



THE UNIVERSITY
OF BRITISH COLUMBIA

Pathways to Zero Impact Shipping Webinar

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National Research
Council Canada

Conseil national de
recherches Canada

Canada 

clearseas.org

PROJECT TEAM



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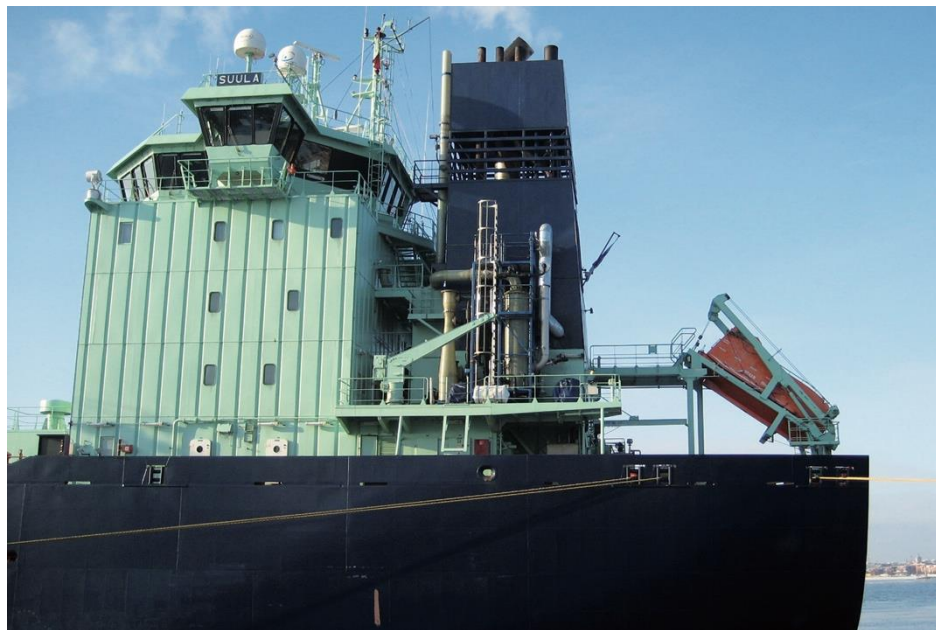
Imranul Laskar

WHY BETTER DECISION- MAKING MATTERS

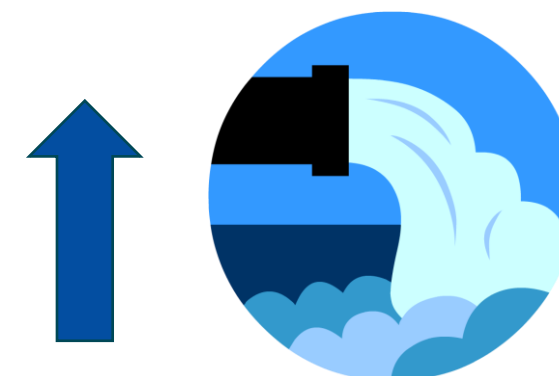
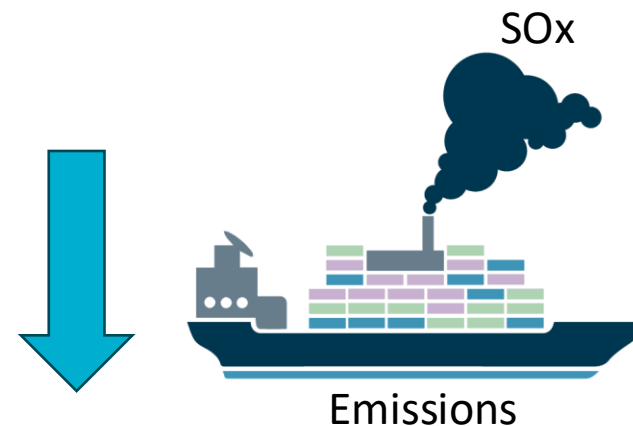
- Marine shipping is under pressure to reduce a wide range of environmental impacts
- Decision-makers face a growing number of technology and fuel options
- Each option involves trade-offs across environmental, operational, social, and economic outcomes

How do we pick which solutions to prioritize and identify potential co-benefits and risks between solutions?

EXAMPLE TECHNOLOGY TRADE-OFF



SOx scrubber system



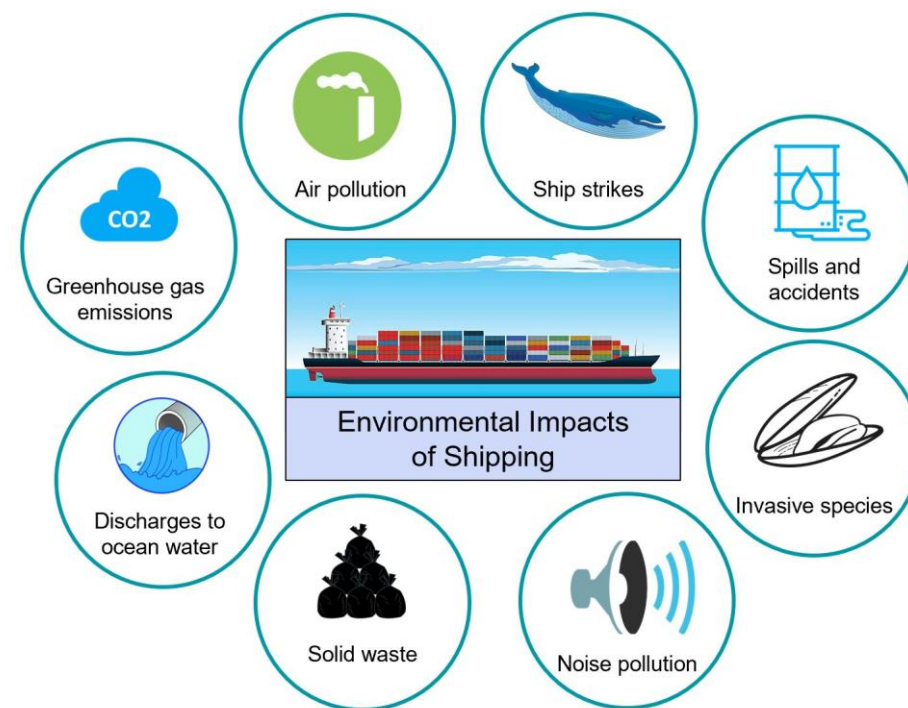
Water pollution

ABOUT THE PROJECT

Project Goal: Identify and pilot tools and approaches to support decision-making around technologies, fuels and investments to reduce environmental impacts of marine shipping.

What we did:

- *Ship Design and Technologies to Reduce Environmental Impact – 2025* sub-project
- Engagement with key maritime stakeholders
- Two case studies with National Research Council of Canada (NRC) and the Canadian Coast Guard (CCG)



Technology Solutions

Automation, fuel type, new propulsion forms, advanced materials, hull coatings, hull-form optimization, ballast water treatment systems

SHIP DESIGN AND TECHNOLOGIES TO REDUCE ENVIRONMENTAL IMPACT

Contracted sub-project:

- Review of current and emerging technologies
- Characterizes how environmental impact-reduction is assessed and decisions currently made

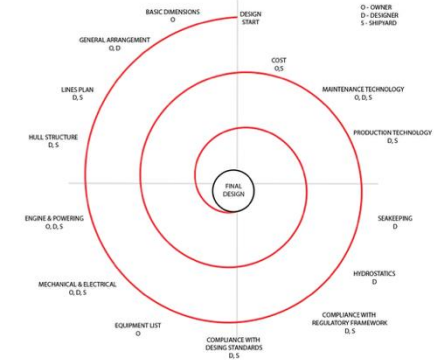
What We Learned

- Cost and regulatory compliance strongly influence technology adoption
- Data gaps and uncertainty remain barriers to innovation
- Technology decisions often need to be made early in vessel design
- No comprehensive decision-support framework was identified

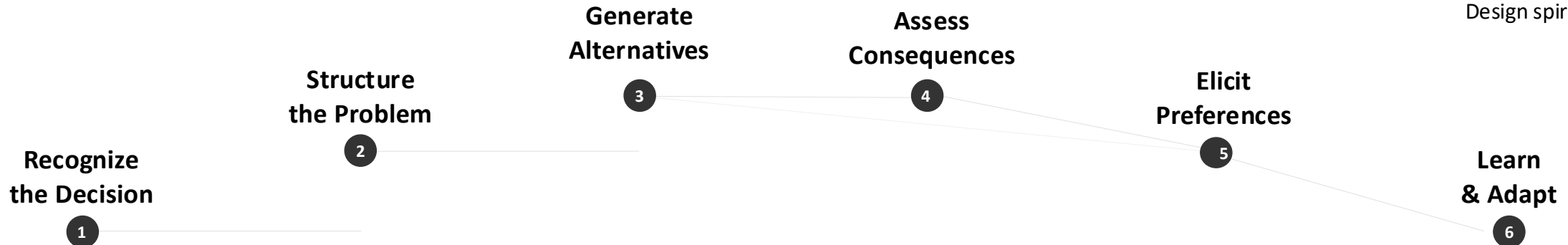


DECISION SUPPORT FRAMEWORK

Structured decision-making helps make trade-offs explicit and supports more transparent decisions.



Design spiral



- *Involve people from different stages of the design/decision-making process together in the steps*
- *Dedicate time to problem structuring (more than you think!)*
- *Use systems methods to help people to visualize and communicate how the technology impacts the environment and people*

CASE STUDIES

Canadian Coast Guard (CCG) Program Ice Breaker Fleet

Decision Context

Evaluating options for reducing environmental impacts

Decision type

Tactical/operational

Constraints

Hard/defined

National Research Council of Canada - Ocean Program (Research)

Decision Context

Evaluating future research investments

Decision type

Strategic/long-term

Constraints

Exploratory

CCG CASE STUDY: EVALUATING OPTIONS

Decision Context

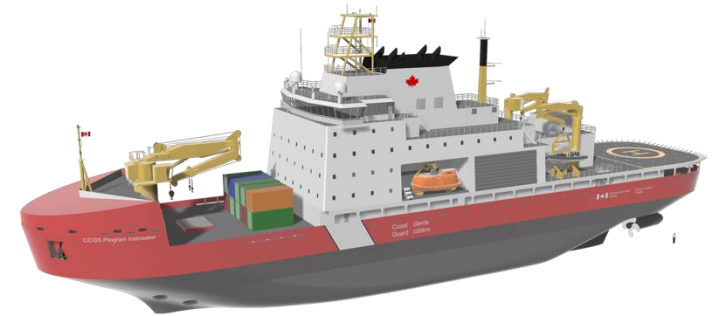
How can environmental, operational, economic, and technical considerations be evaluated together when exploring future options for program icebreaker fleet?

Workshop 1: Problem Structuring

- Brought together policy, engineering, procurement and operational perspectives
- Identified objectives, concerns, and performance indicators
- Mapped key trade-offs and uncertainties

Workshop 2: Preference Elicitation

- Applied the decision support framework to a priority area for impact reduction identified through Workshop 1
- Examined fuel pathways as a key opportunity
- Used Alta Viz to explore alternatives under uncertainty



The process supported a shared understanding of priorities, trade-offs, and uncertainty

NRC CASE STUDY: EVALUATING RESEARCH PRIORITIES

Decision Context

How can future maritime R&D investments be evaluated across environmental, social, economic, and strategic objectives?

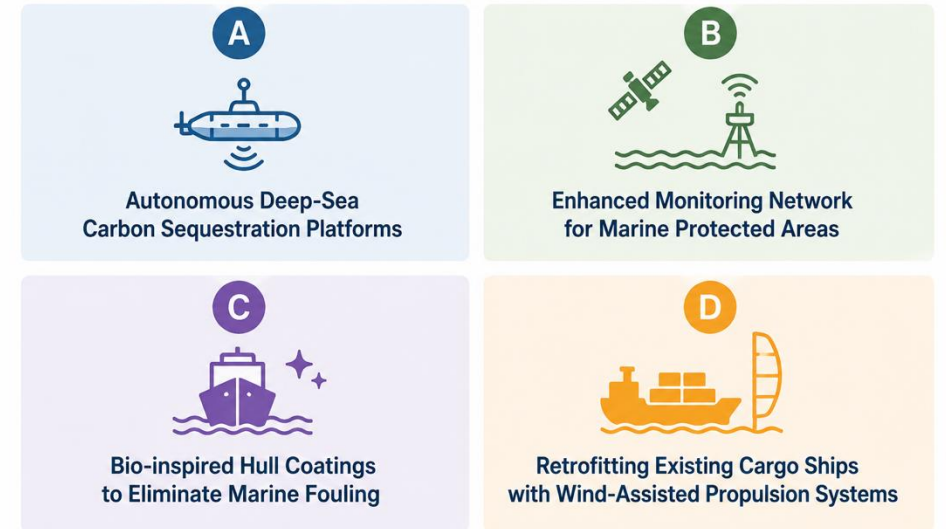
Workshop 1: Problem Structuring

- Identified objectives and evaluation criteria
- Explored what success looks like across multiple perspectives
- Developed a shared framework for assessing proposals

Workshop 2: Preference Elicitation

- Applied the framework to hypothetical R&D proposals
- Tested weighting and trade-off exercises
- Gained deeper understanding of peoples' preferences

Four Hypothetical R&D Projects Evaluated



The framework helped participants make assumptions and priorities explicit

WHAT WE LEARNED FROM THE CASE STUDIES

Convening different perspectives matters

Including operational, policy, engineering, and research perspectives bring different priorities to the decision-making process.

Trade-offs become visible

Structured discussions help surface assumptions, risks, and co-benefits that may otherwise remain hidden.

The process can create shared understanding

Decision support tools do not provide “the answer.” They help stakeholders build a shared understanding of priorities, trade-offs and uncertainty so that decisions are well thought out and transparent.

HOW COULD DECISION SUPPORT BE APPLIED TO MARINE SHIPPING?

Match the process to the decision

Not every decision requires the same level of analysis or complexity.

Invest in problem structuring

A shared understanding of objectives is essential before evaluating alternatives.

Co-create solutions

Decision support works best when developed with practitioners, not for them.

Use multi-criteria approaches

Environmental, operational, safety, and economic objectives need to be considered together.

Build on existing systems thinking


Marine professionals already think holistically; decision support can build on that strength.

REPORT AND TEMPLATES AT CLEARSEAS.ORG

READ THE REPORT

Decision Support for Pathways to Zero-Impact Shipping



 Decision Support for Pathways to Zero-Impact Shipping

-  [Executive Summary](#)
-  [Introduction](#)
-  [Maritime Shipping Decision-Making: Context and rationale for case studies](#)
-  [Key Components for Supporting Decision-making for Sustainable Marine Shipping](#)
-  [CCG Case Insights: Informing decisions on near-term fuel alternatives for Program Ice Breakers](#)
-  [NRC Case Insights: Supporting evaluation of research and development opportunities](#)
-  [Concluding Thoughts](#)
-  [References](#)

To help apply the framework, the project team has developed free decision support templates available here:

[Download the User Guide](#)

[Download the Interactive Workshop Template](#)

CLOSING THOUGHTS

“The craft of making farsighted choices – decisions that require long periods of deliberation, decisions whose consequences might last for years, if not centuries... is a strangely underappreciated skill.”

Steven Johnson, *How we make the decisions that matter the most*



Questions & Discussion

Pathways to Zero-Impact Shipping



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