

# *Population, Reports and Treaties*

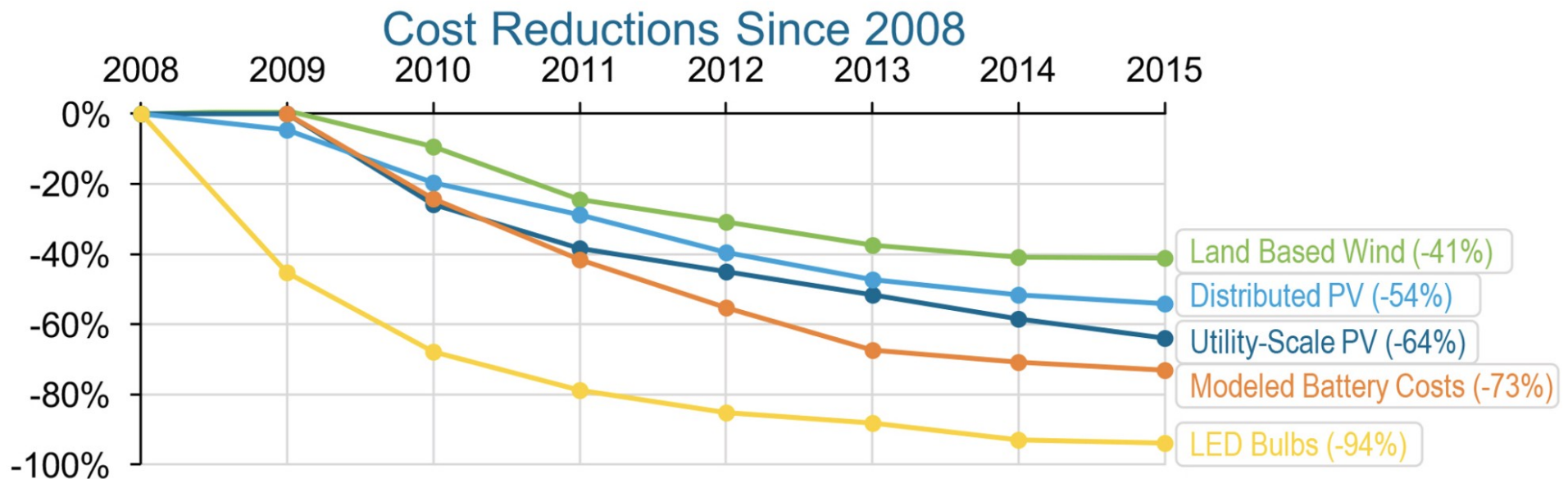
Academy of Lifelong Learning  
Denver, CO

October 6, 2016

JFOrmes@comcast.net

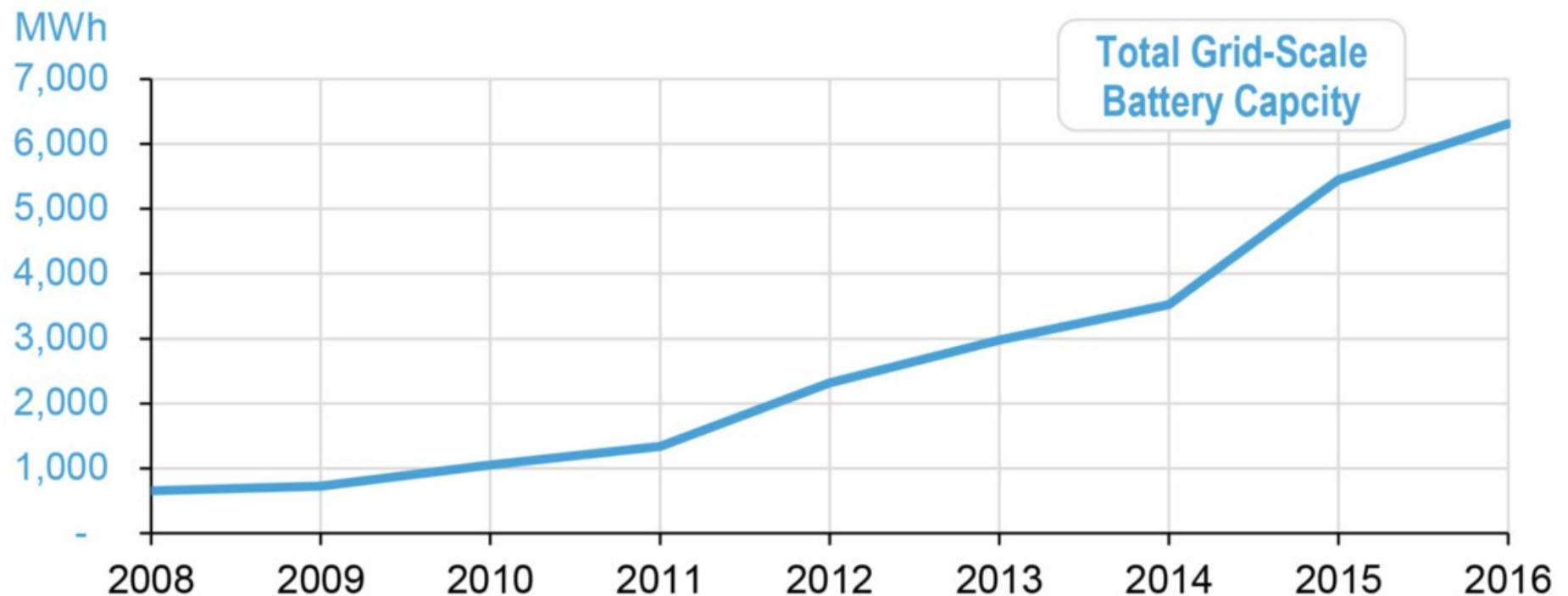
# Why it's not hopeless

- Chart of the year: 'Incredible' price drops jumpstart clean energy revolution
  - New DOE report details latest advances in solar, wind, LED lights, batteries, and electric cars.



# Why it's not hopeless

## Supercharging the Grid with Batteries



**DOE projects “the total domestic energy storage market could be worth \$2.9 billion by 2021, as compared to \$350 million in 2015.”**

**<https://thinkprogress.org/clean-energy-revolution-now-81a8e61134c7#.xqdfaa8cs>**

# Good news

In 2010, more was invested in renewables than in extracting more ancient hydrocarbons, globally.

- Renewable: \$187 billion
- Ancient hydrocarbons: \$157 billion

<http://www.bloomberg.com/news/articles/2011-11-25/fossil-fuels-beaten-by-renewables-for-first-time-as-climate-talks-founder>



# Climate Organizations

- Citizens Climate Lobby (CCL)
- 350.org (Bill McKibben)
- Sierra Club
- Union of Concerned Scientists
- Colorado Renewable Energy Society (CRES)
- Alliance for Sustainable Colorado
- Greenpeace
- Idle No More (mostly Canadian)

# National Climate Assessment (May 2014)

- Melting permafrost in Alaska
- Ocean acidification
- Rising sea level, especially along east coast
- Heat waves in the west
- More severe winter storms and hurricanes

An aside from the DoD: climate change is a “threat multiplier”. Drought in the middle east is widely thought to have helped to precipitate the civil war in Syria.

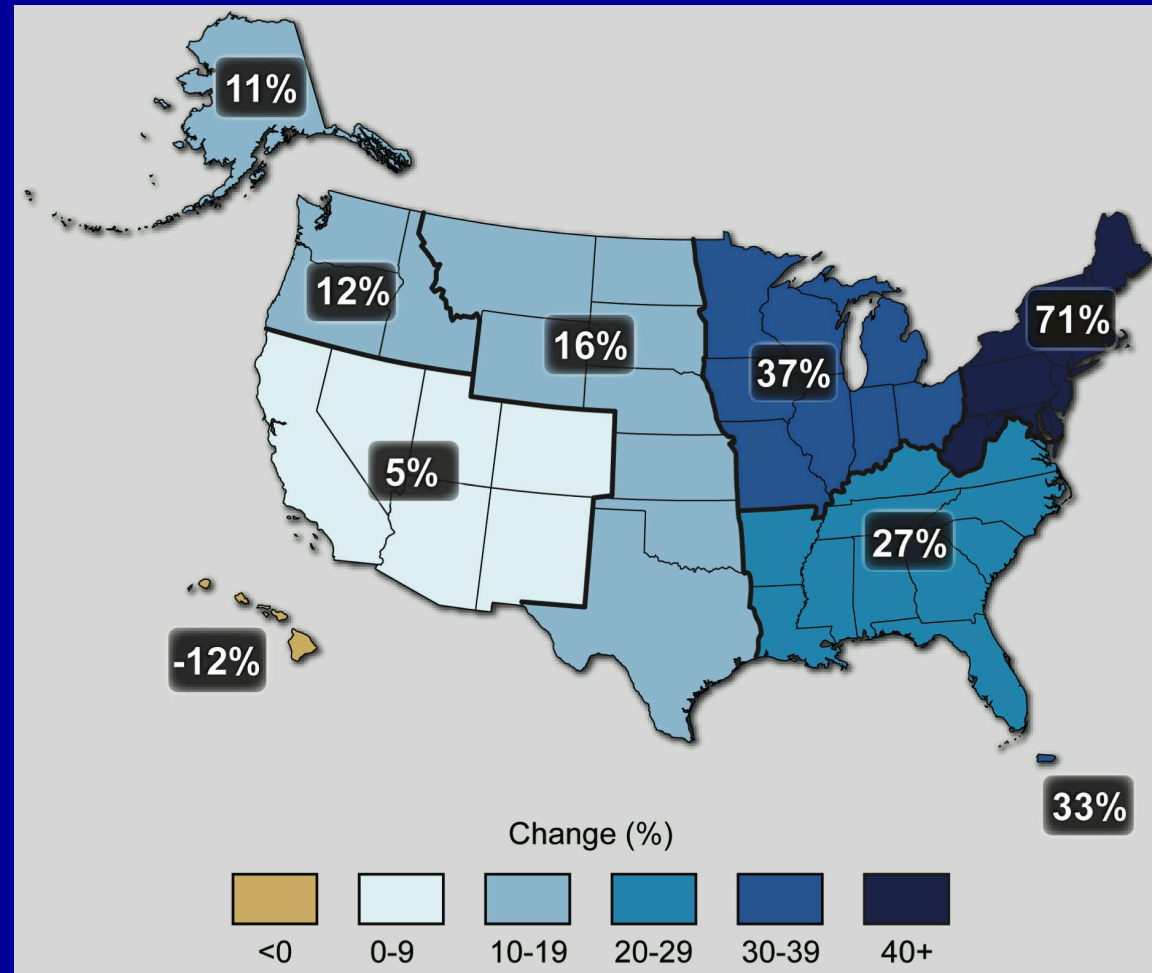


# National Climate Assessment (May 2014)

## Observed increase in “heavy” precipitation events: 1958-2012

Definition of “heavy” depends on location and the long term averages. Usually they are high (90<sup>th</sup>) percentile precipitation events. Remember the 100 year flood plain where there were floods every 10 years?

N.b. A rain event is the weather; the trend relates to the climate.

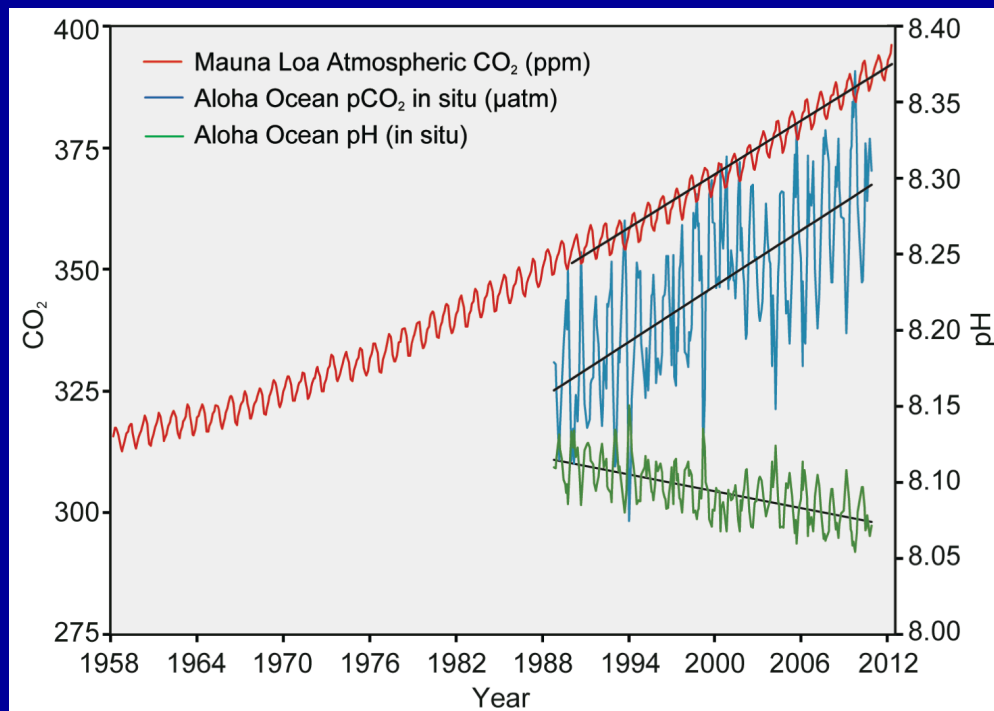


Source: National Climate Assessment Report, adapted from Karl et al. 2009

# National Climate Assessment (May 2014)

Observed decrease in pH of the ocean (lower pH means more acidic):  
roughly 26% of the CO<sub>2</sub> released to the atmosphere between 2002-2011 has dissolved in the ocean (28% to plants, and 48% to atmosphere). See <https://scripps.ucsd.edu/programs/keelingcurve/2013/07/03/how-much-co2-can-the-oceans-take-up/>

Impacts coral reefs, shellfish, many other sea creatures that cannot evolve fast enough to adapt.



Acidification



Small change, big impact.

Source: National Climate Assessment Report, modified from Feely et al. 2009

# There are costs of delaying action

## *White House Warns Delaying Climate Action Costs Billions More*

A new report shows that failing to combat global warming would dramatically increase the cost of climate insurance.

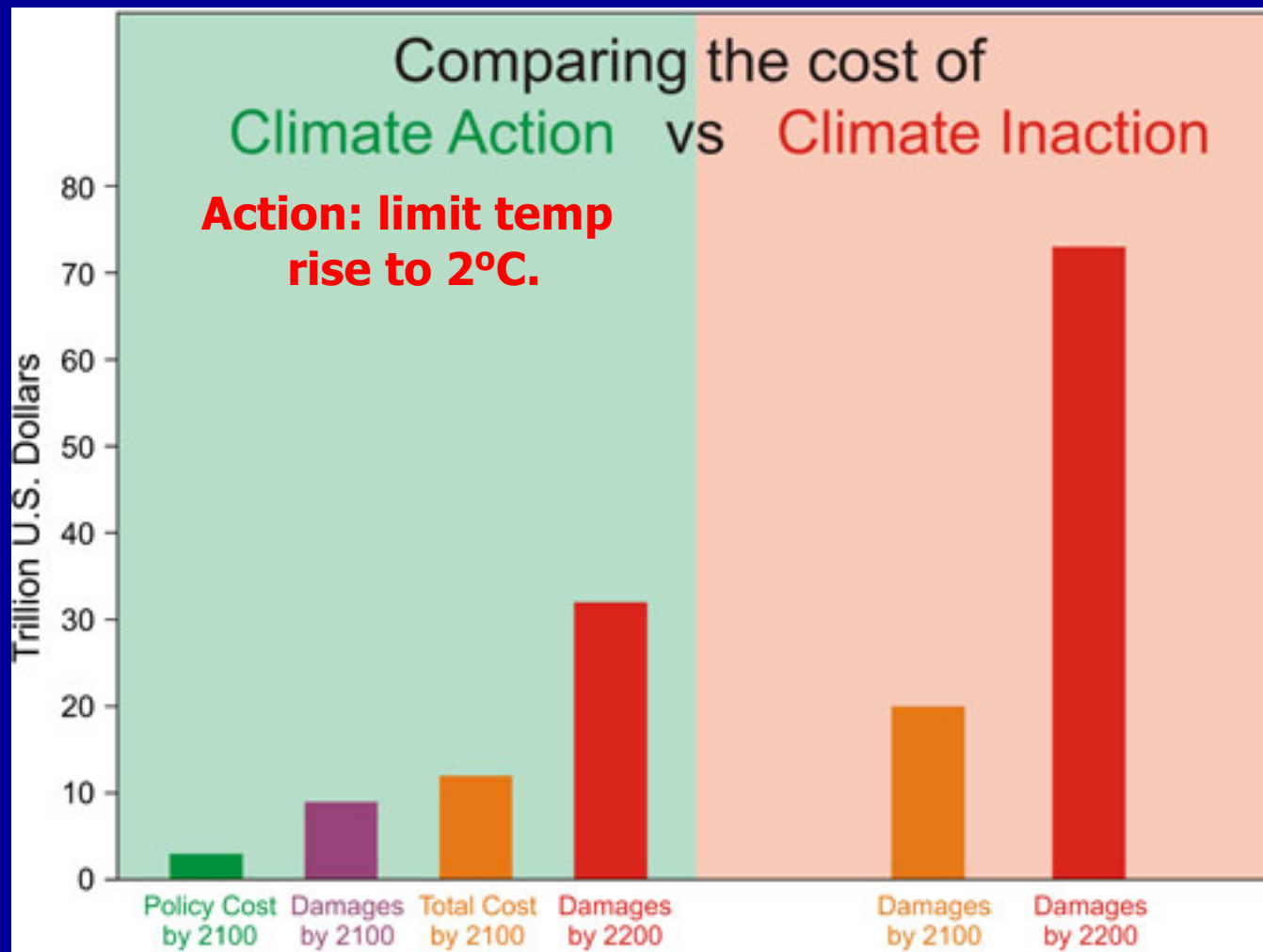
Scientific American, July 29, 2014

The report notes that "each year of delay means more CO<sub>2</sub> emissions, so it becomes increasingly difficult, or even infeasible, to hit a climate target that is likely to yield only moderate temperature increases."



if the world fails to use less fossil fuels before average temperatures rise 3 degrees Celsius—or 2 degrees higher than today—the United States faces yearly economic losses of \$150 billion. That amounts to about 1 percent of the nation's economy.

# Global costs

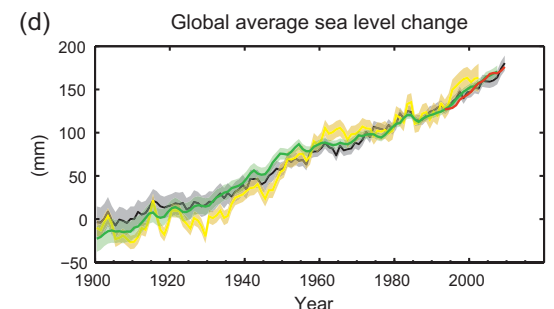
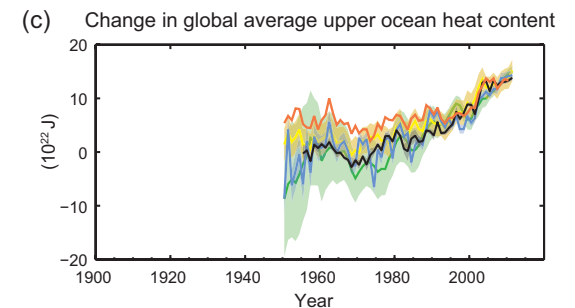
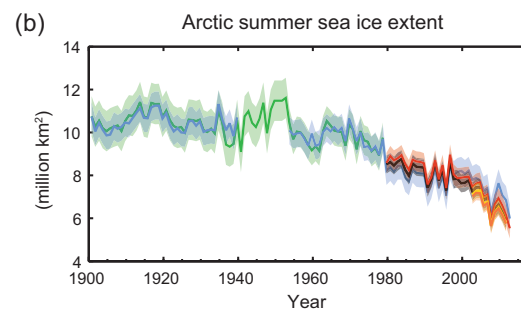
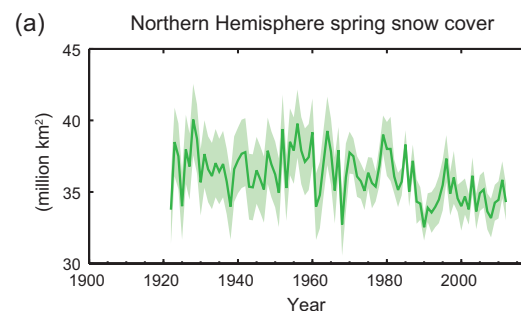
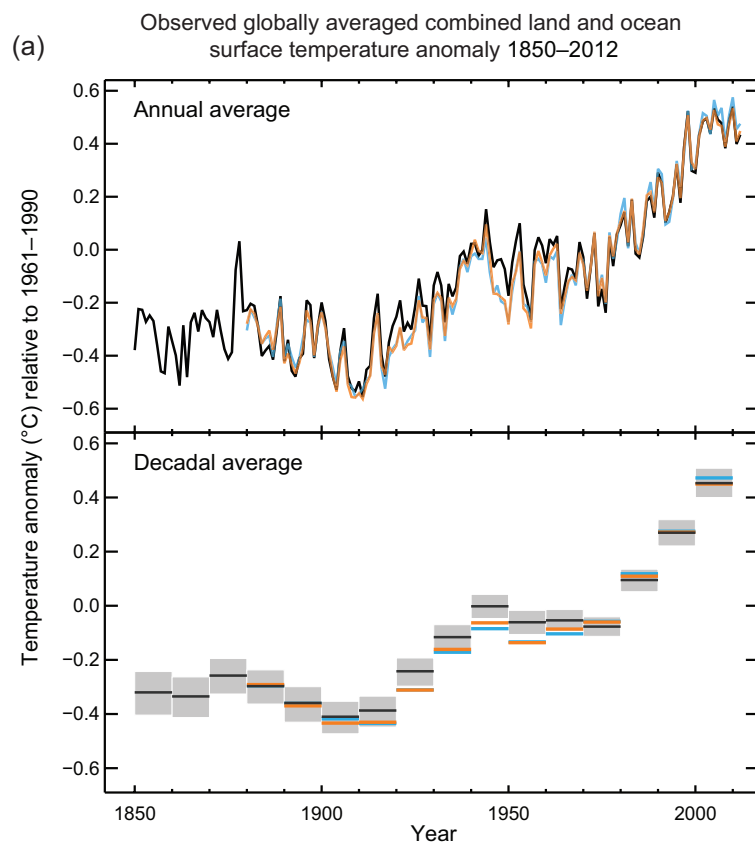


[http://www.diw.de/documents/publikationen/73/diw\\_01.c.43084.de/diw\\_wr\\_2005-12.pdf](http://www.diw.de/documents/publikationen/73/diw_01.c.43084.de/diw_wr_2005-12.pdf)  
and <http://digital.library.unt.edu/ark:/67531/metadc29337/m1/1/>



# 5<sup>th</sup> Climate Assessment Report of the IPCC was released early this year

Data are improving and the confidence in the results is getting higher. These charts are from the Public Policy Summary.



IPCC Report released March 28, 2014  
to this NY Times headline:

**"Climate change 'worst' is yet to come,  
UN report warns today"**

The New York Times summed up the report thusly: "Ice caps are melting, sea ice in the Arctic is collapsing, water supplies are coming under stress, heat waves and heavy rains are intensifying, coral reefs are dying; and fish and many other creatures are migrating toward the poles or in some cases going extinct."

**The  
New York  
Times**

# IPCC Reports

- IPCC reports are developed through multiple rounds of drafting and review.

IPCC member Governments endorse the report based on a dialogue between those who will use the report – the governments – and those who write it – the scientists.

- Endorsement is intended to underpin the report's authority.
- Endorsement does not guarantee any government action.

Assessment Reports AR

1990, FAR, First

1995 SAR, Second

2001, TAR, Third

2007, AR4, forth

2014, AR5, fifth

Not infallible. Mention error in AR4.



# Summary for Policymakers

Governmental endorsement of the summary is by “Approval”.

Approval signifies that the material has been subject to detailed, line-by-line discussion, leading to agreement among the participating IPCC member countries (in consultation with the scientists).

[http://www.ipcc.ch/publications\\_and\\_data/publications\\_and\\_data\\_reports.shtml](http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml)

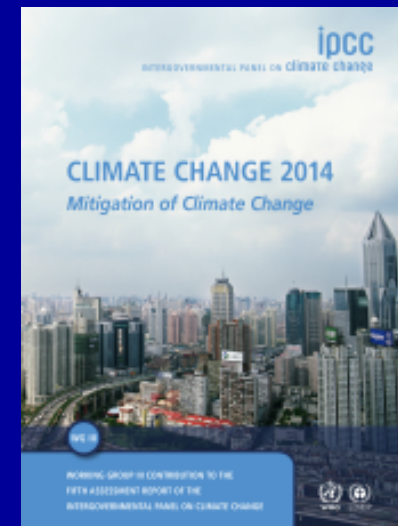
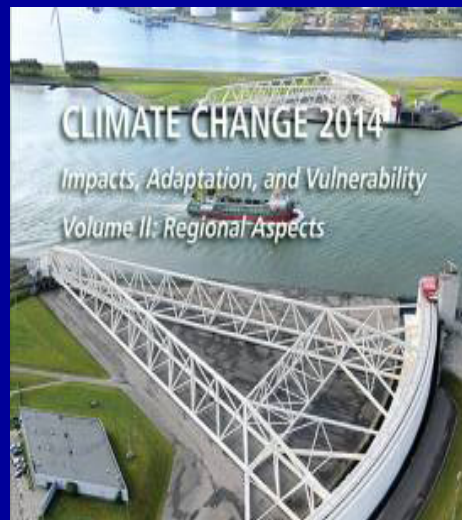


# 3 Major IPCC working groups



Assessment reports  
major working group reports  
(almost 800 authors)  
Various supporting materials

- I. The Physical Science Basis
- II. Impacts, Adaptation and Vulnerability
- III. Mitigation of Climate Change



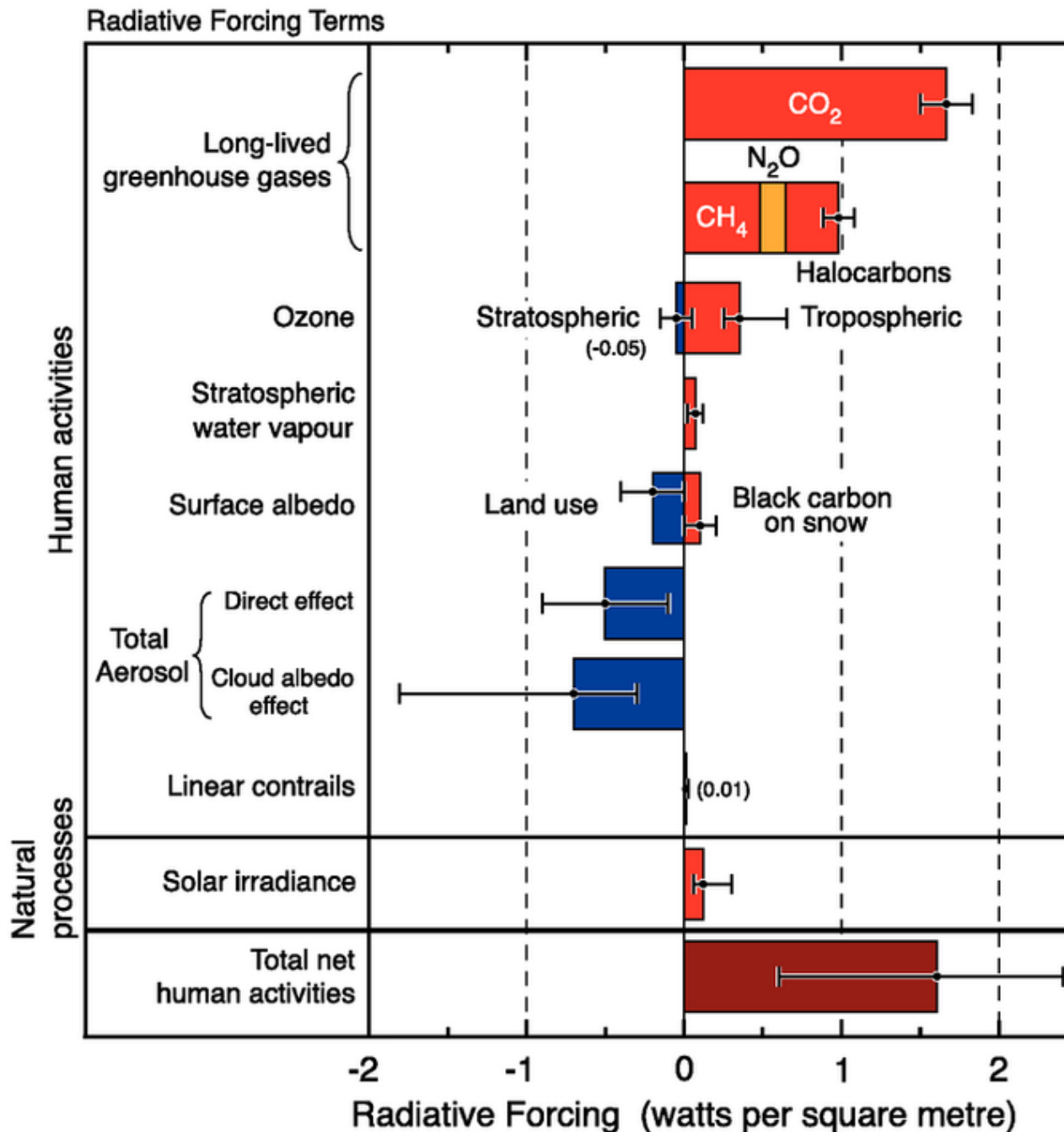
[http://www.ipcc.ch/working\\_groups/working\\_groups.shtml](http://www.ipcc.ch/working_groups/working_groups.shtml)

# Progression in IPCC reports

- First (FAR 1990): Summary for Policymakers report says they are certain that emissions resulting from **human activities** are substantially increasing the atmospheric concentrations of the greenhouse gases, resulting on average in an additional warming of the Earth's surface.
- Second (SAR 1995): The balance of evidence suggests a **discernible human influence** on global climate.
- Third (TAR 2001): Since the mid-20th century, most of the observed warming is "**likely**" (greater than 66% probability, based on expert judgment) due to human activities.
- Fourth (AR4 2007): Most of the global average warming over the past 50 years is "**very likely**" (greater than 90% probability, based on expert judgment) due to human activities.
- Fifth (AR5 2014): Human influence on the climate system is clear. It is **extremely likely** (95-100% probability) that human influence was the dominant cause of global warming between 1951-2010.



## Radiative forcing of climate between 1750 and 2005



What is the relative contribution of human-induced and natural variations?

**Notice the uncertainties.**

We will come back to this figure later in the course.

# Error in AR4

*Glaciers in the Himalaya are receding faster than in any other part of the world (see Table 10.9) and, if the present rate continues, the likelihood of them disappearing by the year 2035 and perhaps sooner is very high if the Earth keeps warming at the current rate. Its total area will likely shrink from the present 500,000 to 100,000 km<sup>2</sup> by the year 2035 (WWF, 2005).*

# World's Largest Polluters Strike Deal to Curb Global Warming

Nov. 12, 2014

The United States will cut emissions 26 to 28 percent below 2005 levels by 2025, a target the White House declared can be met "under existing law"—that is, without the need for Congress to pass legislation. China will peak its fast-rising emissions by 2030 at the latest, while also increasing its share of non-fossil energy to 20 percent in that same period.

U.S. and Chinese presidents Barack Obama and Xi Jinping signed a deal that will cut greenhouse gases and pledged to work together toward a global deal in 2015.



# Laudato Si' (Praised Be)

24 May 2015

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**"The time for seeking global solutions is running out. We can find suitable solutions only if we act together and in agreement."**

**- Pope Francis**

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[http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco\\_20150524\\_enciclica-laudato-si.html](http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html)

# International agreements in place

- international community objective to limit the increase of mean global T < **2° C** (3.6°F) above pre-industrial levels
  - requires global greenhouse gas emissions to peak by 2020 or sooner
  - limit the atmospheric CO<sub>2</sub> < 450 ppm
- This agreement was made in a number of international meetings: G8 2009/2010, G20 2009, UN General Assembly 2009/2010, Copenhagen Conference 2009.

# Paris accord: COP21 aka 2015 Paris Climate Conference

Dec 7,8, 2015

- First international agreement on GHG
- Limit  $\Delta T$  to  $<2^{\circ}\text{C}$  (already have  $0.8^{\circ}\text{C}$ )
  - Try to hold  $\Delta T$  to  $<1.5^{\circ}\text{C}$
- Statements of intention with tracking
- Arguments about enforcement

Rio Earth Summit in 1992  
established the Conference of Parties (hence COP)

<http://www.cop21paris.org>



# Concerning the approach to climate change:

**“...winning slowly is  
the same as losing.”**

...Bill McKibben, Aug 2016  
(co-founder of 350.org)



## – Urgency

- 1.5 deg C planet: 313 gigatonnes to go @ 37 gigatonnes / year = 8.5 years
- 2.0 deg C planet: 866 gigatonnes to go @ 37 gigatonnes / year = 23.4 years
  - (1 gigatonnes = 1 billion tonnes =  $1 \times 10^9$  tonnes)
- Waiting 20 to 30 years to transition from natural gas contributes to a 3.0 deg C warmer planet

# US to Fail Paris Emissions Pledge Without 'Fundamental Change'

## Report

*Published on Monday, September 26, 2016 by Common Dreams*

***US to Fail Paris Emissions Pledge Without 'Fundamental Change': Report***

*'This is a call to action to ensure we close the remaining gap' By Nadia Prupis, staff writer*

Scientists at a University of Oxford conference last week similarly warned that greenhouse gas emissions are not being reduced quickly enough to prevent the Earth from reaching the agreed-upon 1.5°C global warming threshold in a decade.

Meanwhile, a report by the environmental group Oil Change International also released last week found that the world has 17 years to get off fossil fuels entirely to prevent reaching the even more lenient 2°C warming threshold.

<http://www.commondreams.org/news/2016/09/26/us-fail-paris-emissions-pledge-without-fundamental-change-report>