CLIMATE CHANGE VULNERABILITY OF THE CANADIAN MARITIME ENVIRONMENT
SPEAKERS

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AGENDA

1. Word of Welcome
2. Project Context & Overview
3. Summary of Research Findings
4. Q & A
COMMUNICATING COMPLEX ISSUES

Key Issues pages

Research & web-tools (10+)

Blog articles (45+)

Indigenous & research programs
Climate change poses unprecedented challenges to those tasked with maintaining a safe and efficient maritime environment; careful planning and adaptation measures are required to mitigate the risks climate change is posing on human life and the environment.

Project aims to:

- Identify ways climate change will impact Canadian waterways and their users;
- Assess how impacts may affect the delivery of maritime services; and
- Discover potential strategies to manage the climate change adaptation process.
“We are proud to support the work of the Clear Seas Centre for Responsible Marine Shipping and all partners involved in addressing climate change. Understanding climate change threats and adaptation strategies are key to preparing for the future of our operations. This report will help inform our continued commitment to transitioning to low-carbon, climate resilient, and green operations.”

- Mario Pelletier, Commissioner of the Canadian Coast Guard
CLIMATE HAZARDS, RISKS, AND IMPACTS ON THE CANADIAN MARINE ENVIRONMENT

Hazard
Potential occurrence of climate-related physical events or trends that may cause damage and loss.

Exposure
Presence of people (including human health); livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or assets that could be adversely affected.

Vulnerability
Propensity or predisposition to be adversely affected

Impact
The consequences of realised risks on natural and human systems, including infrastructure.

Climate Risk
Climate risk results from the interaction of hazard, exposure and vulnerability.

Adaptation
Actions which seek to manage climate change impacts.
MANAGING AND RESPONDING TO CLIMATE RISKS AND IMPACTS

Adaptation: Actions to manage the impacts of climate change

Mitigation: Actions which seek to reduce emissions which is the major driver of climate change

http://2030palette.org/coastal-adaptation/
CLIMATE CHANGE HAZARDS

Four Interconnected Themes

Sea Level Rise + Extreme Weather Events = Increased Risk of Flooding

Permafrost Melt + Sea Level Rise = Accelerated Coastal Erosion

Ocean Chemistry
- Temperature
- Salinity
- Acidification
- Oxygen depletion

Sea Level Rise
- Coastal inundation
- Storm surges

Extreme Weather
- Reduced visibility
- Storm surges
- Safety hazards
- Extreme drought and heavy precipitation

Changes in Cryosphere
- Permafrost melt
- Erosion
- Changes in sea ice
IMPACTS ON THE CANADIAN MARITIME ENVIRONMENT

Port and Coastal Infrastructure
Commercial Marine Shipping
Marine Fishing
Marine Tourism
Inland Waterway Transport
Indigenous Perspectives
Arctic Sovereignty and Security

Secondary Impacts

Extreme Weather Impacts & Damages, Safety Assessment and Recovery Plan, Vancouver Board of Parks and Recreation Presentation, 2022
Primary Impacts

Impacts resulting from climate hazards

- **Direct damage** to wharves, vessels, moorings, shorelines, breakwaters, dikes, cargo, and equipment
- Shifting **ecosystem dynamics**
- Increased **navigation hazards** and **safety risks**
- Impacts on **traditional food harvesting** by Indigenous communities
- Overall increased **maintenance costs** of ports, coastal roads and infrastructure, vessels, and equipment
- Need for **supporting infrastructure**
- Challenges for **regulating shipping** and managing illegal entry/poaching

Secondary Impacts
*Impacts resulting from primary impacts*

- **Extreme weather** resulting in fewer goods for transportation
- **Safety risks** from less experienced mariners in Arctic channels
- **Loss of critical services**
- Potential accommodation of **deeper draft** vessels in ports (+)
- Potential increase in **Arctic tourism** (+)

ADAPTATION STRATEGIES FOR MANAGING CLIMATE HAZARDS AND RISKS IN THE CANADIAN MARITIME SECTOR
CLIMATE ADAPTATION AND RISK MITIGATION CATEGORIES

**Procedural**
Support or inform adaptation planning processes
*Data collection, coastal zoning, regulatory requirements*

**Avoidance**
Direct developments and assets away from vulnerable areas
*Proactive planning, mapping, and development away from vulnerable areas*

**Accommodation**
Reduce or minimize the impact of climate change using engineering or nature-based measures
*Elevating buildings, raising crests of seawalls, managing erosion on landscape*

**Protection**
Reduce climate impacts on infrastructure and the environment through protective barriers or buffers
*Hybrid infrastructure, hard- or soft-armouring, scour protection*

**Retreat**
Relocate vulnerable assets to prevent further damage or avoid complete failure
*Appropriate where risks to infrastructure or health and safety are unacceptably high*
PORT AND COASTAL INFRASTRUCTURE

Retreat
- Relocating vulnerable infrastructure to prevent damage

Accommodation
- Replenishment of sand on coastal shorelines
- Elevation of coastal buildings

Protection
- Installation of protective infrastructure, such as nearshore breakwaters or artificial reefs

MARINE SHIPPING

**Accommodation**
- Ensure alternative transportation links if ferries are delayed or ports are closed

**Avoidance**
- Shift shipping lanes to avoid vulnerable areas and populations

**Protection**
- Improve vessel design to protect assets from extreme weather damage and ice calving

MARINE FISHING

Procedural

- Incorporate climate change data into fisheries models

Accommodation

- Modifications to vessels and fleets to accommodate larger surf

Avoidance

- Reassess fishing seasons and locations to avoid vulnerable areas and populations

https://atlantic.ctvnews.ca/it-s-opening-day-for-the-largest-of-canada-s-lucrative-lobster-fisheries-1.4702708
MARINE AND COASTAL TOURISM

Accommodation
- Manage erosion on coastal landscapes used by the public

Avoidance
- Regulate development for new tourism activities to avoid vulnerable areas

Procedural
- Increase forecasting, planning, and permitting for tourism-based vessel activities in the Arctic
INLAND WATERWAY TRANSPORT

Accommodation
- Restoring/constructing floodplains, flood bypass zones, or relief channels

Procedural
- Researching and assessing sources of erosion to inform planning

Protection
- Building and/or broadening dunes
- Hard- or soft-armouring

INDIGENOUS PERSPECTIVES

Procedural

• **Inuit-driven** climate change research and monitoring to inform future policy development in the Arctic
• Conduct **vulnerability assessments** to identify adaptation priorities

Accommodation

• Use **nature-based measures** to accommodate sea level rise and weather events in traditional harvesting areas
ARCTIC SOVEREIGNTY AND SECURITY

- Increase **regulatory and monitoring practices** for illegal entry, poaching, and human and substance trafficking on small vessels
- Strategic planning for potential **sovereignty issues** in relation to the Northwest Passage

Procedural
BEST PRACTICES AND STRATEGIES FOR ADAPTATION PLANNING FOR THE CANADIAN MARITIME ENVIRONMENT

https://navclimate.pianc.org/explore/adaptation
BEST PRACTICES AND STRATEGIES FOR CLIMATE CHANGE ASSESSMENT AND ADAPTATION PLANNING

Strategy

- Climate Data
- Asset Data
- Risk and Vulnerability Assessment
- Adaptation Options
- Decision-Making Process
- Monitoring and Evaluation

Communication
KEY TAKEAWAY MESSAGES

• Climate change is a reality and the marine environment needs to adapt
• Climate change can impact various sub-sectors of the Canadian marine environment with primary and secondary impacts
• Vulnerability decision making is a not one size fits all process – strategies should be system, asset, operation or facility specific
• Adaptation strategies should account for both short and long term planning
• Climate change adaptation and implementation is less expensive than responding to climate related crises down the road
Questions
CONCLUDING REMARKS

• Read the report
• Webinar has been recorded
• Watch for new titles, research projects
• Stay in touch with Clear Seas - sign up for our newsletter
• Follow us on social media
• Other comments to info@clearseas.org