

Assessment of Natural Hazard Vulnerability and Resilience in Coastal Environments

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Poster #128

Who we are

Kaus Raghukumar, Ph.D., Senior Scientist

Dr. Raghukumar is a physical oceanographer with 16 years of experience in modeling and at-sea measurements of hydrodynamic processes, such as surface waves, internal waves, and underwater sound.



Craig Jones, Ph.D., Director of Marine Sciences and Engineering

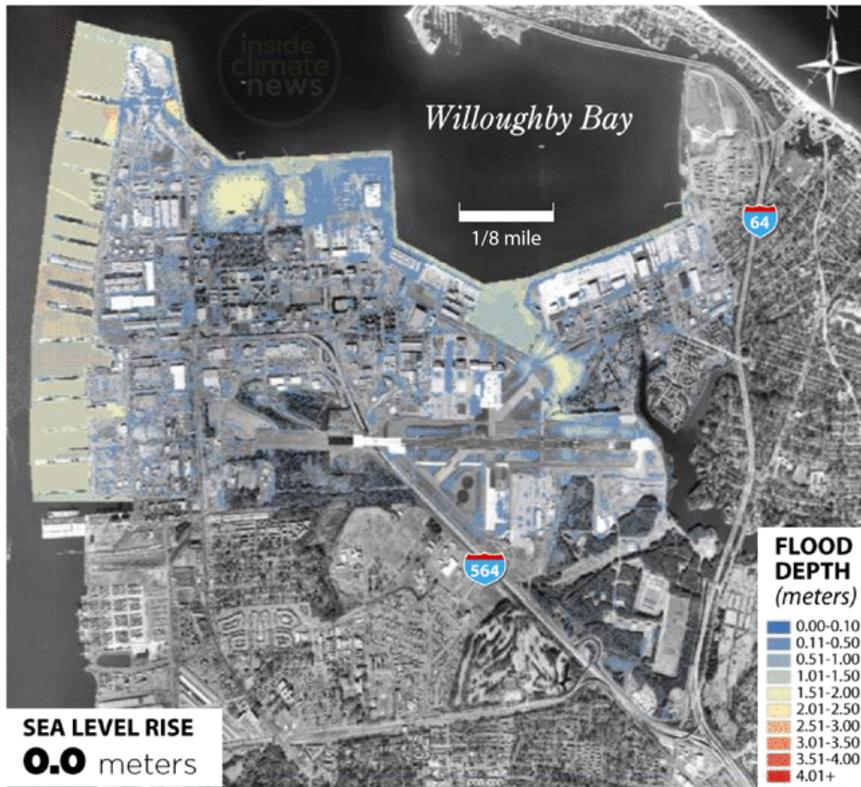
Dr. Jones is an Ocean and Environmental engineer with 20 years' experience in modeling and field studies of coastal and estuarine systems and has over 20 peer-reviewed publications.



What is the problem?

How Rising Seas Will Affect Norfolk Base

This animation shows the flooding that's likely to occur at Naval Station Norfolk, at current and higher sea levels, during the type of storm that hits on average once a year.



SOURCE: U.S. Army Engineer Research and Development Center

PAUL HORN / InsideClimate News

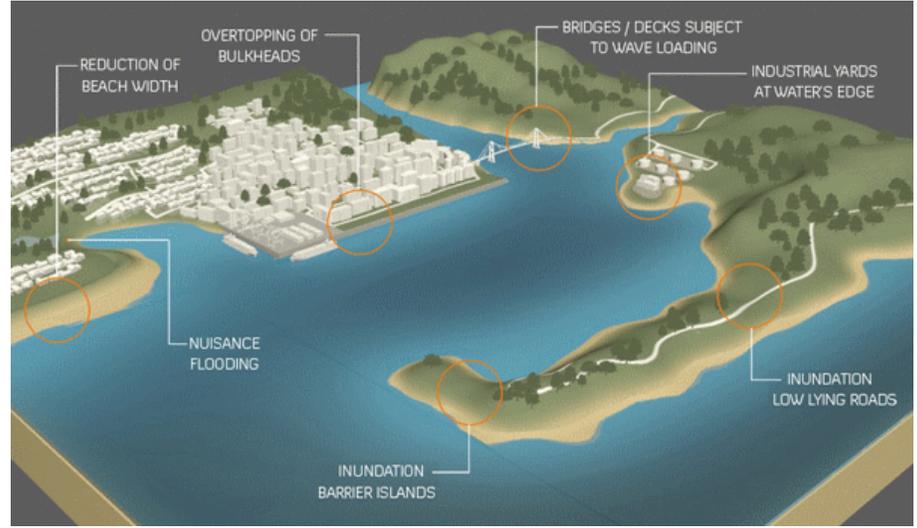


DoD Installation Risks

2/3 of DoD installations at risk of coastal hazards



New approach required for vulnerability assessments

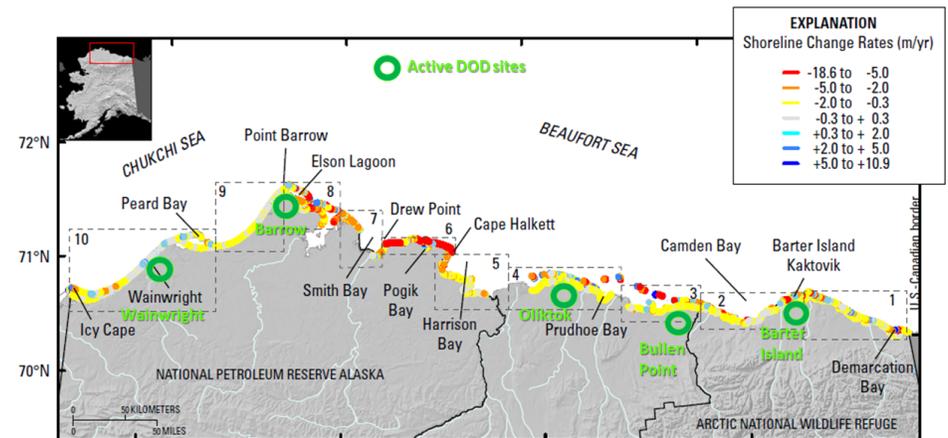


Example: Risks in the Arctic

> 30 m/year of erosion

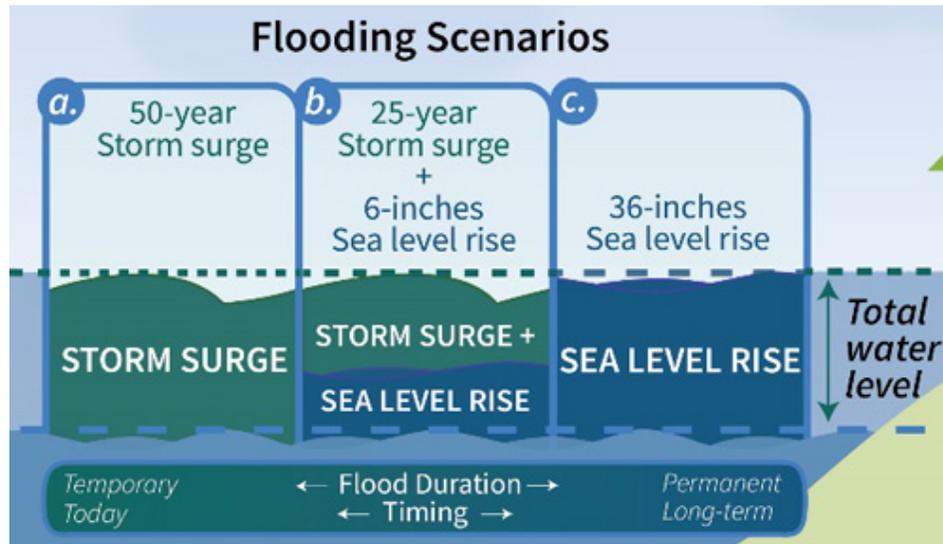


Declining sea-ice extent and increasing sea surface temperature

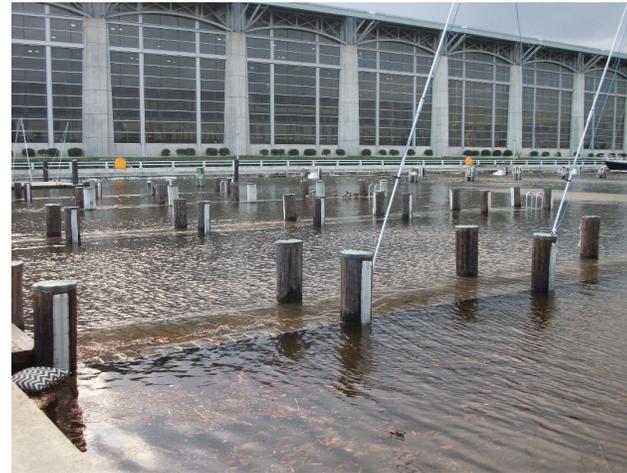


Traditional Coastal Hazards Approach

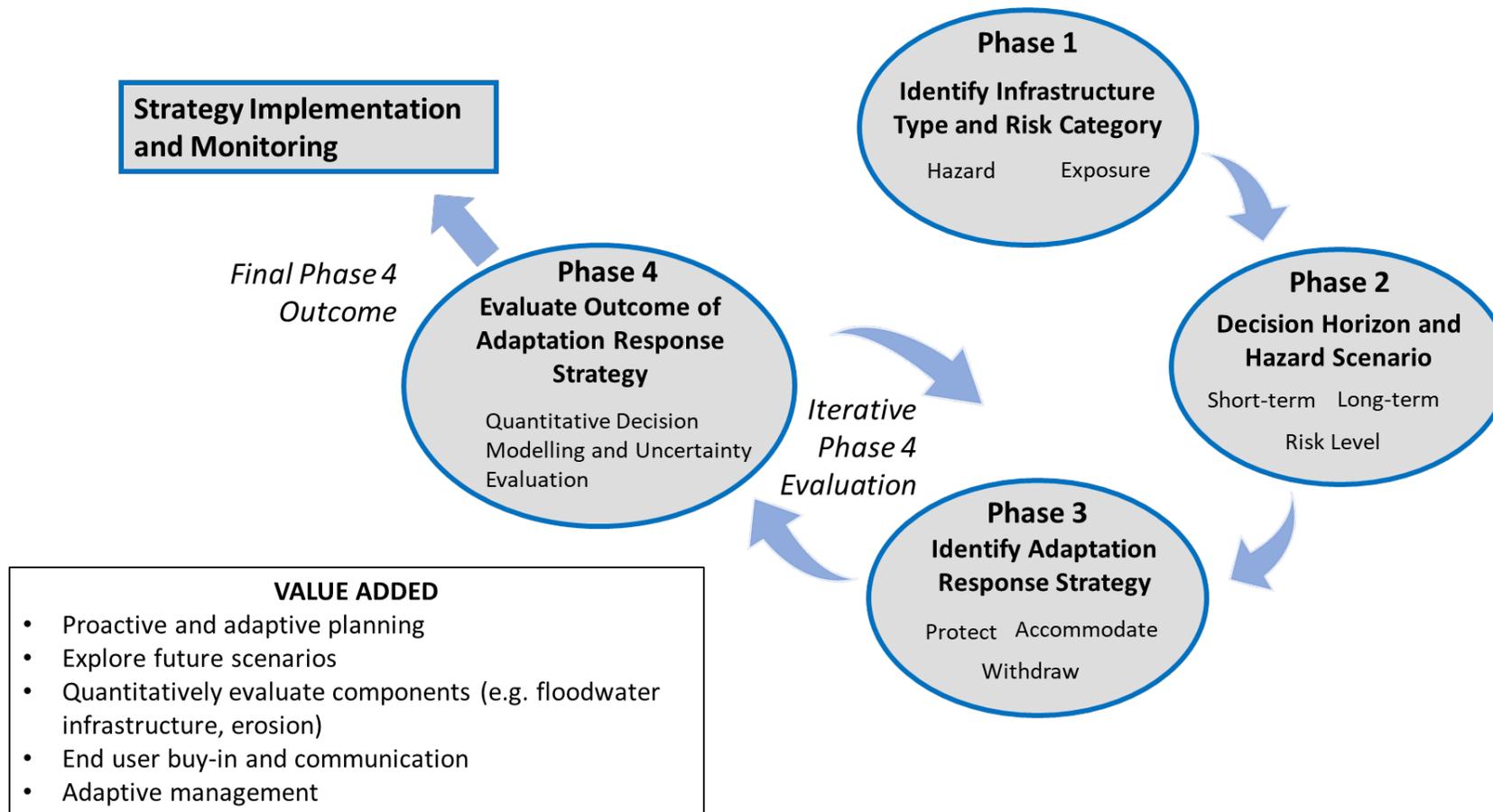
Present day- Total Water Level approach



Coastal flooding hazards are dynamic in nature



Coastal Adaptation Decision and Planning Tool (ADAPT)



Coastal Hazards Require Accurate Definition

Flooding and inundation



Wave impacts



Erosion



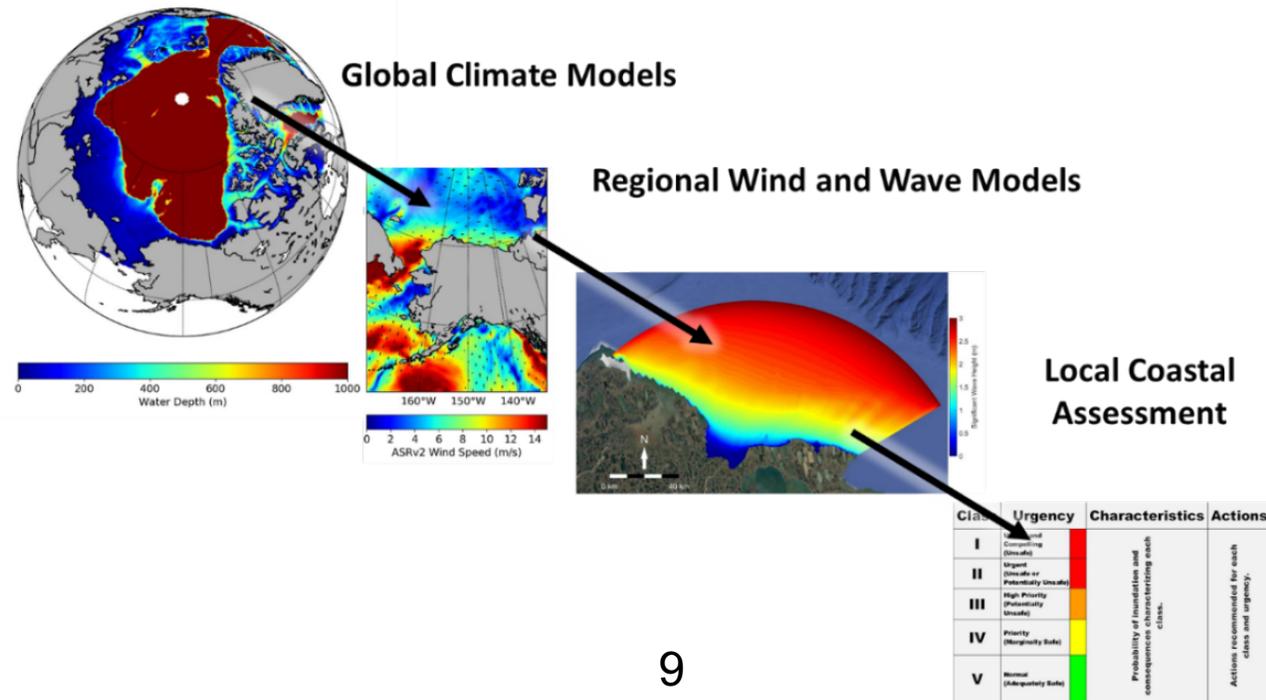
Changes in sediment supply and transport



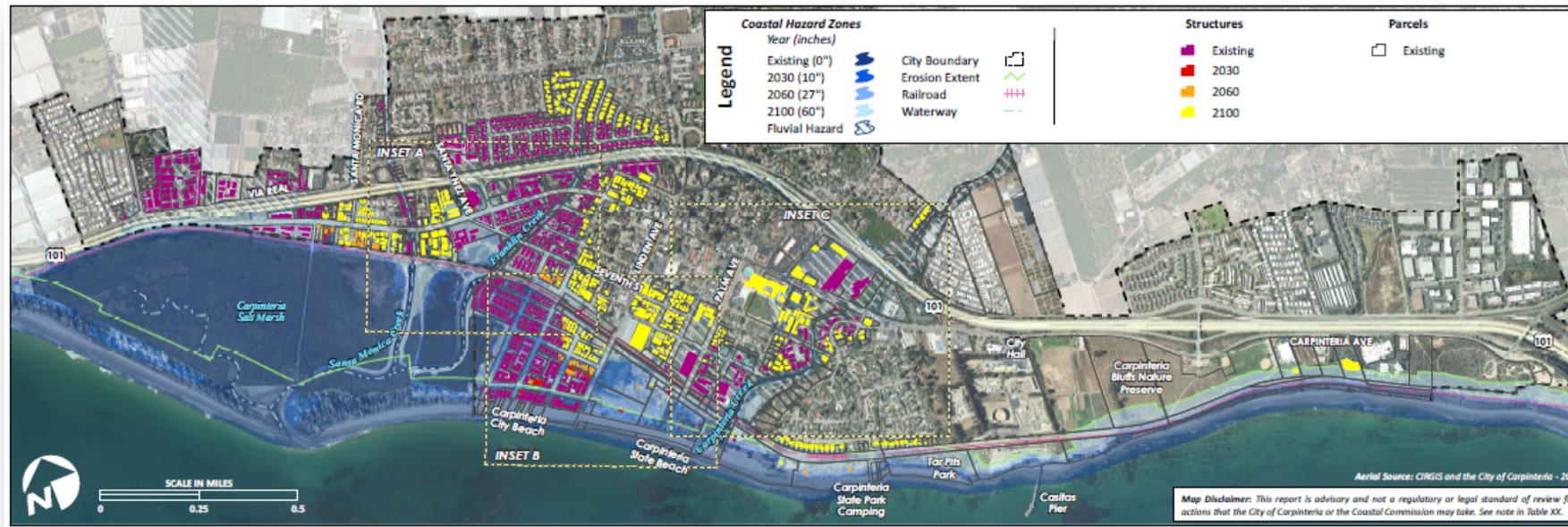
Coastal Hazards Require Accurate Definition

Need: Improved tools for assessing the interactions of sea level rise, storm surge, and flooding

Solution: A quantitative description of coastal hazards and flooding that can be mapped to develop strategies for installation and operational resiliency



Coastal Hazards Mapping



- › Develop metrics
- › Identify exposure
- › Evaluate operational, economic, infrastructure, and other impacts (e.g. UXO, contamination)

Adaptation Strategies

Do nothing



Protect

- Nourishment
- Berm-building
- Living shorelines
- Marsh restoration
- Sandbags
- Reef restoration
- Seawalls
- Bulkheads
- Revetment



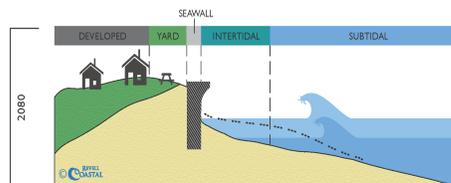
Accommodate

- Elevate buildings
- Flood-proof buildings
- Elevate land and roads
- Increase construction setbacks
- Replacing vegetation

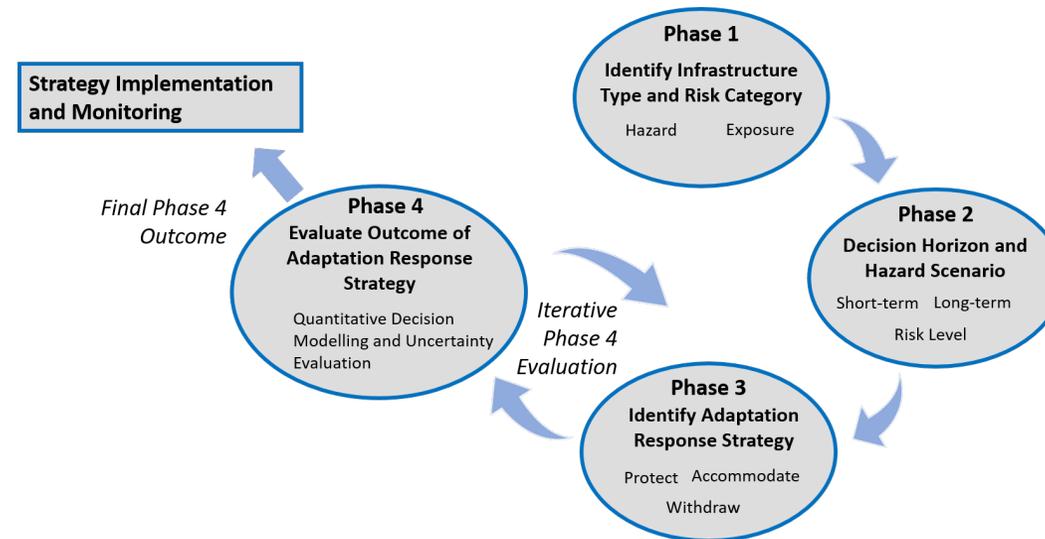


Withdraw/Realign

- Limit expansion and development
- No rebuilding after storms
- Rebuilding restrictions after storms



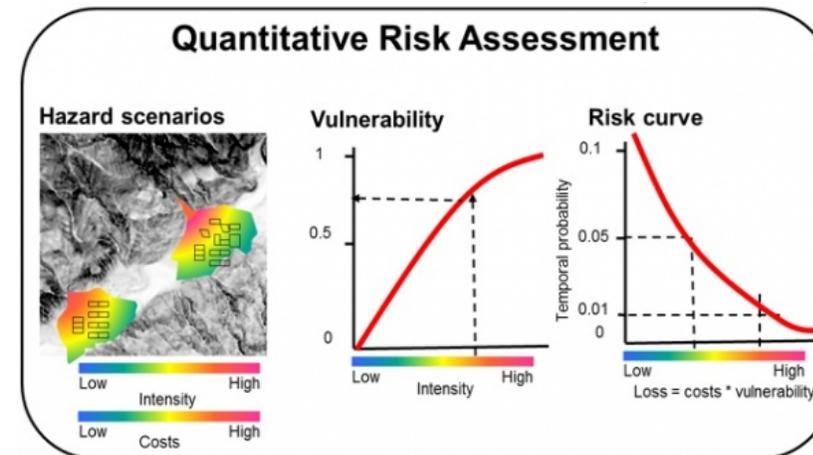
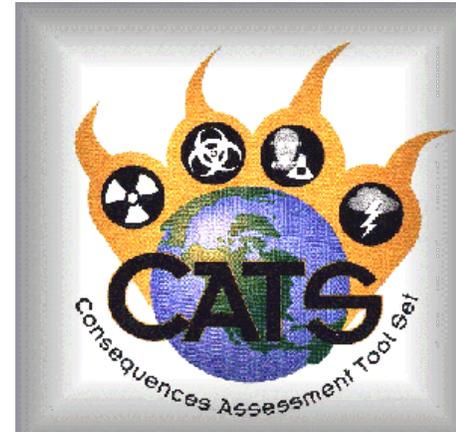
Coastal ADAPT



- Coastal ADAPT framework allows for evaluation of both short- and long-term hazards and quantitative risk metrics
- Provides **effective adaptation strategies for addressing compound threats** to DoD installations and infrastructure

Readily Integrated into DoD Systems

- Consequences Assessment Tool Set (CATS)
- Hazards include those from hurricanes and earthquakes
- CATS can be readily extended for training and planning purposes



Thank You!

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