“Remedios para un planeta en crisis”

Curso de Verano de la Universidad de Cádiz

10 y 11 de julio en Cádiz

El planeta viene sufriendo diversas crisis crecientes claramente de origen antropogénico. Unas afectan a la biosfera (crisis ambiental, climática, de biodiversidad…) y otras, especialmente, a la civilización humana tal como la conocemos (crisis energética y de materiales, crisis social y de cuidados…). Este curso trata de analizar el estado de estas crisis a fecha de 2025, su posible evolución a corto/medio plazo y, las posibles y diferentes estrategias globales de adaptación y acción previstas por las élites del sistema económico e institucional imperante, frente a las propuestas de adaptación decrecentistas y de acción colectiva defendidas por entidades sociales y comunidades organizadas.

"Papel y alcance actual de la tecnología ante los límites planetarios, efectos a corto y medio plazo."

Ferrán Puig Vilar

Universidad de Verano. Cádiz, 10 de julio de 2025

¿Qué es la tecnología?

Tecnología ≡ Materia ⊕ Energía ⊕ Información

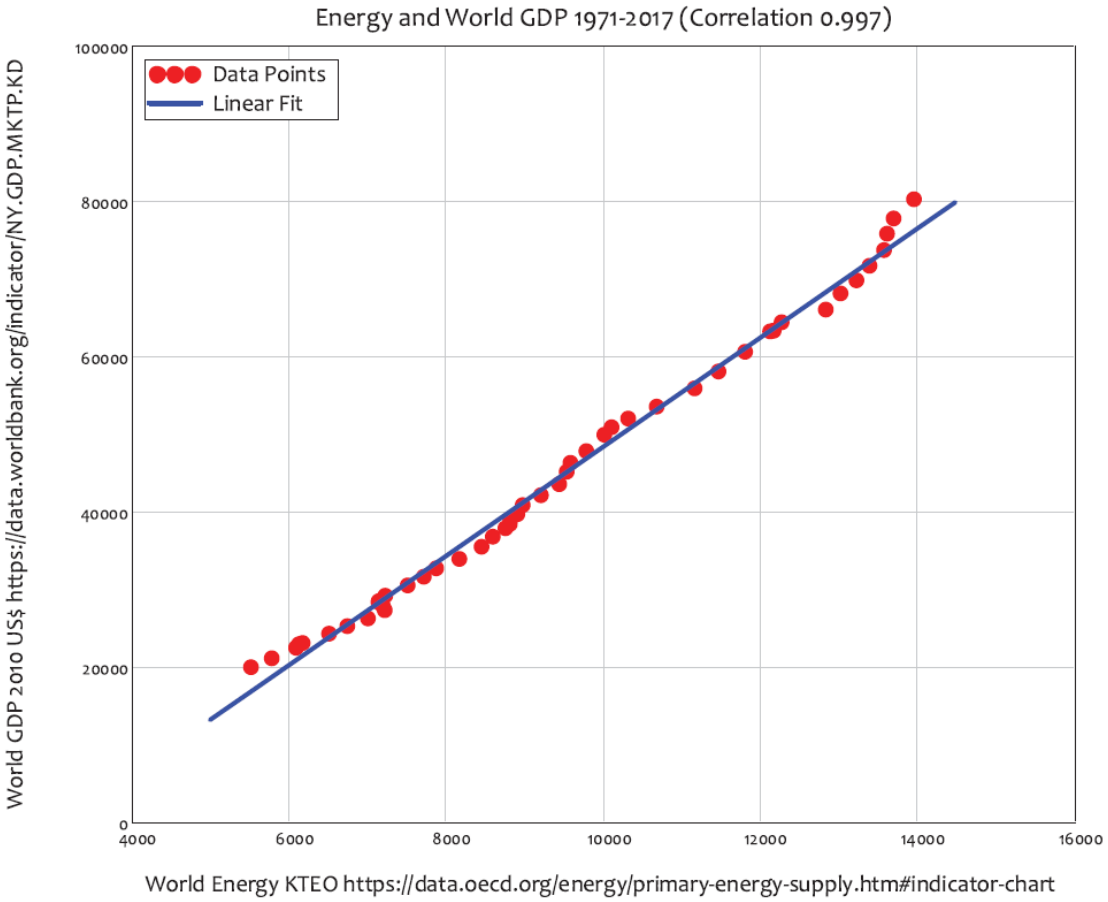
f (e,i) f (m,i) f (e,i)

Ciclo de vida completo.
Cuna a cuna o tumba.
Del minado a reciclado o vertedero.

Contorno del sistema

Físico	→ Mundo, Gaia
Conceptual	→ Biotecnología

La energía (bruta) determina el PIB

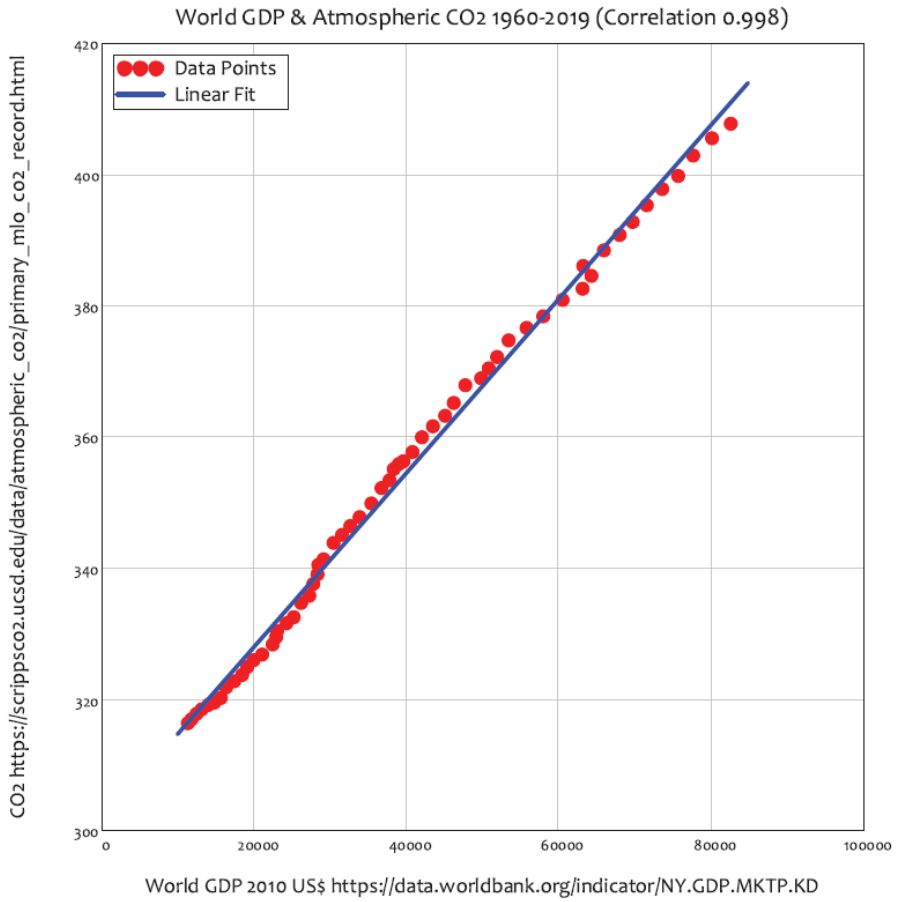


Timothy J. Garrett (2020):
$1(2010) ≡ 5,9±0,1 mW

$1.000 ≈ 6 W

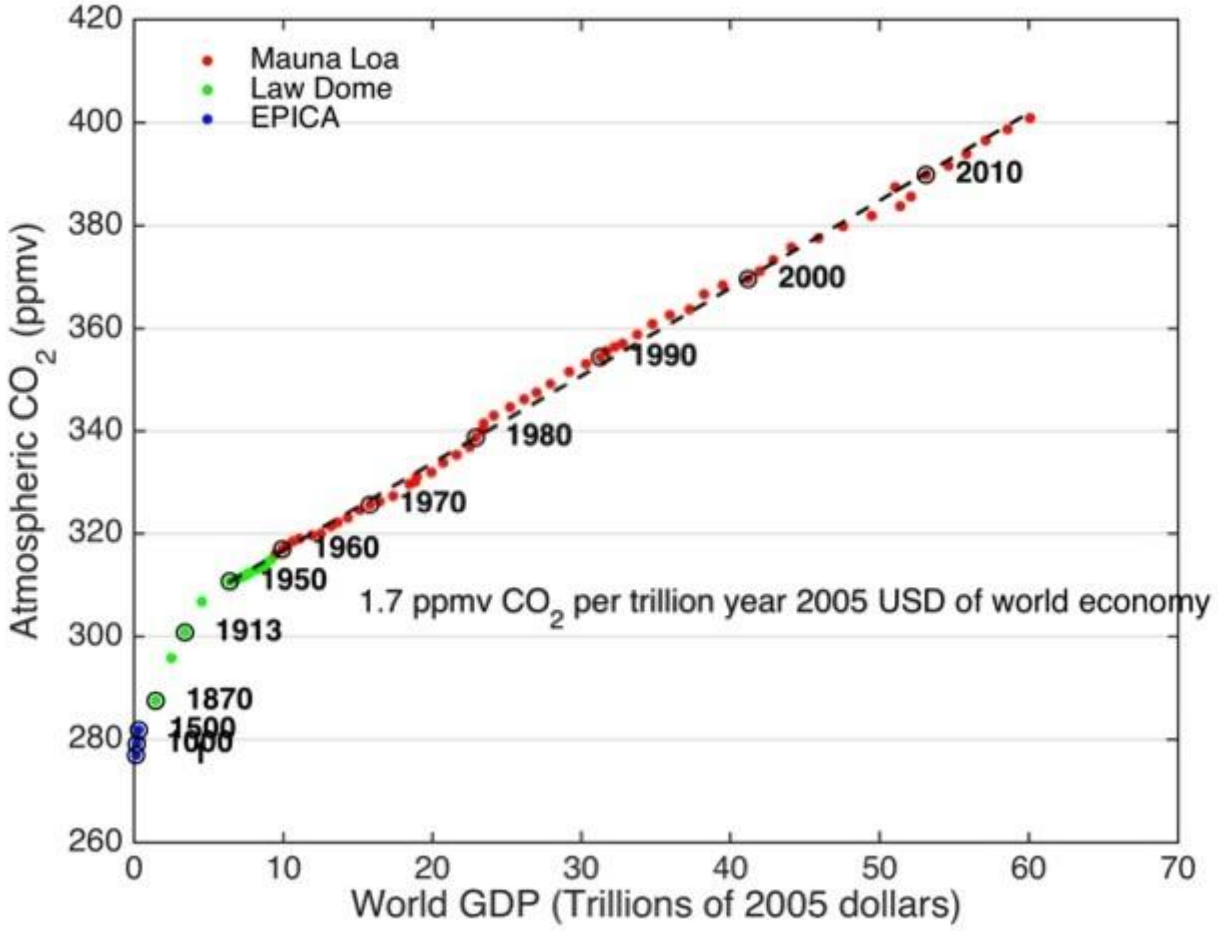
Steve Keen (2020) - **The appallingly bad neoclassical economics of climate change** - Globalizations 18:1149-1177 doi:10.1080/14747731.2020.1807856 - Institute for Strategy, Resilience and Security, University College London - https://www.tandfonline.com/doi/pdf/10.1080/14747731.2020.1807856

También las emisiones de CO_2



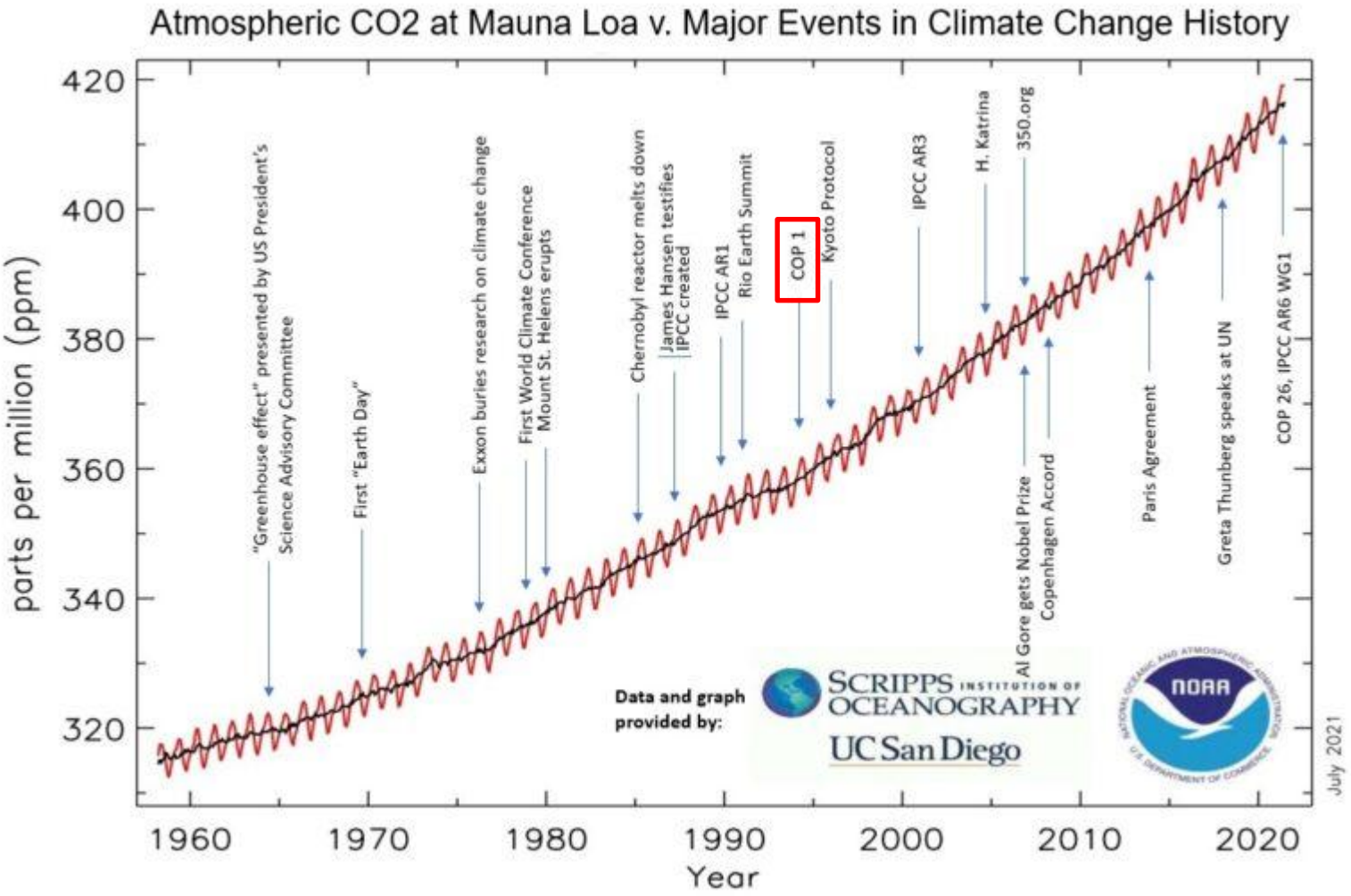
Steve Keen (2020) - **The appallingly bad neoclassical economics of climate change** - Globalizations 18:1149-1177 doi:10.1080/14747731.2020.1807856 - Institute for Strategy, Resilience and Security, University College London - https://www.tandfonline.com/doi/pdf/10.1080/14747731.2020.1807856

También la concentración

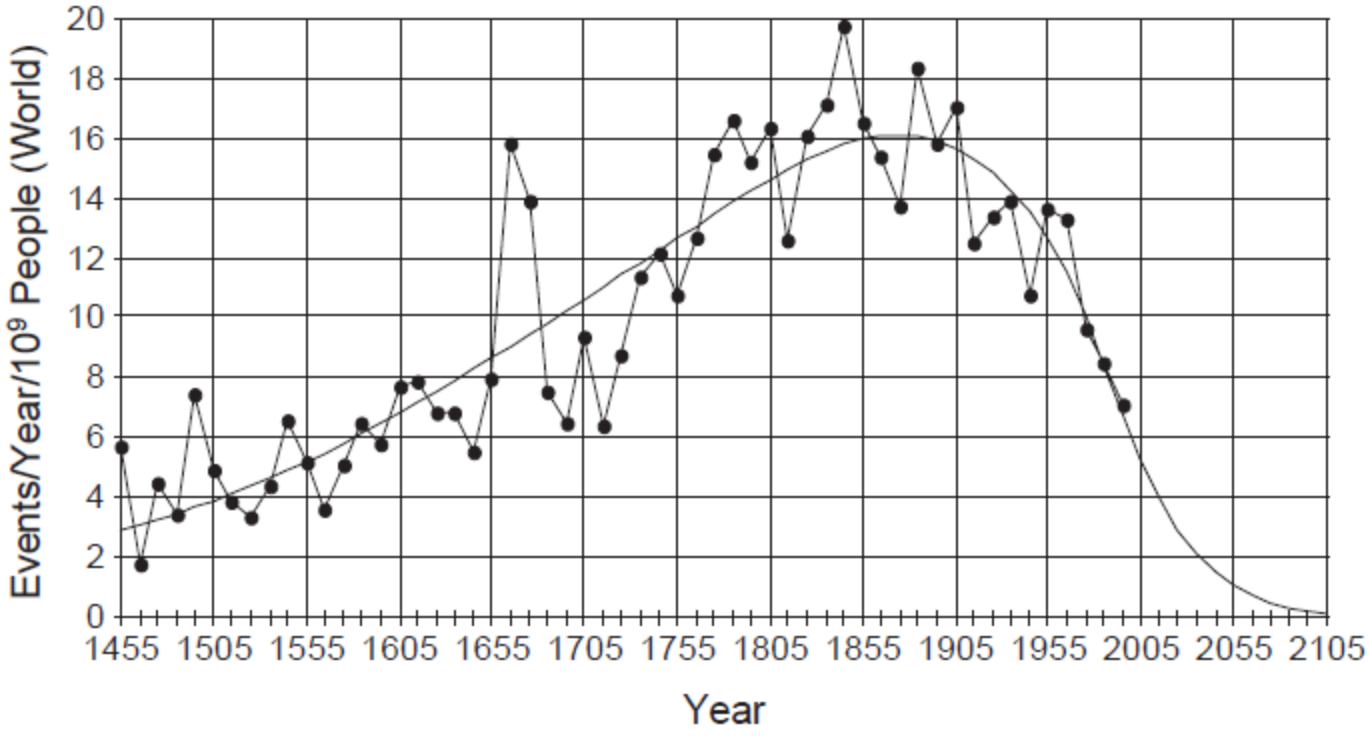


Tim Garrett (2018) - https://www.inscc.utah.edu/~tgarrett/what-is-your-carbon-footprint.html

Influencia de la tecnología

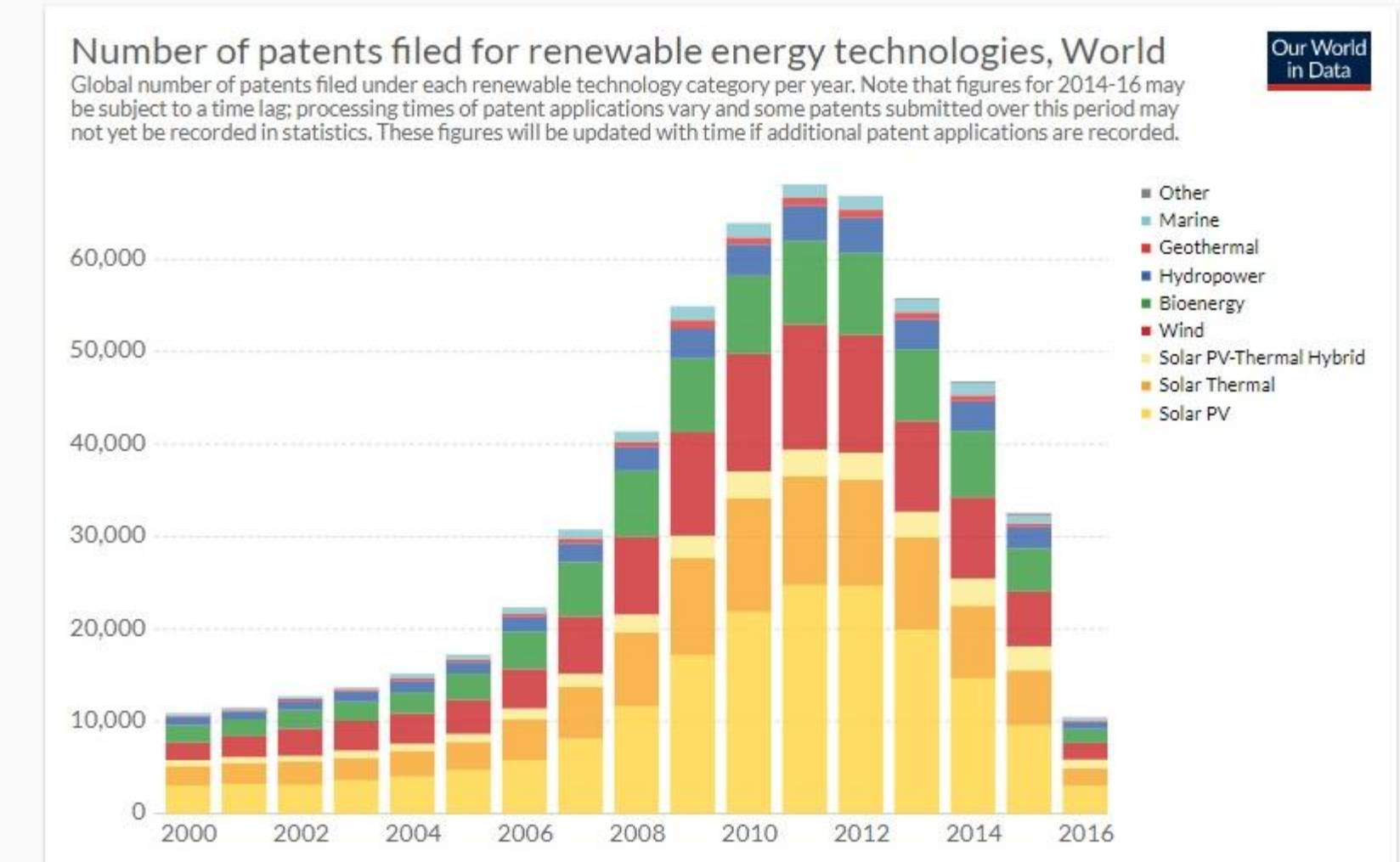


Patentes desde la Edad Media



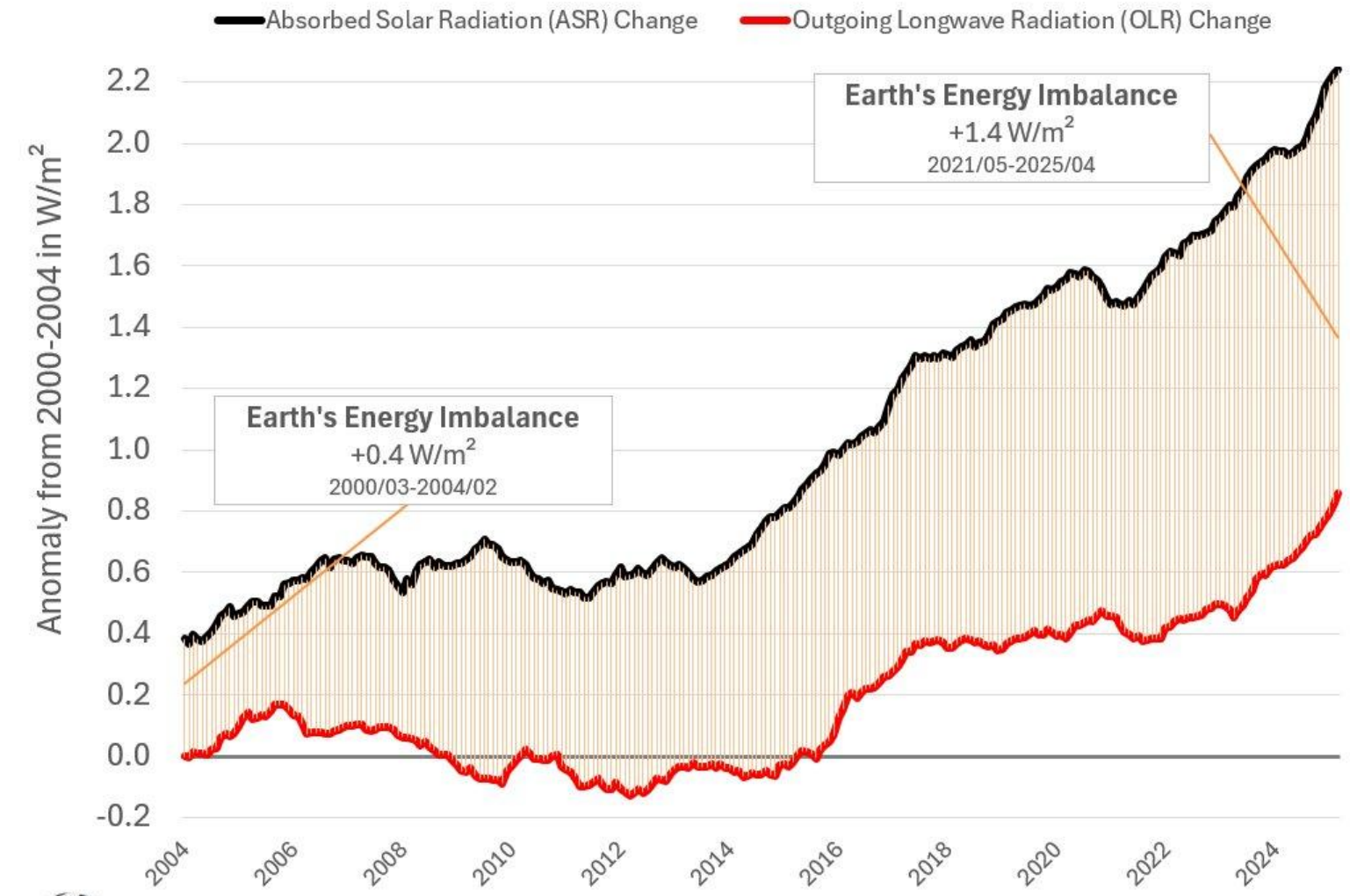
Jonathan Huebner (2005) - **A possible declining trend for worldwide innovation**
Technological Forecasting & Social Change 72:980–986 doi:10.1016/j.techfore.2005.01.003 -
http://www.iaa.es/sites/teslablog.iaa.es/files/InnovationHuebnerTFSC2005.pdf

Patentes energías renovables



Puntos de quiebra superados

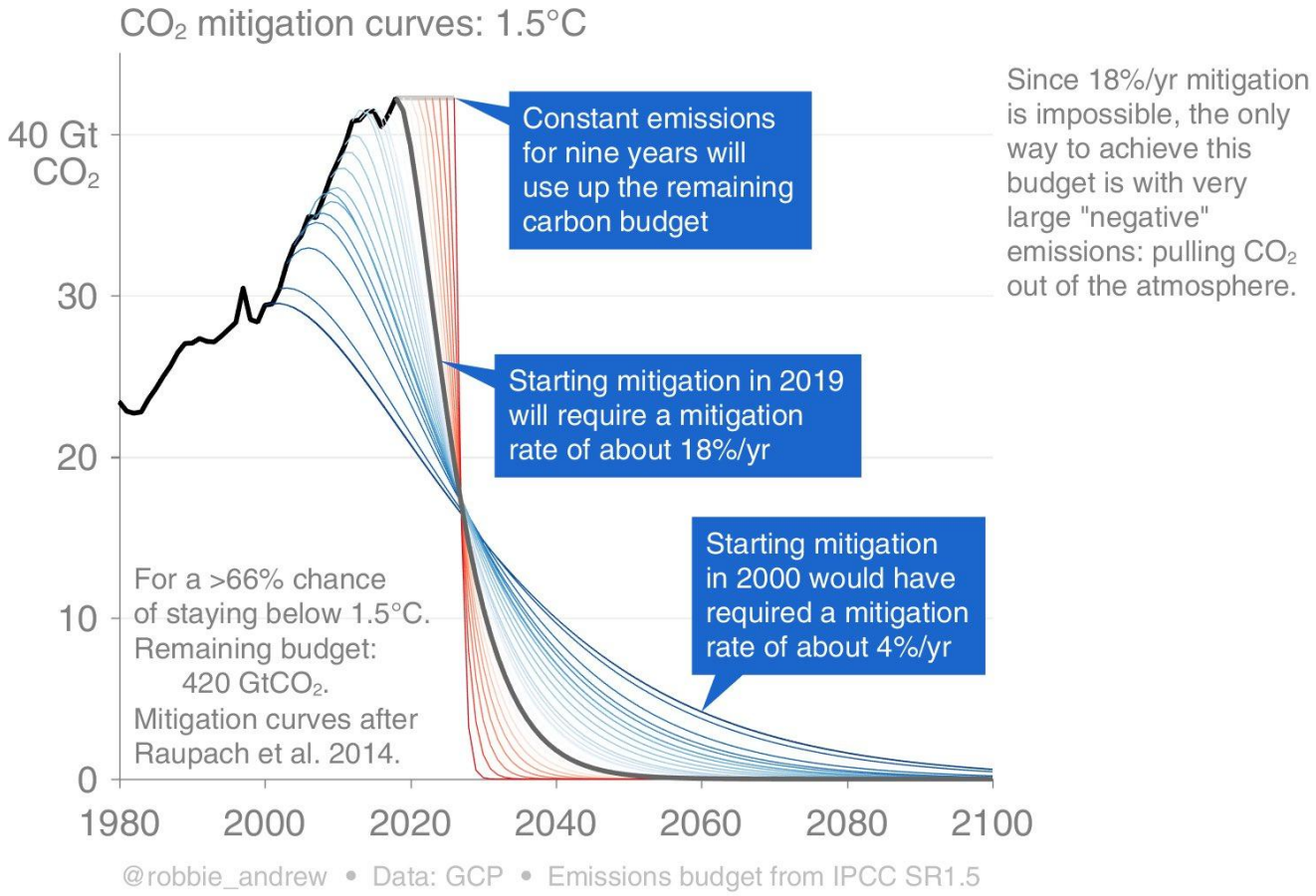
NASA CERES Earth's Energy Imbalance



The Netherlands Association
THE CLUB OF ROME

©Leon simons - Data source: **NASA CERES** EBAF-TOA All-sky Ed4.2.1, 2000/03-2025/04
48-month running mean relative to 2000/03-2004/02, Area = 510 M km², **100% Earth's surface**

Reducción emisiones necesaria



¿Para cuándo?

Global Warming has Accelerated Significantly

Grant Foster and Stefan Rahmstorf (2025 preprint)

¡Nordhaus!

Table 1 Ending value in °C, rate in °C/decade

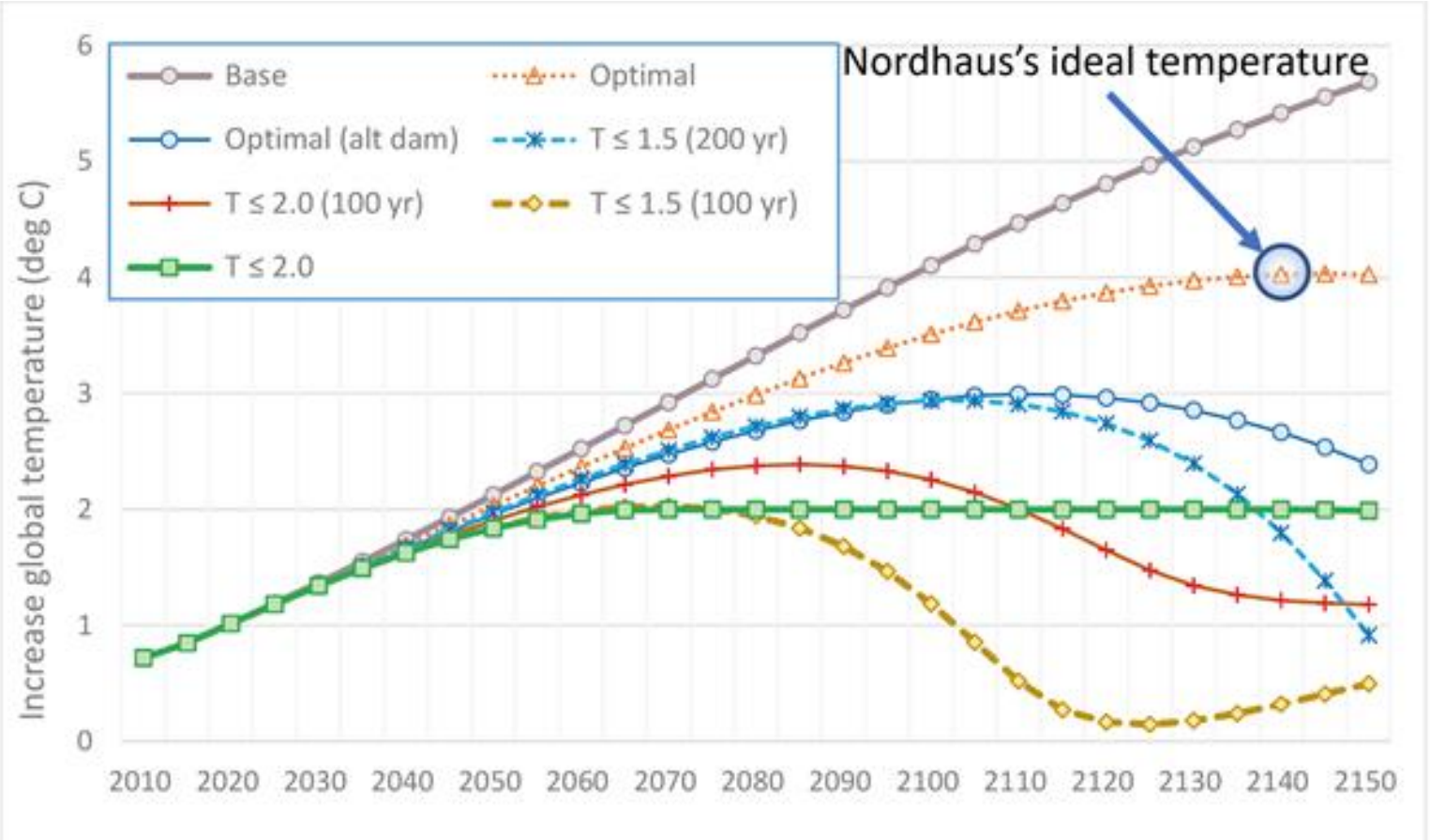
Data	value	rate	cross +1.5°C	cross +2.0°C	cross +2.5°C	cross +3.0°C	cross +3.5°C	cross +4.0°C
NASA	1.45	0.42	2026	2037	2049	2061	2073	2085
NOAA	1.45	0.42	2026	2037	2049	2061	2073	2085
HadCRU	1.42	0.39	2026	2039	2052	2065	2077	2090
Berkeley	1.45	0.43	2026	2037	2048	2060	2072	2083
ERA5	1.54	0.48	2024	2034	2044	2054	2065	2075
Average	1.46	0.43	2026	2037	2048	2060	2072	2084

'The most important insight from these adjusted data is that there is no longer any doubt regarding a recent increase in the warming rate. Although the world may not continue warming at such a fast pace [~0.43/dec], it could likewise continue accelerating to even faster rates.'

Extrapolated presented warming rates linearly after +1.5°C to show additonal cross points, by Leon Simons

Leon Simmons, a partir de Stefan Rahmstorf & Grant Foster (2025) - **Global Warming has Accelerated Significantly** - Research Square doi:10.21203/rs.3.rs-6079807/v1 - Potsdam Institute for Climate Impact Research - https://assets-eu.researchsquare.com/files/rs-6079807/v1_covered_209e5182-d9a5-4305-a4e0-70204151d2b3.pdf

Nordhaus, el economista genocida



Calvin Hanson and Steve Keen - '4°C of Global Warming is Optimal' – Even Nobel Prize Winners are Getting Things Catastrophically Wrong - Brave New Europe - - https://braveneweurope.com/steven-keen-4c-of-global-warming-is-optimal-even-nobel-prize-winners-are-getting-things-catastrophically-wrong

The appallingly bad neoclassical economics of climate change

Steve Keen

Institute for Strategy, Resilience and Security, University College London, London, UK

ABSTRACT

Forecasts by economists of the economic damage from climate change have been notably sanguine, compared to warnings by scientists about damage to the biosphere. This is because economists made their own predictions of damages, using three spurious methods: assuming that about 90% of GDP will be unaffected by climate change, because it happens indoors; using the relationship between temperature and GDP today as a proxy for the impact of global warming over time; and using surveys that diluted extreme warnings from scientists with optimistic expectations from economists. Nordhaus has misrepresented the scientific literature to justify the using a smooth function to describe the damage to GDP from climate change. Correcting for these errors makes it feasible that the economic damages from climate change are at least an order of magnitude worse than forecast by economists, and may be so great as to threaten the survival of human civilization.

KEYWORDS

Climate change; neoclassical economics; William Nordhaus

Steve Keen (2020) - The appallingly bad neoclassical economics of climate change - Globalizations 18:1149-1177 doi:10.1080/14747731.2020.1807856 - Institute for Strategy, Resilience and Security, University College London - https://www.tandfonline.com/doi/pdf/10.1080/14747731.2020.1807856

MARCH 1, 2024 | 4 MIN READ

The False Promise of Carbon Capture as a Climate Solution

Fossil-fuel companies use captured carbon dioxide to extract more fossil fuels, leading to a net increase in atmospheric CO_2

BY NAOMI ORESKES

Penalti de entropía

Naomi Oreskes - The False Promise of Carbon Capture as a Climate Solution - Scientific American, March 2024 - Professor of History of Science, Harvard University; Chair of the Grantham Research Institute on Climate Change and the Environment, London School of Economics

https://www.scientificamerican.com/article/the-false-promise-of-carbon-capture-as-a-climate-solution/

Sunset with Thule Elk at Point Reyes National Seashore, Northern California. Photo by J.Foley © 2021.

insights by Dr. Jonathan Foley

Follow publication

Solar Geoengineering: Ineffective, Risky, and Unnecessary

Some people are proposing to counteract climate change by artificially dimming the Sun. But it's largely ineffective. It's potentially risky. And it's unnecessary. Instead, we should focus on real-world solutions that work.

AGU PUBLICATIONS

Earth's Future

RESEARCH ARTICLE

10.1002/2017EF000735

The Risk of Termination Shock From Solar Geoengineering

Andy Parker[1] **and Peter J. Irvine**[2]

[1] Institute for Advanced Sustainability Studies, Potsdam, Germany, [2] John A. Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, MA, USA

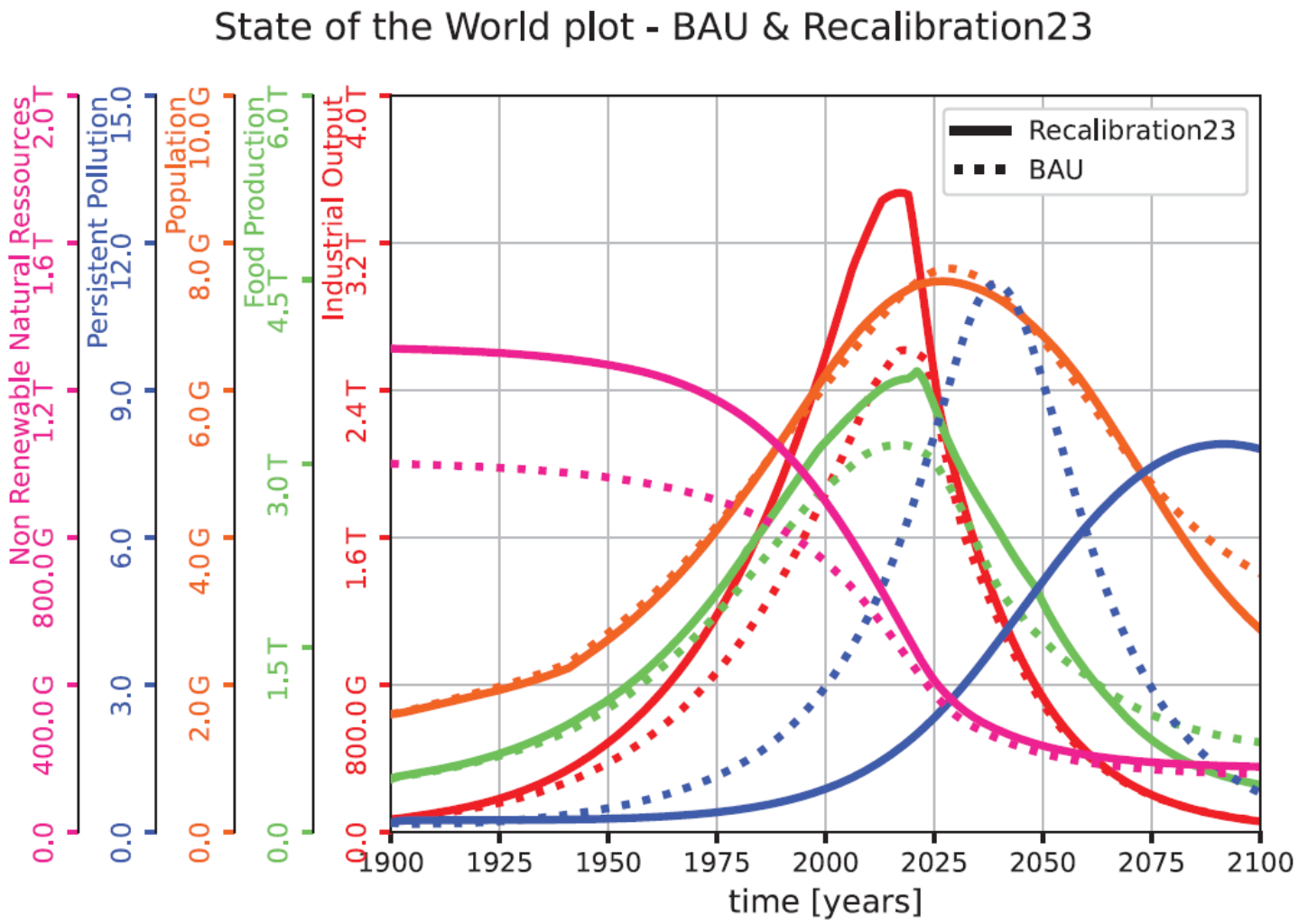
Abstract If solar geoengineering were to be deployed so as to mask a high level of global warming, and then stopped suddenly, there would be a rapid and damaging rise in temperatures. This effect is often referred to as termination shock, and it is an influential concept. Based on studies of its potential impacts, commentators often cite termination shock as one of the greatest risks of solar geoengineering. However, there has been little consideration of the likelihood of termination shock, so that conclusions about its risk are premature. This paper explores the physical characteristics of termination shock, then uses simple scenario analysis to plot out the pathways by which different driver events (such as terrorist attacks, natural disasters, or political action) could lead to termination. It then considers where timely policies could intervene to avert termination shock. We conclude that some relatively simple policies could protect a solar geoengineering system against most of the plausible drivers. If backup deployment hardware were maintained and if solar geoengineering were implemented by agreement among just a few powerful countries, then the system should be resilient against all but the most extreme catastrophes. If this analysis is correct, then termination shock should be much less likely, and therefore much less of a risk, than has previously been assumed. Much more sophisticated scenario analysis—going beyond simulations purely of worst-case scenarios—will be needed to allow for more insightful policy conclusions.

Key Points::

- We found no reason to dismiss the threat of termination shock. Managing this risk should be a key concern if solar radiation management (SRM) is ever considered for use
- But if current projections about stratospheric aerosols injection characteristics prove accurate, it should be easy to build an SRM system that is resilient and robust
- The motivation to avoid termination shock would be strong. Where many parties can maintain SRM, it cannot be terminated unilaterally

Correspondence to:
A. Parker, aparker1@gmail.com

Citation:
Parker, A., & Irvine, P. J. (2018). The Risk



Arjuna Nebel et al (2023) - Recalibration of limits to growth: An update of the World3 model - Journal of Industrial Ecology 28:87-99 doi:10.1111/jiec.13442 - Cologne Institute for Renewable Energy, TH Köln + University of Applied Sciences, Köln - https://onlinelibrary.wiley.com/doi/epdf/10.1111/jiec.13442 - 4 autores

PNAS BRIEF REPORT | EARTH, ATMOSPHERIC, AND PLANETARY SCIENCES OPEN ACCESS

Rising surface salinity and declining sea ice: A new Southern Ocean state revealed by satellites

Alessandro Silvano[a,1], Aditya Narayanan[a], Rafael Catany[b,c], Estrella Olmedo[d], Verónica González-Gambau[d], Antonio Turiel[d], Roberto Sabia[e], Matthew R. Mazloff[f], Theo Spira[g], F. Alexander Haumann[h,i], and Alberto C. Naveira Garabato[a]

Edited by Andrea Rinaldo, Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland; received January 10, 2025; accepted May 9, 2025

For decades, the surface of the polar Southern Ocean (south of 50°S) has been freshening—an expected response to a warming climate. This freshening enhanced upper-ocean stratification, reducing the upward transport of subsurface heat and possibly contributing to sea ice expansion. It also limited the formation of open-ocean polynyas. Using satellite observations, we reveal a marked increase in surface salinity across the circumpolar Southern Ocean since 2015. This shift has weakened upper-ocean stratification, coinciding with a dramatic decline in Antarctic sea ice coverage. Additionally, rising salinity facilitated the reemergence of the Maud Rise polynya in the Weddell Sea, a phenomenon last observed in the mid-1970s. Crucially, we demonstrate that satellites can now monitor these changes in real time, providing essential evidence of the Southern Ocean's potential transition toward persistently reduced sea ice coverage.

sea ice | Antarctica | ocean warming | ocean salinity | satellites

The surface of the polar Southern Ocean has been freshening since the early 1980s (1), coinciding with an expansion of Antarctic sea ice (2). However, this trend reversed abruptly after 2015, coinciding with a record-low sea ice extent in late 2016 (Fig. 1*A*). Since then, sea ice has remained at low levels, with multiple record minima in both summer and winter (2). Moreover, during the period of extensive sea ice coverage, large open-ocean polynyas were absent, but they reemerged over Maud Rise in the Weddell Sea in 2016 and 2017 (3).

2015

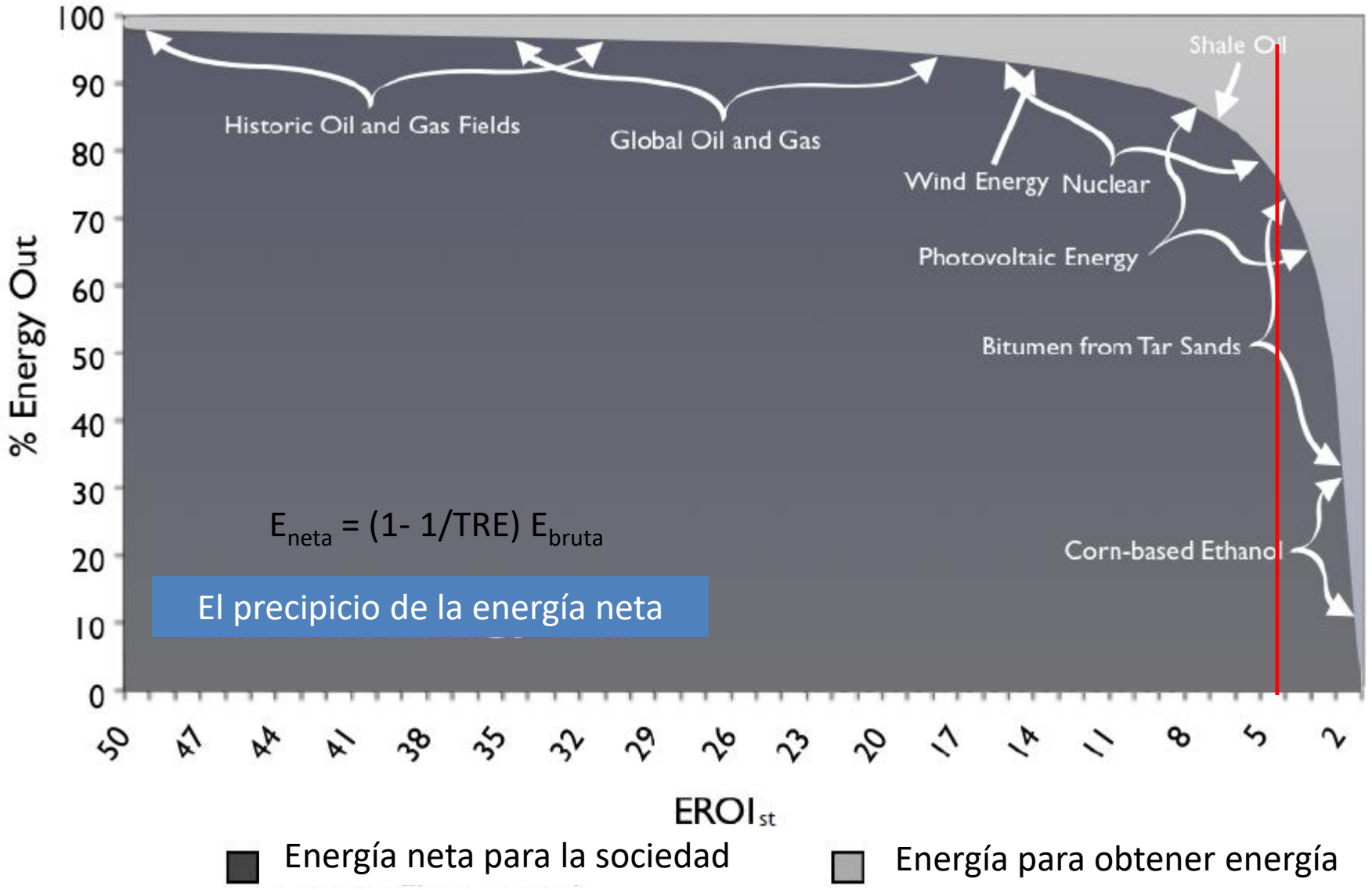
Fin

El precipicio de la TRE

$$TRE = E_{bruta} / E_{empleada}$$

$$E_{neta} = E_{bruta} – E_{empleada}$$

$$E_{neta} = (1- 1/TRE)\ E_{bruta}$$



Jessica Lambert et al (2012) - **EROI of Global Energy Resources: Preliminary Status and Trends** - Robotics Caucus - State University of New York, College of Environmental Science and Forestry - http://www.roboticscaucus.org/ENERGYPOLICYCMTEMTGS/Nov2012AGENDA/documents/DFID_Report1_2012_11_04-2.pdf - 5 authors

TRE Renovables

Table 3. EROI results. Current standard, final, and extended EROI for the renewable electricity generation technologies studied in this work. Performance factors and mineral recycling rates are set at current global average levels.

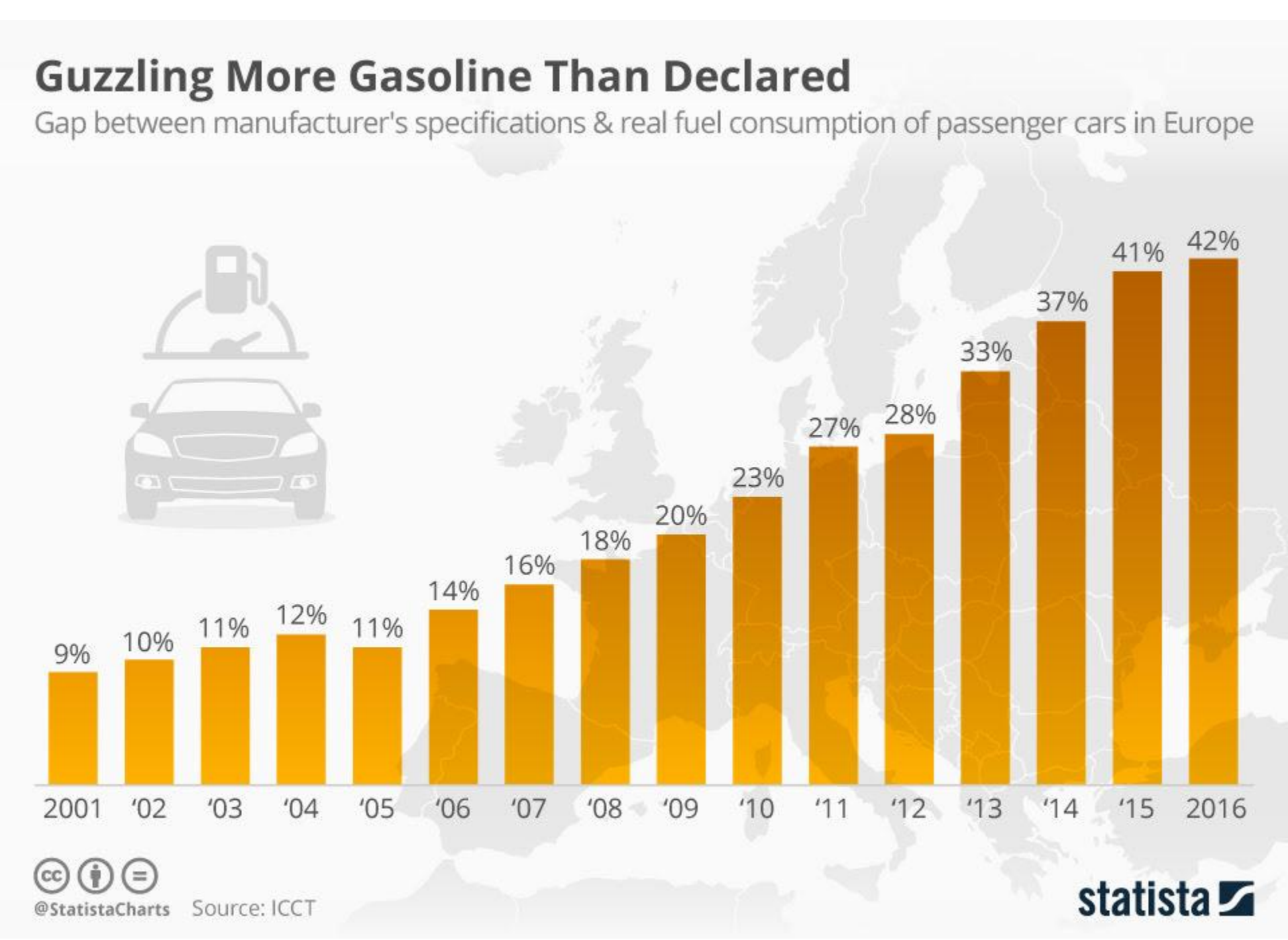
EROI	Large Hydropower	Wind Onshore	Wind Offshore	Solar PV	Solar CSP
$EROI_{st}$	28.4	13.2	8.7	7.8	2.6
$EROI_{final}$	13.0	5.8	4.7	3.5	1.6
$EROI_{ext}$	6.5	2.9	2.3	1.6	0.8

It should be acknowledged that the estimated global EROI current averages mask many regional differences depending on the quality of the resource. The next section takes the example of solar PV to illustrate how the EROI of the current electricity generation at the three boundaries estimated in this work may vary in different countries. We consider both big solar PV on land and rooftop given that we find that their EROI is ultimately quite similar, the lower requirement of material and energy inputs being compensated by a lower efficiency.

Carlos de Castro and Iñigo Capellán-Pérez (2020) - Standard, Point of Use, and Extended Energy Return on Energy Invested (EROI) from Comprehensive Material Requirements of Present Global Wind, Solar, and Hydro Power Technologies - Energies 13:3036 doi:10.3390/en13123036 - - https://www.mdpi.com/1996-1073/13/12/3036/pdf

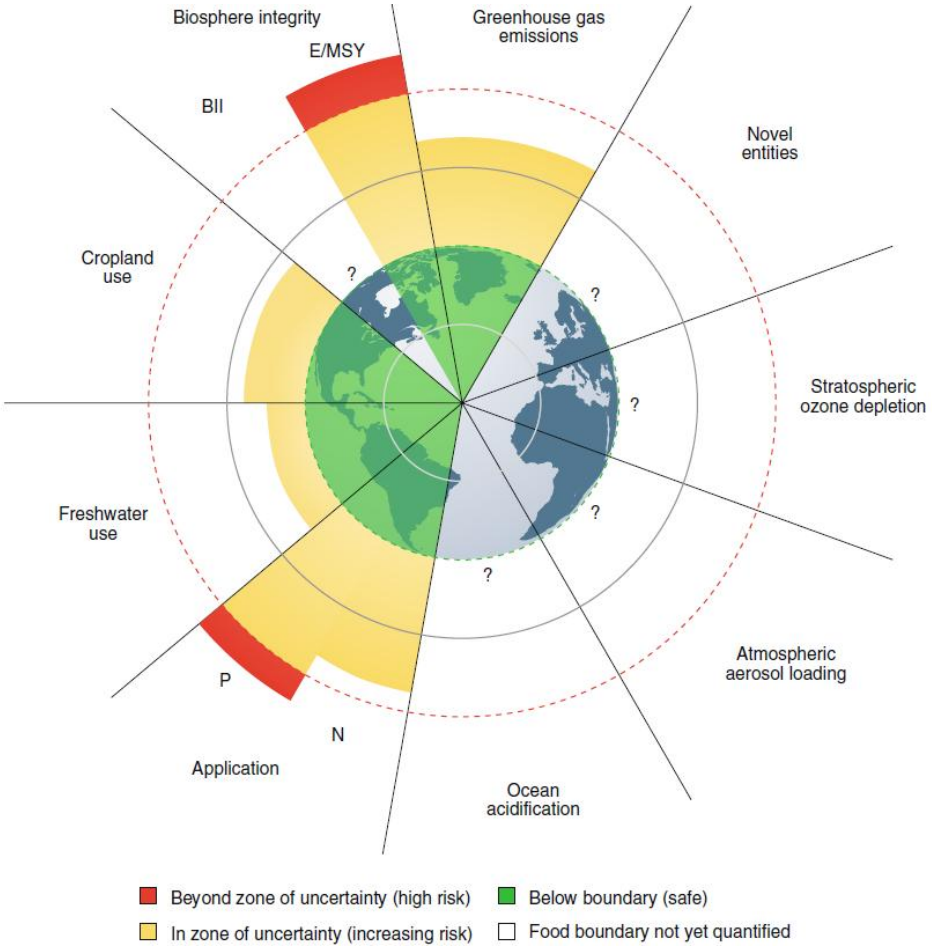
Guzzling More Gasoline Than Declared

Gap between manufacturer's specifications & real fuel consumption of passenger cars in Europe



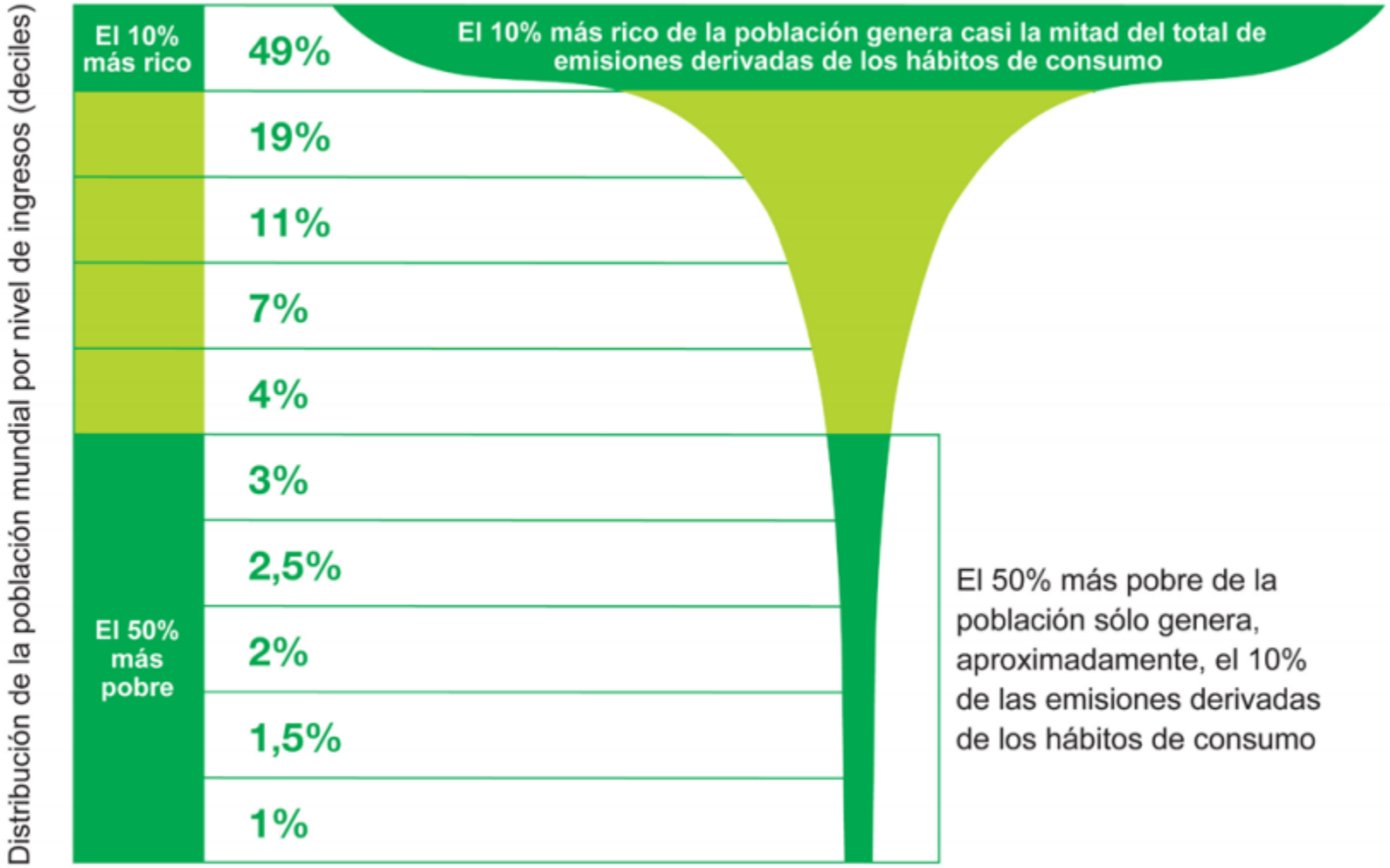
Source: ICCT

Transgresión por sistema alimentario



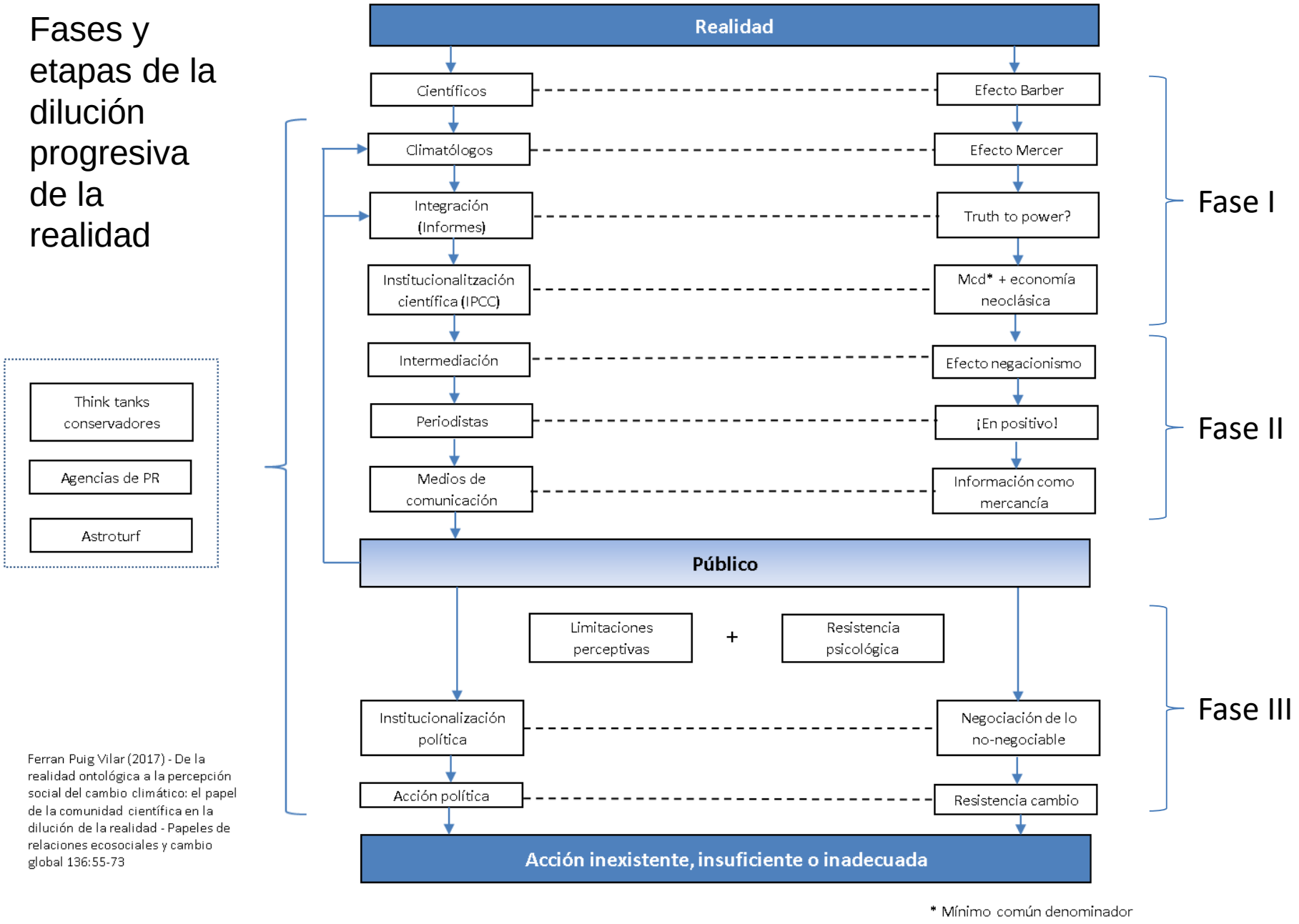
Johan Rockström et al (2020) - Planet-proofing the global food system - Nature Food 1:3-20
doi:10.1038/s43016-019-0010-4 - Potsdam Institute for Climate Impact Research - - 4 autores

Porcentaje de emisiones de CO_2 de la población mundial

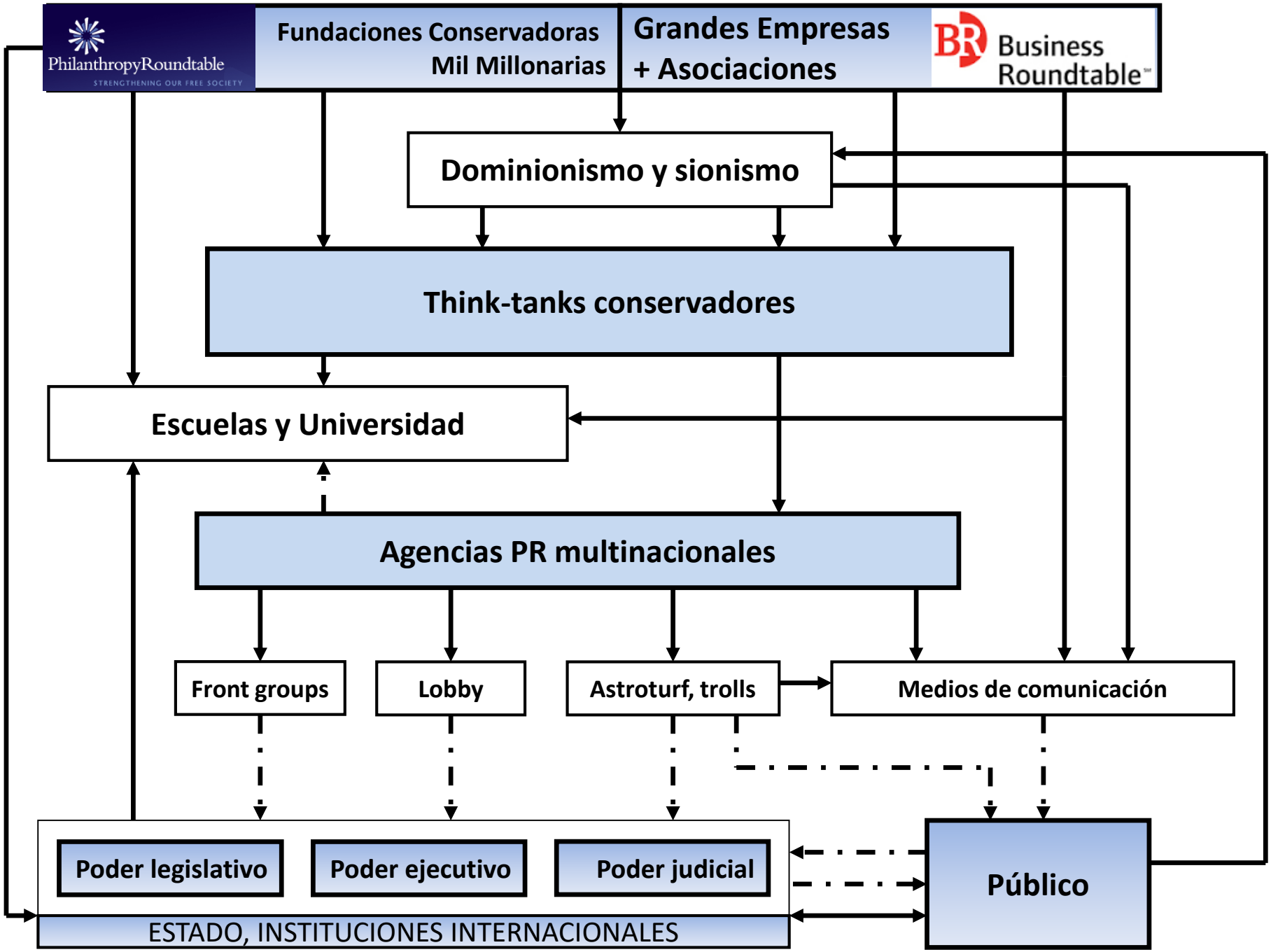


Fuente: Oxfam

Fases y etapas de la dilución progresiva de la realidad



Ferran Puig Vilar (2017) - De la realidad ontológica a la percepción social del cambio climático: el papel de la comunidad científica en la dilución de la realidad - Papeles de relaciones ecosociales y cambio global 136:55-73


PhilanthropyRoundtable
STRENGTHENING OUR FREE SOCIETY
Fundaciones Conservadoras
Mil Millonarias
Grandes Empresas
+ Asociaciones
BR Business Roundtable
Dominionismo y sionismo
Think-tanks conservadores
Escuelas y Universidad
Agencias PR multinacionales
Front groups
Lobby
Astroturf, trolls
Medios de comunicación
Poder legislativo
Poder ejecutivo
Poder judicial
ESTADO, INSTITUCIONES INTERNACIONALES
Público

Nueva cosmovisión

- Nueva sociedad
- Nuevo ser humano

¡Retroprogreso!

Historia (reciente) de desconexión

- Desconexión y dualismo humanidad – naturaleza
  - Planeta a disposición; usar y tirar
- Desconexión histórica
  - Pasado: Renuncia a herencia cultural y espiritual
  - Presente y futuro: Pacto fáustico
- Desconexión entre razón y valores
  - Razón instrumental, dominio, solo valores extrínsecos
- Desconexión de la *totalidad*
  - Reduccionismo vence a visión holística
  - Alienación, separación. Pérdida de relaciones
  - Espiritualidad ausente
- Desconexión de la Tierra (Homo deus)
  - Pérdida del sentido de realidad
  - Arrogancia de especie

S. XVI-XVII: dos ilustraciones

Bacon-Descartes-Newton

- Razón exclusiva: nueva religión
- Emociones son molestia
- Ciencia dominadora
- Centrada en objetos
- Mecanicismo
- Reduccionismo
- Certezas, determinismo
- Humanismo antropocéntrico
- Naturaleza como objeto
- Pasado como ignorancia
- Rechazo de la espiritualidad

Adolescencia

Radical: Bruno-Spinoza-Toland

- Razón como herramienta
- Emociones integradas
- Ciencia contemplativa
- Centrada en relaciones
- Organicismo, vitalismo
- Holismo
- Docta ignorancia (Nicolás de Cusa)
- Humanismo ecológico
- Naturaleza como pariente
- Pasado enriquecedor
- Panteísmo agnóstico

Madurez

Crítica ilustrada de la modernidad
y de sus consecuencias

Comunalismo rural autosuficiente

!Low Tech!


L'ÂGE DES
LOW TECH
Philippe
Bihouix
Vers une civilisation techniquement soutenable
ANTHRO
POCÈNE
SEUIL

ferran.puig.vilar@gmail.com

¡GRACIAS!