

## Adapting Maritime Infrastructure to Climate Challenges: A Landlubber's View

The Johns Hopkins University  
Applied Physics Laboratory Kossiakoff Center  
Laurel, MD  
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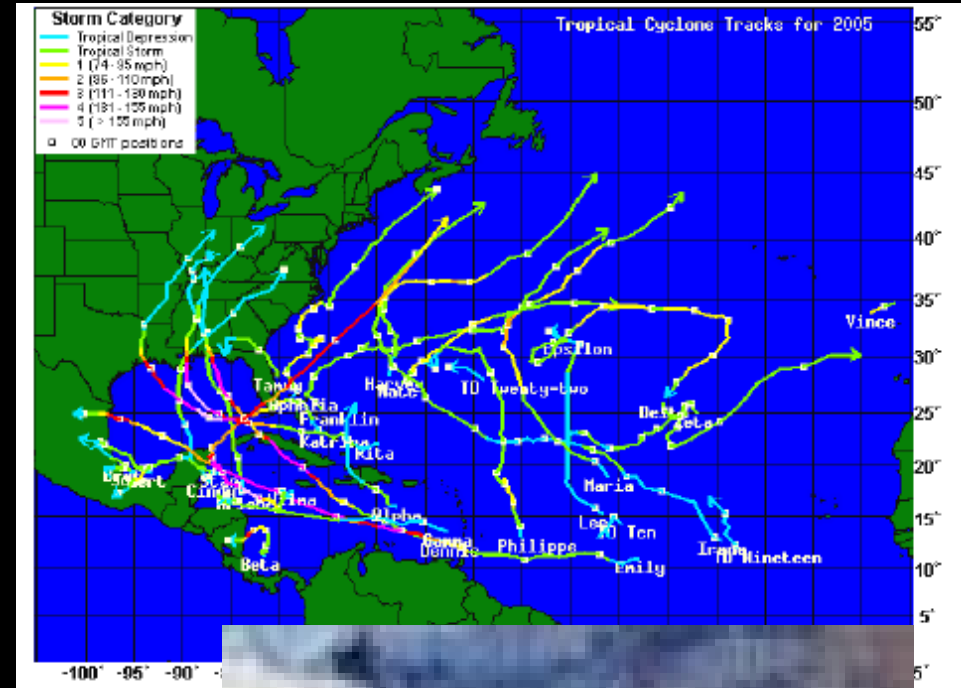


**Fear the Turtle**

# Stipulation:

## There Are Climate Change Challenges

- Increased Temperatures
  - Glacial Melt - Sea Level Rise
  - Increased Hurricane Intensity - SST
  - Increased Flooding
  - Increased Drought
- AND THE COMBINATION  
OF ALL THE ABOVE





# In the US and Around the World

# Planning for Uncertainty

- Traditional Planning

How Do You Get Decision Makers to Think Out  
30-50 Years instead of 5?

Potential  
Variation

Future

Adapted from Marc Waage , Denver  
Water and Malcom Pirnie

- **Maritime Infrastructure:** The basic physical structure needed for the operation of an enterprise or activities in coastal and riverine areas. It includes basic infrastructure (roads, utilities, etc.) as well as those elements necessary for marine operations (piers, cranes, etc) and the protection of both marine and basic facilities (levees, breakwaters, etc)



# Potential Coastal Climate Change Threats

- Increased Riverine Flooding
- Increased Hurricane/Typhoon Surges
- Increased Stormwater Flooding
- Sea Level Rise
- Tidal Changes
- More Storms



Langley AFB

# Impacts of Climate Change on Infrastructure

- Inundation of developed areas
- Erosion of beaches and shorelines
- Degradation of Protection Systems
- Degradation of Transportation Facilities
- Increase in Salinity Content of Rivers, Bays, Estuaries, Wetlands, and Groundwater
- Encroachment
- Etc.



Mayport

# Approaches to Sea Level Rise and Climate Change

- Retreat
- Accommodate - Adapt
- Protect



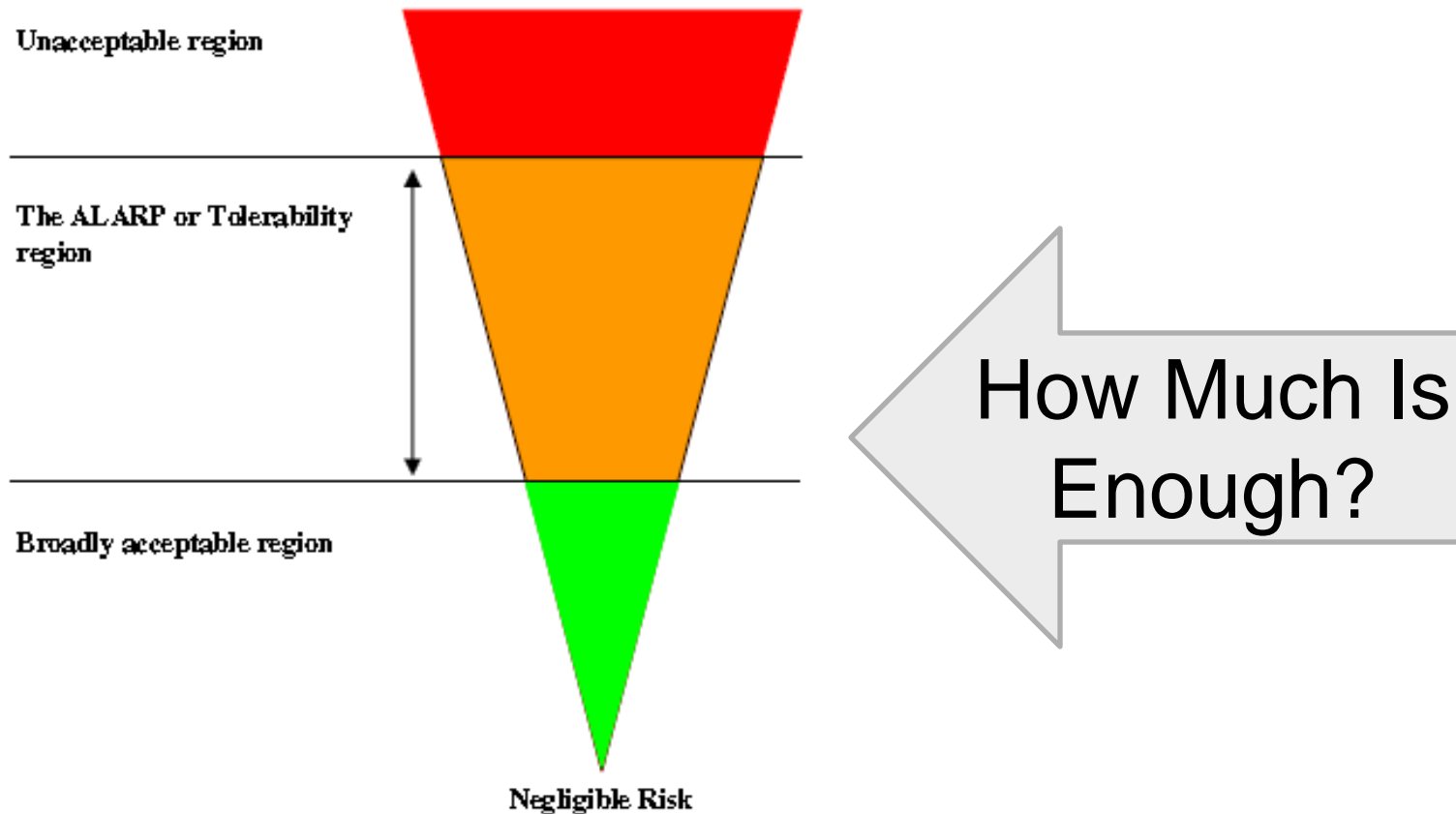
Risk!



**How Much Risk Is Too Much?**

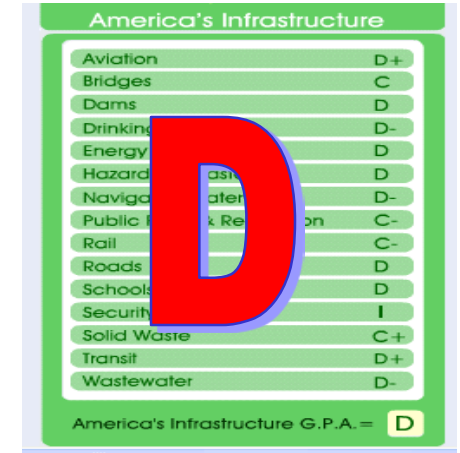
# WHAT DO RISK VALUES MEAN?

Risk is ever present. Risk can be increased, decreased, transferred but rarely eradicated.

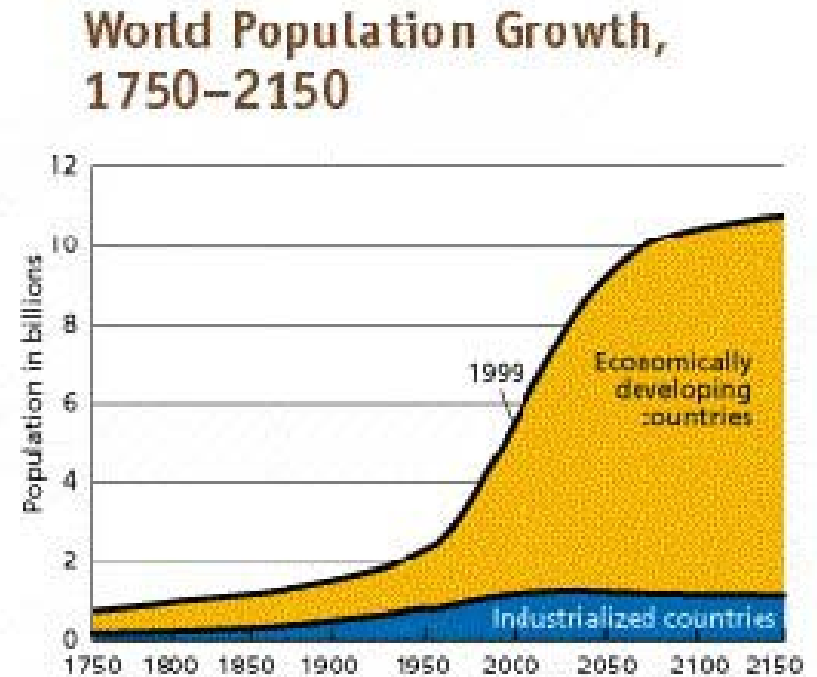
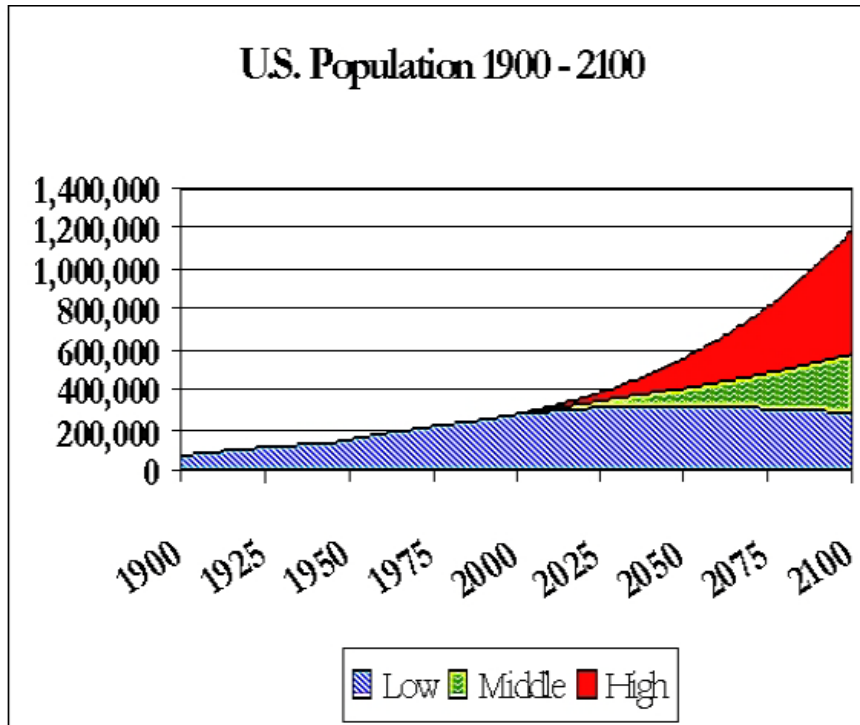


# What Do You Do?

- Know Where You Are
- Identify the Risks
- Assess the Risks
- Address the Risks – Action Agenda



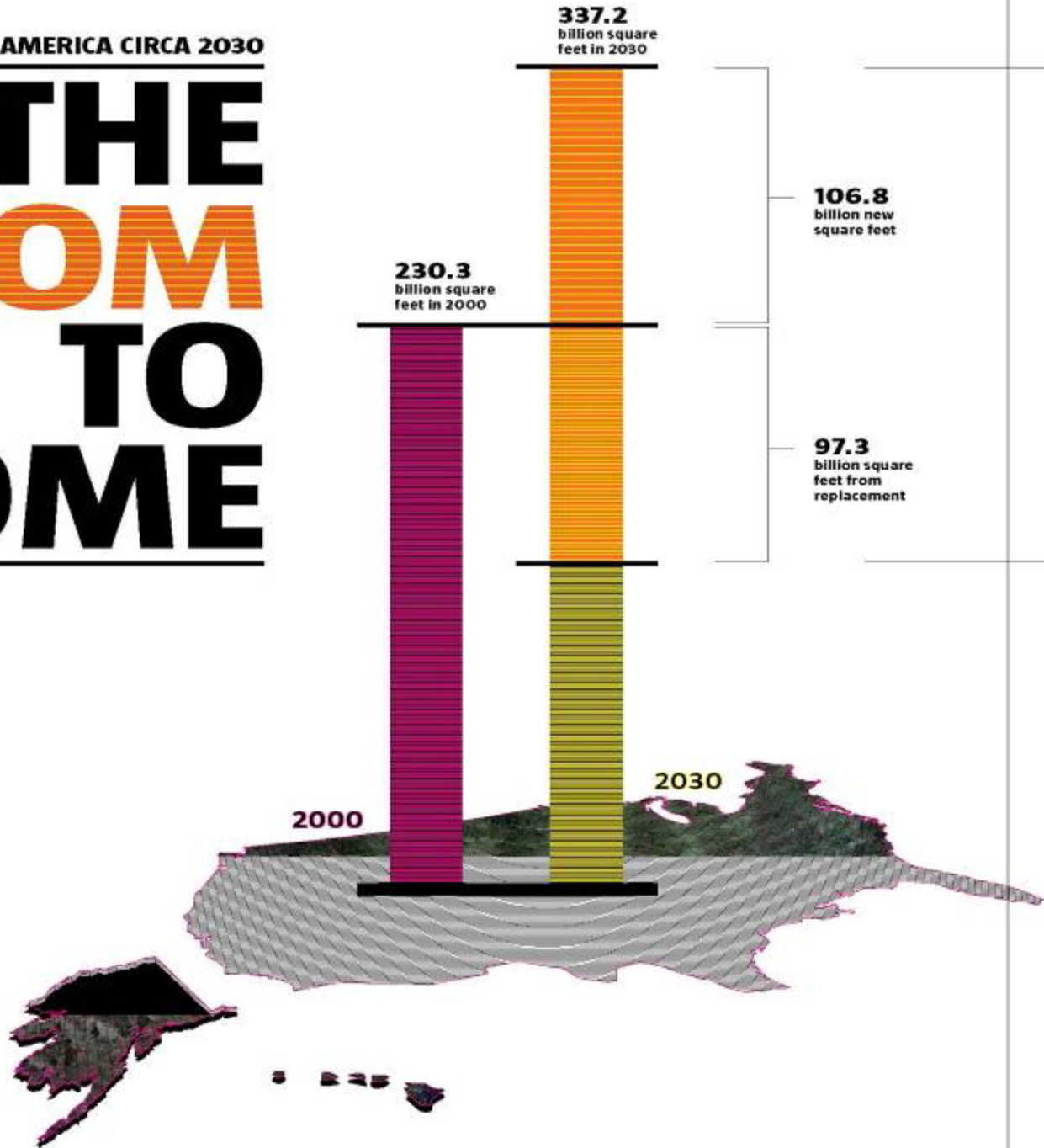
# Population Growth



**More People = More Challenges**

AMERICA CIRCA 2030

# THE BOOM TO COME



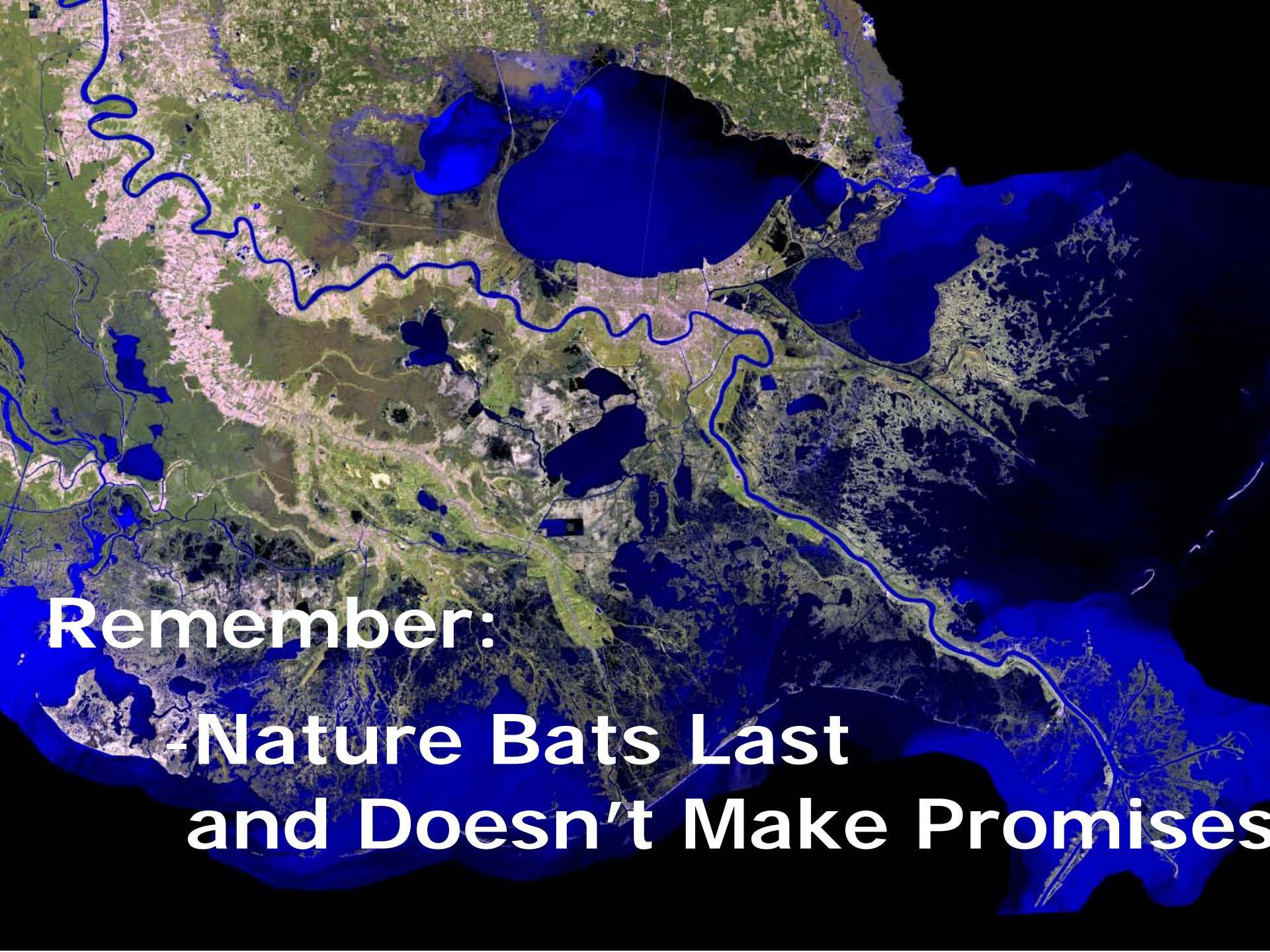
# What Happens on Bases Doesn't Stay on Bases and Vice Versa

- Utilities
- Transportation
- Medical
- Transportation
- Shipyards
- Etc
- 



# Bottom Line

- **Climate Change Will Have Significant Impact on Maritime Infrastructure**
- **It is Possible to Deal with Climate Change Impacts on Infrastructure**
- **Tough Decisions Will Have to be Made**
  - **Priorities – Acceptable Risk**
  - **Resources – Funding**
- **Military Maritime Infrastructure is Tied to Civilian Infrastructure**



**Remember:**

**-Nature Bats Last  
and Doesn't Make Promises**

**GO ARMY**



**BEAT NAVY**