

MARYLAND COMMISSION
on **CLIMATE CHANGE**

Ben Grumbles, Chair

Science and Technology Working Group

MCCC Meeting
September 13, 2021



ipcc
climate change



The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change.

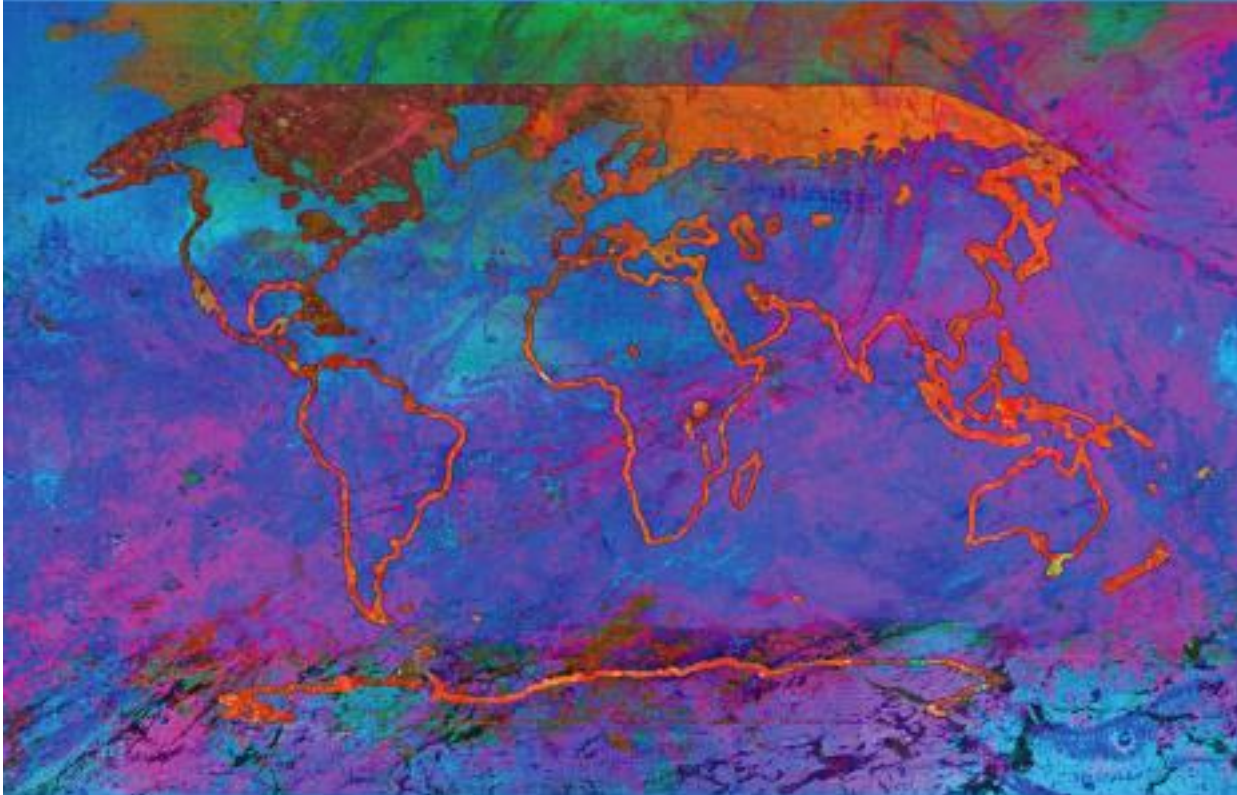
The three Special Reports and Methodology Report have already been produced.

- Special Report: Global Warming of 1.5°C (SR15)
- Special Report: Climate Change and Land (SRCCL)
- Special Report: The Ocean and Cryosphere in a Changing Climate (SROCC)
- Methodology Report: 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories



Climate Change 2021

The Physical Science Basis



*Full synthesis
report due 2022*



Working Group I contribution to the
Sixth Assessment Report of the
Intergovernmental Panel on Climate Change



Work Group 1: Physical Science Basis

Work Group 2: Impacts, Adaptation
and Vulnerability

Work Group 3: Mitigation of Climate
Change

Task Force on GHG Inventories

Full synthesis report due 2022

MCCC STWG evaluating AR6 for annual report

Urgency and increasing variability

For Maryland there is confirmation of:

Increases in mean and extreme precipitation

(very likely)

Expected increase in river and pluvial flooding

(medium confidence)

Expected greater incidence of heat waves

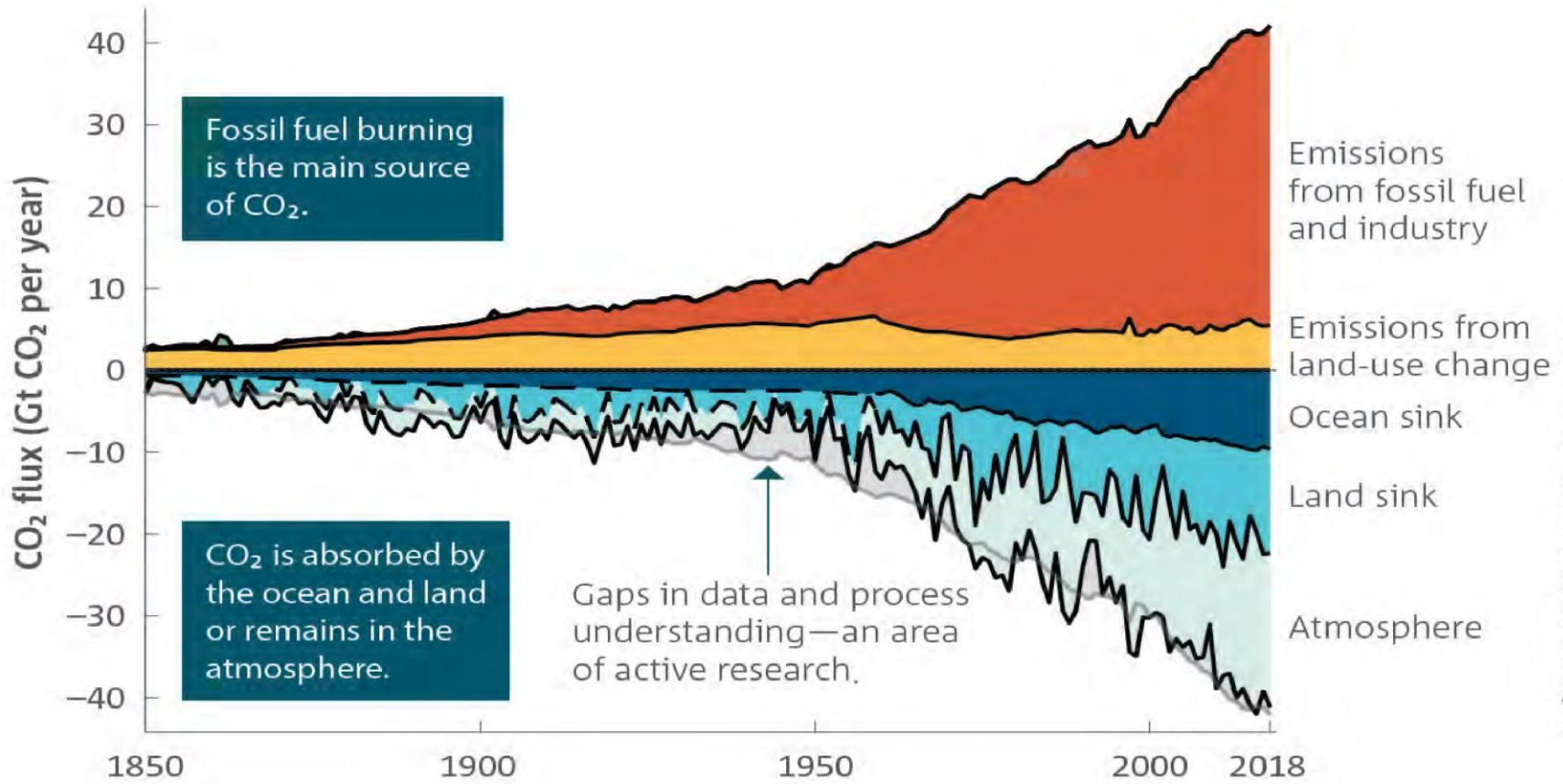
(virtually certain)

More information at: <https://www.ipcc.ch/about/>

Chesapeake Bay Acidification and Maryland's Ocean/Coastal Acidification Action Plan



Jim George,
Maryland Department of Environment
Jeremy Testa,
University of Maryland Center for Environmental Science



Source: CSIRO and Global Carbon Project

Maryland's 2015 Task Force on Ocean Acidification

- Mandated by State Law
- Seven Key Findings:
 1. Enhance monitoring to quantify scale, patterns, and trends
 2. Establish research priorities in estuarine and coastal waters
 3. Coordination with other states and federal resource managers
 4. Focus on impacts to key species and associated activities
 5. Provide direct support to affected industries
 6. Pursue legislative action
 7. Improve communications and outreach

https://dnr.maryland.gov/waters/bay/Pages/MDOATF/OATF_Home.aspx



CHESAPEAKE BAY
FOUNDATION
Saving a National Treasure



Maryland's OA Action Plan 2020

Maryland Ocean Acidification Action Plan 2020



Ocean City Maryland - Leaton Jones

A Collaboration of:

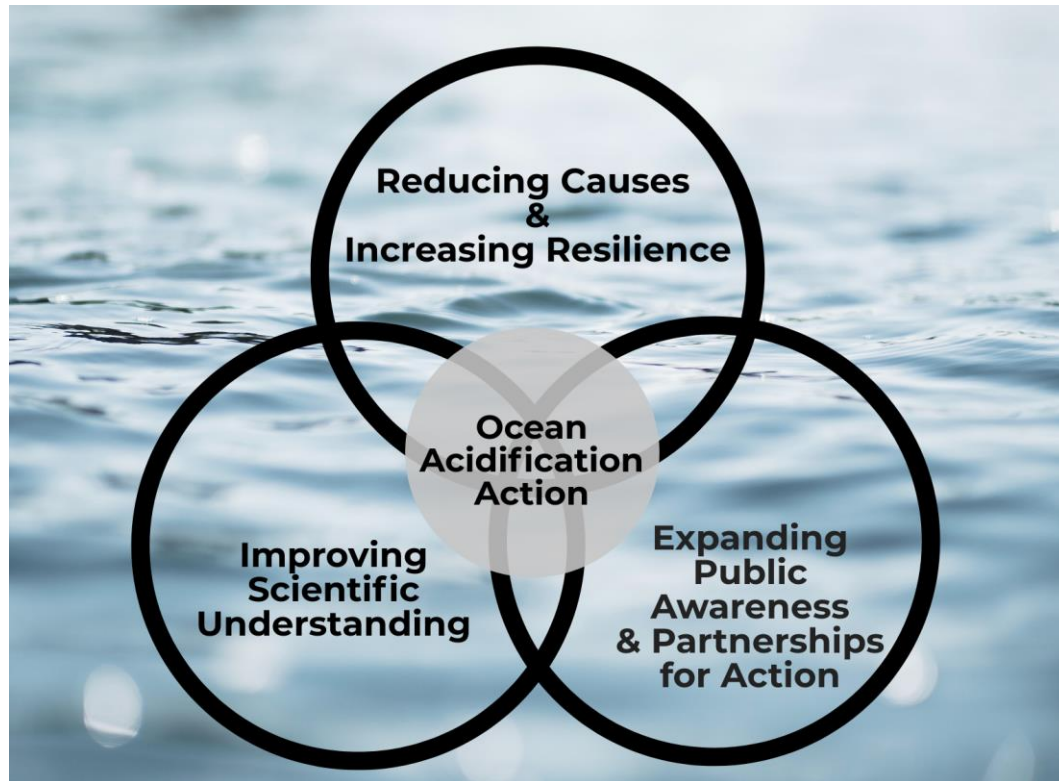
- Maryland Department of the Environment
- Maryland Department of Natural Resources
- University of Maryland Center for Environmental Science

Supported by:

- International Alliance to Combat Ocean Acidification






Three Themes of Maryland's OA Action Plan

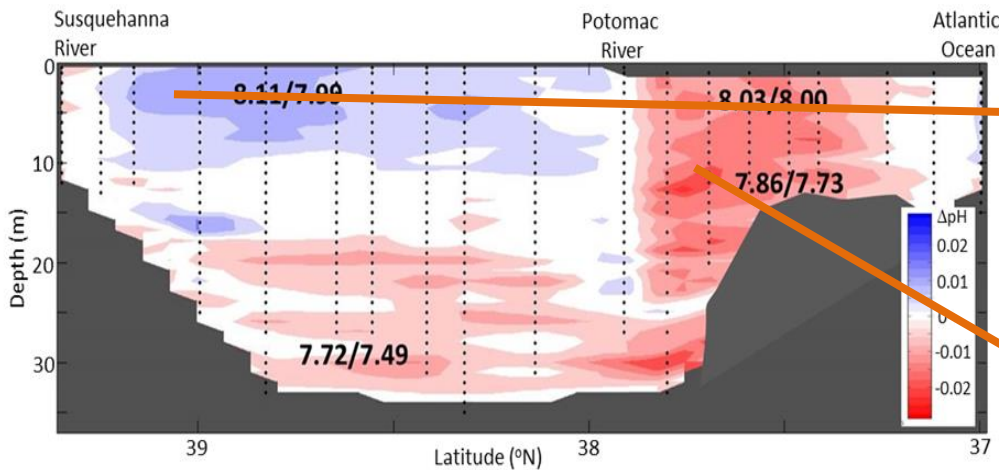


LOCAL POLICY ACTIONS TO COMBAT COASTAL ACIDIFICATION WILL MAKE A DIFFERENCE. HERE'S WHAT WE CAN DO:

Coastal acidification is a danger to our region's economy, food security, ecosystem, and culture— but local-level actions can and will make a difference in mitigating damage and preparing for the future. **It's time for elected officials to publicly acknowledge the threat coastal acidification poses, work locally to implement policy changes, and support educational initiatives that will empower the next generation of coastal champions.**

CONTRIBUTORS TO ACIDIFYING CONDITIONS	WHAT IT DOES	CAN WE DO ANYTHING ABOUT IT?	WHAT POLICY ACTIONS CAN WE TAKE?
 <p>Nutrient Pollution</p>	<ul style="list-style-type: none"> Creates harmful algal blooms that cause extreme pH swings Closes shellfish areas to harvesting Can cause massive fish & shellfish die-off Closes beaches to swimming 	YES	<ul style="list-style-type: none"> <i>Point source pollution:</i> refine the Clean Water Act's technology-based standards <i>Non-point source pollution:</i> impose and enforce limits on total maximum daily load of pollution Support local estuaries in the National Estuary Program and the National Estuarine Research Reserves that protect important habitats and serve as focal areas for place-based research Support tertiary system sewage treatment plants
 <p>Habitat Destruction</p>	<ul style="list-style-type: none"> Estuaries and wetlands are important carbon mitigators; less habitat means less carbon mitigation Loss of vital habitat/nurseries for shellfish and baby fish Fewer wetlands & aquatic vegetation exacerbates low-oxygen "dead zones" and shore erosion 	YES	<ul style="list-style-type: none"> Legislate a state version of the National Environmental Policy Act (NEPA) to ensure that projects requiring government action can be directed (CT, MD, MA, NJ, NY, VA & D.C. already have state-level NEPAs) Continue to empower coastal management programs through the Coastal Zone Management Act, and encourage planning bodies to support habitat restoration projects Require that environmental impact assessments include analysis of potential contributions to coastal acidification
 <p>CO₂ Emissions</p>	<ul style="list-style-type: none"> The ocean is the world's largest "sink" for CO₂, making seawater more acidic Additional CO₂ in the atmosphere traps heat, causing climate change 	To a degree; local action helps, but must be part of a national & global effort	<ul style="list-style-type: none"> Regulate local area CO₂ emissions through the Clean Air Act Improve public transportation infrastructure to remove vehicles from the roads Implement green building codes for new structures and provide incentives to improve the energy efficiency of older, less economical buildings Invest in renewable energy
Upwelling	<ul style="list-style-type: none"> Creates corrosive conditions as cold, acidic water rises up from deep offshore and mixes on the coast 	NO	<ul style="list-style-type: none"> Upwelling is a natural process that happens on a global scale; the process is changing due to rising ocean temperatures and increased acidity, which can only be slowed by reducing CO₂ emissions
Fresh Water Inundation	<ul style="list-style-type: none"> Floods the coastline with corrosive, mineral-poor water Lowers the salinity in estuaries to the point where shellfish are biologically stressed 	NO	<ul style="list-style-type: none"> Spring snow melt and rain are a natural part of the climate cycle, though climate change is causing unprecedented amounts of precipitation, which is worsening the effects of freshwater inundation. This cycle can't be slowed without significant reduction in CO₂ levels.

Past 30 years: Upper Bay 'Basification' Lower Bay 'Acidification'



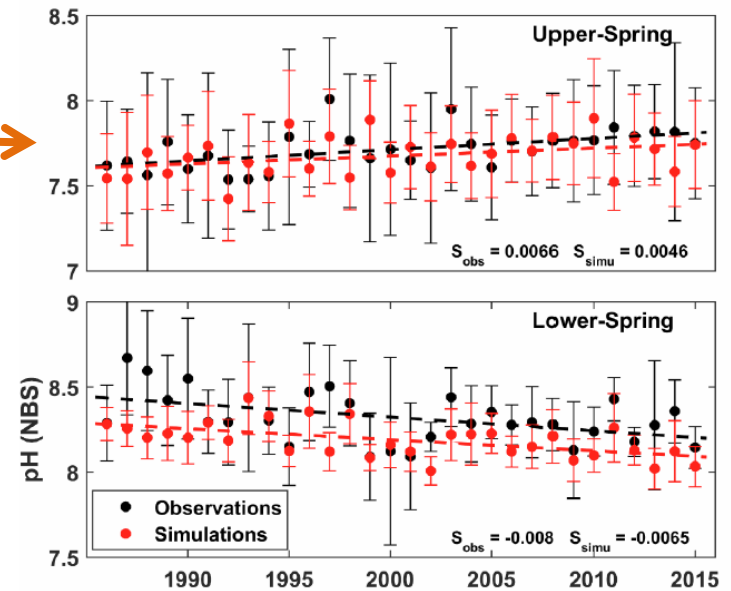
Waldbusser et al. 2011

Upper Bay:

- (1) Elevated spring bloom
- (2) Increase in river alkalinity?
- (3) Other, unidentified change?

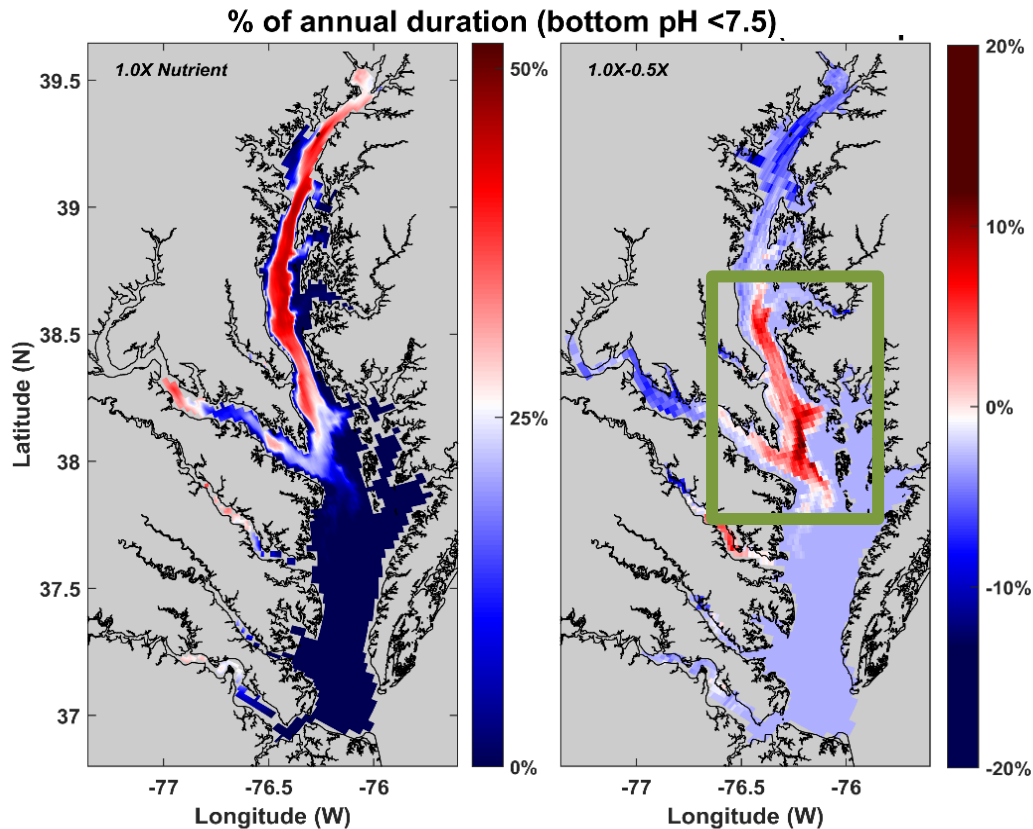
Lower Bay:

- (1) Reduced spring bloom
- (2) Ocean acidification



Shen et al. 2020

Nutrient Reduction Directly Reduces Acidification



Red region in green box indicates reduced low-pH areas with nutrient reduction

In last 30 years, nutrient reductions contribute equally to ocean + atmosphere contribution to acidification

