Integration of Local Planners' and Scientists' Knowledge of Consequences, Vulnerabilities, and Adaptation Strategies to Climate Change Related Hazards

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Abstract

Planning for climate change poses a significant challenge for coastal managers and communities. They must understand and anticipate how diverse stresses interact to produce impacts and how vulnerabilities and impacts can be mitigated via short-term adjustments and longer-term adaptations. Adaptation and hazard mitigation efforts are enhanced by the generation of realistic scenarios and models that produce knowledge, inform decision-making, and build community acceptance.

This project developed a mediated modeling approach to help coastal managers and community members understand how climate change stressors influence existing management challenges and how these impacts and vulnerabilities can be mitigated via short term adjustments and longer-term adaptations. Our methodology is based on participatory, analytic, and deliberative processes, and other experiences with social learning – an approach that is widely used in risk-based management. This poster reviews the development of the "Vulnerability and Consequences Adaptation Planning Scenarios" (VCAPS) tool and lessons learned from its use in Sullivan's Island, South Carolina.

Sullivan's Island, South Carolina

Source: CSE 2009.

- About 2,000 residents.
- Development of Charleston Harbor has led to erosion and accretion. (Accretion shown to the left in green)
- Entire island (8 sq. km) lies within the 100-year floodplain.

The Vulnerability and Consequences Adaptation Planning Scenarios (VCAPS) Process

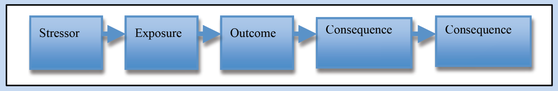
A process that integrates scientific and local knowledge to facilitate social learning about climate vulnerability and adaptation options among participants. Scenario-based influence diagrams are built using an Adobe Flashed-based tool in order to link climate stressors, consequences, and management actions in real-time.

1. Discuss project with community
2. Interview key community leaders
3. Facilitate workshops
   - Present climate change information
   - Diagram scenarios
   - Validate and get feedback

Conceptual Underpinnings of VCAPS

1. Causal model of hazards

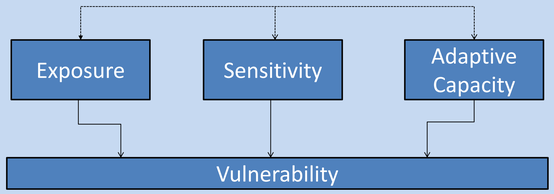
Hazard events are structured as a sequence of stressors, human choices and responses, and consequences. Individual or management actions may be incorporated at any point in the causal chain to mitigate potential impacts.



Source: Hohenemser, Kasperson, and Kates 1985.

2. Vulnerability

This concept clarifies how separate entities can be affected differently by similar exposures. Vulnerability is based on the magnitude of the exposure, sensitivity to the perturbation, and ability to resist or cope.



3. Mediated modeling

A participatory method geared at understanding relationships in complex issues. The goal is to provide a framework for scientists and stakeholders to link important system components rather than predicting a precise outcome.

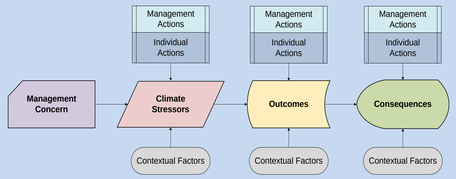
4. Social learning

A multiparty process of interaction and deliberation between individuals and organizations. The goal to provide a basis for establishing shared understandings, meanings, and values to address complex issues.

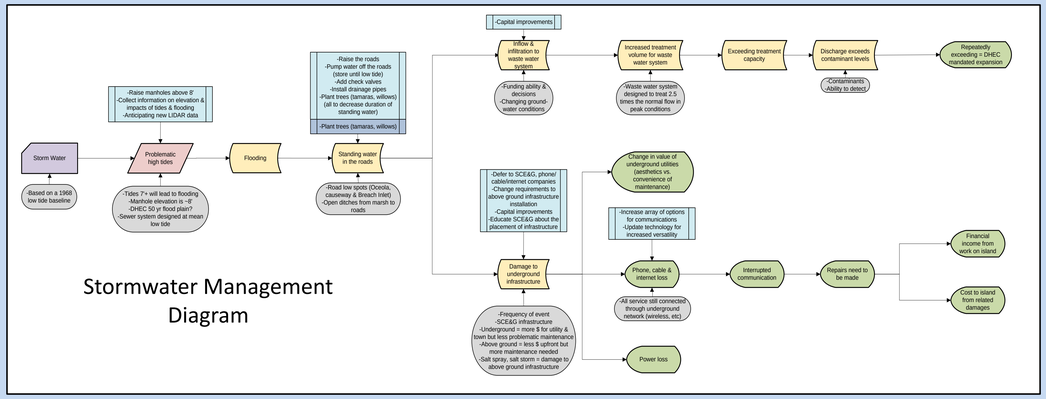
Vulnerability and Consequences Adaptation Planning Scenarios (VCAPS) Diagrams

VCAPS Elements

Element	Purpose
Management Concern	Organize diagrams based on issues of common concern.
Climate Stressor	Identify the dominant physical event(s) or process(es) affected by climate change that impact the management concern.
Outcomes	Identify the process(es) & event(s) that occurs as a result of the climate stressor & lead to consequences.
Consequences	Identify the point in which the outcome(s) affect individuals, communities, institutions or ecosystems.
Management Actions	Identify the actions that can be taken by managers to reduce or eliminate the consequences of the stressor(s).
Individual Actions	Identify the actions that can be taken by individuals to reduce or eliminate the consequences of the stressor(s).
Contextual Factors	Identify the site specific characteristics that affect the magnitude of the climate stressor, outcome or consequence.



- VCAPS is an Adobe Flash-based diagramming tool developed to enable users to capture discussions and revise understandings of potential impacts, consequences, and adaptation options in real-time.
- VCAPS consists of seven building blocks — each block representing a concept that is linked together through a sequence of events.
- For each building block, users can specify:
  1) Management or individual actions to address each of these concerns and contextual factors
  2) Local contextual factors that describe site-specific conditions. These are also known as sensitivities



Stormwater Management Diagram

Lessons learned about the VCAPS process

- VCAPS promoted two types of social learning:
  1) factual information about social-ecological systems and climate change stressors, including local sensitivities
  2) how to think about adaptation planning for climate change
- VCAPS helped participants identify vulnerabilities and management actions that could be taken in response to both short-term and long-term threats, including "no regret" and "low regret strategies."
- VCAPS promoted learning about feedbacks, such as the unintended impacts of management actions.
- Participants thought the VCAPS diagrams were helpful because they contributed to their development.
- Participants thought the VCAPS diagrams would help justify policy changes to local residents.
- Participants were interested in working with professional partners, rather than going through the VCAPS process on their own.

Outcomes from Sullivan's Island

About adaptation options

- Several "no regrets" management actions that yield benefits under existing and future climate regimes were identified.

Backflow preventers keep water from reentering the stormwater system under current extreme high tide events and higher future tides.

- Potential climate impacts on several planning and management goals were identified.
- Upstream and downstream management actions were identified (e.g. reduce infiltration to sewers and have flood-proof evacuation routes).
- Tradeoffs among adaptation options were identified.

Elevating the road surface reduces the probability it floods, but increases the likelihood of flooding on lower adjacent lots.

- Cross-scalar barriers and potential strategies to address them emerged (e.g. city, county, or state ownership over infrastructure influences the control of planning options).
- Potential innovative strategies were identified.

About local process

- Establishing a connection to specific planning needs facilitates the integration of climate information and identification of adaptation options.
- Planners are concerned about justifying actions to skeptical and tax weary residents.
- Cross-sectoral representation supports the identification of possible interactions among impacts and management strategies.
- Adaptation planning would benefit from increased dialogue among planning units.
- Staff discussions about long-term planning needs, such as climate change impacts and action implementation, do not occur often.
- Local planners may not feel an urgent need to act or have the resources or socio-political support to act.

Schedule of Activities

Sullivan's Island, SC – May, 2010	COMPLETED
McClellanville, SC – winter 2011	IN PROGRESS
Two MA municipalities – 2011-2012	RECENTLY FUNDED*

*Funded by MIT Sea Grant on a new award in 2011.

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Citations:

CSE. 2009. Accreted land management Plan: Town of Sullivan's Island, South Carolina. 2nd Draft 108 pages. http://sc.coastalscience.com/sullivansisland/townreport.pdf Accessed 18 January 2011.

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