Notes from the
Sea Level Change and Climate Planning Needs
Stakeholder Workshop
Biloxi, Mississippi
March 11, 2009

Background
Twenty-two stakeholders that represented diverse perspectives provided input to 18 technical partners who work on the NOAA, USGS, and US Army Corps of Engineers Climate Initiative Pilot Project in Alabama and Mississippi. The following are the raw notes from the workshop, and comments are not attributed to specific individuals but are categorized in the following four categories with specified affiliations:

Infrastructure: city planners, floodplain planners, transportation, water and sewer, power, and energy sectors
Emergency management: county, state, and federal emergency management agencies
Natural resource manager
Natural resource scientist

Morning Session
Breakout Discussions

Breakout Group One—Built Environment

Built Environment Question 1—What sea level rise and inundation-related decisions or discussions are you involved in?

Infrastructure—This is the only discussion we've had other than internal discussions; how to use some of the information that was mentioned earlier such as the SLOSH model to help us plan better. We are interested in storm surge and planning for response.

Emergency Management—worried about the change in the community; most of the population wants to live near the water and there is rapid growth on inland waterways; how do we deal with catastrophic events; concerns are building back and insurance; people get their information through several sources-more of a combination of sources than just one resource. If the information is out there we want to look at:
- SLOSH models and storm surge planning
- More acute incidences rather than chronic instances
- Most of the water is going on the inland bayous and waterways; more modeling needs to be done on the <u>inland tributaries</u>
- Coastal inundation; building is not coming back where it was before
- Many people are elevating their homes
- People are still building back
- We get information from the USACE, USGS, NOAA

Infrastructure—east side of Jackson County refinery there; there is a degrading delta and they've been flooded twice, Hurricanes Camille and George flooded them; then they built a dyke around the refinery; what should the dyke look like;

- The risk analysis is critical when you are spending money to build these kinds of things and needs to include SLR
- The farther out you go in time, the more uncertainty there is in the modeling; how do you consider this information when trying to determine how to spend the money; as project further into future then uncertainty increases
- Sensitivity analysis-how -- high do you build the dyke?
- We need to consider risk analysis and how this fits with the economic aspect

Infrastructure—concerned with understanding the impacts of the population moving north of I-10 and the inter-coastal areas; we need to draft up environmental impact statements and rationale for using certain alternatives; future impacts model flood zone areas which will be wider and further back to accommodate this?

- Looking at secondary development north of I-10; what will be the impacts of more impervious surfaces coupled with SLR; interested in impervious surfaces and secondary development; interested in flood zone maps for the future
- Want to build bridges long enough and need rationale for determining bridge length
- Analysis of SLR on populations -- they could use to plan where their facilities are located; they plan based on trends; the trend is going to change so they could plan better for SLR
- There is a load shift where 50% of Bay St. Louis has not returned to that area but development north is increasing and has a higher load
- If there are new underlying trends based on SLR then this would be helpful
- Need to buy more wetlands to serve as detention basins to handle runoff

Infrastructure—we have not sat down and talked about inundation or SLR; we have developed a forecast (i.e. population, school enrollment) to plan out 30 years to see where the growth is going to occur. This is federally mandated by federal hwy (DOT) and updates are provided every 5 years.

- We have regional travel demand models and many small models feed into it.
- We don't have the ability to factor in uncertainty such as SLR into this model; all the roads shifted after Katrina; do not have the ability to pull in the travel pattern information thinking of SLR (right now they get volumes with traffic cams)
- Do not have means to collect data but look at trends for minor events (tropical storms)
- We do not have elevation data for roads

Timeframe (multiple people contributed to this discussion)

- use the 30 year mark
- Other people use different time frames. Comprehensive planners use a 20 year period; for marketing you must show at least 5 years to get an investment; other groups use 50 years
- 500 year data-all uncharted territory for us; the 100 year flood is what we are looking at right now; increase in precipitation, roads, homes, parking lots, impervious surfaces; more flooding will cause inland flooding and wetlands are changing
- We need help to design water drainage/removal, how big should culverts be?
- Need the data or the forecast to predict this inland flooding
- Crossroads Mall used to be a wetland and could easily be underwater; they are moving county offices out of that area

Emergency management—Long-term recovery tries to bring resources to the table; a lot of it is have you sent the worst?

- o Where should you build, SmartGrowth building, trails partnership; how do you invest your fund most responsibly? Invest in a blueway and there is a 2 foot SLR then was it a good investment? Must seek support from outside investors; what should they tell these investors? Is there any reason to invest in this area?

Additional comment from stakeholder via email after workshop concluded:

"Pre Katrina the NFIP was moving away from using the "X year flood" terminology and toward the "x% annual chance of flood". Unfortunately we didn't make it in time and Katrina has inundated the world with the thought that a flood of a certain magnitude will only hit once in X years. So what ever tools you come up with, PLEASE don't use the "X year flood" terminology.

One percent annual chance of flood = the 100 year flood which has a 26 percent chance of occurring during a 30 year period. This one percent annual chance of flood is the regulatory standard used by Federal agencies to administer floodplain management programs and as a basis for flood insurance requirements nationwide. Here is good and quick tutorial on the maps – unfortunately they still use the "X year" lingo. http://www.fema.gov/media/fhm/firm/ot_firm.htm. There are certainly more challenging texts available.

0.2 percent annual chance of flood is unofficially called the 500 year floodplain.

Anyway – it seems to me that in order to calculate SLR, you would want to begin with the generally accepted "Base Flood Elevation" as established by FEMA.

When you look at some of the communities on a FIRM or DFIRM, you will wonder why anyone would live there. It looks as if you are living in the river bed. Until you see the water's edge and then you wonder why anyone would not want to live there. The 1 percent chance annual flood (something that may happen every 30 years) is easy enough to build a return on investment or cost/benefit model around. What would help me as a community manager are tools to predict the changes in the FIRM in the next 5, 10, 15, etc years due to SLR. In other words, for a particular area as described by a FIRM, how many years will that base flood elevation be true?"

Infrastructure— concerns include:
1. increased salinity inflow;
2. many water customers have septic tanks on edge of creeks and bays;
3. circulation in the bay-will this change as a result of SLR? This would be important for discharge permits
4. how will surge impact treatment plants, do they need to be moved?

Infrastructure—we are in the process of updating our comprehensive plans and ordinances; SLR may have implications for how they update this plan; zoning and map changes; possibly need to revisit zoning of single family homes (change in anticipation of SLR) and make hybrid zoning; this changes the way the city works; movement of the population; bring this to the table with the consultant groups they are working with; the comprehensive plan has to better articulate goals; this will be future of the city on the coast; SLR hit the radar screen in the last 2-4 years; all coming into perspective after Katrina; this is not taken lightly; the number one topic is SLR and storm surge - - it will happen.

- o Consulting firms are aware of it but they think this will be brought to the table in a greater way

Infrastructure—Coastal Hazard Outreach Strategy Team; has been addressed in this group; SLR is a concern especially with the new maps out; it is hard to sell the new maps post Katrina; SLR is going to bump these even higher; SLR will make new maps more difficult to accept; also talk about base flood change; I got a lot of grief about why do I need to go higher with my building; now people came in and give thanks since area did not flood with Katrina but water came very close in Gustav and Ike.

- o Developers will show a plan and then sell off the lots and then the people he sold it to have filled it in and the topography and flood vulnerability has changed.

Built Environment Question 2—Where do you obtain the climate information to have those discussions and make decisions?

- DFIRMS—includes some accounting for SLR; they anticipate growth, climate change, road development; some updated in '88, '02; there is no set time that they need to be updated, just when community thinks it is appropriate. They can request an update; depends on the jurisdiction (if a lot of growth, then can request an update).
- NRCS soil maps-precipitation data; 50% counties revised on soils/hydrology
- USACE did surge and SLOSH maps
- Satellite data; look at pre and post Katrina data
- NOAA hydology site; want to know rainfall over different time periods; some people do not pay attention to it because they have had twelve 100 year storms in less than a 100 year period
- Each storm is very different; 500-year flood in 1998 (have had several in their lifetime and do not want to see another one)
- NOAA Storm Prediction Center
- Coastal weather research center; University of Alabama will have a new weather center shortly
- Emergency management must use NWS and National Hurricane Center for their information

Built Environment Question 3—What types of additional information do you need to improve those discussions and decisions?

- Enhanced flood projection models (should project the new contours wherever they are);
  - o it should update the 100 and 500 year flood areas
  - o how far inland-move as far inland as it takes to capture SLR (tidal influences) as far as the river goes (rivers, discharge)
  - o anticipate SLR five to 50 years increments so that you know when you need to redraw maps
  - o Hurricane surge, how it effects these areas with incremental timeframes (5, 10, 15 years)
- Do not report the data as certain; report the uncertainty in the models
  - o Include the uncertainty as time increases
  - o Give the percent change of SLR at certain levels (comparable to the tables produced by the National Hurricane Center on predicted hurricane strength over a certain time period)
  - o Somebody knows the percentage for the likelihood it will rise at certain levels (cost-benefit analysis)
- We need a better job of explaining what that variability is; good at explaining the marginal error
- Public education/outreach to present the raw data to the public; what is the percent accuracy?
  - o Land acquisition was difficult when helping people try and acquire homes after Katrina
- Frequency of storms, flood events, historical data; probability and magnitude of storm events

- Need a database for tracking water on the roads with SLR
- Map showing increase of tidal area as SLR increases
  - Will have to start buying back areas near the roadways like mitigation banks
- How much storm water discharge…
  - What happens with 4" per hour rainfall since surface of land changes, heavy rainfall in areas-look at worst case scenario
  - Have not had a substantial rainfall event since before Katrina; will start to hear people complaining about flooding more now that there are impervious surfaces
  - Slow moving hurricane, higher increase in rain, impervious surfaces, heavy rainfall, coming into rivers that are already flooded
  - Couple surge with rainfall
- Produce a worst case to more typical scenarios and how that will effect people's homes
  - Make it usable
  - Scale should be from the county to individual community level
  - Include these variables, which can be adjusted:
    - Move the path of storms over different areas and change their intensity
    - SLR scenarios and give source of the data, confidence, and rationale for using those numbers
    - Precipitation including intensity, duration, and quantity include inland effects, use historical data from gauge data and use max duration of rainfall
    - Change in impervious surfaces and include inland effects
    - Adjust tidal range when approaching storm
    - Include uncertainty for the variables
    - Wind speed and direction
    - Roadways elevation
    - Critical facilities and infrastructure
      - power
      - sewer-waster water treatment plants, septic tanks
      - shallow drinking water
      - bridges and culverts
    - Right of way embankments, wetlands, hydric soils
    - How far away is an impervious surface going to affect/influence the watershed

How should this model be shared?
- Both web-based and non-web formats are needed
- Web based so that it is available to all people and communities without much resources can still use it
- It should also be developed in a form that it can be delivered like the SLOSH model where communities with resources and capabilities can customize it for their specific use.

Breakout Group Two—Natural Resources

Natural Resource Question 1—What sea level rise and inundation-related decisions or discussions are you involved in?

Natural resource manager – doesn't come into daily management activities
Concern about shellfish diseases – warming and acidification effects
Informal discussions about SLR but it hasn't been a factor in management decisions
Reduction of emergent habitat and how that affects Gulf ecosystems
Impacts of subsidence and SLR on shoreline retreat – from a built environment standpoint, what are we willing to do, where are we willing to go?
Where will the water go in the future?

Natural resource manager – focus on sea level rise and climate change

Natural resource manager – property in Grand Bay and habitat restoration – decisions on what type of projects to do – oyster domes, armoring the shoreline – what needs to be done to protect Grand Bay and the islands that surround it

Natural resource manager – including SLR component in Smart Growth projects and conferences
GOMA resiliency group – partner with TNC and USM – include elevation tables to target particular areas (e.g. NERRS) – consistent models and data gathering (monitoring stations) and experimenting with SLAMM, SLR network and team –

Natural resource manager – purchasing "buyout properties" (areas that continuously flood)

Natural resource scientist – Figure out data that we need to be collecting and put infrastructure in place to do that; Not in the position of making decisions at this time
Focus on natural resources

Natural resource scientist – very few discussions
Used to have coastal geology program that mapped changes over time
No longer collecting data for that program; no coastal geologist on staff but needed
Need someone who can give us the information about barrier island migration and other changes on the coast (currents, winds, subsidence)
Lots of data available on-line (hydrologic, geologic, …) – missing is a framework to put data together in a focused way

Natural resource manager – need to engage Gulf Islands National Seashore
NPS has a Climate Change Program/Office
SLR, erosion, effect on storms, warming waters, impact on coastal habitat and species
Pest and pathogen and changes in coastal forests
Facilities and infrastructure on islands
Protection of species that are "popular" (i.e. things that visitors might be especially interested in – sea turtles in this area)
Fire protection

Recreational aspects – trail and greenway establishment and where they should be located with SLR in mind

Working with groups thinking 2 – 10 years out; How do we make this real for our community – what is the appropriate planning timeframe?

NPS is good for outreach opportunities to the public

Natural resource manager – discussion of role in outreach/extension/information dissemination

Surprise at informal discussions given that the impacts are certain and most costly – seems like the discussions should be formal.

Natural Resource Question 2—Where do you obtain the climate information to have those discussions and make decisions?

Sources of hard data may be different from sources for summarized science

Local, regional partners where there is a relationship may provide other types of information

On-line resources – federal agencies, specifically USGS, NOAA

National Estuary Research Reserve sites

Gulf of Mexico Alliance– all priority issue areas are considering SLR – websites and working relationships that are being established (network)

Broader partners and colleagues provide information

Coastal States Organization

NOAA

Dauphin Island Sea Lab

Non-governmental organizations – The Nature Conservancy, Ocean Conservancy are starting programs relating to SLR

U.S. Navy at Stennis Space Center (Oceanographic Command)

Places that might be considered:

Extension services – Sea Grant

Natural Resource Question 3—What types of additional information do you need to improve those discussions and decisions?

How will water quality change with SLR/climate change – specifically salinity?

Barrier islands serve as a buffer between full strength seawater and lower levels. How will loss of barrier island impact fisheries?

Impact of losing emergent habitat on fisheries nurseries

Changes in precipitation and impact on bacterial counts. Are wastewater systems prepared for changes in precipitation and consequent runoff? Effect on fisheries and on human health.

What will SLR mean?

Sound science on local and state-level SLR and communication strategy – still educated people in the industry who are skeptical

Easy to use GIS-based models (e.g. click on Gulf Shores and demonstrate what will happen in this area) for awareness of impacts to make sound planning decisions. Include adaptation strategies.

SLR range expected over planning time frames for local jurisdictions
Scales for management level (e.g. NPS superintendent, city, etc.) – subsetting

How do I make SLR relevant and concrete to different user groups? – show what this means to a user group – need local landmarks, local impacts. Too easy now to be vague and dismiss concerns. Need to show how it has changed in the past, how it could change in the future – use pictures.

Accessible data

Down-scaled models/scenarios/graphs/maps for management level decision-making – historical, current, future predictions or forecasts

Tools to conduct vulnerability assessments

Long-term monitoring of climate change and impact on ecosystems

Multi-disciplinary science summaries – published for lay audience

Develop and foster interagency and community relationships

Need to know adaptive management tools and techniques. How do we adapt? What are some solutions?

Summary from Report Out for Built Environment Group
- Three general models:
    1. enhanced flood projections (100 and 500 year flood maps including inland flooding);
    2. frequency of flood events (probability of flood events); and
    3. similar to a SLOSH model-encompassing many different variables including sea level rise with the range, source, confidence levels, and incremental levels (5 years, 50 years, 100 years, beyond, in 5 year increments) additional variables including precipitation, road elevation, critical infrastructure, location of shallow aquifers
        - Incorporating influences from inland water sources
        - Slide on a scale to adjust these variables
        - Scale-community and county level
- Delivery-two ways (1) web-based format for those communities that cannot purchase models themselves, (2) tool that can be delivered and uploaded on community computers for planners to use
- We must improve the ability to communicate SLR and uncertainty in the models-in laymen's terms and to the general public

Summary from Report Out for Natural Resources Group
- Broad discussion, not any one decision

- How SLR might changes habitat; academia-funding related to research
- Some agencies had some more specific needs related to wild fire risks
- Relied heavily on federal partners for climate related information
- How could we easily get the data from these agencies
- What products and services do you envision needing as a result of this conversation? GIS based tools; easy to use for planning and decisions, discussed scalability where information and decisions can be made at a local level; and in adaptation strategies
- Monitoring of habitats and where that related to SLR; the loss of barrier islands; impacts on salinity, seagrass resources that lead into wetland habitats for critical management decisions
- Ways we can put sound science to work; dependable and easy to use both state and local users in laymen's terms (this is needed to convince people that this is happening)
- When people are thinking about getting data-there are two groups (1) raw data they can use for research projects and (2) those who want summarized data; there are two different audiences we are trying to reach

Afternoon Session
Participants provide input for the U.S. Climate Change Science Program as one large group

Question 4—Other than sea level rise and inundation, what other climate-related decisions or discussions are you involved in?

Infrastructure—when building highways we must submit draft environmental impacts assessment. EPA asks why bridge is needed? How do you determine specific length of the bridge? Consultants running into problems— using 100 year floods and are asked what rational they are using to make decisions. When talking about inundation we need to take into account new flood risk. People tend to move near intersections and subdivisions and are moving north of I-10. Building on hydritic soils now. If a hurricane moves slower then area would have been inundated longer. Many people moving to these areas that flood. We need to find the model to predict within a certain margin of error the flood zone widths and depths. Help inform how wide and high highways need to be. How to find a model to predict within a certain margin of error these additional flood zones in these watersheds? How wide do the highways need to be? What size culvert is needed? What resources do you need to rationalize decisions?

Infrastructure—in Mobile the waterfront they have intakes for water supply further inland so they are worried about salinity levels increasing at these sites; there are discharge limits based on existing hydrology but this may change if SLR and water movement slow; the region also has a lot of shallow water aquifers and many people are using private wells and septic systems. What is the effect of salinity on sands and deeper aquifers? If septic system is near a creek that rises, what happens?

Natural resource scientist—acidification in the ocean-people in shellfish farming are concerned about this; estuarine acidification; changes in concentrations of aragonites.

Natural resource scientist—any changes in precipitation, intervals short versus long, could effect irrigation, groundwater and agriculture. We need analysis of precipitation trends in coastal counties; need this more broadly and should include other counties in addition to the coastal counties

Natural resource manager—National Park Service does inventorying and monitoring related to climate change. There is concern about invasive species, wild land fires, habitat movement and effects on streams, lake levels, water quality.

Infrastructure (airports)—Effects on the length of runways and the type of asphalt they use to adapt to different climate/temperature conditions.

Natural resource manager—climate related to recreation; get people outside, as the climate changes how will this effect people health wise? Getting people outdoors?

Infrastructure—In Biloxi if sea level increases just a small amount, and there is more impervious surface northward with population growth, there will be inland flooding. The waters are going to meet somewhere in the middle. We need to identify these areas and keep people from building in those areas; this is important in elevation and construction style decisions; not allowing any improvements at all in some areas.

Emergency management—A wise community could use models to see the risks. When you first tell someone they can't build in an area or have to elevate structures - it is inconvenient. Now they see the flooding first hand and can't access their house. Real marketing shows you need to understand the reality – need public awareness.

Emergency management—Working with a community post Katrina; SmartGrowth principles are important and emphasized. Go for density rather than sprawl. I like a lot of maps. It lets people visualize. Can show where people are now and where they will be with SLR. Then people can imagine where they are living and how it might change.

Infrastructure—$ that come in for local communities for transportation programs; rebuild transportation facilities-what is the best design to build back? Elevate the sea wall to include the surge or design road to get inundated again. This is examined whenever making an assessment. A success story is the Bay St. Louis Bridge, by accommodating storm surge you are accommodating SLR.

Infrastructure—Present people with solutions instead of scaring them.

Infrastructure—It costs money to build the bridge higher-what data do you use to make that decision? It is a risk analysis. It becomes an economic analysis; room for the science community to integrate with the economic community to accommodate needs but to not over design.

Natural resource scientist—There are environmental effects of these decisions-huge bridges. Need to know risk of SLR and this needs to be weighed against the impact on other things. Regret if put emphasis on SLR and not look at tradeoffs. How much pavement is needed to expand bridges? What will be impact of more pavement?

Infrastructure—Ran into this with making a bridge 1500 feet when the waterway was small enough a person jump over it. We had to accommodate flooding and it was expensive to build.

Infrastructure—You must include other influencing factors; larger bridge displaces more people and then you are going to have to account for where those people are placed (people and businesses-displacement of communities). What are the impacts of that?

Infrastructure—The science community has to do a better job of communicating risk. We need to know the chances of sea level being a certain amount higher. We need to get band widths. We need to know a range of probability. This will increase the perceived credibility of the numbers. This will help with the believability. There is something dubious about this. Give us all of the probabilities rather than just a single number and include confidence levels. This will give credibility in future. Need probabilities of all. Reporting risks rather than saying it will be a 2 foot increase (give us bandwidths instead of an actual number).

Natural resource manager—In delivery of message also show opportunities. Right now we just see negatives. Salt marsh will be created (some will also be lost). Need to not always be negative. Outreach is difficult if message is all negative. Audience is turned off. Don't just say I hope you are saving money because this is going to cost you. Outreach-bring a message that shows the community opportunities for development.

Emergency management—someone is going to live in a high risk area. We need to see what that area is going to look like.

Natural resource manager—There is an opportunity to move to mass transit in this area. It is expensive but we are talking about a lot of money. Yes there will be change, lets leverage the change.

Infrastructure—The more input during planning process the more I can provide political forces that we are going to thrive on the coast, but how do we make it sustainable. It's not a dooms day but how do we look at our lives. How will the coast change? I like the word coastal change more than the words climate change.

Question 5—What can an interagency federal climate program offer to better meet your climate science and information needs?

Infrastructure—When I saw all of the agencies involved there is a lot of information out there. I've looked at the websites of two or three agencies, but I haven't seen the other agency sites. When have this much studies it gets complicated and will not do any good. Need to translate and make it available. Need to sift through and make it relevant for what you are doing. For example, I did not know that the map of Diamondhead with 3 ft change existed or where to look for it. Make it available and useful to a broader group of folks.

Infrastructure—Someone said I did not know that is available and others do. A clearinghouse would be useful. Just in our company we support research and sometimes can't get research results to others in our company who need it.

Natural resource manager—It would be nice to get feedback about the data. There are federal metadata standards. Synthesize into one decisions support tool is a challenge. Many organizations are collecting

data. But challenge is to get it out. Not everyone needs the same data. It must be customized. Focus more closely.

Question 6—How can the research better inform decision making on both mitigation and adaptation?

General comment: Apply it at a local level

Question 7—Do you need to receive climate information in a timelier manner?
If so, what features are important to you in the delivery of the information? (e.g. point of delivery, tailoring, spatial resolution)

Infrastructure—We are not getting enough information, and there is some bad data that also exists. We need accurate data. What will be the effect of sea level change, so we can plan for it? We need accurate information to make decisions. Everything is based on data. It must be fairly reliable data—not just an assumption.

Infrastructure—How is data coming to us. Seems like you are guessing. Nothing you can sink your teeth into. The confidence level is not there. I'm not doubting that it is on right track, but can't go to the bank with the data. We need to know uncertainty. Should decision makers begin to move communities out? If we are making these decisions then the data must be accurate and reliable-not just making assumptions.

Natural resource scientist—Data does not come to us in an authoritative way. The way it comes down does not provide confidence. It never seems to come in a way that you can sink your teeth into. We need to make judgments on the data based on the source such as the USGS; more reliable if it comes from a non-university source because a university professor may have an agenda due to funding sources. It is a matter of trust and the authority of an agency. It would carry more weight if it came from a trusted agency or type of authority. IPCC may suffer from being an amalgamation.

Infrastructure—any of our planning and statistics goes back to the US census. Maybe have the same place where you can get climate information. One location. Need to know location on where we should go to get information.

Infrastructure—one body that could communicate and interpret everything that is out there. It sounds like they are doing that. We got experts in Netherlands on how to build dike. Can the government help with that? Reporting the variability will be important aspect.

Emergency management—Produce this in a timely and accurate manner such as how the NWS does. Send information out on a regular basis so that it can be taken to the bank.

Natural resource manager—There is a need to bridge the gap between science and the decision makers and the public. Science is not getting to decision makers or the general public. Public—why can't we catch bass in river? Now river is more saline. They are concerned about fisheries and shellfish.

Natural resource manager—I would invest in the tools, scale and usability of tool so that a town has the ability to go to their local governments and present them with the scenarios and show probabilities. I

don't think timeliness is as important as accuracy. Waste of money to know SLR in 2009 and SLR again in 2010. I think we have too much data for decision makers to assimilate. Make data useful rather than collect much more data. There is much variability. Cold winter and someone says climate change is not happening. Timely delivery of tools is more important than timely updates.

Natural resource manager—We need to use long term planning to make these decisions.

Emergency management—Timely means there is a decision making process. Depending on decision we probably need to know I have 4 months to develop land use for a development in a certain area. Can I get enough information fast enough to make whatever decisions are needed? Can they get to their house every day, etc.? Depends on the project where you can wait or hire others to do the research. Can I get the information fast enough for the decisions I need to make? Depends on the project.

Question 8—What should be the role of education in climate change science?

Natural resource—integrated at a practical level in every school. Is this integrated with the department of education? I visit schools and work with science educators. Folks don't know. This can be one level. Climate curriculum at all levels of education and integrated into the existing curricula. Make it required and practical for teachers. Discuss inches of rain. Make it relevant to each community, which makes it very complicated. Start by working specifically with MS and AL department of education on climate and sea level. The so what factor-teach kids they can use a reusable bottle instead of a plastic bottle.

Natural resource— Need to be careful since some groups disagree with IPCC. Empower people to make their own decisions. Empower them to make choices based on the information.

Natural resource—educate in an inspirational and creative way

Natural resource—National Maritime Museum of the Gulf of Mexico in Mobile. Receptive to include hurricanes, SLR, etc. Coastal ecosystem learning center are vehicles for climate change work (Rookery Bay, New Orleans, JL Scott, Dauphin Island). Good location for outreach and education. All of these deal with fisheries. SLR opportunity in Mobile with the Maritime Museum for the Gulf of Mexico

Natural resource—education applies to a lot of things we do. The marine education center JL Scott and DISL. Need to have joint partnerships to share information with people.

Infrastructure—idea of a moving target. It's getting people interested in the so what issue of policy issues. Get them involved in the discussion—whether 2nd grade or college student. How do you get people engaged? The grassroots part—what we are doing on a local level. Look for good behavior. Having more miles per gallon=good behavior. On a national level save critical habitat. Great discussion about this. Need to get out of political realm just have a national public policy discussion on climate change.

Infrastructure—If car emissions are causing global change why won't congress allow Ford to sell the small fuel efficient cars the sell in Europe in the U.S. market? We have more natural energy we just have to develop the technology.

Infrastructure—Need to tie the curricula back to the National and State Standards (Ocean Literacy and Climate Literacy) —-50% of my job is outreach and education. Tough topic. I do my job using the KISS principle. What is it and how does it affect me—whatever level it may be –homeowner, city council member, whoever.

Natural resource manager—I would like to see communities have access to a Sea Grant agent they could call up and work with them, produce a product-that is really useful to me and could help make it real for a local community. Have access to a Sea Grant agent that can help my town with a GIS tool. Don't want a tool that can come out of the box for everyone to use. Use land grant institutions inland. Need agents like this that make things concrete. Many agencies are great at getting data together. Need agencies with specialty in outreach such as Sea Grant. Recommendation that Sea Grant have a role in training programs. This is a possible role for National Sea Grant in dealing with local change. Often simplify message and get it to the people. Sea Grant can develop materials that are refined for local level. Provide training for Sea Grant agents.

Infrastructure—When we need training at the professional level we take a course through federal highway associations, we need risk assessment training, adaptation strategies will have to be taught to us.

Infrastructure—Floodplain managers have extensive training. We just have to roll this in. Everybody is going to depend on some type of federal funding.

Natural resource manager—There are a number of national sea shores. Use them as pilot areas; they have their own studies going on for sea level and climate change monitoring-we have Gulf Islands right here. Have national seashore system for outreach and education and monitoring.

Infrastructure—Outreach to professional associations for mayors, professionals, and others such as through the mayor association, regional associations for local decision makers. For example, the National Governors Association (NGA) is meeting here in June.

Natural resource scientist—Most federal agencies have training opportunities-not exclusive to federal personnel, other people could attend these training sessions. There are venues for training. Education is important-had a class out here recently to 3 mile creek, ran different models to show how their measurements could be use. Many ways to reach out to people... park rangers. If want educational opportunity…talk with the federal agency.

Natural resource manager—NOAA is contemplating an adaptation training for coastal managers-perhaps they can partner with the DOT who is already doing something similar. It is worthwhile to see what other groups are offering and merging them together. Taking pieces of these course that could be useful to the audience.

Natural resource manager—of the 13 federal agencies…is there a lead agency? So this is being done all around the country? Federal agency should look at all comments and then designate a federal lead for specific comments. For example education could be led by NOAA office of education. Many people do not believe SLR on local level. Designated agency that there are leads for each of the tasks that result from this effort. Don't know what USGS, NOAA, EPA are doing. Need structure of lead agencies on each

of these issues. Sounds like the formation of a national climate office…..I'm not saying there should be another office.

Infrastructure—Need to have leads or we will be isolated.

Sea Level Change and Climate Planning Needs Workshop Agenda
Mississippi State University Coastal Research and Extension Center
Biloxi, MS
March 11, 2009
10:00 p.m. – 2:45 p.m.
Updated: 3/2/09

10:00-10:10 **Check-in, coffee available**

10:10-10:15 **Welcome and Purpose**
LaDon Swann, Mississippi-Alabama Sea Grant Consortium

10:15-10:35 **Overview of USGS, NOAA, and USACE sea level change and surge prediction and modeling capabilities**
Virginia Burkett, US Geological Survey
Todd Davison, National Oceanic and Atmospheric Administration
Dennis Mekkers, US Army Corps of Engineers

10:35-12:00 **Breakout groups discuss specific sea level change and surge tools and information needs for coastal communities in Mississippi and Alabama**
o What sea level rise and inundation-related decisions or discussions are you involved in?
o Where do you obtain the climate information to have those discussions and make decisions?
o What types of additional information do you need to improve those discussions and decisions?

12:00-12:45 **Lunch (will be provided)**

12:45-1:00 **Report out on results from the breakout session**

1:00-1:15 **Overview of the U.S. Climate Change Science Program (CCSP)**
Virginia Burkett and Catherine Puckett, US Geological Survey

1:15-2:30 **Participants provide input for the CCSP**
o Other than sea level rise and inundation, what other climate-related decisions or discussions are you involved in?
o What can an interagency federal climate program offer to better meet your climate science and information needs?
o How can the research better inform decision making on both mitigation and adaptation?
o Do you need to receive climate information in a timelier manner?
If so, what features are important to you in the delivery of the information? (e.g. point of delivery, tailoring, spatial resolution)
o What should be the role of education in climate change science?

2:30-2:45 **Wrap-up**
Virginia Burkett, US Geological Survey