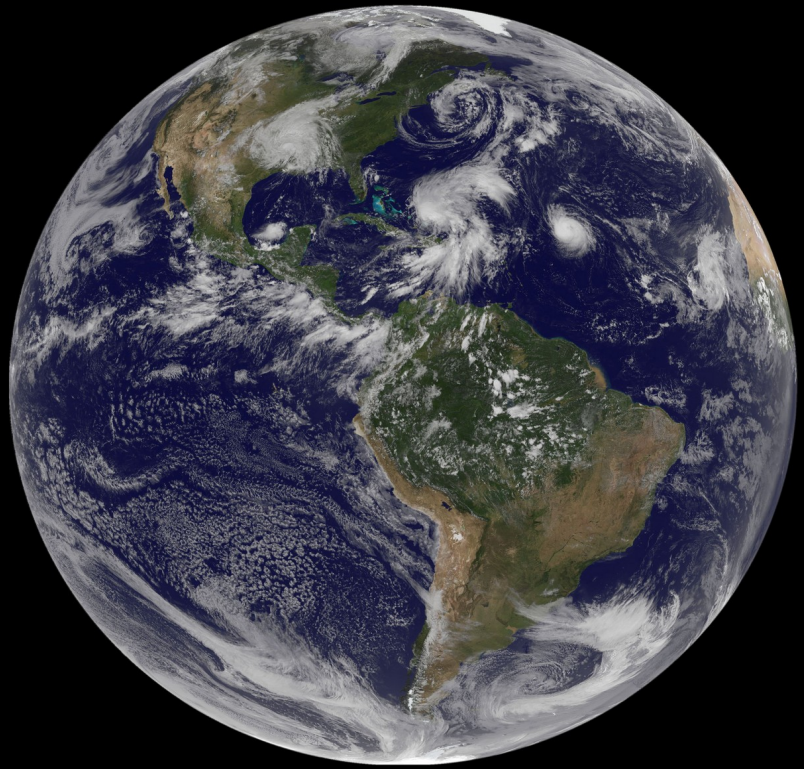
Eine Welt, ein Klima, eine (letzte) Chance …

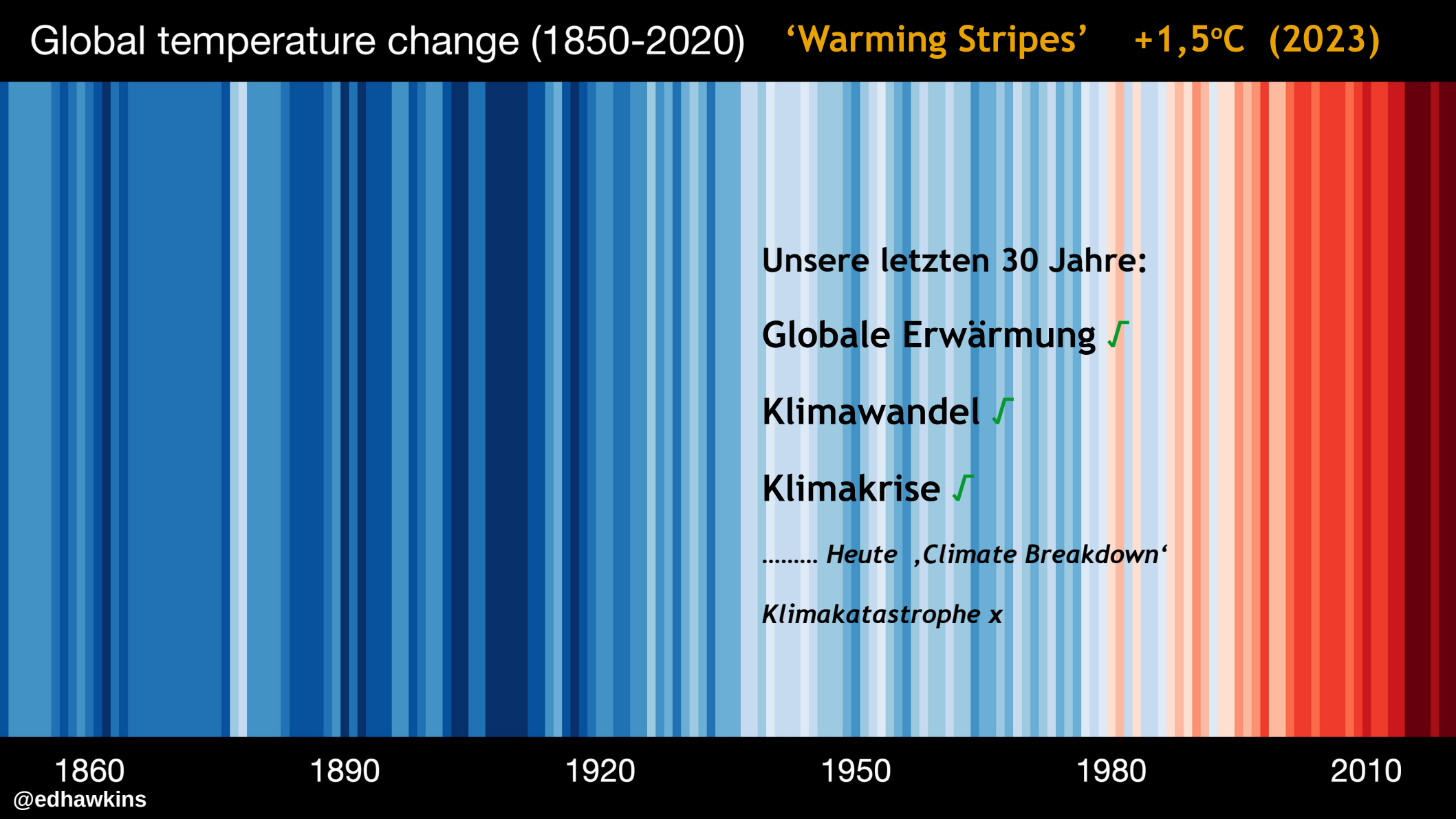
Im Jahrzehnt der Entscheidung – Welche Zukunft wählen wir?



Dr. Udo Engelhardt

Ökologe & Klimafolgenforscher
Chief Scientist (TCTF)
EU Climate Pact Ambassador

udo.engelhardt@ansvar.com


Global temperature change (1850-2020) ‘Warming Stripes’ +1,5°C (2023)
Unsere letzten 30 Jahre:
Globale Erwärmung √
Klimawandel √
Klimakrise √
..... Heute ‚Climate Breakdown‘
Klimakatastrophe x
1860
1890
1920
1950
1980
2010
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Hottest July ever signals ‘era of global boiling has arrived’ says UN chief

THE CLIMATE TASK FORCE

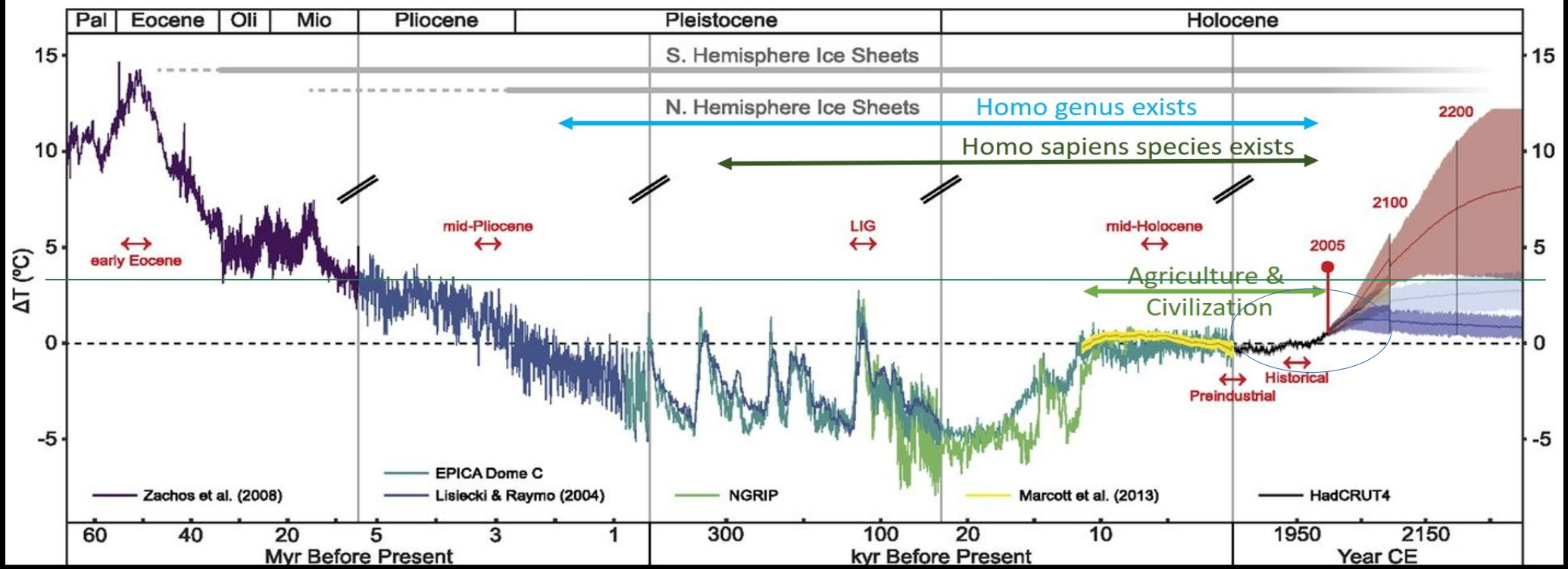
© **Unsplash/Fabian Jones** | Temperatures have hit record highs across the world in 2023.

Planet Erde hat schon immer eine ‚Kohlenstoff-Wirtschaft'

Global warming today mirrors conditions leading to Earth's largest extinction event, study says

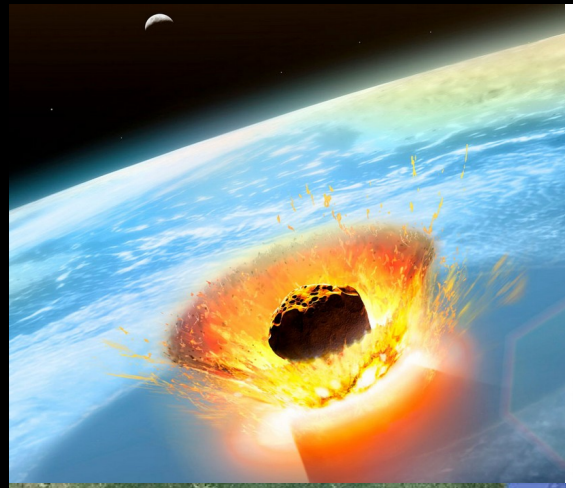
NEWS Dec 07, 2018 by Evan Bush The Seattle Times

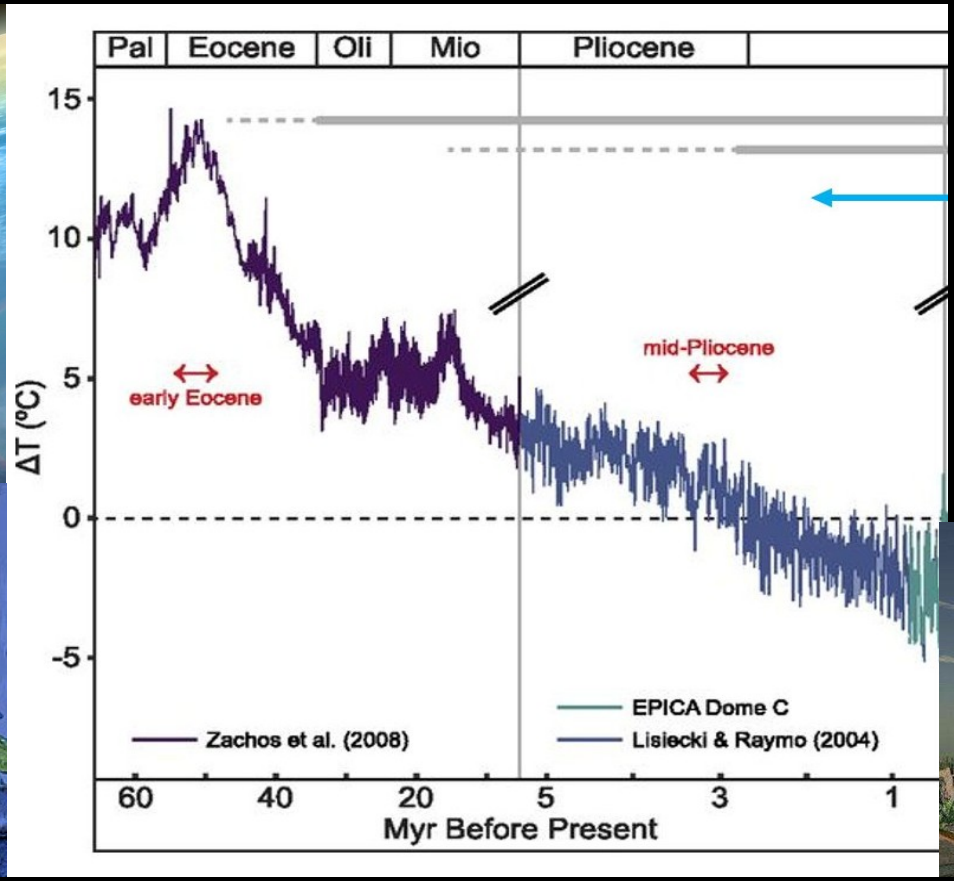
Ref. Burke et al . 2018 PNAS



THE CLIMATE TASK FORCE

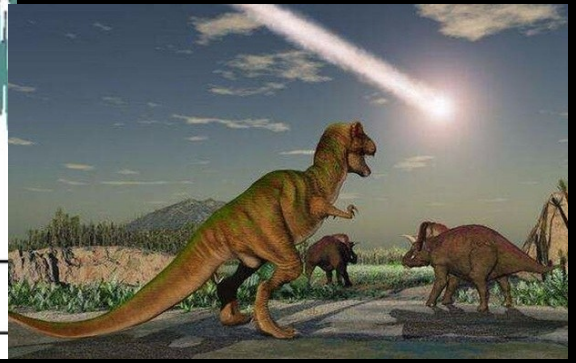
Eine natürliche ‚Kohlenstoff-Wirtschaft' schafft klimatische Stabilität





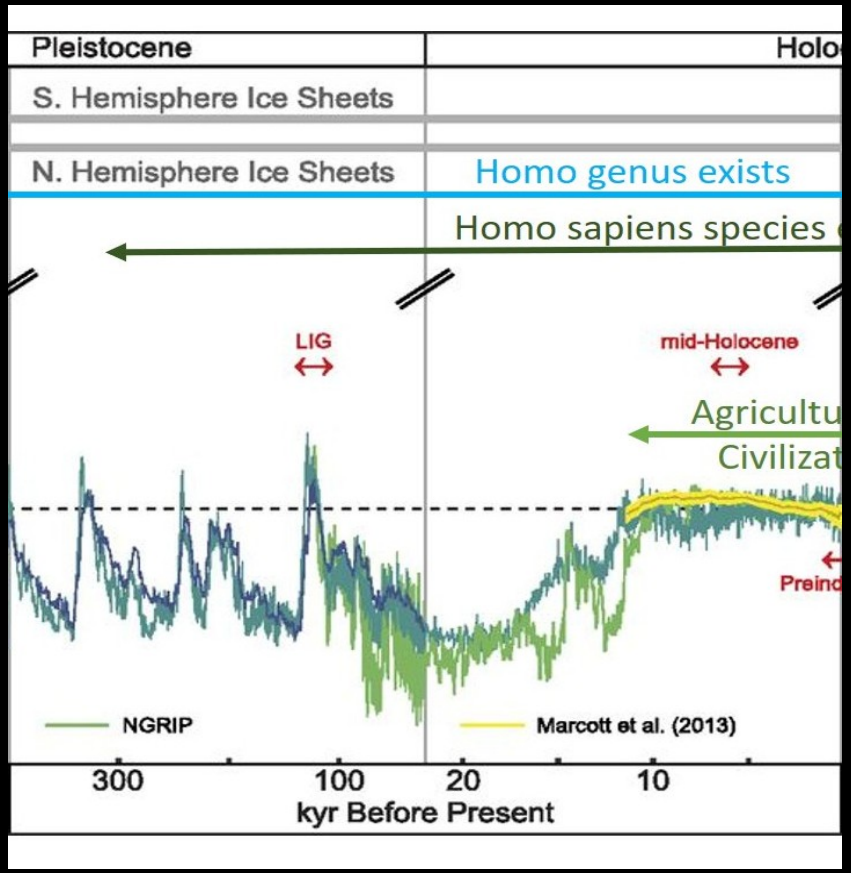
… aber sie braucht Zeit und zwar mehrere Millionen Jahre um ca. 1 Grad Abkühlung zu erzielen;

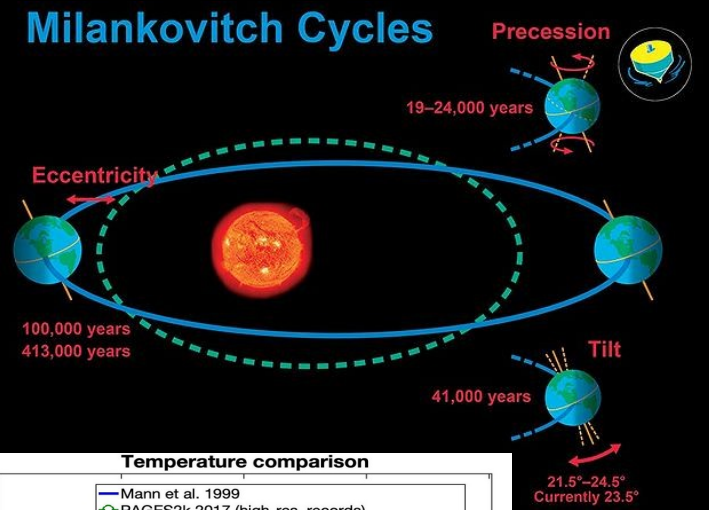
Menschheit und polares Eis überlappen zu 100%!

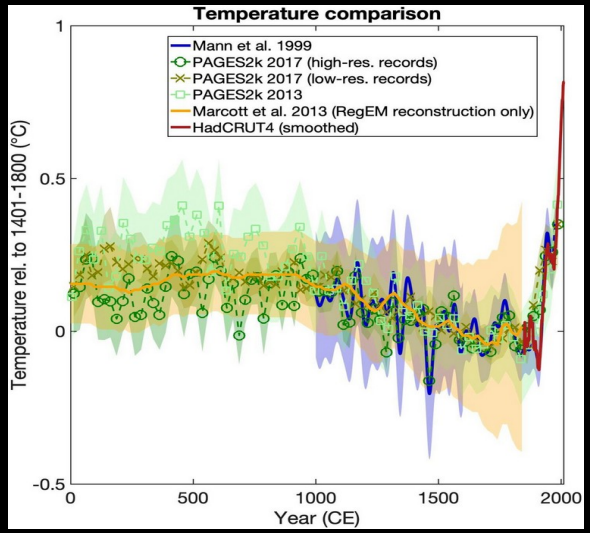


THE CLIMATE TASK FORCE

Nur eine stabile ‚Kohlenstoff-Wirtschaft' zeigt die natürlichen Zyklen



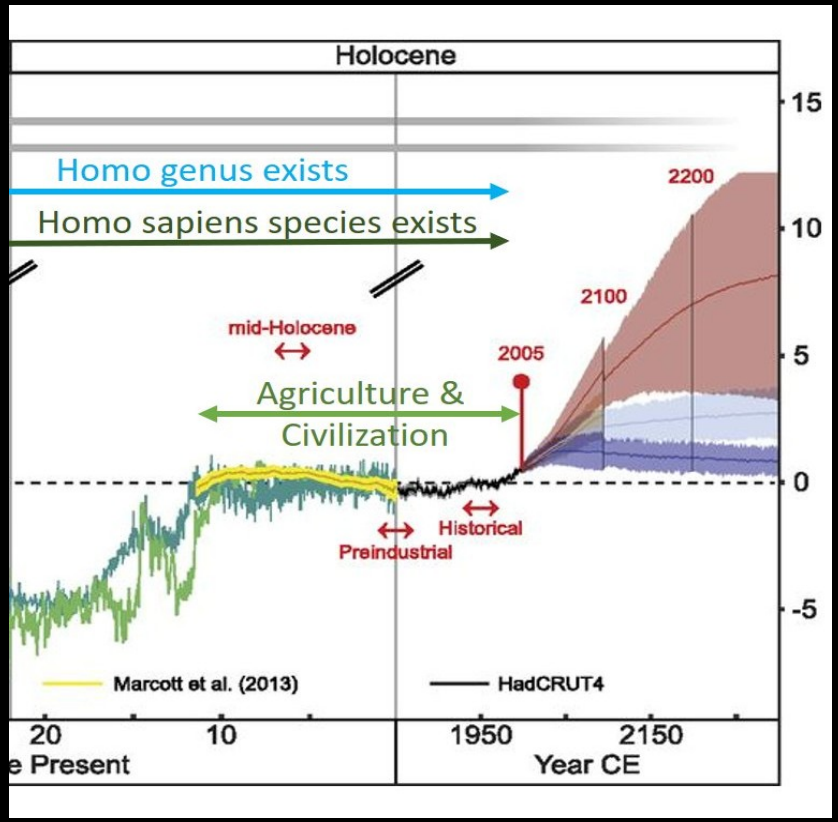




Die aktuelle, menschengemachte Klimakrise ist derart stark ausgeprägt in ihrer Wirkung, dass sie die anstehende, natürliche Abkühlung der Erde komplett überkompensiert!

THE CLIMATE TASK FORCE

Unsere Geschichte basiert auf 12,000 Jahren klimatischer Stabilität



… die wir, mit der Profit-orientierten KW, in weniger als 200 Jahren zerstören!

Die Geschwindigkeit des globalen Temperaturanstiegs ist mindestens 10-mal so schnell wie beim natürlichen Klimawandel!

Die Anpassung bestehender Ökosysteme an derart rapide und massive Veränderungen ist faktisch nicht möglich!

THE CLIMATE TASK FORCE

Die planetare Geschichte von zwei Arten einer Kohlenstoff-Wirtschaft

Nature's Carbon Economy (ca. 4.5 Milliarden Jahre):

- Stabilität (C-Bindung)

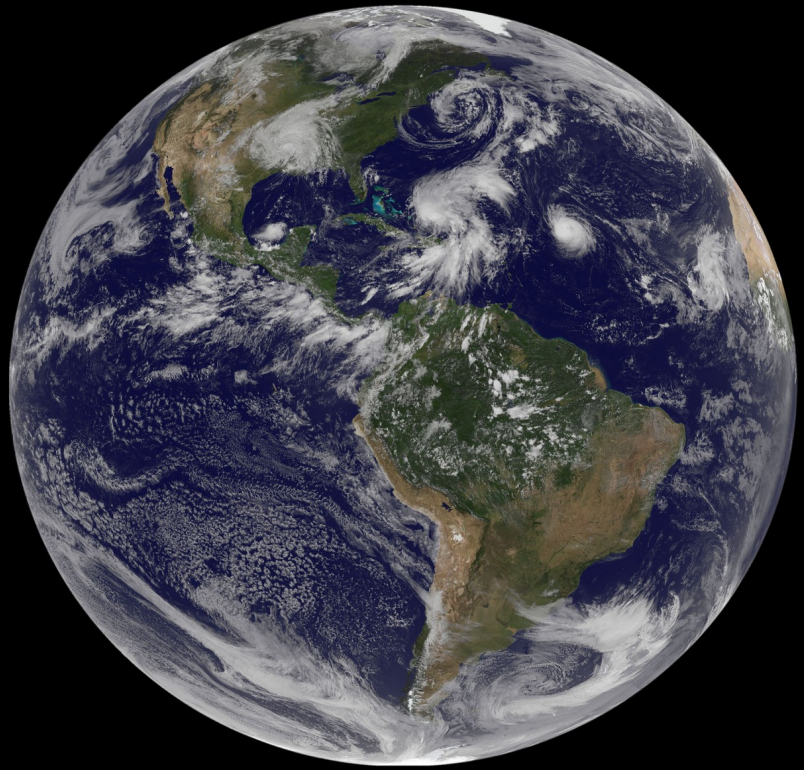
- sporadisches & limitiertes Wachstum

- Vielfalt (Funktionalität)

- Kreisläufe (ohne Abfall)

- geschlossen-systemisch; alles ist miteinander verbunden

= bewiesenermaßen erfolgreiches Langzeit Konzept!



Humanity's Carbon Economy (ca. 170 Jahre):

- Profit (C-Ausstoß)

- ewiges Wachstum

- 'Nur-das-Beste bleibt' (wenige Optionen & Arten)

- Linearität (nehmen - nutzen - wegwerfen)

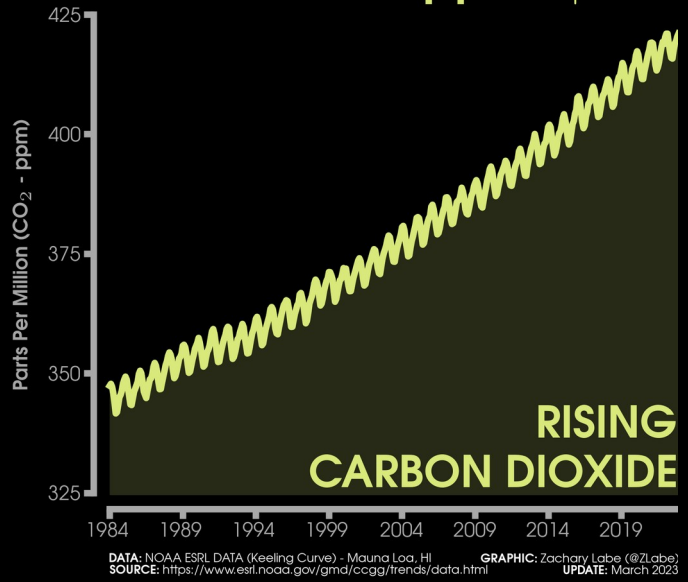
- offen-individualistisch; isolierend

= kurzfristige Erfolge, aber mit hohen ökologischen und sozialen Kosten & Risiko eines System-Kollapses!

Die Klimakrise ist zu 100% Menschen-gemacht, sagen IPCC und ‚BIG Oil & Gas!

CO_2

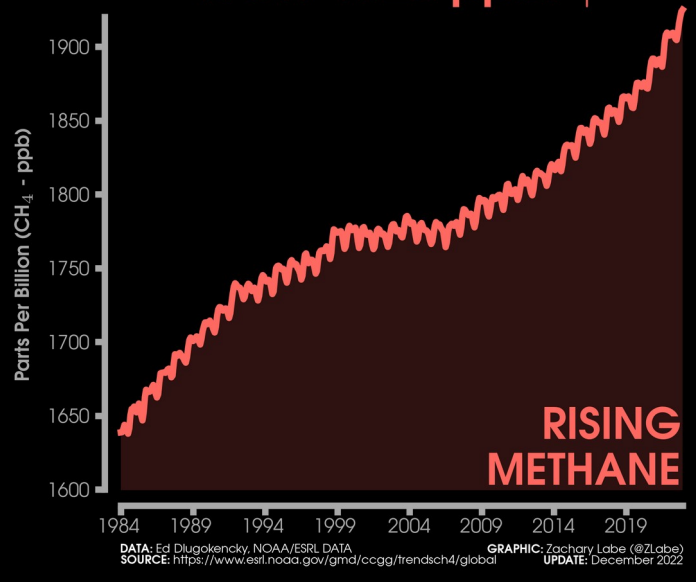
NOW 421 ppm! ↑



Kohlendioxid
Avg. 100-1,500 J. / 1x

CH_4

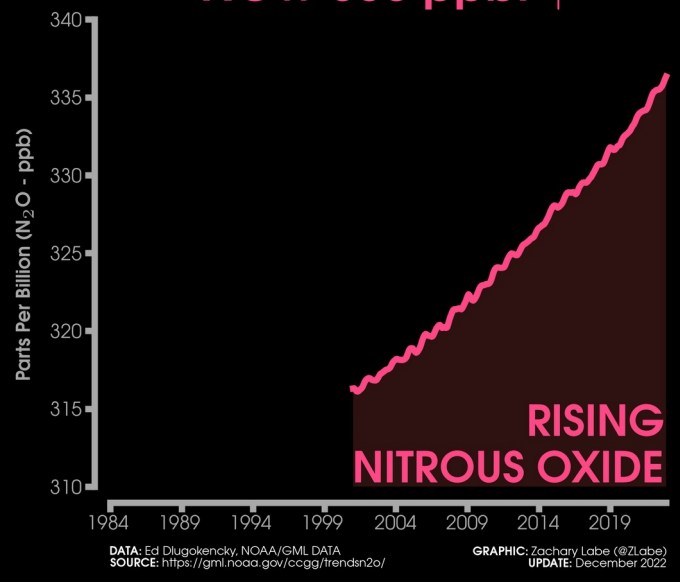
NOW 1925 ppb! ↑



Methan
avg. 9 J. / 32x

N_2O

NOW 336 ppb! ↑



‚Lachgas‘
avg. 130 J. / 298x

THE CLIMATE TASK FORCE

1982 Exxon Memo Summarizing Climate Modeling and CO2 Greenhouse Effect Research

September 2, 1982 Exxon's Roger Cohen sends a memo to Exxon's Al Natkin summarizing climate modeling research and the CO2 greenhouse effect. Cohen writes that while climate models vary widely and that there has not been a measurable change in the earth's climate due increasing CO2, over the past several years have a "clear scientific consensus has emerged regarding the expected effects of increased atmospheric CO2."

Nos. 18-15499, 18-15502, 18-15503, 18-16376

United States Court Of Appeals

FOR THE NINTH CIRCUIT

COUNTY OF SAN MATEO, Plaintiff-Appellee, v. CHEVRON CORPORATION, *et al.*, Defendants-Appellants	No. 18-15499 No. 17-cv-4929-VC N.D. Cal., San Francisco Hon. Vince Chhabria

0757-L-RWC

EXXON RESEARCH AND ENGINEERING COMPANY
CORPORATE RESEARCH
SCIENCE LABORATORIES
P. O. Box 45, Linden, N. J. 07036

DUANE G. LEVINE, Director

ROGER W.COHEN, Director
Theoretical and Mathematical Sciences Laboratory

September 2, 1982

H. N. WEINBERG
SEP 2 1982

Mr. A. M. Natkin
Office of Science and Technology
Exxon Corporation
1251 Avenue of the Americas
New York, New York 10020

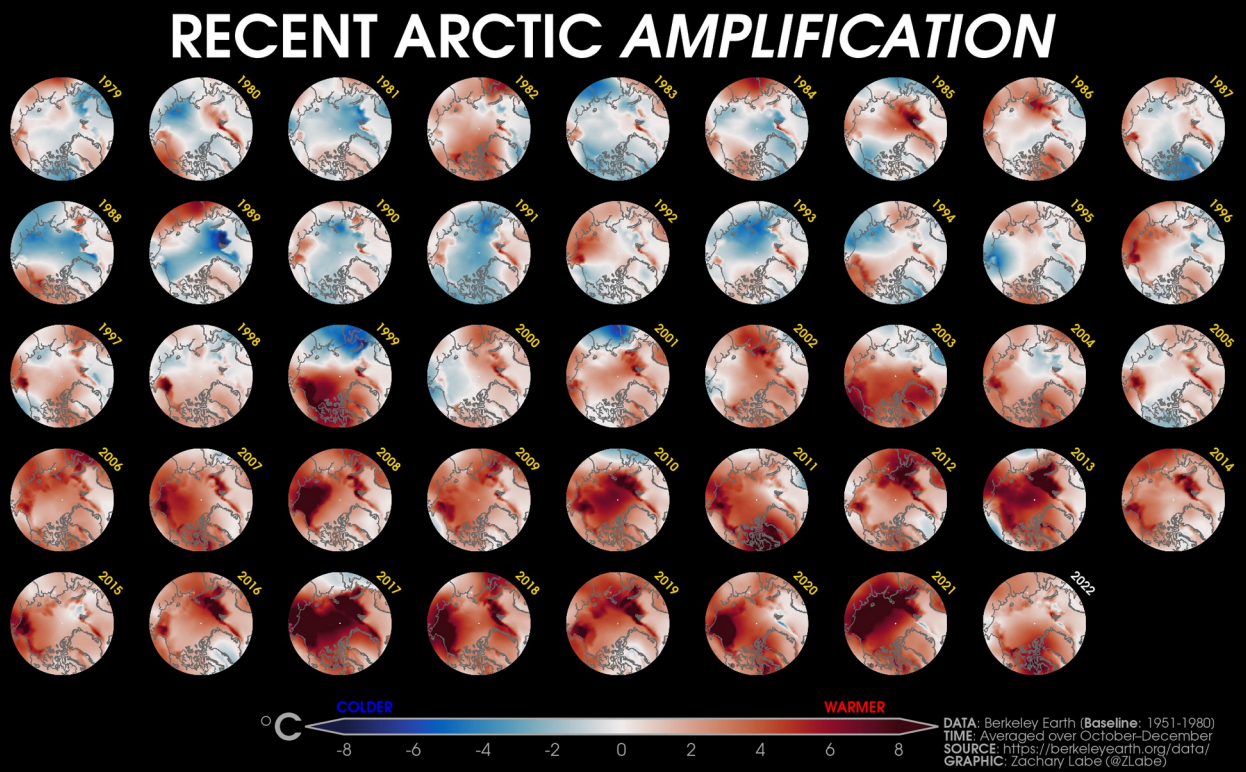
Dear Al:

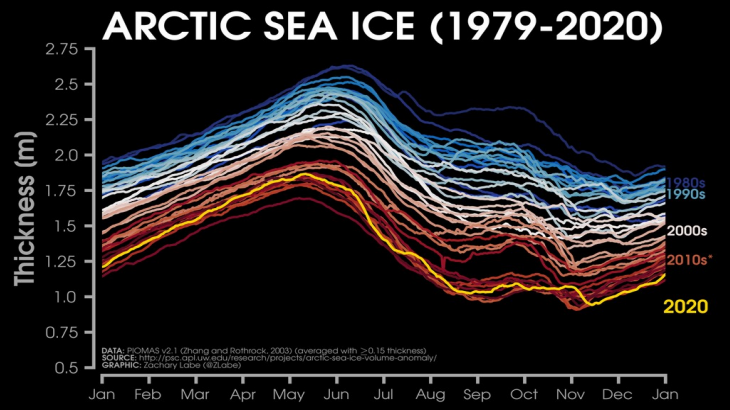
I would like to summarize the findings of our research in climate modeling and place our results in the context of the existing body of knowledge of the CO_2 greenhouse effect.

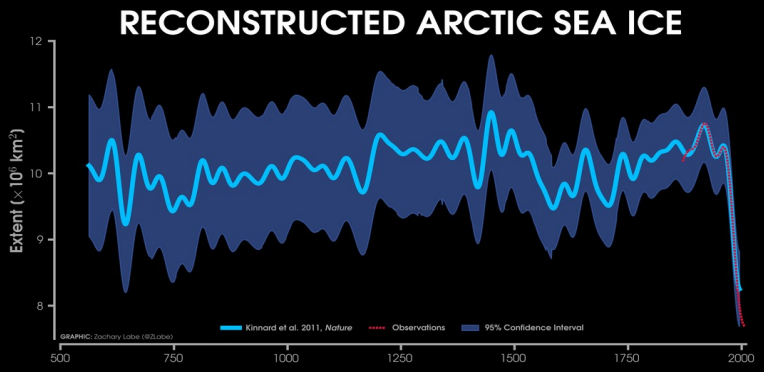
Although the increase of atmospheric CO_2 is well documented, it has not yet resulted in a measurable change in the earth's climate. The concerns surrounding the possible effects of increased CO_2 have been based on the predictions of models which simulate the earth's climate. These models vary widely in the level of detail in which climate processes are treated and in the approximations used to describe the complexities of these processes. Consequently the quantitative predictions derived from the various models show considerable variation. However, over the past several years a clear scientific consensus has emerged regarding the expected climatic effects of increased atmospheric CO_2. The consensus[+] is that a doubling of atmospheric CO_2 from its pre-industrial revolution value would result in an average global temperature rise of $(3.0 \pm 1.5)^{o}C$. The uncertainty in this figure is a result of the inability of even the most elaborate models to simulate climate in a totally realistic manner. The temperature rise is predicted to be distributed nonuniformly over the earth, with above-average temperature elevations in the polar regions and relatively small increases near the equator. There is unanimous agreement in the scientific community that a temperature increase of this magnitude would bring about significant changes in the earth's climate, including rainfall distribution and alterations in the biosphere. The time

[+]National Research Council Panel Report, Carbon Dioxide and Climate: A Second Assessment, National Academy Press, Washington, D.C., 1982.

Das polare Eis schmilzt … Meereis & Gletscher







Die Arktis ist die sich am schnellsten erwärmende Region der Welt (ca. 4-7x!)

THE CLIMATE TASK FORCE

Schwindendes Eis – was macht das?

Dunkle Flächen absorbieren mehr Wärme (‘*Albedo Effekt*’); helles Eis vs. dunkles Wasser
Meereis isoliert die darunter liegenden Wasserschichten (zeitweise Eis-frei schon ab 2027?)

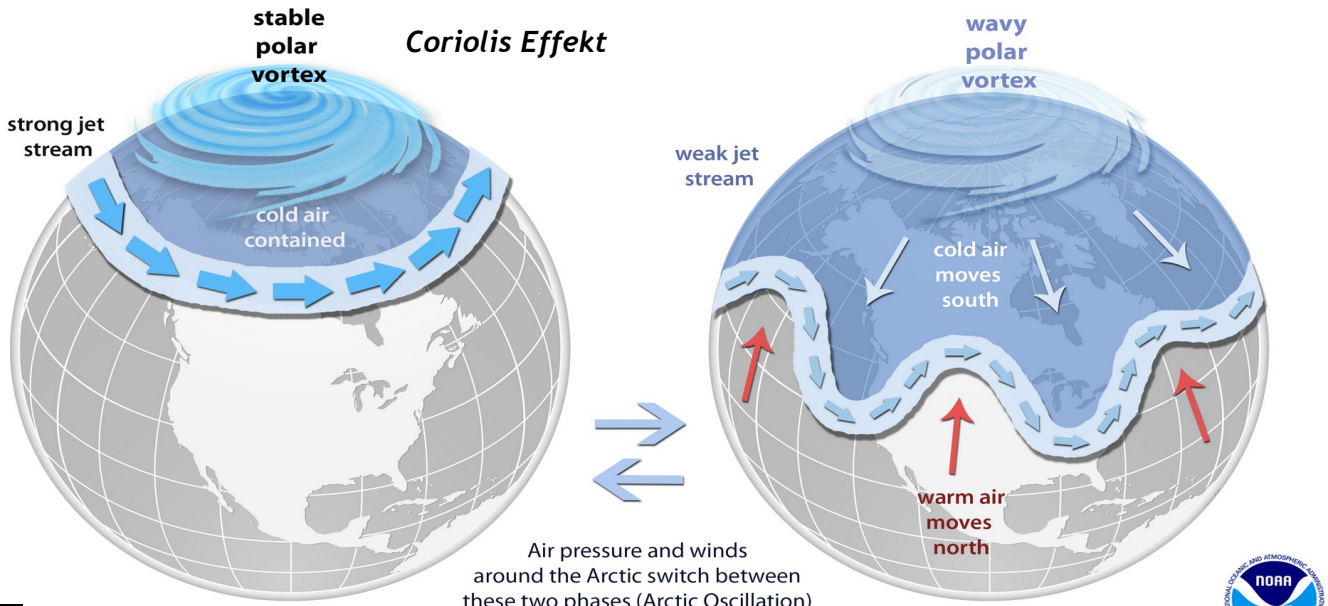
Eine eisfreie Arktis bedeutet ca. 0,2-0,3 °C zusätzliche Erwärmung!

THE CLIMATE TASK FORCE

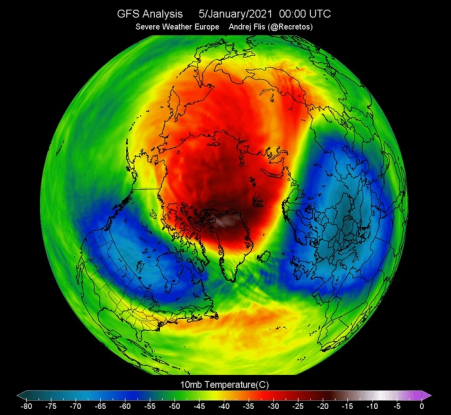
Das Eis schmilzt und die polare Vortex & der Jetstream verändern sich

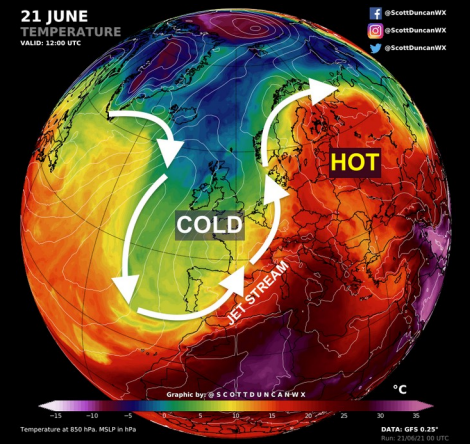
The Science Behind the Polar Vortex

The polar vortex is a large area of low pressure and cold air surrounding the Earth's North and South poles. The term vortex refers to the counterclockwise flow of air that helps keep the colder air close to the poles (left globe). Often during winter in the Northern Hemisphere, the polar vortex will become less stable and expand, sending cold Arctic air southward over the United States with the jet stream (right globe). The polar vortex is nothing new — in fact, it's thought that the term first appeared in an 1853 issue of E. Littell's *Living Age*.



Air pressure and winds around the Arctic switch between these two phases (Arctic Oscillation) and contribute to winter weather patterns.

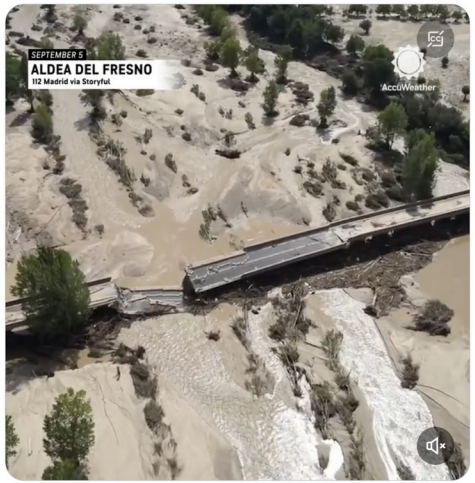




THE CLIMATE TASK FORCE

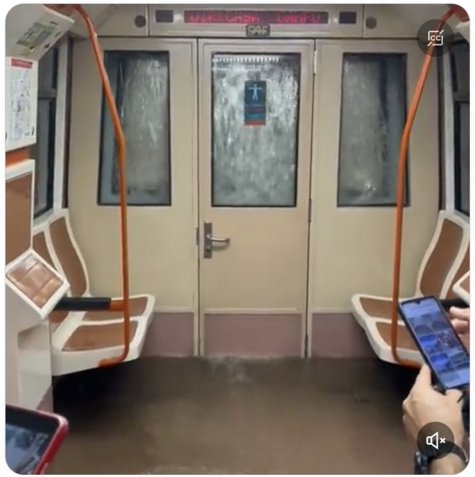
AccuWeather @accuweather · 21h

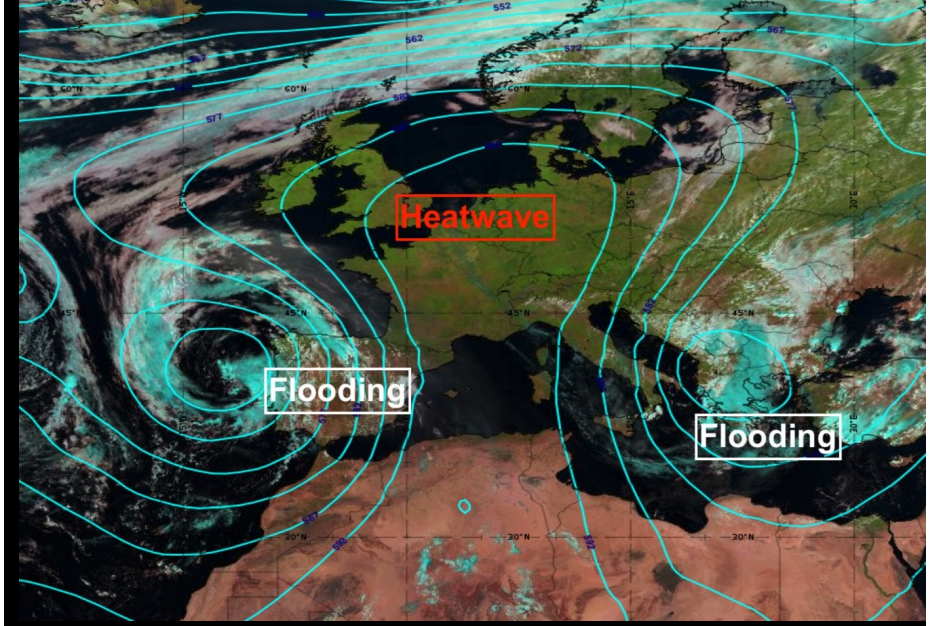
Torrential rain and severe flooding caused a bridge leading to Aldea del Fresno in Spain to partially collapse.

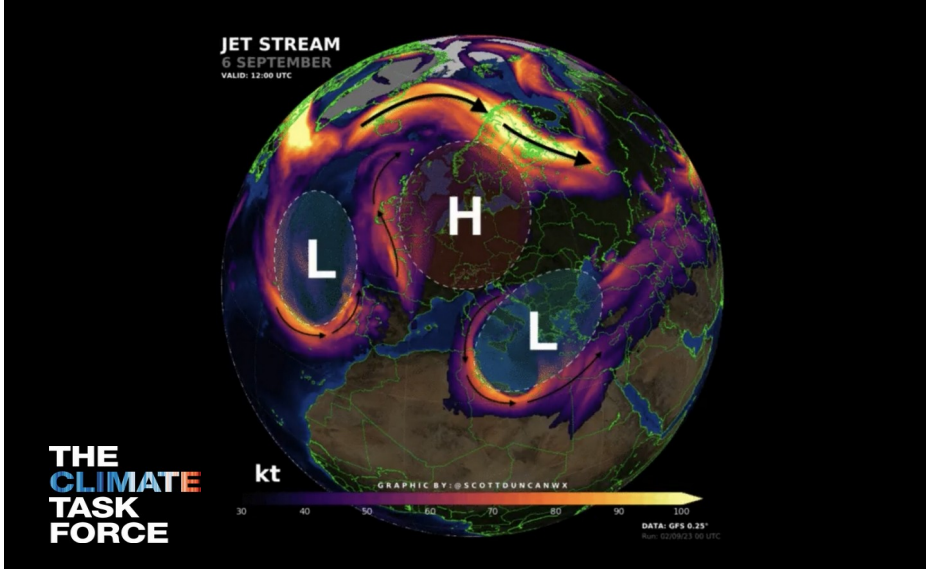


Zoom Earth @zoom_earth · 10h

Flooding on the Madrid Metro #DANA







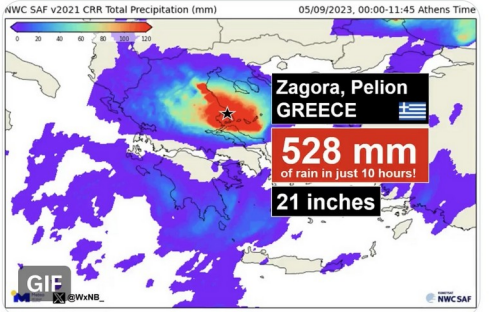
Volcaholic @volcaholic1 · 1h

Almost all the villages of the plain of Karditsa, #Greece are under water this morning 😭

#ClimateEmergency #ClimateActionNow

Nahel Belgherze @WxNB_ · 19h

My goodness! Zagora, Greece recorded a jaw-dropping 528 mm (21 inches) of rain in just 10 hours - an additional 300-500 mm, locally up to 600 mm, of rain could fall by Thursday. A historic flooding event is underway!



Permafrost: gefrorene obere Erdschicht voller fossiler Ablagerungen.

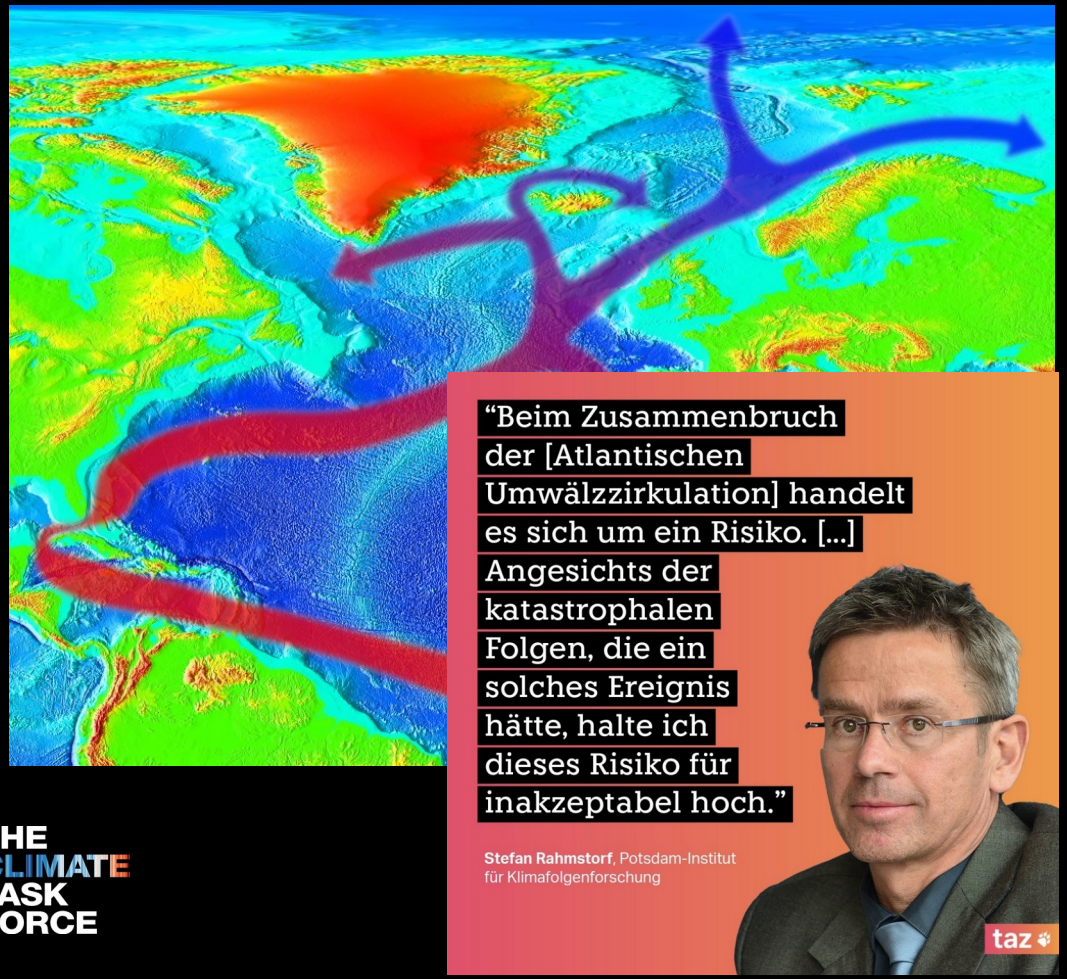
Arktis: +Feuchtigkeit +Schnee +Isolierung = -Permafrost = +CH_4/CO_2 = +°C!

Methan (CH_4) ist ein 32 x schädlicheres 'Klimagas' als CO_2!

Kanadische Arktis: Schmelzrate des Permafrosts bei +150-240% in den letzten 12 Jahren; Permafrost schmilzt 70 Jahre früher als kalkuliert (IPCC RCP 4.5 für 2090)

2019 Geophys Res Lett 46:6681-

Der Golfstrom schwächt sich ab ...



- unsere karibische Wärmepumpe schwächelt;

- >15% verlangsamt in den letzten 70 Jahren;

- droht komplett zum Erliegen zu kommen. Zeitpunkt noch unklar, wird aber immer wahrscheinlicher;

- Trend für Europa: zunehmende Trockenheit und Extremtemperaturen in beide Richtungen … Sommer wie Winter!

THE CLIMATE TASK FORCE

Klimatische Kipppunkte

- bei global +1,5-2°C
(+2,4-3,2 Grad Kurs)

- irreversibel!

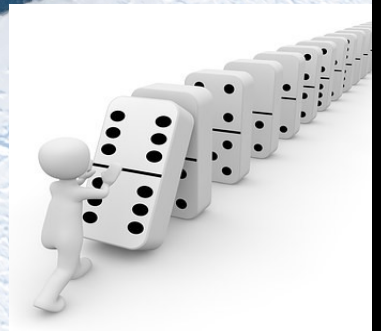
- Schmelzen der arktischen & antarktischen Eisschilde

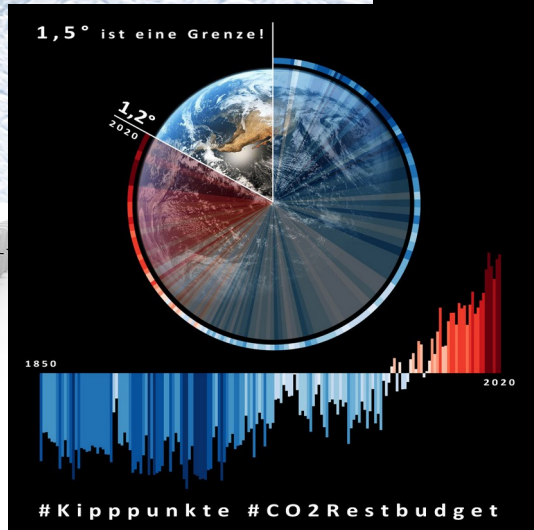
- Schmelzen der Gletscher

- Schmelzen des Permafrosts

- Veränderungen der Meeresströmungen

- Absterben der Korallenriffe





THE CLIMATE TASK FORCE

TIPPING POINTS
FROM CLIMATE CRISIS TO
POSITIVE TRANSFORMATION

HOME ABOUT PROGRAMME SP

TIPPING POINTS
FROM CLIMATE CRISIS TO POSITIVE TRANSFORMATION

12th – 14th September 2022

University of Exeter, Exeter UK

Think Unthinkable @Think_U... · 5d

Positive #tippingpoints are 'our last best hope' to address climate change. Tim Lenton opening Global Tipping Points conference.

Exceeding 1.5°C global warming could trigger multiple climate tipping points

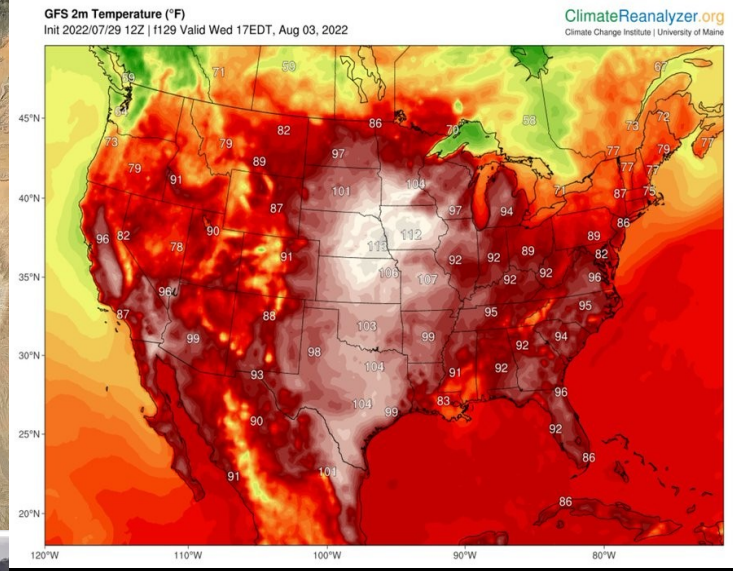
DAVID I. ARMSTRONG MCKAY, ARIE STAAL, JESSE F. ABRAMS, RICARDA WINKELMANN, BORIS SAKSCHEWSKI, SINA LORIANI, INGO FETZER, SARAH E. CORNELL, JOHAN ROCKSTRÖM, [...] TIMOTHY M. LENTON +1 authors Authors Info & Affiliations

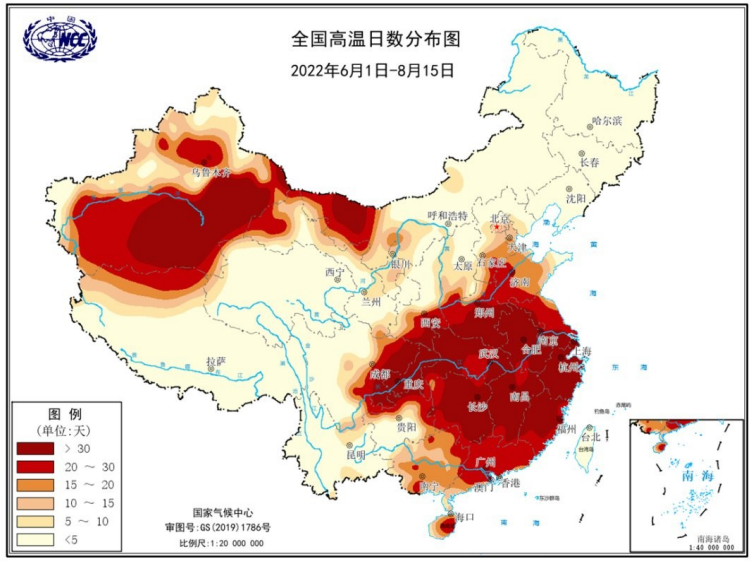
SCIENCE · 9 Sep 2022 · Vol 377, Issue 6611 · DOI: 10.1126/science.abn7950

We have left it too late to tackle climate change incrementally.
It now requires transformational change, and a dramatic acceleration of progress.

California

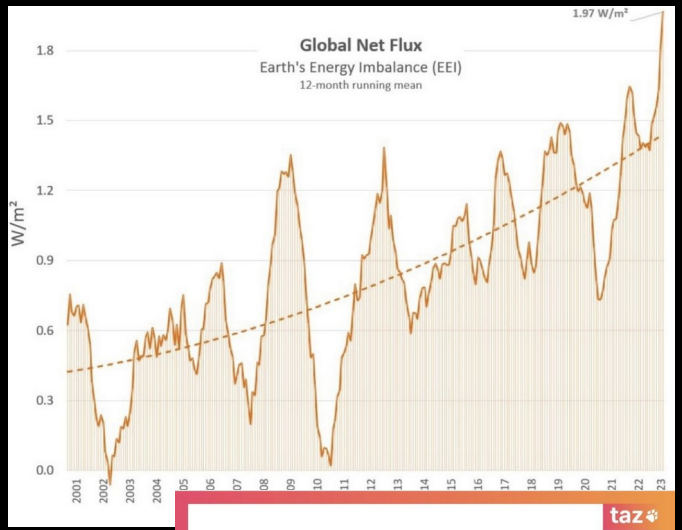
California's largest reservoirs at critically low levels – signaling a dry summer ahead

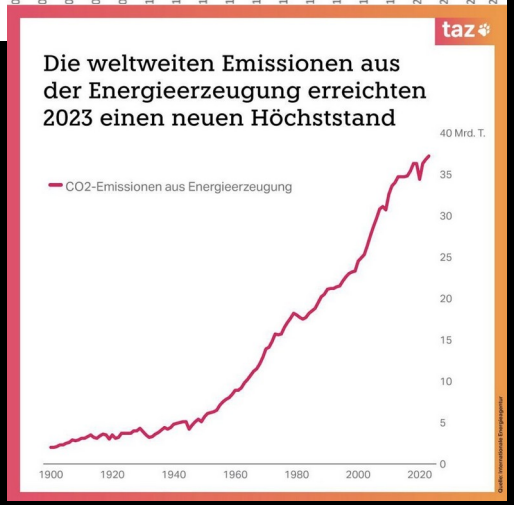


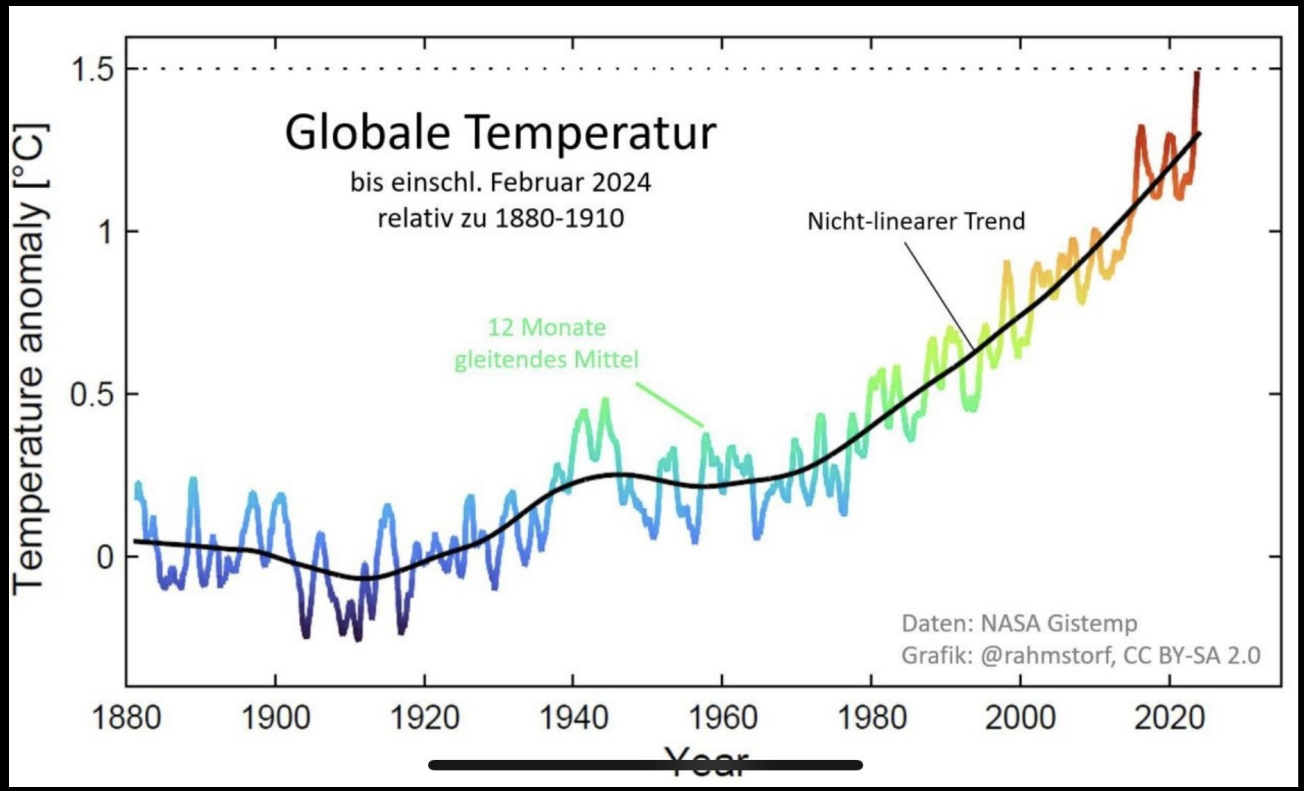


Globale Extrem-Events … Hitzerekorde, Dürren, Fluten, Stürme, Eisschmelze, Meeresspiegelanstieg www.worldweatherattribution.org

Globales Rekord-Hoch an Emissionen (für 2023 & kumulativ) = +++ Strahlungsbilanz & +++ Temperatur-Anomalie







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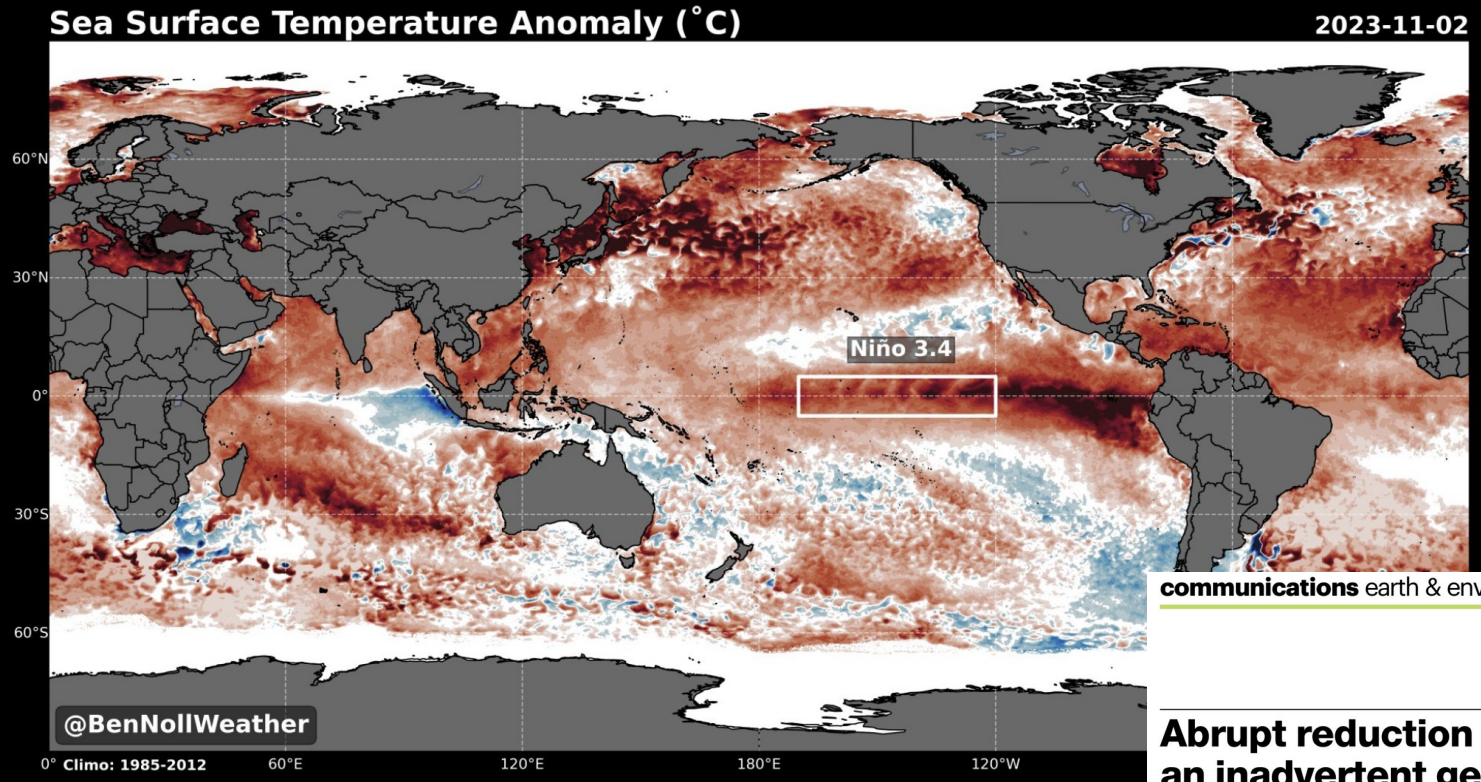
Juni 2023 – April 2024 … El Nino Phase verstärkte die Erwärmung



communications earth & environment
Article
https://doi.org/10.1038/s43247-024-01442-3

Abrupt reduction in shipping emission as an inadvertent geoengineering termination shock produces substantial radiative warming

Check for updates

Tianle Yuan[1,2], Hua Song[2,3], Lazaros Oreopoulos[2], Robert Wood[4], Huisheng Bian[1,2], Katherine Breen[2,5], Mian Chin[2], Hongbin Yu[2], Donifan Barahona[2], Kerry Meyer[2] & Steven Platnick[2]

THE CLIMATE TASK FORCE

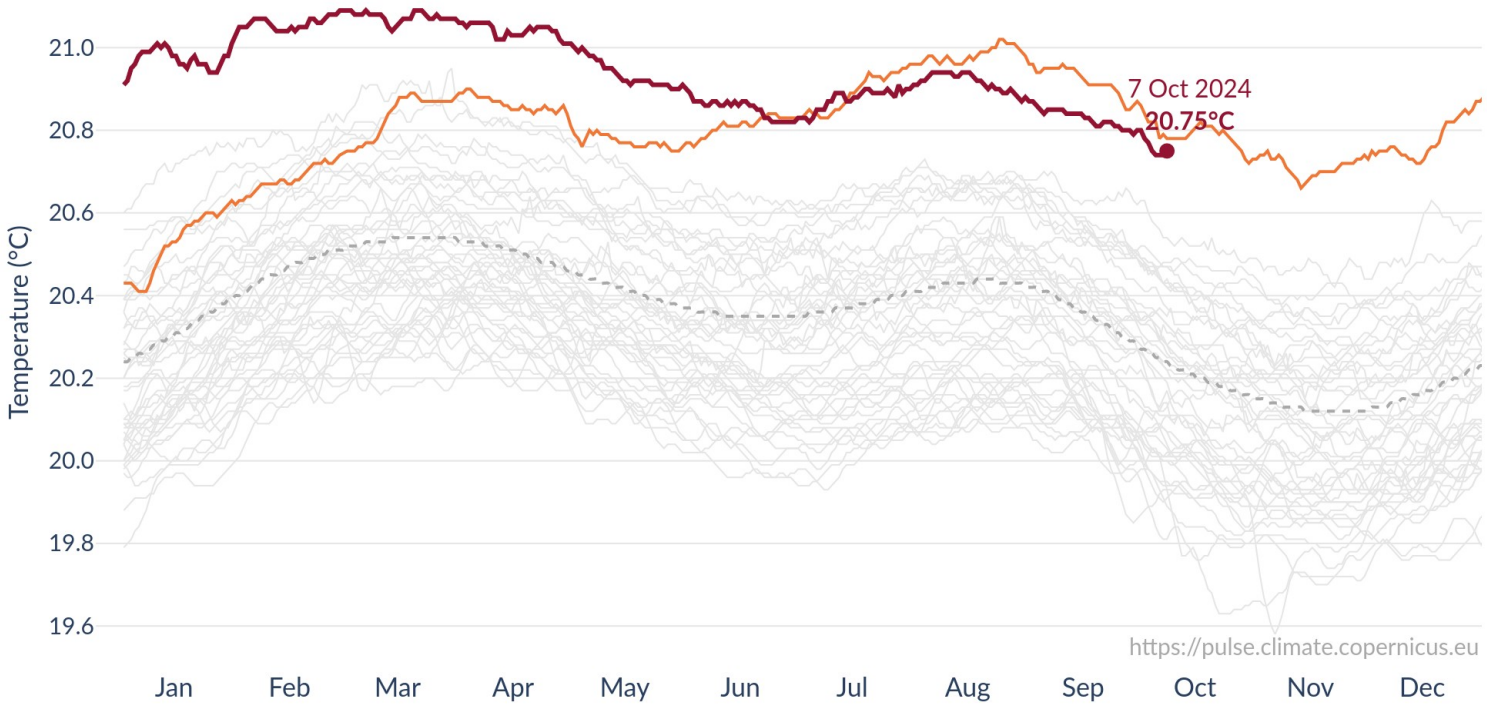
Daily sea surface temperature for 60°S–60°N

Data: ERA5 1979–2024 • Credit: C3S/ECMWF

2024 2023 1979–2022 1991–2020 average

Der massive Sprung in den Temperaturen ist nur teilweise erklärbar?!

AWI Bremerhaven - ‚Science' Artikel

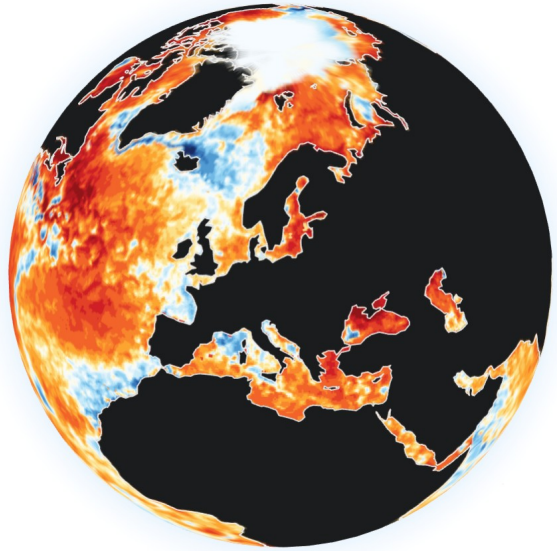


PROGRAMME OF THE EUROPEAN UNION
Copernicus Europe's eyes on Earth
IMPLEMENTED BY ECMWF
Climate Change Service climate.copernicus.eu

Sea surface temperature anomaly • 7 Oct 2024

Daily average • Baseline: 1991-2020

Data: ERA5 • Credit: C3S/ECMWF



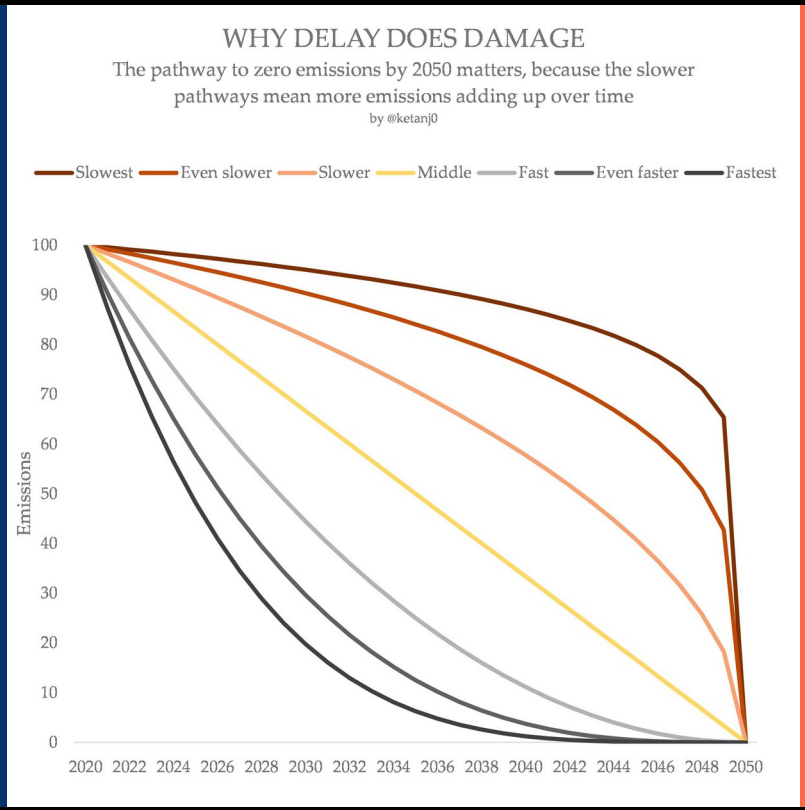
Temperature anomaly (°C)

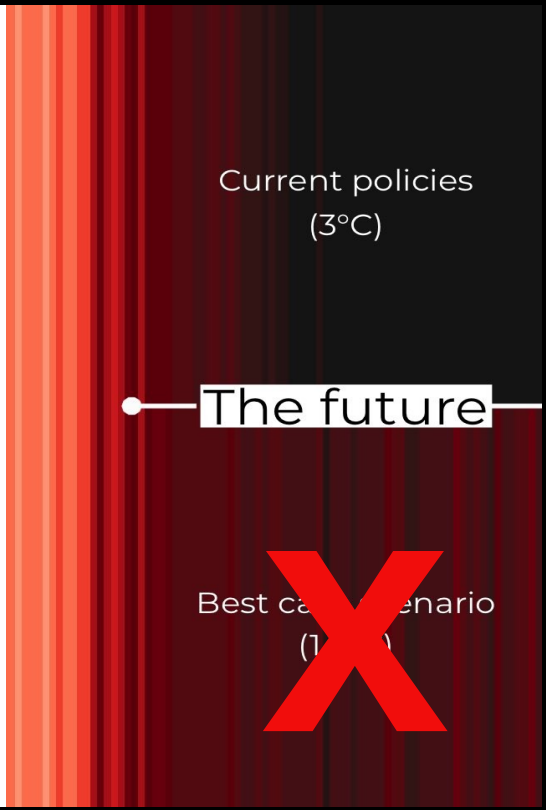
-3 -2 -1 -0.5 -0.2 0 0.2 0.5 1 2 3

‘Beste Option’ die Heute noch übrig ist … unser Klimasystem in den nächsten Jahrzehnten in einem fragilen Zustand zu ‘stabilisieren’!

United Nations Office for Disaster Risk Red... + Follow
544,204 followers
2d •

Global emissions need to be reduced by over 7% every year for the next ten years to reduce the risk of a worsening #ClimateEmergency
Read more 👉 https://bit.ly/3aVxdYw
#UNEA6





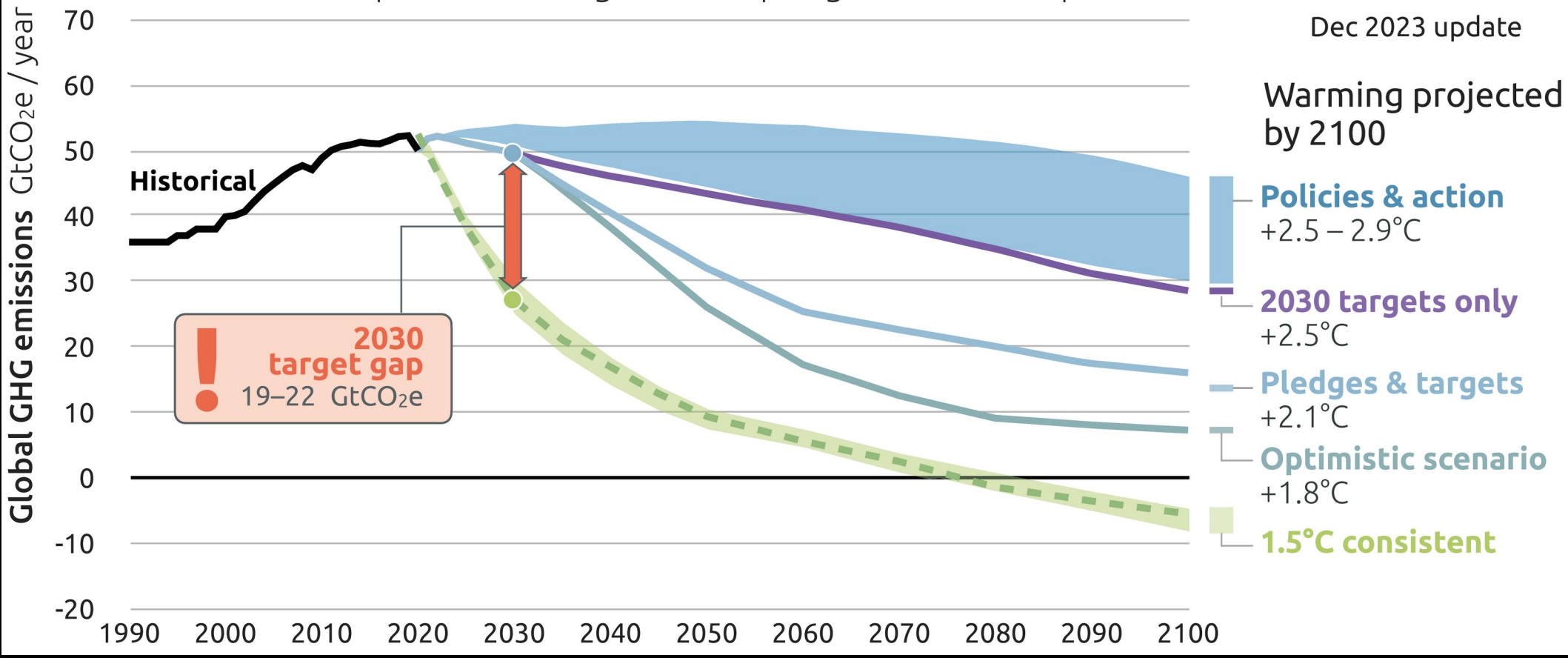
THE CLIMATE TASK FORCE

2100 WARMING PROJECTIONS

Emissions and expected warming based on pledges and current policies

Climate Action Tracker

Dec 2023 update



Welches Risiko akzeptieren wir als Gesellschaft?

- **Verbleibendes CO_2 Budget (ab Anfang 2020) ist abhängig vom akzeptierten Risiko:**

Approximate global warming relative to 1850–1900 until temperature limit *(°C)**(1)	Additional global warming relative to 2010–2019 until temperature limit *(°C)*	Estimated remaining carbon budgets from the beginning of 2020 *($GtCO_2$)* → *Likelihood of limiting global warming to temperature limit*(2)*					Variations in reductions in non-CO_2 emissions*(3)
		17%	*33%*	*50%*	*67%*	*83%*	
1.5	0.43	900	650	500	400	300	Higher or lower reductions in accompanying non-CO_2 emissions can increase or decrease the values on the left by 220 $GtCO_2$ or more
1.7	0.63	1450	1050	850	700	550	
2.0	0.93	2300	1700	1350	1150	900	

Update COP28 prep. Bonn: -250 $GtCO_2$ in nur 3 Jahren!

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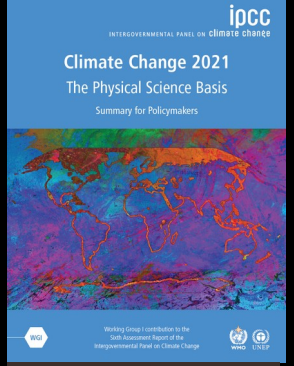


THE CLIMATE TASK FORCE

Unsere Lebensversicherung - Natürliche Kohlenstoff-Speicher

- Natürliche Speicher (Ökosysteme) sind hoch-effektiv, aber oft gefährdet (Wälder, Moore, Böden, Populationen von Tieren und Pflanzen)
- Schutz von Ökosystemen & der Atmosphäre müssen zusammen gedacht werden … Klimaschutz & Naturschutz gehören untrennbar zusammen!
- Jeder Verlust von Ökosystemen, Arten und Lebensformen verschlechtert unsere Kohlenstoffbilanz!
- Biologisches Leben und Artenvielfalt sind die ultimativen Klimastabilisatoren!

THE CLIMATE TASK FORCE

Catastrophic 73% decline in the average size of global wildlife populations in just 50 years reveals a 'system in peril'

1 73% Rückgang in Populationsdichte von Arten

2 Größten Rückgänge in M&S Amerika, Afrika & Asien

3 Zerstörung der Lebensraüme durch unser Nahrungssystem & der KW sind hauptverantwortlich

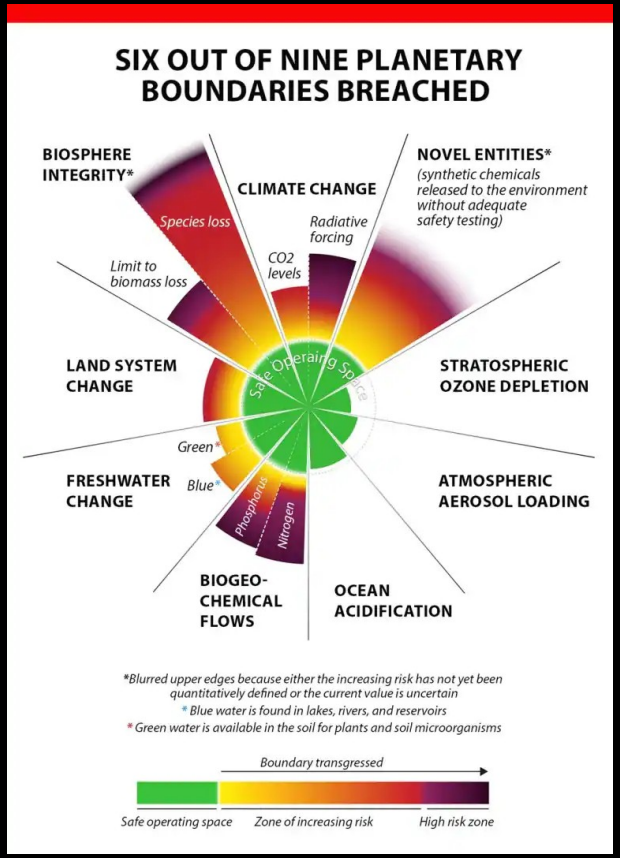
4 Warnsignale für erhöhte Risiken von Artenverlusten und Kipppunkten

5 Schutzmaßnahmen ---

6 Transformation unserer Nahrungsmittel-, Energie & Finanz-Systeme ist nötig

7 Schädliche Aktivitäten müssen unterbunden werden

Ökologischer & gesellschaftlicher Kollaps? Überschreiten planetarer Grenzen!



Article

Safe and just Earth system boundaries

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Check for updates

Johan Rockström[1,2,3]✉, Joyeeta Gupta[4,5], Dahe Qin[6,7,8], Steven J. Lade[3,9,10]✉, Jesse F. Abrams[11], Lauren S. Andersen[1], David I. Armstrong McKay[3,11,12], Xuemei Bai[10], Govindasamy Bala[13], Stuart E. Bunn[14], Daniel Ciobanu[3], Fabrice DeClerck[15,16], Kristie Ebi[17], Lauren Gifford[18], Christopher Gordon[19], Syezlin Hasan[14], Norichika Kanie[20], Timothy M. Lenton[11], Sina Loriani[1], Diana M. Liverman[18], Awaz Mohamed[21], Nebojsa Nakicenovic[22], David Obura[23], Daniel Ospina[9], Klaudia Prodani[4], Crelis Rammelt[4], Boris Sakschewski[1], Joeri Scholtens[4], Ben Stewart-Koster[14], Thejna Tharammal[24], Detlef van Vuuren[25,26], Peter H. Verburg[27,28], Ricarda Winkelmann[1,29], Caroline Zimm[22], Elena M. Bennett[30,31], Stefan Bringezu[32], Wendy Broadgate[9], Pamela A. Green[33], Lei Huang[34], Lisa Jacobson[9], Christopher Ndehedehe[14,35], Simona Pedde[9,36], Juan Rocha[3,9], Marten Scheffer[37], Lena Schulte-Uebbing[25,38], Wim de Vries[38], Cunde Xiao[6,39], Chi Xu[40], Xinwu Xu[7,8], Noelia Zafra-Calvo[41] & Xin Zhang[42]

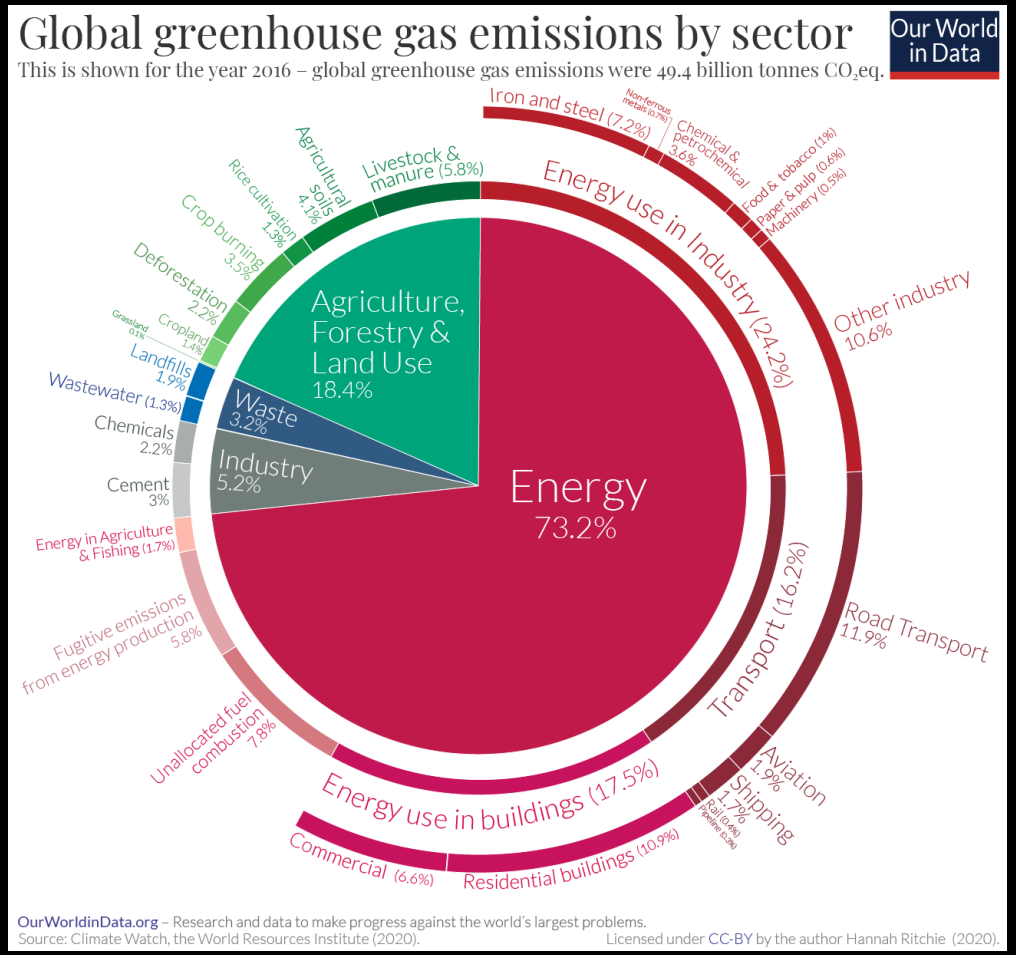
The stability and resilience of the Earth system and human well-being are inseparably linked[1–3], yet their interdependencies are generally under-recognized; consequently, they are often treated independently[4,5]. Here, we use modelling and literature assessment to quantify safe and just Earth system boundaries (ESBs) for climate, the biosphere, water and nutrient cycles, and aerosols at global and subglobal scales. We propose ESBs for maintaining the resilience and stability of the Earth system (safe ESBs) and minimizing exposure to significant harm to humans from Earth system change (a necessary but not sufficient condition for justice)[4]. The stricter of the safe

Planetare Grenzen müssen zwingend respektiert werden, um die Stabilität und Wiederstandsfähigkeit des ganzen Systems zu erhalten … aber 6 von 9 der planetaren Grenzen sind bereits überschritten … inklusive der des Klimas und der Biodiversität!

THE CLIMATE TASK FORCE

Klima & Energiewende - kostengünstig und unverzichtbar!

- ca. ¾ der GHG Emissionen stammen aus der Nutzung fossiler Energien
- klimaneutrale Alternativen existieren
- CO_2 Budget für >50:50 Chance für max. +1,5°C ist aufgebraucht!
- ‚Net Zero' Spielereien haben ausgedient
- CO_2 Zertifikate-Handel ist fast ausnahmslos dubios bis Schwindel!
- Es gibt keine CO_2 Kredite mehr …
- Ziel muss ‚Absolute Zero' sein!



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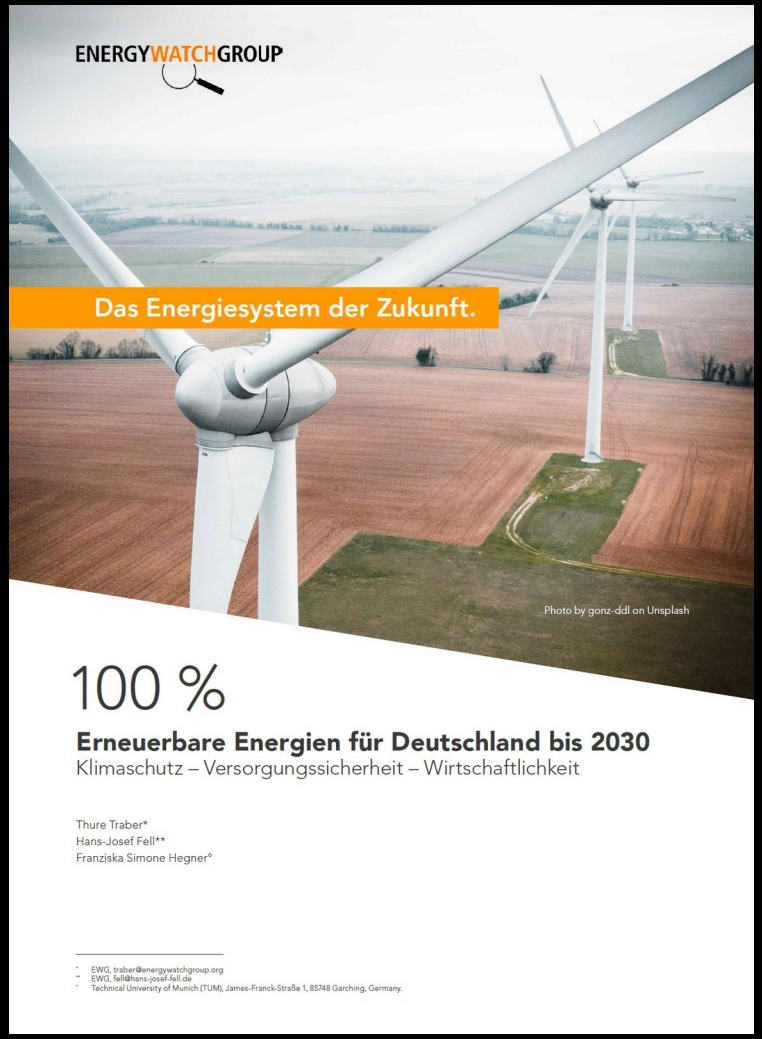
100% Erneuerbare Energien bis 2030

- Billig
- Sauber
- Dezentral
- Bürgerenergie

- Absolut machbar!



www.energywatchgroup.org

www.diw.de

THE CLIMATE TASK FORCE

The future of European competitiveness

Part A | A competitiveness strategy for Europe

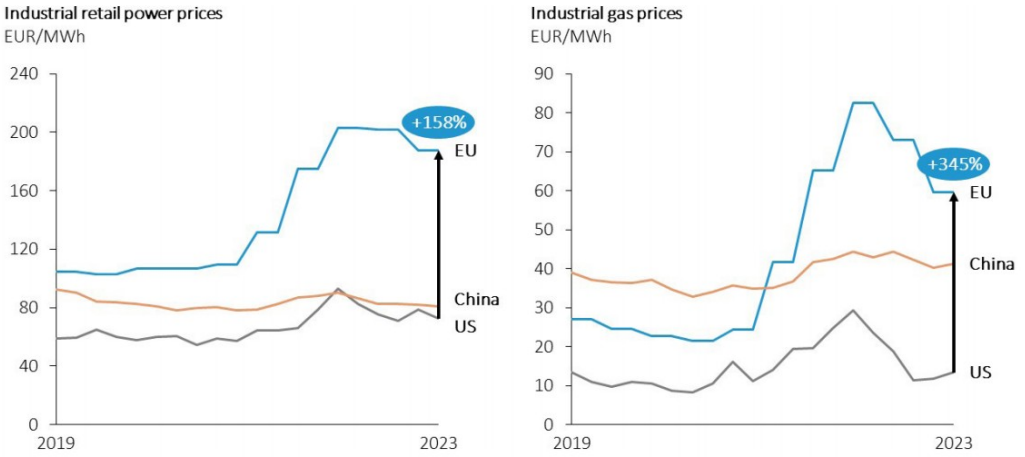
SEPTEMBER 2024

Draghi Bericht für die EC

For the EU to succeed, it will therefore need to engineer a coherent strategy for all aspects of decarbonisation, from energy to industry.

FIGURE 6

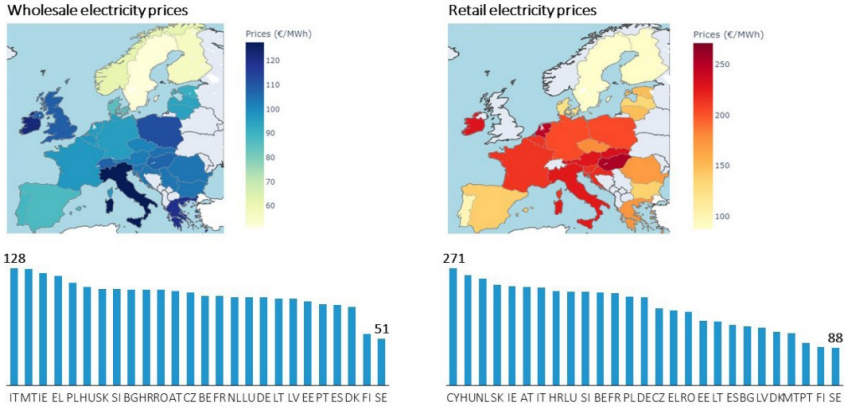
Gas and retail price gap for industry



Source: European Commission, 2024. Based on Eurostat (EU), EIA (US) and CEIC (China), 2024.

Electricity wholesale and retail prices across Member States for industry

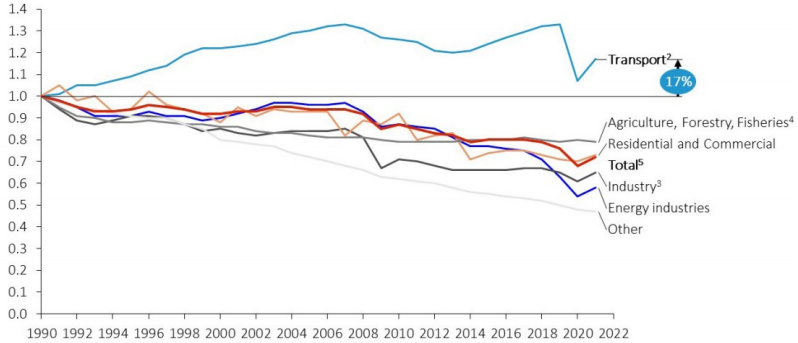
EUR/MWh, 2023



Source: European Commission, 2024. Based on Eurostat, S&P Global, and ENTSO-E, 2024.

Evolution of greenhouse gas emissions by sector in the EU

Greenhouse gas emission[1], Index 1990=1



Notes: 1 Excluding LULUCF emissions and international maritime, including international aviation and indirect CO2. 2 Excluding international maritime (international traffic departing from the EU), including international aviation. 3 Emissions from Manufacturing and Construction, Industrial Processes and Product Use. 4 Emissions from Fuel Combustion and other Emissions from Agriculture.

Source: European Commission, 2023

Klima & Wirtschaft

The Macroeconomic Impact of Climate Change: Global vs. Local Temperature
Adrien Bilal and Diego R. Känzig
NBER Working Paper No. 32450
May 2024
JEL No. E01,E23,F18,O44,Q54,Q56

ABSTRACT

This paper estimates that the macroeconomic damages from climate change are six times larger than previously thought. We exploit natural variability in global temperature and rely on time-series variation. A 1°C increase in global temperature leads to a 12% decline in world GDP. Global temperature shocks correlate much more strongly with extreme climatic events than the country-level temperature shocks commonly used in the panel literature, explaining why our estimate is substantially larger. We use our reduced-form evidence to estimate structural damage functions in a standard neoclassical growth model. Our results imply a Social Cost of Carbon of $1,056 per ton of carbon dioxide. A business-as-usual warming scenario leads to a present value welfare loss of 31%. Both are multiple orders of magnitude above previous estimates and imply that unilateral decarbonization policy is cost-effective for large countries such as the United States.

+1°C globale Erwärmung = -12% Bruttosozialprodukt
Pro Tonne CO_2 = USD 1.056 ‚sozialer Schaden' (-31%)

Einprogrammierter, globaler Einkommensverlust von -19% BST = 6x Vermeidungskosten für 2°C Max.

THE CLIMATE TASK FORCE

Maximilian Kotz, Anders Levermann, Leonie Wenz (2024): The economic commitment of climate change. Nature. [DOI: 10.1038/s41586-024-07219-0]

POTSDAM-INSTITUT FÜR KLIMAFOLGENFORSCHUNG

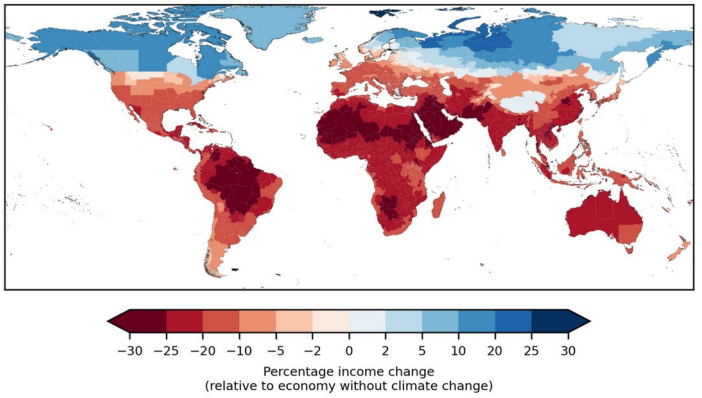
PIK

INSTITUT PERSONEN THEMEN PRODUKTE AKTUELLES

STARTSEITE › AKTUELLES › NACHRICHTEN

38 Billionen Dollar Schäden pro Jahr: 19 Prozent Einkommensverlust weltweit durch Klimawandel

17.04.2024 - Selbst wenn Treibhausgas-Emissionen ab heute drastisch reduziert würden, müsste die Weltwirtschaft aufgrund des Klimawandels bis 2050 bereits mit einem Einkommensverlust von 19 Prozent rechnen, so eine jetzt in der Fachzeitschrift Nature veröffentlichte Studie. Diese Schäden sind sechsmal höher als die Vermeidungskosten zur Begrenzung der globalen Erwärmung auf zwei Grad. Auf der Grundlage von empirischen Daten aus mehr als 1.600 Regionen der letzten 40 Jahre haben Forschende des Potsdam-Instituts für Klimafolgenforschung (PIK) die zukünftigen Auswirkungen veränderter klimatischer Bedingungen auf das Wirtschaftswachstum berechnet.



Prognostizierte Einkommensveränderungen im Jahr 2049 im Vergleich zu einer Wirtschaft ohne Klimawandel. Die Einkommensveränderungen sind eine Folge der bereits verursachten Emissionen. (Bild: Kotz et al., Nature)

Unser Weg aus der Klimakrise … *‚Großes Denken‘ & Handeln*

- Wir brauchen neue (überraschende) Allianzen & Netzwerke
- Wir brauchen Gestalter, nicht Verwalter
- Wir brauchen die Vision des Möglichen, nicht die Illusion eines *‚weiter-so’*

‘SEKTOREN-KOPPLUNG’ – Solar Industrie als Treiber & öffentlicher ‚Lobbyist’

- Realität akzeptieren - Verantwortung übernehmen - gemeinschaftlich Handeln
- Wir sind im *‚Klima-Endspiel‘*, aber wir haben alles was wir brauchen …

Zitat: Helmut Schmidt

‚Wenn du nicht an Wunder glaubst,
bist du kein Realist!‘

THE CLIMATE TASK FORCE

Dr. Udo Engelhardt

E: udo.engelhardt@ansvar.com
& on Linked In