

# South Atlantic Regional Research Project

## Developing Research Priorities: Process and Partnerships

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The **South Atlantic Regional Research Project (SARRP)**<sup>1</sup> is a regional research planning collaboration working to develop a *South Atlantic Regional Research Plan*. This timely effort is part of an initiative to effectively address critical ocean and coastal research issues through region-wide partnerships. This plan is intended for use by federal, regional, state and academic entities within the region and is sponsored by the four South Atlantic Sea Grant Programs (NC, SC, GA, and FL) and coordinated by the Georgia Coastal Research Council<sup>2</sup>.

### Assessment Resources

This document presents an overview of research topics for consideration in the South Atlantic Regional Research Project. It uses the work of the **Governor's South Atlantic Alliance**<sup>3</sup> and the four Regional Priority Issues identified by the Alliance's Executive Group as an organizing framework. These are: Healthy Ecosystems, Working Waterfronts, Clean Coastal and Ocean Waters, and Disaster-Resilient Communities. Each of these issues is described below, along with relevant research needs and issues that we have identified from three critical sources:

- a) National Science and Technology Council's Ocean Research Priorities Plan<sup>4</sup> (ORPP)  
We link the Alliance's Regional Priority Issues with the twenty Research Priorities and topics developed in the ORPP.
- b) SARRP Stakeholder Survey<sup>5</sup>  
We list the top impacts rated "Very Important" by stakeholders in SARRP's recent survey which was completed by over 500 respondents throughout the region. Additional impacts suggested in the open section of the survey are also included. The survey was distributed by the four Sea Grants and numerous partners through a variety of outreach mechanisms.
- c) SARRP Needs Assessment<sup>6</sup>.  
Early in the SARRP process, we conducted an extensive evaluation of over 160 documents related to regional planning, South Atlantic regional research, and other relevant documents (see *Compilation of Documents Examined*<sup>7</sup> available on our website). Previously identified research needs were compiled into our *Needs Assessment* draft, also available on the website. We list some of the top research needs here.

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<sup>1</sup> <http://www.gcrc.uga.edu/SARRP.htm>

<sup>2</sup> <http://www.gcrc.uga.edu/>

<sup>3</sup> "The Governors' South Atlantic Alliance: A Call To Action Framework",  
C. Russo. *Unpublished draft*

<sup>4</sup> <http://ocean.ceq.gov/about/docs/orppfinal.pdf>; see also summary prepared by M. Alber, "Ocean Research Priorities Plan: Synopsis of Research Priorities".

<sup>5</sup> [http://www.surveymonkey.com/sr.aspx?sm=zYbs\\_2bIXyDR\\_2bPdW81cpHHQrzCLodb3Izo4X390U7g1Q4\\_3d](http://www.surveymonkey.com/sr.aspx?sm=zYbs_2bIXyDR_2bPdW81cpHHQrzCLodb3Izo4X390U7g1Q4_3d)

<sup>6</sup> [http://www.gcrc.uga.edu/SARRP/documents\\_list.htm](http://www.gcrc.uga.edu/SARRP/documents_list.htm)

<sup>7</sup> *ibid*

While recognizing that a number of issues and needs from these three sources could be cross-listed, we have listed each only once, under the Alliance Priority that we felt provided the best alignment. For example, Coastal Development is associated with many of the impacts, issues and topics presented below, but it is listed under Alliance Priority 3: Clean Coastal and Ocean Waters.

### **Producing the Plan**

The next critical step in this process is to convene strategy teams, who will use the information provided below, along with supporting materials, as a starting point for developing regional-level research topics for each ORPP Research Priority. For example, the “Healthy Ecosystems” strategy team would evaluate Research Priority #1 (assessing status and trends) and the relative importance of the research topics associated with this priority for the Southeast. They will also be asked to provide more specific information for each topic, such as a list of particular fish stocks that should be assessed. The strategy team may add (or subtract) research topics from the list. They may also determine that a particular Research Priority does not have associated research topics that fall within the scope and criteria of a regional research plan.

We recognize the importance and multiple benefits of coordinating this effort with key state, regional and national efforts already underway in the South Atlantic region. In addition to the Governor’s South Atlantic Alliance, major regional undertakings include NOAA’s Southeast and Caribbean Regional Team (SECART); NOAA in the Carolinas, the South Atlantic Fishery Management Council (SAFMC), and the Southeast Regional Partnership for Planning and Sustainability (SERPPAS), which is a Department of Defense initiative to promote regional collaboration on natural resource and security issues. We work closely with these regional organizations and they maintain high-level representation on our Advisory Group (see SARRP website for more information). Future potential regional partners include Southeast Aquatic Resources Partnership Aquatic Habitat Plan, Atlantic Marine Fisheries Commission, among others. This document is intended to serve as a launching point for developing regional research priorities that maximize coordination and promote partnerships among these efforts. By uniting management needs, stakeholder priorities, and research gaps into a single regional research plan, we also optimize our ability to generate the necessary resources for plan implementation (via leveraging, the political process, and public enthusiasm).

### **Addressing Governors’ Alliance Priorities**

#### **1. Healthy Ecosystems**

Our ocean resources suffer under many pressures, such as overfishing, habitat destruction, competition with invasive species and potential impacts from climate change. As a society we look to our resource professionals to study, understand, manage and protect these resources. The Alliance has identified the “enhancement and support of ecosystem-based management efforts” as a key component of sustaining the health of our regional coastal and ocean resources. The Alliance also identifies mapping the “scope, scale and distribution” of resources within the region as an aid in the development of “standardized, integrated, and accessible spatial and temporal data for coastal resource management.”

The following ORPP Research Priorities and associated research topics most closely relate to the Alliance Priority of “Healthy Ecosystems”.

Research Priority 1: Assess the status and trends of resource abundance and distribution.

Associated research topics:

- *monitor and map natural and cultural resources*
- *assess fish-stocks and status and health of protected resources*
- *monitor living resources (spanning multiple trophic levels)*
- *assess the spatial and temporal variability (both natural and use-induced) of resources (e.g., biota, energy, minerals, and pharmaceuticals)*

Research Priority 2: Understand interspecies and habitat/species relationships.

Associated research topics:

- *develop and validate ecosystem and species interaction models;*
- *assess how environmental change (e.g., responses to climate drivers; changes in bathymetry; watershed discharge) impacts resources*
- *evaluate the effects of natural resource policies on living resources*

Research Priority 4: Enhance the benefits of natural resources.

- *develop sustainable approaches to aquaculture that consider implications for surrounding ecosystems, wild genetic resources, and impacts on coastal economies*
- *advance sustainable energy technologies, including efficient methods for power generation*
- *develop new generations of military subsurface detection systems that are less deleterious to species sensitive to acoustic emissions;*
- *develop bycatch-reduction technologies for fisheries and protected resources (e.g., seabirds)*
- *assess ecological and economic resources in the EEZ and the U.S. continental shelf*

Research Priority 11: Understand ocean-climate interactions.

- *evaluate the temporal and spatial extent of the interactions between ocean regions (e.g. tropical, polar, and deep sea) and climate change, including effects on ocean circulation, air-sea interactions, convection, and water-mass formation*

Research Priority 12: Understand the impact of climate on biogeochemistry and implications for its ecosystems.

- *identify and quantify impacts of climate-induced changes in physical properties of the ocean (e.g., heat, freshwater and circulation), as well as biogeochemical properties (e.g., carbon, nitrogen, dust, trace elements, pollutants) on ecosystems.*
- *determine fluxes and cycling of biogeochemical variables through sustained observations (e.g., observatories), process research (e.g., air-sea exchange, ecosystem interactions) and modeling*

Research Priority 20: Develop products and biological models to enhance human well-being.

- *expand exploration, assessment, and development (e.g., biosynthesis) of ocean bioproducts (e.g., pharmaceuticals, nutrients, diagnostic tools, reagents, enzymes)*
- *assess utility of marine species as mechanistic models for the study of diseases, toxicology, and biochemical processes relevant to human health*

- *identify sentinel species and habitats that may serve as early-warning systems of potential ocean risks to humans*

b) Several impacts identified as high priority in the recent SARRP *Stakeholder Survey* relate to the Alliance Priority Issue of “Healthy Ecosystems”. The top responses related to this Priority were:

- Tidal wetland loss, including marshes, fresh and brackish wetlands (84% rated as very important)
- Changes in estuaries (e.g. water and sediment quality) (79%)
- Degradation / loss of commercial/recreational fisheries, including crabs, shrimp, shellfish, coral, finfish (79%)
- Continuing loss of endangered, threatened spp, incl sea turtles, marine mammals, fish, sea grasses, birds and coastal plants (76%)
- Changes in tidal creeks (e.g. water and sediment quality) (70%)
- Changes in near shore waters (e.g. changes in water and sediment quality) (66%)
- Loss of non-tidal freshwater wetlands (64%)

Related impacts that respondents listed as “Additional Impacts” in the open section of the Survey were the loss of ecosystem services (quantity and quality), linkages between upland watersheds, tidal streams and continental shelf waters, decrease in tidal saltwater endemic species, cumulative impacts (how to study or regulate them), loss of nurseries for fisheries, loss of plankton, and decline in water quantity and quality.

c) The following topics related to the Alliance Priority Issue of “Healthy Ecosystems” were identified in the SARRP *Needs Assessment*.

- Marsh Dieback
- Ocean Processes & dynamics involved in carbon cycling
- Nutrient availability and cycling
- Sea level and other potential impacts of climate change
- Ecosystem -Based Management
- Habitat and species-specific research needs in SAFMC management plans
- Functional role of estuarine habitats and embayment

## **2. Working Waterfronts**

Marine operations are essential components of the local, regional and global economy and national security. The Alliance defines “Working Waterfronts” as “water-dependent facilities and related shore-side infrastructure that offer access or support facilities for recreation, commerce, research, and other public uses including military operations (Coast Guard, Navy, etc).” Our challenge is to sustain robust waterfront cultural traditions, commerce, adequate access and use of public trust waters, and infrastructure” in the face of growth and development pressures.

The Alliance identifies several important related issues: future water access points for various sectors; dealing with the challenges facing traditional working waterfront communities such as growth; environmental degradation and displacement; better control of our coastal facilities both

for Homeland Security issues as well as for military operations; and climate change and associated environmental factors such as storm intensity and sea-level changes.

a) The following ORPP Research Priorities are most closely related to “Working Waterfronts”.

Research Priority 3: Understand human-use patterns that may influence resources.

- *determine the “worth” of natural and cultural resources*
- *evaluate the socioeconomic trade-offs inherent in management efforts*

Research Priority 8: Understand the interactions between marine operations and the environment.

- *evaluate the release, dispersion, cycling, and ecological impacts of contaminants (i.e., oil spills, air emissions)*
- *evaluate interactions with marine life (e.g., bird migration, ship strikes, ocean sound)*
- *assess the impacts of aquaculture*
- *evaluate factors contributing to the introduction and persistence of invasive species (e.g., ballast water)*
- *assess effects of expanding transportation routes (e.g., Arctic routes)*
- *refine sediment transport models to enable rapid, efficient, and environmentally sustainable dredging and dredged-material management*
- *evaluate how climate change (e.g., sea-level rise, sea-ice abatement lake-level decreases) will affect marine operations (transportation routes, ports and harbors, energy-extraction platforms)*

Research Priority 9: Characterize and predict conditions in the maritime domain.

- *enhance environmental observation and forecasting of ocean conditions (e.g., currents, turbidity, surface waves, sea-ice extent, lake levels, and biogeochemical conditions)*
- *increase precision in forecasting marine conditions (e.g., improved real-time, ocean-current models; storm-surge projections)*
- *develop technologies (e.g., robust sensors and infrastructure, autonomous vehicles) to support high-spatial-resolution and near-real-time forecasting*

Research Priority 10: Use environmental information to enhance the marine transportation system.

- *incorporate environmental impacts (e.g., benthic disturbance, contaminant releases, impacts from invasive species), social and economic drivers (e.g. human demographics, land use, income, and output) and operational needs (e.g. port and waterway depth and capacity) into marine operations planning and risk assessment*

Research Priority 15: Develop socioeconomic assessments and models to evaluate the impact of multiple human uses on ecosystems.

- *assess social and economic factors (e.g., energy uses, coastal and watershed development, land use, water use, resource-use perception) that determine how society views and uses marine ecosystems*
- *develop new methods to evaluate non-consumptive use of ecosystem services and characterize the value society places on competing uses, including discounting procedures for adjusting cost-benefit analyses over time*

Research Priority 19: Understand how human use and valuation of ocean resources is affected by the relationship between human activities, health threats, and ocean resources.

*- Evaluate the relationship between social and economic drivers (e.g., shoreline development, tourism, recreational and subsistence fishing) and human-health threats (e.g. contamination by pathogens, toxins, or pollutants)*

b) Concern expressed in the Survey centered around the effects of development and demographic changes on coastal economies and resource access. The following highly rated impacts relate to the Alliance Priority Issue of Working Waterfronts.

- Increase in coastal human population and changing demographics (66%)
- Other effects of human actions on marine life, including food web interactions, community dynamics, trophic structure. (66%)
- Loss of viable fishing or other traditional livelihoods associated with coastal economies (59%)
- Decrease in public access to coastal waters, shores and beaches (52%)

Related impacts that respondents listed as “Additional Impacts” in the open section of the Survey were potential impacts of energy exploration and extraction issues, interactions of marine operations with ecosystem function and health (invasive species, contaminants), acoustic effects on marine species, impacts of erosion and sea level change on coastal tourism.

c) The following topics related to the Alliance Priority Issue of “Working Waterfronts” were identified in the SARRP *Needs Assessment*.

- Dam and impoundment construction, seawalls etc
- Beach processes in built environments
- Impacts of docks and other structures on the marsh
- Development of a coastal circulation model

### **3. Clean Coastal and Ocean Waters**

Significant impacts to estuarine water quality and coastal ecosystem health are predicted as a result of increasing coastal urbanization and climate change. Impacts are evidenced by the increased number of advisories and closures caused by high bacteria levels and harmful algal blooms implicated in fish kills and human health dangers. The Alliance is interested in research that enhances a manager’s ability to effectively target prevention, enforcement, response and mitigation activities that address these impacts. The ocean also holds abundant resources that convey a variety of health benefits to humans, and healthy ecosystems can support increased opportunities for improved human health.

a) The following ORPP Research most closely relate to “Clean Coastal and Ocean Waters”.

Research Priority 14: Understand and predict the impact of natural and anthropogenic processes on ecosystems.

- assess natural and anthropogenic changes in physical, biological, and chemical properties and their impacts on productivity and overall ecosystem health*
- assess dispersal mechanisms for marine organisms*

- develop trophic dynamics models that span multiple trophic levels
- assess impact (loss) and recovery responses to natural and anthropogenic stressors (e.g. impacts from El Niño/La Niña, increases in ocean temperature, ocean acidification, watershed activities, sediment/nutrient/contaminant flux, resource extraction)

Research Priority 16: Develop appropriate indicators and metrics for sustainable use and effective management of marine ecosystems.

- develop metrics and indicators that can be used to assess factors that stress and degrade ecosystems as well as to monitor restoration and recovery.
- use indicators to provide feedback on the efficacy of management practices

Research Priority 17: Understand sources and processes contributing to ocean-related risks to human health.

- evaluate the sources (e.g., runoff, atmospheric deposition), cycling, and effects of current and emerging pathogens, toxins, and contaminants (e.g., mercury, flame retardants, endocrine disruptors and hydrocarbons)
- assess food webs to determine the fate of these compounds (e.g., bioaccumulation, biotransformation, biomagnification)
- provide information on human health risks, such as HAB onset, extent, and duration; infectious disease potential (including microbes that can cross from animal to humans); and the influence of climate change on water-borne diseases (e.g., cholera)

Research Priority 18: Understand human health risks associated with the ocean and the potential benefits of ocean resources to human health.

- characterize the benefits associated with consumption of seafood (e.g., improved cardiovascular health, cognition)
- quantify risks and impacts of exposure to health hazards (e.g., contaminants, pathogens, and toxins) and determine the incidence and severity of human illnesses.
- conduct epidemiological studies on at risk populations (children, pregnant women) and on diseases in ocean species that may serve as sentinels for new or ongoing threats

b) SARRP Survey respondents expressed a high degree of concern for the following impacts related to the Alliance Priority Issue of “Clean Coastal and Ocean Waters” rating them “Very Important”.

- Effects of chemicals on organisms, including toxins, contaminants (pesticides, herbicides, and petroleum products), hormones (77%)
- Contaminated seafood (67%)

Related impacts that respondents offered as “Additional Impacts” in the open section of the Survey were saltwater intrusion in drinking water and human health issues (pollutants causing red tide, odors, and respiratory illnesses).

c) The following topics related to the Alliance Priority Issue of “Clean Coastal and Ocean Waters” were identified in the SARRP Needs Assessment.

- Upland land use and land cover change effects on estuaries
- Acidification effects on crustaceans, corals, other calcareous organisms

- Food web effects
- Estuarine hypoxia, coastal hypoxia, algal blooms
- Aquatic Invasive and non-native species
- Phytoplankton and zooplankton responses
- Coastal development
- Atmospheric deposition

#### **4. Disaster-Resilient Communities**

Recent hurricanes and tsunamis have clearly demonstrated the potential impacts that natural disasters can have economic, environmental, social, and public-health impacts on regional, national, and global scales. Resiliency to changes in short-term and long-term weather and climate are major concerns in the southeastern United States. Resiliency refers to the ability of a system to absorb changes or shocks and retain its basic structure and function.<sup>8</sup> For human communities this concept can mean the ability to weather and adapt to changing conditions. Addressing a range of impacts to public safety, shoreline change, coastal infrastructure, habitat loss, species migration and natural resources are issues listed by the Alliance.

a) The following ORPP Research most closely relate to “Disaster Resilient Communities”.

Research Priority 5: Understand how hazard events initiate and evolve and improve forecasts of future hazard events.

- *develop models of hazard generation (e.g., storms, submarine and coastal landslides, tsunamis, flooding) and evolution (e.g., tsunami propagation, storm and inundation modeling).*
- *assess effects of land subsidence and future climate change (e.g., changes in storm intensity or frequency, sea-level rise, landscape change) on hazard potential and vulnerability*

Research Priority 6: Understand the response of coastal and marine systems to natural hazards and assess future vulnerability.

- *understand and model landscape change (including the adjacent watershed) associated with coastal hazards, including direct alterations and secondary processes (e.g. slope failures, shoreline change, inlet formation, coastal erosion, sediment transport, flooding)*
- *determine structural and infrastructure resilience to hazards, and how it is affected by alterations (i.e., through physical destruction, sediment diversion, land use and restoration)*
- *assess vulnerability of coastal communities, public health, infrastructure, marine operations, and ecosystems to hazards*

Research Priority 7: Develop multi-hazard risk assessments and support development of models, policies, and strategies for hazard mitigation.

- *identify vulnerable ecosystem functions and infrastructure components, determine the potential for cascading component failure, and assess the efficacy of natural (e.g., barrier islands, coastal wetlands) and engineered systems (e.g., hurricane barriers, levees) in hazard mitigation.*
- *develop models and risk assessments that include economic, social and environmental costs associated with natural hazards*

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8. “What is Coastal Resiliency?”, S. Showalter, Sea Grant Law and Policy Journal Vol. 1.1 (i-iii) June, 2008



- *integrate models and risk assessments into decision-support tools for public policy*

Research Priority 13: Project future climate changes and their impacts.

- *use expanded ocean observations, paleoceanographic data and assessments, and enhanced process research to develop coupled ocean-ice-atmosphere-land climate models that provide improved short-term (e.g., hurricane intensity) and long-term (e.g. sea-level rise) projections of the effects of climate change*

b) Overall, survey respondents did not prioritize many impacts explicitly relevant to the Alliance Priority Issue of Disaster-Resilient Communities. The related responses were:

- Loss of hard or rocky formations supporting sponges, corals, and other invertebrates on the ocean floor (57%)
- Increase of erosion (56%)
- Potential changes in shoreline and habitats due to sea level rise (56%)

Related impacts offered as “Additional Impacts” in the open section of the Survey were the effects of shoreline hardening and barrier island destruction on resiliency capacity, and beach re-nourishment issues.

c) Regardless of scale (international, national, South Atlantic regional or state in scope) many documents mentioned Coastal Hazard Resilience in some way. Documents specifically geared towards the southeast identified the following as important related research needs.

- Role of the ocean with respect to long-term global climate change
- Hazard preparation: storms, hurricanes, erosion, oil spills
- Evaluate latest erosion prediction methodologies for identification & management strategies
- Mitigation for effects of climate change
- Digital ocean models integrating best models of ocean processes