

Statues of ostriches in the garden  
of the European Parliament

# Improving the quality of science for governance

## 1. Epistemological Breakdown (taking the red pill . . .)



ECGC  
www.ecgc.eu

**Mario GIAMPIETRO**

European Centre for Governance in Complexity



Natural  
heritage

Interreg  
Euro-MED



Co-funded by  
the European Union

**ANNUAL INSTITUTIONAL DIALOGUE**

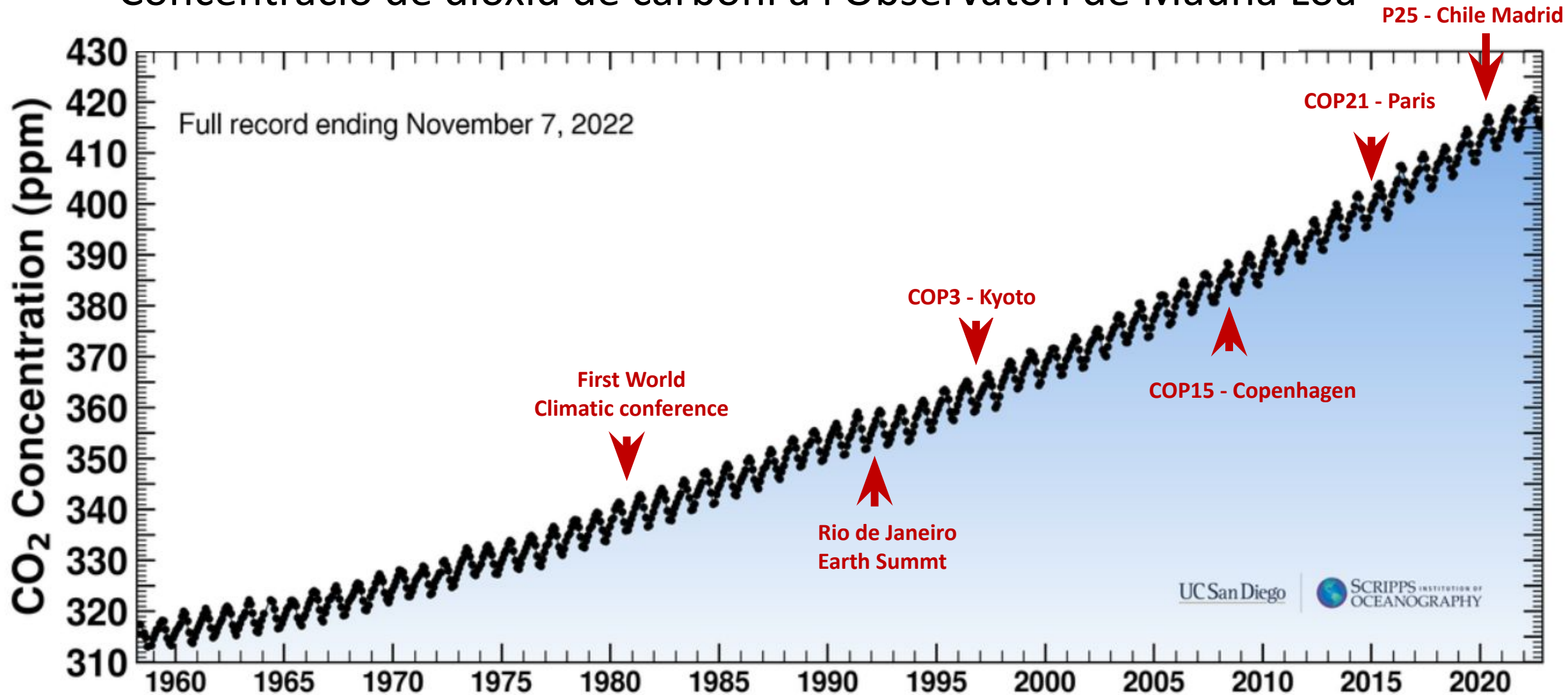
28-29 NOVEMBRE 2024 - MÁLAGA, SPAIN

*“You take the blue pill - the story ends, you wake up in your bed and believe whatever you want to believe. You take the red pill -you stay in Wonderland and I show you how deep the rabbit hole goes”.*

Why sustainability discussions are based on policy legends?



# Concentració de diòxid de carboni a l'Observatori de Mauna Loa



<https://keelingcurve.ucsd.edu/>

full record – 1960-2022

# Climitard

*/'klimit'tard/*

**A person that believes  
the climate  
can be changed by  
paying a CO<sub>2</sub> tax to  
the government.**

## **TRADABLE PERMITS (WITHOUT CAPS)**

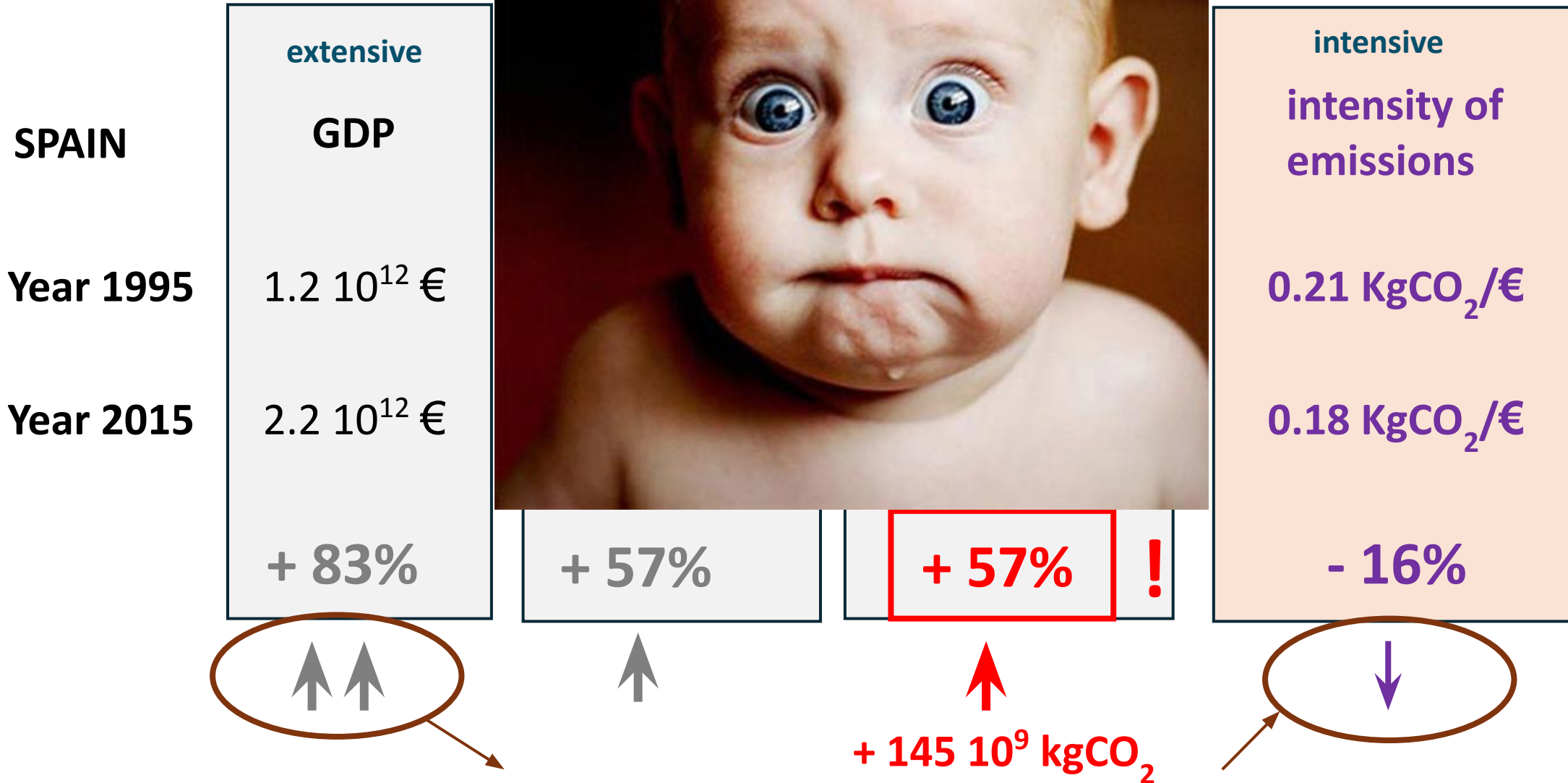
The countries that emit CO<sub>2</sub> can keep emitting if they give money to the countries not emitting enough so that they can industrialize

## **KUZNET CURVE (the policy legend)**

With economic development societies develop better and more efficient technologies that allow to reduce the emissions and the consumption of resources. Therefore, economic growth has a positive effect on the environment.

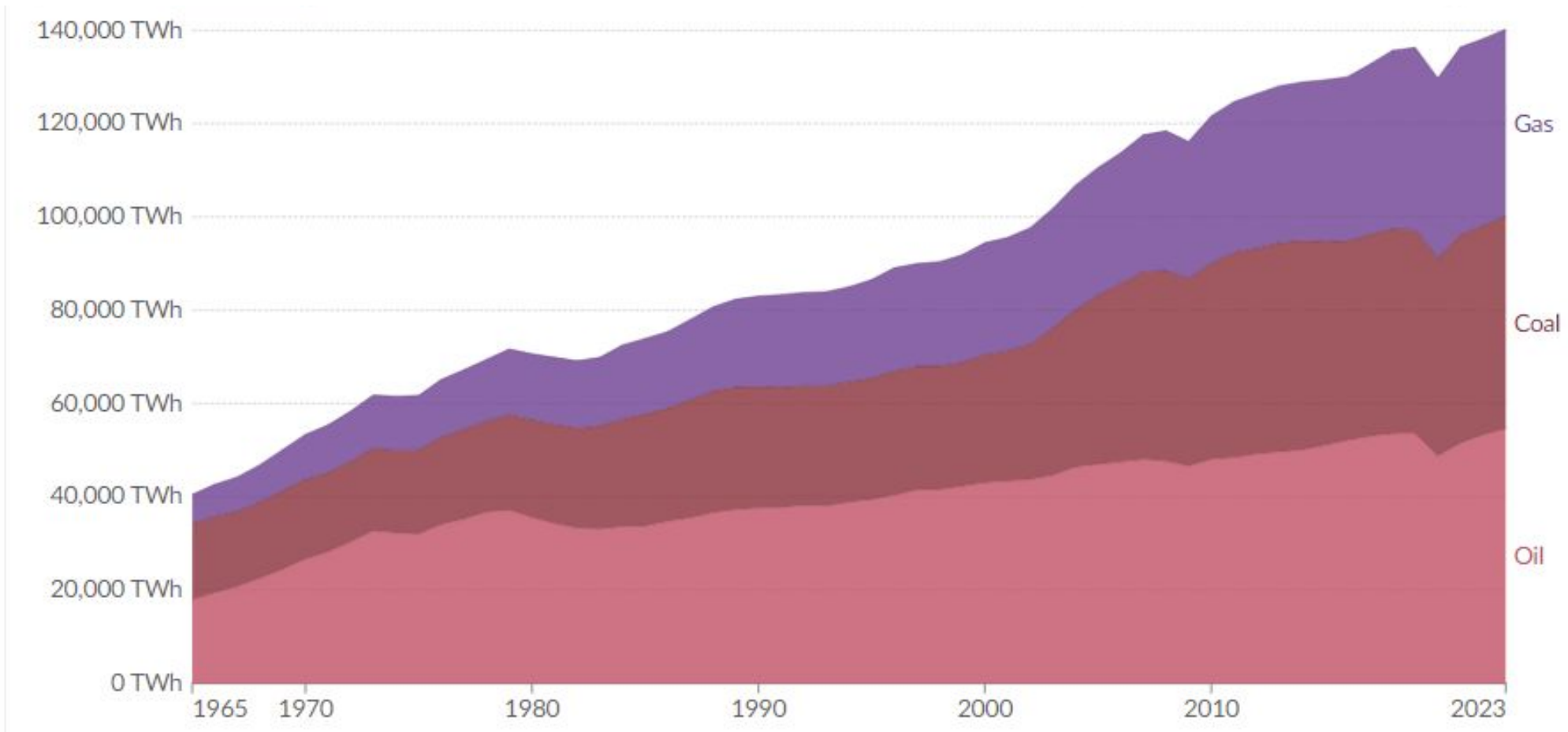
How did we get this policy legend? Because of bad indicators . . .

The policy legend of “*growth is the solution*” for “*developed economies*”  
based on the “*economic growth*” –  $\text{CO}_2/\text{GDP}$




**Economic growth reduces emissions!**

# Fossil energy consumption 1965 - 2023



Data source: Energy Institute - Statistical Review of World Energy (2024)



**The variety of indicators and controls needed by an airline pilot.**

We are still generating quantitative analysis as it was done by Newton

... using **reductionism**, one scale and one dimension at a time!

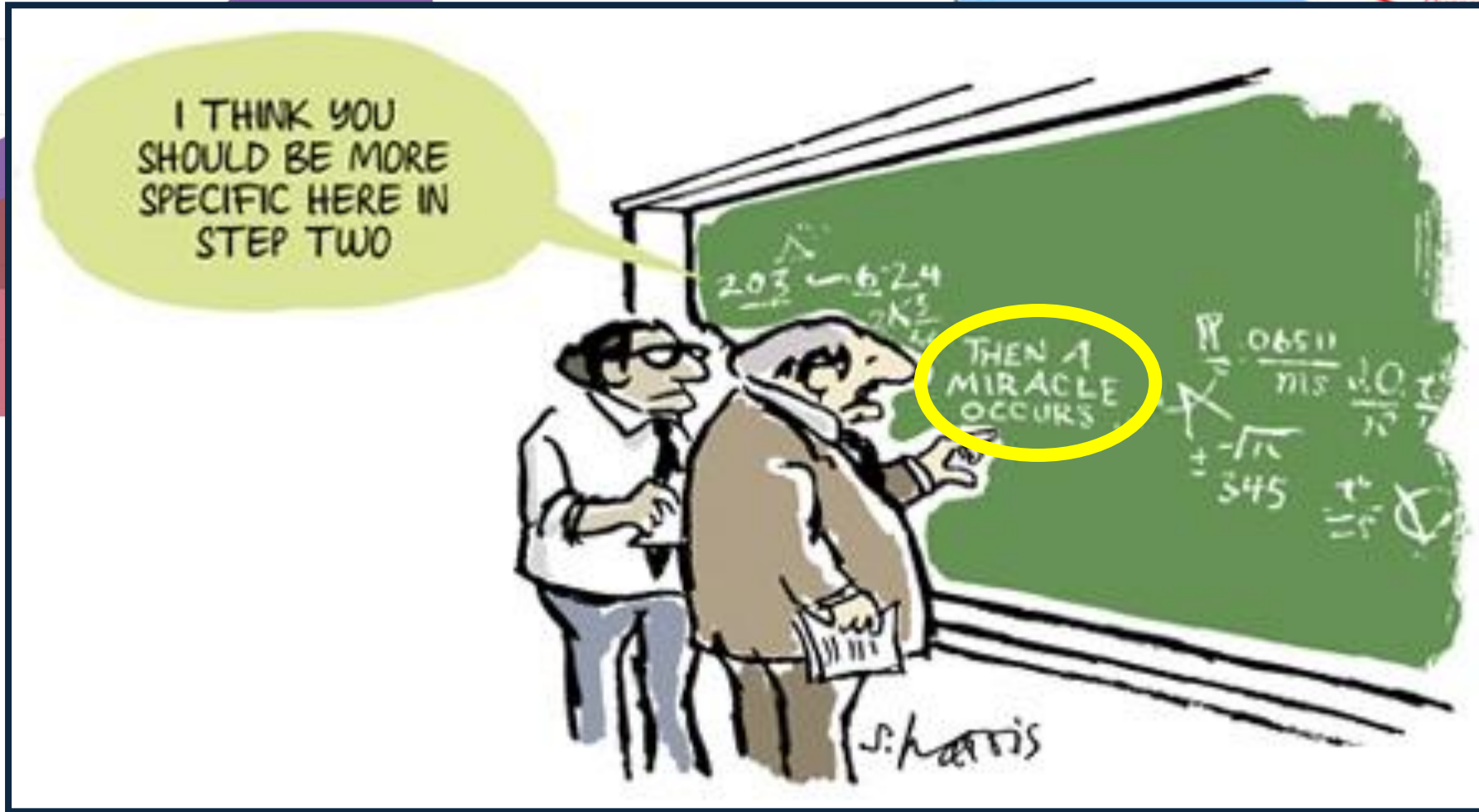
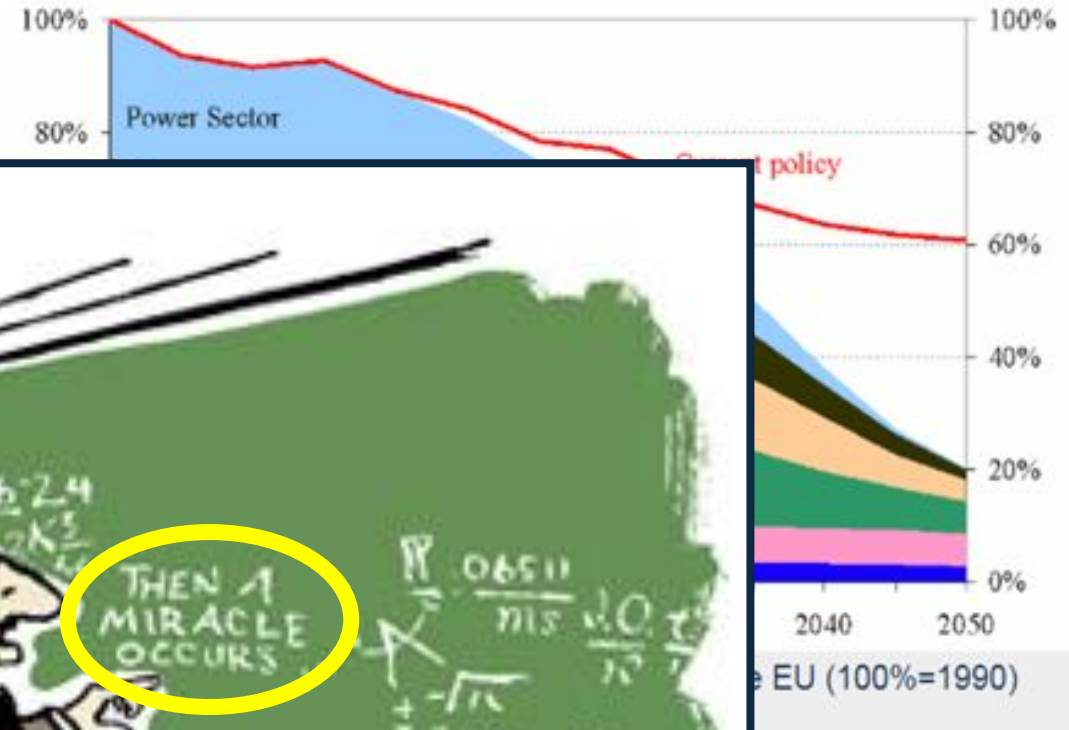
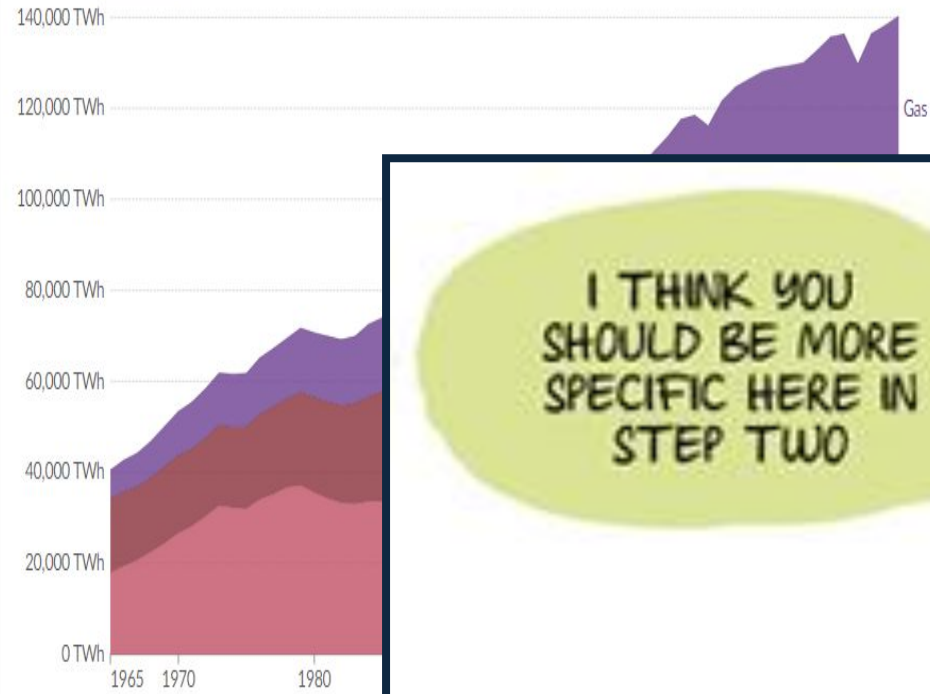
“Make everything as simple as possible, **but not simpler.**”





**Economic Energy Intensity**

**Would you fly on this airplane?**

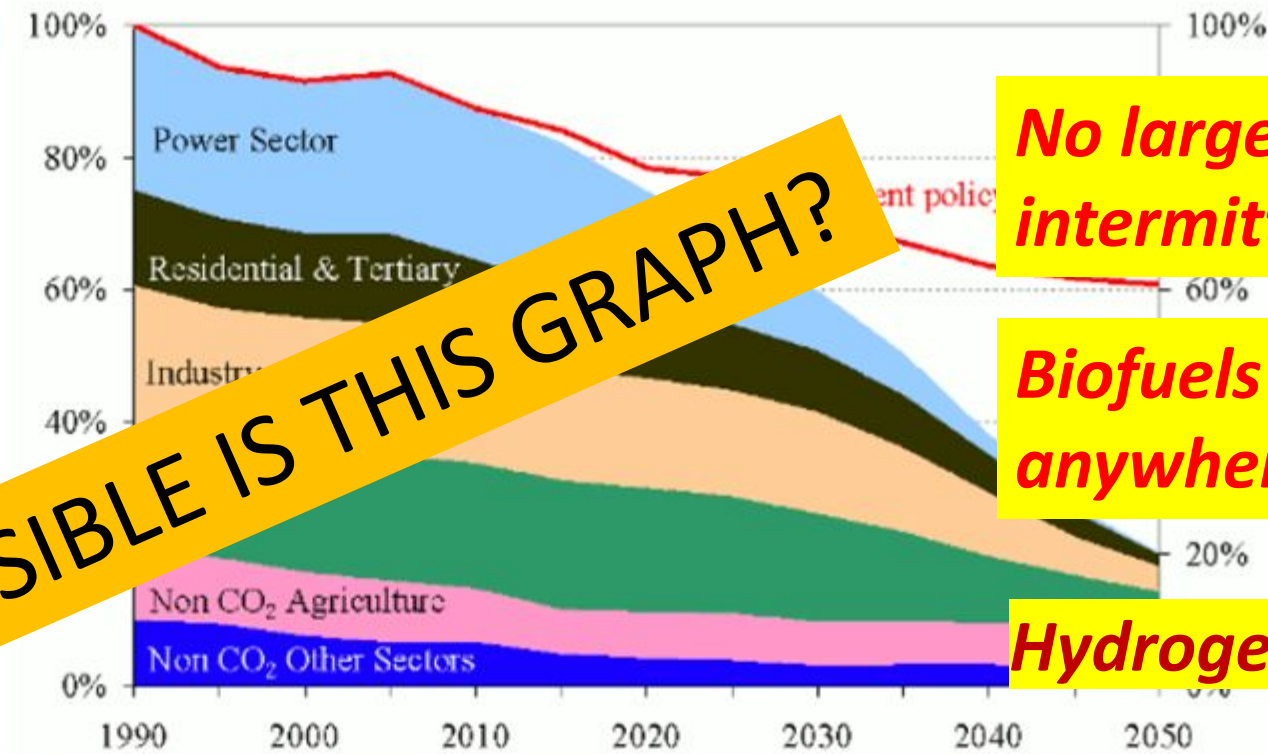


Practical consequences: sloppy analyses generate policy legends

## Power generation & distribution

The power sector has the biggest potential for cutting emissions. It can almost totally eliminate CO<sub>2</sub> emissions by 2050.

Electricity could not replace fossil fuels for transport. Electricity will come from renewable sources like



Possible 80% cut in greenhouse gas emissions in the EU (100%=1990)

**No large-scale storage for intermittent electricity**

**Biofuels are not getting anywhere**

**Hydrogen is still far away**

**HOW PLAUSIBLE IS THIS GRAPH?**

In addition to these implausible assumptions there is also a systemic flaw in the modeling . . .

We will have to develop and implement alternative processes\* needed for the supply of: (i) energy carriers; (ii) cement; (iii) steel; (iv) plastic; (v) ammonia (*fertilizers*)

\* *Making new types of power plants, factories, infrastructures . . .*

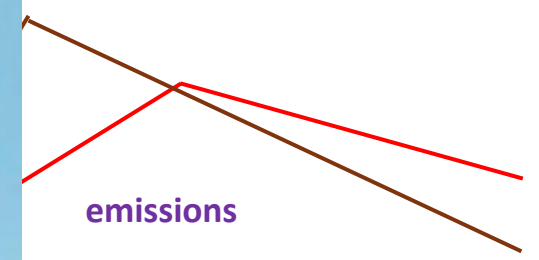
# Halfway Between Kyoto and 2050

Zero Carbon Is a Highly Unlikely Outcome



Vaclav Smil

## ENERGY SYSTEMS

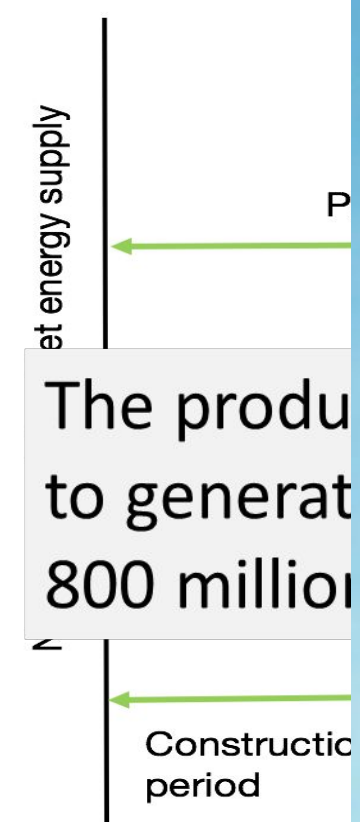


turbines expected to more than

t in energy systems

in emissions!

## THE CO



The produ  
to generat  
800 million

## ENERGY CA

It e

<https://vaclavsmil.com/wp-content/uploads/2024/06/HALFWAY.pdf>

# Roskill: CO2 emissions from lithium production set to triple by 2025

In the journey towards reducing the CO<sub>2</sub> footprint of refined lithium production, there is still progress to be made as demand is set to soar over the coming decade. In recent years, the lithium industry has been rocked by allegations of excess water usage at brine operations, chemical contamination of local environments and poor relationships with local indigenous groups. Now, with demand for lithium set to increase over the next decade, Roskill has calculated, using its in-house analysis, that versus current levels CO<sub>2</sub> emissions from lithium production are set to triple by 2025 and grow by a factor of six by 2030, with the vast majority of this coming from mineral concentrate production, shipping and refining.

Forecast CO<sub>2</sub> emissions from the lithium supply chain, 2020-2030

# Roskill

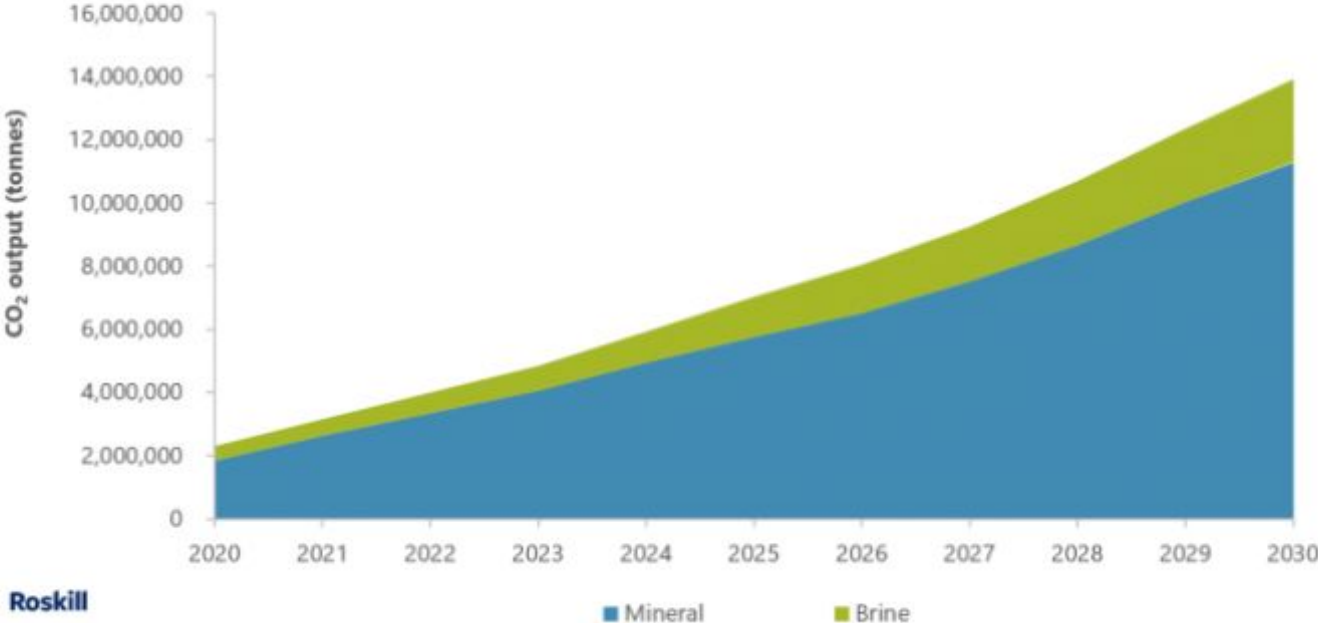
White Paper

*Forward thinking*

## Lithium's growing CO<sub>2</sub> footprint

An analysis of energy consumption and emissions intensity from global lithium supply

October 2020





Economy

# India invokes emergency law to force coal plants to boost output

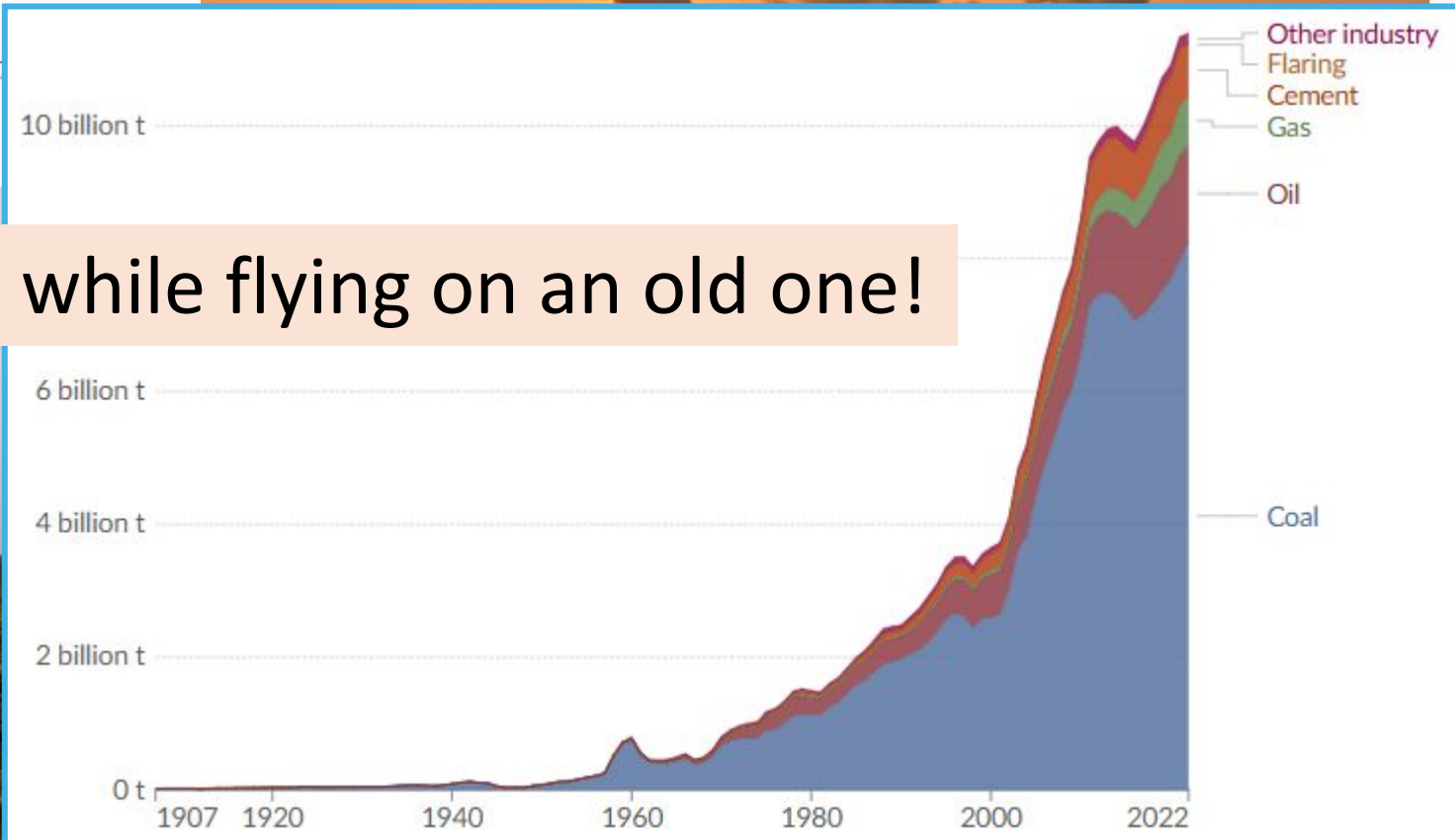
Directive calling on coal plants to run at full capacity comes as an expected surge in power usage this summer.



You cannot build a new plane while flying on an old one!



The chimneys of a coal-fired power plant are pictured in New Delhi, India, July 20, 2017 [REUTERS/Adnan A



## China CO<sub>2</sub> emissions by source

<https://ourworldindata.org/co2/country/china>



**The greatest long-term challenge in the industrial sector will be to displace fossil carbon used in the production of primary steel, cement, ammonia and plastics**

	Output (Mt/y)	Energy intensity (GJ/t)	Embodied energy (EJ/y)	Dominant energies
Primary steel	1,100	20	22	coal (coke), natural gas
Cement	4,200	4	17	coal, petcoke, fuel oil
Ammonia	180	30	5	natural gas
Plastics	300	100	30	natural gas, crude oil
<b>TOTAL</b>		<b>~75</b>		

**Global fossil fuel consumption: 510 EJ**

**□ 75/510 = 15% of the total (conservative, more likely 20%)**

**When adding liquid fuels the share comes close to 50%**

**We have no mass-scale alternatives that could be deployed immediately or within 10-20 years to replace fossil energies**

**DO WE HAVE ALTERNATIVES TO FOSSIL CARBON?**



From the movie "Apollo 13"

The Yin-Yang tension between  
**Toxic Truths** and **Noble Lies**

"Houston, we have a problem"

VS

**"Don't worry, we have solutions"**





The social construction of ignorance in science and environmental policy discourses



The liquefaction of the blood of San Gennaro

# The sustainability predicament #1: SOCIALLY CONSTRUCTED IGNORANCE

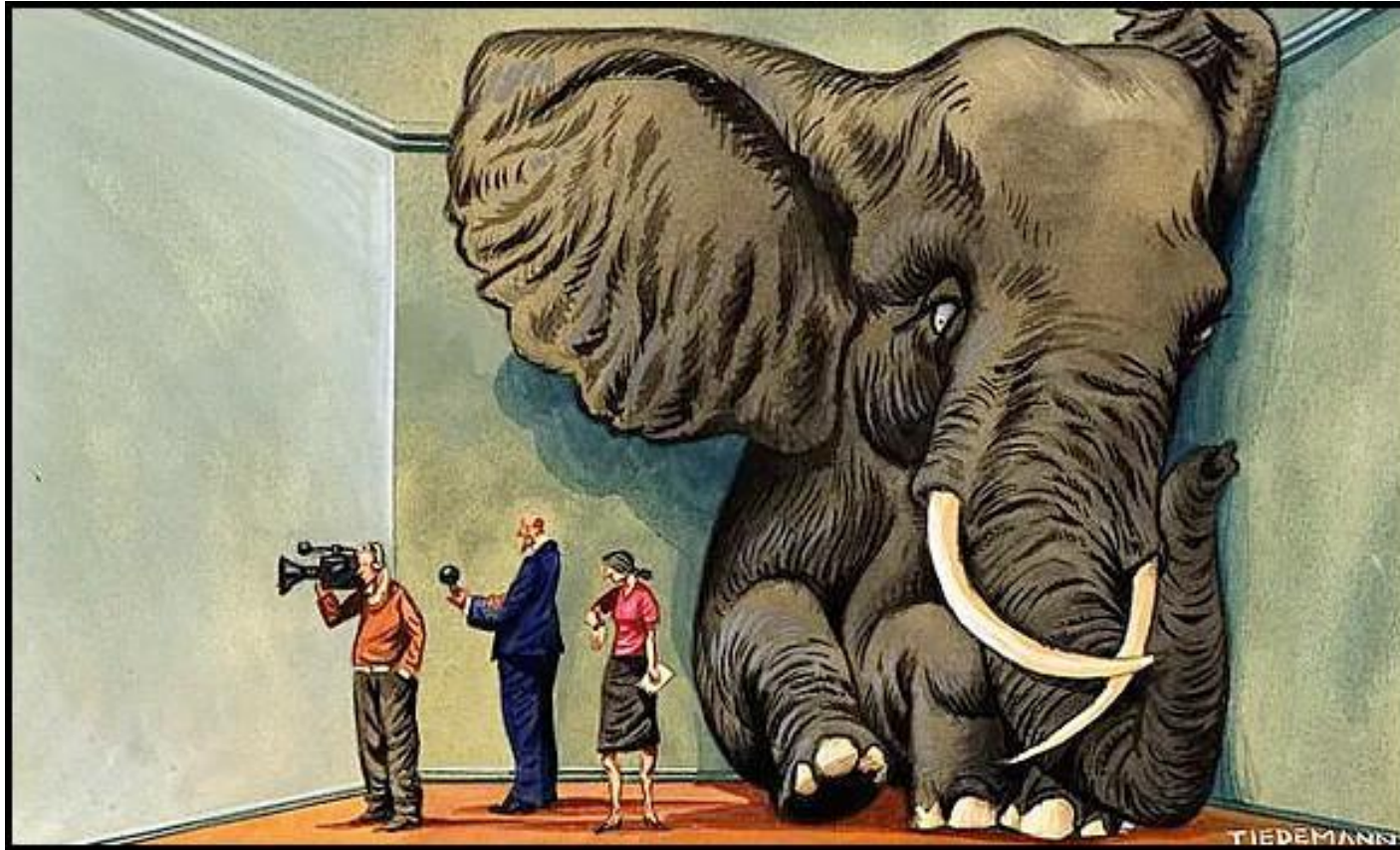


Steve Rayner

“To make sense of the complexity of the world so that they can act, individuals and institutions need to develop simplified, self-consistent versions of that world. The process of doing so means that . . . knowledge which is in tension or outright contradiction with those versions must be expunged . . .”

dysfunctional cases of **uncomfortable knowledge**  
have to be ignored in the official story-telling

Rayner, S., 2012. “Uncomfortable knowledge: the social construction of ignorance in science and environmental policy discourses”, *Economy and Society*, 41(1): 107-125.



**Practical example of the consequences of avoidance of uncomfortable knowledge experiences in the activities of the MAGIC project in relation to the policies of decarbonization**



## COVID-19 IHR Emergency Committee

1. *Tropical Medicine Research Unit, Faculty of Tropical Medicine*
2. *Global Migration and Quarantine, National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention*
3. *Medical Officer of Health, Ministry of Health*
4. *Advisor, Department of Disease Control, Ministry of Public Health*
5. *Department Head, Epizootic monitoring and forecasting, Plague Control Research Institute*
6. *Advisor Global Centre for Infectious Diseases*
7. *Program Director, Field Epidemiology Training Program*
- ...
10. *Chief, Virology Department, Laboratory for Infectious Diseases and Screening, National Institute of Public Health*
- ...
20. *Senior Director, Public Communication Division,*
21. *Director, Programme in Emerging Infectious Diseases,*
22. *Clinical Associate Professor, College of Medicine*

## What expertise is required?

- monitoring and studying the pandemic  
generating useful information for policy

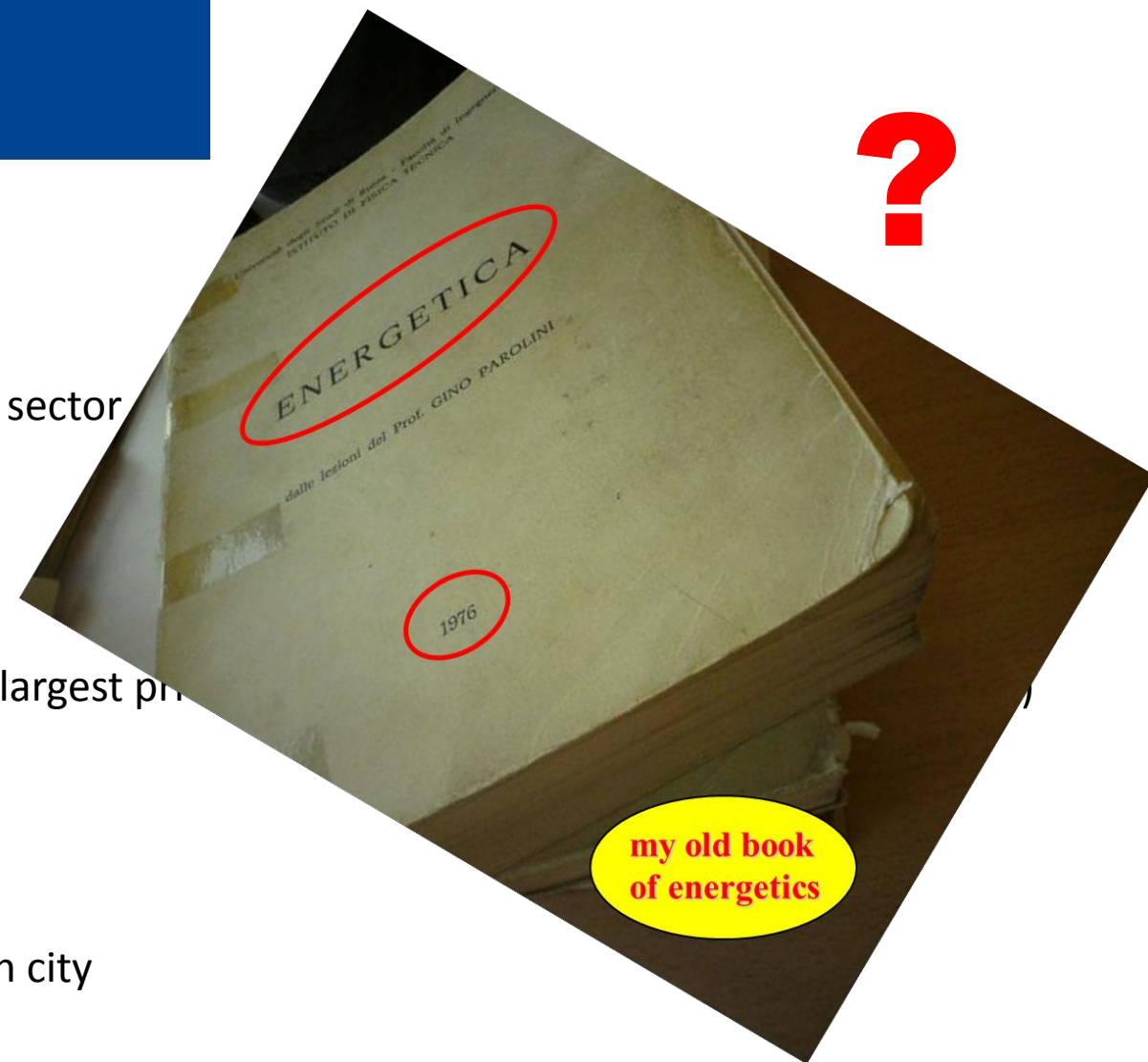
What expertise is required?

What is the academic background of the nine members of this panel?

STUDY

## Final Report of the High-Level Panel of the European Decarbonisation Pathways Initiative

- \* Professor of Theoretical Physics
- \* Ex-Minister of Economic Affairs
- \* Chemist degree - inventor of around 80 patent families in the sector
- \* PhD in Economics
- \* Graduate from the Faculty of Law and Administration
- \* Member of several Boards of Directors (including the world's largest private bank)
- \* Professor of Insurance and Finance
- \* PhD in economics
- \* Human Resource management and mayor of a large European city



# THE MONIST

## THE MODERN THEORY OF ENERGETICS.\*

SINCE the middle of the last century when the comprehensive significance of the law of the conservation of energy became generally acknowledged, the conviction has also developed that this law must serve as the foundation of the natural sciences, above all of physics. The realization of this thought, however, though in itself quite obvious, has been even to-day seriously un-

derstanding several laws requirement neighboring

So close discovery was significance conference obligation a Scientific M tion, but For this it w ve over the the laws of e give light wh

\* Translated *Scienza* by Lydi

[onlinelibrary.wiley.com](http://onlinelibrary.wiley.com)

**ENERGY AND THE EVOLUTION OF CULTURE** Leslie A. White (1943), American Anthropologist

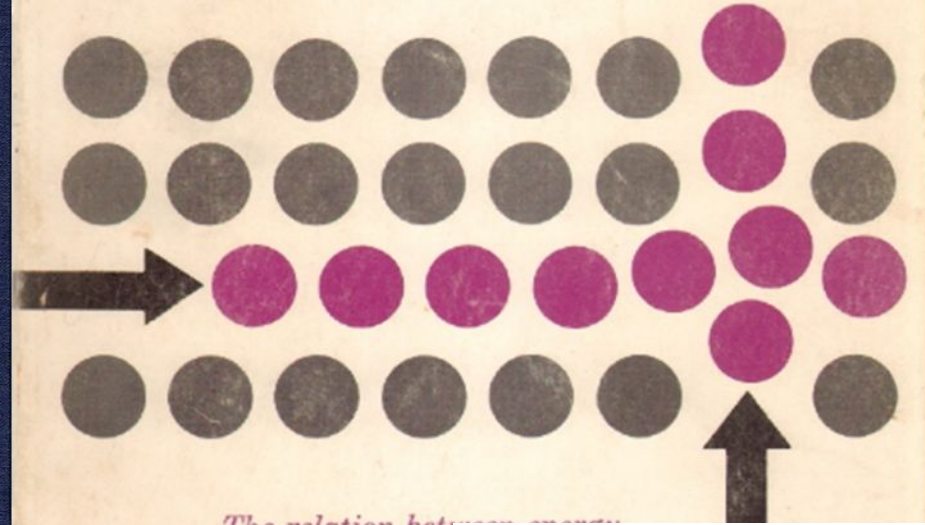
# NATIONAL UNITY and DISUNITY

1941

GEORGE KINGSLEY ZIPF

Since 1907!

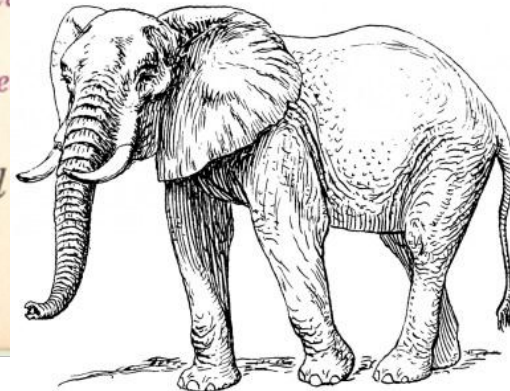
# ENERGY and SOCIETY



*The relation between social change, and economic development*

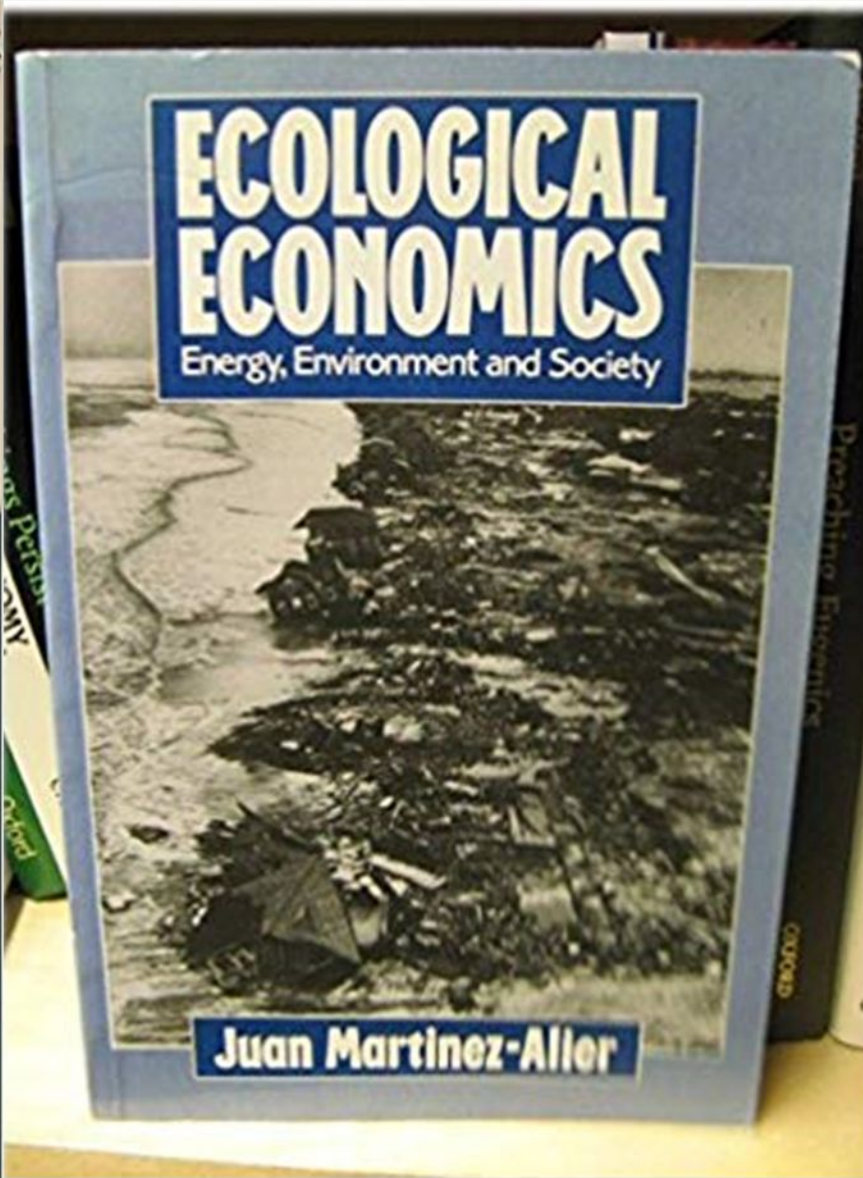
Fred Cottrell

1955

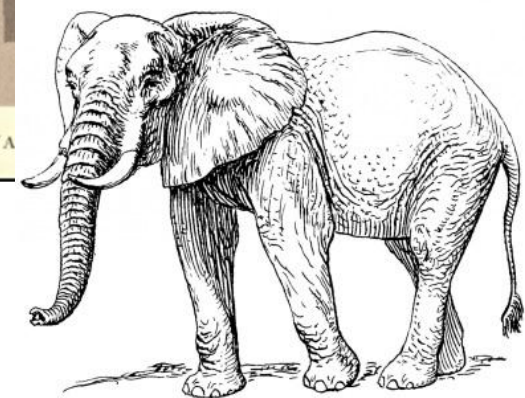
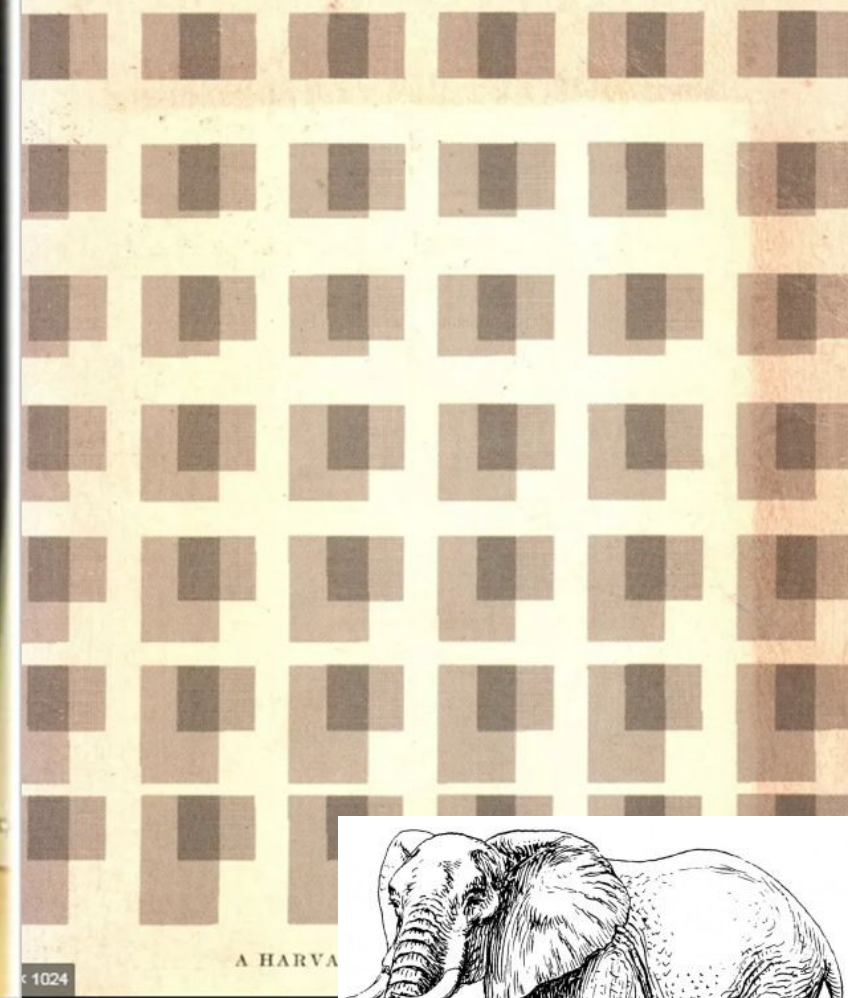


# Energy in the Economy

Slessor, Malcolm

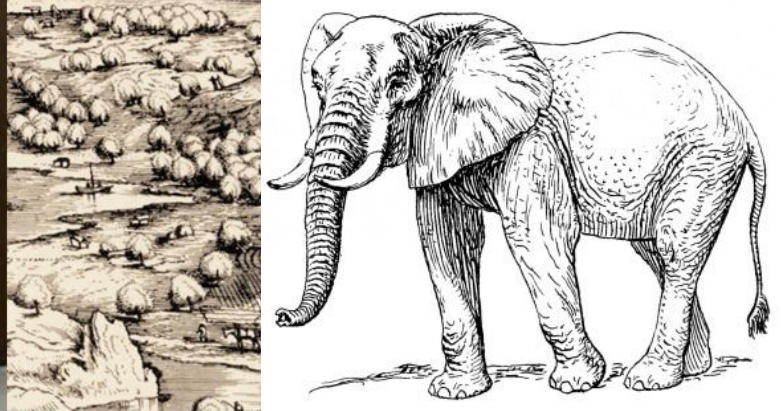
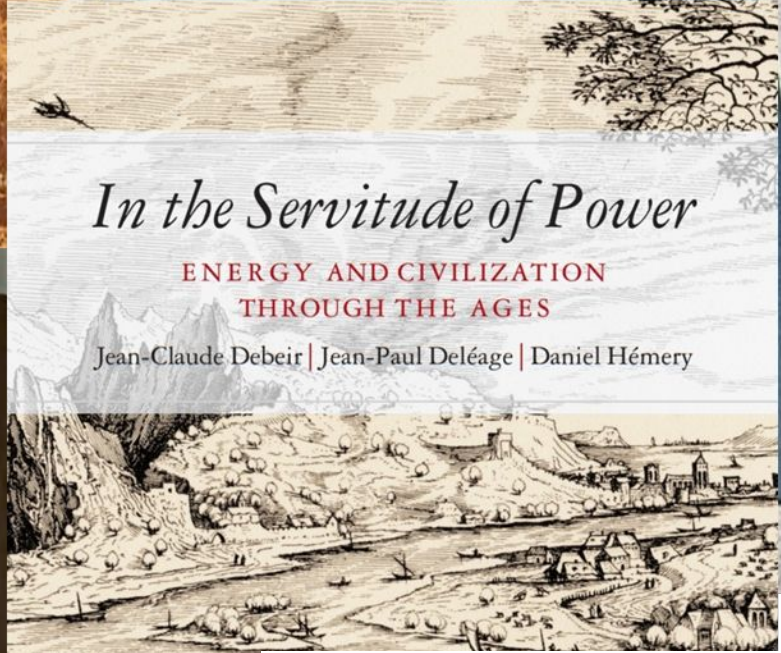
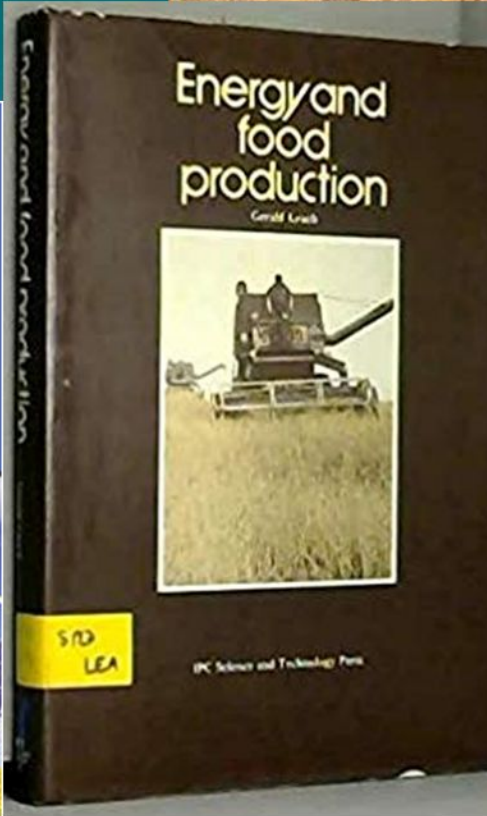
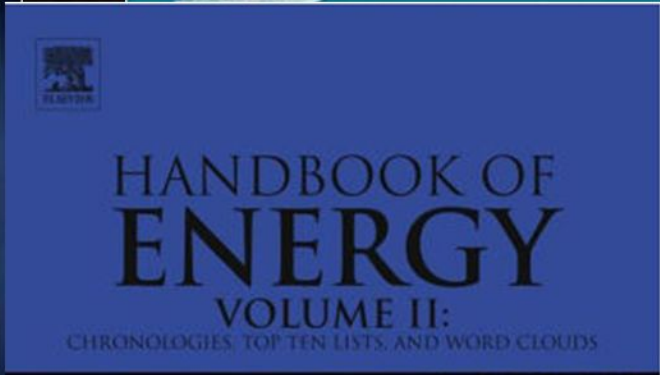
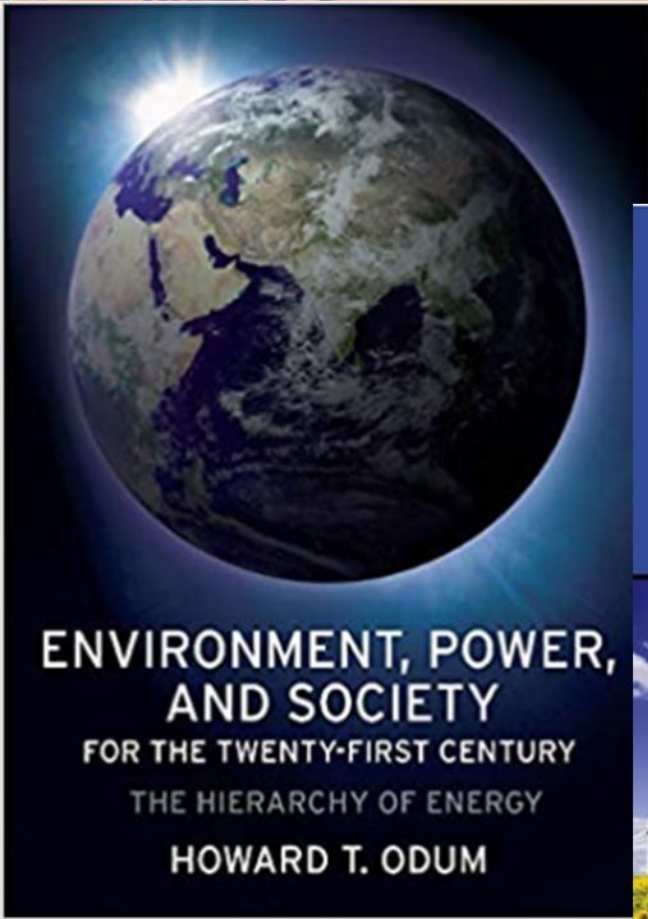
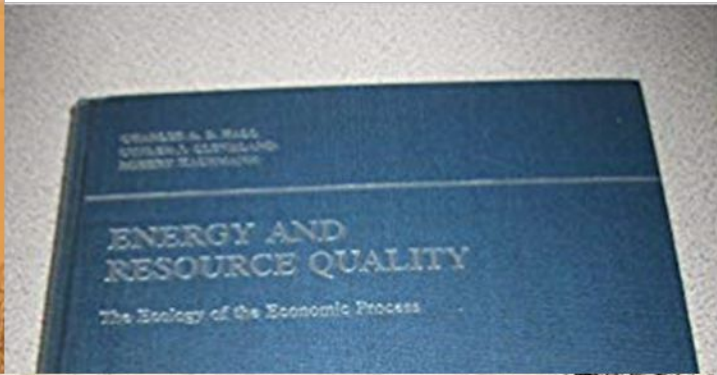
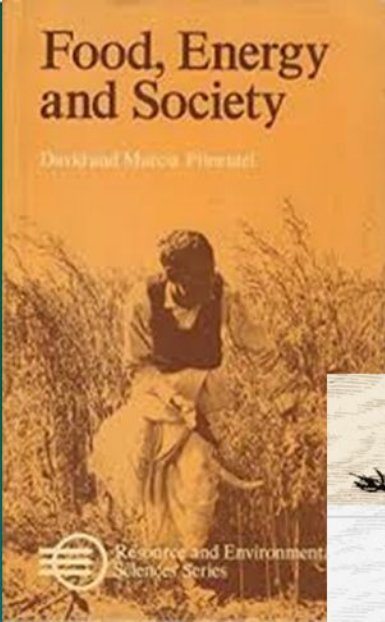
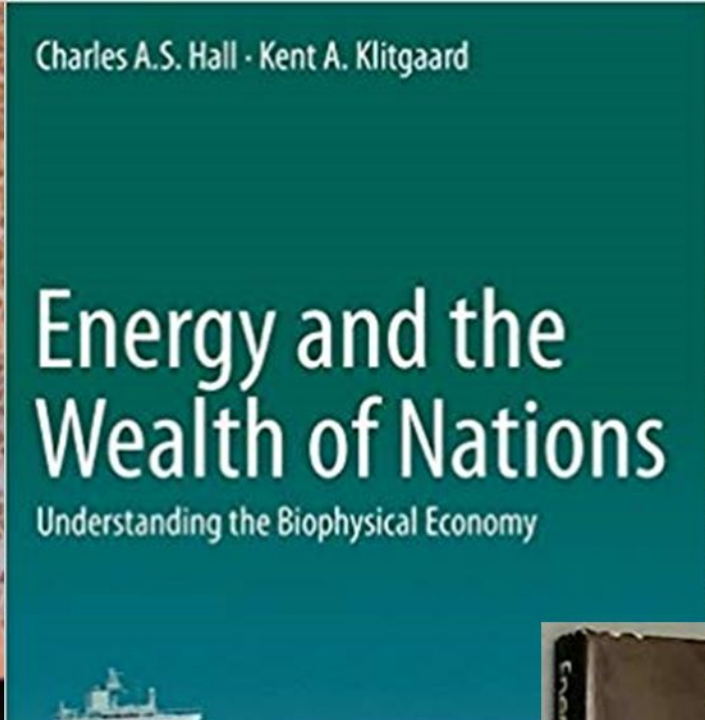
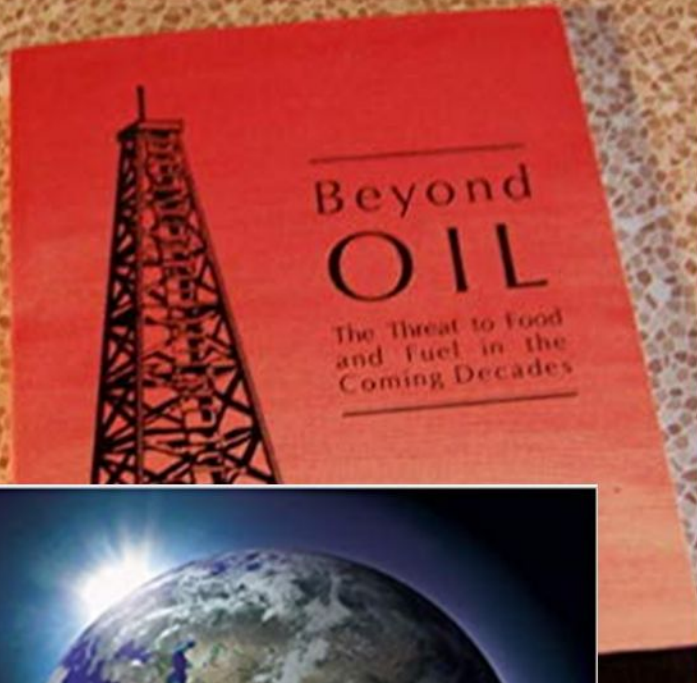


Nicholas Georgescu-Roegen  
The Entropy Law and the Economic Process



The second wave of conceptualizations in the 70s and 80s





What if, an expert of energetics would have been included in that panel?

BUSINESS INSIDER

## Bill Gates has read nearly all 37 books by this scientist here are 7 of his favorites

Leanna Garfield Dec 5, 2017, 11:38 AM

On Monday, Bill Gates released his annual list of favorite books that he read over the year. One of his recommendations was "Energy and Civilization: A History" by Vaclav Smil.



Vaclav Smil, a Czech-Canadian scientist and professor. Winnipeg Free Press

This pick should come as no surprise — Gates has not been shy about his admiration of Smil's work. On his Gates Notes blog, he said he had read nearly all of Smil's 37 books, most of which delve into topics like food production, energy, public policy, and the environment.



EYE ON THE MARKET • ENERGY OUTLOOK 2020

# Tenth Annual Energy Paper

### Acknowledgements

Our energy *Eye on the Market* is overseen by **Vaclav Smil**, Distinguished Professor Emeritus in the Faculty of Environment at the University of Manitoba and a Fellow of the Royal Society of Canada. His inter-

J.P.Morgan

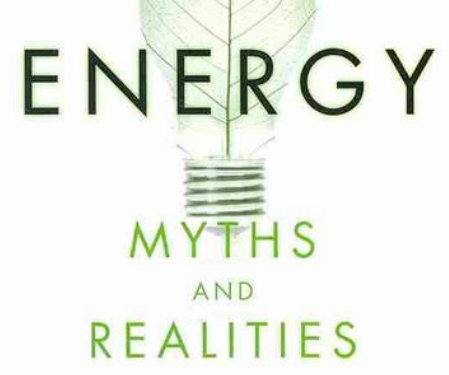
## VACLAV SMIL AND THE VALUE OF DOUBT

*A ruthless dissector of unwarranted assumptions takes on environmental catastrophists and techno-optimists*

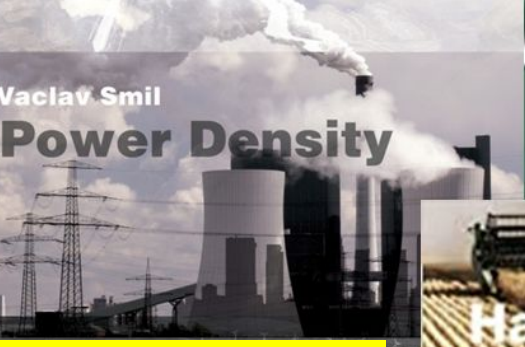


Why bankers ask energy experts while EU institutions ask economists to run Integrated Assessment Models?

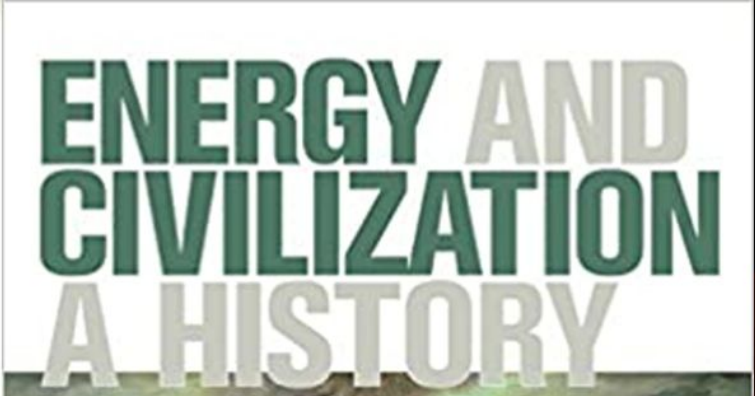
The ongoing policy debate is quite sloppy



BRINGING SCIENCE TO THE ENERGY POLICY DEBATE



Why it is not possible to use biofuels to replace fossil energy fuels



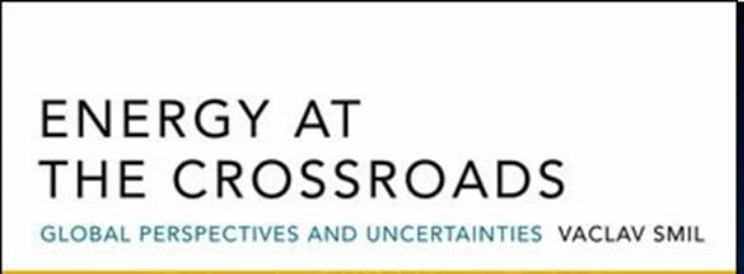
Why it is important to understand what happened with the industrial revolution to modern societies



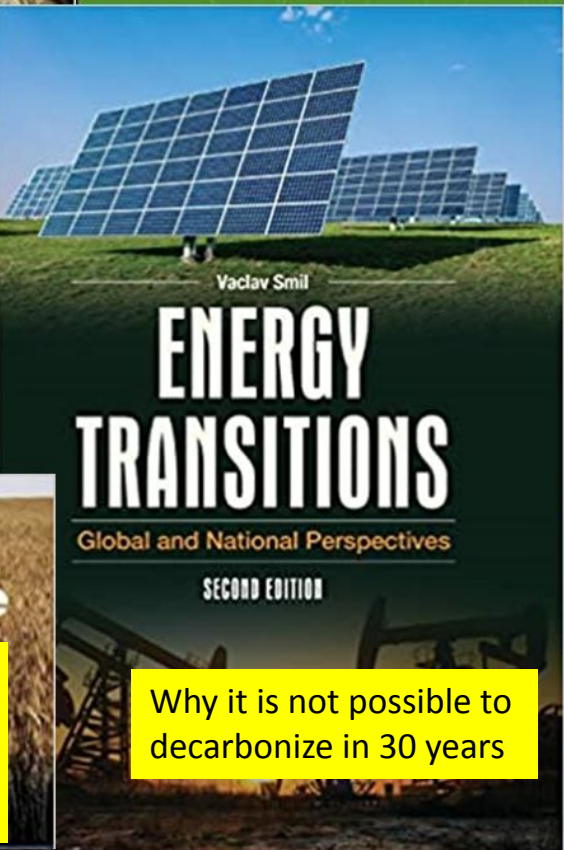
Harvesting the Biosphere

What We Have from Nature

Why it is not possible to produce what we eat with a circular, organic bioeconomy



Why it is essential to recognize the high level of uncertainty about our energetic future

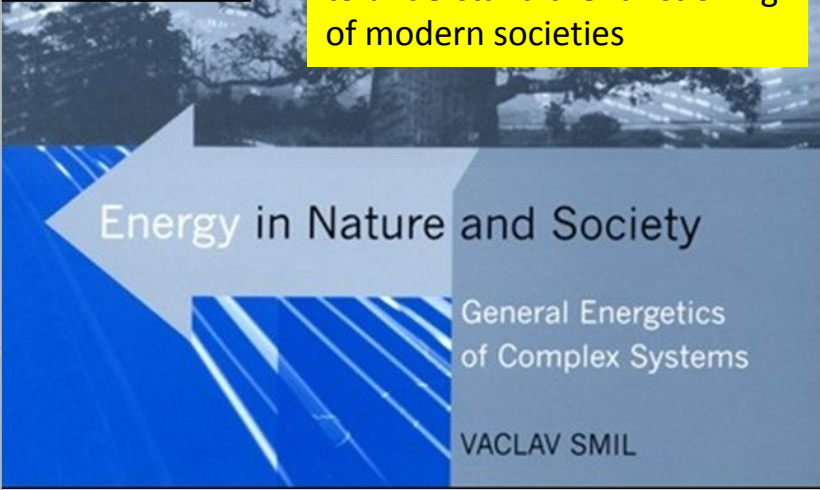


Why it is not possible to decarbonize in 30 years



Why alternative sources of energy will be still dependent on critical materials

Why energetics is important to understand the functioning of modern societies



Energy in Nature and Society

General Energetics of Complex Systems

VACLAV SMIL

WILEY

## The prophetic concern of Habermas about the existence of a systemic legitimation problem in social welfare state mass democracies . . .

Habermas argued in 1979 that, after abandoning the “dangerous” nationalistic mechanism of formation of a common identity adopted in the past, modern states would have to base their legitimacy on the claim that they can solve all the perceived sustainability challenges, thereby keeping contradictions under control.

*“the European Green Deal will transform the EU into a modern, resource- efficient and competitive economy, ensuring: **no net emissions of greenhouse gases by 2050; economic growth decoupled from resource use; no person and no place left behind”***

*(European Commission, 2021).*



**Jürgen Habermas**



**Sheila Jasanoff**

**Sociotechnical imaginaries** are “*collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of advances in science and technology*”\*

Sociotechnical imaginaries allow the colonization of the future by defining visions and expectations for the society. They are key elements for designing ambitious policy agendas such as the Green Deal. However, they can also represent powerful generators of *socially constructed ignorance* to be used to lock-in existing power structures

\* Jasanoff S. and Kim S.H. (eds) 2015 *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power* The University of Chicago Press



**The real winner of the cold war was “the American dream”:  
i.e. the belief that sooner or later “everyone” living on this planet will become as rich as US people**

*THE KEY WINNING FEATURE!  
It provides the required hope  
making inequity acceptable*

**But what if the finite availability of resources and the need of preserving the health of ecological systems will limit a perpetual economic growth?**

sorry my friends: the social conquests  
were only temporary concessions



*Viñeta de El Roto  
6 Septiembre 2012*

## ***WE NEED TO CONTROL THE CAUSES OF EMOTIONAL STRESS***

What is the role of science in society?

1. Generating useful knowledge claims

2. Legitimizing social institutions  
("they know what they are doing . . .")



**This role becomes important  
in moments of crisis . . .**

## NOBLE LIES vs TOXIC TRUTHS

In Plato's *Republic* we can find the idea of the **Noble Lie** – “*whereby a ruling intellectual elite promulgate a myth in order to maintain social harmony and the people's acceptance of their social position together with its restrictions which he considered integral to maintaining justice in the polity*” (Hayward, 2024).

Habermas' prophecy

□ Bioeconomy is a panacea for achieving a perpetual green economic growth

*A democratic society depends on the trust and goodwill of citizens towards each other and towards the system that regulates their interactions. **If that trust is severely eroded, there is a risk of system collapse and social crisis** (Hayward, 2024). Information that erodes this trust (uncomfortable knowledge) even if genuine should be considered as a **Toxic Truth**.*

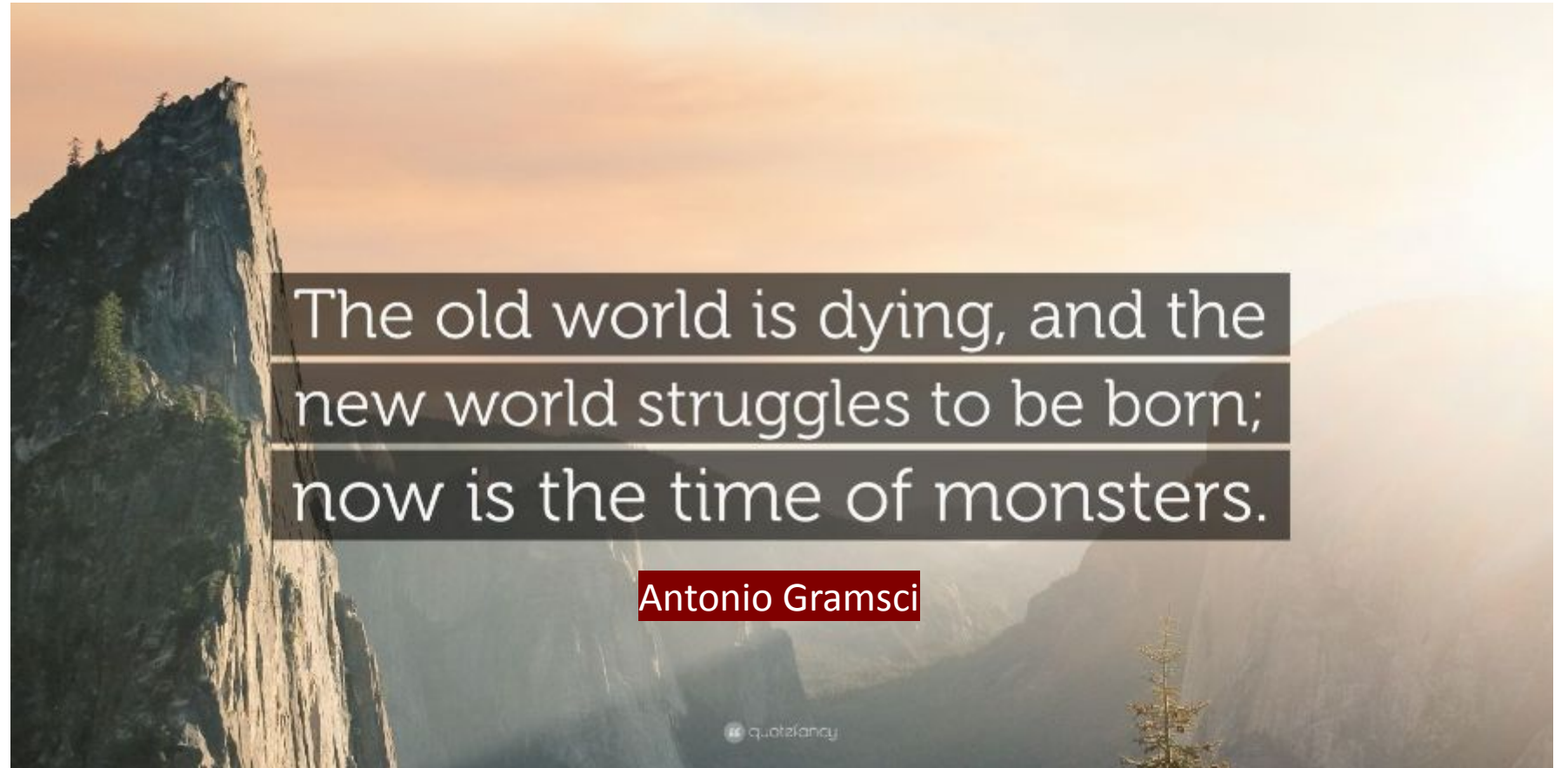
Rayner uncomfortable knowledge

□ Bioeconomy is a policy legend used to stabilize the status quo





The sustainability crisis consists precisely in the fact that . . .



*how to preserve/adapt  
affective interactions*

# WHY PURPOSES

## Represent notional

storage of knowledge claims,  
effective narratives, rules and  
organizational settings

**Exosomatic  
memory**

sociotechnical  
imaginaries

### COMMUNICATIONS

SHARED BELIEFS  
**EXPLANATION  
NARRATIVES**

**HOW**  
act

*identity*

Turnover of knowledge claims,  
anticipatory models, technological  
solutions, institutions, rules

### INTERACTIONS

**POLICIES**

**Interpret**

SHARED BELIEFS  
**JUSTIFICATION  
NARRATIVES**

Turnover in the universe  
of feelings, concerns,  
aspirations, story-telling

**HOW**  
represent

**Interpret**

Psychic structure  
(inside interactions)

**the self**

establishing priorities inside the  
universe of different experiences  
done in daily affective interactions

social  
practices

**the other** Biophysical interactions  
with the environment

expressing/adapting viable &  
feasible biophysical interactions

**WHA**  
**tangible**  
**Act**

Shared myths giving justification to the chosen identity

American dream Technological innovations  
Cartesian **the dying old world!**

Validated knowledge narratives/taxonomies of types

*Sociotechnical imaginaries*

**WHY**

LEGITIMIZING  
UPDATING

**COMMUNICATIONS**

**REPRESENT**

Validating knowledge

*knowledge claims*

**HOW**

**INTERPRET**

*affective interactions*

**NOTIONAL SIDE**

**TANGIBLE SIDE**

**INTERPRET**

**INTERACTIONS**

**ACT**

Using knowledge

GUIDING ACTION  
MONITORING AND CONTROL

**WHA**

**Psychic Structure**  
bonding feelings and passions through affective interactions



**Social Practices**  
**SOCIETAL METABOLISM**



**EMBEDDING ECOSYSTEMS**  
biophysical interactions

**Socio-technical  
Imaginaries**

American Dream  
Cartesian dream  
Economic Growth

Circular Economy  
missions  
Growth

**LOCK-IN !!!**

*POLICY LEGENDS  
NOBLE LIES*

**HOW**

**SCIENCE**

*Validated knowledge*

Evidence Based Policy



Policy Based Evidence

**POLICY**

*possible solutions*

**GOVERNANCE**

*Myths*

**WHY**

**VALUES**

**COMMUNICATIONS**  
Validating  
knowledge

**NOTIONAL SIDE**

**NORMS**

**TANGIBLE SIDE**

*TOXIC TRUTHS !*



*affective interactions*



**INTERACTIONS**  
Using  
knowledge

GUIDING ACTION  
MONITORING AND CONTROL

**WHA**

**T**

**Psychic Structure**  
bonding feelings and passions  
through affective interactions



**Social Practices**  
**SOCIETAL METABOLISM**



**EMBEDDING ECOSYSTEMS**  
biophysical interactions

## NOBLE LIES

economic growth will be decoupled from resource use, and no person and no place will be left behind

circular bioeconomy will solve all our problems of sustainability

by 2050 Europe will be a zero emission economy

*“ancient regime syndrome” - “a state of affairs in which the ruling elites become unable to cope with stressors and adopt instead a strategy of denial, refusing to process either internal or external signals, including those of danger” (Funtowicz and Ravetz, 1994).*

perpetual economic growth is impossible

our wealth is based on debt and an unjust appropriation of global resources

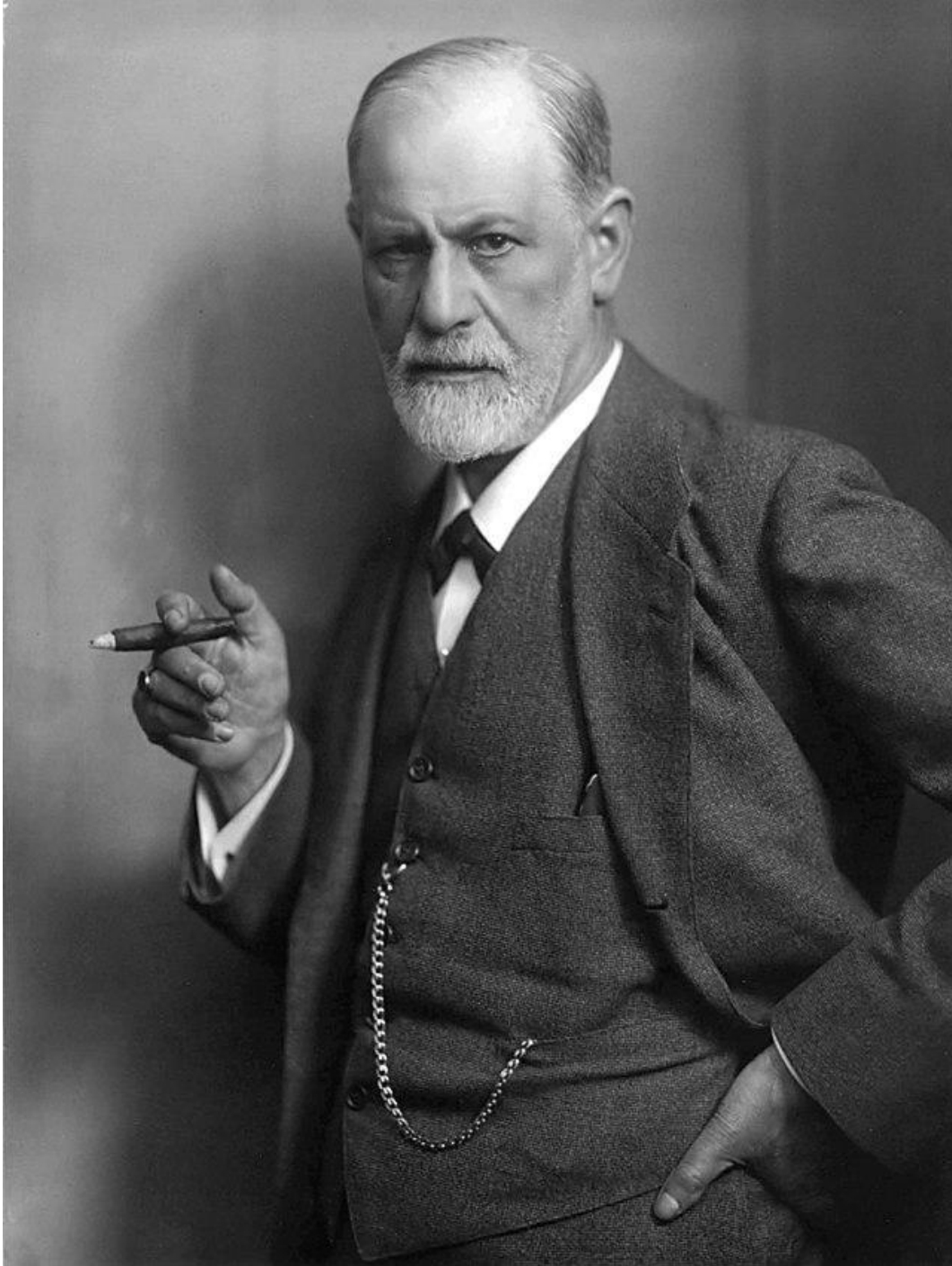
technology and business innovations cannot avoid thermodynamic limits

**TOXIC TRUTHS**

# Conclusions



We do not properly understand the problem of sustainability and we do not know that we do not know . . .

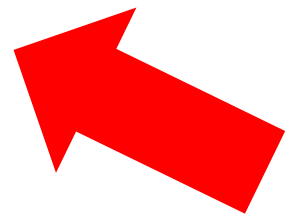


## Psychotic Delirium

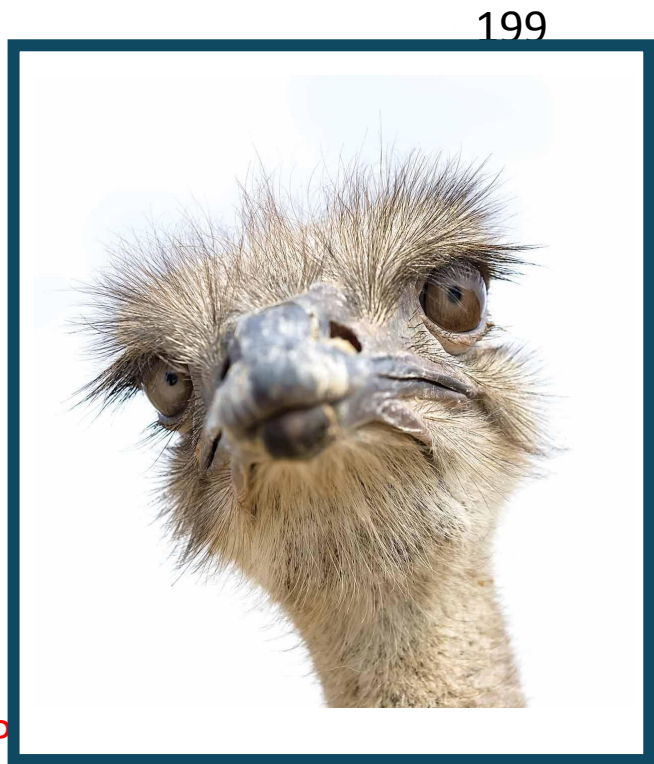
**Psychosis** is a conditions where there is **a loss of contact with reality**. When a person experiences psychosis, their thoughts and perceptions are disturbed, and the individual has difficulty understanding what is real and what is not real.

**Delirium** may be a common cause of psychotic symptoms such as **hallucinations, bizarre delusions** and **thought-disorder**

# Global debt has increased by \$57 trillion since 2007, **outpacing world GDP growth**



Global stock of debt outstanding by type  
US\$ trillion, constant 2013 exchange rate



Total debt  
as % of GDP

Compound annual  
growth rate (%)

	2000-07	2007-14 <sup>1</sup>
	7.3	5.3
Household	8.5	2.8
Corporate	5.7	5.9
Government	5.8	9.3
Financial	9.4	2.9

It reached 315 trillions in 2024  
(67% of it in mature markets)

MCKINSEY GLOBAL INSTITUTE

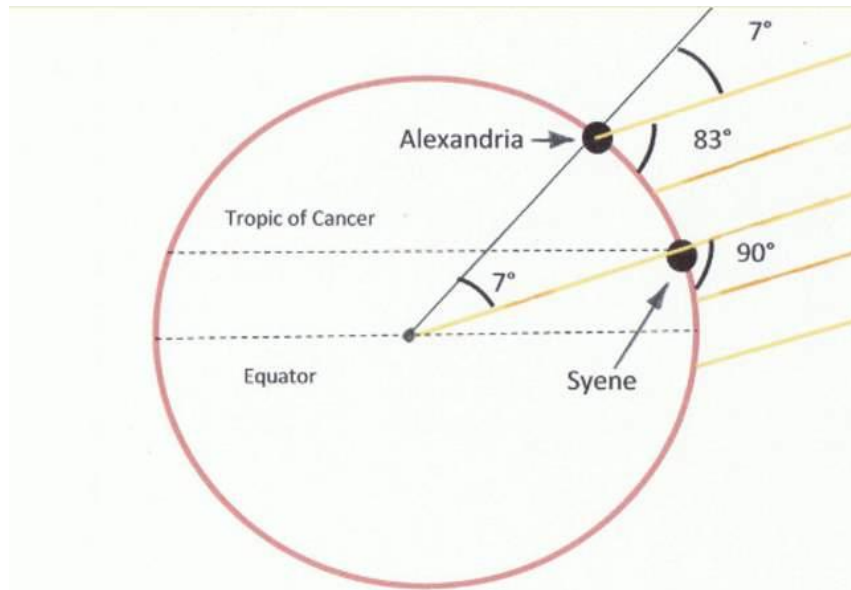
## DEBT AND (NOT MUCH) DELEVERAGING

February 2015



*After 800 years . . .*

240 AC



*The calculation made by Eratosthenes to measure the circumference of the earth*

starting from the distance between Alexandria and Syene

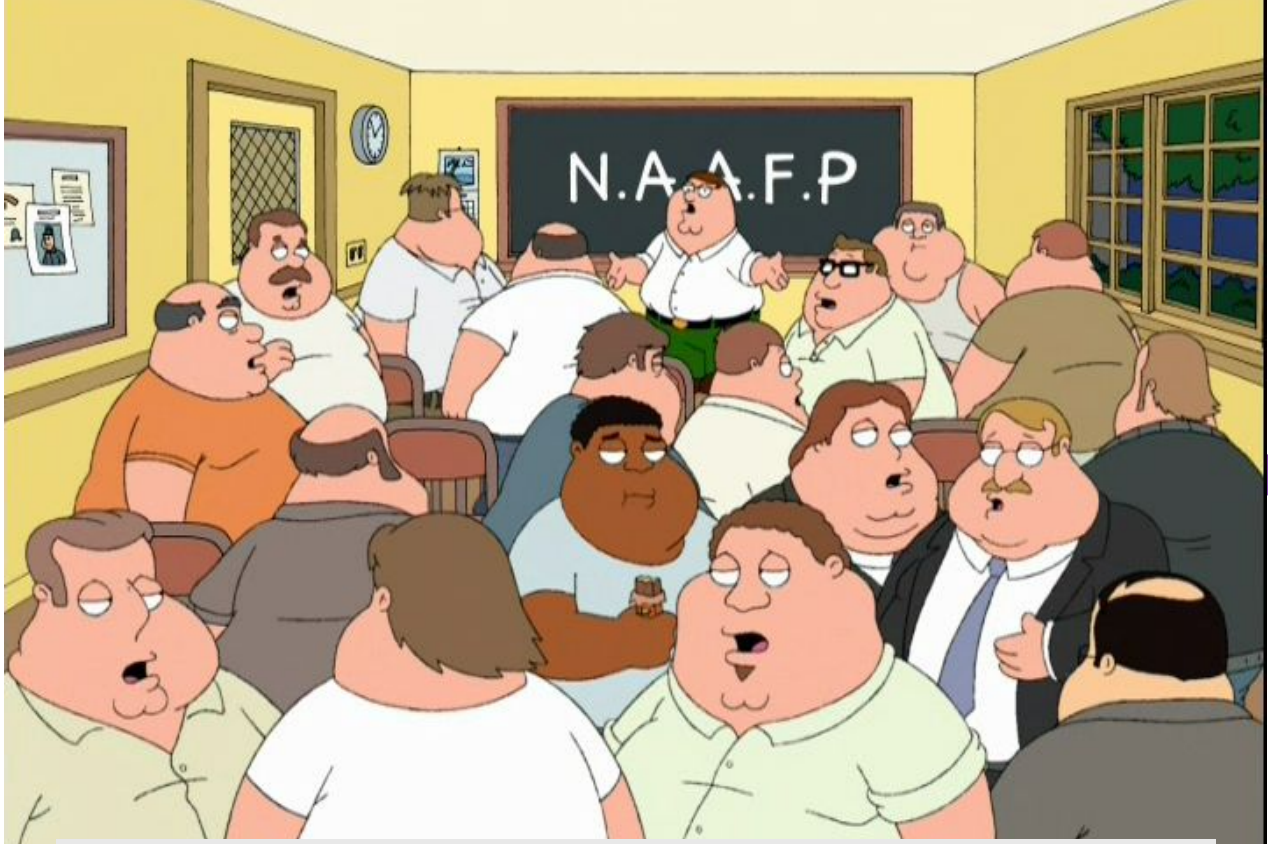
550 DC



*Cosmas Indicopleustes*  
"Topographia Cristiana"

A flat earth supporting the sky  
with high walls at its borders

EL ROTO



N.A.A.F.P. is suing



**WORLD FARMERS' ORGANISATION**

for the health damage generated by obesity

National Association for the Advancement of Fat People



Ancien Régime Syndrome

## Farm to Fork: Updating Narratives about agriculture



## Decarbonization of electricity production



## Decarbonization of liquid fuels production



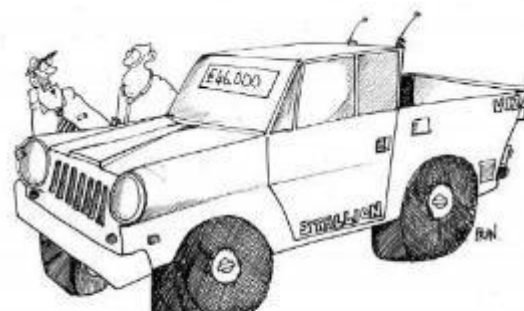
<https://uncomfortableknowledge.com/>

## Circular Economy and the use of Policy Legends



"I try to do my part"

## Energy Efficiency: a treacherous concept



In line with our company environmental policies all our 5.7 litre "STALLION" SUVs are fitted with energy efficient headlamps

## Complexity and Scientific Advice



If you are reading this slide, you made it . . .

CONGRATULATIONS!!!

**Thanks for your attention**

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