



LOCAL GOVERNMENT COASTAL CLIMATE VULNERABILITY ASSESSMENT AND ADAPTATION ALTERNATIVES ANALYSIS

Overall Project Description:

Coastal Risk Consulting can help your community become climate ready and storm safe by finding answers to the following questions and facilitating communication of the findings:

1. Where will flooding occur? When will it occur? How frequently? How deep?
2. What alternatives are being considered for climate adaptations? Are the benefits (flood prevention) and burdens (expenses) being fairly distributed?
3. Are proposed adaptation measures going to be cost-effective? How long will they remain functional, given climate change and sea level rise?
4. How do these questions apply to both tidal/sea level rise flooding and hurricane/storm surge flooding within your jurisdiction?
5. Have you considered heavy rainfall flooding? How is that added in?
6. How do groundwater saturation and salt-water intrusion impact resiliency?

The project will also examine coastal adaptation alternatives to improve resiliency. These projects are generally divided into six interrelated phases.

Phase 1 – Tailoring the Scope of Work (SOW) to specific local issues.

Phase 2 – Scoping and Data Acquisition

Based on discussions in Phase 1, we develop a detailed SOW while accessing the data sets appropriate to these tasks and identifying data gaps that need to be filled.

Phase 3 – Coastal Climate Impact Vulnerability Assessment

- Conduct a comprehensive Flood Risk Vulnerability Analysis (including Sea Level Rise (SLR)). The analysis identifies flood risk for the community area and identifies changes in flood risk over a thirty-year period in five-year increments (or another period at the client's discretion).
- Flood score all properties using the online Coastal Risk FIRST Score™ (optional). See, www.coastalriskrapidassessment.com.
The flood score analysis identifies vulnerable areas and areas that have little or no risk of flooding. Maps, graphs and report text would be generated.

Phase 4 – Alternatives Analysis and Prioritization

- Develop a Flooding Adaptation Plan (with SLR), including recommendations on adaptation and mitigation strategies that improve coastal resilience and increase community awareness of SLR risks;
- Provide affordable options to improve your FEMA CRS rating. Improvements to the CRS Category have been documented to save the local governments and all other property owners thousands of dollars on flood insurance premiums. Multiplied by all of the property owners in the jurisdiction, CRS improvements can amount to millions of dollars in savings each year.
- As an outcome of the analysis, a small workshop with senior resource management and planning staff to identify key issues for the community and set out adaptation alternatives with a potential time scale for each.

Phase 5 – Stakeholder Engagement and Public Meetings

- Organize and present the results in a meaningful and compelling format via one or a series of design charrettes that consider and include the feedback and opinions of stakeholders within the community. The results of the analysis and proposals for adaptation alternatives would be presented for stakeholder and community involvement in the decision process through public meetings organized through existing community networks.
- Charrettes will make use of the Coastal Risk FIRST Score™ cloud-based flood Prediction modeling in real-time. This will be particularly useful in answering questions posed by residents.
- Identify key stakeholders (property owners, business owners, emergency management, school administrators, chamber of commerce, health care organizations, assisted-living administrators, police and fire chiefs, etc.).
- Develop and maintain a regularly-updated contact list of these stakeholders.

Phase 6 – Final Report

A final report will be prepared with priority actionable items over a time-frame specified by the customer.

Potential Follow-Up Activities

- As an IBM business partner, we also offer the following:
Implementation of a “Living Flood Map” Online – taking static flood maps and updating them to reflect status of flood pumps, levees, building works and so on, to reflect risk "right now", for example as a hurricane approaches. Integration with IBM's Emergency Management Center, and other IBM Smarter City solutions, such as Maximo Asset Management.
- Monitoring of Implemented Alternatives
- Feedback loop

The proposed work and deliverables will build upon existing data sources and research and take advantage of national and regional examples, but will be tailored to specific characteristics of the study area. Deliverables will include reports, presentations and informational graphics, as well as public meetings, and all of the information will be made available on the partners’ websites. The overarching goal of these actions is to enhance climate impact risk understanding within the community.

Specific Deliverables:

- Maps showing vulnerability hotspot areas subject to flood risk and damage;
- A Flooding Adaptation Plan (including SLR), complete with baseline risk conditions, future projections, and recommendations for actions, plans, and policy tools; and
- A Communication and Outreach Strategy for Design Charrette(s).

The underlying tasks for each of the deliverables are organized to flow from a translation of data compilation to knowledge, and finally, to action. The Flood Vulnerability Assessment will focus on current and future risks from extreme tides, storm surge, and groundwater storage reduction (using NOAA’s methods for incorporating uncertainty) and heavy rainfall (optional). There will usually be intensive consideration of issues related to transportation, stormwater infrastructure, natural systems and health. CRC will analyze a broad set of variables associated with flood risk, including extreme tides, hurricanes, sea level rise,

erosion, sewage, social vulnerability, ecosystem vulnerability, water quality and availability, and the built environment.

To gain speed, efficiency and to capture cost savings, the assessment will utilize Coastal Risk's unique, cloud-based tools. The Coastal Risk Rapid Assessment™ is an automated, LIDAR-based, flood risk vulnerability assessment. The CRRA models current and future flood risks due to tidal, storm, and groundwater flooding, as compounded by local sea-level rise rates, calculated out to a specified future date and using customer-specified hurricane categories. In addition to identifying WHERE on specific properties it will flood, the CRRA™ projects WHEN (how many days per year) and HOW DEEP the water will be. The CRRA includes the following components: (1) Initial Government Risk Categories; (2) Flood Inundation Risk Score and Table™ (FIRST Score™); (3) Parcel-Specific Tidal Flooding and SLOSH model; and, (4) Airborne LIDAR High Resolution Elevation Map.

The Initial Risk Categories are an account of the climate-related, government-designated risk zones within which the site currently lies. The risk zones include: FEMA flood zones, wind zones, evacuation zones, Community Rating Score, Special Flood Hazard Areas, Base Flood Elevation and the Coastal Construction Control Lines (if applicable).

FIRST Score - The FIRST™ Score provides the total number of tidal, non-storm flood days the site is projected to experience over the next 30-years. A flood day is defined as a day when the measured water level, enhanced by tides and sea level rise, is greater than a threshold elevation of the site. The standard FIRST Score™ is projected out to 30-years (e.g., 2015 to 2045) and is displayed using a table divided into 5-year increments to show the progression of flood risk over time.

Parcel-Specific Tidal Flooding and SLOSH Model - the CRRA LIDAR-downscaled aerial photo maps show nuisance flooding along with the option of including storm surge risk inputs for the site utilizing CRC's Parcel-Specific SLOSH Model. This model is a downscaled application of the Seas Lakes and Overland Surges from Hurricanes (SLOSH) model developed by NOAA. The standard model uses maximum storm surge from a Category 3 hurricane layered with tidal cycles and sea level rise, but this can easily be adjusted to customer-specified requirements.

Airborne LiDAR High Resolution Elevation Map - The Airborne LIDAR High Resolution Elevation Map provides detailed elevation information for the extent of the site. This map provides a visualization of the location of low-lying areas and helps give context to the results of the CRRA, FIRST and SLOSH models, assisting with evaluation, prioritization, and decision-making. FEMA Base Flood Elevations (BFEs) are shown on the maps.

Following the completion of the Flood Vulnerability Assessment, a preliminary

town hall meeting will typically be organized with the goal of collecting perceptions on the results of the analysis, which will help guide the second objective, the Flooding Adaptation Plan. Adaptation recommendations will address key vulnerabilities as outlined by the Vulnerability Assessment, including a timeline for which incremental actions should be implemented, recommendations for future analysis and key concerns, and costs associated with the various adaptation options. Specific components of the Adaptation Plan are outlined below:

- An **Introduction**, which will define vulnerability as a product of exposure (likelihood of impact) and consequence (damage from the impact).
- The **Background** section will include a description of demographics, physical characteristics, economic and recreational aspects, and historic hurricanes, other storms and associated damage, and related features specific to the project area, which are connected to increasing resilience. These facts will lay a foundation for later references, which highlight the co-benefits of adaptation actions across various sectors. This section will also provide a preview of the results from the Vulnerability Assessment Report.
- A **Resilience Planning** section that will cover policy tools and key focus areas in which they can be applied, including infrastructure, access and connectivity, coastal dynamics, culture and recreation, as well as management and planning and zoning options that will improve the community's CRS score (e.g., community education, mapping, and, location of potential conservation easement properties).
- An **Outreach and Engagement Process** description to document the process of the Communication and Outreach Strategy and the Design Charrette(s). It will include the specific feedback from the community as well as integrate the progression of comments through the series of interactions leading up to the Charrette(s).

The Communication and Outreach Strategy for the Design Charrette(s) will include a written plan for community outreach and stakeholder engagement to discuss the results of the vulnerability assessment and carry out the Flooding Adaptation Plan. The progression of outreach strategies and messages will include scaffolding as follows:

- 1) Introduction to the project and connections with existing hazard programs;
- 2) Vulnerability assessment and definition of flooding and SLR scenarios and adaptation options;
- 3) Description of modeling process for Vulnerability Assessment Report;
- 4) Description of results from Vulnerability Assessment Report and cost-benefit analysis. Technical discussions to define and discuss vulnerabilities will lead to more creative conversations on solutions. Such solutions may include

land-use regulations & building codes, conservation easements, redesign and retrofitting of structures, updates for drainage, flood control, water supply infrastructure, and increased coastal protection.

- 5) Areas identified in Vulnerability Assessment Report in which community can earn CRS points, estimated cost of implementing any necessary changes to earn points, and resulting potential discounts to property owners on flood insurance premiums. This will be discussed during the charrette process to gauge public reaction to various implementation scenarios and proceed based upon likelihood of public support and political will of the governing body.

Coastal Risk Consulting brings its wealth of knowledge and experience to your community to help you develop a politically and socially viable, cost-effective strategy to protect your vulnerable assets, economic vitality, and social fabric against the increased coastal flooding and severe weather events caused by climate change and sea level rise.



“Sunny day” flooding - Miami

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