Chesapeake Bay at the Forefront of Addressing Climate Change

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Center for Environmental Science

Chesapeake Biological Laborato
Science for Citizens Seminar
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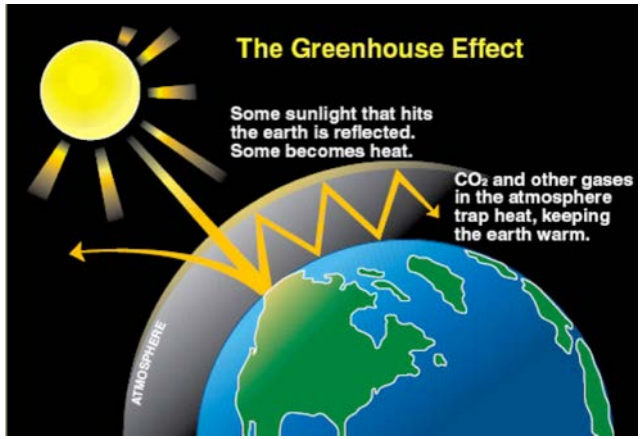
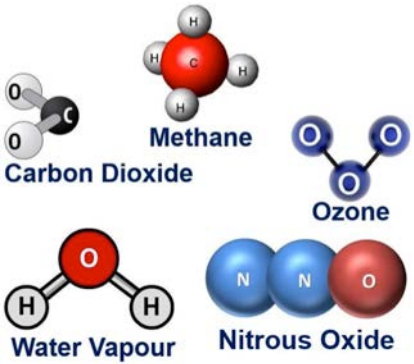
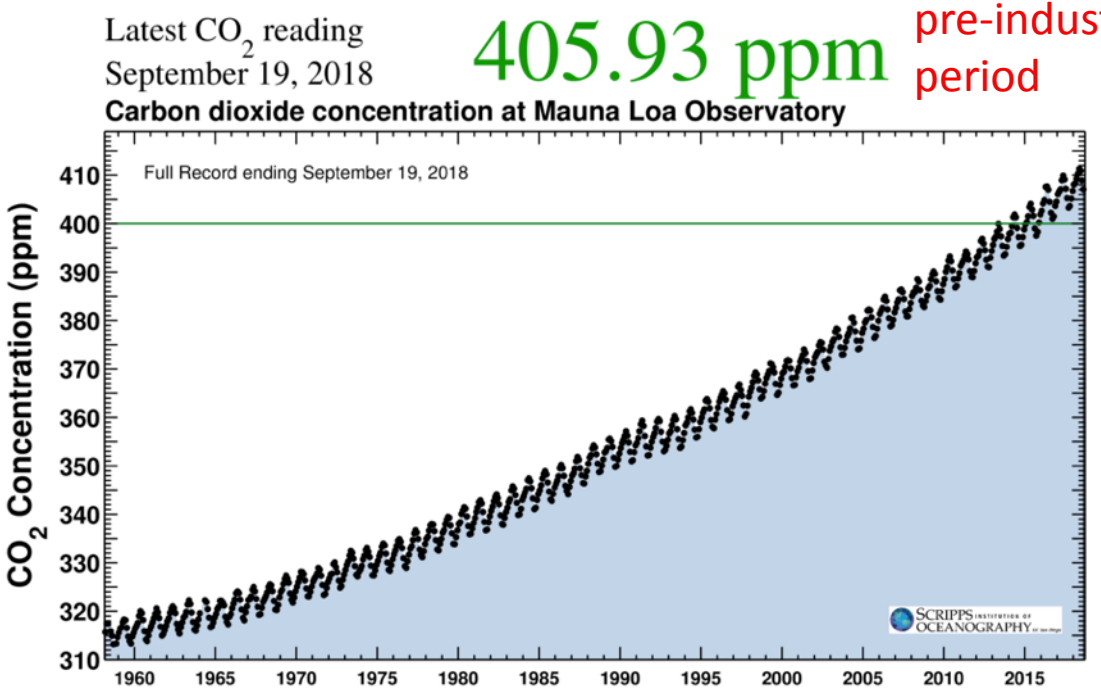
Chesapeake Biological Lab: A Special Place

Greenhouse Gas Concentrations Increasing



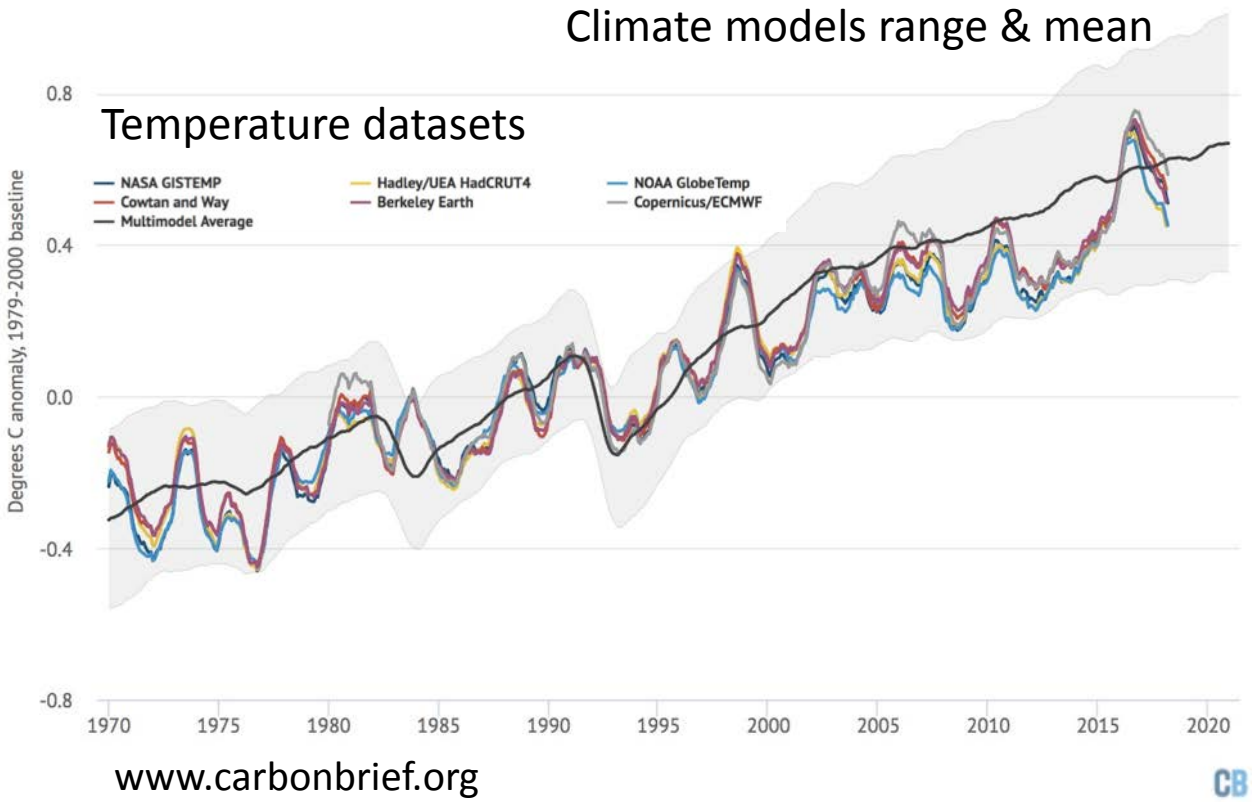


+46% since pre-industrial period



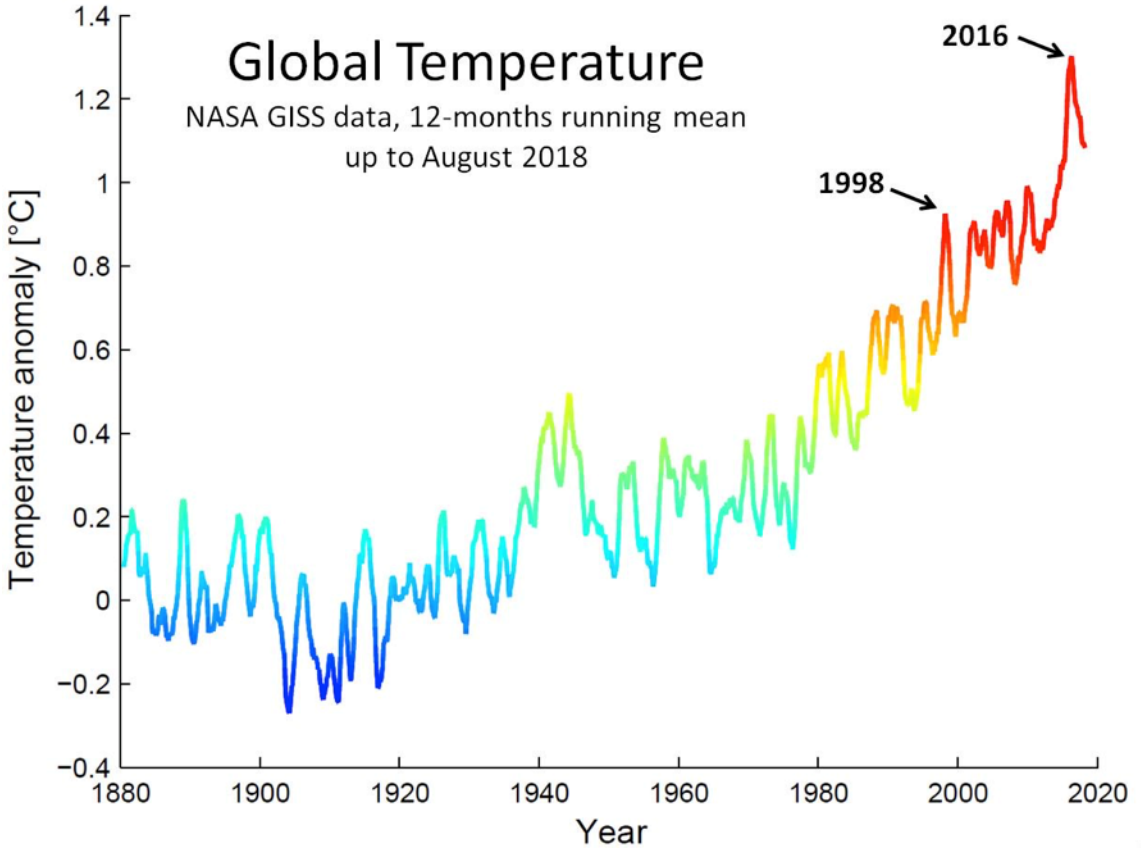
The Keeling Curve, Scripps Institution of Oceanography

Global Temperature Rising



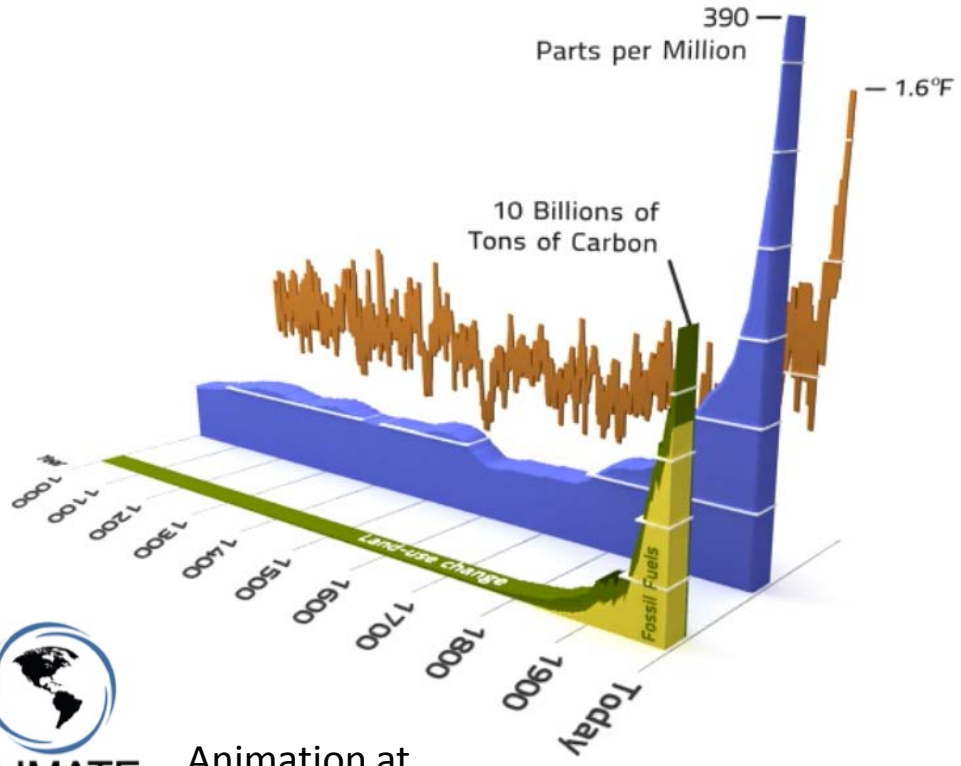
- Over 0.8°C (1.4°F) warming since 1970
- Varies with climate cycles such as El Niño-Southern Oscillation
- 2016 was warmest year on record, 2017 second warmest
- 2018 likely to be fourth warmest even though includes cooler La Niña phase

Even Over Longer Periods



- About 1.4°C (2.5°F) warming since 19th Century
- No lasting decline or pause after 1998
- Varies major volcano eruptions as well as with climate cycles

Putting It Together Over the Millennium

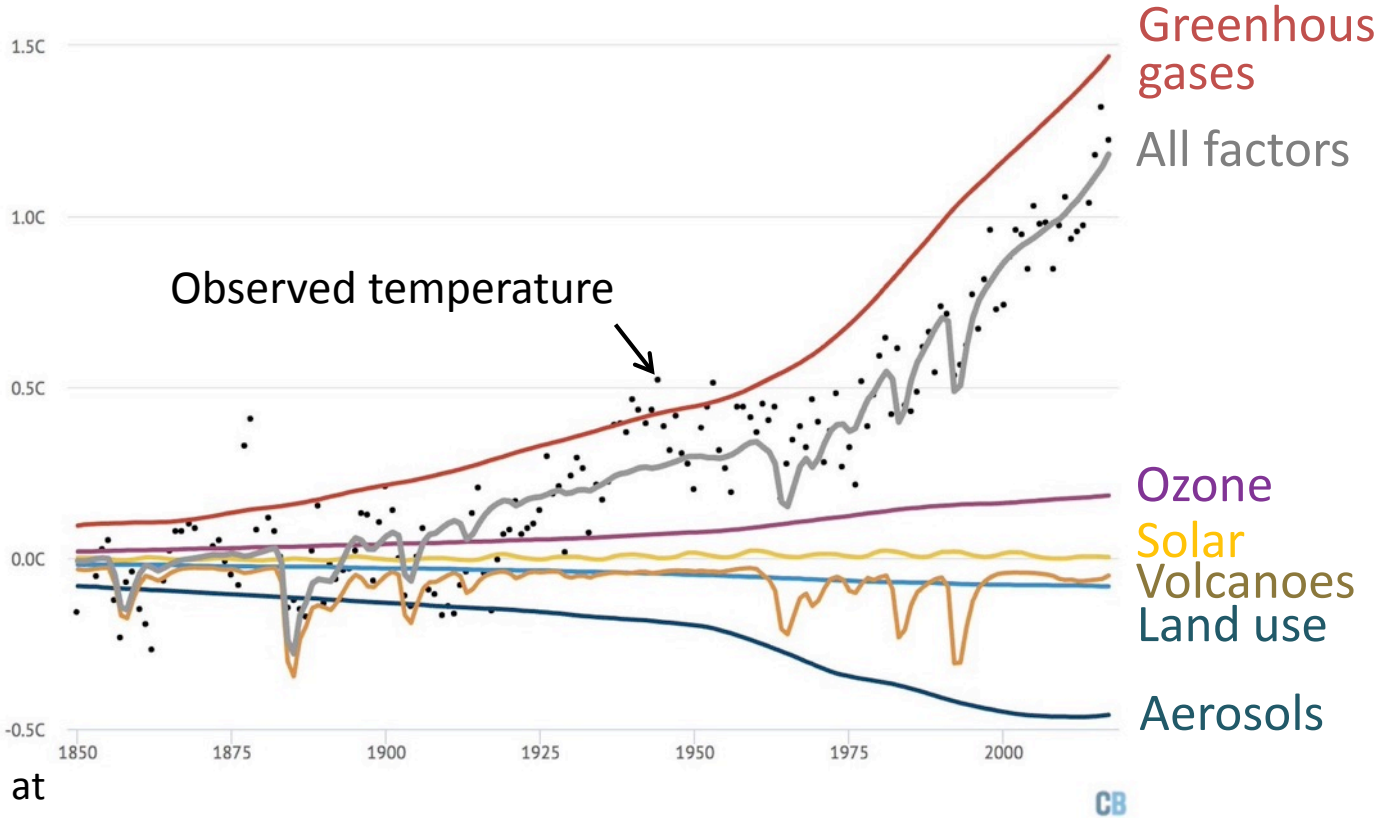


CLIMATE COMMUNICATION
SCIENCE & OUTREACH

Animation at
www.climatecommunication.org

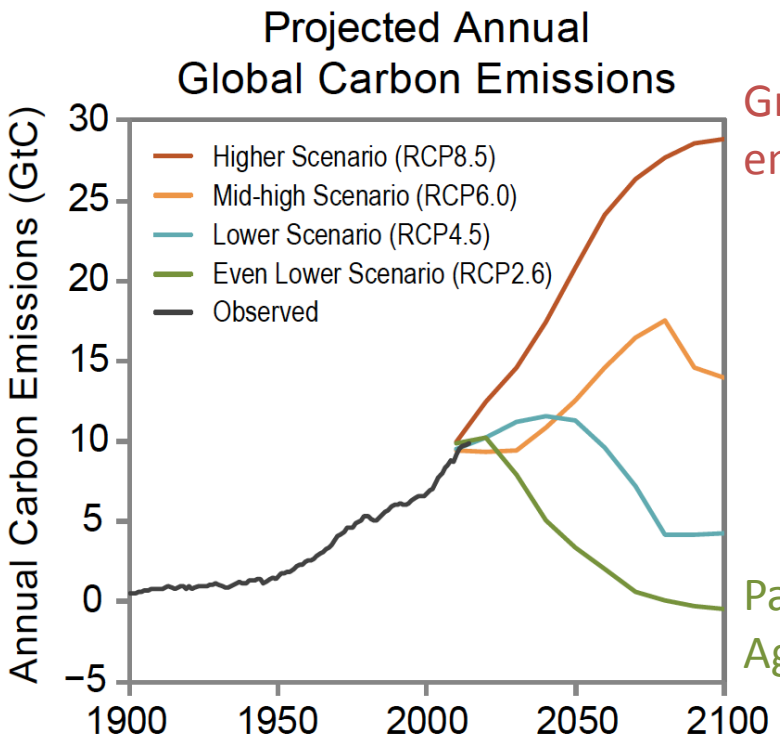
- Emissions resulting from human land development began to affect temperature ~200 years ago
- Fossil fuel emissions and more rapid land development dramatically affected CO_2 concentrations from late 19th century
- Emissions and temperature skyrocketed in the late 20th century

Warming Is Due to Greenhouse Gases



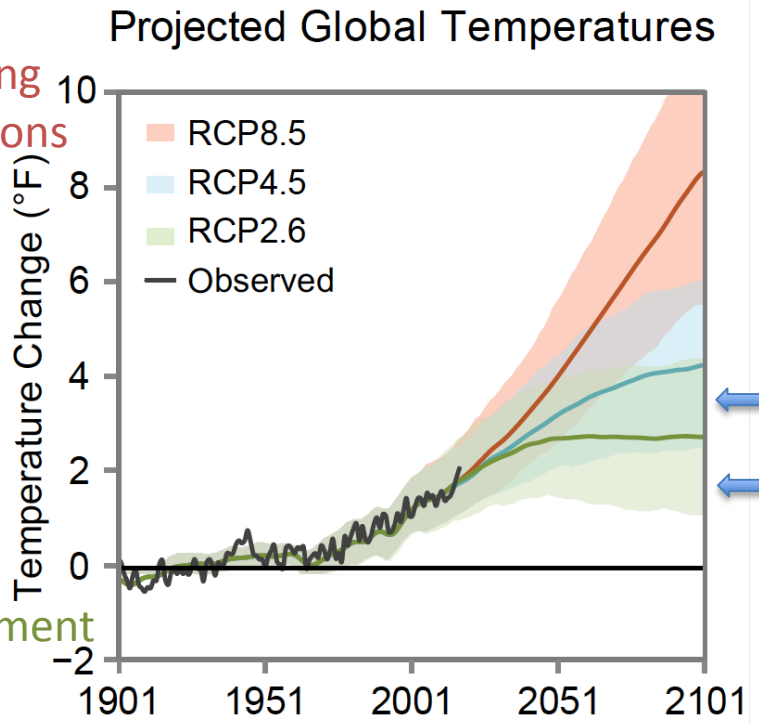
Animation at
www.carbonbrief.org/analysis-why-scientists-think-100-of-global-warming-is-due-to-humans

Limiting Global Warming



Growing emissions

Paris Agreement



2°C

1.5°C

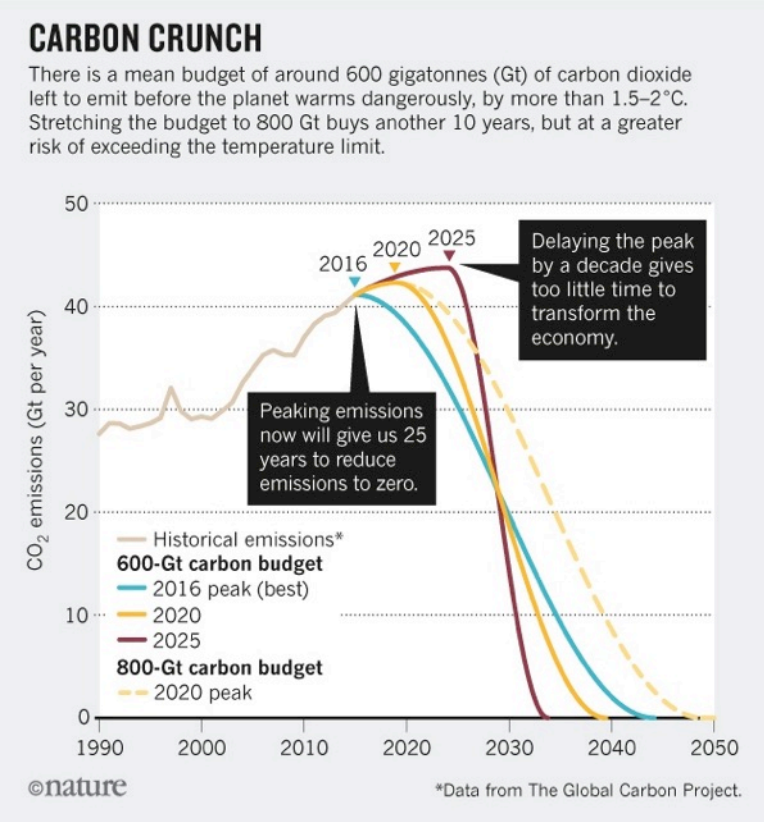
Paris Agreement targets

Figueres et al. 2017 *Nature* 546:993

Crunch Time on Paris Agreement

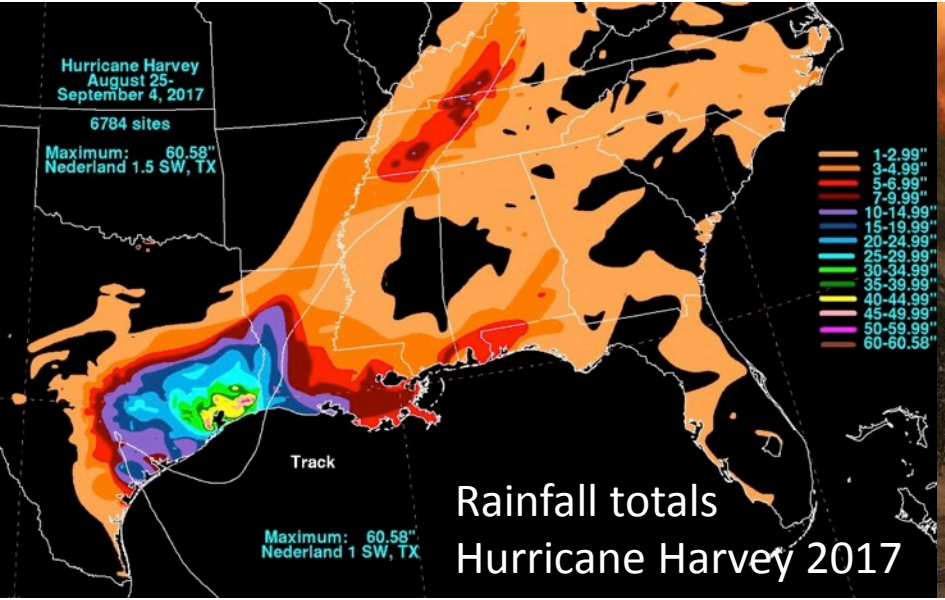
. . . strengthen the global response to the threat of climate change by keeping a global temperature rise this century ***well below 2 degrees Celsius*** *above pre-industrial levels and to pursue efforts to limit the temperature increase* ***even further to 1.5 degrees Celsius.***

U.S. Intended Nationally Determined Contribution: reduce its greenhouse gas emissions by 26-28 per cent below its 2005 level in 2025 and to make best efforts to reduce its emissions by 28%.



Figueres et al. 2017 *Nature* 546:993

Attribution of Extreme Events

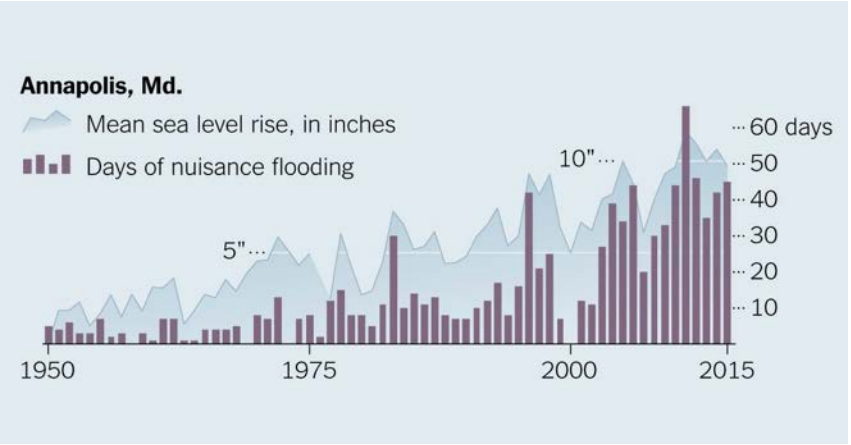


Rainfall totals
Hurricane Harvey 2017

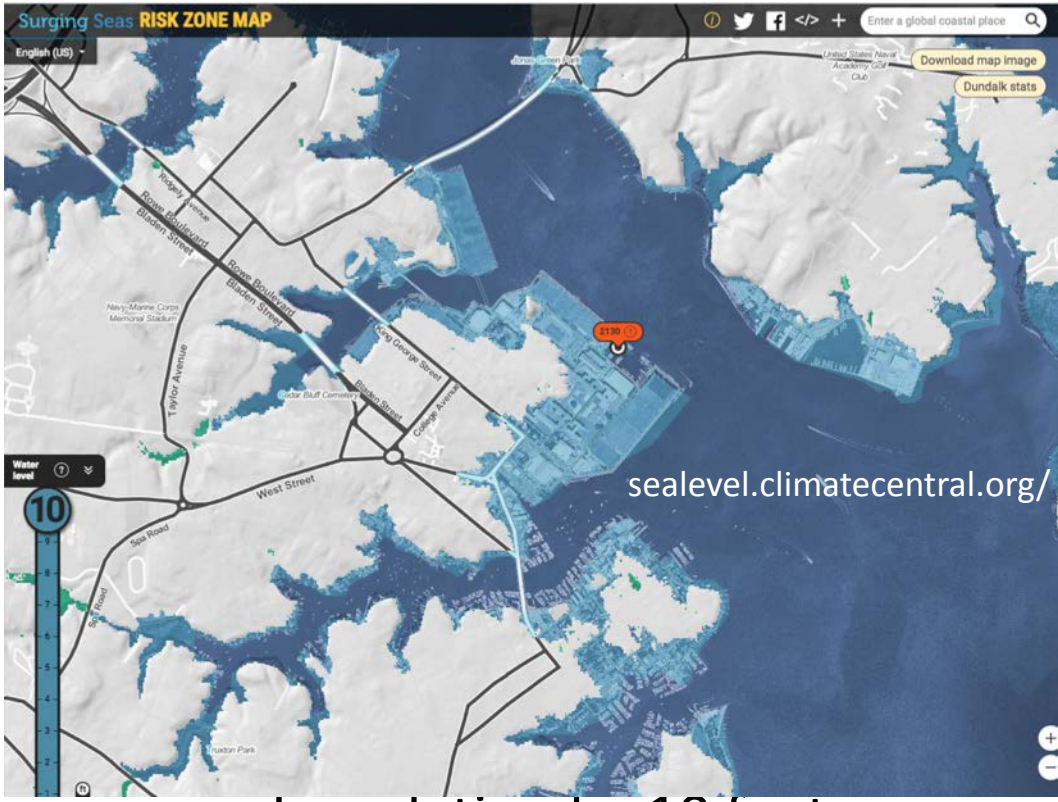
3 times more likely & at least 19% more rain than without climate change

Weak & wavy jet stream caused +10°F heat spell; dry forest and chaparral; 50% caused by climate change

Adapting to Climate Change: Sea-Level Rise



Increase in days of “nuisance” flooding in Annapolis



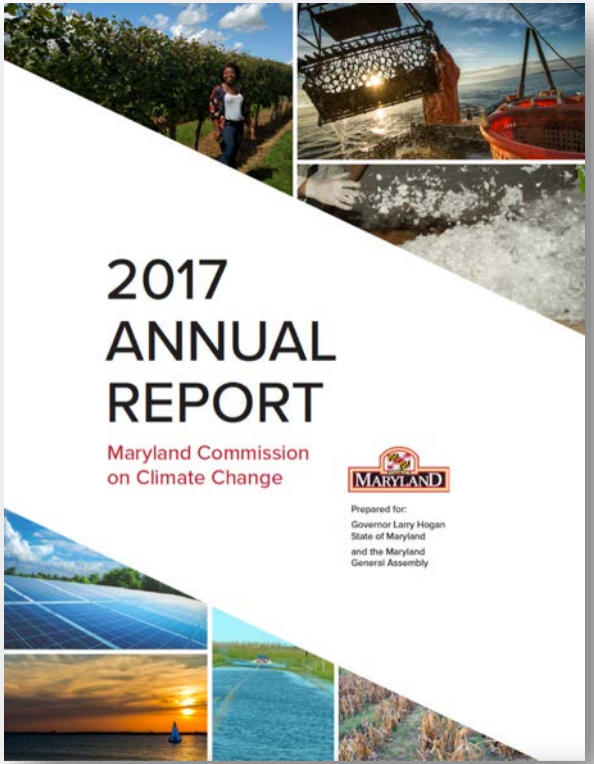
Inundation by 10 feet

Chesapeake Politics & Climate Change

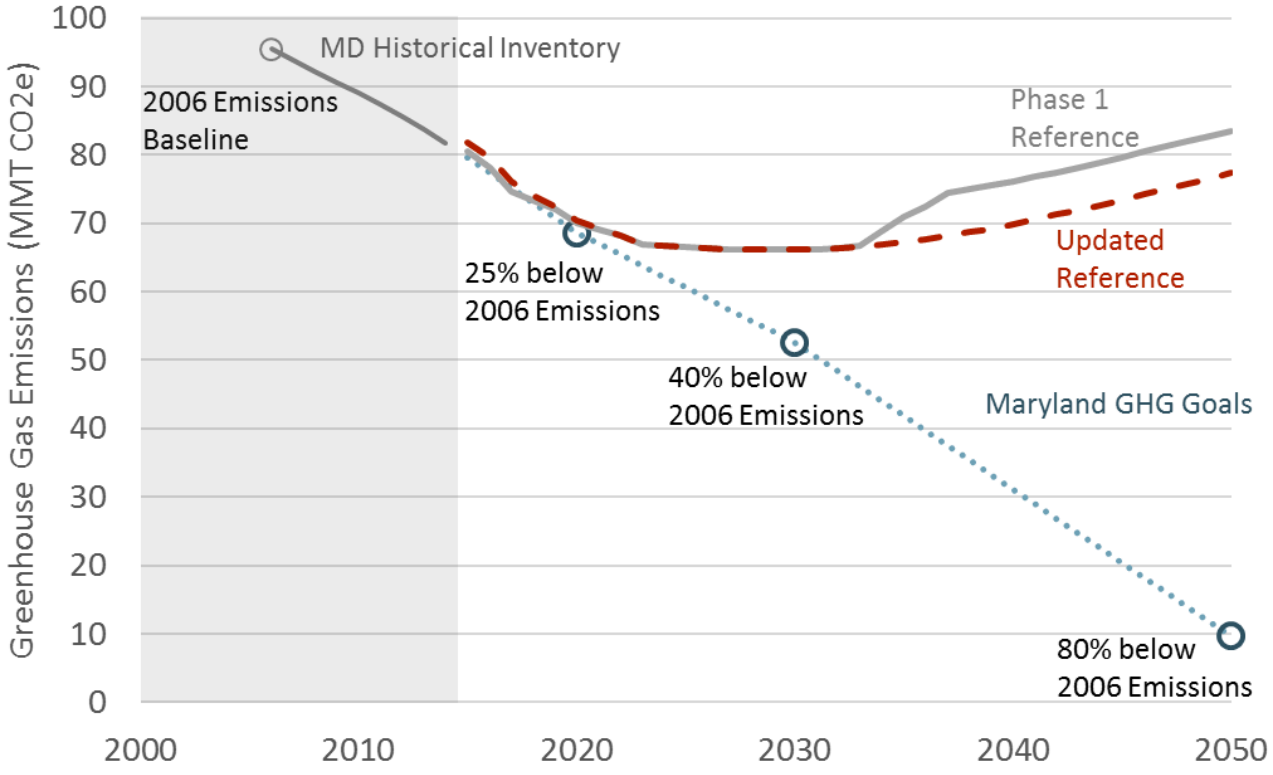
"The science is not exact on this, but we also can't afford to wait for that perfect and mythical moment where all the science is perfect and everything is fully understood. We need to be proactive." Ben Grumbles, Maryland's (Republican) Secretary of the Environment

Maryland Addresses Climate Change

- Clean Cars, Regional Greenhouse Gas Initiative, EmPOWER Maryland
- Commission on Climate Change
- Greenhouse Gas Reduction Act
  - 2009 – 25% reduction by 2020
  - 2016 – 40% reduction by 2030
- Renewable Portfolio Standards (25% of electricity generation)
- U.S. Climate Alliance



Longer-Term Targets Require More



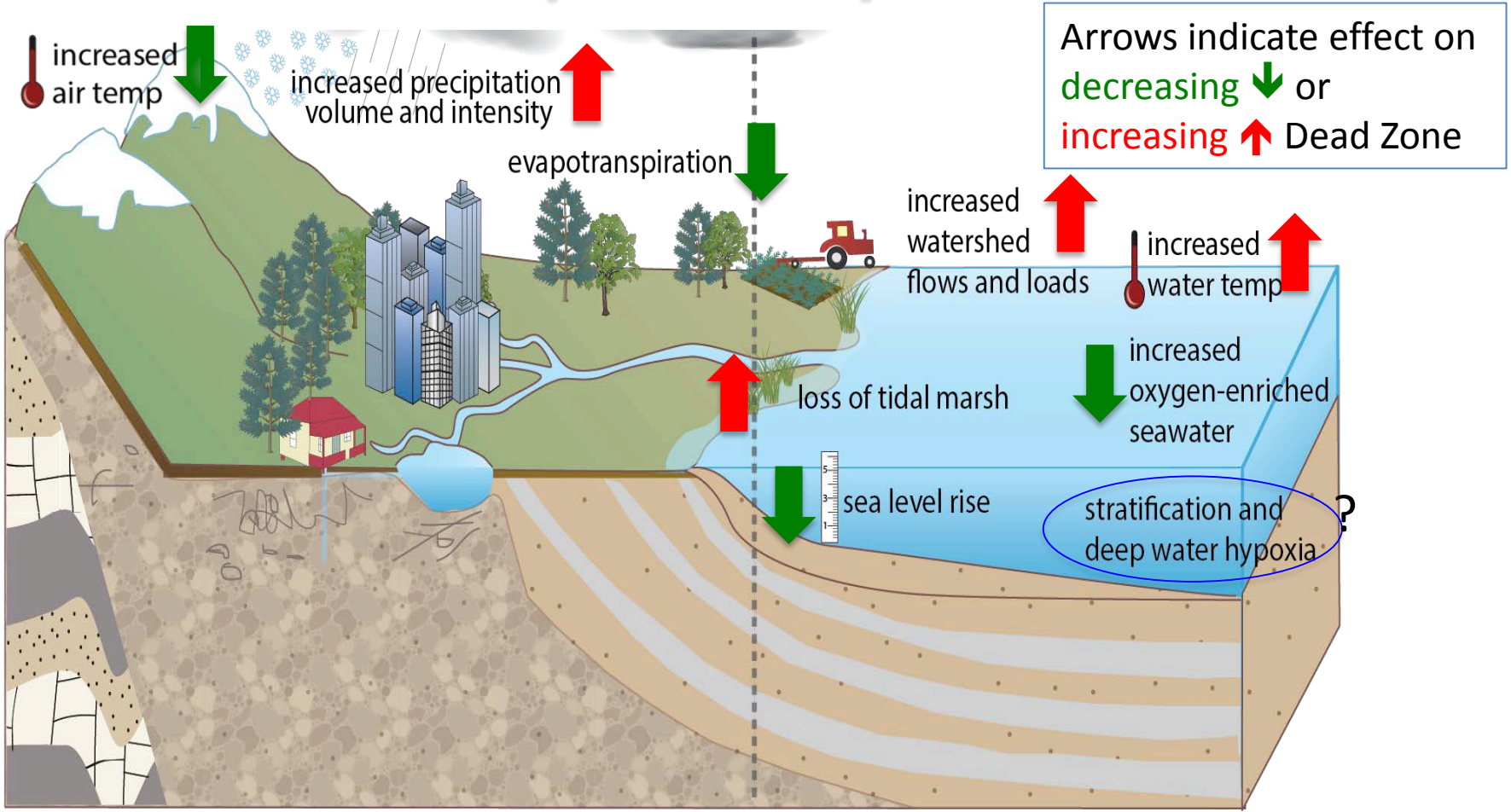
Maryland Greenhouse Gas Emissions

Gap in 2020: 1.7 MMT (2% above goal)

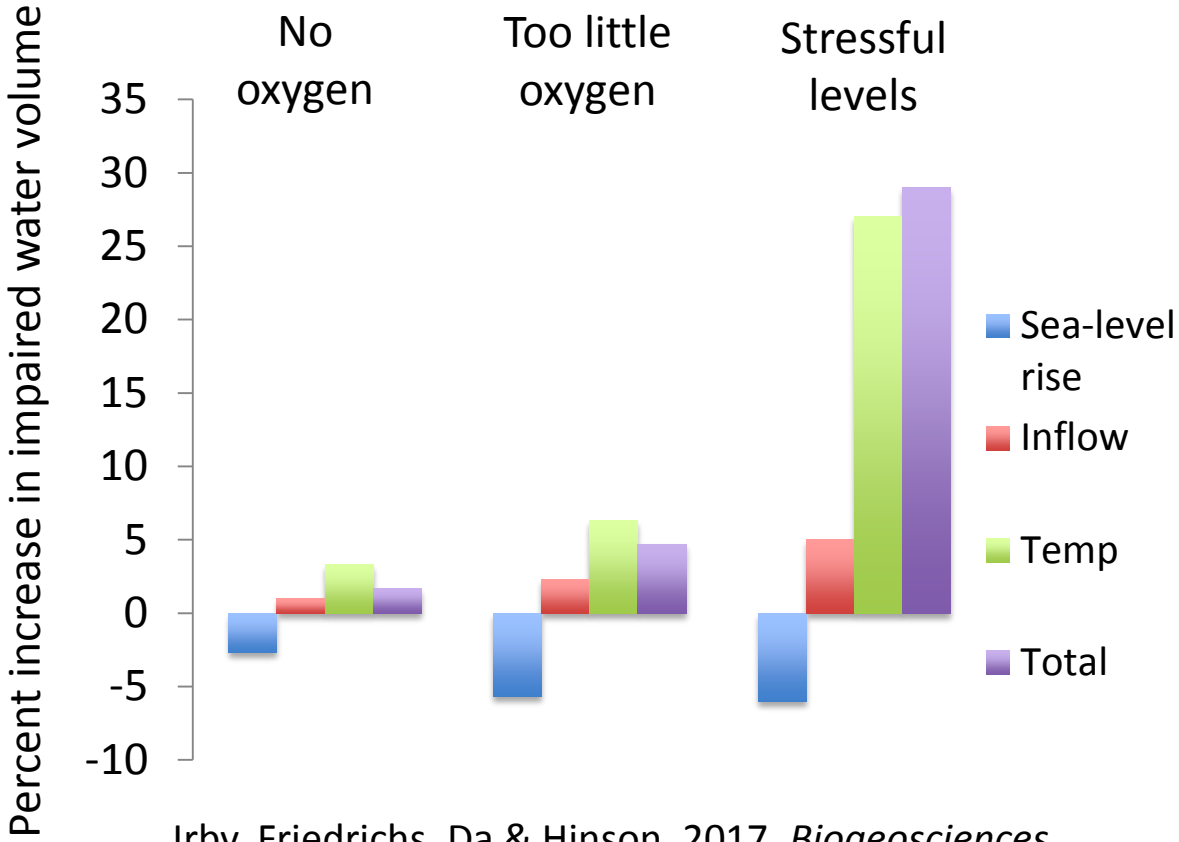
Gap in 2030: 13.6 MMT (26% above goal)

Energy+Environmental Economics

Effects on Chesapeake Bay "Dead Zone"



Reversal of Improvement Due to Climate

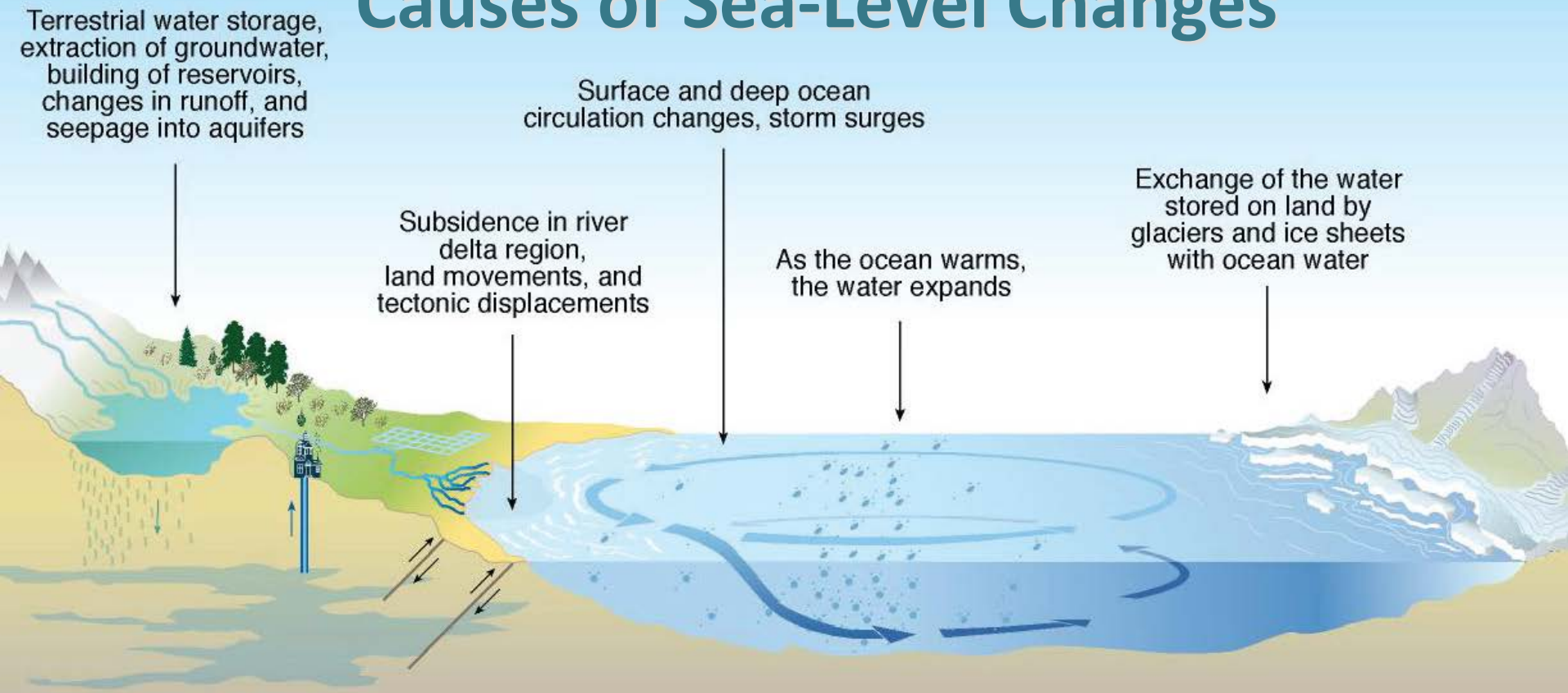


Irby, Friedrichs, Da & Hinson. 2017. *Biogeosciences*

May require additional reduction in nitrogen pollution of 9 million pounds per year to offset.

States already struggling to meet legally binding reductions by 2025.

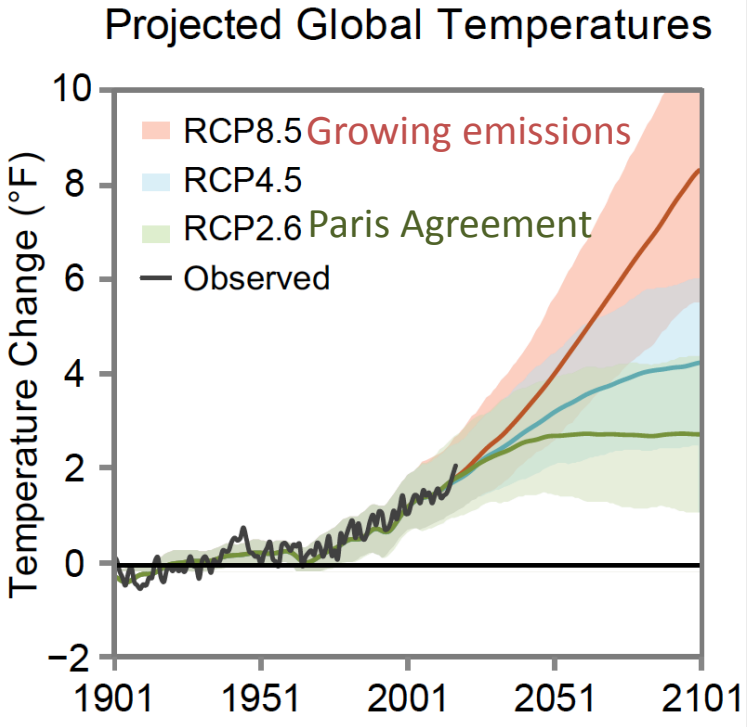
Causes of Sea-Level Changes

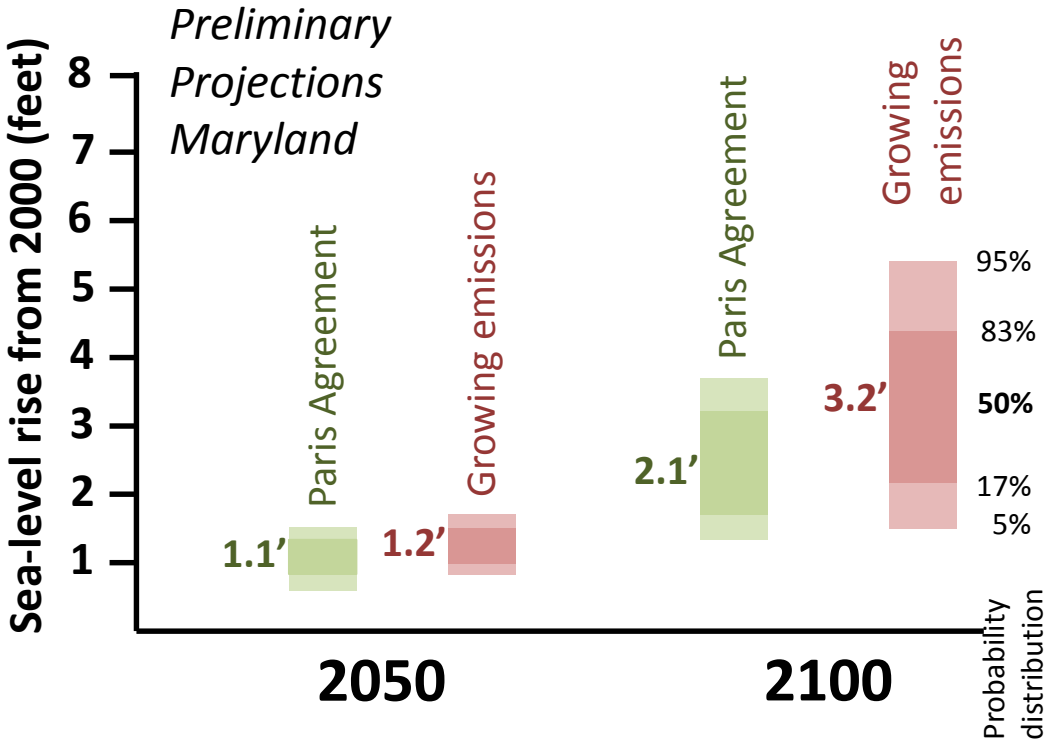


These factors must be taken into account to project sea-level rise changes for specific location.

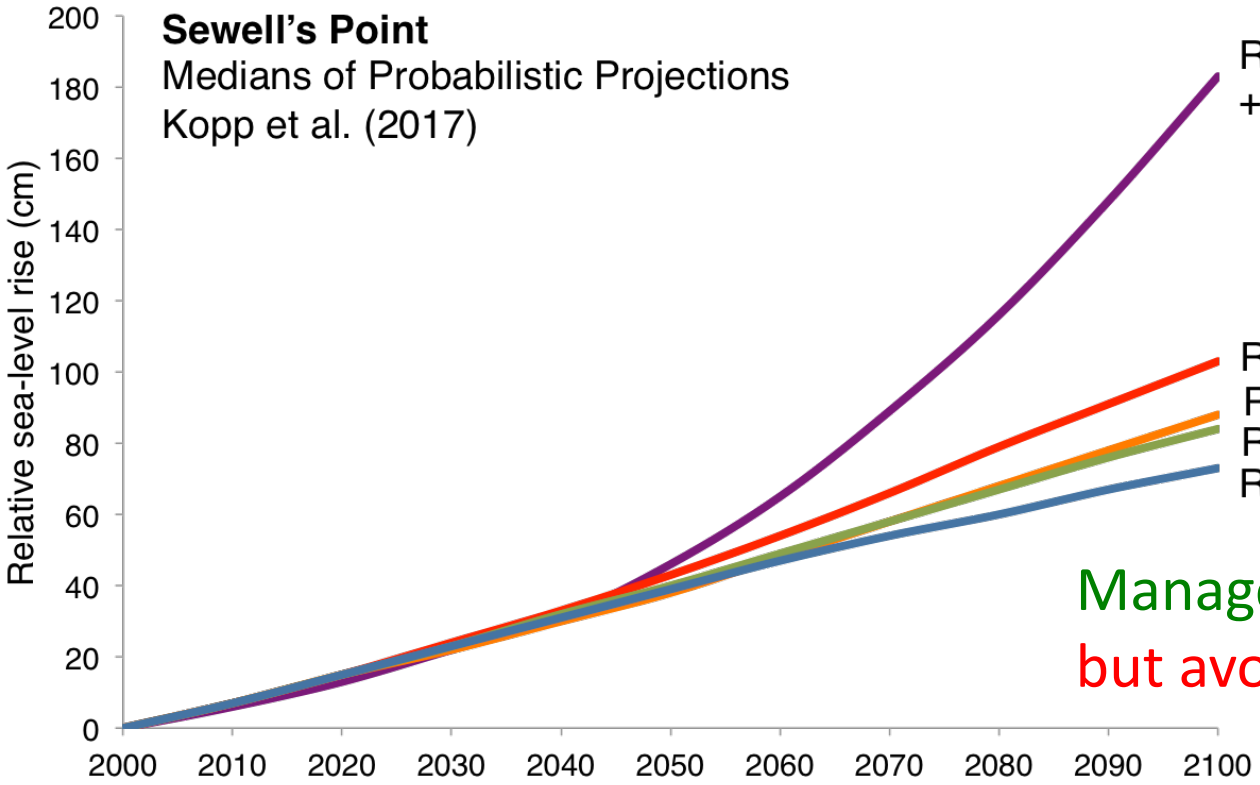
SYR - FIGURE 3-

Updating SLR Projections with Latest Science





But Antarctica Is a Wild Card

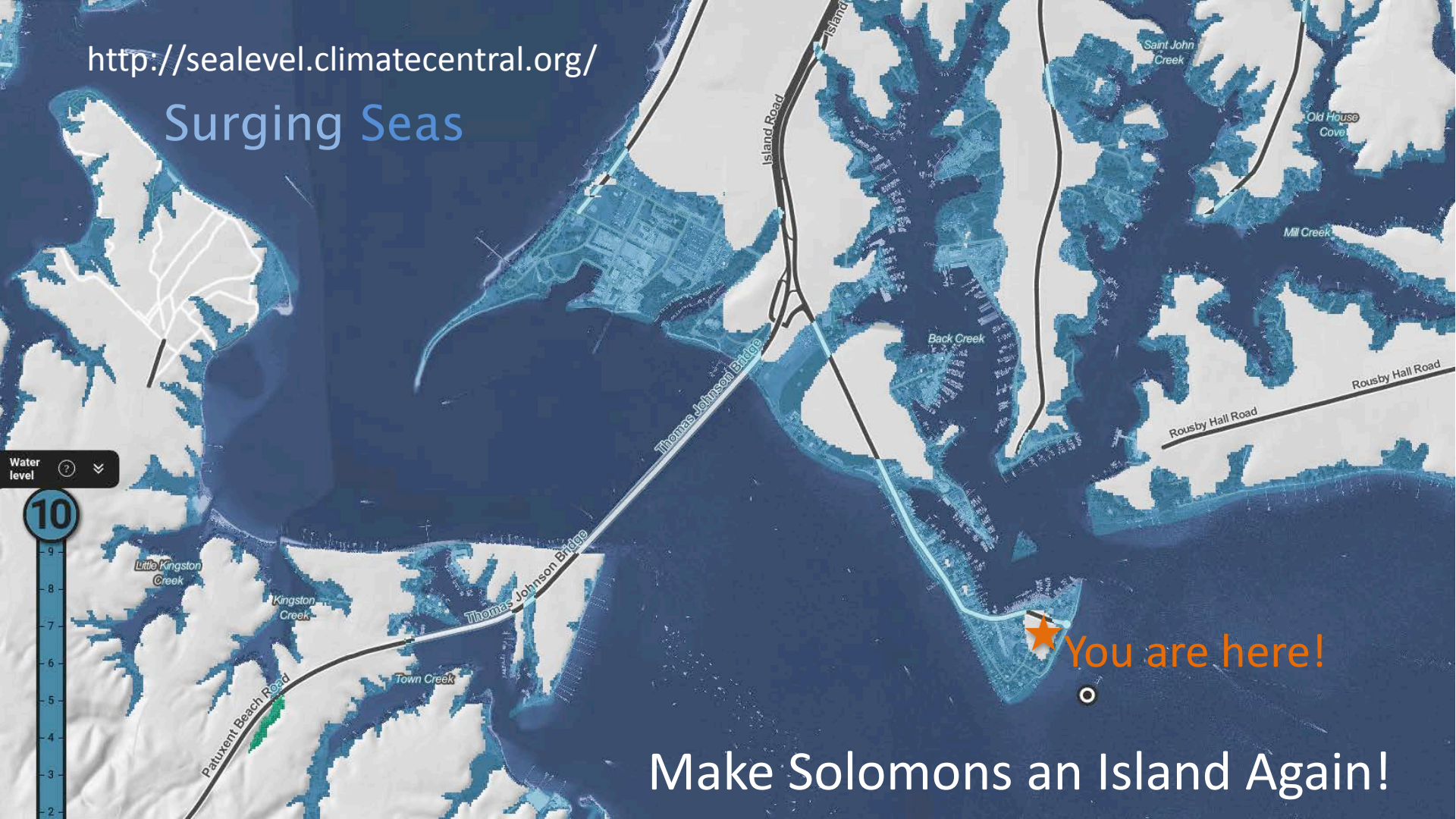


Growing emissions with rapid loss of Antarctic Ice Sheet

Growing emissions

Paris Agreement

Manage the unavoidable, but avoid the unmanageable


http://sealevel.climatecentral.org/
Surging Seas
Island Road
Saint John Creek
Old House Cove
Mill Creek
Back Creek
Thomas Johnson Bridge
Rousby Hall Road
Rousby Hall Road
Water level
10
9
8
7
6
5
4
3
2
Little Kingston Creek
Kingston Creek
Thomas Johnson Bridge
Town Creek
Patuxent Beach Road
You are here!
Make Solomons an Island Again!

And the (Women) Scientists of CBL Are On It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