



Auditing Government Efforts to Adapt to Climate Change and Ocean Acidification in the Marine Environment

WGEA Parallel Session – Group #2

SAI of the United States

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Introduction

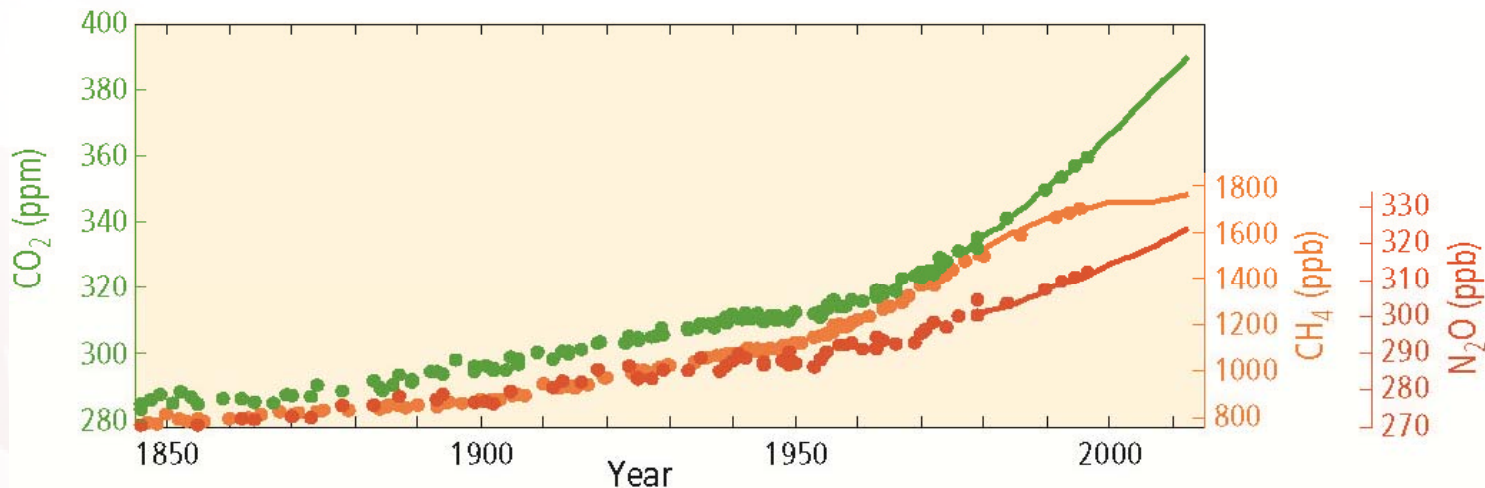
- Welcome
- Research project overview
 - WGEA 2014 – 2016 Work Plan
 - Project lead: SAI of the United States
 - Subcommittee members:
 - 1) Bulgaria
 - 2) Indonesia
 - 3) Kenya
 - 4) Kuwait
 - 5) Morocco
 - 6) Netherlands
 - 7) Norway
 - 8) Philippines
 - 9) Senegal
 - 10) Yemen

Why Focus on the Marine Environment?

- Marine environment = oceans and coastal communities
- People depend on marine habitats and species for food, jobs, and economic activity
- Much of the world's population lives in coastal areas
- Climate change and ocean acidification could significantly affect marine ecosystems and coastal communities
- The marine environment has long been an area of interest for the WGEA

Background: Climate Change

- Elevated concentrations of greenhouse gases in the atmosphere could lead to a variety of physical changes in the marine environment, including warmer ocean temperatures and sea level rise.



Source: IPCC

Note: Green = carbon dioxide; Orange = methane; Red = nitrous oxide

Background: Ocean Acidification

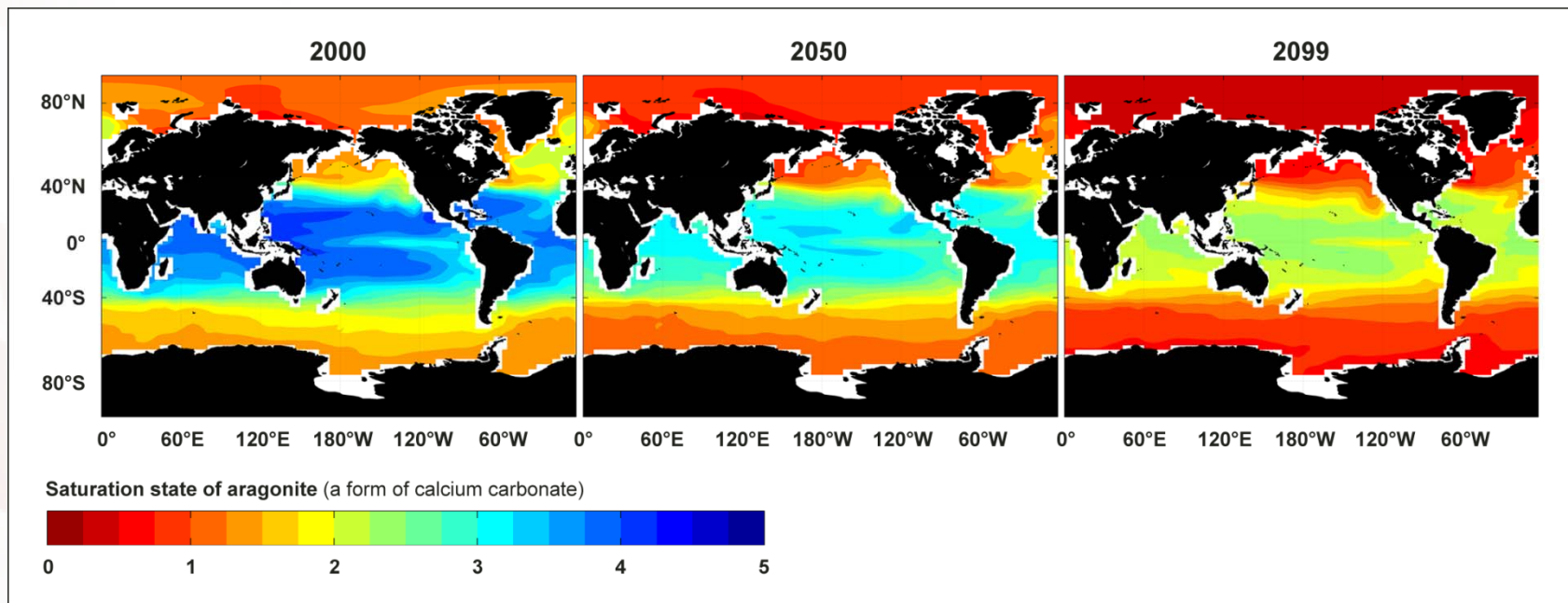
- Introductory video clip: <http://apps.seattletimes.com/reports/sea-change/2013/sep/11/pacific-ocean-perilous-turn-overview/>
- The oceans are estimated to have absorbed approximately 30 percent of the carbon dioxide emitted by human activities since 1750.
- As more carbon dioxide is absorbed by the oceans, the *pH* of the ocean water decreases (i.e., it becomes more acidic).

Background: Ocean Acidification

- Higher levels of carbon dioxide in the oceans also cause chemical reactions that reduce the amount (known as the “saturation state”) of certain minerals (such as aragonite and calcite) in the oceans.
- Lower saturation states make it more difficult for marine animals to build shells and skeletons.

Background: Ocean Acidification

- As oceans absorb more carbon dioxide, scientific models predict that the saturation state will continue to decline.



Source: Katherine Spencer Joyce, adapted from Richard A. Feely, Scott C. Doney, and Sarah R. Cooley ©Woods Hole Oceanographic Institution. | GAO-14-736

Research Project Objectives

- 1) Identify and describe potential effects of climate change and ocean acidification on the marine environment and examples of government efforts to adapt to these effects

- 2) Provide information on previous SAI audit work related to climate change and ocean acidification issues in the marine environment

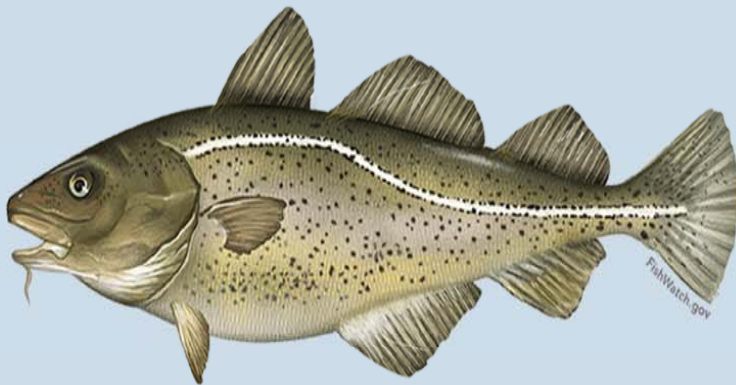
- 3) Describe the challenges SAIs have experienced in auditing these issues and identify approaches SAIs can take to help overcome them

Methodology

- Literature reviews of reports from national institutions (e.g., environmental ministries) and international bodies (e.g., IPCC, UN, World Bank)
- Identified and examined 37 relevant audits published by SAIs from 20 countries between 2002 and 2015
- Developed audit matrices for 6 feature audits; gathered information from SAI officials that worked on those audits
- Used the WGEA Secretariat's 2014 survey of INTOSAI members to collect information on challenges and ways to overcome them

Objective 1: Effects on Marine Species

- Warming ocean temperatures may affect the distribution and abundance of some fish and invertebrate species



Atlantic cod have experienced a decline in abundance in recent decades, and warming ocean temperatures may have contributed to this decline, according to NMFS and Council officials. However, the officials said the extent to which changing temperatures played a role in the decline is unclear because it is difficult to isolate this factor from other contributing factors, such as overfishing.

Sources: National Marine Fisheries Service (NMFS) and Regional Fishery Management Council (Council) officials (text); <http://www.fishwatch.gov/> (image). | GAO-16-827

Objective 1: Effects on Marine Food Webs

- Changes in species distribution and abundance could reverberate throughout marine food webs.
 - For example, ocean acidification may cause increased shell dissolution and reduced growth for pteropods (a type of sea snail). Reductions in pteropod populations could harm other species, such as salmon, that rely on pteropods for food.

Pteropods exposed to waters with varying pH levels



Source: © Nina Bednaršek. | GAO-14-736

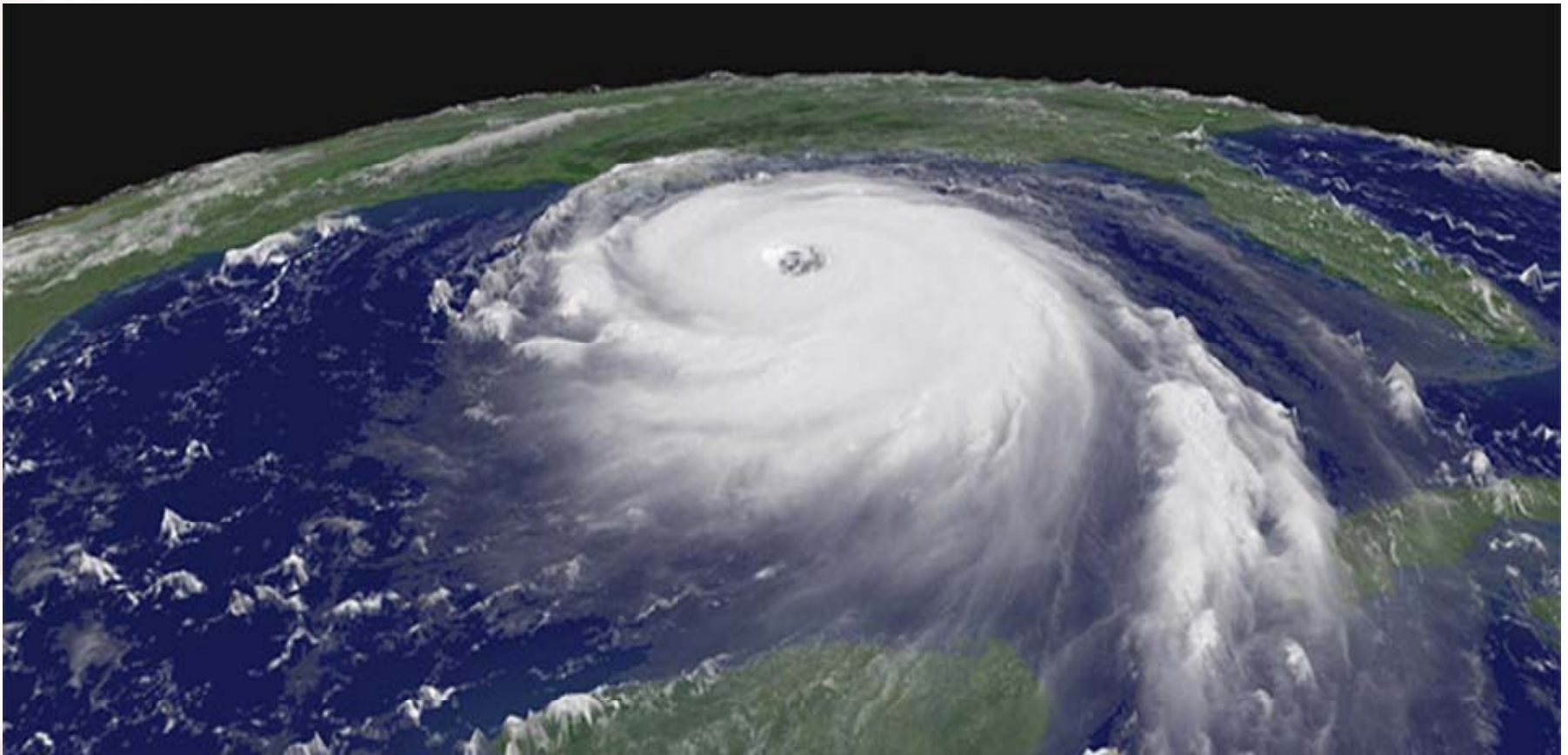
Objective 1: Effects on Coastal Communities

- Rising sea levels and more severe coastal storms could increase coastal flooding and erosion
 - Displacement of people in low-lying areas
 - Damage to homes, businesses, and critical infrastructure (e.g., ports, roads, power and water plants)
- Saltwater intrusion of coastal freshwater resources
 - Harm to coastal agriculture, which could contribute to food security issues in some locations
- Socioeconomic effects for communities and industries (e.g., fishing and tourism) that depend on marine resources for commerce

Objective 1: Government Adaptation Efforts

- Structural adaptation
 - Building sea walls, elevating buildings, relocating affected populations away from vulnerable coastal areas
- Ecosystem-based adaptation
 - Protecting and reinforcing natural coastal defenses such as oyster reefs, mangroves, and salt marshes
- Policy instruments
 - Building codes, zoning restrictions, integrating climate change into disaster planning, financial incentives, tax policies, insurance requirements, and creating marine protected areas

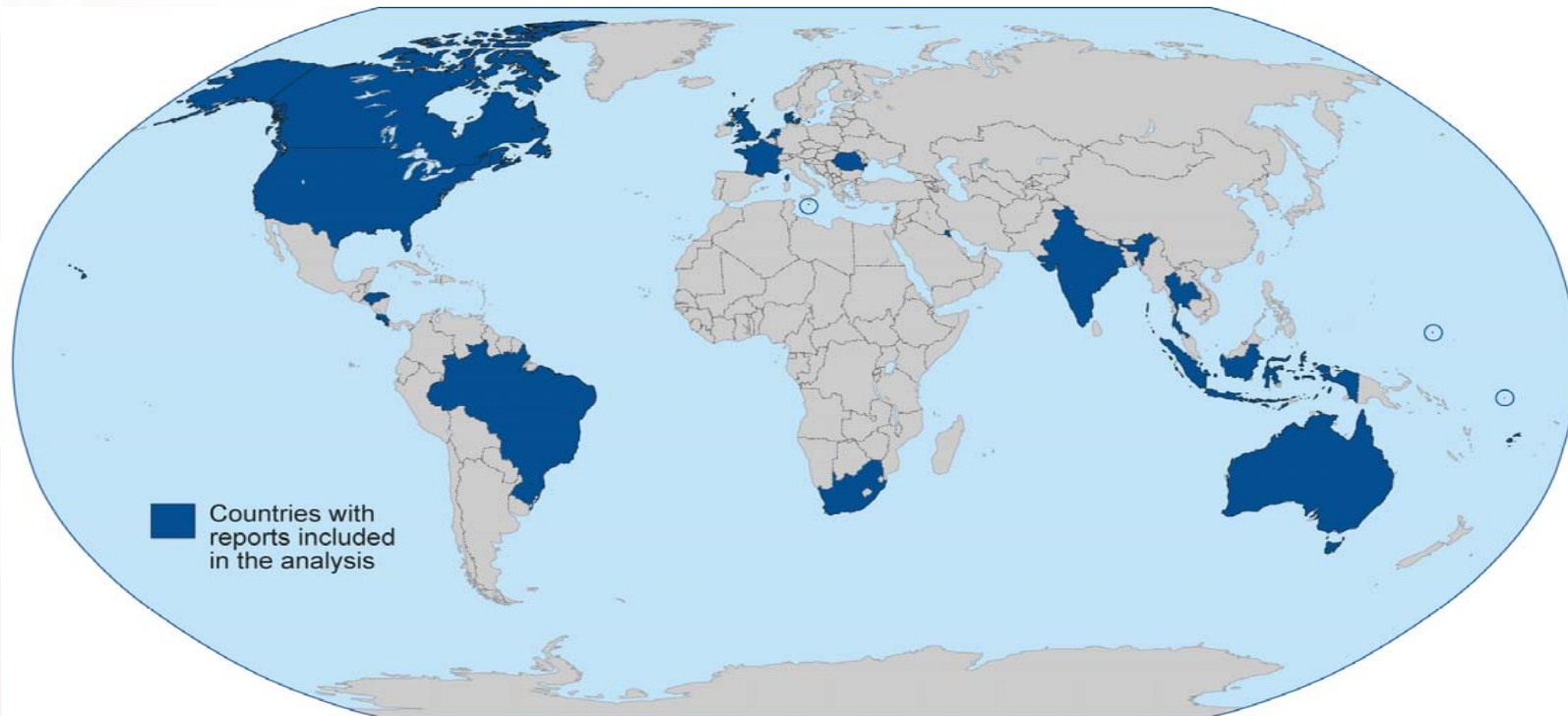
What Role Can SAIs Play?



Objective 2: SAIs' Experiences Auditing These Issues

- We found that a limited number of SAIs have experience auditing climate change and ocean acidification issues in the marine environment. In general, such audits have examined:
 - Government assessments of marine environment risks and vulnerabilities
 - Government efforts to adapt to the effects of climate change and ocean acidification
 - Coordination among government agencies and between governments and other entities

Objective 2: SAIs with Audits Analyzed for the Report



- Australia
- Brazil
- Canada
- Costa Rica

- Denmark
- Federated States of Micronesia
- Fiji

- France
- Honduras
- India
- Indonesia
- Kuwait

- Malta
- Netherlands
- Romania
- South Africa

- Thailand
- Tuvalu
- United Kingdom
- United States

Sources: GAO and Map Resources.

Objective 2: Feature Audit Examples

- 1) Brazil – “Adaptation Measures for Climate Change Scenarios in the Brazilian Coastal Zones”
 - 2) Canada – “Adapting to Climate Impacts”
 - 3) Federated States of Micronesia – “Audit on the Management of the Impacts of Climate Change on Food Security in the FSM (Fiscal Year 2010 – 2012)”
 - 4) Honduras – “Implementation of Commitments Under the United Nations Framework Convention on Climate Change”
 - 5) Tuvalu – “Performance Audit on Coastal Protection Management in Tuvalu”
 - 6) United States – “Ocean Acidification: Federal Response Under Way, but Actions Needed to Understand and Address Potential Impacts”
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Objective 2: Audit Matrix Template

- To present detailed information on the six feature audits, we developed audit matrices using the following template:

Objectives / Researchable Question(s)	Audit Criteria, Required Information, Sources of Information	Scope and Methodology	Challenges Encountered in Conducting the Audit	Audit Results and Key Findings
<p>What questions was the SAI trying to answer?</p>	<p>What criteria, if any, did the SAI use to perform its evaluation?</p> <p>What information did the SAI obtain to answer the researchable questions?</p>	<p>How did the SAI answer each researchable question?</p>	<p>What challenges, if any, did the SAI encounter?</p>	<p>What were the audit's key results and findings?</p> <p>Did the SAI make any recommendations?</p>

Objective 3: Challenges SAIs Face and Approaches to Help Overcome Them

SAIs identified a number of challenges to auditing climate change and ocean acidification issues in the marine environment, including:

- Limited audit criteria and government action
- Fragmented governance
- Limited experience and training
- Competing audit priorities
- Limitations in the scope of SAI audit mandates

Challenge: Limited Audit Criteria and Government Action

- Many SAIs reported being hindered by:
 - The absence of applicable criteria at the national level in countries where governments have not passed laws and regulations related to climate change and ocean acidification issues in the marine environment
 - The limited examples of government actions taken to address these issues, which provides little for SAIs to evaluate

- Approaches that could help overcome these challenges:
 - Use international agreements as criteria (such as the UNFCCC)
 - Use good governance and good management criteria (developed by INTOSAI and others)
 - Use international benchmarking (see the 2013 WGEA guidance document on auditing water issues for examples)
 - Provide descriptive information to inform lawmakers and the public about important issues when an evaluative audit cannot be performed

Challenge: Fragmented Governance

- Efforts to respond to climate change and ocean acidification are often fragmented among multiple government programs (e.g., related to energy policy, fisheries management, air and water pollution) and different levels of government (national, regional, local).
- Approaches that could help overcome this challenge:
 - Use a risk-based approach to identify key programs to audit
 - Assess coordination efforts (fragmentation can present coordination challenges for government agencies)
 - See SAI of the United States' reports identifying best practices for interagency collaboration as a potential source for criteria

Challenge: Limited Experience and Training

- Many SAIs reported that their staff have limited experience and training related to climate change and ocean acidification (and, in some cases, environmental issues more broadly)
 - When staff are not familiar with the science behind these complex and technical topics, it can be difficult to conduct audits in this area
- Approaches that could help overcome this challenge:
 - Provide additional training to staff
 - Contract with independent experts with scientific expertise (e.g., from government agencies or academia)
 - Obtain technical assistance from regional SAI organizations
 - Participate in cooperative audits with other SAIs
 - E.g., PASAI's recent coordinated audit on climate change adaptation and disaster risk reduction

Challenge: Competing Audit Priorities

- Many SAIs reported that they have focused their limited auditing resources on other issues that are considered to be a higher priority.
 - In countries where negative effects from climate change and ocean acidification in the marine environment have not yet been observed, these issues may be viewed as a lower priority for auditing compared with other more immediate concerns.
- To help overcome this challenge, SAIs could expand the scope of some already-planned audits (such as audits focused on traditional fisheries or flooding issues) to include examining the effects of climate change and ocean acidification on the audited topic.

Challenge: Limitations in the Scope of SAI Audit Mandates

- Some SAIs reported that their audit mandates do not specifically include environmental auditing or may limit the scope of their authority to auditing the central government.
- For example, the SAI of the Netherlands' mandate is limited to auditing the central government, but some important government actions (such as those related to coastal flooding defense projects) are also undertaken by lower levels of government.
 - To help overcome this challenge, the SAI said it could audit national entities that supervise regional and local governments and could cooperate with regional and local auditors.

Questions or Comments?