carbone 4

jancovici.com

THE SHIFT PROJECT
THE CARBON TRANSITION THINK TANK

Will technology save us from climate change?

MIT Media Lab
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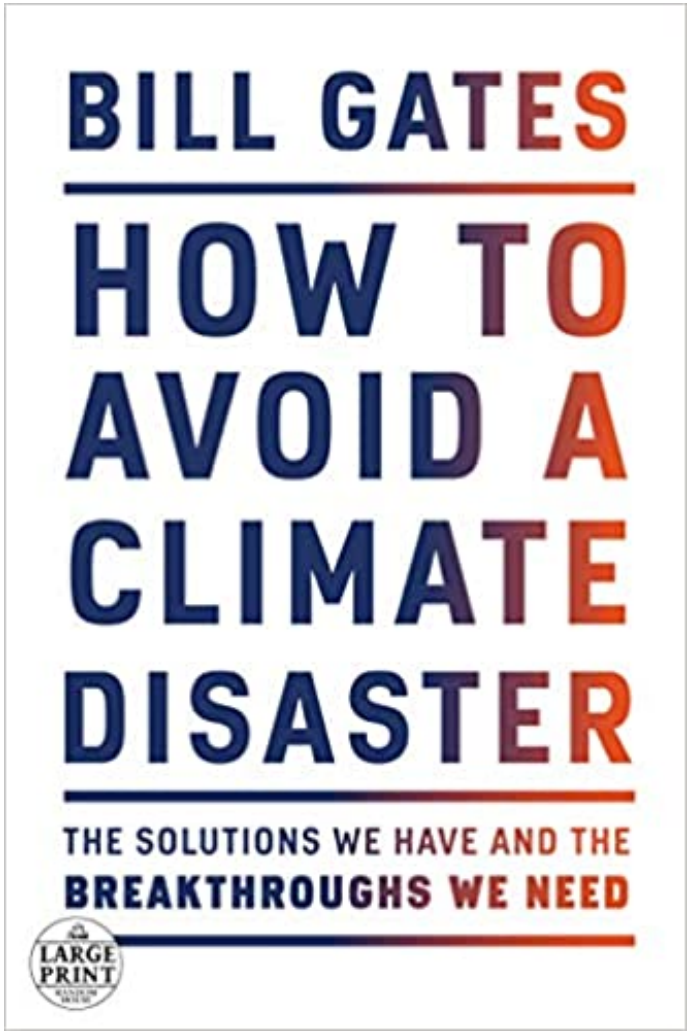
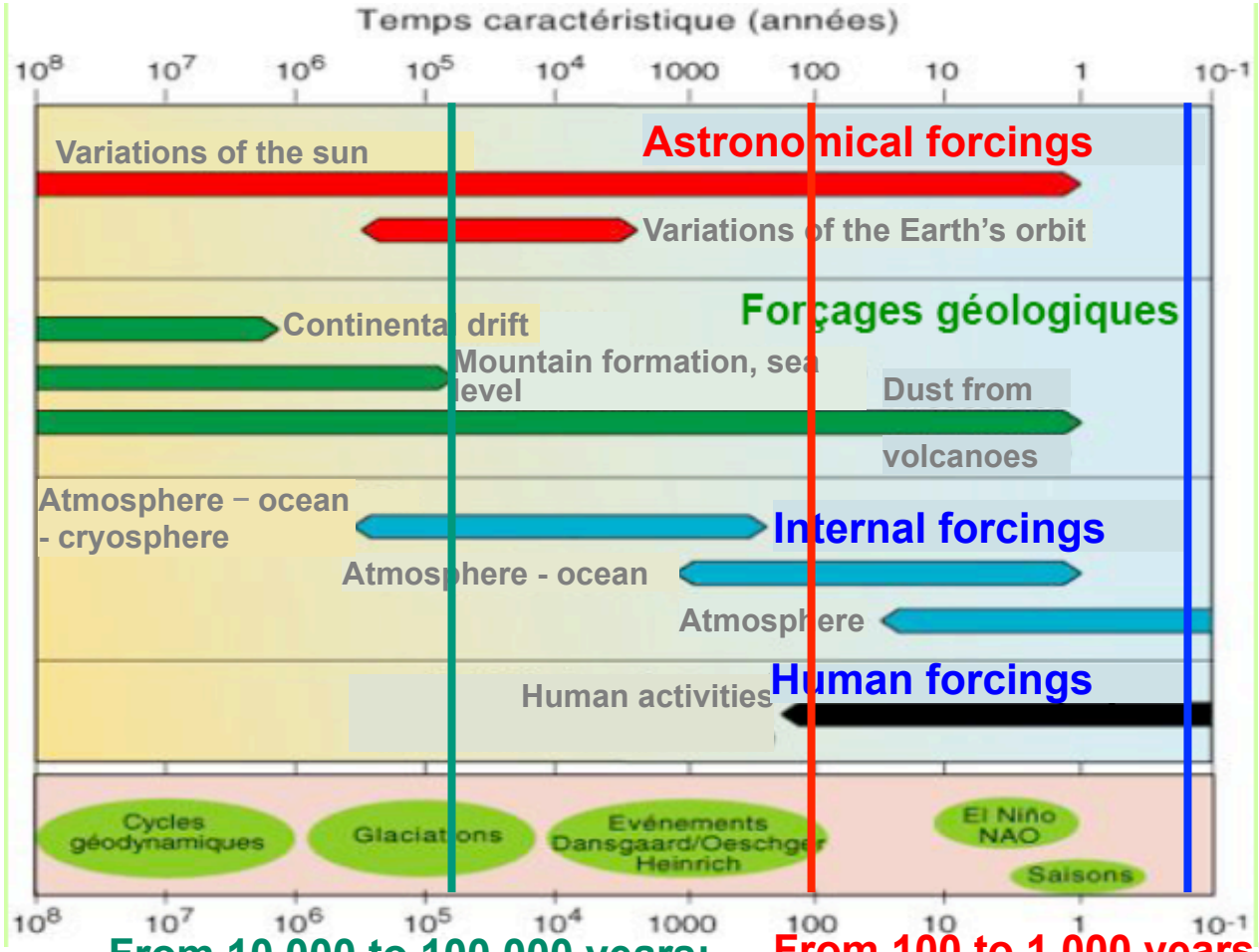
He said yes. Any other question?



Climate change is nothing new under the sun



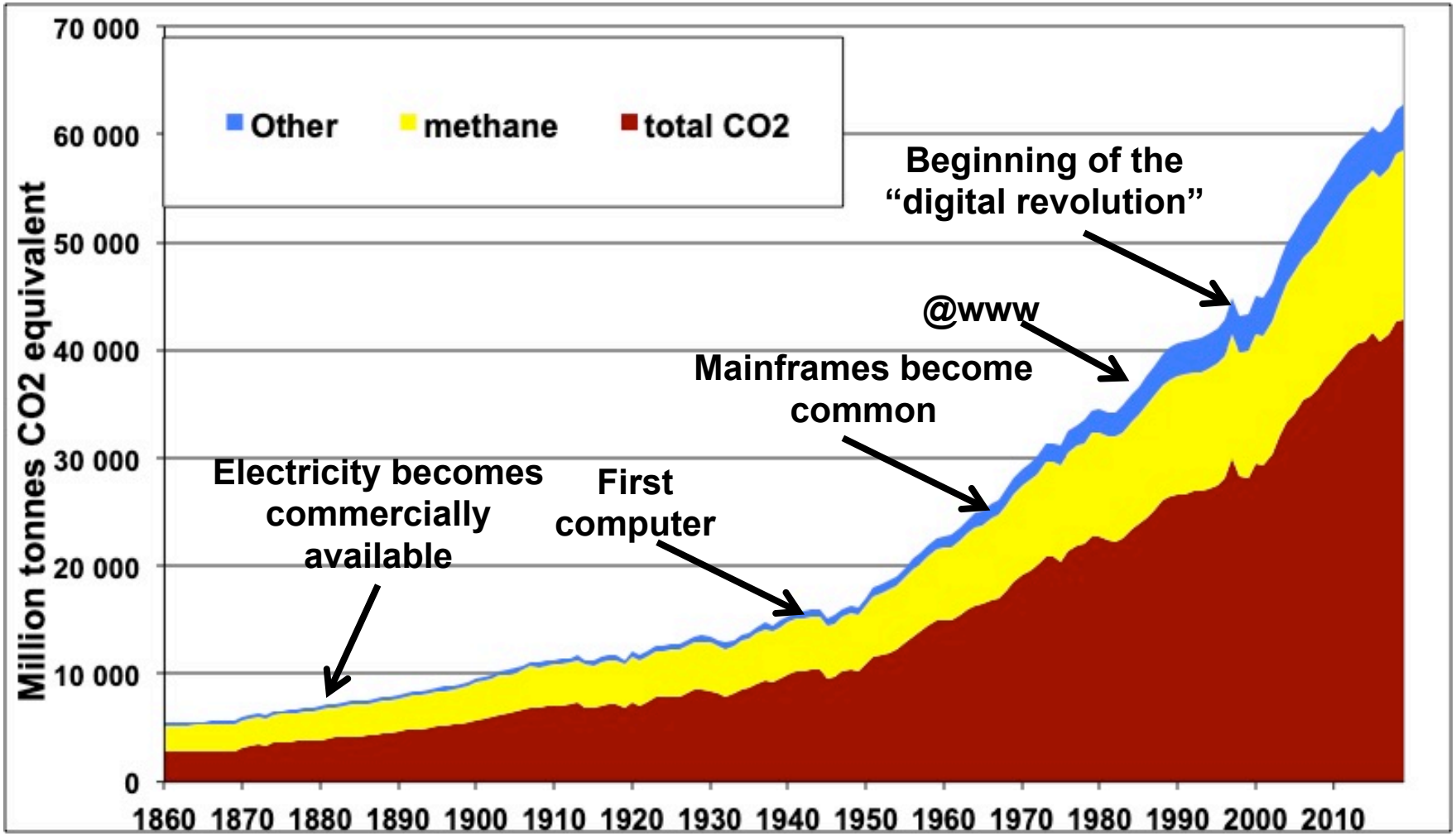
On a weekly time scale: the atmosphere dominates

From 10,000 to 100.000 years: orbital parameters dominate

From 100 to 1,000 years: the ocean dominates

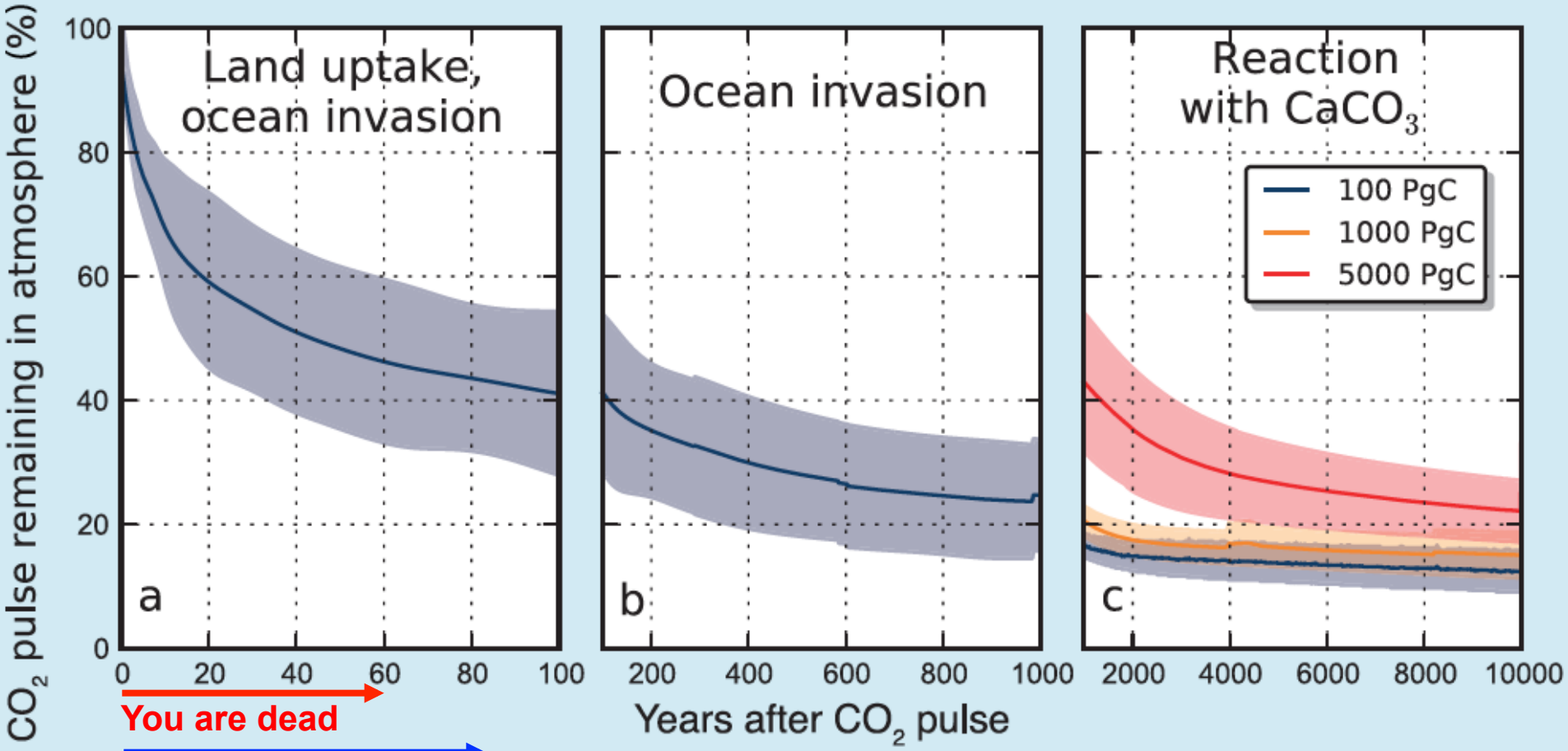
Source: Edouard Bard, Collège de France.

One century and a half of technology improvements, and then what?



Greenhouse gases emissions by gas since 1860. Various data.

Help! Where is the reset button?



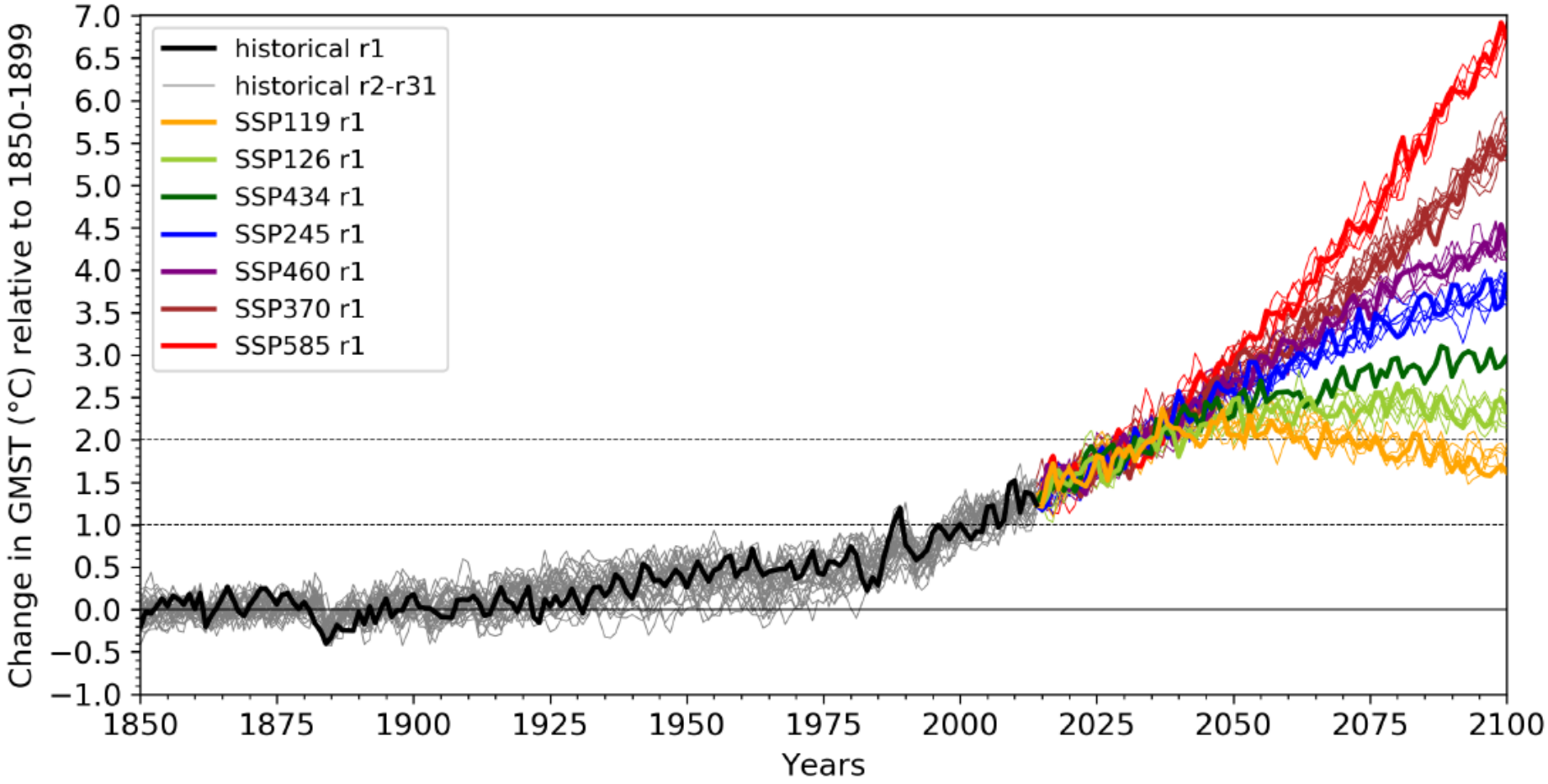
You are dead

Your kids are dead

Any government is history

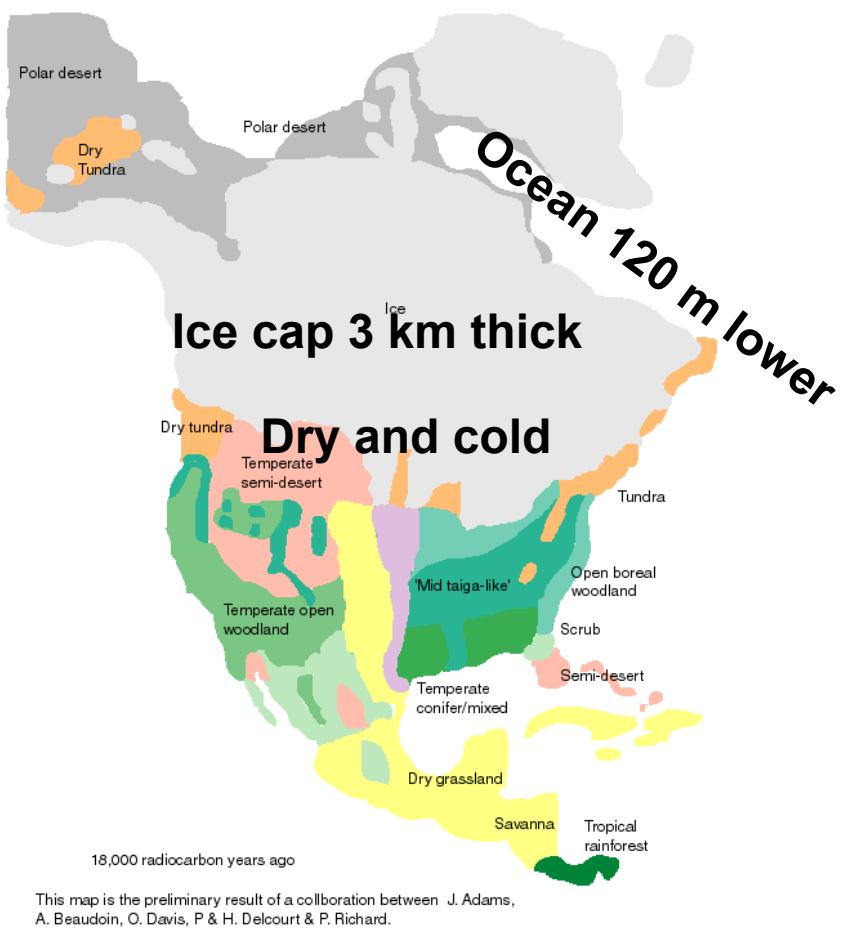
Source IPCC, 5th assessment report

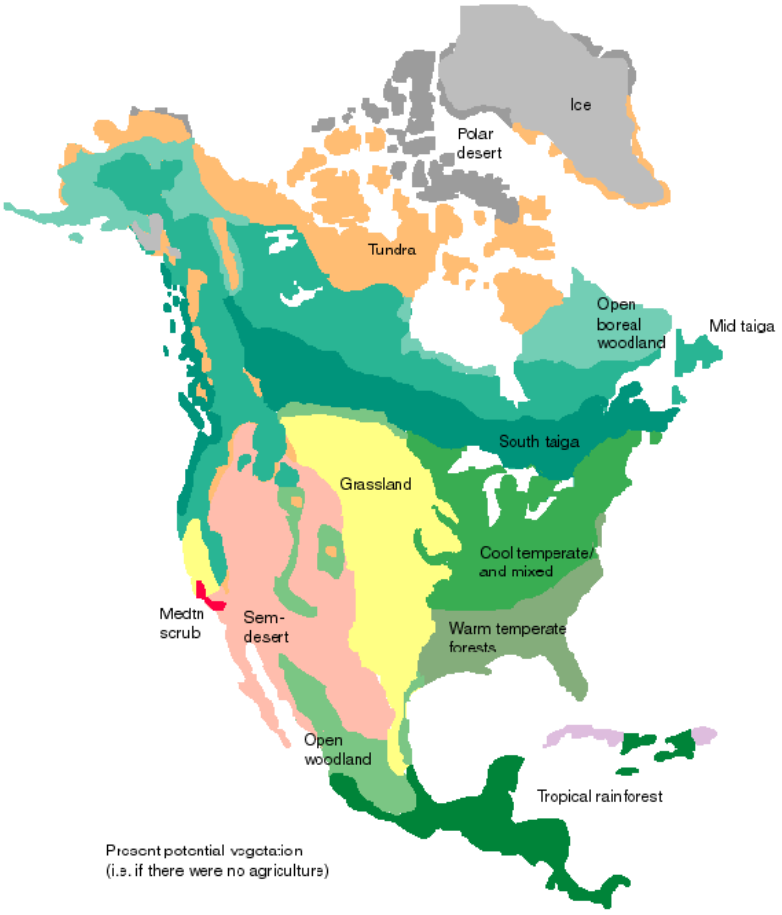
Up, or up?



Climate model IPSL-CM6A-LR
Historical 1850-2014 / scenarios 2015-2100

Fancy triggering a new climate era?

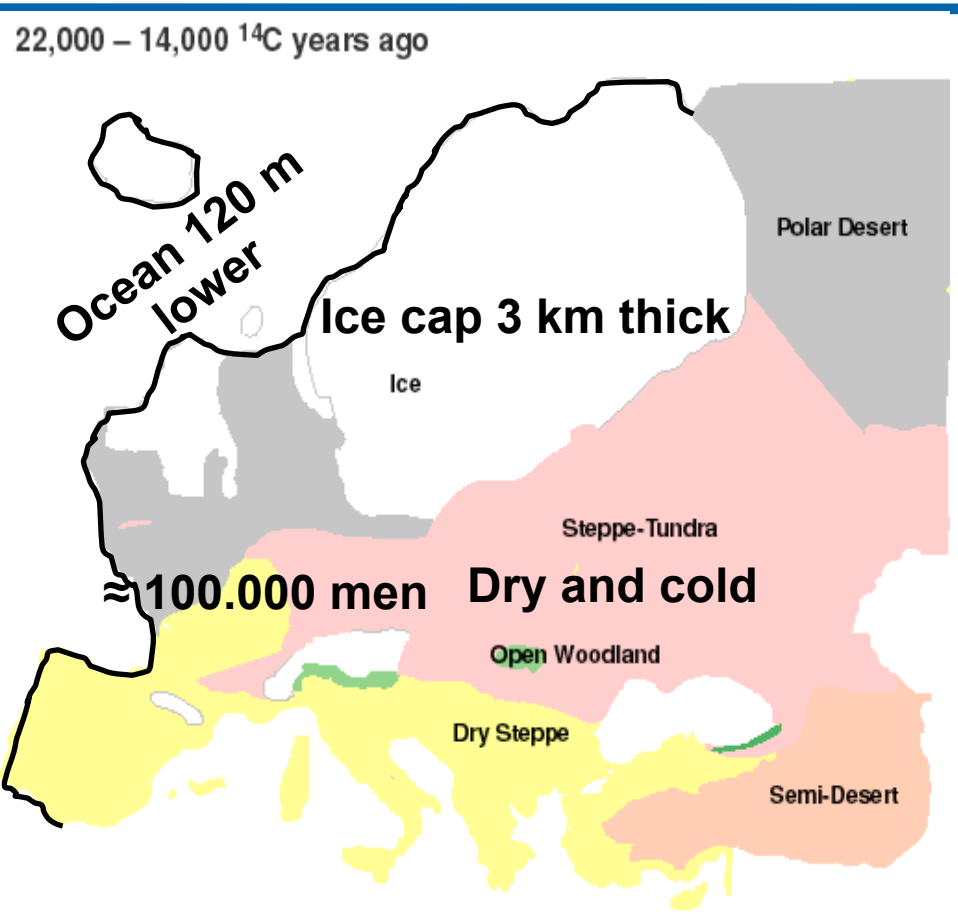


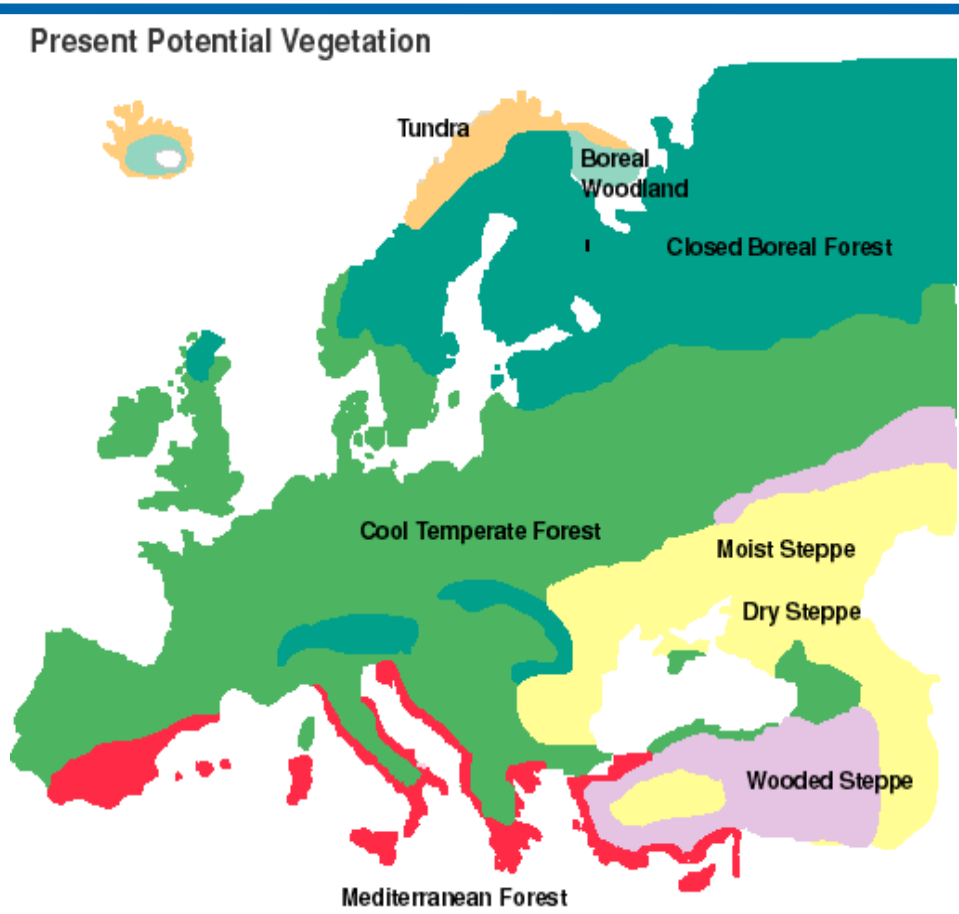


+5°C !!!

Source: Quaternary Environments Network

Fancy triggering a new climate era?

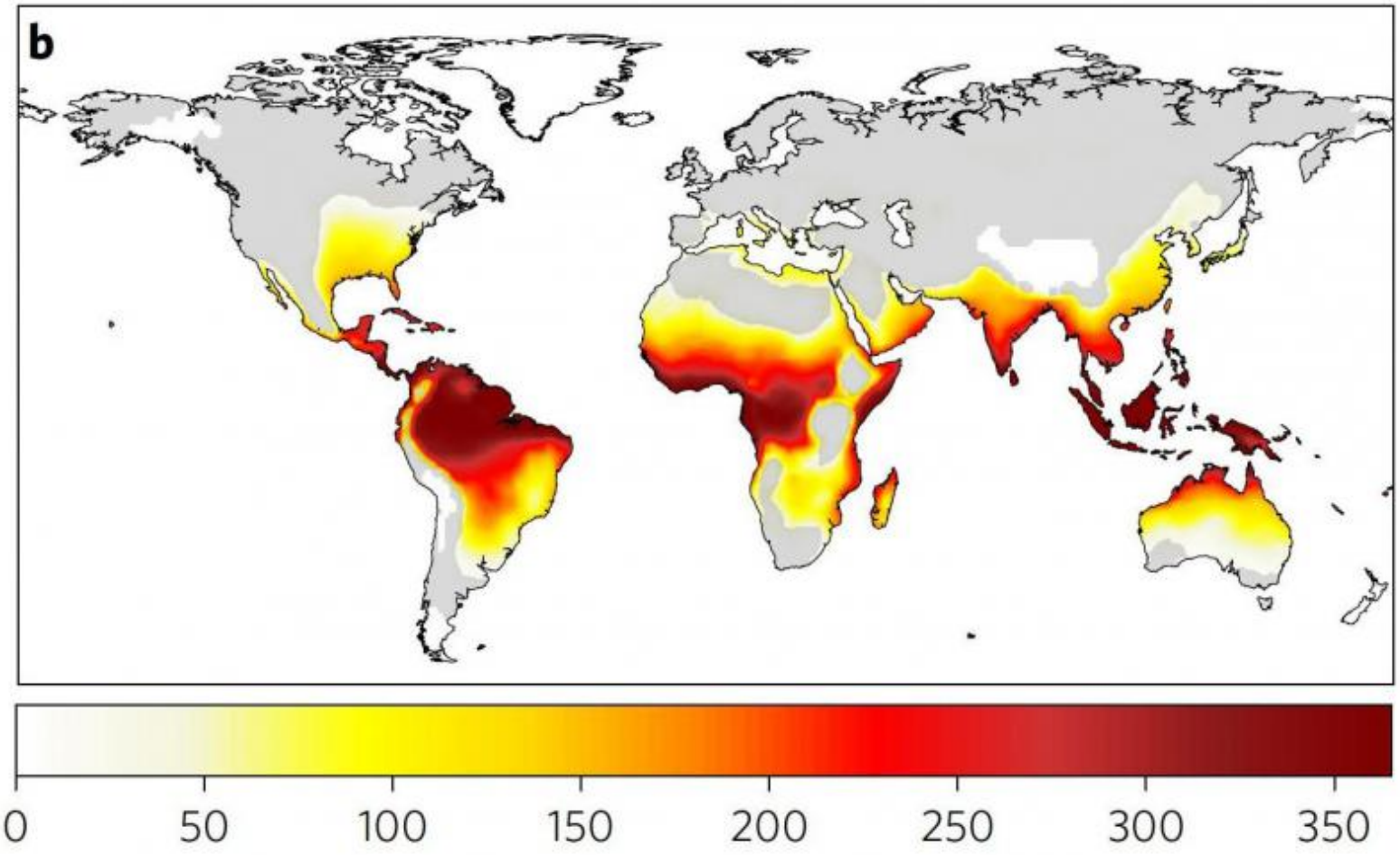




+5°C !!!

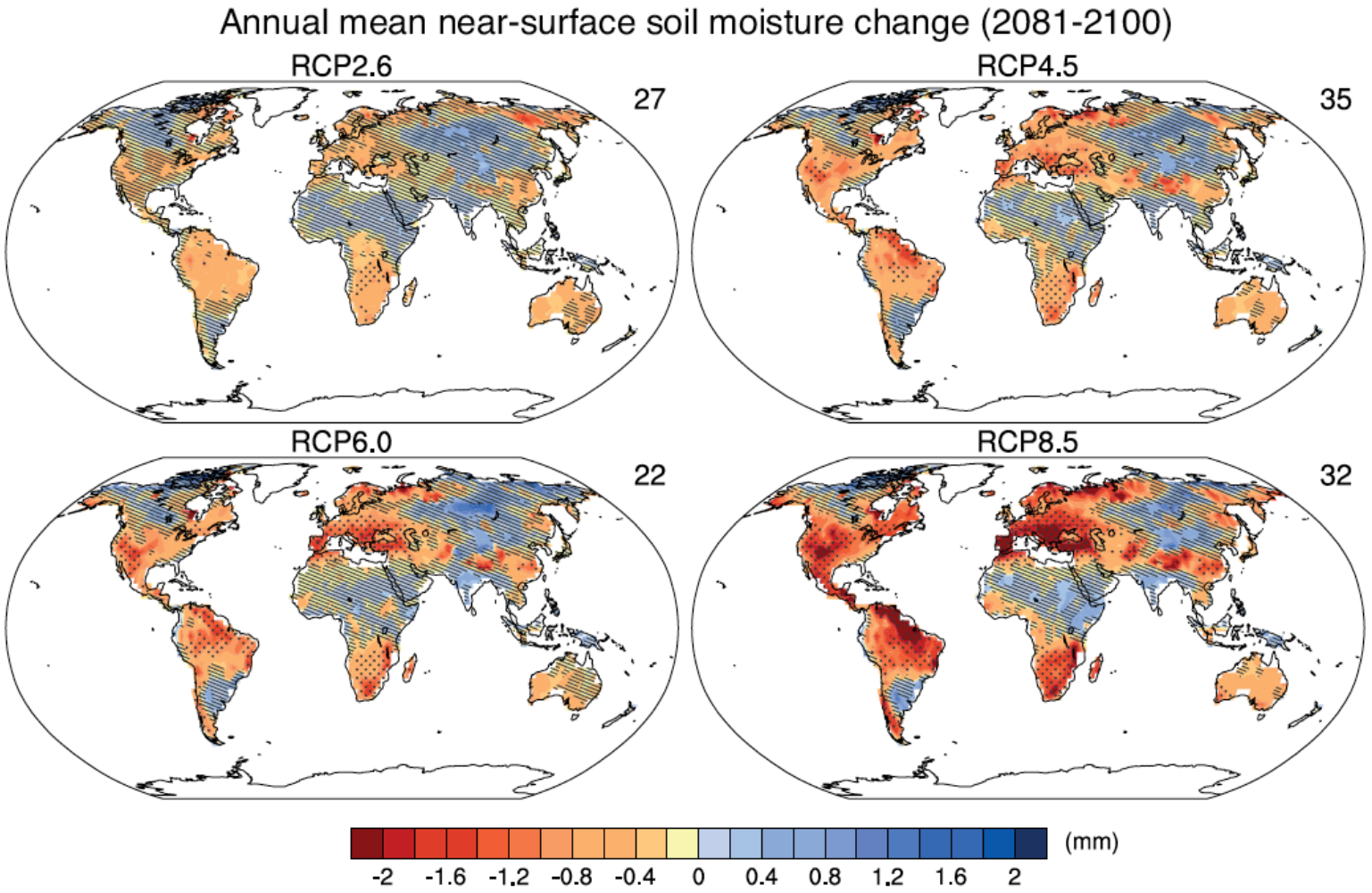
Source: Quaternary Environments Network

Let's feel the heat



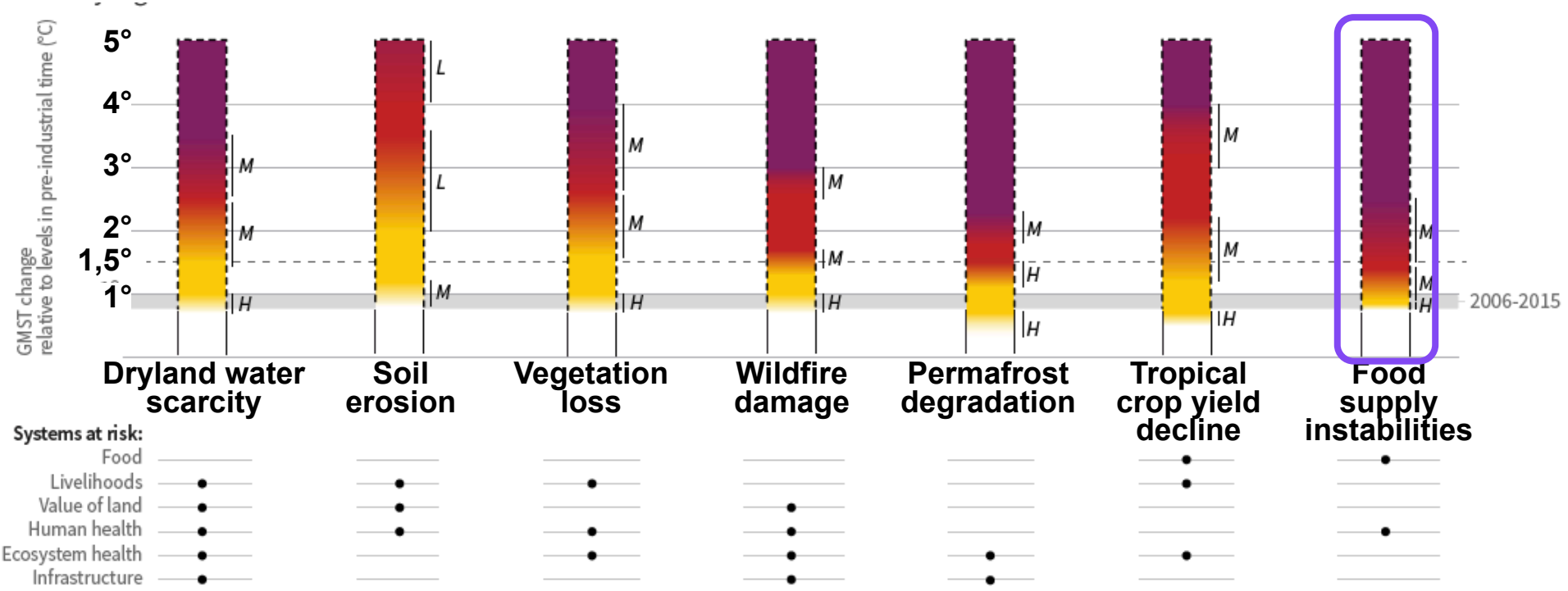
Number of days of deadly heat in 2100 with +4°C. Source: Camilo Mora et al, Global Risk of deadly heat, Nature Climate Change

High and (very) dry…



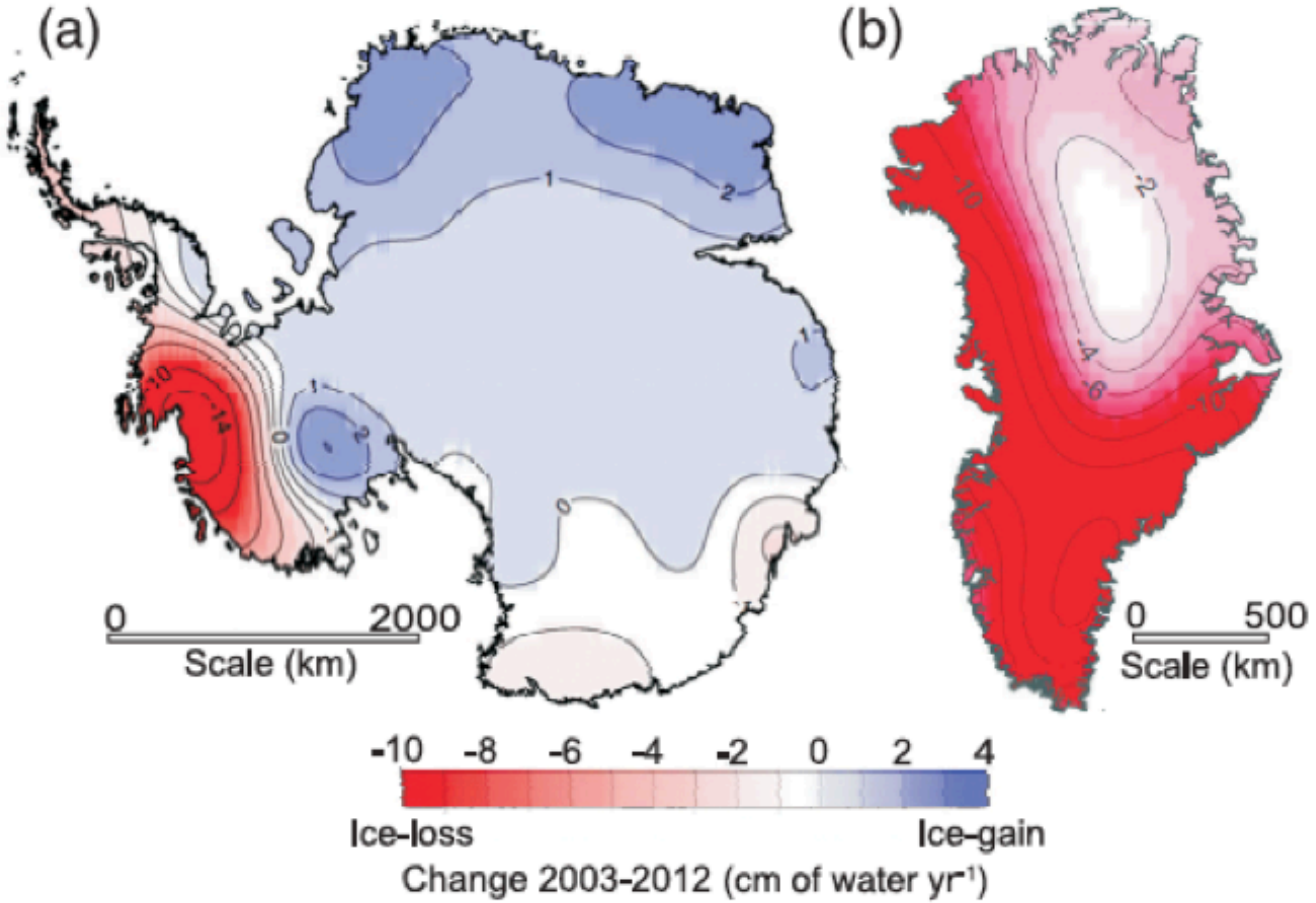
Source: IPCC, 5th assessment report, 2014

Adapting... to what exactly?



IPCC, 2019, Summary for policymakers of the report "climate change and land"

Gurgling gurgling



Ice cap change 2003-2012

1 to 60 times the GDP!

Table 1 Comparison of the social and ultimate costs of carbon

From: The ultimate cost of carbon

Goal		ed on growth,
Characteri time scale		ycle
Economic		caled by
Climate co		
Utility func		ars, rather hined by
Cost basis		on)
Value, $/to		

Average cost of all carbon ever emitted (total cost/cumulative emission)

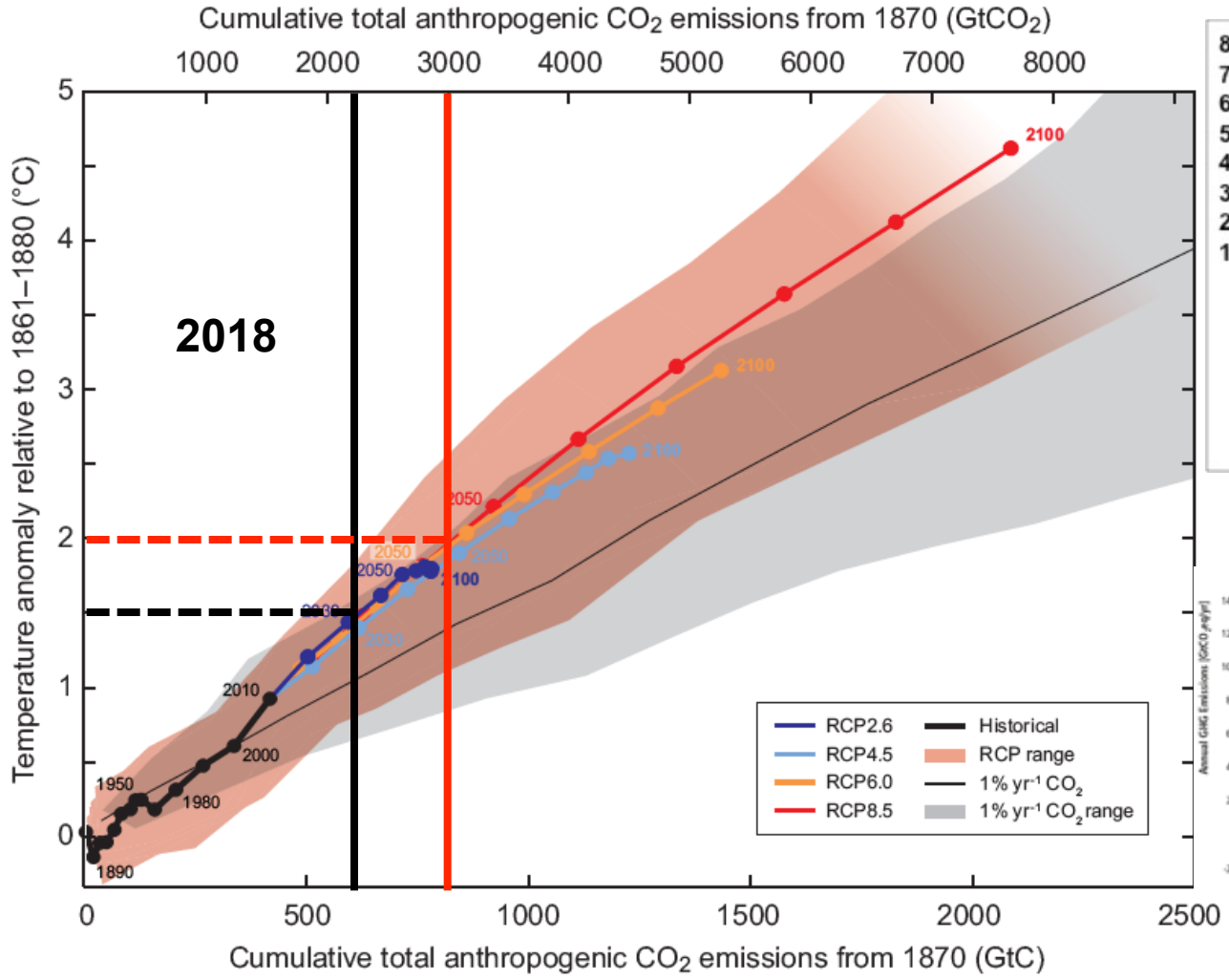
$10,000–$600,000

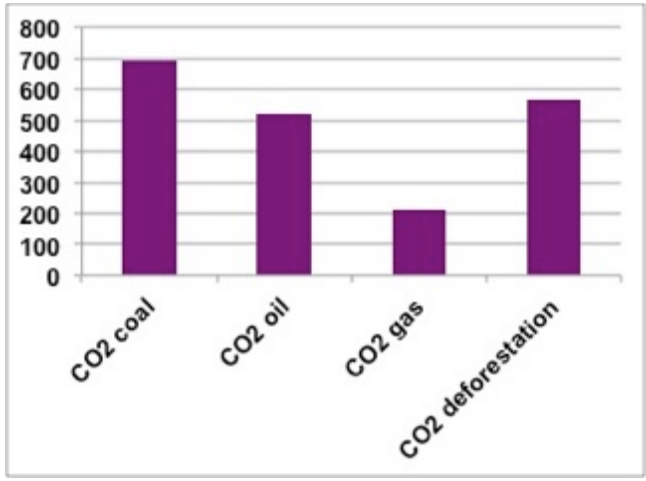
Climatic Change
https://doi.org/10.1007/s10584-020-02785-4

The ultimate cost of carbon

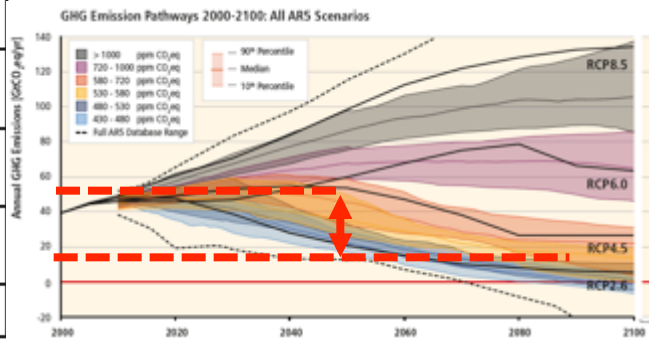
David Archer[1] · Edwin Kite[1] · Greg Lusk[2,3]

2°C, fingers in the nose?





Cumulated CO_2 emissions since 1870 in Gt



÷ 3 in 2050

Source IPCC, 2015

Emissions? But what for?

Deforestation

Other

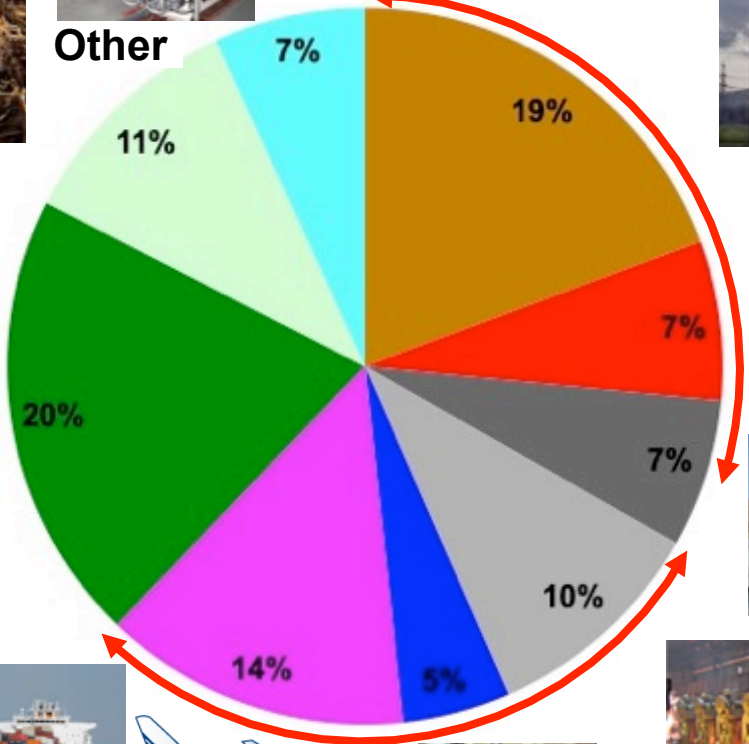
Energy!

Coal power plants

Agriculture

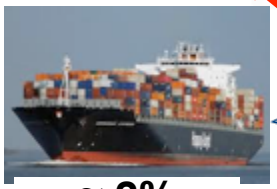
Oil and gas power plants

Cement



≈ 6%

≈ 4%
Transports



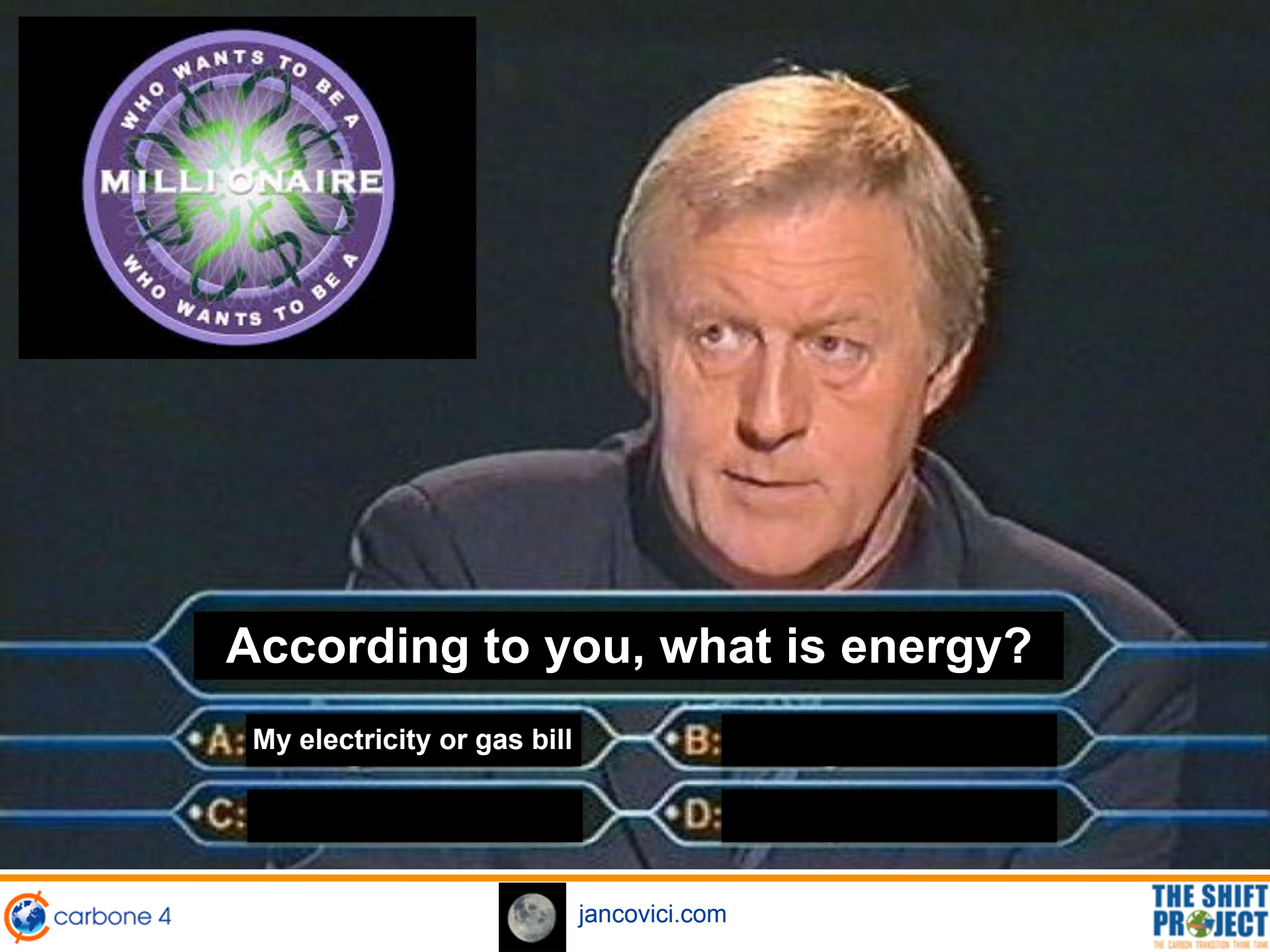
≈ 2%

≈ 2%

Buildings

Other industry

Breakdown of world (direct) emissions in 2019. Jancovici, various data.

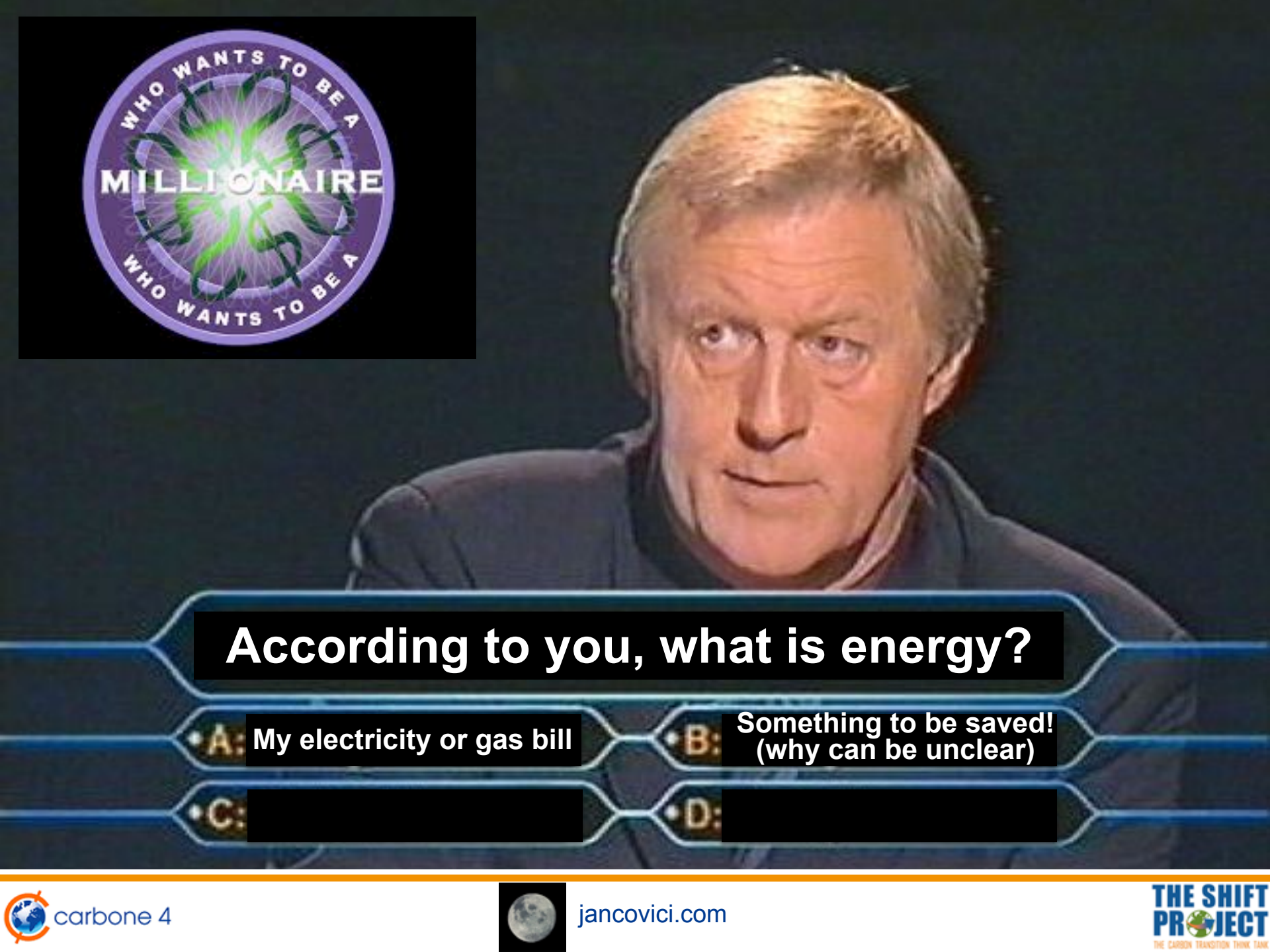

WHO WANTS TO BE A MILLIONAIRE
According to you, what is energy?
A: My electricity or gas bill
B:
C:
D:

It's only 5%!

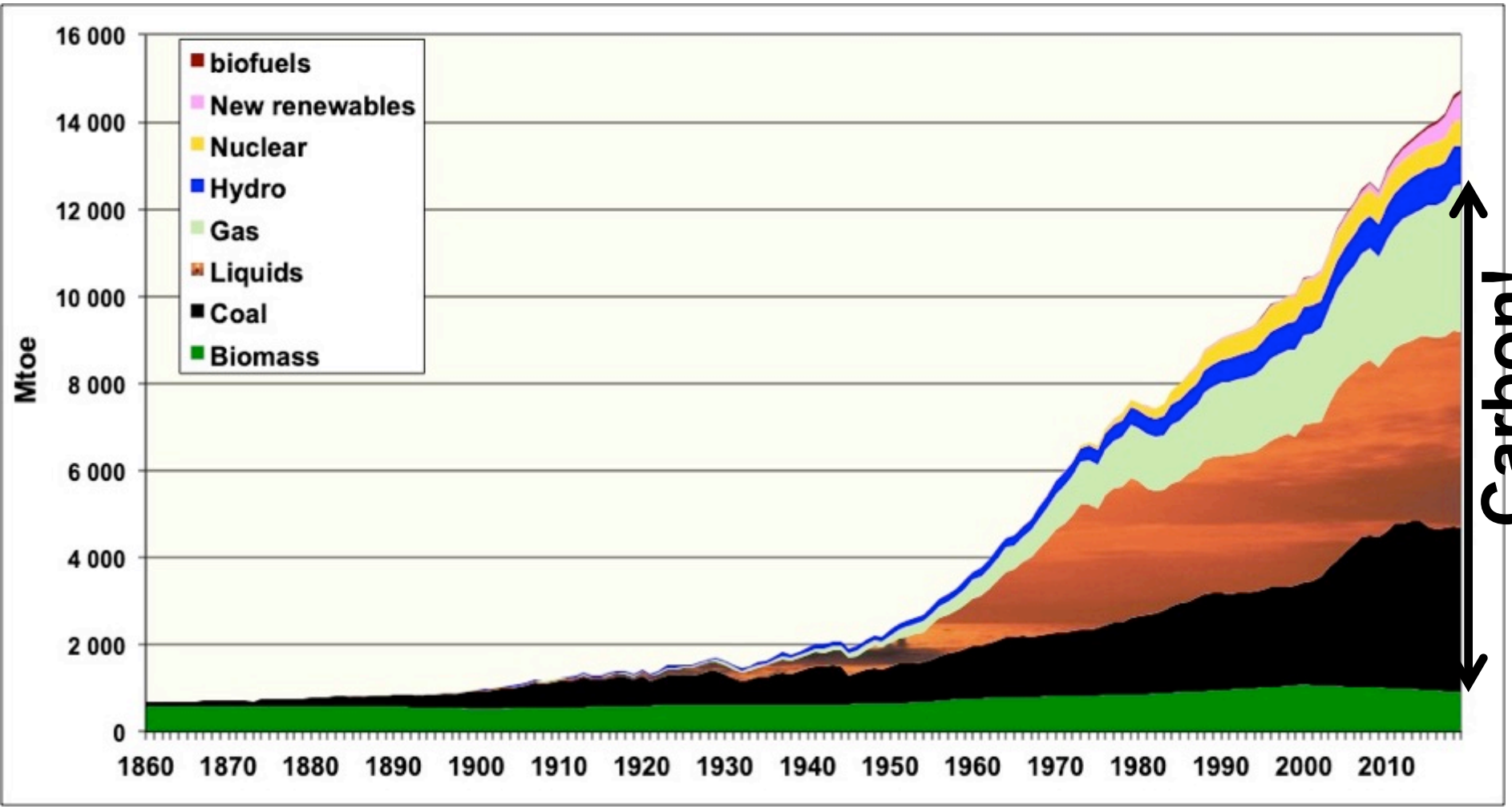
= 5%

= 5%

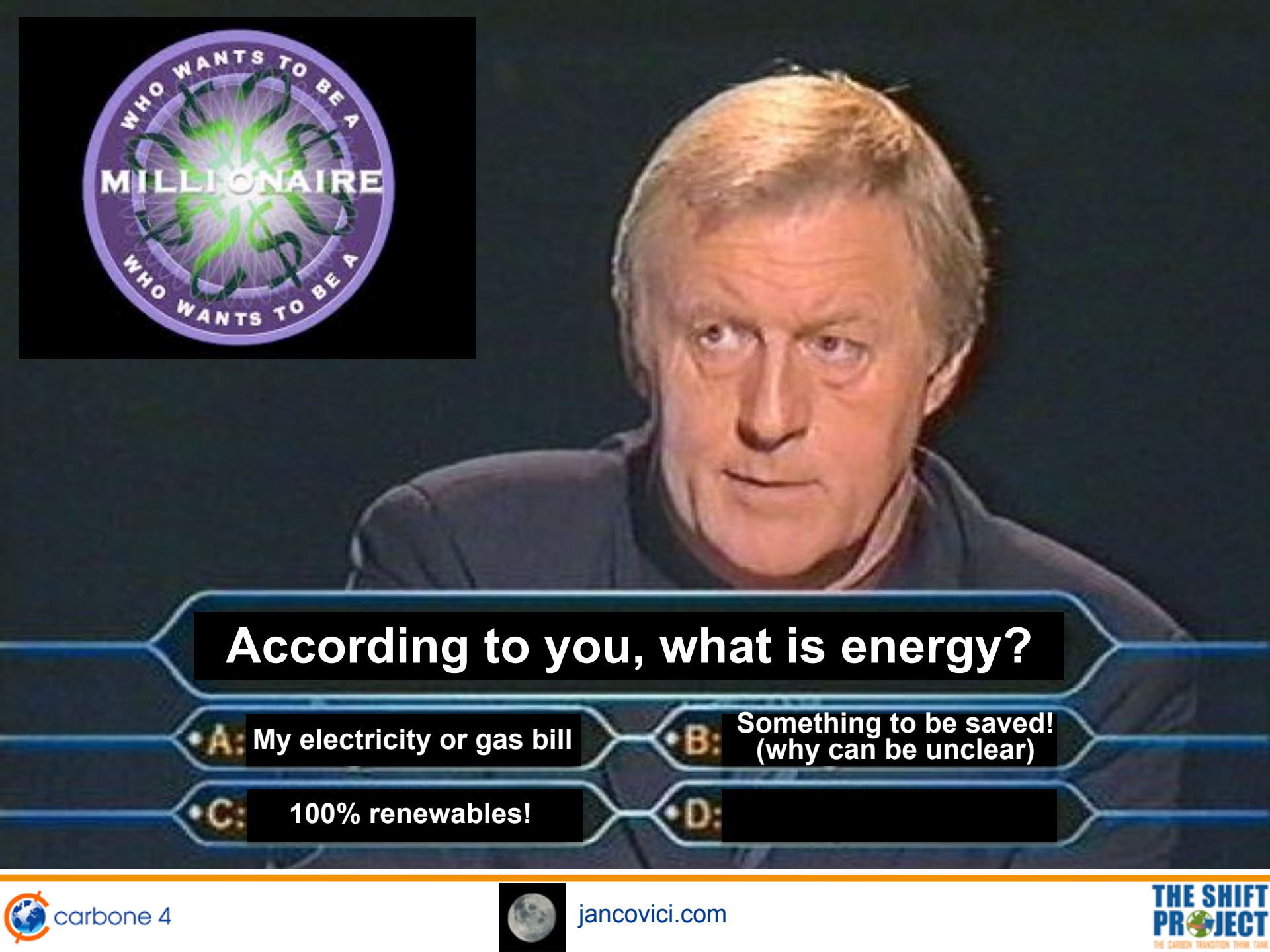
= 2%


WHO WANTS TO BE A MILLIONAIRE
According to you, what is energy?
A: My electricity or gas bill
B: Something to be saved! (why can be unclear)
C:
D:

Did you say savings?



World energy use 1860-2019. Jancovici, 2020

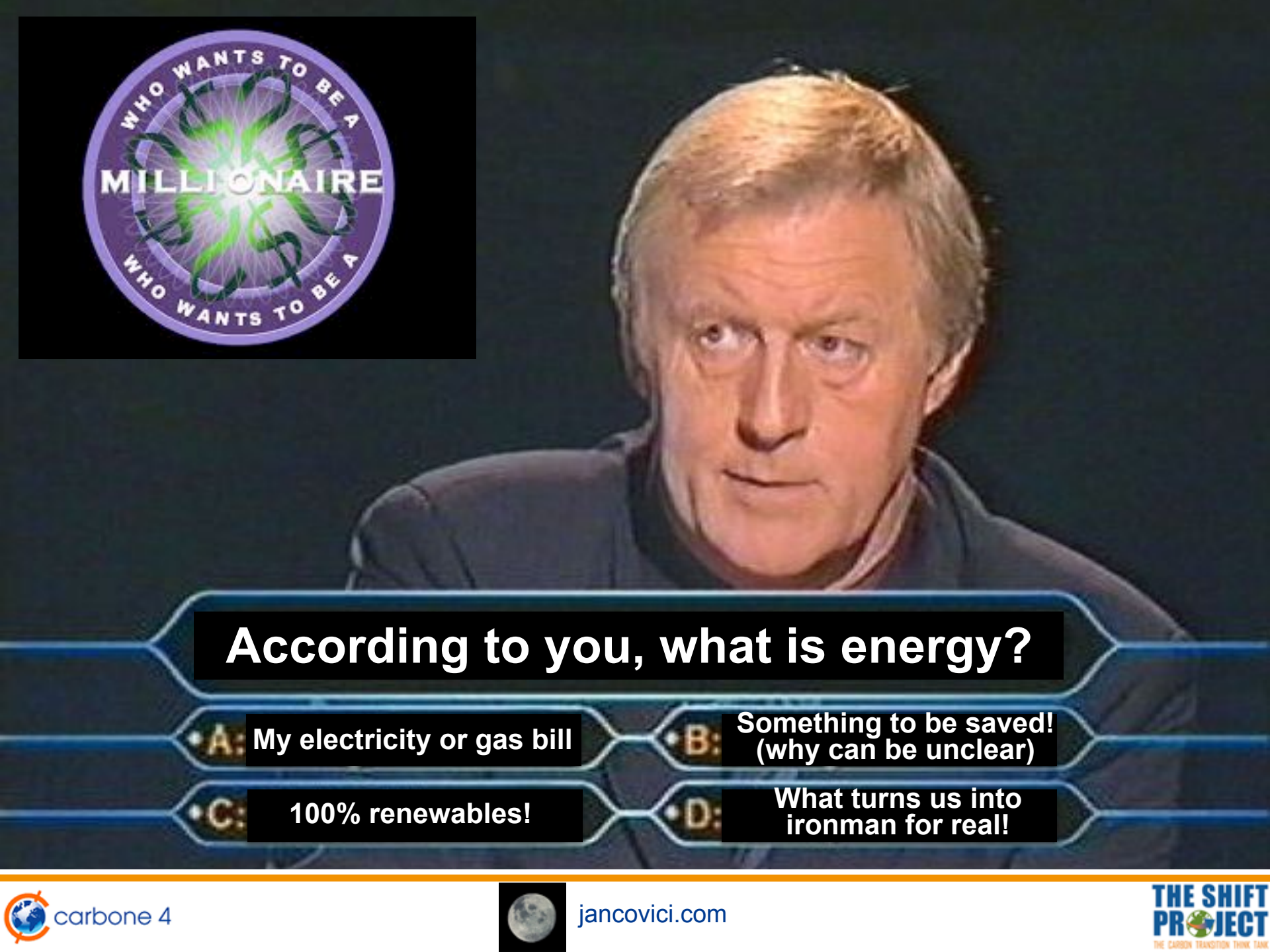

WHO WANTS TO BE A MILLIONAIRE
According to you, what is energy?
A: My electricity or gas bill
B: Something to be saved! (why can be unclear)
C: 100% renewables!
D:

Of course 100% renewable is possible!

Why on Earth did we waive our wonderful renewables for devilish oil?

2000 years ago

1 century ago


WHO WANTS TO BE A MILLIONAIRE
According to you, what is energy?
A: My electricity or gas bill
B: Something to be saved! (why can be unclear)
C: 100% renewables!
D: What turns us into ironman for real!

My left foot runs at 2000 km/h, my right arm lifts thousands tons...

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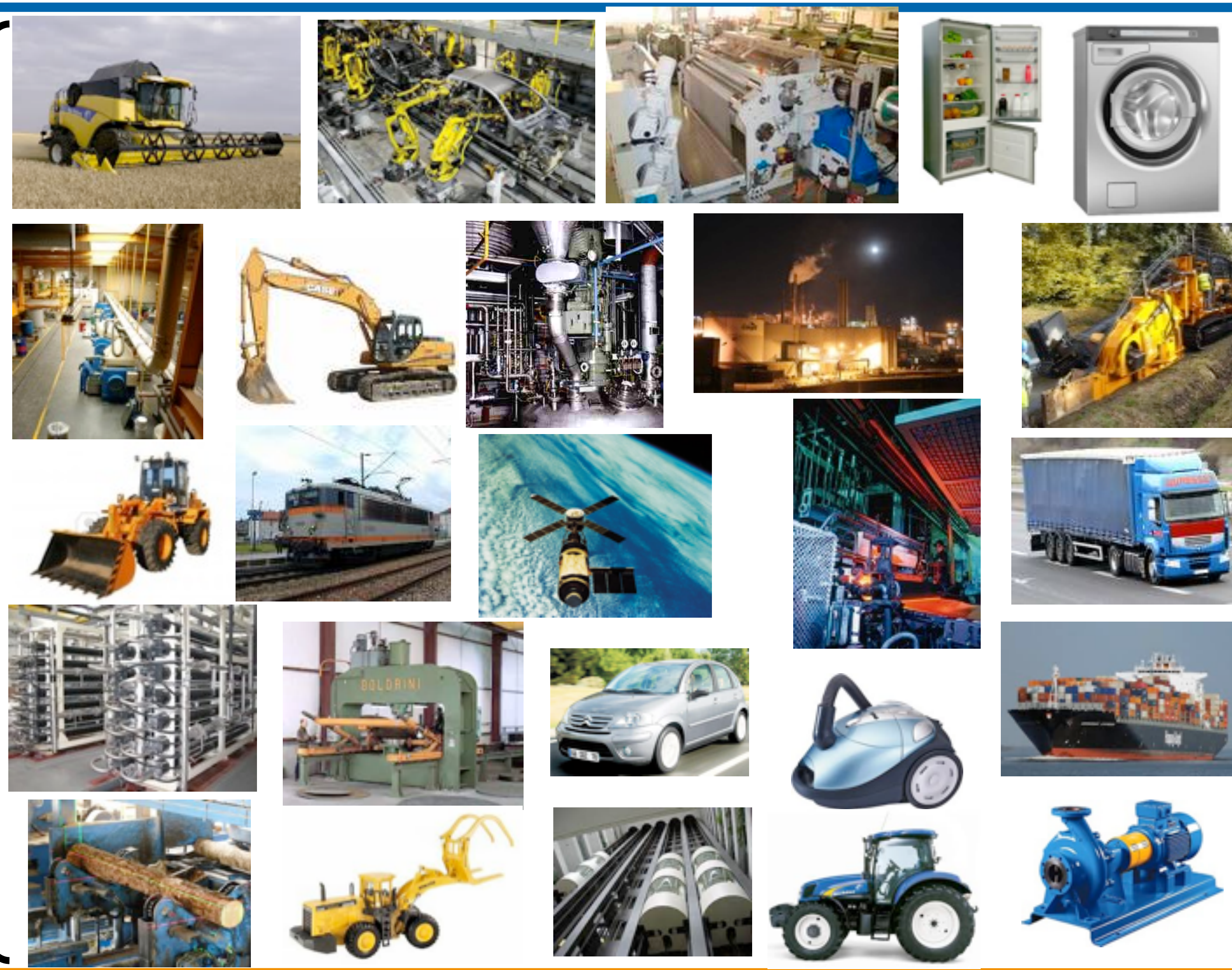
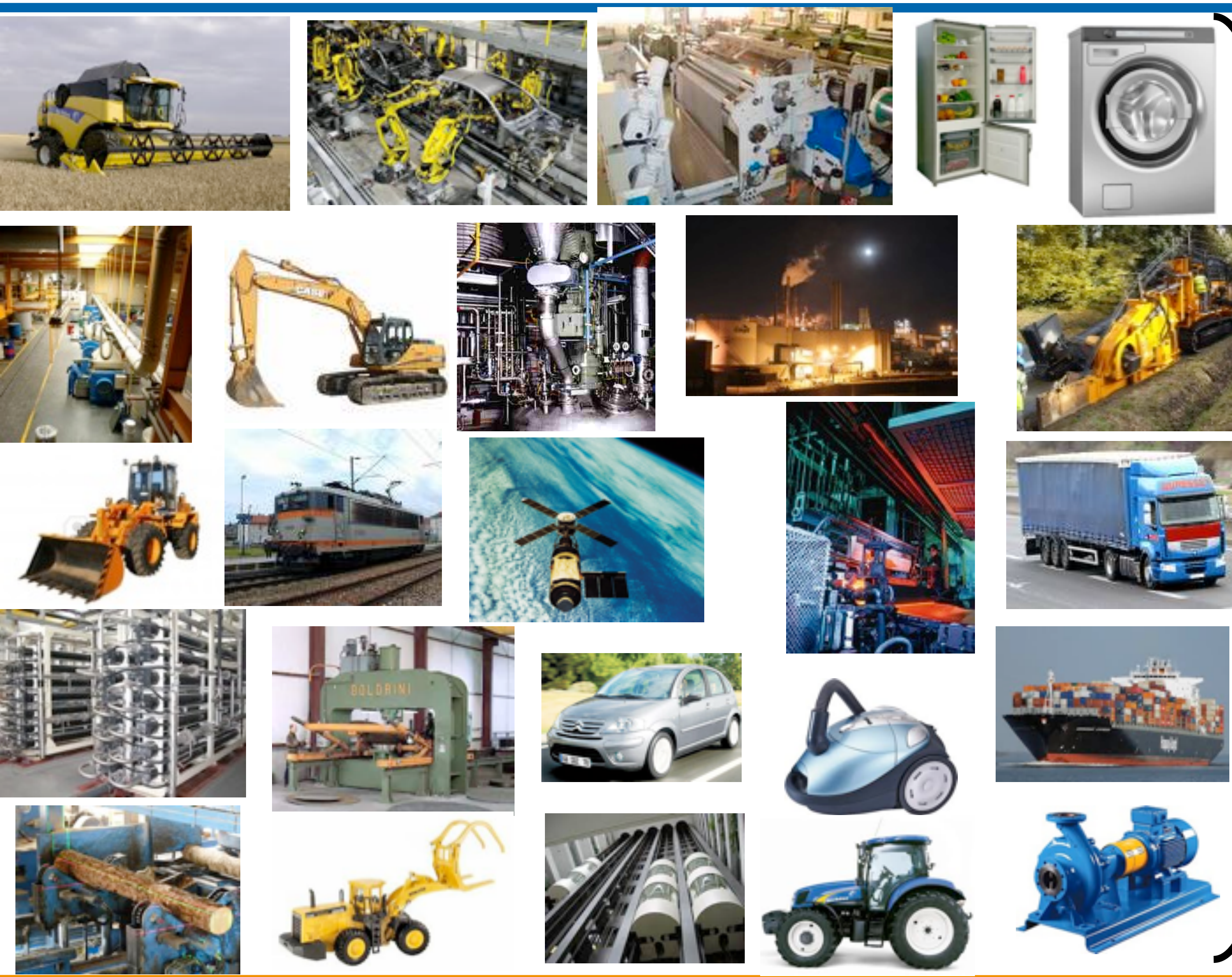


They work for us

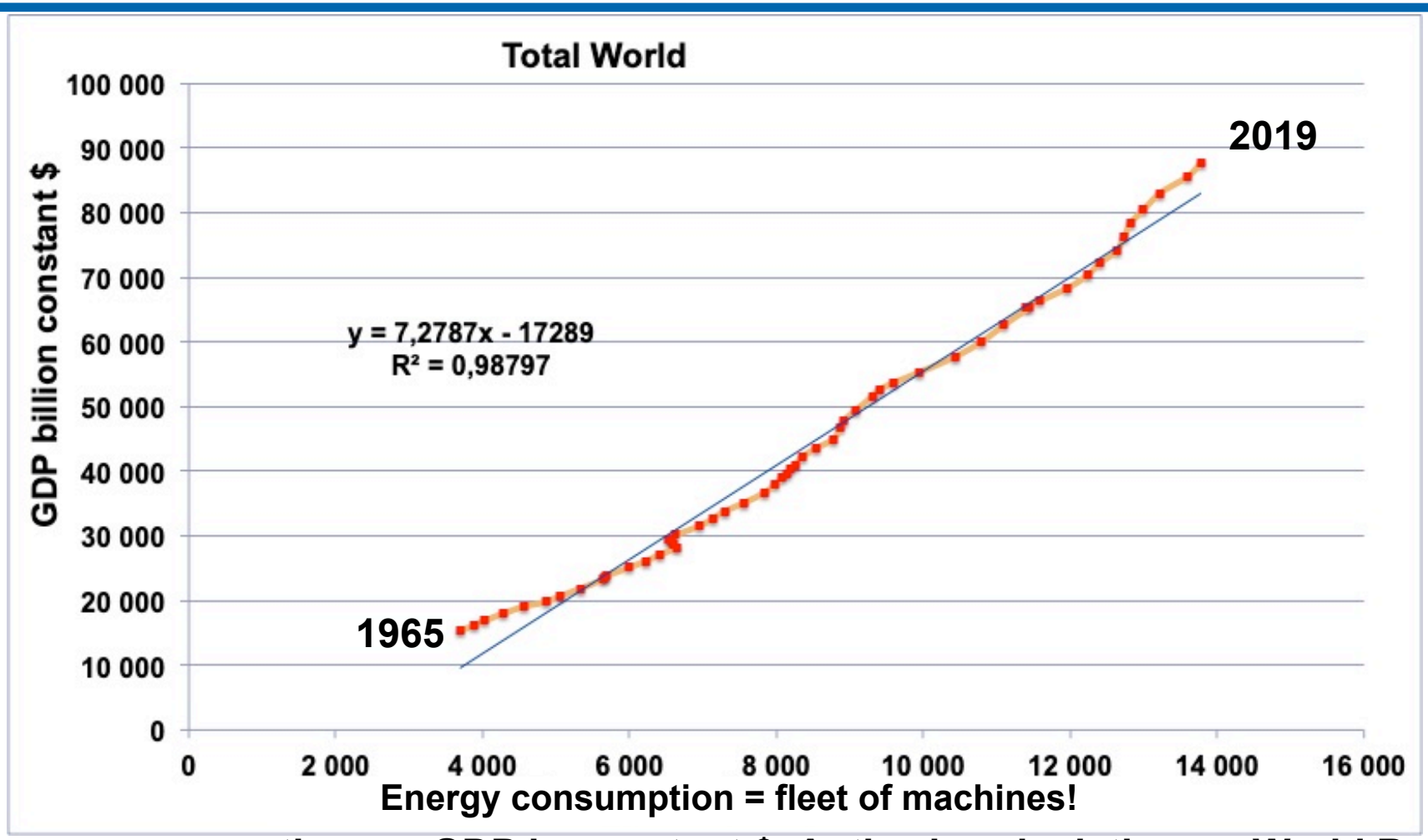


+

=

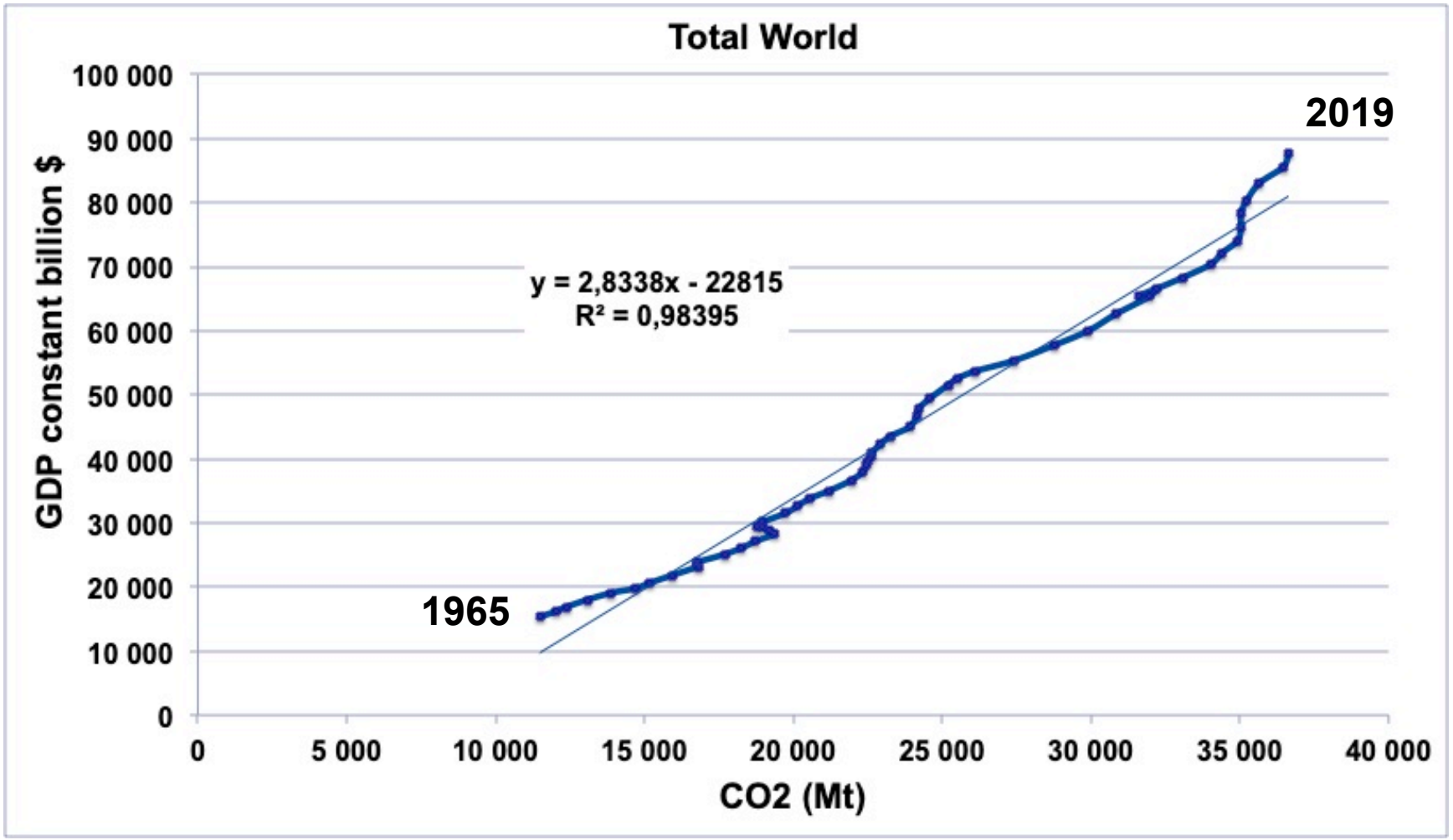
200 (world average) to 600 (European average)

The best macroeconomic model in the world: a straight line



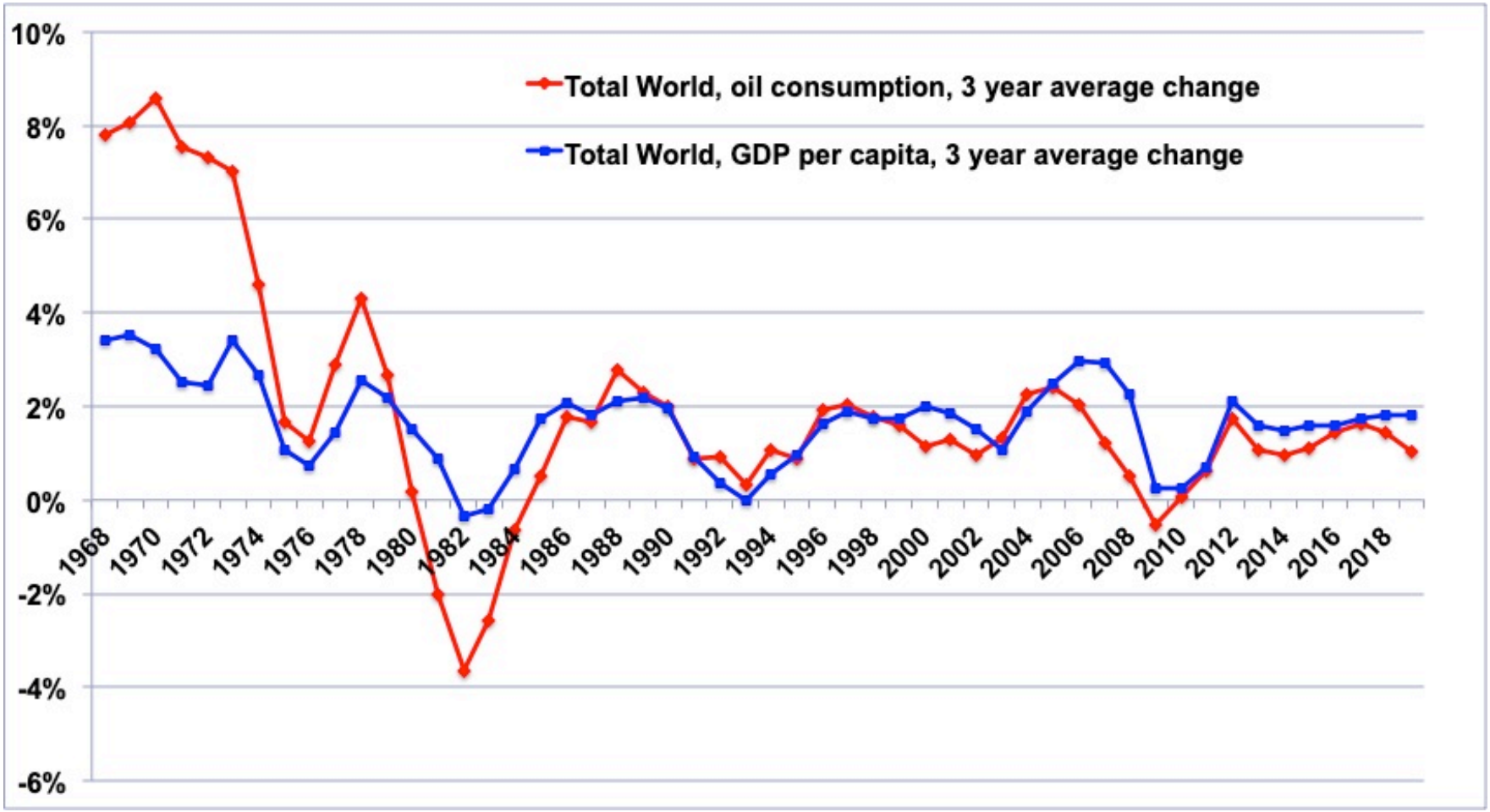
Energy consumption vs. GDP in constant $. Author's calculation on World Bank 2020 for GDP, BP Statistical Review 2020 for energy

Decoupling, a piece of cake?



World CO2 emissions vs. world GDP. Jancovici, 2019

When there is no covid the first limiting factor of the economy lies in the ground



Annual change of the world oil production in volume (red) and the world GDP per capita (blue). Jancovici on World Bank 2020 for the GDP and BP Stat 2020 for oil

The fire age, perpetual growth and two questions

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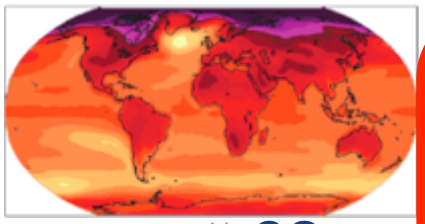
Boom?

Ores & minerals, oceans and soils, wood, all living species… (all free also)



CO_2

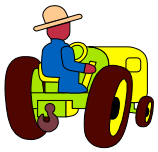
O_2

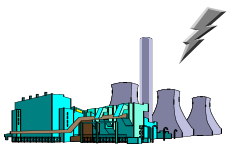
C_nH_p

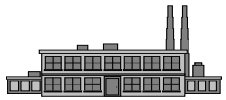
Free !!

= GDP



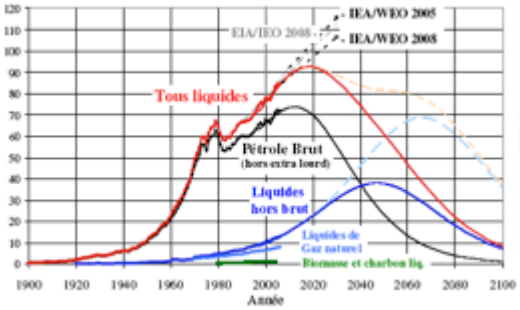


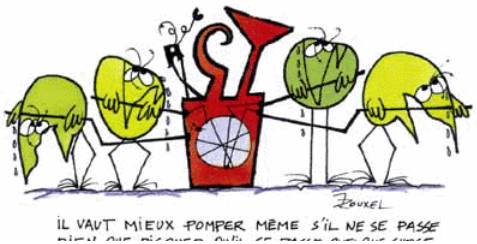




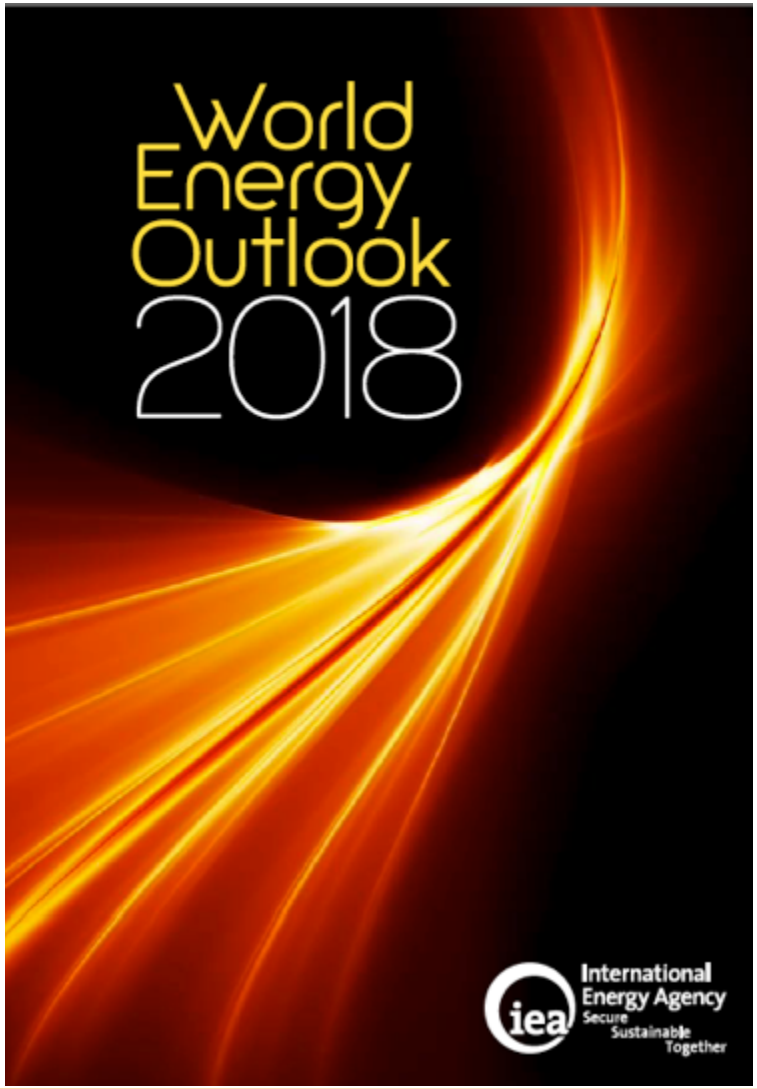

Present job structure, leisure and holidays, long studies, health, retirement, globalization, information society, urban concentration and sprawling…

Crack?





The wolf is here?



« Global conventional crude oil production peaked in 2008 at 69.5 mb/d and has since fallen by around 2.5 mb/d »

The average level of new conventional crude oil project approvals over the last three years is only half the amount necessary to balance the market out to 2025 (…). US tight oil is unlikely to pick up the slack on its own. (…) US tight oil (…) would need to more than triple in order to offset a continued absence of new conventional projects.

Fancy a little rule of three ?

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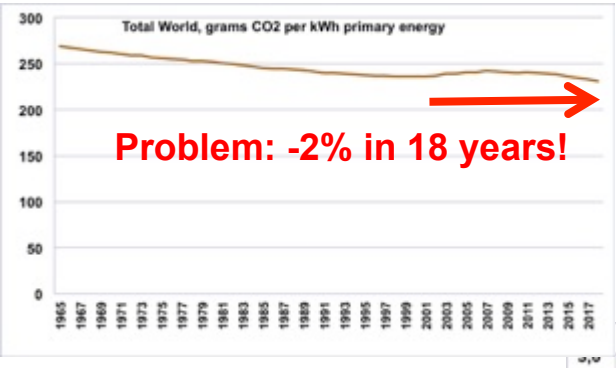
The Kaya identity:

To be divided by 3 by 2050…

and will!

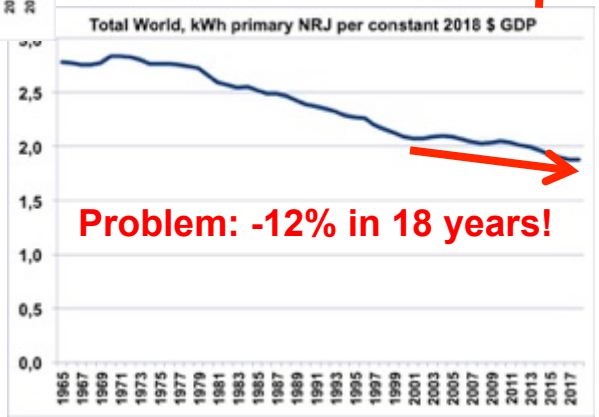
$$CO_2 = \frac{CO_2}{TOE} * \frac{TOE}{GDP} * \frac{GDP}{POP} * POP$$

CO_2 emissions = Carbon content of the energy * Energy intensity of economy * Production per person * Population



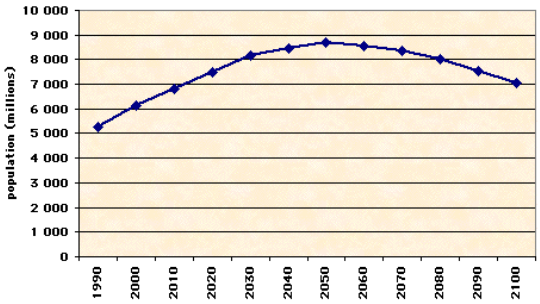
Problem: -2% in 18 years!

Magic technique N° 2: ↘ CO_2 per kWh = +nuke, RE, CCS & switch coal -> gas



Problem: -12% in 18 years!

Magic technique N° 1: ↘ NRJ per $ of GDP



+ 25% in 2050?

+ 2% per year = x 1,8 in 30 years; + 4% per year = x 3,2 in 30 years!

Fancy a little rule of three ?

The Kaya identity:

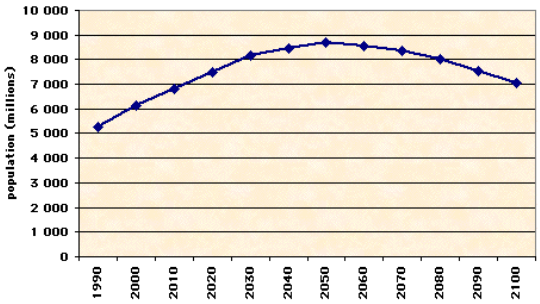
Is divided by 3 in 2050

$$CO_2 = \frac{CO_2}{TOE} * \frac{TOE}{GDP} * \frac{GDP}{POP} * POP$$

CO_2 emissions = Carbon content of the energy * Energy intensity of economy * Production per person * Population

-2% per year (80 coal power plants replaced by nuke each year)

-1,5% per year (cars, homes, machinery...)



+ 20% in 2050

-0,5% per year (but divided by 4 to 5 on the US if equal conditions everywhere)

Achieving wisdom is an old story

By three methods we may learn wisdom: First, by reflection, which is noblest; Second, by imitation, which is easiest; and third by experience, which is the bitterest.

When it is obvious that the goals cannot be reached, don't adjust the goals, adjust the action steps.

Any questions?