Addressing Climate Change with the Ocean SAMP

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Simulation of 3’ SLR, Providence, RI
Overview

- Climate change concerns for Rhode Island
- Impacts and issues
- Role of the SAMP to address climate change
Acknowledgements

Union of Concerned Scientists - www.climatechoices.org/ne/
Grover Fugate, Janet Freedman – CRMC
Jon Boothroyd, Kate Moran, University of Rhode Island
Kelly Knee, Applied Sciences Associates
Cameron Wake, Institute for the Study of Earth, Oceans, and Space (EOS). University of New Hampshire
Existing stresses in the coastal zone:

- Deforestation and erosion
- Agriculture
- Urban spread
- Pollution
- Industrial effluents
- Increased migration and population growth in coastal areas
- Overpopulation
- Mining and quarrying
- Ocean disposal of wastes from ships
- Wastes from ports and harbors
- Domestic wastes
- Agricultural wastes
- Pollution and loss of access to foreshore areas from tourism
- Poison fishing
- Dynamite fishing
- Loss of mangrove habitat from fishpond development
- Loss of critical habitats for juveniles
- Loss of coastal habitats from reclamation and shoreline development
- Uncontrolled fish pens threaten endangered marine species and water quality
- Bycatch of sea turtles and dolphins
- Improper use of artificial reefs and fish aggregating devices
- Destructive gears
- Bottom trawls, drift nets, and fine mesh nets
- Open access
- Overfishing
- Illegal entry of commercial fishing vessels in municipal waters
- Illegal entry of foreign fishing vessels in the Exclusive Economic Zone
Atmospheric Carbon Dioxide

Business as Usual

Clean Energy & Efficiency

Vostok Ice Core

IPCC 2001
Arctic Sea Ice: Sept 1980 vs Sept 2007
There is an unequivocal scientific consensus that increases in greenhouse gases in the atmosphere drive warming temperatures of air and sea, and acidification of the world’s oceans from carbon dioxide absorbed by the oceans.

(IGBP, 2002)
Northeast Climate Impacts Assessment

- Collaboration between Union of Concerned Scientists and 50 independent scientists

- Geographic Scope
  Nine Northeast states, from Maine to Pennsylvania

- Peer Review
  Climate Dynamics, 2007
  14 papers in Adaptation and Mitigation of Climate Change, 2008

www.climatechoices.org
Indicators of Climate Change in the Northeast US over the last 30-40 yrs

- Winter warming
- Decreased snowfall
- Fewer days with snow on ground
- Lake ice out dates earlier
- Lilac bloom dates earlier
- More frequent extreme precipitation
- Earlier spring runoff
- Sea levels continuing to rise

Hodgkins et al., 2002; 2003; Wolfe et al., 2005; Wake and Markham, 2005; Wake et al., 2006
Narragansett Bay’s average mean temperature has increased 2°F; average mean winter temperature has increased 4°F over last 30 years.

Higher: 6.5-12.5°F
Continued heavy reliance on fossil fuels

Lower: 3.5-6.5°F
A shift away from fossil fuels

2°F warming since 1970
Rhode Island climate “migration”

By the end of the century, summer in Rhode Island could feel like the typical summer in Virginia (lower emissions scenario) or coastal South Carolina and Georgia (higher emissions scenario)

 Courtesy of the Union of Concerned Scientists
Potential Loss of Commercial Cod Fishery
Economic Impacts: negative & positive?

Mark Gibson/Candace Oviatt: Narragansett Bay turns into the Chesapeake

01:00 AM EDT on Friday, August 1, 2008

MARK GIBSON CANDACE OVIATT

IN LATE JUNE, Rhode Island Department of Environmental Management scientists from the Bay Window monitoring partnership observed through aerial flyovers and purse-seine sampling an estimated 24 million menhaden with an average weight of one pound apiece, in Narragansett Bay. The fish were predominantly in the Upper Bay and the Providence River.

That is a lot of fish, an amount not seen since the 1970s.
Some other climate change impacts to coastal resources

Wetlands loss and introduction of new pathogens (sudden wetlands dieback)
Habitat changes in species and function
Changes to ecological processes (i.e. plankton and the food chain)
Recent studies have shown that ocean acidification impacted mussels
Decadal Trends in 1 inch Precipitation Events 1948-2007

Spiers et al., 2008
Increased Riverine Flooding

Projected 100-year Freshwater Floods in the Lamprey River Watershed, NH
Increased Probability of Storms

Woodworth, 2001
Patriots Day Storm, April 2007 – flooding in Newport and Washington County

October 2005 floods – estimated damages $38 million in Blackstone River Valley
Increased Erosion and shoreline retreat

Oakley, Hehre, Boothroyd

2005

April 16, 2007
Freedman
Projected Change in Relative Sea Level for RI by 2100
Mean projections with upper and lower values shown

3-5 feet (91-152 cm)
CRMC Policy

Science, Sept 2008

(Rahmstorf, 2007)
(IPCC, 2001)
(UCS, 2006)
(Church & White, 2006)
(Newport tide gauge)
Flood zones move landward
What can we do? MITIGATE

A human intervention to actively reduce the production of greenhouse gas emissions or to remove the gases from the atmosphere.
What can we do? ADAPT

Adjust natural or human systems in response to actual or expected climatic changes or their impacts, so as to reduce harm or exploit beneficial opportunities.
The Role of the SAMP

Promote a balanced approach to development and protection of ocean-based resources

- Platform for managing multiple uses (existing & future), such as transportation, fisheries, renewable energy, habitat protection
- Science-based approach that compiles baseline data and monitoring information
- Engage a broad public constituency to address current and future needs and opportunities
Secure existing and future management areas for fisheries which will be increasingly stressed by climate variability/change

Maintain healthy marine transportation network, responding to future needs and technologies
How can the SAMP contribute?

- Identify options for renewable energy - reduce greenhouse gas emissions and mitigate climate impacts
- Provide baseline and future monitoring data critical to identifying changes and understanding localized climate concerns.

www.npower-renewables.com
How can the SAMP contribute?

- Engage a broad constituency - a conduit to get input from and inform stakeholders regarding opportunities and challenges related to climate change.

- Adaptive management approach, with periodic evaluation and updates.... *Living document*
And then there are other options...