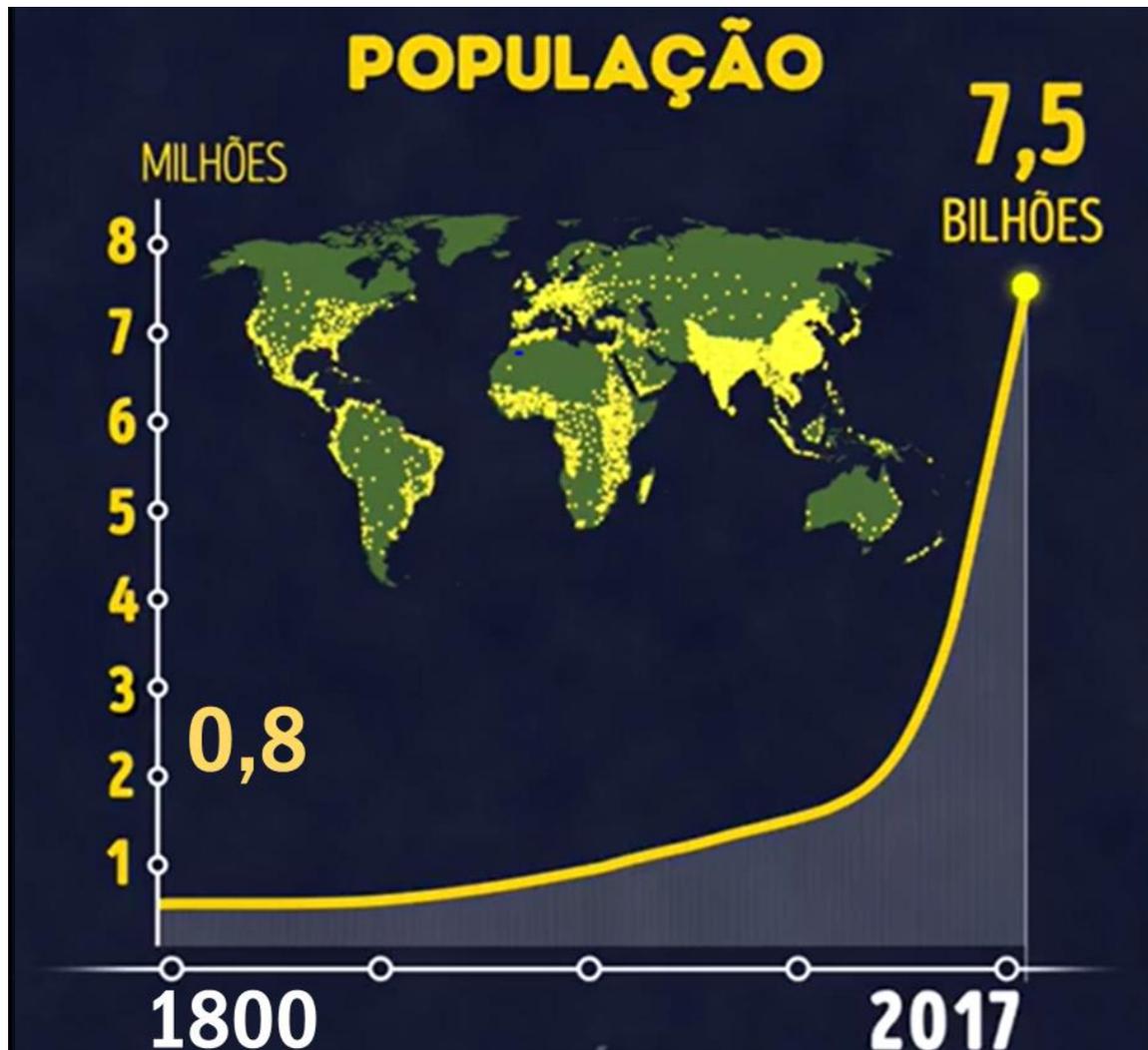




# Laboratório Nacional do BioEtanol

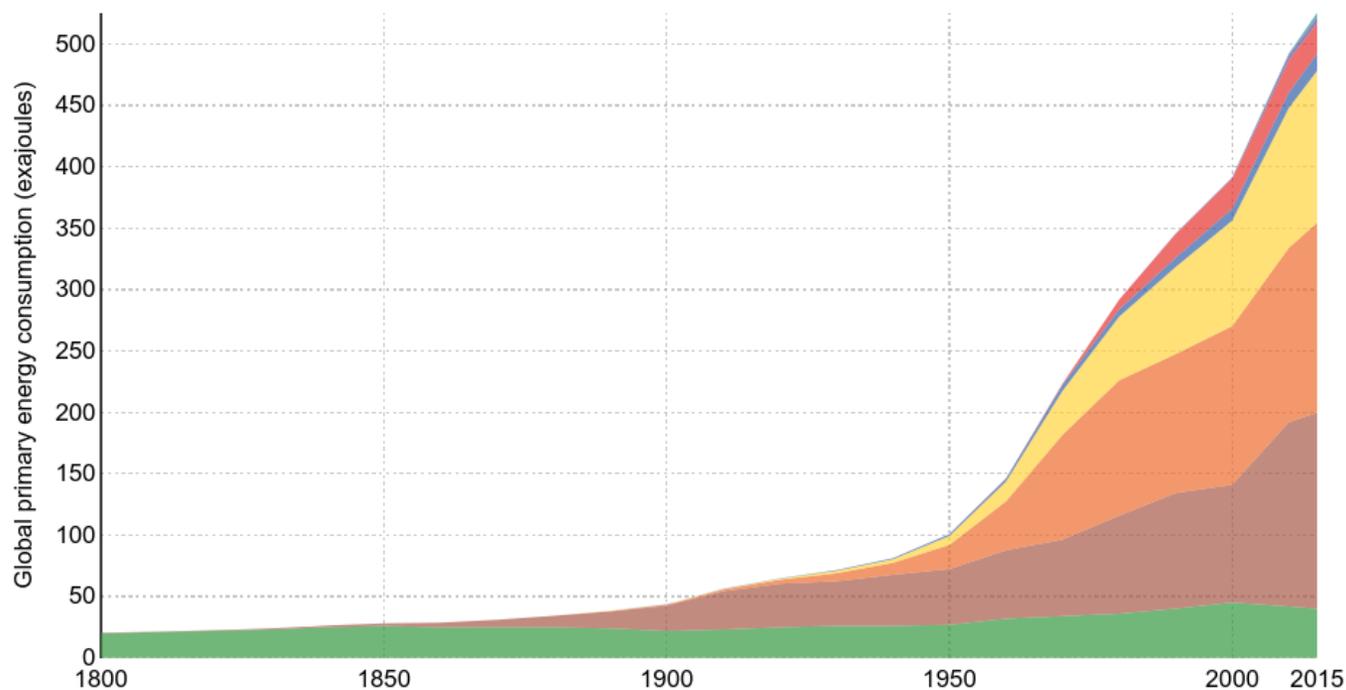




## Global primary energy consumption, 1800-2015

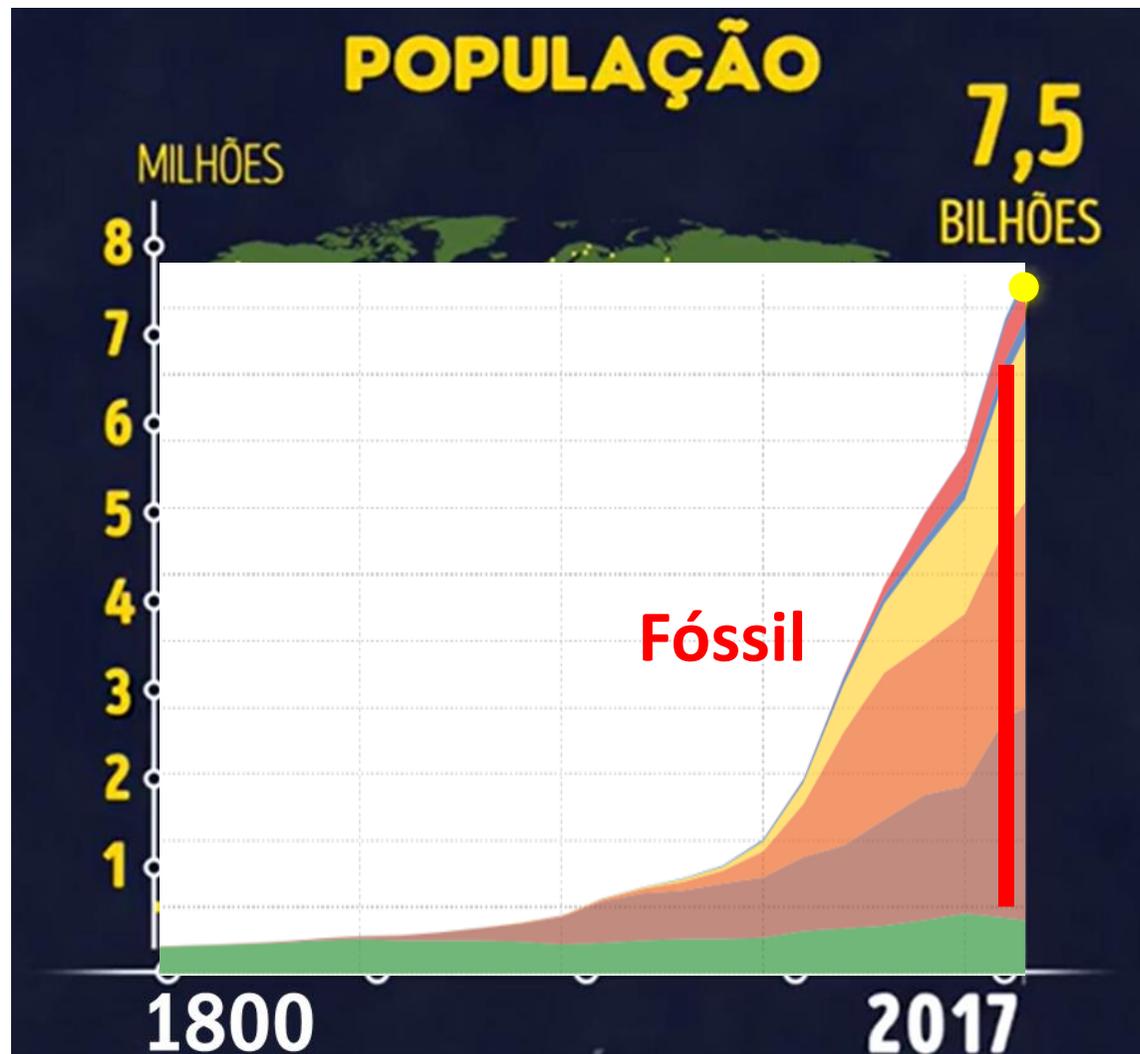
Global primary energy consumption by source, measured in exajoules (EJ). Values are reported to the nearest 0.01EJ

Our World  
in Data



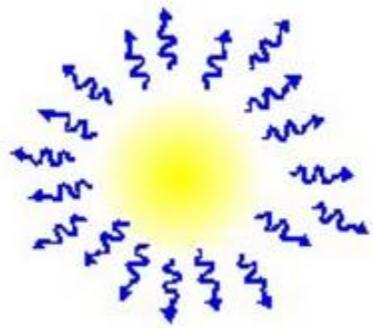
**Fóssil**

Source: Vaclav Smil (2017), Energy Transitions: Global and National Perspectives OurWorldInData.org/energy-production-and-changing-energy-sources/ • CC BY-SA



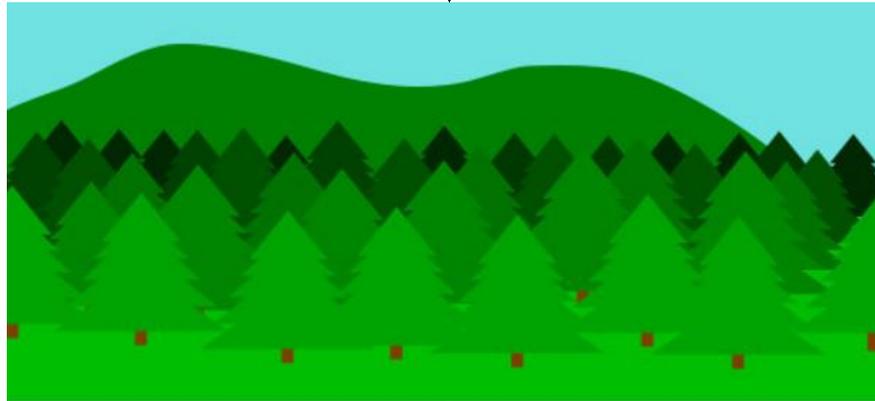
# O Petróleo é Extraordinário



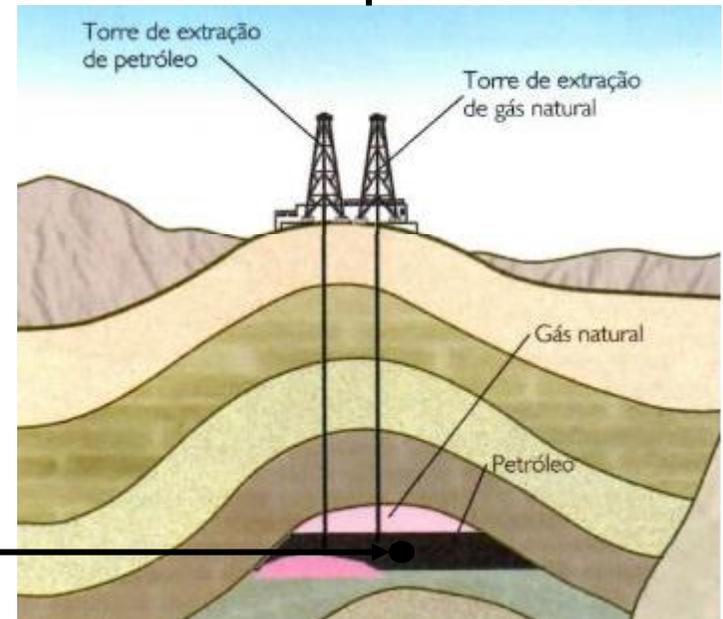


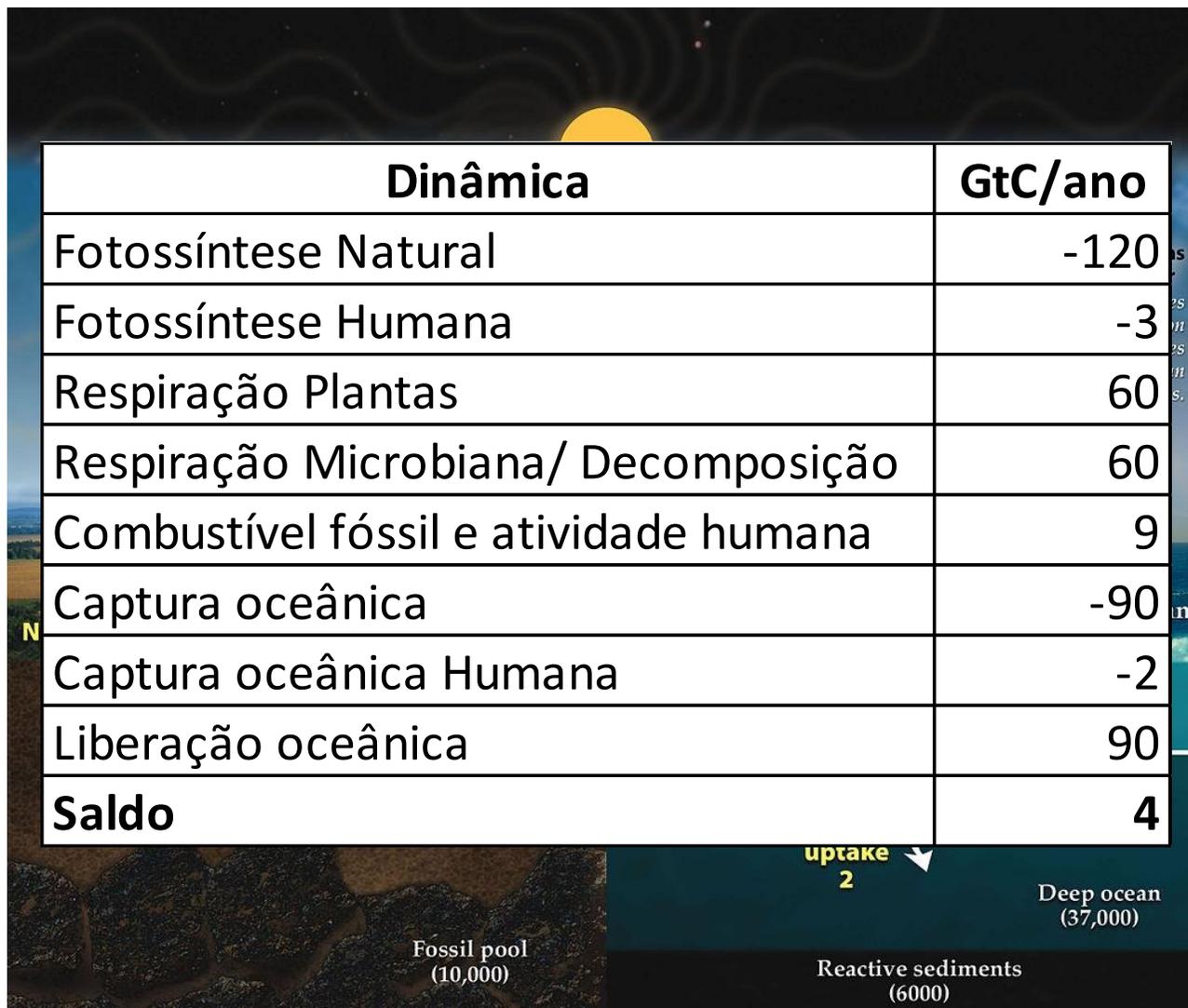
CO<sub>2</sub>

4.500.000.000 t/y



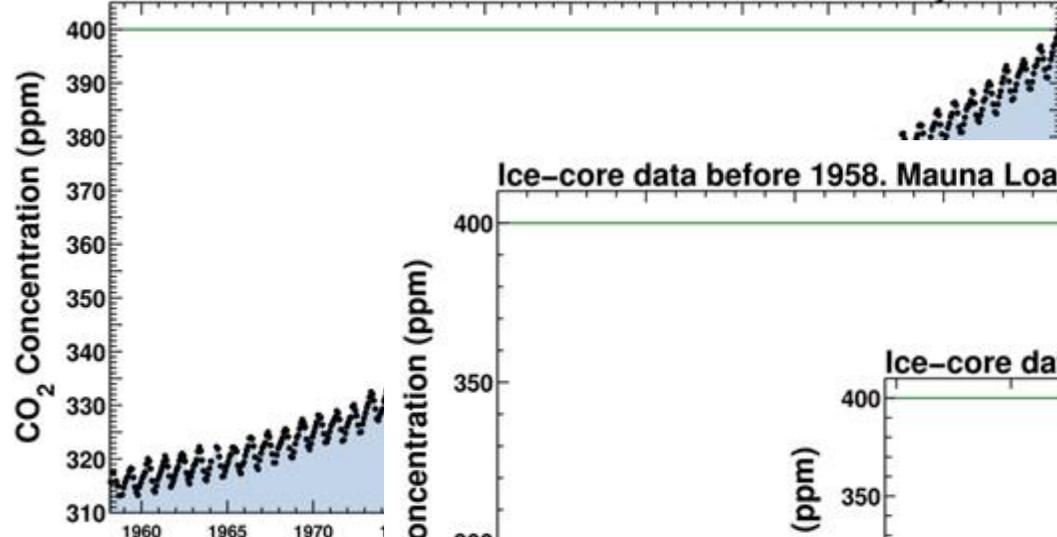
1500 t/y



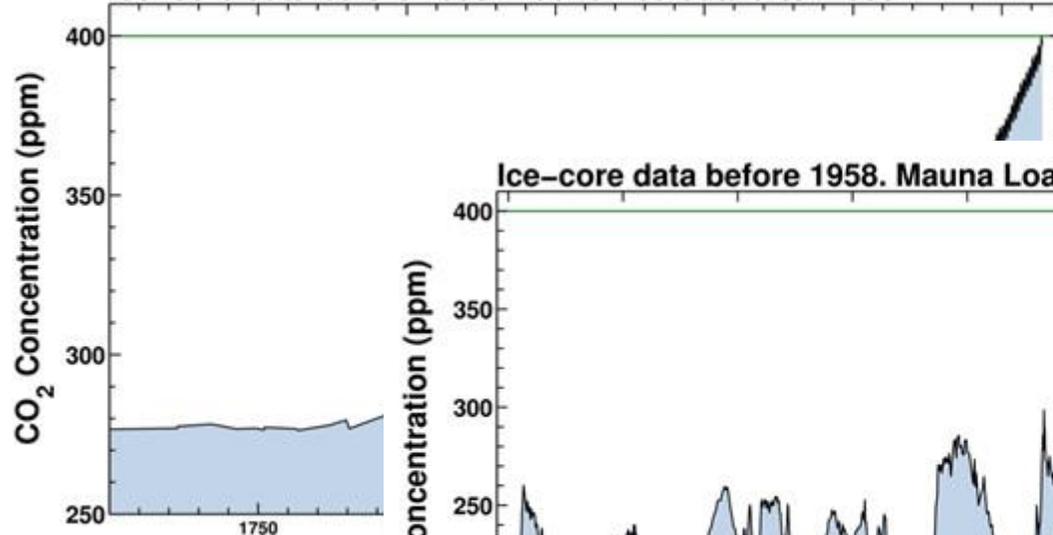


4

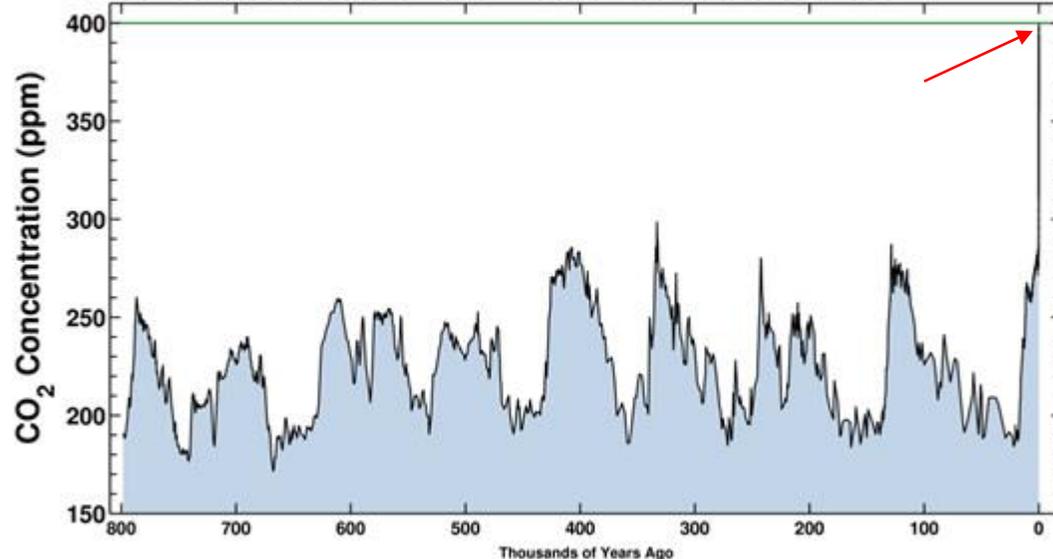
Carbon dioxide concentration at Mauna Loa Observatory



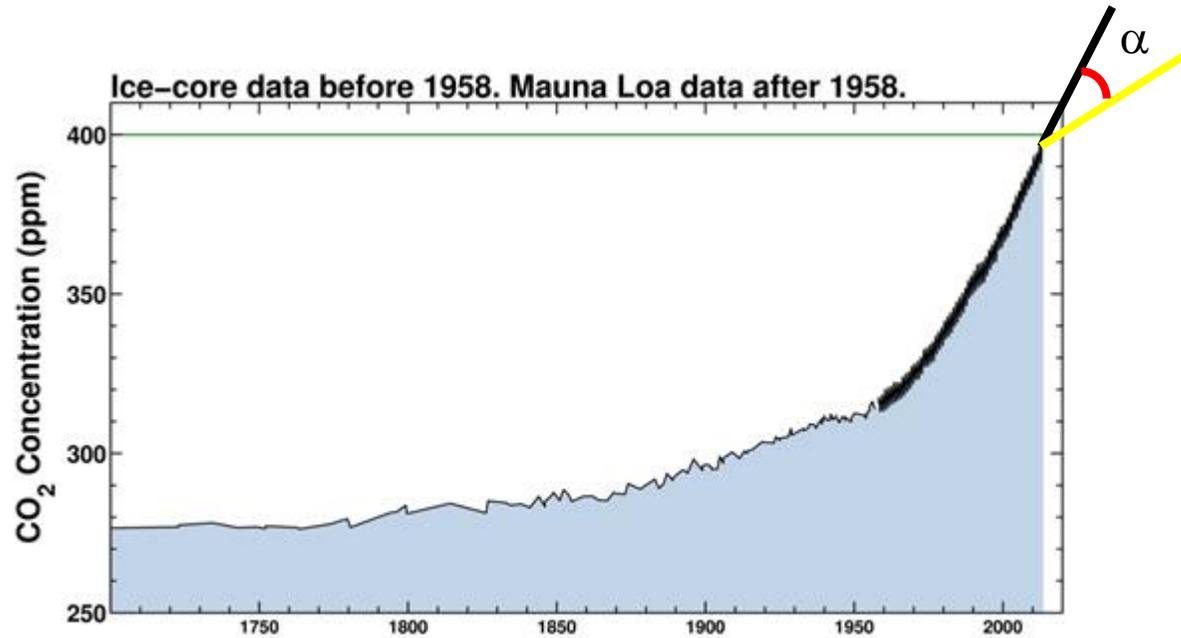
Ice-core data before 1958. Mauna Loa data after 1958.



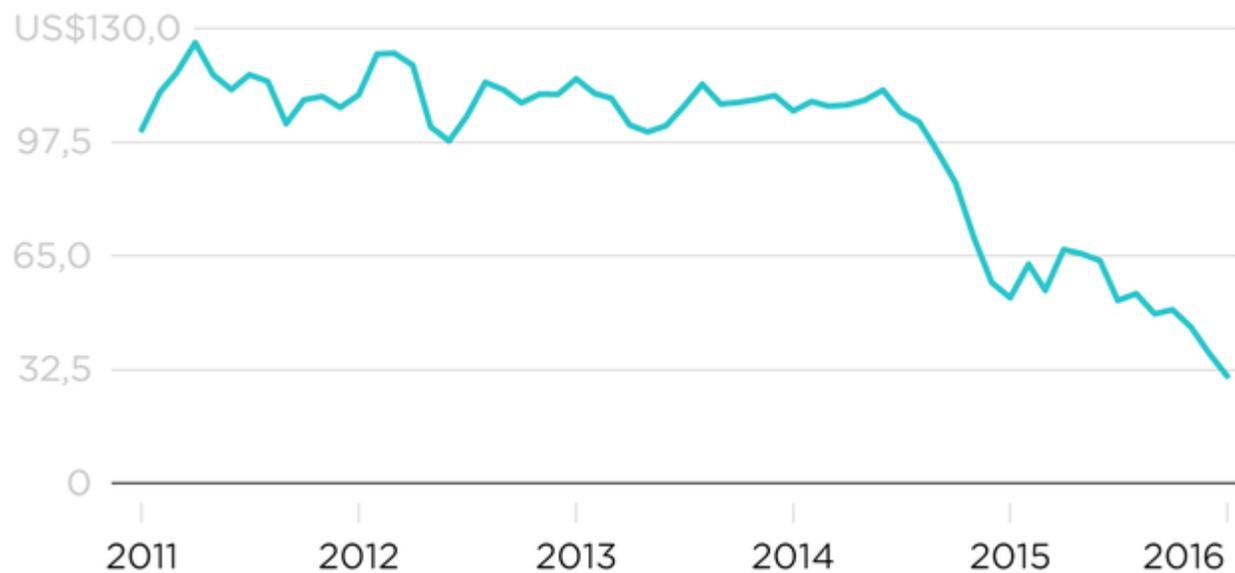
Ice-core data before 1958. Mauna Loa data after 1958.



**2,13 GTc = 1 ppm**



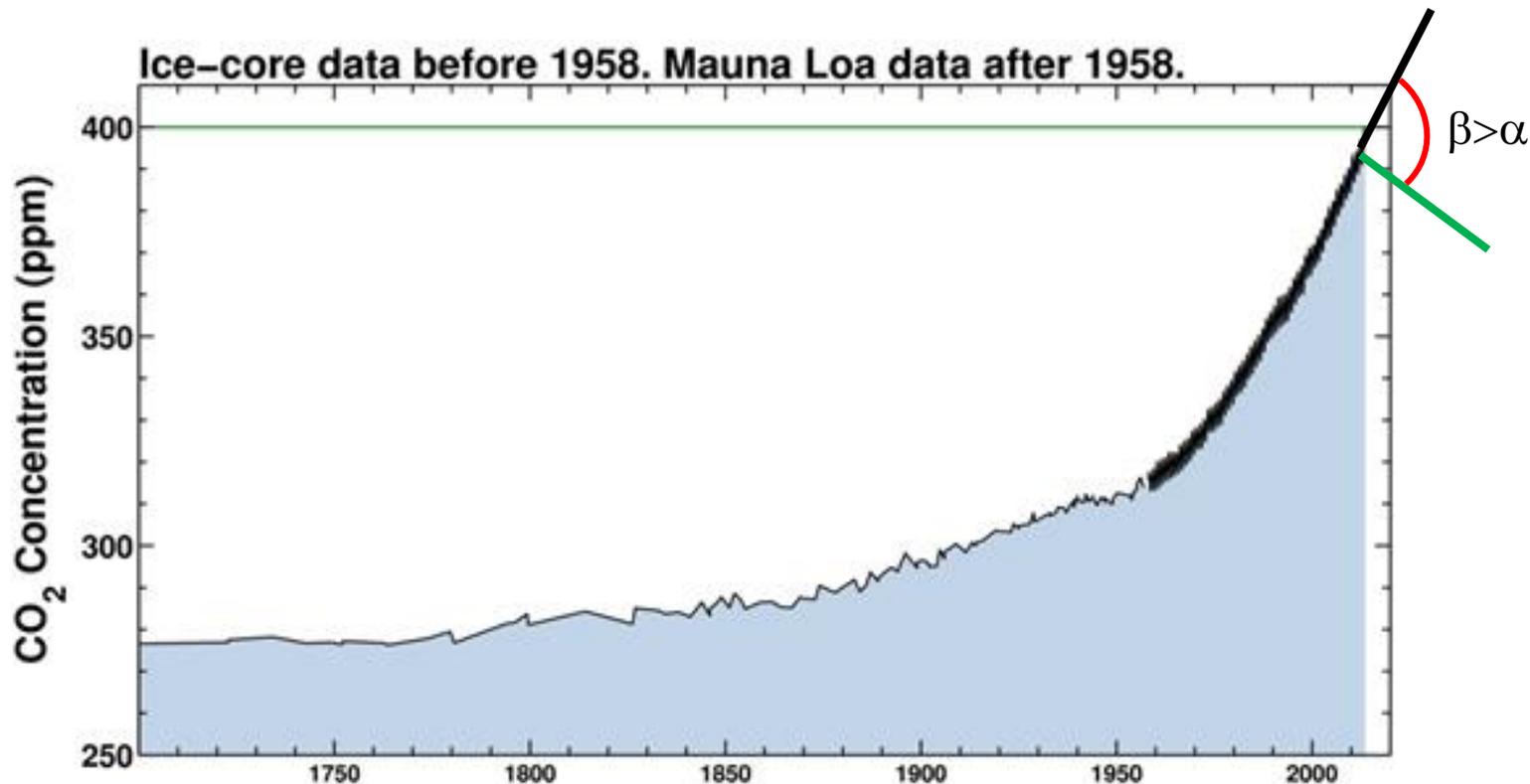
Preço do barril no mercado internacional



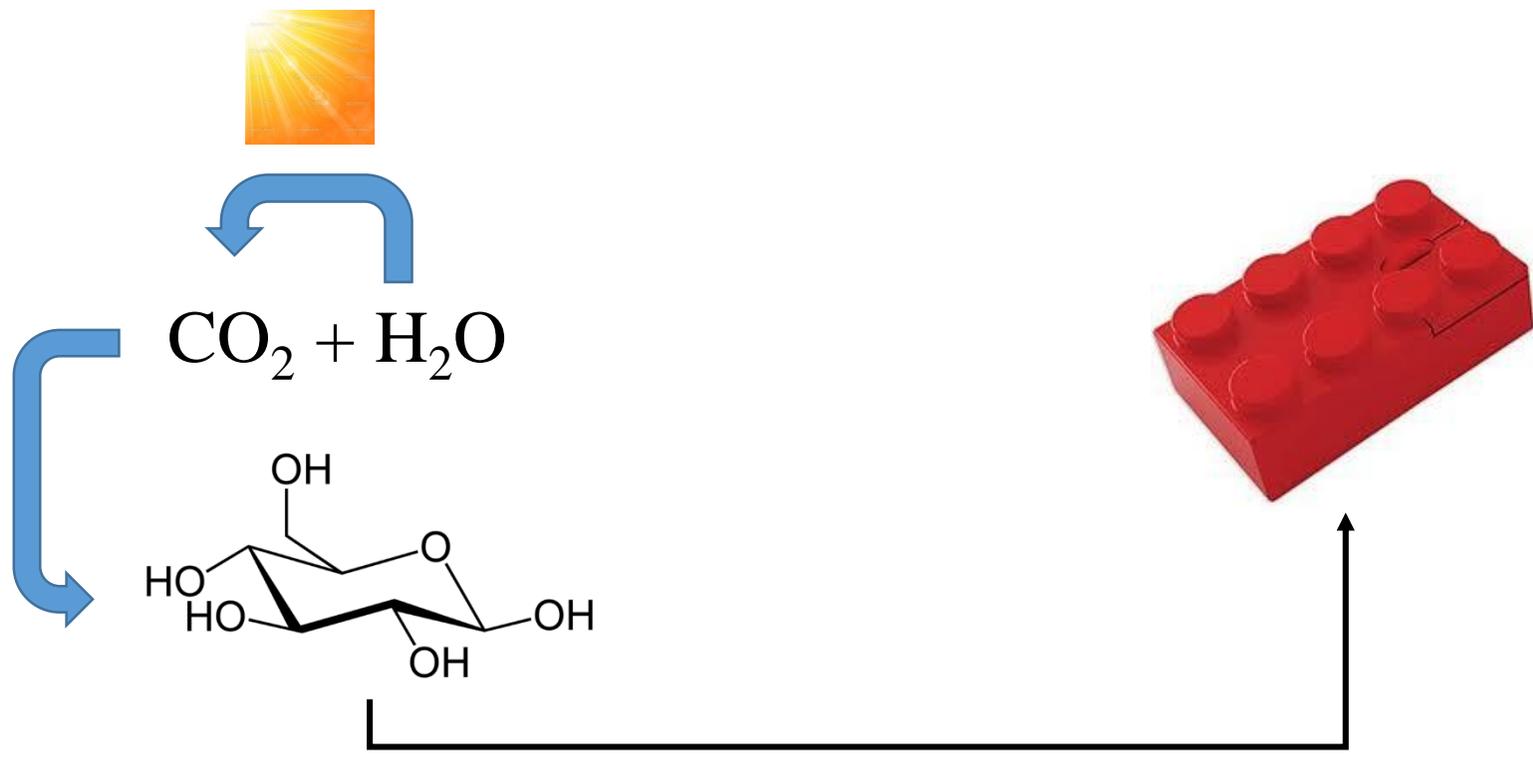
Fonte: Investing.com

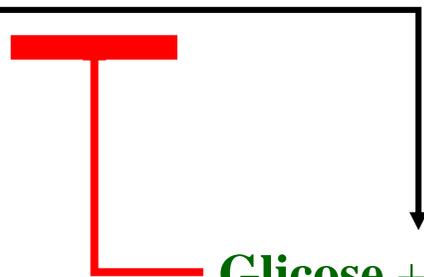
NEXO



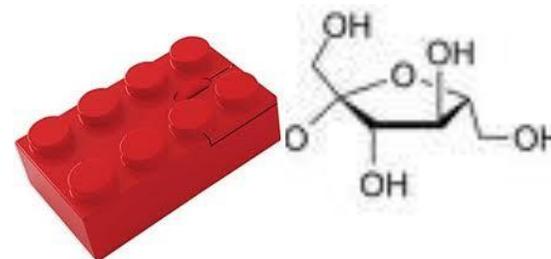


## Engenharia Climática



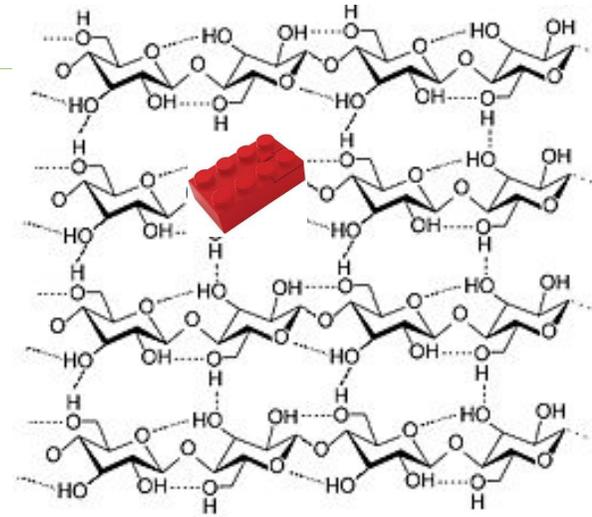


**Glicose + Frutose**



**Sacarose**

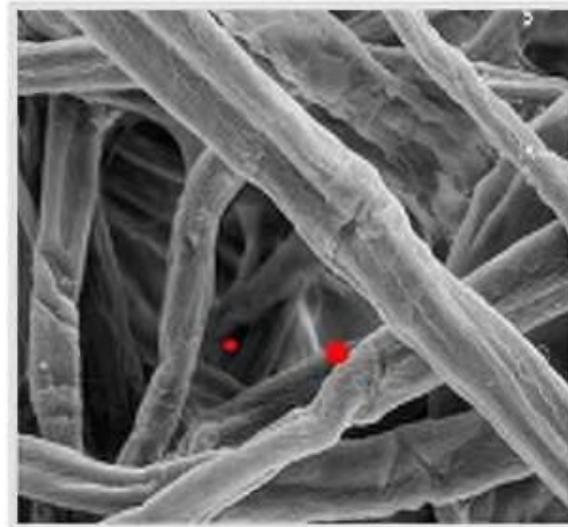




Glicose + Glicose + Glicose + .....



Celulose



## Variabilidade

### Eficiência Fotossintética

Plant	Efficiency
Typical Plants	0.1% <sup>[2]</sup> 0.2–2% <sup>[3]</sup>
Typical Cultures	1–2% <sup>[2]</sup>
<b>Cane</b>	7-8% peak <sup>[2][4]</sup>





X



=



*S. officinarum*

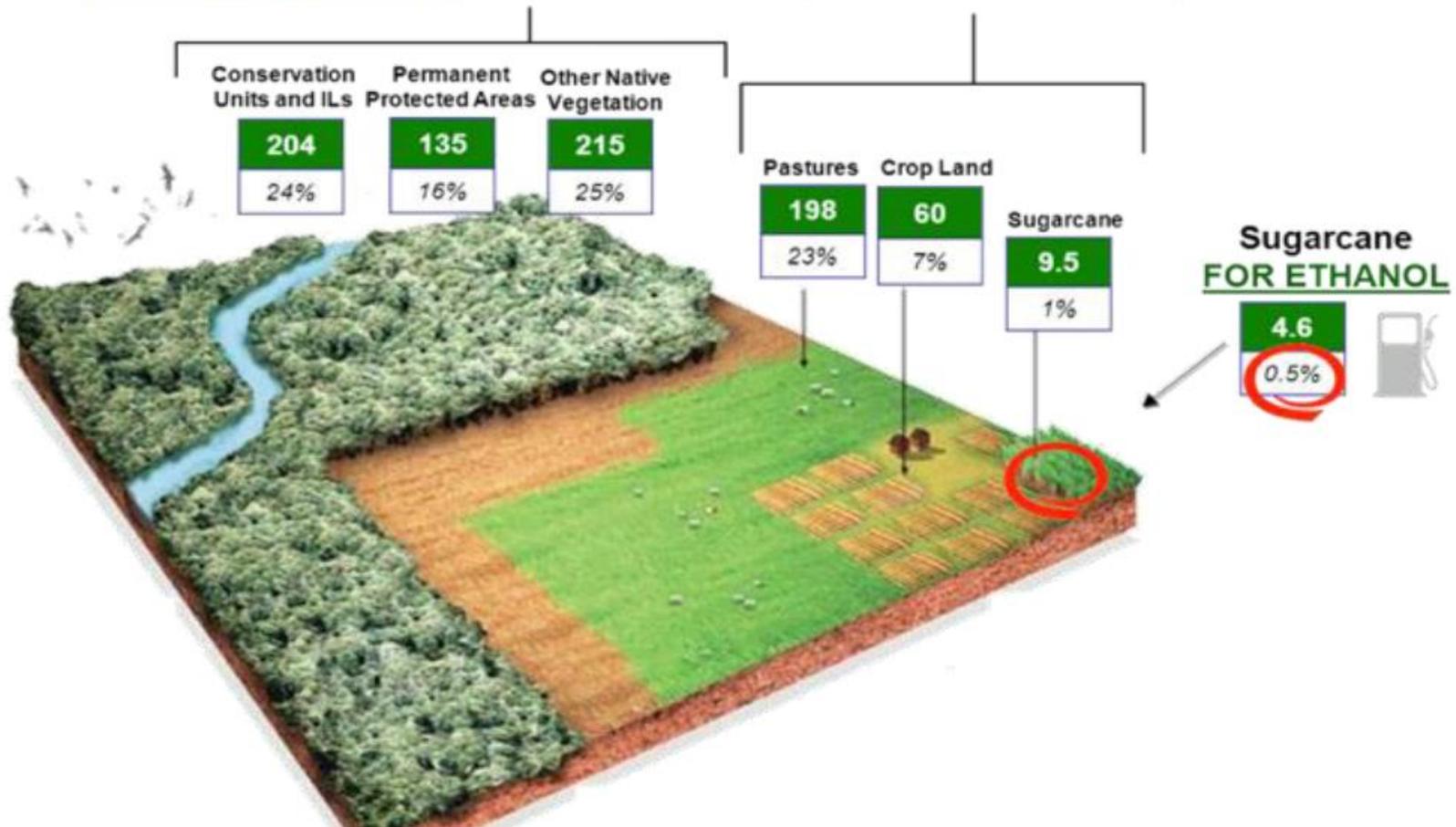
*S. spontaneum*

Com ***Ciência, Tecnologia e Políticas Públicas*** somos capazes de fazer a Gestão Adequada do ***Solo, Água e Recursos Biológicos*** para gerar uma alternativa eficiente às fontes fósseis de carbono e fazer disso um ***Excelente Negócio***



Million Hectares

Total Area	Native Vegetation	Land in Actual Use	Other Uses
851	554	258	38
100%	65%	30%	5%

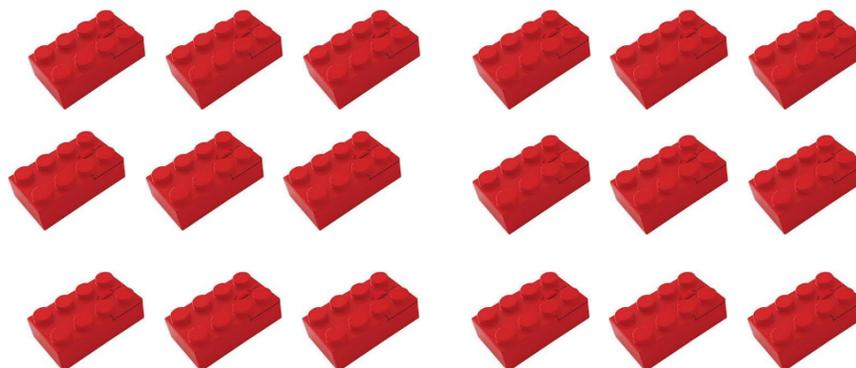
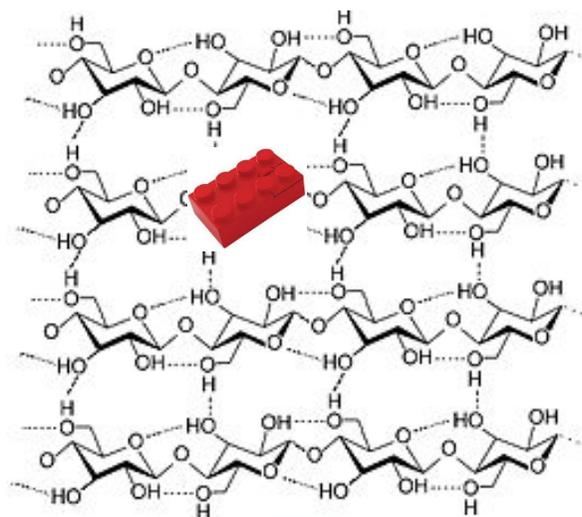


# Cana Energia

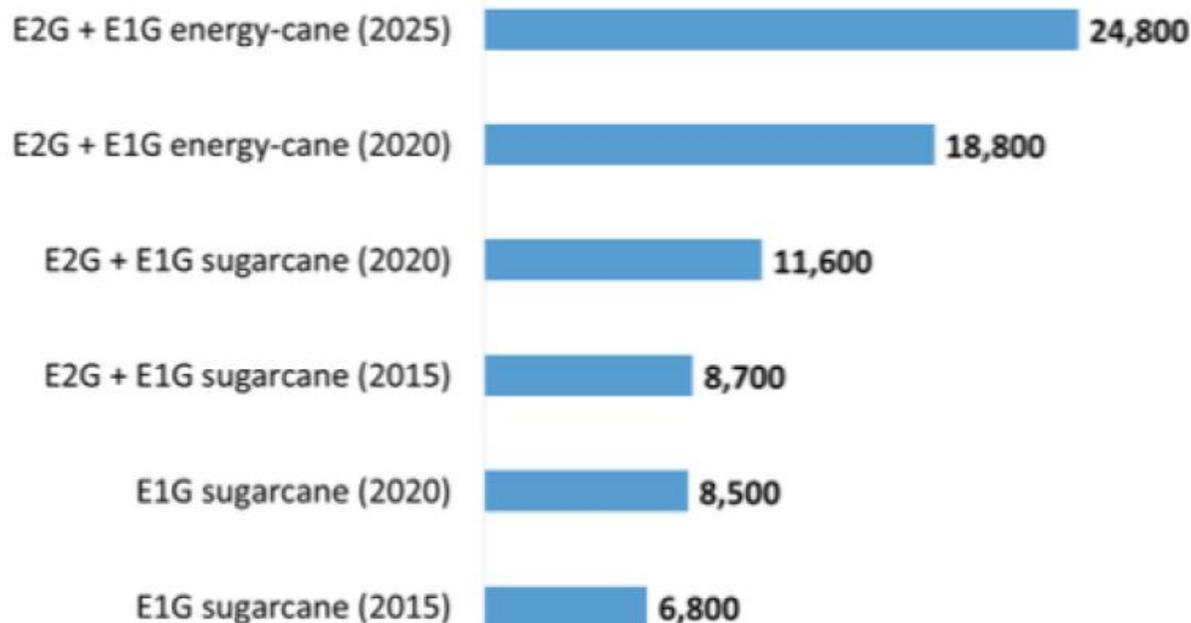
85t/ ha  
R\$ 96,00/t  
10 k ha = 680.000 t



180 t/ha  
R\$ 45,00/t  
10 k ha = 1.620.000 t



**Ethanol productivity (liters/ha)**



Area Requirement Analysis	
Global Gasoline Consumption	1,3tri liters/year
EtOH Equivalent	1,86 tri liters/year
<i>Required Area E2G + E1G Energy Cane (2025)</i>	<i>75MM hectares</i>
<i>Required Area E2G + E1G Energy Cane (2020)</i>	<i>100MM hectares</i>

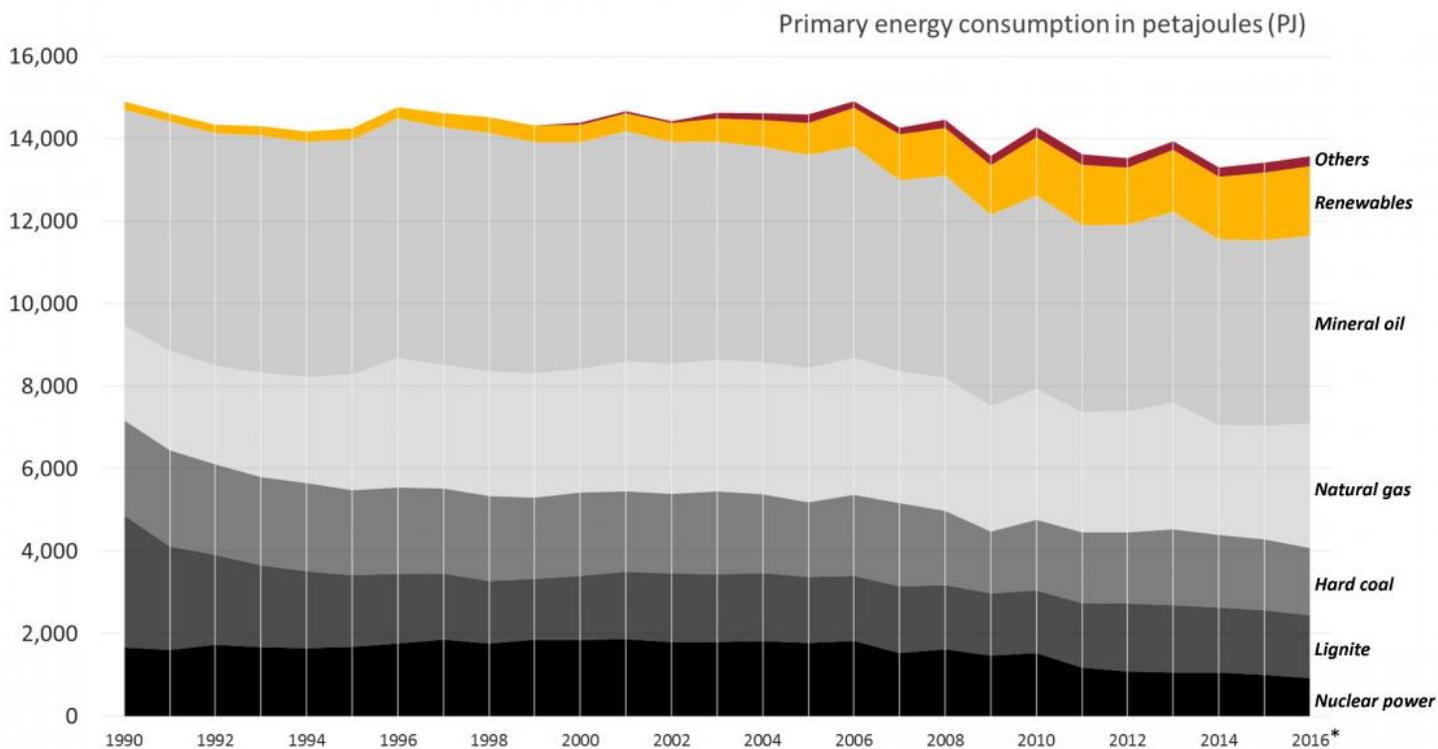
**50% do Pasto = 200 MM ha, que podem produzir**

**Consumo Global de Gasolina**



## German energy sources' share in primary energy consumption 1990 - 2016.

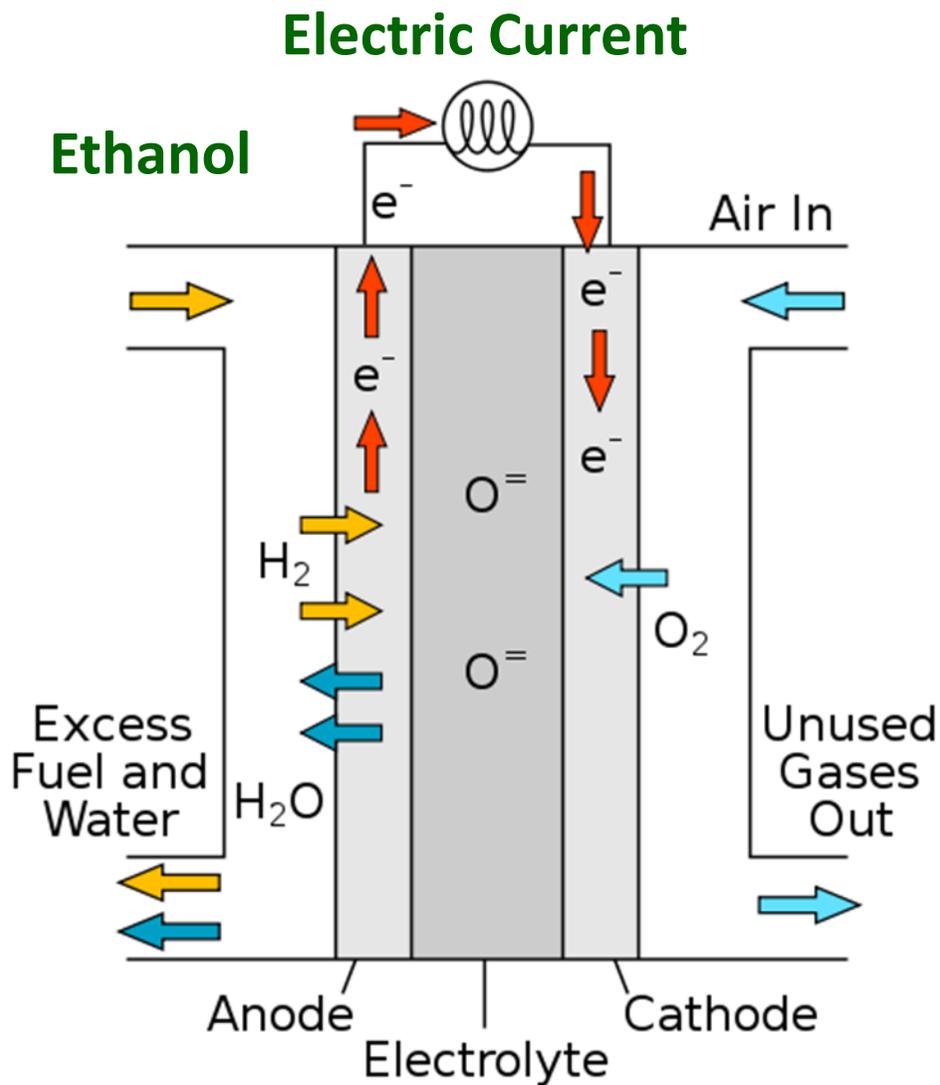
Data: AG Energiebilanzen 2017.



**Não  
Renovável**

\*2016: preliminary data

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## Nissan unveils world's first Solid-Oxide Fuel Cell vehicle

YOKOHAMA, Japan (August 4, 2016) – In Brazil today, Nissan Motor Co., Ltd. today revealed the world's first Solid Oxide Fuel-Cell (SOFC)-powered prototype vehicle that runs on bio-ethanol electric power. The breakthrough model is an all-new light-commercial vehicle that can rely on multiple fuels – including ethanol and natural gas – to produce high-efficiency electricity as a power source.

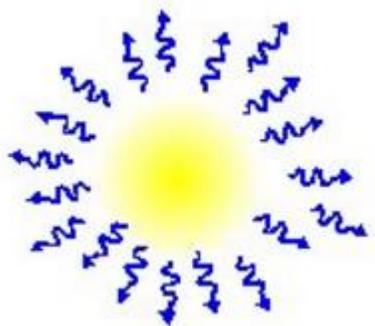
  1920 x 1080

  1200 x 1200

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Aumentar a competitividade da BioEconomia através do  
***Aprofundamento Científico, Desenvolvimento Tecnológico e Apoio a Inovação***



## Ranking mundial de trabalhos indexados (2013)

Rank	Country	Papers	% of total papers in the world
1	USA	378.625	27,0
2	CHINA	219.281	15,6
3	GERMANY	102.271	7,3
4	ENGLAND	94.660	6,8
5	JAPAN	78.447	5,6
6	FRANCE	70.732	5,0
7	CANADA	62.804	4,5
8	ITALY	61.963	4,4
9	SPAIN	55.096	3,9
10	AUSTRALIA	53.296	3,8
11	INDIA	51.660	3,7
12	SOUTH KOREA	51.051	3,6
<b>13</b>	<b>BRAZIL</b>	<b>38.523</b>	<b>2,7</b>
14	NETHERLANDS	37.570	2,7
15	RUSSIA	29.077	2,1
16	TAIWAN	27.699	2,0
17	SWITZERLAND	27.325	1,9
18	TURKEY	25.510	1,8
19	IRAN	25.415	1,8
20	SWEDEN	24.416	1,7

InCites™, Thomson Reuters (2012).  
Report Created: Jul 4, 2015 Data  
Processed March 18, 2015 Data  
Source: Web of Science

**Prof. Helena Nader**

SB  
PC

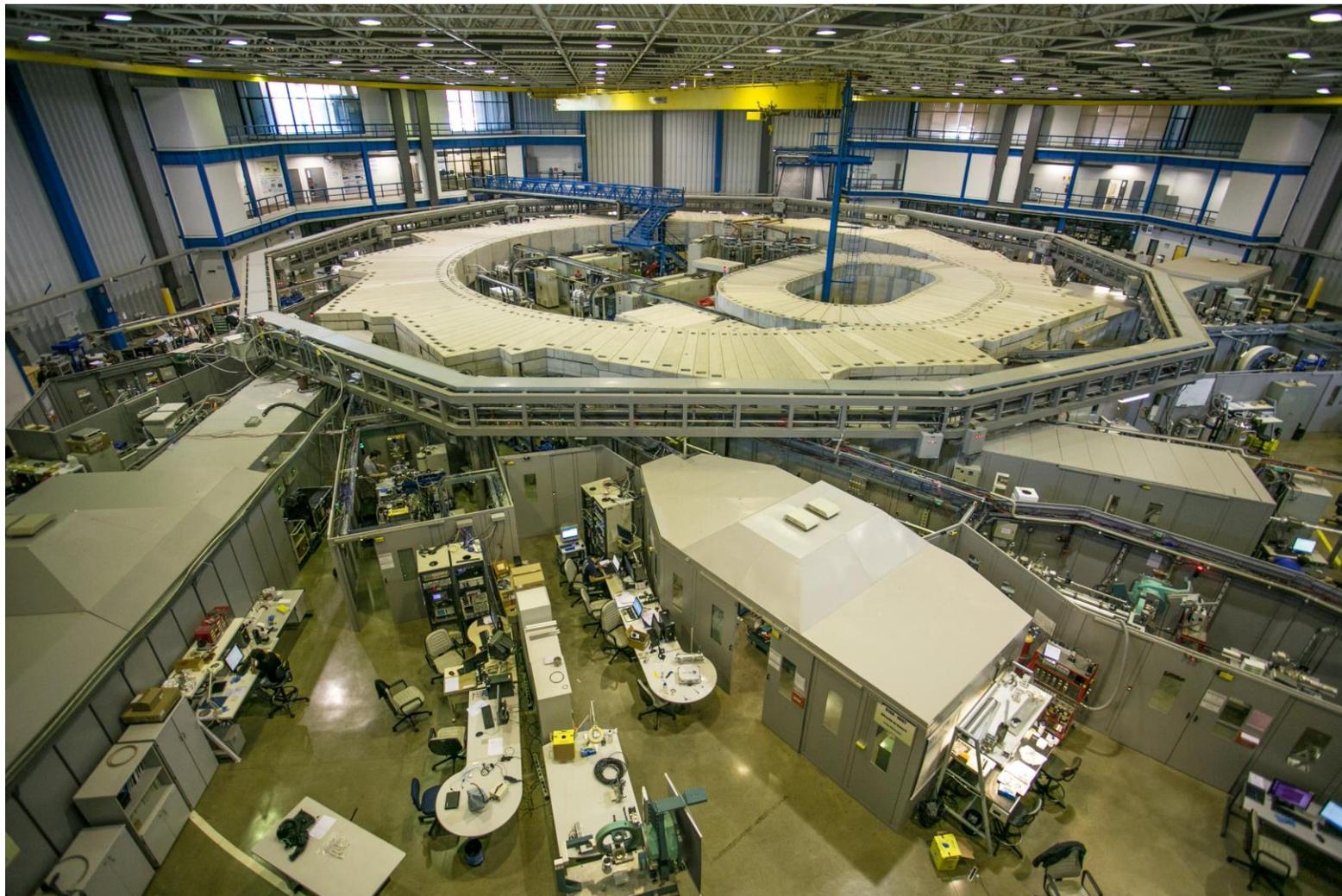
## Global Innovation Index - 2015

POSITION	COUNTRY	% RANK
1	Switzerland	1.00
2	United Kingdom	0.99
3	Sweden	0.99
4	Netherlands	0.98
5	United States of America	0.97
6	Finland	0.96
7	Singapore	0.96
8	Ireland	0.95
9	Luxembourg	0.94
10	Denmark	0.94
11	Hong Kong (China)	0.93
12	Germany	0.92
13	Iceland	0.91
14	Korea, Republic of	0.91
15	New Zealand	0.90
16	Canada	0.89
17	Australia	0.89
18	Austria	0.88
19	Japan	0.87
20	Norway	0.86
21	France	0.86
22	Israel	0.85
29	China	0.8
30	Portugal	0.79
31	Italy	0.79
42	Chile	0.71
51	Costa Rica	0.64
52	Viet Nam	0.64
60	South Africa	0.58
67	Colombia	0.53
68	Uruguay	0.52
69	Oman	0.51
<b>70</b>	<b>Brazil</b>	<b>0.51</b>
71	Peru	0.50
72	Argentina	0.49

Cornell University, INSEAD, and  
WIPO (2015): *The Global  
Innovation Index 2015: The  
Local Dynamics of Innovation*,  
Geneva, Ithaca, and  
Fontainebleau.



Prof. Helena Nader





# Centro Nacional de Pesquisa em Energia e Materiais





**R\$1,8 Bi**

**R\$1,5 Bi**

**É surpreendente  
o que  
conseguimos  
realizar  
quando deixamos de  
lado a questão da  
autoria.**



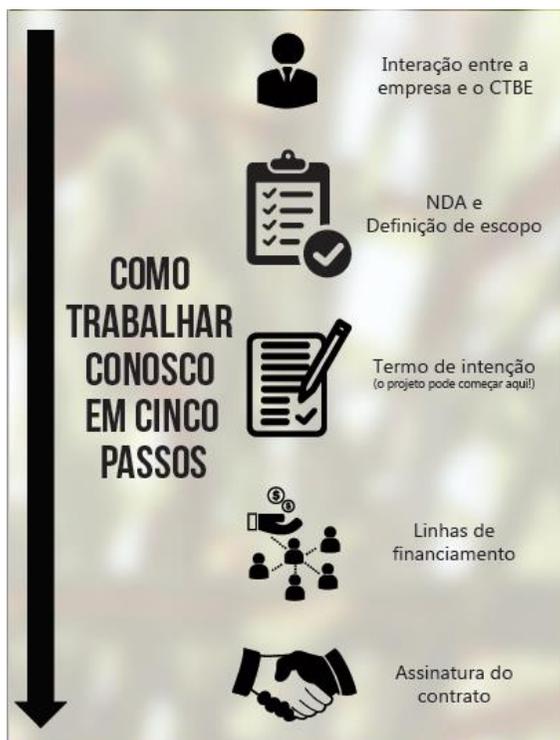


# CTBE





Fazer a **Ponte entre o Conhecimento Científico e o Desenvolvimento Tecnológico** a partir de parcerias com empresas para que essas aumentem sua **Competitividade e a Geração de Riquezas**





Bem Vindos



WECTBE

# Workshop Estratégico CTBE

**ENTENDENDO O RENOVABIO**

**Detalhes Técnicos, Certificações e Calculadora**

18 de agosto | 8h30 às 18h | CTBE