



SHORELINES – May 2009

As presented to the *Island Review* Magazine

Climate and Sea Level – Status and Thoughts

This past March, 2,000 scientists attended a conference in Copenhagen to discuss the “hot” button topic dominating newspapers/news web-sites for the past several years – warming climate and rising seas. Actually, we’ve discussed this subject in some detail in the *Island Review* a couple of years ago and invite you to examine these articles again at <http://www.protectthebeach.com/newsletters/archived%20newsletters.htm> (see the March and April 2007 articles). So what’s the spark igniting this latest round of discussions? Let’s take a bullet-point approach to first help de-mystify some of the reporting vehicles existing today followed by the matter at hand, which we will limit to the subject of sea-level rise (climate discussions relating to atmosphere and hydrosphere can wait for another day).

- **Internationally** - The *Intergovernmental Panel on Climate Change* (IPCC) was founded in 1988 by the World Meteorological Organization and the United Nations Environment Program, and is considered as the preeminent, consensus-driven objective source of information related to global climate change. The IPCC’s fourth assessment report included input from over 2,500 scientists and was issued in 2007 - the projection of sea-level rise utilizing six models ranged from 7 to 23 inches (18 and 59 cm) by 2100. The IPCC also disclosed the full input from melting continental ice was not taken into consideration because of limited data and the inability to model ice flow processes associated with Greenland and Antarctica. Since that time, there is a growing consensus in the scientific community that sea-level rise could reach closer to 3.0 feet by 2100 – an average increase of 4 mm/yr (mid-range IPCC number) to a 9 mm/yr rise. The IPCC may (and should) address this discrepancy before their next assessment report due in 2014.
- **Nationally** – In February 2002 the *U.S. Climate Change Science Program* (CCSP) was launched under a new cabinet-level organization designed to improve government wide management and reporting of climate science and climate-related technology. There are 21 deliverables expected out of this program. The Environmental Protection Agency recently issued a multi-bureau report in January 2009 aimed to document the impacts rising sea levels will have to barrier islands and estuaries along the New York to North Carolina coastal corridor. The report takes a *scenario-based approach* by investigating the impacts of sea-level rise at three intervals - 9.8 inch (25 cm), 19.7 (50 cm), and 39.4 inch (100 cm) by 2100. There are no climate or sea-level predictions contained in this report – just the impacts to the Mid-Atlantic coast at these three elevation intervals. Interestingly, the three intervals of sea-level rise used in this report closely reflects; (1) the 20th century rate of sea-level rise, (2) the 2007 IPCC mid-range rate, and (3) now the new rate proposed by a growing body of scientists. **Commentary** - The good news is that the U.S. Climate Change Science Program was developed to standardize reporting – the bad news to be honest is that there are many Federal agencies investigating and reporting climate/sea-level issues and are all vying for resources. Not saying bigger government is good or bad, but it may be worth pursuing a single Federal climate

office rather than having different messages emanating out of several different agencies such as the EPA, USGS, NASA, NOAA, etc.

- **State** – Currently there is no scientific government agency or program dedicated to climate and sea-level change, albeit there have been committees of experts developed to discuss this subject. Akin to the Federal government, it might be worth evaluating the creation of a climate/sea-level agency to avoid the confusion that often ensues when several different agencies report on matters related to climate and sea level. The good news is that North Carolina is one of three states that have been defined by NOAA with significant vulnerability to sea-level rise. The State has been provided \$5 million to perform a risk assessment and mitigation strategy demonstration regarding the potential impacts of sea-level rise. Aspects of flooding to be evaluated under this study are sea-level rise, increasing frequency and/or intensity of coastal flooding (surge, wave heights), and erosion. The study is in its infancy stages and is being administered by the State's Division of Emergency Management (Geospatial and Technology Management Office), and could be a benchmark study.
- **Problems** – As mentioned above, while the 2007 IPCC 4th assessment report predicted a sea-level rise of roughly 1.5 feet by 2100, or 4 mm/year; glacial ice-packs are melting and sliding into the ocean at rates faster than those predicted by the IPCC – consensus is slowly building towards a 3.0 feet sea-level rise by 2100. Also, the amount of the greenhouse gas carbon dioxide (CO₂) contributing to warming the atmosphere are at extraordinary higher levels today than ever experienced in the Quaternary (a.k.a. “the ice ages”).
- **Perception** - However, most of the public is rightfully concerned about what their favorite beach is going to look like *this* summer for vacation and when they see *millimeters* of sea-level rise per year used, raising awareness to the threats of sea-level rise has been equated to being fearful of an attack by giant snails. Scientists and policy experts are clamoring for governments to do “something” about sea-level rise but, **(A)** there have been huge conflicting numbers regarding the rate of sea-level rise attributed to predominantly melting glacial ice and expansion of seawater (is it 1.5 feet or 3 feet of rise by 2100?) and **(B)** despite recent good efforts by the CCSP, the local and precise impacts of sea-level rise have not been quantified and articulated in a meaningful manner to local governments. If there is confusion and mixed messages regarding “A” and “B” above, then “C” (doing something on a local level) is extremely difficult.
- **Suggestions/solutions (they are not perfect)**
 - (1) **Go with a number!** – If the IPCC is the “go to” source on climate and sea level, then either they should have waited until there was better data to account for the volume of continental ice sliding into the ocean, or should be revising their predictions with a public report to this effect by now. Administrators, elected officials, and the public have a lot of other things to think about and any mixed signals reported in the media or among resource and research agencies obviously adds to the confusion.
 - (2) **Agree what the impacts will be!** Part of this problem is that we don't know who (or which agency) should be answering this question (at least yet). That fundamental issue aside, the response to sea-level rise will not be linear and threshold conditions could be reached in certain areas. Processes such as

increasing the fetch in our estuaries (water surface the wind can blow over) will mean more lateral marsh erosion. More barrier island breaching and overwashing will cause significantly different configurations of the lower topography barrier islands in the State. Of course, determining the chronology and precise geographic extents these processes will occur is difficult, but there is room to gain common understanding that the impacts of sea-level rise are not as steady and fixated as the absolute numbers used in the reports. Maybe the impact difference in a 1.5 to a 3.0 feet rise in sea level by 2100 is actually very minimal. Regardless, communities may be interested for instance to change building codes, setbacks, etc., but will continue to be hesitant to do so unless they can envision what their towns will look like in 2025, 2050, etc...

- (3) **Things move at a glacial pace!** – Both figuratively and literally. Moving climate and sea-level policy forward will be “slow”. For instance, elections generally occur on 4-year cycles and the average family/person owns their home for roughly 7 years before moving on. For someone in the field of coastal defense, most shore protection projects can also have expected life spans of 5 to 10 years. Thus most of the planning we do as a society is for the short term and are based upon the “on the ground” circumstances at the time of the planning decision. If circumstances change in the next 4, 7, or 10 years, then the adaptation occurs “then”, not “now”. Thus picking and choosing which polices or projects to target specifically for sea-level adaption will be difficult and acceptance will be protracted.