

Science Should Change the Nature of the Squibnocket Debate

Written by David Damroth

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Our changing climate

The related concepts of “Global Warming” and “Climate Change” are far more widely accepted by the American public than at any time in the past. Major weather events such as Hurricane Sandy and the frequent announcement of broken weather records has brought to the fore this growing awareness.

One aspect of a warming planet is “Sea-level rise”. For coastal communities world-wide this increase in the ocean levels is presenting problems that must be dealt with politically, scientifically, economically, and socially. It is one of a few issues arising from the “Squibnocket” debate that stands to radically alter the nature of the discussion. The original proposal brought before the Chilmark voters neglected to incorporate much of this science.

This paper seeks to explain what is happening to the sea, why it is happening and how might local authorities take these factors into account when developing policies in response.

Contributing factors to rising sea levels

The first report of the International Panel on Climate Change¹ was issued in 1990. This first pass report sought to broadly identify the major issues that will arise as a result of climate change. It is a consensus report which required agreement from all the scientists who participated in the formulation. This need for consensus drove the findings into a very conservative realm and as time went on were found to be far too cautious. In addition 1990 climate modeling was not as accurate as it is today. Climate modelling, in general, is a continually evolving science and although the understanding is far greater now, it is far from perfect. Chapter 9 of the 1990 report² addressed sea level rise. In this chapter the data of the historical change in sea levels were discussed. With a less exacting body of evidence as a backdrop the scientists made some projections about how much rise would occur. The contributing factors included: thermal expansion due to warming ocean water, meltwater from land ice, melting glaciers, and melting polar ice sheets. The projections called for additional sea level rise of between 15 and 80 centimeters or 5.90-31.5 inches from the year 2000 through 2100. It is widely held that even if all activities affecting the atmosphere ceased as of today the

¹ www.ipcc.ch/publications_and_data/publications_ipcc_first_assessment_1990_wg1.shtml

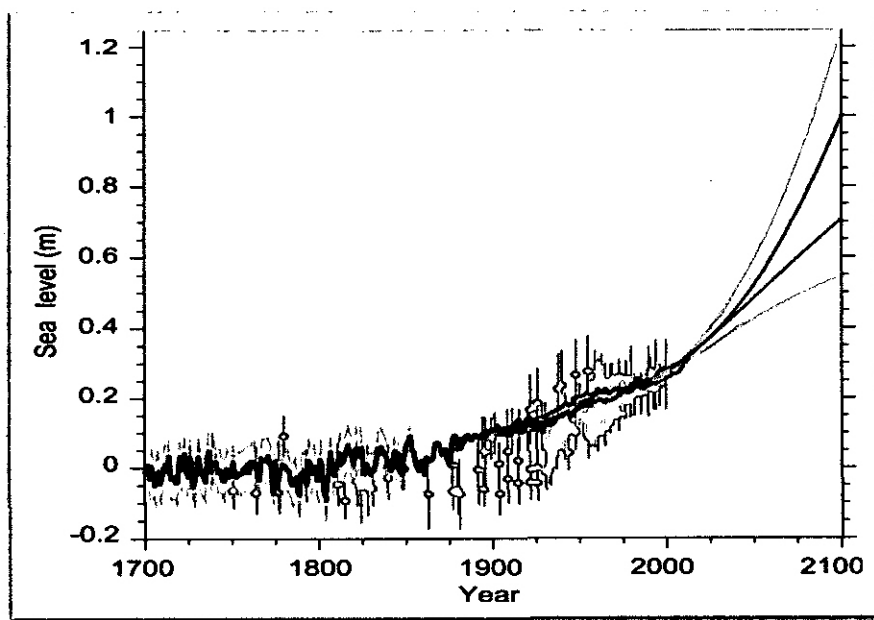
² www.ipcc.ch/ipccreports/far/wg_I/ipcc_far_wg_I_chapter_09.pdf

momentum in climatological systems from these influences will cause effects for decades or even centuries to come.

During the ensuing years most specialties within climate modelling have improved. Perhaps the most important is the increasing scientific understanding in the field of the way polar ice caps and glaciers behave in response to rapid warming. It is in these areas that more accurate research has revealed the potential for increases to sea levels well beyond those projected by the IPCC scientists.

The fifth IPCC report on Climate Change was issued in 2013³. Climate modeling and the scientific understanding of the many dynamics affecting the planets temperature are far better understood in this most recent document.

The graph below⁴ illustrates the increases in sea-level rise projections as indicated in the 2013 report.



³ <http://www.ipcc.ch/report/ar5/wg1>

⁴ http://www.climatechange2013.org/images/report/WG1AR5_Chapter13_FINAL.pdf Figure 13.27 , pg.1264
Compilation of paleo sea level data, tide gauge data, altimeter data (from Figure 13.3), and central estimates and likely

ranges for projections of global mean sea level rise for RCP2.6 (blue) and RCP8.5 (red) scenarios (Section 13.5.1), all relative to pre-industrial values.

During the years 2012-2014 scientists publicized the results of a number of major studies indicating the release of much higher amounts of meltwater and increasing glacial calving⁵ due to underlying mechanisms revealed from more intensive focused studies of ice dynamics. These are acknowledged as major contributors to a rising sea.

A recent article from The Cooperative Institute for Research in Environmental Studies explained the acceleration of glacial movement,

““The sun melts ice into water at the surface, and that water then flows into the ice sheet carrying a tremendous amount of latent energy,”

said William Colgan, a coauthor and CIRES adjunct research associate.

“The latent energy then heats the ice.” The new model shows that this speeds up ice flow in two major ways: One, the retained meltwater warms the bed of the ice sheet and preconditions it to accommodate a basal water layer, making it easier for the ice sheet to slide by lubrication. Two, warmer ice is also softer (less viscous), which makes it flow more readily.”⁶

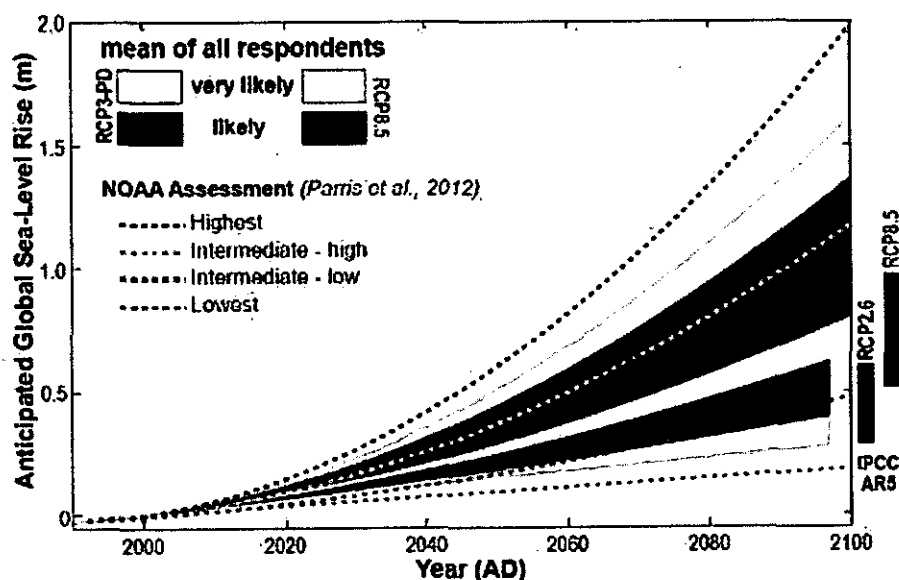
Given the growing body of evidence it is reasonable to assume most of the predictive analytics will be surpassed by some measure. A scientific consensus is quickly developing around this premise.

⁵ Glacial calving is the process that occurs at the terminal edge of a glacier as ice breaks off to become icebergs

⁶ Like Butter: Study Explains Surprising Acceleration of Greenland's Inland Ice, July 16, 2013
<http://cires.colorado.edu/news/press/2013/greenland-inland-ice.html>

In an article published by The Guardian entitled, “Experts say the IPCC underestimated future sea level rise”⁷ the authors discussed this likely possibility.

“They then worked to find contact information for these scientists and finally, they sent a questionnaire. After receiving 90 expert judgments from 18 countries, the results were tallied. So, what do experts think?”



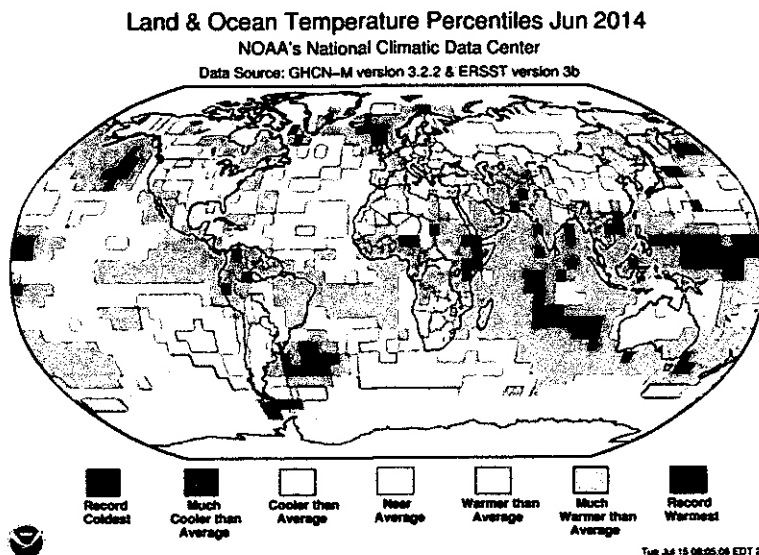
Sea level rise over the period 2000–2100 for high and low warming scenarios

The ranges show the average numbers given across all the experts. For comparison we see the NOAA projections of December 2012 (dashed lines) and the new IPCC projections (bars on the right). According to the best case scenario (humans take very aggressive action to reduce greenhouse gases), the experts think sea level rise will likely be about 0.4–0.6 meters (1.3–2.0 feet) by 2100 and 0.6–1.0 meters (2.0–3.3 feet) by 2300. According to the more likely higher emission scenario, the results are 0.7–1.2 meters (2.3–3.9 feet) by 2100 and 2.0–3.0 meters (6.5–9.8 feet) by 2300. These are significantly larger than the predictions set forth in the recently published IPCC AR5 report. They reflect what my colleagues, particularly scientists at NOAA, have been telling me for about three years.”

⁷ <http://www.theguardian.com/environment/climate-consensus-97-per-cent/2013/dec/04/experts-ipcc-underestimated-sea-level-rise> John Abraham and Dana Nuccitelli, December 4, 2013

It is crucial to coastal communities such as Chilmark that the growing body of data suggesting major changes in sea level be incorporated into every aspect of policy and planning for the future. Each year brings to light more information that bears this out.

In a report issued by NOAA, The National Oceanographic and Atmospheric Administration, was an announcement that yet another record breaking year for global temperatures had occurred. Below is a quote from an article from Science Daily⁸.



June 2014 Blended Land and Sea Surface Temperature Percentiles.

Credit: NOAA

"According to NOAA scientists, the globally averaged temperature over land and ocean surfaces for June 2014 was the highest for June since record keeping began in 1880. It also marked the 38th consecutive June and 352nd consecutive month with a global temperature above the 20th century average. The last below-average global temperature for June was in 1976 and the last below-average global temperature for any month was February 1985."

⁸ NOAA/National Climatic Data Center. "Global temperature reaches record high in June following record warmth in May." ScienceDaily. ScienceDaily, 22 July 2014. <www.sciencedaily.com/releases/2014/07/140722095652.htm>

As this science becomes more mainstream a growing body of state and municipal governments are addressing the issue as a matter of policy. An example of this is found in The State of Maryland which issued a report in 2013 in their effort to address rising sea level as it relates to state policy.

Sea Level Rise Projections for Maryland: Sea level along Maryland's shorelines could rise 2 feet by 2050

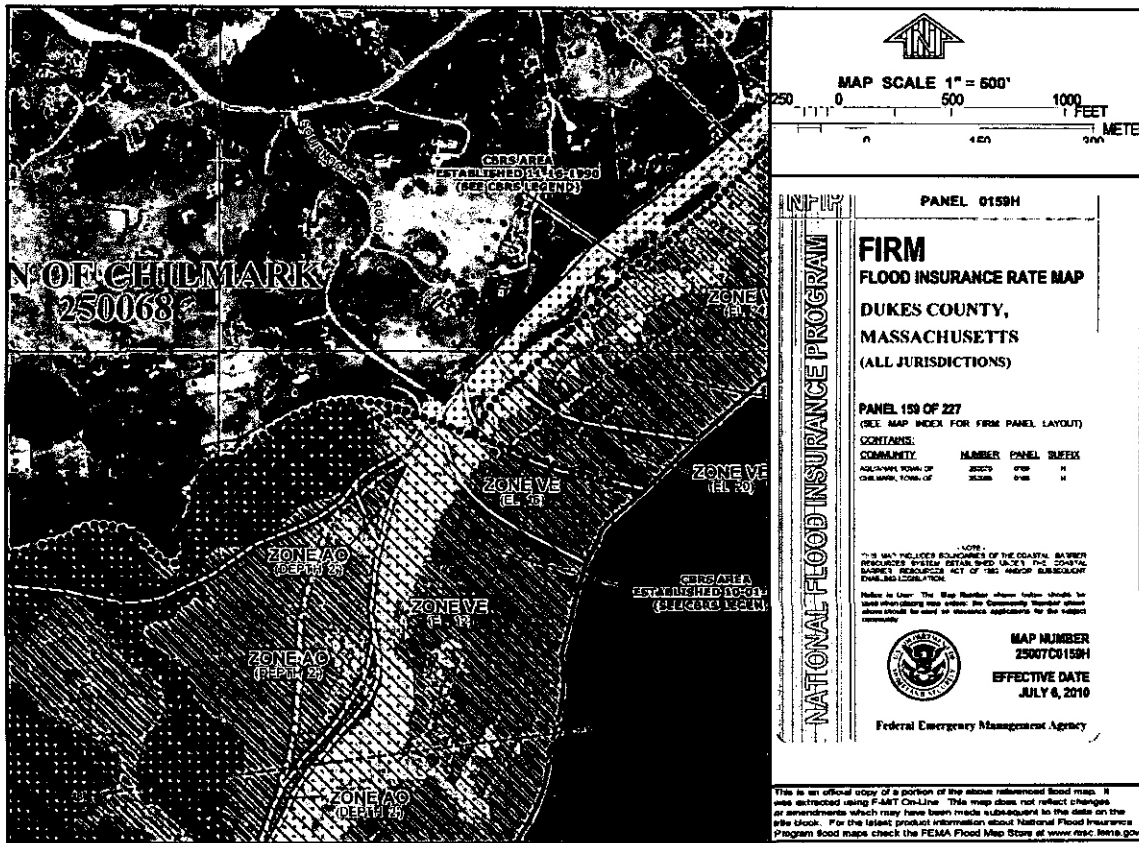
"A new report on sea level rise recommends that the State of Maryland should plan for a rise in sea level of as much as 2 feet by 2050. Led by the University of Maryland Center for Environmental Science, the report was prepared by a panel of scientific experts in response to Governor Martin O'Malley's Executive Order on Climate Change and "Coast Smart" Construction. The projections are based on an assessment of the latest climate change science and federal guidelines.

The State of Maryland is committed to taking the necessary actions to adapt to the rising sea and guard against the impacts of extreme storms," said Governor Martin O'Malley. "In doing so, we must stay abreast of the latest climate science to ensure that we have a sound understanding of our vulnerability and are making informed decisions about how best to protect our land, infrastructure, and most importantly, the citizens of Maryland."⁹

In vulnerable coastal areas such as Chilmark and the Chesapeake Bay the dangers of a rising sea level is compounded and amplified by weather conditions. A rise of 12 inches becomes much more damaging in high wind or hurricane conditions. The newest FEMA maps, on the following page¹⁰ indicate this quite clearly. In this map the Squibnocket area the original proposed parking is listed as being subject to a 1-3 foot flood risk and some is included as being a velocity zone subject to additional hazards.

⁹ Scientific and Technical Working Group
Maryland Climate Change Commission http://ian.umces.edu/pdfs/ian_report_413.pdf June 26, 2013

¹⁰http://map1.msc.fema.gov/idms/IntraView.cgi?ROT=0&O_X=7322&O_Y=7687&O_ZM=0.154664&O_SX=1134&O_SY=821&O_DPI=400&O_TH=92956123&O_EN=11859691&O_PG=1&O_MP=1&CT=0&DI=0&WD=14400&HT=10345&JX=1272&JY=882&MPT=0&MPS=0&ACT=2&KEY=95834751&ITEM=1&PICK_VIEW_CENTER.x=670&PICK_VIEW_CENTER.y=366&R1=VOUT



How does this information influence the discussions now being undertaken about Squibnocket Beach, the construction of a parking lot, and the access to Squibnocket Farms?

It should be noted that project timeframes are boundaries that provide a conditioning of the range of possible solutions.

Using a near-term boundary, such as 10-15 years almost any solution to the access issue or a low level parking area will work. Within this range of time repairs would be required from time to time as in the past. It should be noted and expected that the frequency of needed repairs would likely increase as sea levels increased. This is not a sustainable long term solution for either party.

If, however, a long term boundary is used, 20-50 years, the picture of any set of solutions change dramatically. The data from the FEMA map of this area strongly suggests any future construction be located above the hazard zones which occurs north and at higher elevation of the present parking area. The risk to the interests of the Town of Chilmark and Squibnocket Farms at lower elevation is substantial. Any move to higher elevation begins to rapidly reduce the long term risk. It is also in this timeframe that the construction methodology would need to change. A bridge at elevations above flood levels would be required. In addition it must be noted that in the event of abruptly rising sea levels a single segment of elevated bridge would not provide adequate access to Squibnocket Farms. At this point it will be necessary to build a continuous structure from the present Squibnocket Road to the higher elevations found on the most westerly end of the present roadway

What is clear from the trends identified by the evolving science is that the use of purely historical data in any discussion is not of sufficient consideration in the quest to arrive at a sound solution. Projections derived from the ongoing development of climate science must be central to the debate.

Any consideration to build a new parking lot at an elevation lower than the present area must be viewed as a very short-term solution. It will also result in increased vulnerability to some of the adjacent lands. If the long term interests of both parties are to be met parity of interests and any resolution must be achieved. The original proposal brought before the Chilmark voters neglected to incorporate much of this science into the concept which created an extreme imbalance in the resulting benefits.

It is important to the vitality of the Chilmark community that any solution be developed for the long term. It is far better to manage a situation with preventative solutions rather than those that provide remediation. With prevention more options are available and the accompanying economics are far more manageable.

The Town of Chilmark includes a number of extremely vulnerable areas. Squibnocket Beach, Lucy Vincent Beach, Menemsha and the Hariph Creek Bridge are some that are of critical concern. Across the United States towns and cities are beginning to be aware of the very real necessity to address sea level rise before it is too late and economically unfeasible.

The Squibnocket project is at the forefront of this effort. What we, as a town, do in response will ensure or fail to safeguard our children's ability to thrive in the place we all love. We must not be afraid to look ahead and accept what the science is telling us even if it is not completely proven. If we fail to do so now we will most certainly have to deal with major problems well into the future.

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