

Comment	Section	Page	Line	Comment	Response
1	General	0	0	A brief glance at the appendices leads the reader to believe that is where the meat of this report lies. Actual examples of what states and localities are doing to adapt to sea level rise can be found there. This is the most useful part of this document. An overall streamlining of the main sections of the document would be helpful. In its entirety it is not as valuable to the reader as sections will be skimmed or skipped altogether.	Report has been streamlined and Appendices have been brought forward into Part IV.
2	General	0	0	At least a section, if not as an element of multiple sections, the idea that methodologies employed to adapt to sea level rise are not that dissimilar from methodologies to adapt to inundation from storm surge should be discussed. Setbacks, low density development, and easements can be employed to deal with multiple hazards which may provide more of an economic incentive and a better cost benefit ratio.	The techniques introduced are almost entirely available for existing erosion and flooding regardless of whether the sea is rising.
3	General	0	0	Pull out sections or one-pagers should be developed describing the various adaptation strategies such as rolling easements or shoreline protection measures for easy reference.	Chapter 5 describes adaptation strategies.
4	General	0	0	Only minimal mention of the potential increase in sea level rise with the accelerated melting of the ice sheets is included in this document. There could be huge consequences if recent trends continue. As such a more comprehensive look at this aspect of the science should be included.	Text has been added to include rates that are supported by new literature and which are higher than the IPCC values.
5	General	0	0	The two primary assumptions in the entire report are seriously flawed. Therefore, the report has virtually no value. First, the report states that SL has been relatively stable (CCSP 4.1, line 809) for the last 10K years. This is not the case, evidence points to it rising over 15 meters during that time, with scattered periods of both sharp rises and falls. SLR in the 20th century is a continuation of the same overall trend of about 7 inches/century. Second, that anthropogenic CO2 is unequivocally causing global warming is not supported by any scientific evidence and is only supported by assumption-driven computer models. The same computer models, the predictions of which, you use to set up your study scenarios.	Sea-level rise history is discussed in depth as supported by peer-reviewed literature. Findings about anthropogenic climate change are substantiated by IPCC, CCSP, and peer-reviewed literature.
6	General	0	0	The report should have included a summary of all of the related research, yet is chose to hang its hat on the IPCC's executive summary, a politically driven document written by bureaucrats, not the scientists that contributed to the study group work, many of which now dispute the findings.	See response to comment 5.
7	General	0	0	The report should include the amazing amount of research that better correlates both historic and recent past climate change with the sun's activity. Maybe you could have included that 400 prominent physical scientists, many of whom did contribute to the IPCC's reports, issued a report to Congress stating they do not support the anthropogenic GHG climate change theory. You appeared to also ignore and fail to include that temperature has declined for the last 10 years (acknowledged by the IPCC) and that this past year was about 0.5 degrees colder than last year. You might want to include recent data showing that temperature measurements in the ocean have shown no warming, opposite of what your models have been predicting. You might also include results of studies showing that the increase in atmospheric CO2 would be very beneficial to plants (increased species richness), crop yields, and therefore, humans.	See response to comment 5.
8	General	0	0	Finally, being in the coastal regulatory community, I see these reports as being very dangerous. Some of my coworkers and peers toss around huge, unsubstantiated SLR figures with near absolute certainty of their accuracy, in house and at conferences, and none of them appear to have any real knowledge on the subject. They simply look towards reports like the one you'll be issuing soon, filled with unsupported predictions as their template.	See response to comment 5.
9	General	0	0	Government has a responsibility to accurately report back to the public. This report should not be released in its present form as it based on a thin slice of the (hand picked) current scientific research, apparently to carry out the participants views on the subject. Bad form!	See response to comment 5.
10	General	0	0	First of all, I would like to state that I think the report is excellent; it superbly addresses intellectual merit and broader impacts of sea-level rise for the Atlantic coast. I am a coastal geologist, indeed a sea-level scientist, thus I was very pleased to find that the reports believes that to improve our understanding of sea-level rise in the mid Atlantic we must "focus on insights from the historic and geological past". I have concentrated on the historical/geological sections of the report in the following comments:	No response necessary

Comment	Section	Page	Line	Comment	Response
11	General	0	0	<p>The report provides an excellent summary of approximately thirty years of geologically related sea-level research. As the authors are aware, the sea-level community is now well-equipped to develop local, regional and global records of relative sea-level (RSL) change. It is also increasingly able to describe linkages between terrestrial, coastal and marine environments through the application of new techniques of sediment fingerprinting, dating, as well as quantitative models of coastal change, sea-level change and sediment flux. However, the geological sea-level community has so far been less successful in determining the driving mechanisms of the patterns we observe and reconstruct. The report rightly states that we need to "understand the rates and patterns of change during this part (last 5000 years) of the recent geological past". The research of the geological sea-level community contrasts with many other areas of Quaternary science where, motivated by the emerging climate records from ice sheets and oceans, research scientists are eagerly pursuing the driving mechanisms of climate change or ocean circulation through hypothesis testing and model building.</p> <p>I would like to see the report explicitly state that coastal change in the future will be driven by a combination of local, regional and global processes. The report could go on to say that the sea-level community must seek to better understand these processes, including defining the potential driving mechanisms behind future sea-level change (global to regional changes in vertical sea-level) and shoreline evolution (including sediment budgets and human impacts) at regional to local scales. This must include a focus on palaeo-extreme events, such as storm surges, tidal surges and even tsunamis</p>	No response necessary
12	General	0	0	<p>Linked to #2 the report could provide guidelines for the scientific strategy. That is, the geological sea-level community must develop high-resolution (centimeter to meter scale vertical resolution and annual to centennial scale age resolution) records of vertical changes in RSL that can be meaningfully compared with other local, regional and global environmental records derived from terrestrial and marine environments. The community must develop new quantitative models of RSL change based on a range of proxy indicators (such as microfossils, geochemical markers, etc), as well as a more standardized approach to data collection and analysis to facilitate national and international correlation. A key objective here will be to test hypotheses regarding the driving mechanisms behind vertical changes in sea-level over different spatial and temporal scales, including the influences of ocean circulation, climate change and neotectonics.</p>	Agree and some of this is discussed in Part 6.
13	General	0	0	<p>I think the report can go further and define the new challenges the geological sea-level community must answer: a. To develop new, high resolution, records of sea-level change and coastal evolution that can be meaningfully compared with the emerging high-precision palaeoenvironmental records from the ice sheets (cores), the oceans (e.g. corals, high-resolution sedimentation cores) and other terrestrial archives (e.g. peat bogs and loess sequences). The time scale of the last 5000 years seems appropriate. b. To develop new methodologies for determining the driving mechanisms behind sea-level and coastal change, including capabilities for coastal and sea-level forecasting. This will require the close co-operation of field scientists, laboratory and theoretical studies from a variety of disciplines. c. To develop new techniques to resolve the importance of terrestrial and oceanic processes in controlling coastal stratigraphic sequences, sea-level change and coastal evolution. Where possible, to explore the opportunities provided by the often rich archaeological record for human activity in coastal</p>	Agree and some of this is included in Part 6.
14	General	0	0	<p>The report states that sea-level is rising (pg 18 – 1.7mm/yr over the 20th century). However, this rate and the timing of the change is subject of much recent scientific debate (e.g. IPCC 2001 Clark et al 2002; Douglas and Peitler 2002; Munk 2002; Miller and Douglas 2004; Mörner 2004; Rohling et al 2004; Cazenave 2005; Church et al 2005; Church and White 2006; Meehl et al 2005; Velicogna and Wahr 2005, 2006; Larsen and Clark 2006; Wahr et al 2006). I think the report should state this as a gap in our knowledge that must be addressed. The report correctly states that we can use the geological rates of sea-level rise during the last 5000 years to provide the fundamental basis for comparison with historical and present-day changes. The report could explicitly state that the geological data provide an essential benchmark against which the RSL rise that has occurred over the last 100-150 years is compared.</p>	<p>The research plan in Part VI is intended to be somewhat generalized, hence this level of specificity unbalanced that part of the report so was not added. However, these kinds of studies are hopefully implicit if not explicit within the broad geologic and biologic research themes already described in the report.</p>
15	General	0	0	<p>The rates used here reflect the consensus of the IPCC 2007 report and other relevant literature, and are provided principally for context. It is not the intent of this report to examine the nature of the change in rate. Part VI of the report explicitly sets a goal to understand the rate and magnitude of sea-level changes over the past 5000 years.</p>	

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16	General	0	0	<p>I am very pleased to see the report acknowledges recent research from the Atlantic margins of the North Atlantic, which has provided the first indication that modern rates of relative sea-level rise (last 100-150 years) in this region may be more rapid than the long-term rate of rise over the last 4 ka (last 4000 years) BP (Donnelly et al 2004; Donnelly 2006; Gehrels et al 2005; Horton et al 2006). The report could add that identifying the exact timing of this acceleration is of huge scientific importance because it will suggest the relative contributions of natural versus human forcing to sea-level rise. That is, the timing of this acceleration may be indicative of a link with human-induced climate change. Furthermore, the timing of this acceleration may enable a fingerprint the source of the sea-level rise (that is, is it Antarctica, Greenland?) – see the recent paper Douglas and Miller (2006).</p> <p>The report could also highlight that high quality sea-level data from the last 5000 years will reveal spatial and temporal variations in crustal movements. Thus, investigations of former sea-levels from the Atlantic Coast of United States and constitute a vital constraint upon the dynamical models of the Glacio Isostatic Adjustment (GIA) process. There is an urgent need for a sufficiently accurate model of the GIA process to inform the global data set currently being produced on the time dependence of the gravitational field of the planet by the Gravity Recovery and Climate Experiment (GRACE). There exists a systematic misfit of the existing GIA filter for GRACE to sea-level observations along the Atlantic coast of the United States. It is presently unknown whether these misfits derive from a fundamental flaw in the models of the GIA process or in the interpretation of former sea-level measurements from this critical region.</p>	<p>These are specific activities that could (and should) be undertaken as part of the research agenda outlined in Part VI of the report.</p>
17	General	0	0	<p>The report could highlight that rates of sea-level change during the last 5000 years provide information of the background rates of vertical land movement (these have far greater precision than the geodetic measurements – the time series is not long enough yet). Regional variations in net sea level rise along the Atlantic coast must make allowances to reflect latest information on vertical land movement.</p>	<p>See responses to comments 15-16.</p>
18	General	0	0	<p>The report states many times the link between sea-level stabilization during the past 10,000 years and civilizations. This is very controversial and is really based on one or two recent publications of Professor John Day (I was a co-authors on one of John's papers) and speculation among the expansion of wetland, reliable, nutritional food source and birth of civilization, in particular in Mesopotamia. However, there are many, many archeologists and anthropologists who disagree with this. Thus, I would remove or certainly downplay this suggestion in the report. Furthermore, John Day et al stated that sea-level stabilized approximately 6K not 10K. That is, when the Laurentide and Fennoscandinavian ice sheets had completed their meltwater input.</p>	<p>See responses to comments 15-16.</p>
19	General	0	0	<p>This report has been significantly improved since the draft that I reviewed last fall as part of your peer review, and almost all of my comments have been addressed. Unfortunately, the most important error discussed in my peer review has still not been corrected: the prediction that barrier islands will disintegrate. That error goes to the very heart of coastal geomorphology, and by adopting a previously unpublished prediction based on neither data nor models, the Climate Change Science Program would do a serious disservice to public understanding about the risks of climate change.</p>	<p>This has been toned down by stating that much of the development has taken place over the past 3 k yrs when sea level really was quite stable and deltas world wide developed as discussed by Stanley et al.</p>
20	General	0	0	<p>The report includes maps and text that predict the likelihood that specific barrier islands will disintegrate under four alternative scenarios of sea level rise. It certainly would be useful to have that information. But an honest review of the literature must start by admitting that we do not have that case of barrier islands that have developed on a rapidly subsiding deltaic plain that contains mostly fine grained sediments, such as the mouth of the Mississippi River. Thus, the available information is insufficient to make even a general predictive statement that some barrier islands would disintegrate along the Atlantic Coast. The report makes a serious error by making such statements.</p>	<p>Disagree. This topic was discussed by an expert panel and results are published as a provisional assessment of how barriers might respond to rapid SLR. This is a new topic in great need of further research.</p>
21	General	0	0		<p>Much of this information is the result of discussions of the expert panel and results of mapping east coast and LA barriers.</p>

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22	General	0	0	<p>The more serious error, however, is that the report then goes on to make site-specific predictions. The report provides no basis for the assumed probabilities or threshold rates of sea level rise, nor does it provide any basis for the predicted site-specific variation in the probabilities and threshold rates. The lack of basis in the report is not surprising, because no studies or models exist to provide such a basis. What is surprising is that the US Government would make such statements without basis.</p> <p>The only citation for these site-specific predictions is a brand new USGS report. But that report provides no additional documentation. In fact, it was written by the same people who wrote the CCSP chapter, and it appears to simply be an expanded version of the CCSP chapter. The sole justification for the prediction is that USGS convened a meeting and the meeting participants agreed to the characterization in these maps. But without data or models—or even text to explain the specifics—it is circular reasoning to say that these findings are supported. (Even if there was a wealth of site-specific information on barrier island disintegration, the USGS report would be suspect, because the meeting was organized by the USGS authors rather than a neutral party. The panel was not independent of USGS; instead it was mostly USGS employees, funding recipients, and other close collaborators.)</p>	Disagree. The basis of these conclusions is clearly stated.
23	General	0	0	<p>Because the Climate Change Science Program is directed by climate experts rather than coastal experts, you may not be familiar with the knowledge limitations and insitutional biases in the coastal sciences. But you are probably familiar with questions about hurricane genesis. Given what we know, suppose the Union of Concerned Scientists convened a meeting of 15 of their member meteorologists from each coastal state, and then prepared a map that showed the number of hurricanes that will strike each barrier island in the next century under three alternative scenarios of global warming, and published that report a few months before one of your reports. Would you adopt such a map as the US Government prediction on the impact of climate change?</p>	<p>The use of the expert panel of independent coastal experts is one method for trying to gain insights into what is likely to happen with future SLR. USGS does not have an agenda in carrying out this line of study.</p>
24	General	0	0	<p>I do not mean to disparage sincere efforts by scientists to raise concerns and help to structure the USGS budget. If USGS wants to use its panel assessment to help allocate its research budget, that may be a reasonable use of the panel report. Speculation may sometimes be the only basis for allocating a research budget. And good journalism or good policy analysis might consider these speculations as a point of departure for considering risks to the coast—as long as they are recognized as speculation.</p>	<p>The USGS report summarizes a transparent process of expert opinion solicitation, discussion, and consensus. Chapter 2 of this report builds on that foundation.</p>
25	General	0	0	<p>But good science has a greater responsibility to differentiate pure speculation from a well founded result. This report fails that central responsibility, and in so doing implies (probably falsely) that the communities in which millions of people own homes and vacation will be destroyed within the next century. It would be ashame if the more well-founded results elsewhere in this report were to be discredited due to their association with this false alarm.</p>	<p>USGS is not structuring its budget based on this report. The "speculation" to which reviewer refers is the opinion of independent experts, as described in this report.</p>
26	General	0	0	<p>If my comments alone do not persuade you, I would suggest you have the relevant discussions reviewed by coastal geomorphologists who are truly independent of the USGS, most of whom may be overseas.</p>	<p>Disagree. There is no implication of mass destruction.</p>
27	General	0	0	<p>The report needs to mention more prominently that, for areas not subsiding, the coastline is, after thousands of years at current sea level, likely reasonably hardened to the sea level that is near its present level (so with dunes, vegetation, rock outcrops, etc.), but that the coastline is not likely to be so resilient at a higher sea level, it taking time for hardness to develop. We can see, for example, that where relative sea level has been rising for centuries and longer (e.g., in Chesapeake Bay) that the coast is not resilient at all and that substantial inundation is occurring, and wetland development has not been able to keep up with even the limited rise in relative sea level that has been occurring (compared to what is likely to be coming).</p>	<p>This report as well as the background USGS report has been reviewed by independent experts and the panel was composed of leading coastal experts. Reviewer's assertions of conflict of interest are unfounded.</p>
28	General	0	0		<p>Agree and some of this is discussed.</p>

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29	General	0	0	It is particularly unfortunate that there is no mention at all of the very substantive assessment effort carried out for the U.S. National Assessment. The coastal sector report was published as an official publication of NOAA (NOAA Coastal Ocean Program Decision Analysis Series No. 21) and it contains a lot of relevant information, and case studies for regions around the country. While this draft report has much more detail for the Mid-Atlantic, the results for the rest of the country in the previous report really need to be mentioned and cited.	The National Assessment has been included.
30	General	0	0	The report seems to fail to address the Dutch approach to protecting the coast, namely with levees, and that the Dutch are planning protection based on a 1 in 10,000 year exceedance level—a lesson they learned after having experienced inundation and the deaths that occurred roughly 50 years ago. It would seem that there should be some discussion that learns from their efforts, pointing out that in the US we have been tending to protect only against 1 in 100 year events (or less in some cases) and considering what is an appropriate level (at least there should be a discussion of this issue).	Dutch approach is based on dikes rather than levees. We have made passing reference to the need to experience a disaster before one designs to tight standards, in chapters 5 and Part III. We do not address the Dutch approach of entirely closing off estuaries other than brief mention of tide gates, because the environmental consequences are severe.
31	General	0	0	There seems to be no discussion of storm surge barriers (e.g., Thames River barriers, Venice lagoon, etc.)—either of those existing or as options. In that a group at Stony Brook University has laid out ideas for storm surge barriers to protect much of New York harbor, it would seem that this report should be covering this as a potential approach for other rivers along the Mid-Atlantic region (and for a number of them, this would be quite problematic). There is an interesting chapter on such protection approaches in Europe and New England, plus the proposal for New York, in a chapter by Malcolm Bowman (see Bowman, M., D. Hill, F. Buonaiuto, B. Colle, R. Flood, R. Wilson, R. Hunter, and J. Wang, 2008: Threats and responses associated with rapid climate change in metropolitan New York, pp. 119-142 in Sudden and Disruptive Climate Change: Exploring the Real Risks and How We Can Avoid Them, M. C. MacCracken, F. Moore, and J. C. Topping, Jr., eds., Earthscan, London, UK, 326 pp.).	There is a brief mention in New York Section B of Part IV, as well as chapter 5.
32	General	0	0	I think it needs to be pointed out more prominently that this report (at least the front part of it) is really focused on the general coastline and coastal ecosystems and is not primarily focused on how cities and large populations might be affected (e.g., flooding of Annapolis, Washington DC, etc.). Much of the infrastructure that is most valuable for cities is located right on the coasts and is very exposed (reiterating why it is unfortunate that FEMA is not a participant).	Agree and some of this high risk of low-lying cities is discussed.
33	General	0	0	While this report is essentially about the Mid-Atlantic region, there is some mention of other areas. One that, near as I could tell, was omitted, was the very serious situation in the Sacramento-San Joaquin River delta; take a look at Reisner (Reisner, M., 2003: A Dangerous Place: California's Unsettling Fate, Pantheon, 192 pp.) to get a sense of the precariousness of the situation, and I understand that the State is starting to take (or at least plan) action. Mention should be made to give a real sense of the seriousness of the situation being faced by the country.	Part V revised to include this issue.
34	General	0	0	Document should be more consistent in usage of technical terms. It should also specifically state the importance of using consistent spatial reference frames and consistent shoreline delineation methods as these are critical elements for truly measuring and understanding changes in the physical structure of the environment. NOAA has the observing systems in place and the mandate to make these observations and this document should specifically state that these are important pieces in the overall science strategy for addressing climate change.	As regards the science strategy, based on previous guidance from CCSP/NOCD staff on this matter, the research plan deliberately attempts to avoid mention of specific federal agency programs, lest it be interpreted as a call for increased funding of that particular program.
35	General	0	0	In general, though RSD (NOAA's National Geodetic Survey, Remote Sensing Div) is not specifically mentioned in the document, we already have a major role here in data collection/processing/synthesis (calibration data). This is especially true now, with the advent of our LIDAR MHW shoreline surveys. Concerning Modeling, at a minimum, RSD should have a role in validating shoreline change models. My choice here would be a collaborative process where RSD is involved in the model building process, but I've no idea how that would be budgeted. Concerning Decision Support Systems: though important, much too political for scientist types to understand.	Noted. The suggested actions should be part of agency/interagency discussions as followup to this report.

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36	General	0	0	<p>1) Part VI and Appendix H make no attempt to technically define the Shoreline – such as:                      a. Datum based MHW or MLLW, or                      b. Proxy based parameters of the MHL - as wet line, berm line, scarp etc.</p> <p>2) Regarding Part VI and the /Data collection/synthesis - predictive modeling – decision support/ paradigm:                      a. I agree that RSD currently falls into the first category of data collection/synthesis. Do we want to proceed outside of that realm into modeling shoreline change?                      b. I also have a small research proposal that would fit somewhere in section VI.1.2 (page 459) under the heading of “Develop and maintain coastal observing systems” or “Develop time series data to monitor environmental and landscape changes”. We could initiate and survey a set of shoreline fiducial sites where RSD would survey and map LIDAR MHW shoreline on the order of every 2-3 years. Six sites: two each on the East, Gulf and West Coasts might suffice. For example, the IOCM area of Cape Henry to Cape Hatteras might be one of the East Coast sites. A key would be USGS support: verbally, financially and/or with research types. Is such an effort already underway?                      c. Under section VI.1.2 (page 459) under the heading of “Assemble and update baseline data for coastal zone” should we suggest text detailing our future LIDAR system and coastal acquisitions (IOCM</p>	<p>Part VI does not refer to the shoreline in technical terms. The description in Appendix 2 of the methods often used to predict shoreline changes does not require this level of technical detail.</p> <p>Noted. Based on previous guidance from CCSP/NCDC staff on this matter, the research plan deliberately attempts to avoid mention of specific federal agency programs, lest it be interpreted as a call for increased funding of that particular program. The suggested actions should be part of agency/interagency discussions as followup to this report.</p>
37	General	0	0	<p>General comment on report: Marketing sea level rise mitigation will always be hampered by its long-term impact and its high uncertainty. The report should recognize that marketing and implementation would be significantly enhanced by identifying other more immediate and more certain reasons to take the same actions. As an example freeboard for floor elevations is appropriate for a storm tomorrow or in 50 years, even if sea level does not rise. The report would also be improved by identifying programs that address sea level rise mitigation but were developed for other hazard purposes. In the case of freeboard, incentives for the community are already in place thru the Community Rating System and for the individual owner thru the elevation discounts available on individual flood policies. Those incentives are generally limited to 2-4 feet above the minimum. A minor modification to better address sea level rise might be to distribute the discounts over a wider range and into less flood prone zones where they are not presently available.</p>	<p>Some of the ancillary benefits of preparing for sea level rise are mentioned in Chapter 9—not as a topic unto itself but as one of several considerations in the overall calculation of benefits. But it is also possible that the barrier to preparing for sea level rise has been that people only have done so when there was a near-term justification for doing the same thing. The risk of that approach is that if sea level rise requires a different way of looking at things than current problems, we will never really address the issue head on. This report tries to give equal play to those two perspectives, perhaps more implicitly than explicitly. Questions underlying chapter 9 and 10 are clearly about the things that are justified by sea level rise which might not otherwise be justified; chapter 11, by contrast inherently includes institutional opportunities.</p>
38	General	0	0	<p>My comment is not line specific but a general comment. The effect of sea level rise on groundwater resources in coastal areas is important. I did not see this addressed. HAS it been addressed elsewhere/ Will it be discussed in a future document?</p>	<p>Effects on GW are mentioned as a consequence, but not in any great detail.</p>
39	General	0	0	<p>This is a comprehensive, long overdue effort on the part of the federal government. As we are just starting to understand the potential impacts of sea level rise in the lower lying areas of Hampton Roads, this report will be of use in establishing credibility to those seeking to elevate the policy debate. Many states in the mid-Atlantic region are considering the impacts of climate change and this study will make a great contribution. As a member of Virginia's Commission on Climate Change, I feel that this report will be of great assistance here and the sooner this report can be finalized, the better. Maryland, Virginia, and North Carolina all have commission deliberations this year.</p>	
40	General	0	0		<p>No response needed.</p>

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41	General	0	0	<p>The inclusion of site-specific analyses in the appendices is very useful. They put the general discussion into site-specific context. Most members of the public are not going to fully grasp these impacts unless they can relate them to a landscape feature near them. Just as a wetlands scientist would turn first (after the executive summary) to the wetlands sections, a member of the public or policymaker will turn to their geographic region's summary. The regional summaries in the appendix provide meaning and context for the general reader and are probably the most important point of entry into the body of the report. Without these appendices this study risks becoming a policy document written by agency staff, academics, and consultants to be read by other agency staff, academics, and consultants.</p> <p>In my comments at the advisory committee meeting in Portsmouth, VA I noted the balance to be struck between the use of cautious qualifiers and unwarranted extensions of inadequate data. Too much caution and the report loses relevance: policymakers looking for guidance find none and the public looking for concrete information find only generalities. The other extreme is just as dangerous: too many unwarranted conclusions and the credibility of the study suffers or a policy maker will take a "fact" out of context and politicize the conclusions.</p>	Information from Appendices has been brought forward into Part IV.
42	General	0	0	<p>It seems the report has become more conservative in its conclusions since the previous draft I reviewed. That may be the natural process of advanced review, but this trend risks tilting the study into the category of caution and irrelevance. The study avoids providing bounded estimates of impacts with arguments of inadequate data and the need for more research. This cautious approach has plagued much of our climate change debate. We know a great deal today and we understand that decisions will have to be made, or at least started, well in advance of a state of perfect knowledge.</p>	We have tried to rely on current literature and scientific consensus and make clear the distinction between what's known with confidence and what is likely but not yet well supported with facts.
43	General	0	0	<p>Wetlands Watch is working today to help coastal localities find ways to protect coastal ecosystems and adjacent landscapes. We cannot wait for state and federal governments to come to firm conclusions to begin to make common sense decisions about our coastlines. This study has a responsibility to take some risks in order to drive early adaptation strategies.</p>	We have tried to rely on current literature and scientific consensus and make clear the distinction between what's known with confidence and what is likely but not yet well supported with facts.
44	General	0	0	<p>The National Wildlife Federation (NWF) appreciates the opportunity to comment on this important and timely report. Overall, this report provides an excellent overview of the current state of the science on sea-level rise and its implications for coastal habitats, fish and wildlife species, and human communities in the mid-Atlantic region. We believe that it will serve as a useful tool to guide policy makers, coastal resource managers, and other relevant stakeholders in the development of meaningful strategies to minimize the adverse impacts on our natural systems and society.</p>	Report attempts to inform adaptation by relying on the most recent peer-reviewed scientific literature.
177	General	0	0	<p>Sea-level rise is one of the most certain and direct consequences of global warming, and many of the nation's coastal areas are at risk – including the mid-Atlantic region. As highlighted in the important Appendices to this report, sea-level rise is already affecting coastal habitats and communities throughout the region. With the rate of sea-level rise projected to increase significantly in the coming decades, the risks to our coasts are mounting. Indeed, as a number of studies cited in this report show, even the lower-range projections for sea-level rise in the coming decades will have a dramatic impact on coastal habitats and the fish, wildlife, and people they support. Without significant efforts today to minimize those risks, sea-level rise is likely to have catastrophic consequences for the region and nation's economic and ecological well being.</p>	No response necessary.
178	General	0	0	<p>Certainly, there will always be a degree of uncertainty about how, when, and where sea-level rise and other global warming impacts will affect natural and human systems. The more we know about the potential impacts of sea-level rise, the better able we will be to develop and refine effective management strategies. This underscores the importance of continuing to invest in monitoring and scientific research. In view of that, the NWF has recently completed an extensive modeling analysis of the impacts of sea-level rise on coastal habitats for the Delaware Bay and Chesapeake Bay region, the results of which both support and enhance the information highlighted in this report. We are happy to submit our report for the record.</p>	No response necessary.
179	General	0	0	<p>submit our report for the record.</p>	No response necessary.

Comment	Section	Page	Line	Comment	Response
180	General	0	0	<p>However, it is important to acknowledge that there is already sufficient scientific evidence of the threat of sea-level rise to warrant immediate action. It is prudent to consider steps we can take now that will reduce our vulnerability as well as incorporate useful measures of uncertainty in our decision making. Accordingly, we believe the information in Part III of this report is particularly important and that the recommendations should feature more prominently in the Executive Summary. Many of the decisions we make today – from where and how we build our homes, businesses, and highways, to how much and what kinds of energy we use – will have a significant impact on our resources, land use, and even our climate for many decades to come. Failure to incorporate sea-level rise into those decisions could ultimately lead to irreversible damages. For example, while some new wetlands are likely to be created in low-lying upland coastal zones as sea-level rises, efforts to minimize land loss and protect roads, buildings, and other structures will likely lead to more armoring of shorelines, precluding the</p> <p>Now is the time for the region to develop a comprehensive strategy to confront sea-level rise in a way that increases the resiliency of coastal habitats by steering away from structural armoring of shorelines and restoring and protecting natural buffers, and reduces the risks to communities by discouraging building in vulnerable areas. Maryland has taken an important first step by establishing a state-wide Sea-Level Rise Response Strategy, which has laid out a number of recommended actions. To be successful, however, actions should be coordinated throughout the region. Indeed, many of state and federal procedures for planning and assessing conditions for coastal and shoreline development fail to incorporate effects of sea-level rise, climate change, and future development. This report should serve as an important impetus and guide for the development of the proactive measures necessary to protect the region's coastal resources for generations to come.</p>	<p>Findings from Part III are now featured more prominently in Executive Summary.</p>
181	General	0	0	<p>Our comments will focus on chapters 1-5, where our expertise lies. Our model (SLAMM) focuses on the potential impact of sea level rise on coastal ecosystems, and over the last 20 years has been used by sea level rise assessments conducted by federal, and state agencies, and most recently the National Wildlife Federation. Recent applications include the entire GA and SC coastline under close review of wetlands expert Dr. Christopher Craft, and Chesapeake Bay.</p>	<p>Noted; this report attempts to inform strategy building for sea-level rise.</p>
182	General	0	0	<p>The overall structure of this report is consistent with the way that models (with wide geographical application) examine sea level rise impacts. Like SLAMM, this report views wetland loss as resulting from the interplay of four overall factors: vertical accretion and submergence when vertical accretion is less than sea level rise (chapter 3), shoreline erosion (chapter 2), wetland horizontal migration, (chapter 1), and shore protection (chapter 5). Like SLAMM, the report looks at the different types of tidal habitat in chapter 4, including beaches, marshes, swamps, and mudflats. Although some sentences need to be clarified, the overall message of the report is consistent with the results of models such as ours.</p>	<p>The new Ch. 1 does not address specific sea level rise models, but rather discusses issues of data quality and uncertainty that are relevant for all models that use elevation data.</p>
183	General	0	0	<p>It is very unfortunate that the US Army Corps of Engineers and FEMA were not participants in this effort. That they were not participants really lowers credibility in the assertion that the Administration is taking this issue seriously.</p>	<p>The new Ch. 1 no longer addresses wetland migration issues.</p>
45	Cover	1	16-19		<p>USACE and FEMA employees commented on the report but were not authors.</p>





Comment	Section	Page	Line	Comment	Reponse
51	ES	0	0	The following phases should be consistent. I noticed a mixed usage of those phases throughout the text.  Mid-Atlantic / mid-Atlantic sea-level/ sea level spring-high-water/ spring high water	Report edited so that phrases are consistent for final draft
52	ES	0	0	Units should be consistent throughout the text and in the tables. I noticed a combined usage of SI units and English units always.	Units edited for consistency. In addition, a conversion table is included in the Preface.
53	ES	0	0	Notation of units after the value should be consistent. There should be a space in between the value and the unit. But I noted an intermix usage of with-space, without-space, with a dash, and with a dash within inverted commas. e.g., 5 m / 5m /5-m / "5-m"	Units edited for consistency.
54	ES	18	0	Sea level rise in the Mid Atlantic, executive summary, Lines 539-541...should also indicate thermal expansion as a primary factor affecting global sea level, not just the proportion of water that exists in ocean basins and the amount that is held in glaciers and ice sheets as indicated. This should also be highlighted in the 'Why is Global Sea Level Rising?' section (C1, beginning on page 33), which I did not review, but only glanced at since I saw it this way in the executive summary.	Thermal expansion and ice-sheet melting are both included.
55	ES	18	549	Citing the 1993-2003 rate that IPCC cites is really out of date, given that NASA is making the observations. In my visit to JPL in January, those doing the analysis of the data say 'the current rate is up near 4 mm/yr. Mention of the data being gathered as part of the CCSP/USGCRP effort should be made.	Possibility of higher scenarios is mentioned in Executive Summary and elaborated in Context.
56	ES	21	0	SLR and the Physical Environment 2.1.1 Coastal Elevations... 'Approximately one-sixth of the nation's land close to sea level is in the mid Atlantic... Based on what? What does 'close to sea level' mean? Within what criteria?	This statement was based on the old Chapter 1 and no longer appears in the Executive Summary.
57	ES	21	599-600	This sentence should be reflected to acknowledge the fact that some coastal wetlands rise along with the sea if organic matter accumulation is sufficient to compensate for the rise in sea level, whereas other coastal marshes rise along with the sea if sediment inputs are sufficient to compensate for the rise in sea level. The studies supporting marsh vertical accretion via vegetative growth are: (McCaffrey and Thomson 1980, Hatton et al. 1983, Bricker-Urso et al. 1989, Nyman et al. 1993, Callaway et al. 1997, Annisfeld et al. 1999, Turner et al. 2000, Chmura and Hung 2004, Nyman et al. 2006), but they do not need to be cited here in the Executive Summary. Callaway, J. C., DeLaune, R. D., and Patrick, W. H., Jr. 1997. Sediment accretion rates from four coastal wetlands along the Gulf of Mexico. Journal of Coastal Research 13, 181-191. Chmura, G. L., Hung, G.-A. 2004. Controls on salt marsh accretion: a test in salt marshes of Eastern Canada. Estuaries 27, 70-81. Hatton, R. S., DeLaune, R. D. and Patrick, W. H., Jr. 1983. Sedimentation, accretion, and subsidence in marshes of Barataria Basin, Louisiana. Limnology and Oceanography 28, 494-502.	Addressed in Chapter 3. Too detailed for the Executive Summary.
58	ES	25	679-681	This sentence (679-681) is awkward: "The coastal zone has competing interests of increasing population and development building of the necessary supporting infrastructure, while preserving natural coastal wetlands and buffer zones."	Sentence has been reworded.

Comment		Section	Page	Line	Comment	Response
59	ES	25	684 (and elsewhere, including 4961 and 4965)		"Data" should be treated as plural.	All instances where "data" is not treated as plural fixed during final editing.
60	ES	29-30	0		Measure to Improve Understanding. This section needs to highlight the benefit of working with those that will be doing the 'sound coastal zone planning' from the very beginning of the process so they inform the data monitoring, research, and tool and dataset development so it will meet their needs and be in an appropriate format for their consumption. The need to involve decision making through all steps of the process should be reiterated in the 'Develop tools, datasets, and other land management information to support and promote coastal decisions, planning, and policy making' section. There is no sense in making this information available, or developing tools for decision makers if you do not get their input from the beginning and involve them in the process along the way.	Added emphasis on including stakeholders.
61	Context	40	1051-1052		The phrasing here is quite misleading. It seems to imply that there is some actual or implied relationship that gives a factor of 2 when that was purely by chance. It would be better to basically give both rates—then say for the 20th century they were about the same (and maybe say earlier that the subsidence term has been larger for thousands of years before this).	Text has been edited to clarify.
62	P1	0	0		Format of list of authors in different chapters of PART 1. There are five different formats for list of authors in Overview, Chapter1, Chapter 2, Chapter 3, Chapter 4, and Chapter 5.	Noted.
63	P1	56	1422		Re-phrase the sentence beginning with "These coastal elevation data are also used to estimate the land....." as it seems a repetition of the earlier sentence and too many usage of sea-level rise.	This sentence referred to the version of Chapter 1 that appeared in the public review draft. Part 1 revised to include overview of revised Chapter 1.
64	P1	57	1433		Add more references	More references have been added.
65	P1	57	1443		Avoid the repetition of terms "shoreline" and "coastline".	This section has been shortened and use of these terms has been reduced.
66	P1	58	1459		"coastal setting"	This term has been removed.
67	P1	58	1463		Merge two sentences "The fate of coastal wetlands in the Mid-Atlantic are determined in large part by the way in which wetland vertical development processes change with climate drivers." and "Chapter 3 identifies the important climate drivers affecting the vertical development of wetlands in the mid-Atlantic region." to avoid the repeated usage of underlined text.	The two sentences were edited to remove the redundancies.
184	1	0	0		One of us (Clough) reviewed the Titus and Wang paper, which provides the quantitative results in this chapter. We have new SLAMM model results for Chesapeake Bay which could be added to this chapter or the Chesapeake Bay appendix.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
185	1	0	0		The last portion of this chapter shows the ratio of land available for wetland migration to the area of tidal wetlands. It would be better to have a numerical estimate of wetland loss, to integrate the results of this chapter and chapter 3. Still, the table and map are useful for understanding where wetland migration potential is significant and where it is not. These ratios also represent the ratio of current wetland to what the area of wetlands would be in the SLAMM model for the extreme scenario in which wetlands are unable to accrete as sea level rises. Similarly, if SLAMM assumes that wetland accretion is half the rate of sea level rise, then it takes twice as long to drown newly created wetlands as if there is no accretion. (In other words, slope ratios are twice the ratio of surviving wetlands to current wetlands, in that scenario. This may be too much detail for the report, but it is worth noting that both SLAMM and this table reflect the geometry of a shore profile.)	Rewrite of Chapter 1 has addressed the collective comments made on the original text.

Comment	Section	Page	Line	Comment	Response
186	1	0	0	Of course, our model generally assumes that most submerged dry lands become wetlands of some type. Although there will always be exceptions, such as dry land converting directly to open water or mudflat, it is a good place to start for first approximation calculations. As we are talking about a rapid SLR resulting in a loss of equilibrium, dike removal may be considered a strong analog for this event. When dikes have been removed in Puget Sound locations, for example, the spread of marsh has directly been a function of the tidal range as compared to the upland elevations. Bernhart and Koch (2003) found that "five years after removing [a] dike line nearly 75% of the 350 ha [of previously dry farmland] were covered by typical salt marsh and salt grassland vegetation types." This illustrates that even under the most rapid rate of SLR, as represented by instantaneous dike removal, marsh conditions will soon persist as a result of inundation. In general, upland that is subjected to regular inundation (i.e. that is within the tidal-range appropriate for marsh cultivation) will convert to marshland, (though the process may not be immediate nor will the	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
187	1	0	0	Nor are upland characteristics required to conform to wetland characteristics in terms of slope or soil composition in order for such migration to occur. The presence of marsh ecosystems and regular flooding producing sedimentation will modify both the slope and chemistry of the marshland over time.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
68	1	0	0	This is a useful overview of the issue. The way that elevation data was interpolated in the absence of decent mapping data was good, especially for Virginia that lacks LIDAR mapping data for most of its coastal region. It begins to frame the extent of the coastal ecosystem impacts from sea level rise, allowing policymakers to more clearly see the need for action in the present, rather than waiting for actual inundation and ecosystem failure.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
69	1	62	1544	Shores' does not specify open coast - most of the 'shores' of the mid Atlantic are muddy shorelines (i.e. wetland shoreline)	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
70	1	62	1546	inundation as well as identifying and quantifying the low-lying land, the Mid-Atlantic is critical in	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
71	1	62	1557	Sentence is very confusing since the statement is circular; what is 'larger' rise compared to??	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
72	1	63	1566	less than one-sixth of the current area of tidal wetlands.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
73	1	63	1569	maps may better be 'data'	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
74	1	64	1582	In Box 1.1, line 5, delete "s" in protections measures	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
75	1	64	1582	In Box 1.1, line 8, For example, higher.....	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
76	1	64	1596	some' should be removed, 'used' should be active verb	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
77	1	65	1603	This value is not what is listed on NED metadata, and is contrast to other estimates that use 2+ meters for the RMSE error	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
78	1	65	1610	Need to have a reference here - who said it is the most important use of elevation?	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
79	1	65	1611	Not necessarily, many of these studies are being done with lidar data collected to meet a uniform data accuracy	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
80	1	65	1614	delete "full stop" between (1 ft) and (See Chapter 8)	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
81	1	65	1615	contour intervals do not specify accuracy, this should relate to data accuracy (the casual reader is not going to know how accuracy and contour interval relate)	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
82	1	65	1615	Another example of what? New paragraph would help clarify change	Rewrite of Chapter 1 has addressed the collective comments made on the original text.

Comment	Section	Page	Line	Comment	Response
83	1	65	1616-1618	Combine the two sentences underlined	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
84	1	66	1621	It seems obvious that they would - maybe how they do it would be better to include	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
85	1	66	1626	Old reference - is this 95% accuracy or RMSE, - newer data (2004 and later) has RMSE of 15 cm or better in most cases. It is becoming more widely available - sometimes it costs \$ to get but is available.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
86	1	67	1635	How can there be no mention of the coastal sector report of the National Assessment, which was published as an official NOAA document? Nor is there mention of the Mid-Atlantic regional report and then there subsequent studies along the NJ coast, etc.—funded by EPA.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
87	1	67	1635	Table 1.1. Use a consistent unit system	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
88	1	67	1641	Insert comma (In this report, the best.....)	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
89	1	67	1641	Best existing needs to have a date - and it is a loose term, since some areas do sell their data and may not have been incorporated.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
90	1	68	1646	A very loose sentence - leaves the reader questioning the validity of the information - both in terms of the elevation and other questions addressed by this report.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
91	1	68	1655	No boundaries for study are provided - is it the 3 meter contour?	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
92	1	69	1664	most people are using NAVD today, so that reference should be mentioned as well (most if not all lidar data are collected/specified in NAVD88 and all of the Continental NED DEMs are in NAVD88)	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
93	1	70	1667	are beaches considered tidal wetlands in this study (sand with no wetland plants)?	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
94	1	70	1670	What is the NOAA reference for this data?	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
95	1	70	1675	This is an extreme example - might not be the best to use considering that it is at the end of the spectrum	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
96	1	70	1681	Should be figure 1.1?	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
97	1	73	1720	what does it mean by "-,"	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
98	1	73	1725	Low marsh is generally found up to mean high water, not up to spring high water as is stated.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
99	1	74	1773	best estimates' should be 'estimates' since it is assumed that the best possible answer was used	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
100	1	75	1780	Never any discussion of the resolution of the wetland (land cover) data - what is the resolution of the land cover data. In fact no mention of the data source is provided and its use is extensive in the chapter.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
101	1	76	1785	I am having a hard time believing that there is only about 720 sq km of dry land within the state of NY that has elevations below 5 meters (16 ft). This is how this chart reads - please make sure that the reader is aware of any caveats here.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
102	1	79	1797	Using the stated data and accuracies - it seems that getting into 50 cm divisions may be beyond the accuracy achievable.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
103	1	80	1823	Vulnerability would seem to be an entirely different issue that has not been discussed in this chapter.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
104	1	80	1831	The whole aspect of vulnerability and the effects of sea level rise (nothing new - has been occurring more or less for 15,000 yrs) seems out of place in a chapter concerning elevation data.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.

Comment	Section	Page	Line	Comment	Reponse
105	1	81	1841	The coastal geological processes that create barrier islands can be quite different than those that sustain them; and these may also be better called the 'physical processes' since it is a complex set of variables (tides, rivers, currents, winds, sediment, etc) - to label them all as 'geological' is a leap. These processes can also create large inland dunes (next to bays) - so be careful of over simplifying.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
106	1	81	1843	I would disagree with this broad statement - older communities would not have developed directly on the coast (too dangerous) - the newer development is moving closer to the oceans/bays. The conclusion of Section 1.3 Implications of Topography for Tidal Wetlands (p. 85, line 1917) is built upon a scenario that has been perpetuated for two decades, and is being proposed as supporting the conclusion that the effects of rising sea level along the Atlantic coast of the United States will result in a loss of wetlands. I agree that there are a number of reasons why accelerated rates of rising sea level will likely result in a reduction in the amount of coastal wetlands influenced by sea level. The major reason is the lack of sufficient sediment and organic accumulation to maintain an elevation favorable for continued survival and production by marsh plants. There are several well studied locations where marsh low is occurring, with the Blackwater NWR being one of the best studied examples. (Additional contributing causes include grazing by mammals, impoundment water management, frequent prescribed burning, and for the Mississippi Delta, subsidence). So we have real-time examples of marsh loss and know it does happen.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
107	1	85-92	0	The problem with Section 1.3, however, is that it projects marsh change by using upland slopes as the new land surface upon which marshes will exist. I will focus on this aspect only, because it is fundamental to explaining why the logic presented in the chapter is flawed. (Others have raised the issue of inaccuracies in measurement at the spatial scales used. Even if these calculations were sufficiently accurate, the problem addressed here would still be relevant.) The consequences of this flaw are that (1) it would perpetuate a model that has no real-world analog for observation or validation, (2) erroneous conclusions would result and be transmitted to the public, and (3) faulty conclusions may lead to public policy that is not in the best interest of the resource or the nation (not to mention a total embarrassment for the agencies).	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
108	1	85-92	0	There have been dozens of papers published on tidal marsh sediments that use as vertical sediment cores to describe the progressive accumulation of sediment as a consequence of rising sea level. In fact, the chronology of sediment deposition has been one of the most useful sources of information for estimating rates of sea level rise for the past several thousand years. The process by which this vertical accretion occurs is through deposition of sediments carried by tidal flooding of marsh surfaces, with organic matter accumulation playing a greater or lesser role locally. As a result of depositional process, marshes tend to be quite flat, although not perfectly so. Inherently depositional surfaces occur in other landforms like growing deltas and floodplains of rivers. And if marshes were not inherently flat, tides would not be able to flood their surfaces. So as marshes migrate landward during the process of rising sea level, they are burying landforms (uplands) that have a quite different history.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
109	1	85-92	0	The uplands that are currently being buried achieved their present form through erosional, not depositional processes. When sea level dropped as continental glaciers formed and uplands became newly exposed, the topography of today's coastal plain formed which is not nearly as flat as a depositional surface described in the previous paragraph. Thus we have streams valleys eroded into this surface and a number of surface and subsurface downslope processes that contribute to a varied topography as the landscape aged. Consequently, landforms that have been exposed to erosion become increasingly and topographically complex (sloping).	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
110	1	85-92	0		Rewrite of Chapter 1 has addressed the collective comments made on the original text.

Comment	Section	Page	Line	Comment	Response
111	1	85-92	0	<p>These are the two landforms that are compared used in Table 1.4, one that is exposed to processes that favor flatness and one that is exposed to processes that favor slopes. For the past 3-4 thousand years that sea level has been rising slowly, at approximately 1-3 mm/y, the flatter marshes have been migrating landward over the more topographically complex upland (Pleistocene) surface. Except for some well documented but geographically restricted examples (Blackwater NWR, Mississippi Delta), marshes should be able to maintain vertical accretion as they have for thousands of years, as long as sediment sources remain available. One can envision, with continued slow to moderate rates of rising sea level, that vertical accretion through sediment and organic matter accretion will continue, and there would be no gains nor losses of marsh area – a steady state would exist, as long as landward migration were allowed to proceed.</p> <p>Table 1.4 (p. 87, line 1880) takes a different approach (copied below). It suggests that as marshes move landward, that the marshes themselves will assume a new and steeper slope – that of the upland landform slope (all other factors remaining equal). This is counter to the processes that have formed marshes in the past - processes of creating a relatively flat depositional surface above the underlying and typically steeper sloping land. Numerous stratigraphic cross sections of marsh sediments from published, peer-reviewed studies show a relatively flat surface overlying a pre-marsh Pleistocene surface that is by comparison very uneven. Underlying all other ecological or geological functions of marshes is the capacity to build relatively flat land with allocthonous sediments.</p>	<p>Rewrite of Chapter 1 has addressed the collective comments made on the original text.</p>
112	1	85-92	0	<p>Table 1.4 uses the surface area of upland within one-half tide range above spring high water as the area for "potential wetland migration," with the assumption that the half-tide range above spring high water approximates the area of marsh under tidal control. Because of the steeper slope of the upland than the wetland in the vast majority of areas, the ratio of marsh to potential upland area is almost always greater than 1.0 (the two last columns of Table 1.4), and often much greater. The implication is that, because there is more area of tidal wetlands than there is potential land area for marsh migration, there would be a loss proportional to the calculated ratio. In other words, a ratio of 2.0 (twice as much current marsh as potential upland for migration) would mean that only half of the current wetland area would be wetland area in the future, once sea level had risen as to the projected elevation.</p>	<p>Rewrite of Chapter 1 has addressed the collective comments made on the original text.</p>
113	1	85-92	0	<p>Using this particular ratio of 2.0 as an example, does this mean that when sea level was lower that the coast had twice as many wetlands as it does now? The chapter does not address how the past has led to the present situation. What I suspect is that the mechanisms that have led to our current understanding of how wetlands develop with rising sea level have been ignored, and have not changed in this instance over the past 20 years. One can go back to some EPA supported publications and see the source of this line of thinking (Hoffman et al. 1983; Kana et al. 1988). Perhaps this uncritical thinking was "acceptable" twenty years ago because little attention given to global change at the time and sea level change in particular. I would consider it careless and potentially harmful to have this false logic perpetuated. Please recognize that this "false slope" approach has no standing in science as we understand it today.</p>	<p>Rewrite of Chapter 1 has addressed the collective comments made on the original text.</p>
114	1	85-92	0	<p>I recommend that Table 1.4 be removed from the report, and that all written material in the report be removed that uses the calculations and data upon which Table 1.4 is based. (Please recognize that there may be other sections of the report that use this first chapter as a foundation for additional observations and conclusions. I did not take nor have the time to ferret out any potential references to the underlying and flawed principles that would result from reliance on Table 1.4.)</p>	<p>Rewrite of Chapter 1 has addressed the collective comments made on the original text.</p>
115	1	85-92	0	<p>I recommend that Table 1.4 be removed from the report, and that all written material in the report be removed that uses the calculations and data upon which Table 1.4 is based. (Please recognize that there may be other sections of the report that use this first chapter as a foundation for additional observations and conclusions. I did not take nor have the time to ferret out any potential references to the underlying and flawed principles that would result from reliance on Table 1.4.)</p>	<p>Rewrite of Chapter 1 has addressed the collective comments made on the original text.</p>

Comment	Section	Page	Line	Comment	Response
116	1	85	1880	Section 1.3 is a little difficult to work through from reading alone. The points are critical (less land area behind the tidal wetlands than the current area of wetlands) and need to be made so that the reader understands the implications should wetlands fail to accrete at the rate of accelerated sea level rise. In Virginia this is a critical issue along reaches dominated by narrow, fringing marshes at the base of bluffs and steeper, vegetated slopes. While wetlands may be able to find sediment inputs from more rapidly eroding slopes behind, thus keeping their area, this is uncertain and dependant upon individual landowner decisions (85% of the Chesapeake Bay shoreline is privately owned). And the sediment budget of the Chesapeake Bay has been altered over the preceding century by conversion of agricultural lands, construction of dams, and erosion and sediment controls on development. What the impacts of these will be on the sediment budget and wetland accretion rates in the future is unknown.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
117	1	85	1880	The inclusion of the table and the maps allows the reader to better understand what is being discussed and to put it in a geographic context. As someone working in Virginia (without LIDAR data), having this discussion and these tables and maps makes it easier to involve state and local policymakers in a discussion of the need to keep shorelines open and undeveloped if wetlands fail to accrete at sufficient rates.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
118	1	85	1884	The fact that NC is poorly suited to the analysis raises questions regarding the premise of the study. If NC has lidar - arguably the best form of elevation information available - but does not conform to a study on elevation in coastal regions then the reader is left wondering why good elevation is needed.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
119	1	85	1896	Really getting away from the Elevation aspect and highlighting the land cover aspect - which is great - but a much stronger foundation (specs, techniques, etc) for land cover data should be given.	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
120	1	86	1903	Again, the issue of not being able to use great coastal elevation data in the study is disconcerting (excluding North Carolina)	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
121	1	87	1917	There seems to be a numerical reference in the box text not present in the table ("region wide ratio of 6.48..." - is this supposed to be 6.70?)	Rewrite of Chapter 1 has addressed the collective comments made on the original text.
188	2	0	0	This chapter is useful. The scenarios will allow future modeling efforts to consider barrier island changes and resulting increases in tide range and wave climatology.	Noted.
189	2	0	0	It would be useful to have analogous information for estuarine shore erosion. If that is not practical for this report, it is still an area for additional research.	We acknowledge the need for this information. For this report, we found that there was a wide range of information available for inland and estuarine shores, but it varied in age, spatial extent and quality and we did not feel that it allowed for a consistent treatment of potential impacts on these shores. This limitation is noted in the SAP 4.1 Prospectus.
122	2	98	2163	Insert the relevant page number for (See page X)	Revised to specify Appendix 2.
123	2	112	2460	The long-term conclusions inferred from (Komar and Allan, 2007) are clearly biased by their limited data period, developing a trend from known period of low hurricane impact to much higher recently. Consideration of the intense hurricane activity in NC in the 1950s or in FL during the 1940s would clearly result in different conclusions but are unfortunately undocumented for wave heights.	The discussion of future storm trends has been revised according to the findings of recent IPCC and CCSP reports, the latter of which discusses Komar and Allan (2007).
190	2	112	2465	The frequency of extra-tropical storms have also increased. The report should include discussion of these storms as well as hurricanes.	The topic of climate change and hurricane characteristics is the subject of much debate within the scientific community. The discussion of this topic in the report has been revised to reflect findings in recent IPCC and CCSP reports.



Comment	Section	Page	Line	Comment	Reponse
124	2	112	2467		<p>The net loss in tidal inlets over the 60 years could be attributed in part to the changes in storminess noted by Rogers in comment #123, and/or coastal management practices. The geological record indicates that there have been many inlets along the NC coast that have open and closed in response to storms and sedimentation. e.g., Everts, C.H., J.P. Battley, and P.N. Gibson, 1983: Shoreline movements, Cape Henry, VA to Cape Hatteras, NC, 1849-1980, Report 1, U.S. Army Corps of Engineers, Washington, DC, Tech. Rept. CERC-83-1, 111pp. Also see: Culver, S.J., K.M. Farrell, D.J. Mallinson, B.P. Horton, D.A. Willard, E.R. Thielert, S.R. Riggs, S.W. Snyder, J.F. Wehmiller, C.E. Bernhardt, C. Hillier, 2008: Micropaleontologic record of late Pliocene and Quaternary paleoenvironments in the northern Albemarle Embayment, North Carolina, USA. <i>Palaeogeography, Palaeoclimatology, Palaeoecology</i>, 264, 54-77.</p>
125	2	113	2488	Also inlet closure. NC has a net loss in inlets over the last 60 years.	
191	3	0	0	Delete "that"	<p>The panel of wetland experts who reported their findings in Reed et al. 2008 stopped short of reporting tables of wetland areas because they thought this would lend a sense of accuracy and precision to their analyses that could not be justified.</p>
126	3	0	0	<p>The wetland accretion projections are useful. Although modelers can obtain the GIS data that underlies the maps, this chapter would be more useful if it quantified the area of wetland loss.</p> <p>We are trying to keep shorelines behind tidal wetlands open so that these lands are available for migration, should the accretion rates not keep pace with sea level rise. The inclusion of the maps (figs 3.1, 3.3) makes the discussion understandable and puts it in a visual/geographic context. The maps in this chapter make useful companions to the tables and maps in Chapter one dealing with first order estimates of ratios of land available.</p>	<p>No response is required to this statement other than to say that Chapter 1 analyses have been removed from the report. It should also be noted that vertical accretion drives wetland migration, so space to migrate is needed when marshes are keeping pace with sea-level rise if the marshes are to expand inland.</p>
127	3	0	0	<p>On a general editorial note, there seems to be a parallel discussion taking place in this chapter (accretion) and in chapter 1 (migration) that needs some better integration, integration that occurs later at section 5.4. References to that section should be here and in chapter 1.</p>	<p>Chapter 1 has been revised. All discussion of wetlands have been removed from chapters 1 and 5 and integrated into chapter 3.</p>
128	3	136	2930	<p>This chapter was well prepared, but an idea that was addressed in the Key Findings of this chapter (lines 2940-2977) regarding accretion via vegetative growth was not described in sufficient detail in the body of this chapter.</p> <p>The fact that some marshes at some times accrete via organic matter accumulation, as acknowledged here, should be reflected in the Executive Summary on page 221, line 599-600. I suggest revising the phrase "and soil organic matter accretion" to read "factors determining when accretion is limited by sediment inputs and when accretion is limited by organic accumulation." The studies supporting marsh vertical accretion via vegetative growth are Bricker-Urso, S., Nixon, S. W., Cochran, J. K., Hirschberg, D. J. and Hunt, C. 1989. Accretion rates and sediment accumulation in Rhode Island salt marshes. <i>Estuaries</i> 12, 300-317.</p> <p>Callaway, J. C., DeLaune, R. D., and Patrick, W. H., Jr. 1997. Sediment accretion rates from four coastal wetlands along the Gulf of Mexico. <i>Journal of Coastal Research</i> 13, 181-191.</p> <p>Chmura, G. L., Hung, G.-A. 2004. Controls on salt marsh accretion: a test in salt marshes of Eastern Canada. <i>Estuaries</i> 27, 70-81.</p>	<p>Further clarification of the role of organic matter accumulation was added to the text, including citing Nyman et al. 2006 as a review article and a paragraph was added describing climate change effects on organic matter accumulation.</p>
129	3	137	2973	<p>Hatton, R. S., DeLaune, R. D. and Patrick, W. H., Jr. 1983. Sedimentation, accretion, and subsidence</p>	<p>The Exec Summary has been thoroughly re-written, but any direct reference to the processes contributing to wetland vertical development were revised to clarify the contributions of both mineral and organic matter accumulation.</p>
130	3	138	2983	<p>There is mention made of "this chapter's key question" but I am unable to find a key question listed at the chapter heading. Restating it at this point would be useful.</p>	<p>This sentence was revised and the question restated.</p>

Comment	Section	Page	Line	Comment	Response
131	3	141	3037-3058	Wetland Accretionary Dynamics: This section contains one factual error that must be corrected, and also could be improved by incorporating more recent data. In lines 3050-3052, the draft states that the formation of organic rich soils is an important contributor to wetland elevation particularly in environments with low mineral sediments supplies. However, several studies published within the last 10 years have demonstrated that vertical accretion depends on organic matter accumulation rather than mineral sedimentation across a wide range of salinity, tidal range, and mineral sedimentation (McCaffrey and Thomson 1980, Hatton et al. 1983, Bricker-Urso et al. 1989, Nyman et al. 1993, Callaway et al. 1997, Annisfeld et al. 1999, Turner et al. 2000, Chmura and Hung 2004, Nyman et al. 2006). Thus, the formation of organic rich soils is important in environments with high mineral sediments as well. This error can be corrected by omitting the clause "particularly in environments with low mineral sediment supplies" from the draft. Another shortcoming of this section is that it cites only one reference (Turner et al. 2000). This section on the influence of climate change on accretionary drivers and processes pays adequate attention to likely effects of climate change on mineral sedimentation but ignores likely effects of climate change on accretion that depends upon organic matter accumulation as observed by others (McCaffrey and Thomson 1980, Hatton et al. 1983, Bricker-Urso et al. 1989, Nyman et al. 1993, Callaway et al. 1997, Annisfeld et al. 1999, Turner et al. 2000, Chmura and Hung 2004, Nyman et al. 2006). I suggest paying equal attention to accretion via organic matter accumulation. Bricker-Urso, S., Nixon, S. W., Cochran, J. K., Hirschberg, D. J. and Hunt, C. 1989. Accretion rates and sediment accumulation in Rhode Island salt marshes. <i>Estuaries</i> 12: 300-317. Callaway, J. C., DeLaune, R. D., and Patrick, W. H., Jr. 1997. Sediment accretion rates from four coastal wetlands along the Gulf of Mexico. <i>Journal of Coastal Research</i> 13, 181-191. Chmura, G. L., Hung, G. A. 2004. Controls on salt marsh accretion: a test in salt marshes of Eastern Canada. <i>Estuaries</i> 27: 70-81.	The clause was deleted and further explanation of local controls on mineral organic accumulation was added at the end of this paragraph.
132	3	145	3064-3105	"An increasing number of reports (http://.etc.)" The reports cited should be in the reference section at the end with standard notation.	A paragraph was added describing climate change effects on organic matter accumulation.
133	3	148	3136	Marsh migration capacity is altered by changes in slope caused by man-placed fill, which is typically associated with some but not all structures. Fill has a similar impact in the absence of other structures. See: Phillips, Jonathan D., 1986. "Coastal Submergence and Marsh Fringe Erosion." <i>Journal of Coastal Research</i> , 2(4), 427-436. Fort Lauderdale, FL.	The decision whether to include these as references for possible inclusion in the final draft has been left to the editors.
134	4	184	3824	The potential impact to adjacent properties should also be mentioned. This ties into the No Adverse Impact approach to floodplain management, discussed in section 8.5.2.	Reference added to discussion.
192	P2	214	4443	This general statement about patterns of development is not consistent with our experience in Massachusetts.	no change made. This opening paragraph is outlining the motivation for chapter 5, not chapter 8. This overview has to stick to the key points, and not get into the weeds of specific chapters.
193	P2	215	4472	All of our comments on the other chapters apply here, because this is where the various components of wetland impacts are synthesized. It is important to make sure that people realize that if sea level rises too rapidly, then eventually the areas that have wetlands today will all convert to open water. If that happens, then we will have no tidal wetlands unless wetland migration occurs. This chapter seems to say that wetland migration may be important in some areas. It would be more accurate to say that the greater the rate of sea level rise, the greater the loss of existing wetlands, and hence, the greater the importance of wetland migration.	moot. Passage on which reviewer commented should have been deleted when planning study was cut from the report.
194	5	0	0	The discussion of wetland migration, specifically tidal marsh migration, was moved to Chapter 3. Wetland migration is the landward or seaward expansion of a marsh laterally as it accretes vertically in response to sea-level rise. The increase in marsh elevation in response to sea level rise leads to lateral accretion and expansion of the marsh landward and, under some circumstances, seaward if the sediment supply is adequate to support a prograding process. What this comment describes is not wetland migration, but a re-establishment on a new, and likely eroding environment. As such, the environment would likely occupy only a narrow zone unless a large sediment supply was available to reverse an erosional sediment deficit and begin to establish a new marsh platform. We agree with the commenters that when a marsh becomes submerged because it cannot keep pace with sea-level rise it will be lost. The commenters propose that the lost marsh is replaced by a new marsh through colonization of newly wetted shorelines, which is why they believe that removing barriers (e.g., dikes and bulkheads) that prevent wetting of the sh	The discussion of wetland migration, specifically tidal marsh migration, was moved to Chapter 3. Wetland migration is the landward or seaward expansion of a marsh laterally as it accretes vertically in response to sea-level rise. The increase in marsh elevation in response to sea level rise leads to lateral accretion and expansion of the marsh landward and, under some circumstances, seaward if the sediment supply is adequate to support a prograding process. What this comment describes is not wetland migration, but a re-establishment on a new, and likely eroding environment. As such, the environment would likely occupy only a narrow zone unless a large sediment supply was available to reverse an erosional sediment deficit and begin to establish a new marsh platform. We agree with the commenters that when a marsh becomes submerged because it cannot keep pace with sea-level rise it will be lost. The commenters propose that the lost marsh is replaced by a new marsh through colonization of newly wetted shorelines, which is why they believe that removing barriers (e.g., dikes and bulkheads) that prevent wetting of the sh

Comment	Section	Page	Line	Comment	Response
135	5	0	0	An earlier draft of this chapter (which I reviewed) had a significant amount of material on potential shoreline hardening. This information is absent, even in summary form, in this version of the report. This is important information to state and local land use managers since it indicates the potential problem posed by shoreline hardening in specific regions. Sea level rise will unfold storm by storm and shoreline hardening will follow, well in advance of any focused state or federal policy on adaptation to sea level rise. The shoreline hardening estimates help flag areas of concern, where estimates of shoreline hardening are high and as is the value of the coastal ecosystems at risk from inundation.	The discussion to which reviewer refers was deleted.
136	5	0	0	While the general discussion of shoreline hardening remaining in this chapter is useful, a more focused and detailed discussion – even some of the maps and tables from earlier drafts – would make this discussion meaningful on a regional basis.	The discussion to which reviewer refers was deleted.
195	5	220	4573	Shore protection projects may help reduce or mitigate flooding, but they cannot "prevent" all flooding, particularly in the long-term. This statement needs to be qualified further, or the word prevent could be deleted.	Sentence edited.
196	5	220	4577	Shore protection projects may help reduce or mitigate erosion, but they cannot "prevent" all erosion, particularly in the long-term. This statement needs to be qualified further, or the word prevent could be deleted.	No change made. Author reviewed three dictionaries. The sentence at issue is a definition, not an evaluation of the effectiveness of various measures. The term "prevent" is correctly in this sentence. Bulkheads are addressed in the previous section. While they may have some of the features of a retaining wall, they serve a very different function.
137	5	222	4613	bulkheads are retaining structures	Fixed.
138	5	223	4623	Revetments are sloped but usually different from the beach	
197	5	224	4639	Dunes are accumulations of both windblown sediment and overwash, which can be a mix of sand, gravel and cobble.	Edited to add "other materials". Cobble dunes are rare in the mid-Atlantic.
139	5	226	4663	Beachfill may stabilize the shoreline but does not reverse erosion only provides a larger sand supply to be eroded.	passage has been clarified
140	5	233	4799	Section 5.4 starting at this point in the report, begins to integrate the ideas laid out earlier in chapter 1 (migration) and chapter 3 (accretion). The discussion, however, lacks the specificity that would urge policymakers to take action today on conserving vital shorelines. Specifically, there are no estimates of potential wetlands losses under various scenarios of sea level rise, accretion rates, and shoreline conditions. As stated previously, there is always the risk of making an estimate that will be too high and/or taken out of context and away from the qualifiers that would accompany it in this study.	The discussion to which reviewer refers was deleted in response to interagency comments.
141	5	233	4799	However, waiting until we have perfect knowledge of inundation impacts will occur long after a number of early adaptation strategies will need to have been implemented.	The discussion to which reviewer refers was deleted in response to interagency comments.
142	5	233	4799	Some quantification of possible wetlands losses is needed. Otherwise you cede the field to groups like Wetlands Watch who make estimates based upon a best guess.	The discussion to which reviewer refers was deleted in response to interagency comments.
143	7	282	5625	NC has both common law and legislative easements to use the dry ocean beach. Most other states at least have common law easements on the ocean	No change made. Author sent reviewer email requesting clarification and authentication of assertion. ( This assertion is at odds with reviews of caselaw cited in the chapter.) Reviewer wrote back said that he did not know of any cases or statute to support his assertion, and suggested that the author should talk to a lawyer instead of him. (Author is aware that a lawsuit had (Giampa v Currituck County) been filed at one time on whether there is a common law public access along the shore in NC, and that a few commentators have argued that there should be such a right. But that case has no written opinion and no other court has declared such a general right in North Carolina. Reviewer was simply wrong about the other states.)

Comment	Section	Page	Line	Comment	Reponse
144	8	0	0	This is a very important chapter, providing better understanding of the policy options and limitations in addressing prospective sea level rise. As states begin work on adaptation strategies, understanding the web of federal, state, and local authorities becomes essential. The limitations on FEMA's ability to prospectively evaluate risk from sea level rise is an important fact because of FEMA's central role in creating incentives and disincentives for development in the coastal region. A robust discussion of FEMA's authorities is essential to this report.	comments noted
145	8	0	0	A discussion of the limitations on the EPA and US Army Corps of Engineers authorities is also warranted. Does NEPA's "reasonably foreseeable future" threshold for Environmental Assessments include sea level rise? Can the USACE include sea level rise in its current shoreline protection and civil engineering activities?	see chapters 9,10, and chapter 5 for this discussion
146	8	0	0	Wetlands Watch is working today to conserve options for future adaptation strategies, using local land use tools in a few coastal counties. The discussion in this chapter helps groups like ours do their work better and begins to outline policy options and needs for future work. Again, the role of FEMA is central to this work and its operations are not well understood by the public and many policymakers, urging for a complete examination of its role.	comments noted
198	8	287	5726	This section should note that sea level rise is an ongoing process; the rate, not the existence, of sea level rise is what is still to be determined.	added context
147	8	288	5744	Historical tide stations do not reliably record the highest storm tides only normal tides. The conclusion is otherwise accurate	NOAA disagrees on point-historical tide records record all observed water levels, including storms not just "normal" tides - only thing excluded from storm tides are effects of waves.Information is only found at locations of tide stations however,
199	8	289	5761	The increased knowledge and acceptance of sea level rise has created an opportunity for all coastal managers to be proactive on this issue. MA CZM suggests expanding the point made in the first sentence of this bullet.	this topic of institutional response and recommendation is contained in chapters 9,10,11
148	8	304	6024	Preliminary NFIP maps have been released for MS coastal counties, soon to replace the ABFE maps	noted , but not for mid-atlantic
149	8	305	6049	Some communities require future conditions in flood mapping: Charlotte NC. It is used for management but not NFIP insurance rating purposes	added text
200	8	306	6056	This section appears to be mislabeled; it gives an overview of the Association of State Floodplain Manager's No Adverse Impact approach to floodplain management.	changed title to reflect content
201	8	308	6104	As identified earlier in this Chapter, one of the greatest challenges in any government effort to improve management of coastal areas is that most land use decisions are made by various state, county, or municipal governments. By actively encouraging all levels of government to adopt the No Adverse Impact (NAI) approach, this report may influence the day-to-day decisions so critical to protecting people and property. The NAI approach has many advantages, which could be articulated in the report: 1. It is founded in "common law principles." It is both legally robust (see the ASFPM white-paper NAI and the Courts: <a href="http://www.floods.org/PDF/ASFPM_NAI_Legal_Paper_1107.pdf">http://www.floods.org/PDF/ASFPM_NAI_Legal_Paper_1107.pdf</a> ) and appealing across the political spectrum. 2. It is comprehensible and relevant for both the general public and decision-makers at all levels (for an example of a document on NAI targeting local officials, see The Massachusetts StormSmart Coasts fact sheet, Introduction to No Adverse Impact (NAI) Land Management in the Coastal Zone, <a href="http://mass.gov/czm/stormsmart/resources/stormsmart_nai.pdf">http://mass.gov/czm/stormsmart/resources/stormsmart_nai.pdf</a> ). 3. It is highly adaptable to different areas. It is relevant in all types of shorelines, and in urban and undeveloped areas.	edited to reflect this and added reference
150	8	311	6143	General comment: The primary floodplain management adjustment for sea level rise is the local increase in required base flood elevation for new construction. Freeboard additions are generally justified for other more immediate purposes including: the lack of safety factor in the 1% flood and uncertainties in prediction and modeling. FEMA encourages freeboard adoptions thru the Community Rating System which offers community-wide flood insurance premium discounts for higher local standards and for individuals thru premium discounts for higher than minimum elevation on higher risk buildings (A & V-zones).	comment included in text

Comment	Section	Page	Line	Comment	Response
151	8	313	6208	8.6.4 Coastal Zone Management Act General comment: Historical sea level rise is known to be one of numerous causes of long-term shoreline erosion. Those states that use historical erosion rates to establish shoreline building setbacks are in effect assuming a continuation of the historical rate in their management.  Do policies really 'encourage/favor coastal development' or do they just not discourage it? This is an important distinction that should be made. Does this come out in the text of that section since it does not come out in the overview? Later in the text (Box 9.2) it says 'empirical verification that shore protection increases development is even less' which does not support previous statements.	added a sentence on this point  Here we are discussing chapter 11, not chapter 9. Chapter 11 does indeed discuss how some policies encourage coastal development (subsidized flood insurance, high property taxes on vacant or lightly developed land, shore protection, provision of infrastructure and government services). Nevertheless, this comment alerted author to the possibility that this paragraph may be overstating the importance of those policies--paragraph toned down slightly.
152	P3	332	0	Decisions Where Preparing for SLR is Worthwhile  This section does not address the fact that many decisions to attempt to prepare for sea level rise are the same that would be used for adapting to potential loss from storm surge, including setbacks, elevation and buffers. When combined, the economics impacts/savings could be much greater and should be considered here. This is alluded to in some of the sections including 'Decisions that Address Large Near-term Impacts' where beach nourishment to protect homes in danger of being lost now are more due to erosion from storms or periods on strong onshore flow particularly when combined with high spring tides. This is not really a sea level rise issue at this point.	Added sentence in introduction making it clear that most responses to sea level rise are similar to responses to other factors--and referring reader back to chapter 5 where that point is made in much greater detail. Note also: Editors at the last minute removed the question being answered from the chapter heading, which may have left readers confused about the mission of this chapter. The chapter introduction now makes it clear what question is being answered, so that readers will not expect more than what the chapter is providing.
153	9	0	0	9.2 Protecting Coastal Wetlands. I expected this section to should highlight and explain techniques or best practices to protect coastal wetlands. It sounds more like a commentary on old and new practices and that we need to take action while some states are, without any real examples of what has or will work. Some examples of how to prepare for landward migration of coastal wetlands would be very helpful.	Editors at the last minute removed the question being answered from the chapter heading, which may have left readers confused about the mission of this chapter. The chapter introduction now makes it clear what question is being answered, so that readers will not expect more than what the chapter is providing. Author agrees that additional details might be useful to readers, but they are beyond the scope of what this chapter can do within the space allotted, which is to merely suggest which areas appear to justify adaptation. Moreover, the literature on how to prepare for landward migration is not extensive.
154	9	0	0	9.3 Shore Protection. This section barely mentions the idea of shore protection for sea level rise that is ultimately not that different from protecting the shore from storms. When considered for both efforts, protection practices could be effective for storm surge as well as sea level rise. There is also the issue of potentially stronger storms in response to climate change which should be considered for true shore protection. A more comprehensive study of shore protection is needed here. What other studies have been done and what are some practices that have worked in areas that we may need to protect?	Added sentence in introduction making it clear that most responses to sea level rise are similar to responses to other factors--and referring reader back to chapter 5 where that point is made in much greater detail. Otherwise, author agrees that this section provides a very thin treatment of the implications of sea level rise for the level of shore protection now being implemented. The draft prospectus for this report proposed an author from the Corps of Engineers to address the shore protection issues, but the Corps could not participate and instead the prospectus question concerning shore protection was dropped. Therefore, we provide a less thorough treatment of these issues.
155	9	0	0	9.4 Long Lived Structures: Should we plan now or later?  The final sentence in this section suggests we should 'consider lead times associated with particular types of adaptation. Additional discussion of this thought is necessary. How can this be employed?	Added three sentences so that the point is left hanging. A complete treatment is precluded by space constraints.
157	9	0	0	Chapter 9 Conclusion states 'it is very likely that options such as rolling easement, density restrictions, coastal setbacks and vegetative buffers will increase the ability of wetlands and beaches to migrate inland'. While rolling easements are presented, I do not see discussion of density restrictions, coastal setbacks and vegetative buffers within this chapter. These topics should be explained including how they are viable alternatives that would enable in land migration of wetlands and beaches.	Added sentence at the end of Section 9.2 cross-referencing chapter 5 where these options are discussed.

Comment	Section	Page	Line	Comment	Reponse
158	9	336	0	There is danger in the following statement: 'there is no need to anticipate sea level rise in the construction of port facilities (NRC 1987)' even in the context of impacts far enough in the future that people will have ample time to respond. The NRC report is outdated and earlier in this document you state that 70% of the port in Wilmington may be impacted with a 50 cm sea level rise. These statements seem contradictory, particularly if a port is infrastructure that is developed for the long term. Waterfront land was not nearly as costly and scarce in 1987 as it is today.	Clarified sentence at issue--the point was not land but docks. The 1987 report used higher scenarios than used by this report: 70-170 cm local rise by 2100. Note also that the sentence about port of Wilmington DE may be in error. Even if literally correct, the point here is simply that decisions with short lifetimes relative to the rate of sea level rise do not need to be as concerned.
159	9	340	0	Uncertainty. The author states that the uncertainty seems to justify waiting to prepare until later. This seems like the author's own personal opinion. The section should include discussion that indications from IPCC and other sources show SLR is more likely to be worse than IPCC estimates due to ice sheet melt that has accelerated in recent years.	Reviewer is mistaken that this paragraph provides no support for the assertion made. Footnote 25 provides citations to 4 articles related to the "quasi-option value" issues. Reviewer suggestion that sea level may rise by more than IPCC suggestion is inapplicable here, because the discussion is not tied to a specific scenario--and because many of the reports that form the background of this discussion were contemplating a range of sea level rise scenarios from the current trend to two meters per century.
160	9	344	6899	Cite needs fixing - Heinz 2000 is correct	fixed ref
202	9	347	6946	This example presumes that the only resource area migrating landward is marsh. In many cases, there is no marsh involved, which does not seem to be considered.	added "along a marsh". The original article addresses estuarine beaches as well. Comment also referred to part V
161	9	348	6952	This section is a little complicated. It should be a decision discussion, not a recapitulation of the calculations made in Chapter 1 and Chapter 3. It would be best to summarize those conclusions quickly and move to the policy/decision discussion to avoid confusing the reader.	Three sentences about wetland processes were deleted.
203	9	349	6982	The conclusion about what permits for fill is inconsistent with what we have observed in Massachusetts. This statement also assumes marsh is the only resource area that a project might fill. If the resource is coastal beach instead of marsh, it is often approved.	Text is just citing the regulations. Beyond scope to examine cases where rules are not applied.
204	9	352	7046	This statement indicates the only resource areas migrating landward is marsh or tidal flat. Coastal beach needs to be considered in this discussion.  10.1.1 Environmental Regulators Indicates some states and locales outside the Mid-Atlantic such as RI, Maine and Cape Cod have enacted sea level rise regulations and statutes but does not say what they are. The only regulation that is described is not even geared directly towards sea level rise. These examples, while outside the Mid-Atlantic could provide examples for managers in the Mid-Atlantic that may read this report. That information would be most valuable here instead of discussing the lack of action of the federal side or a Maryland statute that was geared towards density of development. The best part of Chapter 10 is the paragraph on The Nature Conservancy in the Environmental Regulators section. Additional discussion of TNC practices would be beneficial since at least they are trying to take action. For this product to be most useful, it would be best to discuss what is actually being tried, what is working and what is not so managers can learn from others.	This is simply a topic sentence not intended to exclude estuarine beaches. Appendices clearly examined estuarine beaches--as does chapter 4. The reality is that some people include beaches and some do not in the definition of wetlands--but all the issues discussed here apply generally to beaches, though some of the specifics vary.
162	10	0	0	Sea level rise has been addressed as a hazard in Massachusetts since 1978.	Added a phrase to indicate that the regulations restrict shoreline armoring. Author would have added more explanation about those rules, except that changes to the following paragraph now explain the new Maryland statute. Details about the New England rules would have been repetitious and possibly steal Maryland's thunder. We have asked MA to provide details on their experience, and if any information is available to add additional insight, author will do so.
205	10	376	7617	The Massachusetts Wetlands Protect Act Regulations and CZM Program Plan include provisions that address sea level rise, and protect the dynamic nature of the coast.	Spoke with reviewer on the phone. Did not receive documentation on when MA started addressing sea level rise; but would have been somewhat tangential here anyway.
206	10	376	7620	The only example cited outside the mid-Atlantic is California. This section should reference and include other examples from the CSO Climate Change Work Group Report, available online at <a href="http://www.coastalstates.org/documents/CSO%20Climate%20Change%20Final%20Report.pdf">www.coastalstates.org/documents/CSO%20Climate%20Change%20Final%20Report.pdf</a>	Added citation to main wetland regulations rule on no armoring in section 10.1.1.
207	10	378	7648	The statement about general mindset might apply to some property owners, but it doesn't apply to everyone as currently phrased.	Added reference to the CSO report and deleted the reference to California.
208	11	381	7726		edited/clarified statement

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209	11	382	7735	The concept of No Adverse Impact, as articulated by the Association of State Floodplain Managers (referred to in section 8.5.2), can be applied to ensure that any measures taken by one property owner do have adverse affects. MA CZM recommends incorporating discussion of this important floodplain management tool into this discussion.	Comment does not seem germane to sentence commented on. We are just providing an overview of the context that makes preparing difficult--not sure how no adverse impact relates to that point.
163	11	384	7783	NC ocean shoreline management policy prioritizes relocation and beach fill for erosion response. Most oceanfront erosion control structures are prohibited by NC law.	Intended meaning was that overall, federal, state, local, and private have a bias favoring protection--but not that every single institution in the country has that bias. Revised accordingly. (But note: NC state overall is doing more to preserve infrastructure in developed areas than to promote its abandonment, even if there are some policies that encourage retreat).
210	11	384	7783	This broad generalization is not true for all government state agencies, and needs to be rephrased.	Intended meaning was that overall, federal, state, local, and private have a bias favoring protection--but not that every single institution in the country has that bias. Revised accordingly. (But note: MA state overall is doing more to preserve infrastructure in developed areas than to promote its abandonment, even if there are some policies that encourage retreat).
164	11	392	7977	North Topsail Beach NC is clear evidence that owners are will to risk much that \$250k where no flood insurance is available.	Comment is generally consistent with the text, which now directs people to chapter 9 for more discussion of this issue. In general, however, the fact that many people are willing to risk the loss of a home without insurance does not mean that everyone could take on such a risk. Much depends on whether the house is a large part of someone's net worth, as well as their risk aversion.
165	11	394	8007	It is my understanding that the cap was removed following Katrina. Check with FEMA	Moot. This text was cut as part of the revision to be consistent with the revised chapter 9.
166	P5	435	8782-8795	It appears that the CVI does not include any consideration of the people and structures along the coast--again, the report seems to focus on the effect of sea level rise on the natural environment. It would really seem that this should be made clear by changing the title of the report to reflect this--and this index should perhaps be changed to CEVI, for Coastal Environmental Vulnerability Index, in that it really seems to miss the impacts on people that many will be most interested in.	Agree that CVI's focus is on the coastal geology and processes. Human effects are discussed. It's intended as a planning tool.
167	P5	440	8898-8902	It is really amazing that the list of assessments referred to here includes neither the Coastal Sector report (NOAA supported) nor the Mid-Atlantic regional report (and subsequent efforts by Penn State, all supported by EPA) and their discussions of sea level rise. While this report has more material and a number of EPA reports will be cited, it will give the impression again that the US National Assessment effort is being buried, and I had thought we were getting past that.	ok
168	P6	0	0	The research agenda set out here is a good one but seems to be nearly entirely focused on the "hard science" research agenda. There needs to be a social science and policy and economic research agenda developed as well. As with the larger issue of climate change, any avoidance, adaptation, or mitigation strategy will require changing current human behavior. The economic incentives/disincentives, social marketing, policy approaches, and other factors involved need as much (or more) emphasis than the biology and physics of climate change.	Figure VI.1 modified to include several items for future social science research. Text modified and expanded to include discussion of social science research as part of an overall science strategy for sea-level rise.
169	H	0	0	An assumption made in using calculated shoreline change rates to predict future changes is that these change rates will remain constant (i.e., there will not be accelerating erosion or accretion). Recommend that this assumption be stated and its validity discussed on pp. 761-762.	The text has been modified to include this important point.
170	H	0	0	What are the units of the variables in Eq. H.3? How is geomorphology quantified? How were these six metrics selected as being the most useful in estimating shoreline vulnerability? How was the decision made to weight each variable equally? Was any consideration given to correlation between these variables?	This description is intended to be a brief overview. Readers can find the details of the method and its development by consulting the citations provided in this brief review.

Comment	Section	Page	Line	Comment	Reponse
171	H	758	0	<p>Eq. H.1 (pg. 758): L* is not defined; h is defined but h* is not (unless these definitions are in some other part of the document that was not provided to me). Also, there appear to be discrepancies between Eq. H.1 and Figure H.1 (e.g., the use of uppercase and lowercase letters for variable names). The entire discussion of the Bruun model is somewhat unclear to start with, and the discrepancies between the illustration, text, and equation exacerbate this.</p> <p>There is a potential flaw in the methodology described on pp. 761-762 for calculating shoreline change rate (and in other USGS documents related to shoreline change rate calculations that I have reviewed). Namely, if the different shorelines used to calculate change rates are defined differently (e.g., high water line vs. intersection of a specified tidal datum, such as MHW or MLLW, w/ the beach profile, etc.), measured differently (e.g., in situ surveys vs. tide-coordinated aerial imagery vs. time-of-flight airborne or spaceborne imagery, etc.), or referenced to different datums, this can potentially render the results of the shoreline change rate calculations entirely meaningless. Any discussion of shoreline change rate calculation should discuss the steps taken to ensure that the different shorelines used in the calculation are defined and mapped in a consistent manner, or, if this is not possible, the propagated uncertainty in the results should be discussed.</p>	<p>The figure has been revised to be consistent with the description in the text.</p> <p>The description of the rate-extrapolation methodology is correct as it applies to the context of this chapter. The reviewer describes a technical issue that is relevant to the larger issue of shoreline change analysis, but not relevant here. For further discussion of how USGS and other scientists are addressing the issue raised by the reviewer, the reviewer should consult the following as a starting point: Moore, L.J., Ruggiero, P., and List, J.H., 2004, Quantifying shoreline change using mean high water and high water line shorelines: should proxy-datum offsets be incorporated? Eos Trans AGU, Fall Meet. Suppl., Abstract H41C-0324.</p> <p>Morton, R. A., and Miller, T. L., 2005, National assessment of shoreline change: Part 2: Historical shoreline changes and associated coastal land loss along the U.S. Southeast Atlantic coast: U.S. Geological Survey Open file Report 2005-1401.</p>
172	H	761-762	0		<p>Ruggiero, P., and List, J.H., 2006, Quantifying errors in shoreline change rates due to evolving definition of the shoreline: implications for California change rates. Abstracts, Shoreline Change Conference II: a workshop on r</p>
173	H	761	14861	the word "of" appears to be missing between "calculation" and "shoreline change."	Noted.
174	H	767	14988	There appears to be a typo or grammatical error	Noted.
175	H	770	15047	"the 1995 shoreline was used..." Q: Which 1995 shoreline?? I.e., does this refer to the National Shoreline mapped by NOAA, USGS shoreline, etc.?	This discussion of the Fire Island Case study was removed to shorten the report.
176	H	772	15095	"straightforward" is one word.	This discussion of the Fire Island Case study was removed to shorten the report.