Sea Level Rise In Maryland

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Poplar Island eroding marsh, credit Chesapeake Bay Foundation

Ocean City Inlet 1933 Hurricane
Maryland House Bill 514, Senate Bill 258 of 2015
• Established Maryland Commission on Climate Change
• Mandated a sea-level rise report from UMCES every 5 years

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Educate yourself! Please download it!
https://www.umces.edu/sea-level-rise-projections
Global mean sea level record from a series of satellite altimetry missions.

Sea Levels Are Rising Locally

- Baltimore: 3.09 ± 0.10 mm/yr
- Annapolis: 3.37 ± 0.16 mm/yr
- Washington DC: 2.96 ± 0.24 mm/yr
- Cambridge: 3.34 ± 0.46 mm/yr
- Solomons: 3.49 ± 0.19 mm/yr
Sea Level Rise is Impacting Us Locally
Days of Nuisance Flooding in Annapolis, MD
Primary Causes of Global (Eustatic) Sea Level Change

Greenland and Antarctic Ice Sheet Volume Change

Mountain Glacier Ice Volume

Oceanic Heat and Salt Changes (Steric)

Tectonics – Sea Floor Spreading Rates (Relevant only on million year timescales)
Local factors cause sea level in our region to rise slightly faster than global sea level.
Glacial Isostatic Adjustment

A Last glaciation (21,000 years ago)

Displaced bedrock

Bedrock forebulge rises
Future Projections
Projections of Future Sea-Level Rise Account for Many Factors + Uncertainties

Local factors cause sea level in our region to rise slightly faster than global sea level.

Image: UMCES-IAN
Baltimore
*K14 projections*

- Paris Agreement (RCP2.6)
- Stabilized Emissions (RCP4.5)
- Growing Emissions (RCP8.5)

We decide the future

Locked-in

Relative sea-level rise from 2000 (feet)

- 2030
- 2050
- 2080
- 2100
- 2150

- 95%
- 83%
- 50%
- 17%
- 5%
Antarctica – big source of uncertainty

Antarctica is a Desert – warm it and you increase moisture

West Antarctic Ice Sheet
• Below sea level and not stable
• 3.2 m (10.5 ft) sea level equivalent

East Antarctic Ice Sheet
• above sea level and stable
• ~60 m (197 ft) sea level equivalent
The Past is the Key to the Future:

How have the polar ice sheets behaved in the past when the Earth warmed?
Corals Mark Sea Level and Can Be Dated Precisely by Radiometric Dating

Elkhorn coral at Buck Island. NPS photo (S. Pershern)

Hali Kilbourne for scale with ~90,000-year-old coral, Little Bay, Barbados 2019
Sea Level History Since the Last Ice Age

Based on many precise dates of corals with known elevations.

Fastest rates of sea level rise in Melt Water Pulses

We think these are ice sheet collapses (WAIS).

Modern SL Rise: \( \sim 0.13 \text{in/yr} \)

Kurt Lambeck et al. PNAS 2014;111:43:15296-15303
A 2016 article in Nature demonstrated that recent advances in understanding ice sheet physics enabled researchers to accurately model historical ice sheet behavior.
Median (middle) projections of sea-level rise for Baltimore, including Antarctic Ice Sheet dynamics

These higher rates are consistent with the geologic evidence for sea-level rise

Kopp14
No Ice Collapse (dashed)
Maps and analysis from Climate Central

sealevel.climatecentral.org
2100

Business as usual with Antarctic Ice collapse
Will we continue like ostriches?
...or will we be matadors and face our fears

Etching and aquatint by Francisco Goya, circa 1815: The Bravery of Martincho in the Ring of Saragassa
PLEASE!!!
What do we do?

• Inform yourself
• Demand our politicians address this issue (how? – that depends on your political leanings)
• Curb our personal dependence on fossil fuels
  – Reduce transportation fuel use
  – Conserve energy
  – Make our houses energy efficient
• Tell others!