



### CLIMATE CHANGE VULNERABILITY OF THE CANADIAN MARITIME ENVIRONMENT







### SPEAKERS



Jennifer Steele Manager Research and Knowledge Mobilization Clear Seas



Dave Creber Partner Dillon Consulting

Rebecca Eldridge Technical Specialist Dillon Consulting



Paul Blomerus Executive Director Clear Seas



### AGENDA

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





### COMMUNICATING COMPLEX ISSUES

#### Key Issues pages

















OIL TANKERS

SHIP WASTE RESPONDING TO OIL SPILLS

#### UNDERWATER NOISE

#### MARINE SHIPPING & YOU W

#### WHO PAYS FOR AN OIL SPILL

INVASIVE SPECIES

AIR POLLUTION

Indigenous & research programs

LNG

#### Research & web-tools (10+)



DALHOUSIE UNIVERSITY

AND MARINE USE

SUPPORTING INUIT RIGHTS

May 6, 2022







April 28, 2022 ASSESSING SHIPPING RISK IN CANADA

#### Blog articles (45+)



March 1, 2022 LIQUEFIED NATURAL GAS AS A MARINE FUEL IN THE ARCTIC: PANACEA OR POISON?



February 25, 2022 STRANDED AT SEA: COVID-19 AND ITS TOLL ON MARINERS

January 13, 2022

OCEANS?

IS MARINE SPATIAL

PLANNING THE KEY TO

SAFER AND HEALTHIER



February 1, 2022 DECARBONIZING MARINE SHIPPING: CLEAN FUELS FOR A GREENER FUTURE?



CLEAR SEAS' INDIGENOUS INTERNSHIP PROGRAM



INDIGENOUS CAREER PIVOT PROGRAM



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### CLIMATE CHANGE VULNERABILITY OF THE CANADIAN MARITIME ENVIRONMENT

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.







### CONTEXT

"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

bttps://canadiansailings.ca/port-of-vancouver-cargo-diversity-and-strong-canadian-economy-drive-record-volumes-at-port-of-vancouver/





### UNDERSTANDING CLIMATE RISK AND IMPACT (IPCC)

#### **Vulnerability** Hazard Exposure Presence of people (including Propensity or Potential occurrence of human health); livelihoods; species predisposition to climate-related physical events or ecosystems; environmental be adversely functions, services, and resources; or trends that may cause affected damage and loss. infrastructure; or economic, social, Adaptive or assets that could be adversely Capacity 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





### CLIMATE CHANGE HAZARDS

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#### **Ocean Chemistry**

- Temperature
- Salinity
- Acidification
- Oxygen depletion

#### **Extreme Weather**

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

#### Changes in Cryosphere

**Sea Level Rise** 

Coastal inundation

• Storm surges

- Permafrost melt
- Erosion
- Changes in sea ice

#### **Four Interconnected Themes**

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

Permafrost Melt + Sea Level Rise = Accelerated Coastal Erosion



### IMPACTS ON THE CANADIAN MARITIME ENVIRONMENT



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



### IMPACTS ON THE CANADIAN MARITIME ENVIRONMENT

#### 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



ttps://www.thestar.com/business/2015/11/14/prince-edward-island-coastal-real-estate-and-the-impact-of-climate-change.html



### IMPACTS ON THE CANADIAN MARITIME ENVIRONMENT

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 (+)



bttps://www.scientificamerican.com/article/ship-freezes-itself-in-arctic-ice-to-study-climate-change/

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



#### https://climateriskinstitute.ca/platform-webinars/

#### 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







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## MARINE SHIPPING

Accommodation

Avoidance

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

• 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



### MARINE AND COASTAL TOURISM



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#### INLAND WATERWAY TRANSPORT



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# INDIGENOUS PERSPECTIVES

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

Accommodation

Procedural

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

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# ARCTIC SOVEREIGNTY AND SECURITY

### Procedural

- 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

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





# KEY TAKEAWAY MESSAGES

- Climate change is a reality and the marine environment needs to adapt
- Climate change can impact various subsectors 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

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# 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

Climate Change Vulnerability of the Canadian Maritime Environment

April 2022

