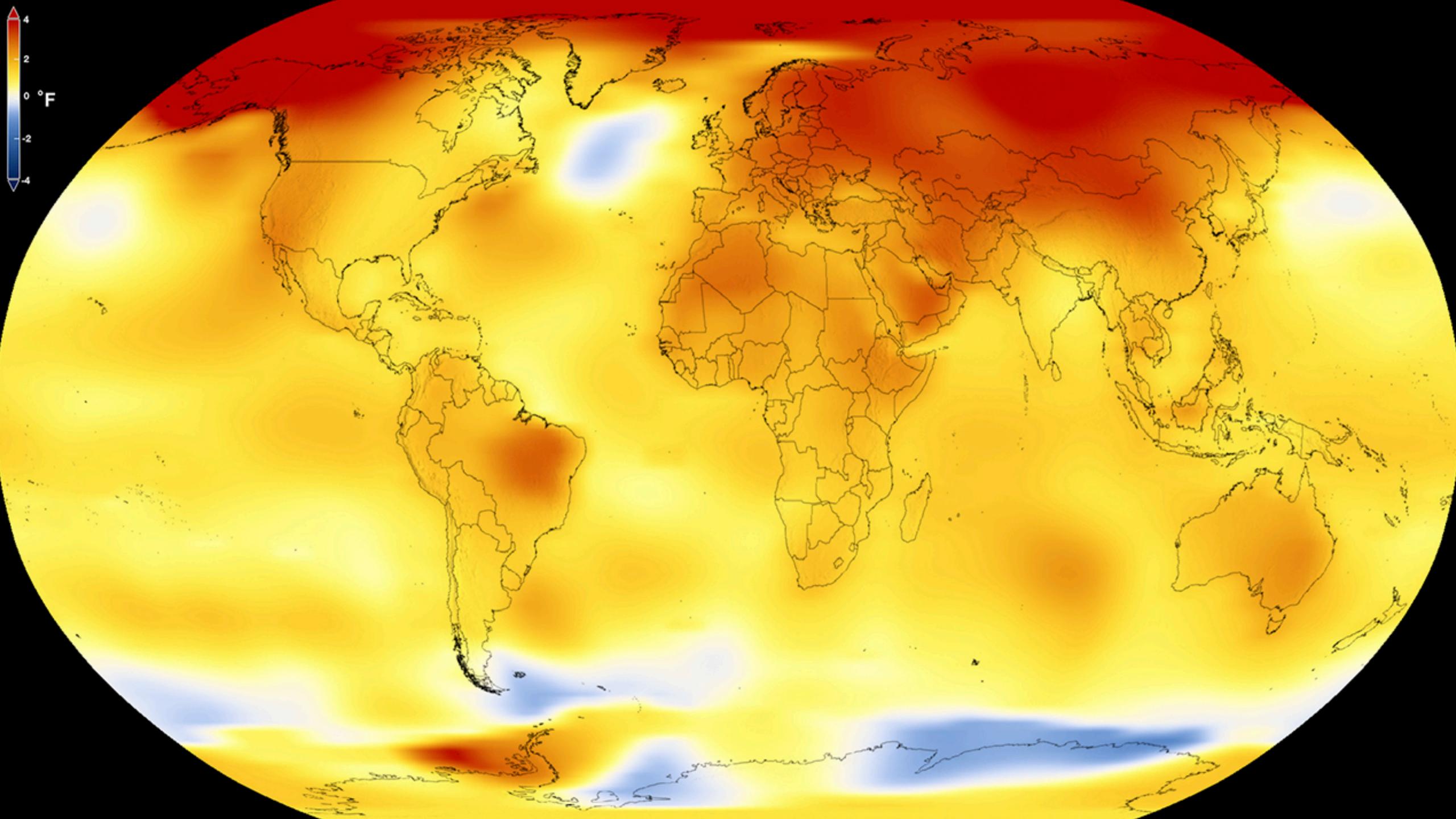
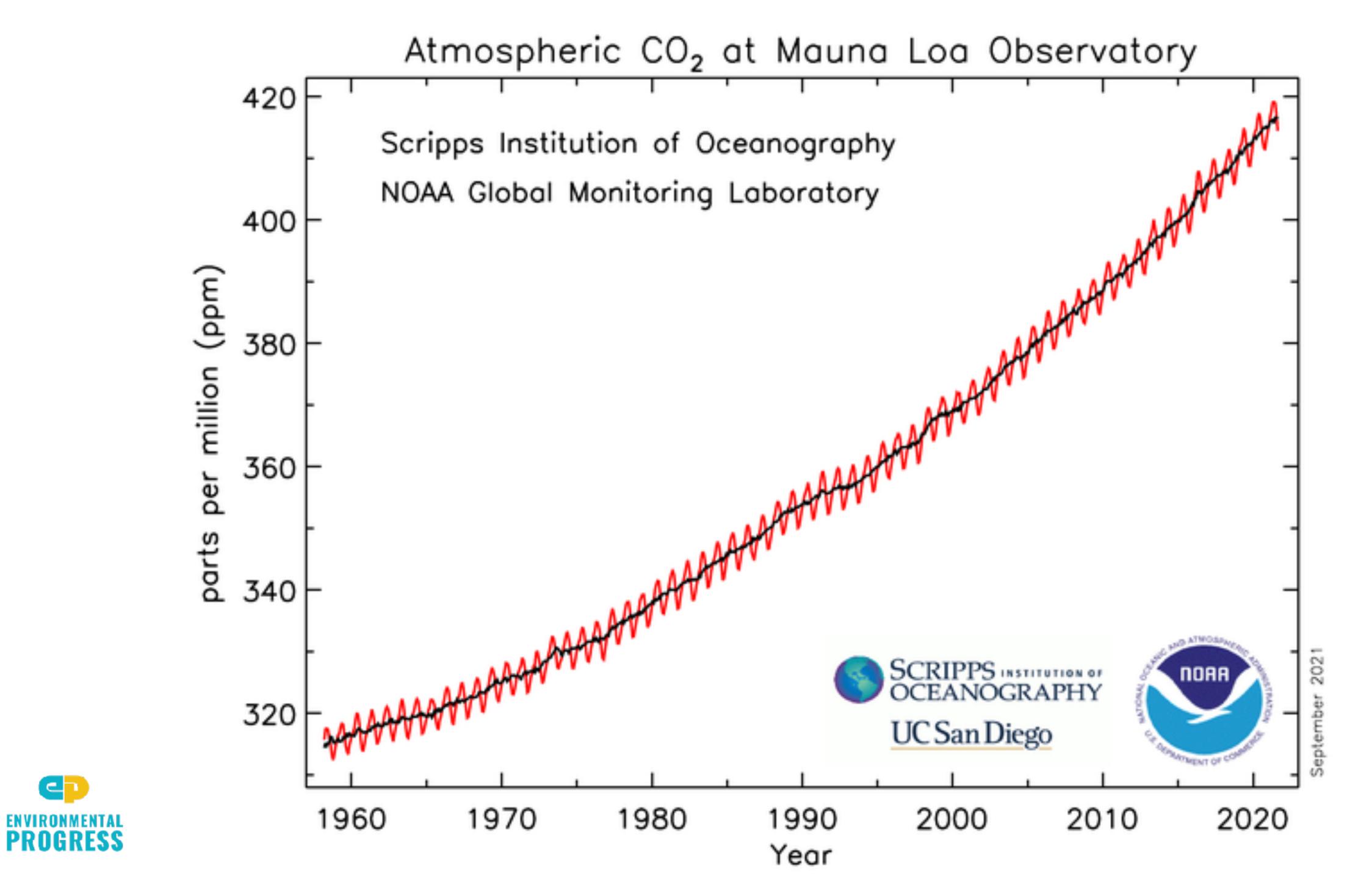


Apocalypse Never

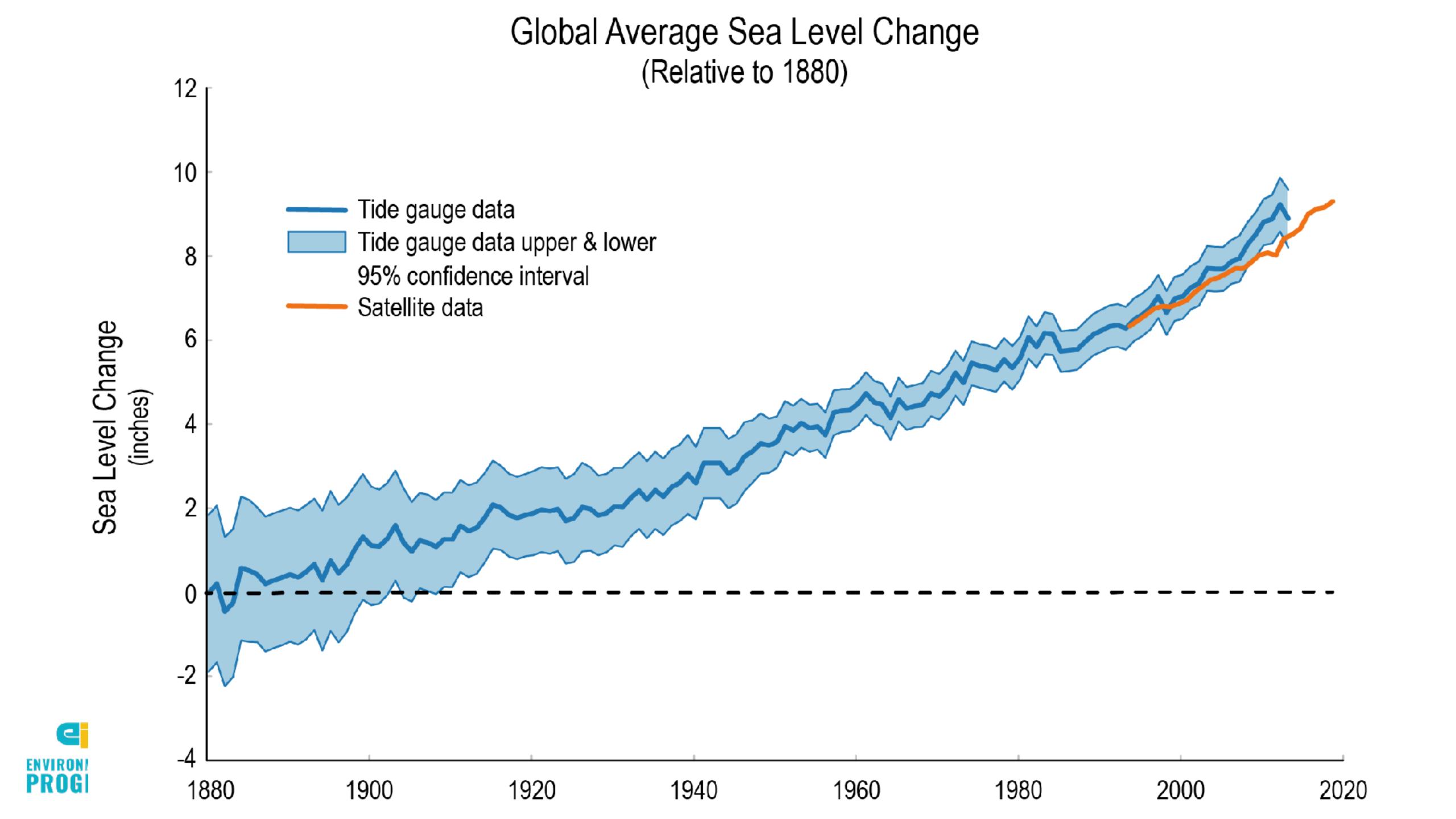
Why Our Environmental Future Is Bright







GP







Heart-Wrenching Video Shows Starving Polar Bear on Iceless Land

Lack of sea ice is making it more difficult for polar bears to find food.









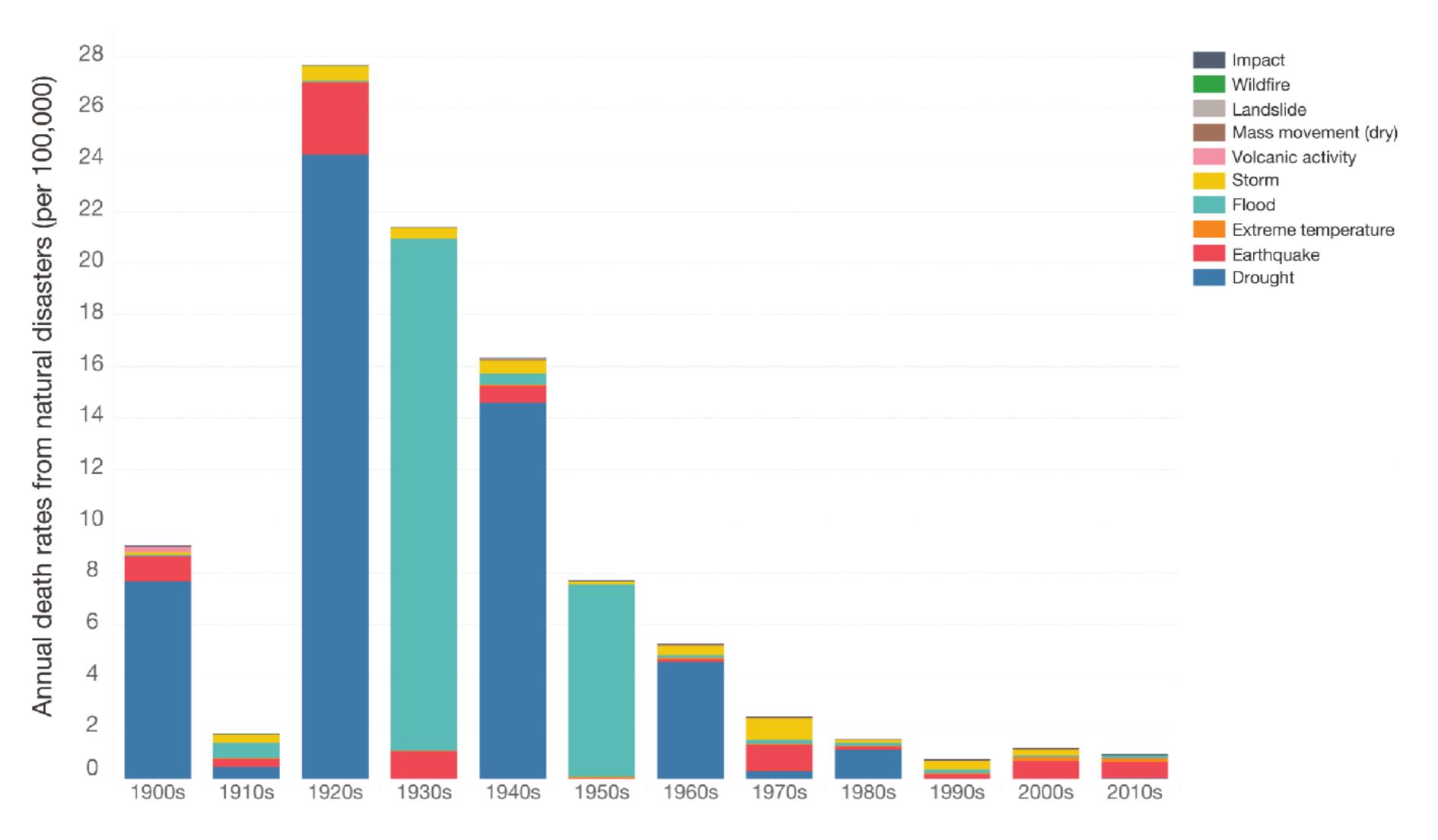


But That's Not the End of the Story

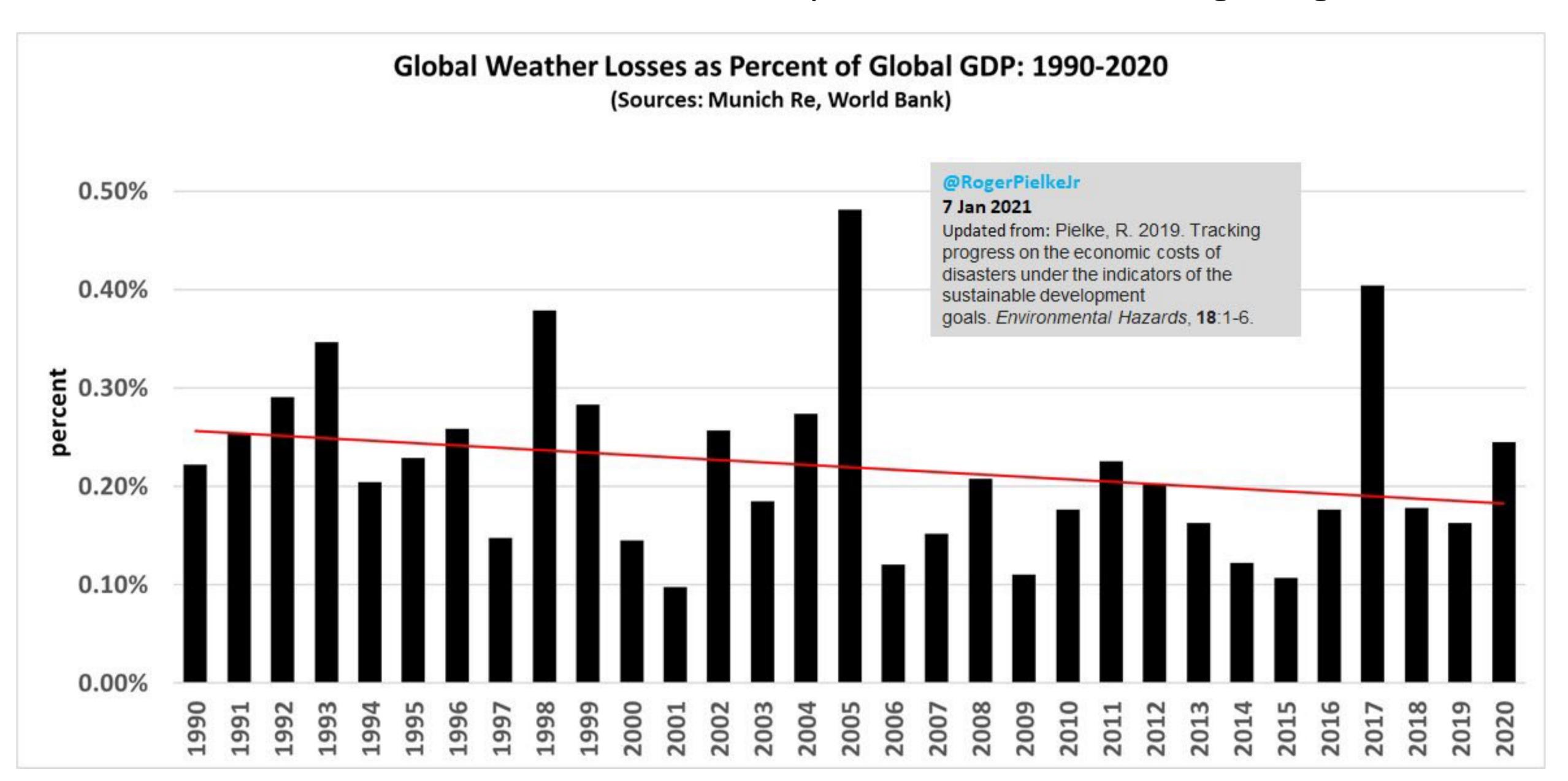
Global annual death rate from natural disasters, by decade Our World in Data



Global death rate measured as the number of deaths per 100,000 of the world population. This is given as the annual average per decade (by decade 1900s to 2000s; and then six years from 2010-2015).

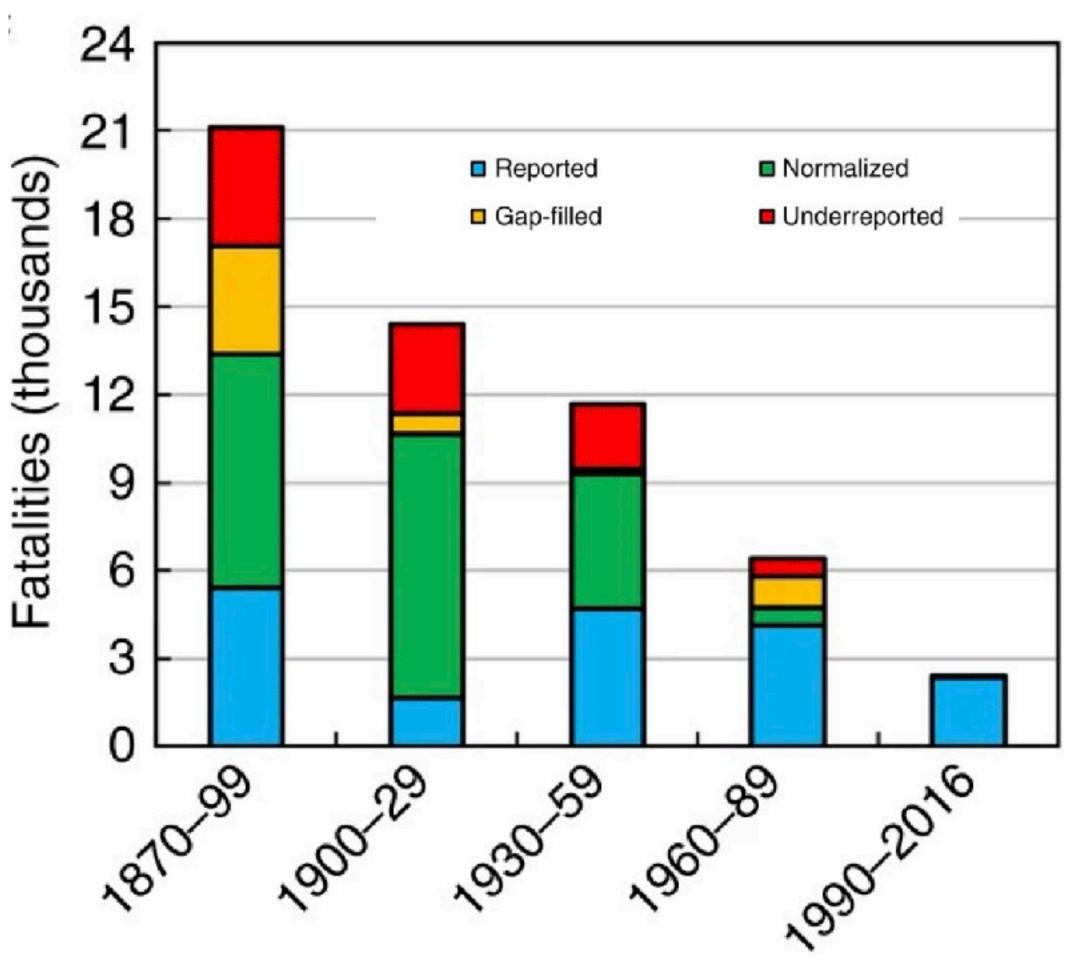


The cost of natural disasters as a percent of GDP is going down



Flood Deaths Declining in Europe





iource: Paprotny, D., Sebastian, A., Morales-Nápoles, O. et al. Trends in flood losses in Europe over the past 150 years. *Nature Commun* 9, 1985 (2018). https://doi.org/10.1038/s41467-018-04253-1

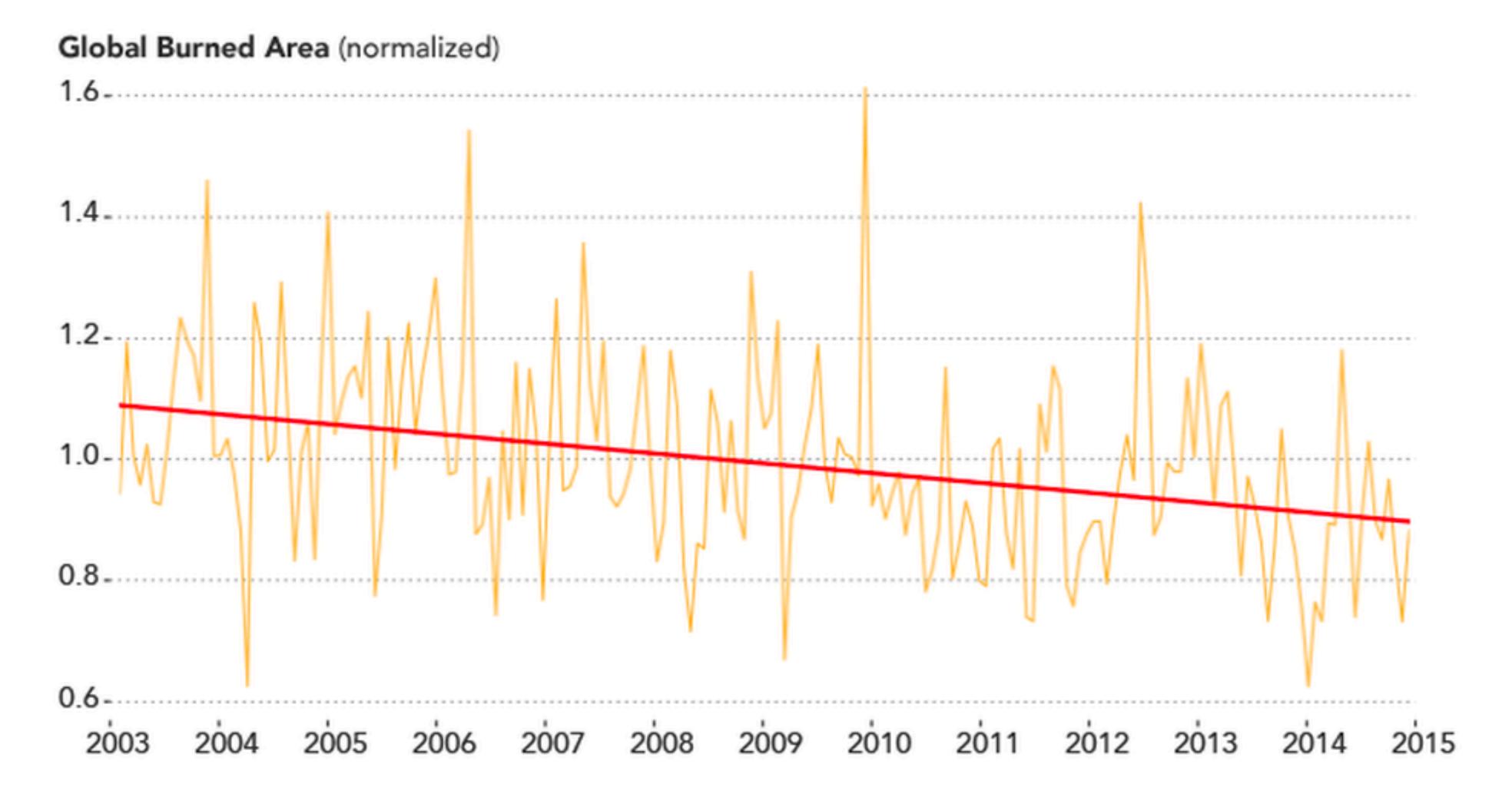


"Climate dries the [wood] fuels out and extends the fire season from 4-6 months to nearly year-round but it's not the cause of the intensity of the fires. The cause of that is fire suppression and the existing debt of wood fuel."

– US Forest Service scientist Malcolm North, Forbes, September 13, 2020

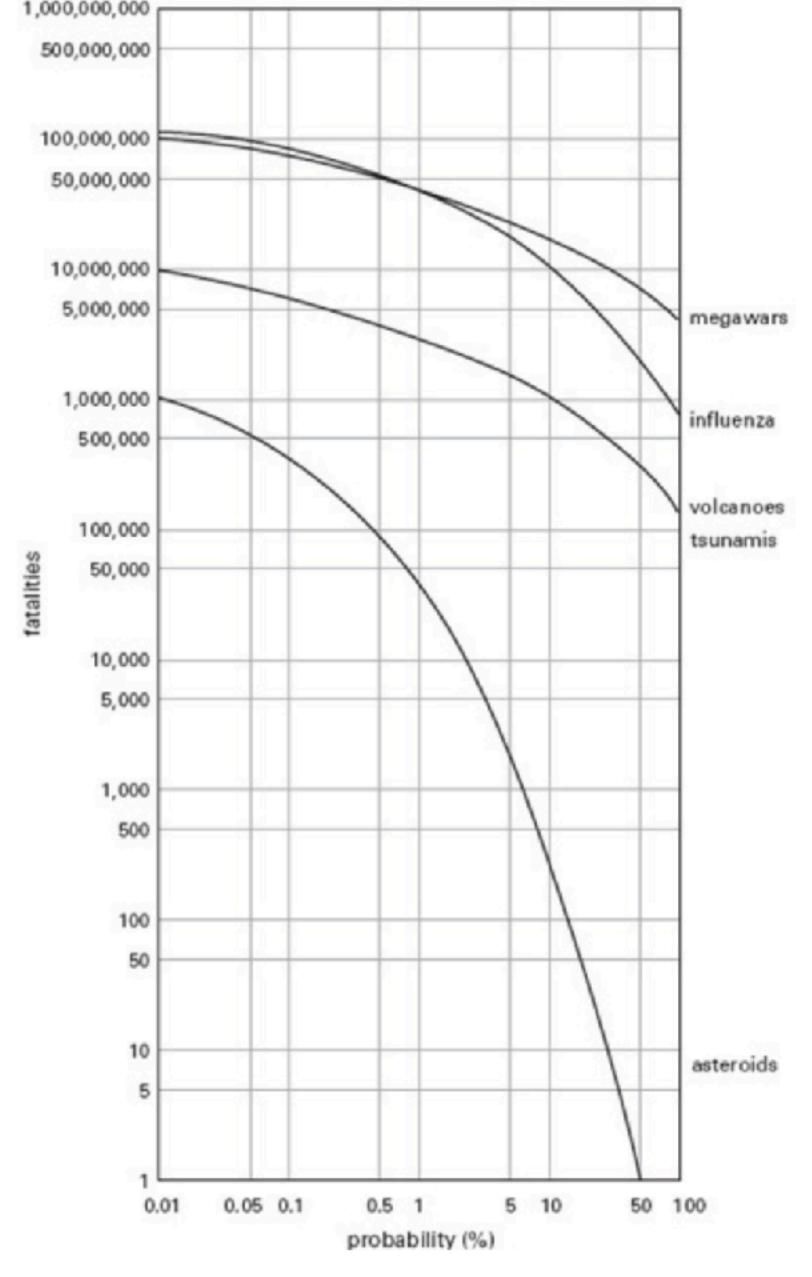


According to NASA scientists, from 2003 to 2019, the area burned globally declined 25%, an area the size of Texas



Source: N. Andela, et al., "A human-driven decline in global burned area," Science, June 30, 2017

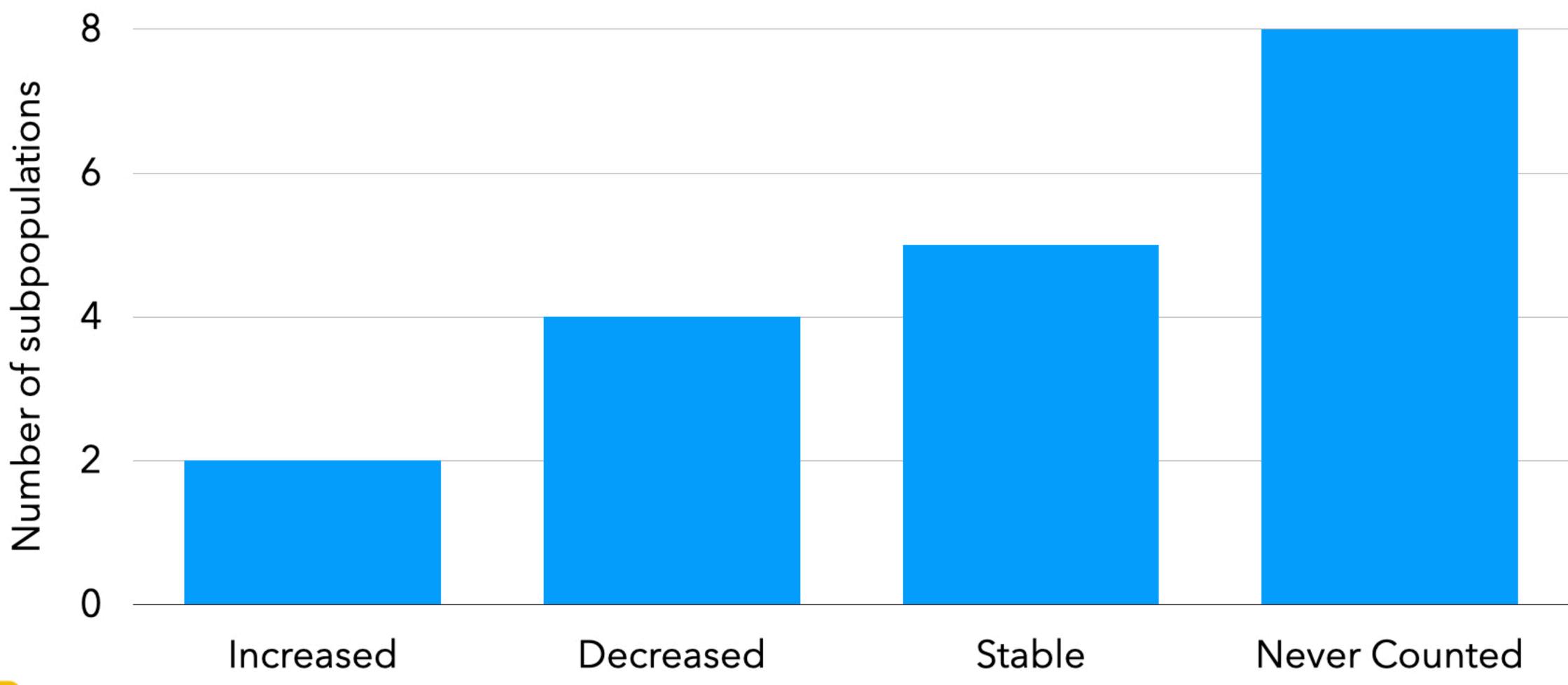
Wars, disease, volcanoes, tsunamis and asteroids, not climate change, pose the highest risk of catastrophe





Source: Vaclav Smil, "Global Catastrophes and Trends: The Next 50 Years," MIT Press (2008).

There is no discernible overall trend to suggest polar bear famine



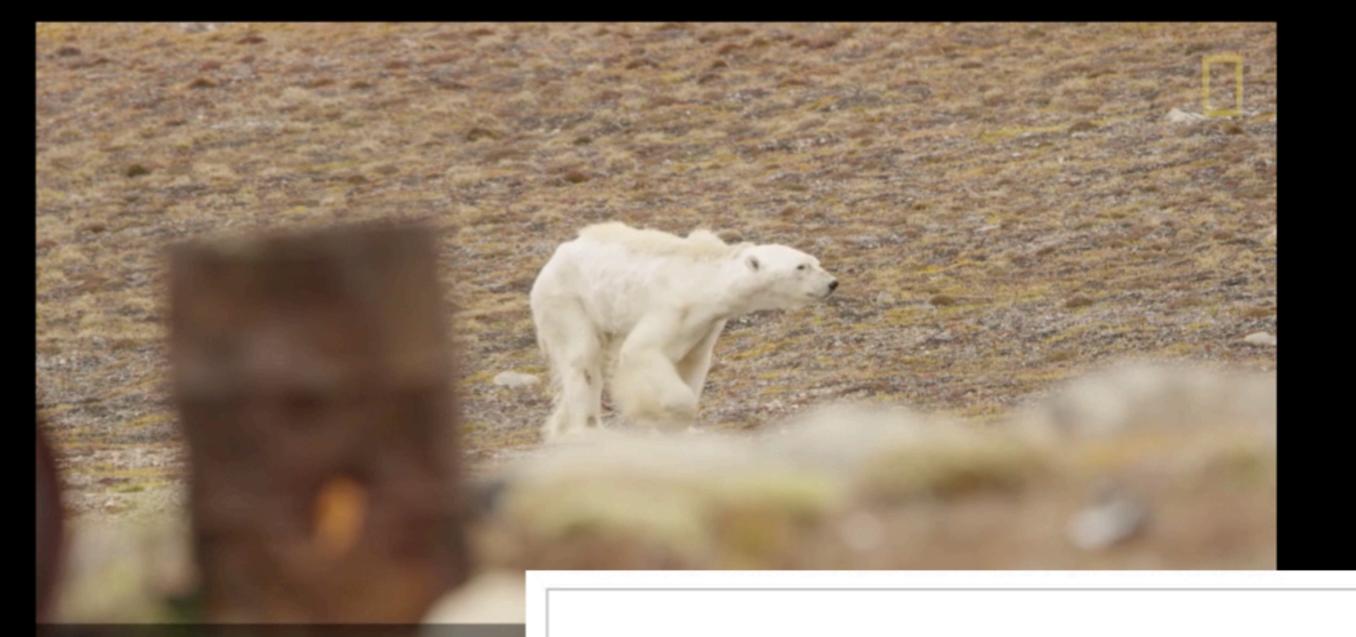


Between 1963 and 2016, twice as many polar bears were killed by hunters as exist in the wild today



Heart-Wrenching Video Shows Starving Polar Bear on Iceless Land

Lack of sea ice is making it more difficult for polar bears to find food.



THIS IS WHAT A

"National Geographic went too far with the caption"

Cristina Mittermeier,
 National Geographic

The text on the video above was edited on June 1, 2018 to make it clear that it is impossible to know why the polar bear pictured was starving. An earlier version of the video went too far in suggesting that climate change was responsible (read more). This story was updated on January 19, 2018 to reflect the more specific location of where the photographs were taken.





= 0.03% of plastic waste

The major causes of the Black-Browed Albatross mortality are fishing boats and invasive predators, not plastic



"Illegal fishing by-catch overshadows climate as a driver of [black-browed] albatross population decline."



Nearly nine million Hawksbill sea turtles were hunted for their (bioplastic) shells between 1844 to 1992...







As a result, fossil plastics saved the Hawksbill turtles...



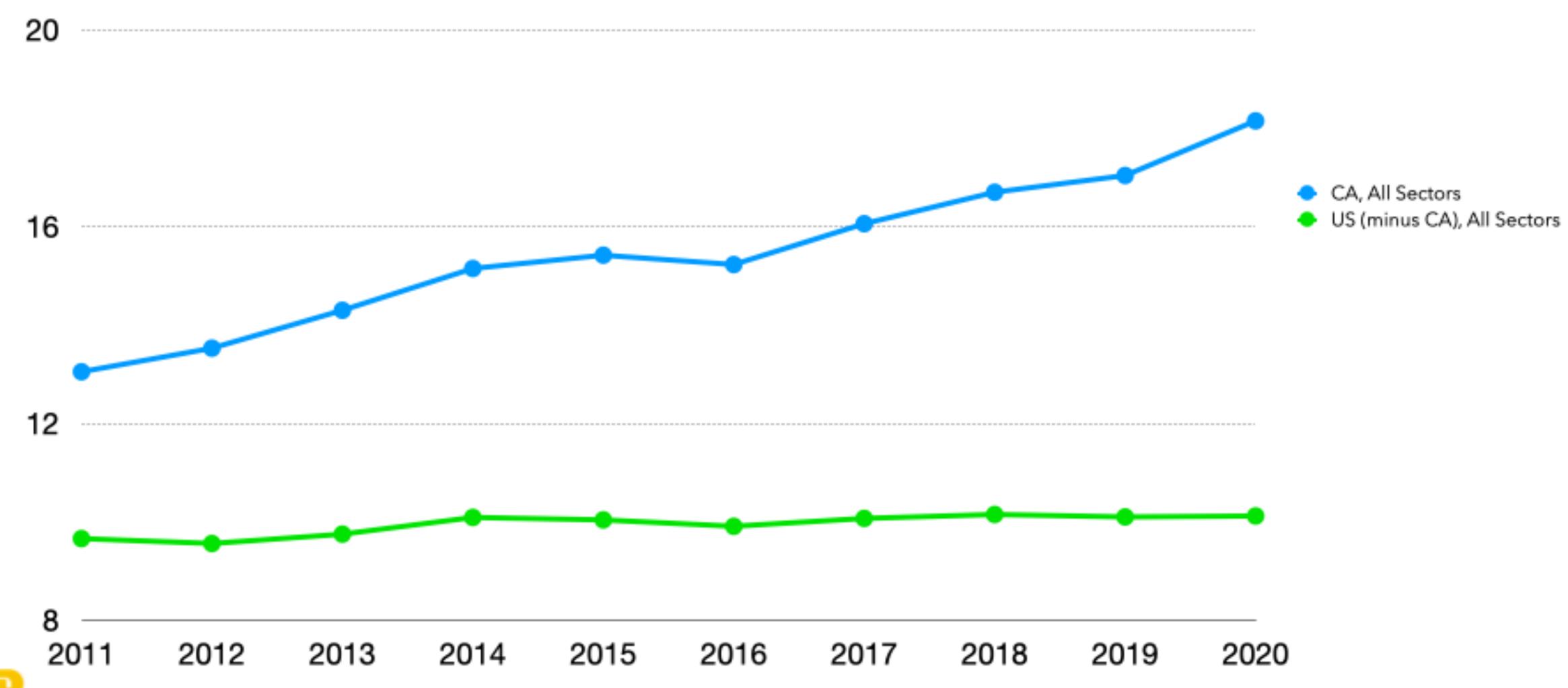


monitoring efforts that underpin this global conservation success story.

news for sea turtle conservation, we show that even small sea turtle populations have the capacity to recover, that is, Allee effects appear unimportant. Positive trends in abundance are likely linked to the effective protection of eggs and nesting females, as well as reduced bycatch. However, conservation concerns remain, such as the decline in leatherback turtles in the Eastern and Western Pacific. Furthermore, we also show that, often, time series are too short to identify trends in abundance. Our findings highlight the importance of continued conservation and

Source: Mazaris et al., Sci. Adv. 2017;3: e1600730 20 September 2017

Electricity Prices in California rose 7x more than in rest of the U.S.

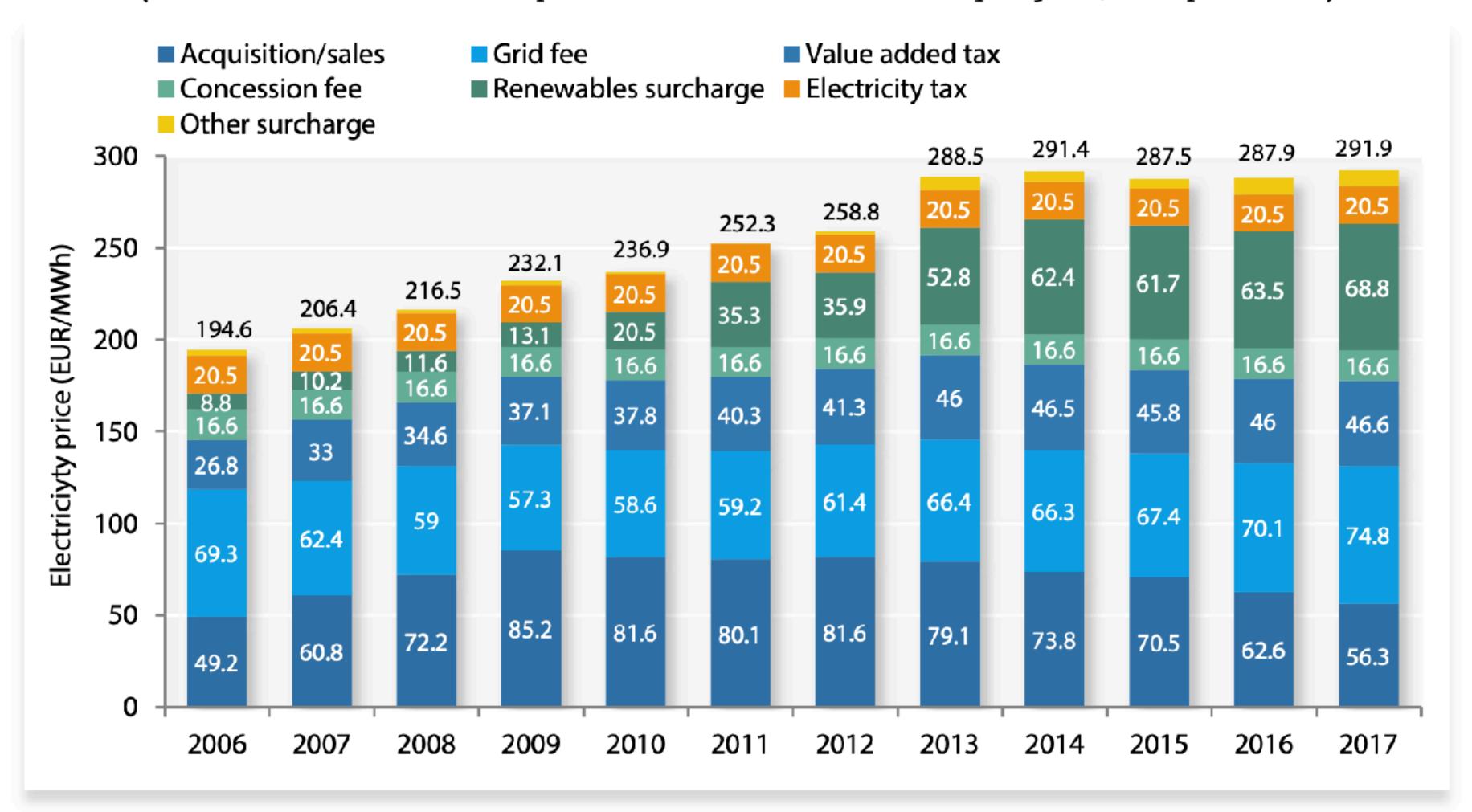




German Power Prices Rose 50% – And Are Still Rising

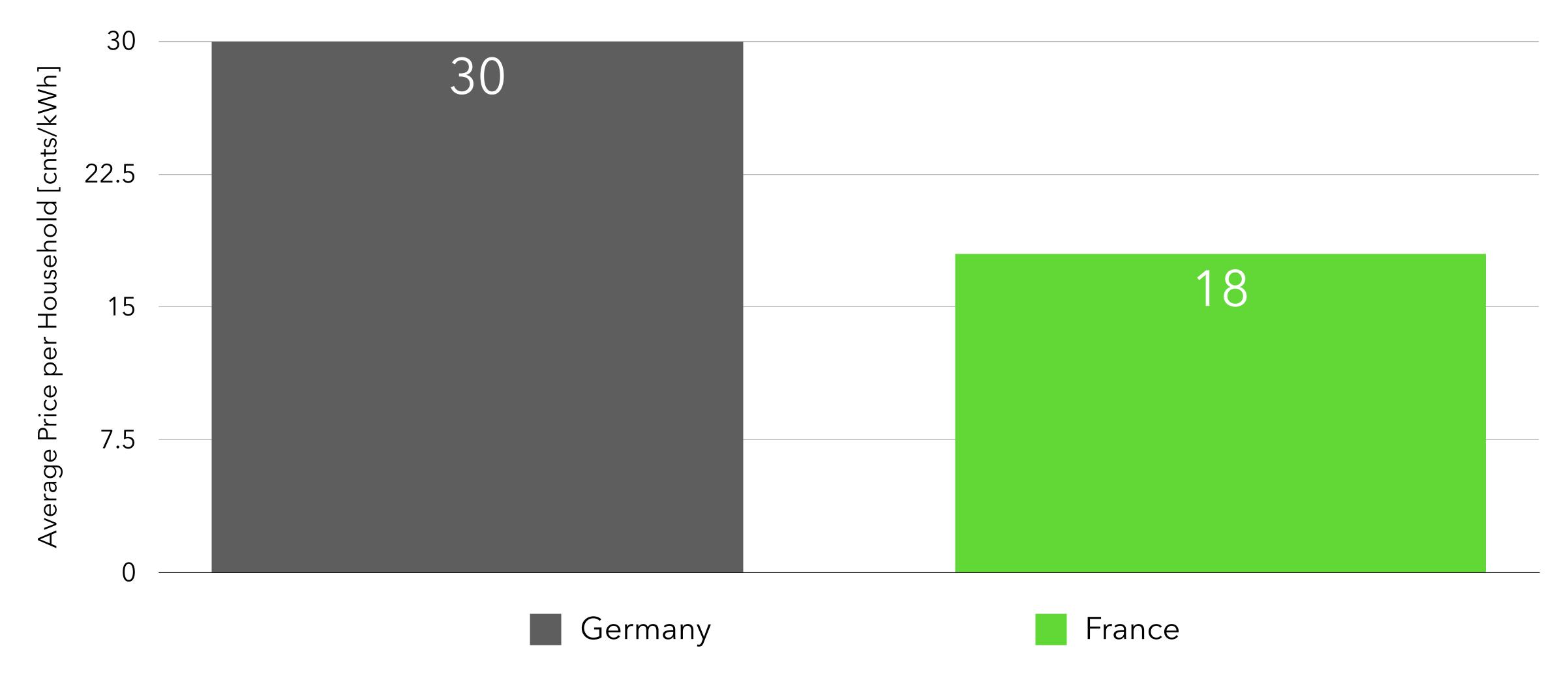
Figure 6. Household electricity prices (<3 500 kWh per year) in Germany

(Households with consumption of less than 3 500 kWh per year, EUR per MWh)



Source: Adapted from BDEW, 2017.

German electricity is nearly twice as expensive as French electricity

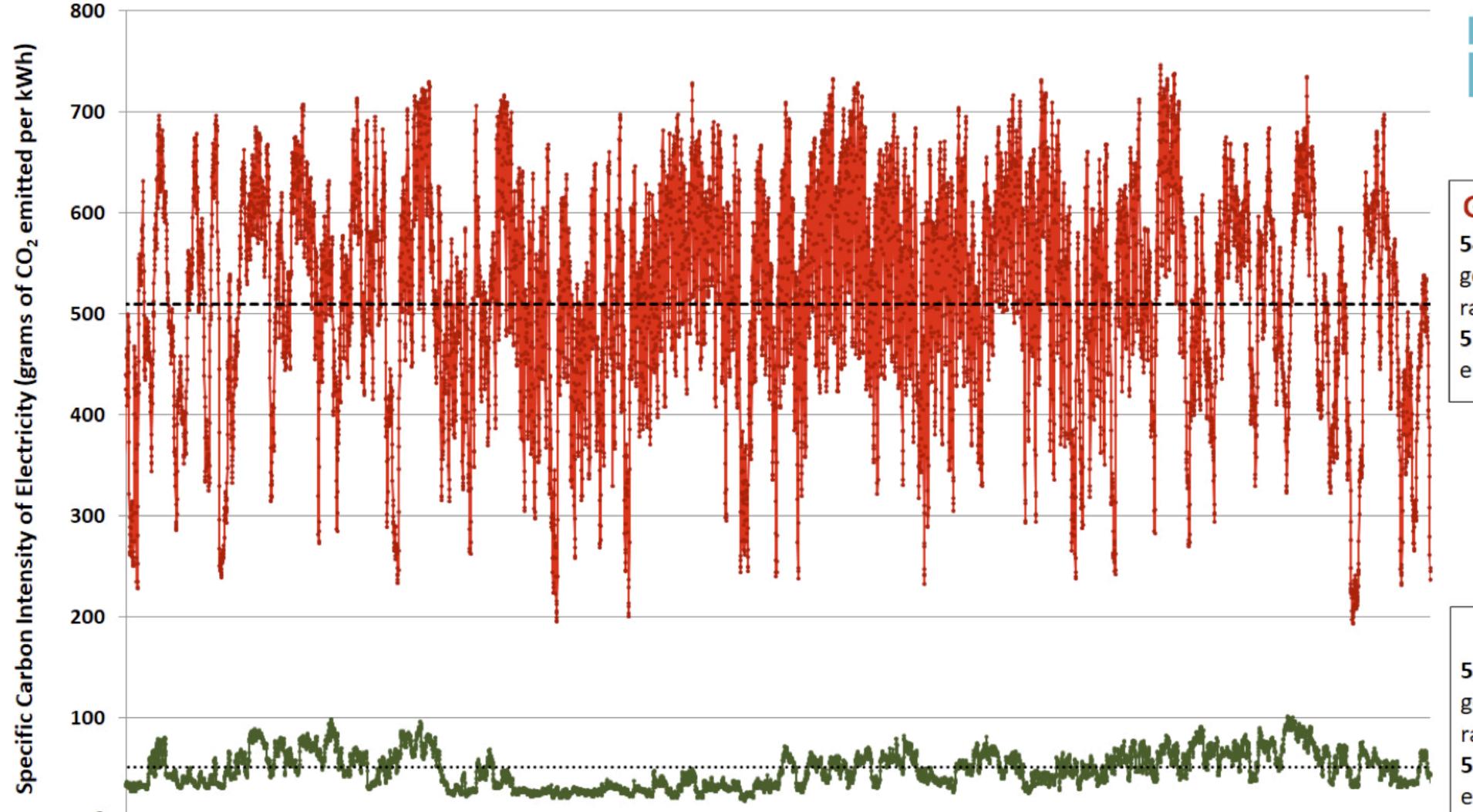




Source: Eurostat, 2018

How dirty was French and German electricity production in 2018? A Comparison of Hourly Specific Carbon Intensity





Germany in 2018:

540 TWh of electricity generated at an average rate of approximately 510 grams of CO₂ emitted per kWh

France in 2018:

547 TWh of electricity generated at an average rate of approximately 51 grams of CO₂ emitted per kWh

Hourly generation data from Fraunhofer ISE (Germany) and RTE (France), as of February 28, 2019. Conversion of German generation data to Specific Carbon Intensity uses emissions factors of 1150g, 900g, 369g, 780g, and 983g of CO2 per kWh for lignite, hard coal, natural gas, oil, and biomass (respectively). Conversion of French generation data to Specific Carbon Intensity uses RTE-France's emissions factors.

June

July

August

February

March

January

April

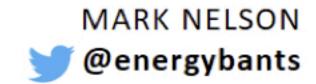
May

October

September

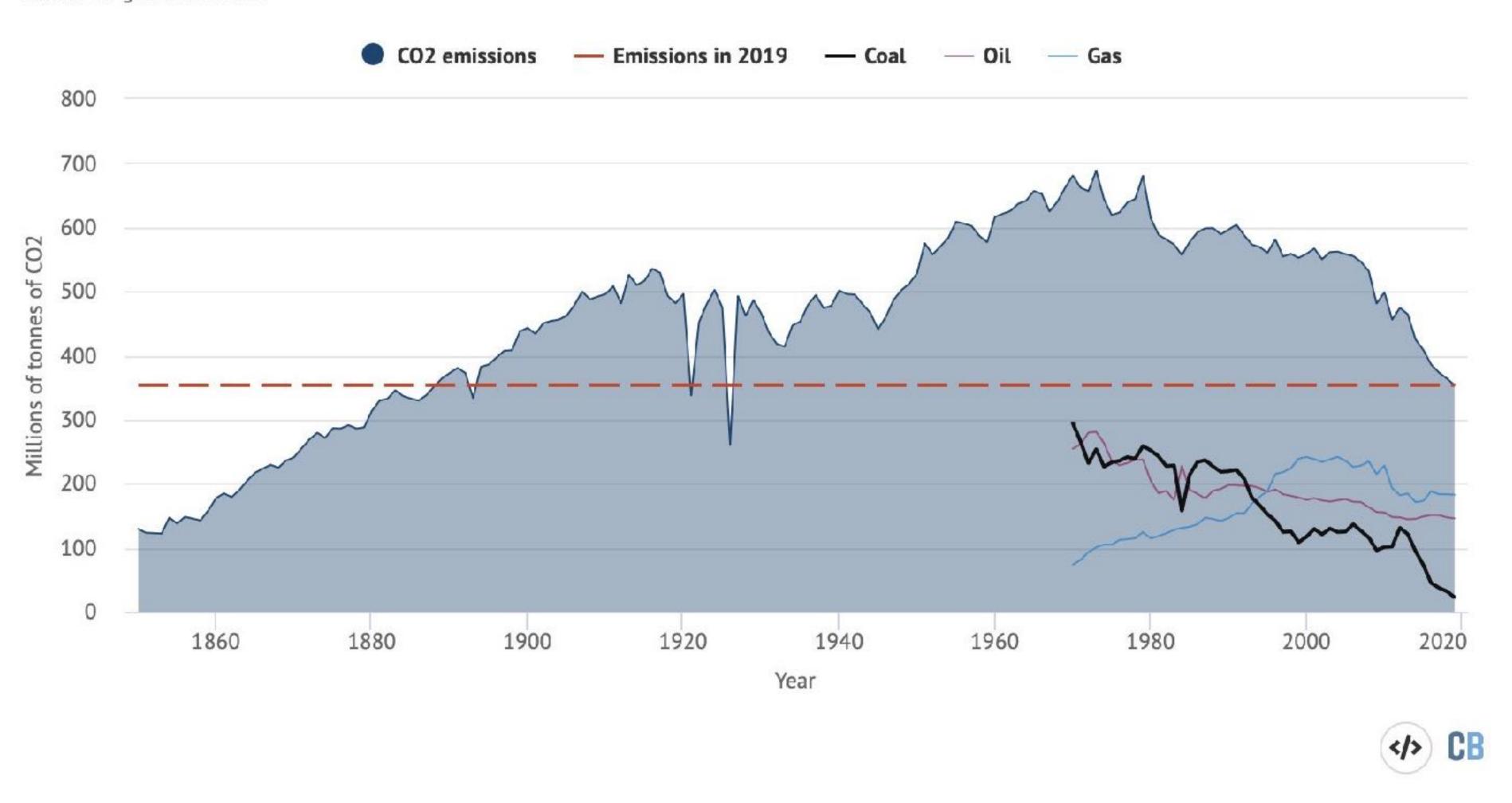
December

November



UK CO2 emissions in 2019 are the lowest since 1888*

The 2.9% cut was driven again by coal, with oil and gas CO2 unchanged *outside of general strikes



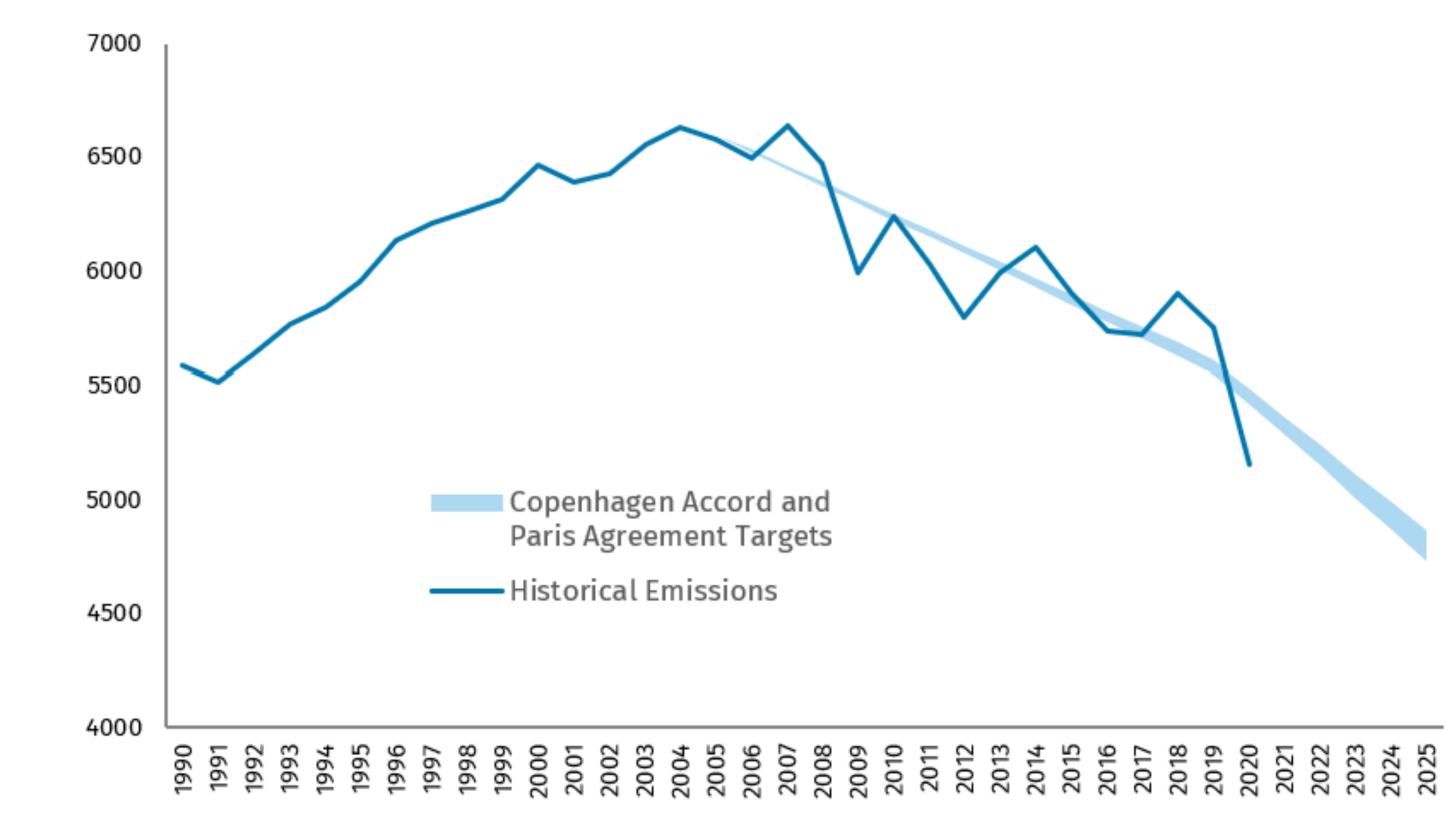
The UK's CO2 emissions 1850-2019, millions of tonnes (blue area) and the level in 2019 (dashed red line). Emissions from coal, oil and gas are shown from 1970 onwards. Source: BEIS, Carbon Brief analysis and the World Resources Institute CAIT data explorer. The CAIT data has been adjusted because it excludes emissions from land use and forestry. Chart by Carbon Brief using Highcharts.

U.S. Is World Climate Leader

"The U.S. saw the largest decline in energy-related CO₂ emissions in 2019 on a country basis... US emissions are now down almost 1 Gt from their peak in the year 2000, the largest absolute decline by any country over that period." – International Energy Agency, 2020

Net US GHG emissions relative to international commitments

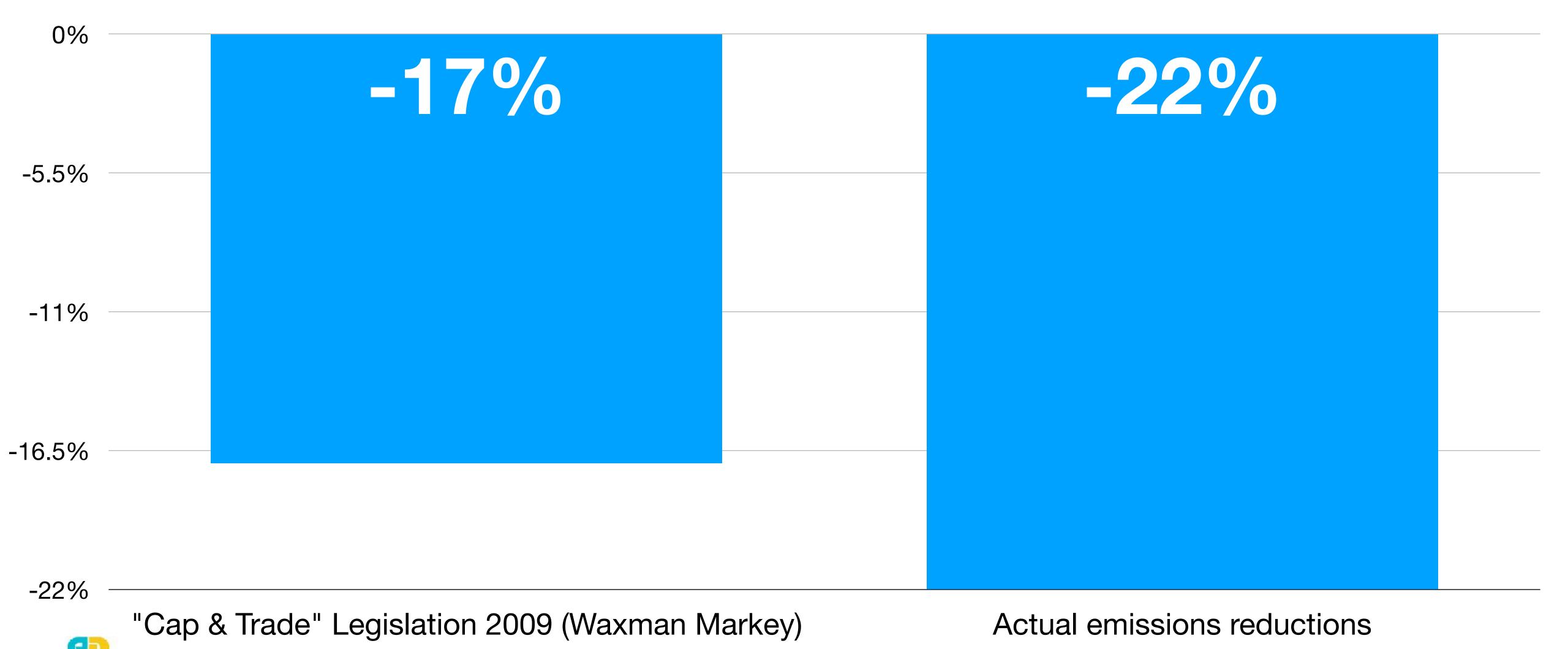
Million metric tons CO₂e, IPCC definitions, excludes international bunkers



Source: ClimateDeck



U.S. Reduced Emissions In Reality More Than It Aimed to Under 2009 "Cap & Trade" Climate Legislation



ENVIRONMENTAL

PROGRESS

Source: Kate Larsen et. Al, "Preliminary U.S. Greenhouse Gas Emissions Estimates for 2020," Rhodium Group, January 12, 2021, https://rhg.com/research/preliminary-us-emissions-2020/

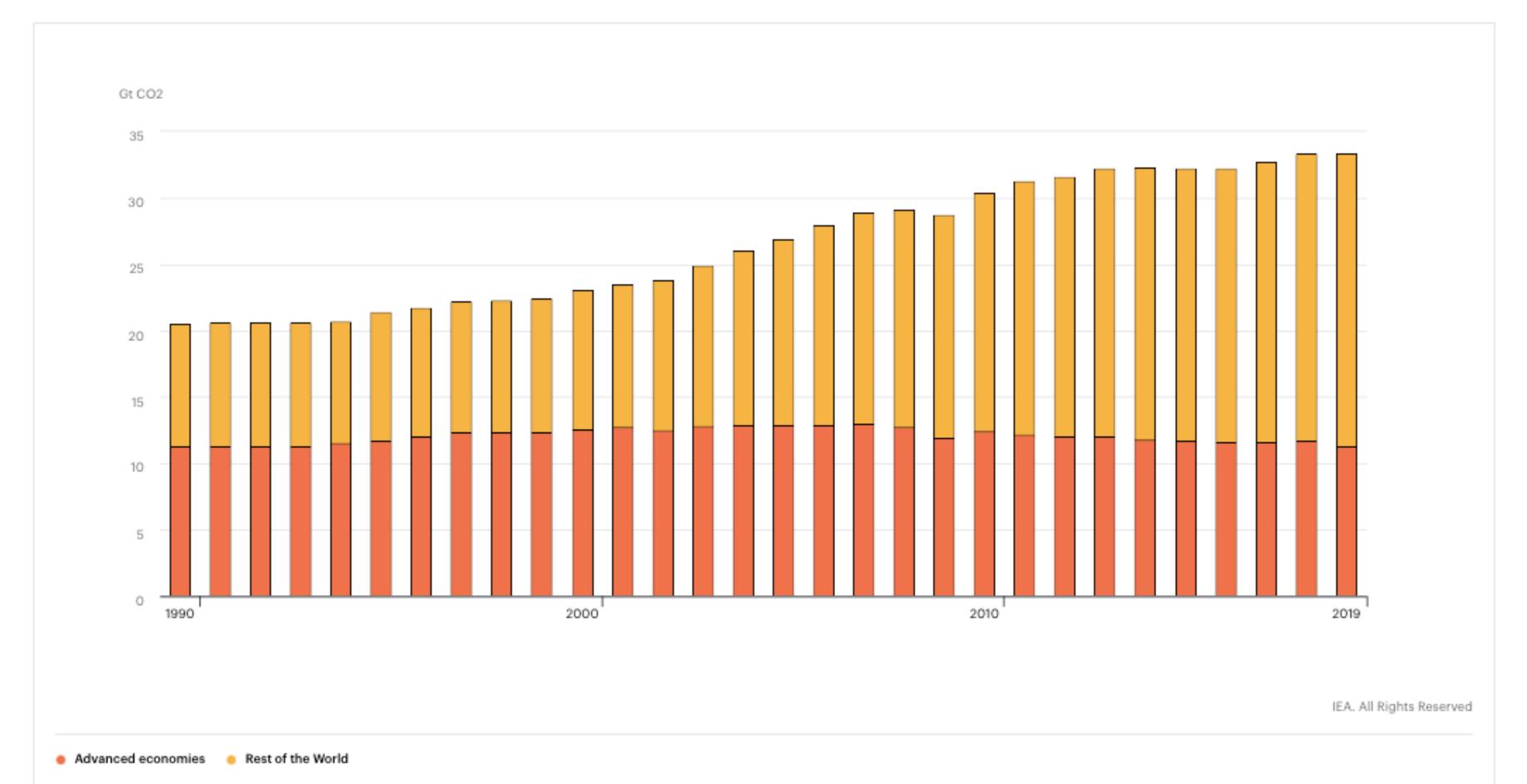
World near peak emissions

Energy related CO2 emissions, 1990-2019

Last updated 11 Feb 2020

Download chart ↓





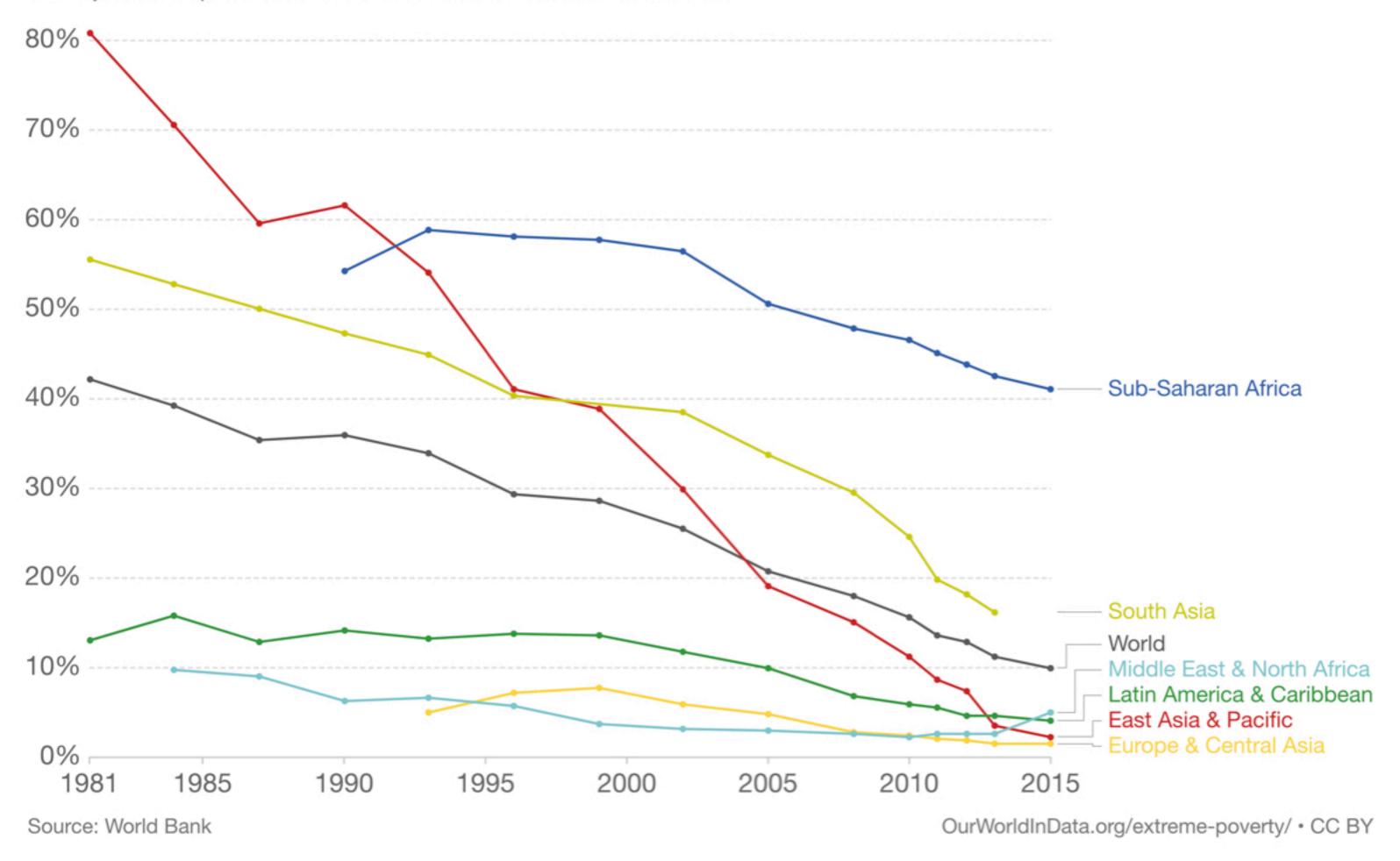


What's going on?

Share of population living in extreme poverty by world region



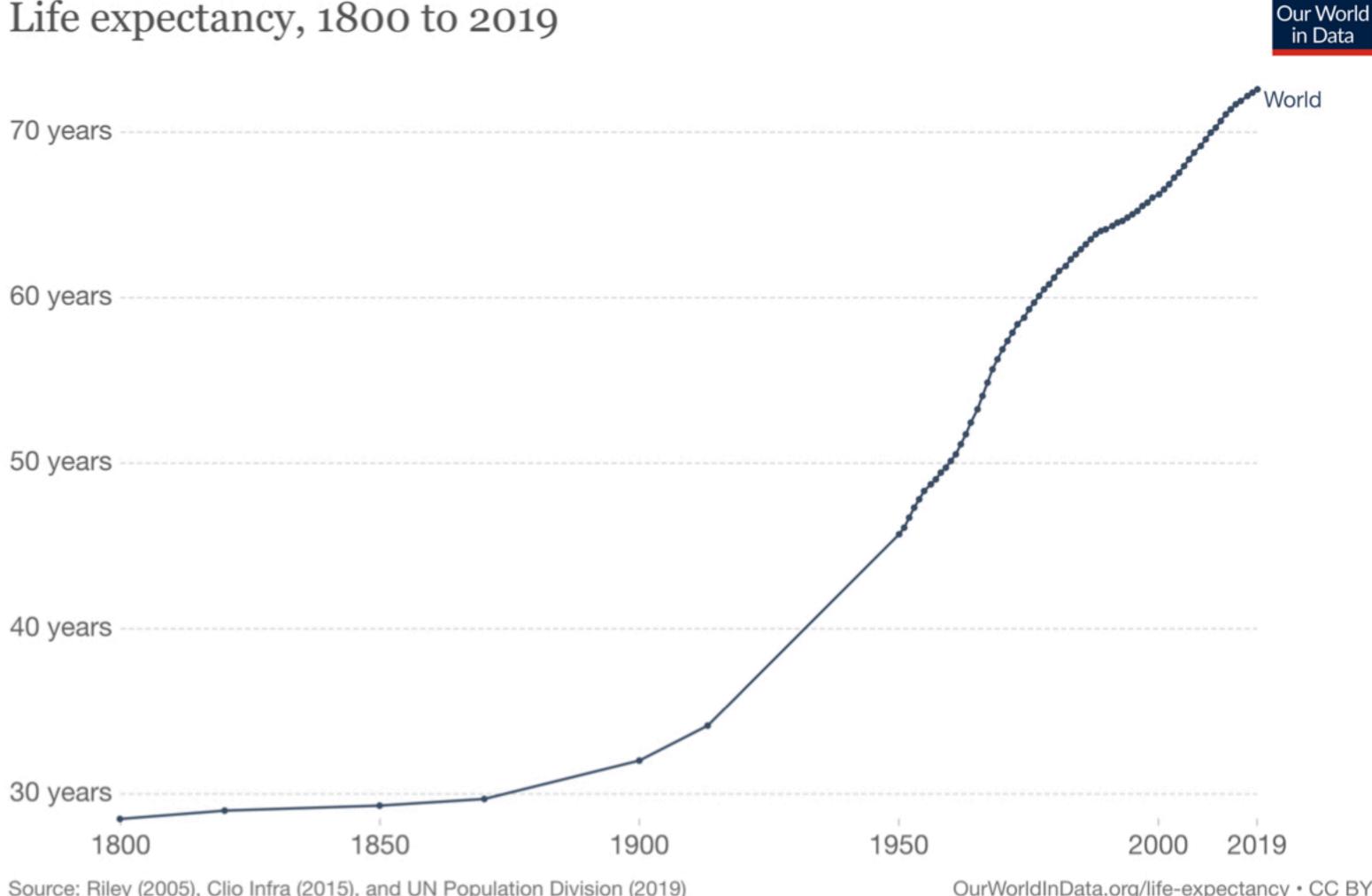
Extreme poverty is defined as living with less than 1.90\$ per day (in 2011 International Dollar). International dollars are adjusted for price differences across countries and across time.



From 1981 to 2015, the global population living in extreme poverty fell from 44% to 10%



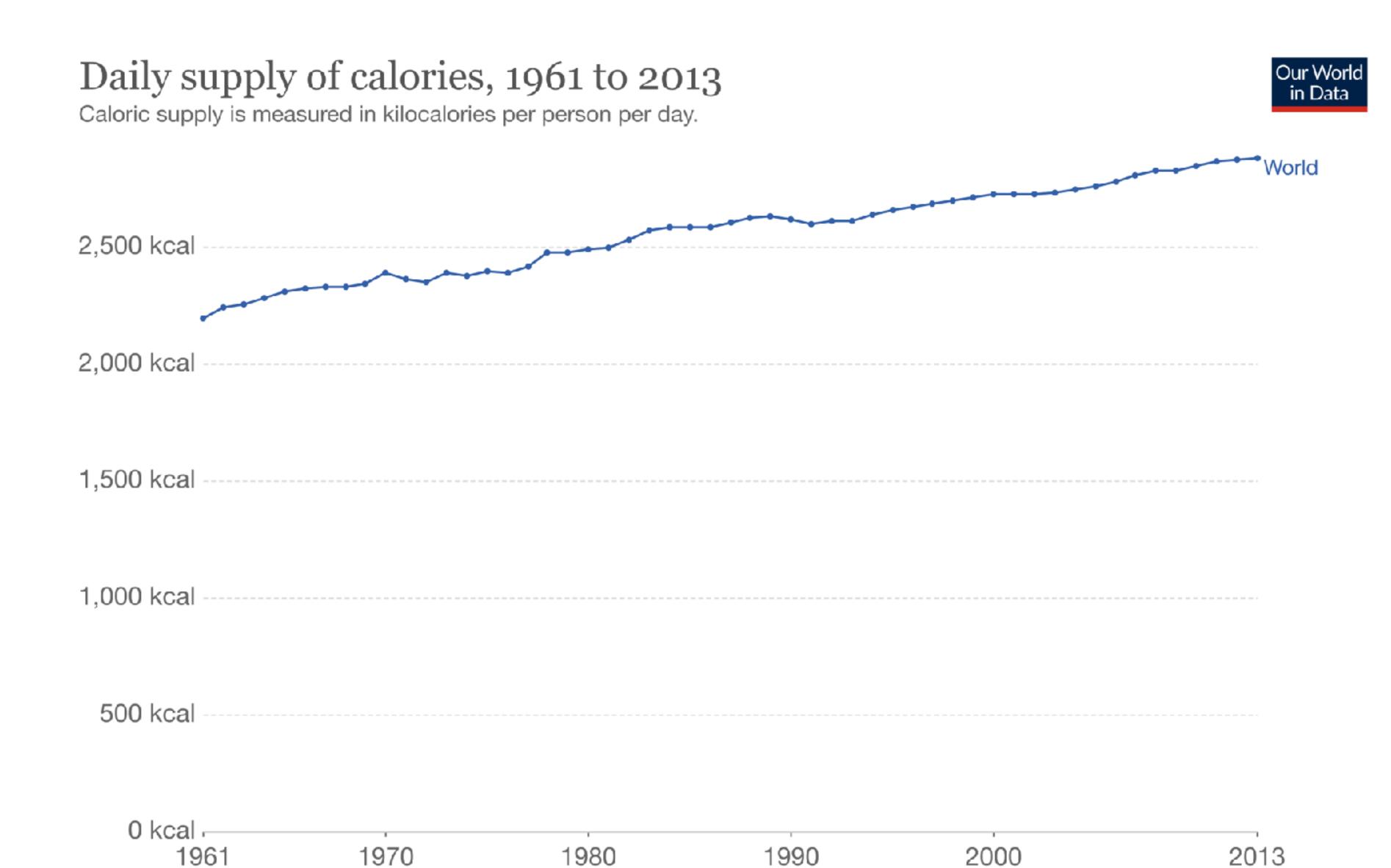
Urbanization, industrialization, and energy consumption have contributed to an extension of life expectancy of over 40 years...



Source: Riley (2005), Clio Infra (2015), and UN Population Division (2019)

Note: Shown is period life expectancy at birth, the average number of years a newborn would live if the pattern of mortality in the given year were to stay the same throughout its life.









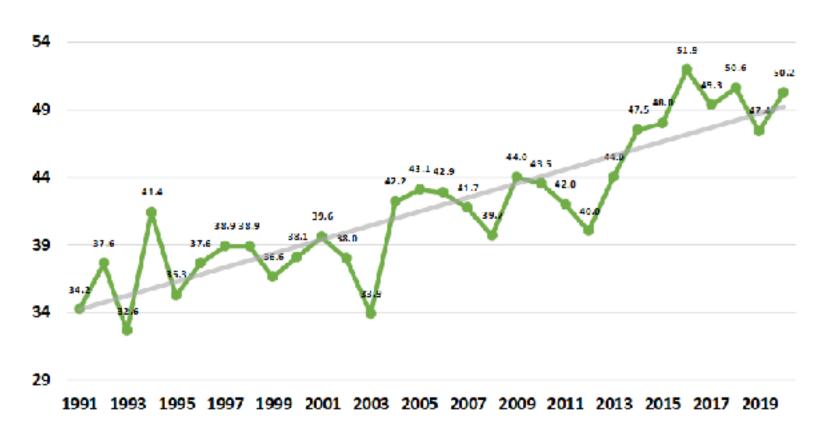
Yields Rising



Soybean Yield **United States**



Bushels per Acre



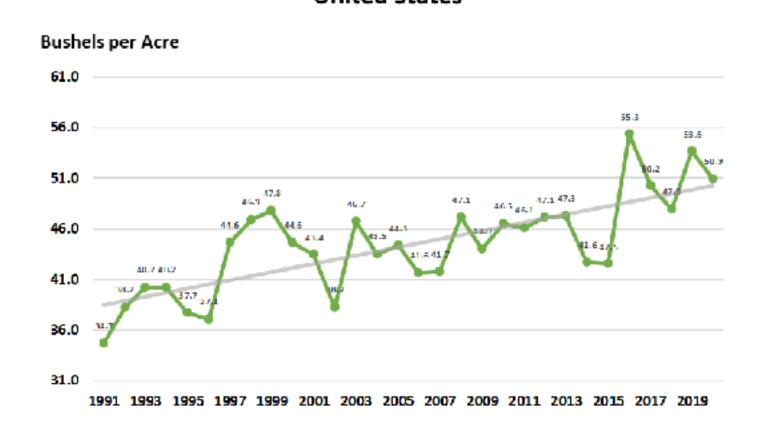


2020 Winter Wheat Yield **United States**



Corn Yield





Bushels per Acre

170

United States

160 150 140 130 110 100

1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017 2019

United States Department of Agriculture National Agricultural Statistics Service

January 12, 2021

United States Department of Agriculture National Agricultural Statistics Service

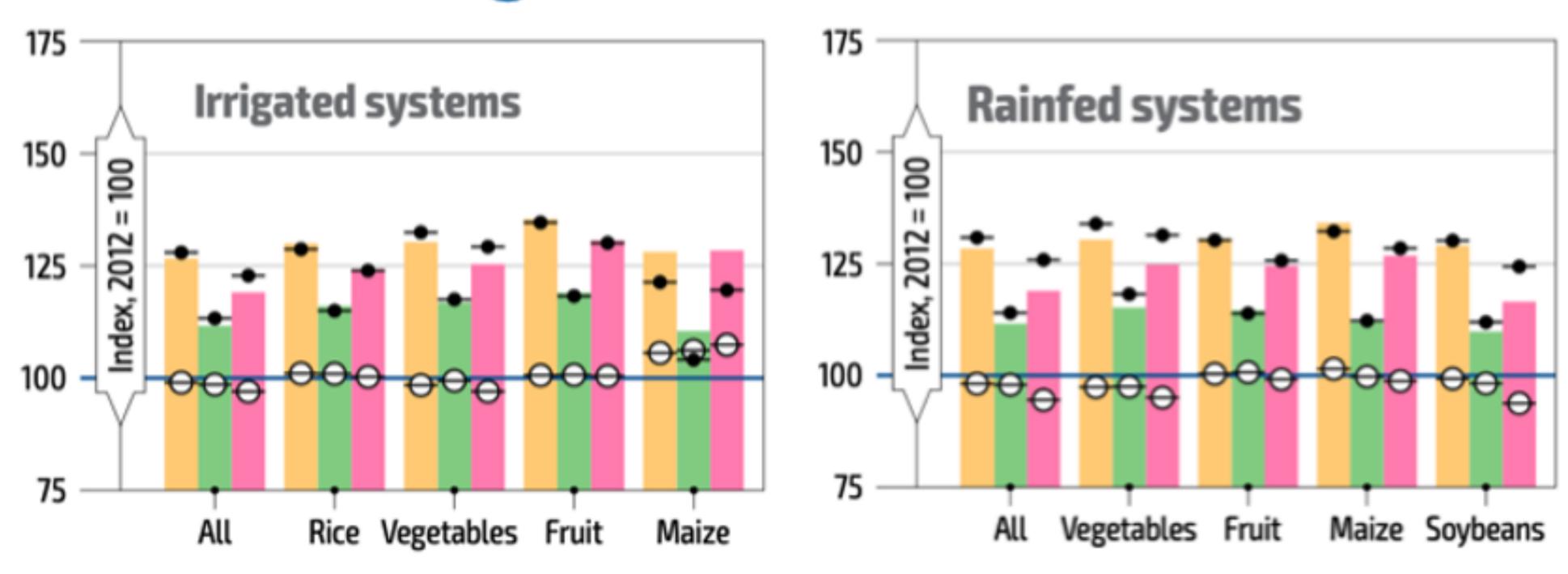
September 30, 2020

United States Department of Agriculture National Agricultural Statistics Service





Tech Change Outweighs Climate Change in Food Production



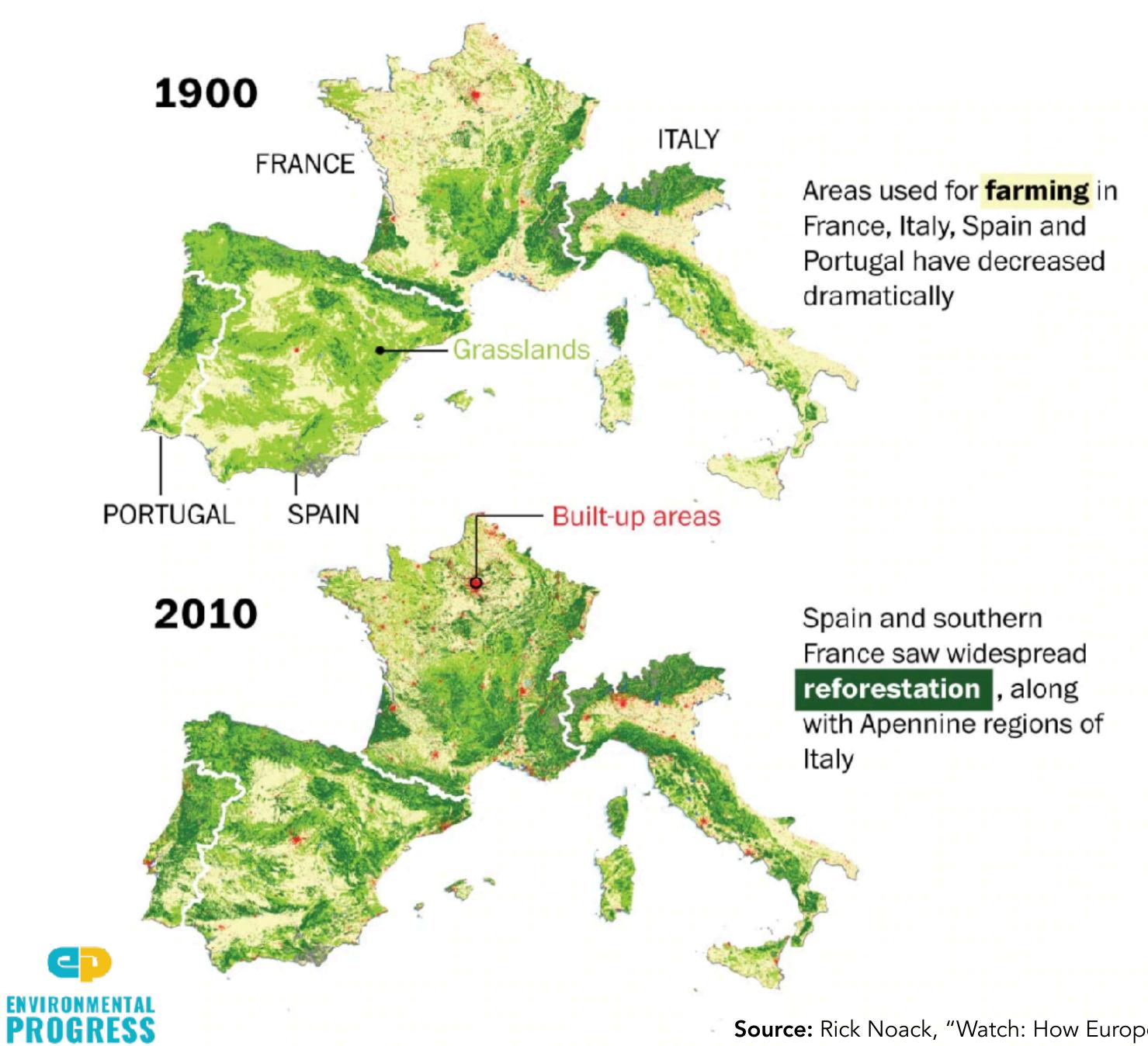
Note: Coloured bars indicate price-independent changes in yields attributed to both technical progress and climate change. The white circles indicate changes in yields arising from climate change, while the black barred dots indicate changes arising from technical progress. Climate change impacts are computed based on FAO-IIASA GAEZ v4 (scenario without CO2 fertilization, median value for five climate models). Changes in yields are shown for the four top commodities, as classified in the FAO GAPS model, in each region, and production system, ranked by value of production in 2012. In this figure, "Citrus" and "Other fruit" are aggregated into "Fruit". "All" refers to the aggregated change in production over the total harvested areas for all crops. Note that the results of research into the impacts of climate change on fruit trees are not conclusive (Ramírez and Kallarackal, 2015).

Sources: FAO Global Perspectives Studies, based on FAOSTAT (various years) for historical crop yields and value of production; FAO-IIASA GAEZ v4 for climate change shifters; and FAO expert judgement for technical shifters.

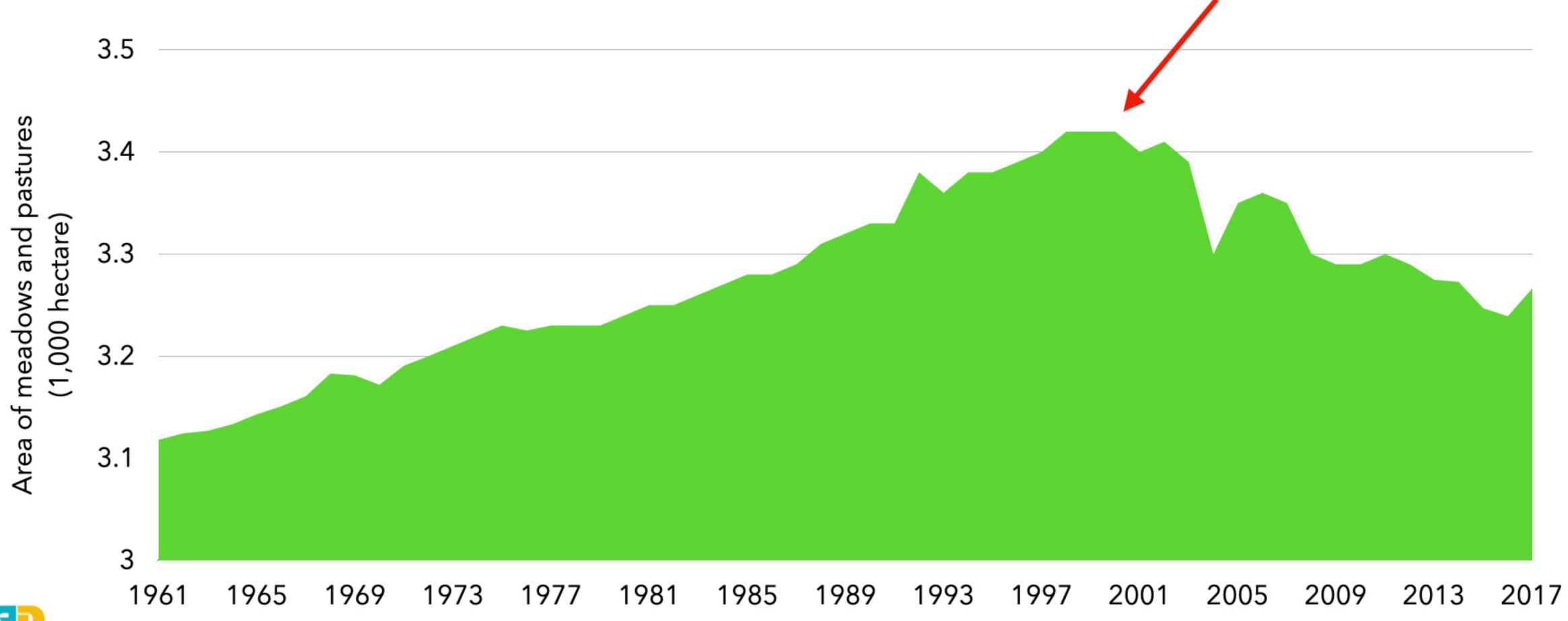
- Technical change
- → Climate change

Combined effects by scenario

- Business as usual
- Towards sustainability
- Stratified societies



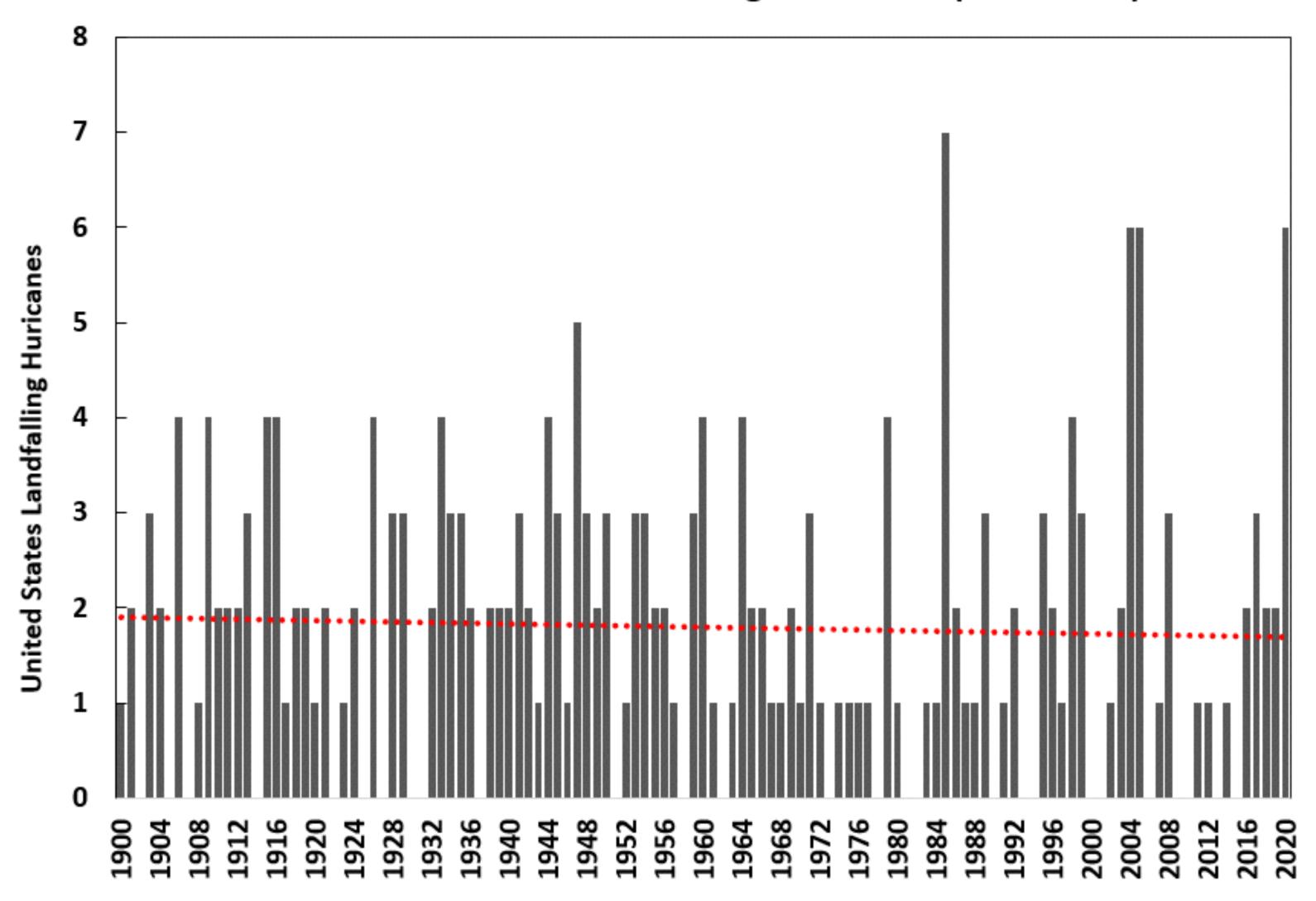
Between 1900 and 2010, the intensification of agriculture allowed Spain and France to reforest The total amount of land humankind uses to produce meat peaked in the year 2000. Since then, land used for livestock and pasture has decreased by an area 80% the size of Alaska





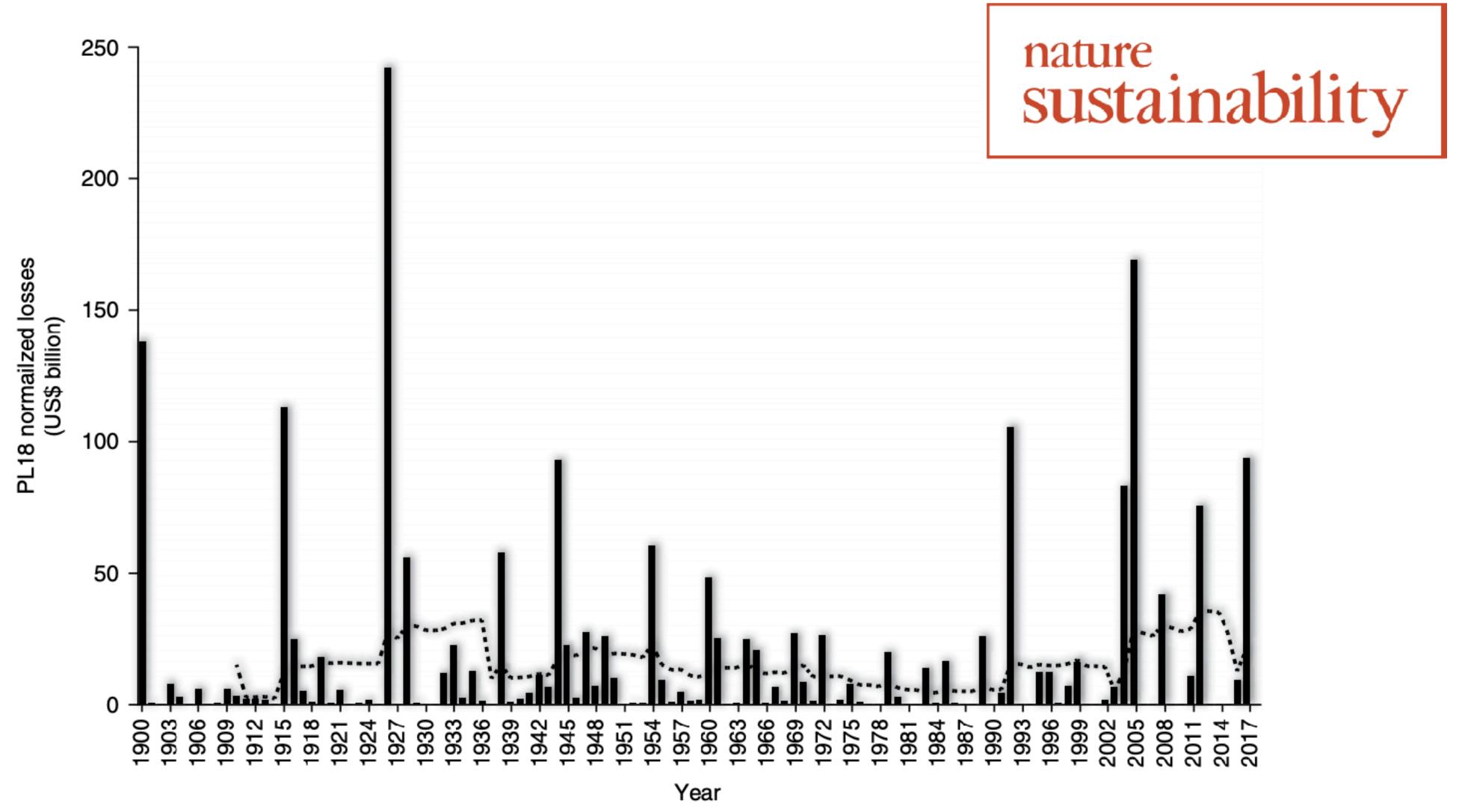
No increase in hurricane frequency

Continental United States Landfalling Hurricanes (1900-2020)





No increase in hurricane damage when normalized for higher wealth





Source: Jessica Weinkle, Chris Landsea, Douglas Collins, et al., "Normalized Hurricane Damage in the Continental United States 1900-2017," Nature Sustainability 1 (2018): 808-813, https://doi.org/10.1038/s41893-018-0165-2

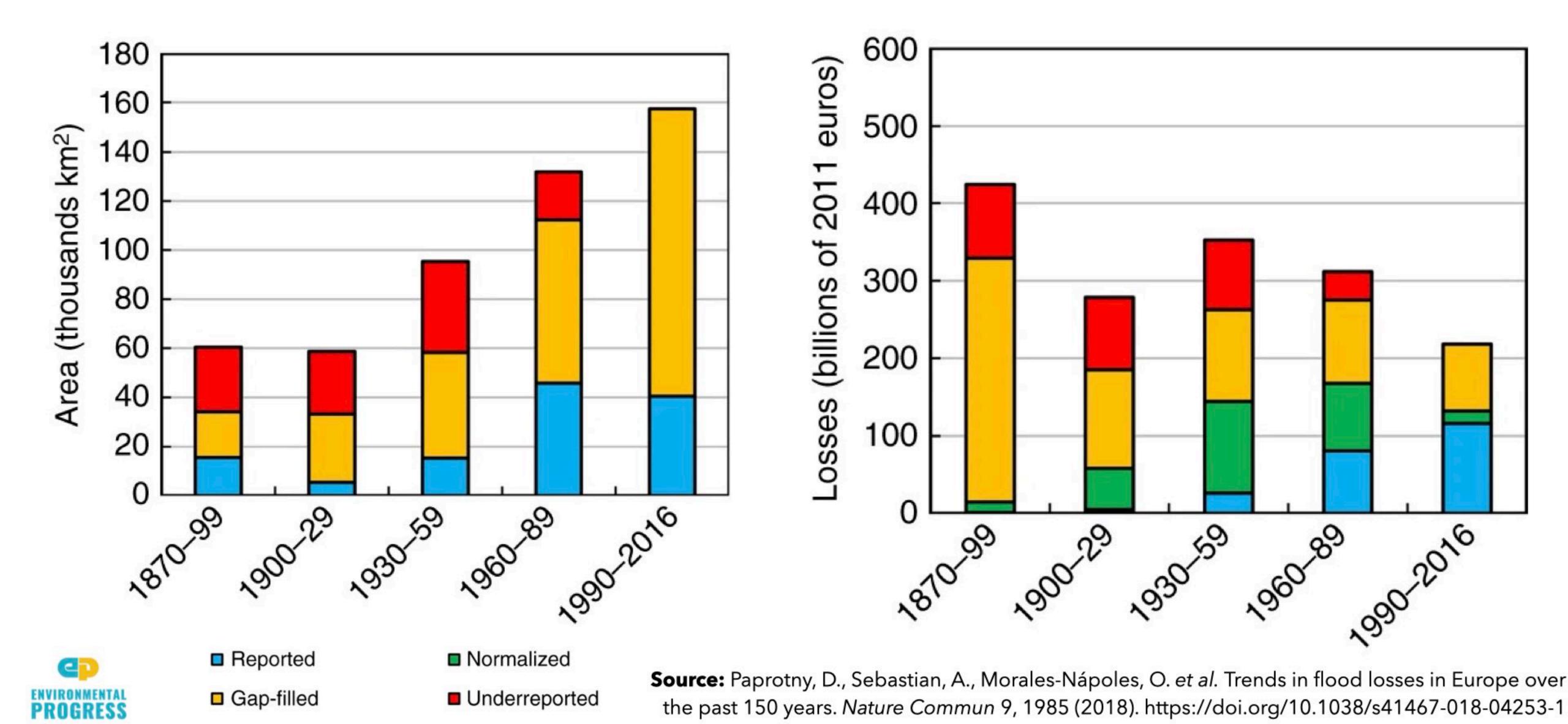
Miami Beach, Then and Now



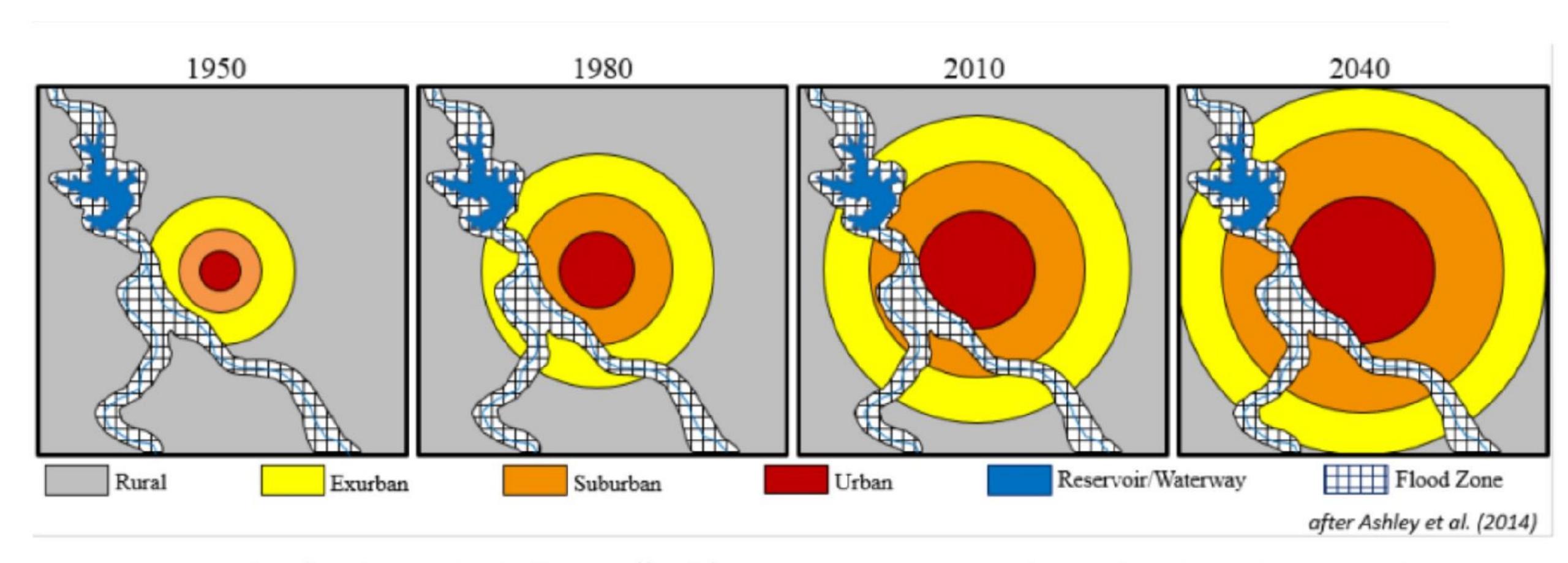




Greater Area Flooded But Less Damage



More people living in flood zones explains rising costs



A conceptual model of the "expanding bull's-eye effect" for a hypothetical metropolitan region that is characterized by increasing development spreading from an urban core over time. A sample **flood** scenario is overlaid to show how expanding development creates larger areas of potential impacts from hazards. Credit: <u>Stephen M. Strader</u>

NOAA & IPCC Predict Far Larger Decline in Hurricane Frequency Than Increase in Intensity



"The model also supports the notion of a substantial decrease (~25%) in the overall number of Atlantic hurricanes and tropical storms... and the lifetime maximum intensity of Atlantic hurricanes will increase by about 5% during the 21st century."



"The total global frequency of tropical cyclone frequency formation will decrease or remain unchanged with increasing global warming."

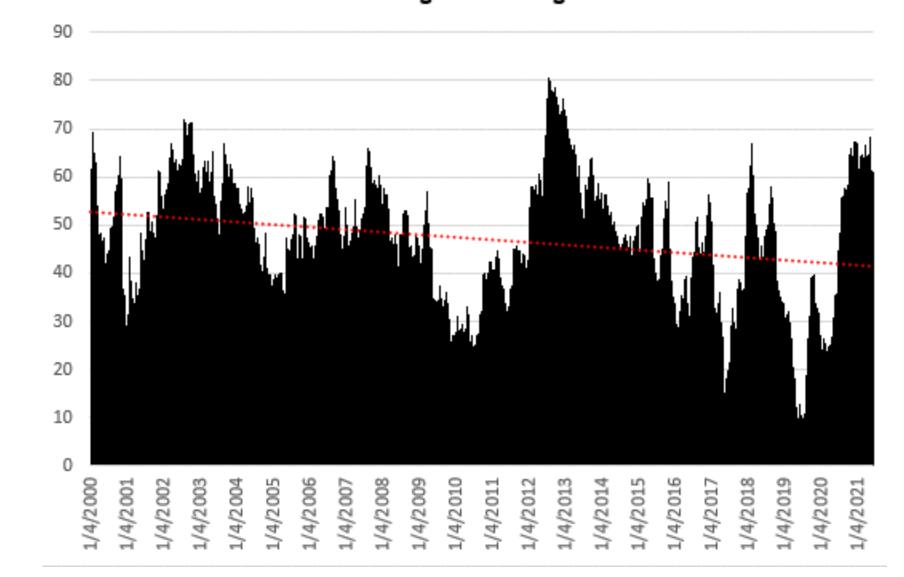
Source: – S.I., N. Nicholls, et al., "A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC)," Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 109-230.

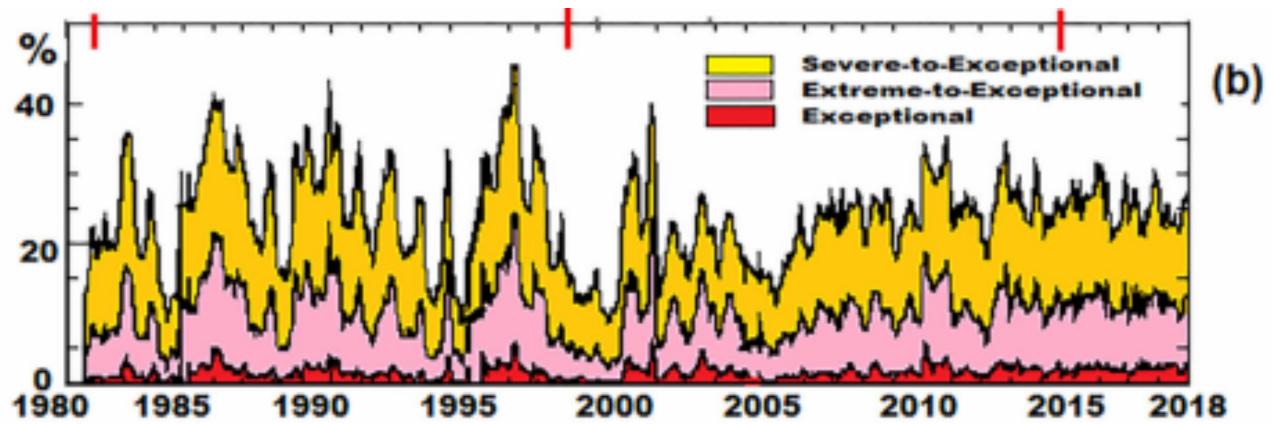
Drought area declining in US & flat globally

"Global and main grain countries' drought area and intensity trends have not been following global climate warming since 1980's"

Felix Kogan , Wei Guo & Wenze Yang (2020) Near 40-year drought trend during 1981-2019 earth warming and food security, Geomatics, Natural Hazards and Risk, 11:1, 469-490, DOI: 10.1080/19475705.2020.1730452

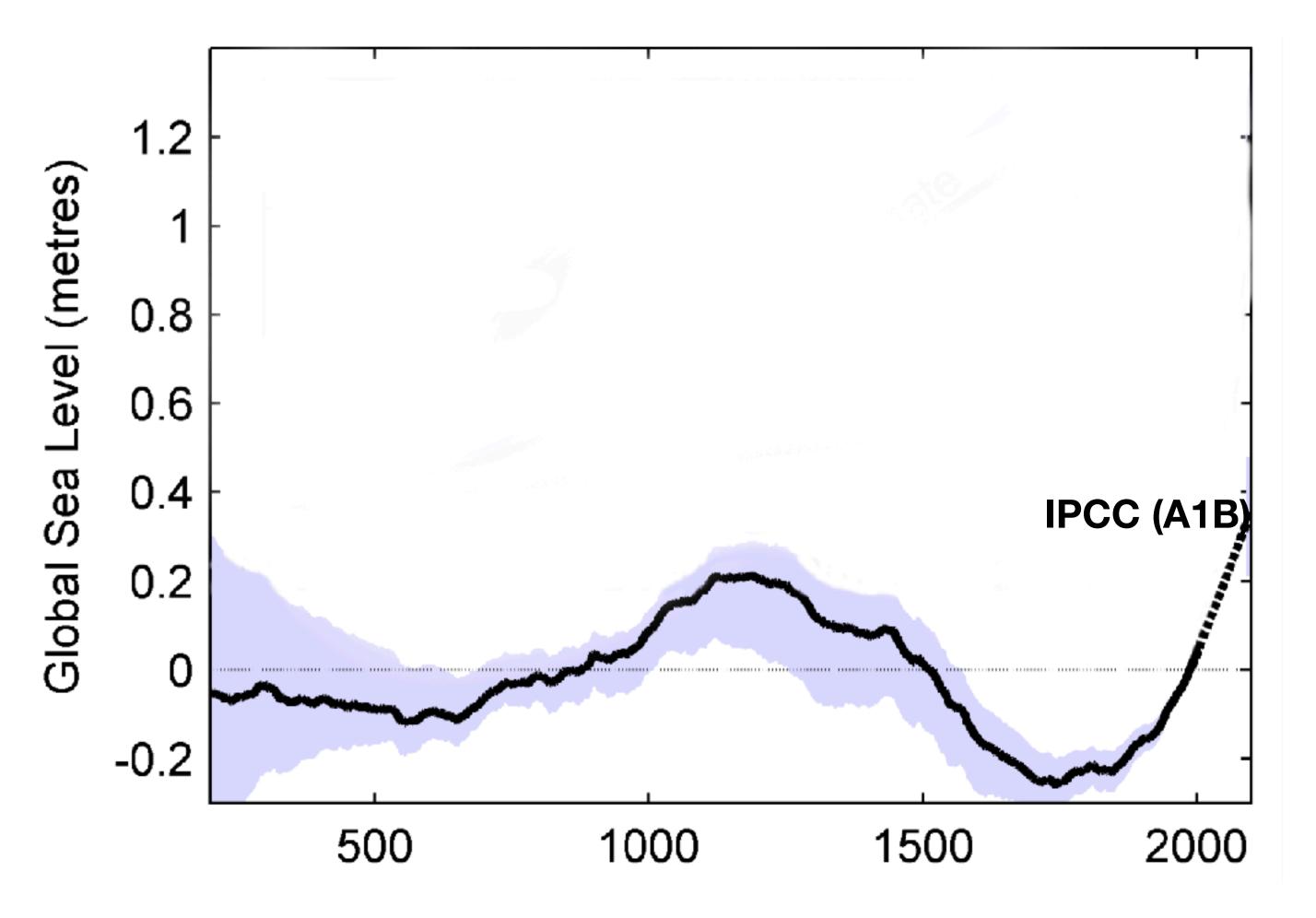
Percent Area of Continential US in Drought: 1 Jan 2000 to 8 June 2021 D0-D4 According to US Drought Monitor





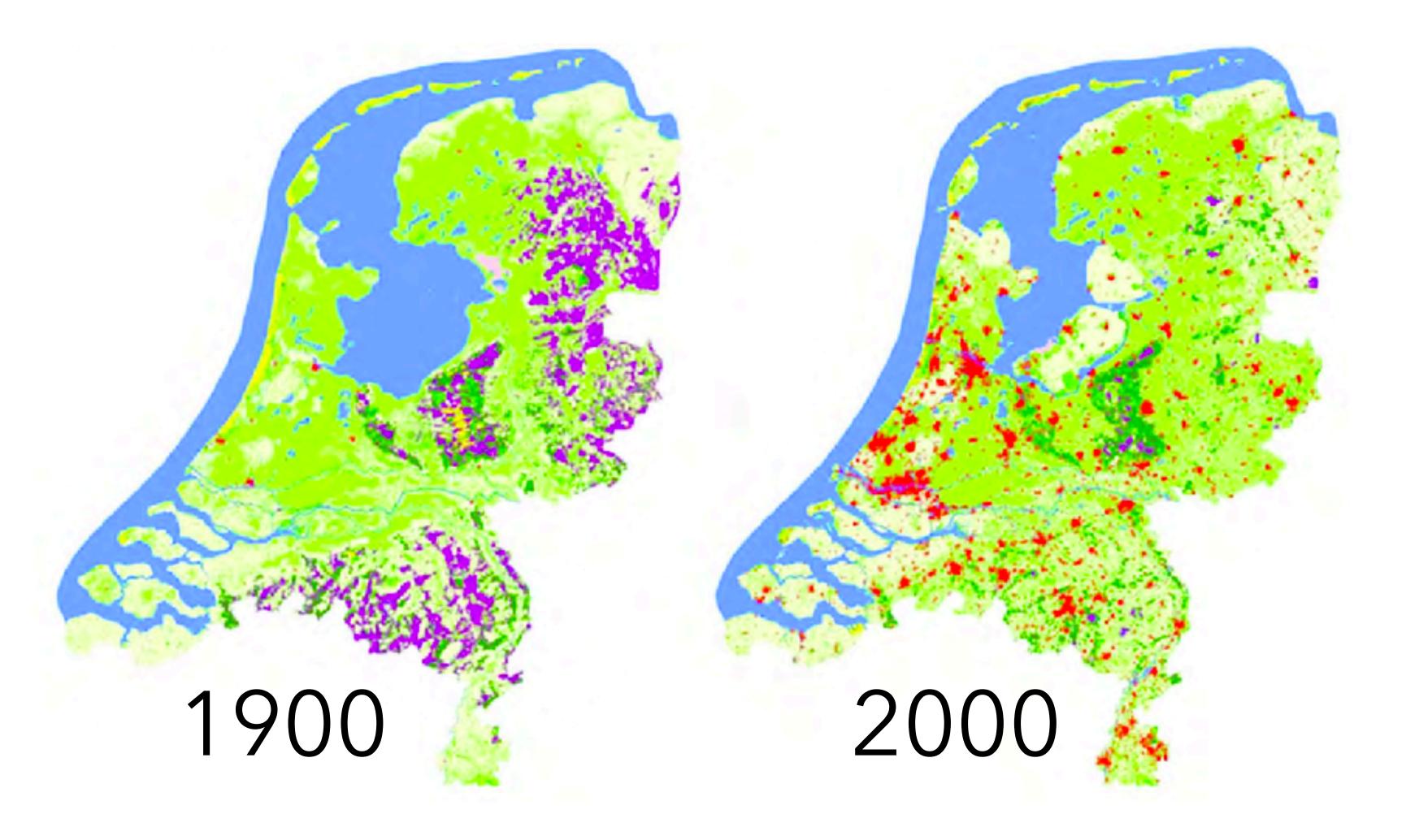


Even if IPCC's predictions prove to be significant under-estimates, the pace of sea level rise will allow time for adaptation





1/3 of the Netherlands lies below sea level, some areas as low as 7 meters





MotherJones

POLITICS

ENVIRONMENT

CRIME AND JUSTICE

FOOD

MEDIA

INVESTIGATIONS

ENVIRONMENT DECEMBER 12, 2017

A Century of Fire Suppression Is Why California Is in Flames

"The wake-up call has already happened."

ELIZABETH SHOGREN

Bio | Follow











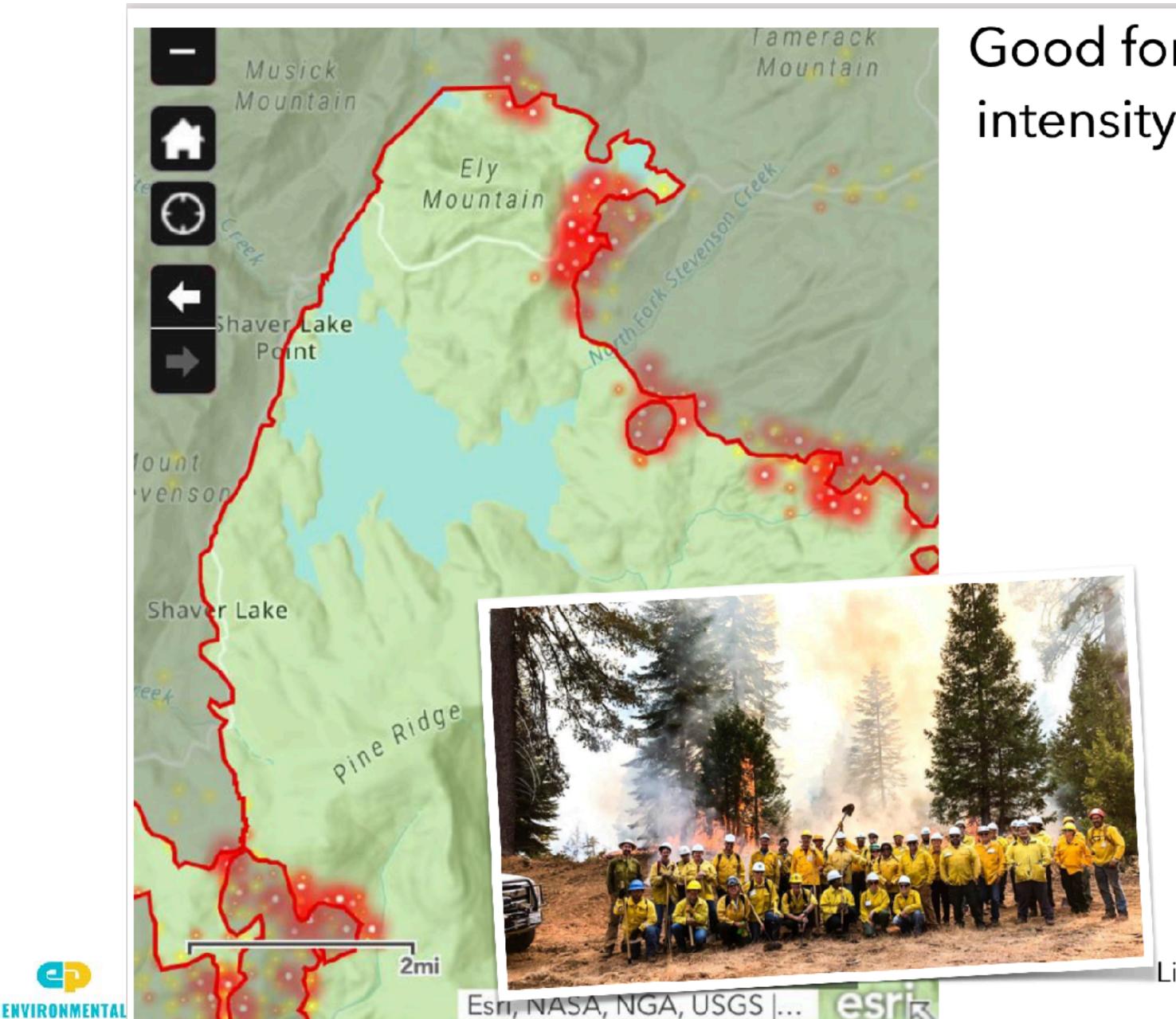












Gp

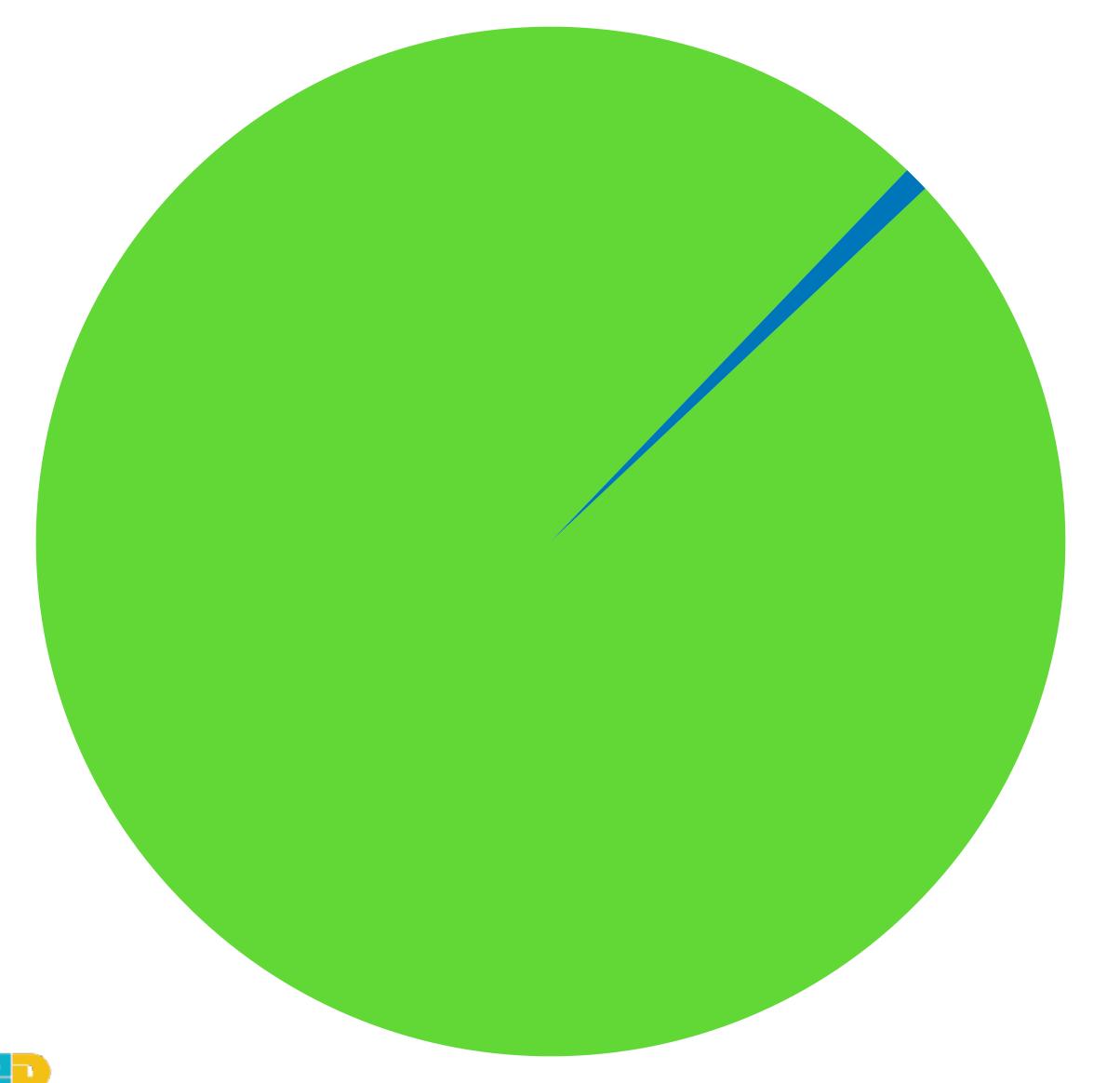
PROGRESS

Good forest management prevents highintensity fires, as California's Shaver Lake proved in 2020.

> "The fire comes up to [Shaver Lake] drops to the ground, and stays out of the tree crowns" – forest historian Jared Dahl Aldern

> "I'm not worried about the fire on our property because it's like a hot prescribed burn. But on the forest service lands it's all fuel, and so if the fire gets in there you know it's going to rage." – Shaver Lake forester Ryan Stewart

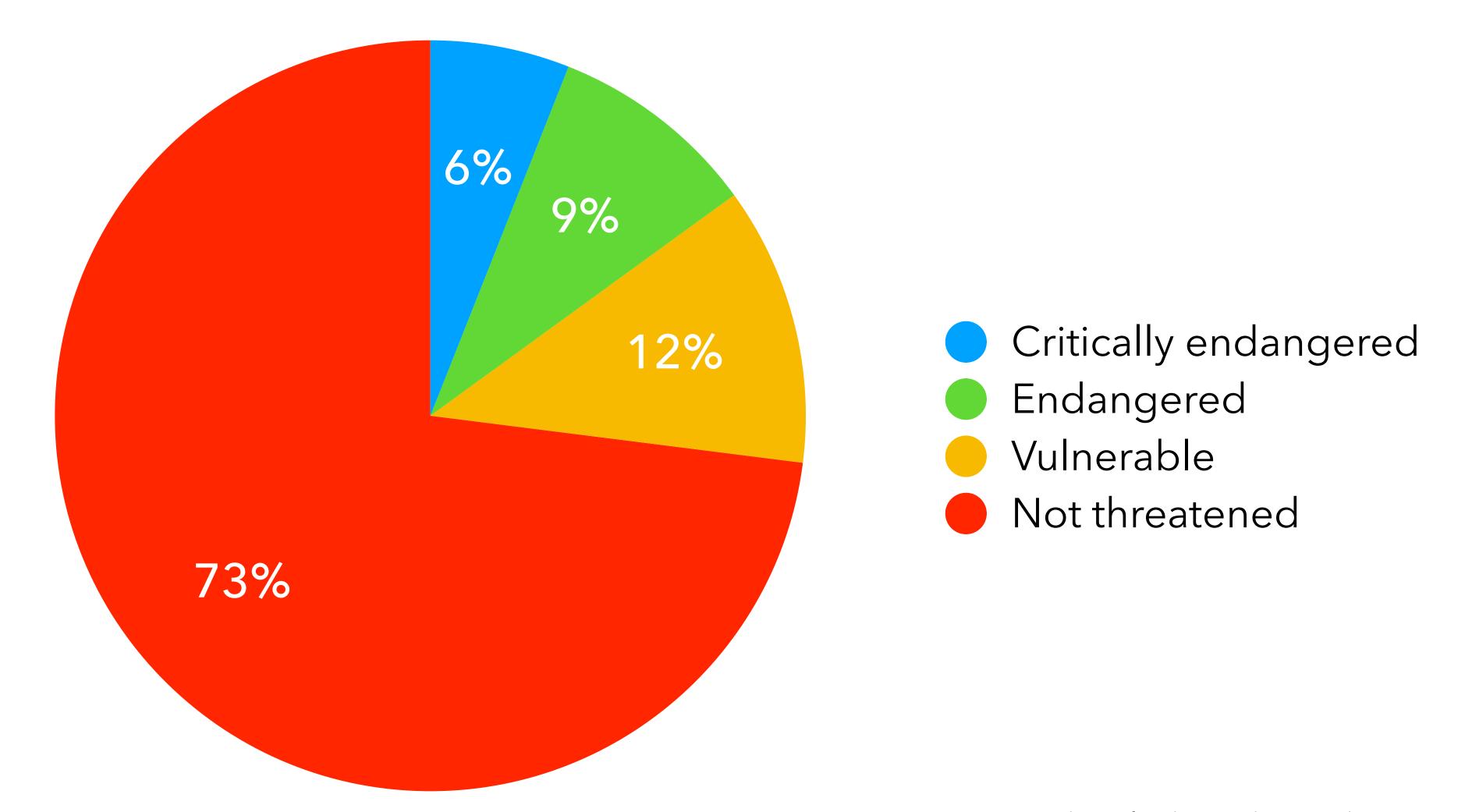
Links to original sources for quotes at Michael Shellenberger, "Forests that Survive Megafires," Forbes, Sept 13, 2020



IUCN estimates that 0.8% of the 112,432 plant, animal, and insect species on Earth within its data have gone extinct since 1500

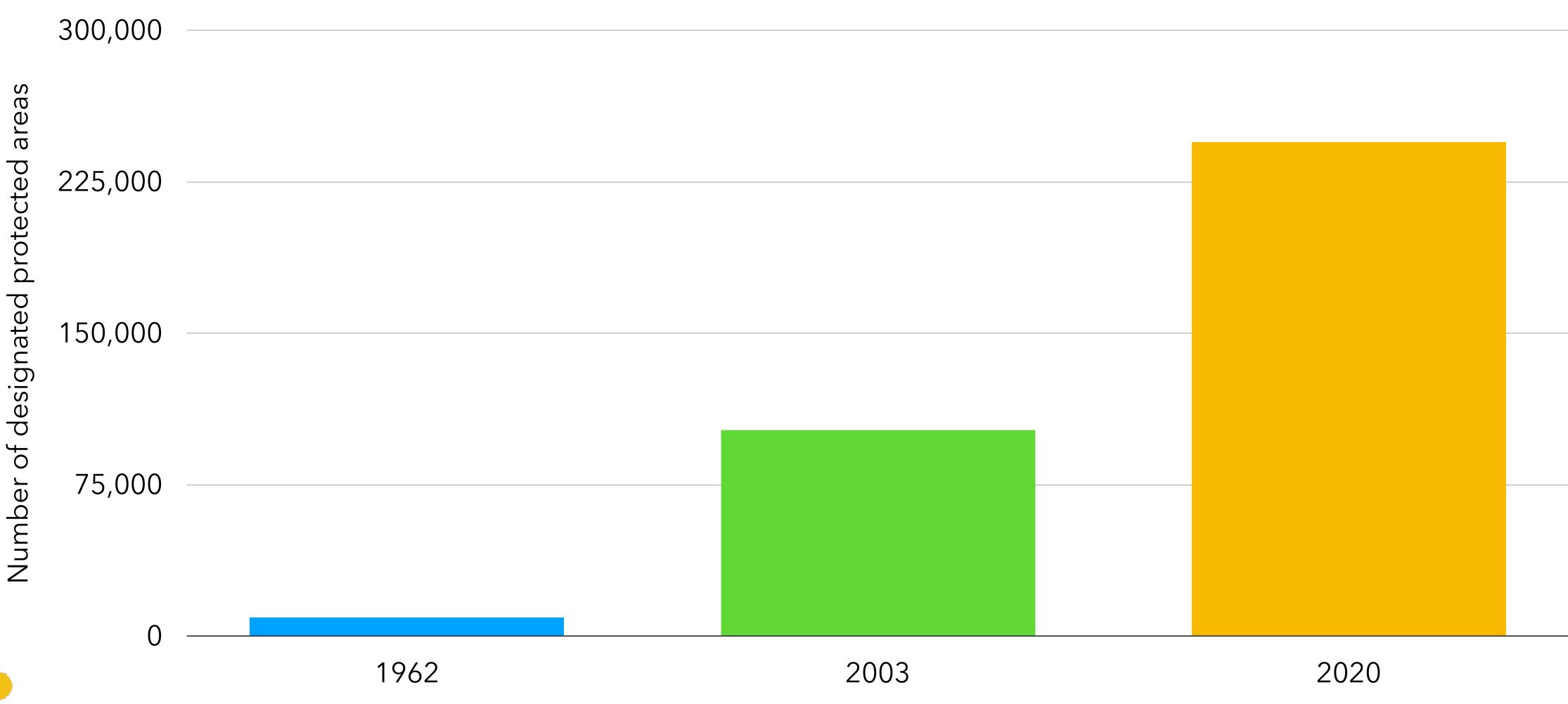


The International Union for the Conservation of Nature (IUCN) estimates that nearly **three-fourths** of all species are not threatened





There are more than **25x** the number of designated protected areas in the world today than in 1962

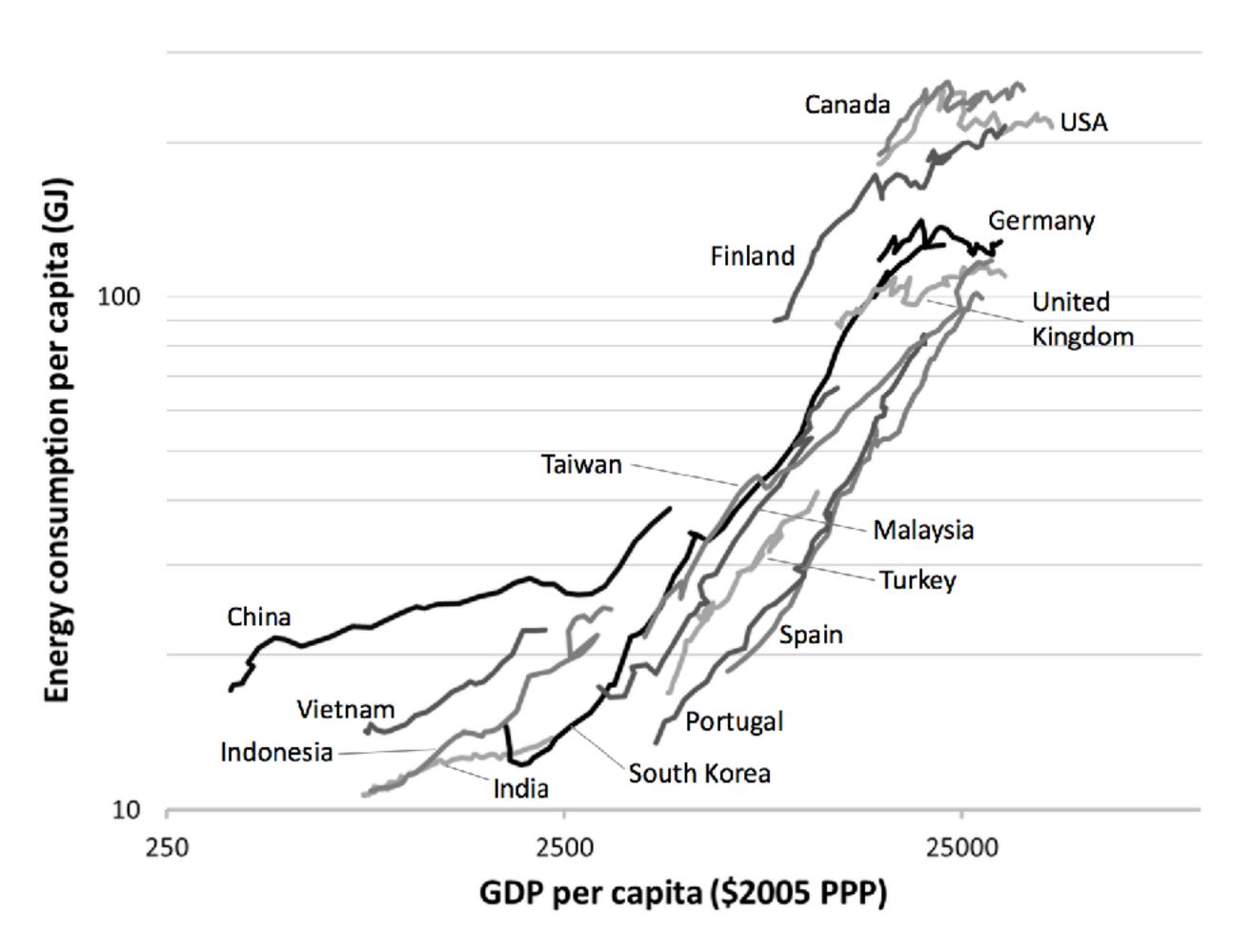




Source: Marine Deguignet, Diego Juffe-Bignoli, Jerry Harrison et al., 2014 United Nations List of Protected Areas, United Nations Environment Programme, 2014, www.unep-wcmc.org.

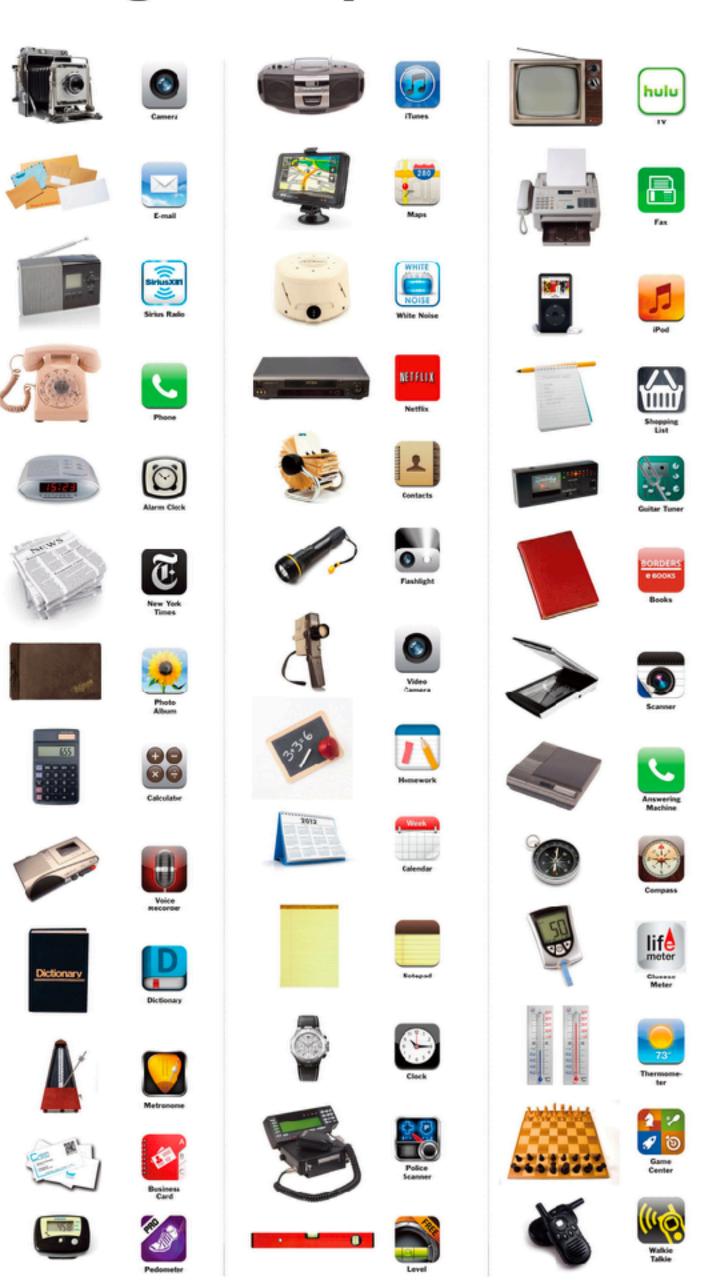
Energy consumption tightly tied to GDP

Figure 1: The *Energy Ladder*: Per Capita Final Energy Consumption and GDP at PPP, 1960 – 2006



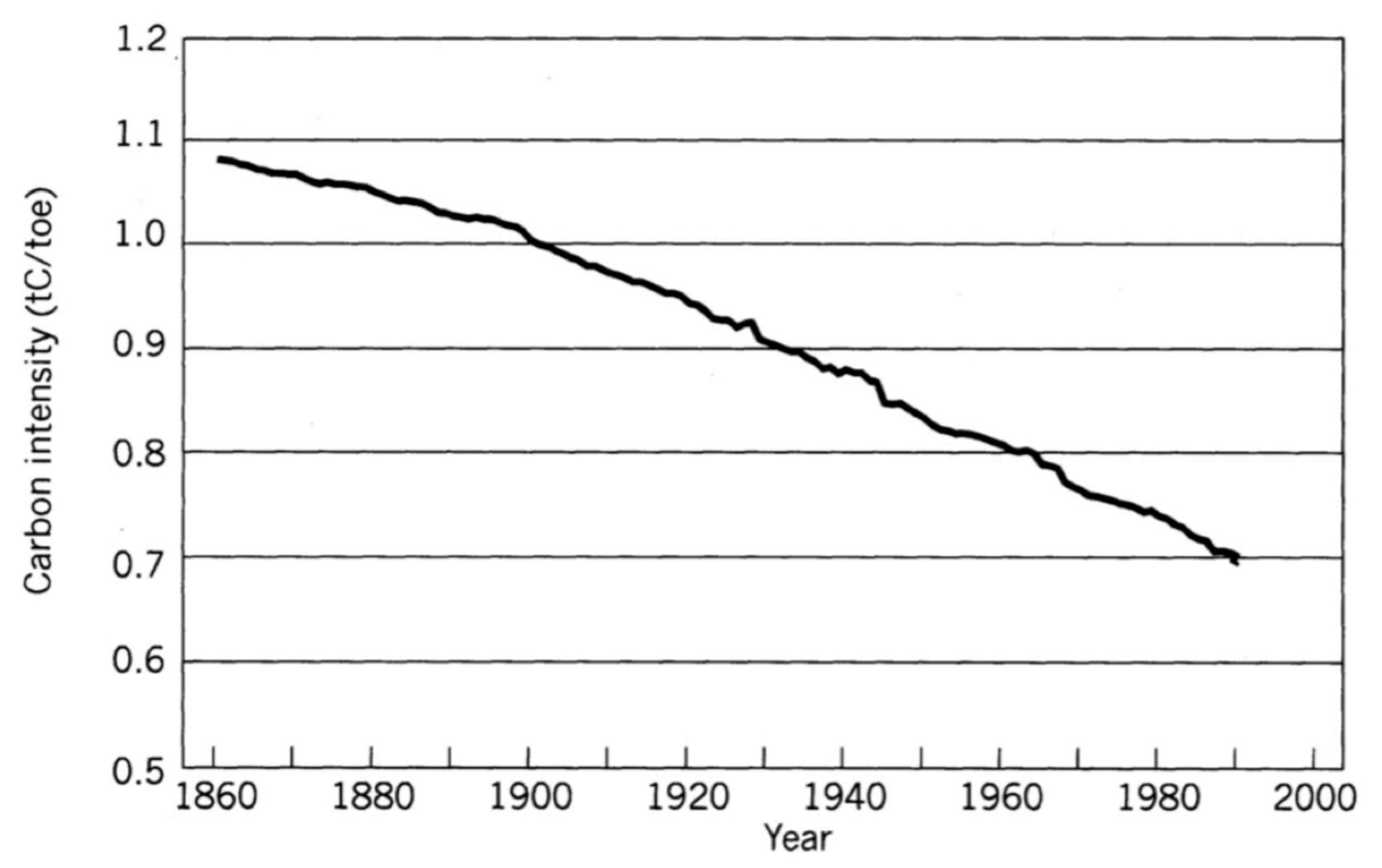
Notes: Both axes have a logarithmic scale. Energy consumption data are obtained from the International Energy Agency's Extended Energy Balances, GDP per capita from the World Bank's World Development Indicators.

DEMATERIALIZATION:Using less to produce more





As a consequence of energy transitions, the carbon-intensity of energy has declined for more than 150 years





Matter-dense fuels

Energy-dense fuels



Renewables (wood, solar, biofuels, wind)

Coal

Oil

Natural Gas

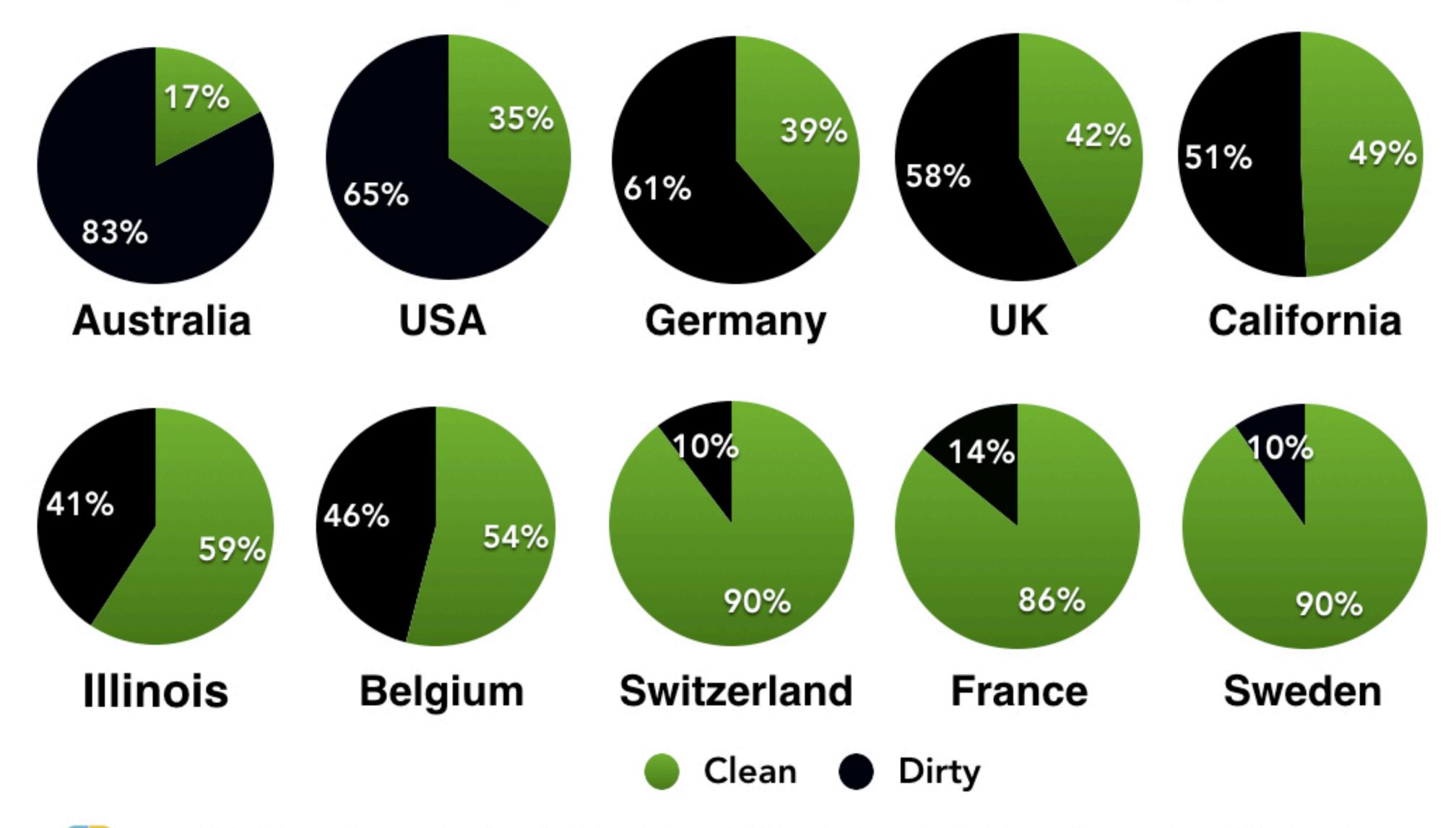
Uranium







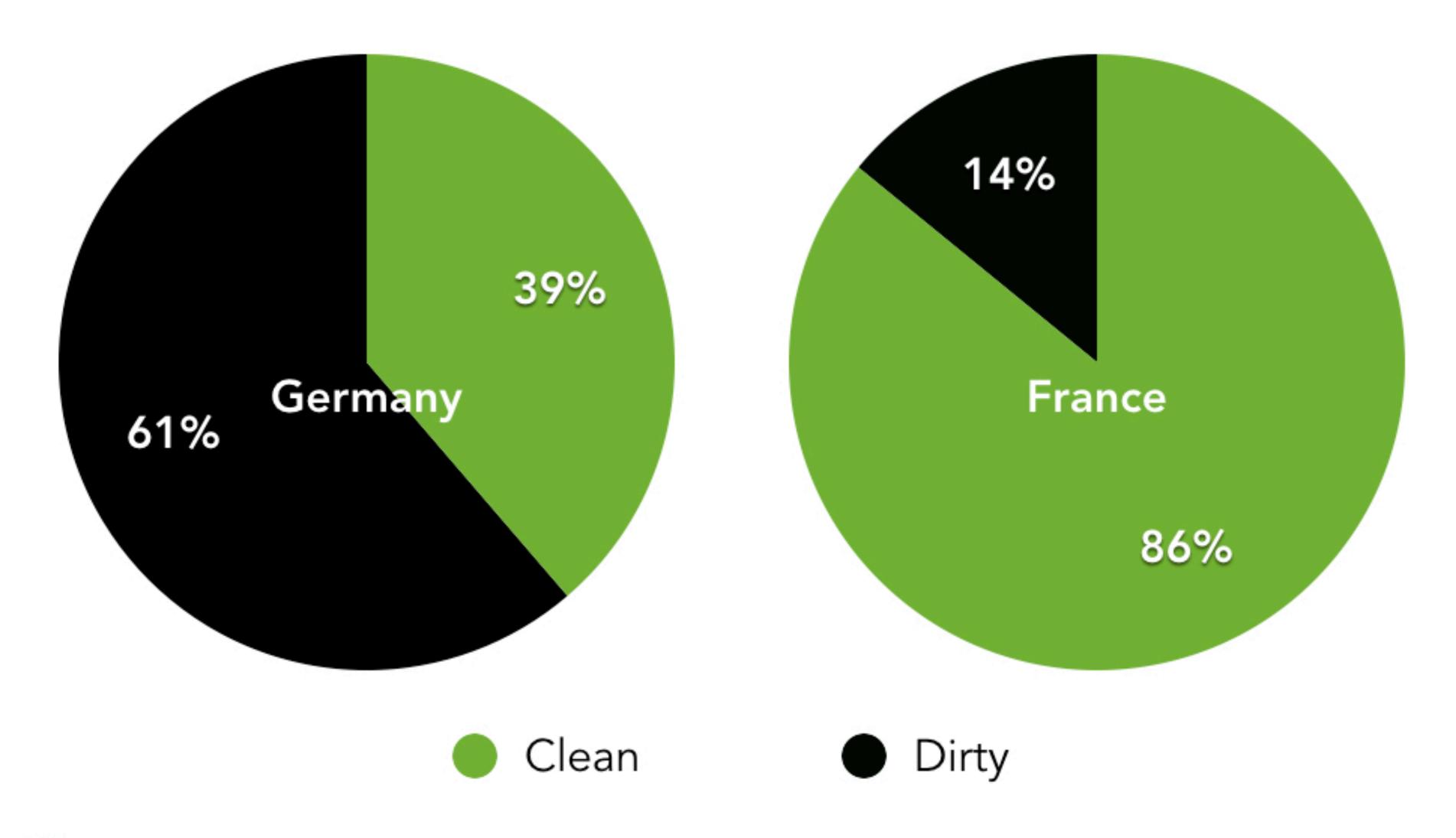
Carbon-Dependence of Electricity Supply





Source: Data for countries from BP Global Outlook 2019, referring to 2018 electricity generation. Data for U.S. states from U.S. Energy Information Agency, and also refers to 2018 electricity generation. Biomass combustion is classified as carbon-based fuel.

Carbon-Dependence of Electricity Supply





Source: Data for countries from BP Global Outlook 2019, referring to 2018 electricity generation. Data for U.S. states from U.S. Energy Information Agency, and also refers to 2018 electricity generation. Biomass combustion is classified as carbon-based fuel.

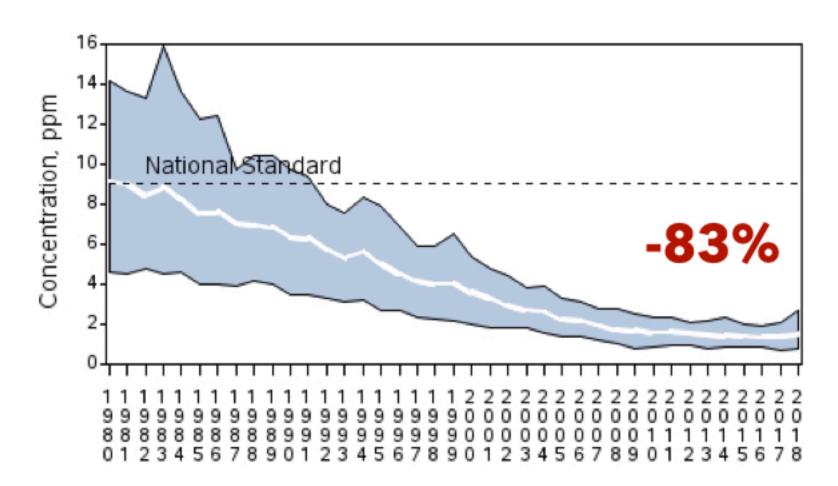
It would require **15,280** storage centers the size of Escondido, the largest in California, to provide just **4 hours** of backup power for the U.S. grid — at an estimated cost of **\$764 billion**



As a result of cleaner-burning coal, the transition to natural gas, cleaner vehicles, and other technological changes, the U.S. and other developed nations have seen major improvements in air quality

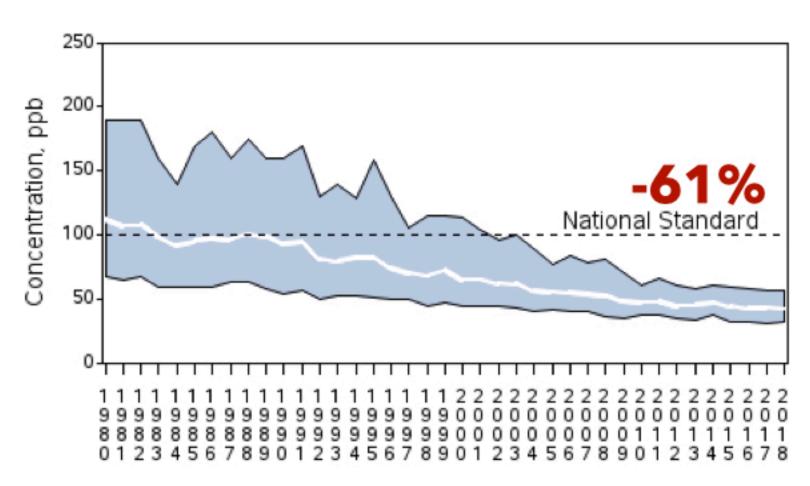
CO Air Quality, 1980 - 2018 (Annual 2nd Maximum 8-hour Average)

National Trend based on 44 Sites



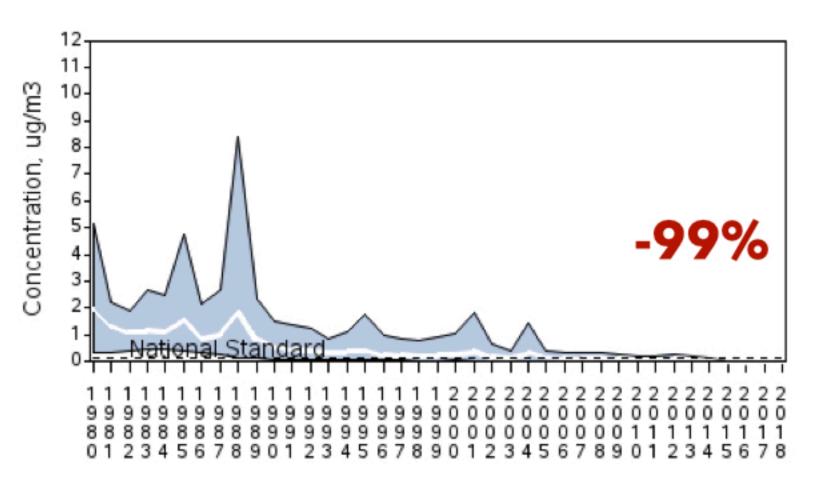
NO2 Air Quality, 1980 - 2018 (Annual 98th Percentile of Daily Max 1-Hour Average)

National Trend based on 22 Sites



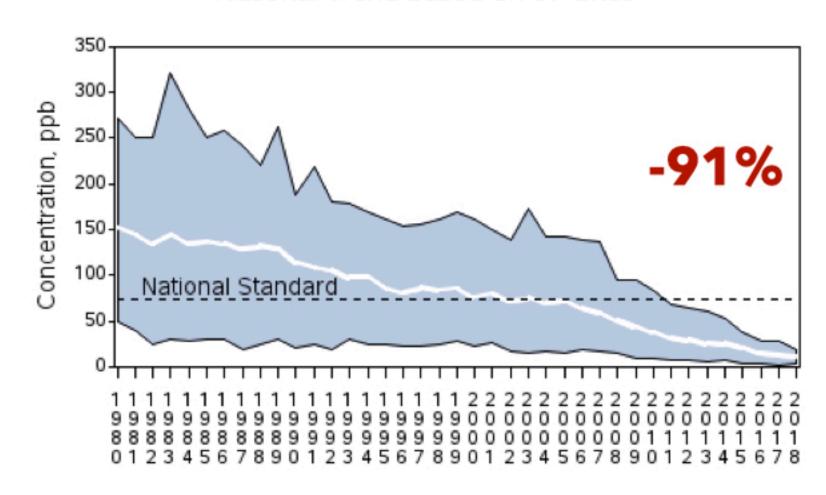
Lead Air Quality, 1980 - 2018

(Annual Maximum 3-Month Average) National Trend based on 6 Sites



SO2 Air Quality, 1980 - 2018

(Annual 99th Percentile of Daily Max 1-Hour Average) National Trend based on 37 Sites





California Blackouts 2020

- Higher temps led to greater demand for air conditioning plus California had less electricity, including from wind energy, available.
- While California is hot, weather conditions were well within the normal range for the state's summer weather.
- The underlying reason blackouts occurred is because California had closed both natural gas and nuclear power plants, according to grid operator.



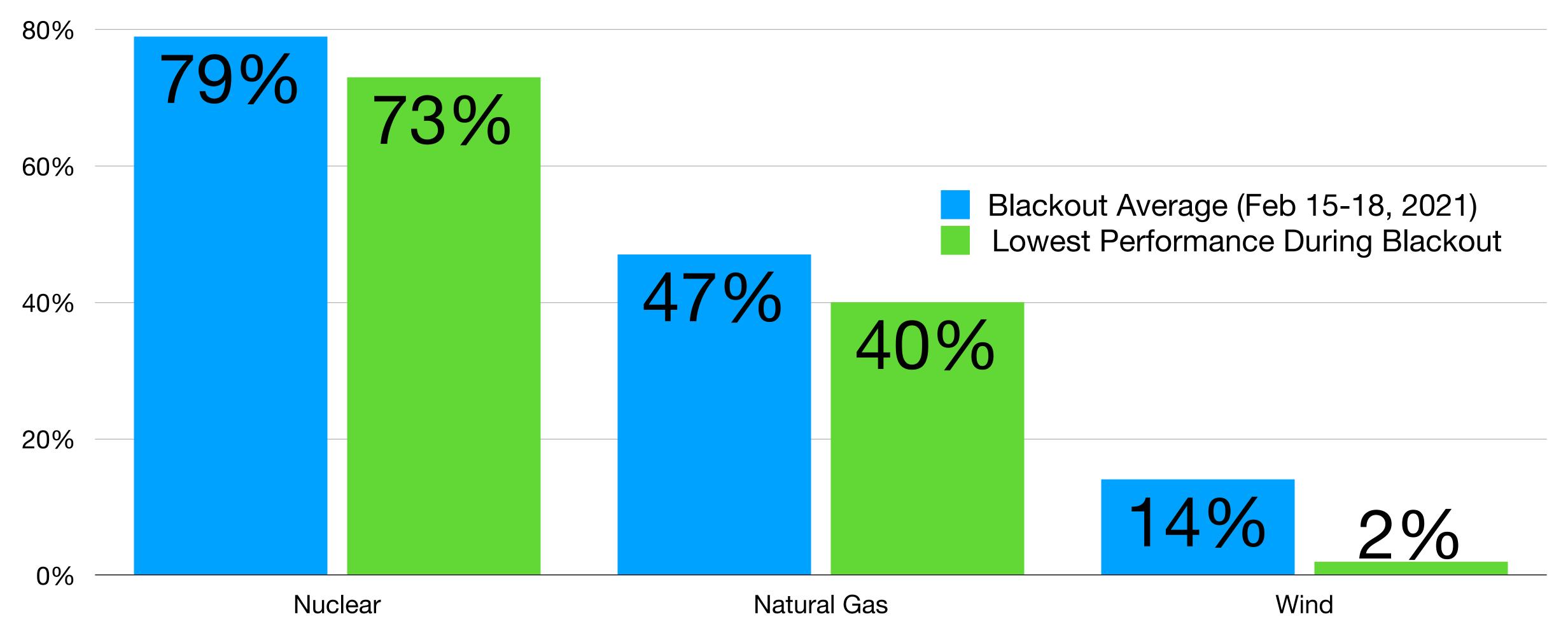


"People wonder how we made it through the heat wave of 2006. The answer is that there was a lot more generating capacity in 2006 than in 2020.... We had San Onofre [nuclear plant] of 2,200 megawatts, and a number of other plants, totaling thousands of megawatts not there today."

Steve Berberich, then-CEO CAISO,
 August 17, 2020 conference call with reporters

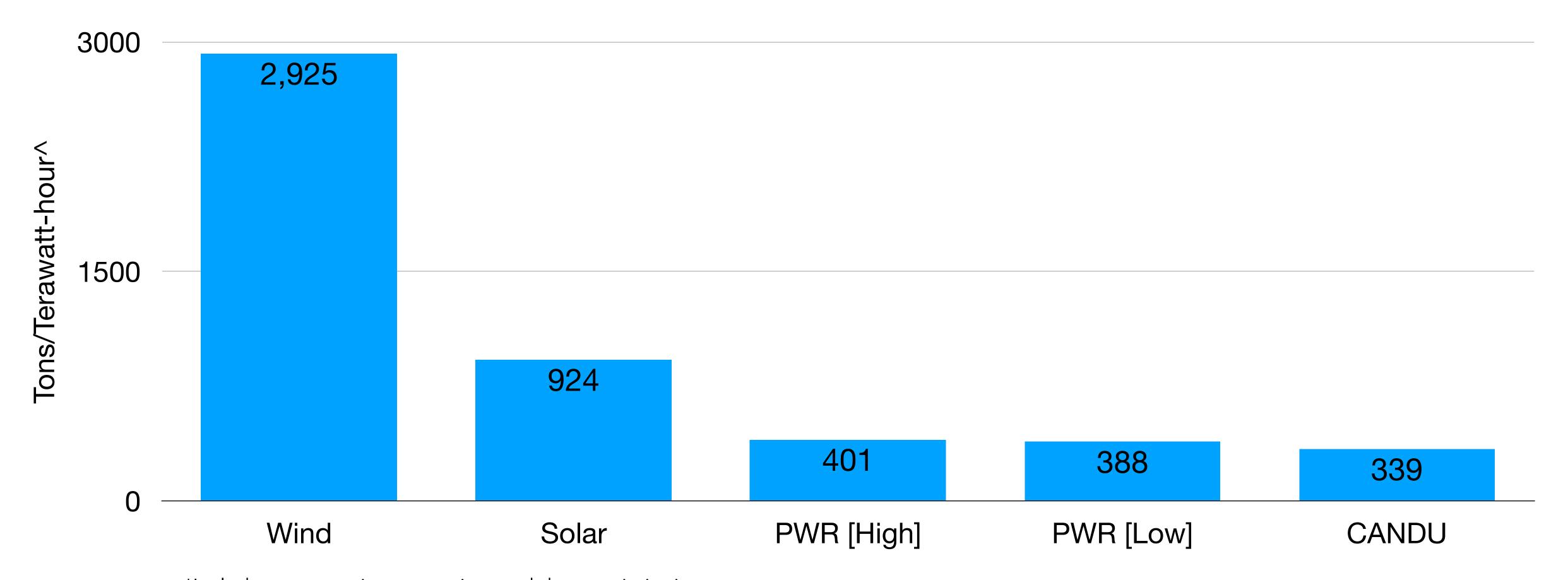


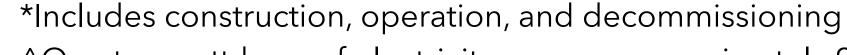
Performance of Different Energy Sources in Texas Electricity Grid During February 2021 Blackouts





Lifecycle* Concrete Use by Energy Source

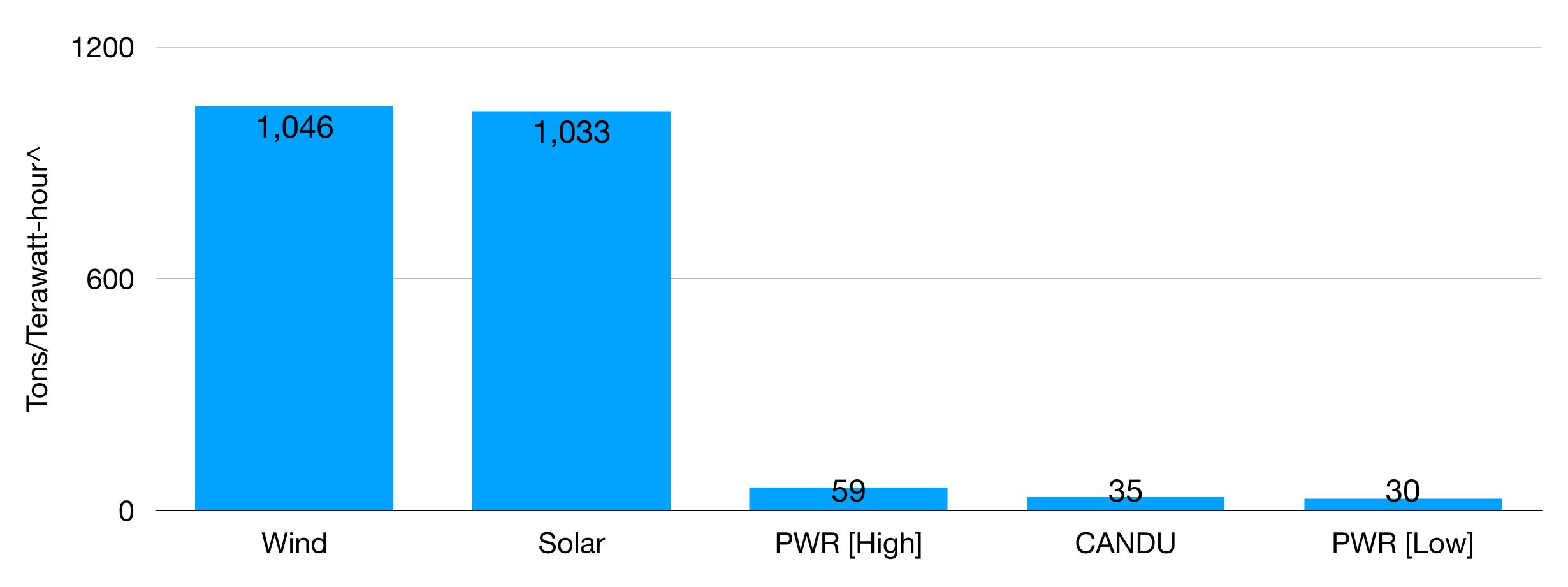








Lifecycle* Steel Use by Energy Source

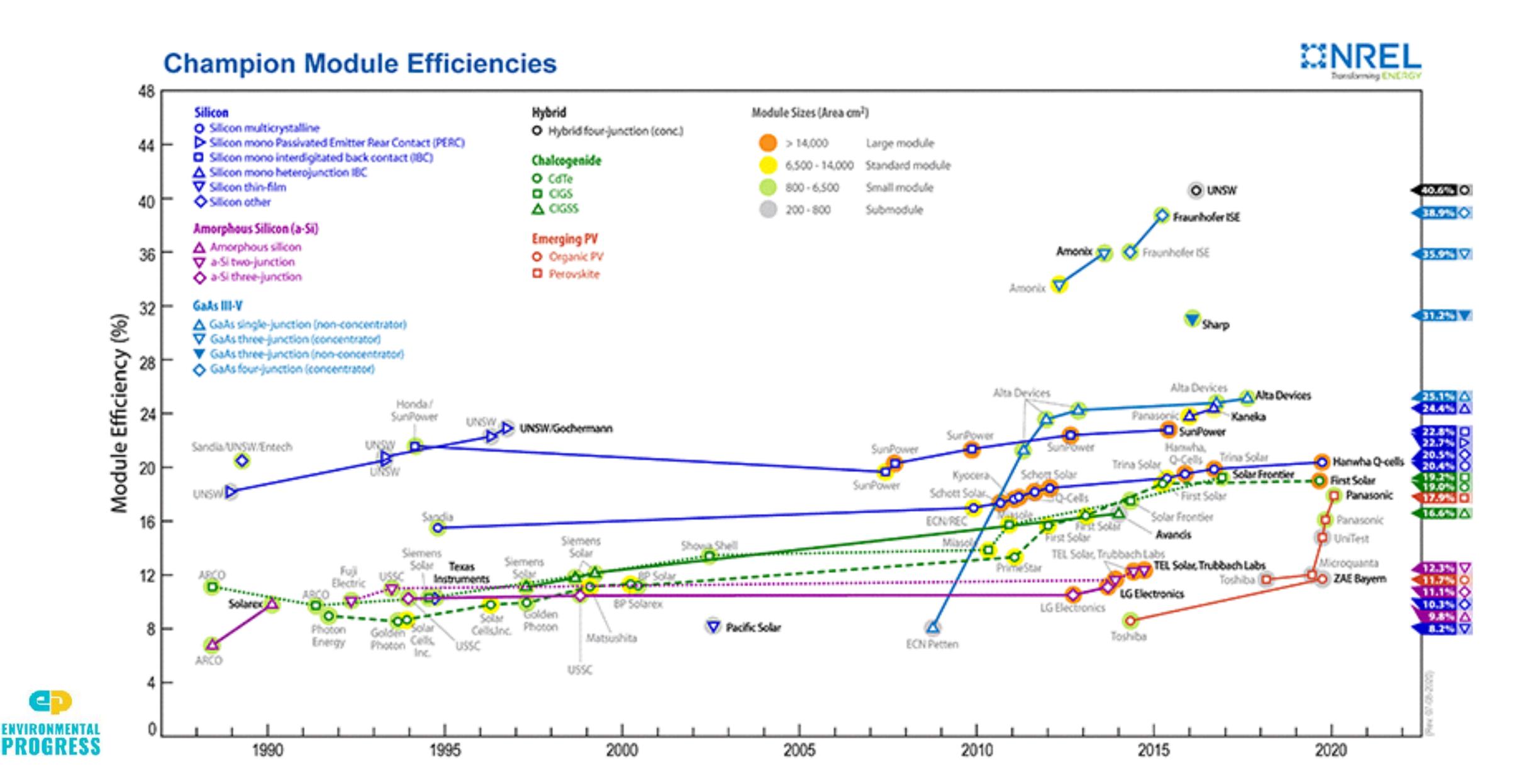




*Includes construction, operation, and decommissioning

^One terawatt-hour of electricity powers approximately 90,000 American households per year Calculated using data from Alves, Dias, *Raw Materials Demand for Wind and Solar PV technologies in the Transition towards a Decarbonised Energy System,* JRC, European Commission, April 2020; and JRC, *Technical Assessment of Nuclear Energy*, European Commission, February 2021

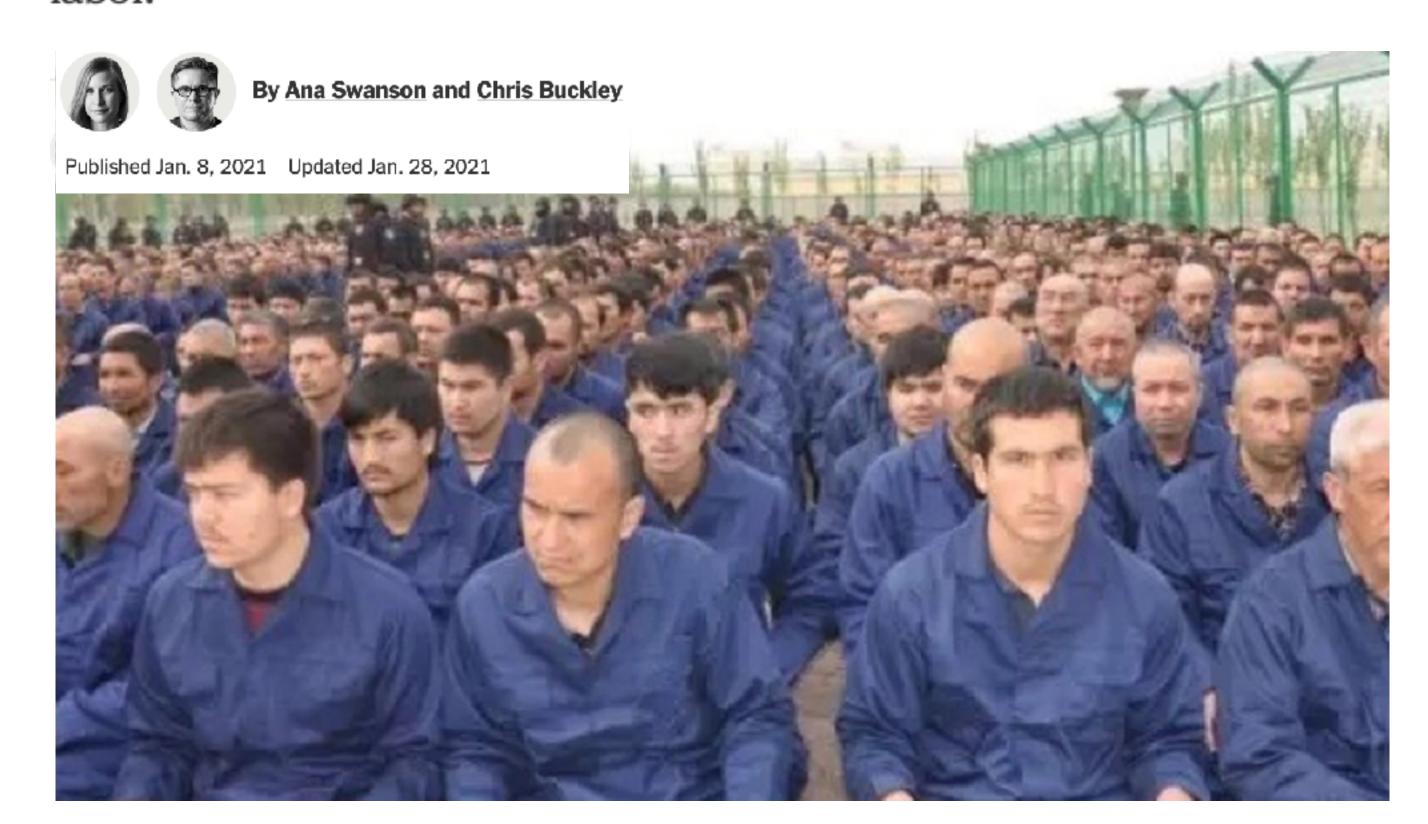
Solar Panel Efficiencies Increased 3% over last decade



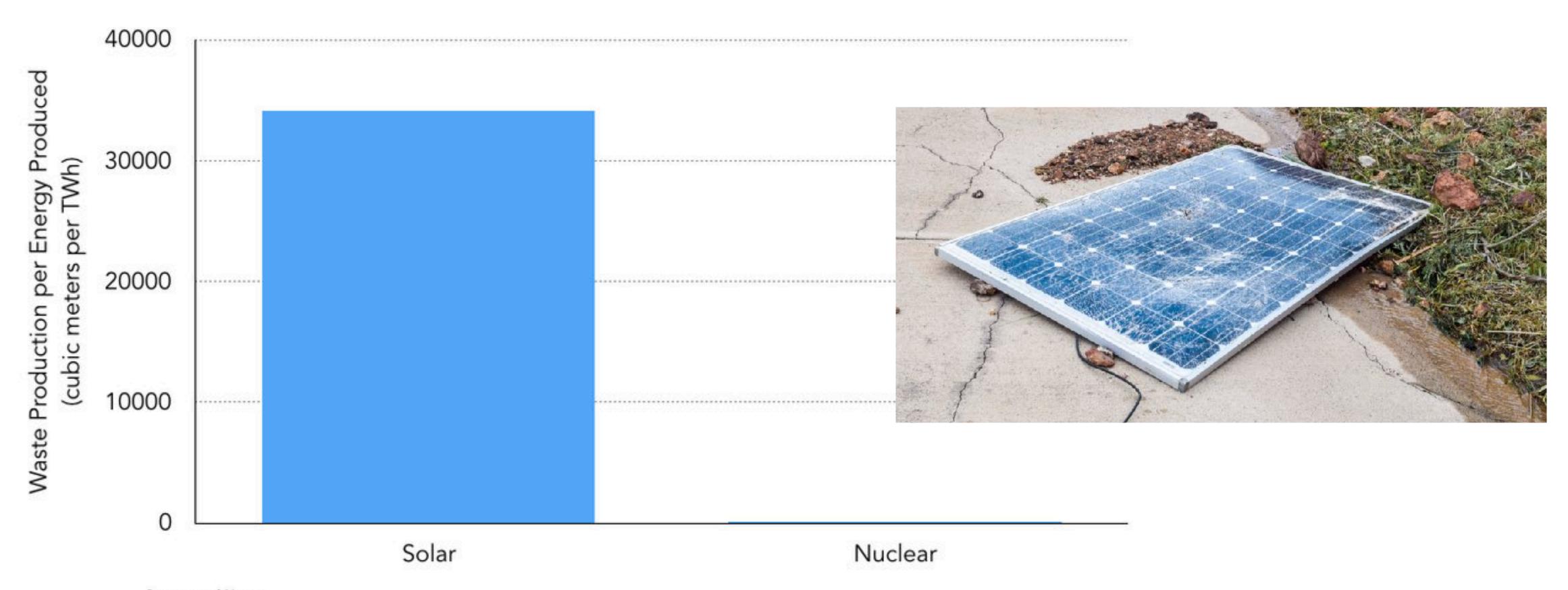
The New York Times

Chinese Solar Companies Tied to Use of Forced Labor

A new report shows some of the world's biggest solar companies work with the Chinese government to absorb workers from Xinjiang, programs that are often seen as a red flag for forced labor.



Solar panels produce ~300x more waste than nuclear reactors when providing the same amount of energy.



Sources and Notes:

US GAO, http://www.gao.gov/key_issues/disposal_of_highlevel_nuclear_waste/issue_summary

World Nuclear Association, http://www.world-nuclear.org/information-library/facts-and-figures/world-nuclear-power-reactors-archive/reactor-archive-december-2015.aspx
IAEA, https://www.iaea.org/PRIS/home.aspx

BP, http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html



Solar panels specifications vary. Panel specifications were standardized according to TrinaSolar's Duomax Dual Glass 60-Cell Module: http://static.trinasolar.com/sites/default/files/PS-M-0474%20A%20Datasheet Duomax PEG5.XX US Feb 2017 A.pdf In 2020, a national survey found that one out of five British children was having nightmares about climate change





Media outlets like the Associated Press have been publishing alarmist articles on climate change for decades

U.N. Predicts Disaster if Global Warming Not Checked

PETER JAMES SPIELMANN June 29, 1989



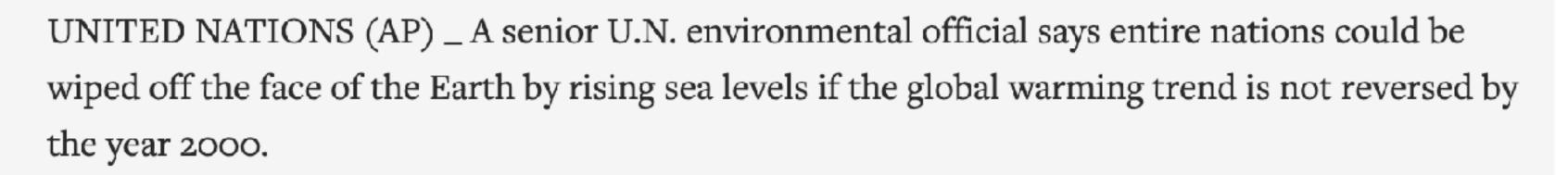








Archive



Coastal flooding and crop failures would create an exodus of "eco- refugees,' ' threatening political chaos, said Noel Brown, director of the New York office of the U.N. Environment Program, or UNEP.





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RESOURCE LIBRARY I ARTICLE

A Whopping 91 Percent of Plastic Isn't Recycled

Billions of tons of plastic have been made of the past decades, and much of it is becoming trash and litter, finds the first analysist of the issue.

GRADES

SUBJECTS

5 - 12+

Biology, Chemistry, Conservation, Earth Science, Oceanography



Forbes

EDITORS' PICK | Apr 21, 2018, 10:18pm EDT

Five Asian Countries Dump More Plastic Into Oceans Than Anyone Else Combined: How You Can Help



Hannah Leung Former Staff ①
Asia

(1) This article is more than 2 years old.

TWEET THIS



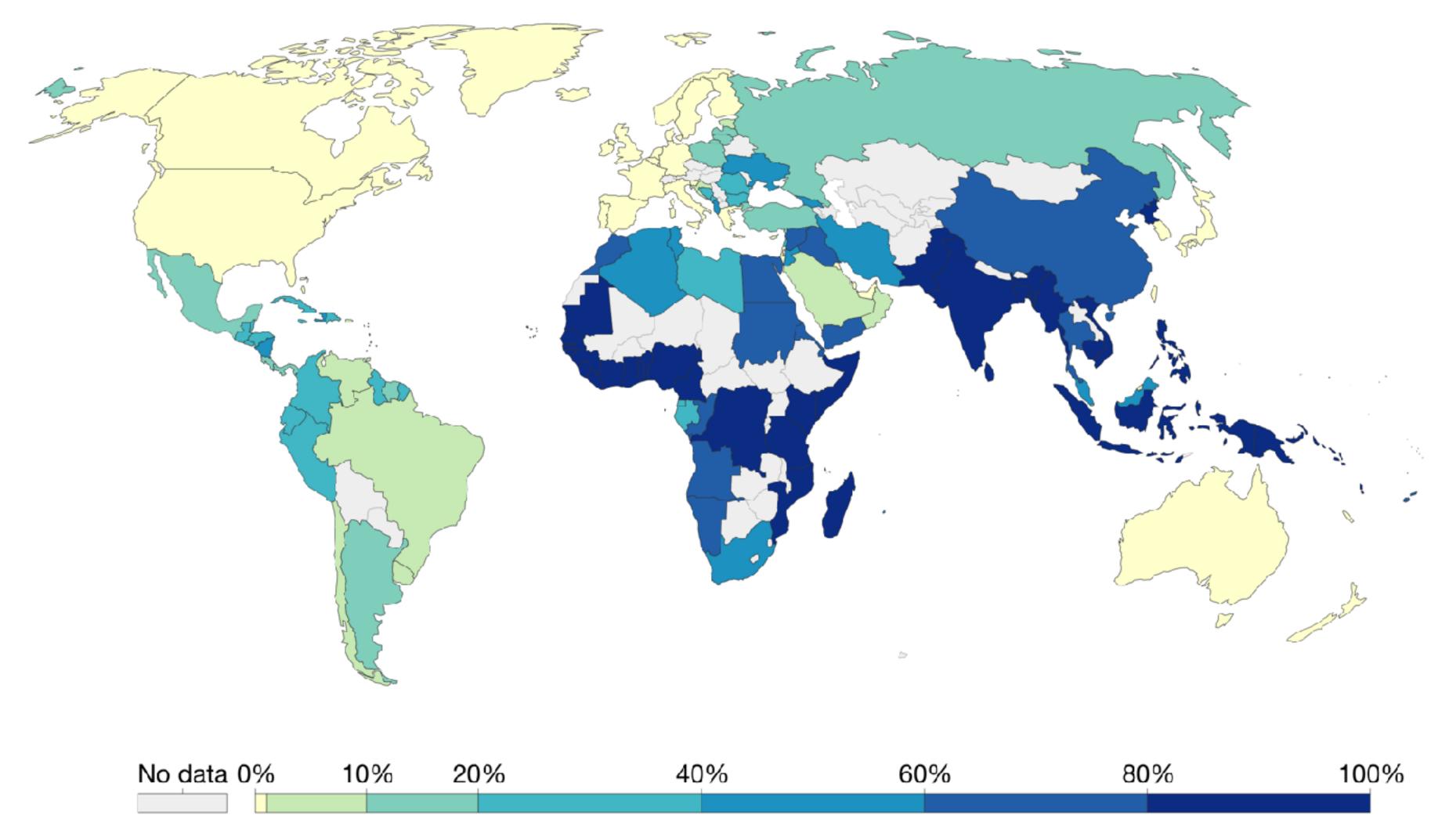
China, Indonesia, Philippines, Thailand, and Vietnam are dumping more plastic into oceans than the rest of the world combined



Share of plastic waste that is inadequately managed, 2010



Share of total plastic waste that is inadequately managed. Inadequately disposed waste is not formally managed and includes disposal in dumps or open, uncontrolled landfills, where it is not fully contained. Inadequately managed waste has high risk of polluting rivers and oceans. This does not include 'littered' plastic waste, which is approximately 2% of total waste (including high-income countries).







45 YEARS OF SWISS NUCLEAR WASTE





Needs 379 times more land for solar than nuclear





Source: Comparison between Diablo Canyon Nuclear Plant and Topaz. In 2018, Diablo Canyon produced 18.29 TWh of electricity on an approximate land area of .742 square kilometers. In 2018, Topaz produced 1.3 TWh of electricity on an approximate land area of 20 square kilometers. Generation data from Energy Information Agency.

Needs 421 times more land for wind than nuclear







Source: Comparison between Diablo Canyon Nuclear Plant and Alta Wind Energy Center. In 2018, Diablo Canyon produced 18.29 TWh of electricity on an approximate land area of .742 square kilometers. In 2018, Alta produced 3.52 TWh of electricity on an approximate land area of 60.1 square kilometers.

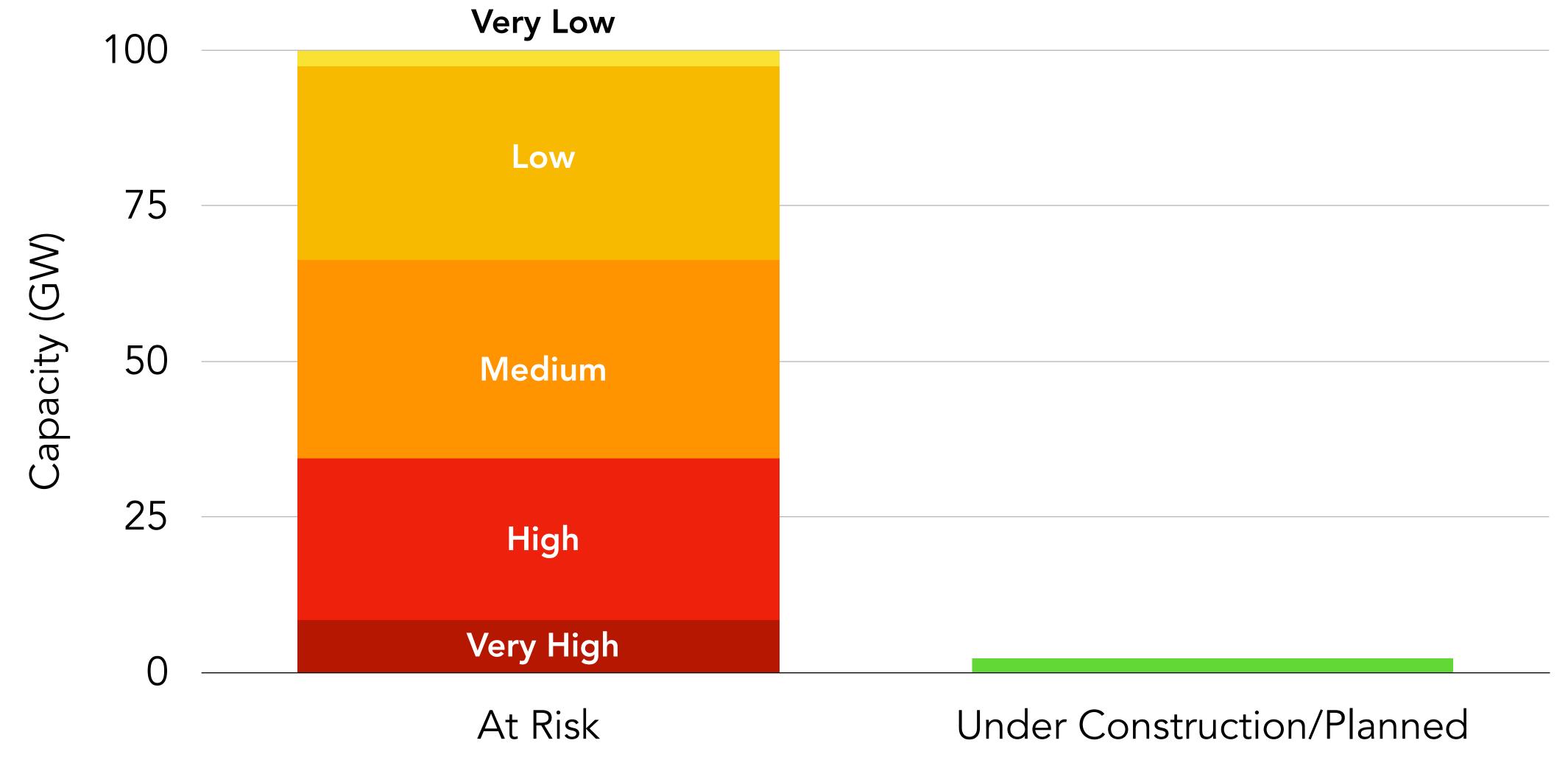
Generation data from Energy Information Agency.



"Everybody knows that translocation [of desert tortoises] doesn't work. When you're walking in front of a bulldozer, crying, and moving animals and cacti out of the way, it's hard to think that the project is a good idea."

Source: Peter Laufer,
"The Tortoise is
Collateral Damage in
the Mojave," High
Country News, March
19, 2014

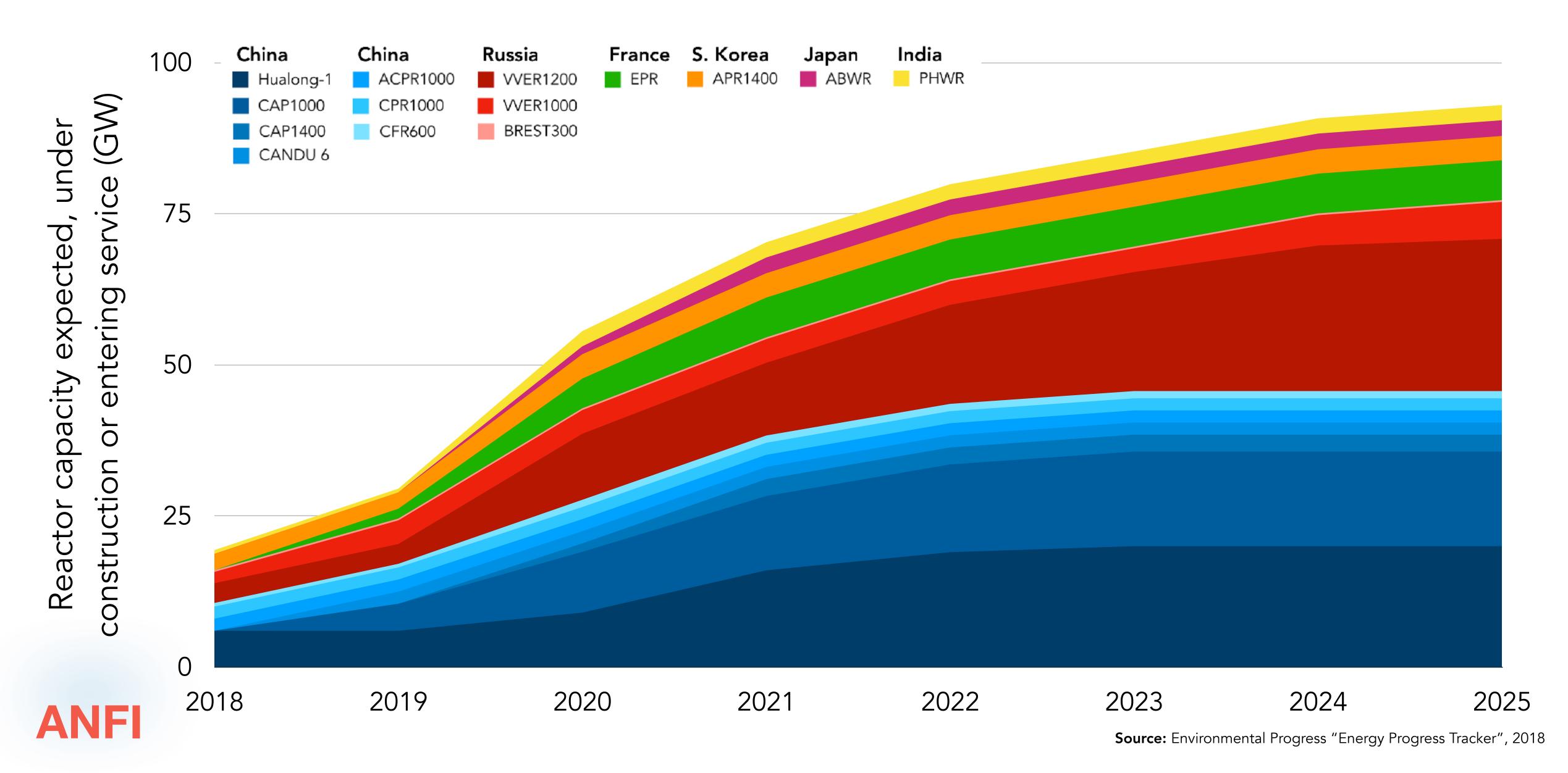
The U.S. could lose 30X as much nuclear capacity as it gains by 2030



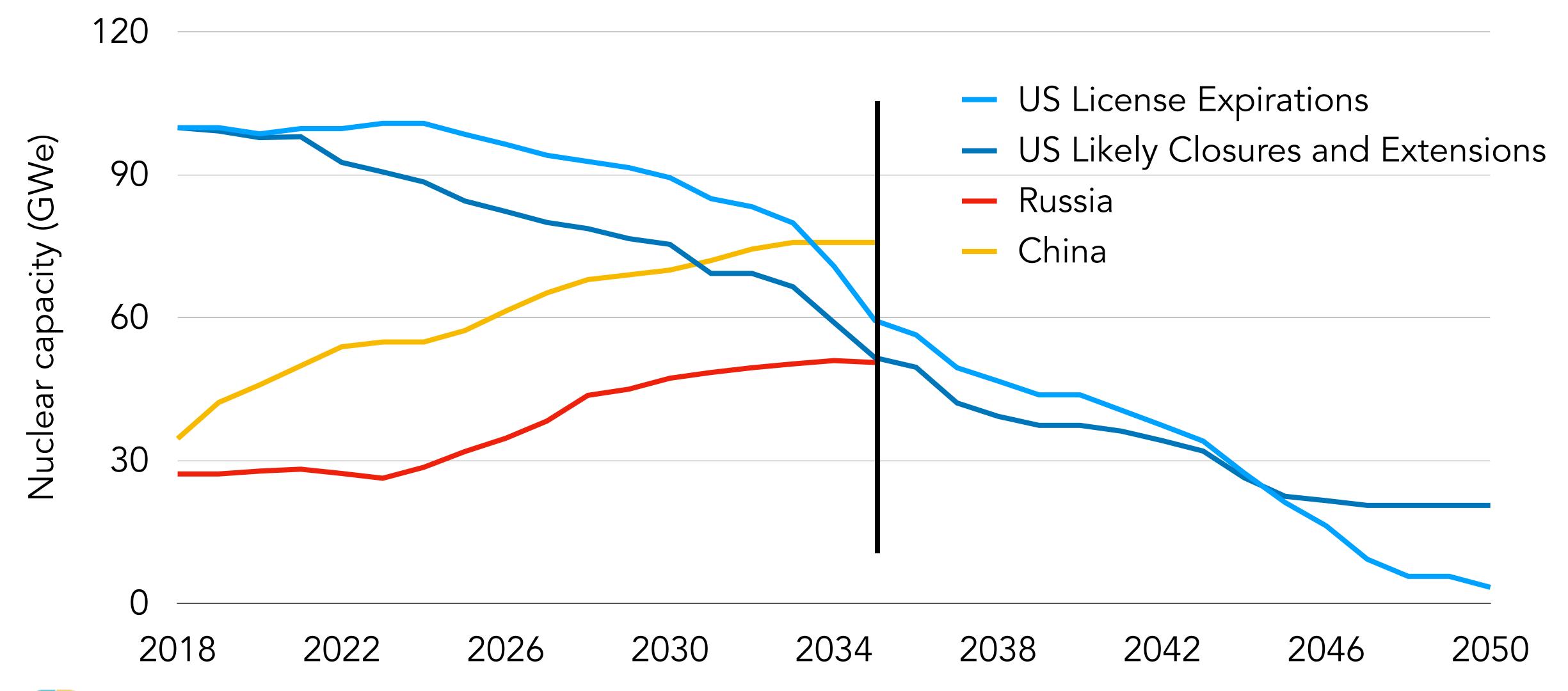


Source: EP Energy Progress Tracker, 2019. Reactor-specific ratings based on economic and energy trend analysis, political and societal assessment, and expert elicitations. Nuclear at risk includes all reactors assessed as having a Moderate, High, or Extreme Risk of closure in EP's Energy Progress Tracker.

World Nuclear Outlook Through 2025



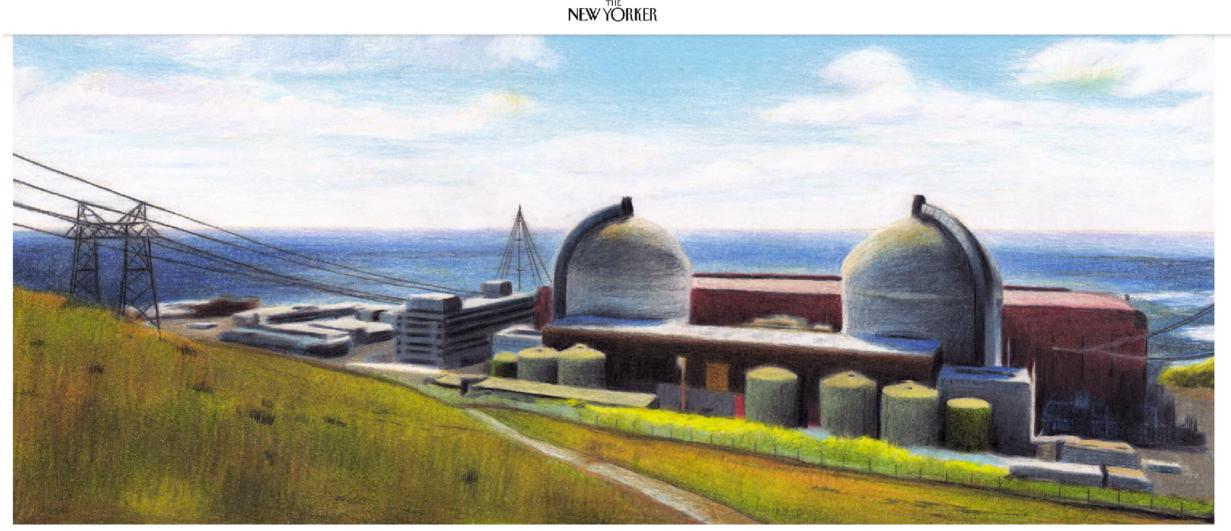
American nuclear capacity falls below China in 2030, Russia shortly after





Source: Russian and Chinese capacity includes expected domestic closures and construction of domestic and exported plants before 2035. Plants included according to EP Analysis of global reactor construction plans in the near and medium term. Tianwan Units 7 and 8 are credited to China rather than to Russia. "US License Expirations" scenario shows closures if subsequent license renewals are not sought. "US Likely Closures and Extension" scenario shows EP's expectations for early plant closures and license renewals as of 2019.



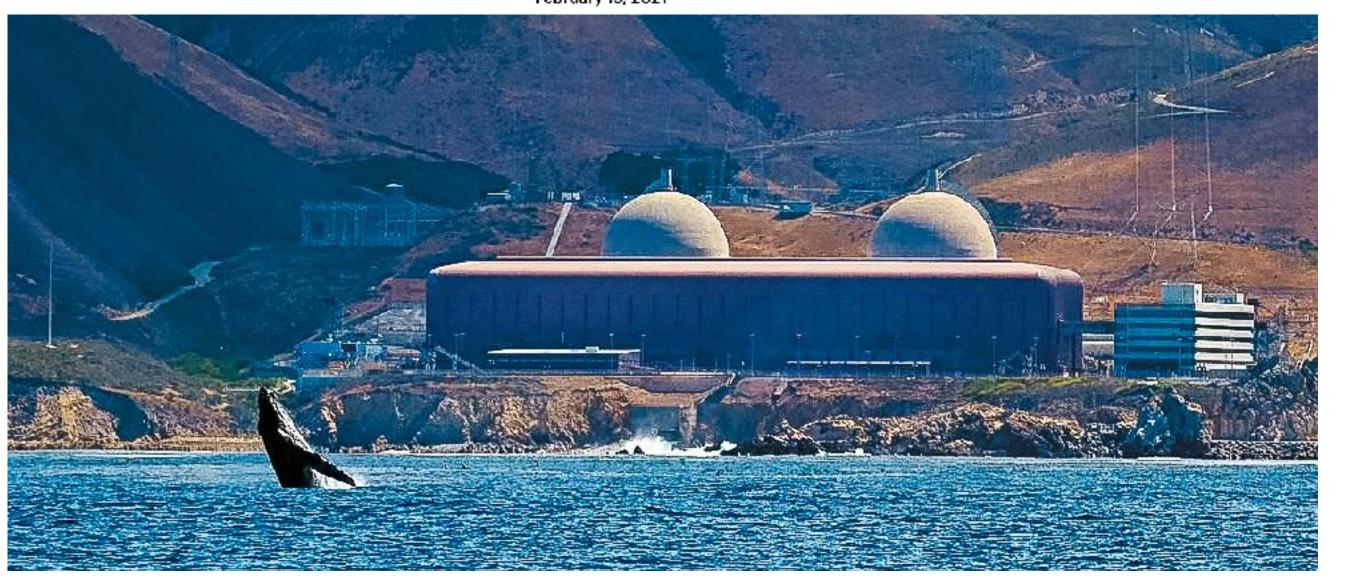


In the face of climate change, some environmentalists are fighting not to close power plants but to save them. Illustration by Clément Thoby: Source photograph by David Paul Morris / Bloomberg / Gett:

ANNALS OF TECHNOLOGY

THE ACTIVISTS WHO EMBRACE NUCLEAR POWER

By Rebecca Tuhus-Dubrow February 19, 2021



"Much of what we think we know about nuclear is wrong. Instead of being the most dangerous energy source, it is one of the safest....

"To be fervently pro-nuclear is to see in the peaceful splitting of the atom something almost miraculous.

"It is to see an energy source that has been steadily providing low-carbon electricity for decades—doing vastly more good than harm, saving vastly more lives than it has taken—but which has received little credit and instead been maligned.

"It is to believe that the most significant problem with nuclear power, by far, is public perception."

– Rebecca Tuhus-Dubrow, *The New Yorker*, February 19, 2021

APOCALYPSE NEVER

WHY ENVIRONMENTAL
ALARMISM HURTS US ALL

MICHAEL SHELLENBERGER



Thank you!