GHG emissions, 2020 (Gt CO_2)

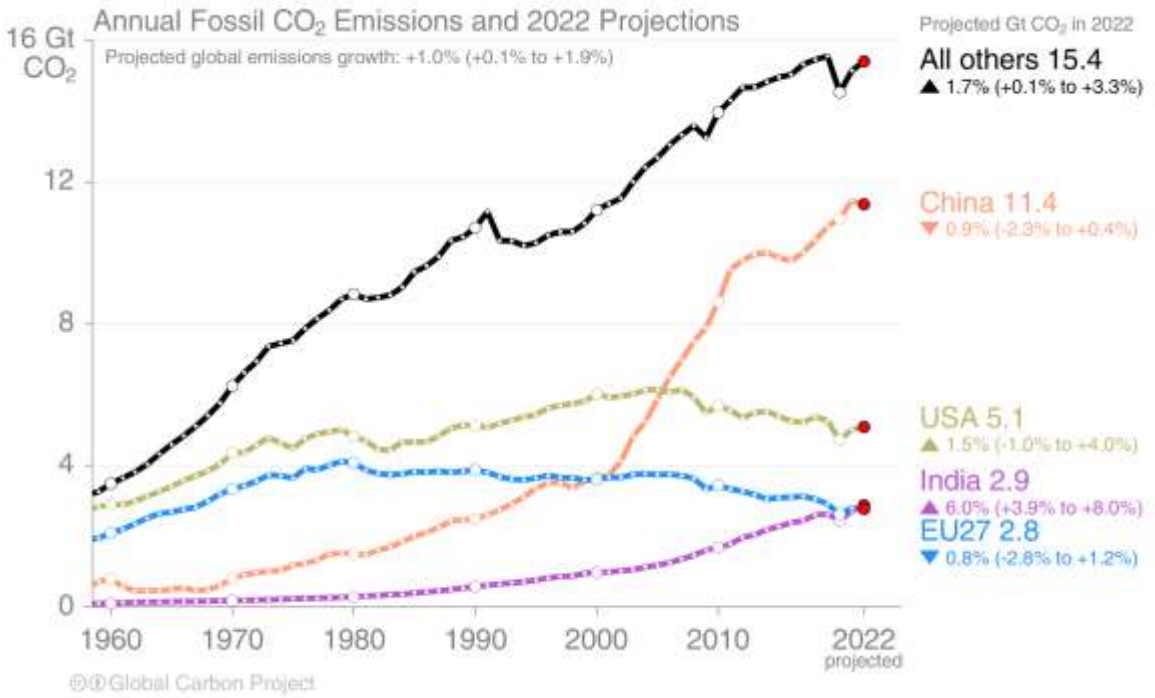
Source: Trends in Global CO_2 and Total Greenhouse Gas Emissions, 2021 Report (PBL Netherlands Environmental Assessment Agency, August 2022)

14.3	China
5.64	United States
3.52	India
2.21	Russia
1.26	Brazil
1.16	Japan
1.15	International transport
1.04	Indonesia
0.95	Iran
0.76	Saudi Arabia
0.75	Germany
0.71	Canada
0.71	Mexico

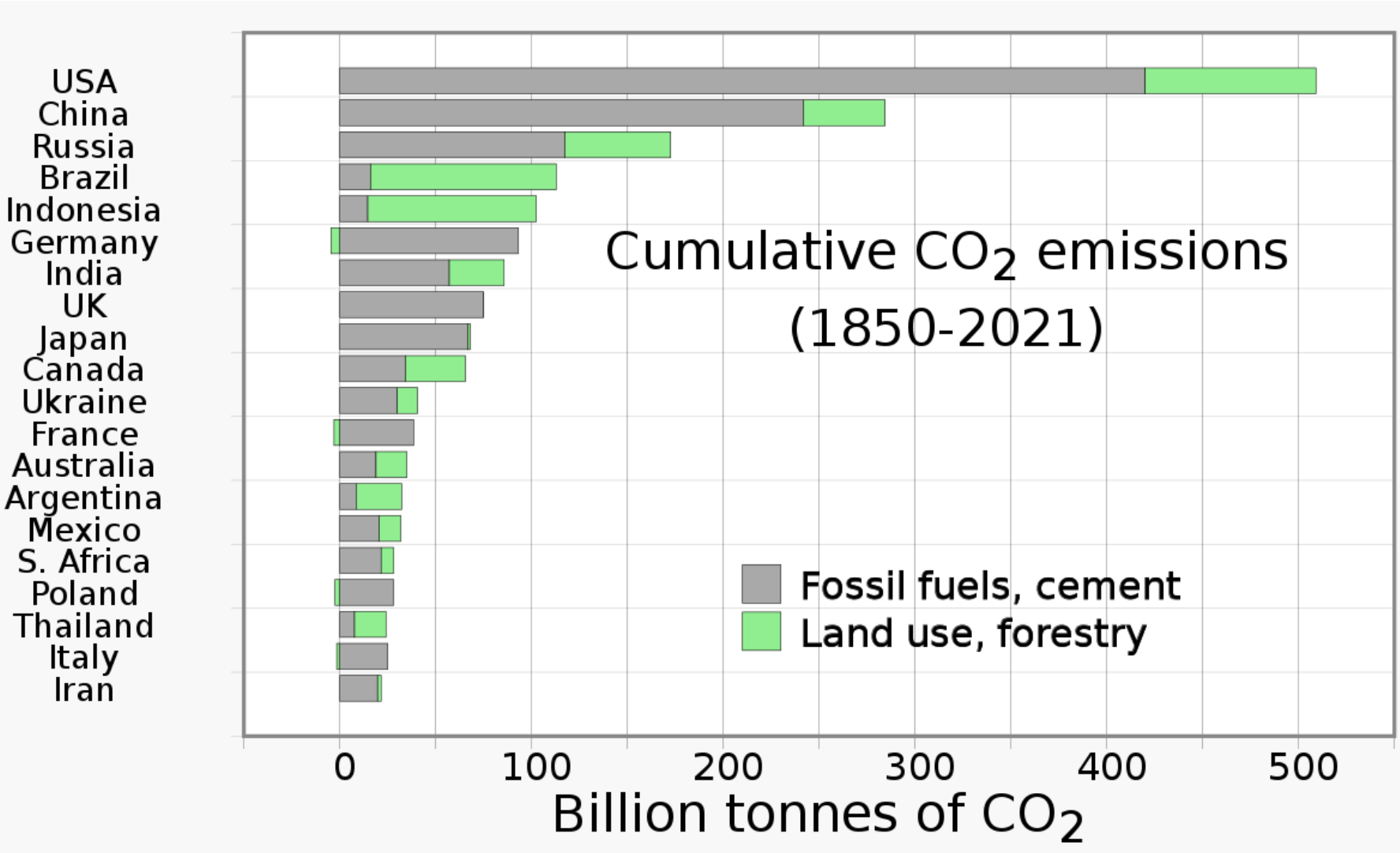
GLOBAL CARBON PROJECT

Emissions Projections for 2022

Global fossil CO_2 emissions are projected to increase by 1.0% [0.1% to 1.9%] in 2022

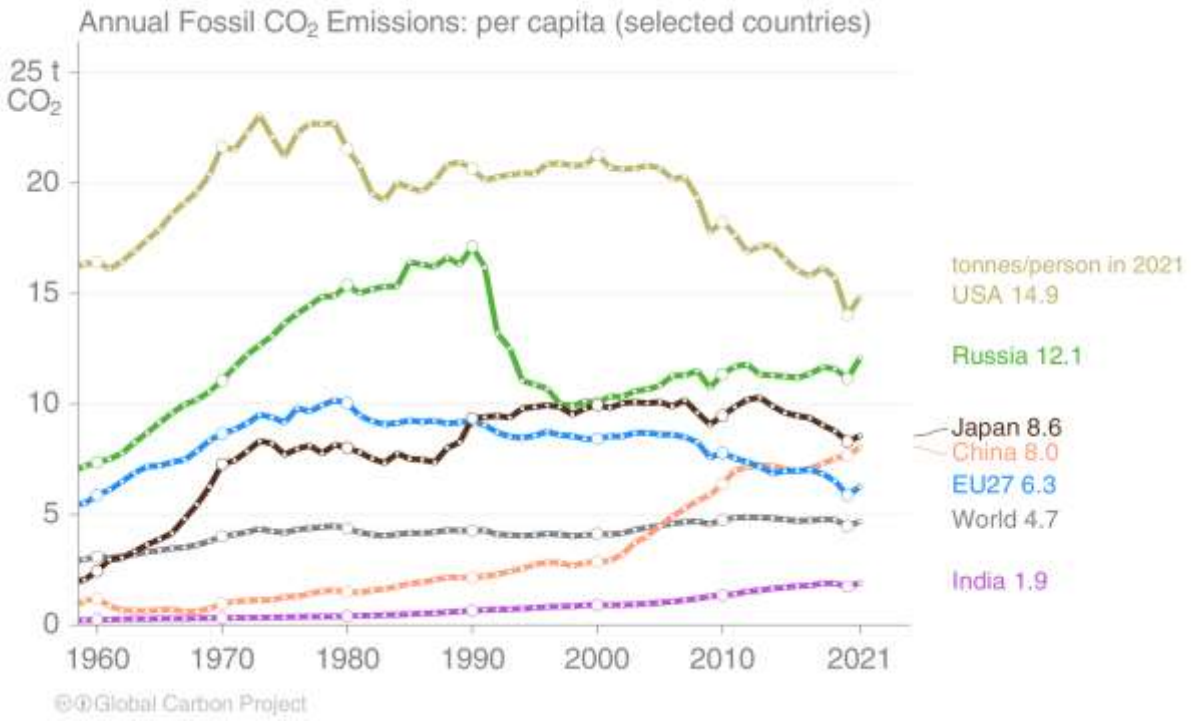


The 2022 projections are based on preliminary data and modelling.
Source: Friedlingstein et al 2022; Global Carbon Project 2022


USA
China
Russia
Brazil
Indonesia
Germany
India
UK
Japan
Canada
Ukraine
France
Australia
Argentina
Mexico
S. Africa
Poland
Thailand
Italy
Iran
Cumulative CO_2 emissions
(1850-2021)
Fossil fuels, cement
Land use, forestry
0
100
200
300
400
500
Billion tonnes of CO_2

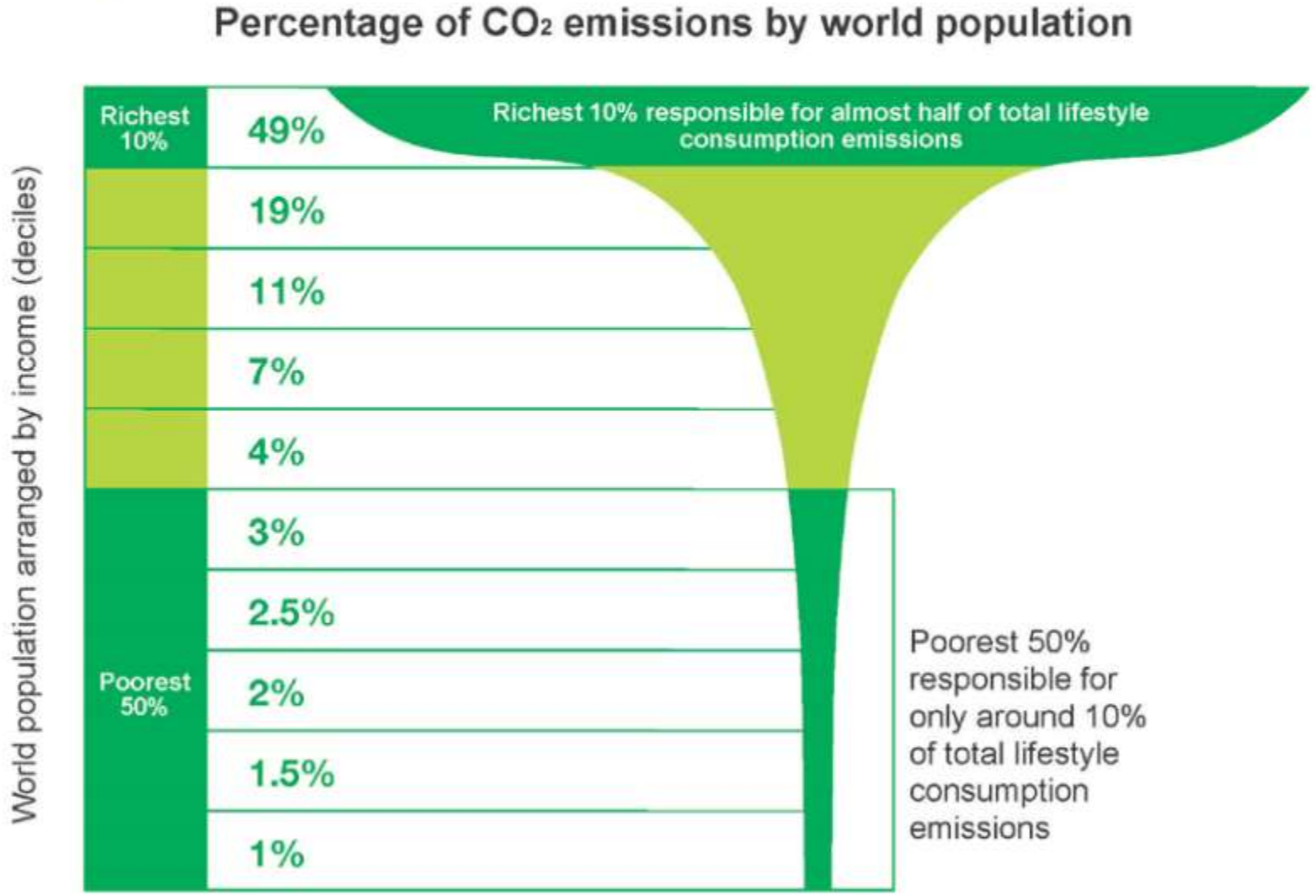
Top emitters: Fossil CO_2 Emissions per capita to 2021

Countries have a broad range of per capita emissions reflecting their national circumstances



Source: Friedlingstein et al 2022; Global Carbon Project 2022

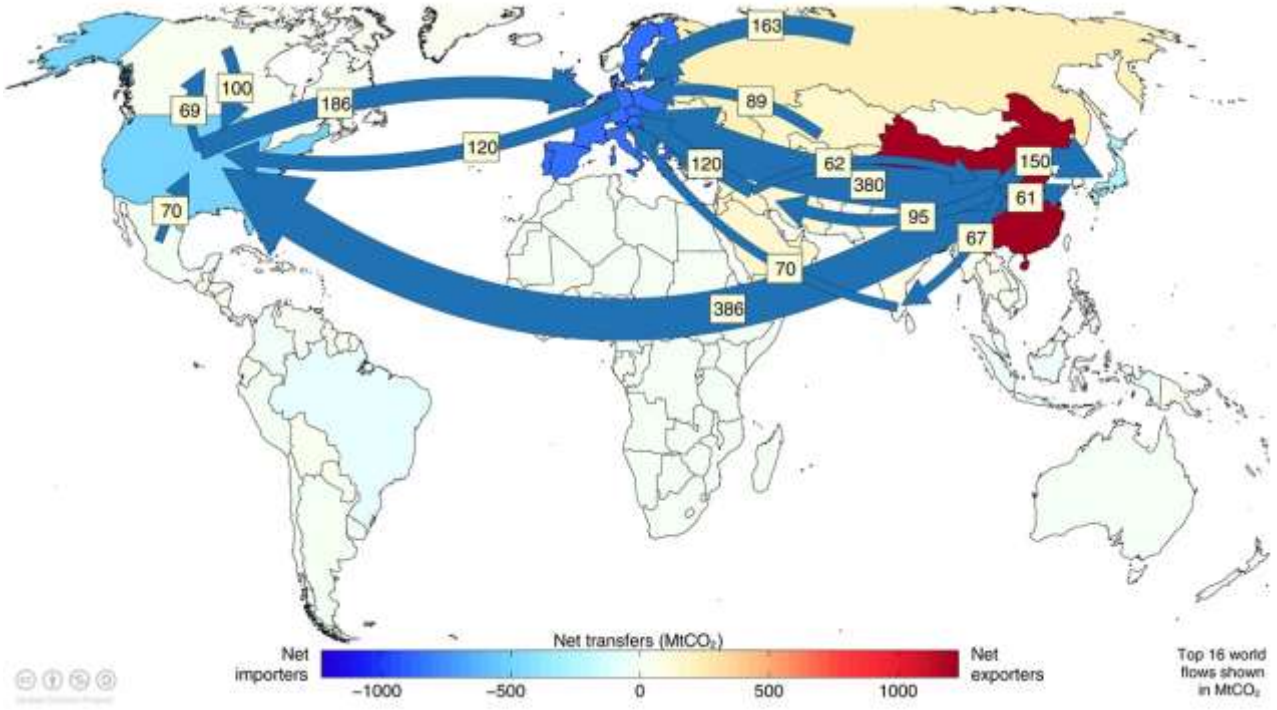
Figure 1: Global income deciles and associated lifestyle consumption emissions



Source: Oxfam

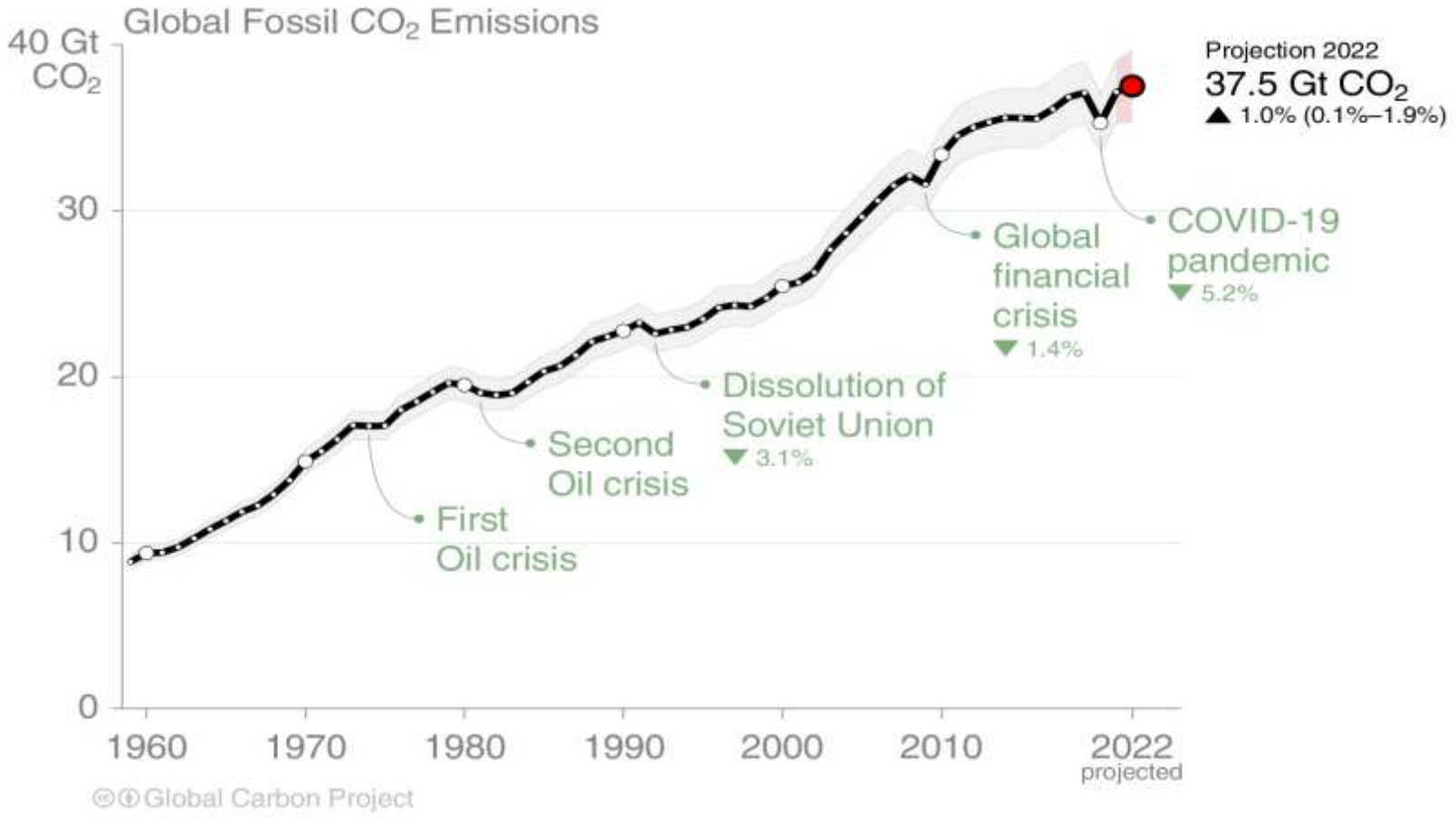
Major flows from production to consumption

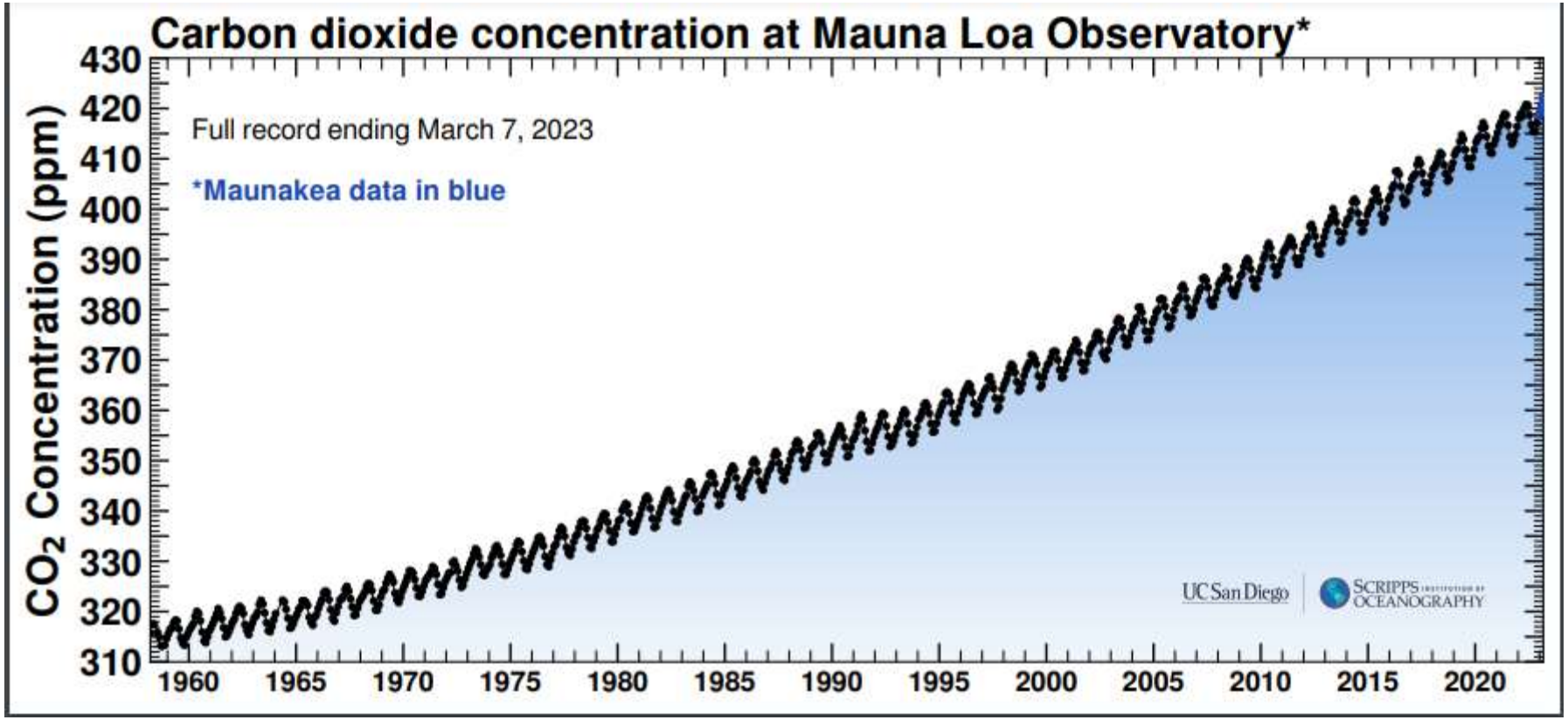
Flows from location of generation of emissions to location of consumption of goods and services

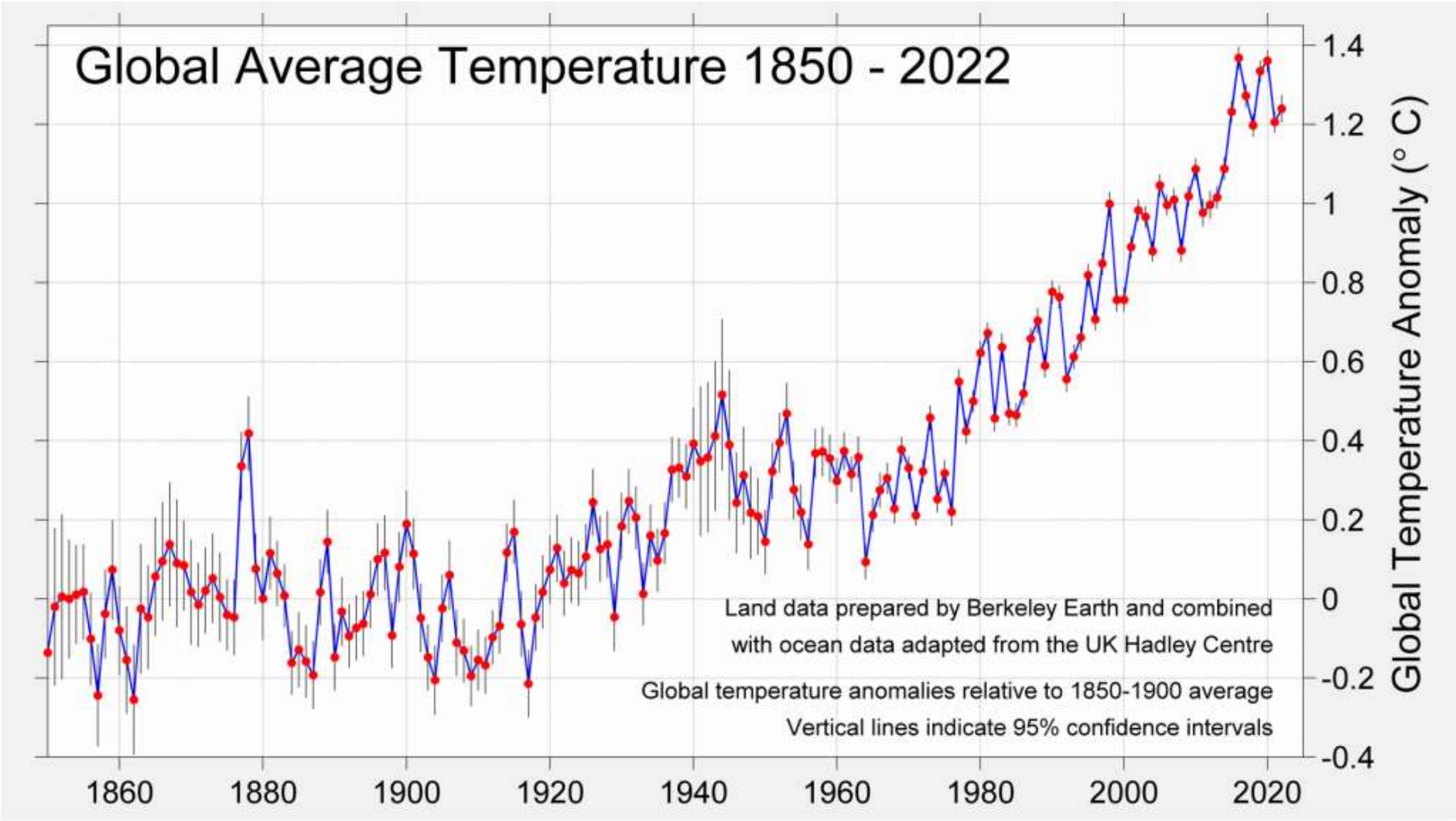


Values for 2011. EU is treated as one region. Units: $MtCO_2$

Source: Peters et al 2012

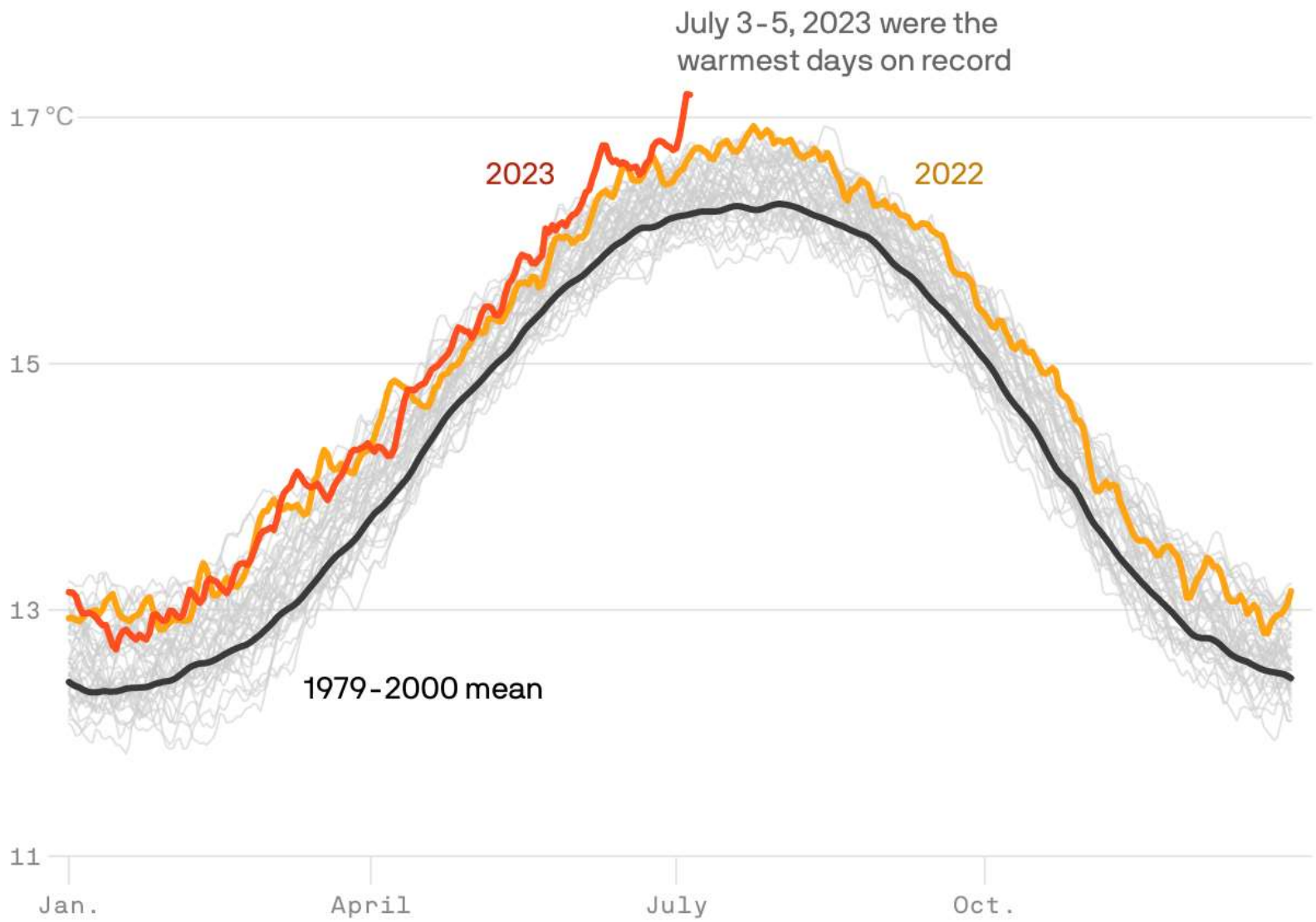

Global Fossil CO_2 Emissions
40 Gt CO_2
30
20
10
0
1960
1970
1980
1990
2000
2010
2022
projected
Projection 2022
37.5 Gt CO_2
▲ 1.0% (0.1%–1.9%)
First Oil crisis
Second Oil crisis
Dissolution of Soviet Union
▼ 3.1%
Global financial crisis
▼ 1.4%
COVID-19 pandemic
▼ 5.2%
Global Carbon Project

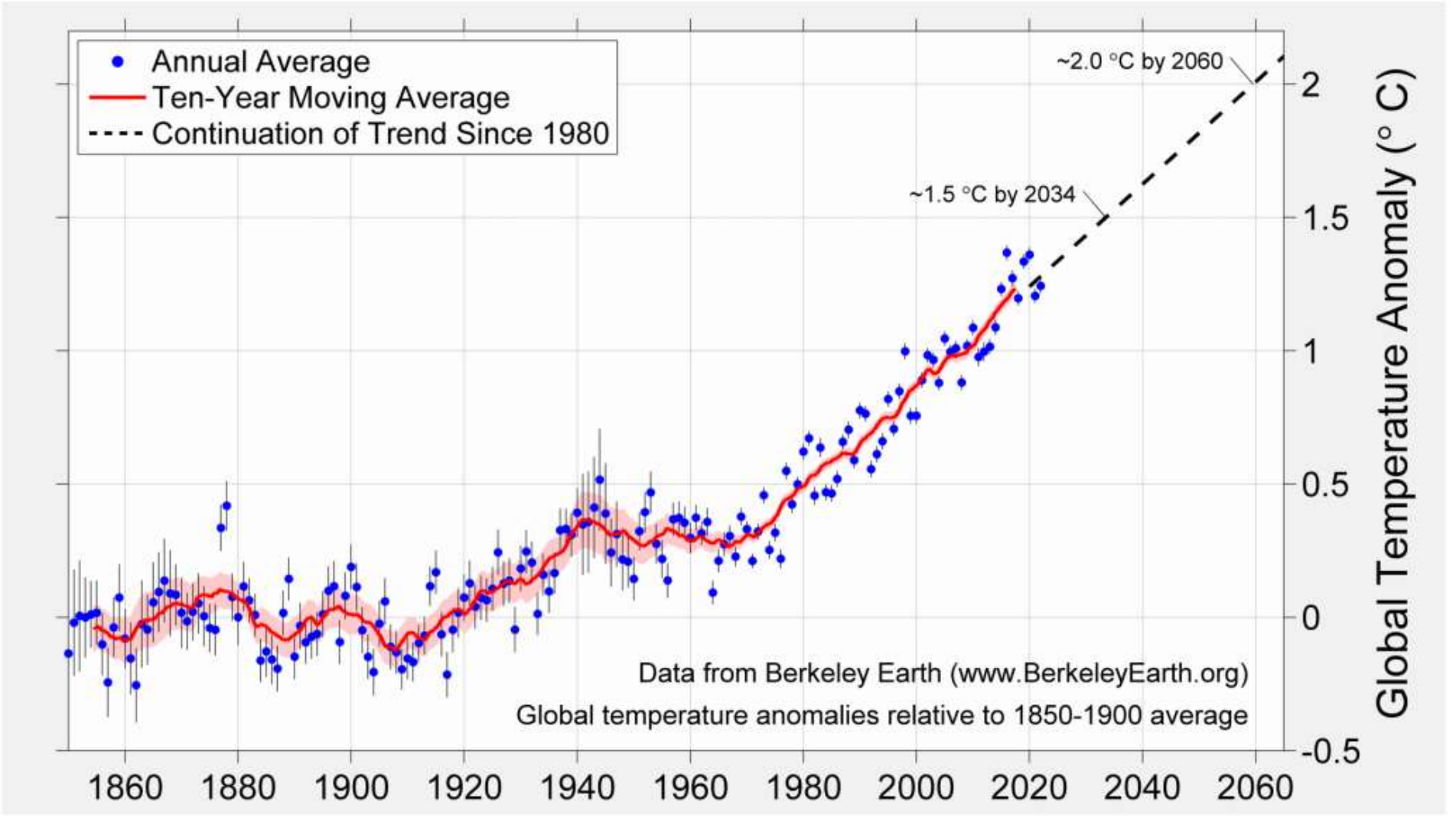

Carbon dioxide concentration at Mauna Loa Observatory*
Full record ending March 7, 2023
*Maunakea data in blue
CO_2 Concentration (ppm)
430
420
410
400
390
380
370
360
350
340
330
320
310
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
UC San Diego
SCRIPPS OCEANOGRAPHY


Global Average Temperature 1850 - 2022
Land data prepared by Berkeley Earth and combined
with ocean data adapted from the UK Hadley Centre
Global temperature anomalies relative to 1850-1900 average
Vertical lines indicate 95% confidence intervals
Global Temperature Anomaly (° C)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
1860
1880
1900
1920
1940
1960
1980
2000
2020

Daily global mean surface air temperatures

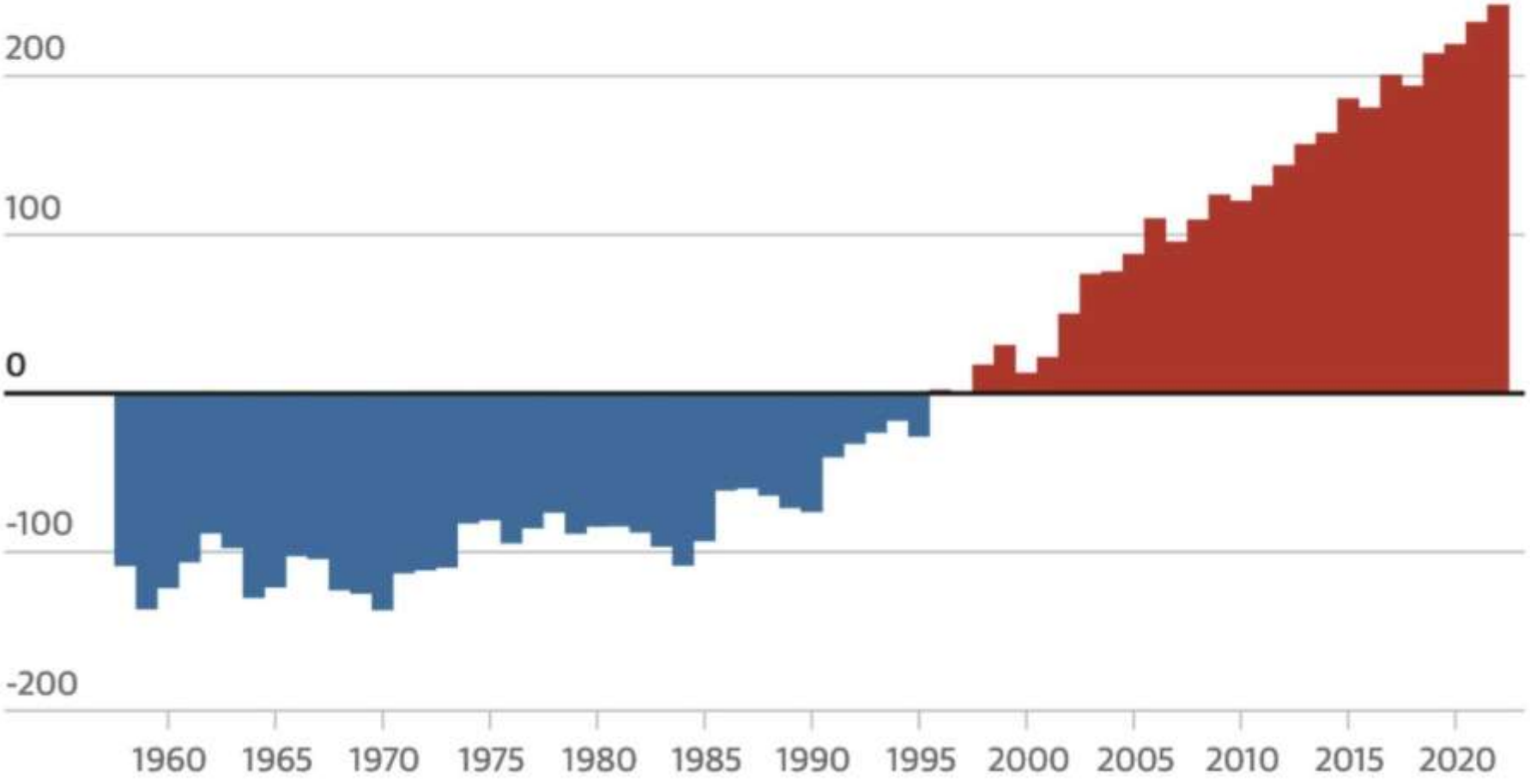
In degrees Celsius; 1979-2023 (As of July 5)




Annual Average
Ten-Year Moving Average
Continuation of Trend Since 1980
~2.0 °C by 2060
~1.5 °C by 2034
Data from Berkeley Earth (www.BerkeleyEarth.org)
Global temperature anomalies relative to 1850-1900 average
Global Temperature Anomaly (° C)
2
1.5
1
0.5
0
-0.5
1860
1880
1900
1920
1940
1960
1980
2000
2020
2040
2060

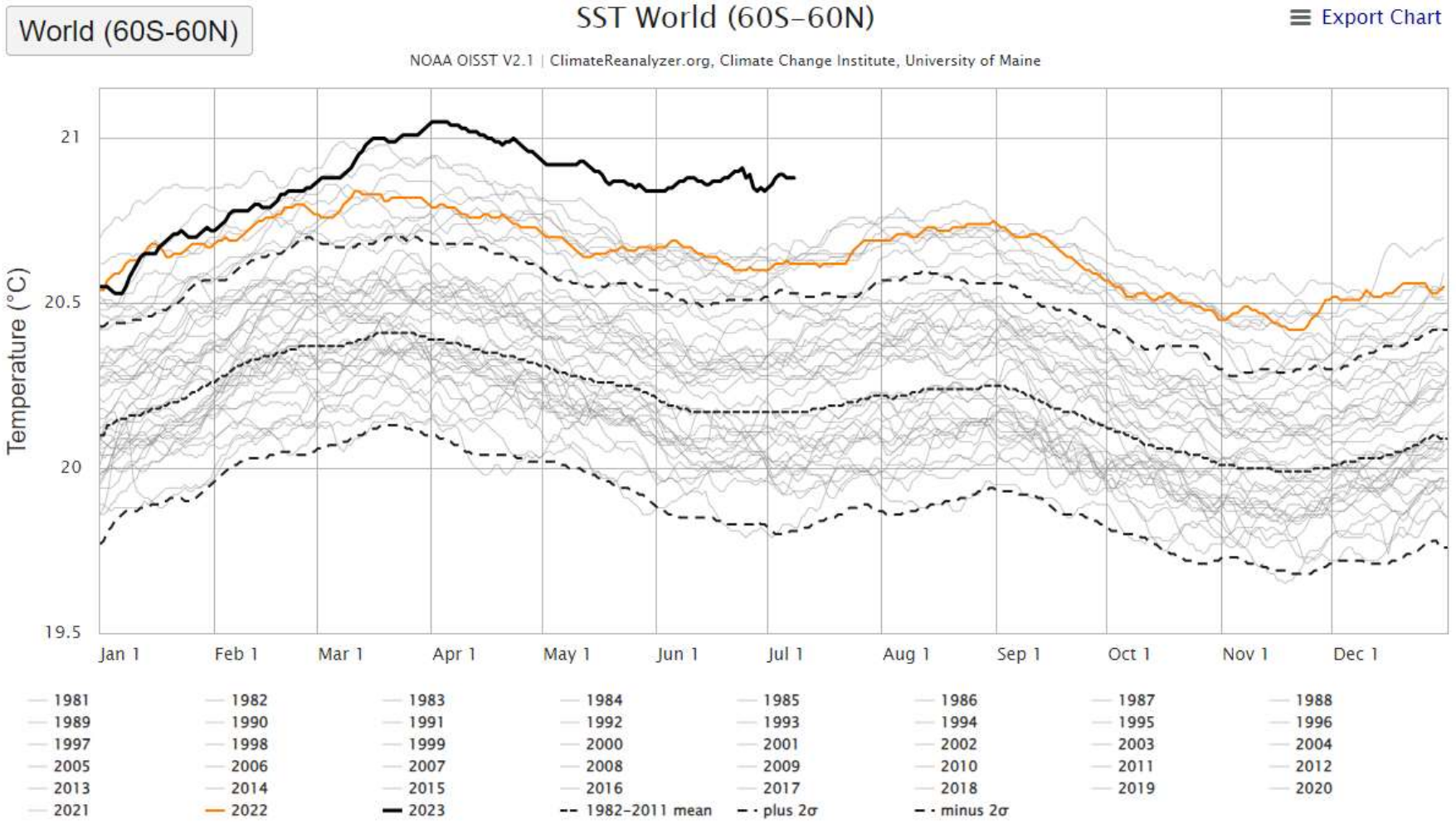
The climate crisis pushed the oceans to a new record in 2022

Ocean heat content in upper 2,000 metres relative to 1981-2010 average (zettajoules)

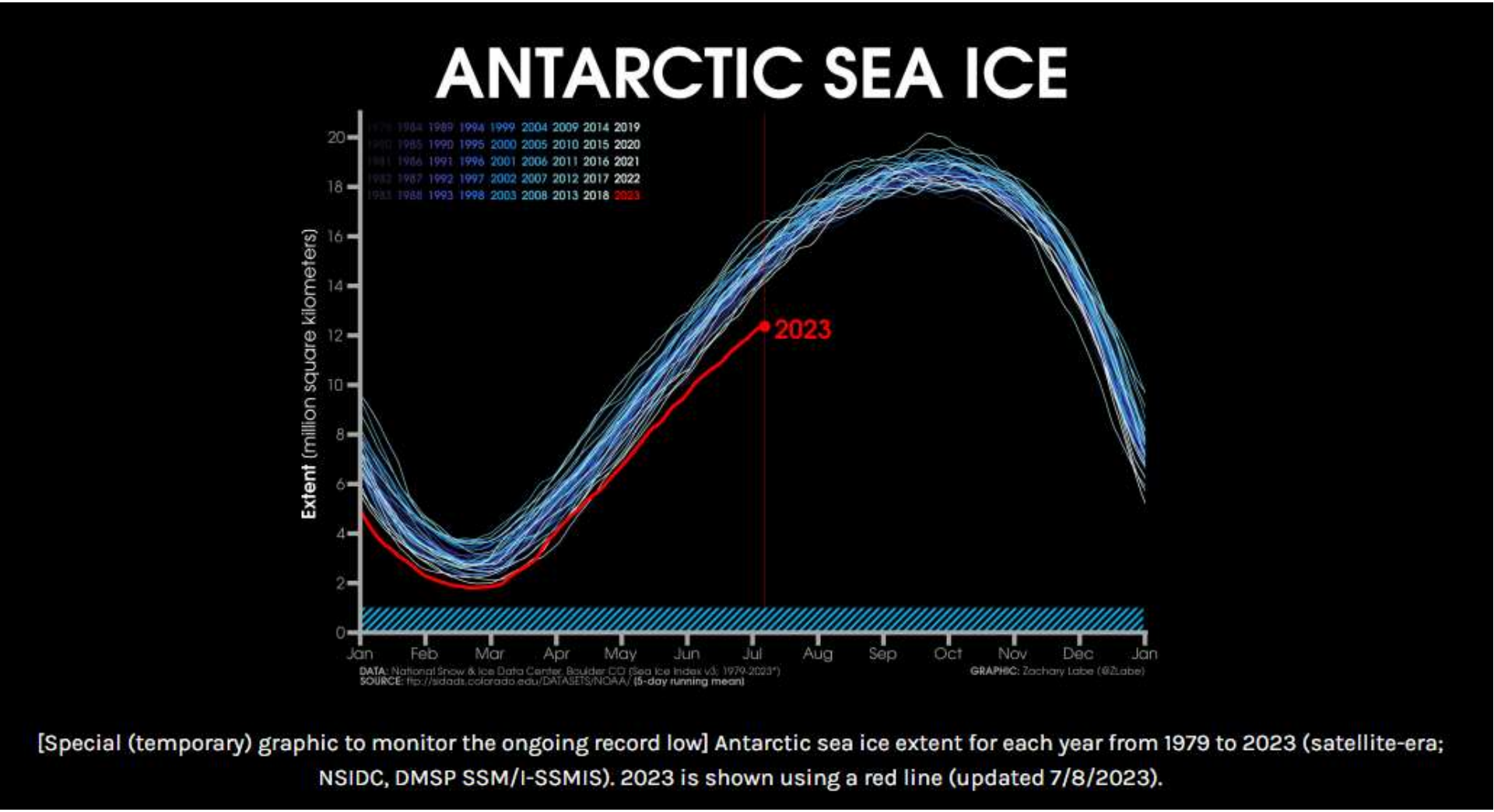


Sea surface temperatures

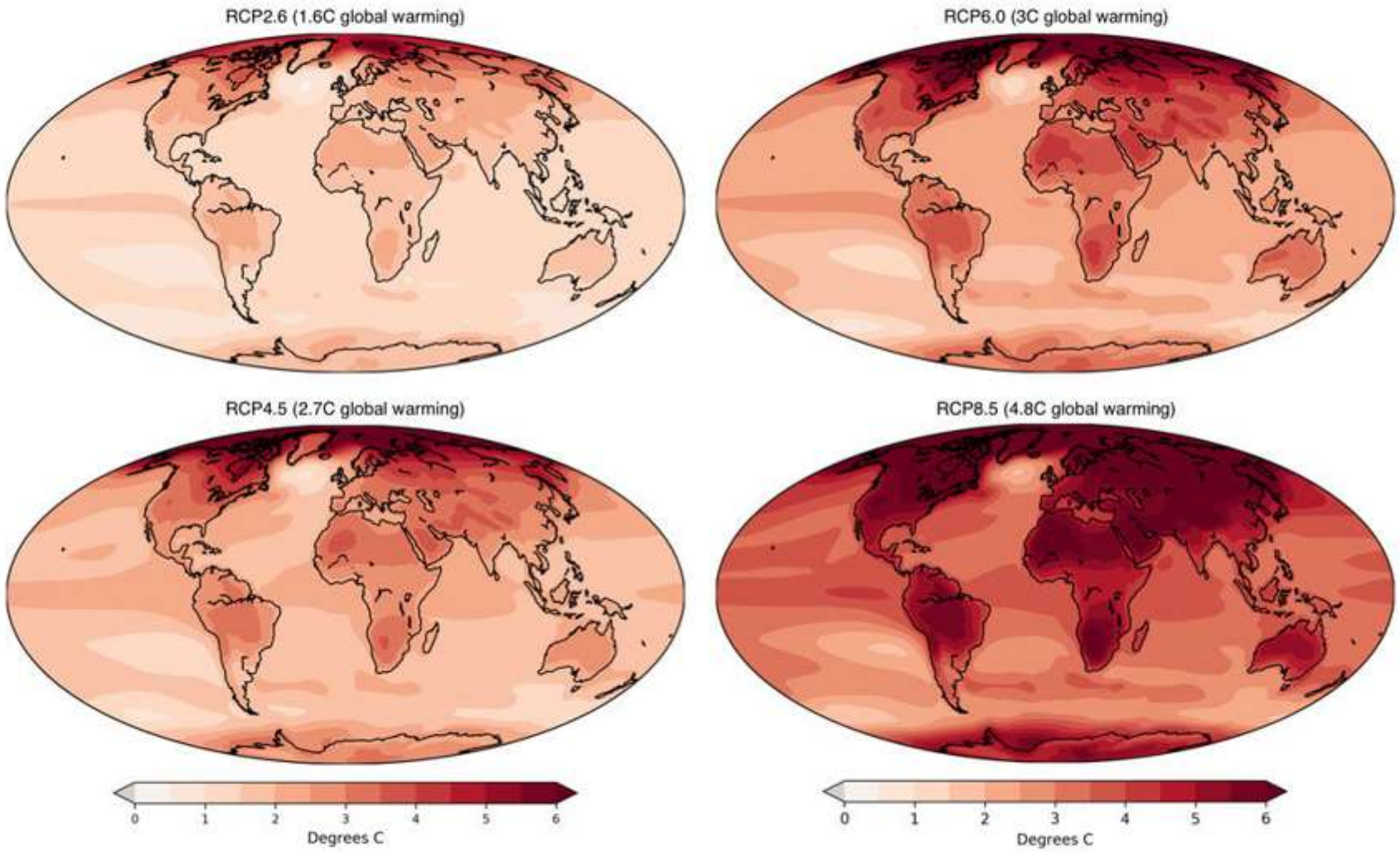
https://climatereanalyzer.org/clim/sst_daily/



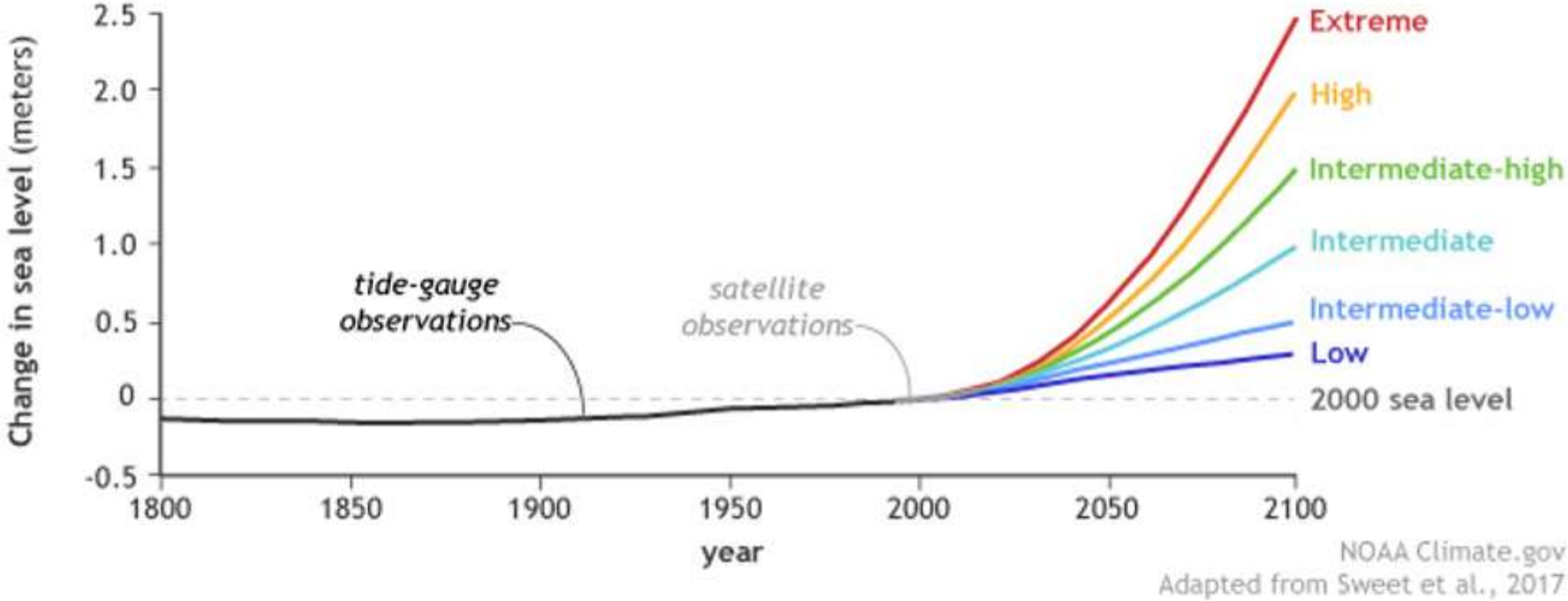
https://zacklabe.com/antarctic-sea-ice-extentconcentration/



[Special (temporary) graphic to monitor the ongoing record low] Antarctic sea ice extent for each year from 1979 to 2023 (satellite-era; NSIDC, DMSP SSM/I-SSMIS). 2023 is shown using a red line (updated 7/8/2023).


Warming from 1900-1920 to 2080-2100 in CMIP5 climate models
RCP2.6 (1.6C global warming)
RCP6.0 (3C global warming)
RCP4.5 (2.7C global warming)
RCP8.5 (4.8C global warming)
0
1
2
3
4
5
6
Degrees C
0
1
2
3
4
5
6
Degrees C

Possible future sea levels for different greenhouse gas pathways



NOAA Climate.gov
Adapted from Sweet et al., 2017

GROUNDSWELL

By 2050—without concrete climate and development action—climate change could lead more than

216 MILLION PEOPLE

in 6 regions to migrate within their own countries

EASTERN EUROPE AND CENTRAL ASIA
5 MILLION

EAST ASIA AND THE PACIFIC
49 MILLION

NORTH AFRICA
19 MILLION

SOUTH ASIA
40 MILLION

SUB SAHARAN AFRICA
86 MILLION

LATIN AMERICA
17 MILLION

Key International Climate Agreements

1987 – Montreal Protocol on Ozone-Depleting Substances

1988 – Creation of Intergovernmental Panel on Climate Change

1992 – UN Framework Convention on Climate Change

1997 – Kyoto Protocol

2009 – Copenhagen Climate Accord

2015 – Paris Climate Agreement

2021 – Glasgow Climate Pact

Kyoto Protocol Clean Development Mechanism projects

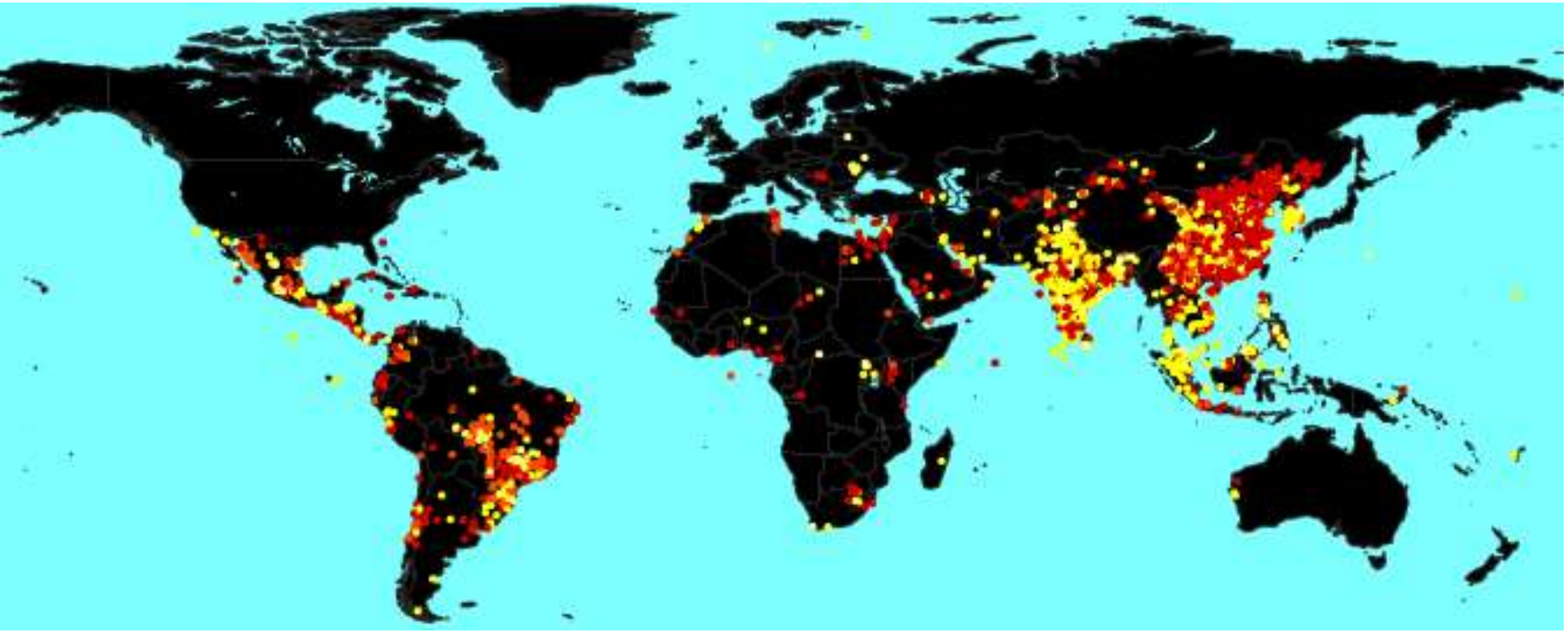
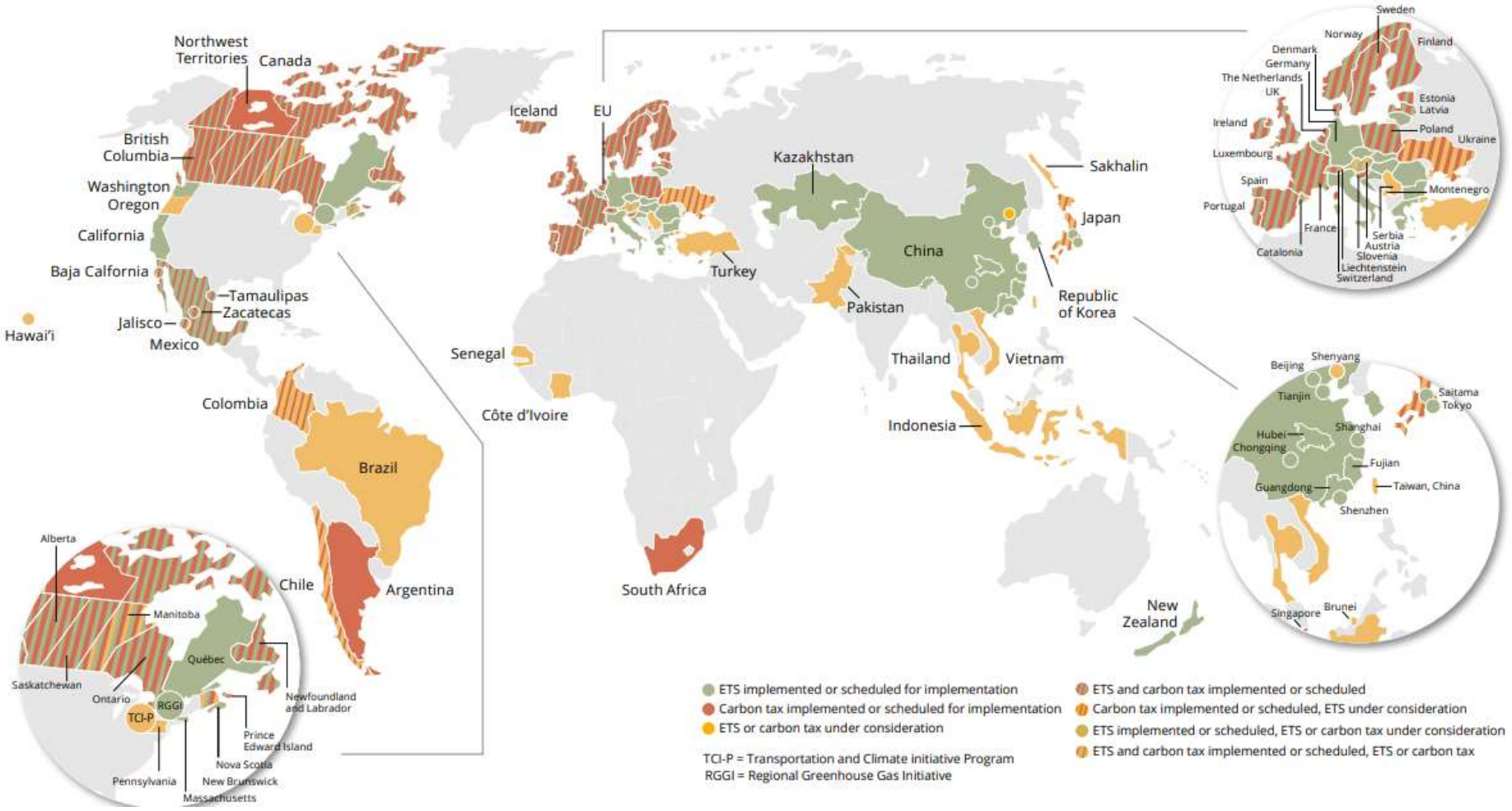


FIGURE 2.1
Map of carbon taxes and emissions trading systems



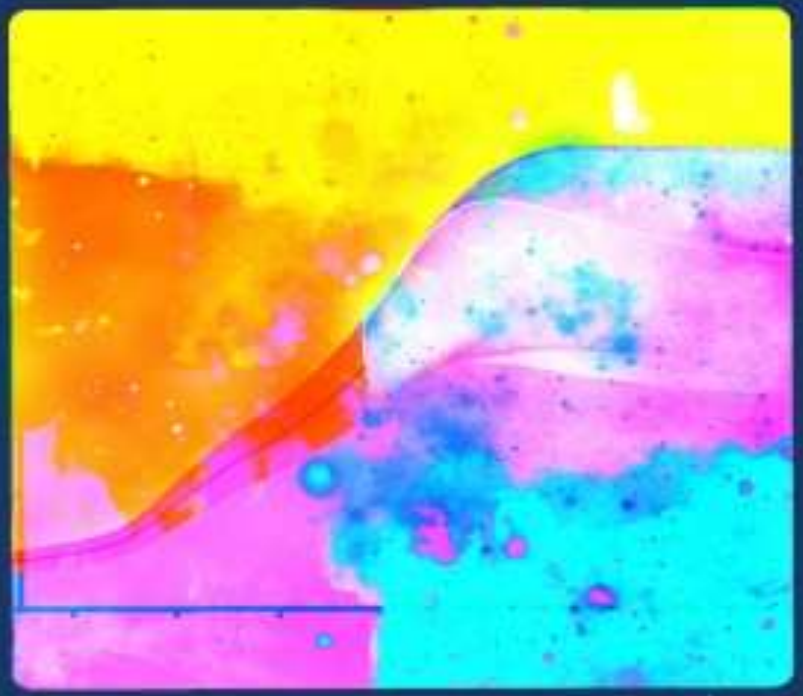
Agreement Reached in Paris (2015)

ipcc

INTERGOVERNMENTAL PANEL ON climate change

Global Warming of 1.5°C

An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty

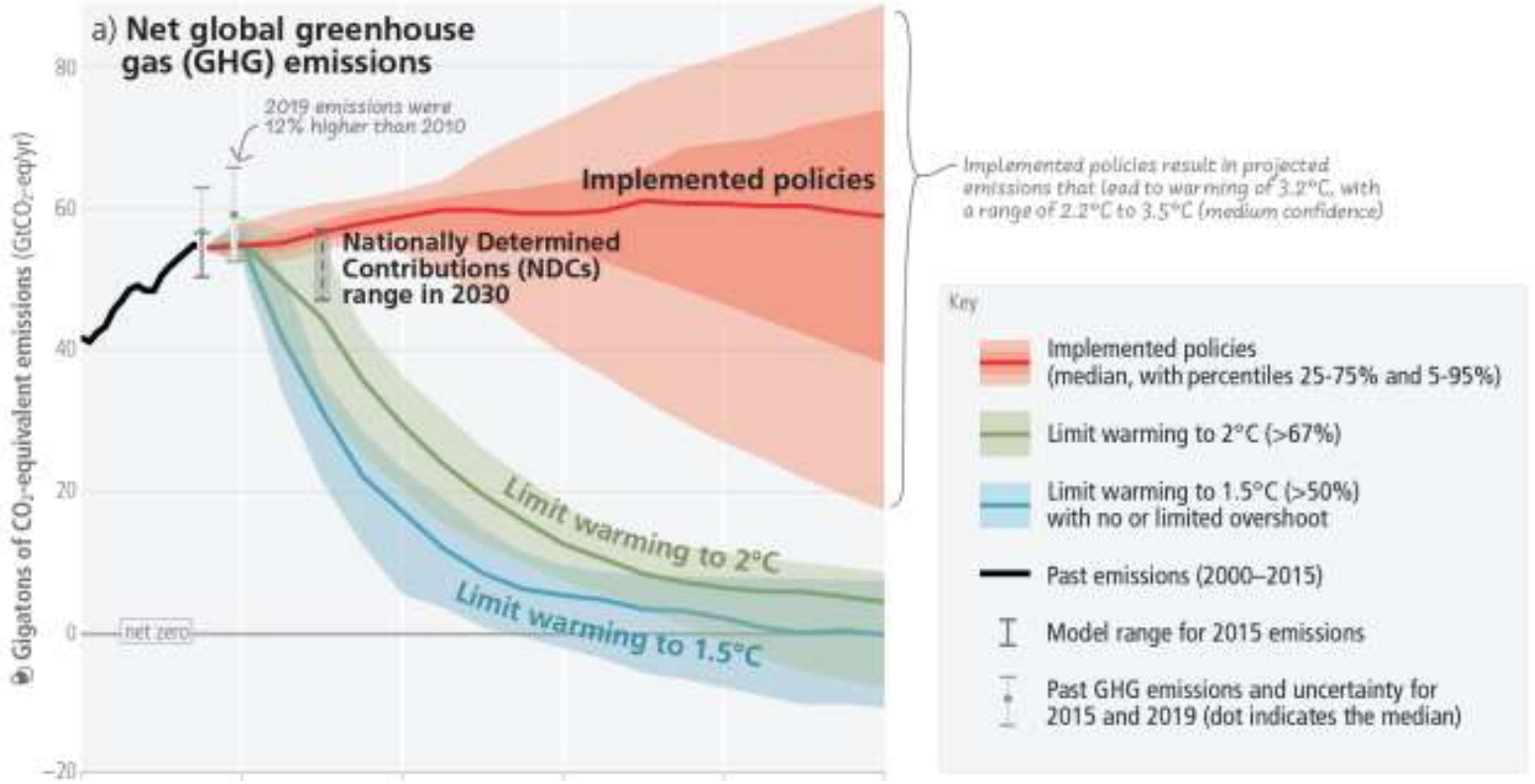


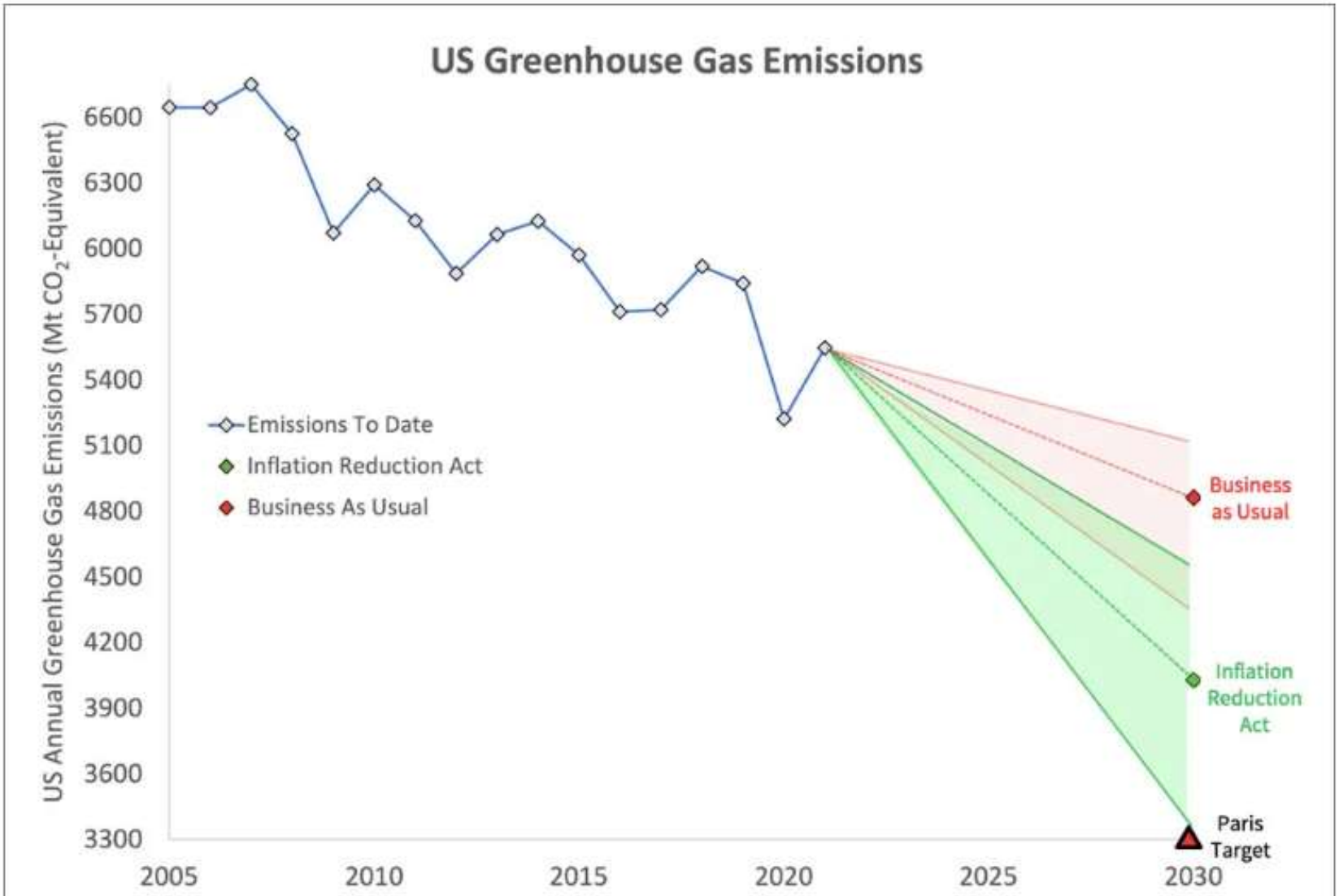
WG I WG II WG III

WMO UNEP

Limiting warming to 1.5°C and 2°C involves rapid, deep and in most cases immediate greenhouse gas emission reductions

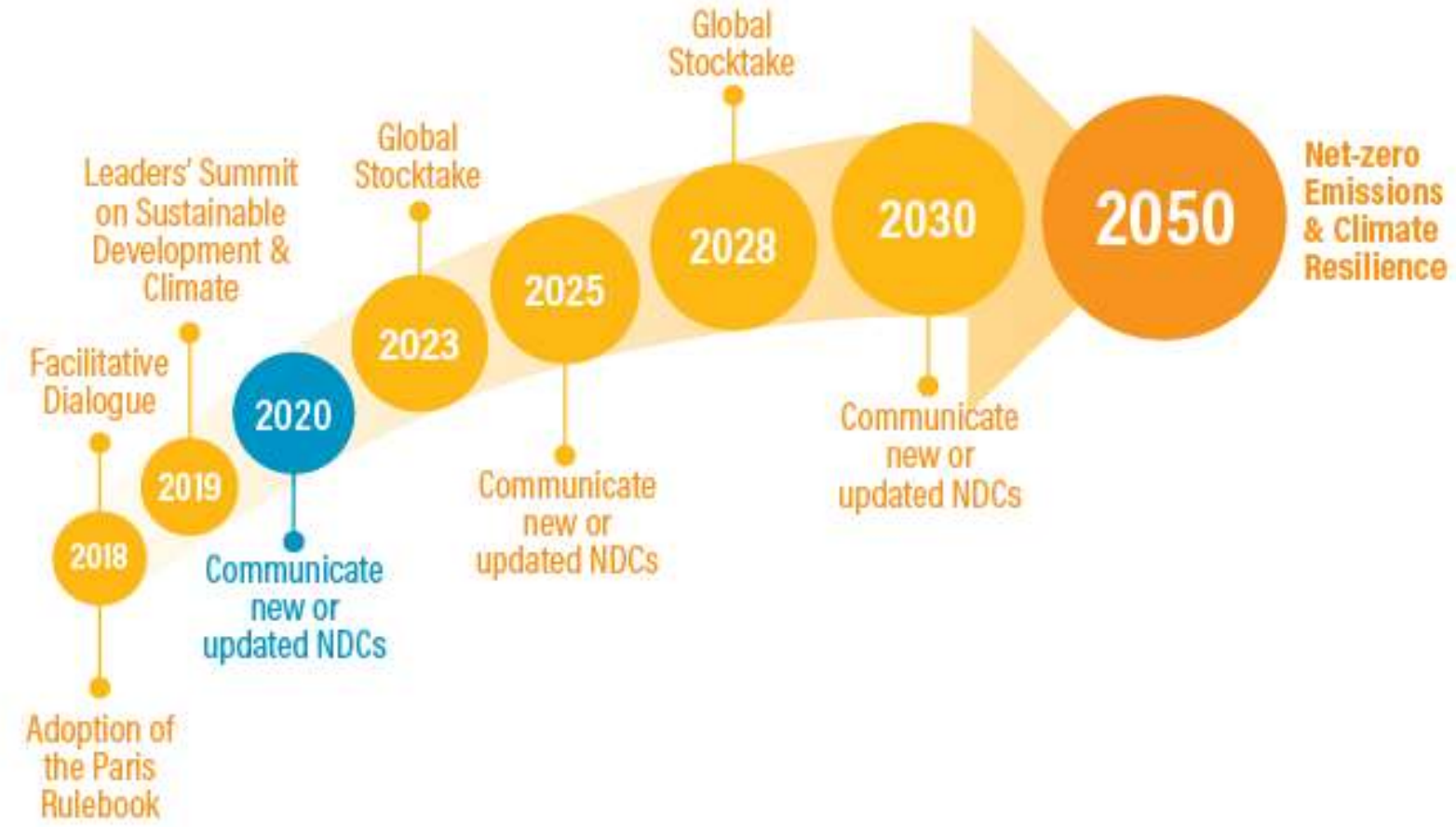
Net zero CO_2 and net zero GHG emissions can be achieved through strong reductions across all sectors





U.S. greenhouse gas emissions, projected emissions under current policy (red), and under the Inflation Reduction Act according to Princeton REPEAT, Energy Innovation, and Rhodium Group analyses. (Created by Dana Nuccitelli)

Ambition Mechanism in the Paris Agreement



Source: wri.org/publication/NDC-enhancement-by-2020

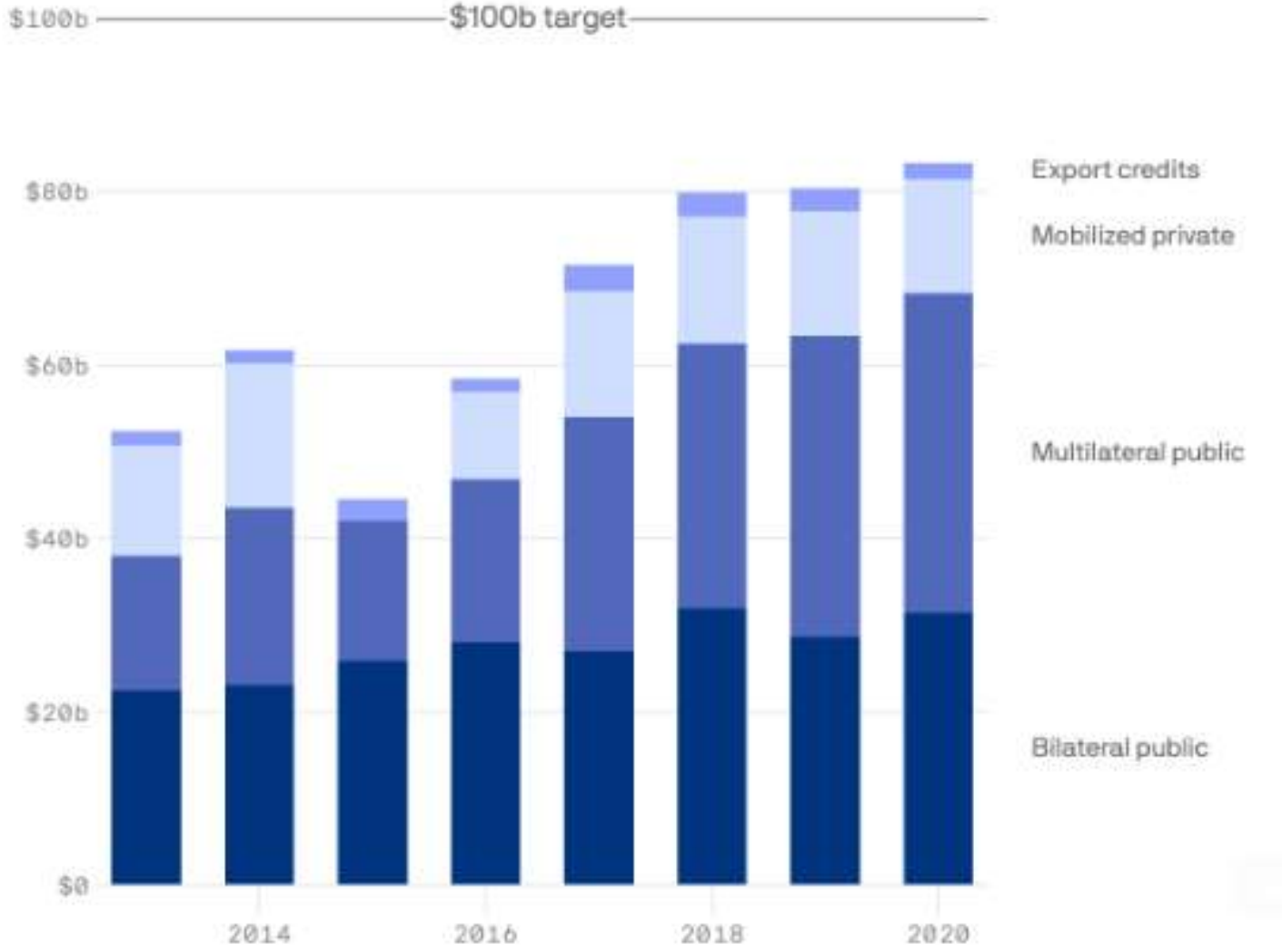
WORLD RESOURCES INSTITUTE

Rating Countries' Climate Policies and Actions
Climate Action Tracker

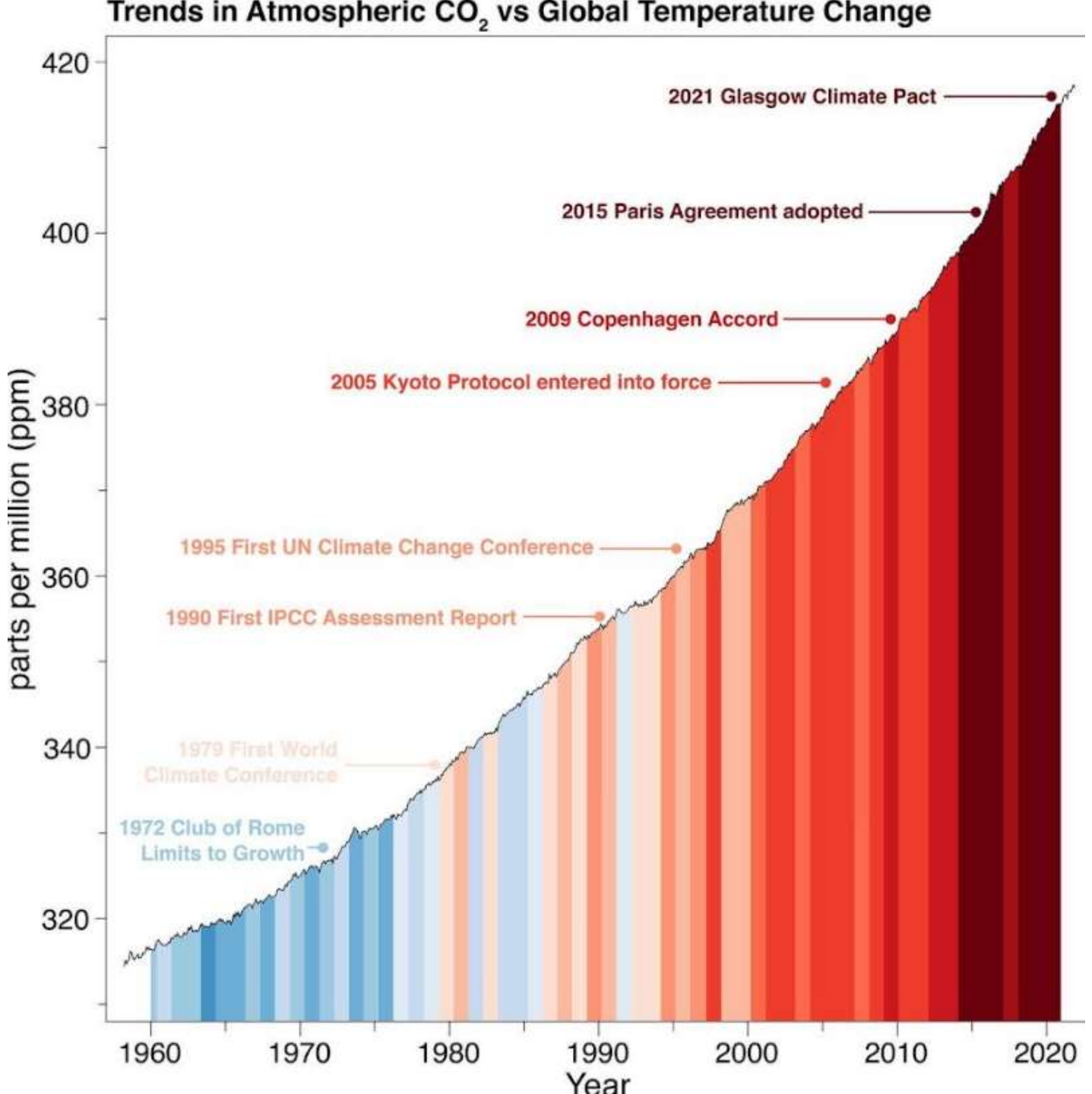
https://climateactiontracker.org/countries/

Climate finance for developing countries

Yearly; 2013-2020



Reproduced from OECD; Chart: Axios Visuals


Trends in Atmospheric CO_2 vs Global Temperature Change
parts per million (ppm)
420
400
380
360
340
320
1960
1970
1980
1990
2000
2010
2020
Year
2021 Glasgow Climate Pact
2015 Paris Agreement adopted
2009 Copenhagen Accord
2005 Kyoto Protocol entered into force
1995 First UN Climate Change Conference
1990 First IPCC Assessment Report
1979 First World Climate Conference
1972 Club of Rome Limits to Growth

Climate Change Litigation Databases

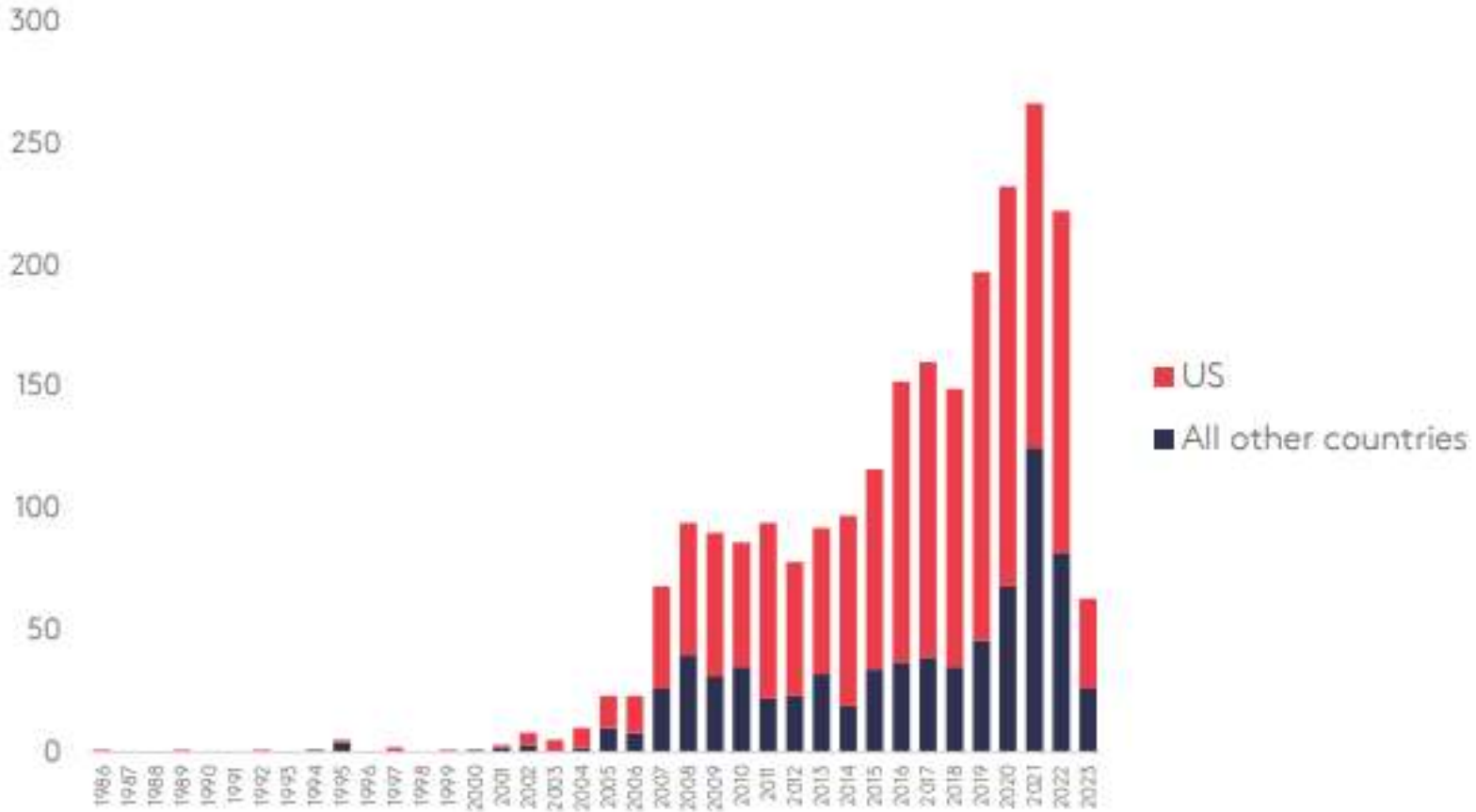
U.S. CLIMATE CHANGE LITIGATION

NON-U.S. CLIMATE CHANGE LITIGATION

This site provides two databases of climate change caselaw. Cases in the databases are organized by type of claim and are searchable. In many cases, links are available to decisions, complaints, and other case documents.

https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2023/06/Global_trends_in_climate_change_litigation_2023_snapshot.pdf

Figure 1.1. Total climate change cases over time, US and non-US (1986 to 31 May 2023)



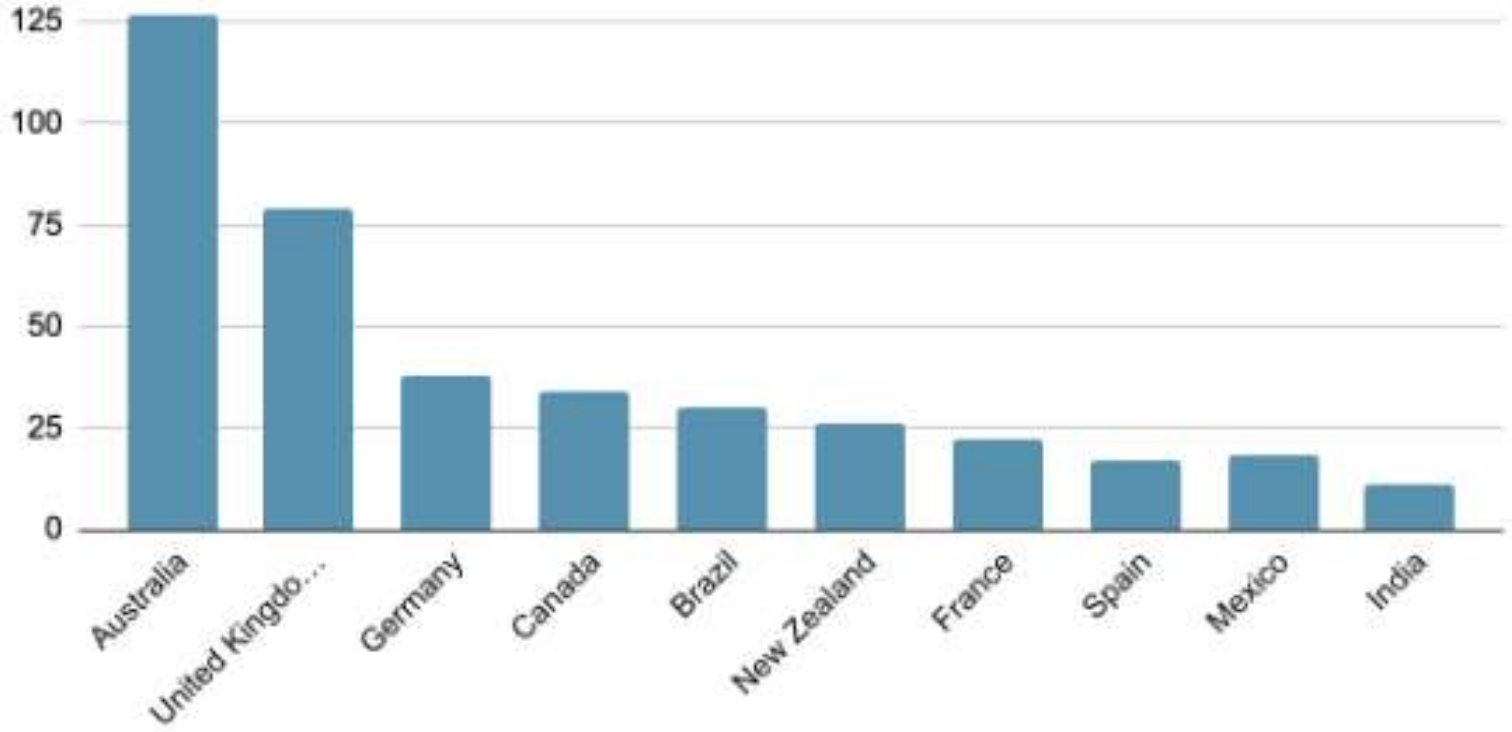
Note: Data collection for 2023 is still underway, and there may be a small delay between cases being filed and being identified and processed for inclusion in the databases, therefore the 2023 data are incomplete.

Source: Authors based on Sabin Center databases

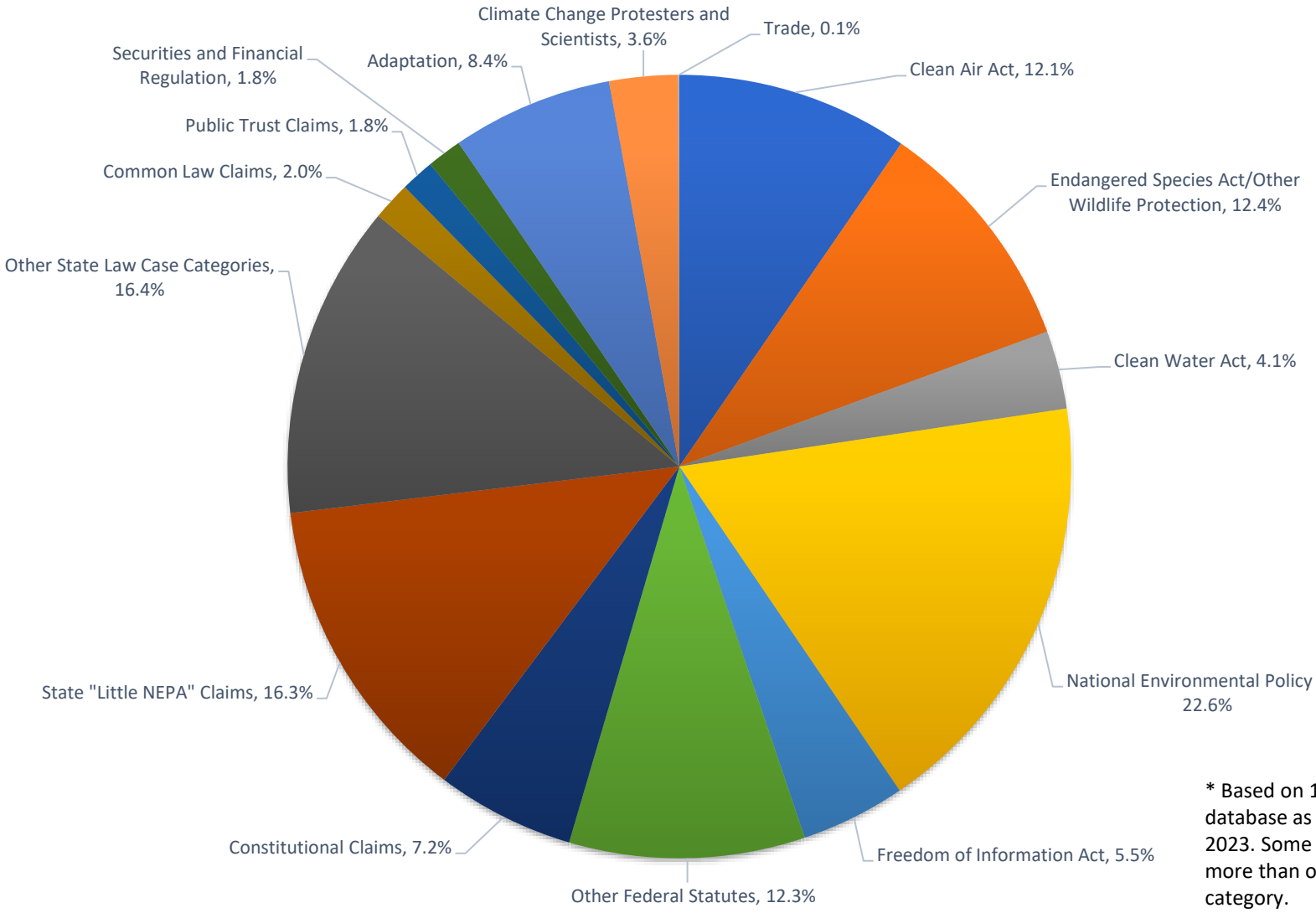
Climate Cases in Sabin Center Database

	March 2017	July 2020	December 2022
Total cases	884	1,550	2,180
US cases	654	1,200	1,522
Not US cases	230	350	659
Number of jurisdictions	24	30	65

Figure 3: Top 10 jurisdictions with the highest number of cumulative cases (excluding the United States and European Union)



Types of U.S. Climate Cases Filed*



* Based on 1,591 cases in database as of May 18, 2023. Some cases fall into more than one case category.

American Electric Power v. Connecticut

Dismissed, 406 F.Supp.2d 265 (SDNY 2005) (Preska, J.)

Reversed, 582 F.3d 309 (2d Cir. 2009) (Hall and McLaughlin, JJ.)

Reversed, 564 U.S. 410 (2011) (Ginsburg, J.; 8-0)

Native Village of Kivalina v. ExxonMobil Corp.

Dismissed, 663 F. Supp.2d 863 (ND CA) (Armstrong, J.)
Aff'd, 696 F.3d 849 (9th Cir. 2012) (Thomas, Clifton; Pro, concurring)

Climate Change Cases Against Fossil Fuel Companies

States	Counties, cities
Rhode Island (7/2/18)	San Mateo, Marin, Imperial Beach (CA) (7/17/17)
Massachusetts (10/24/19)	San Francisco, Oakland (CA) (9/19/17)
Minnesota (6/24/20)	Santa Cruz (CA) (12/20/17)
D.C. (6/25/20)	New York City (1/9/18) + (2/22/21)
Delaware (9/10/20)	Richmond (CA) (1/22/18)
Connecticut (9/14/20)	Boulder (CO) (4/17/18)
Vermont (9/14/21)	King County (WA) (5/9/18)
New Jersey (10/18/22)	Baltimore (MD) (7/20/18)
Puerto Rico (11/29/22)	Honolulu (HI) (3/9/20)
Others	Hoboken (NJ) (9/2/20)
Pacific Coast Federation	Charleston (SC) (9/9/20)
of Fishermen's Assns.	Maui (HI) (10/12/20)
(11/14/18)	Annapolis (MD) (2/22/21)
Beyond Pesticides v. Exxon (5/15/20)	Anne Arundel (MD) (4/26/21)

https://theconversation.com/more-than-two-dozen-cities-and-states-are-suing-big-oil-over-climate-change-they-just-got-a-boost-from-the-us-supreme-court-205009

Lawsuits against oil companies over climate change

More than two dozen U.S. cities, states and counties are suing oil companies over damage caused by climate change or misleading the public about the risks.

Hawaii's location and spacing of San Francisco-area and Baltimore-area cases are not to scale

Map: The Conversation/CC-BY-ND • Source: Sher Edling, research • Download image • Created with Datawrapper

City of New York v. Chevron Corp., 993 F.3d 81 (2d Cir. 2021)

"First, global warming is a uniquely international concern that touches upon issues of federalism and foreign policy. As a result, it calls for the application of federal common law, not state law. Second, the Clean Air Act grants the Environmental Protection Agency – not federal courts – the authority to regulate domestic greenhouse gas emissions. Federal common law actions concerning such emissions are therefore displaced."

What's Coming in City/State Litigation Against Fossil Fuel Companies

Motions to dismiss

- In personam jurisdiction
- Substantive

Discovery demands (both directions)

Motions to stay discovery pending disposition of motions to dismiss

More lawsuits

Third party claims (later)

Restatement of Torts, Second

§ 821B. **Public Nuisance**

(1) A public nuisance is an **unreasonable** interference with a right to the general public.

(2) Circumstances that may sustain a holding that an interference with a public right is unreasonable include the following:

(a) Whether the conduct involves a significant interference with the public health, the public safety, the public peace, the public comfort or the public convenience, or

(b) whether the conduct is proscribed by a statute, ordinance or administrative regulation, or

(c) whether the conduct is of a continuing nature or has produced a permanent or long-lasting effect, and, as the actor knows or has reason to know, has a significant effect upon the public right

Tracing anthropogenic carbon dioxide and methane emissions to fossil fuel and cement producers, 1854–2010

Richard Heede

Received: 5 March 2013 / Accepted: 14 October 2013 / Published online: 22 November 2013

Abstract This paper presents a quantitative analysis of the historic fossil fuel and cement production records of the 50 leading investor-owned, 31 state-owned, and 9 nation-state producers of oil, natural gas, coal, and cement from as early as 1854 to 2010. This analysis traces emissions totaling 914 $GtCO_2e$—63 % of cumulative worldwide emissions of industrial CO_2 and methane between 1751 and 2010—to the 90 "carbon major" entities based on the carbon content of marketed hydrocarbon fuels (subtracting for non-energy uses), process CO_2 from cement manufacture, CO_2 from flaring, venting, and own fuel use, and fugitive or vented methane. Cumulatively, emissions of 315 $GtCO_2e$ have been traced to investor-owned entities, 288 $GtCO_2e$ to state-owned enterprises, and 312 $GtCO_2e$ to nation-states. Of these emissions, half has been emitted since 1986. The carbon major entities possess fossil fuel reserves that will, if produced and emitted, intensify anthropogenic climate change. The purpose of the analysis is to understand the historic emissions as a factual matter, and to invite consideration of their possible relevance to public policy.

1 Introduction

It is now broadly accepted that anthropogenic climate change presents a serious threat to the health, prosperity, and stability of human communities, and to the stability and existence of non-human species and ecosystems (IPCC 2007; World Bank 2012b; Hoeppe 2011; Busby 2007). The international legal framework established in 1992 to prevent "dangerous anthropogenic interference" with the climate system has focused attention on the role of nation-states, and has led to commitments by many nation-states (particularly the Annex I or highly developed nations) to cut their greenhouse gas (GHG) emissions. However, current climate change is primarily driven by historic emissions (Allen et al. 2009b; Matthews et al. 2009; Wei et al. 2012; IPCC 2013), and the parties responsible for the dominant sources of historic emissions are not necessarily the same as those responsible for the dominant share of current emissions. This paper provides an original quantitative analysis of historic emissions by

Table 3 Top twenty investor- & state-owned entities and attributed CO_2 & CH_4 emissions

Entity	2010 emissions $MtCO_2e$	Cumulative 1854–2010 $MtCO_2e$	Percent of global 1751–2010
1. Chevron, USA	423	51,096	3.52 %
2. ExxonMobil, USA	655	46,672	3.22 %
3. Saudi Aramco, Saudi Arabia	1,550	46,033	3.17 %
4. BP, UK	554	35,837	2.47 %
5. Gazprom, Russian Federation	1,371	32,136	2.22 %
6. Royal Dutch/Shell, Netherlands	478	30,751	2.12 %
7. National Iranian Oil Company	867	29,084	2.01 %
8. Pemex, Mexico	602	20,025	1.38 %
9. ConocoPhillips, USA	359	16,866	1.16 %
10. Petroleos de Venezuela	485	16,157	1.11 %
11. Coal India	830	15,493	1.07 %
12. Peabody Energy, USA	519	12,432	0.86 %
13. Total, France	398	11,911	0.82 %
14. PetroChina, China	614	10,564	0.73 %
15. Kuwait Petroleum Corp.	323	10,503	0.73 %
16. Abu Dhabi NOC, UAE	387	9,672	0.67 %
17. Sonatrach, Algeria	386	9,263	0.64 %
18. Consol Energy, Inc., USA	160	9,096	0.63 %
19. BHP-Billiton, Australia	320	7,606	0.52 %
20. Anglo American, United Kingdom	242	7,242	0.50 %
Top 20 IOCs & SOEs	11,523	428,439	29.54 %
Top 40 IOCs & SOEs		546,767	37.70 %

Right column compares each entity's cumulative emissions to CDIAC's global emissions 1751–2010. Excludes British Coal, whose production and assets have not been attributed to extant

Supply chains

Coal

Coal mine

↓

Power plant

↓

Distribution utility

↓

Electricity user

Oil

Oil well

↓

Refinery

↓

Gasoline station

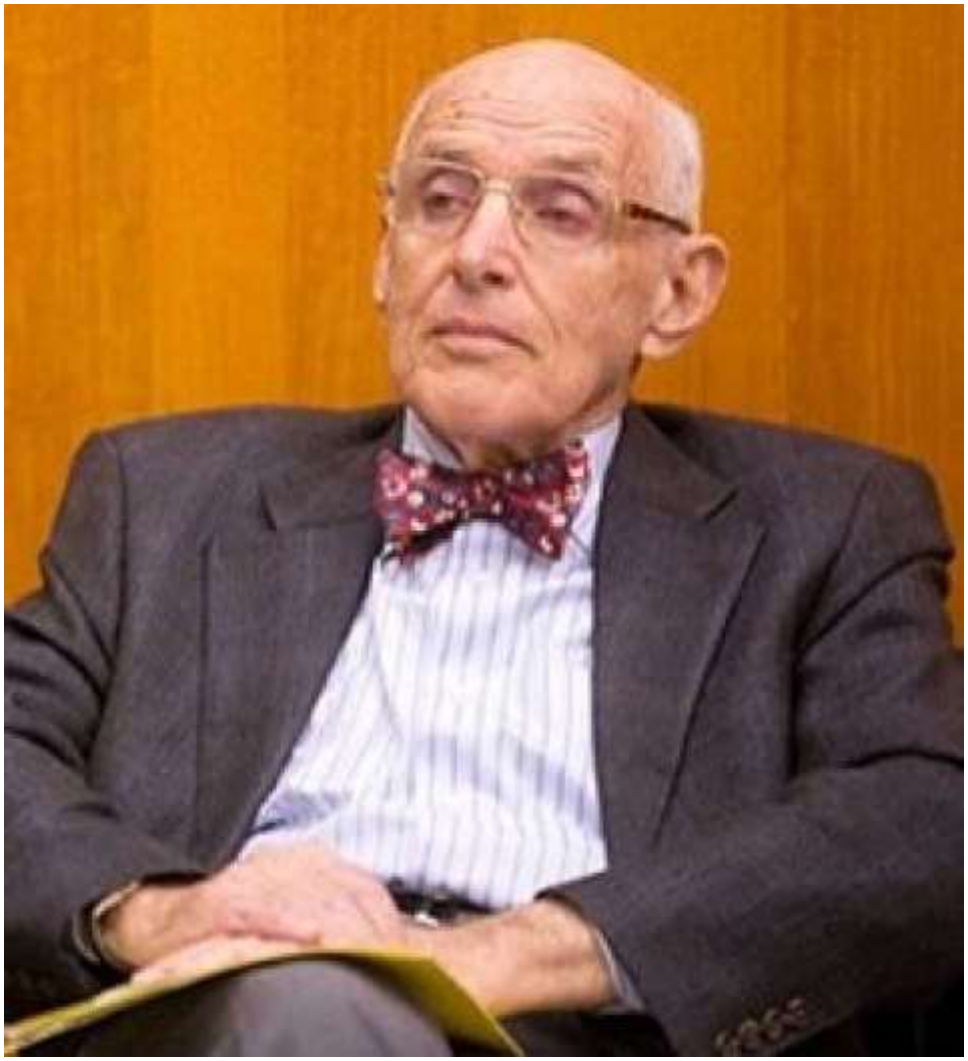
↓

Vehicle

↓

Driver

Joseph Sax (1936-2014)

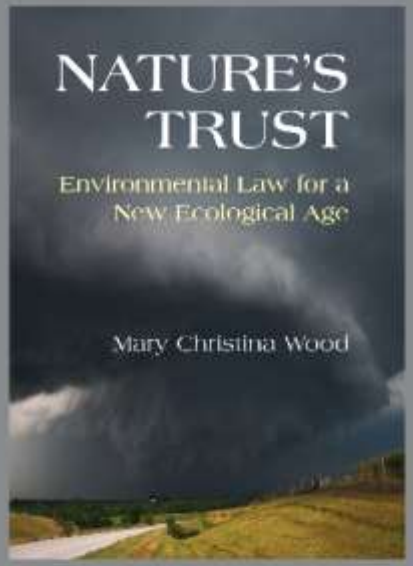


BOOK LAUNCH EVENT

TUESDAY, NOVEMBER 19, 2013 4:30 TO 6 P.M. WAYNE MORSE COMMONS, KNIGHT LAW CENTER

NATURE'S TRUST

ENVIRONMENTAL LAW FOR A NEW ECOLOGICAL AGE



"Our children are trusting us to protect their Earth. Our governments are on trial for failing that trust. This is the trial that should rivet the public's attention, for all life depends on its outcome. This book puts the people—all of us—in the jury box."

—James Hansen, author of *Storms of My Grandchildren* and former director, NASA's Goddard Institute for Space Studies

MARY WOOD

Mary Christina Wood is the Philip H. Knight Professor of Law and founding faculty director of the school's Environmental and Natural Resources Law Program. She teaches property law, natural resources law, public trust law, and federal Indian law.

Sponsored by the Environmental and Natural Resources Law Center and the Wayne Morse Center for Law and Politics.

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UNIVERSITY OF OREGON
School of Law

Our Children's Trust

Our Children's Trust Litigation

Year Filed	Name of Case	Court	Status
2011	Barhaugh v. Montana	Montana Supreme Court	Petition denied, 06/15/11
2011	Chernaik v. Brown (originally Chernaik v. Kitzhaber)	Oregon Circuit Court	The Oregon Court of Appeals directed a declaratory judgment in favor of State defendants, 01/09/19; OR Supreme Court aff'd 10/22/20
2011	Sanders-Reed v. Martinez	New Mexico District Court	Summary judgment in favor of the State aff'd by New Mexico Court of Appeals, 03/12/15
2011	Bonser-Lain v. Texas Commission on Environmental Quality	Texas District Court	The Texas Court of Appeals vacated the District Court's judgment and dismissed for lack of subject-matter jurisdiction, 07/23/14
2011	Svitak v. State of Washington	Washington Superior Court	Dismissal aff'd by Washington Court of Appeals, 12/16/13
2011	Blades v. California	California Superior Court	Voluntarily dismissed by plaintiffs, 02/07/12
2011	Filippone v. Iowa Department of Natural Resources	Iowa District Court	The Iowa Court of Appeals aff'd Department's decision to deny rulemaking petition, 03/13/13

Year Filed	Name of Case	Court	Status
2011	Aronow v. Minnesota	Minnesota District Court	Dismissal aff'd by Minnesota Court of Appeals, 10/01/12
2011	Kanuk v. Alaska	Alaska Superior Court	Dismissal aff'd by Alaska Supreme Court, 09/12/14
2011	Butler v. Brewer	Arizona Superior Court	Dismissal aff'd by Arizona Court of Appeals, 03/14/13
2012	Funk v. Commonwealth of Pennsylvania	Pennsylvania Commonwealth Court	Dismissed, 07/03/13
2012	Farb v. Kansas	Kansas District Court	Dismissed, 06/04/13
2014	Foster v. Washington Department of Ecology	Washington Superior Court	The Washington Court of Appeals reversed the Superior Court's order requiring the Department of Ecology to set greenhouse gas standards by end of 2016, 09/05/17
2015	Turner v. North Carolina Environmental Management Commission	North Carolina Superior Court	Appeal denied, 11/27/15

2015	Funk v. Wolf	Pennsylvania Commonwealth Court	Dismissal aff'd by Pennsylvania Supreme Court, 03/28/17
2015	Juliana v. United States	District of Oregon	The Ninth Circuit reversed the District of Oregon and remanded with directions to dismiss for lack of standing, 01/17/20; Petition for rehearing denied; Complaint amended, 11/29/21
2017	Sinnok v. Alaska	Alaska Superior Court	Dismissed, 10/30/18; Appeal pending
2017	Sagoonick v. Alaska	Alaska Supreme Court	Dismissed, 1/28/22; Petition for rehearing denied, 02/25/22
2018	Aji P. v. State of Washington	Washington Superior Court	Dismissed, 08/14/18; Dismissal aff'd by WA Ct. of Appeals 2/8/2021; WA Supreme Ct. denies petition for review, 10/6/21
2018	Reynolds v. Florida	Florida Circuit Court	Dismissed, 6/1/20; Dismissal aff'd, 05/18/21
2020	Held v. Montana	Montana District Court	Pending; Court finds plaintiffs have standing, 8/4/21; Trial date set for 02/2023

Juliana v. United States

Juliana v. US – relief sought

"Order Defendants to prepare and implement an enforceable national remedial plan to phase out fossil fuel emissions and draw down excess atmospheric CO_2 so as to stabilize the climate system and protect the vital resources on which Plaintiffs now and in the future will depend."

First Amended Complaint, Prayer for Relief

Juliana v. US, 947 F.3d 1159 (9th Cir. 2020) – Majority Opinion (Hurwitz & Murguia, JJ)

The plaintiffs have made a compelling case that action is needed; it will be increasingly difficult in light of that record for the political branches to deny that climate change is occurring, that the government has had a role in causing it, and that our elected officials have a moral responsibility to seek solutions. We do not dispute that the broad judicial relief the plaintiffs seek could well goad the political branches into action… **We reluctantly conclude, however, that the plaintiffs' case must be made to the political branches or to the electorate at large**, the latter of which can change the composition of the political branches through the ballot box. That the other branches may have abdicated their responsibility to remediate the problem does not confer on Article III courts, no matter how well-intentioned, the ability to step into their shoes.

Juliana v. US – dissent (Staton, J.)

Plaintiffs' claims are based on science, specifically, an impending point of no return. If plaintiffs' fears, backed by the government's *own studies*, prove true, history will not judge us kindly. **When the seas envelop our coastal cities, fires and droughts haunt our interiors, and storms ravage everything between, those remaining will ask: Why did so many do so little?**

I would hold that plaintiffs have standing to challenge the government's conduct, have articulated claims under the Constitution, and have presented sufficient evidence to press those claims at trial. I would therefore affirm the district court.

Plaintiffs' Proposed Second Amended Complaint – Prayer for Relief

Argued June 25, 2021

Leave to amend granted June 1, 2023

1. Pursuant to 28 U.S.C. § 2201 and this Court's Article III authority, enter a judgment declaring the United States' national energy system that creates the harmful conditions described herein has violated and continues to violate the Fifth Amendment of the U.S. Constitution and Plaintiffs' constitutional rights to substantive due process and equal protection of the law;
2. Pursuant to 28 U.S.C. § 2201 and this Court's Article III authority, enter a judgment declaring the United States' national energy system that creates the harmful conditions described herein has violated and continues to violate the public trust doctrine;
3. Pursuant to 28 U.S.C. § 2201 and this Court's Article III authority, enter a judgment declaring that § 201 of the Energy Policy Act has violated and continues to violate the Fifth Amendment of the U.S. Constitution and Plaintiffs' constitutional rights to substantive due process and equal protection of the law.

Held v. Montana trial – June 2023