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Division of Energy & Fuels (ENFL)

Methane: Useful fuel and feedstock, but potent greenhouse gas

Organizers: **Jingbo Louise Lui** and **Joseph Sabol**; *Cosponsor* **CES**

8:05 **Selina Roman-White**, *Converting measurements into measurement informed inventories for decision makers: Lessons from Cheniere's QMRV research series*

8:25 **Satish Kumar**, *MethaneMapper: Spectral absorption aware hyperspectral transformer for methane detection*

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11:15 **Discussion**

11:35 **Adjourn**

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Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years

Changes in global surface temperature relative to 1850-1900

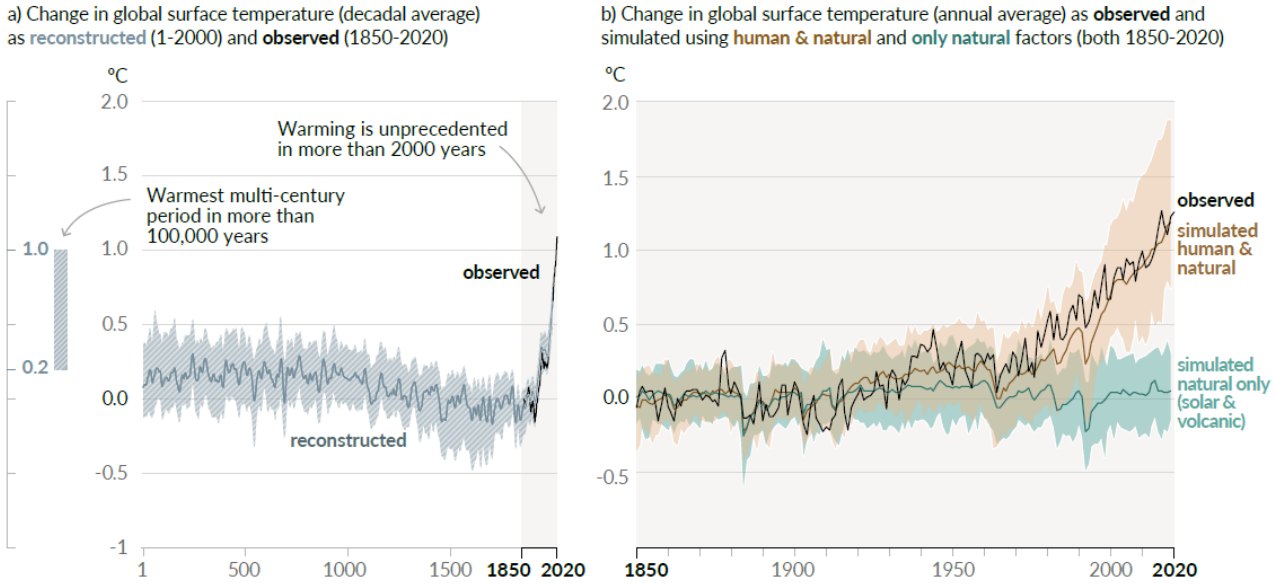

Figure SPM.1: History of global temperature change and causes of recent warming.

Panel a): Changes in global surface temperature reconstructed from paleoclimate archives (solid grey line, 1–2000) **and from direct observations** (solid black line, 1850–2020), both relative to 1850–1900 and decadally

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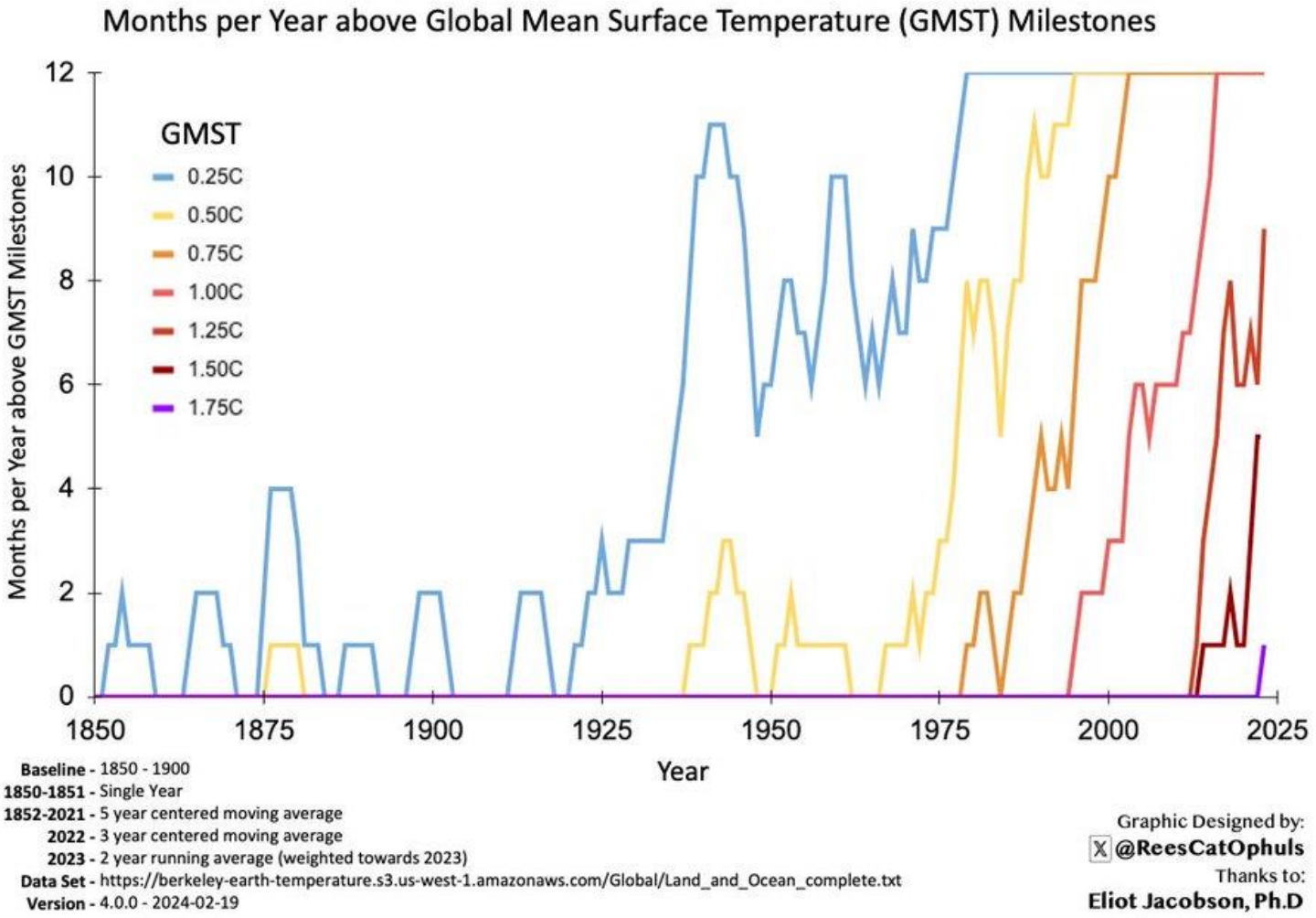

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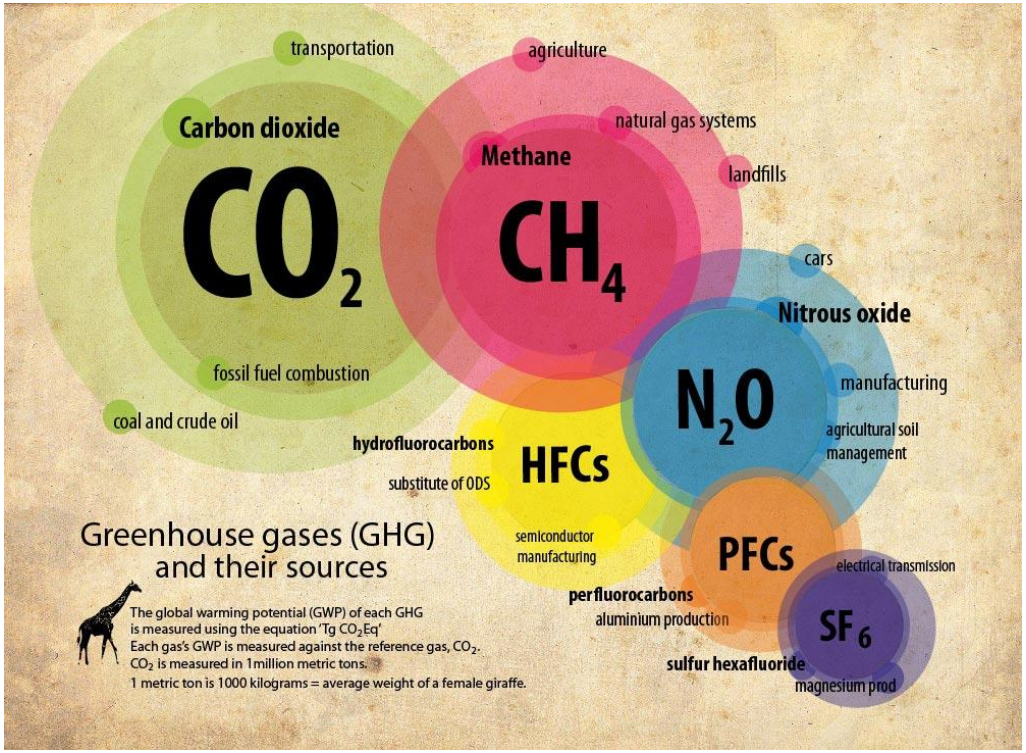

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Methane: The consumer's guide

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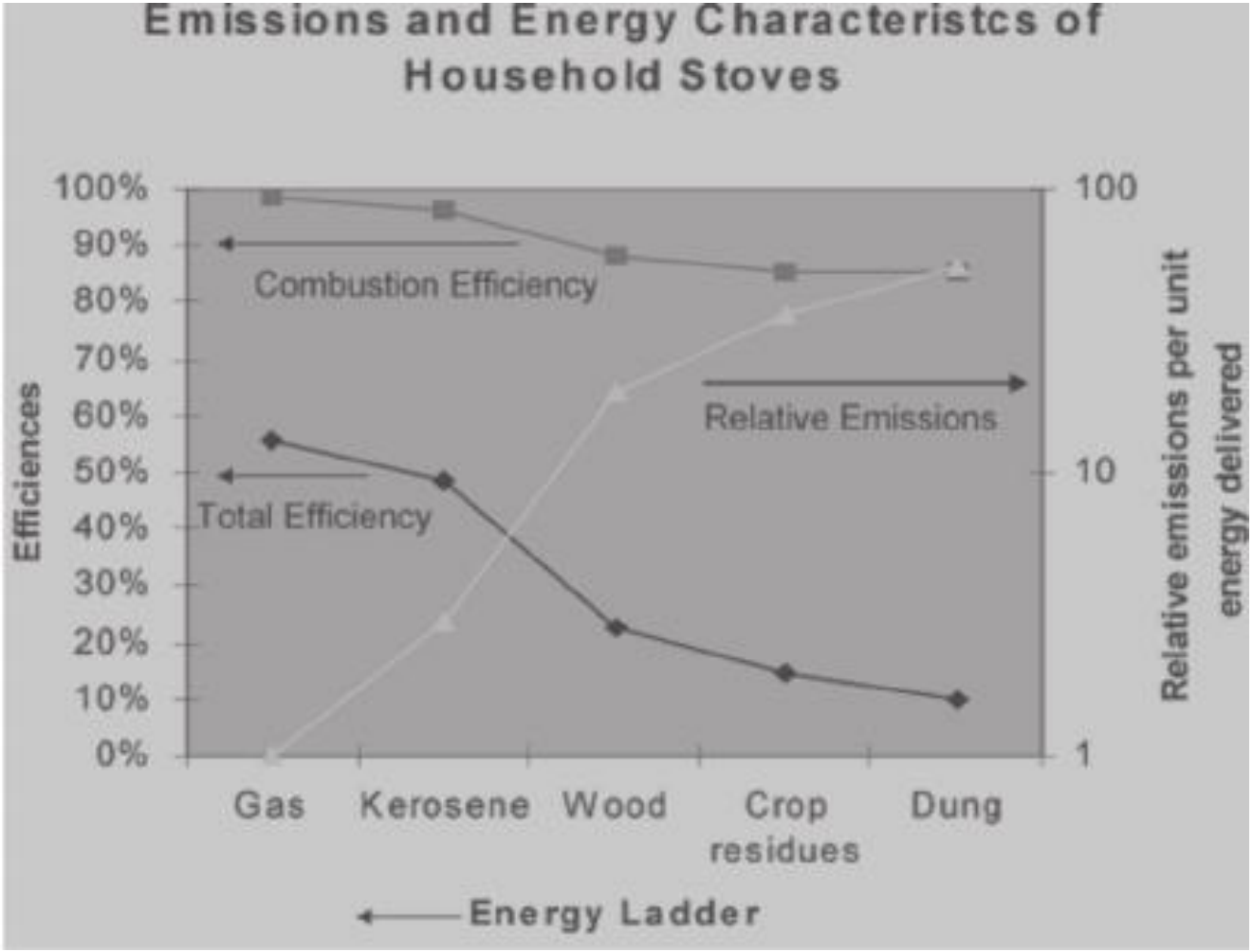

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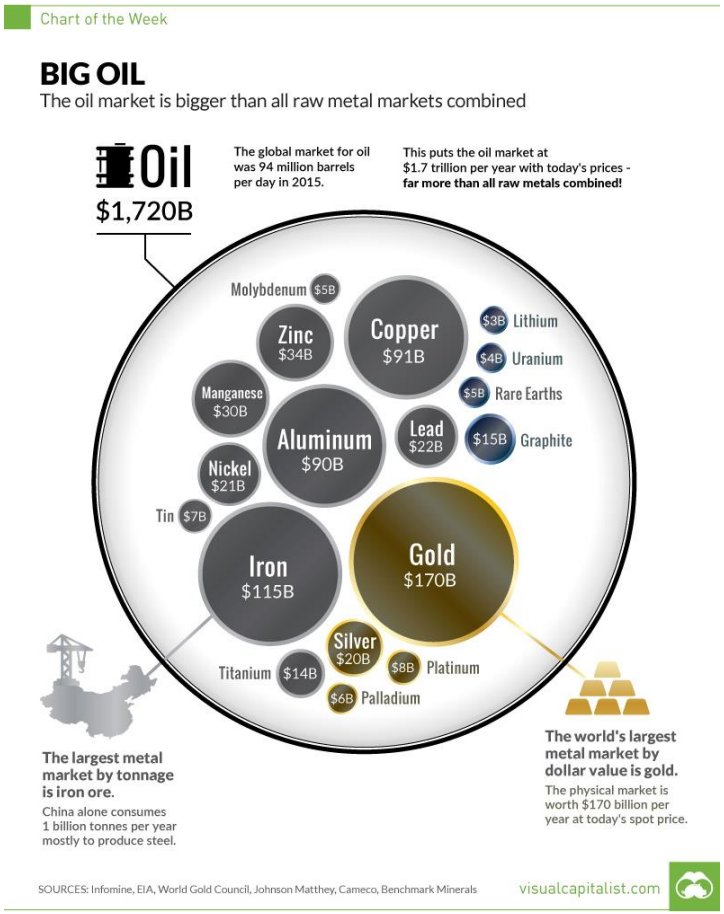

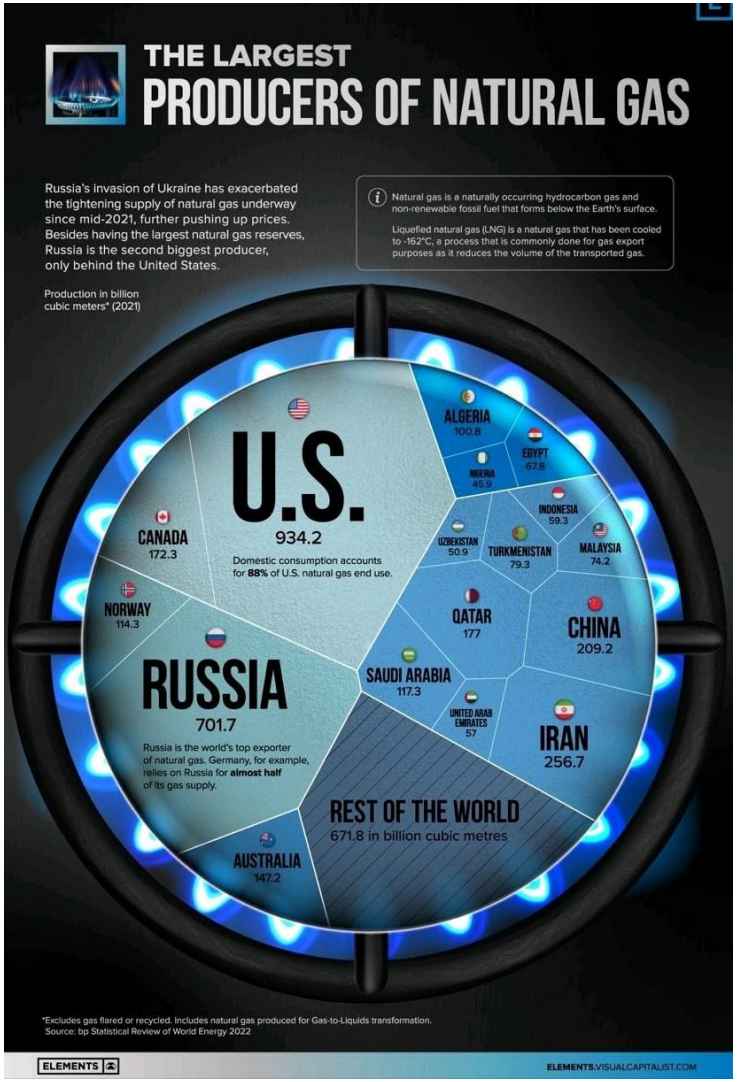

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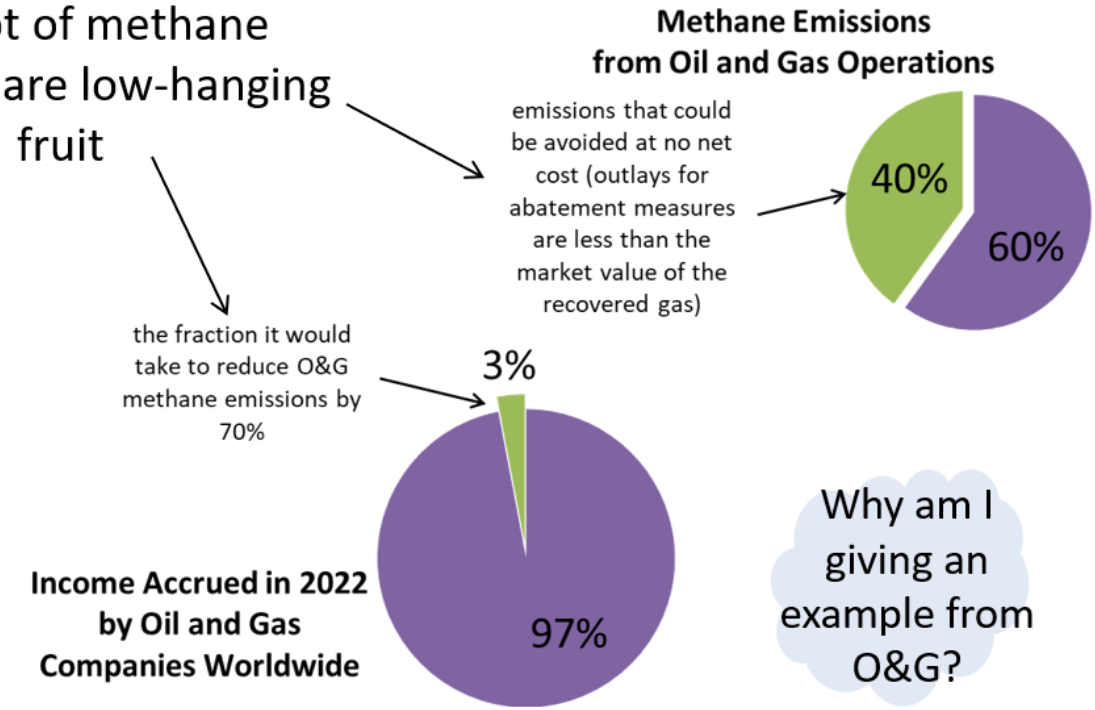
https://www.climate.gov/news-features/features/happy-200th-birthday-eunice-foote-hidden-climate-science-pioneer

Why focus on methane emissions?

#1 Methane concentrations can be reduced in the short-term because it is short-lived and this will reduce global warming in the short-term which is important because of climate tipping points

#2 A lot of methane emissions are low-hanging fruit



https://www.iea.org/reports/global-methane-tracker-2023/overview

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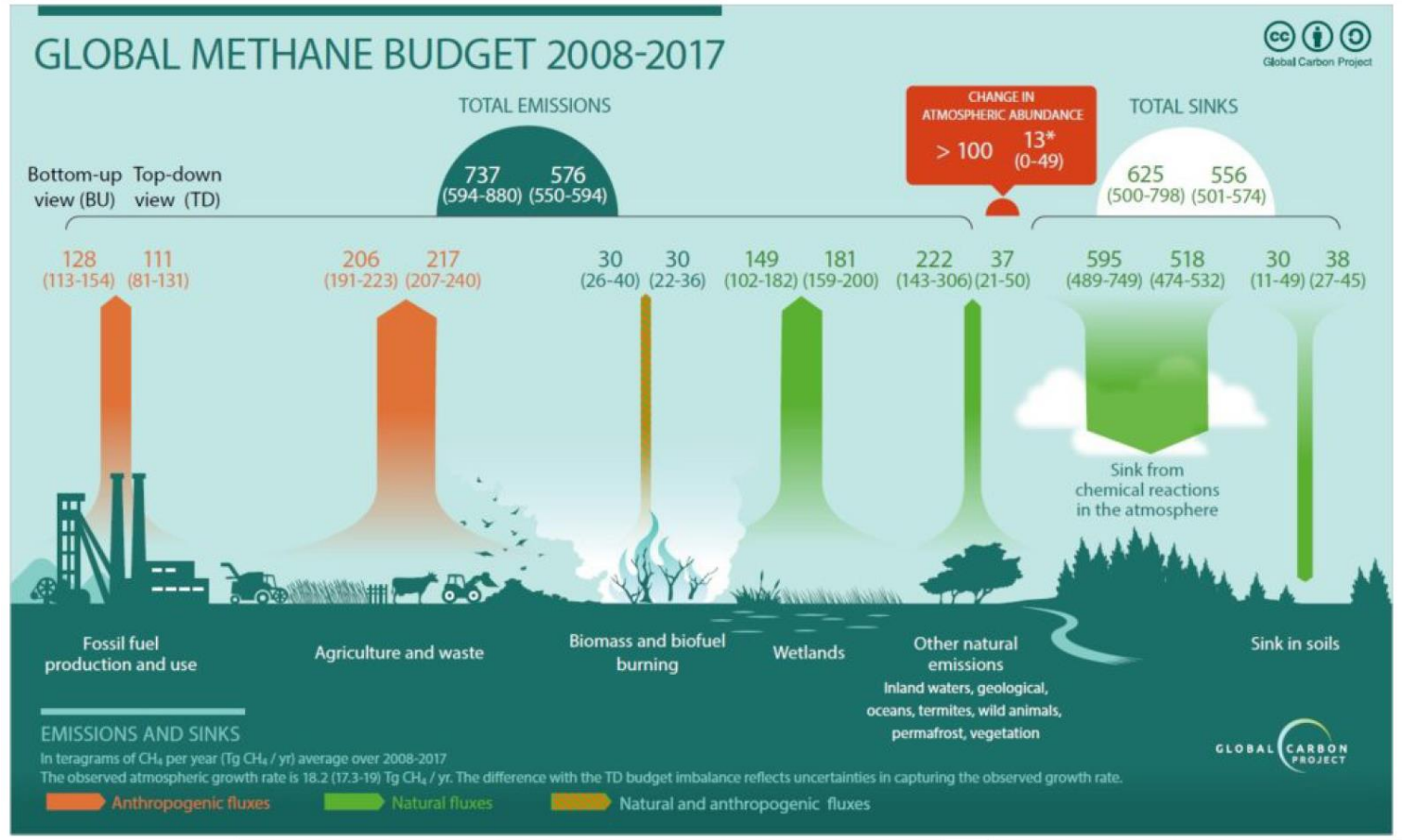

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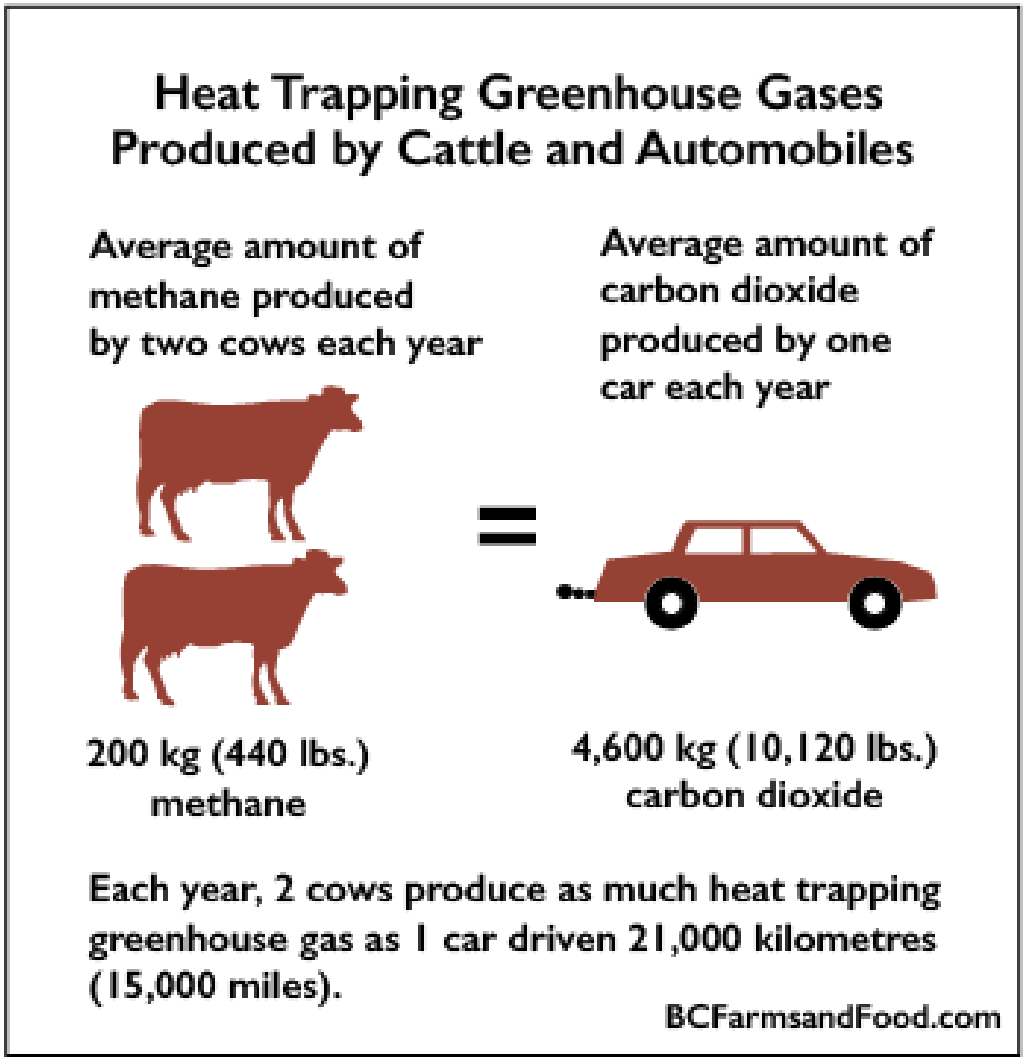

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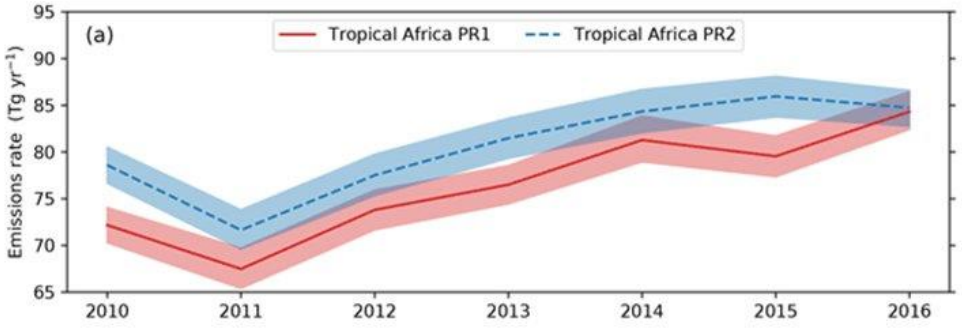
ACS Chemistry for Life®

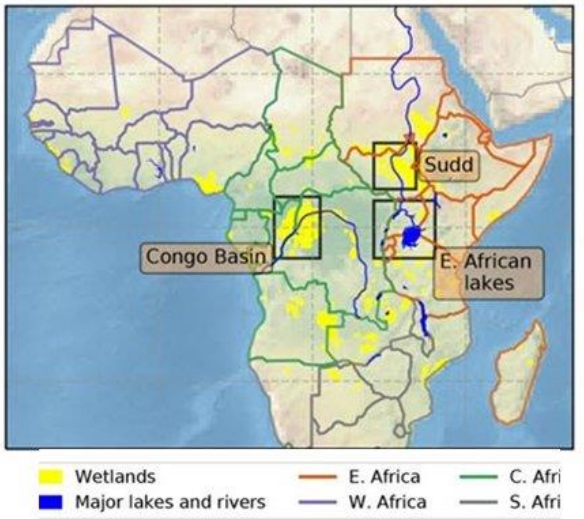
One third of recent global methane Increase comes from feedback emissions of vast warmed tropical African wetlands

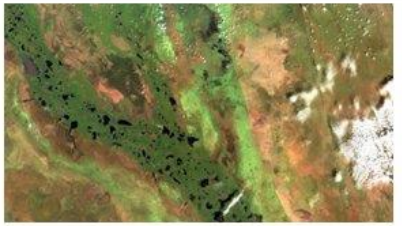
2019

The research results indicate that about a third of the global atmospheric methane increase observed between 2010-2016 originates in Africa's tropics. Most of this came from East Africa, including a pronounced, short-term boost in emissions from the Sudd, one of the world's largest wetlands, in South Sudan.

Research used data retrieved from GOSAT, the Japanese Greenhouse gases Observing Satellite, to examine annual—and even seasonal—trends in Africa







11 Dec. 2019 An increase in methane emissions from tropical Africa between 2010 and 2016 inferred from satellite data Mark F. Lunt et al

Peter Carter, Climate Emergency Institute

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Environmental Science & Technology

pubs.acs.org/est

Article

Methane and NO_x Emissions from Natural Gas Stoves, Cooktops, and Ovens in Residential Homes

Eric D. Lebel,* Colin J. Finnegan, Zutao Ouyang, and Robert B. Jackson

Cite This: *Environ. Sci. Technol.* 2022, 56, 2529–2539

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ABSTRACT: Natural gas stoves in >40 million U.S. residences release methane (CH_4)—a potent greenhouse gas—through post-meter leaks and incomplete combustion. We quantified methane released in 53 homes during all phases of stove use: steady-state-off (appliance not in use), steady-state-on (during combustion), and transitory periods of ignition and extinguishment. We estimated that natural gas stoves emit 0.8−1.3% of the gas they use as unburned methane and that total U.S. stove emissions are 28.1 [95% confidence interval: 18.5, 41.2] Gg CH_4 $year^{-1}$. More than three-quarters of methane emissions we measured originated during steady-state-off. Using a 20-year timeframe for methane, annual methane emissions from all gas stoves in U.S. homes have a climate

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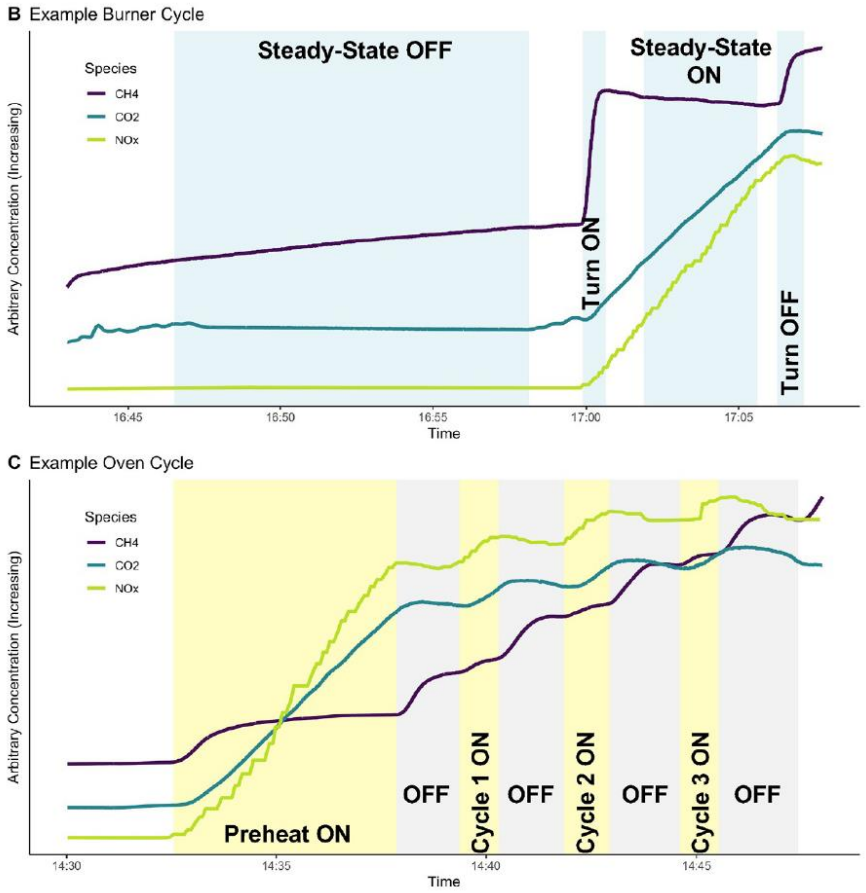

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The Economist

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Leaders | A planet-cooking gas

What the world must do to tame methane

The world needs a deal during COP28 to limit a nasty source of emissions

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METHANE IS A potent greenhouse gas. Over 20 years it has over 80 times the planet-cooking power of carbon dioxide, and is the culprit behind nearly 45% of warming today. Because methane is the main component of natural gas, a big chunk of man-made emissions comes from the energy industry. Yet because it is short-lived, curbing methane offers the world its best possible chance for quick progress against climate change.

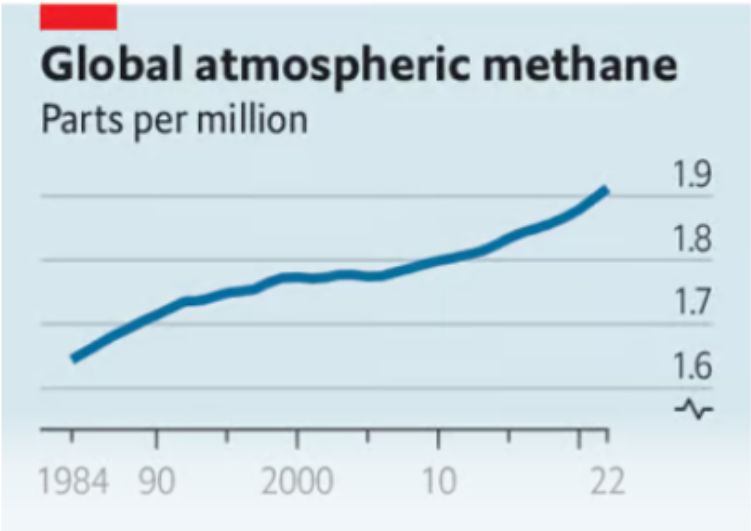

IMAGE: THE ECONOMIST

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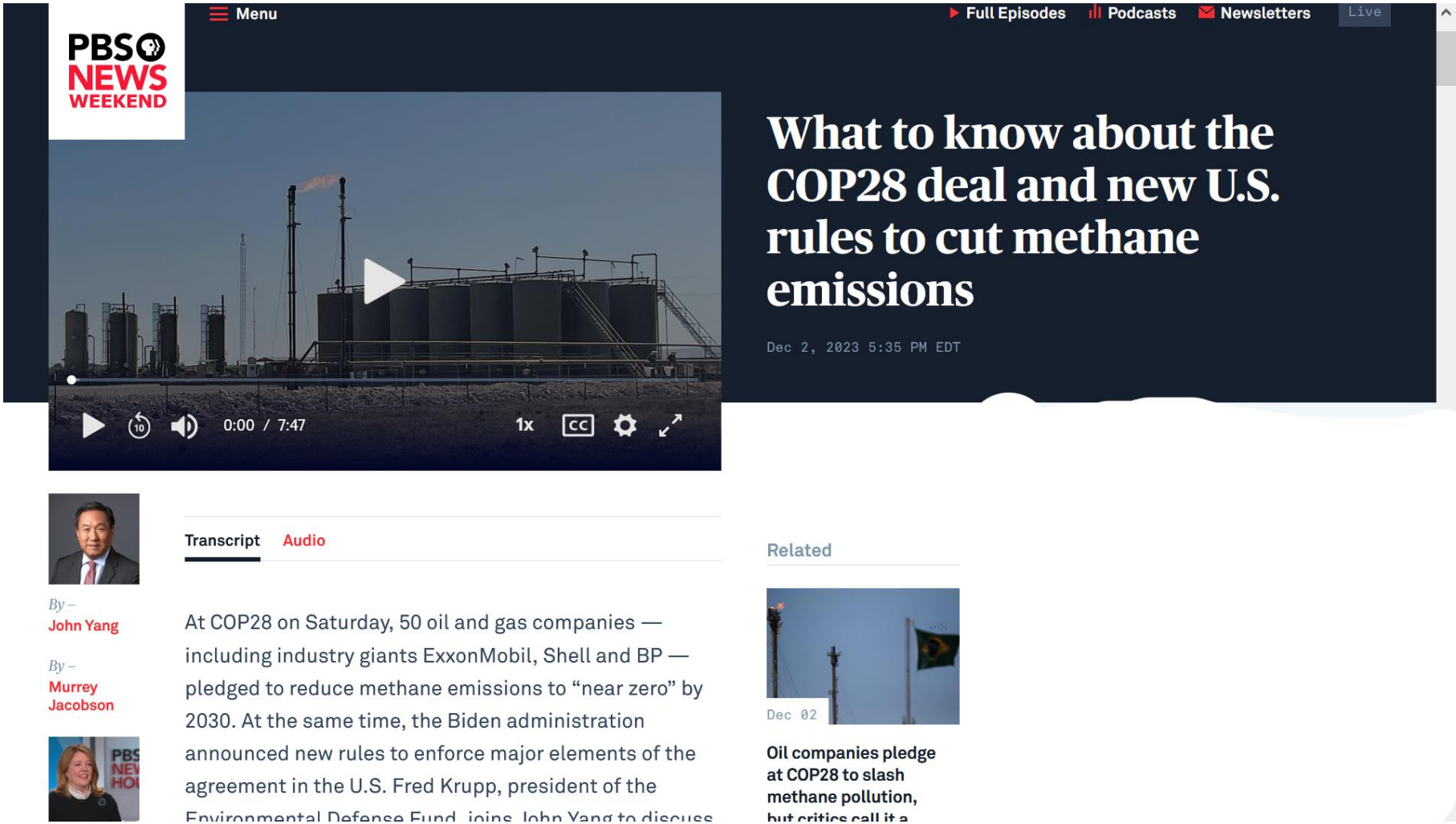

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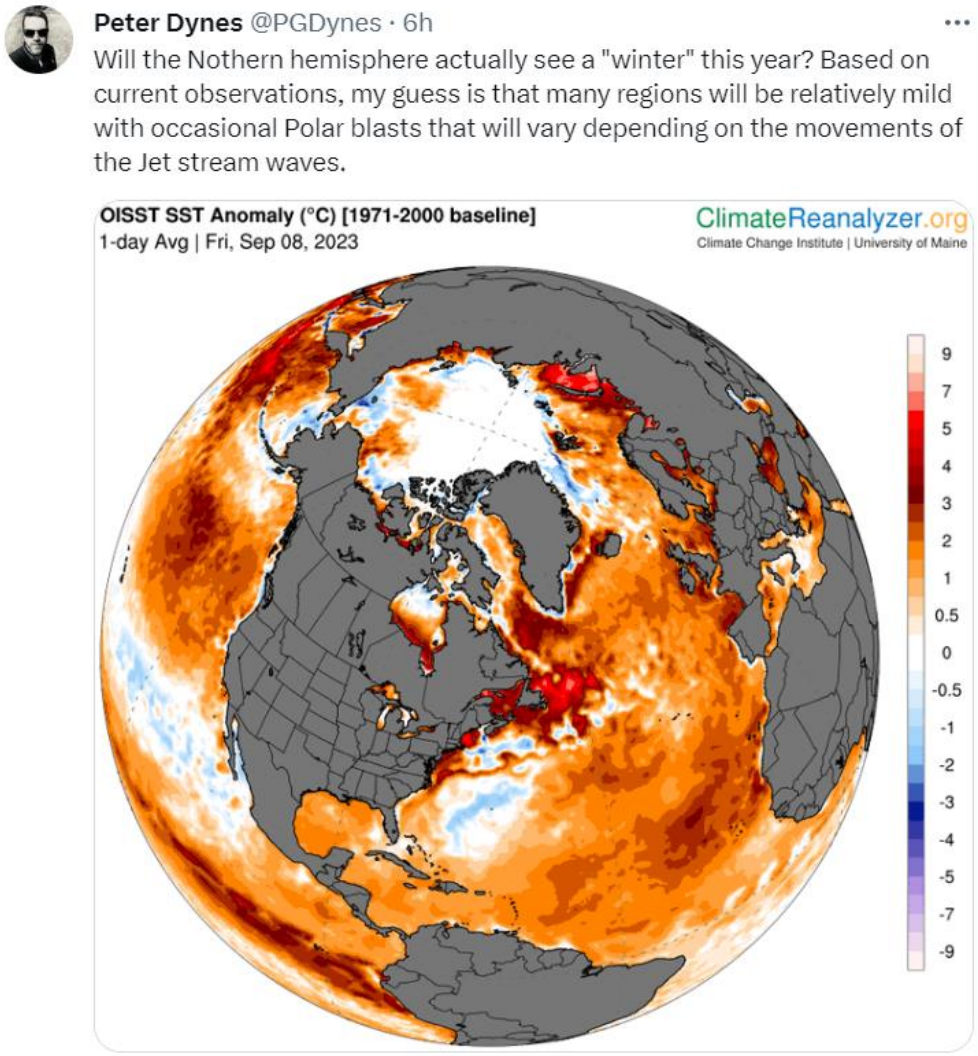

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nature climate change

PERSPECTIVE

https://doi.org/10.1038/s41558-021-01203-6

Check for updates

The cost of mitigation revisited

Alexandre C. Köberle[1]✉, Toon Vandyck[2], Celine Guivarch[3], Nick Macaluso[4], Valentina Bosetti[5,6], Ajay Gambhir[1], Massimo Tavoni[6,7] and Joeri Rogelj[1,8]

Estimates of economic implications of climate policy are important inputs into policy-making. Despite care to contextualize quantitative assessments of mitigation costs, one strong view outside academic climate economics is that achieving Paris Agreement goals implies sizable macroeconomic losses. Here, we argue that this notion results from unwarranted simplification or omission of the complexities of quantifying mitigation costs, which generates ambiguity in communication and interpretation. We synthesize key factors influencing mitigation cost estimates to guide interpretation of estimates, for example from the Intergovernmental Panel on Climate Change, and suggest ways to improve the underlying models. We propose alternatives for the scenario design framework, the framing of mitigation costs and the methods used to derive them, to better inform public debate and policy.

The United Nations Framework Convention on Climate Change states that "policies and measures to deal with climate change should be cost effective to ensure global benefits at the lowest possible costs"[1]. Correspondingly, the government-approved outlines of Intergovernmental Panel on Climate Change (IPCC) reports often explicitly indicate that the macroeconomic costs of mitigation should be assessed. For example, the outline for the upcoming Sixth Assessment Report (AR6) requests that authors assess "Economics of mitigation and development pathways, including mitigation costs"[2], reflecting concerns about the costs of climate policy. This concern is mirrored in national policy documents such as the 2007 Stern Review[3], and more recently from the USA[4], the Reports explored costs of mitigation more theoretically, but their treatment has gradually shifted towards a more quantitative basis (Fig. 1). Scenario quantification with models such as integrated assessment models (IAMs) has been part of IPCC assessment reports since the beginning[11] (Box 1).

Currently, climate mitigation scenarios do not consider important determinants of net costs. In this Perspective, we discuss missing elements, highlighting the uncertainties involved and the ambiguities in the size and sign of the changes resulting from these deficiencies. We also illustrate opportunities for an improved presentation of mitigation costs that may help size opportunities for social, environmental and economic benefits beyond those from

Nature Climate Change | VOL 11 | December 2021 | 1035–1045 | www.nature.com/natureclimatechange

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Yale

Yale Association of Rhode Island - Dr. Peter Gleic...

Summary

Climate science has established beyond any reasonable doubt that…

- Earth's climate has been changing for many decades in ways that can **ONLY be explained by human influences.**
- The definitive explanation is emissions of heat-trapping gases from fossil-fuel burning and land-use changes.
- The changes are already affecting human health, property, economies, and ecosystems.
- The changes and the impacts will get worse in the future no matter what action we take, because of time lags in the climate system and the energy system.
- But the future consequences will be much smaller the sooner society takes strong actions to both "mitigate" and "adapt."

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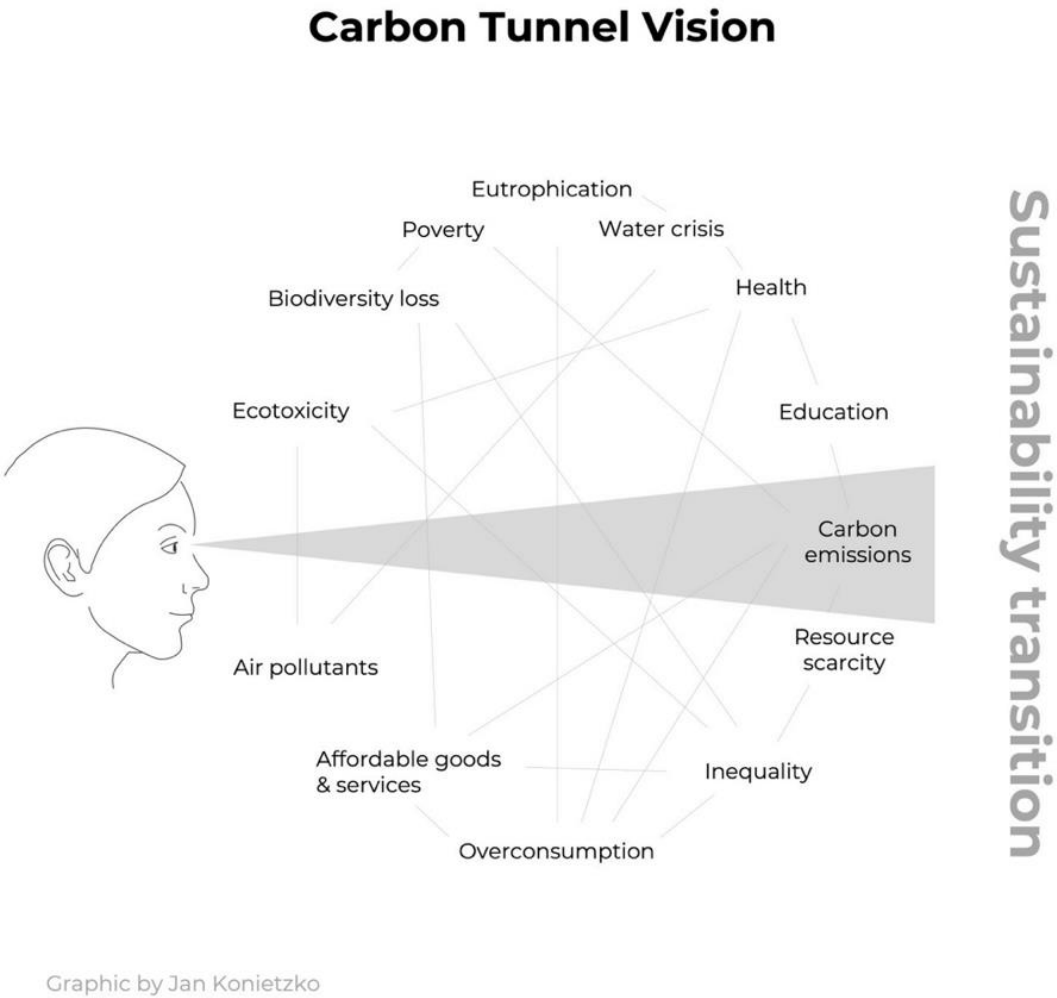

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Energy Summit (Invited)			• Shirley Meng		Electrochemical energy storage, epitomized by batteries, stands at the forefront of our global effor... Read more

Elevating the Discussion Around Methane

The current global market value of methane (natural gas) is $105 billion and is projected to grow at least 5% per year. Methane is second in terms of contribution to the greenhouse gas inventory, between carbon dioxide and nitrous oxide, and accounting for about 30% of the global warming since the industrial revolution; the atmospheric concentration of methane is increasing faster than at any time since record keeping began in the 1980s. Methane's savior is its mean atmospheric lifetime of about ten years, providing a near-term opportunity to mitigate its atmospheric concentration, the imbalance between natural sources and sinks. This symposium includes methane sources and sinks, measurement, control, and use technology, climate modeling, regulatory impacts, and market supply and demand.

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