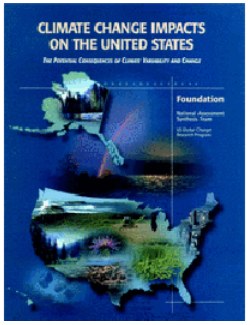
Oceans and Marine Resources in a Changing Climate

Technical Input Report to the 2013 National Climate Assessment

“Industrial, agricultural, and other human activities, coupled with an expanding world population, are contributing to processes of global change that may significantly alter the Earth habitat within a few generations.” ***Global Change Research Act***

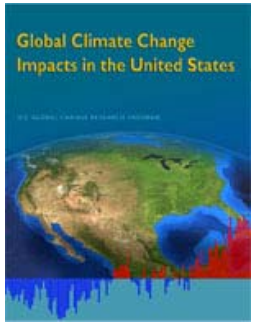
The National Climate Assessment acts as status reports about climate change science and impacts. It aims to incorporate advances in the understanding of climate science into larger social, ecological, and policy systems, and with this provide integrated analyses of impacts and vulnerability.

2000: First National Assessment

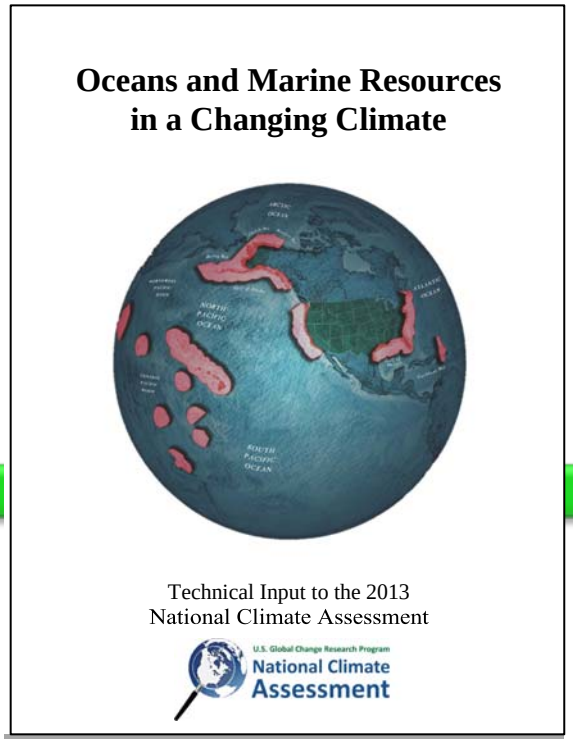


2011: Addition of the Coastal and Marine Regions

1990: The Global Research Act



2009: Second National Assessment

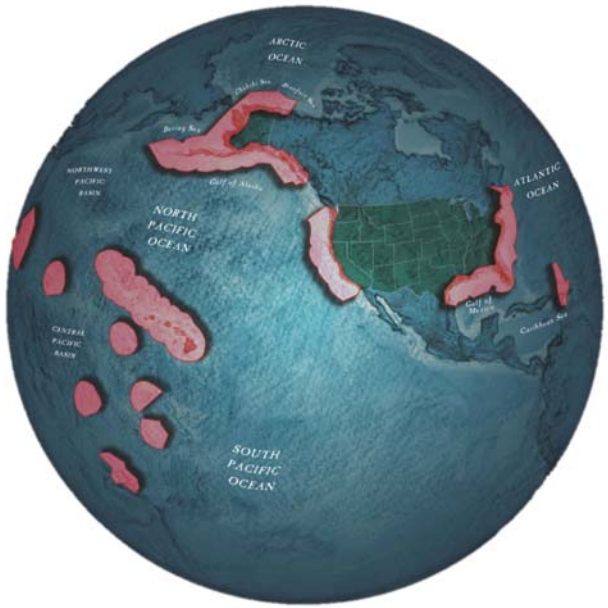


2012: Production of the Marine Technical Input Report

2013: Next National Assessment

2017: Sustaining the Assessment

Oceans and Marine Resources in a Changing Climate



Technical Input to the 2013
National Climate Assessment

U.S. Global Change Research Program
National Climate Assessment

Climate Driven Physical and Chemical Changes in Marine Ecosystems

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Impacts of Climate Change on Marine Organisms

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Impacts of Climate Change on Human Uses of the Ocean and Ocean Services

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International Implications of Climate Change

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Ocean Management Challenges, Adaptation Approaches, and Opportunities in a Changing Climate

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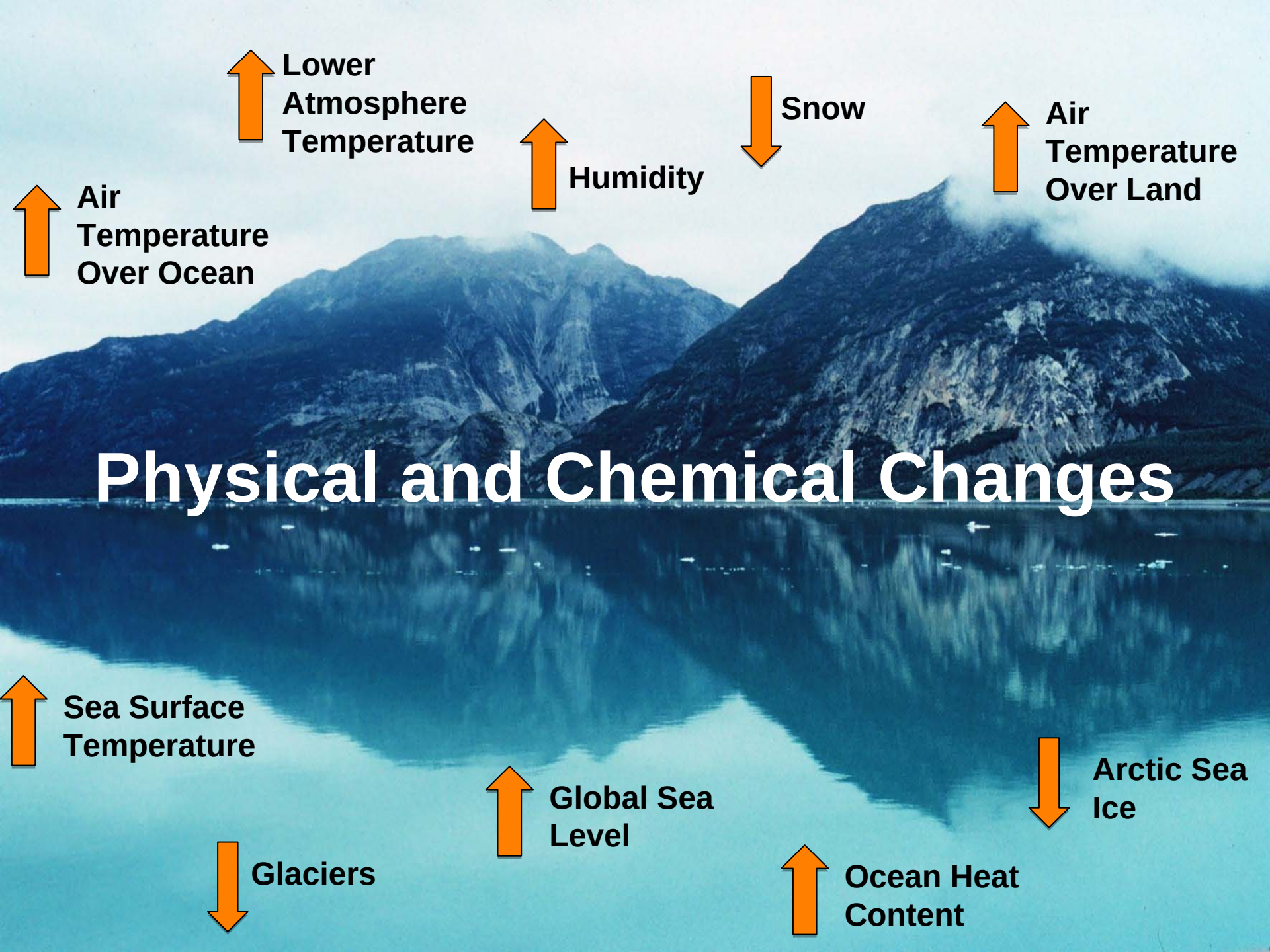
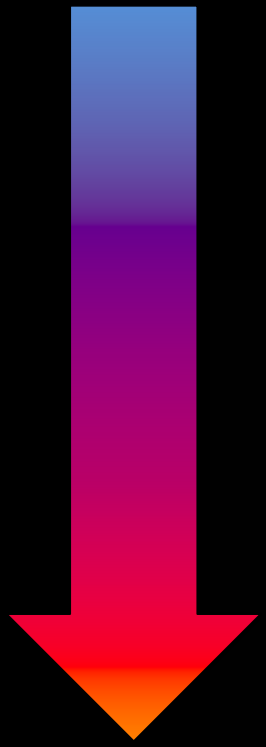
Sustaining the Assessment of Climate Impacts on Oceans and Marine Resources

Author Team


Lower Atmosphere Temperature
Snow
Air Temperature Over Land
Humidity
Air Temperature Over Ocean
Physical and Chemical Changes
Sea Surface Temperature
Arctic Sea Ice
Global Sea Level
Glaciers
Ocean Heat Content

Ocean Acidification = the other CO_2 problem

pH



Decreased 30% in the last century

Impacts of Climate Change on Marine Organisms

Impacts on survival, growth, reproduction, health and phenology

Climate change interacts with and usually exacerbates non-climate stressors

Shifts in species distributions and ranges

Alterations in species interactions

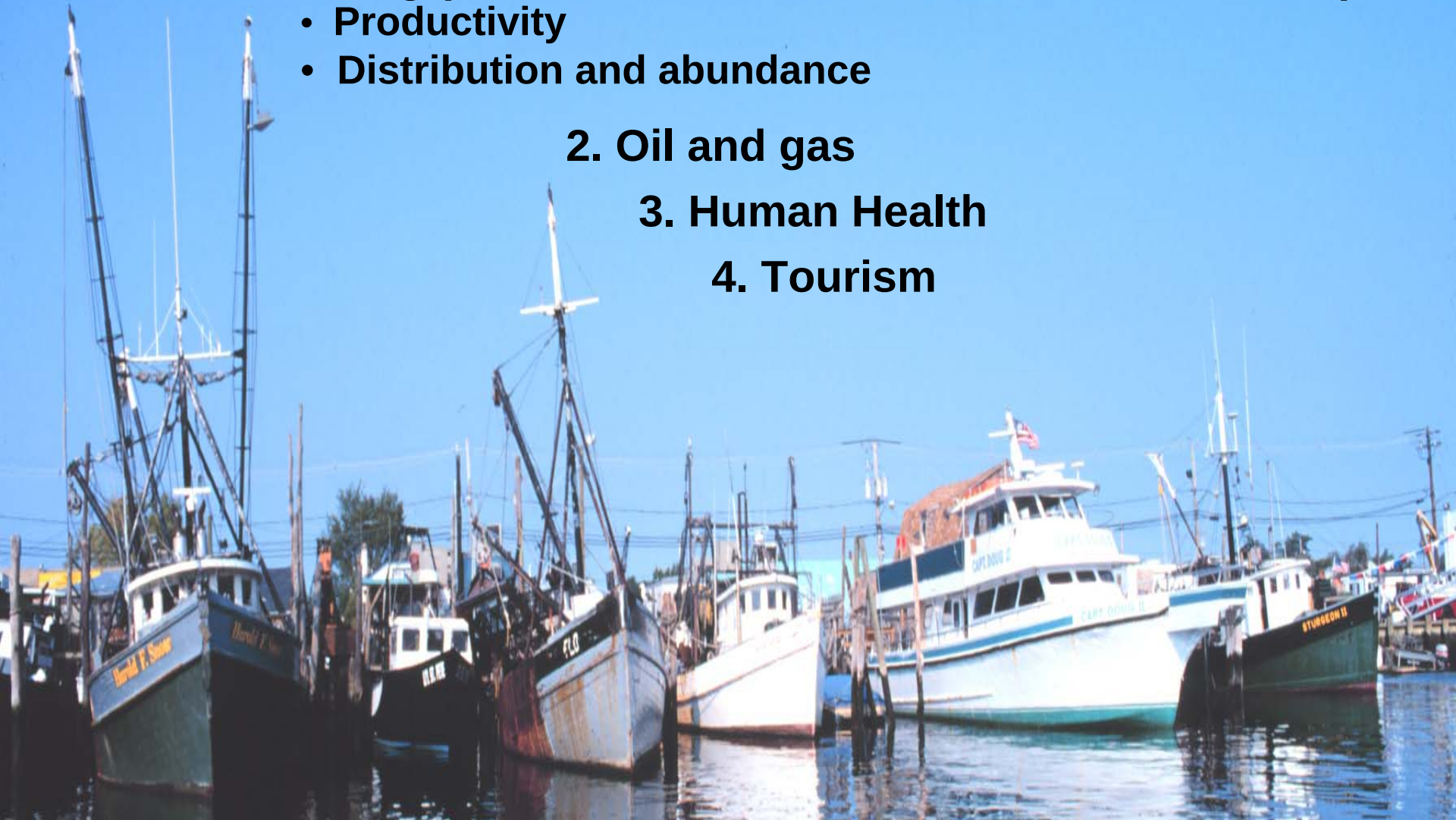
Tipping points resulting in rapid ecosystem change

Winners and Losers

Increased impacts seen in high latitude and tropical areas

Impacts of Climate Change on Human Uses of the Ocean

1. Fishing (Commercial, Recreation, and Subsistence)
   - Productivity
   - Distribution and abundance
2. Oil and gas
3. Human Health
4. Tourism



International Implications of Climate Change

- Highly migratory species, and shifting ranges
- International partnership
- Regional Fisheries Management Organizations (RFMOs)
- Opening of the Arctic
  - Transportation
  - Shipping
  - Pollution
  - Security

Management Challenges, Adaptation Approaches, and Opportunities

Management Challenges

A survey was conducted of North American coastal and marine managers, who articulated the following as barriers:

- Lack of institutional support, governance, and mandates to take adaptation action;
- Lack of institutional capacity and guidance on how to take action;
- Lack of key information on locally and regionally specific climate projections, and tools to support assessments and monitoring;
- Lack of awareness, stakeholder support, and engagement;
- Uncertainty about risk and vulnerability; and
- Lack of economic resources and budgetary constraints

(Gregg et al., 2011)

Adaptation Approaches

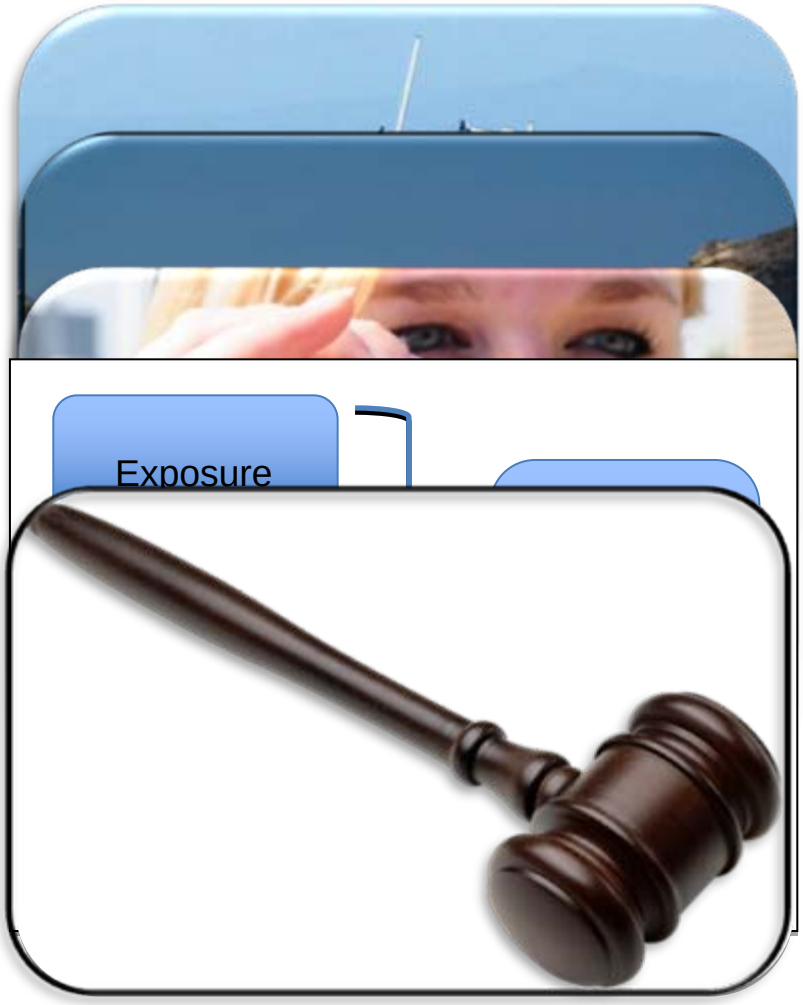
Long term monitoring

Marine spatial planning (MPAs)

Regulation of non-climate stressors

Fisheries management

Integration into existing legislation
- **Clean Water Act**
- **Endangered Species Act**
- **Magnuson Stevens Fisheries Conservation and Management Act**



Opportunities and Emerging Frameworks

National / Federal

- Interagency Climate Change Adaptation Task Force
- National Fish, Wildlife, and Plant Climate Adaptation Strategy
- National Ocean Policy

Regional / State

- West Coast Governors Alliance on Ocean Health
- State of California Climate Adaptation Strategy
- Massachusetts Climate Change Adaptation Report

Non-Governmental

- Alaskan Marine Arctic Conservation Action Plan for the Chukchi and Beaufort Seas (TNC)
- A Climate Change Action Plan for the Florida Reef System (The Florida Reef Resilience Program)

Sustaining the Assessment

- Identify and collect information on a set of core indicators of the condition of marine ecosystems and track the effectiveness of mitigation and adaptation efforts over time at regional to national scales.

- Conduct regional-scale assessment of current and projected impacts of climate change.

- Develop mechanisms for getting and sharing information and resources on impacts, vulnerabilities and adaptation of U.S. ocean ecosystems in a changing climate.

- Build and support mechanisms with neighboring countries and other international partners for assessing and addressing impacts of climate change and ocean acidification on marine ecosystems of key interest to the U.S.

- **Coordination and communication between decision-makers and science providers to ensure the most critical information needs are being met related to impacts, vulnerabilities, mitigation, and adaptation of ocean ecosystems in a changing climate.**


Now What?


Questions?