The Socioeconomic Impacts of Climate Change: Finding Solutions Through Sustainable Resources and Cultural Resiliency

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UNITED STATES COAST GUARD ACADEMY

What is a Resilience Hub?

A resilience hub is a physical structure designed to meet a myriad of physical and social goals by using either existing or implemented infrastructure in combination with surrounding infrastructure and organizations. A resilience hub serves to build community resilience, navigate emergency management, mitigate the effects of climate change, and provide opportunities for social equity. This gives communities the opportunity to become more self-sufficient, socially connected, and successful before, during and after disruptions. (Department of Energy & Environment, District of Colombia)

Problem Statement

Climate change will have significant consequences for CG operations and assets, affecting both members and their families. Anticipated sea level rise and more severe and frequent storms will lead to ongoing crises, allowing little time for recovery. Evacuating CG assets during climatic events is time-consuming and expensive, resulting in loss of time and money for post-disaster recovery. It is crucial for CG assets to operate at maximum capacity during crises. Lower Enlisted facing greater socioeconomic and geographic risks, are disproportionately vulnerable to climate change effects. Complicating matters, most CG members reside in local communities surrounding bases and stations, lacking resilient infrastructure. This lack directly affects CG members and their families during disasters, jeopardizing their ability to perform critical duties and posing a risk to public safety and national security.

Purpose

a) Propose a culturally resilient solution to climate change for the USCG in Miami
b) Use FEMA and NOAA data to identify climate change impacts & vulnerabilities
c) Analyze policy associated with a resilience hub for the USCG
d) Serve as a foundation for future capstone expansion across disciplines

Solution: Coast Guard Resilience Hub

Integrates existing services of USCG for members, their families, and broader community.

Provides daily and emergency services, strengthening community resources for extreme events.

Mitigates costs associated with USCG member relocation, ensuring a fully-functional workforce.

Policy Methods

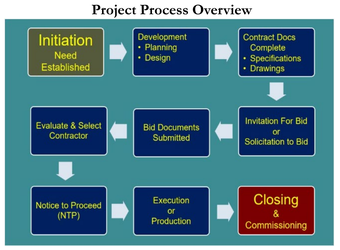
Following Policy

During the construction phase, adherence to both the state regulations, particularly those of Florida in this instance, and the Coast Guard policies is imperative. Extensive research indicates that the Coast Guard policies typically exhibit a higher degree of stringency compared to state regulations. However, in scenarios where state policies surpass the stringency level of the Coast Guard, precedence should be given to the state policies. Adherence to the more stringent policy is a fundamental guideline, as it holds precedence in ensuring compliance with the highest standards of safety and regulation. (SHORE FACILITIES STANDARDS MANUAL COMDTINST 11012.9A)

Coast Guard Publications		
Asset Investment Methodology RDTO	SILC-RDTO-36-115313XX-01/20141107	Establishes methods to optimize funding investments for shore infrastructure.
Civil Engineering Manual	COMDTINST 11000.11	Establishes framework for the CE program.
Coast Guard Strategic Cost Manual	COMDTINST M7000.4	Policy regarding tools and techniques when conducting economic analysis and activity based costing.
DD-1391 Process Guide		Provides guidance on Coast Guard use of the US Army Corp of Engineers DD-1391 software package
Equipment Hierarchy CSTO	SILC-CSTO-36-1129 15 00-02	Provides guidance and requirements for UNIFORMAT II WBS
Financial Resource Management Manual (FRMM)	COMDTINST M7100.3	Establishes financial management policy for Coast Guard funding.
Shore Facilities Standards Manual	COMDTINST M11012.9	Establishes square foot and functional requirements for categories of shore facilities.
Shore Infrastructure – Mission Support Business Model Requirements Directive Technical Order	SILC-RDTO-36-11 29 11 00-01	Authority for creating SILC technical orders to further define the MSBM
USCG Facilities Classification Guide		Shore Facilities Real Property Asset Enrollment and Inventory Validation, establishes Category Codes and ensures the Shore Facilities Inventory is accurate.

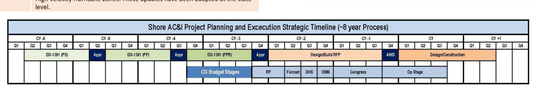
Florida Publication	
2023 Florida Building Code, Building, Eighth Edition	Structures are constructed according to the most recent updates of the 2021 International Building Code, incorporating custom amendments adopted across the state.
2023 Florida Building Code, Residential, Eighth Edition	Residential properties are constructed in accordance with the latest revisions of the 2021 International Residential Code, integrating customized amendments adopted statewide.
2023 Florida Building Code, Energy Conservation, Eighth Edition	Energy conservation measures are implemented according to the most recent updates of the 2021 International Energy Conservation Code®, incorporating customized amendments adopted statewide.
2023 Florida Building Code, Accessibility, Eighth Edition	The Seventh Edition of the 2020 Florida Building Code for Accessibility, which includes updates, has been adopted statewide.
2023 Florida Building Code, Mechanical, Eighth Edition	Mechanical systems are covered comprehensively in a fully integrated publication, which updates the Seventh Edition 2020 Florida Building Code for Mechanical. It incorporates the most recent revisions of the 2021 International Mechanical Code, along with customized amendments adopted statewide.
2023 Florida Building Code, Plumbing, Eighth Edition	Plumbing systems are addressed comprehensively in a fully integrated publication, which updates the Seventh Edition 2020 Florida Building Code for Plumbing. It incorporates the most recent revisions of the 2021 International Plumbing Code, along with customized amendments adopted statewide.
2023 Florida Building Code, Test Protocols for High Velocity Hurricane Zone, Eighth Edition	The Test Protocols for the High Velocity Hurricane Zone have been updated to align with the Seventh Edition 2020 Florida Building Code for Test Protocols in High Velocity Hurricane Zones. These updates have been adopted at the state level.

Project Process Overview

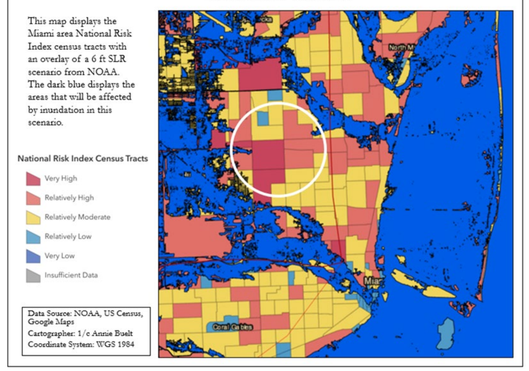


Process Description

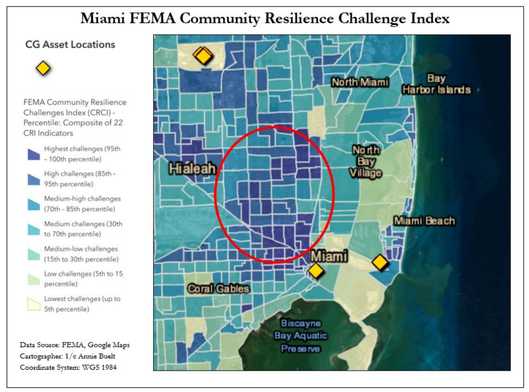
Shore AC&I Project Planning and Execution Strategic Timeline (~8 year Process)



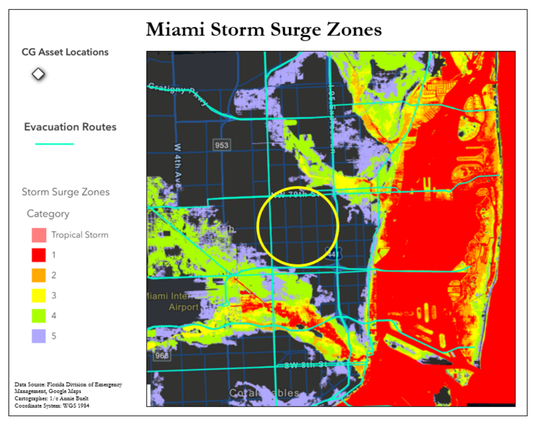
6 ft Sea Level Rise Inundation & National Risk Index for Miami



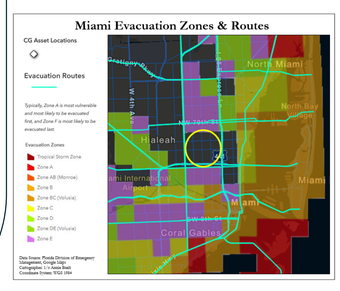
Miami FEMA Community Resilience Challenge Index



Miami Storm Surge Zones



Miami Evacuation Zones & Routes



Miami Medical Emergency Response Structures

Methods: Finding a Site Location

Visual representations of data in ArcGIS was used to identify susceptibilities of the Miami area and choose an appropriate location for building the CG Resilience hub by overlaying data layers. The selection process for the hub location prioritized proximity to Coast Guard assets, vulnerable demographic neighborhoods, social and infrastructure systems, and protection from natural hazards. This involved using a list of criteria for choosing a general resilience hub site, as shown on the slide.

Site Location Criteria:

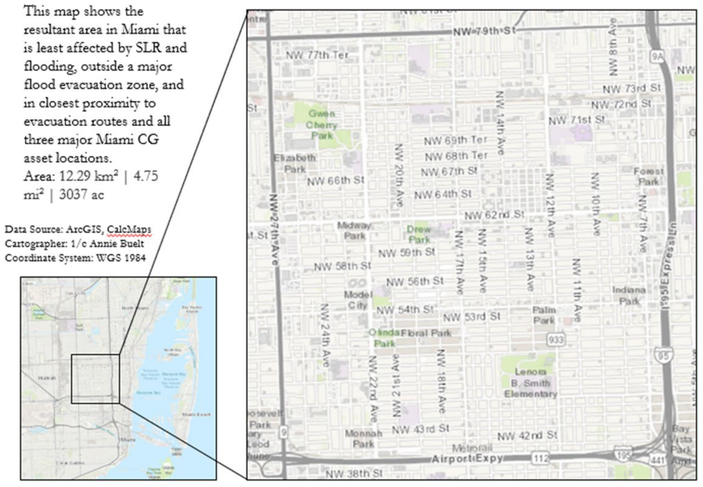
a) Area unaffected by 6 ft SLR
b) At least one census tract with "Highest [Community Resilience] challenges" (95th to 100th)
c) At least one "Relatively High" or "Very High" NRI census tracts
d) Outside a major flood evacuation zone
e) Area with identified shortcomings in emergency response structures
f) Area of less than 5 mi^2

Resultant Location Options for CG Resilience Hub

West of I-95, North of Airport Expy, East of NW 27th Ave, South of E 25th St

This map shows the resultant area in Miami that is least affected by SLR and flooding, outside a major flood evacuation zone, and in closest proximity to evacuation routes and all three major Miami CG asset locations.
Area: 12.29 km^2 | 4.75 mi^2 | 3037 ac

Data Source: ArcGIS, CaleMaps
Cartographer: 1/c Annie Boelt
Coordinate System: WGS 1984



Functional Capacities of the Resilience Hub

Normal/Steady

Condition: Everything is operating as usual: essential infrastructure is accessible, no dangers are evident, and the Resilience Hub continues to offer its standard community services.

Operations: Classes, recruitment events, childcare, cultural programs

Disruption

Condition: Any deviation from regular operations, regardless of its length, may occur. Although the timeframe can range from minutes to months, typically, a 72-hour period is used as a standard planning benchmark.

Operations: Sheltering, food preparation/distribution, logistical support, water sources

Recovery

Condition: Everything is operating as usual: essential infrastructure is accessible, no dangers are evident, and the Resilience Hub continues to offer its standard community services.

Operations: Counseling services, youth & family services, energy/internet, rebuilding efforts