Rising Seas, Stormy Skies Ahead

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As temperatures warm and ocean waters expand and rise in response, while polar ice continues to melt, sea-level rise will increasingly impact low-lying coastal areas. According to the NOAA State of the Climate Report for 2009, the past three decades have each been warmer than the three previous decades, a trend unprecedented in the historical record of the last 150 years. But what will rising seas mean specifically in Connecticut and the Long Island Sound region?

According to the U.S. E.P.A., sea levels have risen about 8 inches over the past century. Scientists have estimated that in the previous century, both sea level and the rate at which it has been rising have increased, but there is a great deal of uncertainty involved in predicting the future. Of course, sea level is commonly given relative to land and can be difficult to pinpoint because the land may be sinking or rising at the same time that sea waters go up or down. Connecticut and other parts of the Northeast are said to be sinking, because of adjustment effects from the end of the last glaciation.

Currently, Connecticut's sea level is rising at 0.1 inch per year in Bridgeport and 0.08 inches per year in New London, according to NOAA data. That's not too far from the NOAA estimate of mean global sea level rise, now 0.12 inches per year (about one and a quarter inches per decade). In 2007, the Intergovernmental Panel on Climate Change projected that global sea level would rise 7 to 23 inches by 2100. Some groups have suggested that this estimate is much too low, in part, because it does not take possible accelerated melting of the polar ice sheets into account. Estimates vary by the scenario used to model future greenhouse gas emissions, so there is a range of possibilities.

Because the Earth's shape is a geoid, not a perfect sphere, sea level rise is not evenly distributed. A 2009 Yale report indicates that the Long Island Sound area is likely to experience higher rates of sea-level rise than others. Already, residents of New Haven are dealing with flooded basements.

In a worst-case scenario of some future century, if someday all the polar and land ice melted, sea level could rise as much as 70 meters (231 feet). (illustrated on page 10-11.) That hasn't happened since dinosaurs roamed the Earth. However, a rise of 1 to 5 feet by the middle of this century is consistent with some of the current model projections, if greenhouse gas emissions continue unabated at present rates. Coastal communities will need to adapt to rising seas and changing shorelines.

Sea level is measured in several ways. Modern tide gauges record the movement of the land to which instruments are attached and changes in local sea level. Sea-level rise estimates can then be made by subtracting the land elevation change component from the tide gauge data. In marshes, sediment elevation tables are used to measure accretion and erosion, However, variations in ocean circulation and other factors can cause fluctuations over decadal time periods. The most reliable sea level data are from tide gauges having records that date back 50 years or longer, which makes short-term estimates problematic.

Satelllite altimetry is a newer, high technology tool used today. In this method, radar waves sent from the satellite bounce off the ocean surface and return. Measuring the time it takes for the radar signal to return gives a proxy indication of sea surface height.

Elevation changes of the land surface may also result from sediment compaction and extraction of liquids or gas below the surface, such as oil and water.

The horizontal distance that the water moves inland when it rises vertically depends on local topography. If the land is flat, a small rise in water height can go quite far inland; if the land is steep, such as a rocky cliff, obviously that's a different story. There are many variables, but one thing is certain: higher sea levels mean more hazards from flooding and storm surge, and retreating or vanishing wetlands and beaches.

Coastal flooding is becoming more frequent as sea level rises and precipitation and consequent storm runoff increase, leaving towns and municipalities hefty bills for repairs.

Even the State's capitol, Hartford, is vulnerable to rising sea level, because it is situated on the Connecticut River and has low-lying areas. Flooding levels in a major storm event that happens on top of sea level rise, could range from 14 to 18 feet, putting coastal cities like Bridgeport, New Haven, and New London and major transportation routes at risk for huge economic damage from such an event.

Scientists will continue to improve the ways that they measure and predict sea level rise. In the meantime, we can try to emit fewer greenhouse gasses, the preferred action, or try to adapt by living in houseboats or floating houses as some Netherlanders do, but otherwise the strategy must be classic "fight or flight"–armor the shore in an attempt to hold back the sea (which may be futile, given accelerated coastal erosion) and fortify coastal bridges and other infrastructure, or migrate inland if possible.

About the Author:

Peg Van Patten edits and designs Wrack Lines. She also writes for NOAA's ClimateWatch Magazine.