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North Carolina has been identified by NOAA as one of three states with significant vulnerability to sea level rise. The state possesses the largest estuarine system on the U.S. Atlantic coast, with an extensive barrier island chain, and over 2,300 square miles of coastal land vulnerable to a 1 m rise in sea level (Poulter et al, 2009). The large exposure of North Carolina to the affects of sea level rise necessitates an evaluation of the potential system-wide impacts to built and living assets. In recognition of this need, the North Carolina Office of Geospatial and Technology Management Floodplain Mapping Program (NCFMP) received a $5 million grant from FEMA to comprehensively study the change in risk to built and living systems, and to develop science-based mitigation and adaptation strategies that will pro-actively reduce future risk.

The North Carolina Sea Level Rise Risk Management Study (NC SLRRMS) was initiated in February of 2009 and is expected to conclude in June 2011. The overarching goal of this study is to inform State and Federal policy makers on the subject of the sea-level rise impacts and foster development of risk management policy. NC SLRRMS will evaluate the potential changes in coastal flooding hazards due to sea-level rise and changes in storm frequency and intensity on a system-wide basis, considering built and living systems, and inclusive of societal and economic impacts. This assessment will include future vulnerability to both temporary and permanent flooding, land loss, and account for dynamic interactions and feedback between receptor systems.

Changes in hazards will be evaluated using a source, pathway, receptor framework applied at four 25-year "time slices" through 2100. Several scenarios of future conditions will be evaluated at each time slice in order to quantify the plausible range of future conditions. The forcing scenarios will be assessed across the receptor systems to identify the vulnerability of each system to each scenario. Uncertainty will be defined for all analytical aspects of the study process and attached to results. A risk assessment will then be applied to quantify the impact of each scenario.

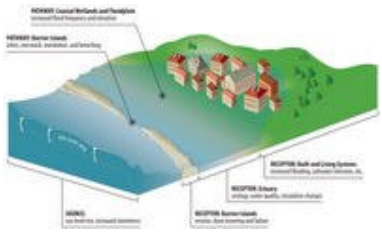

Figure 1. Source-Pathway-Receptor Framework

Flood risk management strategies, considering public policy, planning and zoning, codes and standards, resource management, and outreach will be iteratively developed with the risk assessment. Strategies will be evaluated on estimated economic impacts, regulatory costs, implementation costs, and stakeholder acceptance. The best "next steps" as determined from the strategy analysis will then be put forth to the study stakeholders.

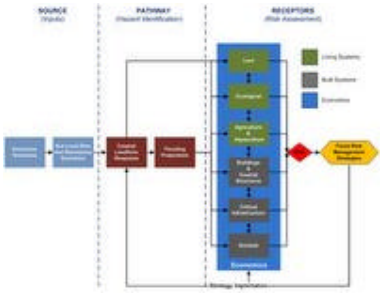

Figure 2. Macro Conceptual Model for NC SLRRMS.

Study products will include a final report describing the identified hazards and risks, in addition to mapping products presenting future vulnerability. A study template, data requirements and guidance will be developed to assist future studies in other locations. It is also anticipated that a GIS analytical toolset will be developed. Preferred mitigation and adaptation options will be identified and discussed with guidance on applicability in varying environments.

The study will be accomplished by a partnership between the State of North Carolina, the North Carolina university system, the study contractor, and other stakeholders. These entities are to be organized into nine work groups comprised of: conceptual modeling, analytical modeling and programming, coastal landforms, processes and structures, flood risk strategies, buildings and coastal structures, critical infrastructure, ecological, agriculture and aquaculture, and societal.

Figure 3. Macro Study Process

An advisory committee, representing a broad range of viewpoints, is overseeing the study efforts helping build consensus, and ensuring that the quality of the study meets community standards and fulfills stakeholder needs. Advisory committee membership includes NC State agencies, Federal agencies, academia, stakeholder associations, and other public and private sector experts.