

WOOD ENERGY: CHARCOAL IN BRAZIL

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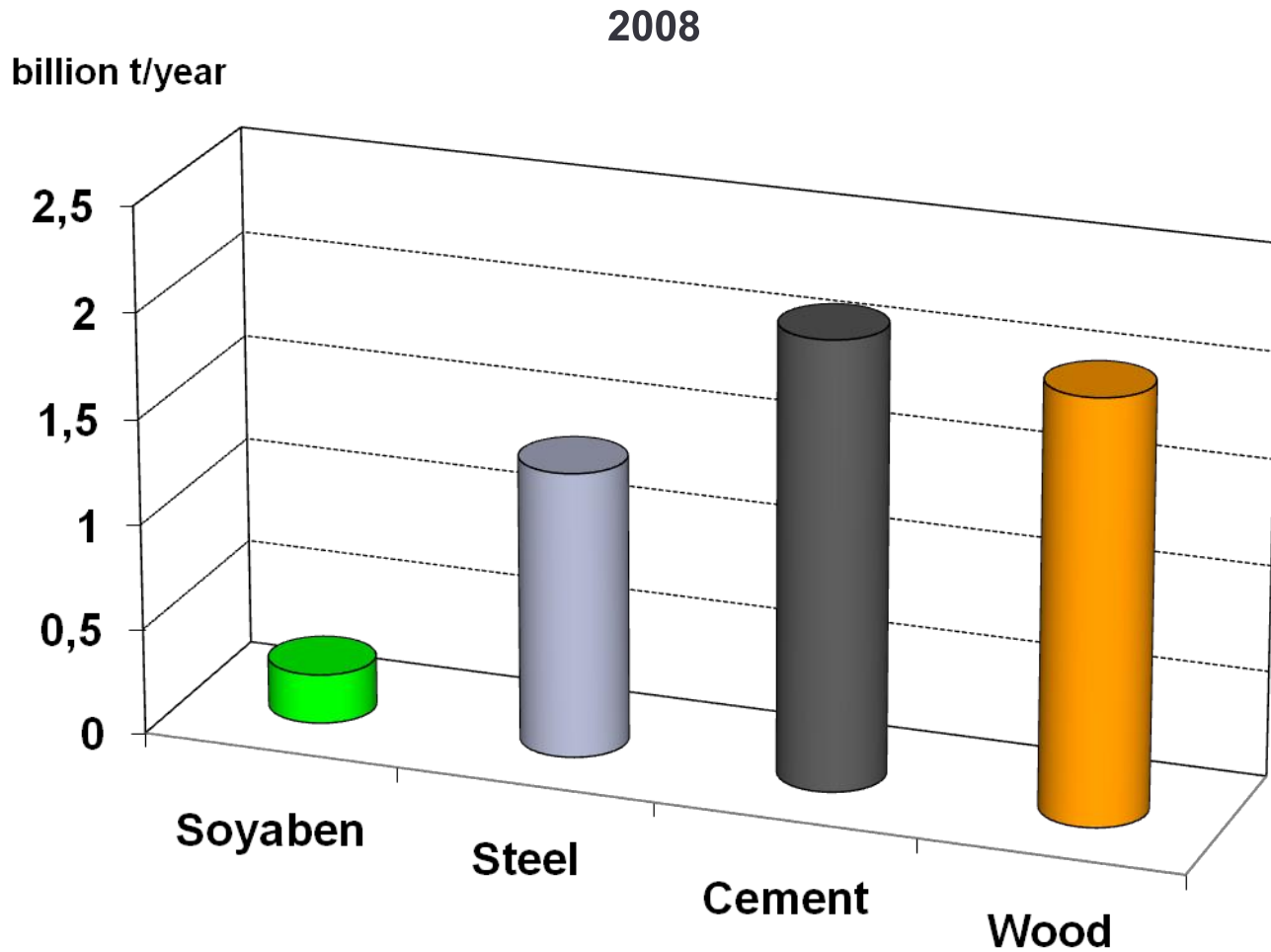
South – South knowledge exchange on planted forests in Brazil, with Ethiopia and Mozambique

Meeting with visitors

February 25, 2015

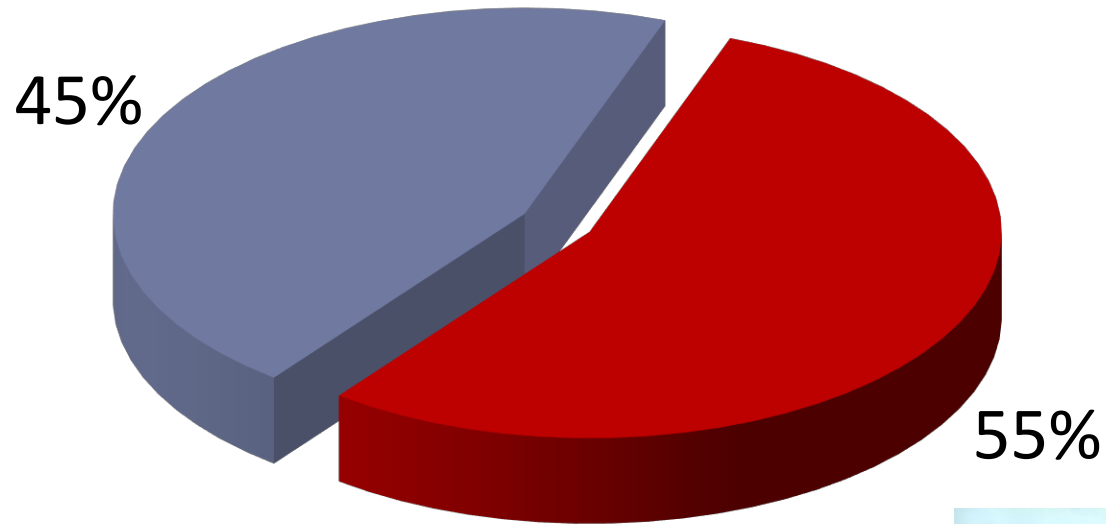
Piracicaba, SP, Brazil

COMPARING THE GLOBAL CONSUMPTION OF WOOD



WHERE WOOD IS USED IN THE WORLD ?

2010



■ Energy ■ Other

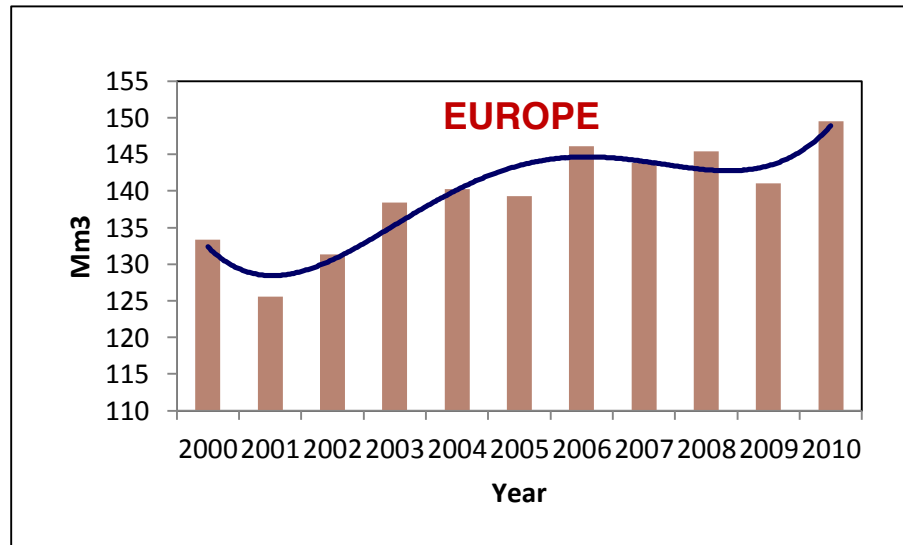
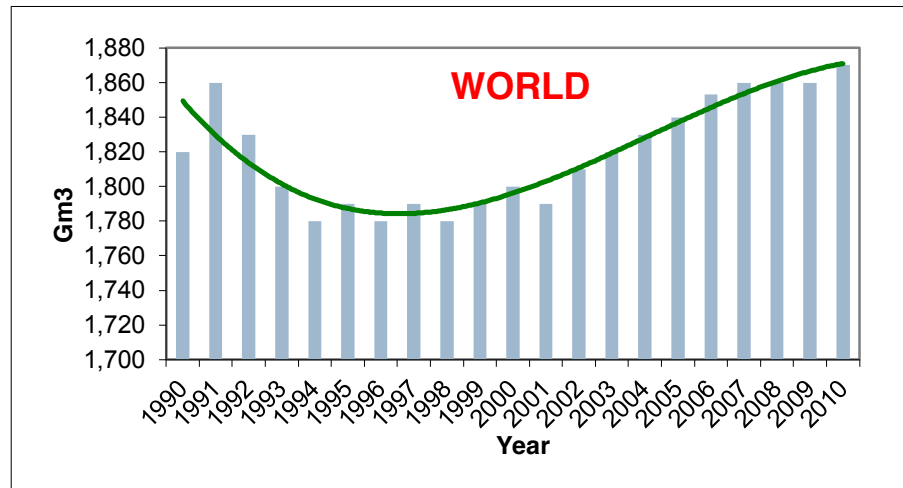
~ 1,7 Gt



FAO, 2012



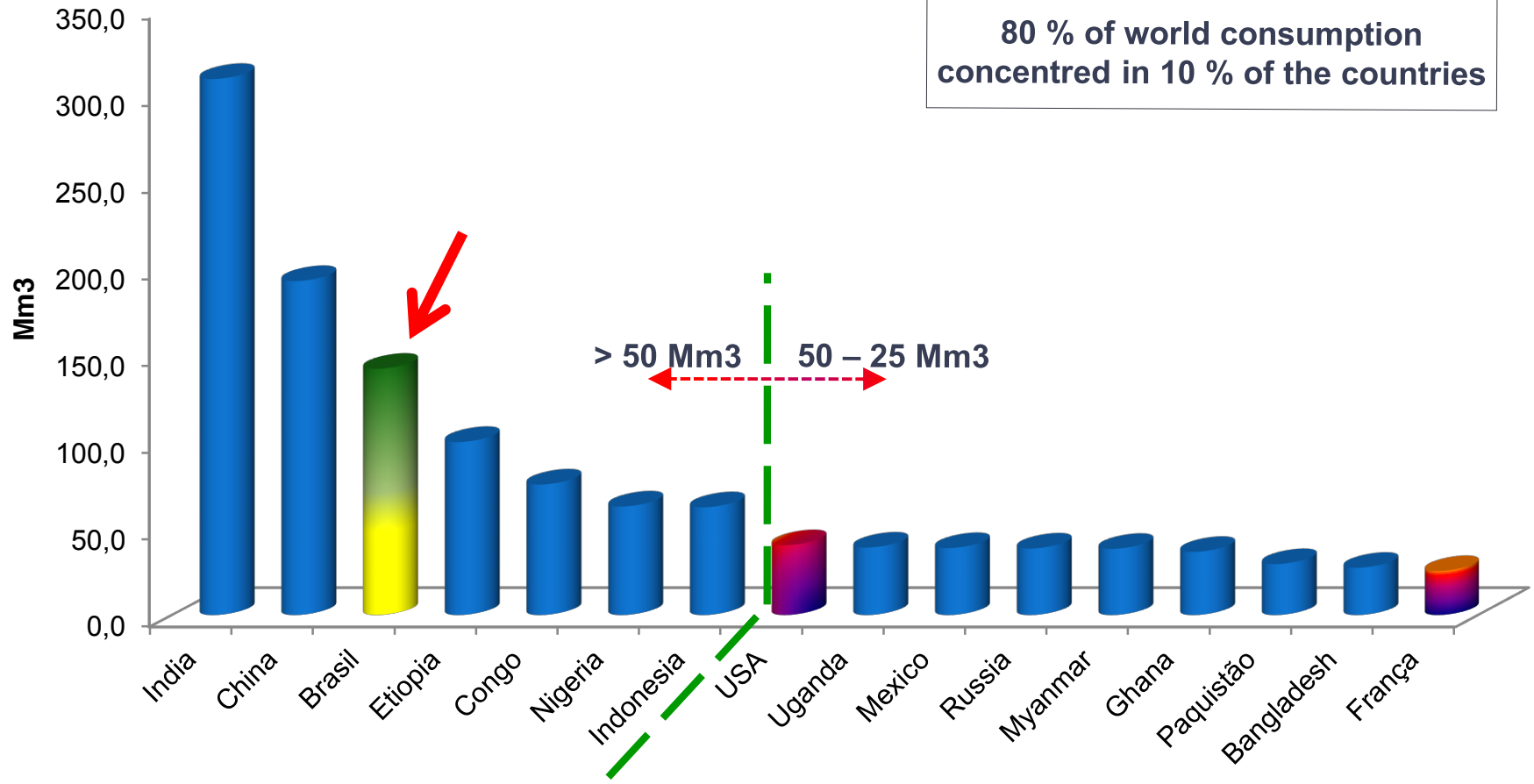
EVOLUTION OF THE CONSUMPTION OF WOOD FOR ENERGY



MAIN COUNTRIES USING WOOD FOR ENERGY

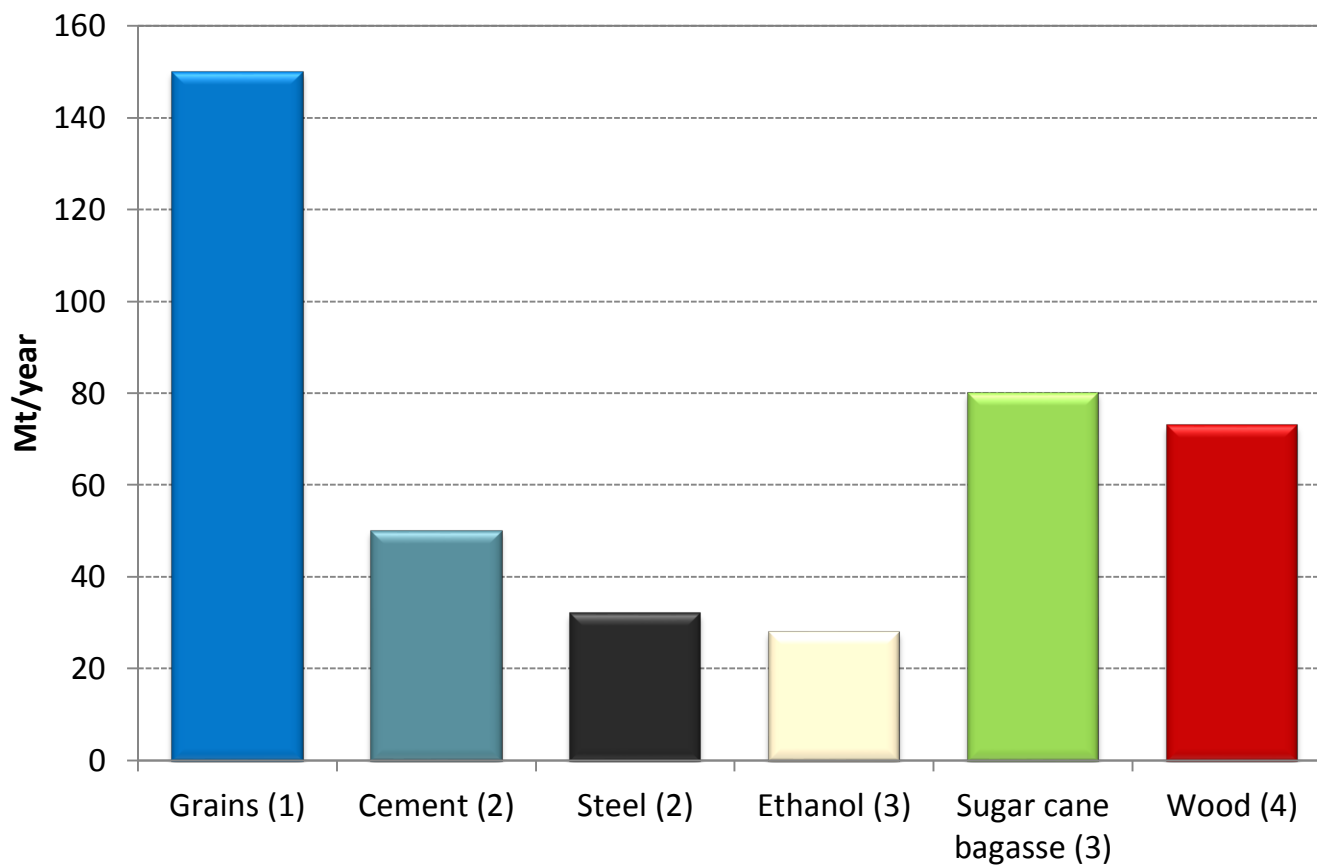
2009

80 % of world consumption
concentrated in 10 % of the countries

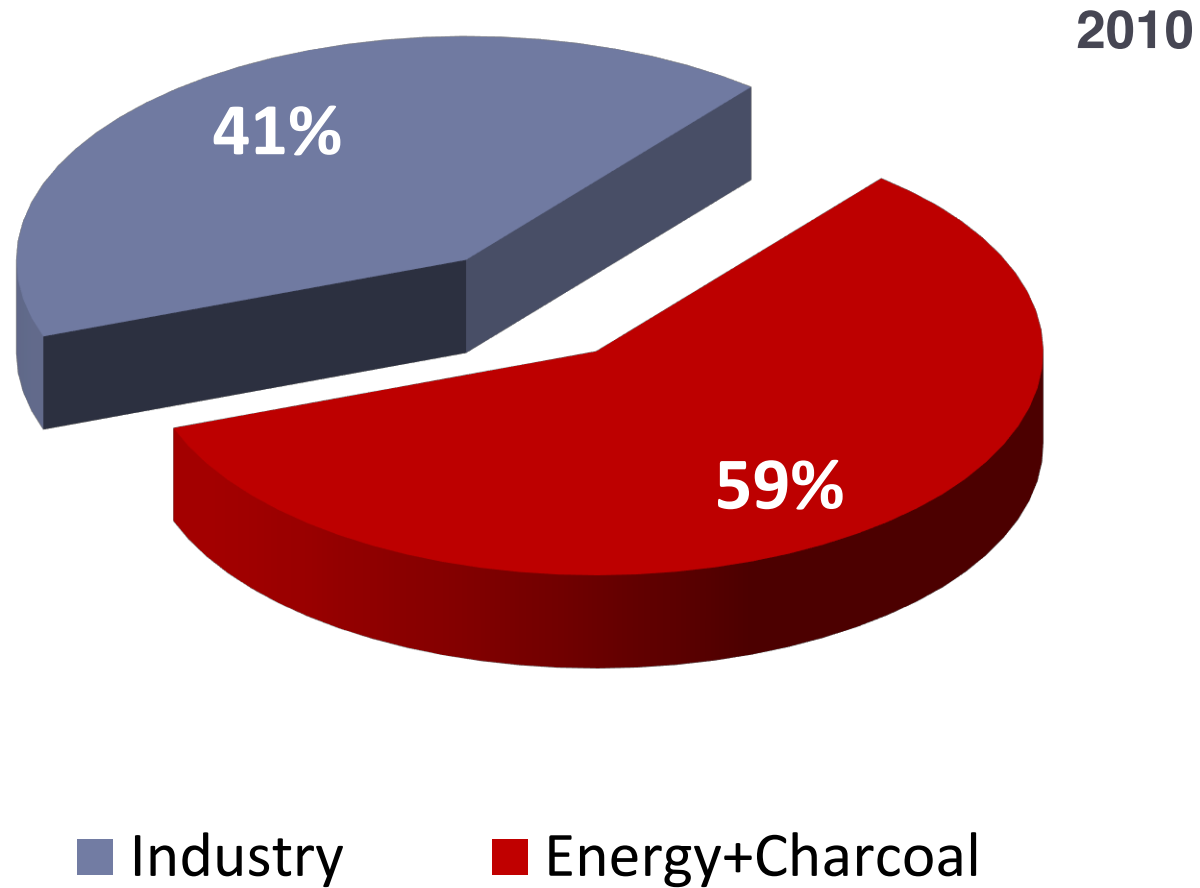


COMPARING THE CONSUMPTION OF WOOD - BRAZIL

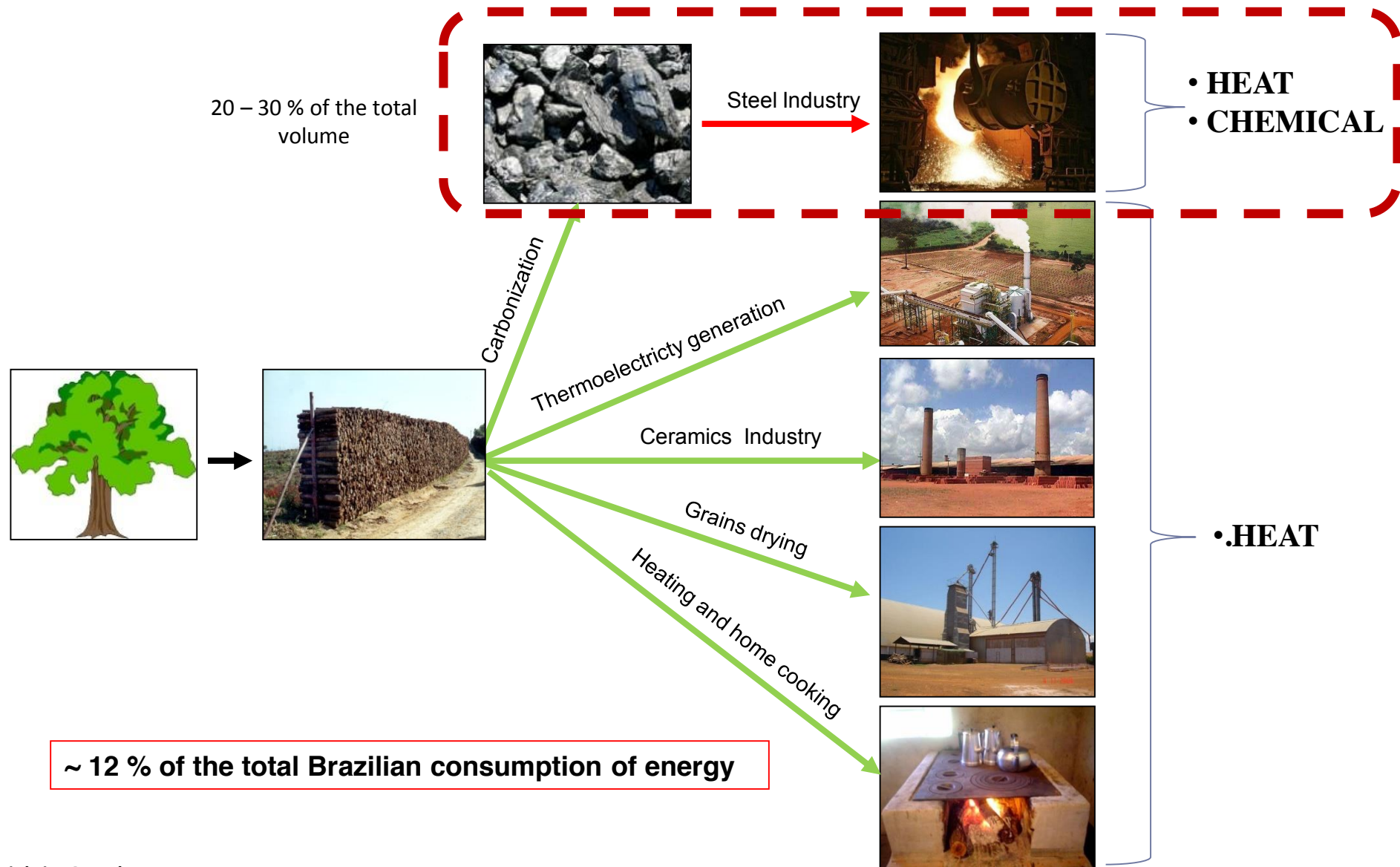
2010-2011



WHERE WOOD IS USED IN BRAZIL ?



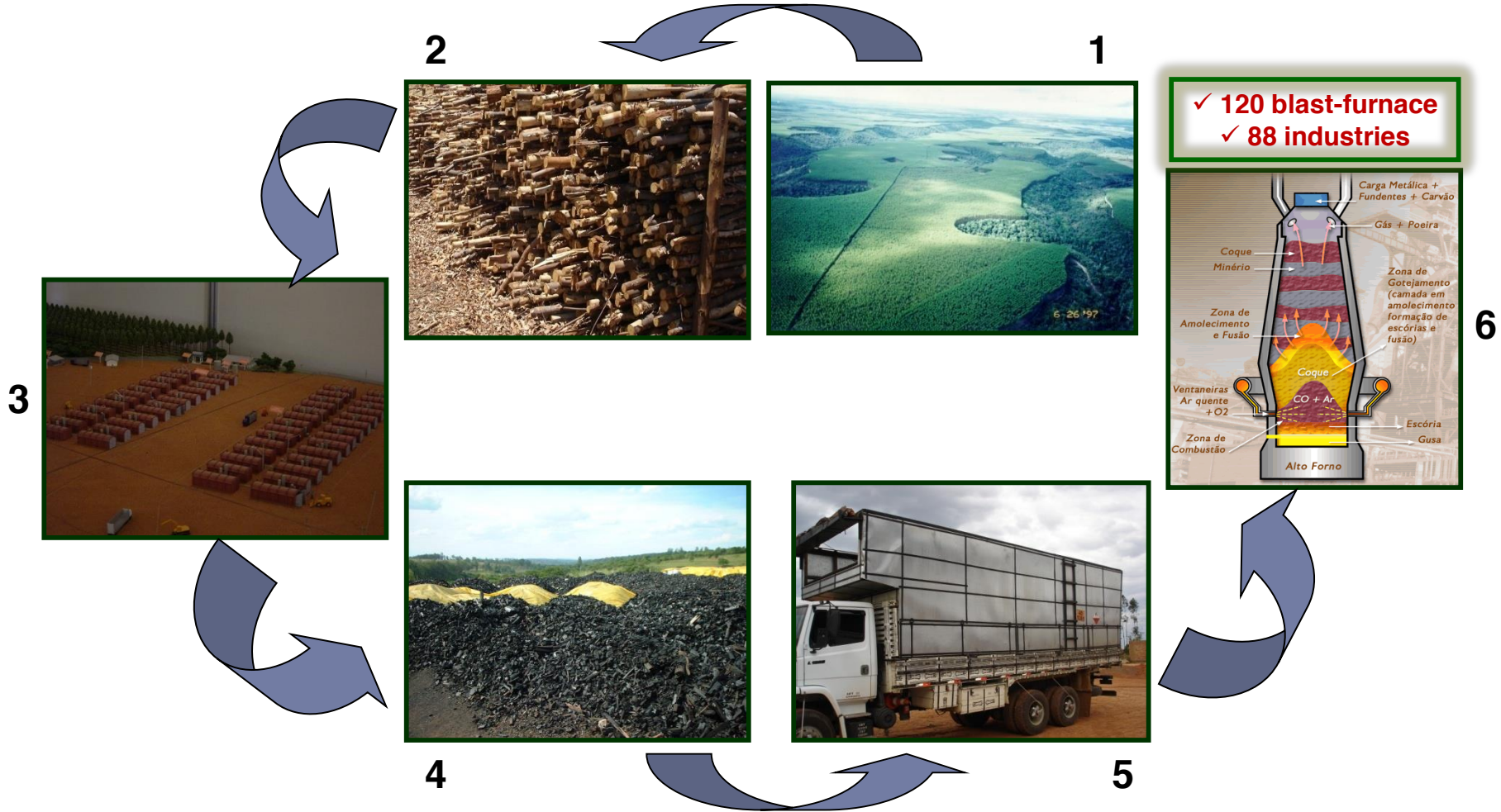
THE FLOW OF USE OF WOOD FOR ENERGY IN BRAZIL



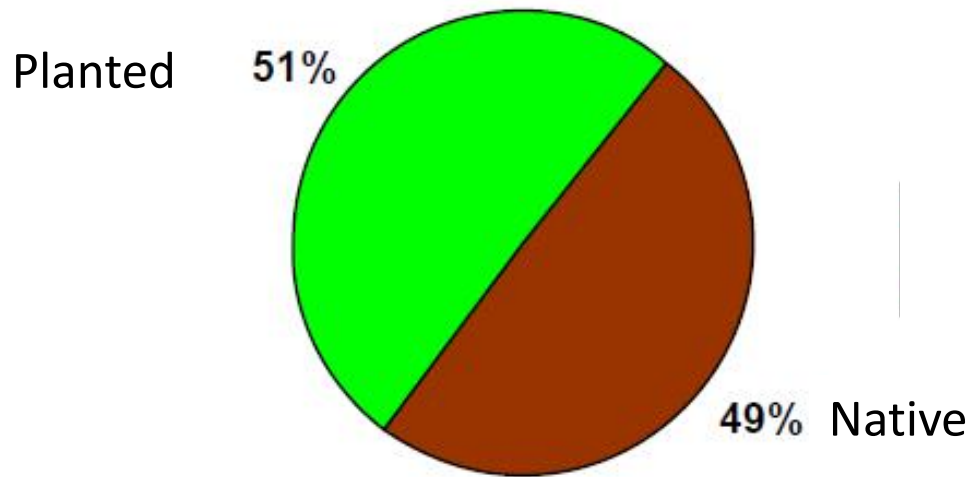
CHARCOAL IN BRAZIL

Thermal-reducer in the siderurgical process – Pig iron production

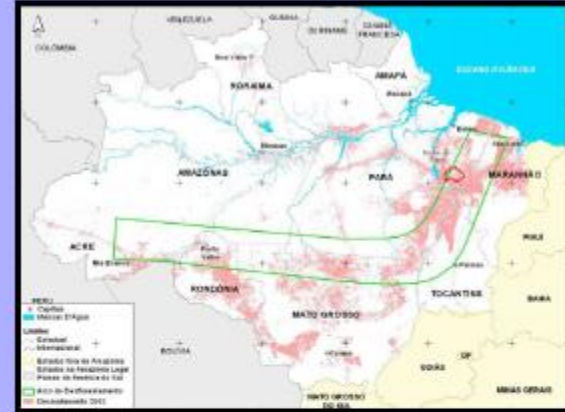
LARGEST PRODUCERS OF CHARCOAL IN THE WORLD



Wood origin



- Amazon Region
- New siderurgy center
- Native wood (residues)



A BIG SUSTAINABLE PROGRAM OF FOREST PLANTATION





To find the best quality of wood for pyrolysis

- To find the best chemical and physical characteristics
 - Ex: 500 *Eucalyptus* species

IMPROVING THE PROCESS OF CHARCOAL PRODUCTION



**Traditional
> 60 %**



There are some lessons!



> 8 million t /year

1000 kg wood
(± 20% Umidity)

CHARCOAL
310 kg

GAS
690 kg

Condensables
500 kg

Non-Condensables
190 kg

LOST!

Water
280 kg

Organics Products
220 kg

Acetic Acid
60 kg

Methanol
25 kg

Several Aromatics
35 kg

Phenolics
30 kg

Aldehydes
10 kg

Pitch
60 kg

CO₂
100 kg

CO
70 kg

H₂ e hydrocarbonets
20 kg

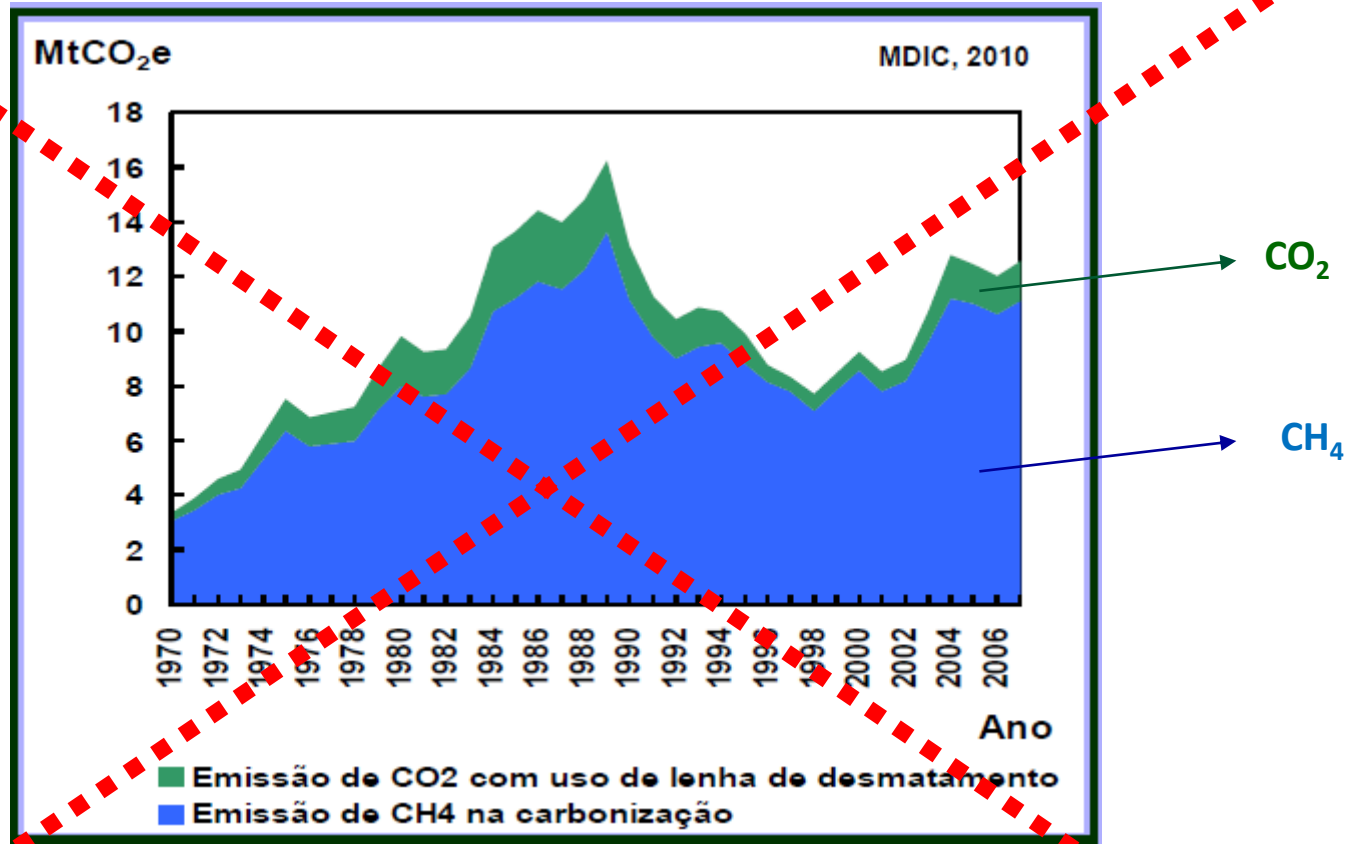
Wood Pyrolysis

Wood → Charcoal

500°C

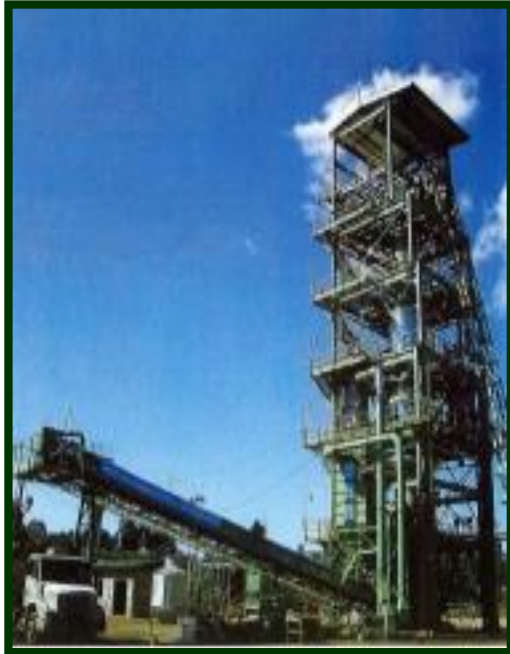
Gas emissions!

3.6 % of the total of Brazilian emissions



HIGH PERFORMANCE TECHNOLOGIES

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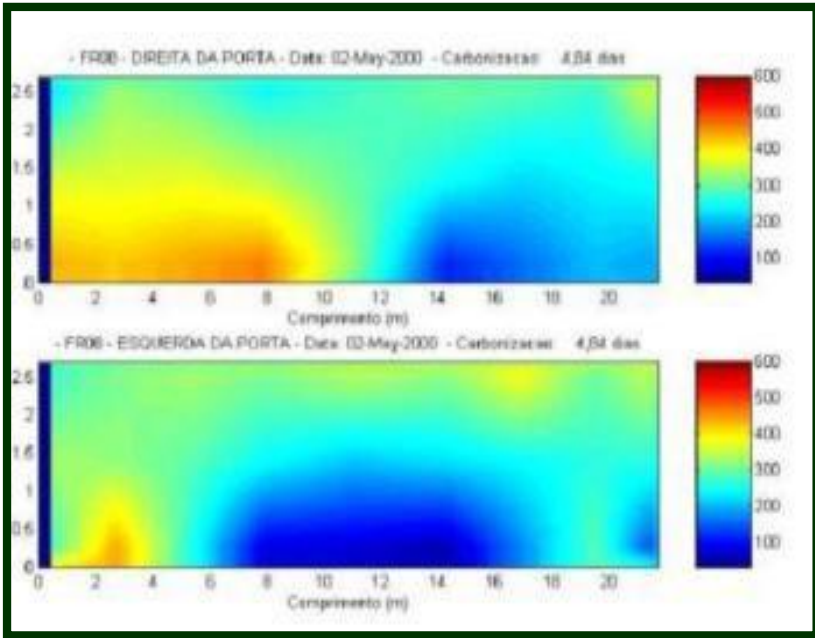
SIZE AND MECHANIZATION



700 m³



CONTROLLING THE PROCESS



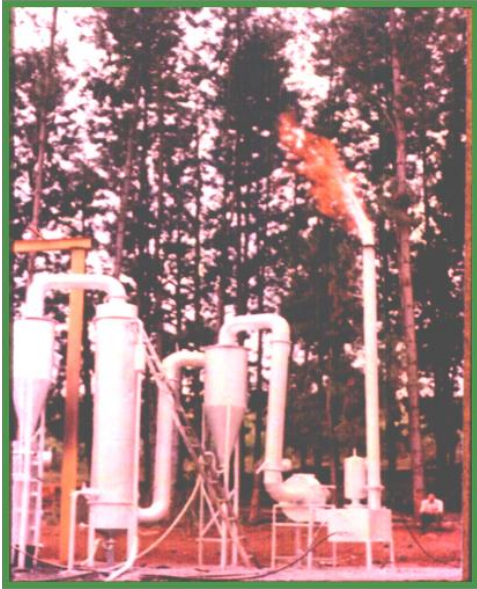
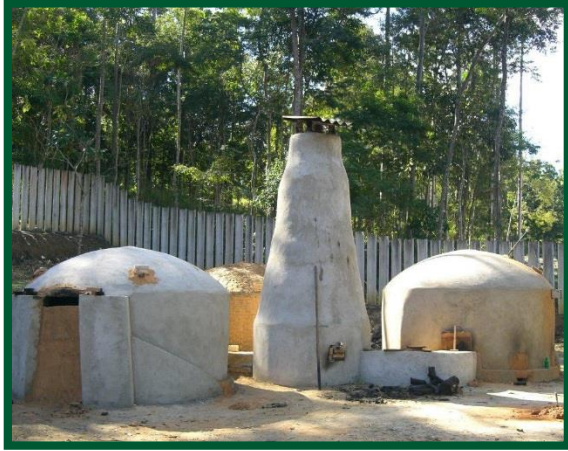
ArcelorMittal



CONTROLLING THE GAS EMISSIONS



BURNING OR RECOVERING THE GAS





University of São Paulo
Brazil

The major institution of higher learning and research in South America

Student enrollment	88.962
Undergraduate	57.300
Graduate	26.568
Faculty	5.865

It is located in 7 cities of Sao Paulo State:

São Paulo (*), Bauru, Piracicaba, Pirassununga, Lorena, Ribeirão Preto e São Carlos

Jose Otavio Brito - Academic Visitor – Imperial College of London
- 11/10/2012



College of Agriculture “Luiz de Queiroz”



University of São Paulo

College of Agriculture “Luiz de Queiroz”

Founding date: 1901

Departments: 12

Laboratories: 150

Undergraduate students: 2,000

Graduate students: 1,500

Faculty: 242



AGRI-FOOD INDUSTRY, FOOD AND NUTRITION (LAN)

ANIMAL SCIENCE (LZT)

BIOLOGICAL SCIENCES (LCB)

BIOSYSTEMS ENGINEERING (LEB)

CROP SCIENCE (LPV)

ECONOMICS, ADMINISTRATION AND SOCIOLOGY (LES)

ENTOMOLOGY AND ACAROLGY (LEA)

EXACT SCIENCES (LCE)

FOREST SCIENCES (LCF)

GENETICS (LGN)

PLANT PATHOLOGY AND NEMATOTOLOGY (LFN)

SOIL SCIENCE (LSO)





Designed in the neoclassical style by English architect Alfred Hutchings Brandford - 1895







Forest Sciences Department

FORESTRY

ENVIRONMENT

FOREST PRODUCTS



10 laboratories



Undergraduate - Forest Engineering

Graduate — Forest Resources / Wood and Forest Products Technology



Forest Sciences Department / Forest Products



Wood Chemistry, Pulp and Energy Laboratory

Common

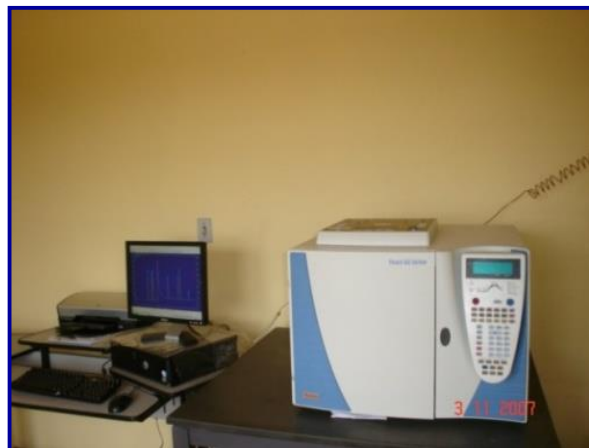
Especific

Especific



LQCE Wood Chemistry, Pulp and Energy Laboratory

GENERAL CHEMICAL ANALYSIS OF WOOD AND FOREST PRODUCTS



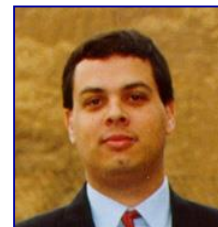


LQCE Wood Chemistry, Pulp and Energy Laboratory

Wood Pulp

(Francides G. Silva Jr. – Associated Professor)

Pulping process of fibrous raw materials
Pulp bleaching





LQCE Wood Chemistry, Pulp and Energy Laboratory

Bioenergy and Bioproducts

Jose Otavio Brito – Professor – jobrito@usp.br



Courses:

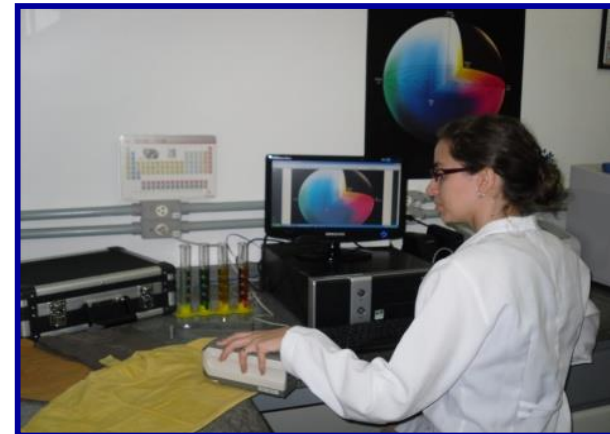
- Undergraduate: - Wood and Non-Wood Forest Products Chemistry
- Wood Energy
- Graduate: - Wood Energy



LQCE Wood Chemistry, Pulp and Energy Laboratory

BIOPRODUCTS

Essential oils, gum-resins and others wood extractives





BIOENERGY

- Wood pyrolysis, carbonization and torrefication
- Charcoal and firewood
- Greenhouse gas emissions





LQCE Wood Chemistry, Pulp and Energy Laboratory

Bioenergy and Bioproducts

We try to answer questions to the ...

Forestry sector, Energetic sector, Wood industry, Pulp and paper industry,
Steel industry, Textile industry, Cosmetic products industry

