Long term planning for NJ Coastal Resiliency: Coastal Flood Exposure Assessment and Salt Marsh Migration under future sea level rise

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Climate and Environmental Change Initiative

Jacques Cousteau National Estuarine Research Reserve

NOAA Coastal Services Center
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Coastal Community Resiliency Progression

Understand the Issues

Assess Risk and Vulnerability

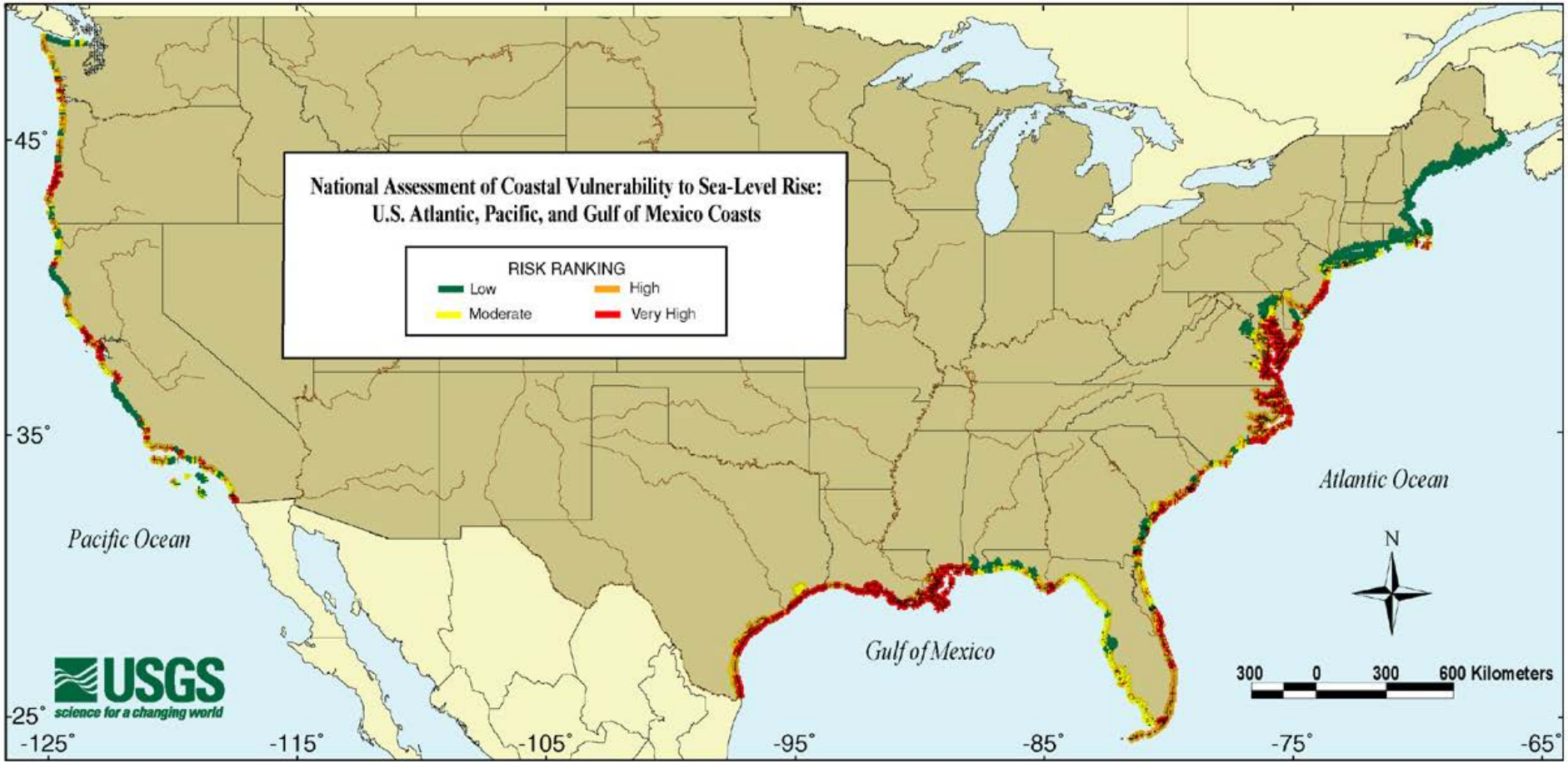
Plan for the Future

Implement and Adapt

Understand the Issues

Photo credit: N. Psuty

National Assessment of Coastal Vulnerability to Sea-Level Rise

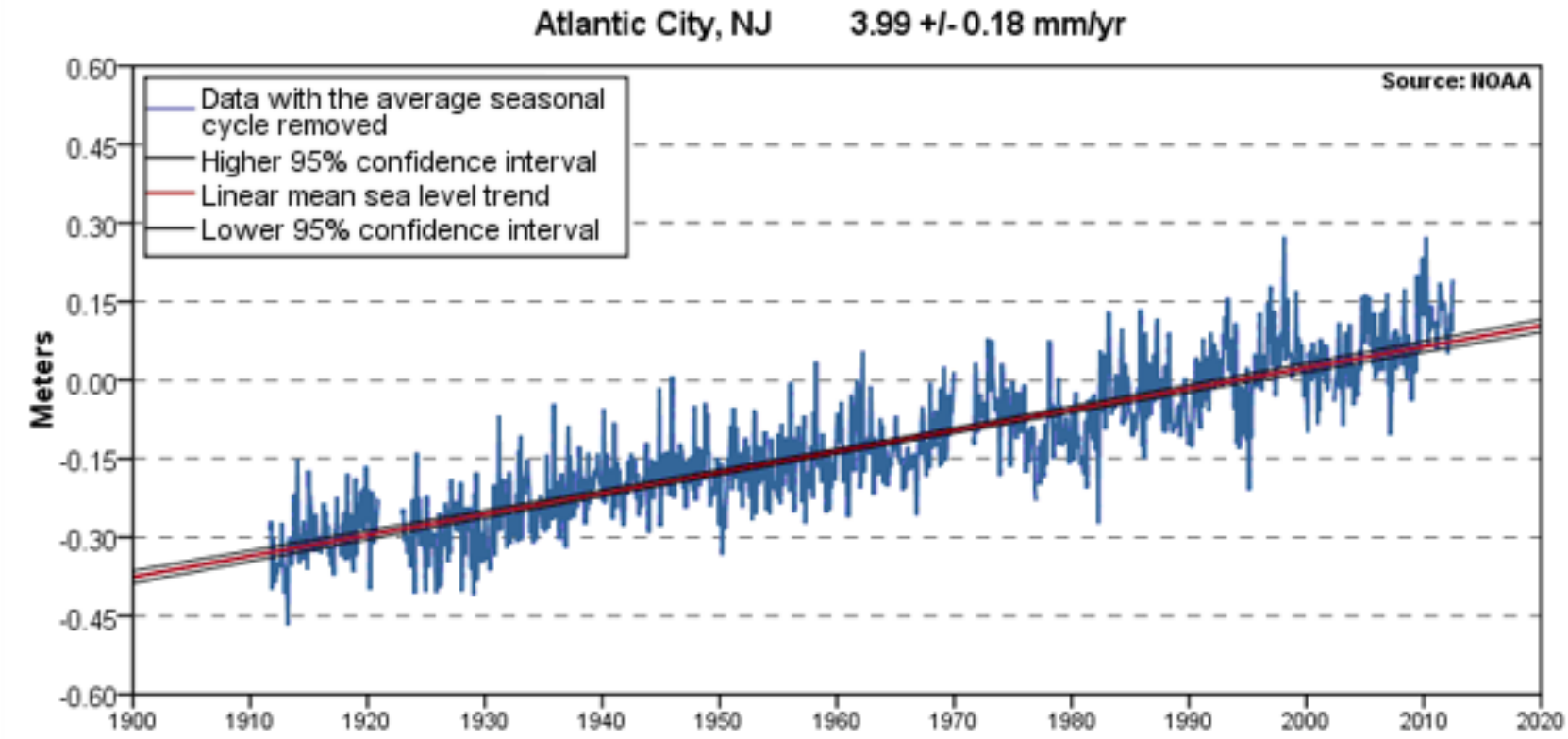


Regional factors will influence relative sea level rise for specific coastlines.

Graphic from USGS 2001 http://woodshole.er.usgs.gov/project-pages/cvi/

Rising sea level is a physical reality that is impacting the New Jersey and the entire Mid-Atlantic coastline.

Predicted future rates are expected to increase to 12 mm/yr (or 0.5 in/yr). This means that by 2050 sea level rise is expected to rise by approximately 1 foot and by 2100 sea level rise is projected to rise about 3 feet along the Jersey shore.



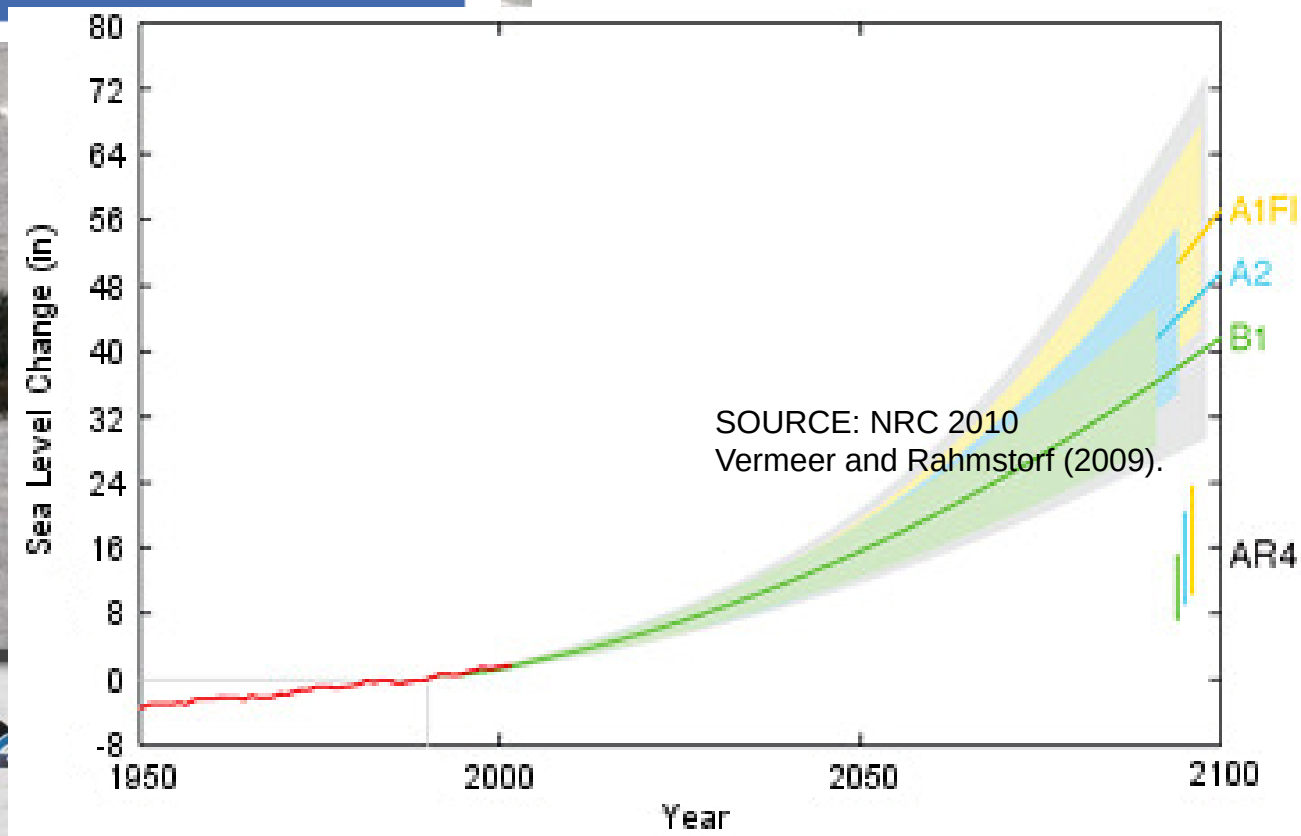
The mean sea level trend over the past century is 3.99 millimeters/year (0.15 in/yr) which is equivalent to a change of 1.31 feet in 100 years. Graphic Credit: NOAA
http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8534720%20Atlantic%20City,%20NJ

Global Sea Level Rise Scenarios for the United States National Climate Assessment

Global Mean SLR Scenarios

We have very high confidence (>9 in 10 chance) that global mean sea level will rise at least 0.2 meters (8 inches) and no more than 2.0 meters (6.6 feet) by 2100.

Projection of sea level rise from 1990 to 2100, based on temperature projections for different Green House Gas emissions scenarios



SOURCE: NRC 2010
Vermeer and Rahmstorf (2009).

SLR Scenarios

R. Lathrop, R. Kopp and M. Kaplan

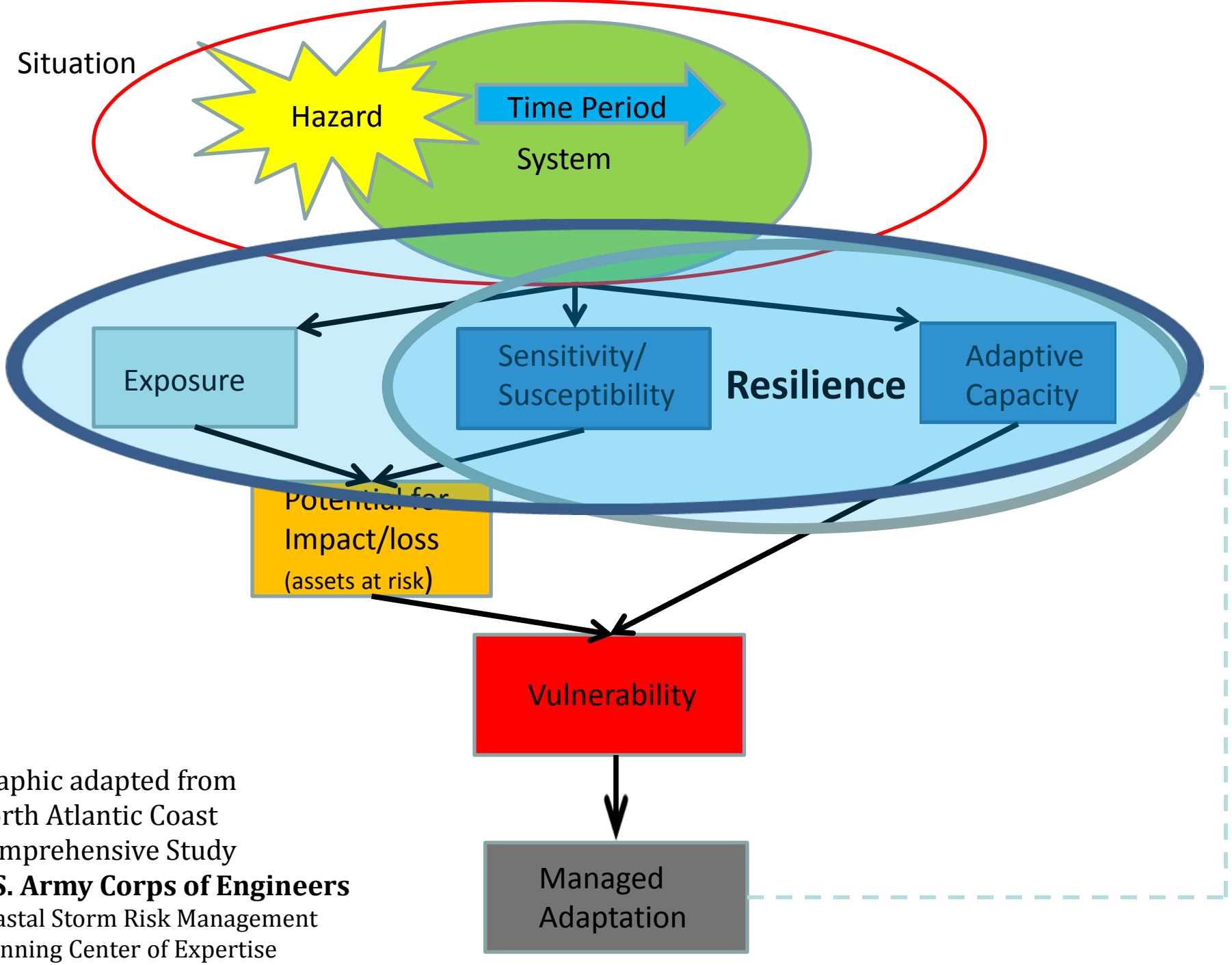
2050 Projection	**Low**	**High**	**Higher**
NOAA Average	1.0	1.5	2.5
RU Miller/Kopp (2013)	1.1	1.9	2.2
Mean of NOAA and M/K	1.0	1.7	2.4
Consensus Values	1.0	2.0	2.5
CFE Values: % Chance of SLR exceeding this value	85%	8%	0.5%
2100 Projection	**Low**	**High**	**Higher**
NOAA Average	2.3	4.5	7.5
RU Miller/Kopp (2013)	2.5	4.9	5.8
Mean NOAA and M/K	2.4	4.7	6.7
Consensus Values	2.5	5.0	7.0
CFE Values: % Chance of SLR exceeding this value	80%	10%	0.8%

Available at NJAdapt.org

Assess Risk and Vulnerability

Information and tools to support place-based decision-making

www.wptv.com/dpp/news



Graphic adapted from
North Atlantic Coast
Comprehensive Study
U.S. Army Corps of Engineers
Coastal Storm Risk Management
Planning Center of Expertise

Preparing Your Community in the Face of a Changing Climate

April 1, 2010

Sea Oaks Golf Course

Little Egg Harbor, NJ 08087

Co-Sponsored by:

Jacques Cousteau National Estuarine Research Reserve

Barnegat Bay Partnership — Research · Educate · Restore

NJ Coastal Management Program

Urban Coast Institute — Monmouth University — where leaders look forward

Background

Global climate change is one of the most pressing challenges facing coastal communities today.

The Intergovernmental Panel on Climate Change concluded in February 2007 that it is "unequivocal" that Earth's climate is warming, and that it is "very likely" (a greater than 90 percent certainty) that the heat-trapping emissions from the burning of fossil fuels and other human activities have caused "most of the observed increase in globally averaged temperatures since the mid-twentieth century".

According to the Union for Concerned Scientists, "the Northeast and the rest of the world face continued warming and more extensive climate-related changes to come—changes that could dramatically alter the region's economy, landscape, character, and quality of life." They go on to state, "By the end of this century, global sea level is projected to rise 7 to 14 inches under a lower emissions scenario and 10 to 23 inches under a higher-emissions scenario. Several lines of evidence indicate that these projections may be quite conservative. Even under these projections, many areas of the densely populated Northeast coast face substantial increases in the extent and frequency of coastal flooding and are at increased risk of severe storm-related damage.

This conference provided an opportunity for municipal leaders, scientists, resource managers, engineers, and others interested in the consequences of climate change to meet and discuss the latest science-based information, highest priority needs, and next steps.

Conference Goals

- To facilitate a dialogue on key issues facing New Jersey's coastal estuaries related to climate change and sea level rise.
- To present sample adaptation tools and strategies.
- To share information amongst local stakeholders.

Workshop Survey Results:

The audience of coastal decision makers highlighted their perceived need for place-based information and decision support tools to inform land use planning, floodplain management and emergency management in the face of accelerating sea level rise.

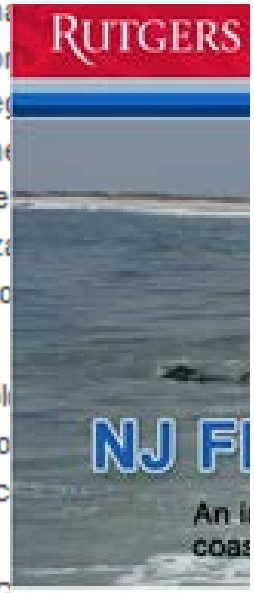
Using the NJFloodMapper to Understand your Current and Future Risk

In order to answer the evaluation questions po
current and future risk and ha
visualizes different inundation
routes, FEMA flood maps (reg
Flood Elevation Maps) and the
Super Storm Sandy. The site
on-the-ground photo visualiza
at iconic Jersey Shore locatio

Additional data layers to expl
economic vulnerability, the po
and percentage of confidenc

The NJFloodMapper uses a G
user friendly tool to help com
You can print your maps or s
using the "share" button.

Explore the website at: NJFlo



Funding provided

Produced in collab
Reserve (JCNERR)

About

> Start Viewer <

Resources

To access go to NJFloodMapper.org

Applying a Instructional Systems Design Model

Analyze Audience	☐	**Design Product**	☐	**Develop Product**	☐	**Launch Product**	☐	**Evaluate Product & Process**
Front-end Evaluation *(assess users needs & desires for improved decision making)*		Formative Evaluation *(get feedback on design criteria, storyboards, prototypes, beta products, etc., as often as possible & is needed)*						Summative Evaluation *(assess if products work & are useful)*

Front-End and Formative Evaluation

An Analysis of End User Preferences for Climate Change Related Information and Data

Prepared by: Lisa Auermuller, Watershed Coordinator
Jacques Cousteau National Estuarine Research Reserve

BETA Testing Results – August 2012:
NJ Sea Level Rise Viewer Website (http://SLRviewer.rutgers.edu)
Prepared by: Lisa Auermuller, Watershed Coordinator
Jacques Cousteau National Estuarine Research Reserve

Background

Geospatial tools can be used to examine the impact of sea level rise on existing infrastructure and natural habitats. To be effective, this information and the associated decision support tools need to be available and useable by a wide audience of decision makers involved in coastal land use planning and emergency preparedness. To address this issue, a suite of interactive internet-based geospatial tools or Sea Level Rise & Coastal Inundation Visualization Tool is being developed. This online mapping tool will be geared to meet the needs of municipal and county governments in supporting their place-based decisions.

In order to design the web-based tool so that the needs of potential user groups are met, a second BETA test of the website was completed. These opinions were collected to gather feedback on the design, functionality and the display of the website. The results of this assessment will guide and inform this phase of website development.

Methods

A total of 26 individuals participated in the BETA testing of the website (see Appendix A). These individuals volunteered to participate in the testing after receiving an email invitation sent to over 2040 individuals on the Jacques Cousteau National Estuarine Research Reserve's (JC NERR) Coastal Training Program email list serve. Individuals represented local communities and county, state, federal and non-profit organizations.

The BETA testing consisted of two parts: (1) individuals working on their own or in groups of two on fictitious website "quests" or quester testing scenarios (see Appendix B); and (2) a facilitated group discussion reviewing the feedback from the website "quest" assignments along with overall impressions and suggestions for further website refinement. BETA testing lasted a total of three and a half hours, with a lunch break after one and a half hours.

Results

Quester Scenario Testing

The quester scenario testing consisted of seven questions, designed to have the BETA testers navigate through a variety of functionalities on the website. After testers ran through the scenarios they were asked to rate how well they felt the website worked, on a likert scale ranging from poor to excellent. Secondly, they were asked which functionalities could be added to the website to make that particular use of the website more effective.

Web - based Sea Level Rise Mapping Usability Testing

Prepared by: Lisa Auermuller, Watershed Coordinator
Jacques Cousteau National Estuarine Research Reserve

Introduction:

The Jacques Cousteau National Estuarine Research Reserve (JC NERR) and Rutgers Center for Remote Sensing and Spatial Analysis (CRSSA) are partners on an effort to develop an interactive website which will display coastal vulnerability due to sea level rise. As a first step in this effort, existing web-based sea level rise mapping tools were evaluated by potential end users. Known as "usability testing", this digital media evaluation method measures the effectiveness of digital products with members of a target audience. Usability testing is undertaken in order to (1) verify appeal of various designs, (2) verify effectiveness of various designs, (3) determine usefulness of content, and (4) determine how to best display data so that it's useful to the data users.

Methods:

Members of the "target audience" were recruited through an email sent to the JC NERR "Coastal Decision Maker" contact database. Twelve individuals participated in the usability testing on September 29, 2010. From here on in, these twelve individuals will be referred to as "evaluators".

Five websites and one online "report" were evaluated. These were selected to provide the widest variety of mapping platforms, display approaches, functionalities, and options to the evaluators.

One online report was chosen as an example of a type of product that could be created as a map-based output.

In an effort to understand the variety of perspectives with which the evaluators were reviewing the web-based tools, each evaluator was asked to introduce themselves. Evaluators gave their name, affiliation, and the reason why they were interested in viewing sea level rise information. They were also asked to comment on how they might use a sea level rise mapping website in their coastal decision-making position.

A laptop with wireless internet connection was provided for each evaluator. These laptops were "bookmarked" with each of the web-based tools to increase the ease of navigation to each of the websites. Efforts were also made to ensure the laptops were also updated with the latest versions of internet tools such as "Google Earth", "Java script", etc.

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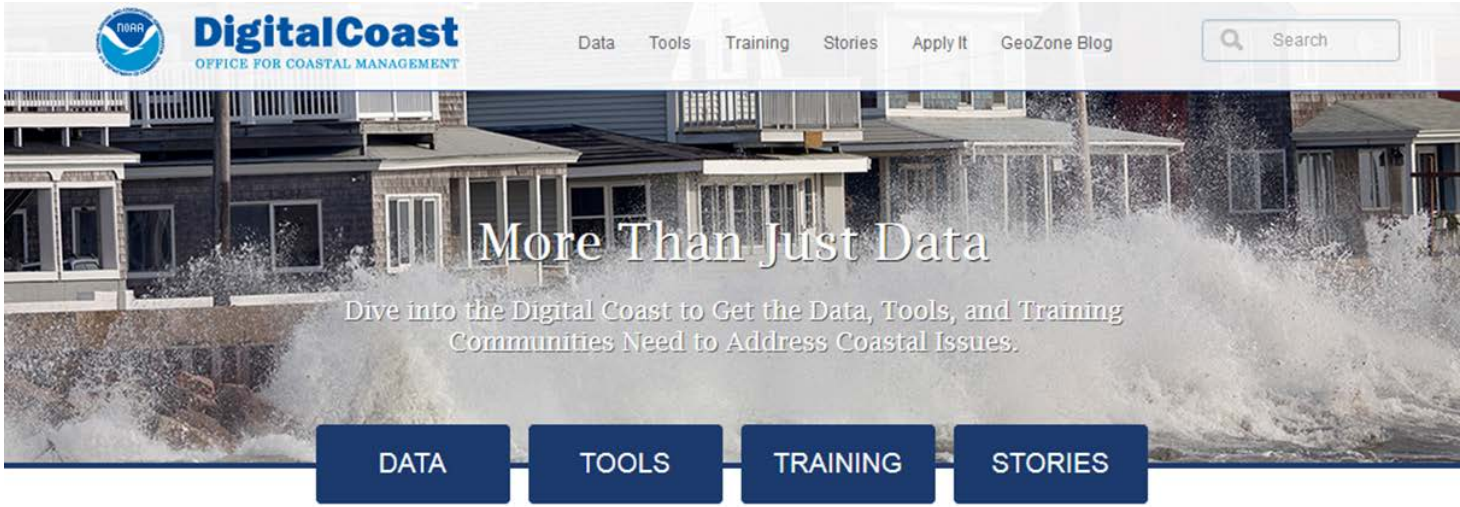
Leveraging federal assets for local application



What is the Digital Coast?

This NOAA-sponsored website is focused on helping communities address coastal issues and has become one of the most-used resources in the coastal management community. The dynamic Digital Coast Partnership, whose members represent the website's primary user groups, keeps the effort focused on customer needs.

Learn more in our About section, or just dive in. And please provide feedback as often as possible. Hearing from you is what makes the Digital Coast work.

Learn More about the Digital Coast

About Contributing Partners Watch the Video

Top: Data Tools Training Stories

1. Coastal Lidar
2. Coastal Change Analysis Program
3. Economics: National Ocean Watch
4. Electronic Navigational Charts
5. Emergency Response Imagery

Firefox

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breaking Bad buried money

Sea Level Rise | Confidence | Marsh

Vulnerability | Flooding | Facilities

Sea Level Rise

Current MHHW

Legend

Water Depth

Low-lying Areas

Visualization Location

Overview

Use the slider bar above to see how various levels of sea level rise will impact this area.

Levels represent inundation at high tide. Areas that are hydrologically connected are shown in shades of blue (darker blue = greater depth).

Low-lying areas, displayed in green, are hydrologically "unconnected" areas that may flood. They are determined solely by how well the elevation data captures the area's hydraulics. A more detailed analysis of these areas is required to determine the susceptibility to flooding.

Understanding the Map

Additional Information

Zoom to: New Jersey

NOAA Coastal Services Center

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Sea Level Rise and Coastal Flooding Impacts

The purpose of this data viewer is to provide coastal managers and scientists with a preliminary look at sea level rise and coastal flooding impacts. The viewer is a screening-level tool that uses nationally consistent data sets and analyses. Data and maps provided can be used at several scales to help gauge trends and prioritize actions for different scenarios.

Use the six tabs at the top of the legend (ex. "Facilities") to explore visualizations of sea level rise. The slider bar in each tab can be used to examine the impacts of multiple sea level rise scenarios. The overview text directly below the legend describes individual impacts. Additional documents and links provide further detail.

Disclaimer

The data and maps in this tool illustrate the scale of potential flooding, not the exact location, and do not account for

Continue

Stamford

Newark

Jersey City

NEW YORK

Allentown

PHILADELPHIA

Wilmington

Atlantic City

- Windows Internet Explorer

http://slrviewer.rutgers.edu/#

Sea Level Rise | Confidence | Marsh

Vulnerability | Flooding | Facilities

Facility Locations

3 ft SLR

Legend

Water Depth

Schools | Police Stations

Hospitals | Fire Stations

Evacuation Routes

Visibility	Layer Name
☑	Schools
☑	Public Safety
☑	Hospitals
☑	Evacuation Routes

Overview

By overlaying facility locations on a map that depicts sea level rise, a community can identify the potential impact that sea level rise can have on vulnerable locations.

The location of various community facilities are depicted on this map.

Understanding the Map

Additional Information

Zoom to: New Jersey | Glossary | Share

Imagery | Streets | Topo

Sea Level Rise | Confidence | Marsh

Vulnerability | Flooding | Facilities

Sea Level Rise

Current MHHW

Legend

- Water Depth
- Low-lying Areas
- Visualization Location

Overview

Use the slider bar above to see how various levels of sea level rise will impact this area.

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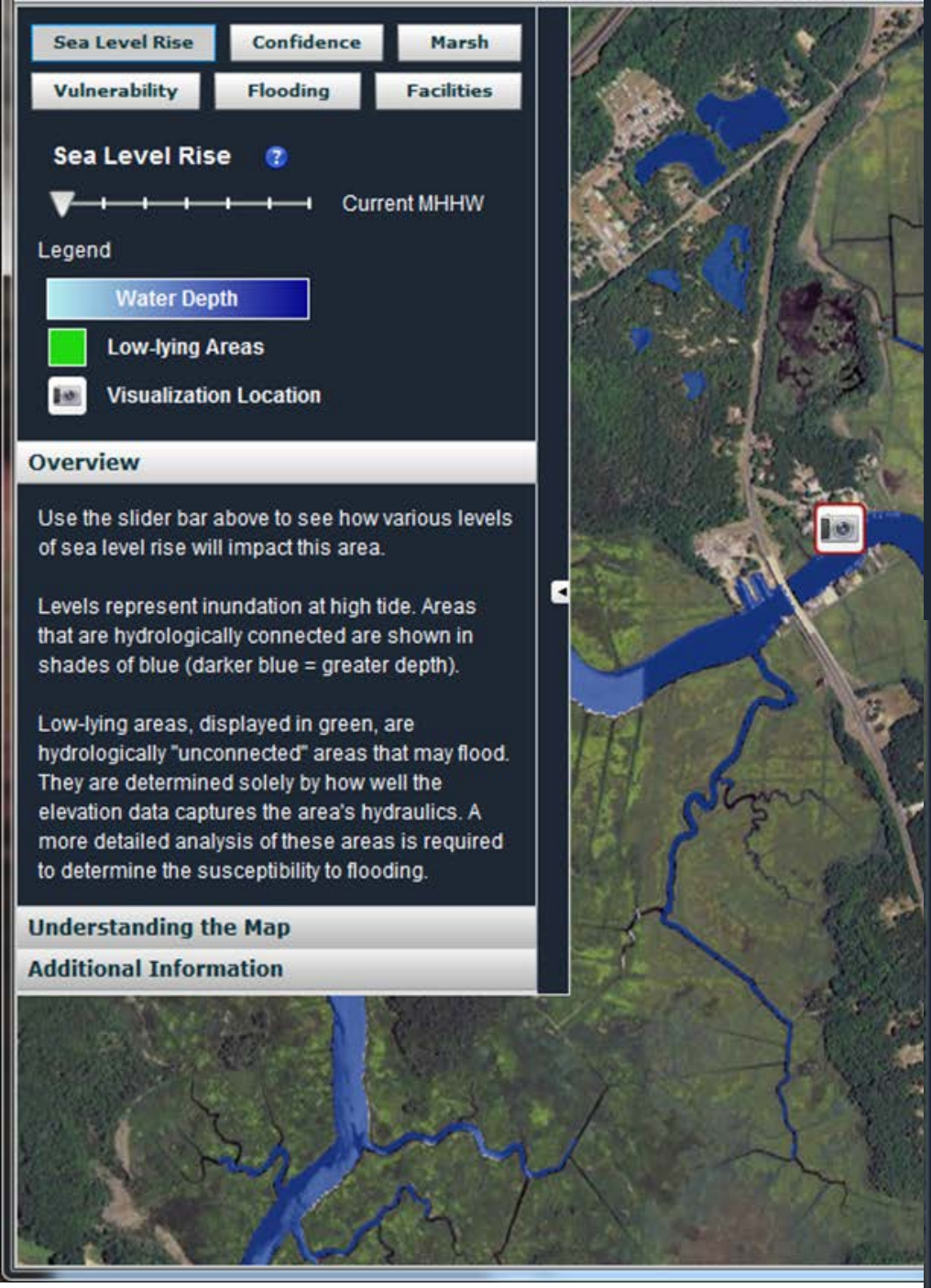
Understanding the Map

Additional Information



CRC Building

Use the slider to view a simulation of sea level rise at this location.

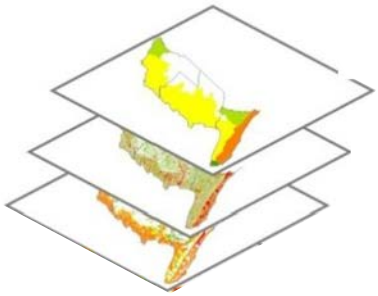
CRC Building

Use the slider to view a simulation of sea level rise at this location.

Assessing New Jersey's Exposure and Vulnerability to Sea Level Rise and Coastal Flooding

To help meet the needs of local governments interested in enhancing coastal resiliency in their communities, Rutgers University developed the Coastal Flooding Exposure (CFE) Assessment and the NJDEP developed the Coastal Vulnerability Index (CVI).

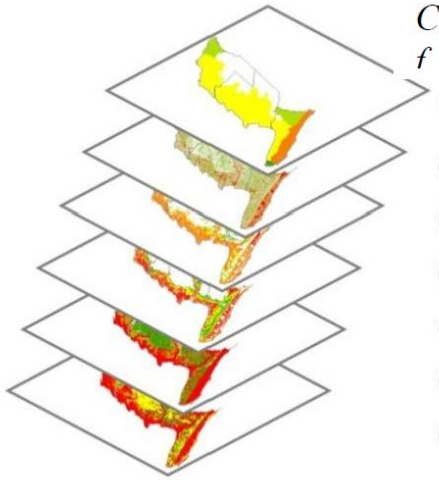
As the graphic below illustrates, the CFE strictly maps flooding exposure with the intention for later use in the assessment of vulnerability as a separate step. The CVI combines aspects of environmental vulnerability (a, b, e & f) along with flooding exposure (c & d). Depending on your intended use, one or the other products may be more applicable.



CFE = a + b + c

Where CFE =

(a) Flood Prone Areas
(b) Storm Surge (SLOSH)
(c) Nuisance Coastal Flooding



$CVI = a + b + c + d + e + f$

Where CVI =

(a) Geomorphology
(b) Slope (% Rise)
(c) Flood Prone Areas
(d) Storm Surge (SLOSH)
(e) Drainage
(f) Erosion

NJ Coastal Flooding Exposure (CFE)

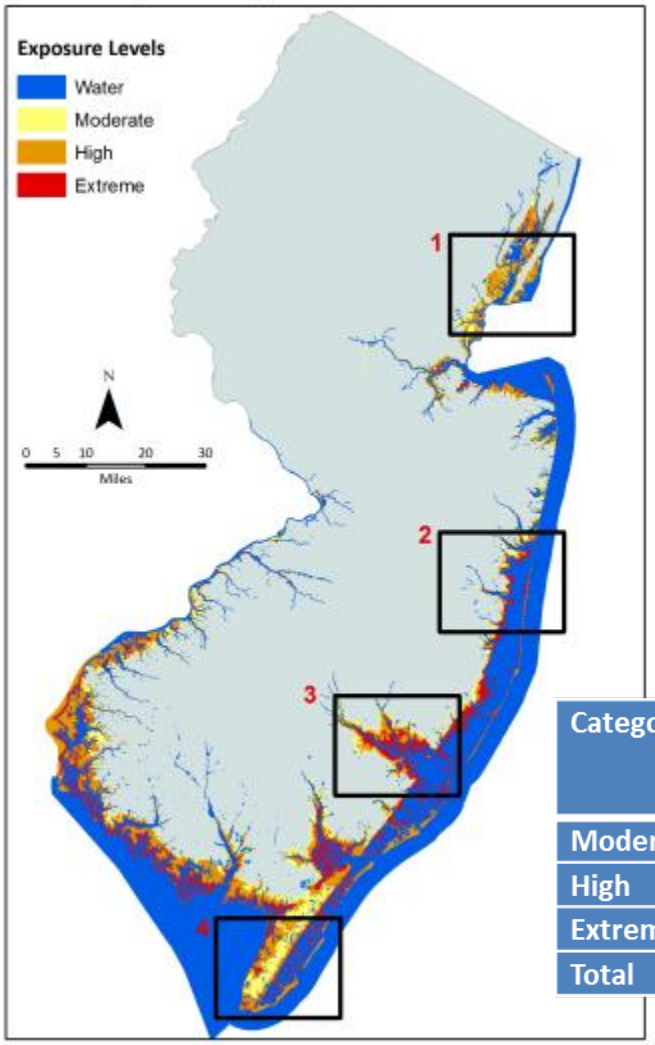
- Objective: An integrated statewide assessment to address questions such as which areas of the state are most exposed to coastal hazards now or might be in the future under sea level rise.
- The assessment distinguishes three classes of geographic areas : Moderate, High and Extreme exposure.
- The logic was such that areas exposed to flooding on a more frequent basis were given a higher ranking. Thus the ranking incorporates the probability or likelihood of the area being flooded.
  - For example, even though a Category 3 storm surge has higher flooding elevations, the likelihood of occurrence is lower than a Category 1 storm surge and therefore the Category 3 flood area was given a lower exposure ranking.
- Extreme exposure areas are those that are exposed to relatively frequent flooding. In addition, the Extreme exposure areas also include those areas subject to the most powerful wave impacts.

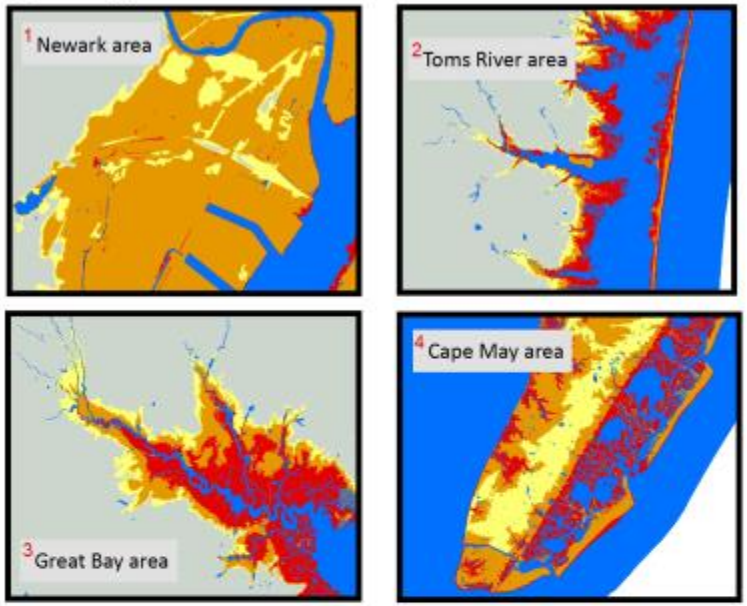
NJ Coastal Flooding Exposure: projecting into the future

Flooding Hazard	Present	2050	2100
FEMA Special Flood Hazard Areas (SFHA)	Extreme: V zone High: 1% A zone Moderate: 0.2% (X) zone	Extreme: V zone High: 1% A zone + 2' Moderate: 0.2% (X) zone + 2'	Extreme: V zone High: 1% A zone + 5' Moderate: 0.2% (X) zone + 5'
SLOSH Storm Surge	Extreme: N/A High: SLOSH Cat 1 Moderate: SLOSH Cat 3	Extreme: N/A High: SLOSH Cat 1 + 2' Moderate: SLOSH Cat 3 + 2'	Extreme: N/A High: SLOSH Cat 1 + 5' Moderate: SLOSH Cat 3 + 5'
NOAA/NWS Shallow coastal flooding (SCF)	Extreme: SCF High: N/A Moderate: N/A	Extreme: SCF + 1' High: SCF + 2' Moderate: SCF + 2.5'	Extreme: SCF + 2.5' High: SCF + 5' Moderate: SCF + 7'

NJ Coastal Flooding Exposure - Present

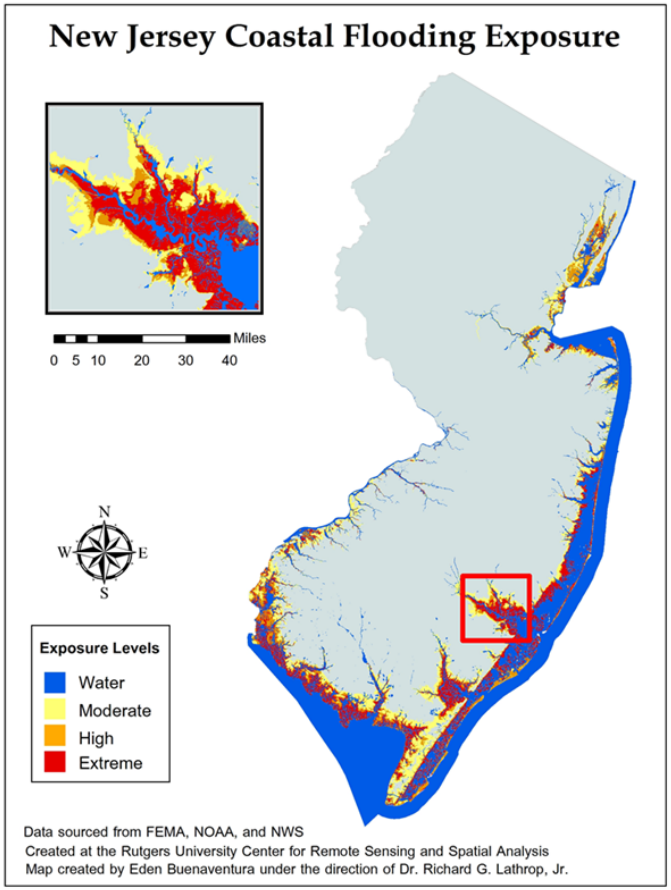
New Jersey Coastal Flooding Exposure





Category	2000	2050		2100	
	Area (ac)	Area (ac)	% change	Area (ac)	% Change
Moderate	197,433	183,329	-7.1	165,833	-16.0
High	148,060	165,272	+11.6	185,489	+25.3
Extreme	234,224	271,784	+16.6	310,608	+32.6
Total	579,717	620,385	+7.0	661,930	+14.2

NJ Coastal Flooding Exposure



Infrastructure	Moderate (M)	High (H)	Extreme (E)	Total
Miles of road affected				
Major Roads (miles)	382	270	45	697
Evacuation Routes (miles)	297	249	58	604
# of facilities affected				
Wastewater Treatment	10	17	4	31
Coastal Energy Facilities	12	15	1	28
Schools	180	119	2	301
Fire Stations	99	90	6	195
Law Enforcement	46	44	3	93
Long Term Care / Assisted Living Facilities	20	11	0	31
Hospitals	7	6	0	13
Socially vulnerable populations				
Total Population (in persons using 2010 Census)	428,769	333,923	150,959	913,651
Zero Vehicle Households (persons 2010 Census)	26,642	29,549	6,007	62,198
Limited English Proficiency (persons 2010 Census)	69,262	50,513	10,192	129,967
Over 65 years in age (persons 2010 Census)	52,121	39,420	22,606	114,147
Known Contaminated Sites (NJDEP)				
Active Sites with Confirmed Contamination	197	269	24	490
Total (including pending sites)	1261	1501	193	2955
	M-H-E categories combined			
Property parcels affected	# affected	$ Land value (in 2013 $)		
Commercial Properties	20,154	$26,555,293,664		
Industrial Properties	3,934	$8,960,318,156		
Residential Properties (includes Apartments)	335,873	$129,057,872,992		
Total Combined	359,961	$164,573,484,812		

Category	2000	2050		2100	
	Area (ac)	Area (ac)	% change	Area (ac)	% Change
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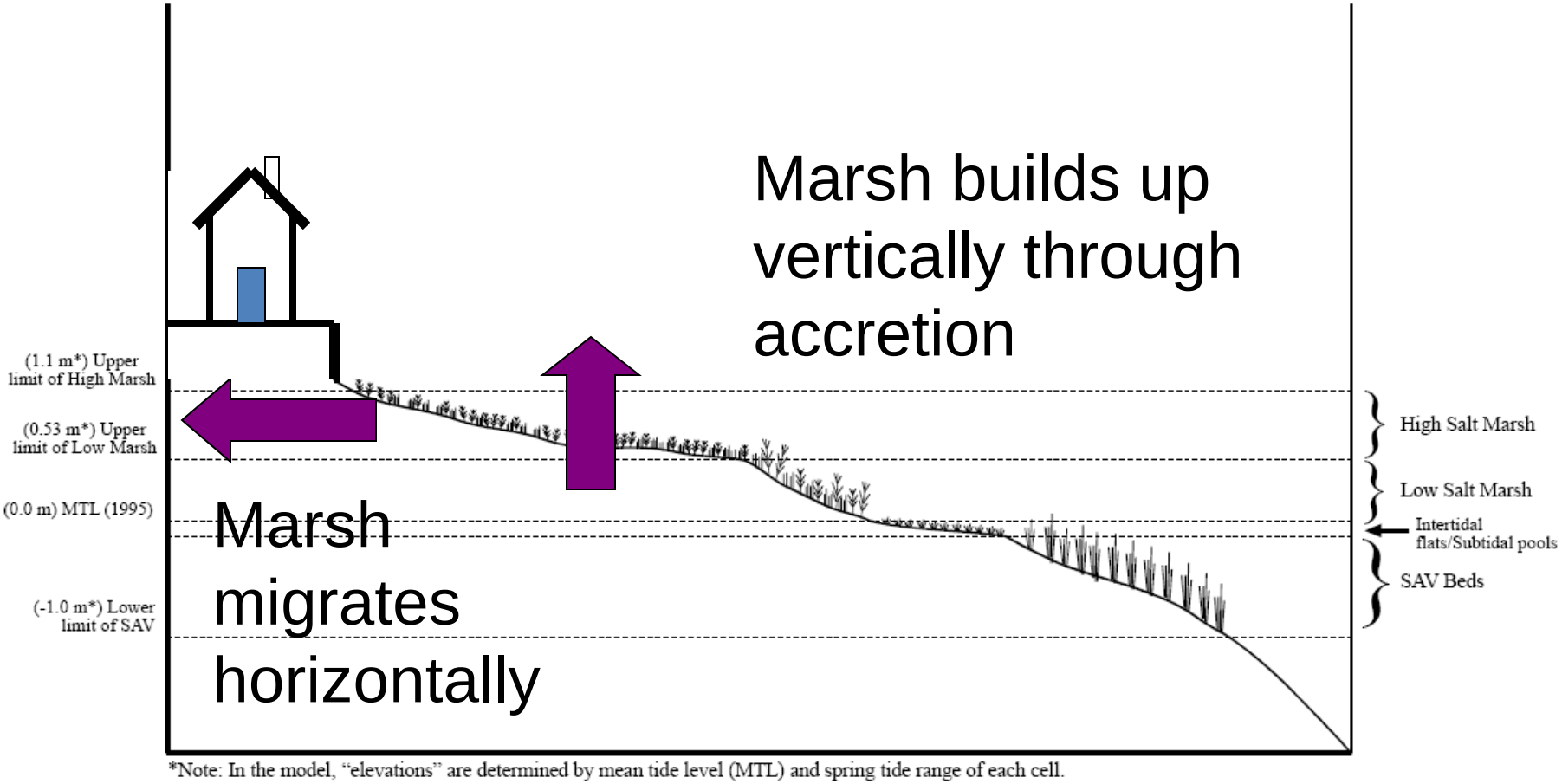
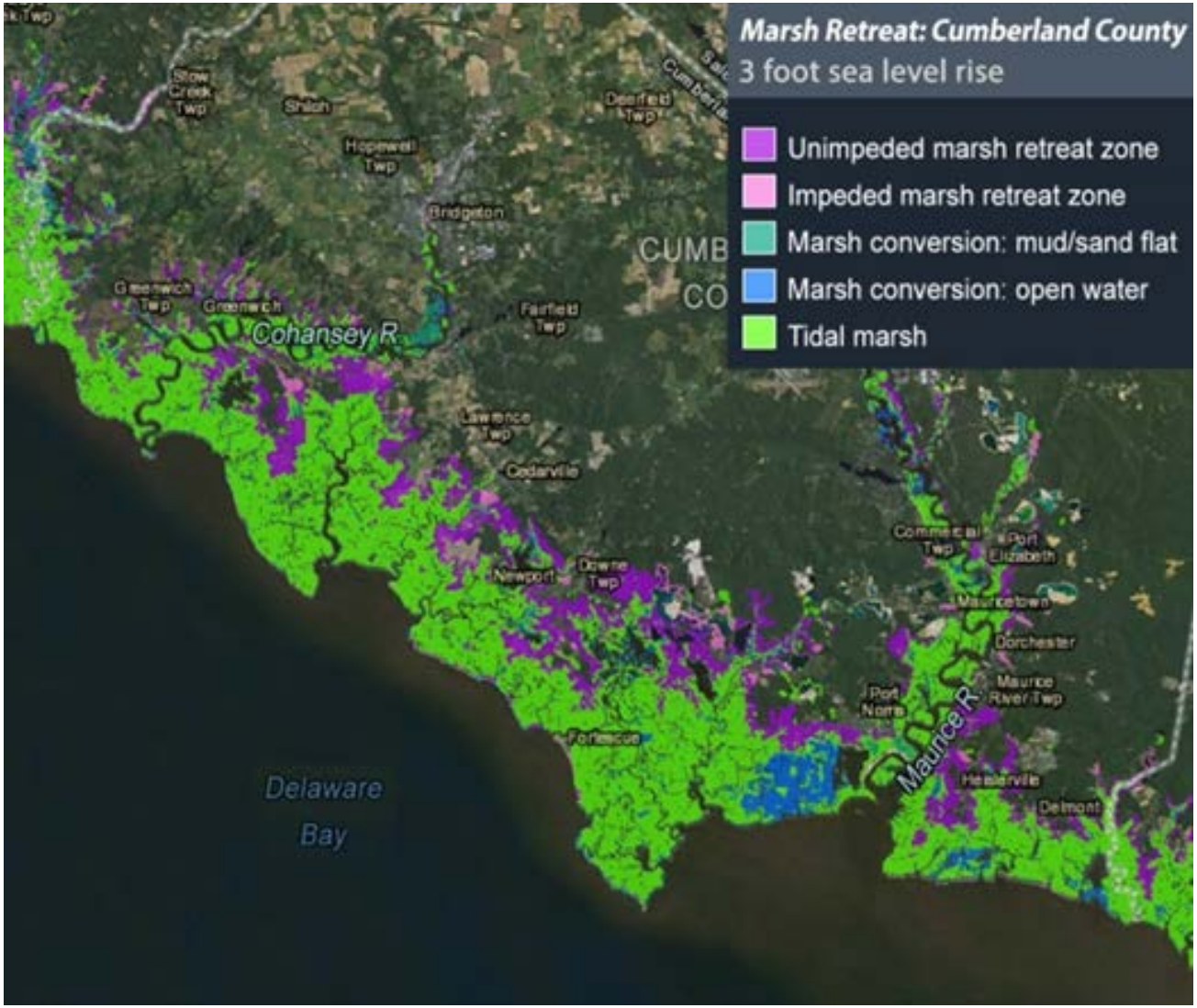
Maintaining Green Infrastructure: Coastal Salt Marshes



Tidal Marsh Retreat

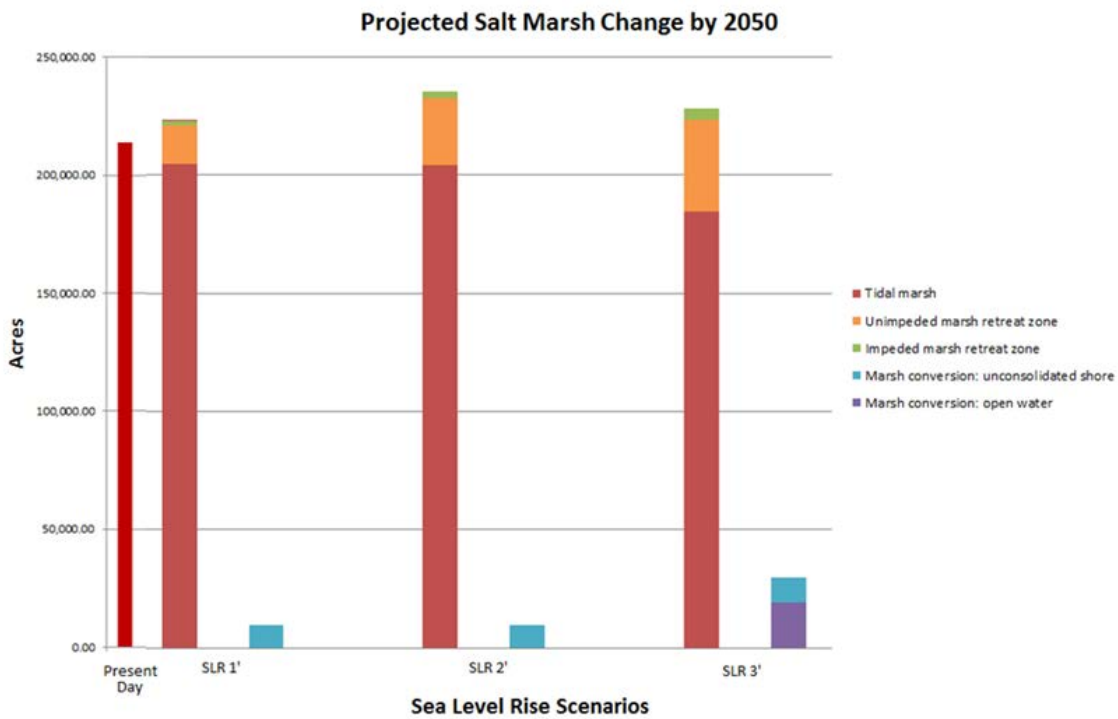
Graphic from http://www.epa.gov/climatechange/effects/downloads/section3_20.pdf

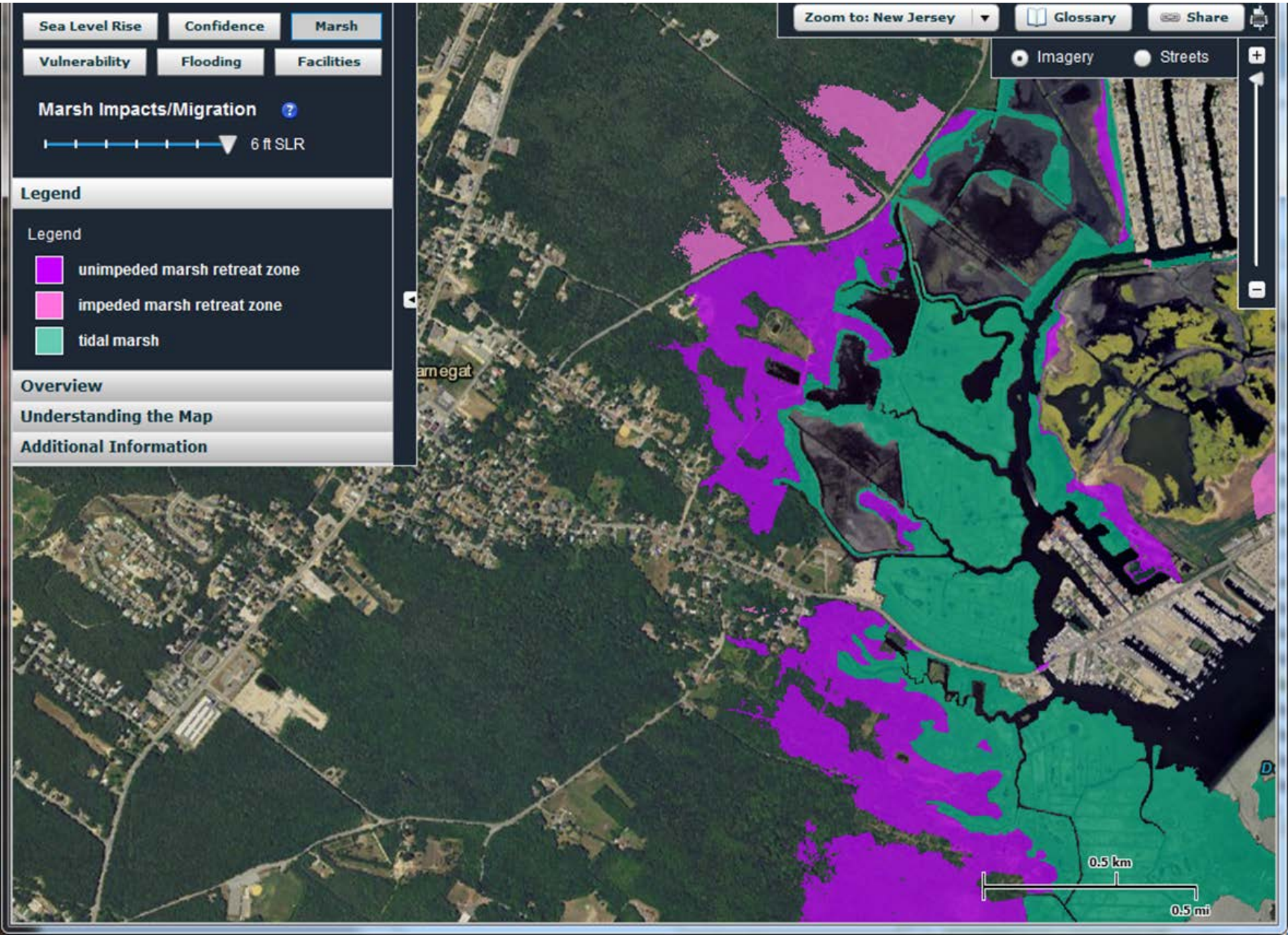
Modeling the Fate of New Jersey's Salt Marshes Under Future Sea Level Rise



Modeling the Fate of New Jersey's Salt Marshes Under Future Sea Level Rise

DESCRIPTION	Baseline	1 ft SLR		2 ft SLR		3 ft SLR	
	acres	acres	% change	acres	% change	acres	% change
Tidal salt marsh	213,977	204,340	-4.5%	204,195	-4.6%	184,295	13.9%
Unimpeded marsh retreat		16,631	NA	28,220	NA	39,072	NA
Impeded marsh retreat		1,955	NA	2,980	NA	4,764	NA
Marsh conversion: uncon. shore		320	+0.1%	326	+0.1%	19,276	+9.0%
Marsh conversion: open water		9,316	+4.4%	9,455	+4.5%	10,406	+4.9%




Sea Level Rise
Confidence
Marsh
Vulnerability
Flooding
Facilities
Marsh Impacts/Migration
6 ft SLR
Legend
Legend
unimpeded marsh retreat zone
impeded marsh retreat zone
tidal marsh
Overview
Understanding the Map
Additional Information
Zoom to: New Jersey
Glossary
Share
Imagery
Streets
0.5 km
0.5 mi

Maintaining/restoring salt marshes long term

PARTNERSHIP FOR THE DELAWARE ESTUARY INC.

BARNEGAT BAY PARTNERSHIP
RESEARCH · EDUCATE · RESTORE

AMERICAN LITTORAL SOCIETY
Coastal Conservation

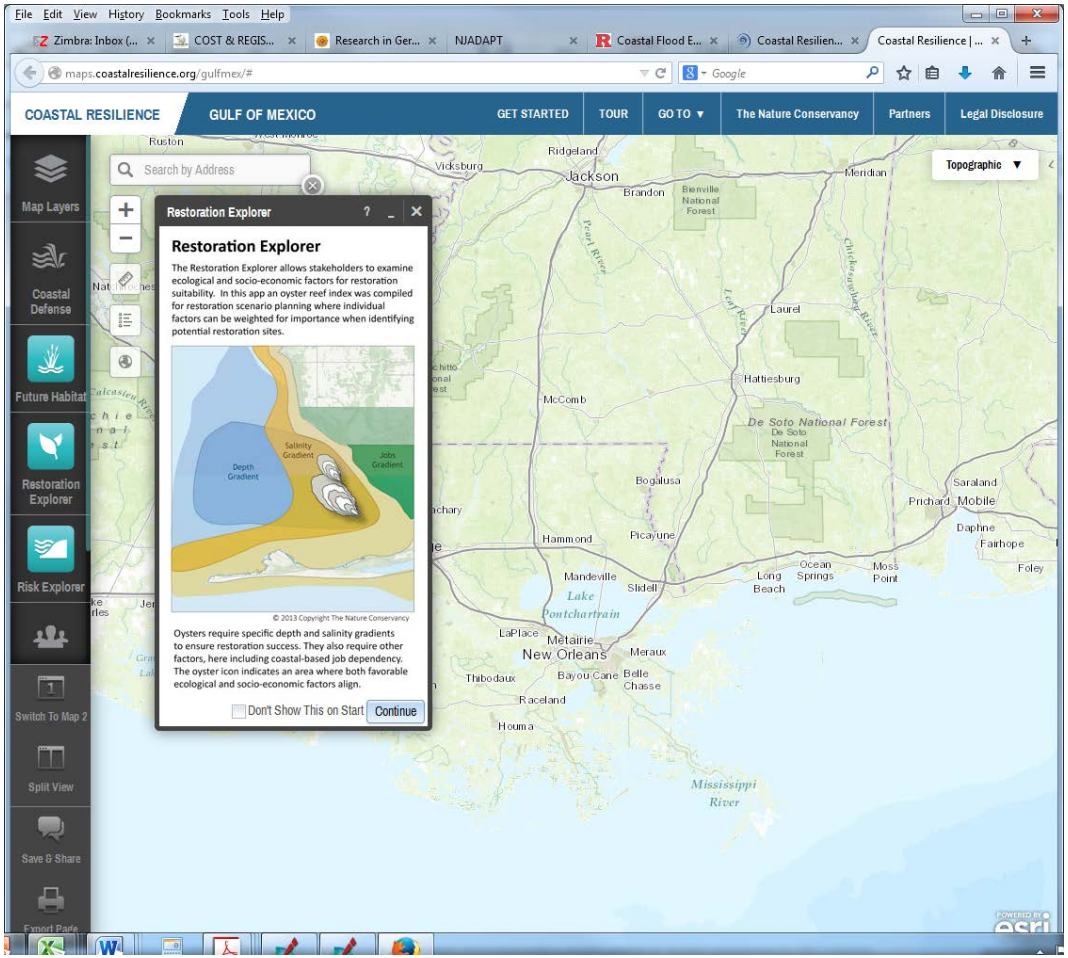
The Nature Conservancy
Protecting nature. Preserving life.

CoastalResilience.org
Restoration Explorer for New Jersey

The Nature Conservancy
Protecting nature. Preserving life.

STEVENS
Institute of Technology

Grant F Walton
CRSSA
Center for Remote Sensing & Spatial Analysis



Coastal Training Program
Jacques Cousteau

Barnegat Bay Partnership
Research · Educate · Restore

Create an Account | Log In

Home Climate Change Linkages FAQ Tutorials Flood Mapper C

Getting to Resilience
A Community Planning Evaluation Tool

This online self assessment process is a tool to assist communities to reduce vulnerability and increase preparedness by linking planning, mitigation, and adaptation. Through this assessment you will find out how your preparedness can be worth valuable points through FEMA's Community Rating System and Sustainable Jersey.

Plan for your community's future in the face of climate change **Get Started Now**

HOW DO I GET TO RESILIENCE?

Enabling communities to be prepared and more resilient.

Map Flood Vulnerability 1
This user-friendly online flood mapper will help you better visualize your community's susceptibility to flooding and sea level rise.

Assemble Municipal Plans 2
The Community Plan Checklist includes a list of municipal and county documents that may assist you in the completing your evaluation.

Complete the Evaluation
Identify planning, mitigation, and adaptation opportunities to reduce vulnerability to flooding and sea le rise and build capacity for commu resilience.

Discover Links with Other Municipal Programs 4
This tool will help you identify connections between preparedness and programs like FEMA's Community Rating System, Hazard Mitigation Planning and Sustainable Jersey.

Explore Related Resources
Additional tools and best management practices that will help you with vulnerability assessments, outreach, integrated planning, storm preparedness and mitigation.

FEMA

Plan for the Future

Coastal Management Program

Climate Ready Estuaries EPA

Sustainable Jersey Certified

www.PrepareYourCommunityNJ.org

NJADAPT

Visualization & Information capture through map/graphics

Flood Exposure Profile

Help jump-start your community discussions about hazard impacts with maps of your area that show people, places, and assets exposed to coastal flooding. The map data and the discussions spurred from these maps are valuable and applicable to a variety of community planning processes—from comprehensive land-use to hazards mitigation and conservation planning.

Launch Site

Visualize exposure & sensitivity

NJ FloodMapper

The NJ FloodMapper is a user-friendly visualization tool for local communities who need to make decisions concerning flooding hazards and sea level rise. This website should be used to promote enhanced preparedness and land use planning decisions with considerations for possible future conditions.

Launch Site

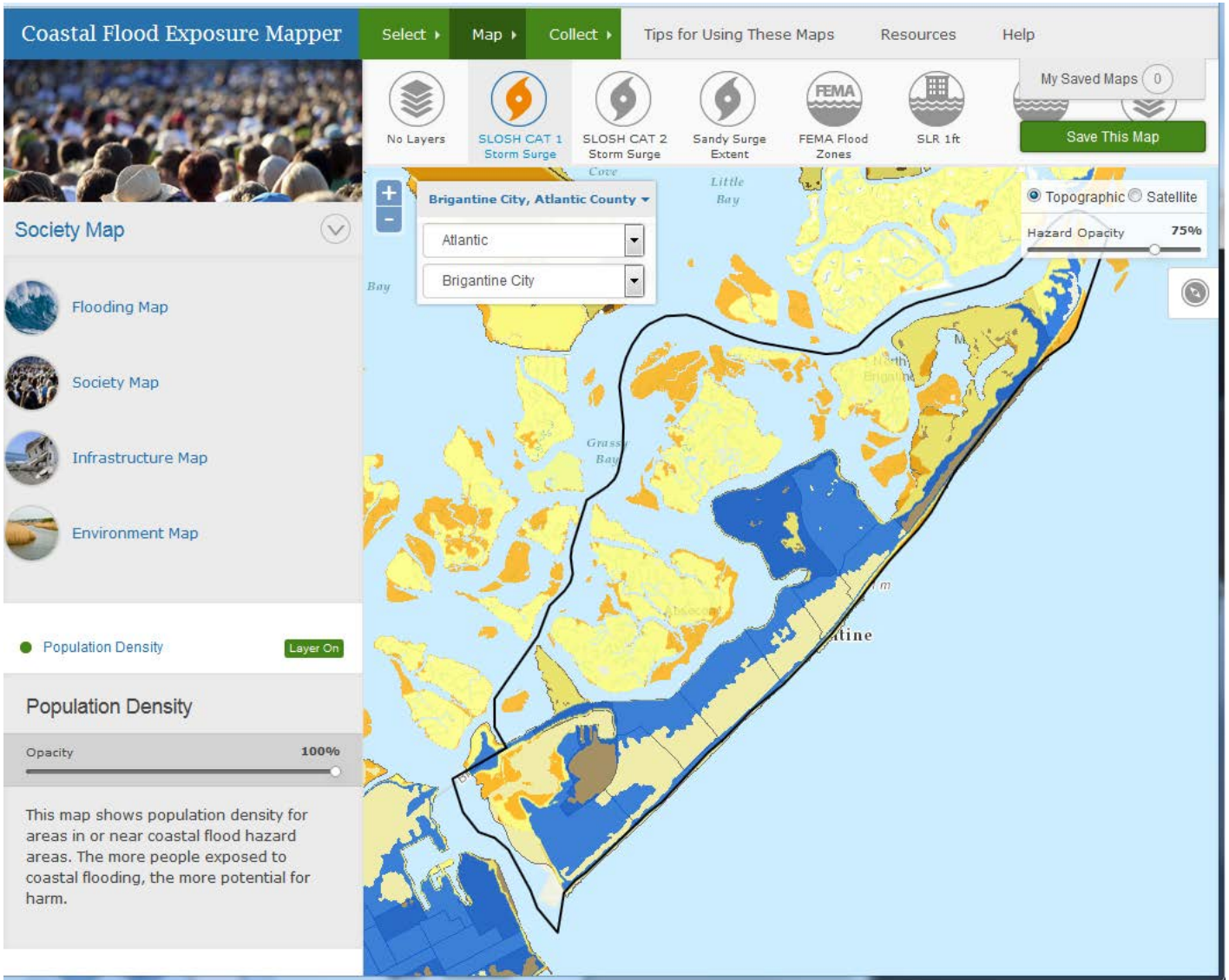
Preparedness Assessment

Getting To Resilience

This online self-assessment process is a tool to assist communities to reduce vulnerability and increase preparedness. Through this assessment you will find out how your preparedness can be worth valuable points through FEMA's Community Rating System and Sustainable Jersey. Also the outputs provided at the completion of the questionnaire can strengthen local/county all-hazards and emergency operations plans.

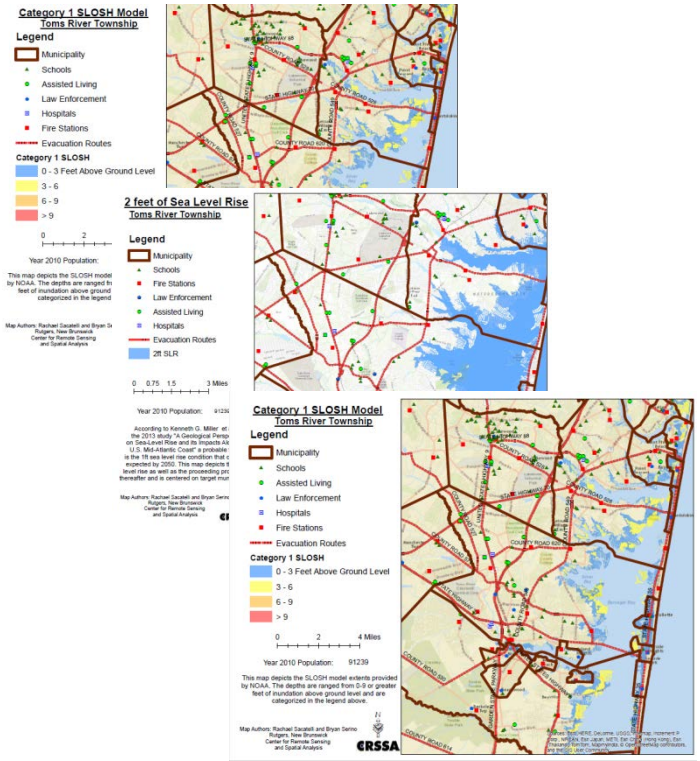
Launch Site

NJAdapt Coastal Flood Exposure Profiler



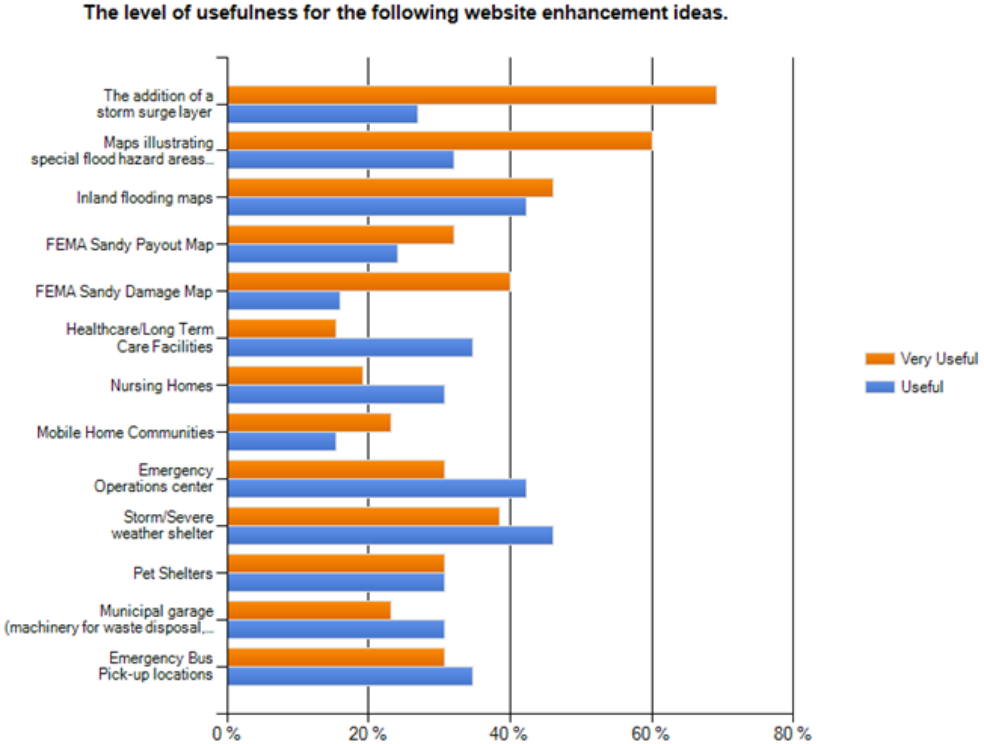
Municipal Profiles

“map-packs”



Summative Evaluation

How useful are these tools?
How can they be improved?



Sea Grant
NJ Sea Grant Consortium

Implement and Adapt

Ocean County HMP

Search this site

Navigation

- Welcome to the Ocean County 2013 Hazard Mitigation Plan Project Website
- About the Project
- What is Hazard Mitigation?
- Announcements
- Project Calendar
- Project Partners
- Project Documents
- Contact the Team
- Ocean County Online

Hazard Mitigation Links

- FEMA Mitigation Home Page
- FEMA Mitigation Planning Home Page
- FEMA Mitigation Grants Home Page
- New Jersey Office of Emergency Management Home Page
- New Jersey Department of Environmental Protection Home Page

Welcome to the Ocean County 2013 Hazard Mitigation Plan Project Website

Coastal Training Program Jacques Cousteau National Estuarine Research Reserve

Rutgers Edward J. Bloustein School of Planning and Public Policy

NJ Coastal Management Program

Urban Coast Institute Monmouth University where leaders look forward

New Jersey Future

Barnegat Bay Partnership Research · Educate · Restore

Partnership for the Delaware Estuary Inc.

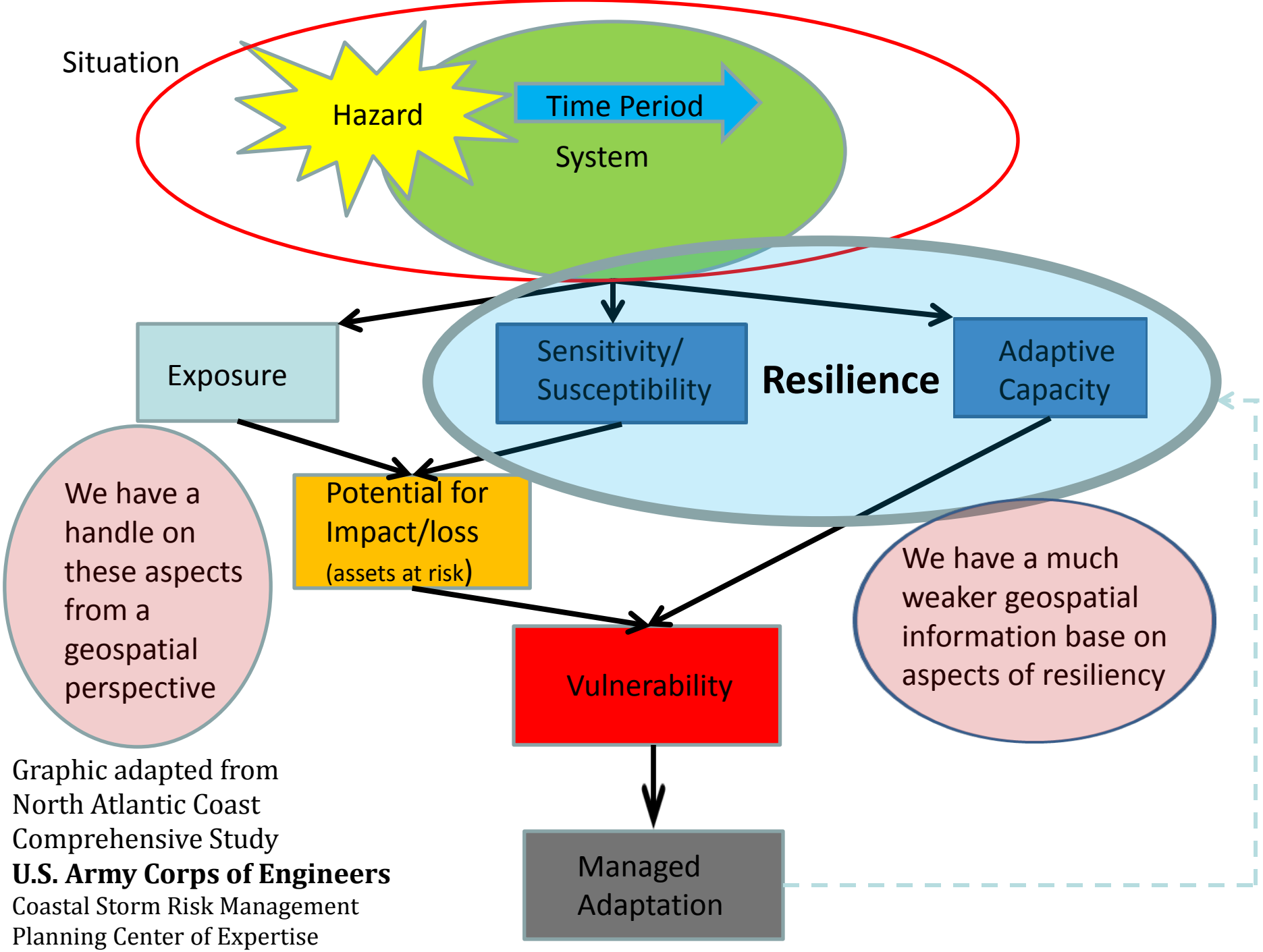
Coastal Community Resiliency Progression

Understand the Issues

Assess Risk and Vulnerability

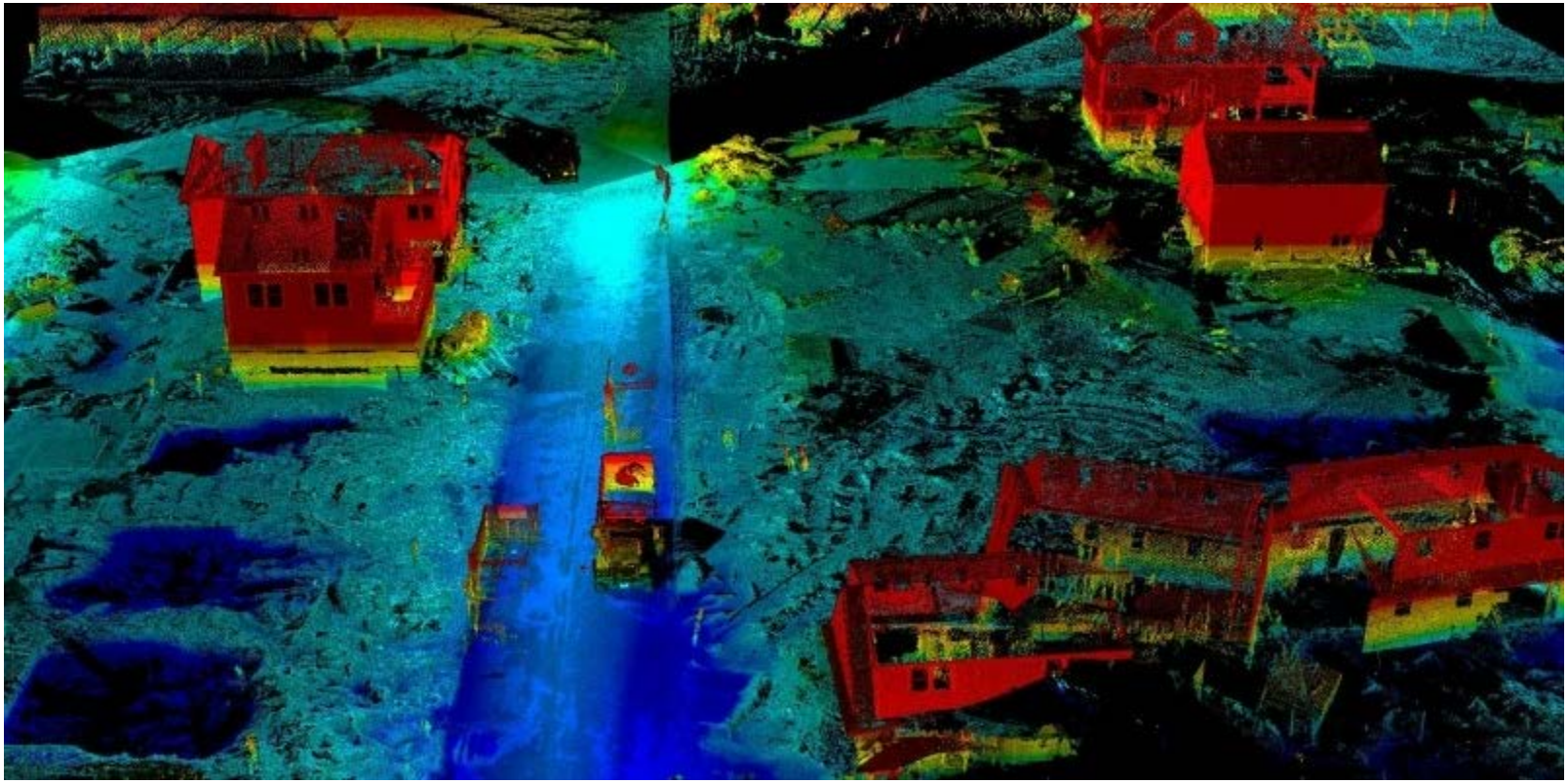
Plan for the Future

Implement and Adapt



Graphic adapted from
North Atlantic Coast
Comprehensive Study
U.S. Army Corps of Engineers
Coastal Storm Risk Management
Planning Center of Expertise

Assessing Sensitivity



Jie Gong of Rutgers School of Engineering is employing mobile LiDAR to map building footprints, elevation and post-storm damage to inform rebuilding and recovery efforts

2 Design Considerations in Floodproofing

The most effe
not feasible
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or nuisance floodin

The development
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  standards,
  (Section 2
- **Design l**
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  (Section 2
- **Flood ch**
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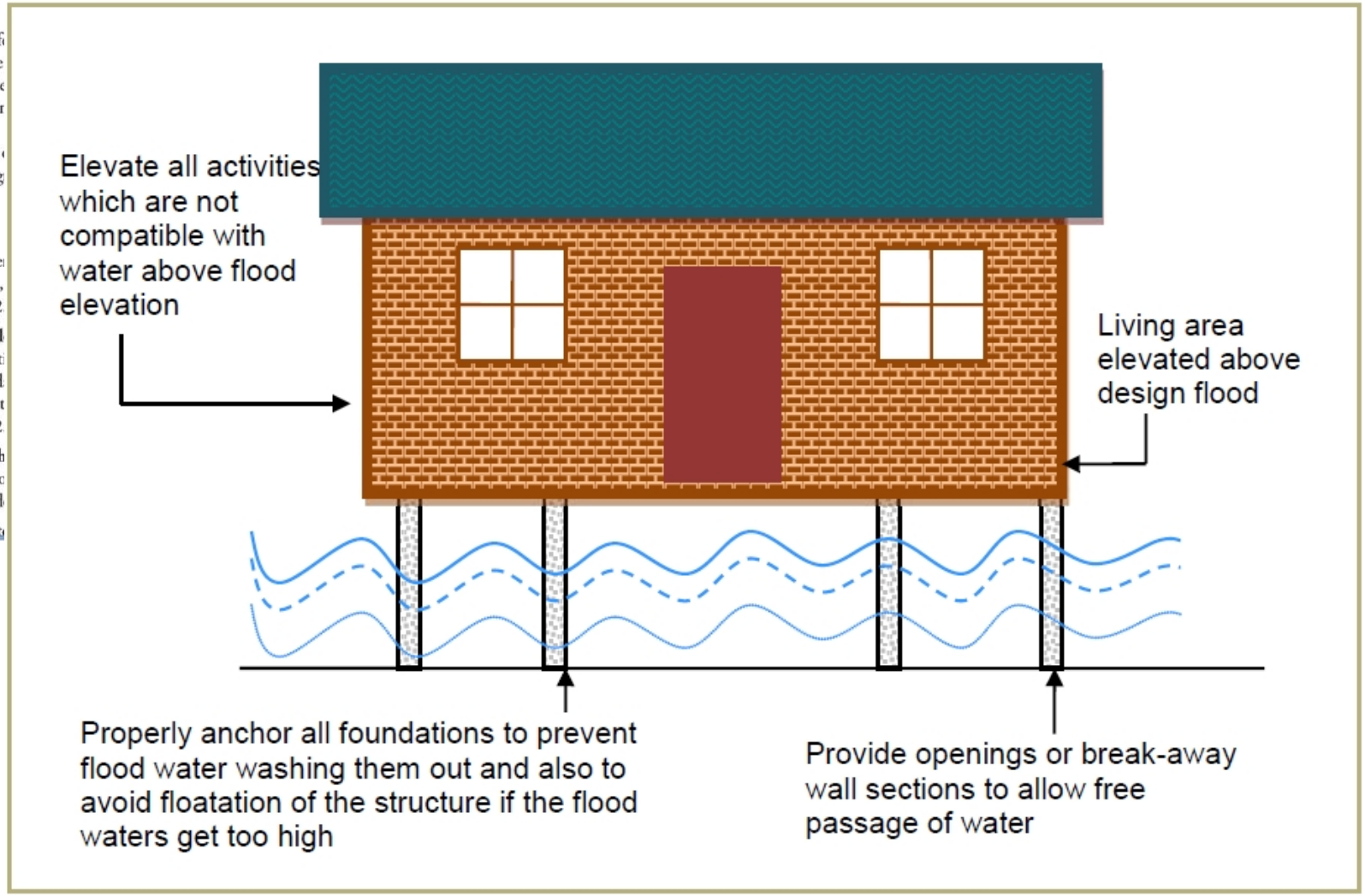
  and fall, fl
- **Site fact**



http://www.climatetechwiki.org/sites/climatetechwiki.org/files/images/extra/media_image_1_17.jpg

Closing Thoughts: Information

- Our efforts at developing geospatial information and tools relevant for place-based decision-making
- The NJ Coastal Flood Exposure assessment represents one approach at assessing coastal flood hazard statewide.
- While we have a good handle on mapping coastal flood hazard exposure, we have a ways to go on assessing sensitivity and adaptive capacity: 2 key aspects of resilience.
- Maintaining NJ’s Salt Marsh long term will require consideration of both seaward edge erosion, vertical accretion as well as landward progression

Closing Thoughts: Tools

- WebGIS tools, such as *NJFloodMapper*, can provide access to critical place-based information on coastal flood exposure and potential vulnerability.
- Leveraging national-scale effort with locally-refined geospatial data and functionality is a good model.
  - Providing a local scale – municipal focus
  - Adding local data and functionality requested by the community
- The user-centered design process was central to that elusive goal of “virtual accessibility.”
  - Fostered connection to target audience.
  - Promoted greater acceptance once tool was released.
- Even with great tools still need a personal touch through in-the-field outreach and assistance

Key Websites:

- Coastal Flood Exposure Profiler
  - Njadapt.org
- NJFlood Mapper: visualizing SLR
  - NJFloodMapper.org
- Getting To Resilience: A Community Planning Evaluation Tool
  - Prepareyourcommunitynj.org
- NJ Climate Adaptation Alliance
  - Climatechange.rutgers.edu