

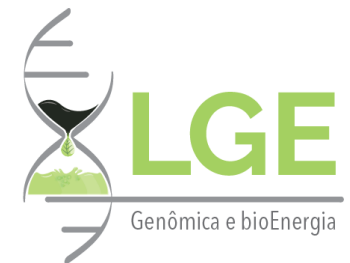


Importar Problemas ou Exportar Soluções: Eis a Questão

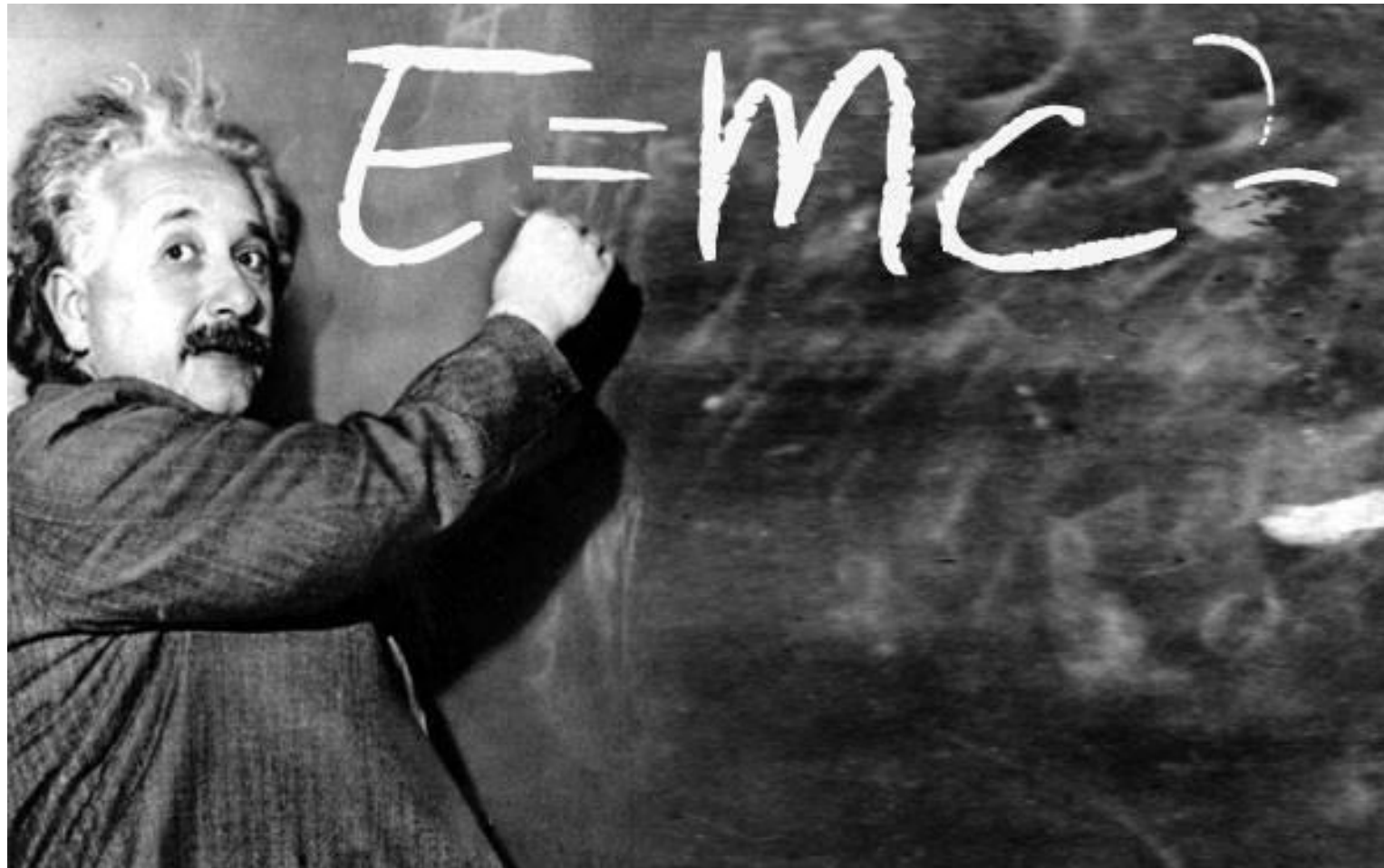
Gonçalo Amarante Guimarães Pereira

30/03/2023

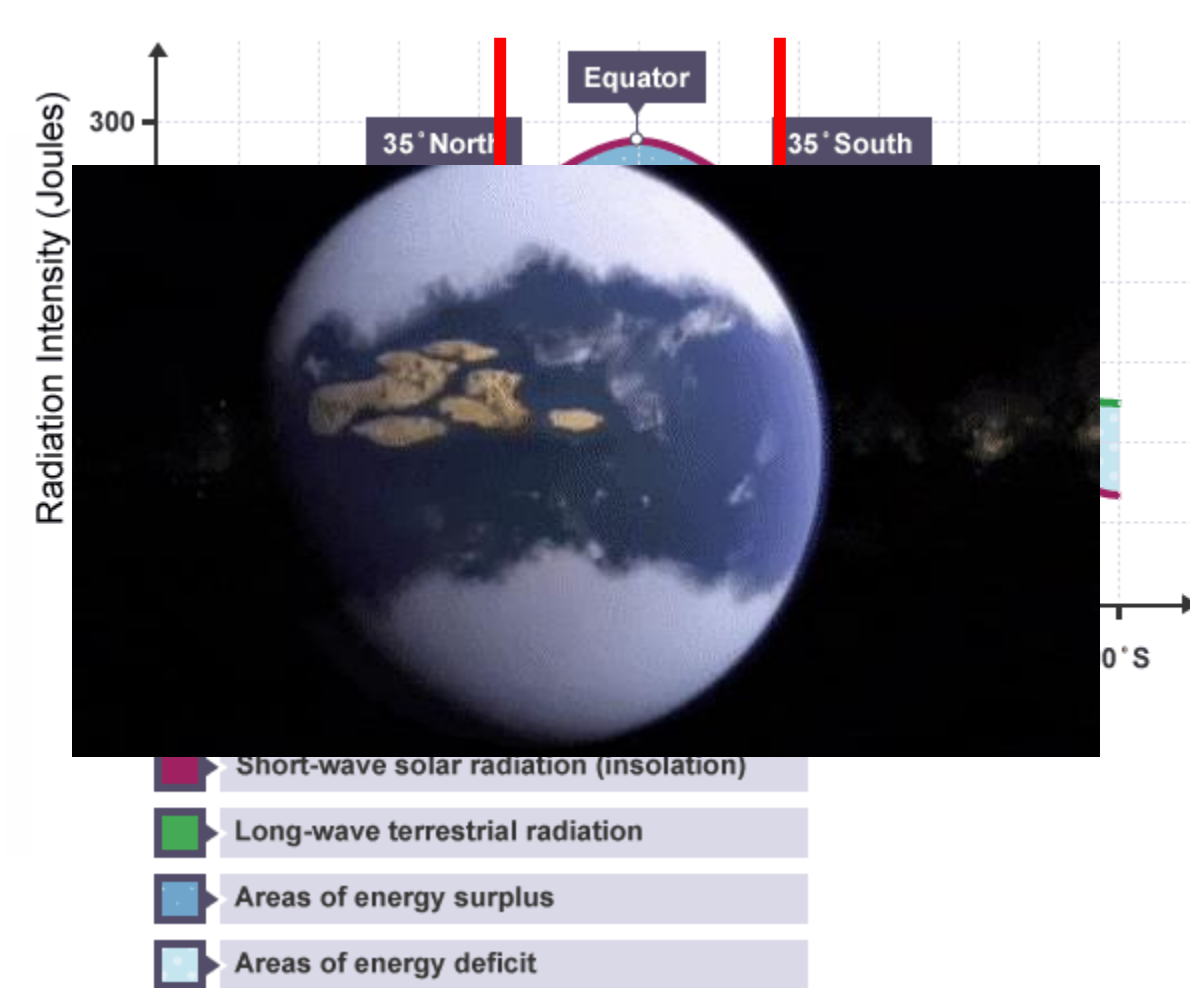
 <https://www.linkedin.com/in/goncalopereiraunicamp/>



Siga a Energia...



Cenário Global de Energia



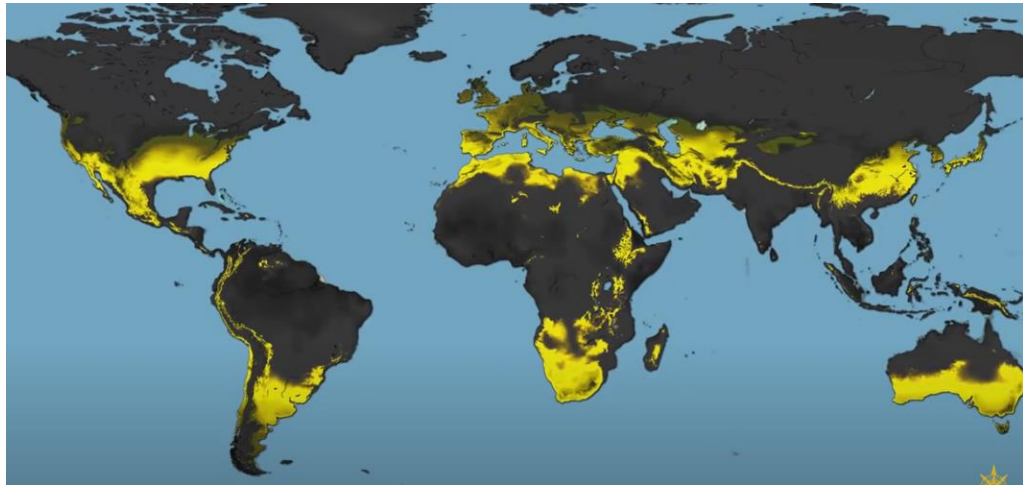
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Por quê o Paradoxo?



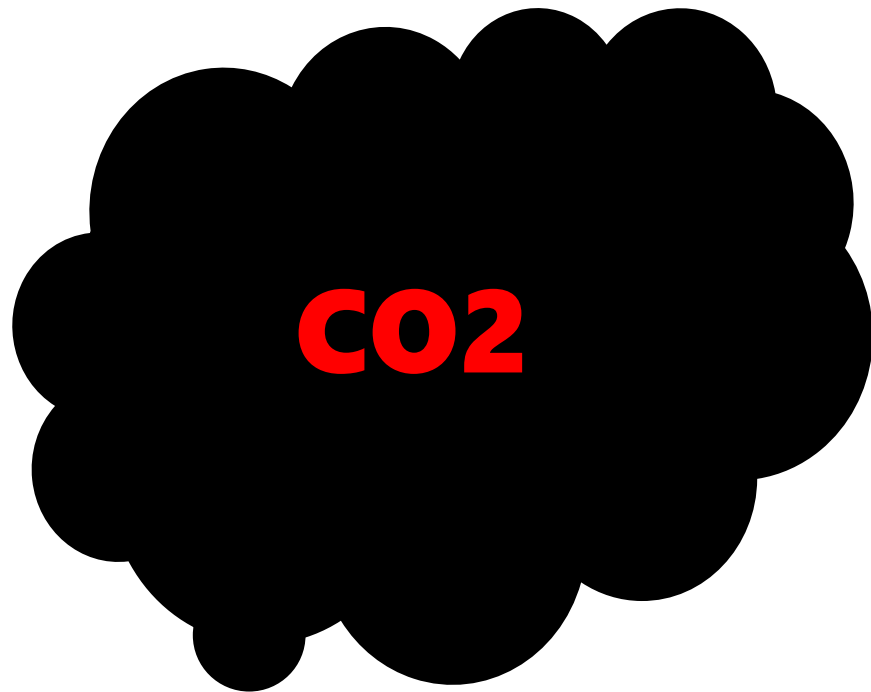
21 – 23 °C



Como Resolver?



Efeito Colateral



CO₂ é O Problema Global

E um Excelente Negócio....

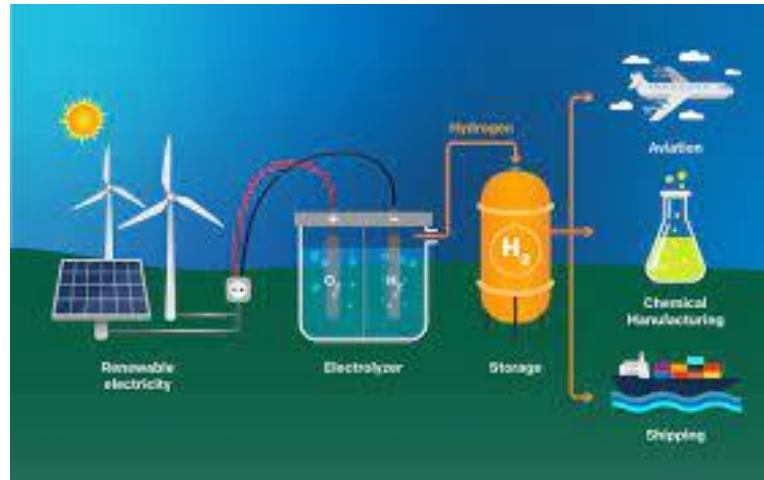
Tese



35%



90%

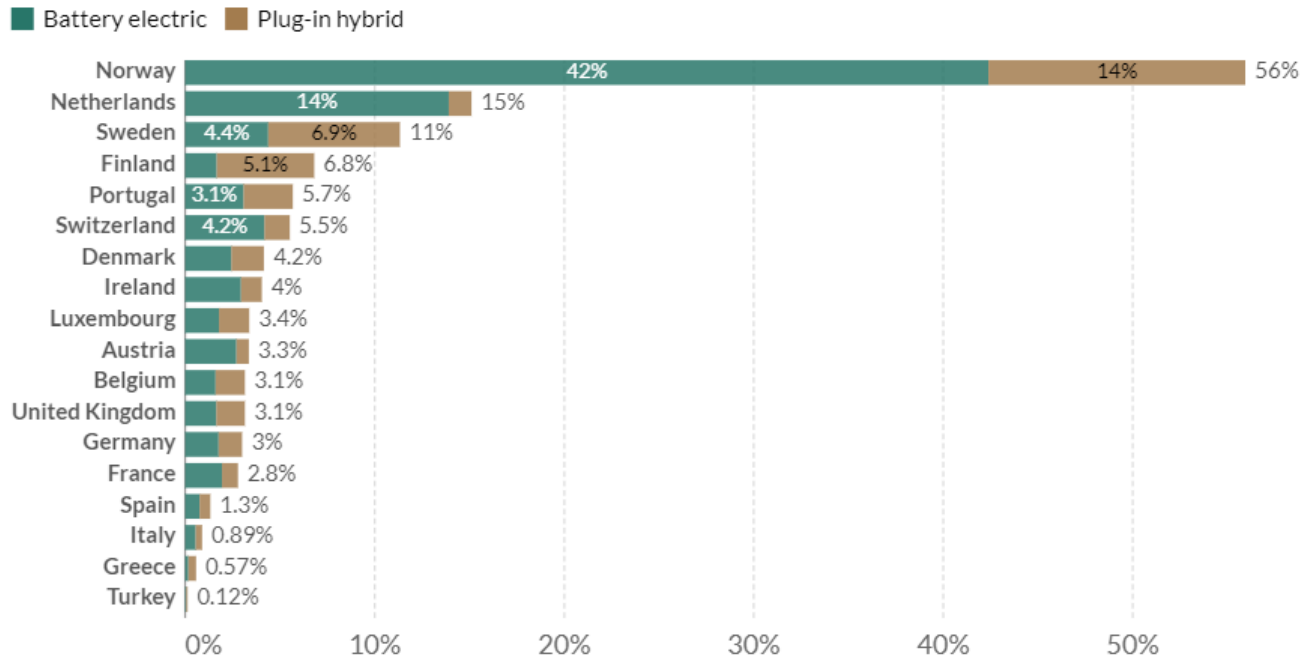


Marketing: A Batalha que (ainda) estamos Perdendo.....

Share of new passenger vehicles that are electric or plug-in hybrid, 2019

Our World in Data

+ Add country



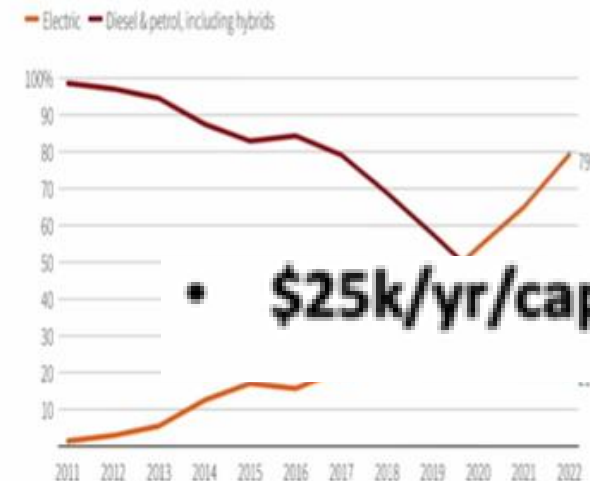
Source: International Council on Clean Transport (ICCT) and European Environment Agency
Note: Based on new passenger vehicle registrations.

OurWorldInData.org/transport • CC BY

Can The World Follow Norway?

Jeg er en Nordmann

Norway New Car Sales



Norway State-of-Play

- 80% new cars EV
- 90% electricity renewable
- 50% primary energy renewable
- 700% of global avg GDP/capita

• \$25k/yr/capita from oil+gas.

Fabricating 1 EV → import ~25 BOE energy

► 2001 ◀ 2019

No Escuro, todos os Gatos são Pardos



FORSCHUNGSERGEBNISSE

*Christoph Buchal, Hans-Dieter Karl und Hans-Werner Sinn**

Kohlemotoren, Windmotoren und Dieselmotoren: Was zeigt die CO₂-Bilanz?

ifo Schnelldienst 8/2019 72. Jahrgang 25. April 2019 43

Emissões de CO₂ são mais altas nos elétricos que nos carros a diesel

Segundo o estudo [apresentado](#) pelo Centro de Estudos Económicos da Alemanha, os veículos elétricos não são uma panaceia para as mudanças climáticas.

Assim, considerando o atual *mix* de energia na Alemanha e a quantidade de energia usada na produção de baterias, as emissões de CO₂ dos carros elétricos a bateria são, na melhor das hipóteses, ligeiramente superiores às de um motor a diesel, e são muito maiores.

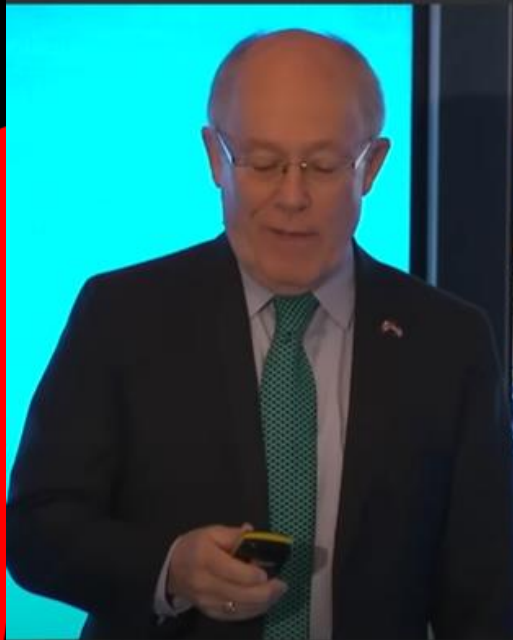
Quem afirma isto são alguns especialistas em energia do Instituto de Pesquisa Económico (Ifo), docentes de física da Universidade de Colónia e da Universidade de Munique.



Classificação dos Países

Flashlight on PassCar/LDV Regional Trends						
Categories/Regions	Europe	China	US	Japan	Brazil	ROW
LCA	Tank to Well CO2	Sincere	Political dependent	Well to Wheel	Well to Wheel	
Electification	Push to BEV	BEV and HEV	BEV, H2, HEV	Most effective	Fashion	
Tendency	ICE Sales stop in 2035	H2 and Methanol ICE	BEV with boundaries	Most effective	Flex and HEV	
Backdoor	CO2 neutral fuel - X and Biofuel	No need	No need	Most effective	Biofuel	
Consequences of electrification	Jobs destruction	Jobs creation	Inflation Reduction Act	Energy Supply	Lobbies	Energy Supply, Price, Infrastructure
Electrification Philosophy	Dogmatic	Pragmatic	Opportunistic	Fact Based	Unnecessary	None - Lobby dependent

Antítese 1 - Metais



Energy Transition Delusion: Inescapable Mineral Realities

Mark P. Mills

*Senior Fellow
Manhattan Institute for Policy
Research*

*Partner
Montrose Lane Ventures*

*Faculty Fellow
Northwestern University
McCormick School of
Engineering*

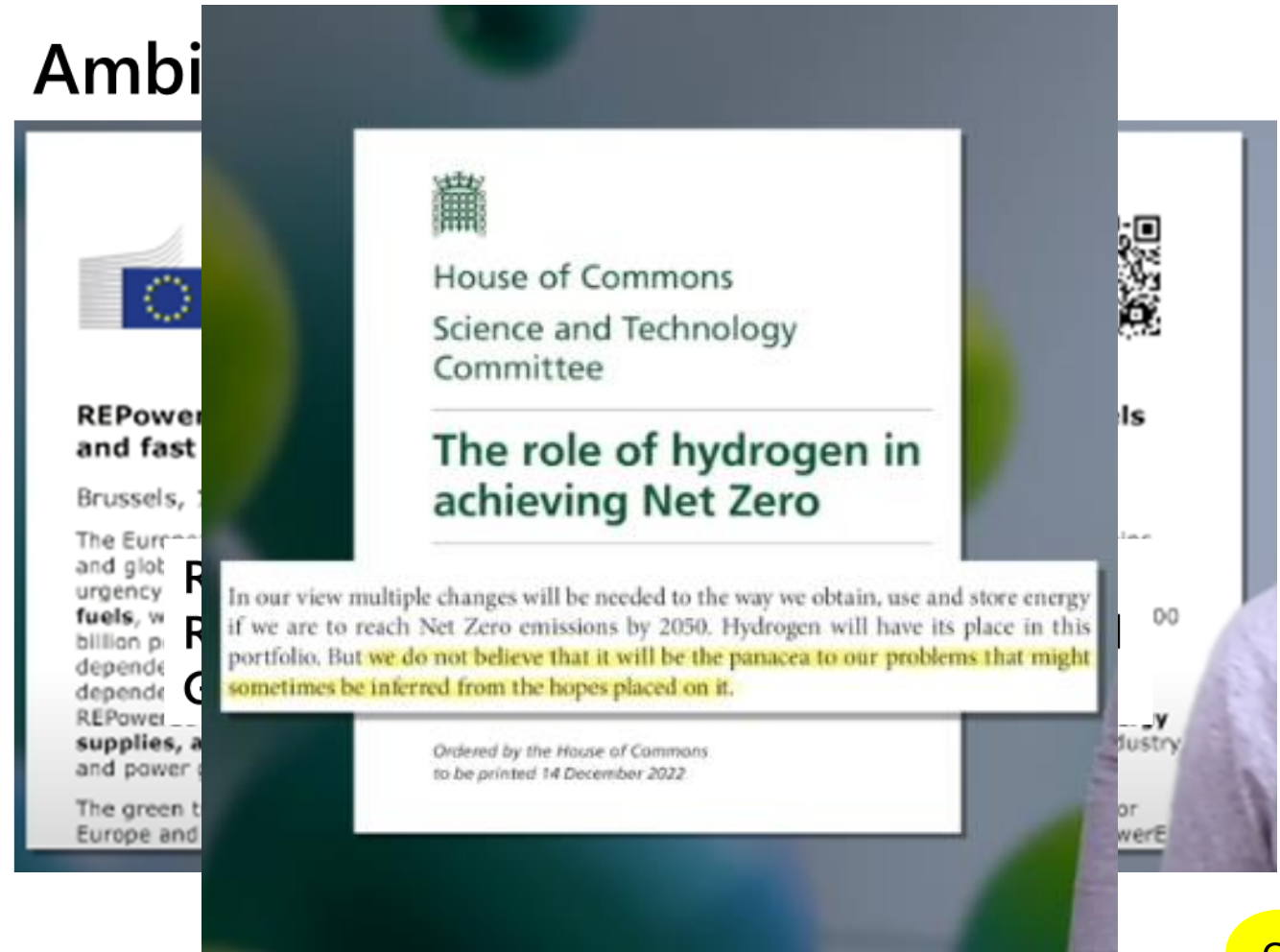
mium
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941

Antítese 2: Hidrogênio



Hydrogen Will Not Save Us. Here's Why.

Ambi



O Estranho Arco-Íris do Hidrogênio

Hydrogen production methods

Naturally occurring, mined

Coal

Methane

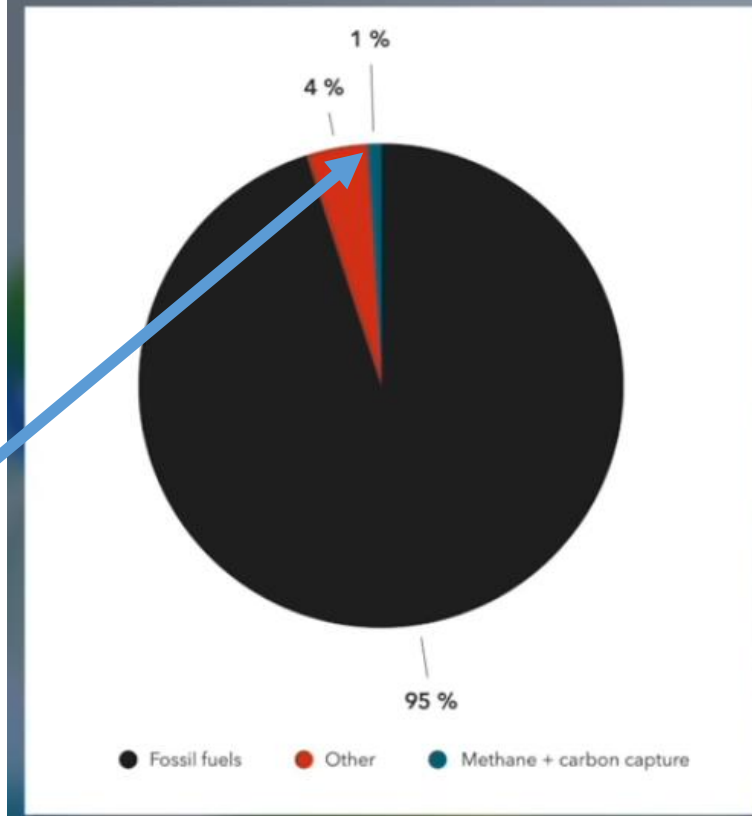
Lignite

Methane + carbon capture

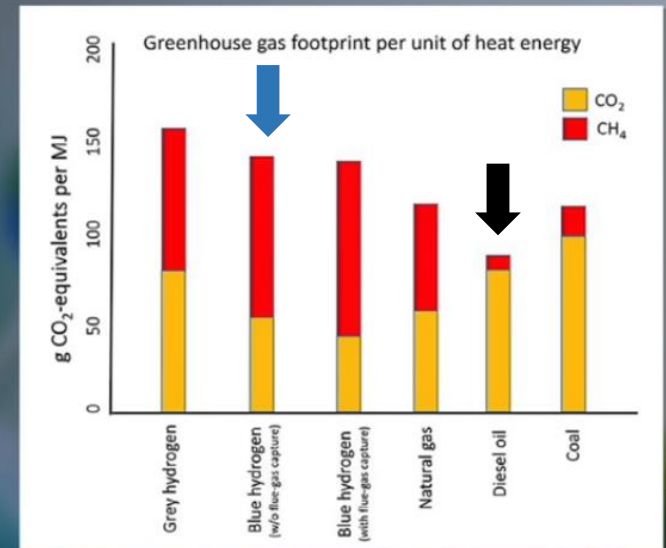
Renewable energy

Nuclear power

Global Hydrogen Production 2019



Grey: 550 g CO₂/kWh
Blue: 486 g CO₂/kWh



Howarth & Jacobson, Energy Sci. Eng. 9, 10, 1676 (2021)

V€RD €???

Energy & Environmental Science

ANALYSIS
View Article Online
View Journal

Check for updates

Cite this: DOI: 10.1039/d1ee01288f

Life-cycle greenhouse gas emissions and net energy assessment of large-scale hydrogen production via electrolysis and solar PV†

Graham Palmer,^{a,*} Ashley Roberts,^b Andrew Hoadley,^c Roger Dargaville^d and Damon Honnery^a

Water electrolysis powered by solar photovoltaics (PV) is one of several promising green hydrogen production technologies. It is critical that the life cycle environmental impacts and net energy balance are assessed to ensure that solar-electrolysis can contribute to the deep decarbonisation of global energy. Life cycle assessment (LCA) and net energy analysis (NEA) are tools for environmental and net energy assessment of such technologies. LCA/NEA studies of renewable hydrogen typically include simplifying assumptions, such as steady state operation under average conditions. Whilst simplifications may be necessary for preliminary analysis, marked differences arising from context specific variances and operation constraints may be overlooked. To address this gap, we conduct an LCA/NEA of a

Palmer^{*} et al, Energy Sci. Eng. 14, 10, 5113 (2021)

Methane

Process	SMR with CCS	SMR without CCS	Standard fossil fuels	Natural gas	Coal	Hydrogen cost (kg)
	180.7	180.7	180.7	180.7	180.7	2.08
	545.6	545.6	545.6	545.6	545.6	1.63

Water Electrolysis

\$\$\$

Water Electrolysis

\$\$\$

Water Electrolysis

\$\$\$

Pyrolysis

\$\$

H₂ PRODUCTION COLORS

Carbon Capture & Storage

\$\$

Steam Reforming

\$

Gasification

\$

Gasification

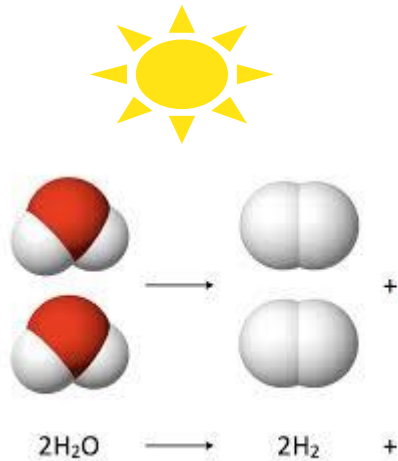
\$

Naturally occurring

Process	Nuclear electrolysis	Nuclear thermolysis	Solar thermolysis	Photo-electrolysis
Water	—	39.6–2107.6	5.7–16	—
Water	4.15–7.00	2.17–2.63	7.98–8.40	10.36

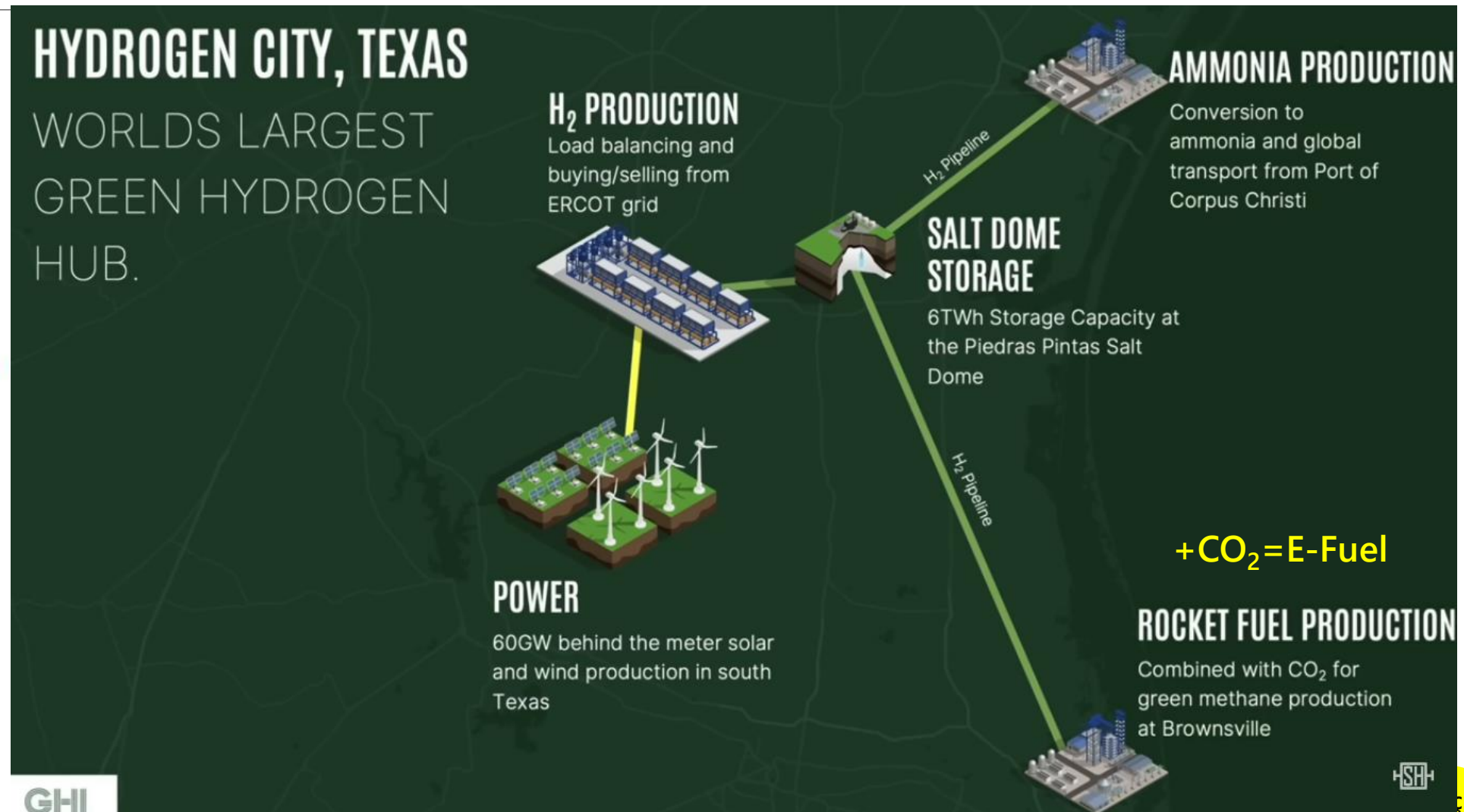
Kayfeci et al, in "Solar Hydrogen Production," Academic Press (2019)

(Foto)Síntese



HYDROGEN CITY, TEXAS

WORLD'S LARGEST
GREEN HYDROGEN
HUB.



Choque de Realidade

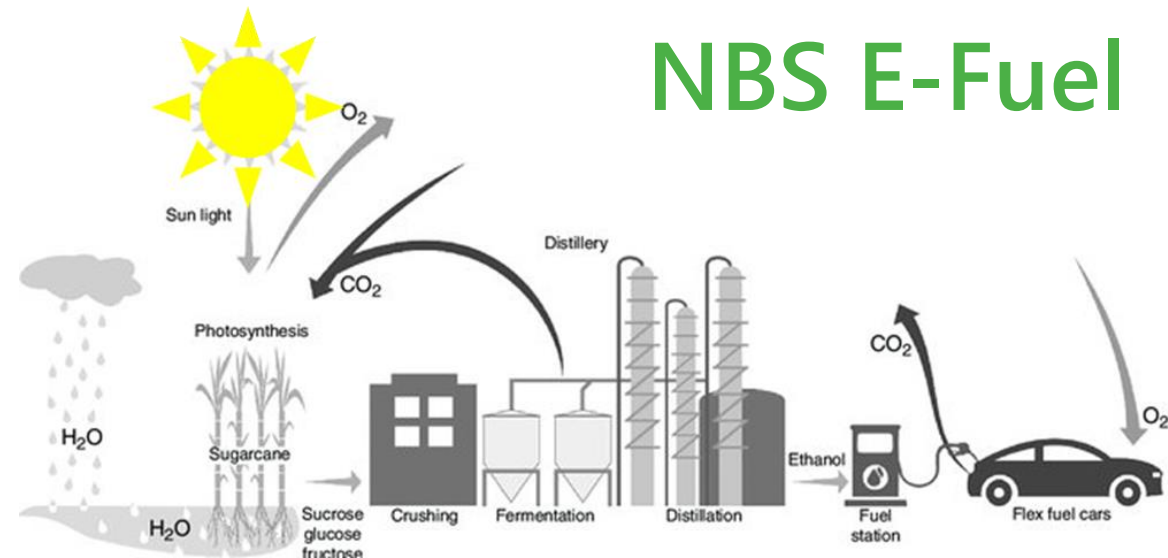


Exclusive: EU drafts plan to allow e-fuel combustion engine cars

By Markus Wacket



BERLIN/BRUSSELS, March 21 (Reuters) - The European Commission has drafted a plan to allow sales of new cars with internal combustion engines after 2035 if they run only on climate neutral e-fuels,

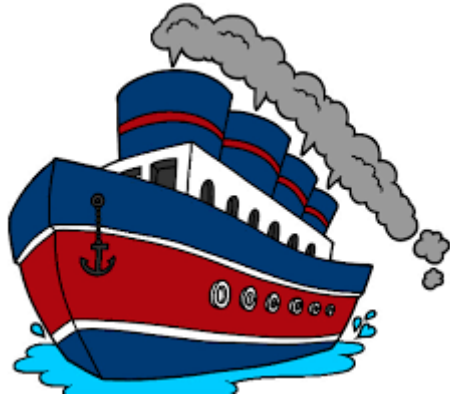


Chega a ser Infantil....



SAF

HEFA
ATJ



Bunker Fuel

Methanol
Ammonia



Green Diesel

HVO
Biodiesel
DME
Methane



Light

Ethanol
Ethanol
Ethanol
.....

Exemplo do SAF

- Market Perspective: Air Bus reported that there are approximately 15.750 aircraft in the world (2022), and it is projected to reach 32.000 by 2028;
- Price Challenge: Nowadays the *fuel consumption is around 3-4 liters/(passenger. 100km)*, which makes fuel the *1° cost for an airline (30% of total costs)*;
- Safety and Entrance Barrier: To be approved by international standards (*ASTM D4054 – Qualification Procedure*);
 - *ASTM qualification is a long and costly process*;
 - *It requires a large quantity of jet fuel, from about 38 to 380 m³, several years, e.g. 2 to more than 5 years, with a cost that can overpass US\$10 million.*
 - *The construction, and operation for a few years, of a big size pilot plant or demo plant, to demonstrate the process and to be able to scale it up, with costs typically in the range of US\$ 100 to a few hundred millions.*
- The SAF cost is not competitive compared to petroleum-based Jet fuel. SAF is 2-2,5 times more expensive than fossil Jet fuel; (ONDE e POR QUÊ?)

O Preço da Biomassa é a Chave



Energy-cane I

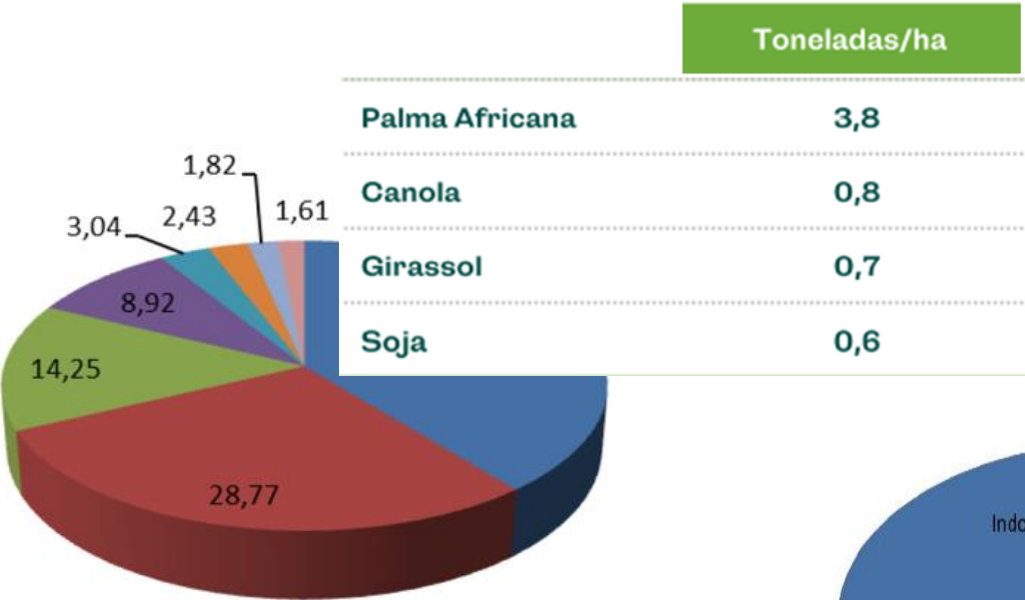
Sugarcane

Energy-cane II



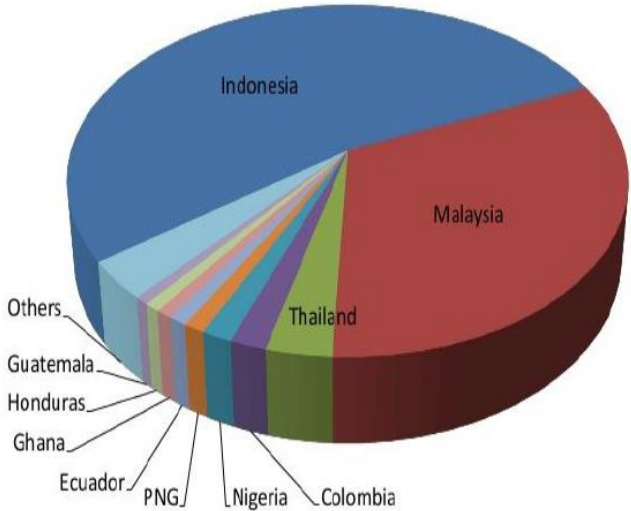
Diversificação

A questão do Bioóleo



■ Oil Palm (CPO PKO)

■ Soybean



Opção Brasileira



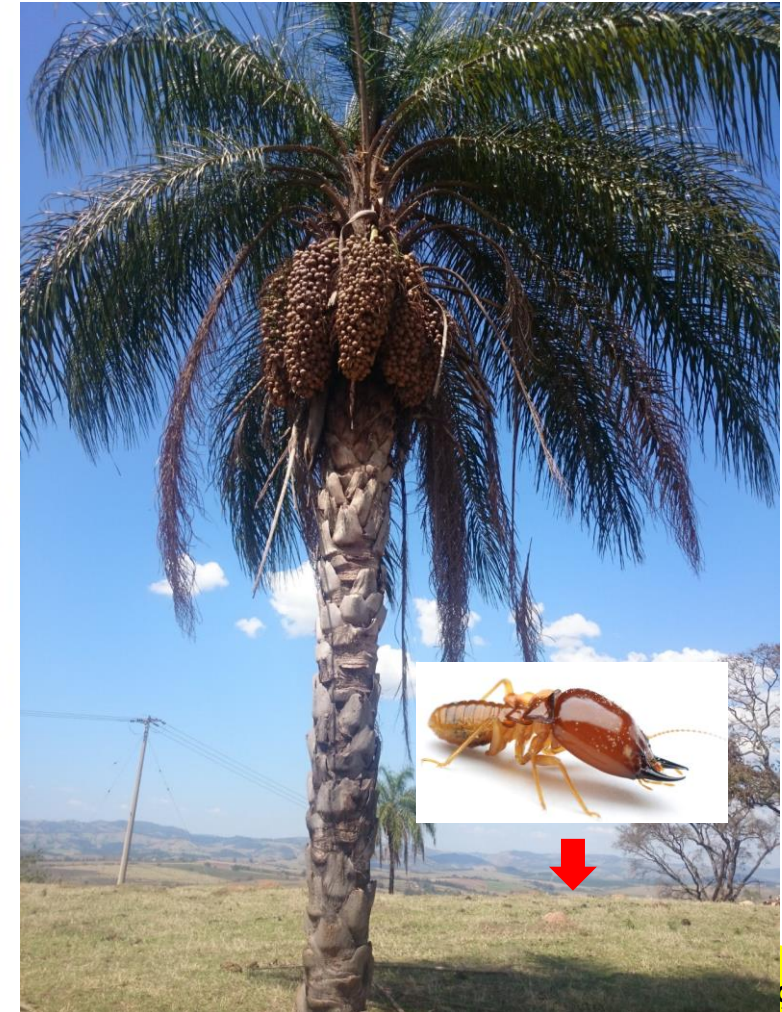
Elaeis guineensis

2000mm



Acrocomia aculeata

1000mm



Ocorrência Natural Maciça



Números - Soleum

	Toneladas/ha	Soja
Macaúba	9,0	15,00x
Palma Africana	3,8	6,33x
Canola	0,8	1,33x
Girassol	0,7	1,17x
Soja	0,6	

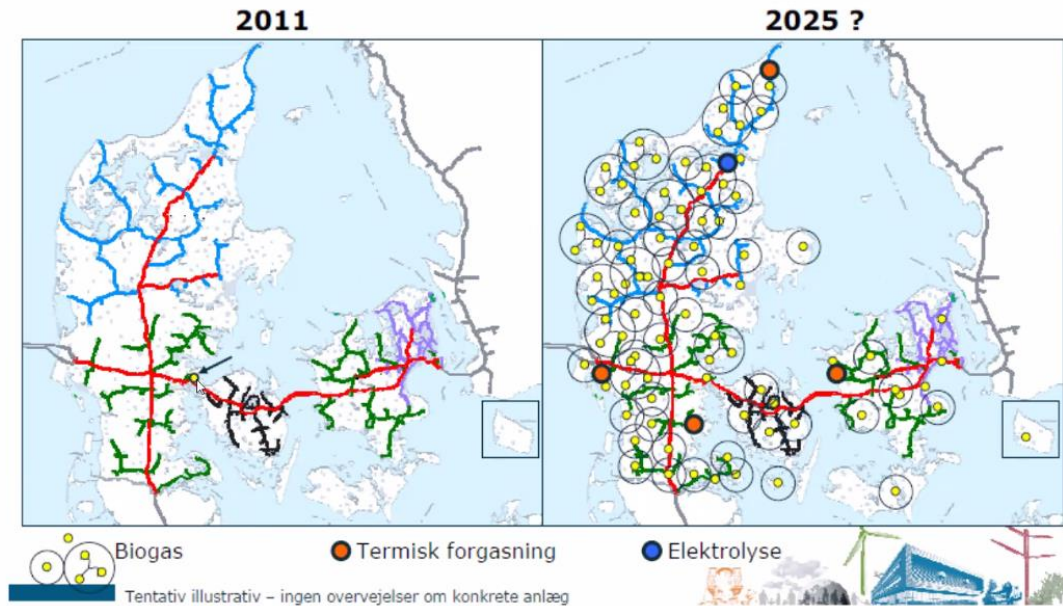
Biomass no Brasil	KM²	%
Amazônia	4.196.943	49,3%
Cerrado	2.036.448	23,9%
Mata Atlântica	1.110.182	13,0%
Caatinga	844.453	9,9%
Pampa	176.496	2,1%
Pantanal	150.355	1,8%
Brasil	8.514.877	100,0%



Área	Km²	%
Brasil	8.514.877	100%
Cerrado	2.036.448	24%
Áreas Degradadas do Cerrado	290,707	14%

Biogás

Future gassector?



Shell conclui aquisição de maior produtor de biometano da Europa

Petroleira adquiriu 100% das ações da Nature Energy Biogas; empresa possui 14 usinas em operação e um pipeline de cerca de 30 novos projetos de fábricas na Europa e na América do Norte

epbr — 27 de fevereiro de 2023

Em Biocombustíveis, Internacional, Mercado de gás, Transição energética

AA



Utilizando resíduos agrícolas, industriais e domésticos, a Nature Energy possui 14 usinas em operação (Foto: Divulgação/Nature Energy)

Uma Cana Para o Sertão



Potencial de Produção de Etanol



Journal of Cleaner Production 261 (2020) 121283

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro



Agave: A promising feedstock for biofuels in the water-energy-food-environment (WEFE) nexus

Xiaoyu Yan ^{a, b, *, 1}, Kendall R. Corbin ^{c, 1, 2}, Rachel A. Burton ^c, Daniel K.Y. Tan ^d

^a Environment and Sustainability Institute, University of Exeter, UK
^b College of Engineering, Mathematics and Physical Sciences, University of Exeter, UK
^c ARC Centre of Excellence in Plant Cell Walls, University of Adelaide, Australia
^d The University of Sydney, Sydney Institute of Agriculture, School of Life and Environmental Sciences, Faculty of Science, Sydney, NSW, 2006, Australia



28 MM Ha

Ha	Litros
1	7.414
1.000	7.414.000
1.000.000	7.414.000.000
10.000.000	74.140.000.000

3,3 MM ha – 30 Bi Litros

Sugar Cane



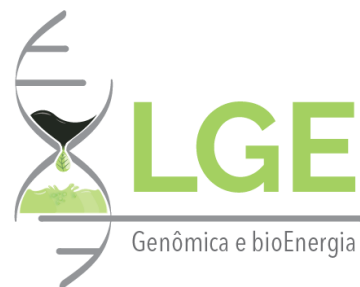
4,5 MM ha – 30 Bi Litros

The Opportunity...





BRAVE Program



Para começar agora....

Sisal	2017	2018	2019	2020	2021 (jan/jun)	2021 (estimated)
Total Exported (US\$ 1,000)	75,973	84,538	85,321	77,999	39,764	79,528
Fiber	31,761	40,032	44,003	37,597	20,110	40,220
Manufactured	44,212	44,506	41,318	40,402	19,654	39,308
Total Exported (ton 1,000)	49,523	49,563	57,988	59,381	30,123	60,246
Fiber	23,224	29,539	36,149	34,432	17,001	34,002
Manufactured	26,299	20,024	21,839	24,949	13,122	26,244
Average (US\$/ton)	1,534	1,706	1,471	1,314	1,320	1,320
Fiber	1,368	1,355	1,217	1,092	1,183	1,183
Manufactured	1,681	2,223	1,892	1,619	1,498	1,498
Production (ton 1,000)	70,7	70,4	82,8	84,8		86,1

4%
qç

Biogas: O Fruto Maduro...

14 BOE/ha

	Fibra seca/há	Peso das Folhas	No de folhas	Pot. Biomet. M ³ /há.ano	Faturamento/há.ano	BOE
HB 11648	4.000	100.000	250.000	2294,67	R\$18.884,00	13,87355467



Combustível Marítimo

TED Ideas worth spreading

WATCH



1,554,121 views | Jim Hagemann Snares • Countdown Summit

Like (46K)

Share

Add

Dreams and details for a decarbonized future

Read transcript

"How much green electricity do we need to fuel all of our 750 vessels with green fuel?" Our fleet today consumes 10 million tonnes of bunker oil. To replace that with green fuel, we estimate that we need 220,000 gigawatt-hours of green electricity. That is the equivalent of 10 percent of the installed base of solar and wind in 2019. And Maersk is 20 percent of the cargo shipping industry. So, to fuel the cargo shipping industry alone would consume 50 percent of the entire installed base of green electricity. And that's just cargo shipping. In other words, we need a dramatic, exponential scale of installations of solar, of wind, of hydrogen production, of green fuel production, to solve this problem. We estimate that the total investment will be in the neighborhood of two trillion dollars, which, granted, is a lot of money. But actually, it is the equivalent of four years of capital expenditure in the oil and gas industry today.

Uma conta de Padeiro...

Transporte de Carga no Mundo segundo Maersk			
Item	Unidade	Número Maersk	Números Mundo
Navios	n	750,00	3.750,00
Consumo Bunker Fuel	t	10.000.000,00	50.000.000,00
Eletricidade equivalente	Gwh	220.000,00	1.100.000,00
Petróleo Equivalente	BOE	129.448.000,00	647.240.000,00
Equiv. Energia Verde Instalada	%	10,00	50,00
Investimento necessário	U\$ Trillion	0,60	3,00
Investimento necessário	Anos de gasto de petróleo	0,80	4,00

Biogás no Sertão	14 BOE/hectare	9.246.285,71	46.231.428,57
-------------------------	-----------------------	---------------------	----------------------

Sertão = 105 MM hectares

Metanol

EVOLUÇÃO DO CONSUMO BRASILEIRO DE METANOL

Metanol - 2905.11.00 (t)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Produção	167.131	115.282	80.230	74.000	40.000	0	0	0	0
Importação	637.870	750.339	851.478	840.826	1.058.319	1.157.994	1.206.176	1.224.279	1.265.014
Exportação	275	3.519	213	114	0	0	0	0	0
Preço FOB (US\$/t)	389	443	458	343	212	315	397	307	378
Cons. <u>Aparente</u>	804.726	862.101	931.495	914.712	1.098.319	1.157.994	1.206.176	1.224.279	1.265.014

Taxa de Crescimento	-9,0%	7,1%	8,0%	-1,8%	20,1%	5,4%	4,2%	1,5%	3,3%
PIB	1,92%	3,00%	0,50%	-3,55%	-3,32%	1,06%	1,12%	1,14%	-4,10%

Média do PIB -0,2% (2012 / 2020)

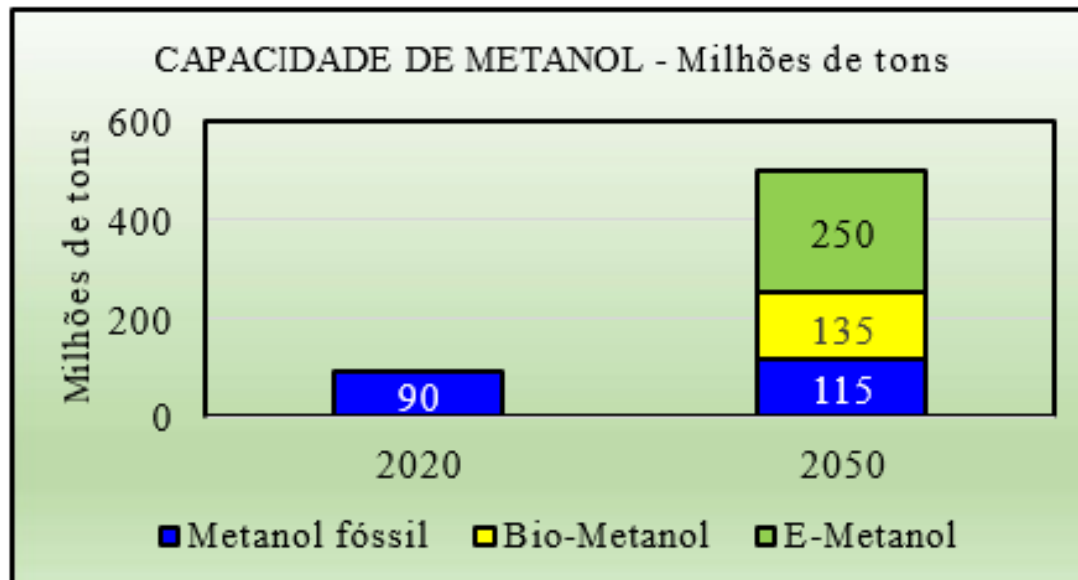
Taxa de Crescimento 20120 / 2020 = 5,8%

De Jan/Agosto de 2021 as importações foram de 902.654 ton, dando para 2021 1.353.981 ton (estimativa)

A um preço médio FOB de 377 US\$/ton com um crescimento de 7,0% sobre 2020
devido principalmente ao Biodiesel e ao Formaldeído

Futuro do Metanol

A IRENA (International Renewable Energy Agency) prevê o seguinte cenário mundial em 2050 para a produção de metanol incluindo o Bio Metanol (ex-Biometano) e o E-Metanol (CO₂ e H₂ Azul)



O grande mercado em estudo é substituição do óleo combustível e o Bunker para os motores dos grandes navios do transporte marítimo.

Organização Marítima Internacional adotou regulamentos para reduzir drasticamente as emissões de SO₂

O limite atual para o teor de enxofre do óleo combustível dos navios é 3,50% devendo ser reduzido a 0,5%

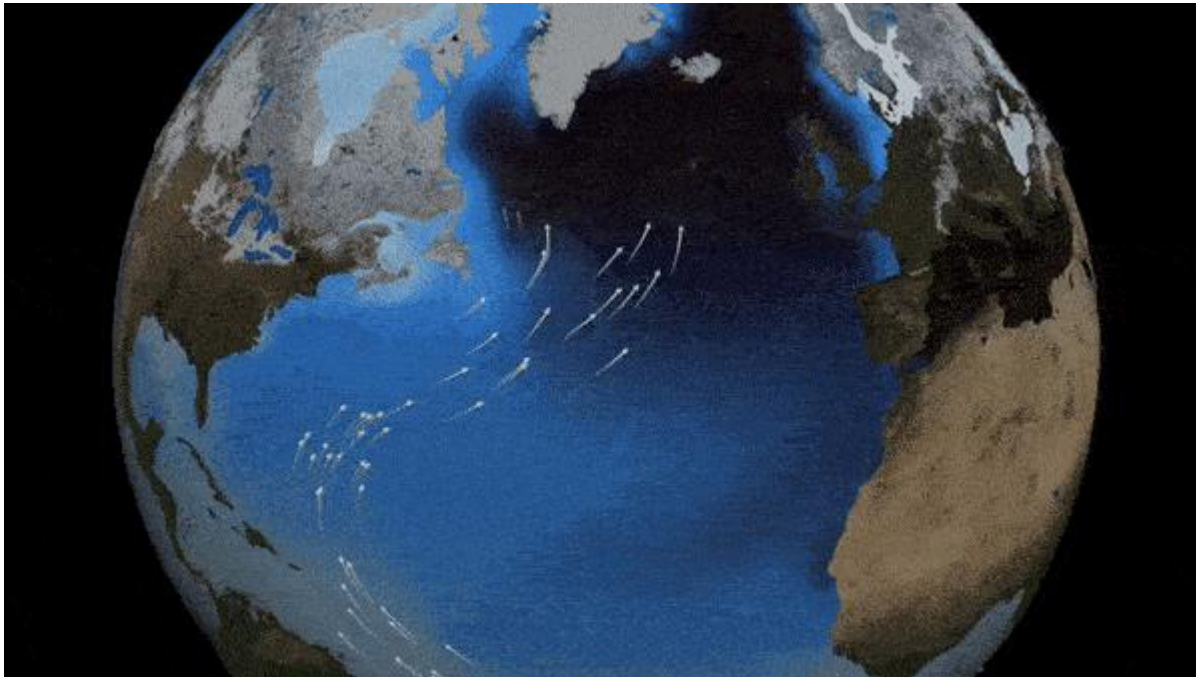
Compensando a Natureza

What's The Best Temperature for Civilization?



Atlas Pro ✓

1,11 mi de inscritos



Forbes

FORBES > FORBES MAGAZINE > FORBES ASIA

Biggest Invention: The Transistor, The Internet....Or The Air-Conditioner? (Hint) None Of The Above

Eamonn Fingleton Contributor

A sharp eye on media bias, official propaganda, and globaloney.

Follow

Jul 5, 2015, 11:21am EDT

When Lee Kuan Yew, the late Singaporean patriarch, was asked to name the twentieth century's most consequential invention, he gave a characteristically counterintuitive answer. Not for him anything so obvious as television, antibiotics, the transistor, or the internet.

Equação da Bioeconomia



Importando Problemas – E sem taxa.....

A Resolução 92 da Camex, que determina exceções à Tarifa Externa Comum do Mercosul, que é de 20%, foi revisada em setembro de 2020 e manteve em 35% a alíquota para importação de veículos a combustão, o imposto para elétricos seguiu zerado e no caso de híbridos ficou em 2% ou 4%, dependendo do tamanho e eficiência ... 23 de fev. de 2023

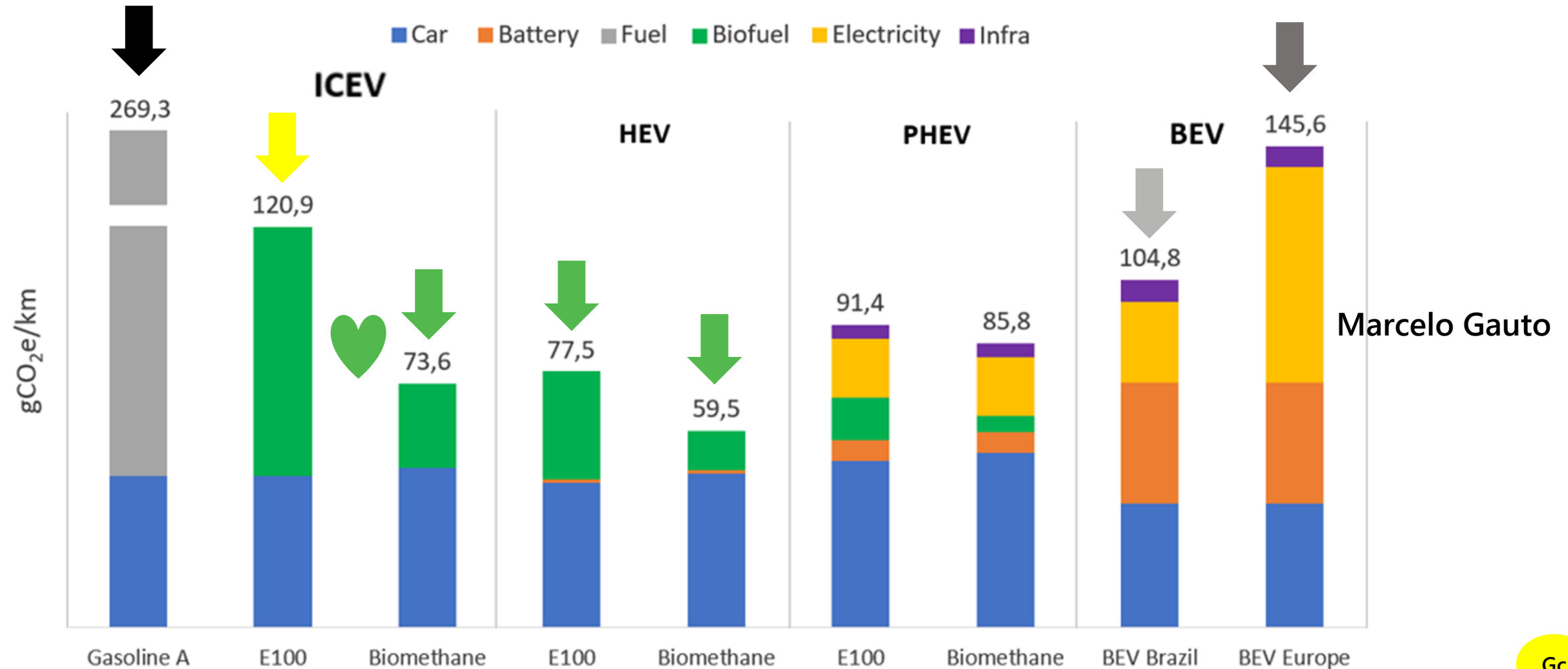


uol.com.br

<https://motor1.uol.com.br> > ... > Observatório Automotivo

Incentivo a carro elétrico importado precisa mirar em ... - Motor1

Performance dos Híbridos com Biocombustíveis



Revolução do Biometano



Solid Oxide Fuel Cell



News

Ceres and Bosch Scale up for Mass Solid Oxide Fuel Cell (SOFC) Production

By FuelCellsWorks | December 7, 2020 | 4 min read (785 words)



1920 x 1080

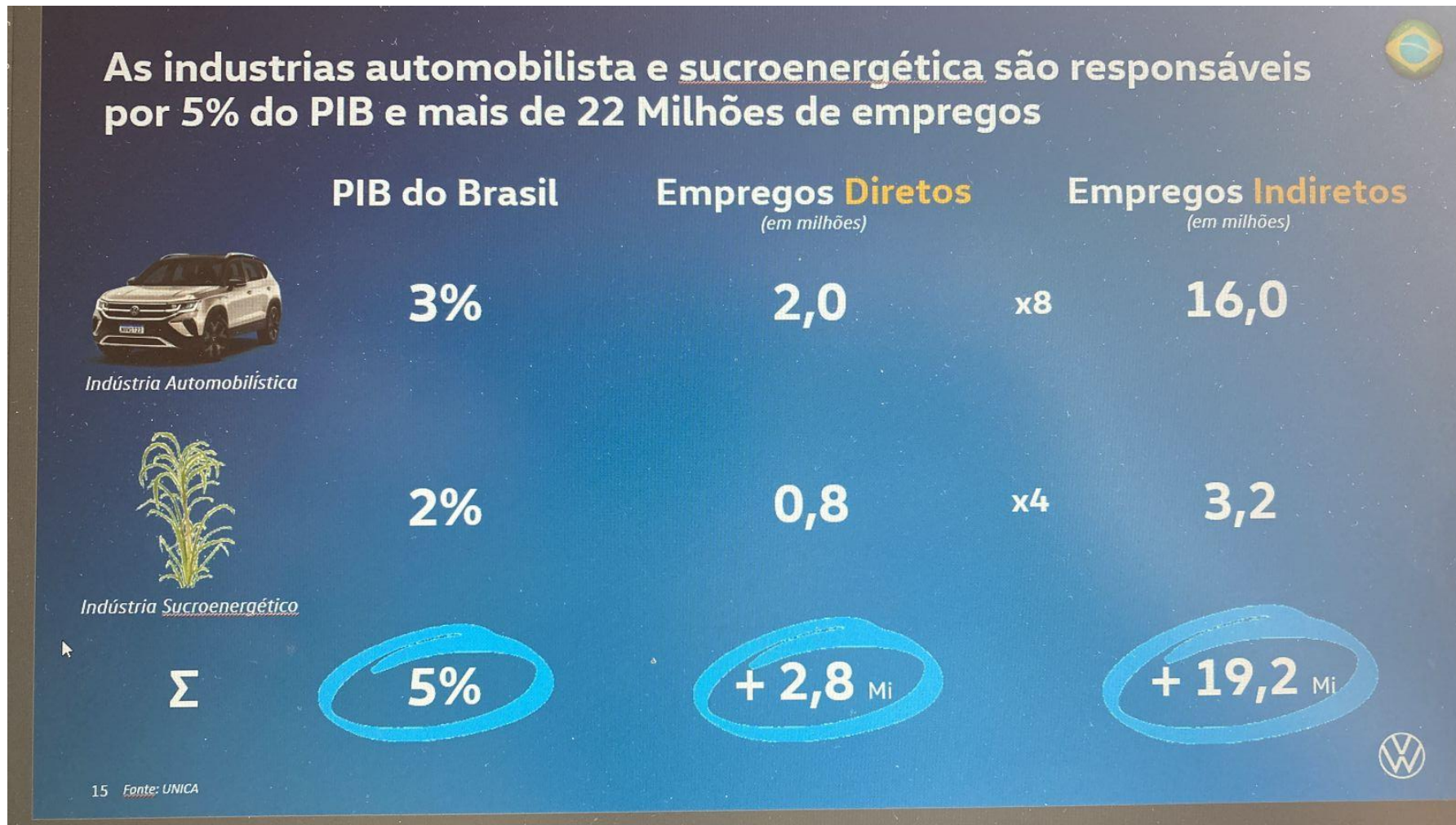
1200 x 1200

SHARE

COPY EMBED HTML

26 km/l

Argumentos



Nada menos do que isso....



 **seminário
bioenergia**

**BRASIL, A HORA DE SER
PROTAGONISTA NA
ENERGIA RENOVÁVEL**

Pablo Di SI



25 DE NOVEMBRO DE 2021 | 13H |
CANAL NO YOUTUBE: BIOENERGIA UNICAMP

Roadmap Tecnológico - Stellantis



Tecnologia desenvolvida no Brasil pode ajudar na transição para veículos movidos por novos combustíveis

Uma peça chamada microrreformador transforma etanol em hidrogênio, que gera eletricidade a partir de uma reação química. Segundo pesquisadores, essa pode ser a forma de abastecer os carros do futuro.

Por **Jornal Nacional**

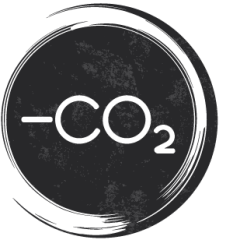
29/03/2023 20h55 · Atualizado há 12 horas



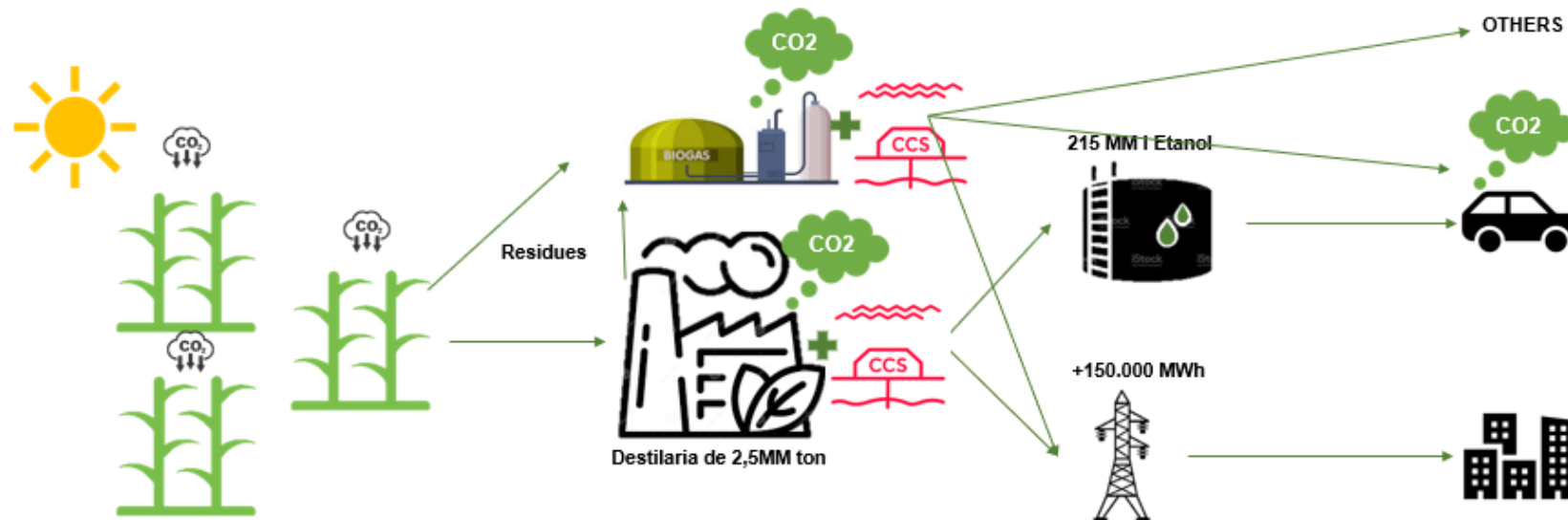
Luz no Fim do Túnel de CO₂



CARBONO
NEGATIVO



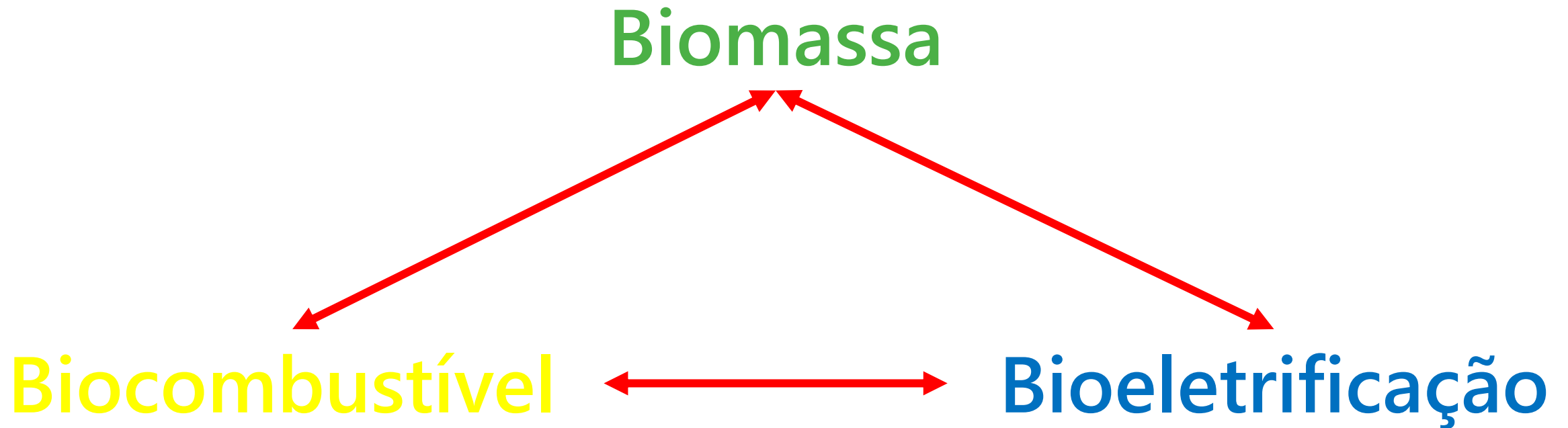
Caminho do CO₂ no setor sucroenergético – Potencial BECCS



Tomaz Pereira

em CO ₂ eq	Cana de açúcar	Industrialização	Consumo	Balanço
Emissões Processo	Captura Fotossíntese - 952k ton	Fermentação : +31kton (Δ124kt*) Cogeração : +98k ton (Δ390kt*) Total : +129k ton	Emissões combustão etanol: +309k ton	-514k ton
Emissões "Manejo"	Emissões Manejo + 121k ton	Emissões Industria: + 6k ton	Emissões transporte e uso: +11k ton	-376 k ton

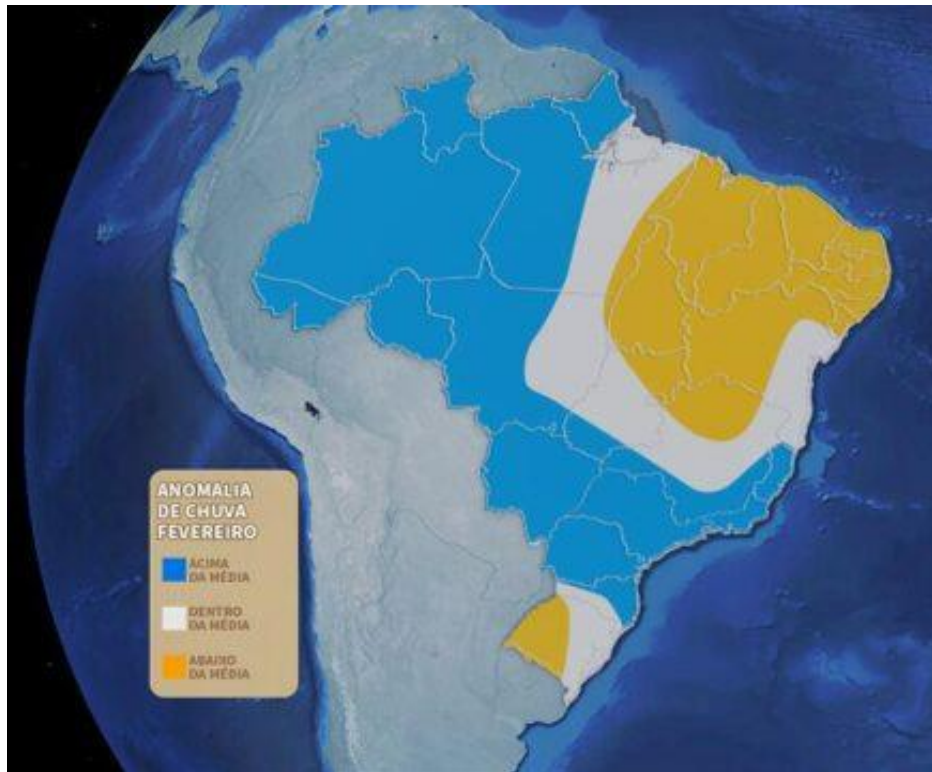
O Triângulo do Desenvolvimento



bioFuel for Food



De um Grande Problema



...a uma Grande Oportunidade



Um Futuro para Todos



Recarregar dados da reunião ↺

CMA

30/03/2023 às 09h – 4ª, Extraordinária

Aberta

Participe

Anexo II, Ala Senador Alexandre Costa, Plenário nº 15

P C N



► Painel de Reunião

Participante(s)

- Sra. Eduarda Zoghbi**
 - Oficial de Desenvolvimento no Rocky Mountain Institute
 - Apresentação
 - Representante de Consultores Especializados da CEPAL no Fórum da Geração Ecológica
- Sr. Guilherme Syrkis**
 - Diretor Executivo da Centro Brasil no Clima (CBC)
 - Representante de Grupo de Trabalho Energia do Fórum da Geração Ecológica
- Sra. Michelle Hallack**
 - Consultora Executiva da Mercados-Aries Internacional
- Sra. Elbia Gannoum**
 - Presidente da Associação Brasileira de Energia Eólica – ABEEólica
 - Apresentação
 - Representante de Grupo de Trabalho Energia do Fórum da Geração Ecológica
- Sr. Gonçalo Pereira**
 - Prof. Titular e Coordenador do Laboratório de Genoma e Bioenergia da Unicamp