

## Country Update Brazil

### In Brazil, the intensive renewable energy generation facilitates Hydrogen Production

- 84.3% of the Brazilian electricity supply is renewable: Hydro: 68.1 %; Biomass: 8.2%; Wind: 5.4%; Nuclear: 2.6%.



Iguaçu Falls, where Itaipú hydropower plant is located

Consumption of biomasses for energy production: equivalent of 876 TWh/year

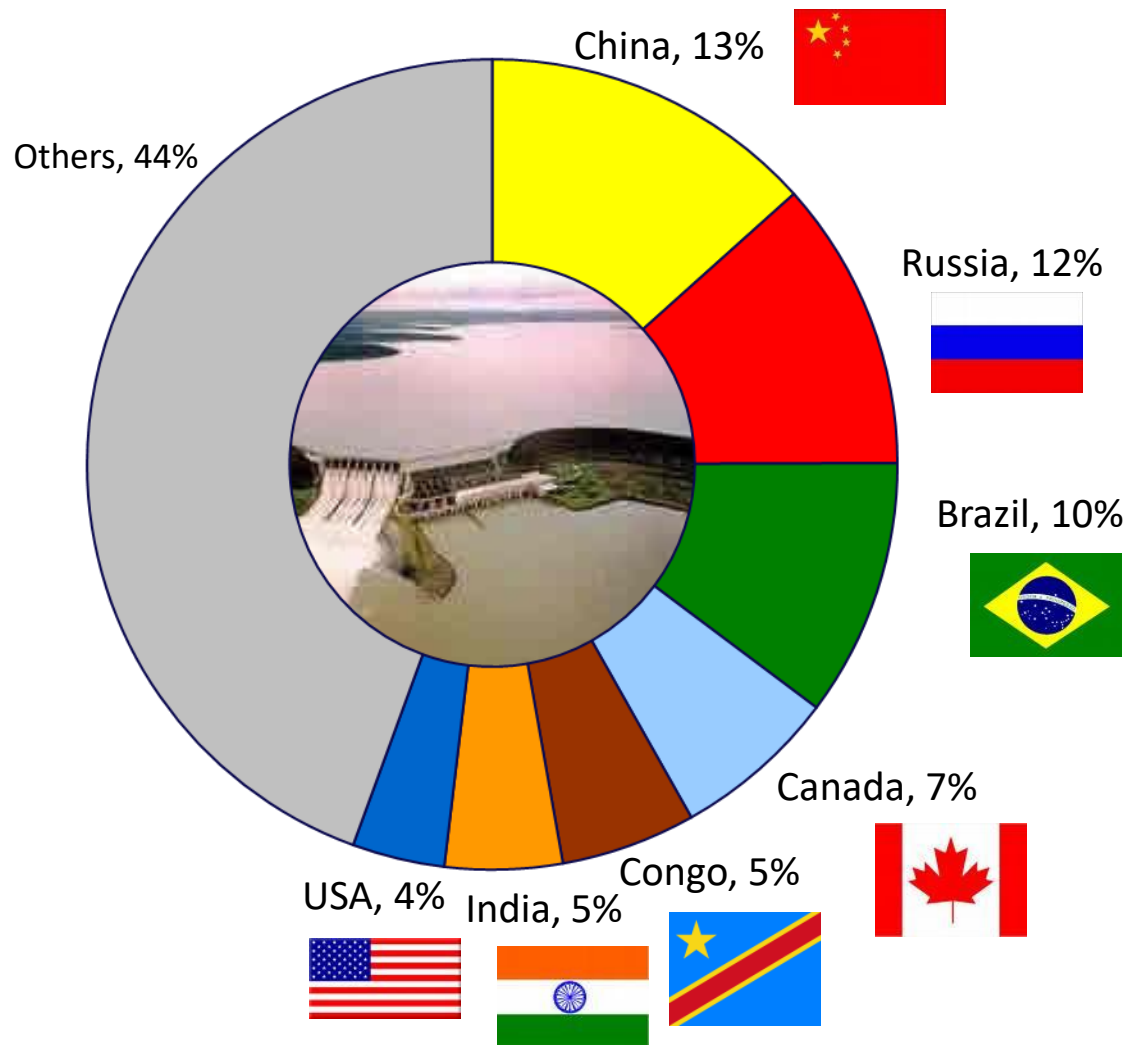
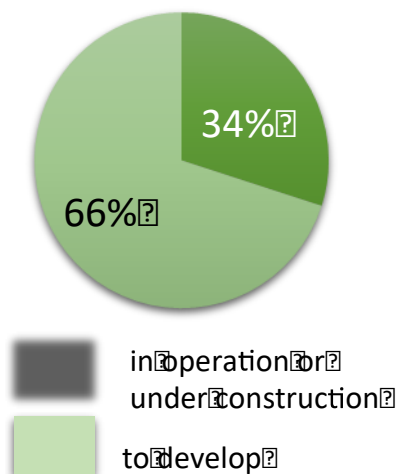
Ethanol production in 2016: 28.3 billion liters from a sugarcane output of 39 million tons.

The total Brazilian energy consumption is 3,183 TWh/year, being 43.5% renewable.



## Country Update Brazil

Brazil has the third world's biggest hydro potential  
Estimated, equal to 260 GW



## Country Update Brazil

Brazil has a huge bioenergy potential (biofuel and bioelectricity)

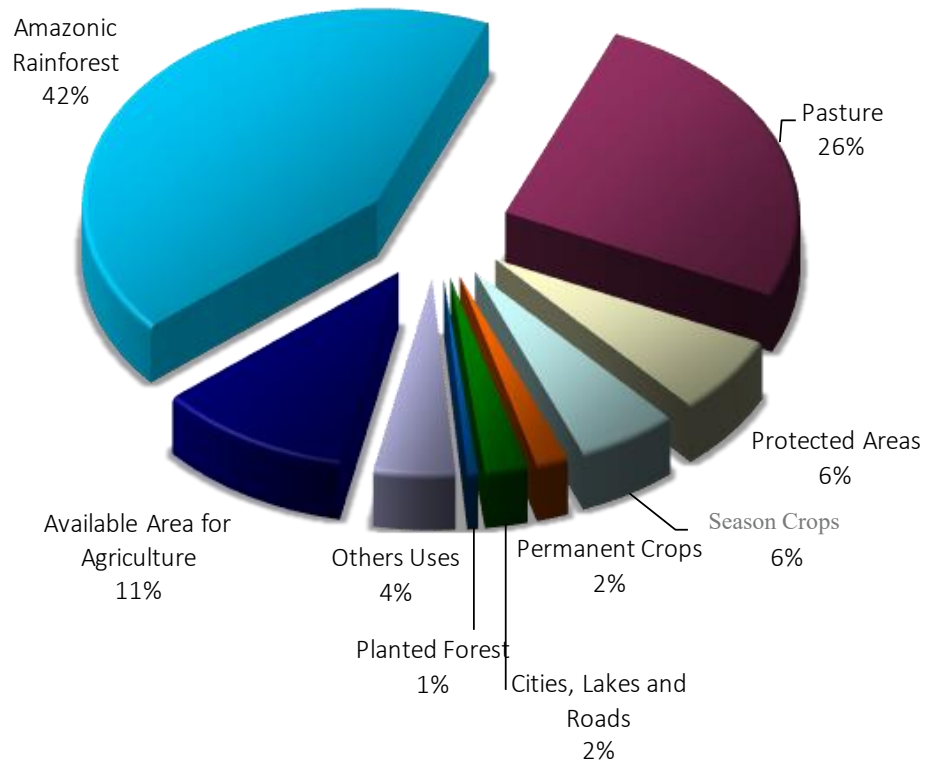
### ■ FAVORABLE GEOGRAPHIC AND NATURAL CONDITIONS

- *land availability for agriculture*
- *soil characteristics*
- *climate conditions (sun, rain, etc.)*

### ■ TECHNOLOGY DEVELOPED

- *ethanol*
- *cogeneration from bagasse*
- *biodiesel*

### ■ RELATIVELY LOW PRODUCTION COST

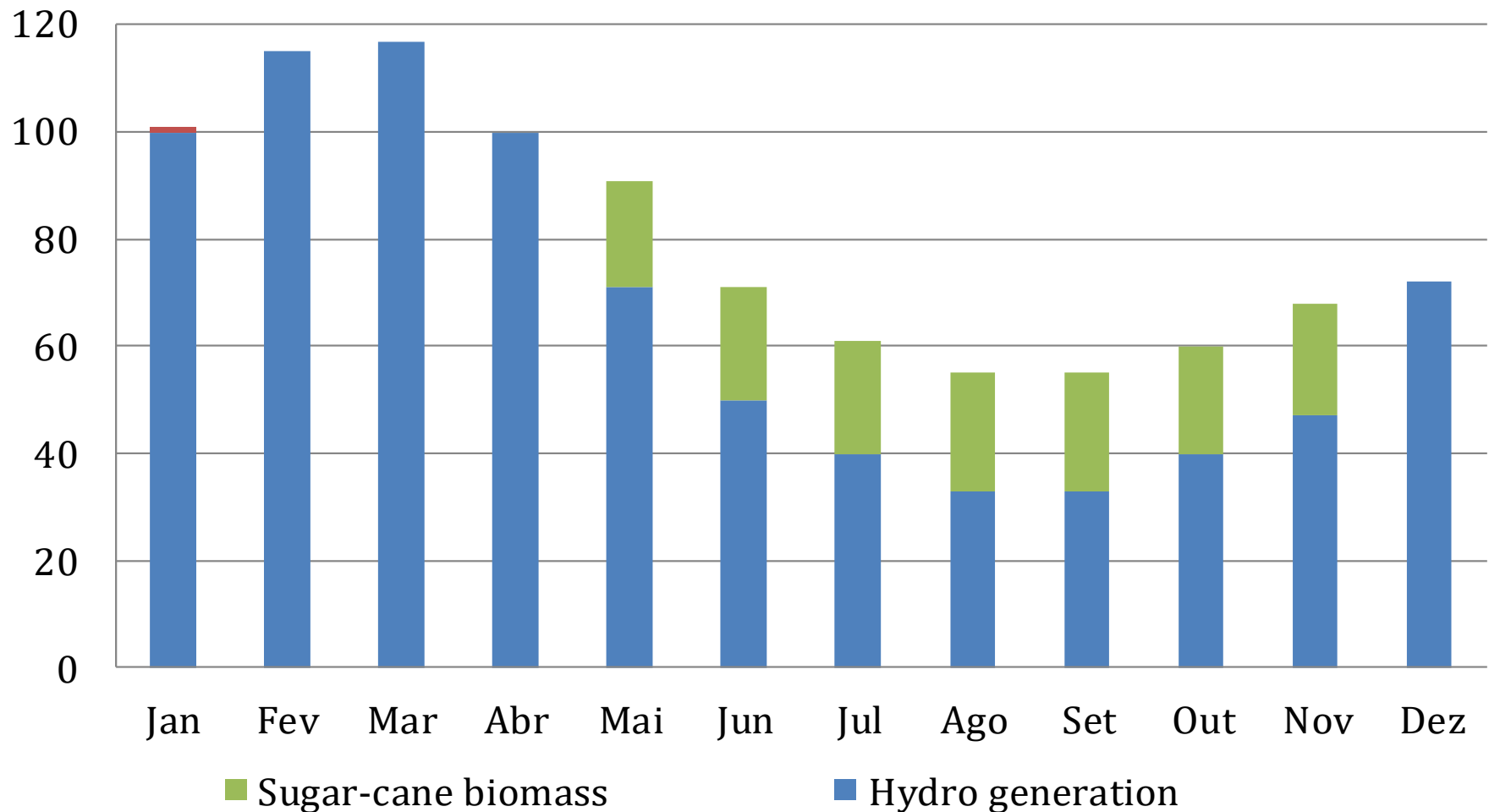


Source: IBGE & CONAB (2007)



## Country Update Brazil

### COMPLEMENTARY BETWEEN HYDRO GENERATION AND BIOELECTRICITY

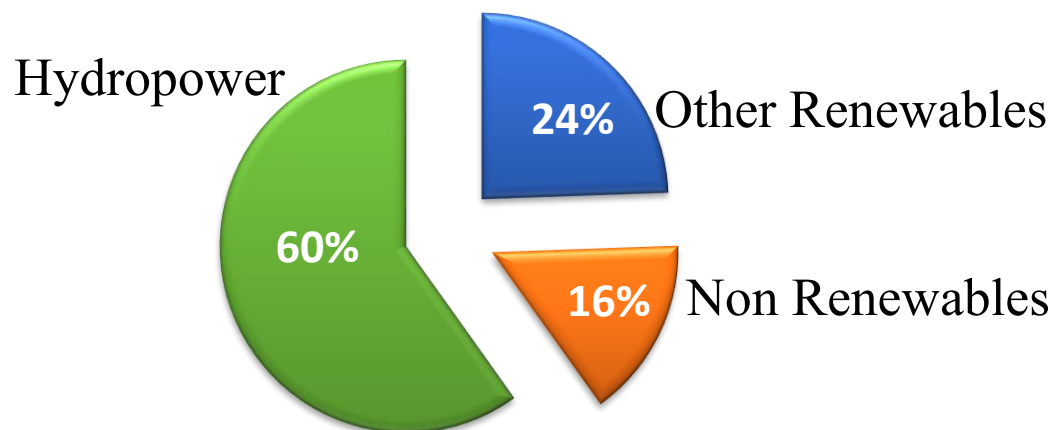




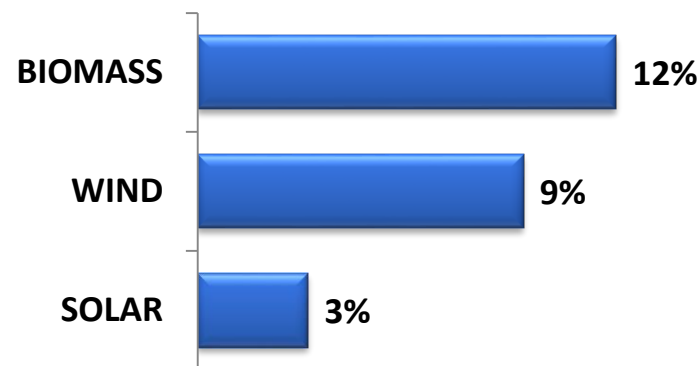
# NEW RENEWABLES IN ELECTRICITY SUPPLY

Country Update Brazil

2030



Share of renewables  
(other than hydropower)  
in 2030

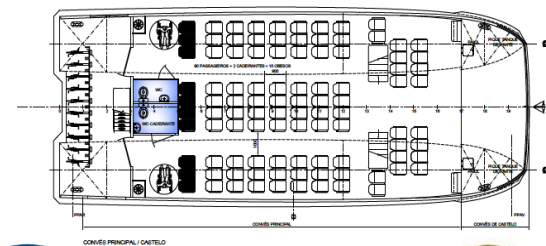
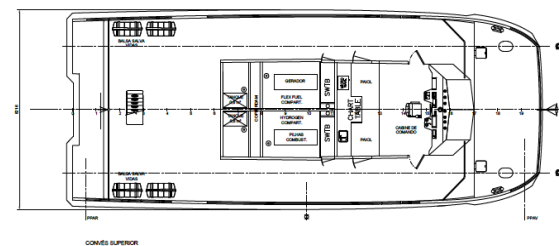
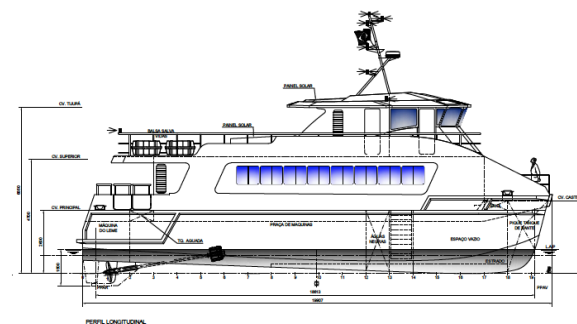


## Brazilian actions in Hydrogen and Fuel Cells

Catamaran with capacity for 100 passengers. Electric propulsion with hydrogen and fuel cell



## Country Update Brazil





## **Brazilian actions in Hydrogen and Fuel Cells**

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- bilateral cooperation established between the Ministry of Science, Technology, Innovation and Communications (MCTIC) and the German Aerospace Center (DLR) for the joint development of hydrogen-based advanced fuels for aviation
- Currently, 756 PhD researchers are allocated in 46 graduate centers in the thematic “Hydrogen and Fuel Cells”
- Governmental and private investment in 2017 amounted over 41 million dollars, The main focus were hydrogen production from renewables, heavy-duty vehicles, SOFC, PEMFC and reforming.



# World Hydrogen Energy Conference



**“Power and biomass  
to hydrogen”**



**AB  
H2** ASSOCIAÇÃO  
BRASILEIRA DO  
HIDROGÊNIO

## Country Update Brazil

**Rio de Janeiro  
June 17 to 22, 2018**

Topic	No. of Abstracts	%
1. Hydrogen energy	46	8
2. Fuel cells	117	22
3. Science and technologies of hydrogen and hydrogen-rich fuels production from biomass	148	27
4. Energy storage using hydrogen produced from excess renewable electricity: Power to hydrogen	108	20
5. Hydrogen energy engineering application and products	74	14
6. Market, commercialization and deployment: Total owner cost of hydrogen energy technologies	22	4
7. Regulatory framework, safety aspects, public policies and social acceptance of hydrogen energy technologies	24	4
8. Others	5	1
<b>TOTAL</b>	<b>544</b>	<b>100</b>



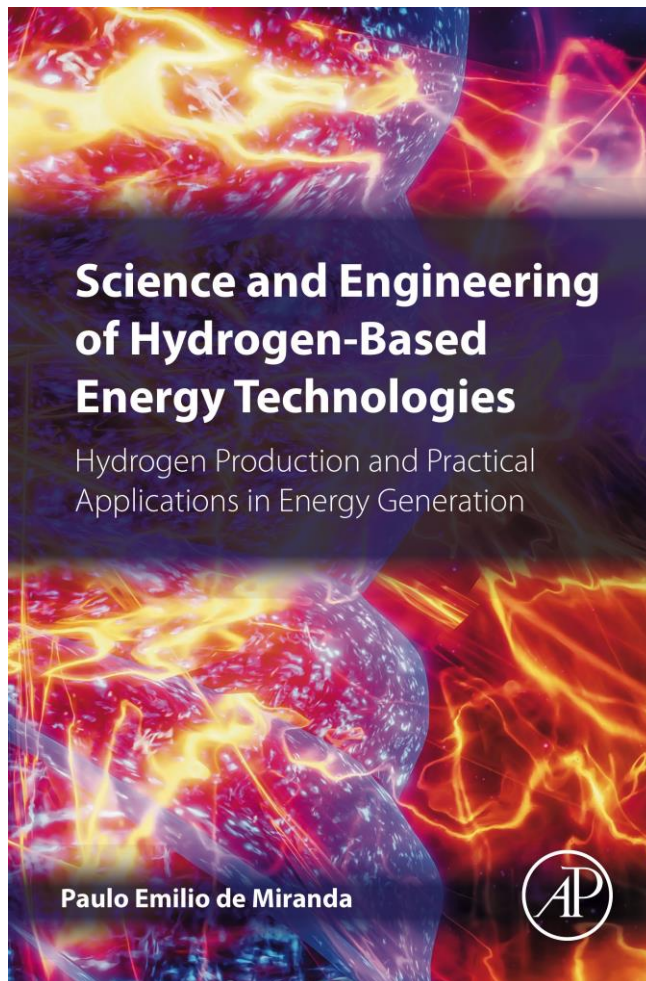
## Country Update Brazil

The existence of Natural Hydrogen has been proved



Geological structure composed of a circular depression on a craton zone formation in Brazil where hydrogen gas is detected flowing out.

## Country Update Brazil







ca. 575–550 BC, Louvre Museum

*"Chimaera, daughter of Echidna, breathed raging fire, a creature fearful, great, swift-footed and strong, who had three heads, one of a grim-eyed lion; in her hinderpart, a dragon; and in her middle, a goat, breathing forth a fearful blast of blazing fire. Her did Pegasus and noble Bellerophon slay."*

by Homer, in the Iliads