Michigan Maritime Strategy

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UNIVERSITY OF MICHIGAN

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

MDOT
Michigan Department of Transportation

DEPARTMENT OF NATURAL RESOURCES
DNR
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Michigan Department of AGRICULTURE & Rural Development

MICHIGAN DEPARTMENT OF LABOR & ECONOMIC OPPORTUNITY

MICHIGAN ECONOMIC DEVELOPMENT CORPORATION

Vision

Michigan will lead the nation in sustainable, innovative, equitable, and collaborative maritime solutions, ensuring a robust maritime economy and healthy Great Lakes ecosystem.

View of tour boat at Pictured Rocks National Lakeshore on Lake Superior at sunset.

St. Joseph North Pier Inner and Outer Lights.

Mackinaw City Marina.

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MICHIGAN MARITIME STRATEGY

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A Message From Governor Whitmer

The Great Lakes define Michigan. Our thousands of miles of coastline and inland rivers, streams, and our lakes, both Great and small, are core to our identity and huge economic drivers, too. They connect communities, fuel trade, and support industries from manufacturing to tourism. To protect these precious natural resources and harness them effectively to grow our economy, the State of Michigan is, for the first time ever, issuing a Michigan Maritime Strategy. The strategy will align public and private sector stakeholders on water priorities we all share and help us continue to grow industries that rely on our spectacular natural resources while also protecting them for future generations.

The Michigan Maritime Strategy covers a range of priorities.

Modernizing ports and investing in intermodal infrastructure

Michigan has 33 active ports that handle over 50 million tons of cargo, contribute over $4.7 billion to our economy, and support more than 17,000 jobs. Continued investment in these facilities is vital for sustained economic growth.

Growing Michigan's maritime manufacturing economy

Build off the $50 million Michigan Maritime Manufacturing (M3) initiative and the U.S. Navy's Maritime Industrial Base (MIB) Program. Position Michigan to support naval ship repair and component construction.

Accelerating adoption of advanced vessel technologies and fuels

Lead the development and use of alternative marine fuels to reduce maritime emissions. Invest in a clean energy transition for ferries by creating opportunities to convert operations to hybrid or electric.

Leading the nation in recruitment, training, and retention of the maritime workforce

Launch a Michigan Maritime Education and Workforce Development Initiative to boost Michigan's engineering, mariner, and skilled trades capabilities. Continue implementing the statewide Infrastructure Workforce Plan which aims to train 5,000 new workers by 2030 to support state infrastructure investments, including in the maritime sector.

Cultivating a thriving maritime innovation ecosystem

Invest in maritime test and demonstration zones to drive innovation and evaluate emerging technologies. Formalize transportation corridors with Canadian provinces and states and seek federal support to co-fund corridor infrastructure.

Increasing sustainability, resilience, and revitalization of harbors and marinas

Promote sustainable harbor tactics to increase resiliency. Enhance public access through boat and kayak launches, water trails, and accessible shoreline entryways.

> Michigan is ready to lead the future of the maritime industry and protect its most precious natural resources for generations to come. With our new Michigan Maritime Strategy, we will.

Executive Summary

Michigan's identity has long been shaped by the Great Lakes, which make up the world's largest surface freshwater system representing more than 20% of the planet's surface fresh water supply. The Great Lakes and St. Lawrence River are precious natural resources that demand protection for the sake of long-term ecosystem health, biodiversity, community resilience, and support of the North American economy.

The Great Lakes supply over 40 million residents of the U.S. and Canada with clean drinking water[1]. Michigan is home to over 3,224 miles of Great Lakes shoreline, 11,000+ inland lakes, 33,000 miles of rivers and streams, and more than 3,000 miles of water trails[2]. For centuries, the Great Lakes and its vast water resources have shaped the culture, economy, and way of life for Michiganders — from the Indigenous peoples who relied on these waters for fishing and trade, to the early settlers and industrialists who built thriving ports and shipping networks that remain active today.

Michigan's waterways drive its maritime economy supporting intermodal transportation fueling trade, as well as a wide range of industries including manufacturing, tourism, recreation, and fishing. The state's central location within the Great Lakes St. Lawrence Seaway system as well as the Soo Locks positions it as a crucial link in North America's freight transportation system and integral to the U.S. national economy. The Great Lakes-St. Lawrence Seaway System is a critical international transportation corridor for commodities such as aggregates, coal, iron ore, petroleum, agricultural products, steel, project cargo, and containers. This connectivity not only strengthens Michigan's economic linkages with Canada and international markets but also reinforces global supply chain resilience and trade efficiency.

Today, Michigan's maritime industry plays a key role in the more than 350,000 shipping-related jobs across the U.S. and Canada, contributes to $50 billion in economic activity — including commercial and recreational uses — and supports the binational region's $9.3 trillion economy[3]. The protection and sustainable management of the Great Lakes is essential to long-term ecosystem health, economic vitality, and community well-being in Michigan and beyond.

Michigan's Maritime Strategy is a 10-year, forward-looking plan to capitalize on the state's strategic position in the Great Lakes region and its extensive maritime assets.

The Strategy integrates efforts across state agencies, industry, academia, and communities to foster a sustainable, innovative, and inclusive maritime future that aligns with broader transportation, environmental, and workforce development goals.

Michigan's Maritime Strategy targets business growth and economic development through an expansion of global export markets and diversification of cargo through containerization, modernization of port infrastructure to build resilience and accommodate alternative marine fuels, and development of a skilled workforce via leading maritime institutions. It prioritizes achieving carbon neutrality by 2050 through the expansion of clean fuel adoption, vessel electrification, and other clean energy alternatives, strengthens shipbuilding and manufacturing, and advances maritime technology and autonomous vessels.

It also supports investments in sustainability of ports and harbors and enhances environmental stewardship with pollution prevention and emission reductions to support sustainable Great Lakes tourism and recreational boating.

(Top) A passenger nautical vessel can be seen on the Detroit River. (Bottom) Historic shipwrecked pier pillon on Lake Michigan in Mackinac City, Michigan.

Shepler's ferry offers passengers a ride to Mackinac Island.

Strategic Vision and Objectives

Michigan's Maritime Strategy sets forth a unified vision emphasizing economic development, modernization of maritime infrastructure, marine manufacturing, clean energy transition and innovation, maritime research, workforce development and sustainable port and harbor development and practices. The strategy takes a holistic approach to both leverage and protect our state's greatest natural assets.

This strategy builds on a foundation of existing plans and laws, including the Michigan Mobility 2045 Plan, Carbon Reduction Strategy, and MI Healthy Climate Plan, and aligns maritime priorities with statewide goals for transportation transformation, carbon neutrality by 2050, and future conditions.

The Maritime Strategy outlines a plan to achieve four objectives:

1. Support economic development through the modernization of maritime infrastructure, intermodal transportation connectivity, leveraging manufacturing capability, and supporting supply chain resilience.
2. Accelerate the clean energy transition in maritime uses by demonstrating and deploying infrastructure and vessels that support Michigan's path to economy-wide carbon neutrality by 2050.
3. Invest in maritime research, innovation, education, and workforce development by expanding maritime programs, supporting advanced research and technology, and building partnerships.
4. Enhance Great Lakes ecosystem health and resilience by supporting environmentally sustainable practices and increasing resilience and revitalization of ports, harbors, and waterfronts.

Strategic Goals

The strategy includes 55 recommendations to address six integrated goal areas:

Modernize ports and invest in intermodal infrastructure: Invest in port upgrades to handle bulk and containerized goods efficiently; improve first- and last-mile truck and rail connections; implement data sharing for logistics optimization; and secure ongoing funding through state and federal programs.

Grow Michigan's maritime manufacturing economy: Establish Michigan as a national leader in marine component production, shipbuilding, and ship repair by expanding supply chains, attracting shipbuilders, and supporting naval ship repair opportunities.

Accelerate adoption of advanced vessel technologies and fuels: Develop biofuel supply chains; invest in alternative marine fuels (e.g., ammonia, methanol, green hydrogen); support electric and hybrid powertrain technologies for recreational boats and ferries; and invest in necessary infrastructure such as shore power and fueling facilities.

Lead the nation in recruitment, training, and retention of the maritime workforce: Launch a holistic maritime education and workforce initiative; align maritime curricula across colleges and universities; expand trade and skilled labor programs; and promote maritime careers through campaigns as part of Michigan's outreach strategy and integrate them into K-12 education.

Cultivate a thriving maritime innovation ecosystem: Expand maritime technology test and demonstration zones in collaboration with research institutions and industry; support research and development (R&D) on cutting-edge maritime technologies; and cultivate regional innovation hubs to support startups and commercialization efforts.

Increase sustainability, resilience, and revitalization of recreational harbors, marinas, and boating access sites: Support modernizing recreational harbors and marinas through sustainable planning and funding, pollution prevention and source reduction practices, increase education on invasive species management, and promote best practices to protect aquatic environments.

Implementation and Governance

The Michigan Maritime Strategy provides a roadmap for collective action, collaboration and investment in transportation innovation, emission reductions, resilience and environmental stewardship, workforce development, and inclusive economic opportunity.

The Strategy is not just for the State of Michigan, but for all relevant stakeholders, maritime interests, and organizations. To ensure the Maritime Strategy persists over time and across administrations, the elements of the Strategy need to be fully integrated into decision-making processes, governance structures and the collective work of the state, industry, business, academia, tribal and local governments, other organizations, and individuals.

Ensuring long-term implementation of the Strategy will depend on how the recommendations get adopted by various actors or organizations and enacted in legislation, funded, supported, and realized. Continued collaboration with Michigan's congressional delegation and federal partners is essential to fully leverage and maximize, state, federal, and private investments.

The Strategy is intended to lay out a five-year implementation plan to achieve progress toward accomplishing goals and recommendations. Strategy recommendations must evolve and adapt with advancements in technology, research, innovation, and policies and as new funding and investments opportunities arise. The Strategy is intended to be a living document, and as such should be reviewed and revised regularly to adequately address and incorporate emerging needs and opportunities.

An interdepartmental maritime team led by the Michigan Department of Transportation (MDOT) and the Department of Environment, Great Lakes, and Energy's (EGLE) Office of the Great Lakes with Departments of Agriculture and Rural Development (MDARD), Labor and Economic Opportunity (LEO), and Natural Resources (DNR) will ensure a cohesive common strategy around implementation of the Maritime Strategy. The team will establish a process and governance structure for tribal government and stakeholder collaboration, establish criteria for setting implementation priorities, identifying cross agency joint projects, and an approach to assess and evaluate progress.

A Call to Action

The Maritime Strategy is more than a plan — it is a catalyst for transformation and a blueprint for action. It calls on all relevant parties including state agencies, industry leaders, research institutions, local communities, and environmental organizations to join forces in making Michigan's maritime sector a national model for innovation, sustainability, and equity. The success of this vision depends on commitment and collaboration: ownership by a diverse set of actors, investment in high-impact projects, and maritime champions driving progress toward real outcomes that benefit people, the economy, and the environment. The Strategy is intended to be a living document that adapts and evolves with new opportunities, emerging technologies, and changing circumstances.

Michigan's Maritime Strategy

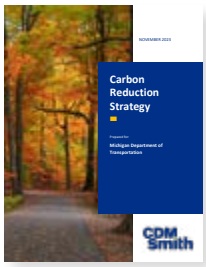
Michigan is emerging as a leader in maritime innovation and sustainability. State agencies, industry leaders, academia, and research institutions are driving a wave of new initiatives and innovation.

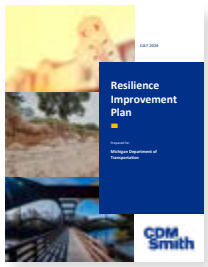
State initiatives and programs like the Michigan Maritime Manufacturing Initiative (M3), the Maritime and Port Facility Grant Program, the Fresh Coast Maritime Challenge, and maritime workforce development initiatives including Michigan Industry-Driven Skills Training Program and Manufacturing and Engineering Education Reimagined for All are targeted at modernizing infrastructure, manufacturing, promoting marine career pathways and preparation, clean energy transition and innovation, and fueling new businesses and economic growth. Institutions like the Great Lakes Research Center at Michigan Technological University and the future Freshwater Research and Innovation Center at Northwestern Michigan College bring together academia and industry to test new technologies, incubate businesses, and launch careers.

The Michigan Maritime Strategy provides a framework to leverage Michigan's maritime assets; align state policy, strategies, and plans; foster collaboration with industry, business, and academia; support R&D; and drive coordinated action. The Maritime Strategy will guide and inform policy, decision-making, and statewide actions in all aspects of both commercial and recreational maritime sector to support social, environmental and economic resilience while both leveraging and protecting Michigan's greatest natural asset, the Great Lakes.

This statewide Strategy takes a holistic approach and addresses economic development, modernization of maritime infrastructure, marine manufacturing, clean energy transition and innovation, maritime research, workforce development, emission reductions and resiliency, and sustainable port and harbor development and practices. By promoting collaboration with industry, academia, and the private sector, the Strategy is not just for the State of Michigan, but for all relevant stakeholders, maritime interests, and organizations.

> The Strategy provides a roadmap for collective action, collaboration and investment positioning Michigan at the forefront of sustainable maritime innovation and environmental stewardship in commercial and recreational marine sectors within the region and beyond.





Building on Existing Strategies and Plans

The Maritime Strategy unifies, integrates, and builds on existing state of Michigan strategies and plans that either directly address maritime issues or offer high-level guidance applicable to maritime sectors. The strategy also supports Michigan's maritime sector's efforts to help the state move toward clean energy targets set through statewide legislation[4] to achieve 100% clean energy by 2040.

Examples of state plans include:

Michigan Mobility 2045 Plan (Long-Range Transportation Plan): A 25-year plan for transforming Michigan's transportation system. It includes the State Rail Plan, State Freight Plan, Statewide Transit Strategy Report, and Active Transportation Plan.

MI Healthy Climate Plan: Sets ambitious goals for achieving statewide carbon neutrality by 2050 with an interim 2030 goal of reducing greenhouse gas emissions by 52% from a 2005 baseline.

MI Future Mobility Plan 2.0: Maps out a comprehensive strategy that addresses future mobility challenges by growing the mobility workforce, providing more accessible transportation infrastructure, and developing innovative mobility policies.

Carbon Reduction Strategy: Identifies and evaluates activities to reduce carbon emissions from the transportation sector in Michigan.

Resilience Improvement Plan: Explores strategies to improve statewide resilience to natural hazards, including flooding, extreme heat, and coastal erosion.

Michigan Statewide Workforce Plan: Addresses workforce needs arising from technological transitions. It prioritizes reskilling and upskilling Michiganders in advanced manufacturing, clean energy technologies, and infrastructure improvements, ensuring the state's workforce is well-prepared for evolving economic opportunities.

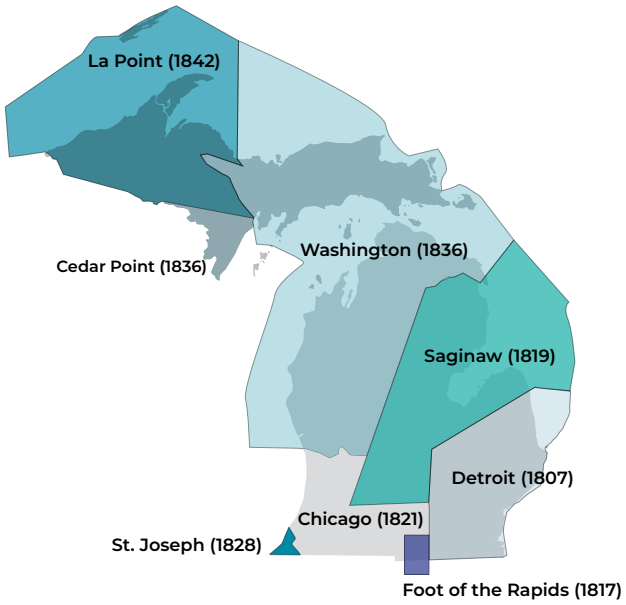
Maritime Strategy Engagement and Co-creation Process

The Maritime Strategy was developed through a one-year inclusive and comprehensive engagement process, involving over 200 unique participants representing a wide range of sectors, organizations, communities, and interests connected to Michigan's maritime ecosystem and industries.

Recognizing that all Michiganders and those in the broader Great Lakes region have a stake in this work, the process included representation from environmental, health, community, and Tribal representatives and stakeholders, alongside business and industry participants. Engagement included in-person meetings, field visits, phone interviews, and a full-day in-person workshop, which enabled deeper exploration of key issues and the identification of stakeholder priorities. Stakeholders also had the opportunity to review and comment on a draft of the strategy. This collaborative and co-creation approach ensured that the strategy reflects diverse perspectives and is grounded in the needs and opportunities identified by those most closely connected to Michigan's maritime future.

Throughout the strategy development process, **Tribal representatives** emphasized their role as equal partners and co-managers of the waterways across Michigan.

Figure 1: Treaty Areas in Michigan



The Treaty of 1836 between the U.S. Government and representatives of the Odawa (Ottawa) and Ojibwe (Chippewa) nations established the right for tribes to hunt, fish, and gather. While each of the 12 federally recognized tribes in the state of Michigan have their own specific priorities, needs, and opinions on maritime-related issues, all representatives who spoke with the strategy development team underscored that clean and healthy waterways and support for treaty rights are essential to maintain in any maritime strategy. Some maritime-related topics important to ensuring continued tribal rights include riparian habitat protection or restoration for culturally important activities such as manoomin (wild rice) and whitefish harvesting. Similarly, fishery resources in Michigan are co-managed by the Michigan Department of Natural Resources (DNR) and, in areas defined by federal treaties (seen in photo above with boundaries courtesy of the Michigan DNR, cooperatively with tribal units).

Michigan Maritime Assets and Economic Impact

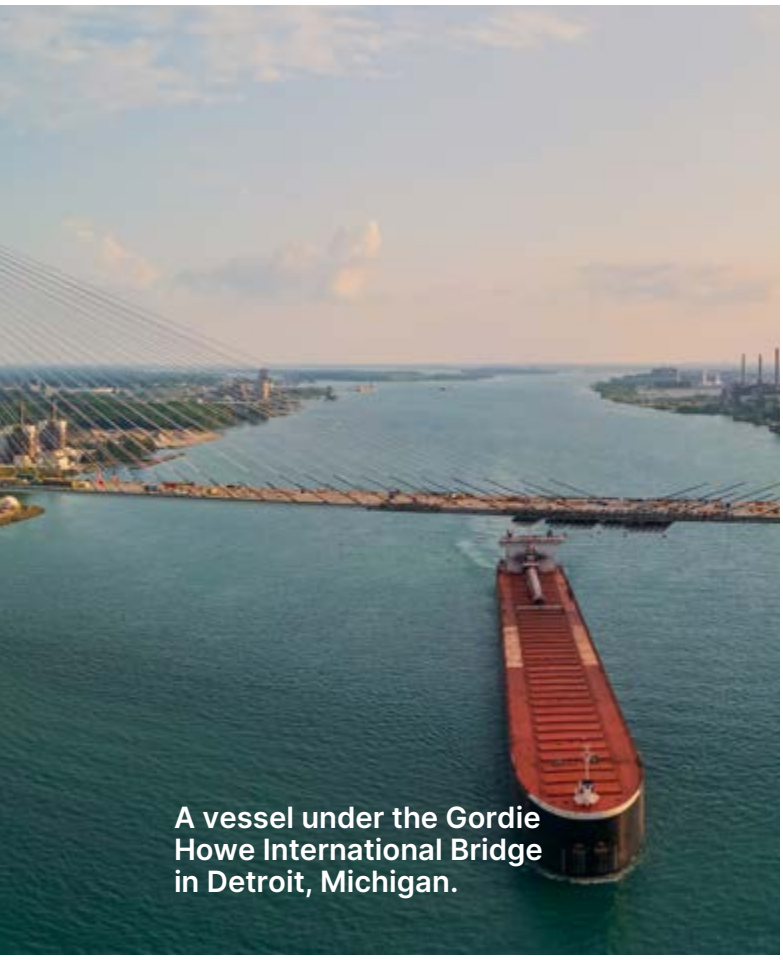
Michigan's maritime industry ecosystem includes: the ports and their operations as key components to intermodal transportation systems and supply chains, cargo handling equipment and supporting infrastructure for fueling and operations, production and transportation of marine fuels (and electricity), the vessels that provide freight and passenger transportation, and small recreational harbors and marinas (see Figure 4).

The scope spans freighters and barges; ferries and Coast Guard operations; recreational boating including nonmotorized craft; and commercial and charter boat fishing on the Great Lakes, inland lakes, and waterways. A total of 376[6] Michigan-registered vessels support maritime freight transportation. These maritime activities and the broader maritime landscape (including a thriving maritime heritage with over 60 maritime-related museums across the state) play a key role in Michigan's economy.

Michigan's maritime ecosystem comprises 33 active commercial ports strategically located in cities such as Detroit, Monroe, Rogers City, Marquette, and Sault Ste. Marie, and supports a multimodal transportation network essential to regional, national, and international trade[5] (see Figure 2). As maritime shipping is the most cost-effective transport service, many companies have historically been drawn to do business in Michigan and other Great Lakes states, which significantly aids the Michigan economy. In 2023, Michigan ports handled 57 million short tons of cargo[7], contributing approximately $4.7 billion[8] directly to the state economy and supporting more than 17,000 maritime-related jobs[9]. Michigan ports have traditionally handled bulk

Figure 2: Major Features and Impacts of Michigan's Maritime Freight Transportation System in 2023

33	56.98 Million	$4.7 Billion	17,000
Active commercial ports	Short tons of cargo handled yearly	Direct contribution to Michigan's economy	Commercial maritime jobs



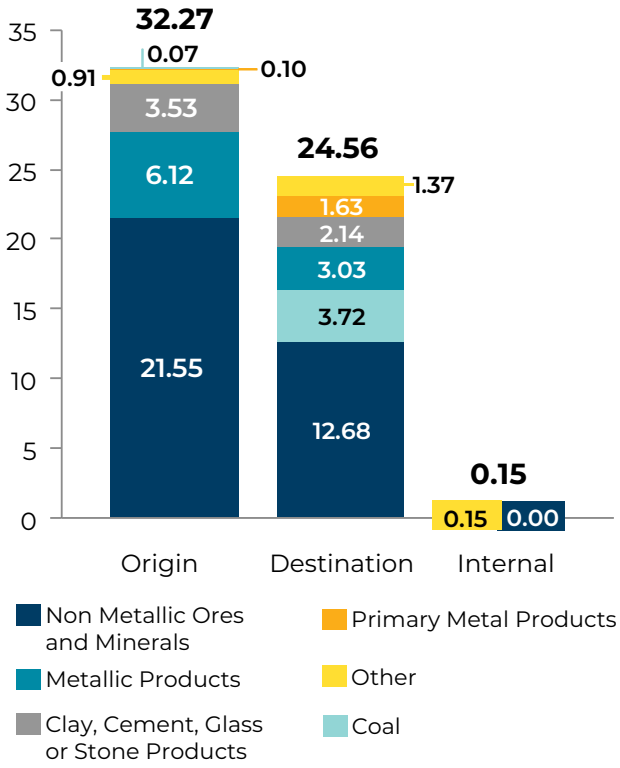
A vessel under the Gordie Howe International Bridge in Detroit, Michigan.

commodities such as ore and limestone, but they are increasingly diversifying by expanding into project cargo and exploring new opportunities to move agricultural products.

Central to Michigan's maritime operations are the Soo Locks in Sault Ste. Marie. The Soo Locks are critical marine infrastructure, enabling efficient transit of over 76 million tons of cargo in 2017, valued at $5.8 billion[10]. These locks enable millions of tons of bulk products to navigate between Lake Superior and the lower Great Lakes. By allowing ships to efficiently transit this crucial juncture, the Soo Locks significantly enhance trade fluidity and economic efficiency. Highly specialized pilots guide ships through the region, ensuring safe and smooth sailing through the Great Lakes.

Figure 3: Inbound and Outbound Cargo, Top Michigan Ports

A. Inbound and Outbound Cargo - 2023



B. Top 5 Michigan Ports in 2023

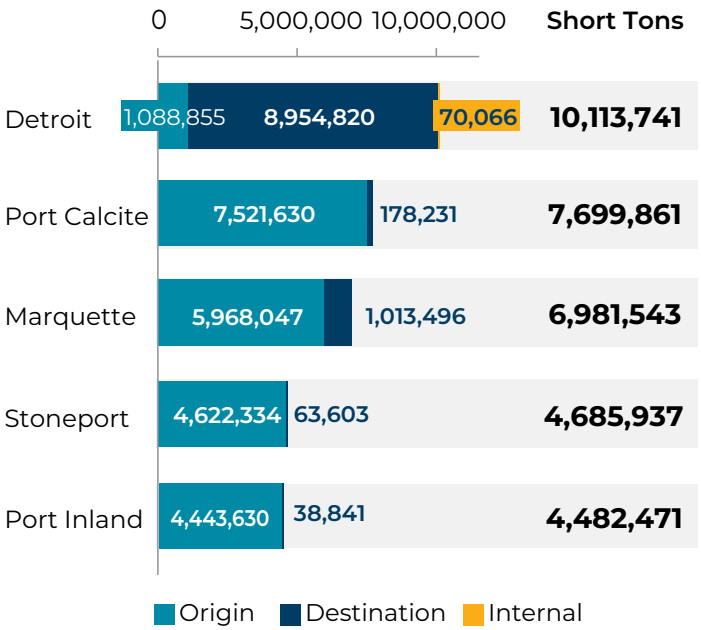
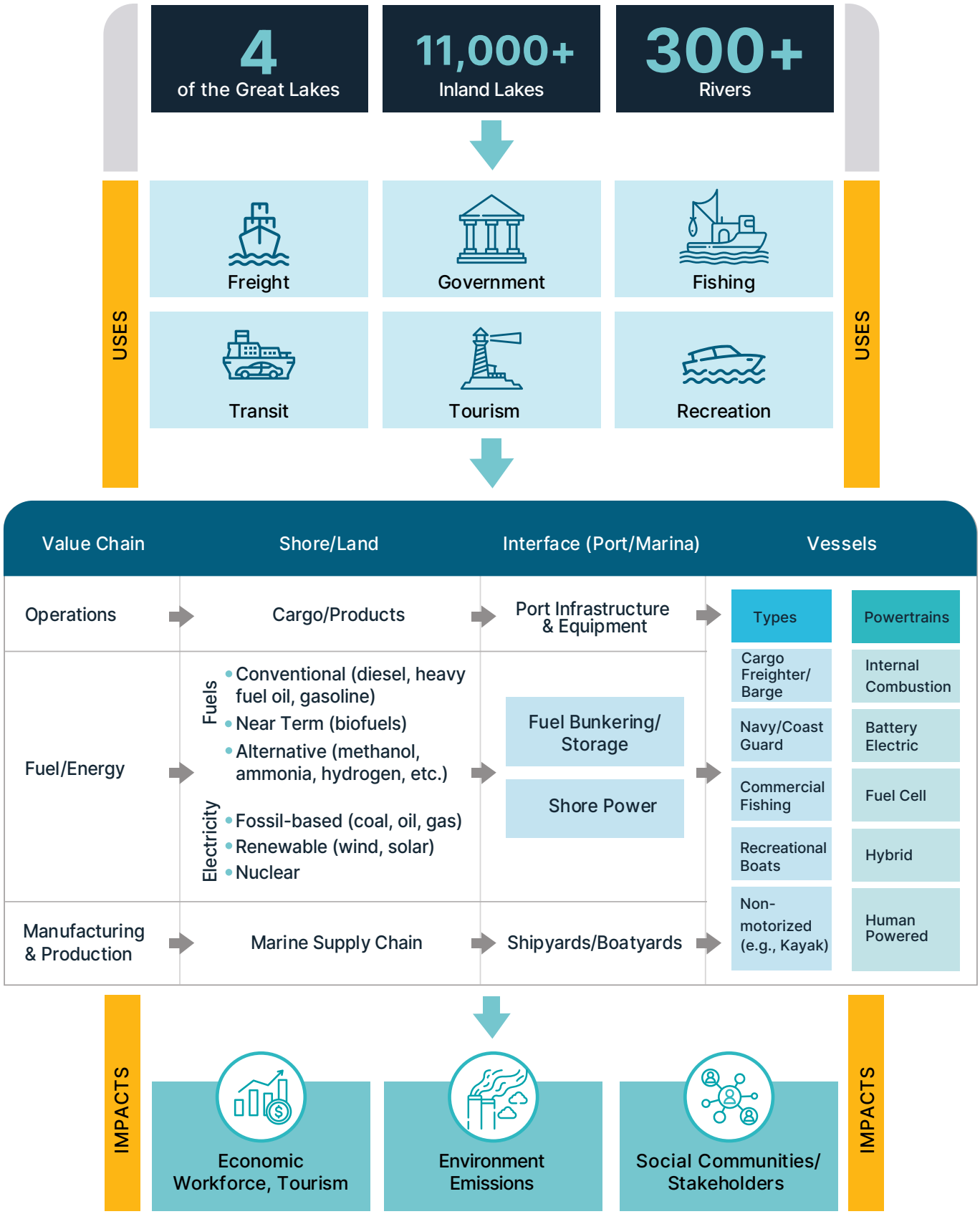


Figure 4: Michigan's Maritime Ecosystem



Michigan ranks third nationally in recreational watercraft registration, with approximately 800,000 registered vessels and a state-sponsored network of over 1,100 boating access sites and over 80 harbors (state or locally administered)[11]. The recreational boating industry contributes significantly to Michigan's economy, generating $11.7 billion a year and supporting 45,000 jobs[13].

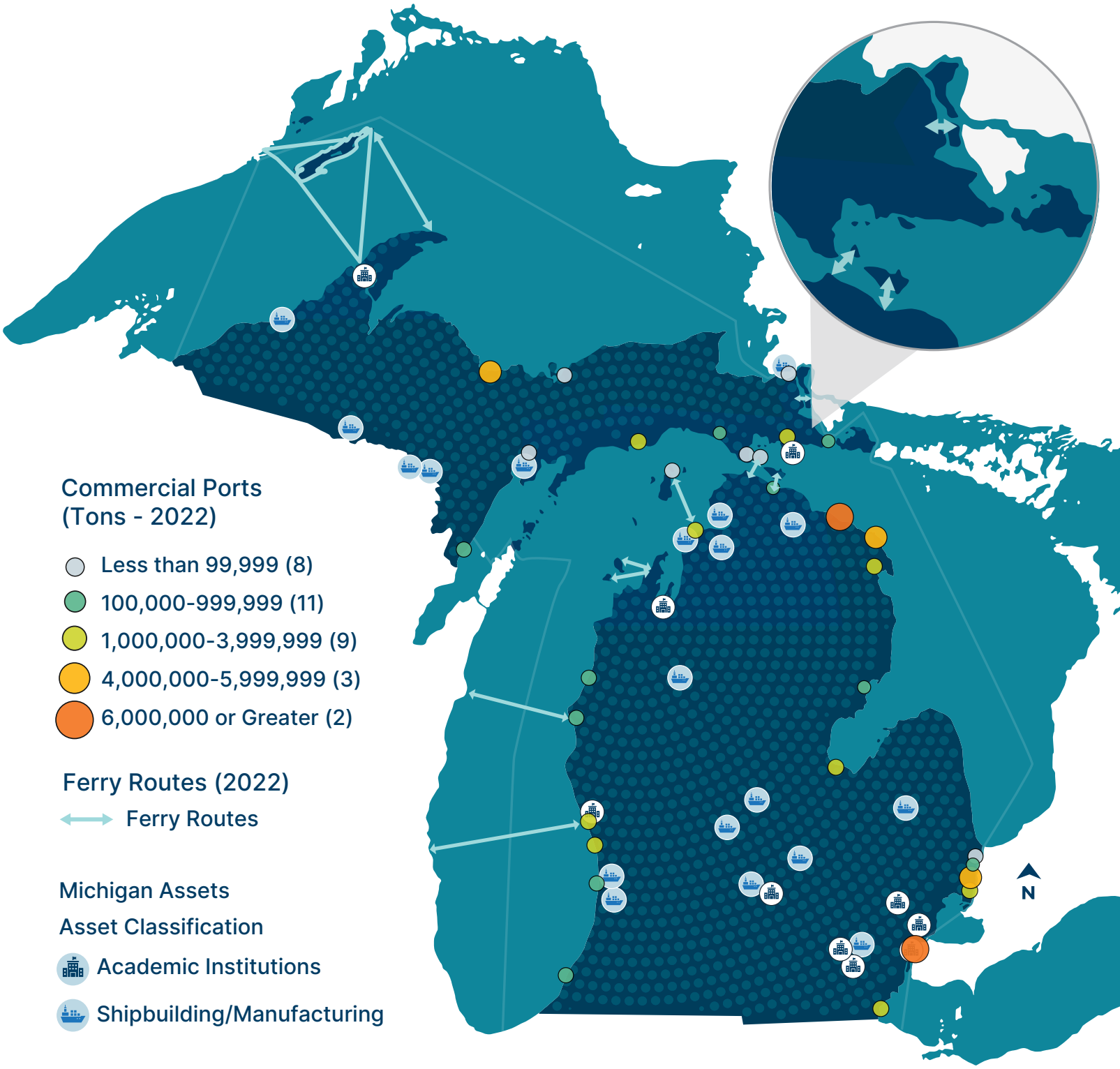
Michigan's recreational harbors, marinas, and boating access sites also support passenger ferries and commercial and charter boat fishing operations. In 2024, there were 20,000 charter excursions, taking 79,000 anglers out for 420,000 hours of fishing[14].

The Great Lakes, with their many islands, make ferries an indispensable component of Michigan's transportation network and culture. Michigan hosts 63 ferries and passenger carriers (60 registered in Michigan, three in other states)[17] plying 16 different routes on the Great Lakes, which support access to remote islands and tourism (see Figure 5). While this figure maps the primary commercial and intermodal ferry corridors in Michigan, it does not depict smaller-scale community crossings. Ferries carry approximately 2 million passengers annually in Michigan. These vessels serve as lifelines, bridging gaps between communities and fostering economic growth across the region[12]. Ferries provide island inhabitants crucial access to essential mainland services while providing tourists the opportunity to visit some of Michigan's more isolated corners.

Another key aspect of Michigan's tourism economy is the expanding Great Lakes cruise ship industry. Michigan is playing an important role in drawing both domestic and international cruise travelers to the region. Regionally, an estimated 175,000 cruise passengers will visit in 2026, up nearly 15% from the 2025 season, with more than 800 port visits, generating an estimated economic impact of over $300 million which includes port visits and shoreside spending[15]. Michigan is a featured highlight on multiple Great Lakes cruise itineraries, including common port calls to Alpena, Detroit, Mackinac Island, Marquette, Muskegon, Sault Ste. Marie, and Traverse City.

Elk Rapids, Michigan E-Marine Event - Test rides of electric recreational vessels with the electric hydro dam in the background, photo courtesy of Elk Rapids Marina

Figure 5: Michigan's Maritime Asset Map



Michigan's Maritime Opportunities

Michigan has multiple opportunities to leverage its geographic advantage, industrial legacy, maritime assets, talent, and workforce while achieving its clean energy commitments. By focusing on infrastructure modernization, enhancing multimodal transportation integration, strengthening the state's role in national and global shipping networks, pioneering new technologies, workforce development, innovation and clean energy transitions in recreational boating, and sustainable practices, Michigan's maritime sector is poised for transformative growth and leadership in the evolving and growing Great Lakes regional economy.

- Port Infrastructure
- Shifting Cargo Demand
- Shipbuilding and Marine Supply Chain
- Maritime Workforce
- Climate and Weather
- Public Health and the Environment
- Recreational Harbors and Boating
- Great Lakes Cruising

PORT INFRASTRUCTURE: Michigan's aging port infrastructure offers opportunities for modernization through preservation and expansion of deep-water cargo capability, enhancement of multimodal connections, and upgrading of facilities for alternative marine fuels. State grants have successfully catalyzed major projects through leveraging significant private investments and demonstrating strong public-private collaboration potential. Continued investment and improved data-driven planning are key to maximizing infrastructure efficiency, sustainability, and economic growth in Michigan's maritime sector.

SHIFTING CARGO DEMAND: Michigan's Great Lakes maritime sector has promising opportunities to grow through expanding export markets in the Middle East, North Africa, and Southeast Asia, and increasing shipments of agricultural products, such as soybeans. Multimodal integration of ships, rail, and trucking offers a path to enhance economic and environmental efficiency, while containerization presents potential for transport of high-value goods. Strategic port infrastructure development and co-locating industrial facilities near ports can boost competitiveness and sustainability, positioning Michigan to capitalize on evolving cargo trends.

SHIPBUILDING AND MARINE SUPPLY CHAIN: Michigan's shipbuilding and marine manufacturing sector is positioned for significant growth, leveraging its strong industrial engineering heritage, skilled workforce, and advanced manufacturing capabilities. Federal maritime and shipbuilding initiatives are driving investment, workforce expansion, and infrastructure refurbishment to serve commercial and defense markets. Innovating in areas such as redevelopment of existing maritime infrastructure and autonomous vessel technologies, Michigan has a strong position and an opportunity to lead in the U.S. marine supply chain and maritime manufacturing.

VESSEL TECHNOLOGY AND INNOVATION: Michigan can leverage its extensive engineering and manufacturing expertise to develop and demonstrate cleaner, more efficient technologies like electric and hybrid propulsion, dual-fuel engines, and alternative fuels for the maritime sector. Advances in digital innovations including real-time operations data, just-in-time scheduling, and integrated logistics platforms can boost efficiency and reduce emissions, while environmental innovations such as dredge material reuse and vessel recycling create new economic opportunities. With targeted investments, regulatory clarity, and collaborative public-private partnerships, Michigan can position itself at the forefront of maritime technology and sustainable innovation.

THE MARITIME WORKFORCE: Michigan has a unique opportunity to become a national leader in training and innovation of the maritime workforce, supported by top institutions like the Great Lakes Maritime Academy, the University of Michigan's Naval Architecture and Marine Engineering program, and Michigan Technological University's autonomous vessel research site. The growing demand for clean maritime technologies and sustainable practices is expected to create new jobs and workforce needs, driving economic growth. Through enhanced education, outreach, and collaboration, Michigan can build a resilient and inclusive workforce ready to meet the future demands of a modern, low-carbon maritime sector.

CLIMATE AND WEATHER: Michigan faces a combination of environmental hazards and increased frequency and intensity of extreme weather and climate events — flooding, ice storms, extreme heat, drought, wildfire smoke, and coastal erosion. These hazards can negatively impact port, harbor, and marina infrastructure, operations, and shipping and lead to costly damage. Michigan's MI Healthy Climate Plan aims for economy-wide carbon neutrality by 2050, emphasizing that every $1 invested in climate adaptation can avoid $4-11 in future damages[18]. Michigan aims to mitigate these hazards through investments in resilient infrastructure systems, clean fuel technologies and innovation, vessels and ports, which in turn aids in creating a reliable and resilient intermodal transportation system and supports the creation of new business opportunities in manufacturing, services, and technology. In addition, the state has developed and will continue to improve upon existing resiliency, hazard mitigation, and improvement plans. These improvements will help the plan align with the International Maritime Organization, which has set aggressive emissions reduction targets for 2030, 2040, and net-zero by 2050[19].

PUBLIC HEALTH AND THE ENVIRONMENT: The Michigan maritime sector offers opportunities to advance environmental and public health improvements by reducing and mitigating emissions through the development of technological advancements and clean energy alternatives and fuels in both the commercial and recreational sector, prevention of invasive species being introduced and spread, and implementation of sustainable development and best practices. The Strategy will position Michigan to lead in building a resilient, low-emission maritime future that protects the Great Lakes ecosystem while supporting economic vitality, public health, and community well-being.

RECREATIONAL HARBORS AND BOATING: Recreational harbors and boating are vital to the economic health of many Michigan harbor communities and present significant opportunities for sustainable growth. Advancing the clean energy transition for the existing Michigan fleet—alongside the development of new, Michigan-made low carbon propulsion technologies—can position the state as a leader in boating innovation. By prioritizing infrastructure repairs in public recreational harbors and supporting community planning and sustainable practices, the Strategy will support development of resilient, modern harbors that serve residents and visitors and protect Michigan's waterways.

GREAT LAKES CRUISING: Michigan's growing Great Lakes cruise industry has a significant opportunity to boost tourism and economic development through expanded itineraries and upgraded docking and infrastructure. The increase in cruise activity supports both iconic ports and emerging destinations, attracting more visitors and investment across the state. By proactively managing sustainability and community impacts, Michigan can ensure this growth benefits local economies while preserving ecological health and community character.

Goals and Recommendations

GOAL 1: Modernize Ports and Invest in Intermodal Infrastructure

Public and private ports are vital to Michigan's multimodal transportation network and economic competitiveness, serving as gateways for regional, national, and international trade. Investing in port modernization, including fuel and cargo handling infrastructure upgrades, container capacity, and data integration, can attract new trade partners, improve logistics, reduce costs, and lower emissions. Collaboration and funding across federal, state, and local levels is essential to modernize facilities, support a resilient supply chain, and accelerate a clean energy transition. The below recommendations apply to both public and private ports.

1.1. Leverage Michigan Ports to Attract New Commercial Trade

Port modernization requires significant upfront investment in materials, labor, and regulations but is justified by expanding commercial trade opportunities. Co-located truck and rail connections are vital for Michigan ports to serve as reliable freight gateways, enhancing supply chain performance and market access. Upgraded facilities for bulk and containerized goods will drive growth and diversification in Michigan's maritime economy.

RECOMMENDATIONS:

1. Secure sustained funding for Michigan's Maritime and Port Facility Assistance Office and associated grant program, which holds a critical role in driving advancements and ensuring long-term competitiveness for all ports in the state.
2. Invest in port facilities and port infrastructure that can better and more efficiently handle bulk and containerized goods.
3. Invest in safe, reliable, and well-maintained first- and last-mile truck and rail connections at Michigan ports.
4. Study and support regional and national efforts that aid freight and logistics network optimization.
5. Assess and invest in upgraded and resilient ferry infrastructure improvements to ensure reliable transport of goods, services, and people to island communities.

The **Port of Monroe** is investing over $30 million to upgrade infrastructure, including dock improvements and a new roll-on, roll-off dock for oversized cargo. The Michigan Maritime Gateway will be Michigan's first on-site international cargo inspection facility, meeting federal screening standards. This Gateway will offer shippers a cost-effective, lower-emission waterborne alternative to East Coast routes, enhancing supply chain resilience, and supporting Great Lakes container ports and short-sea shipping.

Photo Credit: Samuel C. Hankinson - Port of Monroe

1.2. Support and Invest in Port Clean Energy Transitions

Port operations are a vital part of the intermodal transportation system and the supply chain. While intermodal activities at the ports, such as trucking and rail, generate greenhouse gas emissions and air pollutants, ports are increasingly addressing these challenges. Some Michigan ports have initiated significant planning and implementation efforts to reduce emissions and improve air quality. More investments are needed to support planning, emission inventories, alternative fuel and energy source strategies, innovative technologies, emission reduction, equipment purchases as well as support the infrastructure for energy transmission and fuel transitions to meet Michigan's clean energy targets and protect public health.

RECOMMENDATIONS:

1. Conduct a statewide review of energy use, emissions, and charging infrastructure capacity at ports.
2. Conduct port planning and develop port plans to increase operational efficiency and reduce emissions.
3. Upgrade port infrastructure, electrify or hybridize cargo handling equipment to reduce operational emissions.
4. Expand public-private partnerships for innovation demonstration terminals, in existing facilities or in a new location, as a testbed for alternative fuel technologies and energy sources.
5. Expand ship power capabilities at ports and support standardization of ship power connections.
6. Establish collaborations with energy providers and utilities to assess and develop plans to ensure electrical grid preparedness for increased maritime demand.

The **Detroit/Wayne County Port Authority,** located in Downtown Detroit, oversees 18 terminals near residential communities affected by poor air quality due to industrial activity. A greenhouse gas assessment study found the port emits about 30,296 metric tons (over 33,395 short tons) of carbon dioxide (CO_2) annually, prompting a strategic plan to reduce fossil fuel use by adopting cleaner fuels and electrifying equipment. Supported by a $24.9 million U.S. Environmental Protection Agency (EPA) grant, the Port aims to achieve net-zero emissions by 2040 while improving local health, creating green jobs, and promoting sustainable growth.

GOAL 1: Modernize ports and invest in intermodal infrastructure

OUTCOME: Modern, efficient, and sustainable infrastructure driving economic development

#	Recommendation	Implementation Metric	Lead Actor(s)
	1.1: Leverage Michigan ports to attract new commercial trade		
1	Secure sustained funding for Michigan's Maritime and Port Facility Assistance Office and associated grant program, which holds a critical role in driving advancements and ensuring long-term competitiveness for all ports in the state.	• Secure an ongoing annual appropriation by 2028.	Legislature, MDOT
2	Invest in port facilities and port infrastructure that can better and more efficiently handle bulk and containerized goods.	• Increase and maintain funding for state programs that invest in port infrastructure and operational efficiency improvements and ensure equitable distribution of investments. • Number of public-private partnerships that leverage public-private port investments. • Amount of private investment leveraged per state and federal dollar invested.	MDOT, EGLE, Legislature, Federal Department of Transportation, Private investments by ports
3	Invest in safe, reliable, and well-maintained first- and last-mile truck and rail connections at Michigan ports.	• Number of intermodal improvements at land and port connections.	MDOT, Local units of governments, Private railroads
4	Study and support regional and national efforts that aid freight and logistics network optimization.	• By 2029, develop collaborative partnerships to conduct studies that support Michigan freight and logistics network optimization. • Michigan cargo throughput (tons or twenty-foot equivalent units/year/cargo type).	MDOT, Commission for Logistics and Supply Chain Collaboration, Great Lakes-St. Lawrence Governors and Premiers, Federal agencies, Research institutions
5	Assess and invest in upgraded and resilient ferry infrastructure improvements to ensure reliable transport of goods, services, and people to island communities.	• By 2027, review current infrastructure assessments and identify gaps for increasing resilience of ferry infrastructure. • Support projects to secure funding to address priority needs.	MDOT, Ferry owners, Federal Ferry Program

GOAL 1: Modernize ports and invest in intermodal infrastructure
OUTCOME: Modern, efficient, and sustainable infrastructure driving economic development

#	Recommendation	Implementation Metric	Lead Actor(s)
	1.2: Support and invest in port clean energy transitions		
1	Conduct a statewide review of energy use, emissions, and charging infrastructure capacity at ports.	• Fund and complete a study to establish a baseline Michigan maritime energy and emissions inventory by 2027.	EGLE
2	Conduct port planning and develop port plans to increase operational efficiency and reduce emissions.	• Secure funding to support port planning to increase operational efficiencies, reduce port related emissions, and conduct port emission inventories.	EGLE, MDOT
3	Upgrade port infrastructure, electrify or hybridize cargo handling equipment to reduce operational emissions.	• State and Federal funding levels for port decarbonization ($). • Port emissions (tons CO2eq/ year or % reduction compared to baseline); Reduce port emissions 50% by 2030 compared to 2005 levels (in line with MI Healthy Climate Plan).	EGLE, MDOT EGLE, MDOT
4	Expand public-private partnerships for innovation demonstration terminals, in existing facilities or in a new location, as a testbed for alternative fuel technologies and energy sources.	• Number of public-private partnerships established for innovation demonstration terminals in Michigan by 2029.	MEDC, MDOT, Ports, Terminal Operators, Private Investors
5	Expand ship power capabilities at ports and support standardization of ship power connections.	• Conduct assessment to evaluate the needs and determine potential to enhance ship power capabilities and connections. • By 2035, Michigan ports to have needed ship power capabilities. • Utilization rate of shore power connections at Michigan ports.	MDOT, EGLE, Ports
6	Establish collaborations with energy providers and utilities to assess and develop plans to ensure electrical grid preparedness for increased maritime demand.	• Fund and complete joint energy demand and availability study with deployment plan by 2027 (as part of Transportation Electrification Plan).	EGLE, Michigan Public Service Commission, Utilities

GOAL 2: Grow Michigan's Maritime Manufacturing Economy

Michigan is poised to grow its maritime manufacturing economy by building on its strong industrial base with the $50 million Michigan Maritime Manufacturing initiative[20] and the U.S. Navy's Maritime Industrial Base (MIB) Program. The state's expertise in advanced manufacturing, precision machining, shipbuilding, autonomous maritime systems, and robotics supports both Navy and commercial shipbuilding, fueled by top talent, public-private partnerships, including national leadership in registered apprenticeship programs, and research investments. Together, this growth will provide quality careers for Michigan residents, provide the Navy with workforce needs, and enhance the Michigan maritime economy.

2.1. Position Michigan as a National Powerhouse for Marine Component Manufacturing, Ship Repair, and Shipbuilding

Michigan can become one of the major suppliers of Naval and commercial ships including marine components in addition to recreational boats. These efforts will enhance the Michigan Technical Education Center Program and fill critical workforce needs. In addition to component manufacturing, future opportunities include expanding larger-scale autonomous shipbuilding and ship repair in Michigan.

RECOMMENDATIONS:

1. Combine a marine supply chain mapping study with the expansion of the M3 initiative's supplier matching and development program to identify and grow Michigan's marine manufacturing capacities, connecting new and existing suppliers to emerging opportunities.
2. Explore opportunities to support naval ship repair and vessel component construction using advanced manufacturing technologies.

The **M3 Initiative,** a $50 million initiative launched in July 2024, rebuilds Michigan's maritime defense workforce by focusing on submarine production skills like welding and Computer Numerical Control machining. It partners community colleges with K–12 outreach, veteran retraining, and recruiting, featuring a Navy-funded $15.4 million training center at Macomb Community College's Michigan Technical Education Center. The program accelerates training and has already graduated its first cohort, showcasing Michigan's leadership in advanced maritime workforce development.

2.2. Advance Michigan as the Premier Site for Designing, Building, and Testing Autonomous Maritime Systems

Building off programs and competitions already successful within the state like the Uncrewed Triple Challenge (which invites the innovation of autonomous marine technologies to race across Thunder Bay)[21], Michigan can leverage its mobility leadership to design, develop, build, and test autonomous maritime systems by combining its industrial strengths with dedicated testing and demonstration zones.

RECOMMENDATIONS:

1. Leverage existing public and private test sites, innovation zones, and networks to test marine technologies.
2. Explore creating new test sites and zones.
3. Attract marine autonomy companies and establish new production facilities in Michigan to grow the state's autonomous vessel manufacturing sector.
4. Leverage initiatives like the Smart Ships Coalition and national policies to support autonomous maritime R&D and channel funding for system design and production.

The Smart Ships Coalition is a collaborative network comprising academic institutions, government agencies, private industry, and international organizations dedicated to advancing autonomous maritime technologies. Its mission is to facilitate the adoption of autonomous systems in marine environments, enhancing efficiency and safety in operations such as resource management, scientific research, and navigation. The coalition addresses challenges related to technology integration, regulatory compliance, and operational safety. The coalition's work is pivotal in advancing maritime decarbonization. Autonomous vessels can optimize fuel consumption and reduce emissions, contributing to the industry's net-zero goals[22].

GOAL 2: Grow Michigan's Maritime Manufacturing Economy

OUTCOME: Michigan is a nationally recognized hub for shipbuilding and the marine supply chain

#	Recommendation	Implementation Metric	Lead Actor(s)
	2.1: Position Michigan as a national powerhouse for marine component manufacturing, ship repair, and shipbuilding		
1	Combine a marine supply chain mapping study with the expansion of the M3 initiative's supplier matching and development program to identify and grow Michigan's marine manufacturing capacities, connecting new and existing suppliers to emerging opportunities.	• Leverage existing data on Michigan maritime supplier base, conduct a marine supply chain study to address gaps, and incorporate findings into the state's existing business attraction strategies. • Establish a baseline; Number of marine component suppliers in the State; New ones attracted and retained that create/retain jobs; Facilitate investments.	MEDC, LEO, Universities
2	Explore opportunities to support naval ship repair and vessel component construction using advanced manufacturing technologies.	• Leverage the state's existing business attraction strategies to bring foreign and U.S. ship-making to Michigan.	MEDC, LEO, Private Investors, MDOT

GOAL 2: Grow Michigan's Maritime Manufacturing Economy

OUTCOME: Michigan is a nationally recognized hub for shipbuilding and the marine supply chain

#	Recommendation	Implementation Metric	Lead Actor(s)
	2.2: Advance Michigan as the premier site for designing, building, and testing autonomous maritime systems		
1	Leverage existing public and private test sites, innovation zones, and networks to test marine technologies.	• Develop a collaborative approach through public-private partnerships to promote and activate Michigan test capabilities, target large federal projects; number of private investments and number of investments that leveraged test sites.	MEDC, Public/Private Partners, Test Sites
2	Explore creating new test sites and zones.	• Number of test site engagements.	MEDC, Universities, Local Governments, Regional Economic Development Organizations
3	Attract marine autonomy companies and establish new production facilities in Michigan to grow the state's autonomous vessel manufacturing sector.	• Continue business attraction plan to attract major autonomous maritime system companies to move or expand to Michigan by 2027; Number of autonomy-focused production facilities launched; Job creation metrics in autonomy sector; Promote Michigan's maritime ecosystem and existing resources to support maritime-related companies.	MEDC
4	Leverage initiatives like the Smart Ships Coalition and national policies to support autonomous maritime R&D and channel funding for system design and production.	• Amount of R&D funding attracted to Michigan for autonomous maritime; Number of new system designs/ projects funded; Participation in federal maritime innovation programs.	Universities

GOAL 3: Accelerate Adoption of Advanced Vessel Technologies and Fuels

As global maritime emission regulations tighten, vessel operators are seeking lower emission alternatives, especially for vessels that cannot be electrified. Different vessel types will require innovative approaches to transition to cleaner fuels. Michigan is well-positioned to provide clean maritime solutions for the Great Lakes and beyond by leveraging local marine fuel production, marine refueling terminals, and a strong manufacturing base, supported by its automotive expertise, electric vehicle (EV) infrastructure, electric boat startups, and battery ecosystem.

3.1. Identify and Invest in Opportunities to Advance Marine Fuel Alternatives

The state should leverage its innovation strengths across maritime, trucking, and rail to advance sustainable and alternative marine fuels — such as methane, methanol, ammonia, and hydrogen — while expanding the use of readily available and sustainable biofuels with near-term emission reduction potential. Biofuels can potentially offer an immediate reduction in emissions, utilizing existing engine technology and fueling infrastructure[23]. Michigan can also leverage fuel innovation and production development related to other industries, such as automotive and trucking, to accelerate maritime adoption.

RECOMMENDATIONS

1. Assess the feasibility and scalability of using biofuels in ships, considering limitations, existing value chain, supply chain efficiency, engine impacts, fuel storage, and sustainability.
2. Identify areas where Michigan can lead in developing and adopting alternative marine fuels for commercial and recreational uses.
3. Provide incentives and support for marine fuel innovation, strengthen collaboration across the fuel value chain, and enhance programs that grow fuel infrastructure to promote local use.

Michigan lawmakers are considering legislation to support **biodiesel production and retail sales** through a statewide incentive program that provides tax credits based on gallons produced or blended. The bill aims to increase job opportunities, retain the biodiesel supply chain within Michigan, stabilize local soybean prices, reduce greenhouse gas emissions, and enhance energy security by promoting the use of homegrown renewable fuel. Biodiesel is a feasible low-carbon drop-in fuel that can be used today in cargo vessels, commercial boats, and ferries.

Photo Credit pg 34 & 35: Brenda Ahearn/ University of Michigan, College of Engineering, Communications and Marketing

3.2. Support a Clean Energy Transition for Freighters and Oceangoing Vessels

Improving energy efficiency and adopting alternative marine fuels are the main pathways for clean energy transition for freighters and oceangoing vessels. While electrification and hybridization have limited applicability for larger, long-distance vessels, there are significant opportunities to support energy-efficient operational practices, advance vessel designs, and the adoption of sustainable fuels.

Targeted support and incentives can help drive deployment of these solutions and reduce emissions.

RECOMMENDATIONS:

1. Deploy advanced data tools to support operational planning and integration between vessels and shore-side facilities to improve efficiency.
2. Invest in and expand local alternative marine fuel bunkering infrastructure, using public-private partnerships, to support cleaner shipping.

3.3 Support a Clean Energy Transition for Ferries

Michigan ferries provide essential connections to the mainland to island communities for food, supplies, and medical services, among others. Ferries also face seasonal harsh conditions in Great Lakes waters in remote parts of the state. They also provide access to island communities for tourists, which is important for island communities' economies. With high utilization and fixed routes, ferries present a unique use case for customized cleaner energy solutions. Electrification and hybridization solutions suitable for ferries are also more widely applicable for other types of harbor craft such as tugboats that push cargo barges and can benefit from complementary support efforts.

RECOMMENDATIONS:

1. Evaluate and leverage findings from previous ferry electrification studies and explore hybridization technologies to identify new opportunities and guide next steps.
2. Create funding programs and/or policies to help public and private ferry owners adopt hybrid and electric technologies and demonstrate viable business models while building on past Michigan ferry electrification studies.
3. Pursue federal Ferry Boat Program funding and expand the Michigan Comprehensive Transportation Fund to support new ferry construction and conversions.
4. Support and accelerate the clean energy transition for harbor craft and other vessels that align with ferry-related technology and infrastructure development.

3.4 Support a Clean Energy Transition for Recreational Boating

Michigan's strengths in recreational boating and advanced mobility can drive the transition to clean marine propulsion. This will require pursuing multiple pathways, including the development of affordable, efficient electric boats while also advancing alternative fuels (including different types of liquid or drop-in fuels) for the existing fleet[24]. The most effective approaches will balance cost, performance, sustainability, and noise reduction across new and existing vessels.

RECOMMENDATIONS:

1. Attract and support electric boat manufacturers to establish and grow operations in Michigan through workforce development and business attraction.
2. Collaborate with research and innovation hubs to develop, commercialize, and advance clean energy transitions for recreational boats though technological advancement, manufacturing, and innovative design.
3. Expand electric charging and alternative marine fuel infrastructure at marinas and ensure grid readiness.
4. Establish funding programs that support the retrofitting of existing fleets of boats to cleaner energy alternatives and offer incentives for companies and startups to support clean energy transitions in recreational boating.
5. Market and promote recreational boating opportunities that use renewable energy or other new technologies, such as boat rentals and clubs moving towards electric boats and alternative marine fuels in their fleets and partner with Michigan towns to promote marina EV charging infrastructure.

In 2023, Michigan launched the inaugural **Fresh Coast Challenge** awarding $506,000 in grants to six companies aiming to decarbonize the state's waterways by supporting electric boating infrastructure. The initiative includes deploying e-boats, installing fast marine chargers, and conducting technology demonstrations at marinas across Northwest Michigan, with the goal of establishing a sustainable and interconnected water transportation network.

GOAL 3: Accelerate adoption of advanced vessel technologies and fuels

OUTCOME: Michigan's maritime sector has advanced, low-emission vessel and port fuels and technologies

#	Recommendation	Implementation Metric	Lead Actor(s)
	3.1: Identify and invest in opportunities to advance marine fuel alternatives		
1	Assess the feasibility and scalability of using biofuels in ships, considering limitations, existing value chain, supply chain efficiency, engine impacts, fuel storage, and sustainability.	• By 2027, evaluate previous studies on biofuels and assess the feasibility and scalability of using biofuels for commercial and recreational marine uses. By 2027, identify short term actions to advance the use of biofuels for Michigan ports and shipping operations and recreational marine uses.	Clean Fuels Alliance, Michigan Soybean Association, MDARD, EGLE
2	Identify areas where Michigan can lead in developing and adopting alternative marine fuels for commercial and recreational uses.	• By 2027, evaluate and identify opportunties for Michigan to support development and adoption of alternative marine fuels by leveraging fuel innovation in other industries such as automotive and trucking.	Council on Future Mobility and Electrification, EGLE, MDOT, MDARD, Universities, and Trade Association
3	Provide incentives and support for marine fuel innovation, strengthen collaboration across the fuel value chain, and enhance programs that grow fuel infrastructure to promote local use.	• Number/amount of incentives awarded for Michigan-based fuel producer projects that advance energy conversion and technologies; Number of advanced energy projects piloted or commercialized. Number/value of incentive/tax credit claims.	Legislature, USDA, MDARD, Private Investors
	3.2. Support a clean energy transition for freighters and oceangoing vessels		
1	Deploy advanced data tools to support operational planning and integration between vessels and shore-side facilities to improve efficiency.	• Number of ports and ship owners committed to testing data tools.	Ports, Ship Owners/ Operators, Universities, Data Tool Creators
2	Invest in and expand local alternative marine fuel bunkering infrastructure, using public-private partnerships, to support cleaner shipping.	• Number of public-private investments in establishing new clean fuel bunkering availability; number of bunkering sites at Michigan ports.	Ports, Ship Owners/ Operators, EGLE, MDOT

GOAL 3: Accelerate adoption of advanced vessel technologies and fuels

OUTCOME: Michigan's maritime sector has advanced, low-emission vessel and port fuels and technologies

#	Recommendation	Implementation Metric	Lead Actor(s)
	3.3: Support a clean energy transition for ferries		
1	Evaluate and leverage findings from previous ferry electrification studies and explore hybridization technologies to identify new opportunities and guide next steps.	• Number of studies evaluated; New pilot projects launched; Ferry energy transition roadmap created.	MDOT, Ferry Operators
2	Create funding programs and/or policies to help public and private ferry owners adopt hybrid and electric technologies and demonstrate viable business models while building on past Michigan ferry electrification studies.	• Diversity of funding programs available to support ferry clean energy transition; Number of ferries converted/ordered.	MDOT, EGLE, Council on Future Mobility and Electrification
3	Pursue federal Ferry Boat Program funding and expand the Michigan Comprehensive Transportation Fund to support new ferry construction and conversions.	• Amount of federal/state funding secured; Number of new ferry projects funded/year.	MDOT, EGLE
4	Support and accelerate the clean energy transition for harbor craft and other vessels that align with ferry-related technology and infrastructure development.	• Emissions intensity of Michigan ferries (tons CO2 per passenger-mile); Number of supporting infrastructure projects completed/year.	MDOT, EGLE

GOAL 3: Accelerate adoption of advanced vessel technologies and fuels

OUTCOME: Michigan's maritime sector has advanced, low-emission vessel and port fuels and technologies

#	Recommendation	Implementation Metric	Lead Actor(s)
	3.4: Support a clean energy transition for recreational boating		
1	Attract and support electric boat manufacturers to establish and grow operations in Michigan through workforce development and business attraction.	• Electric boats manufactured/ sold in Michigan ($/number of vessels/year); Number of jobs/ manufacturing facilities created.	MEDC, EGLE, Boating start-ups, Michigan Boating Industries Association
2	Collaborate with research and innovation hubs to develop, commercialize, and advance clean energy transitions for recreational boats though technological advancement, manufacturing, and innovative design.	• Number of collaborative projects initiated; Number of clean energy boat models launched.	MEDC, EGLE, Boating start-ups, Michigan Boating Industries Association
3	Expand electric charging and alternative marine fuel infrastructure at marinas and ensure grid readiness.	• Number of charging stations/ alternative fuel infrastructure sites added; Grid readiness assessments completed.	EGLE, DNR, Boating start-ups, Michigan Boating Industries Association
4	Establish funding programs that support the retrofitting of existing fleets of boats to cleaner energy alternatives and offer incentives for companies and startups to support clean energy transitions in recreational boating.	• Number/value of funding grants given; Number of existing boats retrofitted/year.	Legislature, Industry Association
5	Market and promote recreational boating opportunities that use renewable energy or other new technologies, such as boat rentals and clubs moving towards electric boats and alternative marine fuels in their fleets and partner with Michigan towns to promote marina EV charging infrastructure.	• Number of marina EV partnerships/ towns reached/year. • Number of recreational vessels powered by alternative fuels/year.	MEDC, Boating start-ups, Michigan Boating Industries Association, Local Governments

GOAL 4: Lead the Nation in Recruitment, Training, and Retention of the Maritime Workforce

Michigan has a robust maritime workforce training ecosystem, leveraging our advanced manufacturing strength and registered apprenticeship foundation to drive innovation and prepare world-class talent—from skilled trades and engineers to licensed mariners—positioning the state as a national leader. Supported by initiatives like the Michigan Statewide Infrastructure Workforce Plan and M3, the state is well-positioned to lead in next-generation maritime workforce development. By coordinating accessibility, research, and training efforts at existing educational hubs of maritime innovation, including the Great Lakes Maritime Academy, University of Michigan, Michigan Technological University, Northwestern Michigan College, and Macomb College, the state can establish a modern, comprehensive maritime talent pipeline.

4.1. Launch a Maritime Education and Workforce Development Initiative to Boost Michigan's Engineering, Mariner, and Skilled Trades Capabilities and Capacities

Michigan will leverage its unique education and workforce strengths to create a unified, holistic approach to maritime workforce development. By training talent and positioning itself as a hub for maritime careers, the state can build national capacity and retain skilled workers.

RECOMMENDATIONS:

1. Build partnerships among the state, colleges, universities, Michigan Works! System and the Maritime Academy with education systems to develop a holistic approach to growing maritime workforce capabilities.
2. Evaluate current programs to identify gaps and strengthen maritime career pathways by expanding dual enrollment and articulation agreements, especially in high-population areas, to create efficient transitions into registered apprenticeships and maritime careers.
3. Expand and modernize funding for the Michigan Apprenticeship Readiness Certificate (MARC), registered apprenticeship programs, skilled trade training, and community college pathways that support maritime careers.
4. Promote Michigan as a hub and destination for maritime workforce development and careers and develop maritime career awareness initiatives and career pathway programs to attract and retain workers.

The Michigan Statewide Infrastructure Workforce Plan aims to train 5,000 new workers by 2030 to support the state's major infrastructure investments, emphasizing equity, credentialing, and inter-agency coordination. It prioritizes sectors like transportation, energy, and broadband, while also integrating K-12 engagement through career awareness initiatives and partnerships with education systems. Maritime careers are referenced as part of the broader transportation and logistics workforce needs, with goals to build pathways from early education to post-secondary training.

4.2. Establish a Campaign to Promote Maritime Careers

With maritime careers being less well-known compared to other career paths, improving the understanding and marketing potential of maritime careers from a young age is important to establish a robust talent pipeline of future maritime workers and leaders. This pipeline should include introducing future talent to the industry as well as raising awareness for current maritime workers about growth opportunities and next steps within the maritime industry. Michigan should also leverage existing underutilized resources as part of the campaign.

RECOMMENDATIONS:

1. Build partnerships among the state, colleges, universities, the Maritime Academy, ship-based programs, business, and industry to integrate maritime-related careers into the K–12 curriculum by incorporating registered apprenticeship awareness and outreach initiatives, including Race2Talent events and Apprenticeship Walls.

2. Utilize national maritime-related industry and business association programs, resources, and funding to market engineering, mariner, and skilled trades careers and career preparation programming.

WE WORK THE WATERWAYS

We Work the Waterways is a national nonprofit that connects the next generation to careers in maritime, shipping, and logistics through hands-on exploration, classroom learning, and direct engagement with professionals. Their mission is to foster career awareness, workforce readiness, and long-term opportunity by bringing together students, educators, industry leaders, schools, government, and businesses. Operating under guiding principles encapsulated in their "PROPEL" framework: Promote Awareness, Elevate Industry Voices, Celebrate Excellence, Champion Sustainability, Build Partnerships, and Prepare Students, We Work the Waterways serves a diverse community of students, career seekers, educators, industry professionals, and community partners.

GOAL 4: Lead the nation in recruitment, training, and retention of the maritime workforce

OUTCOME: Michigan produces a record number of skilled maritime professionals and retains more talent in-state than ever before

#	Recommendation	Implementation Metric	Lead Actor(s)
	4.1: Launch a maritime education and workforce development initiative to boost Michigan's engineering, mariner, and skilled trades capabilities and capacities		
1	**Build partnerships among the state, colleges, universities, Michigan Works! System and the Maritime Academy with education systems to develop a holistic approach to growing maritime workforce capabilities.**	• Number of mariners, naval architects, marine engineers, and skilled trades graduates from Michigan universities, colleges, and training centers.	LEO, Universities, Colleges, Michigan Department of Education, MiLEAP, Michigan Works!, Michigan Registered Apprenticeship Programs
2	**Evaluate current programs to identify gaps and strengthen maritime career pathways by expanding dual enrollment and articulation agreements, especially in high-population areas, to create efficient transitions into registered apprenticeships and maritime careers.**	• Expand state-sponsored maritime education and workforce initiatives to address gaps and emerging needs by 2026.	LEO, Universities, Colleges, Michigan Department of Education, MiLEAP, Michigan Works!, Michigan Registered Apprenticeship Programs
3	**Expand and modernize funding for the Michigan Apprenticeship Readiness Certificate, registered apprenticeship programs, skilled trade training, and community college pathways that support maritime careers.**	• Annual increase in state and federal funding for maritime skilled trades programs; Number of new or expanded programs launched.	LEO, Universities, Colleges, Michigan Department of Education, MiLEAP, Michigan Works!, Michigan Registered Apprenticeship Programs
4	**Promote Michigan as a hub and destination for maritime workforce development and careers and develop maritime career awareness initiatives and career pathway programs to attract and retain workers.**	• Percentage of maritime professionals staying in Michigan after graduation/ completion.	LEO, Universities, Colleges, Michigan Department of Education, MiLEAP, Michigan Works!, Michigan Registered Apprenticeship Programs

GOAL 4: Lead the nation in recruitment, training, and retention of the maritime workforce

OUTCOME: Michigan produces a record number of skilled maritime professionals and retains more talent in-state than ever before

#	Recommendation	Implementation Metric	Lead Actor(s)
	4.2: Establish a campaign to promote maritime careers		
1	Build partnerships among the state, colleges, universities, the Maritime Academy, ship-based programs, business, and industry to integrate maritime-related careers into the K–12 curriculum by incorporating registered apprenticeship awareness and outreach initiatives, including Race2Talent events and Apprenticeship Walls.	• Launch of a state-sponsored maritime career campaign by 2026. • Number of schools that incorporate current registered apprenticeship awareness including Race2Talent and Apprenticeship Walls in their outreach.	LEO, Universities, Colleges, Michigan Department of Education, MiLEAP, Michigan Works!, Michigan Registered Apprenticeship Programs
2	Utilize national maritime related industry and business association programs, resources, and funding to market engineering, mariner, and skilled trades careers and career preparation programming.	• Number of national association partnerships activated; Reach and engagement of career awareness marketing.	LEO, Universities, Colleges, Michigan Department of Education, MiLEAP, Michigan Works!, Michigan Registered Apprenticeship Programs

GOAL 5: Cultivate a Thriving Maritime Innovation Ecosystem

Michigan is positioned to lead maritime innovation by leveraging its world-class research institutions, advanced manufacturing, skilled workforce, and expanding network of innovation hubs and clean tech coalitions. With strengths in electric and hybrid propulsion, alternative fuels, and autonomous vessels, the state's global leadership in mobility and electrification provides an ideal foundation.

5.1. Invest in and Expand Michigan Maritime Technology Test and Demonstration Zones, Integrating Land- and Water-Based Assets, in Collaboration with Industry and Research Partners

Michigan has existing testing and demonstration assets through its universities, colleges, and incubators, while the state's commercial and military testing capabilities such as Camp Grayling (the only U.S. base allowing simultaneous land, air, sea, and space demonstrations) provide key advantages. Existing testing and demonstration assets include the Marine Autonomy Research Site at Michigan Technological University, Northern Michigan's BlueTech Innovation Hub, ongoing collaborations between Port of Monroe and Newlab Detroit, and the Michigan National All-Domain Warfighting Center in Alpena. Further investment and expansion of dedicated maritime technology and demonstration zones will develop the business environment necessary to drive cross-sector collaboration, speed up commercialization, and attract investment in Michigan.

RECOMMENDATIONS:

1. Invest in maritime test and demonstration zones — including an innovation terminal at an existing or new facility — to evaluate and promote emerging technologies and alternative fuel solutions.
2. Partner with other states and Canadian provinces to formalize transportation corridors and with federal agencies to co-fund corridor infrastructure and sustainable marine fuel bunkering.
3. Market and promote Michigan maritime innovation zones and corridors to companies developing and operating new technologies and vessels.

Launched in 2021 by Northwestern Michigan College, Discovery Pier, Michigan Technological University, Traverse Connect, and 20Fathoms, the **Freshwater Research and Innovation Center** will drive the development of freshwater technologies by combining pier access, advanced labs, expert collaboration, and active research. With startup support, incubation, and accelerator programs, the Center will turn innovation into market-ready solutions while attracting students, educators, researchers, and entrepreneurs to strengthen the marine technology sector through hands-on learning, professional credentials, and workforce development.

5.2. Support and Fund Michigan-Based Maritime Research and Development

Michigan's research universities, colleges, water centers, innovation hubs, and their partners play a vital role in advancing maritime solutions through research, development, testing, demonstration, and commercialization. The University of Michigan is home to a renowned Department of Naval Architecture and Marine Engineering. Michigan Technological University offers state-of-the-art facilities at the Great Lakes Research Center. Michigan State University leads in the development of bio-based fuels, while the Freshwater Research and Innovation Center in Traverse City serves as a dynamic BlueTech incubator and workforce training hub. Networks like the Great Lakes Association of Science Ships coordinate vessel-based research and education. Michigan can leverage its unique R&D assets to strengthen and grow its position as a maritime leader.

RECOMMENDATIONS:

1. Invest in and support R&D efforts that can strengthen the current maritime innovation ecosystem and make Michigan a global leader in maritime innovation.

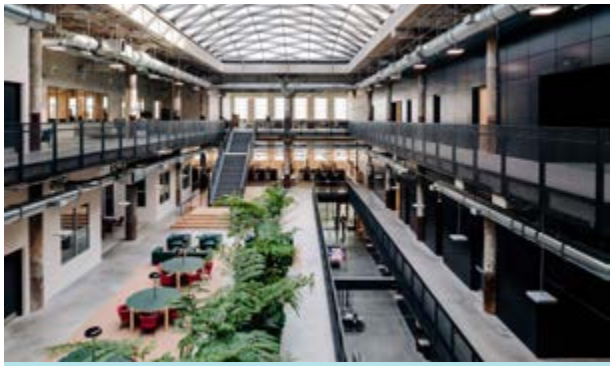
2. Investigate unique opportunities to establish global maritime R&D leadership by leveraging Michigan's strengths in areas such as advanced nuclear technology for applications including vessel propulsion.

5.3. Connect and Build Upon Maritime Startups to Create a Regional Innovation Hub

Building on strong R&D and testing capabilities, Michigan aims to lead a regional maritime innovation hub that supports startups, drives commercialization, and keeps technologies in-state. By linking R&D, demonstration, and national initiatives, Michigan can help revitalize U.S. shipbuilding and advance maritime innovation.

RECOMMENDATIONS:

1. Position Michigan as an incubator and launch pad for maritime startups by supporting partnerships and connecting local startups with industrial partners.
2. Expand existing maritime innovation partnerships including the BlueTech Innovation Zone and Smart Ships Coalition.
3. Establish Michigan-based Maritime Prosperity Zones created to spur investment in maritime infrastructure.



Newlab Detroit is a dynamic innovation hub. This 270,000-square-foot facility offers prototyping labs, collaborative workspaces, and access to specially permitted pilot sites, fostering the development of critical technologies in mobility, energy, and materials. As of July 2024, Newlab Detroit had hosted over 100 member startups, with more than half led by underrepresented minorities, collectively raising upwards of $688 million in venture capital. The hub's location and resources have accelerated numerous pilot programs, including the nation's first public electric road and autonomous maritime navigation projects. By blending Detroit's rich industrial heritage with cutting-edge innovation, Newlab Detroit exemplifies the city's resurgence as a leader in technological advancement and inclusive economic growth.

GOAL 5: Cultivate a thriving maritime innovation ecosystem

OUTCOME: Michigan becomes the regional hub for maritime innovation and demonstration

#	Recommendation	Implementation Metric	Lead Actor(s)
	5.1: Invest in and expand Michigan maritime technology test and demonstration zones, integrating land- and water-based assets, in collaboration with industry and research partners capacities		
1	Invest in maritime test and demonstration zones — including an innovation terminal at an existing or new facility — to evaluate and promote emerging technologies and alternative fuel solutions.	• Number of test zones/facilities created; Number of new technologies tested annually.	MEDC
2	Partner with other states and Canadian provinces to formalize transportation corridors and with federal agencies to co-fund corridor infrastructure and sustainable marine fuel bunkering.	• Number of formalized corridor partnerships; Federal and cross-border co-funded projects initiated.	MDOT, Ports, Canadian Partners
3	Market and promote Michigan maritime innovation zones and corridors to companies developing and operating new technologies and vessels.	• Establish a maritime test and demonstration zone and initiate a demonstration corridor project by 2027.	MEDC, MDOT, EGLE
	5.2. Support and fund Michigan-based maritime research and development		
1	Invest in and support R&D efforts that can strengthen the current maritime innovation ecosystem and make Michigan a global leader in maritime innovation.	• State/private investment in maritime R&D (annual $); Number of R&D projects funded.	Legislature, MEDC
2	Investigate unique opportunities to establish global maritime R&D leadership by leveraging Michigan strengths in areas such as advanced nuclear technology for applications including vessel propulsion.	• New global R&D partnerships or specialized research labs established; Number of Michigan-led research initiatives in advanced maritime technologies.	Universities

GOAL 5: Cultivate a thriving maritime innovation ecosystem

OUTCOME: Michigan becomes the regional hub for maritime innovation and demonstration

#	Recommendation	Implementation Metric	Lead Actor(s)
	5.3. Connect and build upon maritime start-ups to create a regional innovation hub		
1	Position Michigan as an incubator and launch pad for maritime startups by supporting partnerships and connecting local startups with industrial partners.	• Number/size of maritime startups and companies in Michigan.	MEDC
2	Expand existing maritime innovation partnerships including the BlueTech Innovation Zone and Smart Ships Coalition.	• Number of new/existing partnerships supported or expanded; Number of pilot/ demo projects launched.	MEDC
3	Establish Michigan-based Maritime Prosperity Zones created to spur investment in maritime infrastructure.	• Establish the first Michigan Prosperity Zone by 2026. • Number of Prosperity Zones established; Amount of investment attracted annually.	MEDC

GOAL 6: Increase Sustainability, Resilience, and Revitalization of Harbors, Marinas, and Boating Access Sites

Michigan's waterfronts, recreational harbors, and marinas are vital drivers of local economies and Michiganders' way of life. Communities are transforming former industrial waterfronts into vibrant accessible public spaces fueled by outdoor recreation and tourism to create great places to live, work, and play. Community planning is necessary to help waterfront communities protect public access to the water through accessible boat access sites and waterfronts, meet residents' needs, and support tourism and an outdoor recreation economy. Michigan's water resources are protected by public trust held by the State of Michigan. By implementing sustainable development best practices, communities with waterfronts, harbors and marinas can consider and plan for varying lake levels, increased frequency of intense storms, coastal hazards, infrastructure conditions and depreciation, access, boating trends, and future harbor use while ensuring water resources are protected. Encouraging sustainable tourism and environmental stewardship is critical to improving Great Lakes water quality, protecting Michigan's freshwater ecosystems, and preserving our state's natural beauty.

Photo Credit: Brenda Ahearn/University of Michigan, College of Engineering, Communications and Marketing

6.1 Support Sustainable Recreational Harbor and Marina Development

Michigan has more than 80 recreational harbors that significantly contribute to the quality of life, economic vitality, and support of the state's $4 billion boating industry. Many harbors need funding for modernization and infrastructure with some already facing financial difficulty. It is critical to establish long-term funding and promoting sustainability planning, development, and best practices to protect public resources and support public and private marinas. Sustainable sediment management, greater beneficial use of dredged material, and nature-based harbor and coastal solutions are critical, as is addressing navigation challenges during low water.

RECOMMENDATIONS:

1. Promote the use of the Sustainable Small Harbors Tools and Tactics Guidebook and provide funding to support additional harbor towns in developing and implementing waterfront revitalization and placemaking plans.
2. Prioritize infrastructure repairs, upgrading of public recreational harbors and their land-side access, and sustainable harbor maintenance practices and technologies to increase resiliency, maintain navigation, and ensure long-term sustainability.
3. Promote and encourage compliance with the EGLE Marina guidebook[25] and marina development best practices that protect public trust resources and preserve publicly accessible waterfronts.
4. Enhance public access to waterfronts through installation of accessible boating access sites, promoting water trails, and creating accessible shoreline entryways for all abilities.

Muskegon leaders are exploring an electric water taxi to increase access to Muskegon Lake, boosting local tourism and businesses while providing clean energy benefits. They are also considering a cross-lake shipping route between Muskegon and Milwaukee to enhance Midwest freight distribution and reduce traffic emissions. Muskegon's waterfront development plan aims to create a vibrant district blending residential, research, and recreation, highlighting its maritime history and supporting a clean, innovative maritime economy.

6.2 Expand Marine Sustainability Practices

Education and promotion of sustainable practices encourage environmentally-sound marina and boating tools to reduce pollution, enhance fish and wildlife habitat, and protect Great Lakes water quality through understanding, awareness, and action by Michiganders.

Developing and using a full lifecycle approach for marine infrastructure and vessels—covering how materials are sourced, built, fueled, operated, and decommissioned—will improve the sustainability of recreational boating. Programs like the Michigan Clean Marina Program certify marinas that meet high standards for preventing pollution and phasing out harmful practices. Certified marinas benefit from lower insurance and waste-disposal costs, a stronger public image, and better long-term protection of natural resources.

RECOMMENDATIONS:

1. Create a sustainable funding model for recreational boating / State Waterways Fund.
2. Secure sustainable funding and increase promotion of the Michigan Clean Marina Program.
3. Continue and expand the Clean Boats, Clean Waters program[26].
4. Expand boat washing stations at public marinas and state-managed boating access sites to inform recreational boaters about preventing the spread of invasive species.
5. Develop and implement sustainable end-of-life practices for vessels and infrastructure — such as recycling or repurposing hulls, responsibly retiring boating assets.
6. Support pollution prevention practices by promoting best management practices that reduce fuel and oil spills, minimize stormwater runoff contamination, improve waste and materials management, and prevent the release of pollutants during vessel maintenance, storage, and operation.

Clean Boats, Clean Waters (CBCW) is a Michigan State University Extension and EGLE-led volunteer program educating boaters and fishers about how to prevent aquatic invasive species spread. Since 2006, it promotes clean boat practices through materials, demonstrations, mobile wash stations, and events. Through outreach and grants, CBCW helps protect Michigan's Great Lakes and inland waterways from invasive species.

GOAL 6: Increase sustainability, resilience, and revitalization of waterfronts, recreational harbors, boating access sites, and marinas

OUTCOME: Michigan's waterfronts, recreational harbors, boating access sites, and marinas are revitalized through sustainability planning, resilient infrastructure, and expanded stewardship initiatives

#	Recommendation	Implementation Metric	Lead Actor(s)
	6.1: Support sustainable recreational harbor and marina development		
1	Promote the use of the Sustainable Small Harbors Tools and Tactics Guidebook and provide funding to support additional harbor towns in developing and implementing waterfront revitalization and placemaking plans.	• Number of communities developing waterfront revitalization and placemaking plans utilizing the guidebook and other placemaking resources. • Number of projects awarded grant funding for planning or implementation of projects developed using the guidebook.	EGLE, DNR, MEDC, Local governments
2	Prioritize infrastructure repairs, upgrading of public recreational harbors and their land-side access, and sustainable harbor maintenance practices and technologies to increase resiliency, maintain navigation, and ensure long-term sustainability.	• Number of harbors with modernized and resilient infrastructure. • Number of harbors implementing sustainable harbor maintenance practices. • Number of harbors using innovative technologies to sustain harbors. • Number of public-private partnerships that support innovative solutions to sustainable harbor maintenance.	DNR, EGLE, MEDC, Local Governments
3	Promote and encourage compliance with the EGLE Marina guidebook and marina development best practices that protect public trust resources and preserve publicly accessible waterfronts.	• Increase in the number of marina development projects that comply with EGLE Marina guidebook and best management practices and preserve publicly accessible waterfronts.	EGLE, Private developers, Local governments
4	Enhance public access to waterfronts through installation of accessible boating access sites, promoting water trails, and creating accessible shoreline entryways for all abilities.	• Number of projects that include accessible public access points.	DNR, EGLE, Local governments

GOAL 6: Increase sustainability, resilience, and revitalization of waterfronts, recreational harbors, boating access sites, and marinas

OUTCOME: Michigan's waterfronts, recreational harbors, boating access sites, and marinas are revitalized through sustainability planning, resilient infrastructure, and expanded stewardship initiatives

#	Recommendation	Implementation Metric	Lead Actor(s)
	6.2: Expand marine sustainability practices		
1	Create a sustainable funding model for recreational boating / State Waterways Fund.	• Develop a sustainable funding model for recreational boating/ State Waterways Fund by 2028.	DNR, Legislature
2	Secure sustainable funding and increase promotion of the Michigan Clean Marina Program.	• Develop and implement a sustainable funding strategy by 2028; Increase in the percentage of marina certifications and recertifications.	EGLE, DNR, Michigan Sea Grant, Michigan Boating Industries Association
3	Continue and expand Clean Boats, Clean Waters program.	• Increase the number of boat wash demonstration events and grants for boat washing.	MSU Extension, EGLE, Legislature
4	Expand boat washing stations at public marinas and state-managed boating access sites to inform recreational boaters about preventing the spread of invasive species.	• Funding is secured to support public marina and boating access sites having boat washing stations by 2030.	DNR, EGLE, Legislature, Michigan Sea Grant, MSU Extension
5	Develop and implement sustainable end-of-life practices for vessels and infrastructure — such as recycling or repurposing hulls, responsibly retiring boating assets.	• Develop collaborative partnerships with business and industry to create and promote sustainable end-of-life practices for vessels and infrastructure.	DNR, EGLE, Michigan Boating Industries Association, Boating access site and marina operators
6	Support pollution prevention practices by promoting best management practices that reduce fuel and oil spills, minimize stormwater runoff contamination, improve waste and materials management, and prevent the release of pollutants during vessel maintenance, storage, and operation.	• Number of marinas/harbors receiving pollution prevention technical assistance. • Number of facilities adopting recognized clean or sustainable marina best practices. • Educational materials developed and distributed to boaters and marina operators.	EGLE, DNR, Local Harbor Authorities, Marina Operators

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