CCAWWG Workshop Breakout Group Summary
Theme 3, Effects at Coasts and Shorelines, August 26th, 2015

Science co-leads: Adam Terando, USGS Southeast Climate Science Center, Rich Zobel, NOAA National Marine Fisheries Service

Rapporteur: Forrest Melton, NASA ARC-CREST

Summary

The Theme 3 breakout group focused on the effects of climate change on coasts and shorelines. The topic was introduced by the science co-leads who presented summaries of recent scientific progress to understand both biological and physical responses to climate change in coastal regions. Breakout group participants briefly reviewed elements of the current CCAWWG Long-Term Planning Doc (LTDoc) and discussed progress to date in addressing science needs identified in the current LTDoc. Participants then commented on current and emerging high priority needs for research to advance resilience to climate change in coastal regions. One overall comment was that the discussion of issues related to fisheries in the current LTDoc could be expanded to include coastal ecosystems throughout the document. In addition, multiple breakout group participants suggested the need for CCAWWG workshops and reports focused specifically on coastal issues. The breakout group participants identified the following current high priority science needs.

1. Sea-level rise: Participants indicated that substantial progress had been made on planning scenarios and data for sea-level change scenarios (including storm surge, tidal variability). USACE and USBR have gained experience in planning against scenarios and assessing and costing mitigation options. USACE plans to continue to use low/medium/high scenarios unless compelling evidence emerges to alter this approach. Participants noted that lack of clarity on sea level rise scenarios still exists for other local/regional/state agencies and that there is a need to reconcile USACE scenarios with scenarios in the NRC report and other scenarios. In addition, additional science is needed to account for relative vertical land motion vs seal level rise (net sea-level change relative to land surface), and science to support a better understanding of how sea level rise affects coastal ecosystem processes. Participants also supported continued research to update the upper boundary on sea level rise as appropriate.

2. Improve and sustain monitoring: Many participants identified a need for better monitoring and collection of observations to constrain models. Examples of data needs included monitoring of surface elevation, salinity, nutrient loads, harmful algal blooms, pH, temperature, biological response, wetland accretion, sediment loads, and coral bleaching. Participants recognized agency funding and staff constraints, and identified a need for research to inform optimal design of networks / efficient sampling under limited resources. Key monitoring needs included long-term monitoring of baseline conditions for vulnerable ecosystems and species (e.g., anadromous fish, shellfish, coral reefs), and more tide gauges and hydrological monitoring in Alaska. An additional high priority need identified was for Improved DEMs specifically for coastal regions vulnerable to sea level rise and increased storm surge.

3. Integrated modeling: A key science need identified by this breakout group was research to advance integrated models that link inland hydrology and oceanographic trends, which is a particular challenge for coastal ecosystems. Ongoing examples include USBR work to develop and apply these types of linked models in the Sacramento Basin and the San Francisco Bay Delta. Participants also highlighted a need for integrated models to help characterize risk for interactions between sea level rise, extreme events, runoff intensity, biologic impacts and land use change / development (e.g., interactions between rising sea level, increases in frequency / intensity of tropical cyclones or atmospheric rivers). This was recognized as an area with extensive ongoing work, but participants felt that additional applied research was needed to support integration into operational decision making. Additional research needs identified included: better understanding of climate change impacts to both infrastructure and ecosystems; development of multi-scale modeling frameworks; research to advance model interoperability to accelerate linking and integration; improved modeling and mapping of salt water intrusion, impacts on water supplies and changes in demand; and improved understanding / modeling of ecosystem shifts and thresholds.

4. Ocean acidification: Participants identified a need for data on sedimentation and changes in dredging requirements due to changes in vulnerable ecosystems and species (addressing both costs and benefits), and a need for better data on impacts of acidification on concrete and coral reefs.

5. Wetlands and land use change: For coastal systems, there is a critical need for better understanding of interactions between changes in salinity, wetland elevation, freshwater runoff, species movement, changes in ecosystem range, and impacts to coastal water supplies. Participants also identified needs for additional research on effective use of wetlands to reduce coastal risks and a need for information on changes in nutrient inputs and nutrient cycling in wetlands. Participants suggested that it would be highly beneficial to highlight examples of successful use of wetlands, living breakwaters, and other 'green infrastructure' at the coasts to improve resilience to sea level rise, storm surge, and erosion protection (e.g., Rebuild by Design).

6. Aquaculture: A key research need identified for aquaculture was to improve understanding of Impacts of increasing ocean temperatures, hypoxia and ocean acidification on aquaculture, including effects on recruitment failures. This research could be applied to identify needs to relocate or modify cultivation in some regions.

7. Integrated coastal retreat strategies: Participants noted that extensive progress had been made by USACE on development of coastal retreat strategies, including identification of migration pathways and land acquisition strategies (ongoing) under 3 different sea level rise scenarios. Participants identified a need to highlight effective planned retreat strategies for both ecosystems and urban/suburban infrastructure (applicable to both existing and future infrastructure), and to share examples of ongoing adaptive management informed by long-term monitoring (e.g., USACE post-Sandy and post-Katrina reconstruction). Additional needs identified included research on coastal reserve design and facilitation of migration informed by high resolution climate projections and use of results from integrated modeling analyses of sea-level rise, storm surge, and extreme events to inform coastal land use planning. Finally participants encouraged US federal agencies to highlight ongoing work on strategies for increasing community understanding and buy-in for coastal retreat strategies.

8. Regional gaps: Participants identified a number of regional gaps in our scientific understanding of climate change impacts at coasts and oceans. These gaps included: a need for climate projections at higher spatial resolutions to improve local understanding of hydrologic impacts of tropical cyclones / atmospheric rivers; downscaling of climate projections to improve local understanding of climate projections for islands and coastal regions; research to improve understanding of impacts of climate change on riparian vegetation including interactions between changes in snow dynamics / hydrology and changes in vegetation phenology and reproduction; better understanding of interactions between agricultural runoff, nutrient loading, uptake by riparian ecosystems, and coastal water quality; and research to improve modeling of sea level rise, inundation probabilities, and coastal erosion in Alaska.

9. Science translation and impact assessment: During the discussions, participants commented multiple times on the need to highlight examples of success (as well as practices to avoid) at smaller, local scales. Key topics of interest included: integrated modeling, quantification of benefits, implementation of BMPs for improving resilience, effective interagency collaboration; quantifying benefits of different response options: e.g., green infrastructure (at coasts) vs built infrastructure (dams, levees, sea walls); best practices and examples of successful science translation for decision makers and public (and insurance agencies); and use of science to inform flexible and adaptive regulations.