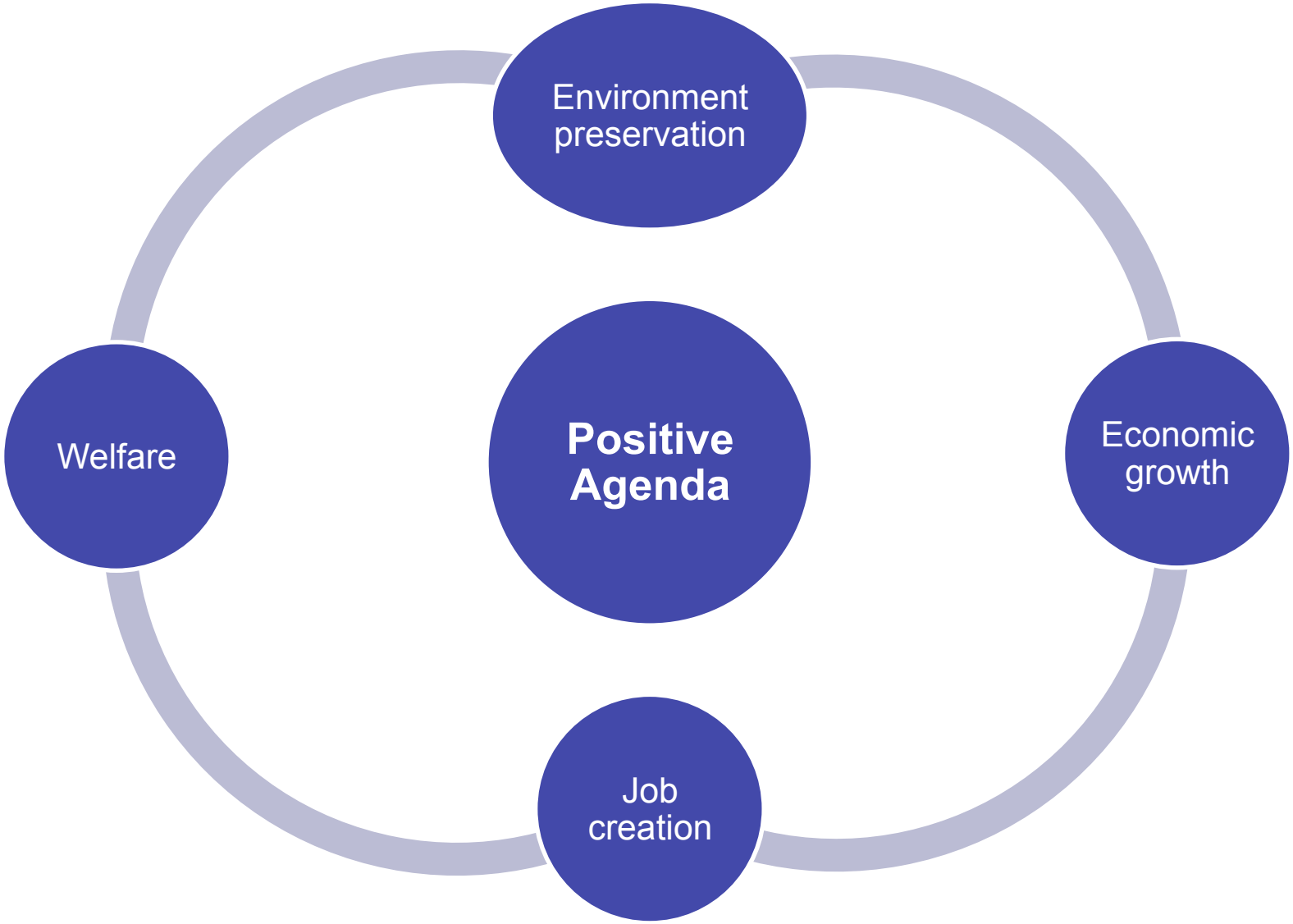
Steel industry

Mining

Transport

Industry

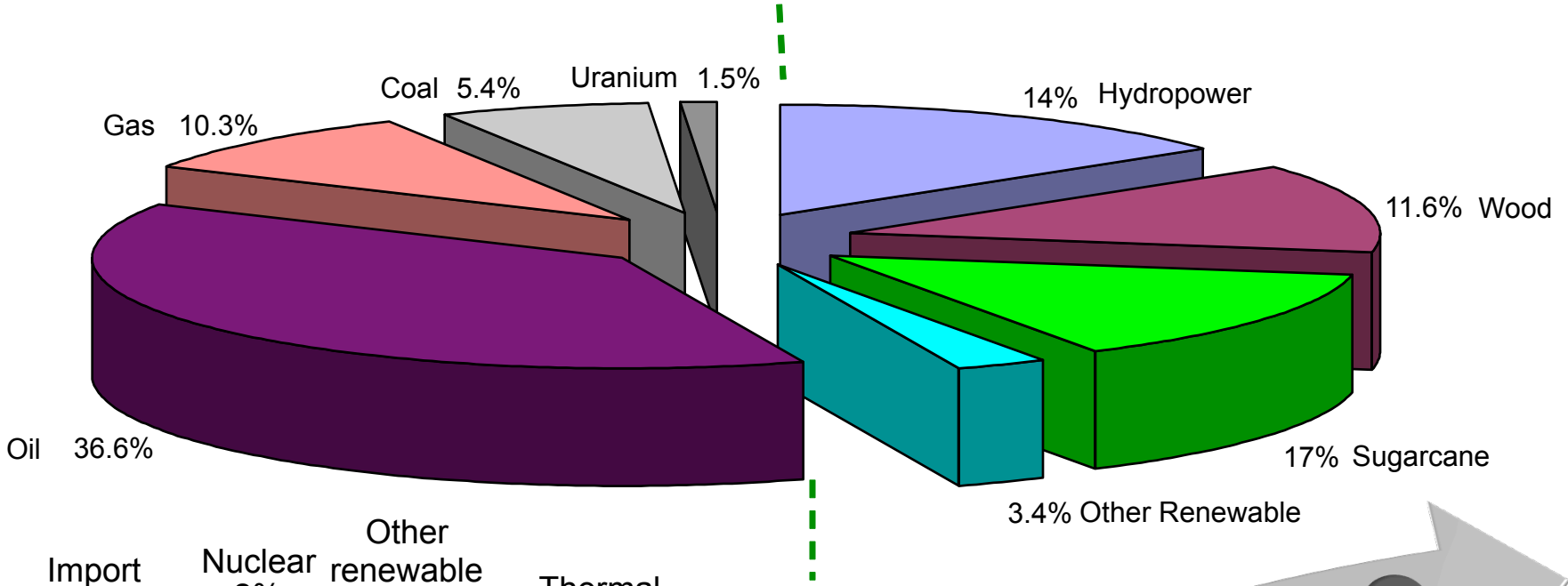
Low carbon transition



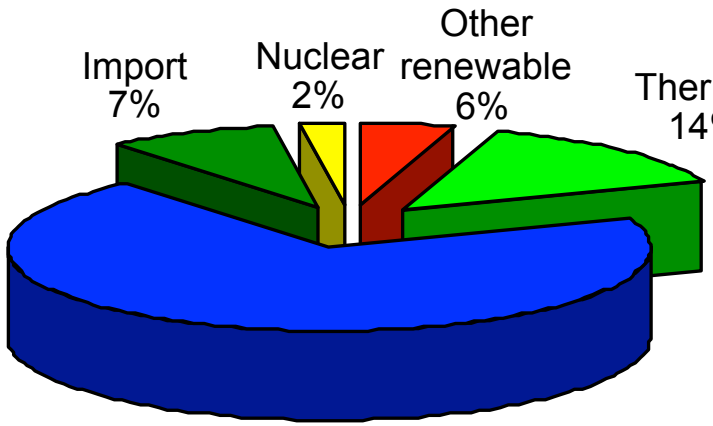
Brazilian energy supply

Non renewables – 54%

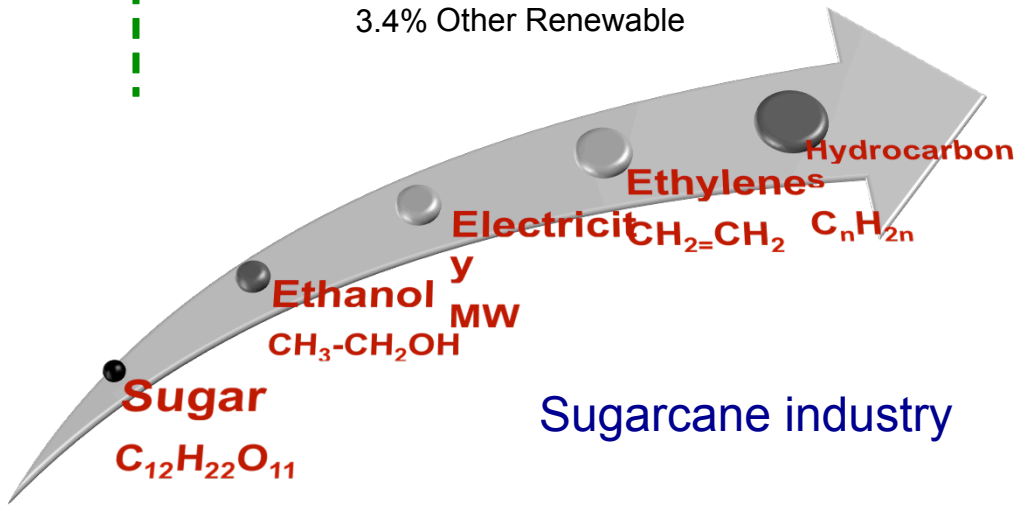
Renewables – 46%



Power supply



Hydro > 30MW = 70%



Sugarcane industry

Liquid biofuels in the World

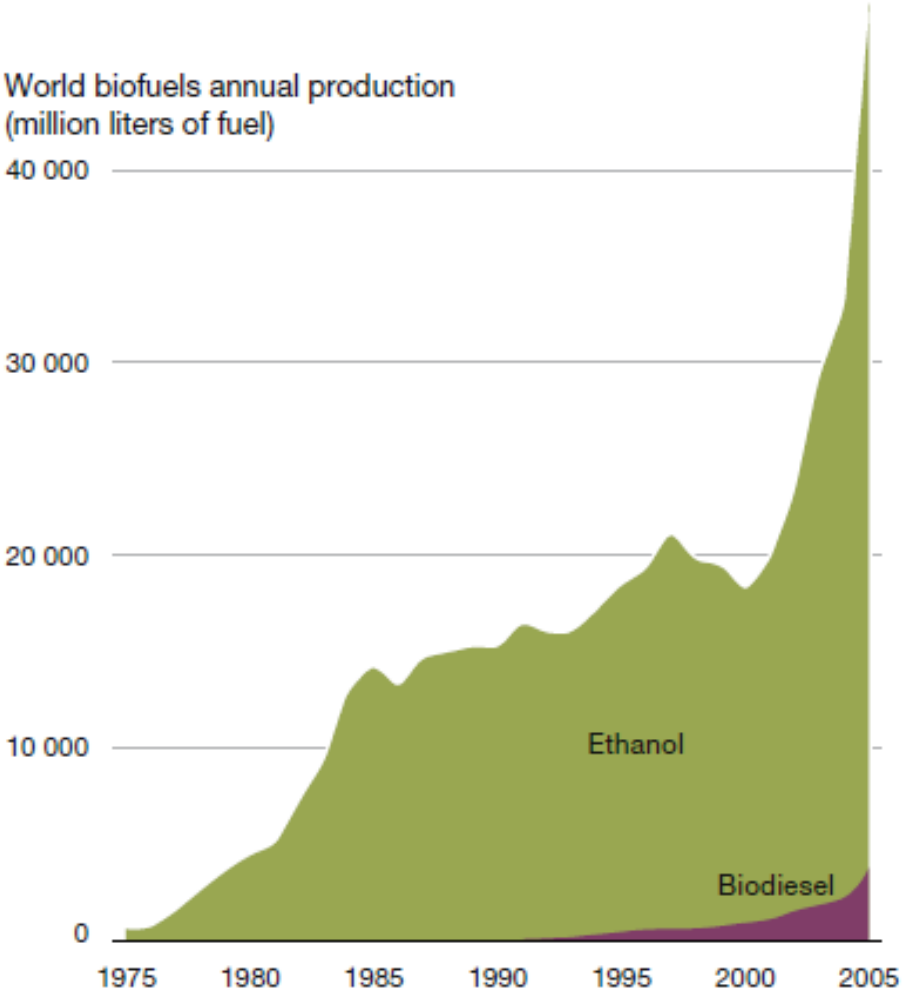


Figure 14: The production of biodiesel and ethanol has increased substantially in recent years. (Source: Earth Policy Institute, 2006).

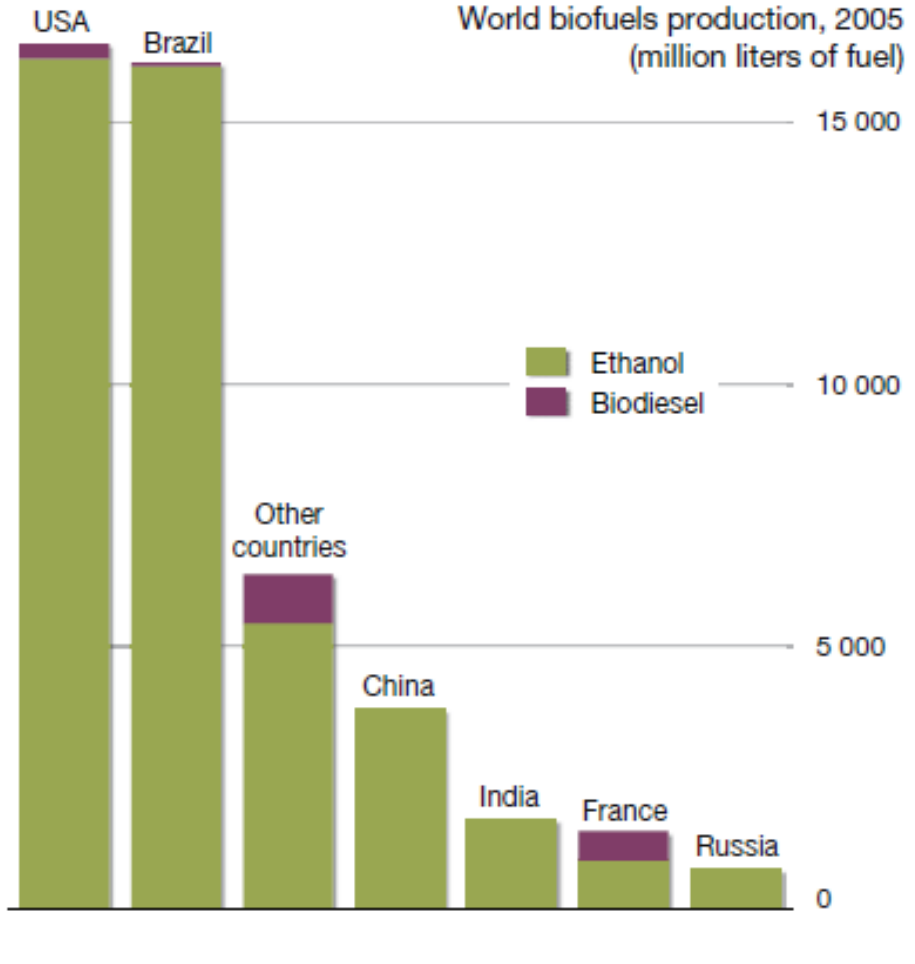
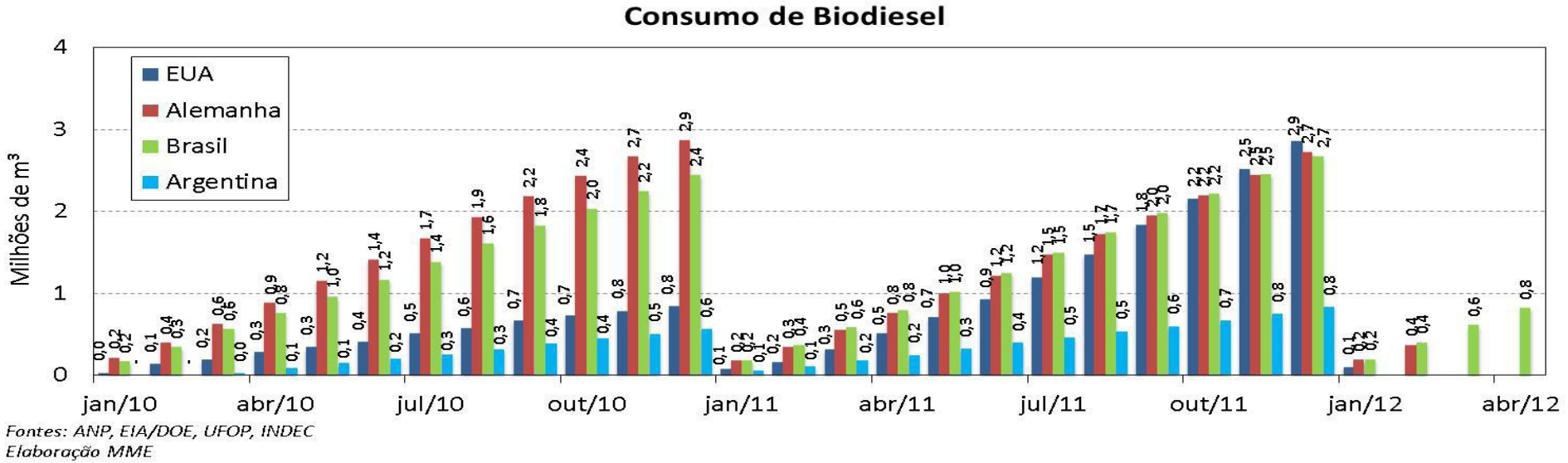
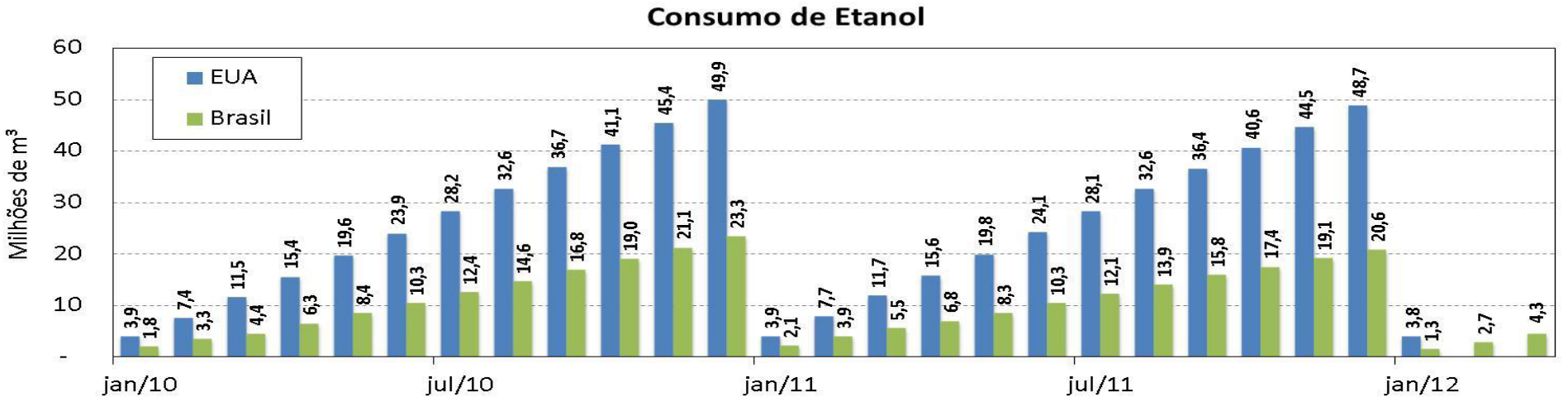


Figure 15: United States and Brazil are among the greatest producers of biofuels today. (Source: Earth Policy Institute, 2006).

Liquid biofuels in the World



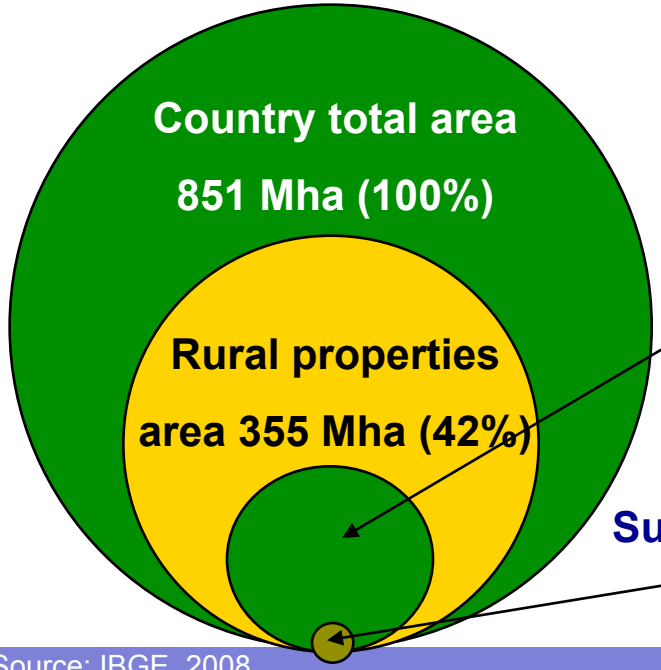
Fontes: ANP, EIA/DOE, UFOP, INDEC
Elaboração MME



Fontes: MAPA, EIA/DOE
Elaboração MME

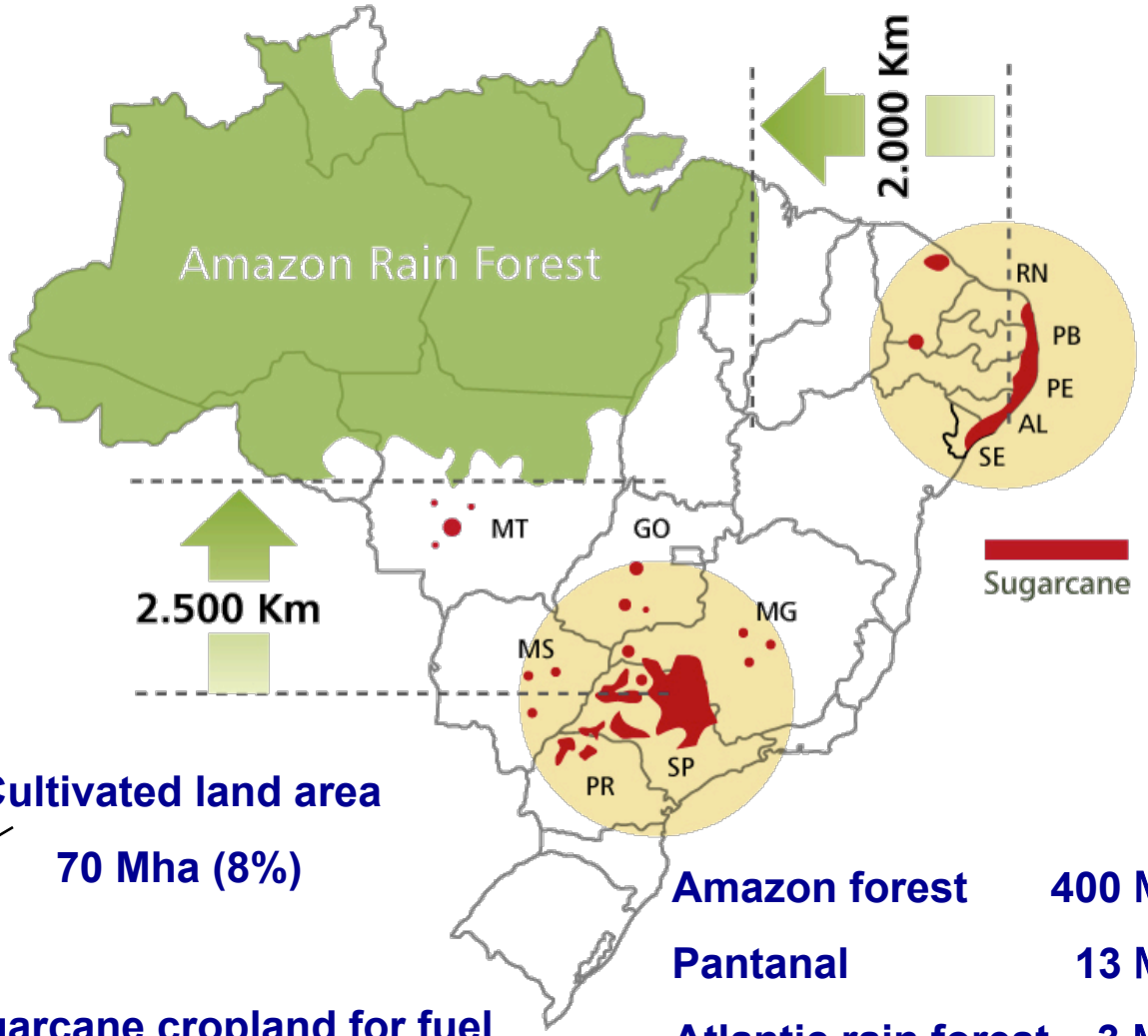
Sugarcane land use in Brazil

Farming (2007)	Area (Mha)
Soya	23
Corn	12
Sugar cane	7
Agriculture	70
Cattle	180



Cultivated land area
70 Mha (8%)

Sugarcane cropland for fuel
3,5 Mha (0.5%)

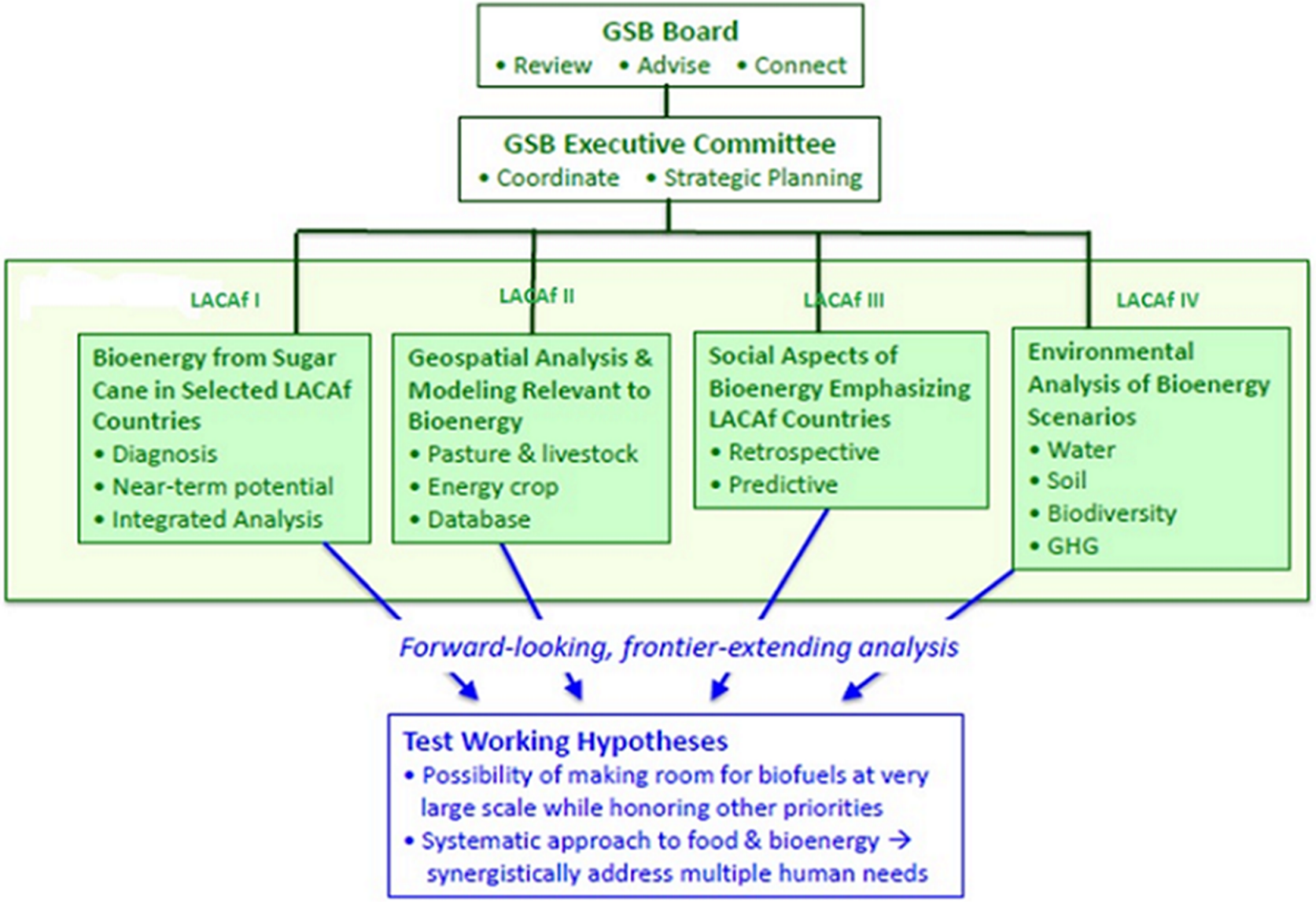


Amazon forest	400 Mha
Pantanal	13 Mha
Atlantic rain forest	3 Mha

Sources: CGEE - NIPE-Unicamp, IBGE and CTC

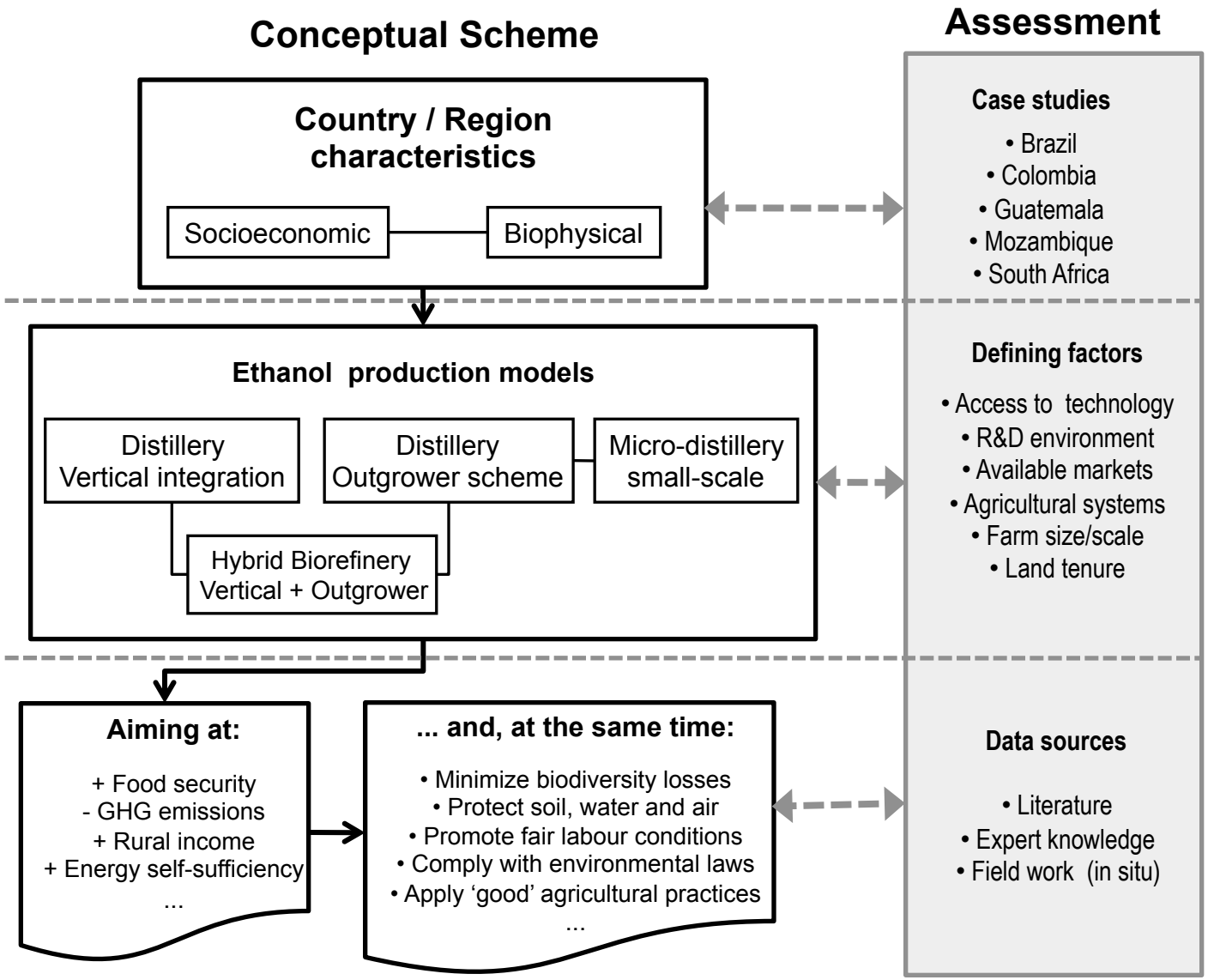
Source: IBGE, 2008

LACAf-Cane study (GSB/Fapesp)



LACAf-Cane study (GSB/Fapesp)

Production model framework



LACAf-Cane study (GSB/Fapesp)

Project Models

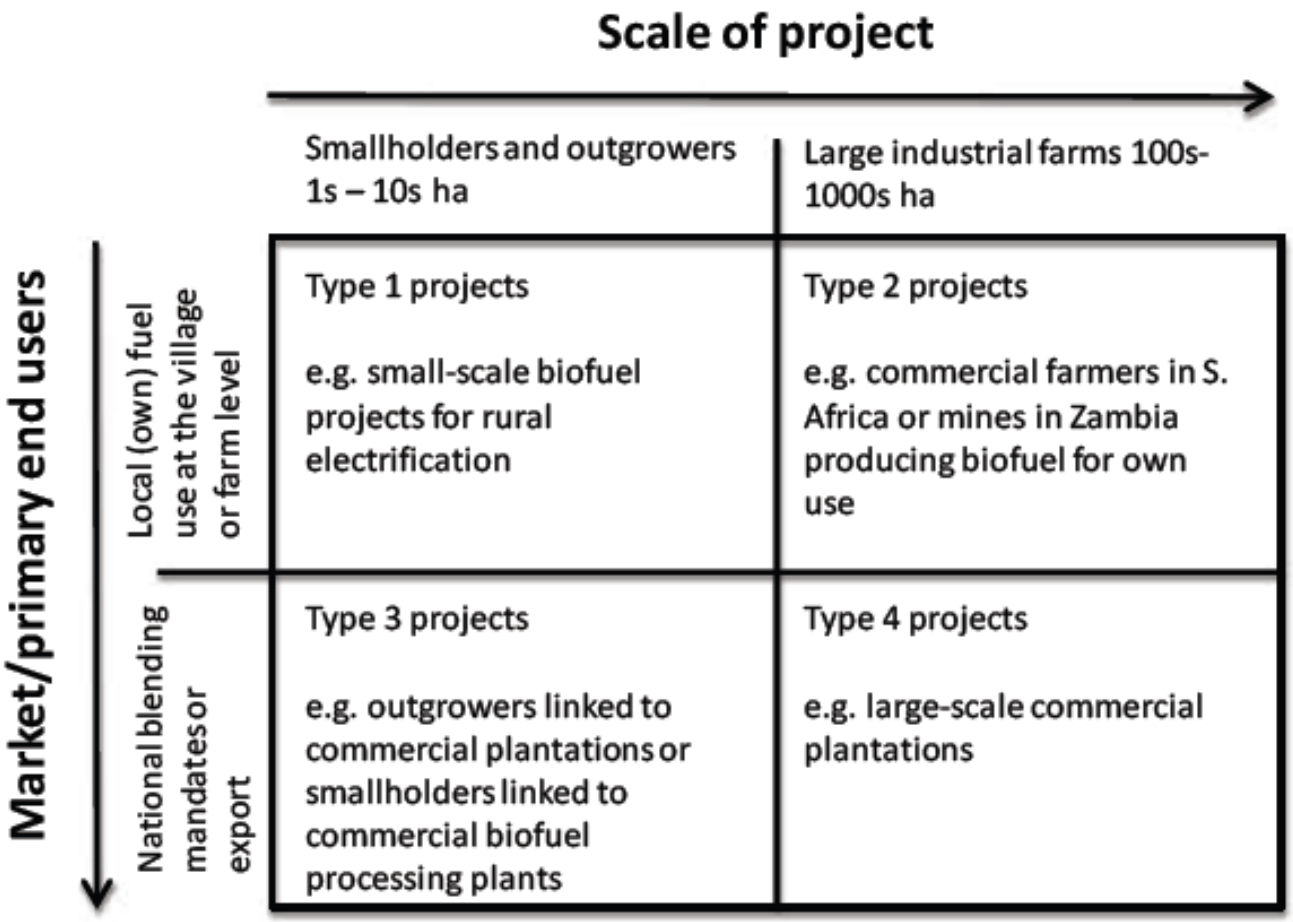
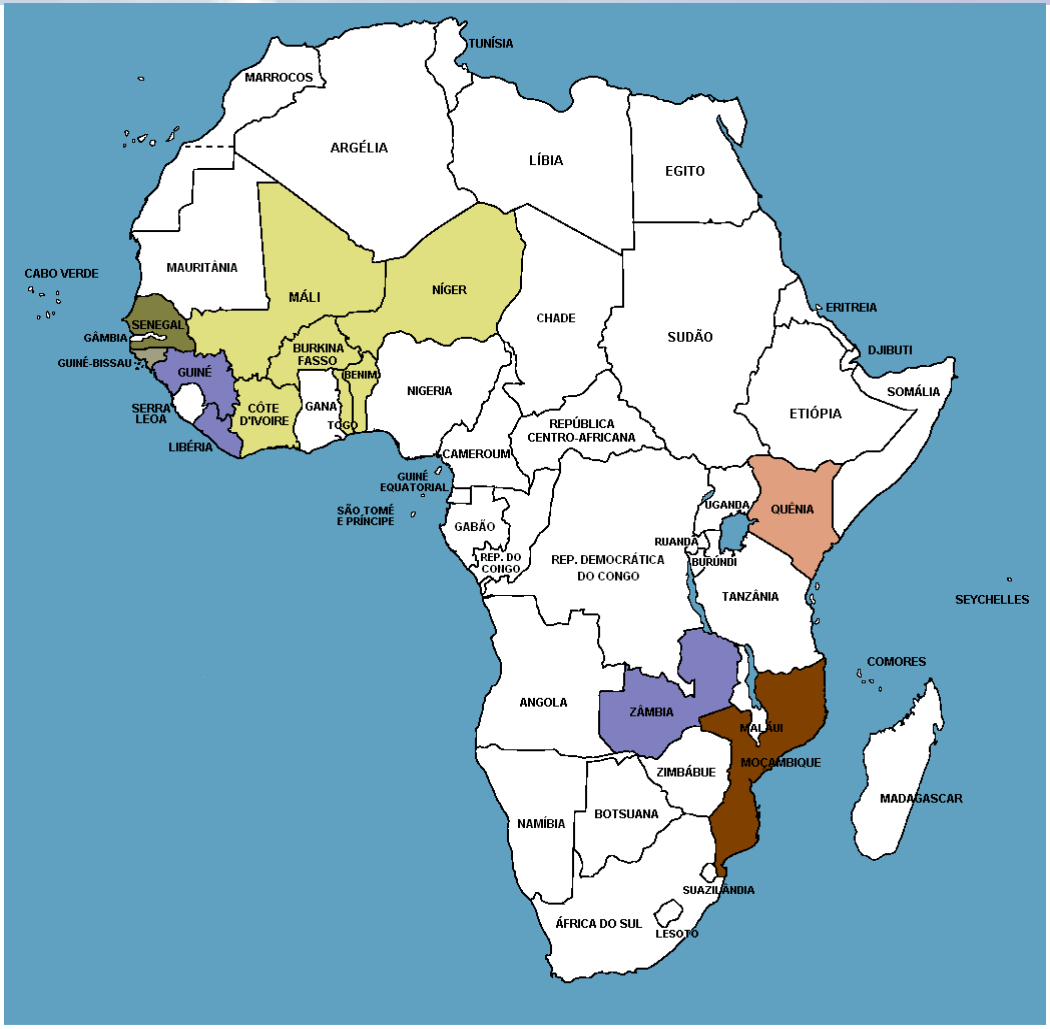


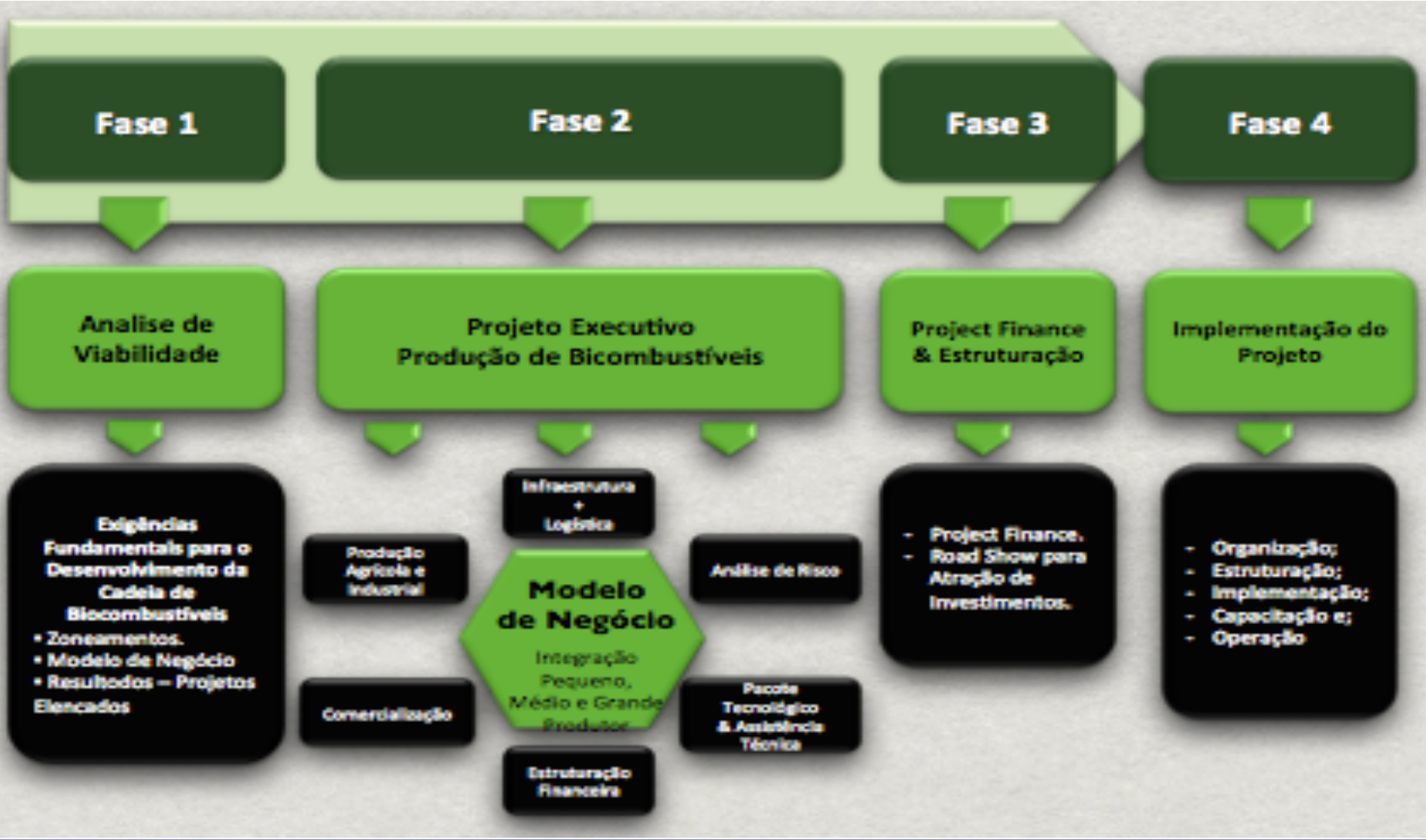
Figure 1: Typology of biofuel projects in Africa
Source: Adapted from (Haywood et al., 2008; von Maltitz et al., 2012).

Feasability biofuels studies in Africa



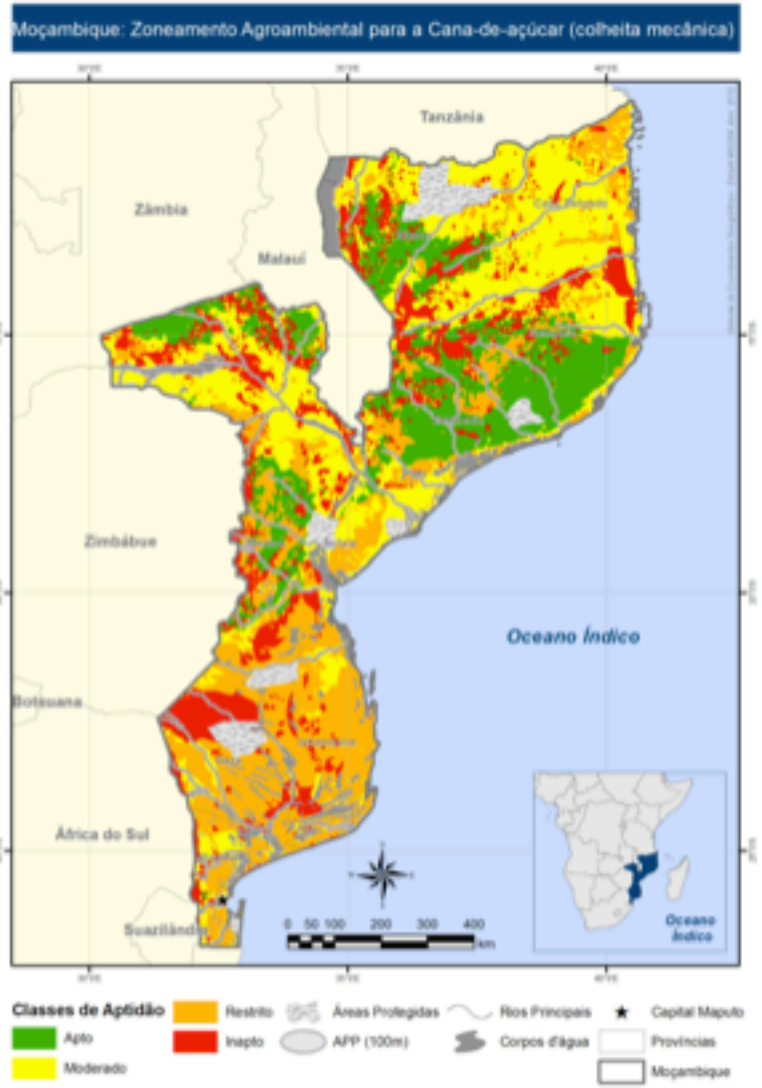
Agro-environmental zoning in Africa (FGV)

Methodology



Agro-environmental zoning in Africa (FGV)

Mozambique – agro-climatic zoning

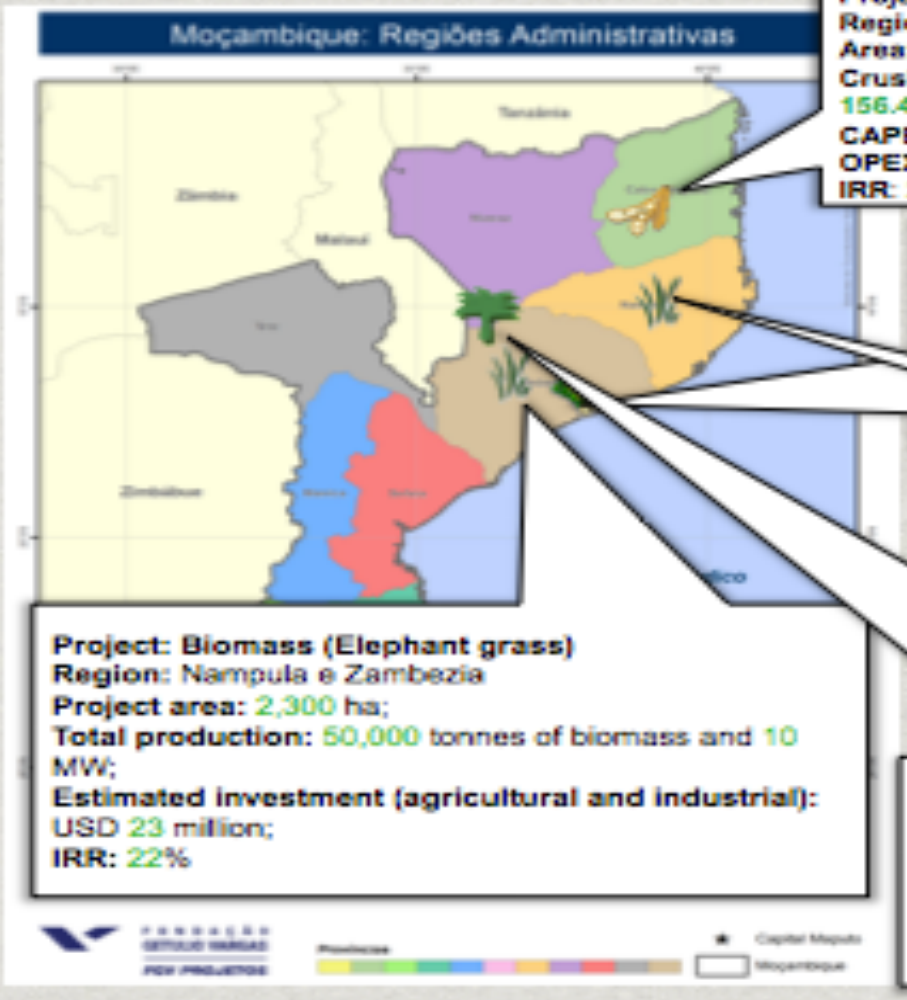


Agro-environmental zoning in Africa (FGV)

Mozambique – results for fourteen crops

Agro-environmental zoning in Africa (FGV)

Mozambique – recommended projects



Project: Soybean
Region: Cabo Delgado.
Area: 66.000 ha;
Crush : 37.620 tons per year of soybean oil;
156.420 tons per year of soybean meal.
CAPEX (agricultural & industrial): USD 120,0 million;
OPEX (agricultural & industrial): USD 41,4 million;
IRR: 28%

Project: Sugarcane (Sugar & Ethanol)
Region: Zambézia.
Area: 22.949 ha;
Process: 2 million tons per year;
CAPEX (agricultural & industrial): USD 471,4 million;
OPEX (agricultural & industrial): USD 27,7 million;
IRR: 22%

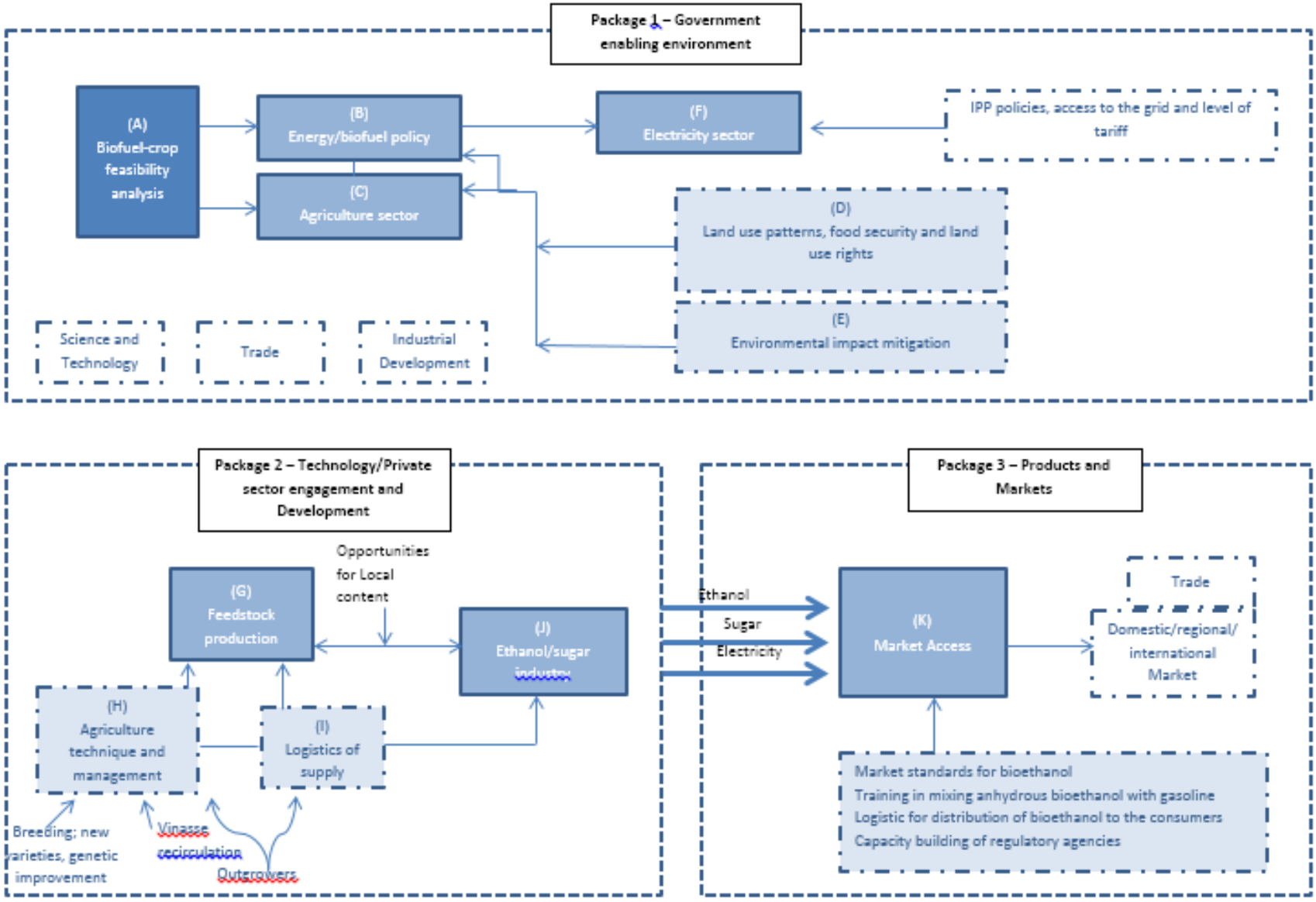
Project: Biomass (Elephant grass)
Region: Nampula e Zambézia.
Area: 1.520 ha;
Production: 36.225 MWh/year;
CAPEX agricultural & industrial): USD 12,3 million;
OPEX (agricultural & industrial): USD 1,1 million;
IRR: 18%

Project: Biomass (Elephant grass)
Region: Nampula e Zambezia
Project area: 2,300 ha;
Total production: 50,000 tonnes of biomass and 10 MW;
Estimated investment (agricultural and industrial): USD 23 million;
IRR: 22%

Project: Biodiesel (Palm)
Region: Lugela, Milange ou Namarroi;
Area: 12.000 ha;
Production: 72.000 tons palm oil per year (top);
CAPEX (agricultural & industrial): USD 74,9 million;
OPEX (agricultural & industrial): USD 19,8 million;
IRR: 25%

Opportunities for tech-transfer study (Irena)

Framework



Opportunities for tech-transfer study (Irena)

Drivers for TT

Government enabling environment	
a) Empowerment of Institutional Capacity	- Different feedstock options and their competitiveness - The current opportunity of sugarcane bioethanol in the region - Technical solution adopted in the agricultural and industrial phase of bioethanol/sugar production for reducing environment impacts - Competitiveness of bioethanol production for domestic and export market (regional, international) - Incentives to promote the bioethanol production (e.g. tax exempt, blending mandates), - The land footprint for bioethanol production to meet: (1) domestic market; (2) International market, and the land potential for expansion at the country level. - Planning tools as agro-ecological zoning, mapping and zoning to address item f - Environmental planning - Water managements issues and potential at the local level - Policies and regulatory framework applicable to promote bioethanol industry - Viable possibilities for Local content and possible policies to increase local skill and employment and enhance the benefits for local people - The needs of education, training and capacity building of farms, local entrepreneur, petrol companies, financial institution and the wide range of stakeholders involved in bioethanol sector - Policies to include bagasse co-generation into IPP projects, access to the grid and level of tariff

Opportunities for tech-transfer study (Irena)

Drivers for TT

Technology/private sector engagement and development	
b) Increase awareness, absorptive capacity and general capabilities of farms and outgrowers, local private sector, existing sugarcane mills	- Technologies and best management in the agricultural side and logistic considering African conditions - Opportunity for Inclusion of small holders / outgrowers in the feedstock supply chain and contracting schemes - Improvement of logistic of sugarcane, including rationalization of transport and clustering of outgrowers - Contracts/schemes for the supply of feedstock between outgrowers and mills / security of feedstock - Credit access and finance mechanisms for bioethanol; finance availability to small farmers and industry in general - Opportunities for SME's across the entire supply chain - Integration of new distilleries with the traditional sugar mills - Evaluate competitiveness and markets for bioethanol from sugarcane in Africa context - Better practices and technologies for the industrial process
c) Support research: breeding, genetics, physiology and biotechnology /collaborative research	- Improving varieties of sugarcane – multipurpose varieties for bioethanol, sugar and electricity - Improving soil condition
d) Increase capacity	- Finance sector to understand feedstock procurement risk and mechanisms for risk mitigation - Capacity building and training of human resources for enginnering, business model, project design, installation, system integration, operation and maintenance. -

Opportunities for tech-transfer study (Irena)

Drivers for TT

Products and market	
e) Institutional support	- Support the creation of regulatory body for monitoring bioethanol/fuel market, and quality and standards of the bioethanol - Support in identifying the best operational model of blending anhydrous bioethanol with gasoline and for distribution - Mechanisms for price parity between hydrous bioethanol and gasoline (if hydrous bioethanol is a focus)
g) Capacity building	- monitoring quality and standards of bioethanol to the final consumers (national or international) - blending bioethanol anhydrous with gasoline - Logistic of distribution of bioethanol to final consumers

Low-carbon energy technology transfer study (CGEE)

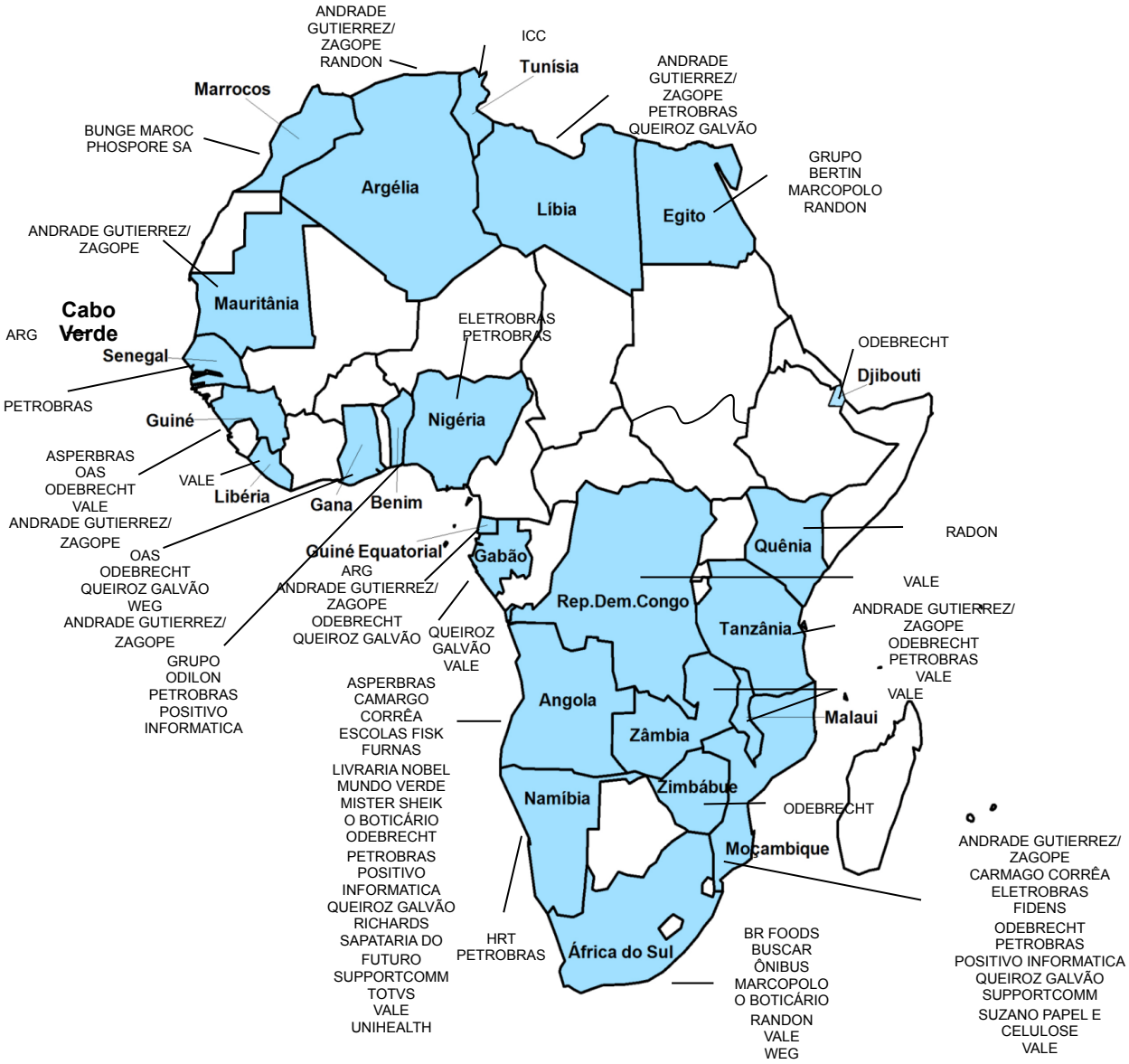
	Technology transfer from Brazil		Technology transfer to Brazil	
	SOUTH-SOUTH	SOUTH-NORTH	SOUTH-SOUTH	NORTH-SOUTH
Fuel and heat				
Natural Gas				
GNL (liquefação e regasificação)	No	No	No	Yes
GTL (gas-to-liquid)	No	No	Yes	Yes
Coal				
CTL (Coal-to-liquid)	No	No	Yes	Yes
Ethanol				
First generation (sugarcane)	Yes	Yes	No	No
Second generation (sugarcane)	Yes	Yes	No	Yes
Solar	Yes	No	Yes	Yes
Charcoal	Yes	Yes	No	Yes
Biodiesel	Yes	No	No	Yes
Crosscutting technologies				
CCS	Yes Δ	No	No	Yes
Smart Grid	Yes Δ	No	No	Yes
Storage (bateries)	Yes Δ	No	No	Yes
Social technologies				
Clean fuel for cooking - LPG, wood, ethanol	Yes	No	Yes	Yes
Rural electr. & energy effic. for low-income families	Yes	No	Yes	Yes
Solar (low temperature) for low-income families	Yes	No	Yes	Yes

Electricity generation technologies	Technology transfer from Brazil		Technology transfer to Brazil	
	SOUTH-SOUTH	SOUTH-NORTH	SOUTH-SOUTH	NORTH-SOUTH
Natural gas				
Turbines	No	No	No	Yes
Micro Turbines	No	No	No	Yes
Coal				
Pulverized (Critical, Supercritical,Ultra-Supercritical	No	No	Yes	Yes
Gasification (IGCC)	No	No	No	Yes
Circulating Fluidized Bed	No	No	Yes	Yes
Nuclear fission (gen III+ and IV)				
Fuel production	Yes	Yes	No	Yes
Reactors	No	No	No	Yes
Solar				
Photovoltaic (Si)	No	No	Yes	Yes
Concentrating solar power	No	No	No	Yes
Wind	Yes	No	No	Yes
Biomass				
Biomass integrated gasification combined cycle	Yes Δ	No	No	Yes
Advanced biomass cogeneration systems	Yes	Yes	No	Yes
Hydro				
Small-scale	Yes	No	No	Yes
Medium and large-scales	Yes	No	No	Yes
Hidrogen				
Fuel cells	Yes	Yes	Yes	Yes
Production and storage	Yes	Yes	Yes	Yes

Brazilian encouragement programs for Africa

- **Pro-Renova** – renewables development – Ministry of Foreign Affairs
- **Pro-Africa** – R&D cooperation – Ministry of Science, Technology and Innovation
- **Pro-Savannah** – research Improvement and transfer of technology to develop agriculture in the Nacala corridor – Embrapa
- **Platform** – technical cooperation to support the agrarian innovation – Embrapa
- **Cotton 4** – Development of the Cotton Sector in Benin, Burkina Faso, Chad and Mali – Brazilian Cooperation Agency (ABC) with UNDP, Embrapa
- **Special found** – investments – BNDES&AfDB
- **Trilateral agreements** – biofuels development – with USA, EU, UEMOA

Brazilian companies in Africa



Low-carbon transitions for African development

Bioenergy to promote the transition from
poverty, improper health, environmental degradation to
more food, better health and stronger local economy

THANK YOU!

Marcelo Poppe

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