



# The Energy Innovation and Carbon Dividend Act of 2019

Dr. James A. (Jim) Martin

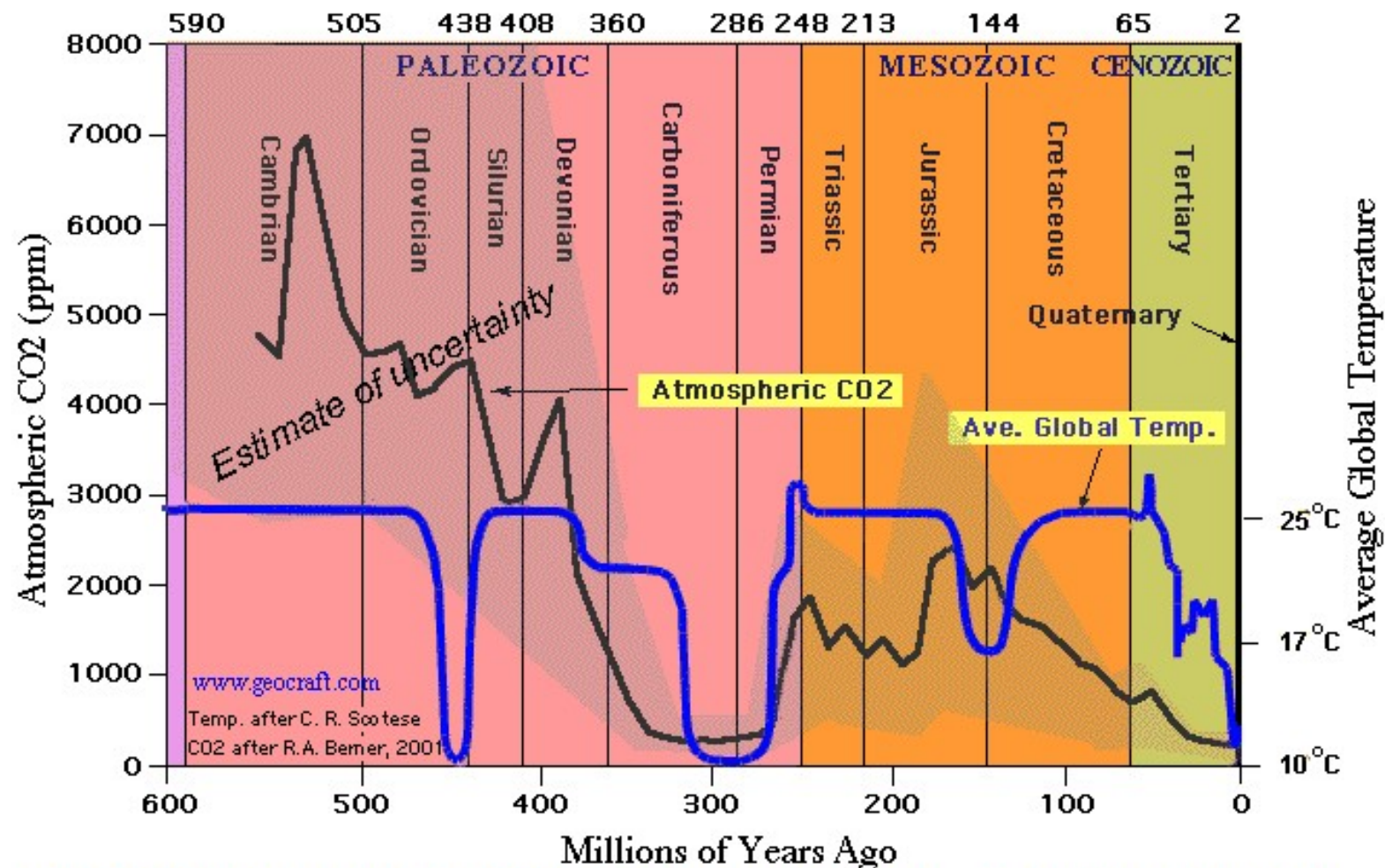
AIAA ASAT Conference  
November 9, 2019

# Our Beautiful Earth





# Global Temperature and Atmospheric CO<sub>2</sub> over Geologic Time



**Late Carboniferous to Early Permian** time (315 mya – 270 mya) is the only time period in the last 600 million years when **both** atmospheric **CO<sub>2</sub>** and **temperatures** were as low as they are today (**Quaternary Period**).

Temperature after C.R. Scotese <http://www.scotese.com/climate.htm>

CO<sub>2</sub> after R.A. Berner, 2001 (GEOCARB III)



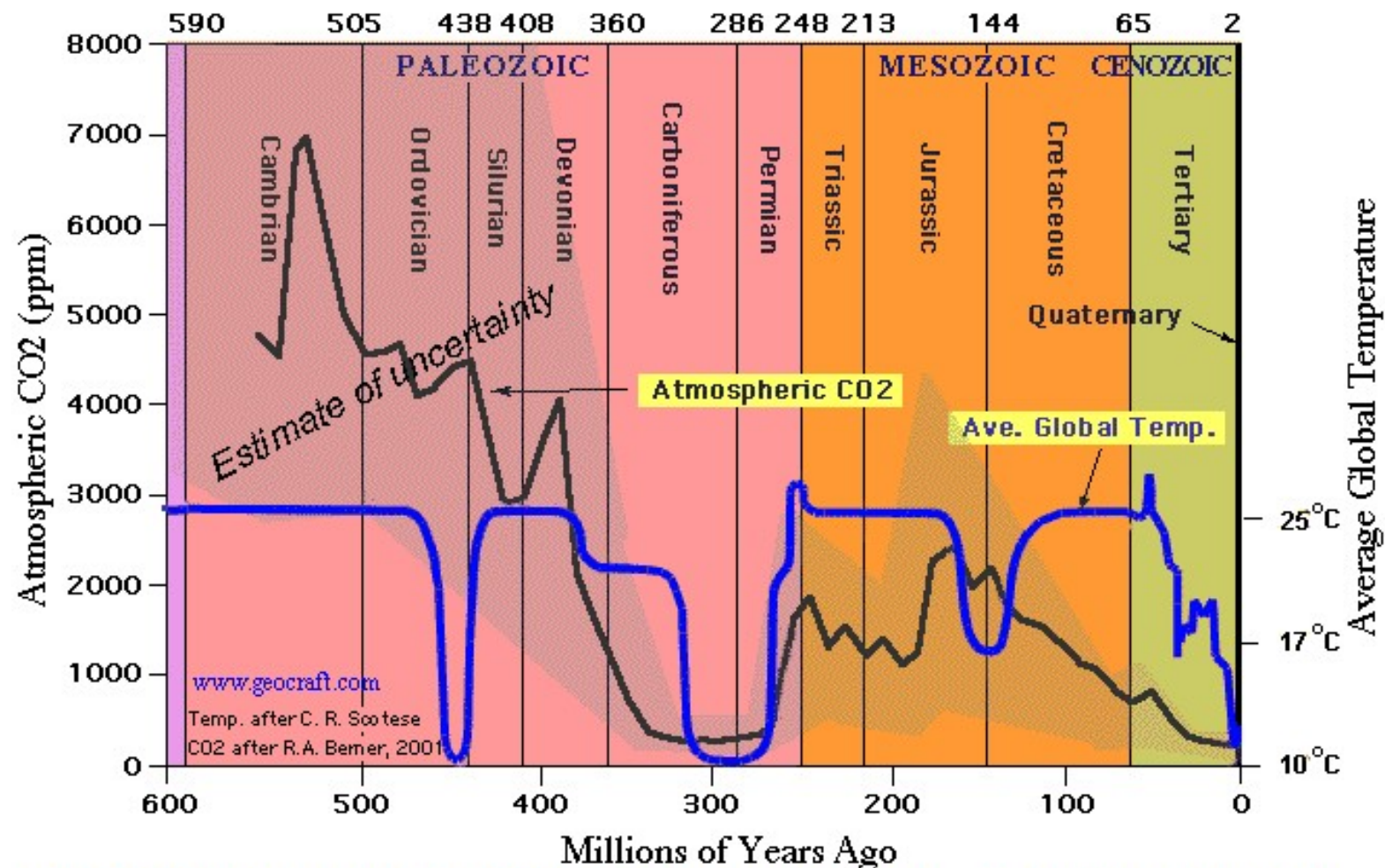
# Development of Plant Life

- Land plants first appeared during the Ordovician period, more than 500 million years ago.
- The early era, known as the Paleozoic, is divided into six periods. It starts with the Cambrian period, followed by the Ordovician, Silurian, Devonian, Carboniferous, and Permian. The major event to mark the Ordovician, more than 500 million years ago, was the colonization of land by the ancestors of modern land plants.
- <https://courses.lumenlearning.com/boundless-biology/chapter/early-plant-life/>





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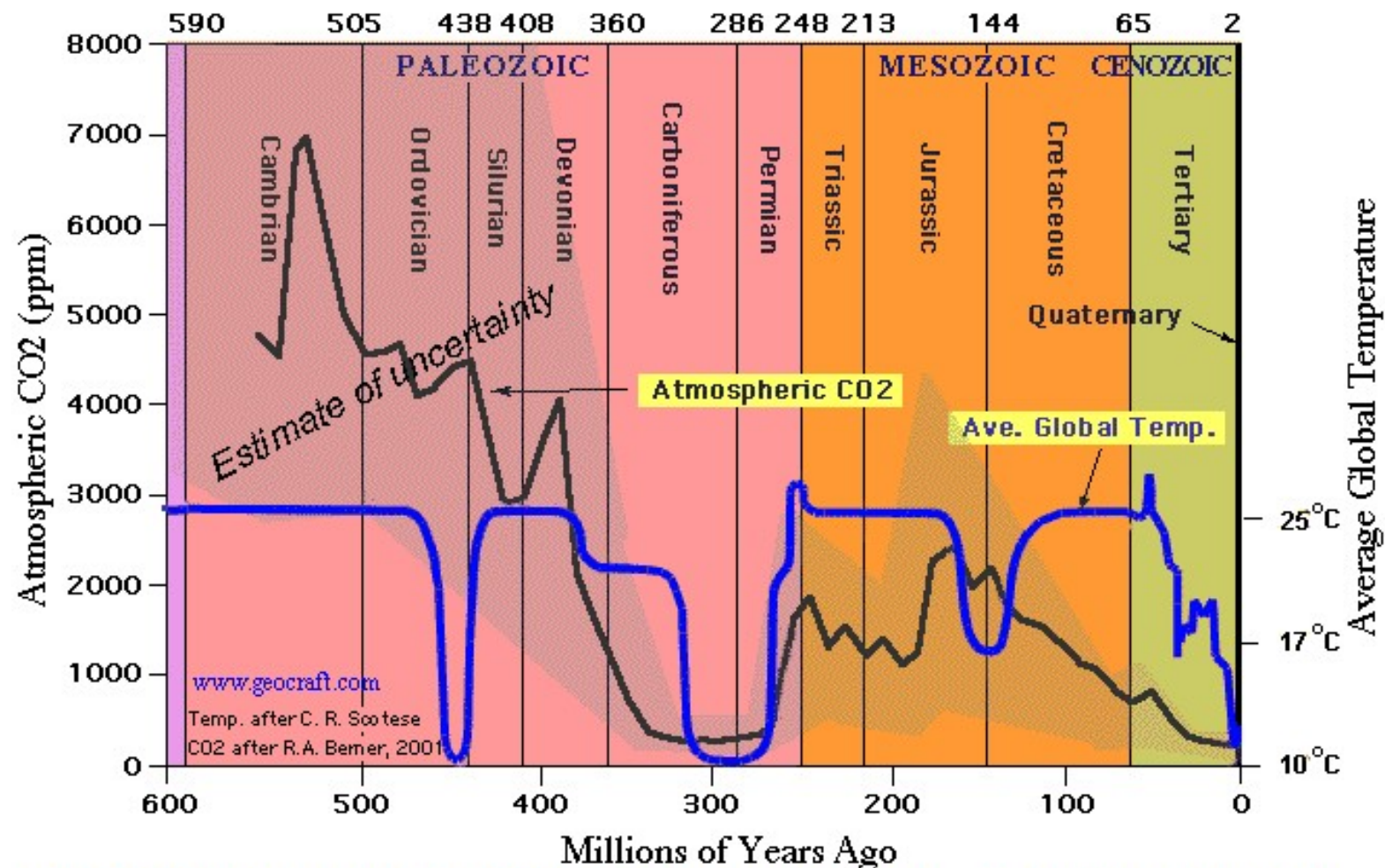
# Dinosaur Times

- Dinosaurs that roamed the Earth 250 million years ago knew a world with five times more carbon dioxide than is present on Earth today, researchers say, and new techniques for estimating the amount of carbon dioxide on prehistoric Earth may help scientists predict how Earth's climate may change in the future.
- The findings are detailed in a recent paper published in the journal Proceedings of the National Academy of Sciences.
- During the Jurassic Period, dinosaurs — ranging from the plant-eating Diplodocus and Brachiosaurus to the meat-craving Ceratosaurus and Megalosaurus — ruled the world. During this time, the Earth's interior was not standing still; rather, the supercontinent Pangaea had started to split into two smaller landmasses, called Laurasia and Gondwana.
- These tectonic movements made the oceans close up and the tectonic plates sink into the Earth. This process, called subduction, led to volcanism at the surface, with rocks constantly melting and emitting CO<sub>2</sub> into the atmosphere. Huge amounts of this greenhouse gas made the climate during the Jurassic Period extremely humid and warm, said geoscientist Douwe van der Meer, lead author of the study and a researcher at Utrecht University in the Netherlands.





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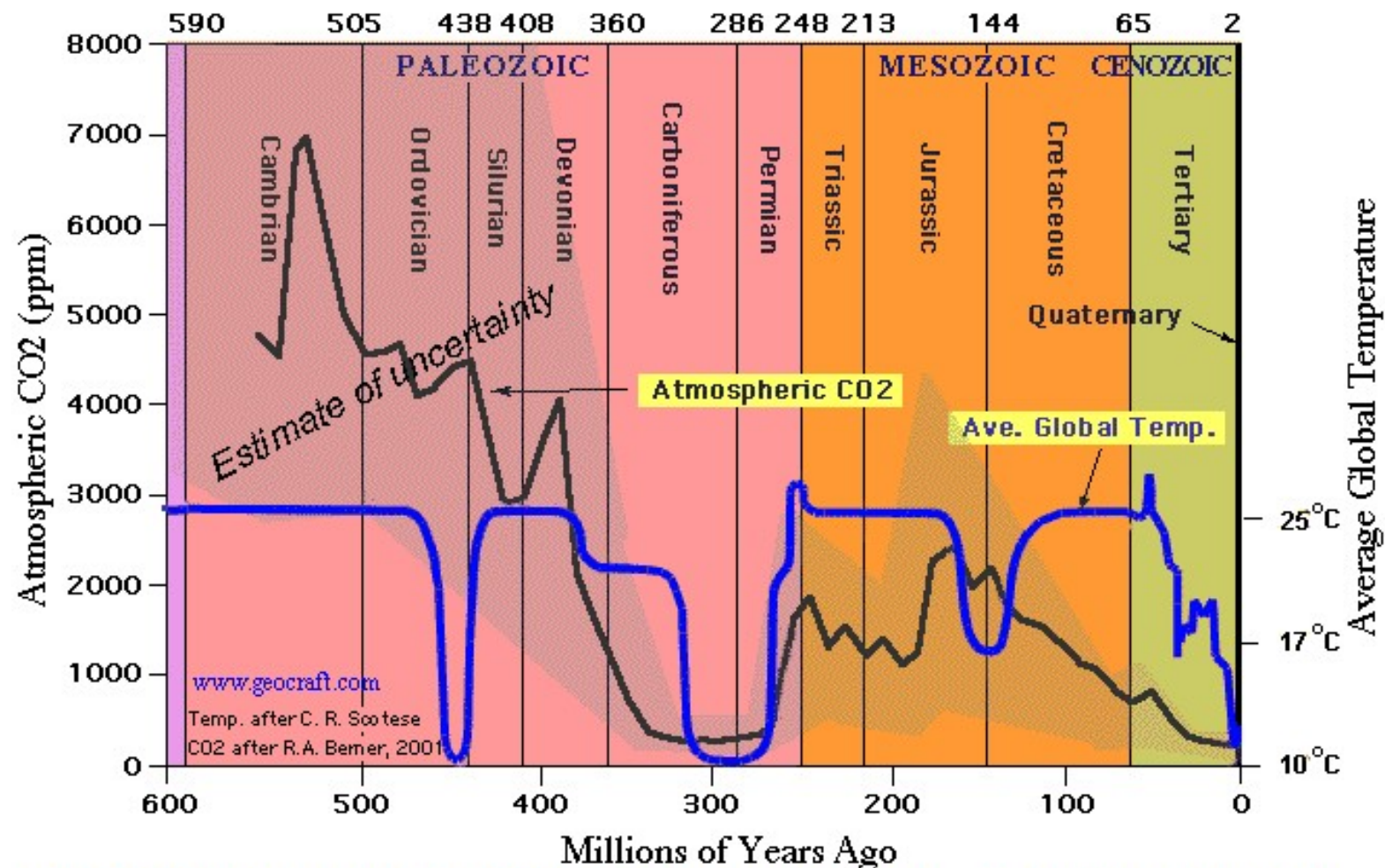
# End of Dinosaur Times

- An Arctic free of ice and stocked with swamp-loving reptiles. Temperate forests covering Antarctica, thriving on heat that kept them alive through the dark months. Average temperatures along the equator of about 100 degrees Fahrenheit.
- High carbon dioxide levels kept the planet warm enough to sustain that life 50 million years ago during the Eocene Epoch. As the CO<sub>2</sub> levels dropped, the planet tilted toward a cooling, and the ice caps were formed, choking off the life that once thrived at the poles.





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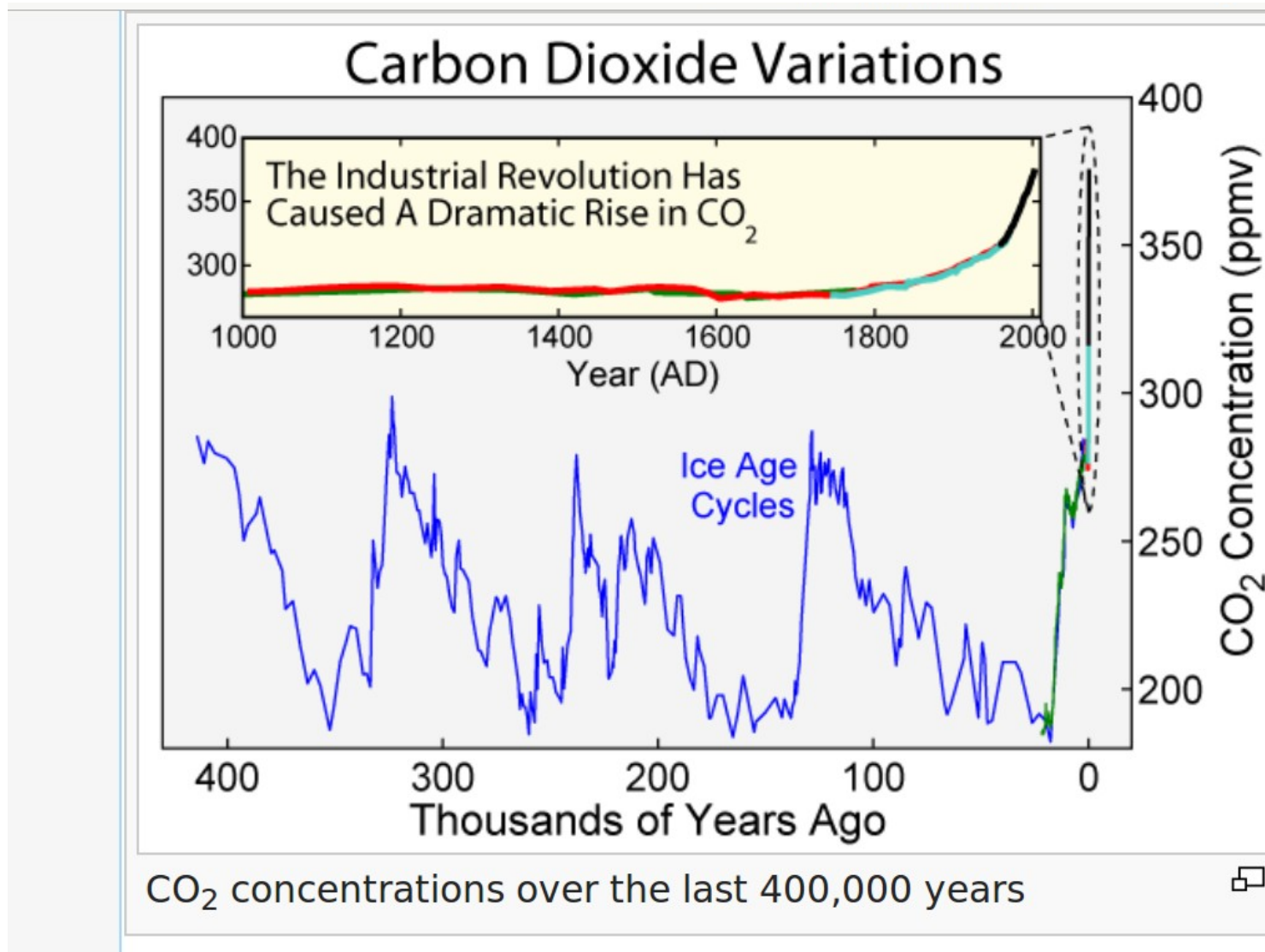


# After Dinosaurs

- For a 2009 study, published in the journal Science, scientists analyzed shells in deep sea sediments to estimate past CO<sub>2</sub> levels, and found that CO<sub>2</sub> levels have not been as high as they are now for at least the past 10 to 15 million years, during the Miocene epoch.
- “This was a time when global temperatures were substantially warmer than today, and there was very little ice around anywhere on the planet. And so sea level was considerably higher — around 100 feet higher — than it is today,” said Pennsylvania State University climate scientist Michael Mann, in an email conversation. “It is for this reason that some climate scientists, like James Hansen, have argued that even current-day CO<sub>2</sub> levels are too high. There is the possibility that we’ve already breached the threshold of truly dangerous human influence on our climate and planet.”

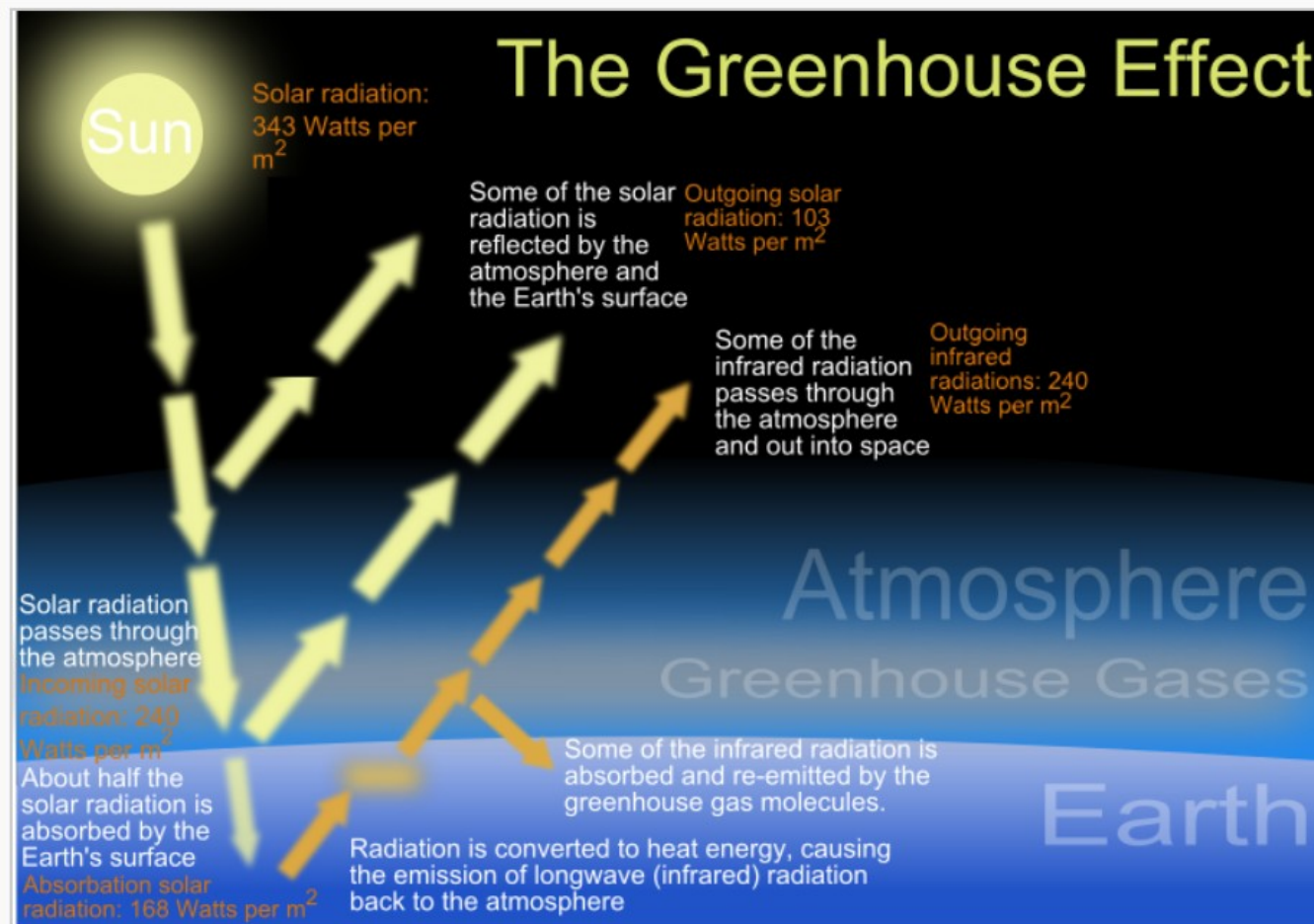


# Atmospheric Carbon Dioxide Up





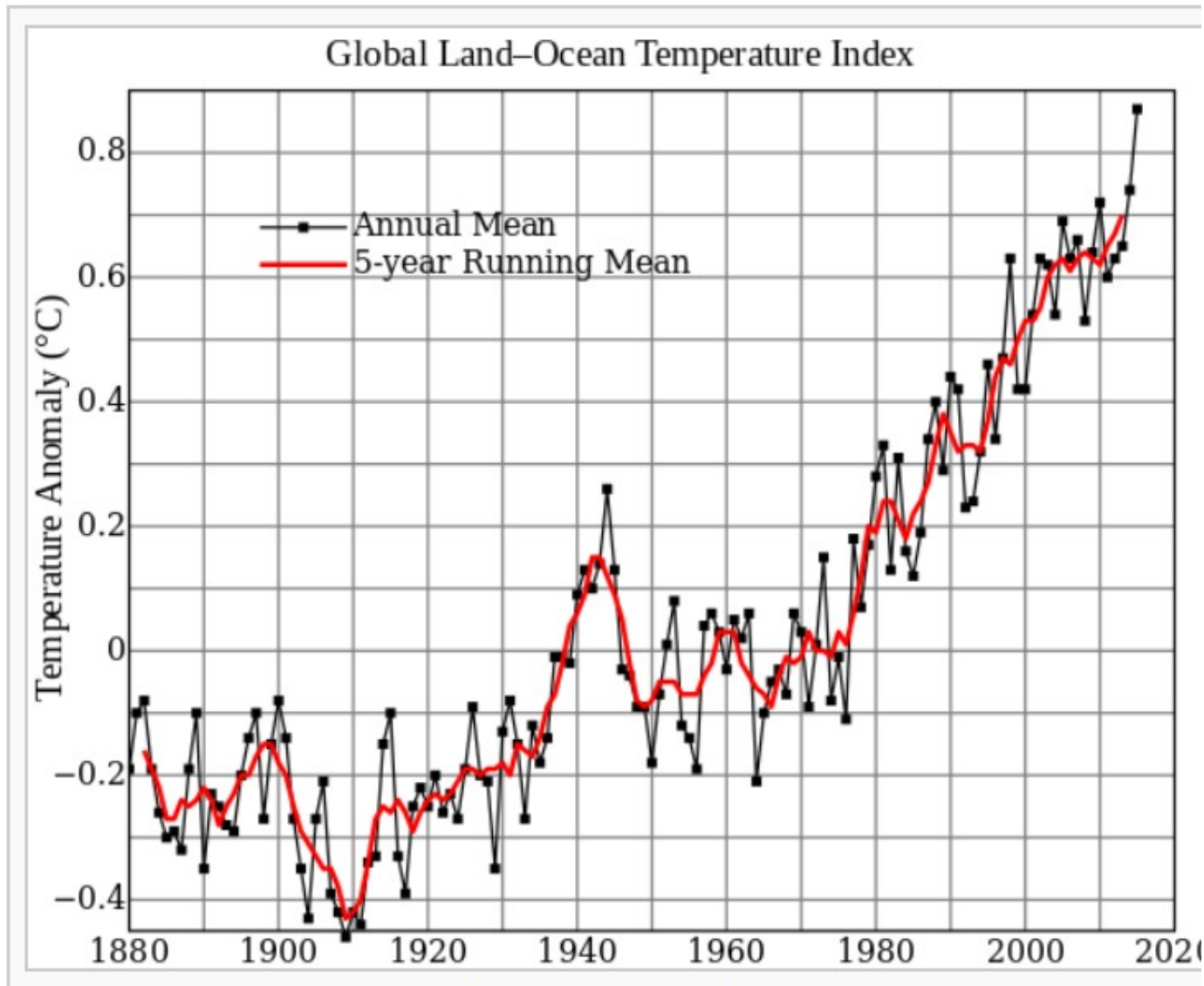
# Atmospheric CO2 Warms Earth



A pictogram of the greenhouse effect



# Temperature Increases



# Future?

- By 2300, there would be little precedent for the transformation of the Earth. That's because humanity's billowing of CO<sub>2</sub> into the atmosphere, chiefly through the consumption of fossil fuels, may be on track in a few centuries to hit a level not seen in 420 million years, according to the findings published yesterday in Nature Communications.



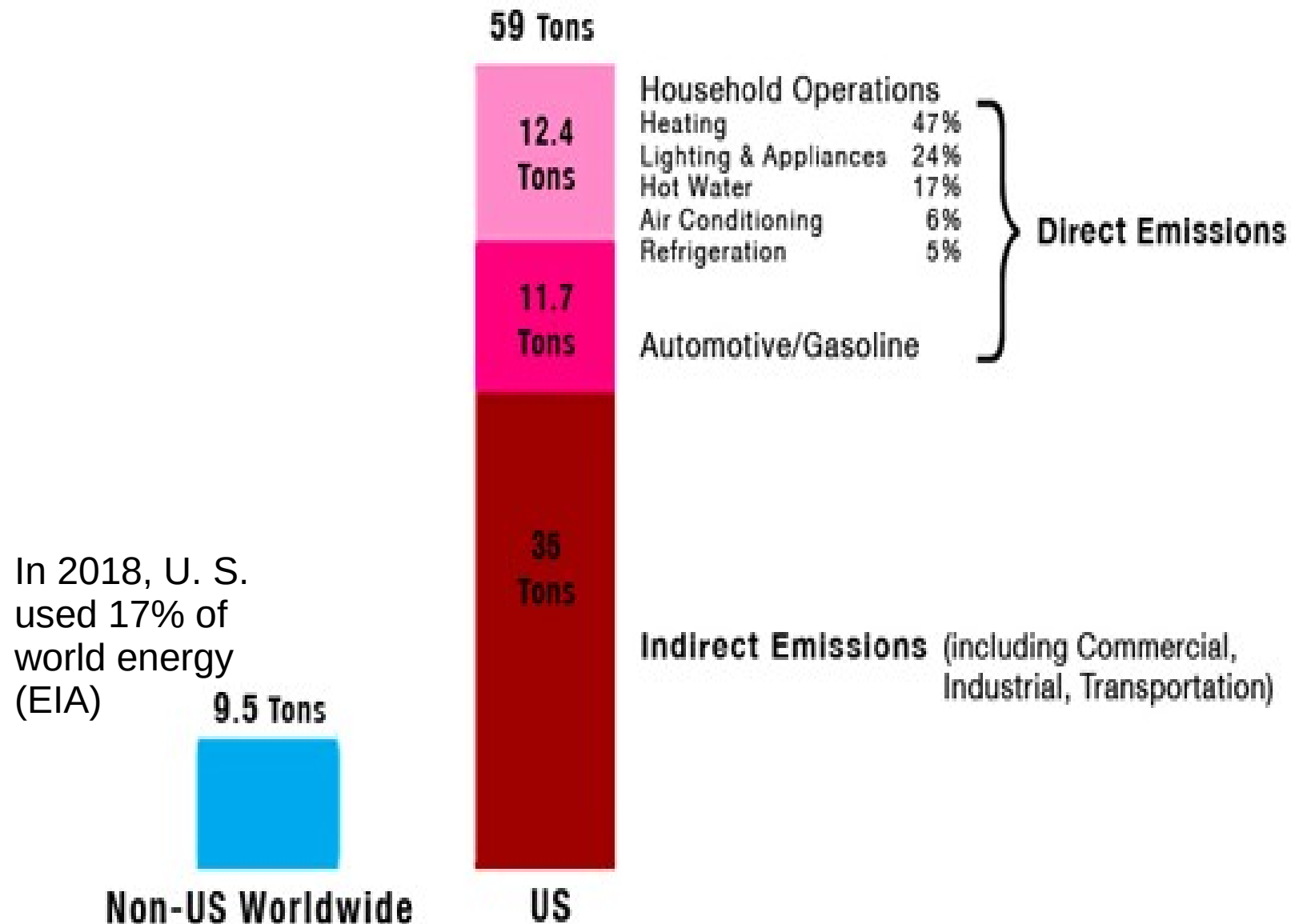


# CAFETERIA





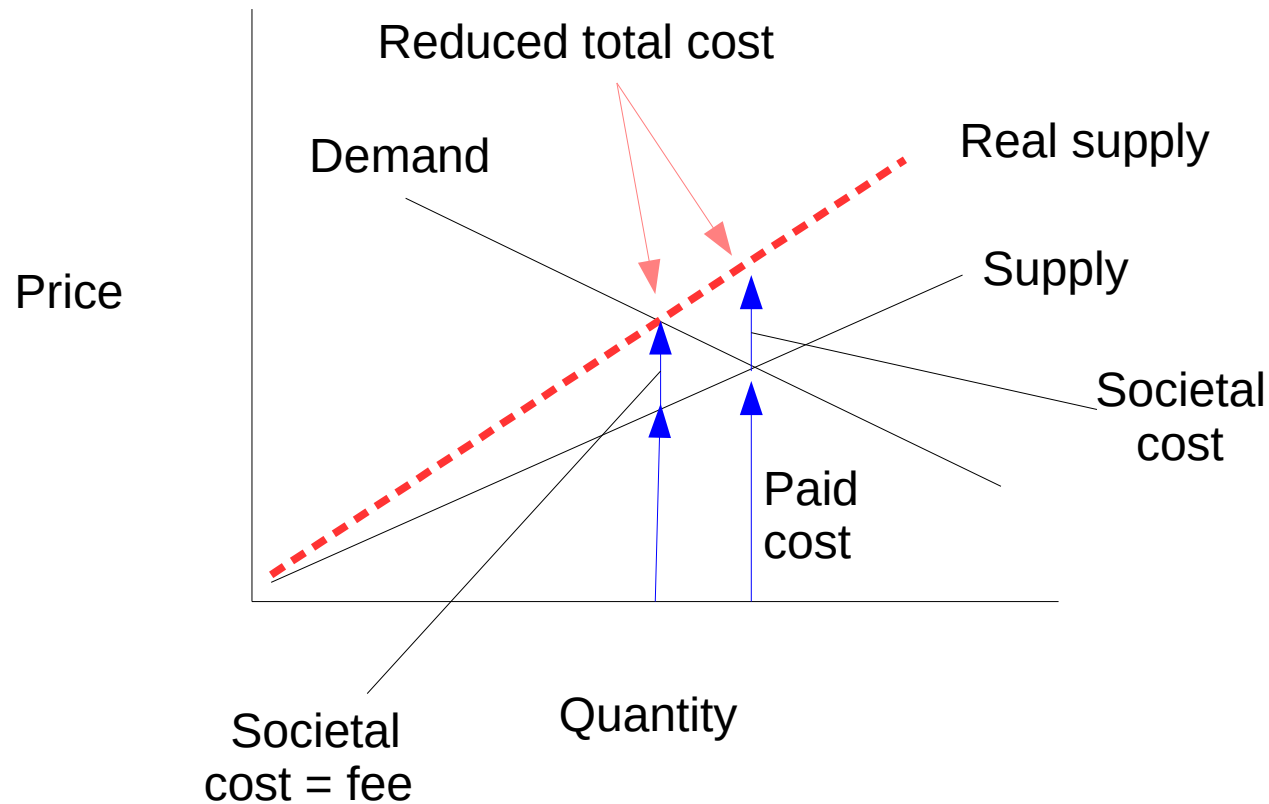
# How Americans Produce Emissions (Carbon Dioxide per Household)



Sources: <http://www.eia.doe.gov/kids/energyfacts/uses/residence.html>  
EIA Annual Energy Review 2004 (presenting 2003 data)

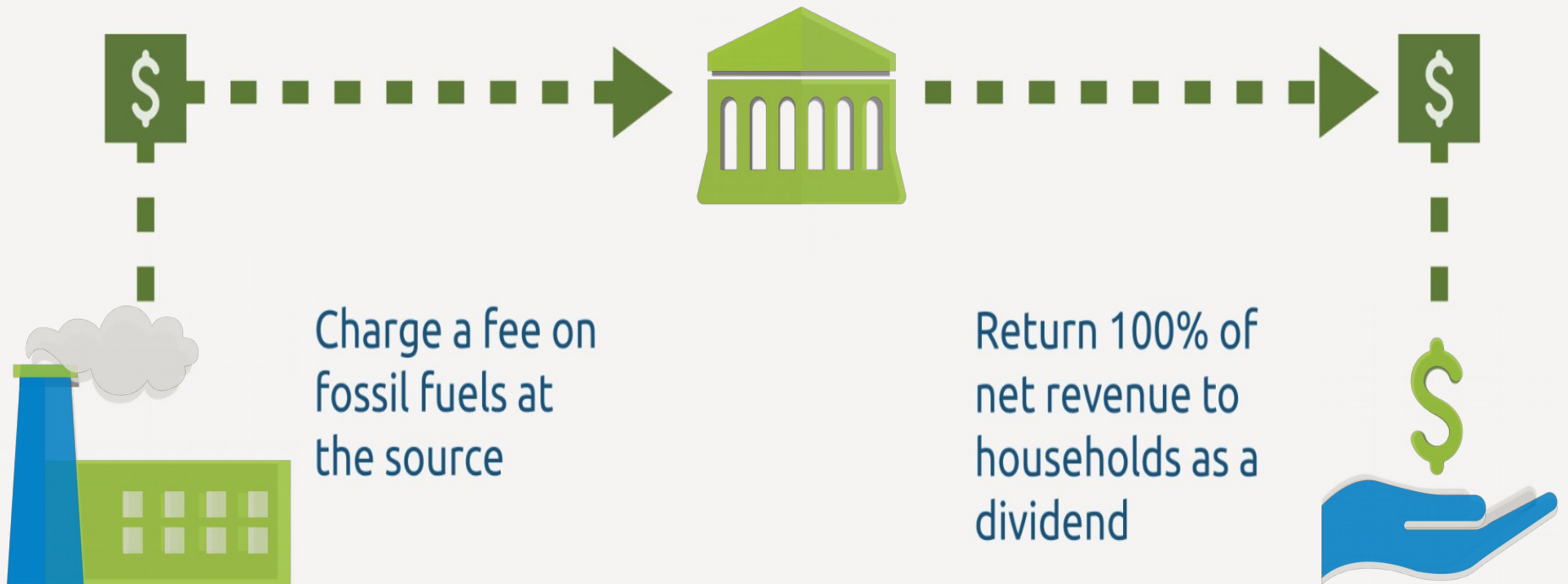


# Real Supply and Demand



# The most effective policy:

## A carbon fee & dividend policy



# The Energy Innovation and Carbon Dividend Act of 2019

- Introduced as H. R. 763
- Supported by 62 Representatives
- Includes one Republican
- Increasing fee on fossil carbon
- Dividend
- Revenue neutral





# Who supports pricing carbon?

- **LEADING CLIMATE ACTIVISTS** BILL MCKIBBEN, VARSHINI PRAKASH AND MANY OTHERS
  - **TOP CLIMATE SCIENTISTS** DR. JAMES HANSEN, DR. KATHERINE HAYHOE, DR. STEVEN CHU, AND MANY MORE.
  - **REPUBLICAN LEADERS** JAMES BAKER, GEORGE SCHULTZ, HENRY PAULSON, LINDSEY GRAHAM AND MANY OTHERS.
  - **DEMOCRATIC LEADERS** ROBERT REICH, BERNIE SANDERS, HENRY WAXMAN, BARACK OBAMA, ELIZABETH WARREN, JOSEPH BIDEN, MAYOR PETE, AND MANY OTHERS.
- MEDICAL GROUPS** AMERICAN MEDICAL ASSOCIATION, AMERICAN HEART ASSOC., AMERICAN LUNG ASSOC., AND 67 OTHERS
- RELIGIONS:** POPE FRANCIS, THE U.S. CONFERENCE OF CATHOLIC BISHOPS, THE PRESBYTERIAN CHURCH USA, UNITED CHURCH OF CHRIST, UNIVERSALIST UNITARIAN ASSOC., EVANGELICAL ACTION NETWORK, FRIENDS COMMITTEE ON NATIONAL LEGISLATION
- THE IPCC:** "A PRICE ON CARBON IS CENTRAL TO PROMPT MITIGATION."

# Alexandra Ocasio-Cortez called for:



“structuring an economy that is sustainable, where the externalities of the damage of some industries or markets get internalized.”

<https://www.carbontax.org/blog/2019/01/21/ocasio-cortez-backs-externality-pricing-during-mlk-celebration/>



“So if there is one thing I would like to see, it’d be for us to be able to price the cost of carbon emissions.”

--Barack Obama



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# Obama Calls Carbon Price Better Than Regulations

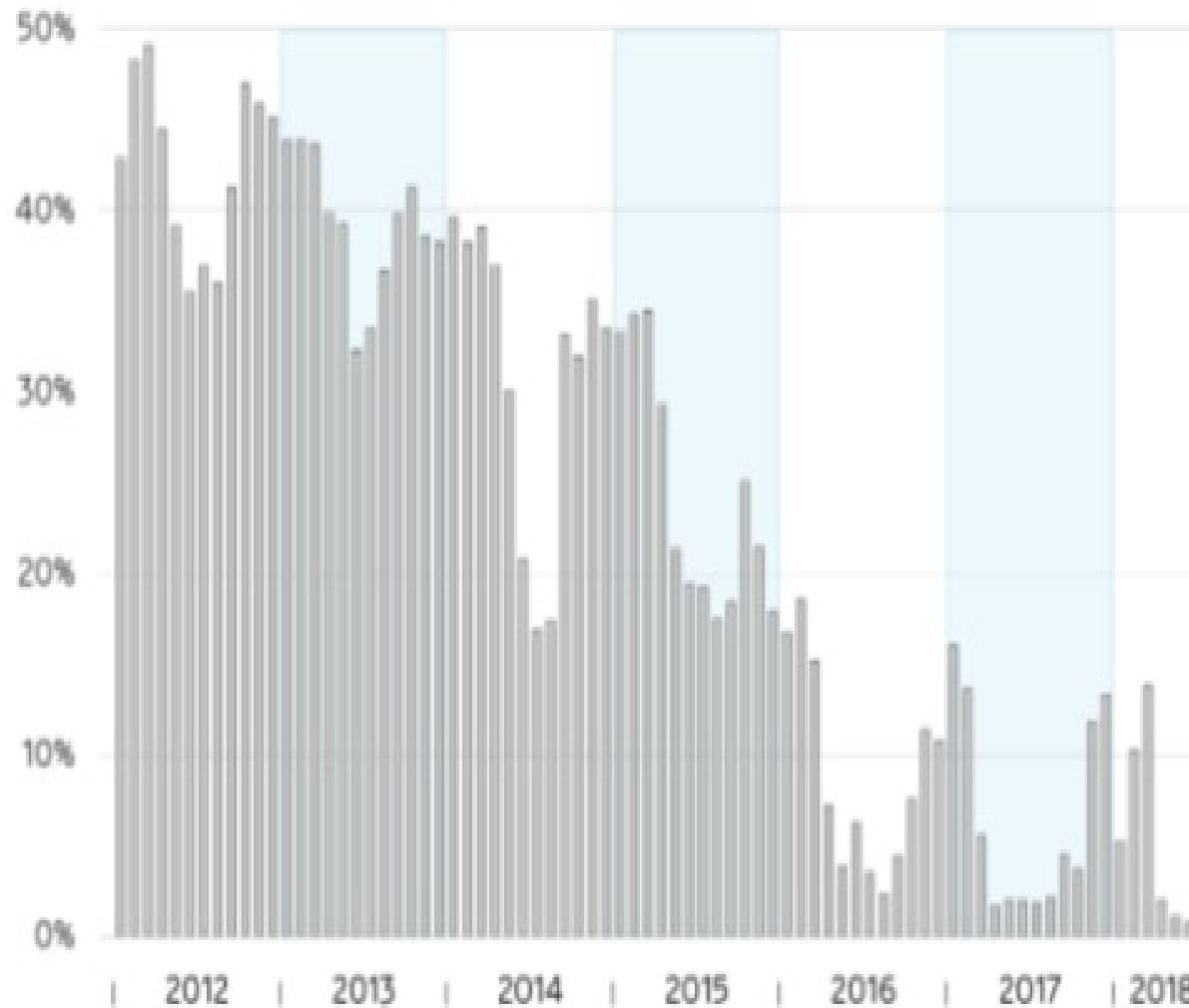
A tax on carbon is the most “elegant” solution to climate change

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By Evan Lehmann, ClimateWire on December 2, 2015

<https://www.scientificamerican.com/article/obama-calls-carbon-price-better-than-regulations/>

## Share of generation from coal



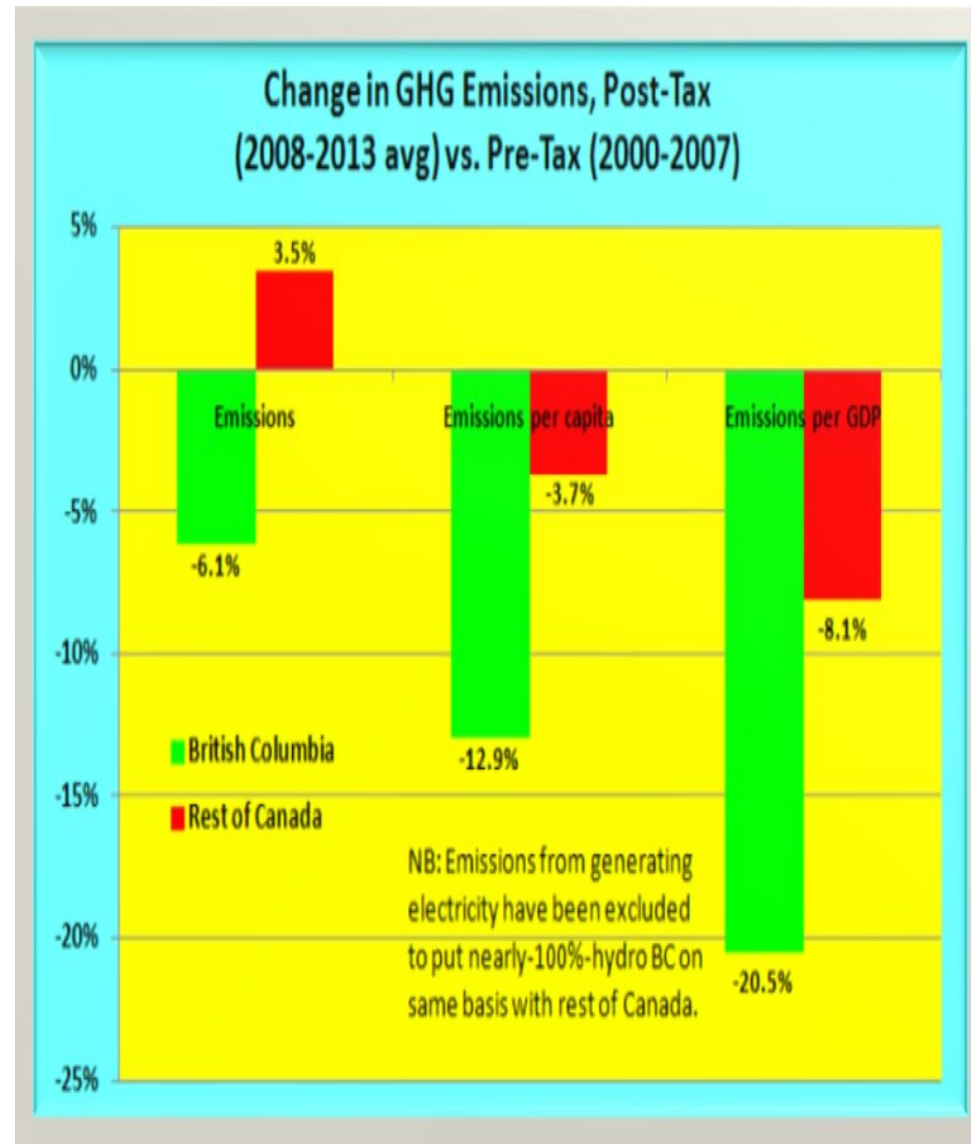
Source: [Electric Insights Quarterly](#) - Q2 2018

Akshat Rathi, "A Carbon Tax Killed Coal in the UK," Quartz.com, February 1, 2018.

# British Columbia, Canada 2008-2012

- Reduced taxes
- Revenue neutral
- Fuel use down
- GDP up
- Popular
- “Proof That a Price on Carbon Works,” NYT Editorial Board,
- [http://www.nytimes.com/2016/01/19/opinion/proof-that-a-price-on-carbon-works.html?\\_r=0](http://www.nytimes.com/2016/01/19/opinion/proof-that-a-price-on-carbon-works.html?_r=0)
- “British Columbia's carbon tax
- The evidence mounts,”

The Economist Magazine,  
<http://www.economist.com/blogs/americasview/2014/07/british-columbias-carbon-tax>



<http://www.carbontax.org/blog/2015/12/17/british-columbias-carbon-tax-by-the-numbers/>

# US and Swedish greenhouse gas emissions

Greenhouse gas emissions have declined by about 25 percent in the past three decades in Sweden, which taxes carbon. In the U.S., which doesn't tax carbon, emissions are declining but were higher in 2016 than in 1990.

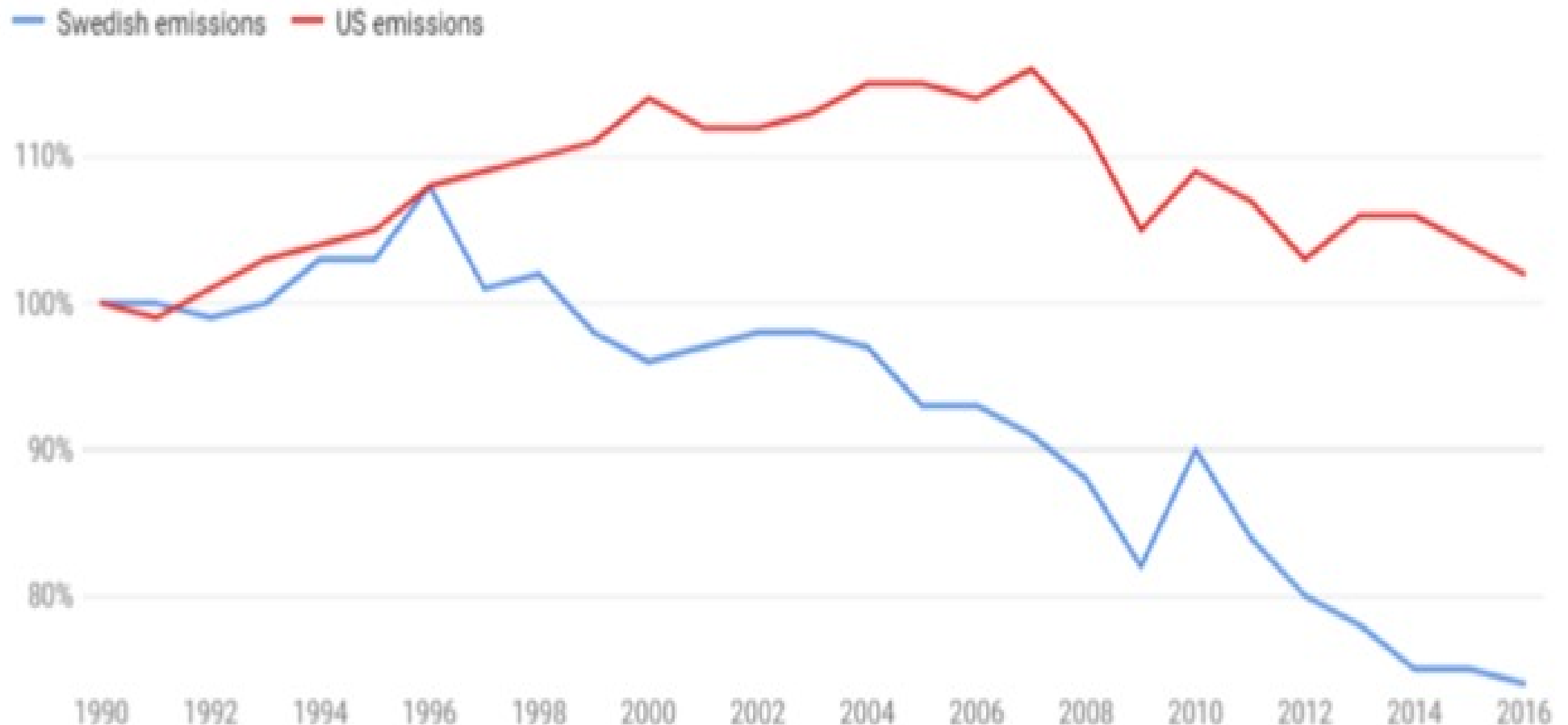


Chart: The Conversation, CC-BY-ND • Source: [Statistics Sweden and EPA](#) • [Get the data](#)

Source: <https://theconversation.com/with-the-right-guiding-principles-carbon-taxes-can-work-109328>



# THE WALL STREET JOURNAL.

THURSDAY, JANUARY 17, 2019

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ORIGINAL CO-SIGNATORIES INCLUDE

- 4** Former Chairs of the Federal Reserve (All)
- 27** Nobel Laureate Economists
- 15** Former Chairs of the Council of Economic Advisers
- 2** Former Secretaries of the U.S. Department of Treasury

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- NATIONAL WILDLIFE FEDERATION
- NATURAL RESOURCES DEFENSE COUNCIL
- NATURE CONSERVANCY

# VERY POSITIVE REVIEWS 2

- OCEAN CONSERVANCY
- RESOURCES FOR THE FUTURE
- THE PRESBYTERIAN CHURCH
- THE EPISCOPAL CHURCH



# VERY POSITIVE REVIEWS 3

- THE U.S. CONFERENCE OF CATHOLIC BISHOPS
- EVANGELICAL ENVIRONMENTAL NETWORK
- YOUNG EVANGELICALS FOR CLIMATE ACTION
- UNITED CHURCH OF CHRIST
- + MANY MORE ([energyinnovationact.org](http://energyinnovationact.org))

# The popular will ... Luntz Poll

**4 out of 5 of voters want Congress to put politics aside and reach a *bipartisan* solution**

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Is it important that any national climate solution be bipartisan?

	Total	GOP	Swing	DEM
Yes	80%	75%	83%	83%
No	20%	25%	17%	17%



# World Economic Forum Annual Meeting 2019 Overview

Davos-Klosters, Switzerland 22-25 January



COMMITTED TO  
IMPROVING THE STATE  
OF THE WORLD



Globalization 4.0: Shaping a Global Architecture in the Age  
of the Fourth Industrial Revolution

## Top 5 global risks 2008 - 2019

Select an option:

☒ Likelihood

☐ Impact

2019

◀ 2008 ▶

1

Extreme weather events

Asset price collapse

2

Failure of climate-change  
mitigation and adaptation

Middle East instability

3

Major natural disasters

Failed and failing states

4

Massive incident of data  
fraud/theft

Oil and gas price spikes

5

Large-scale cyberattacks

Chronic disease, developed  
world

# U.S. CHAMBER OF COMMERCE

- “The climate is changing and humans are contributing to these changes.”
- “Inaction is not an option”
- <https://www.uschamber.com/addressing-climate-change>



“It is free to pollute, so we have too much pollution. Starting next year, it will no longer be free to pollute anywhere in Canada. We are going to place a price on the pollution that causes climate change from coast to coast to coast. We’re also going to help Canadians adjust to this new reality.”

- *Canadian Prime Minister Justin Trudeau*



# Wind Energy Storage

- German program
- Water pumped
- Falling water generates electricity



# The Ocean and Cryosphere in a Changing Climate

This Summary for Policymakers was formally approved at the Second Joint Session of Working Groups I and II of the IPCC and accepted by the 51th Session of the IPCC, Principality of Monaco, 24th September 2019

## Summary for Policymakers



# Ice Loss

- Over the last decades, global warming has led to widespread shrinking of the cryosphere, with mass loss from ice sheets and glaciers (very high confidence), reductions in snow cover (high confidence) and Arctic sea ice extent and thickness (very high confidence), and increased permafrost temperature (very high confidence).  
{2.2, 3.2, 3.3, 3.4, Figures SPM.1, SPM.2}





# Ocean Warming and Acidification

- It is virtually certain that the global ocean has warmed unabated since 1970 and has taken up more than 90% of the excess heat in the climate system (high confidence). Since 1993, the rate of ocean warming has more than doubled (likely). Marine heatwaves have very likely doubled in frequency since 1982 and are increasing in intensity (very high confidence). By absorbing more CO<sub>2</sub>, the ocean has undergone increasing surface acidification (virtually certain). A loss of oxygen has occurred from the surface to 1000 m (medium confidence). {1.4, 3.2, 5.2, 6.4, 6.7, Figures SPM.1, SPM.2}



# Coastal Hazard

- Coastal communities are exposed to multiple climate-related hazards, including tropical cyclones, extreme sea levels and flooding, marine heatwaves, sea ice loss, and permafrost thaw (high confidence). A diversity of responses has been implemented worldwide, mostly after extreme events, but also some in anticipation of future sea level rise.



# Problems Continue

- Global-scale glacier mass loss, permafrost thaw, and decline in snow cover and Arctic sea ice extent are projected to continue in the near-term (2031–2050) due to surface air temperature increases (high confidence), with unavoidable consequences for river runoff and local hazards (high confidence). The Greenland and Antarctic Ice Sheets are projected to lose mass at an increasing rate throughout the 21st century and beyond (high confidence).



# Sea Level Rise

- Sea level continues to rise at an increasing rate. Extreme sea level events that are historically rare (once per century in the recent past) are projected to occur frequently (at least once per year) at many locations by 2050
- Extreme sea levels and coastal hazards will be exacerbated by projected increases in tropical cyclone intensity and precipitation (high confidence).



# Coral Loss

- Ocean warming, oxygen loss, acidification and a decrease in flux of organic carbon from the surface to the deep ocean are projected to harm habitat-forming cold-water corals, which support high biodiversity, partly through decreased calcification, increased dissolution of skeletons, and bioerosion (medium confidence).





# Food Loss

- Future shifts in fish distribution and decreases in their abundance and fisheries catch potential due to climate change are projected to affect income, livelihoods, and food security of marine resource-dependent communities (medium confidence).



# Final Points

- It is already late; climate change is here
- Damage from climate change will get worse for at least 20 years
- Climate change will not be solved without U. S. federal action
- The Carbon Dividend Act can be passed in this Congress
  - House can pass with a large margin; Democrats will not vote against it; Republicans will know voters want it
  - Senate will need to act on it
  - Will pass with reasonably large margin
  - President Trump will not veto before election