

Extended Abstract

Geospatial Decision Support Tools for Coastal Resource Management: Vulnerability Maps Characterizing Regional Climate Variability and Change Impacts

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Marine and coastal resources are under increasing near to long-term pressures as summarized in the US Ocean Commission Report, the Pew Ocean Reports, and synthesized in the Renewable Natural Resources Foundation Report. Extant pressures (e.g. stressors such as pollution, harvesting, habitat destruction, invasive species, land and resource use, extreme natural events) on coastal resources are increasing every day. To those extant pressures, scientists now add climate variability and change drivers that are expected to exacerbate the impacts on coastal resources. Scavia and colleagues produced a summary of the coastal and marine resources sector review of the potential drivers and impacts from climate variability and change. Their analysis considered several key climate change drivers including: sea level change; alterations in precipitation patterns and subsequent delivery of freshwater, nutrients, and sediment; increased ocean temperature; alterations in circulation patterns; changes in frequency and intensity of coastal storms; and increased levels of atmospheric CO₂. From those drivers come impacts on shorelines, estuaries, coastal wetlands, coral reefs, and ocean margin ecosystems. Consequently, climate variability and climate change can be considered additional hazards that should be added to the current slate of hazards already under consideration for stressing Coasts. However, the nature of the cumulative impacts and the resulting cumulative effects are not well understood. Additionally, knowledge about climate variability and change drivers and the resulting individual and cumulative impacts on coastal resources is not integrated with decision support technologies. That circumstance makes it extremely difficult for coastal resource managers to take advantage of what is known in order to plan and improve coastal resource management and mitigate hazards. This project integrates across those gaps in knowledge for the Oregon Coastal areas.

In a first task, the research team will develop and deploy a website for eliciting concerns from community stakeholders about coastal resource (e.g., land use and estuarine ecosystem) management and climate change impacts. Once the website is deployed it will be used in an online experiment to elicit concerns, having participants translate those concerns into climate condition and receptor condition indicators that constitute a database design for data layers that can be mapped.

As a second task, we will develop and implement a data integration strategy for combining coastal resource and hazard information within the context of climate variability and change scenarios to support requirements for extending use of the WWW-enabled Oregon Coastal Atlas. The Atlas was developed by Co-PI Wright and her colleagues at Oregon Ocean-Coastal Management Program and Ecotrust as part of a National Science Foundation Digital Government grant. The Atlas contains a variety of data files for download and for presentation display with the open source Minnesota MapServer. At the current time the Atlas contains 3385 spatial data files covering a very broad-based set of themes for download or to make maps on-line. However, no climate impacts data, per se, exists as yet in the atlas. This project will develop that data and integrate it as part of the data file archive made available to scientists, decision managers, community stakeholders, and the general public.

As a third task, the team will use the decision requirements results of task 1 with the integrated data of task 2 to create a vulnerability mapping capability called a deliberative mapping tool that could be used with the Oregon Coastal Atlas. We will conduct literature and software systems reviews and synthesize information about vulnerability map decision support tools that can support coastal resource management.

The fourth task will deploy the deliberative mapping tool to enable participants to combine receptor conditions and climate change conditions into exposure scenarios. Participants will discuss the exposure, sensitivity, and adaptive capacity of Oregon Coastal communities in light of the exposure scenarios.

Finally, in a fifth task, the team will reflect on how aspects of our collaborative process could be repeated in other places, as supported by the content management tools we used to manage the artifacts developed in the project. Based on a synthesized view of the best practices from our previous efforts, the research team will establish a web platform to support collaboration management using open source Plone, Wiki or Drupal content management tools. The team will design for a web platform that will meet the needs for this project activity, but could be useful to other researchers as well.

The overall project results can be used by decision managers, community stakeholders, and scientists to better understand how to incorporate regional climate information, climate variability, and climate change impacts into decision support processes to improve coastal resource management decision making.