GREAT LAKES
ST. LAWRENCE
GOVERNORS
& PREMIERS

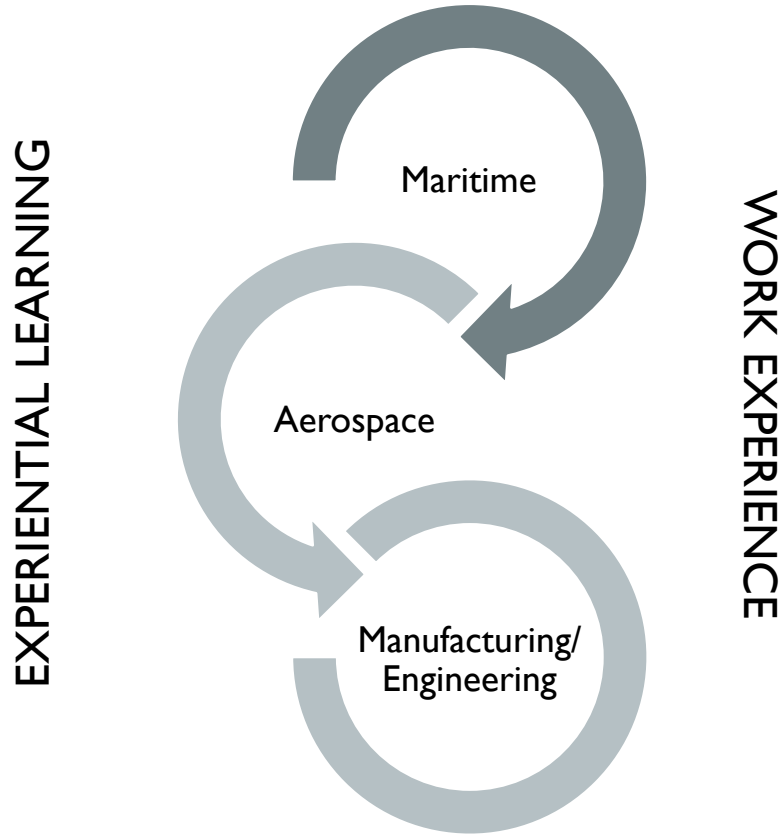
PHASTAR CORPORATION

Maritime and Aerospace Education

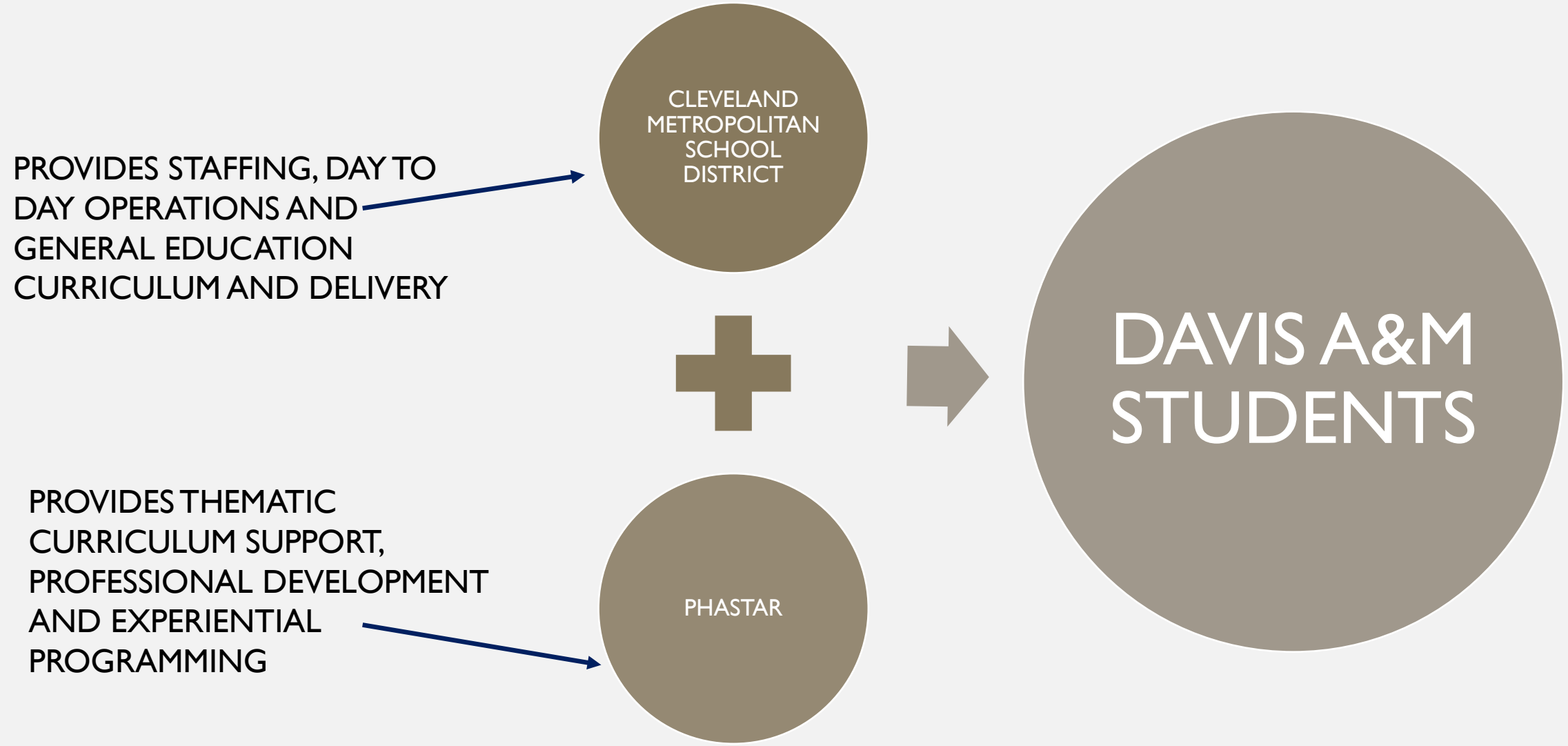
WELCOME TO PHASTAR

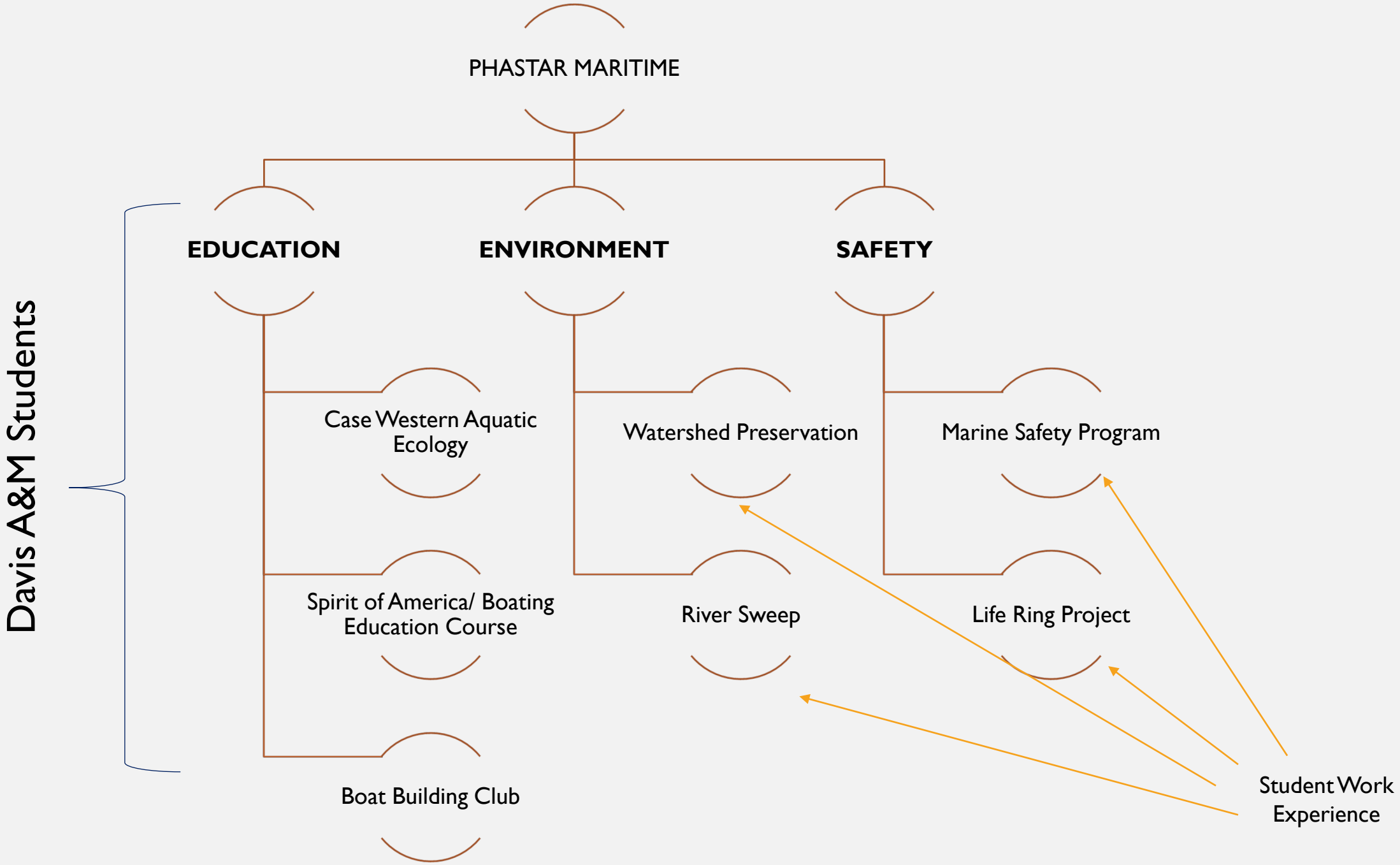
Who We Are

PHASTAR seeks to break the cycle of poverty and increase equity in the workforce by providing hands-on experiential learning opportunities and work experience for youth interested in exploring aerospace and maritime.



DAVIS AEROSPACE AND MARITIME HIGH SCHOOL




PHASTAR MARITIME
EDUCATION
ENVIRONMENT
SAFETY
Davis A&M Students
Case Western Aquatic Ecology
Watershed Preservation
Marine Safety Program
Spirit of America/ Boating Education Course
River Sweep
Life Ring Project
Boat Building Club
Student Work Experience

BOATING EDUCATION

- SPIRIT OF AMERICA
- OHIO BOATING EDUCATION COURSE

BOATING MECHANICS

- YAMAHA UNIVERSITY (small engine repair)

WATER SAFETY

- LIFEGUARDING
- FIRST AID / CPR TRAINING
- SWIMMING

ENVIRONMENTAL EDUCATION

- CASE UNIVERSITY MARINE ECOLOGY
- RIVER SWEEP
- WATERSHED RESTORATION

WATER EXPLORATION

- BOAT BUILDING CLUB
- SAILING
- ROWING

MARITIME EDUCATION & EXPLORATION

2543 MARINE SAFETY SERVICES

NORTHCOAST HARBOR LIFE RING PROJECT

MARITIME COMMUNITY SAFETY & STUDENT WORK EXPERIENCE

KEY MARITIME PARTNERSHIPS

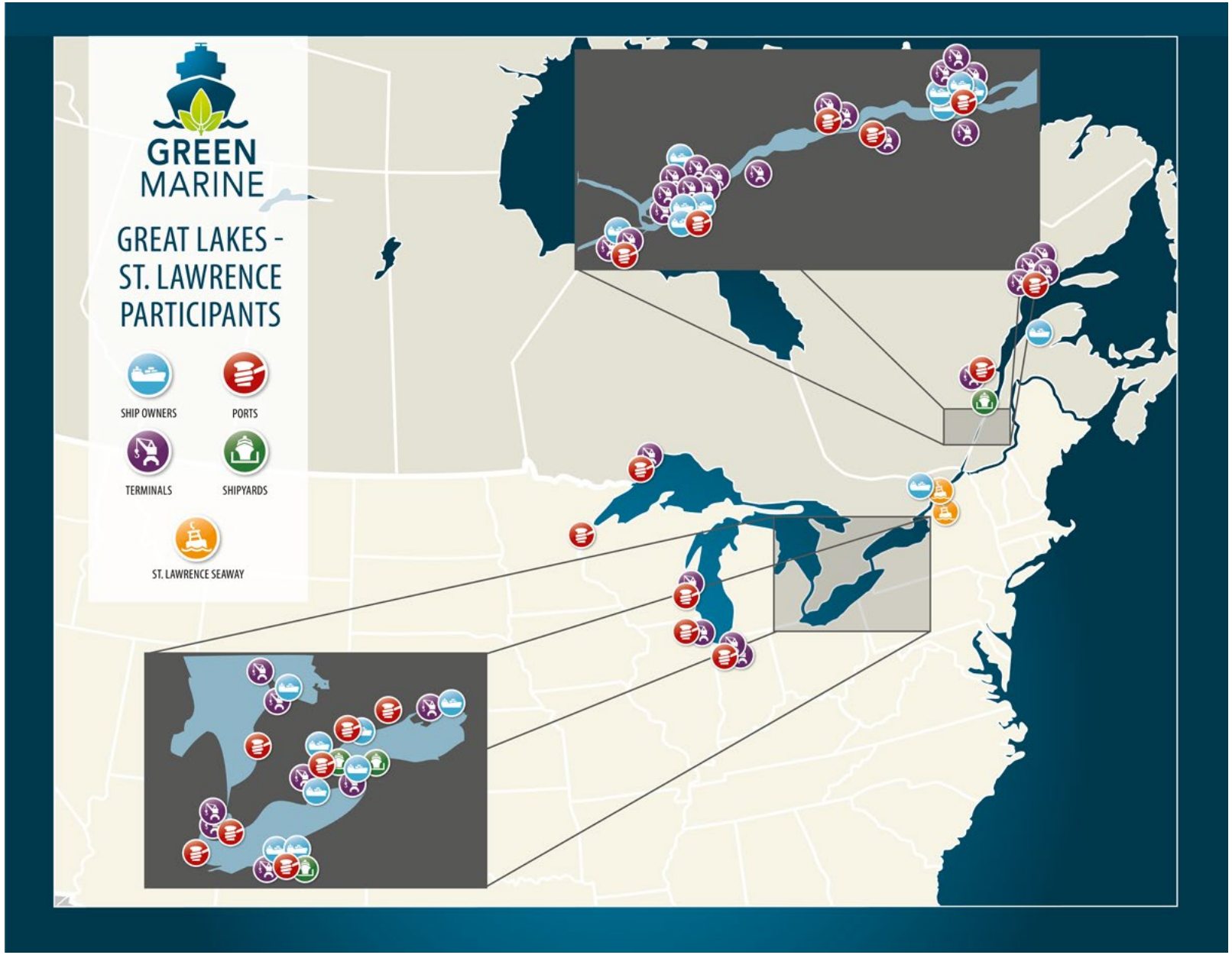
- Port of Cleveland
- Case Western University
- University Hospitals
- Spirit of America
- Interlake Maritime Services
- Lake Carrier's Association
- Samsel Supply Company

GREEN MARINE

Opportunities to improve environmental performance in the Great Lakes and St. Lawrence Maritime Transportation System

September 23, 2021

green-marine.org

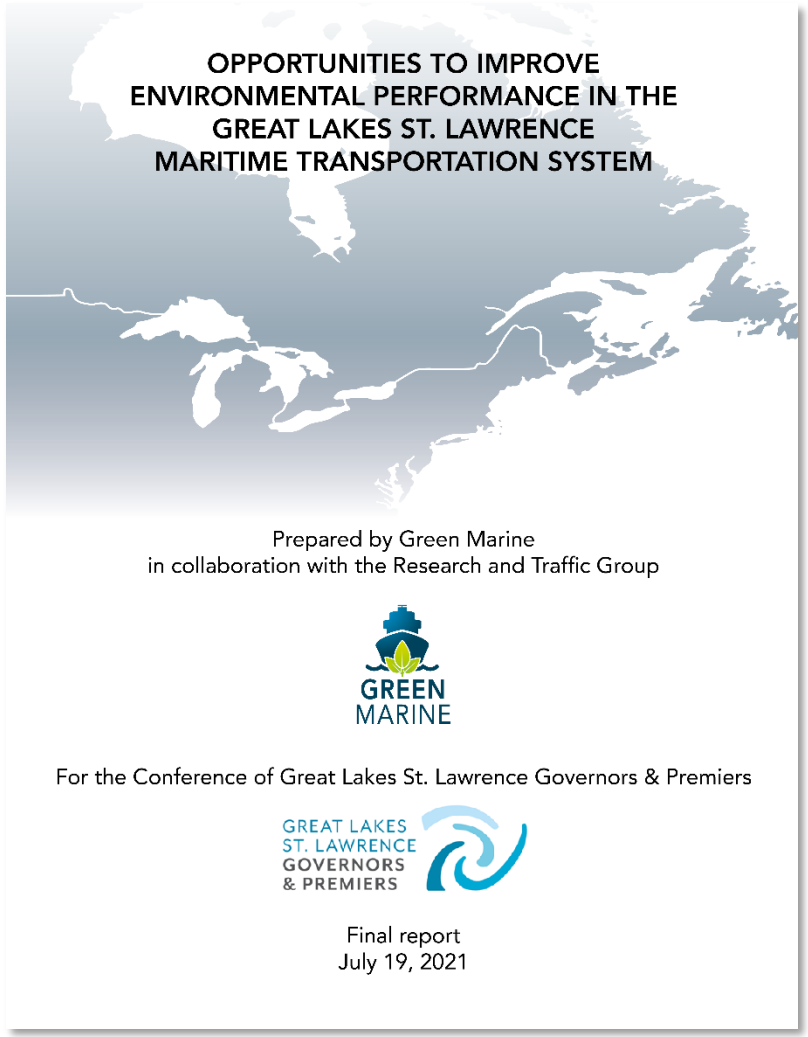


GREEN
MARINE

green-marine.org

GREEN
MARINE

STUDY BACKGROUND - **MANDATE**

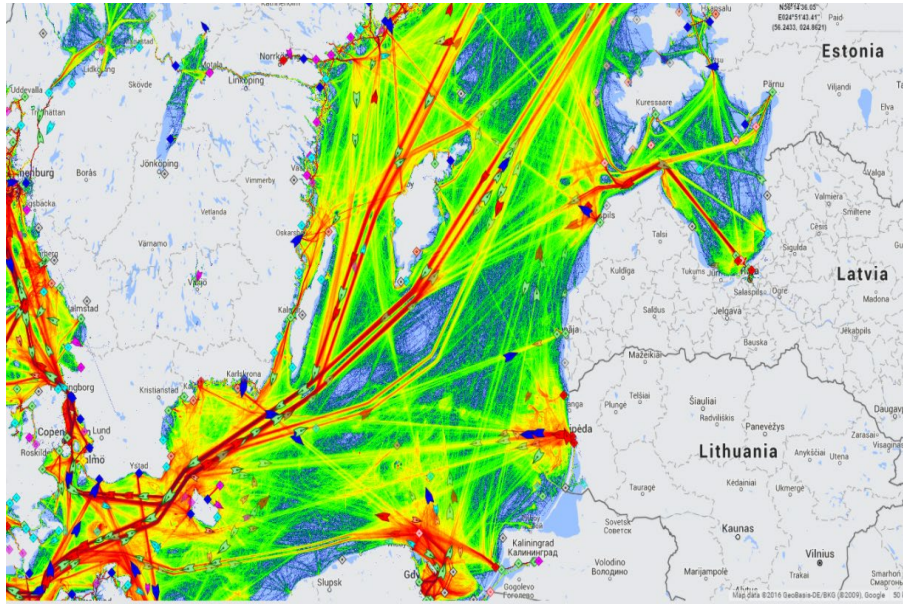


- A **survey of maritime transportation environmental best practices & new technologies**
  - GLSL region
  - Elsewhere in North America
  - Peer European maritime systems

- **High-level strategies and recommendations with short and long-term actions** to exceed regulatory compliance and drive improved environmental performance in the GLSL MTS

PEER SYSTEMS

Baltic Sea



Source: https://www.marinevesseltraffic.com/BALTIC-SEA-AIS/ship-traffic-tracker

Port of Antwerp

Source: Port of Antwerp Website

Rhine River

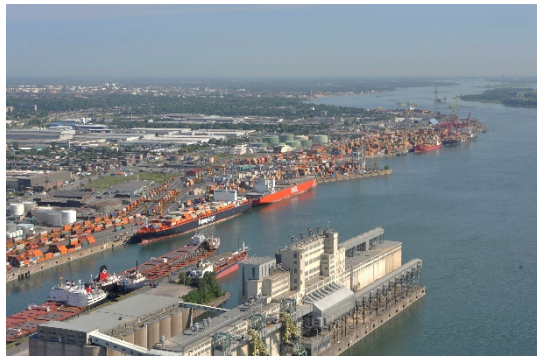
Sources: CORINE Land Cover, Natural Earth

SELECTED ISSUES FOR THE REPORT

1. Air quality and climate change
   - GHGs & energy efficiency
   - Air emissions: SO_X, NO_X, PM
   - Climate change adaptation and resiliency
2. Water quality
   - Vessel incidental discharges
   - Spill prevention
   - Stormwater management
3. Biodiversity
   - Marine mammals
   - Aquatic invasive species - biofouling
4. Waste management
5. Community impacts of port operations

SURVEY OF BEST MANAGEMENT PRACTICES

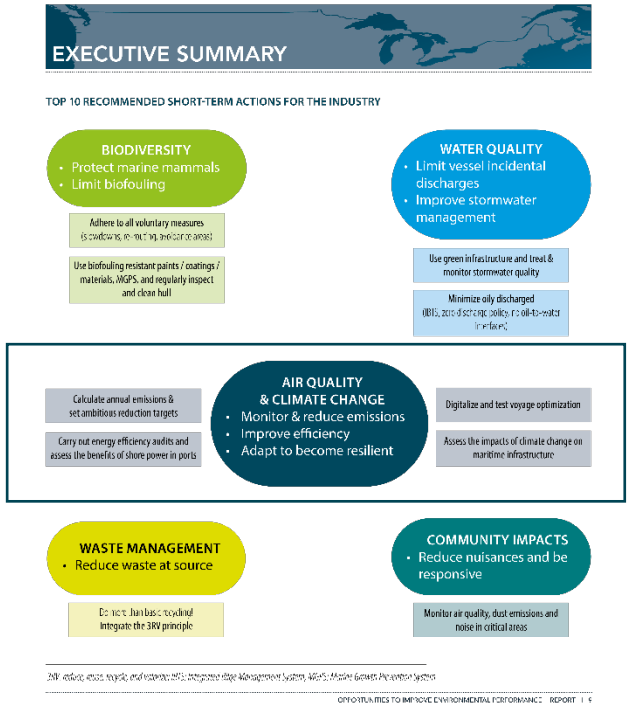
GREEN MARINE



SHORT-TERM ACTIONS FOR THE INDUSTRY

Air Quality and Climate Change

- Top 4 actions -



AIR QUALITY & CLIMATE CHANGE

- Monitor & reduce emissions
- Improve efficiency
- Adapt to become resilient

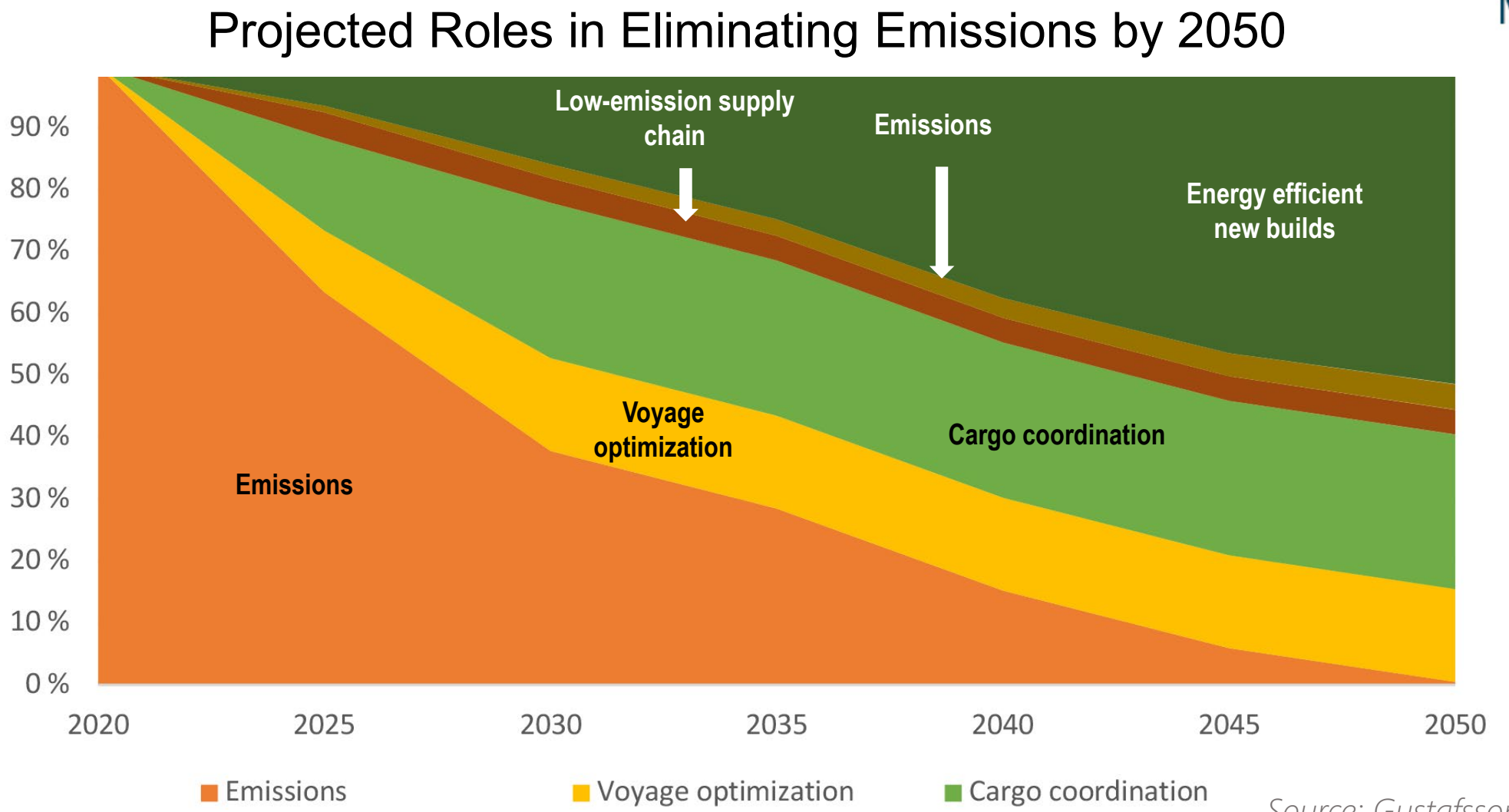
Calculate annual emissions & set ambitious reduction targets

Carry out energy efficiency audits and assess the benefits of shore power in ports

Digitalize and test voyage optimization

Assess the impacts of climate change on maritime infrastructure

IMPACT OF DIGITALIZATION ON GHG REDUCTIONS

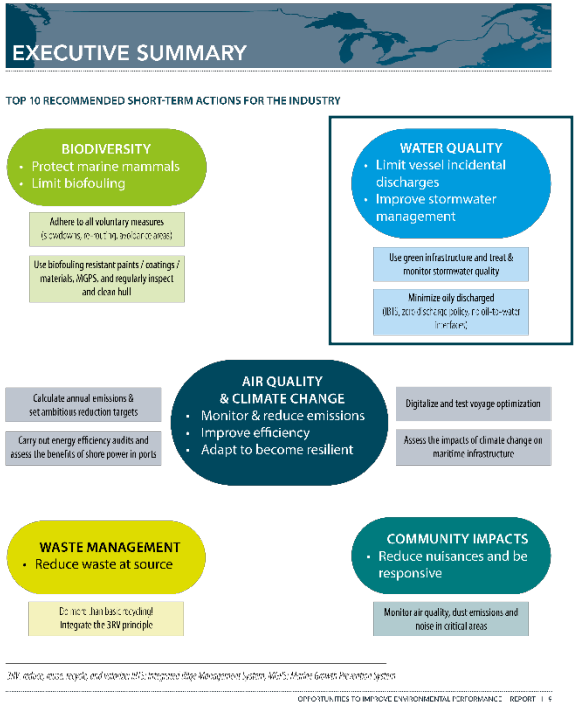


Source: Gustafsson et al. (2019)

SHORT-TERM ACTIONS FOR THE INDUSTRY

Water Quality

- Top 2 actions -



WATER QUALITY

- Limit vessel incidental discharges
- Improve stormwater management

Use green infrastructure and treat & monitor stormwater quality

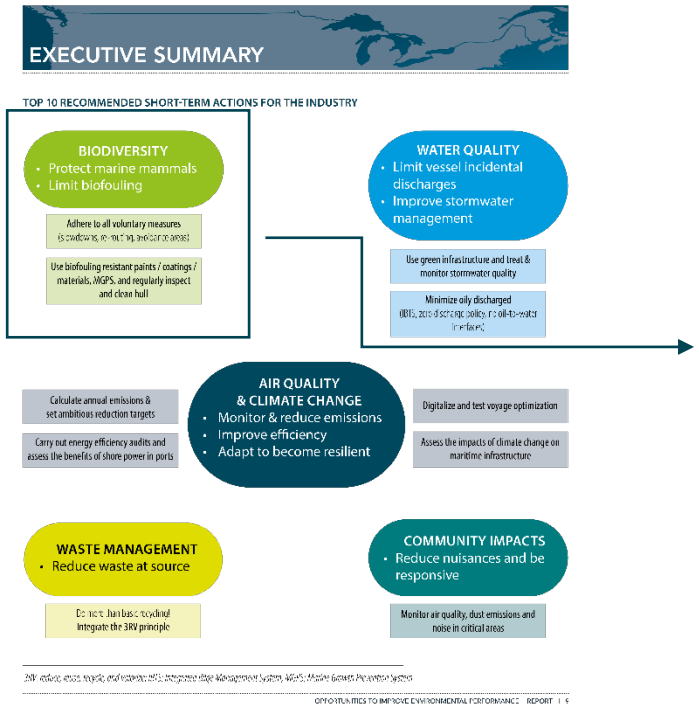
Minimize oily discharge
(IBTS, zero discharge policy, no oil-to-water interfaces)

SHORT-TERM ACTIONS FOR THE INDUSTRY

GREEN MARINE

Biodiversity

- Top 2 actions -


EXECUTIVE SUMMARY

TOP 10 RECOMMENDED SHORT-TERM ACTIONS FOR THE INDUSTRY

BIODIVERSITY
- Protect marine mammals
- Limit biofouling

Adhere to all voluntary measures (slowdowns, re-routing, avoidance areas)

Use biofouling resistant paints / coatings / materials, MGPS, and regularly inspect and clean hull

WATER QUALITY
- Limit vessel incidental discharges
- Improve stormwater management

Use green infrastructure and treat & monitor stormwater quality

Minimize oily discharged (BMS, zero discharge policy, no oil-to-water interface)

AIR QUALITY & CLIMATE CHANGE
- Monitor & reduce emissions
- Improve efficiency
- Adapt to become resilient

Calculate annual emissions & set ambitious reduction targets

Carry out energy efficiency audits and assess the benefits of shore power in ports

Digitalize and test voyage optimization

Assess the impacts of climate change on maritime infrastructure

WASTE MANAGEMENT
- Reduce waste at source

Do more than basic recycling! Integrate the 3RV principle

COMMUNITY IMPACTS
- Reduce nuisances and be responsive

Monitor air quality, dust emissions and noise in critical areas

3RV: reduce, reuse, recycle; and volatile VOC: Volatile Organic Compounds; EMS: Environmental Management System; MGPS: Marine Growth Prevention System

OPPORTUNITIES TO IMPROVE ENVIRONMENTAL PERFORMANCE | REPORT | 6

BIODIVERSITY
- Protect marine mammals
- Limit biofouling

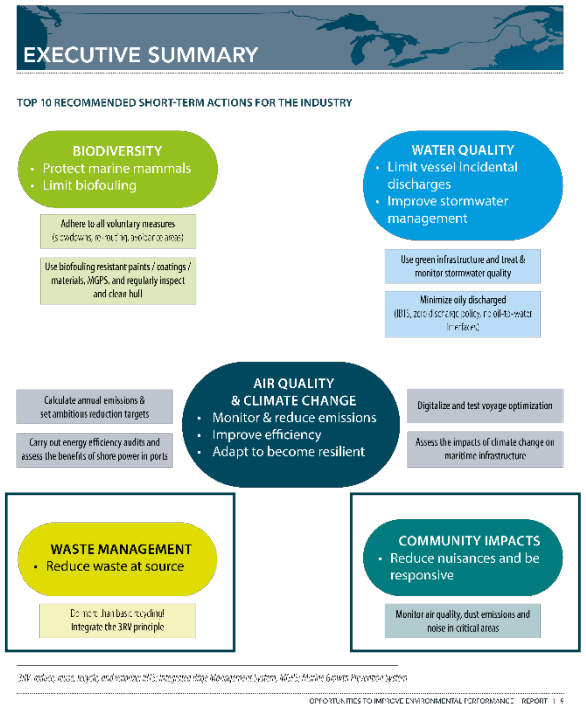
Adhere to all voluntary measures (slowdowns, re-routing, avoidance areas)

Use biofouling resistant paints / coatings / materials, MGPS, and regularly inspect and clean hull

SHORT-TERM ACTIONS FOR THE INDUSTRY

Waste management
Recommended action:

Community Impacts
Recommended action:



WASTE MANAGEMENT
- Reduce waste at source

Do more than basic recycling!
Integrate the 3RV principle

COMMUNITY IMPACTS
- Reduce nuisances and be responsive

Monitor air quality, dust emissions and noise in critical areas

RECOMMENDATIONS & CONCLUSION

GREEN MARINE

FOUR HIGH-LEVEL STRATEGIES FOR FEDERAL, STATE, PROVINCIAL GOVERNMENTS

1. Promote RD&D
2. Plan for the energy transition
3. Incentivize green shipping
4. Harmonize U.S. and Canadian governmental approaches

GREEN MARINE

green-marine.org

DAVID BOLDUC
Executive Director
david.bolduc@green-marine.org

VERONIQUE TRUDEAU
Program Manager – St. Lawrence
veronique.trudeau@green-marine.org

The Axia Institute:
Delivering Value Chain Solutions®
MICHIGAN STATE UNIVERSITY

September 23, 2021

Challenges and Opportunities of Great Lakes Navigation

Dr. David J. Closs

Grand Challenge and Need

Assess the potential benefits of a data sharing platform and specific, value-chain based tools to realize supply chain efficiencies for the taconite and steel industry supply chain in the Great Lakes St. Lawrence region. The primary focus is to identify system constraints and determine ways to increase value for cargo owners and supply chain partners.

Rationale for Methodology

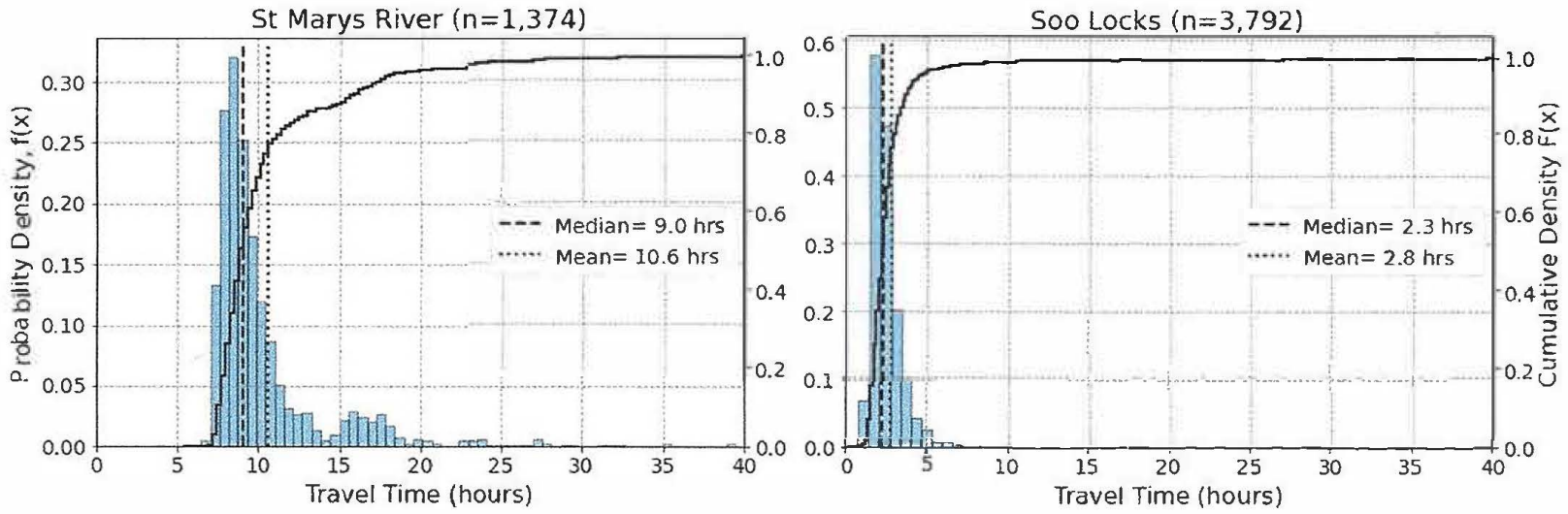
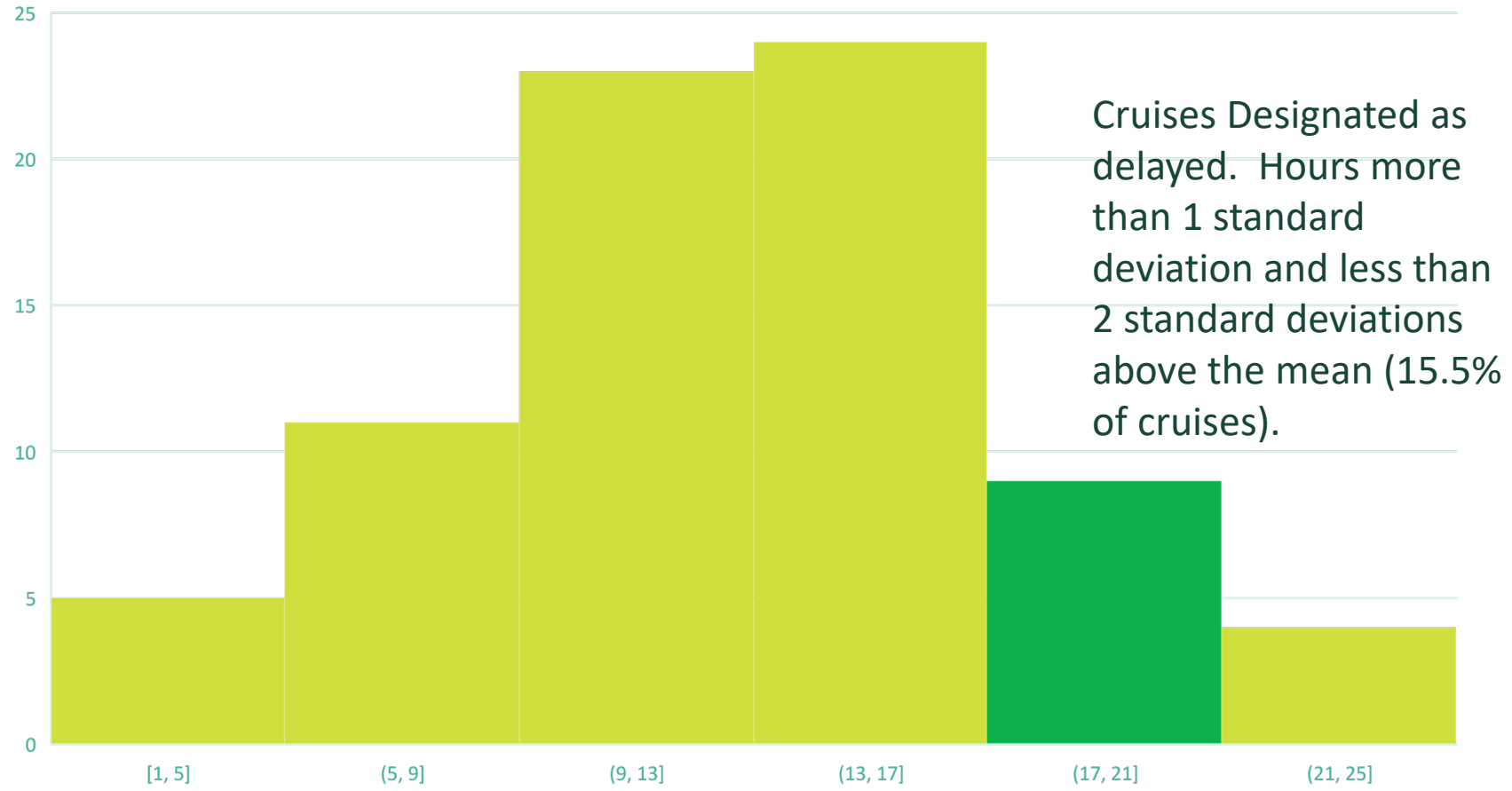


Fig. 9. Travel time distribution for vessel voyages through the St Marys River (left) and the Soo Locks (right). Data ().
Source Sugrue 2020

Example Normal Distribution



Cruises Designated as delayed. Hours more than 1 standard deviation and less than 2 standard deviations above the mean (15.5% of cruises).

NxtPort Applications for Ore Vessels

- NxtPort could assist with tracking and scheduling but the current volume and variation in schedules can be handled effectively using existing data and communication technologies.
- Due to the relatively few number of carriers (3), there is substantial concern regarding data confidentiality and the need for sharing.
- Since each lane is primarily controlled by a single mine-carrier-mill relationship, there is not a significant need to share information.

Results Review – Stakeholder Interviews

1. Based on stakeholder discussions with mines, mills, carriers, industry, and governmental organizations. In total, eight organizations and fifteen individuals were interviewed.
2. While the industry and governmental organizations indicated that they thought the information platform and decision applications would be helpful, the mines, mills, and carriers did not express strong support.
3. Interviewees felt that the taconite industry is relatively simple in terms of shipping patterns, can effectively operate with existing communication and information technologies, and is heavily concentrated.
4. There doesn't seem to be strong taconite industry support to implement a more sophisticated regional data platform and decision application system.

Results Review – Quantitative Analysis

1. Quantitative analysis focused on the commercial Great Lakes maritime activity levels from 2016 through 2020.
2. Taconite represents 65 percent of the tonnage and 31 percent of the sailings on the upper Great Lakes. Generally, taconite moves are from the docks at the mines (Duluth, MN; Presque Isle, MI; Silver Bay, MN; Superior, WI; and Two Harbors, MN) to the mills (Burns Harbor, IN; Cleveland, OH; Conneaut, OH; Dearborn, MI; Gary, IN; and Toledo, OH).
3. The average time from arrival at a dock to the arrival at the next destination is 78 hours. This includes the loading time at the origin dock. The sailing times have standard deviations ranging from 10 to 29 hours.
4. This research defined late shipments as those that had an arrival time later than the average lane arrival time plus one standard deviation but less than two standard deviations. Out of the sample of 2,311 sailings, 137 or 6 percent were identified as delayed.
5. CPCS (2021) report estimated the 1000-foot laker variable cost while moving is $1,188 per hour.
6. When the sample shipments are projected to the total number of annual shipments (divided by 62 percent), the variable cost related to taconite delays is estimated to be $1.4 million on a base of $63.4 million or 2.21 percent.

Results Review – NxtPort Analysis

1. The NxtPort platform provides a strong flexible foundation to monitor and support maritime operations considering facilities, product flows, and activities. The foundation is particularly strong with respect to data interchange between platforms and applications.
2. The applications are generally developed by supply chain collaborators, industry organizations, or third-party developers. While the applications are strong and well done for many industries, they are generally focused on the container trade rather than bulk material such as taconite pellets.
3. It would be necessary for the industry or others to develop applications and this may be a challenge in a highly concentrated competitive industry.
4. In summary, while the NxtPort platform and decision applications could be immediately useful to facilitate, for example, potential Great Lakes container operations, the value for the taconite industry would probably be limited to scheduling in congested areas such as the locks in the near term.

Conclusions

1. Explore the potential for use of the NxtPort platform and decision applications for other cargoes (e.g., bulk, breakbulk, containers, roll-on/roll-off (RORO)) in the upper Great Lakes. While the NxtPort system could facilitate potential container operations or handling of bulk products like steel coils, bars, or slabs, it does not provide significant improvements for the taconite industry in its current form;
2. Explore the application of the NxtPort platform and decision applications in areas of congestion such as the Soo Locks and St. Marys River;
3. Delay reduction can result in reducing variable cost and GHG savings. However, the estimated percentage (2-2.5 percent) and absolute amount ($1.4 million and 221.8 kilotons annually) may not be substantial enough to motivate a change in traditional operations;
4. Consider the use of the NxtPort platform and decision applications that are most developed and ready to implement for the region such as to promote the container trade in the Great Lakes. This consideration would have to evaluate the value proposition for Great Lakes container trade.

Next Steps (Suggestions)

1. Evaluate the opportunity for improved data sharing to reduce transit times (and resulting cost and GHG emissions) at the Soo Locks and at specific docks;
2. Evaluate the opportunity for improved data sharing to increase value for other bulk cargoes already moving on the Great Lakes, as well other cargo types such as breakbulk and containers;
3. Evaluate the potential for increased container trade on Great Lakes ports including analysis of the potential of a data sharing platform and decision tools such as NxtPort to facilitate container movement;
4. Evaluate the potential for improved data sharing to reduce GHG emissions across the regional maritime system; and
5. Evaluate the value proposition of moving specialized freight such as automobiles around the Great Lakes from major manufacturing plants to major markets.

The Axia Institute:
Delivering Value Chain Solutions®
MICHIGAN STATE UNIVERSITY

Questions & Discussion

“Thank You” to Our Sponsors!

GREAT LAKES
ST. LAWRENCE
GOVERNORS
& PREMIERS

Platinum Sponsors

GREAT LAKES ST. LAWRENCE GOVERNORS & PREMIERS

The Axia Institute:
Delivering Value Chain Solutions®
MICHIGAN STATE UNIVERSITY

CHARLES STEWART MOTT FOUNDATION®

The Nature Conservancy

Gold Sponsors

GREAT LAKES ST. LAWRENCE GOVERNORS & PREMIERS

CLIFFS

CLEVELAND-CLIFFS INC.

The Joyce Foundation

PORT CLEVELAND

RW

RALPH C. WILSON, JR. FOUNDATION

Silver Sponsors

GREAT LAKES ST. LAWRENCE GOVERNORS & PREMIERS

ALLIANCE for the GREAT LAKES

AMERICAN GREAT LAKES PORTS ASSOCIATION

CHAMBER OF MARINE COMMERCE | CHAMBRE DE COMMERCE MARITIME

CIBC

CLEVELAND foundation

CN

Consumers Energy
Count on Us®

DTE Energy®

Fred A. and Barbara M. Erb Family Foundation

Silver Sponsors

GREAT LAKES ST. LAWRENCE GOVERNORS & PREMIERS

FEDNAV

Ford

Fund for Lake Michigan
Clearly making a deep impact.

GREAT LAKES DREDGE & DOCK CORPORATION

Great Lakes Protection Fund

The Interlake Steamship Company

LAKE CARRIERS' ASSOCIATION

PORT MONTRĒAL

NATIONAL WILDLIFE FEDERATION
GREAT LAKES REGIONAL CENTER

Silver Sponsors

GREAT LAKES ST. LAWRENCE GOVERNORS & PREMIERS

ONTARIO POWER GENERATION

orrick

Port of Antwerp

PORT Milwaukee
CONNECTING TO THE WORLD

PORT OF MONROE

RioTinto

Contributors

- City of Euclid
- CSL
- Énergir
- Environmental Consulting & Technology, Inc.
- Friends of Henn Mansion
- Great Lakes Science Center
- Government of Canada
- Milwaukee Metropolitan Sewerage District
- Northeast Ohio Regional Sewer District
- Ohio Department of Natural Resources