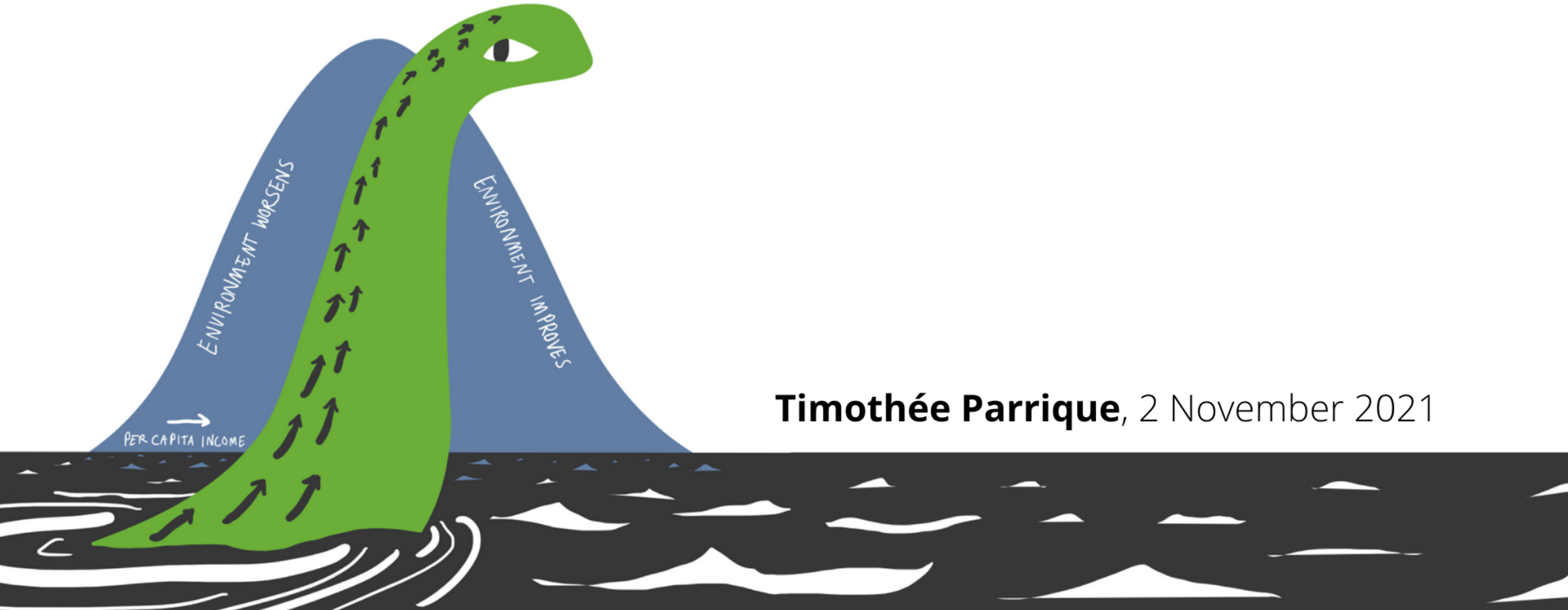
DECOUPLING DEBUNKED

PART 2: IS DECOUPLING HAPPENING?



Timothée Parrique, 2 November 2021

Definitions of green growth

1 “Smart growth (developing an economy based on knowledge and innovation); sustainable growth (promoting a more resource efficient, greener and more competitive economy); inclusive growth (fostering a high-employment economy delivering economic, social and territorial cohesion).” **(European Commission, 2010)**

2 “Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies.” **(OECD, 2011)**

3 “a green economy as one that results in *improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities.* In its simplest expression, a green economy can be thought of as one which is low carbon, resource efficient and socially inclusive. In a green economy, growth in income and employment should be driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services.” **(UNEP, 2011)**

4 “growth that is efficient, clean, and resilient—efficient in its use of natural resources, clean in that it minimizes pollution and environmental impacts, and resilient in that it accounts for natural hazards and the role of environmental management and natural capital in preventing physical disasters.” **(World Bank, 2012)**

5 “Green growth seeks to fuse sustainable development’s economic and environmental pillars into a single intellectual and policy planning process, thereby recasting the very essence of the development model so that it is capable of producing strong and sustainable growth simultaneously.” **(Green Growth Knowledge Platform, 2014)**

6 “a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use.” **(European Green New Deal, 2019)**

PART 1

What does the literature say

Environmental Research Letters

TOPICAL REVIEW

A systematic review of the evidence on decoupling of GDP, resource use and GHG emissions, part I: bibliometric and conceptual mapping

Dominik Wiedenhofer, Doris Virág, Gerald Kalt, Barbara Plank, Jan Streeck, Melanie Pichler, Andreas Mayer, Fridolin Krausmann, Paul Brockway, Anke Schaffartzik, Tomer Fishman, Daniel Hausknost, Bartholomäus Leon-Gruchalski, Tânia Sousa, Felix Creutzig and Helmut Haberl

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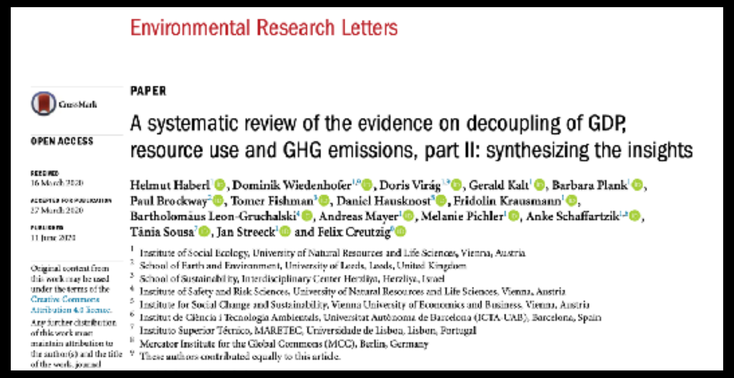

Environmental Research Letters

PAPER

A systematic review of the evidence on decoupling of GDP, resource use and GHG emissions, part II: synthesizing the insights

Helmut Haberl, Dominik Wiedenhofer, Doris Virág, Gerald Kalt, Barbara Plank, Paul Brockway, Tomer Fishman, Daniel Hausknost, Fridolin Krausmann, Bartholomäus Leon-Gruchalski, Andreas Mayer, Melanie Pichler, Anke Schaffartzik, Tânia Sousa, Jan Streeck and Felix Creutzig

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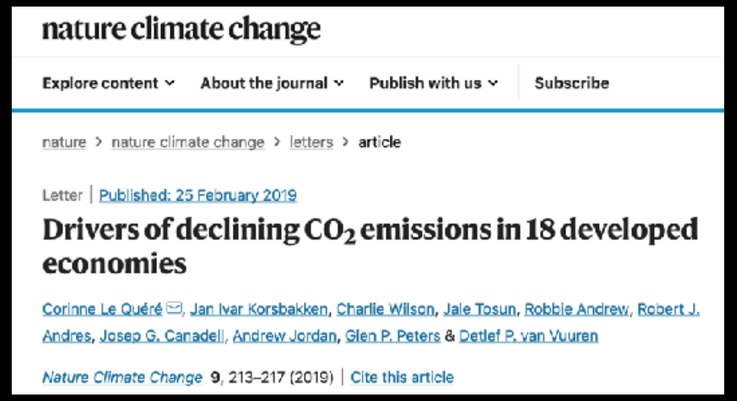
PART 2

How to read a decoupling study



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Corinne Le Quéré, Jan Ivar Korsbakken, Charlie Wilson, Jale Tosun, Robbie Andrew, Robert J. Andres, Josep G. Canadell, Andrew Jordan, Glen P. Peters & Detlef P. van Vuuren

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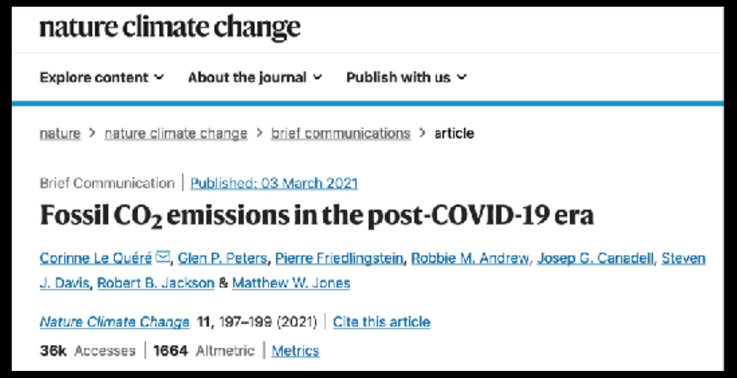

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Corinne Le Quéré, Glen P. Peters, Pierre Friedlingstein, Robbie M. Andrew, Josep G. Canadell, Steven J. Davis, Robert B. Jackson & Matthew W. Jones

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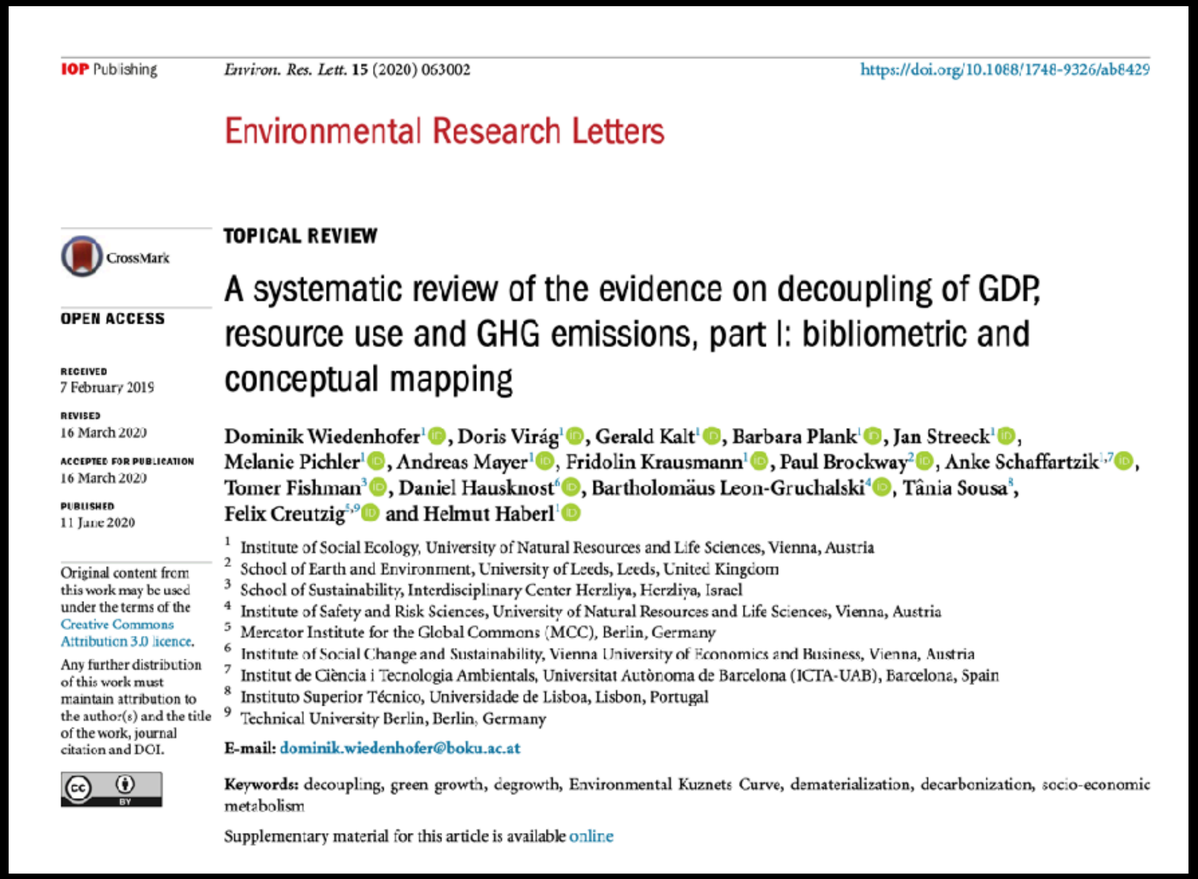
36k Accesses | 1664 Altmetric | Metrics

PART ONE



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Environmental Research Letters

TOPICAL REVIEW

A systematic review of the evidence on decoupling of GDP, resource use and GHG emissions, part I: bibliometric and conceptual mapping

Dominik Wiedenhofer[1], Doris Virág[1], Gerald Kalt[1], Barbara Plank[1], Jan Streeck[1], Melanie Pichler[1], Andreas Mayer[1], Fridolin Krausmann[1], Paul Brockway[2], Anke Schaffartzik[1,7], Tomer Fishman[3], Daniel Hausknost[4], Bartholomäus Leon-Gruchalski[4], Tânia Sousa[8], Felix Creutzig[5,9] and Helmut Haberl[1]

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Supplementary material for this article is available online

Wiedenhofer et al., 2020

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Environmental Research Letters

PAPER

A systematic review of the evidence on decoupling of GDP, resource use and GHG emissions, part II: synthesizing the insights

Helmut Haberl[1], Dominik Wiedenhofer[1,9], Doris Virág[1,9], Gerald Kalt[1], Barbara Plank[1], Paul Brockway[2], Tomer Fishman[3], Daniel Hausknost[5], Fridolin Krausmann[1], Bartholomäus Leon-Gruchalski[4], Andreas Mayer[1], Melanie Pichler[1], Anke Schaffartzik[1,6], Tânia Sousa[7], Jan Streeck[1] and Felix Creutzig[8]

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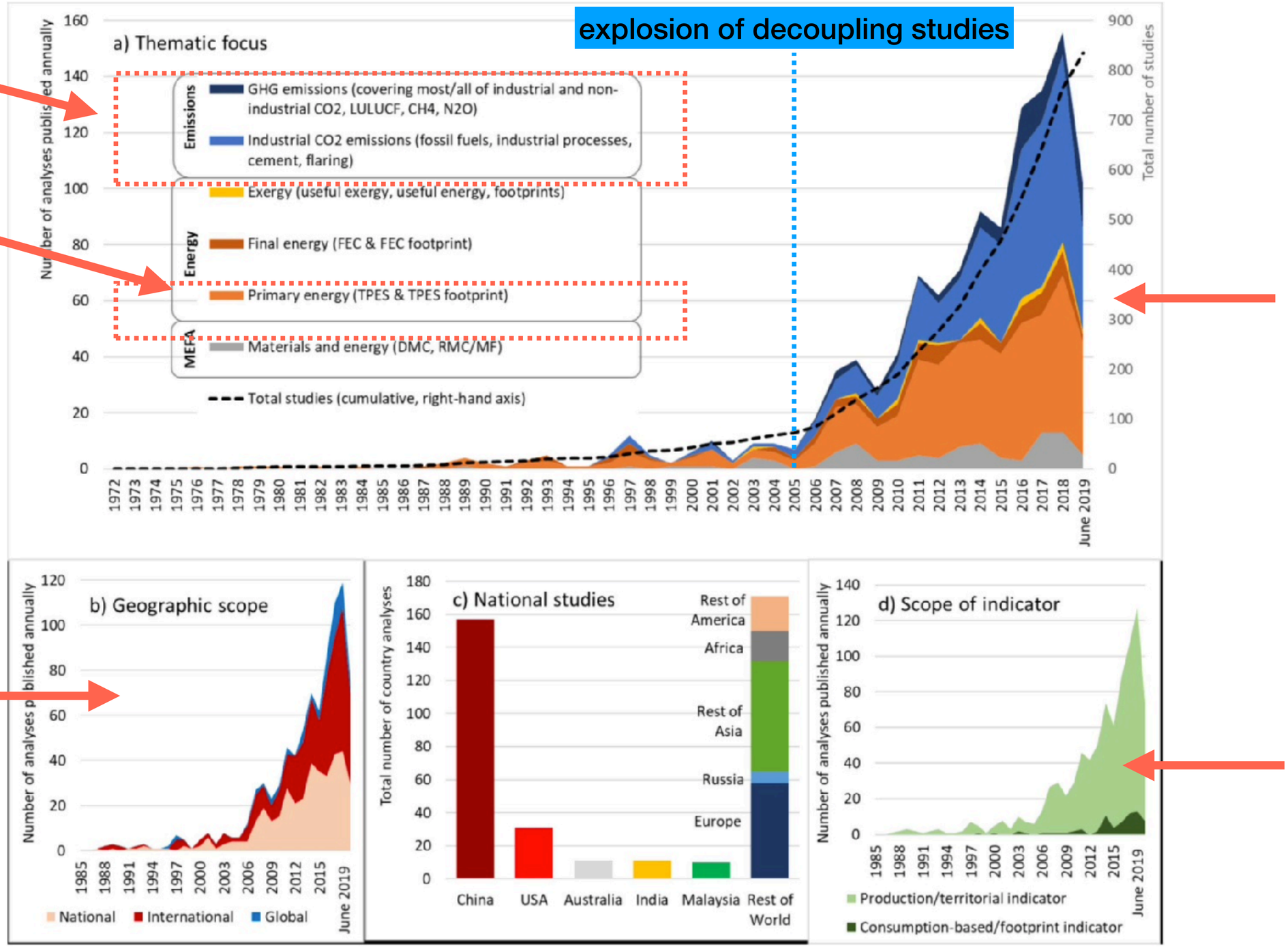
Supplementary material for this article is available online

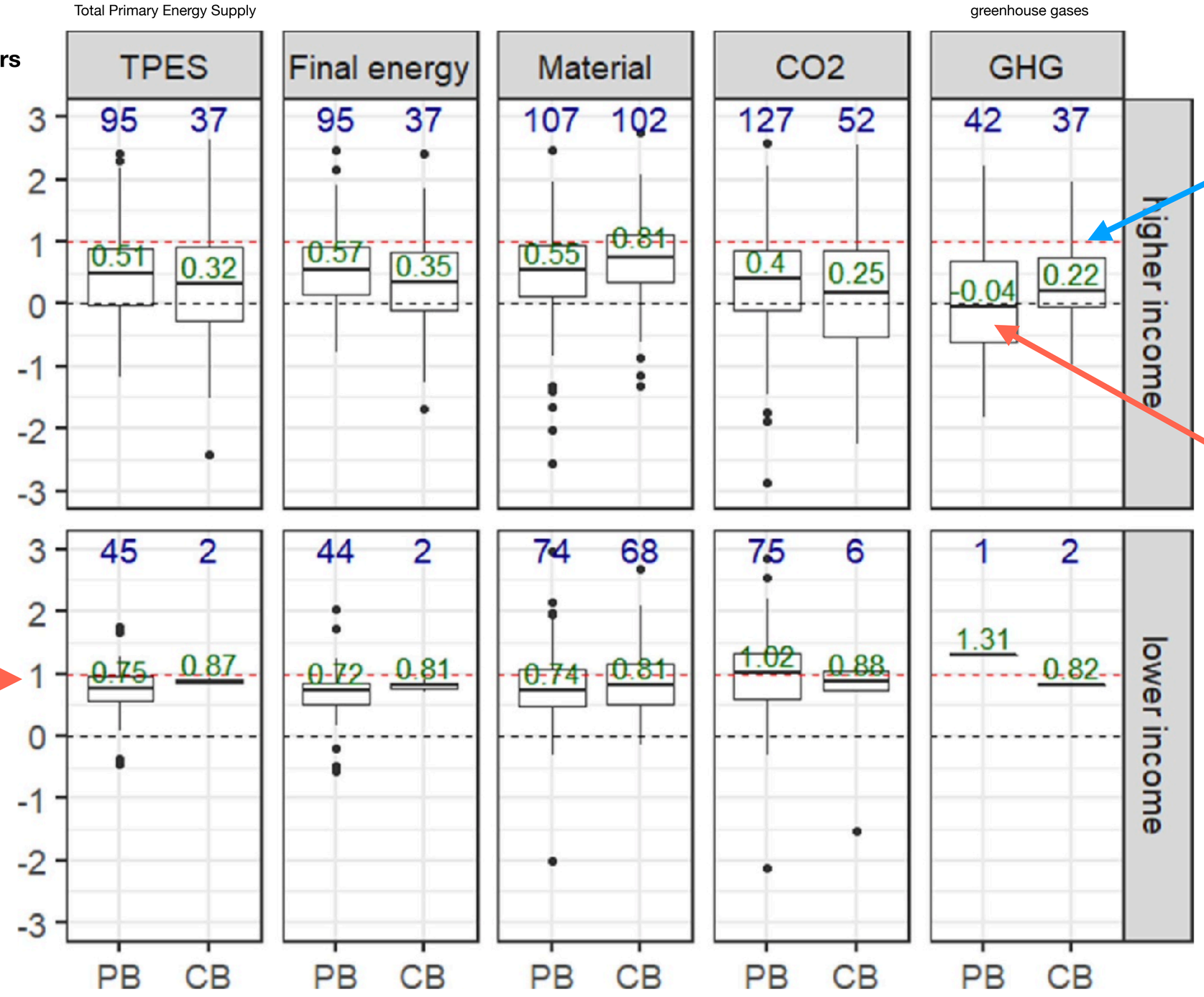
Haberl et al., 2020

835 articles for 1,157 analyses

- "*A systematic review of the evidence on decoupling of GDP, resource use and GHG emissions*"
- Published in **June 2020**
- **16 authors** from **8 different centres** (Vienna, Leeds, Herzliya, Berlin, Barcelona, Lisbon)
- **Quantitative**, empirical studies
- Published in the peer-reviewed journal ***Environmental Research Letters***
- written in **English**
- **Excluded**: modelling exercises; theoretical/conceptual discussions; sub-national geographical scope; sector-specific studies;


explosion of decoupling studies
a) Thematic focus
Number of analyses published annually
Total number of studies
Emissions
GHG emissions (covering most/all of industrial and non-industrial CO2, LULUCF, CH4, N2O)
Industrial CO2 emissions (fossil fuels, industrial processes, cement, flaring)
Energy
Exergy (useful exergy, useful energy, footprints)
Final energy (FEC & FEC footprint)
Primary energy (TPES & TPES footprint)
MEFA
Materials and energy (DMC, RMC/MF)
Total studies (cumulative, right-hand axis)
June 2019
b) Geographic scope
National
International
Global
c) National studies
Total number of country analyses
China
USA
Australia
India
Malaysia
Rest of World
Rest of America
Africa
Rest of Asia
Russia
Europe
d) Scope of indicator
Production/territorial indicator
Consumption-based/footprint indicator

Resources and emission elasticities in the **last 10 years**



+1% GDP growth
with +0.22% emissions
(relative decoupling)

+1% GDP growth
with -0.04% emissions
(absolute decoupling)

Confirmation of results:
absolute decoupling is RARE and very SMALL

Elasticities around 1
in low-income countries
(coupled)

Results: Energy and greenhouse gases

- **ENERGY:** energy and GDP are strongly related. "*primary energy use can be decoupled from GDP only to the extent to which conversion efficiency from primary energy to useful exergy can be increased"* (p.32)
- **GHGs**: global **relative decoupling** (+3.5% GDP per year from 1960-2014 with +2.5% increase in CO2 emissions)
- **Territorial indicators**: Studies looking at territorial CO2 emissions usually find **relative decoupling**; 4 of them find **absolute decoupling** with "*small, short-term reductions of CO2*"
- **Footprint indicators**: "*Footprint studies often find that territory-based emissions grow more slowly or even fall while consumption-based emissions increase*" (p.29)
- "*very recently, absolute decoupling between GDP and GHG emissions can be found in some countries, but even in those cases decoupling is so far insufficient to address stringent climate targets*" (p.30)

Results: Material and energy flows

- relative decoupling mainly for regions/countries with **intermediate economic growth** (e.g. USA, Europe) or countries that experienced political turmoil
- "*Absolute reductions of material flows are generally only found in periods of **very low economic growth or even recession**. (…) high rates of economic growth… often coincides with a growth of material use matching or even outstripping economic growth*" (p.6)
- "*Currently, decoupling appears to **depend on prior use and accumulation of materials and on extractive expansion and rising material flows elsewhere**. As long as this is the case, decoupling cannot be achieved in the long-term or universally*" (p.29)

Simplistic methods of analysis

“a major conclusion of this systematic review is that the vast majority of studies originates in decompositions, causality tests, or related Environmental Kuznets Curve analysis, which approach the topic from a **simplistic statistical econometric point of view.** We find that they hardly incorporate a thermodynamic understanding of resource use and especially energy, and economic growth and rarely take the large-scale consequences of growth dynamics…” Wiedenhofer et al., 2020, p.13

Absolute decoupling is rare

their frequency. Most interestingly, although many articles conclude that absolute decoupling is empirically rarely found, the recommendations to a large extent stick to a green growth repertoire of increasing efficiency, promoting renewable energy and introducing technological solutions and market-based mechanisms (e.g. internalizing or increasing environmental costs through pricing, attract foreign direct investments, financialization or emission trad-

Haberl et al., 2020, p.30

Decoupling because of low growth

This literature suggests that production-based relative decoupling is frequent, although countries exist in which use of physical resources grows faster than GDP. This seems to happen especially at early stages of the agrarian-industrial transition when large stocks of infrastructures and buildings are accumulated, as well as in export-oriented countries where production of raw materials and early processing stages are dominant. Absolute decoupling is rare and generally only occurs during periods of low GDP growth

Haberl et al., 2020, p.32

The dirty past of decoupling

Current trajectories of material and energy use, whether suggesting decoupling of resource use from economic growth or not, cannot be correctly interpreted without considering past material and energy flows on which they are also based. Current stagnation in per capita territorial/production-based resource use (Fishman *et al* 2016, Bleischwitz *et al* 2018a), for example, depends on past material flows

Haberl et al., 2020, p.32

SATURATION

sustenance of a stable, high level of materials use coinciding with a continued growth of GDP

or

EKC

coupling until a peak of materials use and then a decoupling (inverted U shape curve)

In light of the present review, we can safely conclude that there is no empirical evidence supporting the existence of a decoupling of the type described as necessary in the first section of this report – that is an absolute, global, permanent, and sufficiently fast and large decoupling of environmental pressures (both resources and impacts) from economic growth. In the end, our search for robust evidence was unsuccessful, coming up only with a handful of methodologically peculiar exceptions, most often of relative decoupling, and if absolute, mainly temporary and restricted in space, only for territorial indicators (that is to say spatially inconsistent), or having to do with specific local, short-term pollutants. In all cases, the reduction in environmental pressures falls short of current environmental policy targets. After such an extensive search, it is safe to say that the type of decoupling acclaimed by green growth advocates is essentially a statistical figment.

Parrique et al., 2019. Decoupling Debunked, Conclusions of Section 2

PART TWO

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Letter | Published: 25 February 2019

Drivers of declining CO_2 emissions in 18 developed economies

Corinne Le Quéré, Jan Ivar Korsbakken, Charlie Wilson, Jale Tosun, Robbie Andrew, Robert J. Andres, Josep G. Canadell, Andrew Jordan, Glen P. Peters & Detlef P. van Vuuren

Nature Climate Change **9**, 213–217 (2019) | Cite this article

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Brief Communication | Published: 03 March 2021

Fossil CO_2 emissions in the post-COVID-19 era

Corinne Le Quéré, Glen P. Peters, Pierre Friedlingstein, Robbie M. Andrew, Josep G. Canadell, Steven J. Davis, Robert B. Jackson & Matthew W. Jones

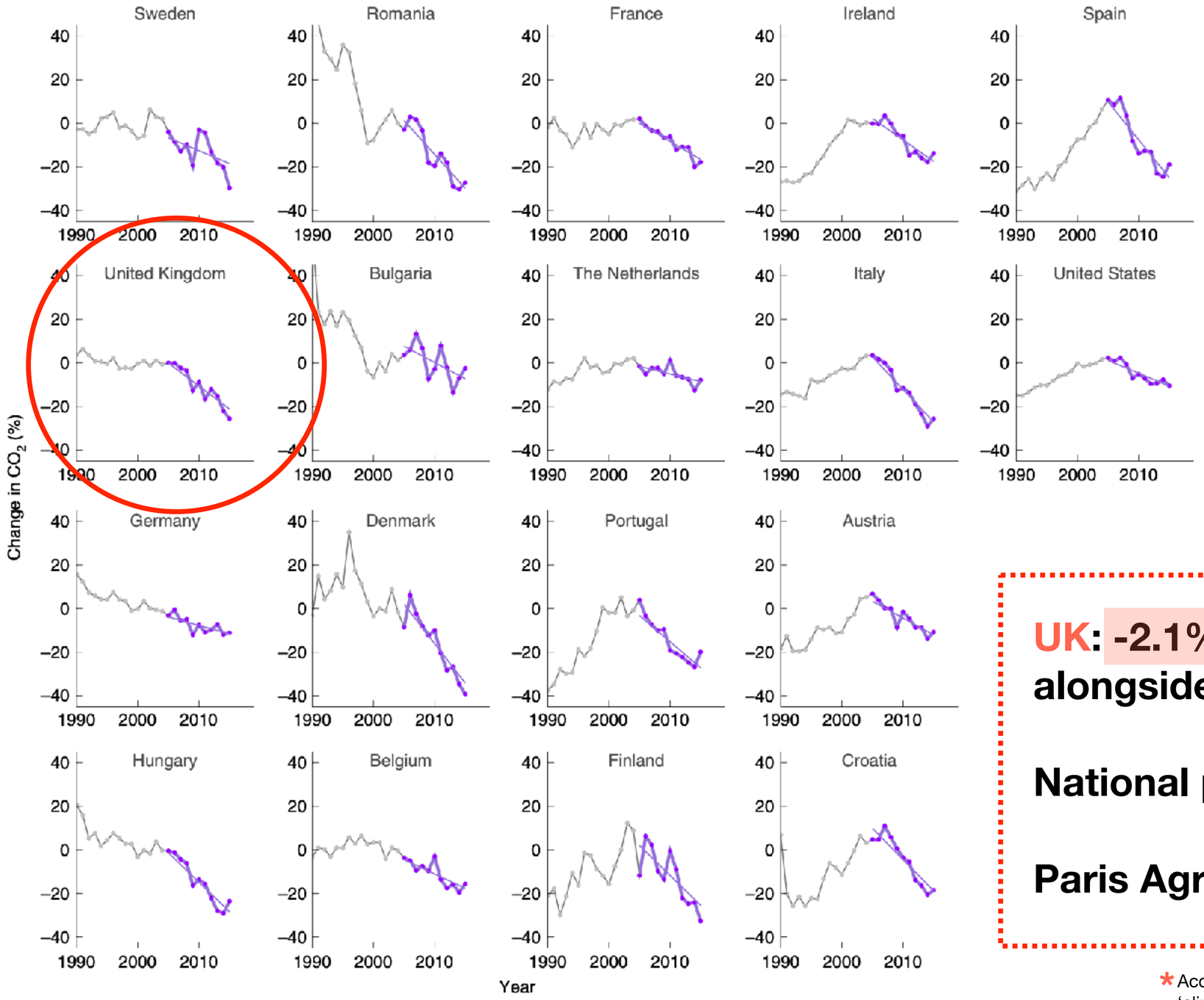
Nature Climate Change **11**, 197–199 (2021) | Cite this article

Le Quéré et al. 2019

Drivers of declining CO2 emissions in 18 developed economies

- **18 developed economies** (Sweden, Romania, France, Ireland, Spain, UK, Bulgaria, The Netherlands, Italy, United States, Germany, Denmark, Portugal, Austria, Hungary, Belgium, Finland, and Croatia)
- They represent 28% of global emissions
- Between **2005 and 2015**
- CO2 emissions decreased by a media **-2.4% per year** alongside a median growth of GDP of **+1.1%**


DECOUPLING CHECKLIST
INDICATORS
1. Are you looking at:
Resources?
Impacts?
2. Are your indicators:
Territorial?
Footprint?
SCALE
3. Is your decoupling:
Local?
Global?
RANGE
4. Is your decoupling:
Relative?
Absolute?
DURABILITY
5. Is your decoupling:
Temporary?
Permanent?
MAGNITUDE
6. Does your decoupling meet mitigation targets?
Yes
No
EQUITY
7. Is your decoupling just?
Yes
No



median
-2.4% per year

UK: -2.1% per year (consumption-based) alongside +1.1% GDP

National pledge: -5.1% per year

Paris Agreement: -13% per year*

* According to **Anderson et al., 2020. A factor of two**: how the mitigation plans of 'climate progressive' nations fall far short of Paris-compliant pathways

Too small

Finally, as significant as they have been, the emissions reductions observed and analysed in the 18 countries of the peak-and-decline group fall a long way short of the deep and rapid global decarbonization of the energy system implied by the Paris Agreement temperature goals[3], especially given the increases in global CO_2 emissions in 2017 and 2018, and the slowdown of decarbonization in Europe since 2014[24]. To limit climate change well below 2 °C, global emissions in 2030 need to be about 25% less than 2018 levels[25]. Recent acceleration in the deployment of renewable energy worldwide will only translate into emissions reductions if accompanied by extensive measures to phase out the use of fossil fuels[26].

Le Quéré et al., 2019, p.217

	IEA Ref			IEA Sector			BP			UNFCCC			consumption			GDP
	total	Δ	%	total	Δ	%	total	Δ	%	total	Δ	%	total	Δ	%	%
Peak-and-decline country group	MtCO2/yr			MtCO2/yr			MtCO2/yr			MtCO2/yr			MtCO2/yr			
Austria	67	-1.2	-1.8%	67	-1.2	-1.8%	68	-1.4	-2.1%	71	-1.4	-2.0%	99	-1.6	-1.6%	1.2%
Belgium	99	-1.3	-1.3%	98	-1.5	-1.5%	130	-3.3	-2.5%	111	-3.4	-1.7%	202	-4.5	-2.2%	1.2%
Bulgaria	47	-0.3	-0.6%	45	-0.3	-0.6%	47	-0.9	-2.0%	49	-0.9	-1.7%	48	-1.2	[illegible]	2.3%
Croatia	18	-0.5	-2.4%	18	-0.4	-2.4%							27	-1.1	-4.2%	0.0%
Denmark	44	-1.6	-3.7%	44	-1.6	-3.7%	50	-2.1	-4.3%	48	-2.1	-4.0%	64	-1.9	[illegible]	0.6%
Finland	56	-1.3	-2.4%	54	-1.3	-2.4%	58	-2.1	-3.6%	58	-1.7	-2.9%	82	-2.5	-3.0%	0.4%
France	336	-7.3	-2.2%	330	-8.1	-2.5%	354	-8.1	-2.3%	382	-9.0	-1.9%	522	-10.0	-1.9%	0.9%
Germany	768	-6.5	-0.9%	755	-5.7	-0.8%	788	-7.6	-1.0%	833	-7.2	-0.9%	992	-17.1	-1.7%	1.4%
Hungary	48	-1.3	-2.7%	47	-1.2	-2.6%	50	-2.0	-4.0%	53	-2.1	-3.7%	73	-2.5	-3.4%	0.9%
Ireland	39	-0.6	-1.5%	39	-0.9	-2.3%	43	-1.6	-3.7%	42	-1.5	-2.4%	55	-3.5	-6.2%	3.4%
Italy	388	-12.8	-3.3%	390	-12.6	-3.2%	412	-16.7	-4.1%	428	-16.8	-3.7%	567	-17.0	-3.0%	-0.5%
Netherland	162	-1.1	-0.7%	160	-1.1	-0.7%	226	-4.5	-2.0%	171	-1.6	-0.9%	183	-5.0	[illegible]	1.0%
Portugal	51	-1.4	-2.8%	50	-1.4	-2.9%	55	-1.8	-3.3%	56	-2.4	-3.5%	68	-3.6	-5.2%	-0.2%
Romania	82	-2.3	-2.8%	81	-2.3	-2.9%	85	-3.4	-4.0%	91	-3.2	-3.8%	94	-3.6	[illegible]	2.6%
Spain	283	-9.0	-3.2%	280	-8.7	-3.1%	325	-12.4	-3.8%	309	-14.7	-4.3%	368	-17.7	-4.8%	0.4%
Sweden	46	-1.4	-3.0%	42	-1.2	-2.8%	55	-1.5	-2.7%	50	-1.2	-1.2%	83	-1.7	[illegible]	1.7%
United Kingdom	484	-13.9	-2.9%	470	-14.2	-3.0%	529	-13.0	-2.5%	507	-14.2	-2.5%	685	-14.4	-2.1%	1.1%
USA	5394	-72.4	-1.3%	5316	-70.5	-1.3%	5768	-74.6	-1.3%	5745	-82.4	-1.4%	6233	-93.4	-1.5%	1.4%
EU28	3622	-72	-2.0%	3566	-72	-2.0%				3940	-94	-2.2%	4893	-112	-2.3%	1.0%
Synthesis of countries																
25% quartile			-2.9%			-2.9%			-3.8%			-3.9%			-3.7%	0.5%
median			**-2.4%**			**-2.4%**			**-2.7%**			**-2.5%**			**-2.8%**	**1.1%**
75% quartile			-1.4%			-1.6%			-2.1%			-1.6%			-2.1%	1.4%
Total CO2 emissions (MtCO2)	8412	-136	-1.6%	8288	-134	-1.6%	9040	-157	-1.7%	9004	-166	-1.8%	10445	-202	-1.9%	

Le Quéré et al., 2019, supplementary information

Decoupling because of low growth

These reductions in the energy intensity of GDP in 2005–2015 do not stand out compared to similar reductions observed since the 1970s (Supplementary Fig. 3), indicating that decreases in energy use in the peak-and-decline group could be explained at least in part by the lower growth in GDP.

if GDP returns to strong growth in the peak-and-decline group, reductions in energy use may weaken or be reversed unless strong climate and energy policies are implemented.

Le Quéré et al., 2019, p.215

Le Quéré et al. 2021

Fossil CO2 emissions in the post-Covid era

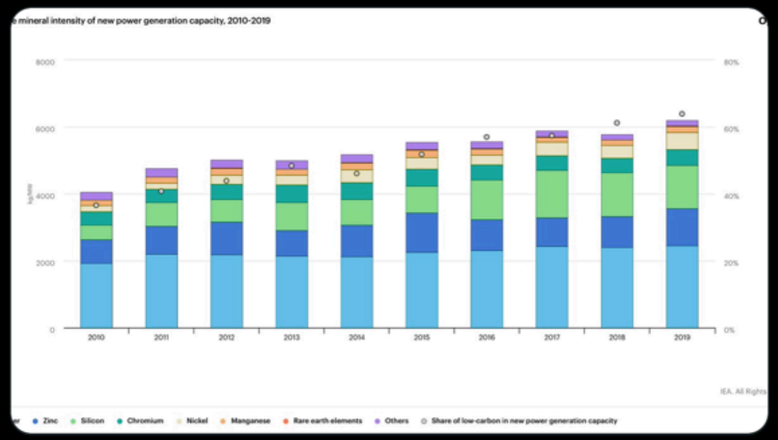
- **64 countries** cut their CO2 emissions by 0.16 GtCO2 every year between 2016 and 2019
- BUT: 150 countries increased their emissions by 0.37 GtCO2 per year.
- So global emissions have continued rising
- My interpretation: something else must be done to accelerate, deepen, and guarantee the reduction of emissions (spoiler alert: that thing is *degrowth*)

MINERALS

Timothée Parrique
@timparrique

No decoupling there. Since 2010 the average amount of minerals needed for a new unit of power generation capacity has increased by 50%. (This is because renewables require more mineral resources than fossil energy.)

iea.org/reports/the-ro...

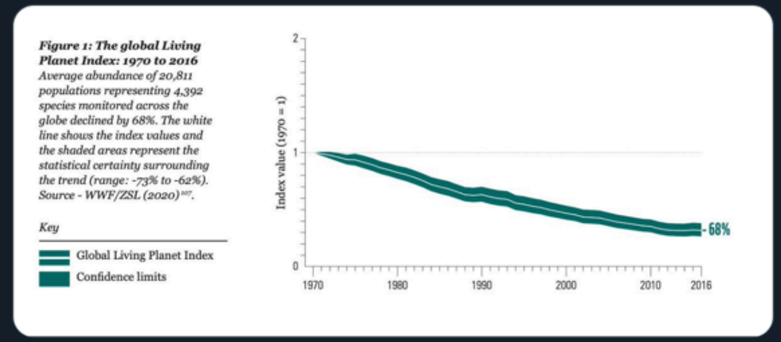


2:25 PM · Jul 21, 2021 · Twitter Web App

BIODIVERSITY

Timothée Parrique
@timparrique

Discussions about green growth focus too much on carbon and not enough on other kinds of pressures. Biodiversity, for example, is in a dire state with a 68% decrease in animal population sizes between 1970 and 2016 (this is from the 2020 Living Planet Report by @WWF).



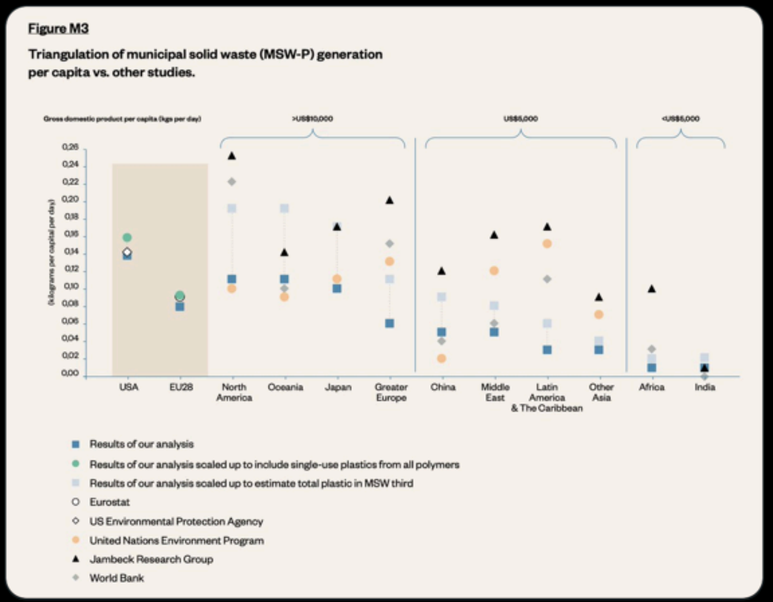
7:30 AM · Jan 14, 2021 · Twitter Web App

SOLID WASTE

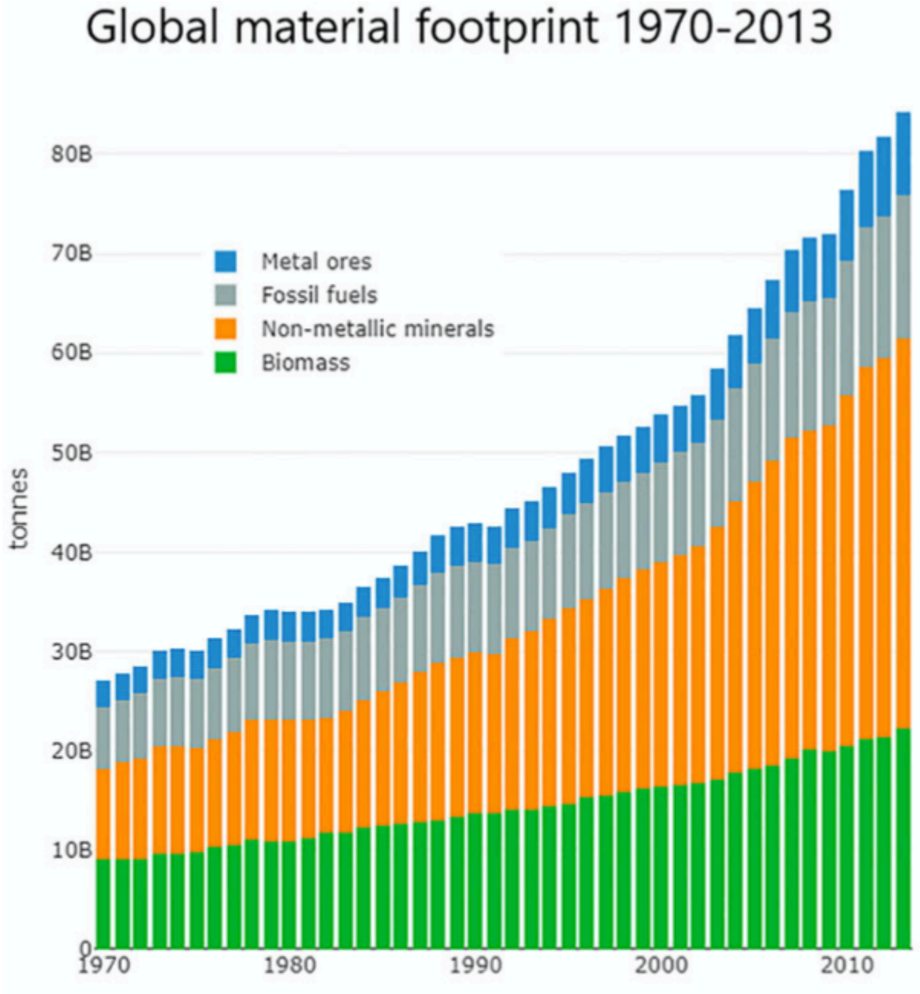
Timothée Parrique
@timparrique

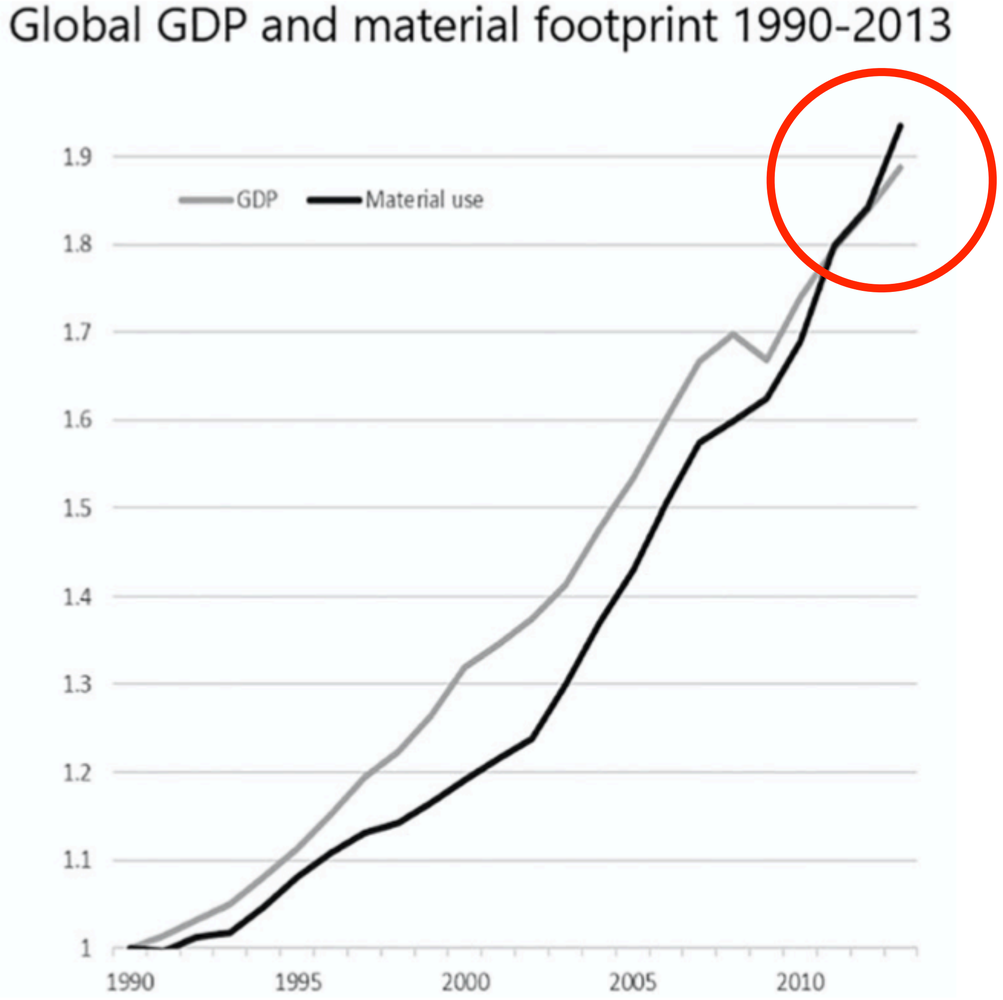
Another troublesome coupling between economies and ecologies: municipal solid waste.

minderoo.org/plastic-waste-...



8:22 AM · Aug 7, 2021 · Twitter Web App





recoupling of global GDP and material footprint

Hickel and Kallis, 2019. Is Green Growth Possible?

(Trying to) conclude

- The decoupling literature is not without **uncertainty**
- But it does bring evidence that the kind of decoupling we would like to see happening is NOT actually happening (far from it)
- We don't need more numbers. This is not **a number-debate**, and we have no time to wait for other decades of experiments.
- Most discussions about decoupling is a **waste of time**
- NEXT WEEK: **Is decoupling likely to happen in the future?**