Facts and findings: Sea level rise and storm surge threats for Maryland

See the full report, *Surging Seas*, for methods used and national findings: SurgingSeas.org/report

Storms and the rising sea

Even small amounts of sea level rise make rare floods more common by adding to tides and storm surge. Climate Central has analyzed data and made projections at water level stations in and near Maryland. For a representative station[1]:

1. Odds of a 100-year flood or worse by 2030, with sea level rise from global warming[2]: **22%**
2. Odds without global warming[3]: **12%**
3. Bottom line: global warming multiplies the odds by **1.8X**
4. Historic local sea level rise rate[4]: **1.2 inches/decade**
5. Projected new sea level rise by 2050[5]: **13 inches**

People, homes and land at risk

Climate Central has developed maps and statistics for Maryland areas less than 1-10 feet above the local high tide line, including searchable results for every coastal town, city and county, accessible via SurgingSeas.org/states/MD. A summary of vulnerability[6] at less than 5 feet[7]:

1. Population at risk: **53,000**[8]
2. Homes at risk: **40,000**
3. Land area at risk[9]: **257,000 acres**
4. Towns and cities where at least half the population is at risk: **17**
5. Counties where at least 10% of the population is at risk: **3**
6. Cities with the largest total exposed populations, ranked most to least: Ocean City, Ocean Pines, Crisfield, West Ocean City, Shady Side, Dundalk, Baltimore, Annapolis Neck, Mayo, Edgemere
7. Counties with the largest total exposed populations, ranked most to least: Worcester, Somerset, Anne Arundel, Dorchester, Baltimore, Queen Anne's, St. Mary's, Talbot, Wicomico, Baltimore

Table: Sea level and high water projections throughout Maryland

Sea level rise projections take into account global and local effects, and vary by site due to differences in local effects, most importantly different rates of sinking or rising land. Scenarios without global warming remove only global effects, both historical and projected. Differences in storm surge patterns and sea level projections together lead to different flood level exceedance odds in different places.

Water level station	Reference 100-year flood level (feet)[2]	Odds of exceeding reference flood level by 2030		Measured historic sea level rise[4]		Projected sea level rise by 2050[5]	
		With global warming[2]	Without global warming[3]	Inches rise	Period of record	Inches rise 2009-2050	90% range
Reedy Point – C&D Canal (DE)	3.9	33%	6%	7	1956-2006	14	7-24
Lewes – Ft. Miles (DE)	5.4	28%	7%	11	1919-2006	13	6-24
Cambridge – Choptank River	4.1	27%	9%	9	1943-2006	13	6-23
Baltimore – Fort McHenry	5.7	22%	12%	13	1902-2006	13	6-23
U.S. Naval Academy – Severn R.	5.3	22%	12%	11	1928-2006	13	6-23
Solomons Island – Patuxent River	4.4	24%	11%	9	1937-2006	14	7-25
Washington – Potomac River (DC)	10.1	19%	16%	10	1924-2006	13	6-23
Kiptopeke – Chesapeake Bay (VA)	3.9	42%	3%	8	1951-2006	14	7-24
Lewisetta – Potomac River (VA)	4.2	29%	10%	6	1974-2006	16	9-26

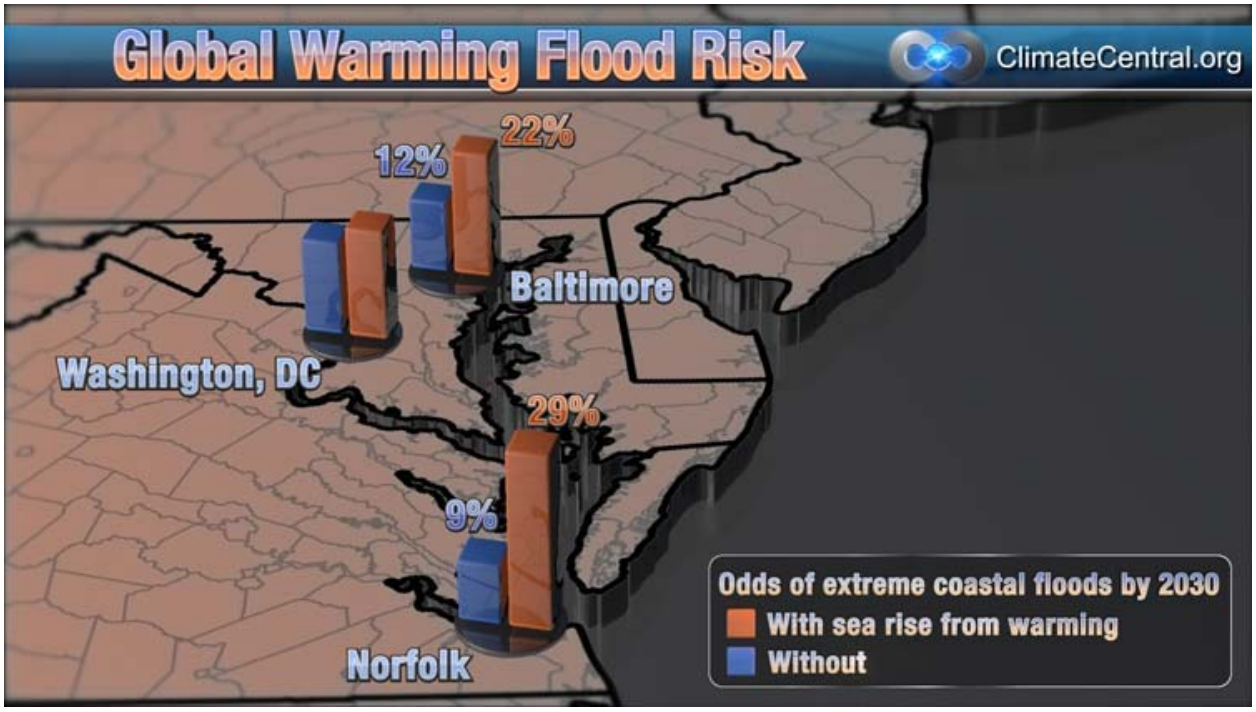

Figure 1. Odds of reference 100-year floods[2] when factoring in sea level rise from global warming, versus when not. See Table for source data.

Limitations

All values presented here are best estimates based on Climate Central's peer-reviewed analysis. Actual values may vary. For discussion of methods, assumptions and limitations, see the full report *Surging Seas* and its citations.

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Notes

[1] Fort McHenry in Baltimore. A table near the end of this sheet gives findings for other Maryland area stations. All values in this list and in the table represent best estimates within wider possible ranges.
[2] A 100-year flood is defined as a flood reaching a fixed elevation so high that it is expected to take place with only a 1% chance in a year, here assuming a water elevation baseline at 2009 sea level. But because sea level is rising, the odds of floods reaching any fixed elevation become higher over time.
[3] This value comes from calculations assuming no past or future sea level rise from melting ice sheets and glaciers, or from ocean expansion due to warming. (Global average sea level has already risen about 8 inches since 1880, known to be mostly or all from warming. This analysis assumes 90% was from warming.) The calculation also assumes global warming does not affect storms, surges or tides.
[4] Source: Zervas, C. 2009. HSea Level Variations of the United States, 1854-2006H, NOAA Technical Report NOS CO-OPS 053.
[5] Projections take into account multiple possible 1) future scenarios of heat-trapping gas emissions; 2) relationships between emissions and global warming; and 3) relationships between warming and sea level rise. See table for confidence ranges, and the full report HSurging SeasH for 2030 projections and further details.
[6] Many areas may be protected, to some degree, by sea walls, levees, forced drainage, or other features – for example, much of New Orleans already lies below the high tide line. This analysis presents vulnerability considering elevation only.
[7] A height near the middle of the range of 100-year flood levels calculated for Maryland area stations.
[8] This is 1% of the coastal contiguous US population living less than 5 feet above the high tide line, and 1% of Maryland's total population living at any elevation.
[9] Includes freshwater wetlands as classified by the National Wetlands Inventory, but not marine or estuarine ones. Excluding freshwater wetlands as well, the total dry land area at risk is 168,000 acres.

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