How Naval Facilities in Hampton Roads Are Coping With Rising Relative Sea Levels

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Federal Recognition of Climate Change

- Recognizes Climate Change and Environmental Impacts (SLR)
- Federal Government/DoD Large Footprint (307,295 buildings)
- Lead by Example
- Executive Orders, Federal Laws
- Policy and Implementation

2 Components

- Sustainability (*Reduction*)
  - Reduce Impact/Contributions
  - Energy Efficiencies (Reduce Costs)
  - Renewable Energy
- Adaptation/Strategy (*Response*)

FY09 $13.4B
- Federal Gov’t 2%
- DoD 80%
- Facilities 30%

*Tom Morehouse OSD-DAT&L*
Federal/DoD Climate Change Drivers, Policy, and Directives

E.O. 13690: Establishing Federal Flood Risk Management Standard
- updates E.O. 11988: Floodplain Management
- defines flood hazard areas based on: climate-informed approach, 100-yr flood plus 2-3 feet, or 500-yr flood elevation

E.O. 13514: “Federal Agencies will reduce, monitor, track, & report GHG emissions”

E.O. 13553: “[facilitate] efforts to improve climate preparedness and resilience; help safeguard our economy, infrastructure, environment, and natural resources;”

2014 Quadrennial Defense Review (QDR): “Climate change poses a significant challenge …”

“DoD will develop a plan to conduct initial vulnerability and risk assessments at each of its installations and facilities …”

E.O. 13653: “[DoD] will complete a comprehensive assessment of all installations to assess potential impacts of climate change on missions and operational resiliency, … adapt as required”

“Climate change is gradually opening up the waters of the Arctic”

“DoD will complete a comprehensive assessment of all installations to assess potential impacts of climate change on missions and operational resiliency, … adapt as required”

“DoD will develop a plan to conduct initial vulnerability and risk assessments at each of its installations and facilities …”

“These opportunities offer potential for growth, they are potential sources of competition for access and natural resources”

Tri-service

Navy

DoD

Federal

UFCs under revision to incorporate SLR

2014 Quadrennial Defense Review

Strategic Sustainability Performance Plan (2010):

Maritime Strategy:

E.O. 13653:

E.O. 13690:

E.O. 13514:

E.O. 13553:

E.O. 11988:

Floodplain Management

UFC 2-100-01:

“3-5.6.2.3 … master planners will seek to understand, monitor and adapt to [changes in external conditions that impact planning decisions] …”

www.navfac.navy.mil

*TFCC, *Kelly Burks-Copes ERDC
Sea Level Rise – US Coast Lines

Local Sea Level Rise Is Relative to Land Movement

Green = Land Relatively Stable (Minimal Vertical Movement)
Yellow to Red = Land Sinking

NOAA Data

*slide from NFESC
Hampton Roads Region Vulnerabilities

- Region vulnerable to Relative Sea Level Rise (RSLR= water level increase + land subsidence)
  - RSLR projected 5.1 mm/yr (Sewells Point)
  - SLR est. ~ 1 ft by 2065 (Regionally)
  - NS Norfolk Pier elev. = 9.0 ft MLLW
  - Average Facility Life ≥ 50 years
  - Tide ~ 3.0 ft
  - CAT 1 Storm (74-95 mph, 4-5 ft surge)
  - 3’ tide + 1’ SLR + 5’ storm surge = ~ 9 ft
  - Piers overtopped (not including wave action)
  - CAT 2 Storm (96-110 mph, 6-8 ft surge)

- Current piers, roadways, and utilities flood during Nor'easters or heavy rains
  - Pre-existing regional flooding problem

- Even if piers were raised, how do you cope with base access?
  - Navy dependent on civil infrastructure

*figure from VIMS-HRPD*
Half of US Navy Atlantic Fleet in Hampton Roads

* Storm Surge in Norfolk (Category 4: 15 ft)
Sea Level Rise Impacts

- More frequent & severe storms
- Higher storm surge & wave action
- Base and roadway flooding
- Over-topped piers
- Utility damage and disruptions
- Shoreline erosion
- Pier & bulkhead scour
- Cost to secure utilities & facilities
- Land use and master planning
- Regional infrastructure impacts
  - Highways/roadways
  - Communications
  - Utilities
- **Disrupts Fleet ops, maintenance, & training**
Adaptation/Mitigation Considerations

- **Site** facilities out of areas potentially impacted by SLR
- **Evaluating** facility elevation based on projected SLR
- **Protect** existing infrastructure
- **Shoreline protection**

**Challenges:**
- SLR not limited to one technical discipline, facility or base
- Mitigation may shift problem to another location
  - Supporting infrastructure (roads, utilities, land)
  - Not limited to base
  - Platform compatibility (ships and aircraft)
- **Mitigation is costly**
  - Difficult to justify to budgeteers based on scientific uncertainty
  - Can’t do everything at once – adaptive management & programmatic approach
Incorporating SLR into Navy Facilities

**Project Examples** (SLR considered/indirect response):

- **Replace Fuel Pier D, NFT Craney Island, VA:**
  - SLR factored in new deck elevation: +3 ft; pier as high as operations permitted

- **Elevating utilities along waterfront as possible during repair**
  - Double-deck piers at NSN, utilities on lower deck to protect from waves and flooding

- **New BEQ at NSN (P-123) designed to incorporate resilient features (solar, storm-water management)**

- **Fort Story, VA & Dam Neck, VA Shoreline Projects:**
  - Beach replenishment and shoreline protection due to mitigate erosion

- **Dry-dock Flood Protection Study, NNSY & PNSY:**
  - Evaluating dry-docks and critical support infrastructure protection from flooding & surge; 500-year flood considered, wave and SLR elevations may also be considered

- **NWS Earle Installation Master Plan considering SLR impacts**

- **Incorporating higher building elevations, flood protection, and resilient features into project documents.**
  - P-726, Operations & Maintenance Facility, JEB Little Creek-Ft Story
Key Drivers to defending the Navy against SLR

• **Education:**
  – Developing understanding of SLR, its impacts, and solutions
  – Working with U.S. Army Corps of Engineers, Virginia Institute of Marine Sciences, Municipalities, Universities, and Private sector on regional response/solution
  – Navy participation in workshops & discussions on infrastructure impacts of SLR & Navy’s unique requirements
  – Communicating impacts of SLR to CNRMA/NAVFAC design & planning communities of practice

• **Planning:**
  – Incorporate SLR into Installation Development Plans, Region Shore Infrastructure Plans, & Global Shore Infrastructure Plan
  – Incorporate SLR into Criteria & Project Requirements
  – *NAVFAC MIDLANT Guidance*: plan for 2 feet of SLR by 2050
Government Collaboration Initiatives: Force Multiplier

• Local/State Engagement:
  – Old Dominion University Adaptation workshops
  – VA Climate Change and Resiliency Commission
  – VA Recurrent Flooding Sub-panel, Secure Commonwealth Panel
  – Hampton Roads Sea Level Rise Preparedness and Resilience Intergovernmental Planning Pilot Project
  – Hampton Roads Planning District Commission

• Federal/DoD Engagement:
  – DoD Climate Change Adaptation Working Group
  – Navy Task Force Climate Change
  – Federal Climate Partners for the Mid-Atlantic
  – North Atlantic Coast Comprehensive Study
  – Navy Climate Readiness Community of Practice
  – NAVFAC Mid-Atlantic Sea Level Rise Working Group
Government Collaboration Initiative: JLUS

- Developing innovative Joint Land Use Study (JLUS) in Hampton Roads partnering with the Hampton Roads Planning District Commission, Norfolk, and Virginia Beach to address recurrent flooding & SLR