

## **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.

The evaluator group was briefed on the reasons for and the objectives of the usability testing. They were instructed to review each of the web-based tools from the perspective of a user visiting the site for the first time. Feedback forms with a consistent set of evaluation questions were provided to the evaluators for each of the websites. Evaluators were instructed to fill out the feedback forms to the best of their ability and to provide any additional comments. A total of two and a half hours were provided for the individual review.

The following web-based tools were evaluated using the usability testing method:

NOAA Coastal Services Center - Galveston, TX  
(Not a publically available website)

The Nature Conservancy – Long Island Sound  
<http://futurescenariosmapper.org/>

Sea Level Rise for Wilmington, Delaware  
[http://csc-s-web-p.csc.noaa.gov/de\\_slr/](http://csc-s-web-p.csc.noaa.gov/de_slr/)

Visualizing California sea level rise  
<http://www.climatechange.ca.gov/visualization/sealevel.html>

Impacts of Sea Level Rise on the California Coast  
[http://www.pacinst.org/reports/sea\\_level\\_rise/gmap.html](http://www.pacinst.org/reports/sea_level_rise/gmap.html)

Galveston Coastal Hazards Report form  
<http://www.pcwp.com/rareport.html>

Questions on the each of the web-based tools were:

- What did you like **MOST** about this website/report?
- What did you like the **LEAST** about this website/report?
- Thinking specifically about **INFORMATION/DATA** presented on this website/report, what **INFORMATION/DATA** do you think will be **MOST IMPORTANT** to coastal decision makers?
- Please fill in the blank: The addition of \_\_\_\_\_ would improve this website/report for me.
- Please list one (or more) thing(s) you would change about this website/report in order to enhance the users' experience and/or comprehension of the information.

- Please rate the overall **“USER FRIENDLY” NATURE** of the website/report using the following scale:

Not at all      Not Very      Somewhat      Very      Extremely

- Please rate the overall **EFFECTIVENESS** of the website/report using the following scale:

Not at all      Not Very      Somewhat      Very      Extremely

Evaluators were also instructed that after reviewing each of the web-based tools individually, a focus group format would be used to facilitate dialogue and feedback on each of the web-based tools.

Approximately one hour was spent reviewing each of the web-based tools using the focus group format. This was done with each of the websites projected on a large screen in front of the evaluators. Each web-based tool was reviewed separately before moving onto the next. Evaluators were asked to comment on both the positives and the negatives of each of the tools. Notes were recorded by the facilitator throughout the discussion.

At the completion of the Usability Testing Session, all written comments were collected. These were typed into an electronic format through the assistance of a JC NERR volunteer. Collated comments were reviewed to note duplicities and improve comprehension. Clear themes and preferences were evident through review of the evaluators’ comments. They are presented in the “Results” and “Conclusions” sections of this document. All collated comments are presented in “Appendix A”.

**Results:**

***The Utility of Sea Level Rise Information***

The evaluators had a variety of reasons they were interested in viewing sea level rise information:

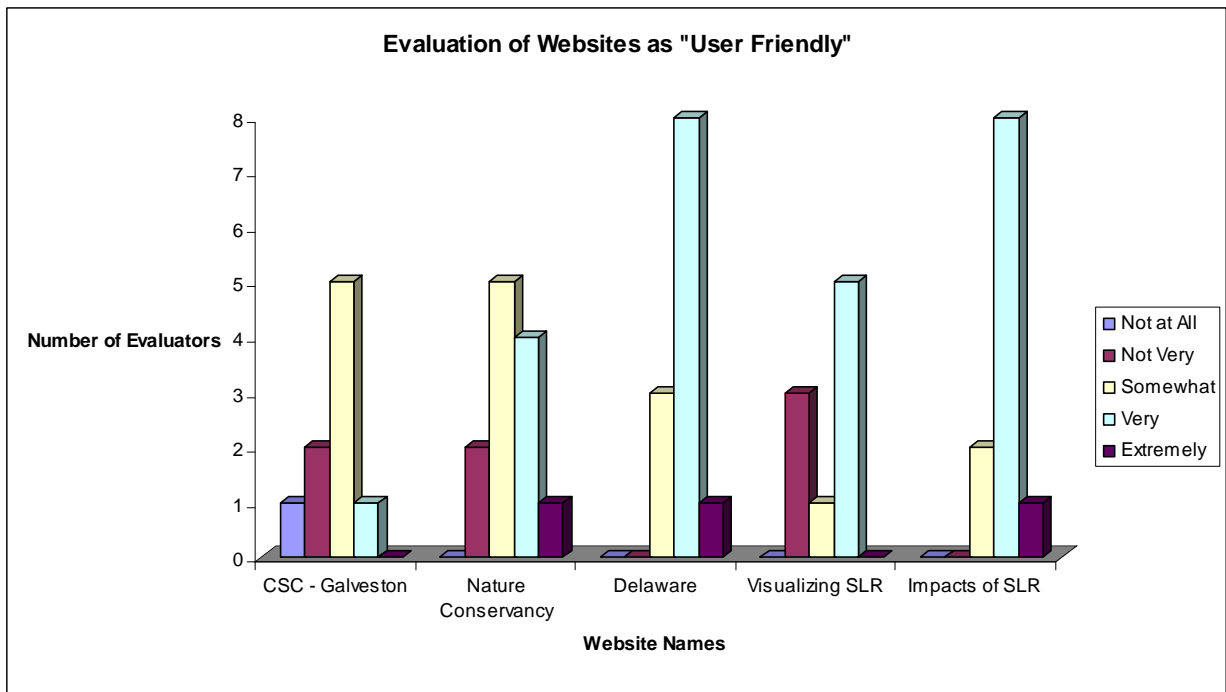
- Public outreach in parks
- To gain a “simple” understanding
- To be an informed member of a local Council
- To help understand future tidal flow exchange for preserved areas
- Developing adaptation strategies
- Emergency response
- A useable/credible source for data dissemination
- As a homeowner
- For habitat/wildlife conservation

- Marsh monitoring and migration
- Land acquisition
- Vulnerability now and into the future

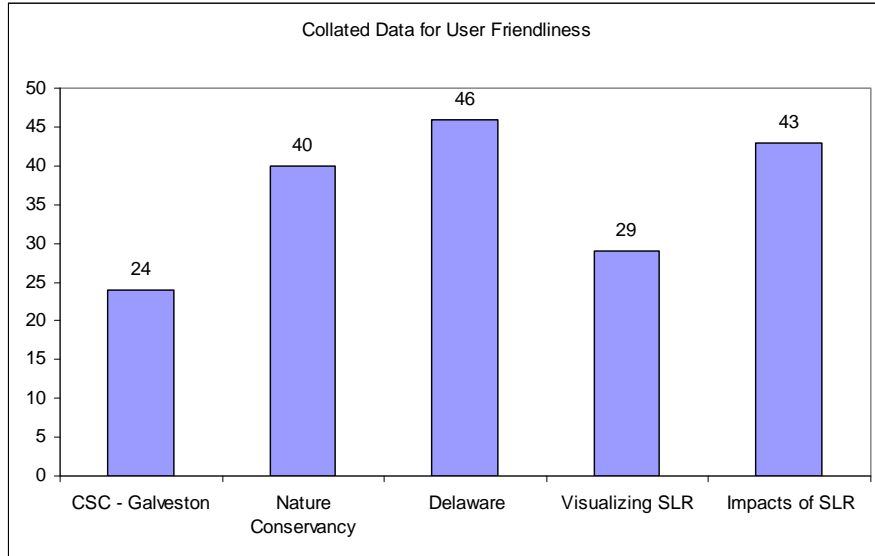
Their perspectives on the utility and use of this information is the lenses with which the results and recommendations of this evaluation should be interpreted.

***Rating of "User Friendliness"***

Evaluators were asked to rate the overall "user friendliness" of each of the websites on a likert scale (see methods section). The following graph illustrates the range of rating data:



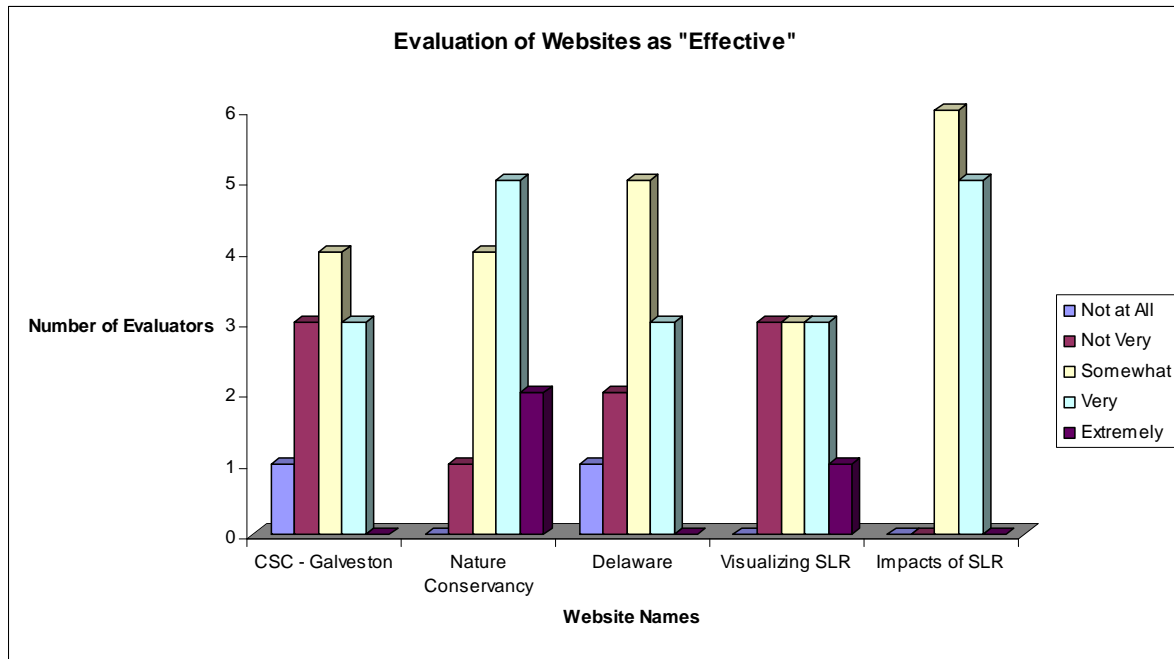
By assigning a point value to each of the ratings (Not at all = 1, Not very = 2, Somewhat = 3, Very = 4, Extremely = 5) and then summing the points, a more clear trend is illustrated:



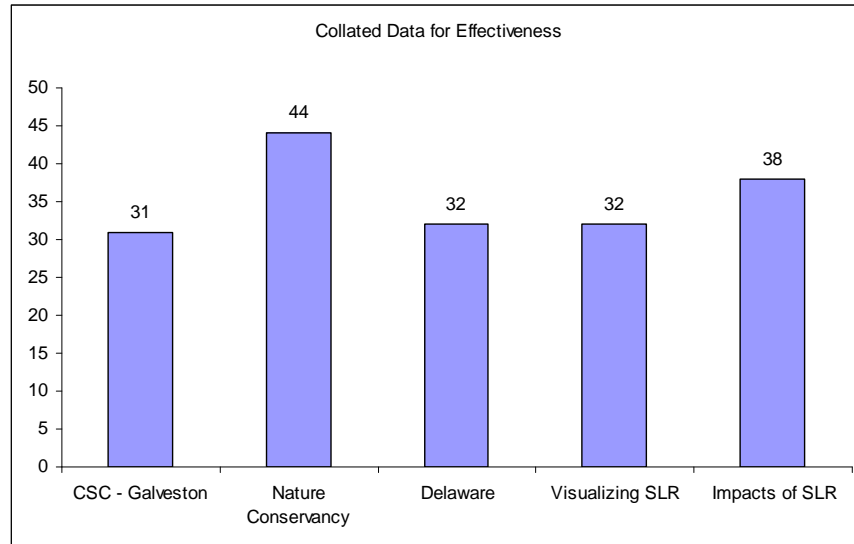
The rating suggests that the "Sea Level Rise for Willington, Delaware" website and the "Impacts of Sea Level Rise on the California Coast" website were ranked most user friendly, respectively. The third most user friendly website was the "Nature Conservancy - Long Island Sound" website.

***Rating of "Effectiveness"***

Evaluators were asked to rate the overall "effectiveness" of each of the websites on a likert scale (See methods section). The following graph illustrates the range of rating data:



By assigning a point value to each of the ratings (Not at all = 1, Not very = 2, Somewhat = 3, Very = 4, Extremely = 5) and then summing the points, a more clear trend is illustrated:



The rating suggests that the "Nature Conservancy - Long Island Sound" website and the 'Impacts of Sea Level Rise on the California Coast' were ranked most effective, respectively. The "Sea Level Rise for Willington, Delaware" and the "Visualizing California sea level rise" website" were equally ranked, followed by the CSC – Galveston website.

### ***The "Must Haves" for a Sea Level Rise Viewing Website***

There were clear preferences for website look, function and usability voiced by the evaluators. No one website had all the aspects that the evaluators found most favorable. The following are a review of the functions, tools and aspects found to be most useful to the evaluators. If combined into one website, these functionalities would best satisfy this evaluator group.

- ***Definition Terminology*** - Any word that could be considered "jargon" needs to be defined (i.e. vulnerability, resilience, sustainability and demographics). Evaluators thought that the information provided under these categories was extremely useful, but the lack of a clear meaning for the terminology hindered the connection between why this information was presented and why it is important in terms of planning for sea level rise.

- ***A Picture Tells a Thousand Words*** - Utilizing pictures, especially pictures of “places of interest” was highly reviewed. The Coastal Services Center’s website illustrates pictures of water level increase, increase in sea level rise, and storm surge. These images were reviewed very positively.
- ***A Slider Bar is Effective*** - Evaluators liked the ability to use a slider bar to manipulate the sea level rise and storm surge scenarios. One additional note – evaluators were very interested in having the option to choose from a variety of scenarios of sea level rise and storm surge.
- ***Provide background and justification*** – Evaluators liked the idea of knowing where the data and the statistics were derived from. Sites which provided this information evoked an added level of credibility and confidence in the data. Evaluators suggested not only citing the metadata, but linking to it where possible. Evaluators also liked the idea of having links where additional information on sea level rise/climate change/coastal hazards could be found.
- ***Website Introduction/Overview and Directions are Critical*** – Upfront, the evaluators wanted to know what they were looking at and how to interact with the website. They liked the idea of having an introduction page or panel which told the user what to expect from the website, and also gave an overview of some of the general functions of the website.
- ***Help, Tutorial, FAQ’s, Keys, Legends, Roll Over Descriptions and a Search Box are Important*** – Evaluators wanted to have access to a “help” function, Frequently Asked Question Section and a tutorial as means to better understand how to use all the functions provided by a website. Website developers should err on the side of over explaining what is being presented. Suggestions were made to have an easy to use tool bar with a roll over feature to help give additional information about the use of each tool. This was especially noted for the use of the slider bar to manipulate sea level rise/storm surge.
- ***Data Layers are Useful*** – Evaluators liked the idea of viewing many different types of data layers, with the additional ability to turn on and off layers to view all, some or none at their discretion. Layers that were found to be most useful were demographics/social vulnerability, evacuation routes, vulnerable infrastructure, population density (including seasonal population density), marsh

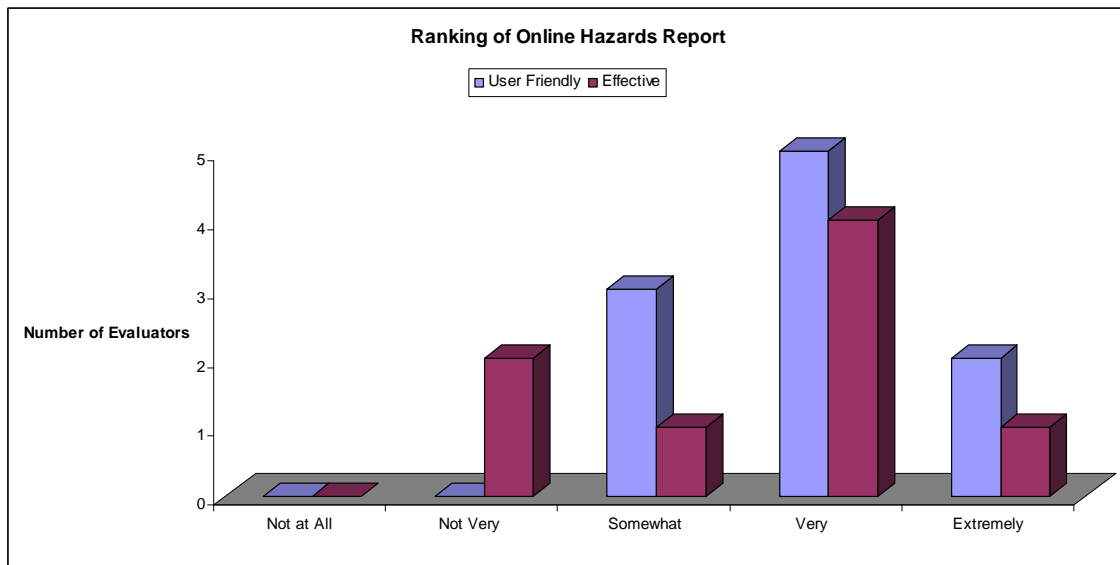
information, and emergency response layers (i.e. shelters, schools, police and fire stations, hospitals, etc.). Evaluators liked having a description of each layer, but wanted to make sure that this was collapsible. It was also noted that providing the ability to change the opacity of layers was also a nice feature. The evaluators liked the idea of having the ability to move the layer bar so that it would not block relevant portions of the map.

- ***Website Interactivity such as User-defined Analyses and Scenarios*** – Evaluators preferred having the option to run their own analyses and scenarios of the data. The Nature Conservancy Website provided this feature. Evaluators also wanted the ability to choose a specific town/municipality before running the scenarios. This feature would allow the information to be provided in a more “specific” manner. The ability to download or export the analysis so that it could be shared with other decision makers was also highly reviewed.
- ***Allow for Map/Analyses Download*** – Evaluators wanted to have the ability to download and save the maps/analyses that they viewed. Specifically, evaluators requested maps/analyses to be downloaded in formats such as PDF files, GIS files or KMZ. In the case of having PDF download option, this would allow for maps and data to be shared easily with others. Additional information about the evaluators’ opinions on the PDF “report” reviewed is discussed later. If GIS or KMZ files were available, it could allow for additional data analysis by end users that had the skills/ability to do so.
- ***Google-maps Platform was User-Friendly*** – Evaluators liked the usability of the websites which displayed information using the “Google Maps” platform. They indicated that they were comfortable with this type of website, and also liked having the ability to switch between the “map, satellite and hybrid” map types. Websites that required “plug-ins” or had a long download time to show the data, were not as well reviewed for usability.

### **Feedback on the “Report”**

In addition to reviewing websites, evaluators were asked to review an online report which illustrated the effects of coastal hazards on Galveston, Texas.

Evaluators were asked to rate the Report’s “User Friendliness” and “Effectiveness”, using the same scales as used for the websites. The following graph illustrates the range of rating results:



The rating results suggest that this online report was both “User Friendly” and “Effective” as presented. Future development of online reports should take into account the positive and negative feedback learned from the evaluators’ comments on the Galveston report. These suggestions are summarized below.

The following list summarizes the overall *positive feedback* suggested regarding the Report format and content:

- The report provided a fairly quick way for someone to determine potential impacts.
- Data was explained in a clear, easy to understand nature.
- A variety of categories of impacts were presented.
- Details were explained about each of the categories of impacts presented.
- Information about storm surge was also presented.
- This type of report would be good to have for future planning purposes.

The following list summarizes the overall *suggestions for improvement* regarding the Report format and content:

- Evaluators wanted the ability to print this out as a PDF file.
- Maps and charts need to be large enough to be clearly read.
- Legends and scales need to be included on maps.
- More information could be provided on the predicted social, infrastructure and economic impacts.
- Metadata and methods were not provided.

- A “What does this mean” section would help with understanding the information presented.
- The addition of photos would greatly enhance the impact.
- The disclaimers should be more carefully written to not discredit the information presented.

**Conclusions:**

The evaluation results provide clear preferences to consider when designing a Sea Level Rise vulnerability website. While each website had some positive functionality, no one provided all the functionalities that were most desirable to the evaluators. A combination of the websites evaluated may be the best model for an “Ultimate Sea Level Rise Vulnerability website. The look and functionality of this Ultimate website needs to include the following:

- The ability to view( and later hide) a variety of data layers (i.e. demographics/social vulnerability, evacuation routes, vulnerable infrastructure, population density (including seasonal population density), marsh information, and emergency shelters, schools, police and fire stations, hospitals, etc.).
- A slider bar which will illustrate sea level rise and storm surge over a variety of scenarios/conditions.
- Pictures which show the impacts of sea level rise and storm surge on “places of interest”.
- A help and tutorial section .
- A jargon- free site with a “glossary” link.
- Metadata and methods provided to add credibility to the visualizations.
- A clear introductory/section on how to use the website, why it is being presented and where to get additional information.
- Allow users to download data either in a “report” format or as GIS/KMZ layers.

## Appendix A:

### Individual Feedback - Collated

#### NOAA Coastal Services Center - Galveston

- **What did you like MOST about this website?**
  - Idea of the banner running at the top – Including the four topic areas.
  - Definitions of these major topics should be provided
  - Especially useful was the “Cost for county” figure.
    - The use of the “radio” buttons
  - More detailed information correlating to the radio buttons could have been useful
    - The ability to choose the type of map background (i.e. map/satellite/hybrid)
    - This could definitely appeal to the technical person as well as the general public.
    - Graphic illustration/picture of areas affected by increase in SLR & storm
    - Easy to understand even by people who do not always deal with sea level rise on a regular basis
  - Could be both used by a technical person and a non-technical person
    - The ability to access both sea level rise and storm surge data.
  - The “add storm” feature was very useful for planning and evacuation
    - Storm & SLR slider is useful.
    - Information is concise.
    - The shared zone of influence was helpful.
  
- **What did you like the LEAST about this website?**
  - More directions/explanations necessary
    - What am I looking at?
    - How do I use this tool?
    - Scale bar is upside down – put miles on top
    - Could not figure out that I had to click on an actual site
  - Better descriptions of visualization
    - Chance of hurricane strike - is this in a given year, decade, century?
    - It did not give the percentage of areas that would be flooded.

- Data doesn't automatically update statics on feet deep when you click on a new point
  - Did not provide information on how stats were derived.
  - Wasn't giving number of schools, houses of worship, etc.
- Too much white space at bottom – map could be sized better.
- Could not find a search box on home page
- Doesn't let you zoom effectively
- No description of what vulnerability, resilience, sustainability & demographics mean to a “lay person”.
  - Didn't get relation of data displayed to resilience/sustainability.
- Missing a FAQ section
- You cannot multi-select points on the map and no drop-down menu of points
- No place to download data
  
- **Thinking specifically about INFORMATION/DATA presented on this website, what INFORMATION/DATA do you think will be MOST IMPORTANT to coastal decision makers?**
  - Idea of vulnerable infrastructure
  - Population centers & where it floods
    - I am unsure if the highest social vulnerability is related to population or income level.
    - Need population density in demographics
  - Vulnerability & resilience in case of storms
  - For emergency response
    - Knowing where schools and other facilities are is very useful
    - Listing of potential hazards (i.e. leaking tanks also important factor in clean-up.
    - Make sure that it is more obvious that emergency response is listed under resilience
  - Demographics/social vulnerability
  - The storm surge and SLR data, viewing the areas as they fill with water.
  
- **Please fill in the blank: The addition of \_\_\_\_\_ would improve this website for me.**
  - Directions
  - Terminology definition; also report generation feature
  - A key
  - Search box
  - Show where 1<sup>st</sup> responders and shelters are located
  - Layer selection
  - Help/tutorial/FAQ's

- No clear explanation of how to use the map or what it means to average citizen.
- Information on how the slider works
- **Please list one (or more) thing(s) you would change about this website in order to enhance the users' experience and/or comprehension of the information.**
  - Shouldn't have to click on a HUD site to view scenarios.
  - Not sure what "feet deep site" under vulnerability means.
  - Visually the ribbon graphics are overwhelming
  - An average user is not clear how sustainability plays into this.
  - Add location of water & wastewater facilities, subsurface sewer lines, and electric power stations.
  - Add a text listing of HUD sites by geographical area
  - The ability to pick your own layers.
  - Better directions and descriptions.
    - I had no idea what the symbols on the map meant.
  - Definitions/explanation of terms (vulnerability, resilience, sustainability)
  - A greater number of HUD sites
  - Add a glossary of terms
  - Explain why things are included in each category. (i.e.. why are # of places of worship under "resiliency"
  - The ability to click on any area in the map & see the statistics.
  - Information on the impact to wildlife, fisheries, economy.
  - An explanation of how this is determined/calculated and probabilities associated with this scenario.
- **Please rate the overall "USER FRIENDLY" NATURE of the website:**
  - Not at all - 1
  - Not Very - 5
  - Somewhat - 5
  - Very - 1
- **Please rate the overall EFFECTIVENESS of the website:**
  - Not at all - 1
  - Not Very - 3
  - Somewhat - 4
  - Very - 3
  - Additional Comments:
    - I think that this site has HUGE potential, but must be more "user friendly".
    - Wasn't sure what I was looking at or the value of the information displayed - no confidence in the data.

Demographics and geographic data ok – but vulnerability, resilience and sustainability were not helpful.

- **Comments During the Focus Group**
  - There was no help or directions
  - There was no legend
  - You cannot select more than one site at a time
  - “Sustainability” as a term was not intuitive
  - They liked the “grayed out” circle
  - Loved the pop up picture
  - It was missing OEM features, like emergency shelters
  - Missing a lead into what was being viewed
  - The “evacuation routes” did not flood
  - Missing the treatment plants and homes on septic
  - Missing total number of people and population density
  - Liked the ribbon graphic but too much going on in one area
  - Thought there could have been less use of white space
  - Liked the ability to choose the different background maps
  - There needs to be more information on the items contained in the ribbon graphic
  - The slider is a very good feature, if there were directions on using it
  - They liked both having sea level rise and storm surge as an option for viewing
  - Add a scroll over to get more details about the functions

## **The Nature Conservancy – Long Island Sound**

<http://futurescenariosmapper.org/>

- **What did you like MOST about this website?**
  - Interface
    - Moveable legend
    - Google based
    - Split screen feature
    - Ability to get to more data
    - Pleasant to the eye (color)
    - Liked the “visible layer sorter”
    - Preformed analysis great!
    - Variety of factors able to be included in scenarios
    - The ability to choose towns for specific analysis results
    - Easy to understand tool bar.

- The thorough explanations that go along with layers
- Good “help” area and appreciate the “tutorial”
- Information on both wildlife habitat and human vulnerability in sea level rise
- The ability to pick the layers you want to see and being able to see multiple layers at one time (i.e. extensive information)
- The marsh information was excellent
- The metadata methods & descriptions of caveats & limitations of the data
  - Instills confidence in the data
- Having the ability to choose diff. years for sea level rise & storm surge level.
  
- **What did you like the LEAST about this website?**
  - Not for the average user
    - Not intuitive to use if you are not used to ARC view or other similar GIS tools
  - Too much information/detail
    - The main points do not catch a person’s attention
    - Seems complicated without directions
  - Not enough context to explain variables/inputs
  - Graphics extremely slow to load. Don’t know if it is the site or not
  - Needs more options for flood scenarios
  - “Clumping” of areas can be confusing
  - I wasn’t able to use any of the tools.
    - All my requests failed
    - Gave me an “at capacity” message from the site.
    - Once you select layers, you should have a separate key that pop us to show you the layers you have on.
  - Cannot collapse or minimize the visible layer sorter.
  - Cannot drag the map round the screen to move to different sites
  - Not easy to change from various scenarios to the analysis function
  
- **Thinking specifically about INFORMATION/DATA presented on this website, what INFORMATION/DATA do you think will be MOST IMPORTANT to coastal decision makers?**
  - Storm surge & sea level rise under different scenarios
  - The ability to clock on & off layers
  - Locations at wave energy – this is a very nice overlay
  - Seasonal population density
  - Information on elevation for 1<sup>st</sup> responders’ location, etc.
  - The ability to see where and when the datasets were taken.

- Physical features group information
  - The “perform analysis” option
  - How to use this site
  - The economic impacts & various scenario options you can choose.
  - The various levels/layers including description and metadata were very helpful.
  - The “perform analysis” menu driven feature with various scenarios
- **Please fill in the blank: The addition of \_\_\_\_\_ would improve this website for me.**
    - Directions as intro page
    - Easier user interface
    - Report generation feature
    - Better layout
    - More flood scenarios
    - SLR impact using a sliding scale
    - Help tools
    - higher volume capacity
    - More explanation of how to interpret the analysis
    - Photography
- **Please list one (or more) thing(s) you would change about this website in order to enhance the users’ experience and/or comprehension of the information.**
    - Too many options (i.e. if a user has this much knowledge they can do the mapping themselves
    - In its current form I don’t see the average municipal leader using this.
    - Maybe add sections on highest population density.
    - Indicate on map what the color coded areas are currently displaying.
    - Eliminate pastoral scene
    - Condense the information
    - User format
    - Placement of menu
    - Addition of a sliding scale for SLR visualization
    - Marsh data update.
    - Maybe “too much info” for general public.
    - Change the visible layer sorter to a drop-down instead of having it permanently imposed, over the map.
    - A FAQ’s section.
    - I think a lay person/general public might be overwhelmed.

- Allow the menu (layer sorter) to collapse, I like to view the data displayed (i.e. GIS ARC view)
- **Please rate the overall “USER FRIENDLY” NATURE of the website:**
  - Not Very - 2
  - Somewhat - 5
  - Very - 4
  - Extremely - 1
- **Please rate the overall EFFECTIVENESS of the website:**
  - Not Very - 1
  - Somewhat - 4
  - Very - 5
  - Extremely – 2
  - Additional comments
    - The perform analysis was a very interesting feature. Needs some more work but could be a very good tool in the future. Best website out of the bunch.
- **Comments During the Focus Group**
  - Too complicated
  - Too long too load
  - There was an explanation for everything on the map
  - Couldn't collapse the side menu
  - Tools couldn't be used with everyone accessing
  - New data would be hard to add
  - Couldn't make SLR
  - Likes the option of energy (?)
  - LiDAR data is awkward
  - Liked the analysis tool, but had to click out and click back in
  - Split pane is good
  - Add the option to expand
  - Too much for the average user
  - Want the added ability to export KML files

## Sea Level Rise for Wilmington, Delaware

[http://csc-s-web-p.csc.noaa.gov/de\\_slr/](http://csc-s-web-p.csc.noaa.gov/de_slr/)

- **What did you like MOST about this website?**
  - The simplicity
    - Google interface

- Easy to use map features, including tool bar & map types (hybrid/satellite, etc.).
- Like term: “Places of Interest”
- Better use of screen space
- Slider bar feature
  - Being able to pick any height from 0 – 4 ft. was useful.
  - The ability to easily view the effects of sea level rise foot by foot
- Description on right
  - Only website with a brief explanation of what you are looking at.
  - Explains what it is & how to use it clearly on opening page.
- Shows where an area is mostly affected by storms/flooding – not just along the coast, but also back waters rise.
- Detailed attribute information for sites of interest.
  
- **What did you like the LEAST about this website?**
  - No description of potential sea level rise.
  - Flood layers are out of order on GIS Interface.
  - Not enough information
    - No detail of density of population, wildlife habitat, emergency shelters.
    - No info on infrastructure impacts, community impacts.
  - Lack of ability to check for detailed public services.
  - Map window was small
  - Places of interest icons should be removed at viewer’s will (i.e. Inundation effect is interfered with as currently presented)
  - The lack of data beyond the sea level rise.
  - Website did not take into account erosion
  - Lack of a timeframe
  - No indication of what predictions are based on
  - No information on methods, metadata, ability to download the data
  - If inundation was for entire area, what where the scenarios the slider bar referred to 2’ by 2020; storm surge?
  - Flood Frequency predictions view - Disconnect between pie charts and current storm tide & sea levels
    - Probably shouldn’t have been displayed on same screen.
  
- **Thinking specifically about INFORMATION/DATA presented on this website, what INFORMATION/DATA do you think will be MOST IMPORTANT to coastal decision makers?**
  - I like the fact sheet concept on the “flood frequency predictions” page
    - Could be more robust

- Having the ability to see the 1.6 ft : 3.3 ft. SLR would be even more helpful.
- Rate of flooding versus level area
- Areas impacted
- Evacuation, planning for permanent event
- The obvious visualization of coastal inundation
  
- **Please fill in the blank: The addition of \_\_\_\_\_ would improve this website for me.**
  - Allow users to download SLR PDF's or GIS
  - Vulnerability mapping
  - Detail
  - Demographics
  - More options
  - User directions
  - More places of interest
  - Concrete science information
  - Time frame & citations
  - Estimates of sea level rise in the future, environmental justice/population demographics
  - Info was too gross for this page to be helpful.
  
- **Please list one (or more) thing(s) you would change about this website in order to enhance the users' experience and/or comprehension of the information.**
  - Sea level rise visualization - I can't tell what are ponds versus new flooding – colors blend together too much.
  - What are projected rates?
  - A combination of features that were presented on the CSC websites
  - Links to additional resources
  - Add detail, population density, public service infrastructure, demographic information, evacuation routes, hospital/nursing homes, septic, storage tank locations.
  - Larger map window
  - Removal of places of interest icons (pointers)
  - Some info/background about current rate of rise & predicted acceleration rate.
  - FAQ's section
  - Color coding of level of flooding
  - Drop down to search for town/municipality/county.
  - This appeared to be an educational tool, but did not supply enough info for planning at local level.

- **Please rate the overall “USER FRIENDLY” NATURE of the website:**
  - Somewhat - 3
  - Very - 8
  - Extremely - 1
  
- **Please rate the overall EFFECTIVENESS of the website:**
  - Not at all - 1
  - Not Very - 2
  - Somewhat - 5
  - Very - 3
  - Extremely
  - Additional comments:
    - This is a rather basic site that the general public could use. It is simple – I love the slide bar.
    - This is a very simple site with little tech data, but I like the usual overlays of sea level rise impact
    - This site is simple and easy to use, but the extent of available info is limited.
  
- **Comments During the Focus Group**
  - Liked the opening page with user information
  - Liked the slider bar
  - Didn't give the scenario perspective
  - Flood frequency – disconnected and not straight forward
  - Add content to the slider bar
  - Add more places to the map
  - Pointers get in the way
  - Add a drop down to town/municipality and then “zoom too”
  - Only display what you can get information about

## Visualizing CA sea level rise

<http://www.climatechange.ca.gov/visualization/sealevel.html>

- **What did you like MOST about this website?**
  - I like the homepage idea to describe project
  - One stop website - Technical, actions, other resources, etc.
  - Shows the depth of sea level rise
  - Loaded instantly.
  - California acknowledging global warming.
  - Tab design at top of page
  - Extensiveness

- HUGE amount of data & user friendly info, excellent directions & help buttons.
- Excellent links for more information
  - Very interactive
  - Take action section
  - As well as a glossary
- Menu bar w/links/contact information
- Easy to use Google maps interface.
- Impact of various rises in sea level.
- Site menu on first page aided in navigation of page & info
- The fact this was a climate change portal and had individual tables that were well developed.
- Liked the idea of downloading KMZ
  
- **What did you like the LEAST about this website?**
  - Had to download Google Earth
  - Too much information
  - Probably a little more challenging for a new user to navigate
    - Not for casual visitor
    - Some graphics were a bit difficult to manipulate – did not appear to flow smoothly
  - Lacks the overlay detail found in other sites.
  - Took a long time to load, can't download data
  - Can't toggle between USGS/Google map and site menu on side
  - As soon as select visualization tool it takes you to new view (function or prototype)
  - Fairly "static" website – not necessarily interactive.
  
- **Thinking specifically about INFORMATION/DATA presented on this website, what INFORMATION/DATA do you think will be MOST IMPORTANT to coastal decision makers?**
  - All
  - Sea level rise/location
  - Info available under the "research" tab.
  - Inter-connect of agencies and info
  - The color coded information on sea level rise
  - Erosion both from SLR & overdevelopment
  - Oceans/coastal adaptation strategies
  - Areas where you see impacts from sea rise level
  - Google map format was helpful to navigate.
  - Climate and data on grid, sea level rise
  
- **Please fill in the blank: The addition of \_\_\_\_\_ would improve this website for me.**

- Risk & vulnerability
  - More data on infrastructure, economic impacts, demographic impacts.
- A tab for maps - Once I left the map I had a lot of trouble getting back to it.
- Dependable mapping
- Very little
- Maps, as opposed to strictly sat. images
- An easier way to get the map
  
- **Please list one (or more) thing(s) you would change about this website in order to enhance the users' experience and/or comprehension of the information.**
  - Not for a regular user
  - I find the site to be rather overwhelming too much info
    - Focus on one area instead of being all over the place
  - Add demographic information
    - Evacuation routes, submerged tanks, hospital/nursing homes
  - Project increase in fresh water usage with increase in temps.
  - Having to upload a plug-in is a real minus
  - More methods/metadata/description of how they built this model
  - Separate the menu pane from the map to allow easier navigation.
  - Visualizing tool should provide various sea level rise scenarios
  
- **Please rate the overall "USER FRIENDLY" NATURE of the website:**
  - Not Very - 3
  - Somewhat - 1
  - Very - 5
  - Extremely - 1
  - Additional comments:
    - Only thing is I am having trouble getting back to a map.
  
- **Please rate the overall EFFECTIVENESS of the website:**
  - Not Very - 3
  - Somewhat - 2
  - Very - 3
  - Extremely - 1
  - Additional Comments:
    - Too much info for me personally

- I like all the information that's available without having the map. I'd probably go to a friendlier site to find a map and access other info at this site.
- **Comments During the Focus Group**
  - Data could not be manipulated
  - Lack of ability to switch map
  - No icons of where important locations are
  - There is other good information presented
  - Liked the glossary of terms

## Impacts of SLR on the California Coast

[http://www.pacinst.org/reports/sea\\_level\\_rise/gmap.html](http://www.pacinst.org/reports/sea_level_rise/gmap.html)

- **What did you like MOST about this website?**
  - Easy to navigate, simple
    - Google map interface
  - Covered entire coast
  - Graphically driven
  - It's clear describing hazard zones, vulnerable schools & 1<sup>st</sup> responders facilities (all in flood zones)
  - Ability to change opacity of layers.
  - The wetland frontier layer is very interesting - For me knowing where the water is going to be going in the future is huge
  - The ability to click through to a "full report" that presents "assumptions, methods and conclusions"
  - The layers approach
  - Infrastructures were easy to discern and map
  - Link to full report on Impacts of Sea Level Rise on CA coast.
  - Provides a link to prepared maps & you can download the shape files used for personal use

### What did you like the LEAST about this website?

- No description of project.
- No variation in SLR scenarios.
  - 1.4 M Why? - User needs to know this isn't the only possibility
  - Only looking ahead 90 years to 2100 is not very useful.
- Can't overlay hazard zones or infrastructure with SLR (i.e. schools & police station)
  - You cannot multi-select more than 1 layer for hazard zone/infrastructure at risk.

- Lacked detail, wetlands, population, etc.
- No clearly marked evacuation routes
- The limitation of Google maps to provide a closer zoom.
- The lack of storm surge data.
- Had to look around to find science/technology data behind the project
- I'd prefer directional tool for navigating the map.

**Thinking specifically about INFORMATION/DATA presented on this website, what INFORMATION/DATA do you think will be MOST IMPORTANT to coastal decision makers?**

- General concept of changing sea levels
- Hazard zones & infrastructure @ rise together
- Report and research area
- The range of areas (incl. population) that would be impacted
- The layer containing the 100 yr coastal flooding event.
  - Seeing what is impacted now and what could be impacted
- Infrastructure risk
- The ability to research the data by clicking on hotspots on the layers menu
- Comparative mapping for currently at risk and area at risk 1.4 meter rise

**Please fill in the blank: The addition of \_\_\_\_\_ would improve this website for me.**

- Multiple SLR scenarios
- Addition of time scale
- Storm surge
- Slide bar
- Search box
- Hazard zones, what would be the recovery for these regions
- Years and more SLR levels
- More science tech data
- Population demographics/environmental justice info.

**Please list one (or more) thing(s) you would change about this website in order to enhance the users' experience and/or comprehension of the information.**

- Allow for download or creation of PDF's.
- No explanation of 1.4 meter sea level rise (plus 100 year flood zone)
- Allow for multiple infrastructure at risk selections
- Allow more overlay detail – population centers, show impacts from different rises in sea level, ex 1 ft, 2ft.

- Improve hospital, police department and fire department locations info and be able to show those locations on the map at the same time, not either/or.
- The ability to zoom into the map closer
- More detailed info needed
- The addition of a compass choice for navigating the map
- Provide different flooding scenarios.

**Please rate the overall “USER FRIENDLY” NATURE of the website:**

- Somewhat - 2
- Very - 8
- Extremely -1

**Please rate the overall EFFECTIVENESS of the website:**

- Somewhat - 6
- Very - 5

**Comments during the Focus Group**

- Couldn't click on multiple layers
- Only showed infrastructure within the flood zone – should show all for planning purposes
- Define the choice for sea level rise

## Report form

<http://www.pcwp.com/rareport.html>

**What did you like MOST about this REPORT?**

- It's basic – but comprehensive
  - Straight-forward presentation with detailed explanation of information and how to use the info
  - Clear description of impacts of types/level of hurricane & wind damage.
  - Data was explained in a clear, easy to understand language.
- I like the storm percentage likeliness by category.
- Good initial overview, more like a fact sheet
- A fairly quick way for someone to determine potential impacts. Good for planning
- Detailed descriptions of hurricane categories.
- The maps that allowed for a visual assessment of surge.
- Detailed description of CAT 1-5 wind damage & what damage would occur to buildings
- Liked description of info (chart & photo) prior to its display.

**What did you like the LEAST about this REPORT?**

- May need an environmental component.
- Doesn't address sea level rise
- Limited application
- Could use some more info on impacts/location of population density & public service infrastructure
- Maps small & not clear
- Wished it included some suggestions for action in the event of an impending storm.
- Storm surge inundation maps
  - Disclaimer state wind direction would preclude accuracy of maps - General public might not read or understand
- Images should have separate maps for different wind scenarios instead of combining the two
- Needed more information on population demographics.

**Thinking specifically about INFORMATION/DATA presented on this REPORT, what INFORMATION/DATA do you think will be MOST IMPORTANT to coastal decision makers?**

- Storm surge likeliness.
- Community description
- Charts would have to be larger - They are a bit small.
- Overall picture of wind conditions for this area
- This information is very helpful in planning for coming danger from sea level rise
- The data presented for each category of storm.
- Planning for worst-case scenarios
- The kinds of information in terms of wind speed, storm surge, water levels, at different storm scenarios was helpful
  - Would need more info on specific elevations, storm tracking, current tide (MHW/HHW)

**Please fill in the blank: The addition of \_\_\_\_\_ would improve this REPORT for me.**

- Whether land area under inundation.
- PDF download option
- Interactive mapping link & other resources
- Public service infrastructure, wastewater & water & power facilities.
- Demographic info
- Estimate of wave heights
- More scenarios represented by maps

- Methods/metadata.
  - Explanation of sample data – what does this mean?
- Current presentation not detailed enough for planning.

**Please list one (or more) thing(s) you would change about this REPORT in order to enhance the users' comprehension of the information.**

- Charts/ w/corresponding graphs
- Better storm surge visualization, add SLR component
- Doesn't make the connection about how all of the impacts relate to each other - Assumes the viewer has that knowledge.
- Infrastructure impacts
- Make the charts/pictures larger.
- Clearer colors on maps
- Add more wind direction info
- Add actual photos of the area.
- FAQ's section info on the modeling.
- Contact info & comments/feedback section.
- Discussion of environmental justice - impacts to those w/o vehicles, low-income, communities of color & their vulnerability.
- Existing MHW/HHW levels to determine if additional damage during storm events
- More detailed elevation data

**Please rate the overall "USER FRIENDLY" NATURE of the REPORT:**

- Somewhat - 3
- Very - 5
- Extremely – 2
- Additional Comments:
  - It would be nice to be able to select what I want in the report

**Please rate the overall EFFECTIVENESS of the REPORT:**

- Not at all
- Not Very - 2
- Somewhat - 1
- Very – 4
- Extremely – 1
- Additional Comments:
  - Wind damage due to cat 1-5 very good & user friendly. Nice presentation of very general info without too much science to confuse general public. Good starting point for actual science to education purposes.

- this info already exists and can be found easily – to be effective should include info on economic losses, infrastructure at risk, demographics, tidal changes – climate change, chance of increase or frequency of storms – hurricanes, tropical storms, more frequent rain events that may mimic a historic storm of lesser intensity

### **Comments during the Focus Group**

- Report is useful
- Liked the description
- There needs to be explanations of maps
- Liked the chart explanations
- Charts should be bigger
- Disclaimer is poorly written
- No legends or scales on maps
- Liked wind impact information such as chance of occurrence
- Nor-Easter impact not included.
- Would be best to capture an analysis feature on an interactive map and then generate a report.