DETERMINING STATE AND FEDERAL TRANSPORTATION RESPONSIBILITIES TO RESIDENTS ON ISLANDS

Research Administration
Reference Number: OR21-012

Prepared for
Michigan Department of Transportation
Division of Research
8885 Ricks Road
Lansing, MI 48917

Prepared by
Michigan State University
Department of Civil and Environmental Engineering
428 South Shaw Lane
East Lansing, MI 48824

June 2023

Technical Report Documentation Page

1. Report No. OR21-012	**2. Government Accession No.** N/A	**3. MDOT Project Manager**	
4. Title and Subtitle Determining State and Federal Transportation Responsibilities to Residents on Islands		**5. Report Date** June 30, 2023 **6. Performing Organization Code** N/A	
7. Author(s) Ali Zockaie, Farish Jazlan, Amirali Soltanpour, Mehrnaz Ghamami, Timothy Gates, Peter Savolainen.		**8. Performing Organization Report No.** N/A	
9. Performing Organization Name and Address Michigan State University 428 S. Shaw Lane Department of Civil and Environmental Engineering 3546 Engineering Building East Lansing, MI 48824		**10. Work Unit No. (TRAIS)** N/A **11. Contract or Grant No.** 2021-0207	
12. Sponsoring Organization Name and Address Michigan Department of Transportation Research Administration 8885 Ricks Rd. P.O. Box 30049 Lansing, MI 48909		**13. Type of Report and Period Covered** Final Report (01/15/2021 to 06/30/2023) **14. Sponsoring Agency Code** N/A	
15. Supplementary Notes Conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration. Michigan Department of Transportation (MDOT) research reports are available at www.michigan.gov/mdotresearch.			
16. Abstract Michigan has the second-longest coastline after Alaska, with approximately 15,000 residents inhabiting the top 5 populous islands in Michigan water bodies. To provide mobility equity, the residents of these islands are expected to have equal access to work, healthcare, emergency services, and economic opportunities as the mainland residents. Four Michigan islands (Beaver, Sugar, Neebish, Drummond) were focal to the research, with certain scope of research being extended to an additional four islands (Manitou, Bois Blanc, Grand, Harsens). The importance of ferry services operation, planning and maintenance, and the lack of rigorous studies that focuses on "ideal transportation responsibility by state and federal authorities" in Michigan, suggest an urgent need to assess the current state of affairs, and identify mobility gaps for island residents, in order to determine how authorities can intervene and facilitate improvements. To do so, the research team conducted a comprehensive review of literatures regarding ferry services across the nation. Then, a holistic appraisal of current ferry operations in Michigan was done, including understanding the backgrounds of islands relevant to the study, operational data inquiry from ferry operators, and an exhaustive review of historical studies and published reports on ferry operations in Michigan. Next, the research team explored governance strategies and best practices by conducting a nationwide state Department of Transportation (DOT) survey. Subsequently, a survey of ferry ridership was done at Beaver, Sugar, Neebish and Drummond Islands that explored satisfaction towards current services, room for improvements, and the perceived ideal role of state/federal authorities for island residents. Interviews with residents, business owners and local representatives were also conducted to understand mobility gaps for different types of users. Maintenance spending analyses were also conducted, which consequently enabled the research team to provide a projection of future maintenance spending and funding needs for MDOT's planning perusal. A synthesis of various data collection was then formed as a mobility trade-off matrix, which highlights pertinent mobility gaps in islands of interest. Additionally, feasibility to access federal funding was also assessed for Manitou, Bois Blanc, Grand and Harsens Islands. Key outcomes of this study are insights on existing ferry operations on the islands of interest, mobility gaps of island residents, maintenance spending forecast and funding needs through 2032. Most importantly, the research team proposed a strategic set of recommendations for MDOT in regard to the ideal roles of state and federal authorities to ensure island residents' welfare and mobility needs were outlined. While the research was conducted on certain islands, study findings may have wider applications on other island communities beyond those studied and analyzed in this report.			
17. Key Words Ferry Operators, Funding Maintenance and Operations, Island Residents, Marine Mobility, Economic Welfare, Social Welfare, Tribal Communities, Ferry Governance, Ferry Boat Program, Marine Capital Funding.		**18. Distribution Statement** No restrictions. This document is available to the public through the Michigan Department of Transportation.	
19. Security Classification (of this report) Unclassified.	**20. Security Classification (of this page)** Unclassified.	**21. No. of Pages** 199	**22. Price** $160,573.35

Form DOT F 1700.7 (8-72) **Reproduction of completed page authorized**

DETERMINING STATE AND FEDERAL TRANSPORTATION RESPONSIBILITIES TO RESIDENTS ON ISLANDS

FINAL REPORT

June 2023

Principal Investigator
Ali Zockaie, Ph.D.
Associate Professor
Michigan State University

Authors
Ali Zockaie, Farish Jazlan, Amirali Soltanpour, Mehrnaz Ghamami, Timothy Gates, Peter Savolainen.

Sponsored by
Michigan Department of Transportation

A report from
Michigan State University
Department of Civil and Environmental Engineering
428 South Shaw Lane
East Lansing, MI 48824

PUBLICATION DISCLAIMER

This publication is disseminated in the interest of information exchange. The Michigan Department of Transportation (hereinafter referred to as MDOT) expressly disclaims any liability, of any kind or for any reason, which might otherwise arise out of any use of this publication, or the information or data provided in the publication. MDOT further disclaims any responsibility for typographical errors or accuracy of the information provided or contained within this information. MDOT makes no warranties or representations whatsoever regarding the quality, content, completeness, suitability, adequacy, sequence, accuracy or timeliness of the information and data provided or that the contents represent standards, specifications, or regulations.

ACKNOWLEDGMENTS

The research team would like to acknowledge the Michigan Department of Transportation (MDOT) for sponsoring this research and the Federal Highway Administration for State Planning and Research (SPR) funds used for this project. The authors also acknowledge the contributions of the members of the MDOT Research Advisory Panel (RAP) for guidance and direction on project tasks, with special recognition to MDOT Project Manager, Valerie Shultz, and Research Manager, Mary Hoffmeyer. The research team also expresses gratitude to all other RAP members: Janet Geissler (MDOT), Elisha Wulff (MDOT), Tina Makarewicz (MDOT), Brian Kass (MDOT), Charles Lindstrom (MDOT), and Peter Krumm (FHWA), who provided feedback in various stages of the project to ensure project objectives were met and improve the quality of project deliverables and outcomes. We are also extremely grateful to Mary Cook of Beaver Island Transportation Authority (BITA), Tim McQueer of Beaver Island Boat Company (BIBCO), Peter Paramski and Akemi Gordon of Eastern Upper Peninsular Transportation Authority (EUPTA), Sleeping Bear Dunes National Park Service (Manitou Islands), Plaunt Transportation (Bois Blanc Island), Grand Island Ferry Services (Grand Island), and Champion's Auto Ferry (Harsens Island) that have been supportive of the study needs. We are also thankful for the various inputs provided by island organizations and communities, including Harsens Island Transportation Authority (HITA), Bois Blanc Township, and Great Lakes Islands Alliance (GLIA). We are also appreciative to the staff of the agencies who participated in the nationwide surveys conducted in this project and ferry operators that have provided insights in interviews, including Washington State Ferry (WSF), North Carolina Ferry System (NCFS), and Delta Ferry Authority (Bradford Island, CA). Finally, we acknowledge the involvements of residents/representatives of Beaver, Sugar, Neebish, Drummond, Manitou, Bois Blanc, Grand, and Harsens Islands, who have been crucial to the success of this study.

TABLE OF CONTENTS

LIST OF FIGURES

Appendices

LIST OF TABLES

Appendices

EXECUTIVE SUMMARY

Surrounded by four of the five great lakes, Michigan is well-known for its nature and tourist attractions. Accordingly, mobility is a critical factor in fulfilling the demand for different services and engaging people in various activities throughout the state. Michigan islands offer a wealth of tourism attractions, natural resources and a sizeable population of island residents serving those needs. To provide for mobility equity, the residents of the islands are expected to have equal access to work, healthcare, emergency services, and economic opportunities as the mainland residents. According to the Bureau of Transportation Statistics (BTS), there are 10 ferry operators in Michigan, among which those related to Beaver, Drummond, Sugar, and Neebish Island are of major interest in this study. Altogether, these islands have about 2,500 residents, more than 15% of the total population who live on islands of Michigan with 50 residents or more, as per 2010 census data. There are also other islands (Manitou, Bois Blanc, Grand, and Harsens) with ferry services that their opportunity to access federal funding is of research interest. Considering the importance of these services on economic growth and societal equity concerns in providing mobility and accessibility to essential needs for island residents, it is crucial to establish MDOT's role, governance strategies and potential additional funding sources for these islands in Michigan. Therefore, **the overarching goal of this study is to identify state and federal responsibilities for the residents of Michigan islands by reviewing federal and state regulations, and best practices nationwide.**

This report involves a review of the literature regarding the state of ferry operations and best practices nationwide (Task 1), a review of Michigan islands' regional background (Task 2), nationwide state DOT and ferry operator surveys (Task 3), survey and interview of island residents and business owners (Task 4), synthesis of data collection through island residents mobility gap analysis and mobility trade-off matrix (Task 5), assessment of historical maintenance spending and developing funding need projection/maintenance plan (Task 6), evaluation of ferry operations in Manitou, Bois Blanc, Grand and Harsens Islands to assess feasibility to access federal funding (Task 7), and final recommendations for Michigan islands accessibility and mobility considering economic impacts and social justice.

In this report, the research team first conducted a comprehensive literature review of general ferry operations as part of the transit system overall, and specific ferry operations in key states with established and large ferry operations. Enabling legislation at the federal level were reviewed

to understand the driving blocks of ferry operation sustainability, stability, and improvements. This includes a review of historical legislative spending acts and specific grants established under them. Federal-level guidelines on ferry operations were also reviewed, such as reports by the Transit Cooperative Research Program (TCRP), the Federal Transit Administration (FTA), and the Bureau of Transport Statistics of United States Department of Transportation (USDOT). The research team then reviewed specific enabling legislation and statutes for the state of Michigan, such as the Michigan Transportation Policy Plan (MTPP), the establishment of The Michigan Transportation Fund Act (Act 51), and various grants that were born as a result of those directives and state visions. Historical marine capital funding disbursement and project authorization grants from the Michigan Department of Transportation (MDOT) were also reviewed.

A review of best practices nationwide was then conducted to understand the type of studies and key insights that have been obtained by state agencies and ferry operators in other states. Historical studies conducted on Michigan ferries were also reviewed, through reports dating back to 1984. The research team also reviewed the literature to understand economic, public welfare, and social equity issues in the state of Michigan, specifically economic data from related counties and regions. The research team also reviewed reports related to tribal communities, given their sizeable presence in the region surrounding islands of interest.

The research team conducted a series of heuristics to understand existing ferry operations, system capacity, and ideal ridership demands and needs on the main islands of interest (Beaver, Sugar, Neebish and Drummond Islands). Beaver Island Transportation Authority (BITA) and Eastern Upper Peninsula Transportation Authority (EUPTA) were consulted throughout the project period, where the research team was furnished by documents and data relevant to the study. Several analyses were conducted, including historical ferry ridership and trend projections.

A nationwide state DOT survey was also conducted. The survey was distributed to 36 state agencies that have ferry operations under their jurisdiction. The main objectives of the survey, amongst many others, were to understand the current state of practice in other states, and what are some best practices and lessons learned regarding governance and coordination excellence. Out of 35 states with ferry operations, the survey received responses from 20 state DOTs, which translates to a 57% response rate. It was noted that most state agencies only impose oversight on ferry operators that receive federal funding. Oversight is extended to certain private operators due to (i) service significance, (ii) broad oversight as public transportation in general, or (iii) oversight only

on specific aspect of operations (i.e., state regulatory compliance). The survey also gathered funding and ridership data from respondents, where several analyses were made. It was found that the state-to-federal funding ratio for MI is vastly below average, implying other states are allocating larger state funding relative to federal funding. The total ferry ridership for MI from 2014 to 2019 also showed a relatively larger percentage growth compared to other states within the same period, but total funding did not grow as much. The main funding criteria are (i) operational assistance need, (ii) economic growth & demands, (iii) asset maintenance & aging infrastructure need, and (iv) region connectivity.

A series of ferry passenger surveys for Beaver, Sugar, Neebish and Drummond Islands were also conducted to attain an idea of the social construct of ground community and to cognize ridership experiences, demands, and expectations of the ferry system. Topics of the survey included demographics of ridership, trip purposes, usage frequency, perception towards existing services, and perception towards the ideal MDOT role as a state authority. A total of 1,813 responses were collected from four islands of interest through an online survey and on-site paper survey collection. It was found that services in Beaver Island and Drummond Island are generally rated with higher satisfaction than in Neebish and Sugar Islands. Overall, Beaver Island had the highest average satisfaction rating across all satisfaction measures, followed closely by Drummond and Neebish, while Sugar Island had the lowest average satisfaction rating. The majority of EUPTA users agreed that 24/7 ferry services for emergency situations are needed. However, BITA users showed a relatively lower need for 24/7 emergency services, given the long sailing duration and the presence of alternative modes of transportation that are quicker than ferries. Island residents and business owners were also interviewed to understand further contextual dynamics of the island regarding service adequacy and reliability. Interviews with the business owners provided input on service adequacy from the perspective of local economic growth and enterprise welfare. Overall, it was noted that while EUPTA and BITA are serving at their optimal capability given funding constraints, there is room for improvements that could supercharge local economy, labor productivity, and social welfare at large.

A series of interviews with ferry operators nationwide was also done to furnish insights obtained from state DOT surveys nationwide, and to identify adoptable best practices in various aspects of operation, funding, and State DOT governance. Topics being discussed includes their governance structure, funding mechanism and strategies, level of service supervision, emergency

service coordination, freight services, public group or tribal considerations, and other management and coordination issues with respect to state DOTs.

Another aspect of the study is to assess funding eligibility for several ferry operators in Michigan. The islands of interest are Manitou, Bois Blanc, Grand, and Harsens. The research team engaged with ferry operators servicing each island to obtain operational data and interviewed local township authorities and resident representatives to understand local dynamics. It was deduced from Grand and Manitou Islands ferry operators that any MDOT contribution and/or involvement towards ferry services as part of transportation equity initiative (or other eligible state programs) are welcomed by ferry operators, as by current FBP funding criteria, they are not competitive for federal funding given their low ridership volume. Harsens Island ferry operator has no eligible assets to receive public funds, while Bois Blanc ferry operators does. However, both Harsens and Bois Blanc ferry operators are not interested in receiving state and federal funding assistance, as they would like to remain independent and not attached to any state/federal bureaucracies.

Upon collection of various data points, analyses of historical data, insights from interviewed parties, and lessons learned from surveys, the research team synthesized pieces of findings from each task. A mobility gap and trade-off matrix were developed and presented with a series of 2 by 2 matrices that correlates public welfare versus cost. Key mobility concerns being the inputs of those matrices for Beaver Island are (i) resident ticket pricing issues, (ii) the need for a deck barge to address freight capacity constraints, (iii) the need for sailing schedule revision to facilitate a more productive tourism industry, (iv) roofed storage for weather-sensitive freights to offset long freight queue times, and (v) feasibility to offer priority freight loading pass. For Sugar, Neebish, and Drummond Islands, key mobility concerns include (i) the need for ticket price assessment and resident ticket pricing, (ii) schedule coordination with other public transit systems, (iii) the need for ticket validity extension, (iv) the need for priority loading pass, and (v) imminent need for emergency services standard of procedures.

This study also assesses and projects future costs and replacement needs of vessels and docks for Beaver, Sugar, Neebish and Drummond Island ferries. Task outcomes include (i) vessel/dock maintenance plan and cost projections and (ii) preservation of capital funding requirements by MDOT through the fiscal year 2031. A historical maintenance spending analysis and cross-analysis with ridership trends were presented. Amongst other findings, historical maintenance analysis on EUPTA's and BITA's assets indicate that vessel depreciation is directly related to

engine hours instead of nautical miles served. This draws a noteworthy concern on FBP's formula funding weightage that considers nautical miles served instead of running engine hour as a parameter to ferry funding needs. Subsequently, a 10-year maintenance spending forecast and projection of optimal funding needs are provided. A list of key major projects expected to be undertaken by EUPTA and BITA through 2033 is also included.

Finally, the research team utilized collective results from literature reviews, nationwide state DOT survey, ferry ridership surveys, interviews with business owners, residents, and ferry operators nationwide to develop a meaningful set of recommendations for MDOT. This set of recommendations are framed and narrated around MDOT's pursuit of ideal and optimal transportation responsibility towards island residents to maximize public mobility and welfare while optimizing state resources available. Recommendations are clustered into the following key topics:

- State funding appropriation and considerations towards ferry funding allocations
- State funding match for FBP
- Operational issues to address mobility gaps
- Backup ferries and requirements of 24/7 emergency services
- Ferry services procurement and bureaucracy issues
- Economic and tribal group considerations
- Sustainability and green marine mobility
- MDOT opportunity for governance

CHAPTER 1 – INTRODUCTION

1-1- Statement of the Problem

Surrounded by four of the five great lakes, Michigan is well-known for its nature and tourist attractions. The state is also known for its contribution to the economy through major industries, including but not limited to auto manufacturing, agriculture, and tourism. Accordingly, mobility is a critical factor in fulfilling the demand for different services and engaging people in various activities throughout the state. Michigan islands offer a wealth of tourism attractions, natural resources and a sizeable population of island residents serving those needs. To provide for mobility equity, the residents on islands are expected to have equal access to work, healthcare, emergency services, and economic opportunities as the mainland residents. However, providing all necessary opportunities and services on the islands may be impractical or financially infeasible. Thus, having access to proper transportation modes is a requirement for these island residents to guarantee their access to the mainland. It reciprocally enables mainland residents to access nature and tourist attractions.

Access modes from islands to the mainland may include bridges, air transportation, and ferry services. A ferry is defined as any vessel used to transport passengers and/or vehicles for less than 300 miles within a waterway (*1*). Ferry functions are classified into three levels: of essential, complementary, and optional (*2*). The quality of service provided by ferries affects travelers and commuters who rely on these services. Ferry services transported 119 million passengers and 25.0 million vehicles nationwide in 2015 (*3*), and 112.1 million passengers and 26.3 million vehicles in 2019 (*4*). This indicates a steady mobility reliance on ferry systems across the nation. Mobility, equity, and social justice issues are among the critical concerns for federal agencies and state Departments of Transportation (DOTs). Therefore, federal and state transportation authorities are responsible for regulating and providing funding to develop and maintain ferry services. Providing an acceptable level of service (LOS) to the island residents depends on the frequency of service and regular maintenance of docks and vessels. Thus, it is critical to determine state and federal transportation responsibilities to residents on islands.

Michigan Department of Transportation (MDOT) has conducted multiple studies on economic and demand analysis, as well as passenger surveys for different ferry systems in Michigan. According to the Bureau of Transportation Statistics (BTS), there are 10 ferry operators in

Michigan, among which those related to Beaver, Drummond, Sugar, and Neebish Islands are of major interest in this study. Drummond, Neebish, and Sugar Islands are in St. Mary's River in the eastern Upper Peninsula, and Beaver Island is in Lake Michigan off the coast of Charlevoix. Altogether, these islands have about 2,500 year-round residents, more than 15% of the total population who live on Michigan islands with 50 residents or more, as per 2010 census data. Ferry boats serving Beaver Island are operated under Beaver Island Transportation Authority (BITA). In Drummond, Neebish, and Sugar Islands, ferry boats are operated under the Eastern Upper Peninsula Transportation Authority (EUPTA). There are also other islands (Manitou, Bois Blanc, Grand, and Harsens) with ferry services that their opportunity to access federal funding is also of study interest.

The importance of ferry services operation, planning and maintenance, and the lack of rigorous studies that focus on island resident's "ideal transportation responsibility by state and federal authorities" in Michigan, suggest an urgent need to assess operational performance and guidelines for these services considering economic and social justice concerns. This study aims to understand and recommend federal and state responsibilities to island residents by identifying the existing services, understanding user demands, and weaving them together to yield mobility gaps. Through these mobility gaps, appropriate recommendations are made to MDOT in terms of funding allocation, service governance, partnership coordination, and other administrative capacities that state and federal authorities could uphold to ensure transportation welfare of island residents.

1-2- Study Objectives

Prior studies have provided useful insights on evaluating provided transportation services for residents and visitors of different islands at the national and international levels. This study presents a great opportunity to reflect on those insights and experiences to assess the provided services for Michigan islands. Considering the importance of these services on economic growth and societal equity concerns in providing accessibility to essential needs for island residents, it is crucial to establish MDOT's role and governance strategies and explore potential additional funding sources for other islands in Michigan. Therefore, ***the overarching goal of this study is to identify state and federal responsibilities for the residents of Michigan islands by reviewing federal and state regulations, and best practices, at the national and international levels.*** To this end, the study is conducted around the following research objectives:

1. Reviewing state and federal regulations and identifying potential funding sources for Michigan islands
2. Reviewing the state-of-the-practice to identify best practices in providing and evaluating transportation services to islands which are comparable with the islands of interest in this study
3. Determining the optimal level of service for ferry systems providing transportation services to Michigan islands
4. Assessing unmet transportation needs for residents of island of interest in Michigan
5. Identifying additional service requirements for the existing ferry systems in islands of interest in this study, including 24/7 emergency services, back-up ferries for maintenance and inspection of in-service ferries, and support for logging trucks
6. Evaluating the available ferry services and estimating projected future operational costs considering required maintenance for docks and vessels and fleet replacement plans for the islands of interest in Michigan

1-3- Research Plan

To accomplish the objectives, the research team prepared a detailed research plan to outline the process to determine state and federal transportation responsibilities on island residents. This research plan includes the following tasks:

- Task 1: Literature Review
- Task 2: Review of Michigan Regional Background
- Task 3: Perform a Nationwide State DOTs and Ferry operators Survey
- Task 4: Survey/Interview of Island Residents and Ferry Operators
- Task 5: Island Residents Mobility Gap Analysis
- Task 6: Assessment of Current Ferry Operations and Developing Maintenance Plan
- Task 7: Evaluate Ferry Operation in Manitou, Bois Blanc, Grand, and Harsens Islands
- Task 8: Develop Recommendations for Michigan Island Accessibility Considering Economic Impacts and Social Justice
- Task 9: Develop and Deliver Draft and Final Reports

These tasks and their relationships are illustrated in *Figure 1-1*.

1-4- Report Structure

The remainder of this report is structured as follows: Chapter 2 provides a comprehensive review of literature regarding existing operations, best practices, previous studies and enabling legislation of ferry operations in Michigan and other states. Chapter 3 showcases an analysis of a nationwide survey of State DOTs that is conducted to review the state of the practice. Chapter 4 presents a review of existing ferry operations for the main islands of interest in this study. Chapter 5 presents an extensive analysis of ferry users' survey on Beaver, Sugar, Neebish, and Drummond Islands, along with island community interviews, including but not limited to business owners. Chapter 6 provides insight into interviews conducted with various ferry operators nationwide and in Michigan. Chapter 7 is a holistic synthesis of data collection to identify pertinent mobility gaps and presents a mobility trade-off matrix. Chapter 8 is a qualitative analysis of ferry system maintenance (BITA & EUPTA) to construct a measure of funding requirement projection. To conclude, Chapter 9 stipulates the summary of findings throughout the research and provides final recommendations regarding transportation responsibilities towards island residents.

Figure 1-1: Project Research and Data Collection Plan Flowchart

CHAPTER 2 – LITERATURE REVIEW

2-1- General Ferry Operations

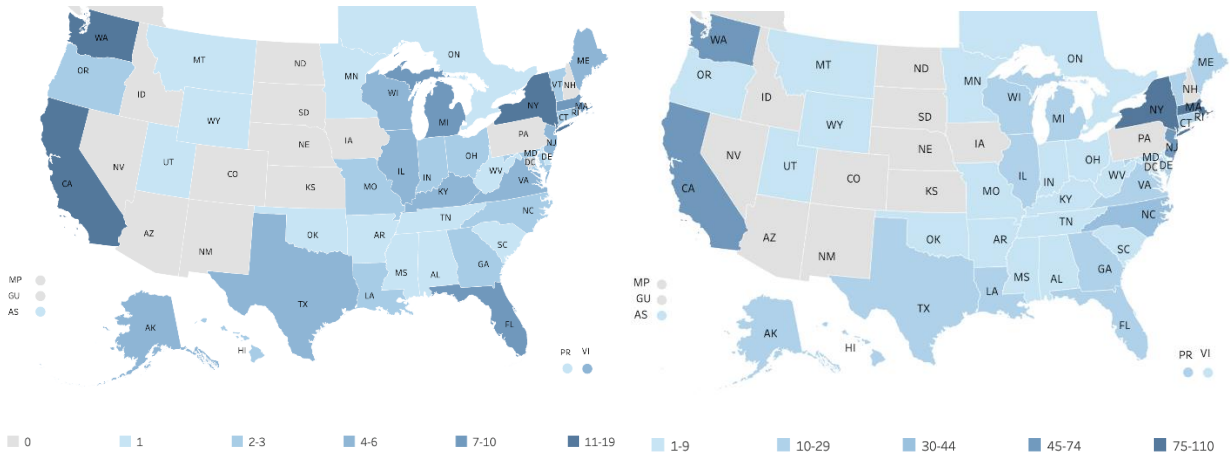
The U.S. Coast Guard definition of ferries is based on statutory reference 46 CFR § 175.400, that asserts "Ferry means a vessel that: (i) Operates in other than ocean or coastwide service; (ii) Has provisions only for deck passengers or vehicles, or both; (iii) Operates on a short run on a frequent schedule between two points over the most direct water route; and (iv) Offers a public service of a type normally attributed to a bridge or tunnel"(*5*). The U.S. Custom and Border Patrol also defines ferries in a similar manner, based on statutory *19 CFR 4.7b(a)*, asserting that ferries are "vessel which is being used to provide transportation only between places that are no more than 300 miles apart, and to transport only – passengers, or vehicles, or railroad cars, which are being used, or have been used, in transporting passengers or goods" (*6*).

Ferries, specifically passenger ferries, are being used across the nation for a myriad of reasons. Some ferry services are offered for recreational and tourism purposes, while some ferry services provide an essential mode of commute and mobility to coastal regions or island residents. For many communities, ferry services are also relied on heavily as their sole mode of transportation to their home or being used as public transportation. For businesses, ferry provides a feasible means for freight transport and region connectivity. According to the Bureau of Transportation Statistics, ferry passenger-miles travelled have grown 6.4% and ferry transit system count has grown 7.5% from 2010 to 2014 (*7, 8*). A more recent statistics indicated U.S. ferries transported approximately 138 million passengers in 2019, which translates to a staggering 11% jump of ridership volume from 2015 reported statistics (*9*).

Figure 2-1 shows the distribution of ferry operators and number of vessels across the country. It can be observed that ferry operations are notably predominant in coastal states, while other states with land borders may have ferry services for river crossings. As for 2020, there are a total of 164 operators in 42 states, operating 756 vessels. New York, Massachusetts, Washington and California are amongst the states with the highest number of operators and vessels. The National Census of Ferry Operators (NCFO), which conducts a biennial census survey for all ferry operators in the United States and its territories, published a statistic, based on their 2020 NCFO survey, indicating that 66.7% of ferry trips are for commuter and transit purposes (*Figure 2-2*), followed by pleasure/recreational (58.6%). This indicates that the top two groups of users either rely on

ferries as an equitable mode of commuting or contribute to tourism economy. Sum of percentages shown in *Figure 2-2* exceeds 100% as the question allows for multiple selections.

Michigan has the second-longest coastline after Alaska (*10*). There are eleven inhabited islands within the Michigan major bodies of water (e.g., Lake Michigan, Lake Huron, Lake Superior, Detroit River, and St. Mary's River). Based on the 2010 census, the total population of the top-nine most populated islands within Michigan sums up to 15,021 people (*11*), and 95% of the total population of Michigan islands live on only five islands (i.e., Grosse Ile, Drummond, Harsens, Sugar, and Beaver). This denotes that a sizeable group of Michigan residents rely on ferry services. Therefore, federal and state authorities may step in via various approaches and strategies to ensure an uninterrupted and reliable ferry service, in pursuit of mobility equity and social welfare. As per 2019 NCFO survey, more than 15% of U.S. ferry segments were operated within U.S. National Park System (NPS), where 60.5% of the segments were reported to be in three states: Michigan, New York and California (*4*).



(a) (b)

Figure 2-1: (a) Ferry operator count in 2020, (b) Number of vessels in 2019 (*4*)

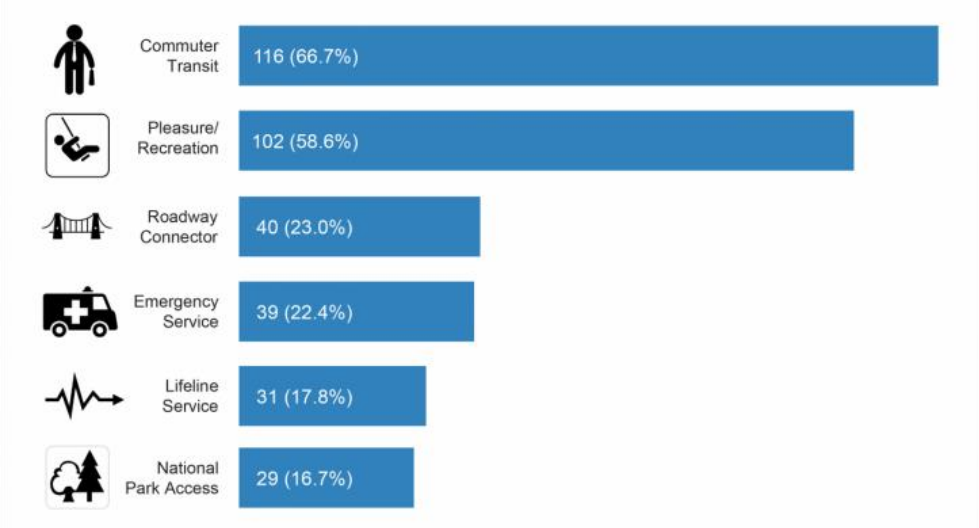


Figure 2-2: Ferry trip purposes from NCFO 2019 survey (*4*)

2-2- Enabling Legislations & Grants

There was no significant federal funding designated for public transit until towards the end of World War II (WWII) due to mounting national debt and low public mobility demands and ridership. Many public transit companies today started off as private entities before they were reorganized as public entities post WWII. Ever since, federal funding for public transit has grown exponentially, which has evolved to capitalize transit systems, enhancing social welfare, reinforce operational expenses, safety oversight, planning, research initiatives and a mechanism for job creation at large.

There are several landmark legislations and funding appropriations that remain the backbone of America's public transit, and ferry system specifically. Several federal-aid funds are available to ferry services, through state transportation agencies, for designing, construction, improvement, and maintenance of vessels and docks.

2-2-1- Nationwide

Transit Cooperative Research Program (TCRP) Report 152, 165, and Synthesis 102 are examples of essential national level guidelines for ferry services (*12–14*). These operational guidelines provide a cohesive framework for ferry operators nationwide, to maintain a certain level of standard and centralization of governance to some extent.

According to the Congressional Research Service, public transportation program funding has risen from $10 billion - $11 billion between FY2010 through FY2015, to $13 billion for FY2018

through FY2020. This modest 3% increase, nonetheless, reflects a robust stream of system preservation funding and improvements (*15*). The funding opportunities are categorized into two major groups of operational and capital funding. Operational funding is used towards service operation, maintenance and service input costs that are needed to sustain ferry operations. On the other hand, capital funding is designated for vessel repairs and purchase of new equipment and assets. An authoritative federal body that oversees public transit system throughout the nation is The Federal Transit Administration (FTA). Jurisdiction of FTA extends to the whole spectrum of public transportation, including buses, transit rails, and ferries. FTA administers several major programs, one of which is The State of Good Repair (SGR) Program. The SGR program that was established under the Moving Ahead for Progress in the 21st Century Act (MAP-21) and provided $2.7 billion in FY2020 to fund fixed guideway systems that includes passenger ferries. Funds are allocated for replacement, rehabilitation and other essential capital projects needed to maintain public transportation systems in a state of good repair.

Another major program administered by the FTA is the Urbanized Area Formula (UAF) Program, that provides funding for public transportation in urbanized areas, that can be used towards capital, planning and operating expenses. Under this program, a designated funding pool for ferry systems is grafted as the Ferry Boat Program (FBP), which was first established under MAP-21 Act in 2012. Under MAP-21, FBP funds are distributed to eligible entities based on a weightage criterion of the number of passengers carried (20%), vehicles carried (45%), and total route miles (35%) (*16*). In 2015, the Fixing America's Surface Transportation (FAST) Act was signed into law, allocating FBP funds to the states, U.S. territories, Puerto Rico, and other eligible entities, based upon a statutory formula (*17*). However, the FAST Act modified the FBP formula, giving greater weight to the number of passengers. MAP-21 and FAST Act assert a different funding eligibility weightage and formula. Referring to *Table 2-1*, the weightage of three key components in the formulation are adjusted. Under the new FAST Act, the numbers of passengers carried were given a greater weightage, while the number of vehicles carried, and total route miles served were given lower weightages. This formulation change had direct implications to a wide array of ferry operators nationwide, especially for those that transport vehicles more than passengers. Conversion of ridership type is not something that ferry operators can manage, therefore would need to settle with a potentially lower FBP allocation. Over the decades, FBP has been revised, evolved, and improved under various enabling legislations (*18*). Other programs

under FAST Act that provide access to funding for ferry system providers, includes the Passenger Ferry Grant Program, and Marine Passenger Program.

Table 2-1: FBP formulation under MAP-21 and FAST Act

	MAP-21	FAST Act	Change
Number of Passengers Carried	20%	35%	↑
Vehicles Carried	45%	35%	↓
Total Route Miles	35%	30%	↓

The available funding programs for ferry services are highly competitive, given that there are approximately 220 ferry operators across 37 states, operating 652 vessels (*19*). Allocating larger weightage to high volume passenger ridership in the updated FBP program indirectly provides ferry operators in urbanized areas with a competitive advantage over ferry operators in rural and remote regions. Despite FBP being the dominant and primary source of ferry funding, there are also multiple other programs through various agencies available for ferry services. This includes the Port Security Grant Program, under purview of Federal Emergency Management (FEMA) and Department of Homeland Security (DHS) that allocates $100 million per year to fund or support for port security enhancements (*20*). The National Park Service (NPS) also provides funding to private ferry operators that serve national parks, through exclusive rights to service contract agreements. The US DOT's Maritime Administration (MARAD) also has a Small Shipyard Grant Program that provides funding to enhance competitiveness of U.S. shipyards (*21*). However, these alternative funds are highly competitive for most ferry operators.

Additionally, there are agencies with funding objectives beyond marine transportation, but their wide scope and eligibility would qualify ferry operators to apply and receive funding. For instance, U.S. Department of Agriculture (USDA)'s Rural Development Program provides funding to rural transportation projects, including ferry services. The Environmental Protection Agency (EPA) also has a Diesel Emission Reduction Act (DERA) program that allocates funding for initiatives to reduce diesel emissions, which ferry operators are eligible to apply to retrofit or replace ferry engines with cleaner technologies. There is also the Economic Development Administration (EDA) Public Works Program, that provides funding for public infrastructure to promote economic development- including provisions for ferry services. Kentucky Transportation Center conducted a review of public ferries funding in 2020 that reviews various federal funding

sources and their eligibility criteria (*22*). Given various funding strategies and sources, ferry operators have the latitude to be creative in applying for appropriate grants they are eligible for.

2-2-2- Michigan

The state of Michigan has historically robust roots of enabling legislation to ensure a quality ferry service being administered in the state. Michigan Transportation Policy Plan (MTPP) enacted in 1992, provides guidance for public sector transportation investment decision making, particularly those involving federal-aid funds (*23*). It also outlines constitutional and statutory constraints on Michigan's transportation tax revenue. MTTP also contains a set of suggested criteria that would require a coordinated response and assistance by any given authoritative bodies, to support transit-dependent individuals, ensure operating efficiency, and customer satisfaction. These provide a state legislative mandate to state authorities, including MDOT, to act on the best interest of public welfare, and for the purpose of this study: ferry services for island residents.

Over the years, the state of Michigan and MDOT have been proactively designating state fiscal budgets towards public transportation improvement and operational assistance. A variety of programs and grants have been established to be allocated across a wide array of beneficiaries. The Michigan Transportation Fund Act (Act 51) was enacted to stipulate how transportation taxes are collected, deposited, prescribes how revenues are to be allocated and for what purposes (*24*).

In 2009, the Michigan Recovery Act designated two grants totaling $8.3 million, towards the improvement projects in Detroit, Drummond Island, Neebish Island and Sault Ste Marie (*25*). $1,175,000 of the grants were used to enhance the safety and efficiency of the St. Mary's River Ferry by lengthening the pier at Drummond Island to accommodate larger vessels, modifying the docks at Neebish Island to accommodate multiple vessels, and replacing deteriorating dock pilings at Sault Ste. Marie.

According to FY2020 Michigan Department of Transportation (MDOT) Section 5304 Work Program, a total of four federal grants were approved for four projects that aimed to (i) support economic vitality, (ii) increase mobility and connectivity of people, (iii) emphasize the preservation of the existing transportation systems, (iv) improve the resiliency and reliability of the transportation system and (v) provide evidence of local support. Recipients includes Beaver Island Transportation Authority (BITA) and Eastern Upper Peninsular Transportation Authority (EUPTA) (*26*). Another long-established funding program that has been a vital backbone to ferry

operators in Michigan is the Marine Capital Program. As the name implies, the program designates annual funding allocation for vessel system upgrades and dock support equipment. This funding is critical to ensure assets are well preserved and provides an acceptable level of service for the public. Up until FY2019, the total pool of annual allocation for marine capital funding were distributed equally to EUPTA and BITA. From FY2020 to FY2023, the marine capital funding is legislatively designated to be used as FBP matching funds, and funds are provisioned to be split 60-40 between EUPTA and BITA. However, FY2024 onwards, there will be no specific funding split requirements.

The state of Michigan, through MDOT, has structured a governance mechanism for ferry operators that receive federal funding. Governances are bound through a Master Agreement for Public Transportation Projects, where it is signed between MDOT and ferry operators that receive federal funding. Among many others, the agreement stipulates accounting standards, reporting guides, and capital/operating project reporting. Such measures are in place to ensure accountability of ferry operators that utilize public funds for their operations.

2-3- Nationwide Studies of Best Practices and Ridership Surveys

To identify what needs to be provided to island residents, it is crucial to obtain ground information from island residents and ferry riders. This allows authorities to recognize mobility gaps, highlight improvement areas, and acknowledge lagging services that may need additional investments. There are several studies in the literature reviewing the current state-of-the-practice worldwide and across the nation. The state of Oregon conducted a review of various ferry operators in the U.S. and internationally to deduce lessons learned that are applicable to islands of Oregon. The review includes types of vessels, funding mechanisms, and service operations that contribute to the overall efficiency and service (*27*). The city of Boston did a study on several ferry operators focusing on their key service characteristics, such as fare competitiveness, type of services offered, and operating characteristics (*28, 29*). New York City Ferry also conducted various local and international reviews of ferry operation best practices, focusing on service profiles, governance, fare collections, operational parameter variations across regions, and exploring financial foundations (*30, 31*). Several local and state transportation authorities (i.e., New York City, Washington State Department of Transportation (WSDOT), and Virginia Department of

Transportation (VDOT)) have also conducted studies regarding their ferry services (*32–34*). A summary of reviewed studies and their domains are tabulated in *Table 2-2*.

A historical study in Michigan explored St. Mary's River Ferry system in 2007 (as a follow up to a 1984 study). This study reviewed the available services' status, and provided recommendations on LOS, financial, vessels, and state involvement (*35, 36*). The state-of-the-practice should be reviewed to adopt the best practices for islands with similar regional attributes and demands to Michigan islands. For Beaver Island, one of the major studies was done in 2005 that explored existing operation, economic impacts, and capital planning (*37*), which is recently funded through their 2021 Section 5304 Transportation Planning study (*38*).

Table 2-2: Summary of studies conducted in various domains

Title	Year	State/ Country	Funding Sources	Economic/ Socioeconomic Impacts	Operation Analysis (LOS)	Surveys	Replacement Plan
Level-of-Service Measures for Ferry Systems	1989	General			✓		
Ferry Route Level of Service	1997	General			✓		
Assessing the Economic Impact of Transport	1997	General		✓			
Estimating Wider Economic Impacts in Transport Project Prioritization	2016	General	✓	✓			
Designing Capacity and Service Level - Ferry	2017	General			✓		
St. Mary's River Ferry Study	1984	MI	✓	✓	✓	✓	
Cross Lake Michigan Ferry Study	1985	MI				✓	
Economic Benefit of Lake Michigan Car Ferry	1976	MI	✓				
Analysis of Drummond Island Ferry System	1986	MI			✓		✓
Area Economic Significance of Rail Car Ferry Service Across the Straits of Mackinac	1971	MI		✓		✓	
Feasibility Study of Proposed Ferry Service between Michigan and Manitoulin Island	1978	MI		✓			
St. Mary's River Ferry Study: Fare Impact and Demand Estimation	1987	MI			✓		
Long Range Transportation and Capital Improvement Plan 2018-2038	2018	MI		✓			
Beaver Island Transportation Coordination Study	2005	MI	✓		✓		✓
St. Mary's River Ferry System Master Plan	2007	MI			✓	✓	✓
Beaver Island Transportation Plan Update	2021	MI		✓	✓	✓	✓
Passenger-Only Ferry Study & Business Plan	2008	WA	✓	✓			
Washington State DOT Ferries Division	2009	WA	✓		✓	✓	✓
Passenger Vessel Sizing and Timing Cedar River	2009	WA					✓
Ferry Replacement Plan	2013	WA					✓
Washington State Ferries 2040 Long Range Plan	2019	WA	✓		✓	✓	✓
Passenger Ferry Best Practice Case Studies for Portland-Vancouver	2019	OR	✓				✓
The Economic Impacts of the Alaska Marine Highway System	2016	AK	✓	✓			✓
Comprehensive Boston Harbor Water Transportation Study	2017	MA	✓				✓
Keeping Passenger Ferry Systems Afloat: What Can Boston Learn?	2018	MA	✓	✓		✓	✓
NYC Quarterly Reports & Statistics 2017- 20	2020	NY			✓	✓	
Citywide Ferry Study 2013 Final Report	2013	NY	✓	✓		✓	
Interagency Study of Regional Private Passenger Ferry Service	2011	NY	✓	✓	✓	✓	
Comprehensive Citywide Ferry Study	2011	NY	✓			✓	✓
Overview of State Ferry System Operations	2019	TX	✓				✓
Economic Impact Analysis of Ferry Operations	2007	WI	✓	✓		✓	
Vessel Replacement Strategy	2006	Canada	✓		✓	✓	✓
Evaluating Transportation Economic Development Impacts	2010	Canada	✓	✓			
Evaluating Transportation Equity	2020	Canada	✓	✓		✓	
Economic Evaluation for Transportation Decision Making	2006	Canada	✓	✓			
Socioeconomic Impacts of BC Ferries	2014	Canada		✓		✓	
On-Board Passenger Survey Report	2017	CA				✓	

Industry practitioners and state authorities often conduct community surveys and interviews to gather this information. Surveys have also been done as an operational performance measure (*39*). Stated preference (SP) surveys have been conducted to reflect ridership demands and expectations, and applied as a hypothetical trip survey, with various mode characteristics to understand user elasticity (*40*). At large, ferry ridership surveys are often conducted to capture topics such as origin-destination, value of time, environmental consideration, service offered & accessibility, demographics, trip frequency & purpose, attitudes towards potential change, fares, quality of service and elasticity of travel behavior (*41*, *42*). However, no nationwide DOT survey has been conducted to identify best practices or coordination strategies. Also, there is no literature exploring government/authority responsibilities to island residents, as most literature are of cost-benefit-analysis or feasibility studies for any kind of ferry/infrastructure projects. It was reported that these issues are often resolved internally, without any studies being done, where solutions are on an ad-hoc basis.

Michigan ferry operators have also conducted their own ridership surveys in the past. Ferry surveys have been found to trace its inception from a Lake Michigan Ferry User Survey done in 1985, that explores four key categories: (i) travel characteristics, (ii) user characteristics, (iii) rating of services, (iv) users' comments. It was a short 10-question survey to gauge ferry service adequacy and economic impact at large, but not specifically designed as service satisfaction surveys. Then in 2007, another study was conducted which contains similar essence of survey content, which seem to be an attempt to update the statistics for current use (*43*, *44*). Beaver Island also had conducted passenger surveys, in 2005 and recently in 2021 (*38, 45*). The survey was to assess ferry service adequacy and economic impact at large, and not specific to service satisfaction. It is noteworthy that surveys conducted in other states may not be directly comparable and applicable to Michigan islands, however, there are key trends and insights that can be extracted to yield meaningful lessons to be learned.

There are a lot of case studies conducted by other states, which reviewed best practices and deducing lessons learned from them. However, there are no recent case studies being done by the state of Michigan, let alone a review of best practices that are comparable to Michigan islands, which possess unique regional attributes and demands compared to other coastal or larger islands. Thereby, warrants for a case study and review of best practices to be done on comparable islands to the island of interest for this project.

2-4- Ferry Maintenance and Replacements

A typical vessel lifespan in the industry practice is 30-40 years on average. However, intermediate maintenance work and asset preservation are often done to extend an asset's lifespan beyond its typical retirement age. The total cost of vessel operation consists of procurement, maintenance, preservation, refurbishing, and decommissioning. Various components need to be considered to identify the necessity of a replacement. Texas DOT considered several factors in determining whether vessel replacements would be a cost-effective measure or merely necessary. The factors include the frequency of repairs, traffic volume, fuel economy and age of the vessels, availability of new technology and engine efficiency, availability of replacement parts, and regulatory change (*46*). Washington State Ferry (WSF) has also provided a comprehensive 20-year operational and development plan, including vessel replacement and maintenance plan to minimize service disruption and maximize system efficiency (*47*). There have also been numerous studies on optimizing replacement strategies by ferry operators across the nation (*48–50*). For Michigan, there has been a 2007 study for EUPTA vessel and asset replacement plan through 2020, and one recent study in 2021 by BITA that assesses their asset lifecycle (*38, 44*).

2-5- Economic, Public Welfare and Social Equity Issues

There have been various Economic Impact Assessment (EIA) studies that relate ferry operations with regional economies. EIAs are conducted to quantify the impacts of any given project or service on the economy, which can be observed directly through the costs of projects or indirectly through employment growth and land value change. Amongst many others, a study in Scotland examined ferry users' demand elasticity to estimate the correlation between ferry service frequency configurations, ridership change, and subsidy requirements (*51*). Wisconsin DOT conducted another study to quantify the significance of ferry operations to their regional economies (*52*). Alaska Marine Highway Systems (AMHS) also conducted an EIA in 2016 when Alaska was facing an acute fiscal crunch (*53*). The EIA enabled AMHS to examine and quantify the contributions of ferry services to the economy, which are then used to justify the need for state funding and projection of investment returns.

Michigan had also conducted a series of similar studies to quantify impacts of ferry services in the past (*43, 45, 54–57*) but these studies are conducted long time ago and may be obsolete for present day insights. These studies primarily focused on ferry systems for St. Mary's River and

Beaver Island. There are also published local economic statistics for some Michigan islands (*58–61*). Understanding underlying economic activities for island of interests in this study would enumerate a more realistic understanding of island mobility needs. Neebish, Sugar, and Drummond Islands have high concentrations of labors in sectors that rely on access to the mainland (*62*). Current ferry operation was reported to pose constricted access to healthcare- given the island resident demographics that requires elevated access to healthcare services, and limited sailing configuration and schedule (*63*). Therefore, attentive resource allocation to the region is essential to restore public welfare and essential mobility needs.

Sugar, Neebish, and Drummond Islands are in Chippewa County, amongst the largest county in Michigan by land area size. To understand local economic activity in the region, various economic metrices were referred to. According to a 2015 study conducted by Eastern Upper Peninsula Regional Planning and Development Commission, location quotients (LQ) are used to understand if an area has more, or less laborers working in an economic sector relative to its base area (*64*). *Figure 2-3* displays Chippewa County's subsector LQs, relative to United States (left column) and Michigan (right column) as its relative comparison region. LQ > 1 indicates a greater concentration of laborer in any sector, relative to its benchmark region. High LQ sector indicates the region's potential to export (services) or attract people/talent, implying presence of economic comparative advantage. The table is color coded in green (high concentration), yellow (above average concentration), and red (below average concentration) of labor working in respective sectors of the economy, compared to its base region. It can be observed that Chippewa County has a high LQ for scenic/sightseeing transportation, museums, historical sites, zoos, and parks sectors when compared to both United States base, and Michigan base. This indicates the importance of tourism for Chippewa County, which has a service-reliant economy with a labor concentration in those sectors, higher than the state and national averages.

Sector 488, which is "support for transportation activities" is rated as the second highest LQ for Chippewa County. Inadequate mobility to/from islands would potentially harm these economies, including sector 488. Logging (Sector 113) is also rated 4th amongst the labor concentration in Chippewa County. This is derived from active logging activities in the region, including on Drummond and Sugar Islands. Drummond Island is also an exporter of dolomite, where dolomite mining and refinery constitutes a notable freight volume being transported via EUPTA ferry services to the mainland.

United States Base	LQ	Michigan Base	LQ
487 Scenic and sightseeing transportation	21.82	487 Scenic and sightseeing transportation	42.73
113 Forestry and logging	4.65	488 Support activities for transportation	5.41
712 Museums, historical sites, zoos, and parks	4.58	712 Museums, historical sites, zoos, and parks	5.22
488 Support activities for transportation	3.69	113 Forestry and logging	4.99
452 General merchandise stores	3.41	212 Mining, except oil and gas	4.69
721 Accommodation	3.26	721 Accommodation	4.61
447 Gasoline stations	2.84	447 Gasoline stations	3.06
212 Mining, except oil and gas	2.66	452 General merchandise stores	2.91
451 Sports, hobby, music instrument, book stores	2.18	624 Social assistance	2.65
453 Miscellaneous store retailers	2.17	443 Electronics and appliance stores	2.22
443 Electronics and appliance stores	2.1	453 Miscellaneous store retailers	2.17
444 Building material and garden supply stores	1.94	492 Couriers and messengers	1.98
814 Private households	1.87	451 Sports, hobby, music instrument, book stores	1.97
441 Motor vehicle and parts dealers	1.84	312 Beverage and tobacco product manufacturing	1.93
312 Beverage and tobacco product manufacturing	1.75	441 Motor vehicle and parts dealers	1.8
446 Health and personal care stores	1.73	999 Unclassified	1.72
624 Social assistance	1.66	446 Health and personal care stores	1.7
522 Credit intermediation and related activities	1.53	444 Building material and garden supply stores	1.69
722 Food services and drinking places	1.43	522 Credit intermediation and related activities	1.66
442 Furniture and home furnishings stores	1.3	236 Construction of buildings	1.54
445 Food and beverage stores	1.29	445 Food and beverage stores	1.54
492 Couriers and messengers	1.27	814 Private households	1.48
236 Construction of buildings	1.15	722 Food services and drinking places	1.47
811 Repair and maintenance	1.14	442 Furniture and home furnishings stores	1.42
623 Nursing and residential care facilities	1.1	448 Clothing and clothing accessories stores	1.31
448 Clothing and clothing accessories stores	1.04	238 Specialty trade contractors	1.27
812 Personal and laundry services	1.02	517 Telecommunications	1.24
238 Specialty trade contractors	1.01	454 Nonstore retailers	1.19
517 Telecommunications	0.95	811 Repair and maintenance	1.15
813 Membership associations and organizations	0.88	812 Personal and laundry services	1.11
713 Amusements, gambling, and recreation	0.86	713 Amusements, gambling, and recreation	1.1
423 Merchant wholesalers, durable goods	0.84	623 Nursing and residential care facilities	1.06
532 Rental and leasing services	0.84	532 Rental and leasing services	1.03
611 Educational services	0.72	237 Heavy and civil engineering construction	0.92
454 Nonstore retailers	0.64	611 Educational services	0.89
621 Ambulatory health care services	0.62	423 Merchant wholesalers, durable goods	0.81
424 Merchant wholesalers, nondurable goods	0.56	813 Membership associations and organizations	0.81
237 Heavy and civil engineering construction	0.52	424 Merchant wholesalers, nondurable goods	0.73
541 Professional and technical services	0.49	621 Ambulatory health care services	0.63
484 Truck transportation	0.47	531 Real estate	0.5
531 Real estate	0.4	484 Truck transportation	0.49
711 Performing arts and spectator sports	0.16	541 Professional and technical services	0.47
		711 Performing arts and spectator sports	0.24

Figure 2-3: Chippewa County Private Industry Location Quotients for 2013 relative to state and national labor concentrations in various economic sectors (*64*)

Beaver Island is predominantly an ecotourism and recreational island, where it draws a paramount number of tourists in the summer. BITA ferry operation remains a crucial support to the local economy by promoting tourism and facilitating freight transport. St. James and Peaine Township on Beaver Island, approximately 46% of the adult workforce are employed in tourism-related sector, while 15% are employed in the construction sector. *Table 2-3* tabularizes the full breakdown of employment by industry for St. James and Peaine Township, according to U.S. Bureau of Labor Statistics.

Table 2-3: St. James and Peaine Township percentage of adult workforce by industry in 2016

	Percent Adult Workforce (%)	
Industry	**St. James Township**	**Peaine Township**
Service	45.7	45.7
Transportation/Utilities	21.4	21.0
Construction	15.0	14.5
Retail Trade	8.1	8.0
Information and Technology	4.0	4.3
Finance and Real Estate	2.3	2.9
Public Administration	2.3	2.9
Agriculture	0.6	0.0
Manufacturing	0.6	0.7
Wholesale Trade	0.0	0.0

Source: ESRI Business Analyst (2016)

Chippewa County is the home to the Sault Ste. Marie Tribe of Chippewa Indians, the largest federally recognized tribe in Michigan. With a tribe size of about 40,000 people that live predominantly in the region of Chippewa County, it is essential to account for their needs and community accommodation as part of the project input (*65*). The Sault Ste. Marie Tribe of Chippewa Indians has published a long-term tribal transportation plan and capital improvement report for 2018-2038 (*66*). Beaver Island has a notable presence of tribal groups on the island, and in the neighboring clusters of islands. The Little Traverse Bay Bands of Odawa Indians and the Grand Traverse Band of Ottawa have the most prominence presence on the island. The Little Traverse Bay Bands oversees the State Historic Preservation Office (SHPO) in the region, which tracks all historic resources on the island. There are various community organizations and treaty denominators that connect the tribal communities in Michigan, such as Chippewa Ottawa Resource Authority (CORA) and The Great Lakes Indian Fish & Wildlife Commission (GLIFWC). CORA is an inter-tribal management body that governs five tribes regarding their fishing treaty and natural resource matters. The five tribes in their pact are Bay Mills Indian Community, Grand Traverse Band of Ottawa and Chippewa Indians, Little River Band of Ottawa Indians, Little Traverse Bay Bands of Odawa Indians, and Sault Ste. Marie Tribe of Chippewa Indians. GLIFWC was formed in 1984, and it represents 11 Ojibwe tribes across Michigan, Wisconsin, and Minnesota. Like CORA, GLIFWC governs the tribal members regarding fishing and gathering rights. At the federal level, there exists a provision for federal lands and tribal transportation programs, under the FAST Act, Sec. 1117, which designates access to federal funding and discretionary grants made available to tribal transportation programs, activities, service, and functions (*67*).

CHAPTER 3 – MICHIGAN ISLAND PROFILES

3-1- Island Profile & Existing Ferry Operations

Each island has their own unique physical features, resident demographics, economic landscape, and social construct of population. The research team initiated a systematic series of data collection to understand general characteristics of the islands of interest (Beaver, Sugar, Neebish and Drummond). *Figure 3-1* portrays the geographical location of islands of interest. Various types of data were collected for these islands including land area size, population, density, resident demographics, existing infrastructures, and amenities (such as schools, hospitals, airports, and bridges), and the underlying economic landscape.

Furthermore, all published reports regarding ferry operations in these islands were also reviewed (*38*, *43–45*, *54–57*, *62*, *63*, *68–77*). Eastern Upper Peninsula Transportation Authority (EUPTA) provides ferry services to Sugar, Neebish, and Drummond Island, while Beaver Island Transportation Authority (BITA) provides ferry services to Beaver Island. The research reviewed publicly available annual and fiscal reports of each transportation authority to assemble their business model, operational cost, and funding sources. The research team reviewed existing ferry operations on each island, including their offered services, number of vessels, ridership data, trip frequencies, and maintenance plans. Some of these data are readily available as part of published reports (*43–45*, *48*, *57*, *62*, *63*, *65*, *66*, *69–78*). However, updated, and recent data were obtained through ferry operators. The 2020-2021 U.S. Census data were utilized to obtain demographic and population data (*79*, *80*). Various external organizations were also consulted to obtain any aspect of data that would provide a facet of understanding for islands of interest, including Department of Natural Resources (DNR) that oversees logging activities on islands, and airport authorities for air mobility. Primarily, the research team coordinated with EUPTA and BITA to obtain various data that includes:

- Service and operation details (revenue, ridership, schedule, emergency services, etc.)
- Vessel details (type, built date, dimensions, capacity, expected retirement, maintenance history, coast guard inspection records, etc.)
- List of assets (dock details, ownership, maintenance history, etc.)
- Vessel Certificate of Inspections
- Historical ferry rates, funding records & Project Authorizations (from MDOT)

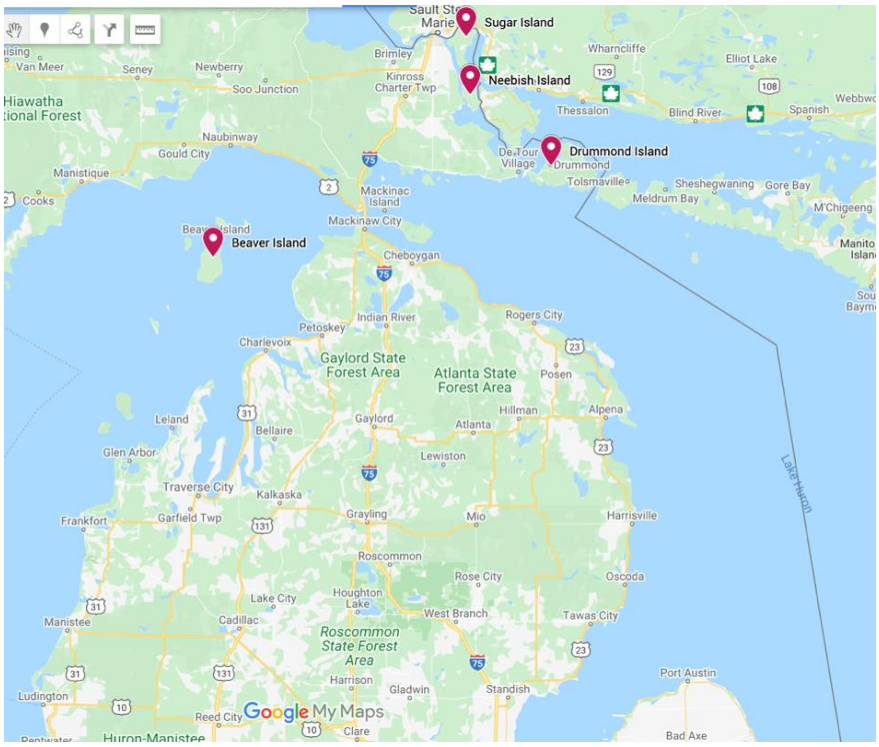


Figure 3-1: Geographic locations of Beaver, Sugar, Neebish and Drummond Islands (*Source: Google Maps*)

3-1-1- Beaver Island

Island background

Located in Lake Michigan, Beaver Island is located about 30 miles off the shore of Charlevoix City. Beaver Island is the largest island on the lake. With a population of 660, as per 2010 U.S. Census data, this translates to a population density of approximately 11.8 people per sq. mi. The island is vast with diverse ecology, wetlands, and community heritage, which draws in an immense volume of tourists during summer seasons. The Beaver Island Chamber of Commerce estimated that summer tourism attracts about 50,000 visitors per year, where population on the island could rise as high as 4,000 people in the summertime.

The island is also host to a substantial number of seasonal residents that own properties on the island as vacation homes. According to Beaver Island Master Plan 2017 (*72*), it was recorded that there were 1,028 houses on the island, which saw a 38.7% increase from recorded statistics in the year 2000. The research team's recent interview with local authorities on the island from 2020-2022 indicated that they observed a rise in population of 100-150 people since the COVID-19 pandemic in early 2020. The service sector is amongst the highest employing sectors on Beaver

Island, followed by sectors like construction, research and education, and other business or natural-resource related jobs such as logging.

Existing ferry operations

Ferries have been the main mode of transport for visitors and commuters to get to the island from the mainland. Alternative modes of transportation include two airports on Beaver Island, which provide year-round flights including during winter, when ferries are not operational. One airport is privately owned, and one is owned by the township. However, ferries remain the critical mode of transportation that caters to passengers, vehicles, and freight goods between City of Charlevoix, and the island. Beaver Island Boat Company (BIBCO) has been serving the island since 1950s, where they are the sole operator of ferry services to the island through an operating agreement with BITA. BITA was incorporated by St. James Township in 1993 to establish and govern transit systems. Federal and state funding are funneled to BITA, which oversees maintenance operations and provides supervision to BIBCO's ferry operation.

Currently, BIBCO operates with two vessels (Emerald Isle and Beaver Islander) that serve on average 40,000 passengers and 6,500 vehicles per year. Emerald Isle was built with federal and state funding, while the Beaver Islander is BIBCO's privately-owned vessel, which has been used as a supplementary vessel or back-up vessel. BIBCO operates both vessels, but Beaver Islander is operated fully without federal and state funding assistance, except for when it needs to resume the operation of Emerald Isle. According to the latest vessel Certificate of Inspection issued by U.S. Coast Guard, Emerald Isle is 116.9-foot long, and has a capacity of 298 passengers, and 20 vehicles, while Beaver Islander is an 87.2-foot vessel that has a capacity of 172 passengers and 10 vehicles at any given time. Detailed vessel specifications for both vessels are tabulated in *Table 3-1*. Both vessels can accommodate various freight transport, including construction materials, logging trucks and grocery pallets, if they can fit through the boat cargo opening. However, load limit restrictions per sailing may apply. *Figure 3-2* shows a freight truck being loaded onto the Emerald Isle, through its cargo space which could fit 20 regular-sized vehicles. There are commercial logging operations on Beaver Island, where logging trucks and equipment are mainly transported by a private logging truck hauler servicing Beaver Island. BIBCO occasionally transport logging crews and equipment. General ferry operations run from April through the end of December.

In the case of emergency, flights are more commonly preferred as the mode of transportation, given the long boat trip to get to the mainland. However, in rare circumstances of severe fog that prohibits flight departures, U.S. Coast Guards would engage to assess the situation and intervene on an ad-hoc basis. While Beaver Island has no hospitals, there is a health center with nurses at service. Ambulances can also get onto the island via ferries if needed.

Figure 3-3 shows the annual sailing schedule for BIBCO boats, frequency of sailing per week, and time of sailing per day. There have been numerous studies conducted by BITA, BIBCO and township authorities that analyze ridership trends over the years (*38*, *45*, *72*). Nonetheless, the research team has conducted ridership analyses that showcase various insights in *Section 3-2: Ferry Ridership Analysis*.

Figure 3-2: Emerald Isle freight loading bay

Figure 3-3: BIBCO ferry schedule and seasonal operation (*81*)

Table 3-1: BITA/BIBCO vessel specifications

	Vessel 1	**Vessel 2**
Vessel Name	Beaver Islander	Emerald Isle
Owner	BIBCO	BITA
Operator	BIBCO	BIBCO
Horsepower (hp)	1,350	3,000
Acquisition Year	January 1962	November 1997
Acquisition Cost	*(Not available)*	$3.5 million
Years in Service (till August 2021)	59 years, 7 months	23 years, 9 months
Size (Length x Breadth x Depth)	87.2 x 27.2 x 8.3	116.9 x 38 x 12
Average Operating Speed	14 knots	14.5 knots
Passenger Capacity	172	298
Vehicle Capacity	10	20
Service Area	Beaver Island-Charlevoix	Beaver Island-Charlevoix
Year of latest COI	May-17	Apr-21

3-1-2- Sugar, Neebish & Drummond Islands

Background

St. Mary's River separates Michigan from Ontario, Canada. It flows approximately 74.5 miles Southeast, connecting Lake Superior to Lake Huron. The entire stream of the river is an international border, and a major transportation route for commercial cargo vessels that connects Lake Superior and the lower great lakes. Along the river, and within Chippewa County, lie the three islands of interest to this study: Sugar, Neebish and Drummond (*Figure 3-1*). Ferry services to these three islands are operated by EUPTA. Established in 1975, EUPTA initially began as a transportation authority that serviced Drummond Island, which then five years later, began to undertake governance of Sugar and Neebish Islands' ferry operations as well.

According to 2010 U.S. Census data, of all the three islands, Drummond has the highest population of 1,058, followed by Sugar (683) and Neebish (89). The population size directly corresponds to the land area of respective islands, with Drummond being the largest, followed by Sugar, and then Neebish. However, Sugar Island has the highest population density of 13.8 people per sq. mi., followed by Drummond (8.2 people per sq. mi.), and Neebish (4.1 people per sq. mi.). Sugar is primarily a residential island with stable year-round population, while Neebish and Drummond encircles considerable tourism and recreational activity, especially in the summer. In the summer, the population of Drummond could go up as high as 4,000 and population on Neebish could reach up to 500 people, when seasonal residents and tourists would visit the island for ecotourism and recreational purposes.

Neither of the three islands has bridges connecting them to the mainland, therefore relying on ferry services as sole mode of transportation. Drummond Island used to have an airline service before 2019, when it was decommissioned. Distance between the Drummond Island dock and the mainland is about one mile, while the ferry crossing span for Neebish is only 0.1 miles, and about 0.2 miles for Sugar. Given the distance to mainland and sizeable population, Drummond has a public elementary school and a health facility, unlike Sugar and Neebish. The ferry crossing for Drummond Island takes about 15 minutes per sailing, while it takes about five minutes for Sugar and Neebish. *Table 3-2* tabulates a summary statistic for the three islands.

It is also notable that Drummond Island has a direct connection to the M-134 state trunkline highway. M-134 is one of the two highways in Michigan to have a ferry-connected link, the other being US Highway 10. M-134 is an east-west trunkline that starts from exit 359 along I-75 and

runs eastward to De Tour Village where Drummond Island ferry dock is located. The link then continues on Drummond Island, heading east until south of the Drummond Island Airport, where it terminates at the intersection of Channel, Townline, Johnswood, and Shore roads.

Table 3-2: Neebish, Sugar, Drummond Island background summary

		Neebish	**Sugar**	**Drummond**
Population		89	683	1,058
Land Area (sq mile)		21.5	49.4	128.9
Population Density (#/sq mi)		4.1	13.8	8.2
Amenities	Operator	EUPTA	EUPTA	EUPTA
	Vessels	1	1	2
	Funding/ Revenue Source	Fares + State/ Federal Subsidy	Fares + State/ Federal Subsidy	Fares + State/ Federal Subsidy
	Annual Ridership	Vehicles: ~26,000 Passenger: ~39,500	Vehicles: ~300,000 Passenger: ~400,000	Vehicles: ~200,000 Passenger: ~300,000
	Routes Served	1	1	1
	Hospital	0	0	0
	Airport	0	0	1 (up to 2019 only)
	Bridges	0	0	0
	Public Schools	0	0	1 (elementary only)

Existing ferry operations

EUPTA owns, manages, and maintains four vessels during time of study. Operations to Drummond and Sugar Islands are operated by EUPTA themselves, while service to Neebish Island is contracted out to a private operator, using EUPTA's assets. Given the ferry crossing span, and a shared path for commercial cargo vessels, operations to all three islands run year-round including in the winter. However, operations in the winter may be subject to lake and river ice conditions, where the ice breaking schedule would be determined by the U.S. Coast Guard.

Sugar Island ferry offers the highest frequency of service that runs almost 24 hours a day, with two round trips per hour. It is being served with Sugar Islander II, which has a capacity of up to 24 vehicles and/or 130 passengers. The vessel has been in operation since 1995.

Drummond Island ferry runs about 20 hours a day with 21 round trips per day. It is served by two vessels: Drummond Islander III and Drummond Islander IV, which have been in service since 1989 and 2000 respectively. According to the latest U.S. Coast Guard Certificate of Inspection, Drummond Islander III has a vehicle capacity of approximately 24-30 vehicles, and passenger capacity of 129, while Drummond Islander IV has a vehicle capacity of approximately 24-30 vehicles, and a passenger capacity of 130 passengers.

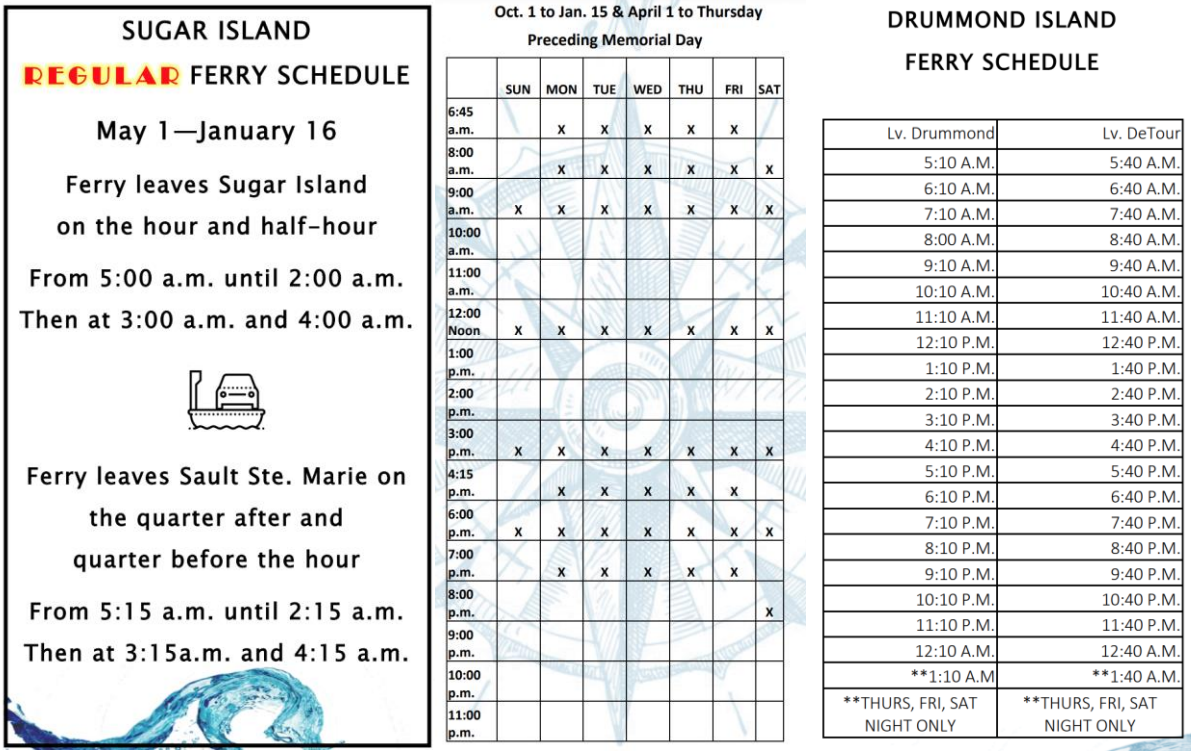
Given the low ridership demand for Neebish, ferry schedules are only 6-10 round trips per day between 6am-10pm in the summer, and 6am-7pm in the winter. The island ferry operations were served by Neebish Islander II (up until November 2022), which has been in operation since 1946- the oldest vessel in EUPTA's fleet. During the research period, Neebish Islander II was drydocked and EUPTA had Drummond Islander III service Neebish Island. EUPTA reported that they received a new vessel, Neebish Islander III, that began its operation in November 2022. This $5.6 million new vessel replaced EUPTA's Neebish Islander II after 76 years of service. Neebish Islander III is a 600hp vessel, is 88.3 ft in length and has a capacity of 15 vehicles and 115 passengers. Neebish Islander III is also capable of servicing Sugar and Drummond Islands, due to its dimension and compatibility with dock infrastructure. It was reported that Neebish Islander II was sold in June 2023. *Table 3-3* tabulates vessel specifications summary, and *Figure 3-4* is a sample of service schedules for all three ferry services.

It should be noted that in the summer, when ridership traffic is saturated, the sailing schedule would often deviate from scheduled time as needed, usually to make additional sailings to reduce wait and queue times. In the case of emergency, ferry captains are engaged to make special runs, if needed. If for any reason the weather or water condition does not permit for ferry sailings, the U.S. Coast Guard or county sheriff would be engaged for emergency transports via air boats, hover crafts or helicopters, especially during icy conditions. For Neebish island, snowmobiles can be used during cold seasons as well, as the route to the mainland usually freezes in the winter.

Drummond has one of the most prevalent logging industries in the state of Michigan, while Sugar has also some logging activities on the island. Logging trucks can be accommodated onto existing vessels without prior scheduling needed.

Table 3-3: EUPTA vessel specifications

	Vessel 1	Vessel 2	Vessel 3	Vessel 4	Vessel 5
Vessel Name	Sugar Islander II	Neebish Islander II	Neebish Islander III	Drummond Islander IV	Drummond Islander III
Owner	EUPTA	EUPA	EUPA	EUPTA	EUPTA
Operator	EUPTA	Pringle Maritime	Pringle Maritime	EUPTA	EUPTA
Horsepower (hp)	540	200	600	1,920	1,080
Acquisition Year	Oct-95	Dec-46	Nov-22	Nov-00	Jan-89
Acquisition Cost	$1,661,169	$645,254	$5,600,000	$2,945,907	$1,494,670
Years in Service (Till December 2022)	27yrs, 2mo	76yrs, 0mo	1mo	22yrs, 1mo	33yrs, 11mo
Vessel Length (ft)	109.4	79.9	88.3	142.1	101.1
Passenger Capacity	130	96	115	130	129
Vehicle Capacity	24	12	15	32	24



(a) (b) (c)

Figure 3-4: Sample ferry schedules for (a) Sugar Island , (b) Neebish Island, (c) Drummond Island (*82*)

Figure 3-5: Commercial cargo vessel passing through St. Mary River, intersecting Neebish Island ferry route

3-2- Ferry Ridership Analysis

The research team had coordinated with EUPTA and BITA to obtain up-to-date ridership data to observe historical trends and understand potential correlation for future ridership trajectories. Previously published reports for Beaver, Sugar, Neebish and Drummond Islands, were also gathered to observe if there have been any ridership analyses or projections made. Ridership projection models were available for Sugar, Neebish and Drummond Islands through a St. Mary's River Ferry Systems Master Plan conducted in 2007 (*44*), while projections for Beaver Island ridership are available through Beaver Island Transportation Coordination Study in 2005 (*45*), which is updated in 2021 (*38*).

The research team then compared the results for 2010-2020 ridership projections made in previous reports, with actual ridership data received from EUPTA and BITA. Based on BITA's 2005 study, forecasts were based on historical population and ferry passenger ridership trends. The EUPTA 2007 study considers three ranges of forecast: High, Medium, Low. High-Range forecasts are based on a ten-year rolling average of passenger growth rates. Low-Range forecasts are based on a six-year rolling average of passenger growth rates. Medium-Range forecasts are calculated as an average projection between the high range and low range scenarios. For EUPTA 2007 study,

current passenger/vehicle average ratio is used to estimate vehicle ridership based on passenger ridership (Drummond: 1.75, Neebish: 1.60, and Sugar: 1.45).

Figure 3-6, and *Figure 3-7* present actual ridership from 1997 to 2021 for all islands. Sugar has the highest level of annual ridership for passengers and vehicles, amongst all other islands, followed by Drummond. Beaver and Neebish have about the same level of ridership volume, with Neebish having a slightly higher vehicle volume than Beaver. These statistics, however, are not an accurate representation of operation size. Beaver Island ferry service takes 2.5 hours per sailing, across a span of more than 30 miles, and runs only up to two round trips per day. Sugar Island on the other hand, crosses a river of about 700ft span, with each sailing taking less than five minutes, and with service schedule up to 36 departures per day.

The nature of both islands and ridership profiles are also starkly different, where Sugar, Neebish and Drummond cater for a majority of their ridership being regular commuters. Except for Drummond Island, where it hosts a relatively higher number of tourist ridership compared to Sugar and Neebish. A direct comparison for ferry operational need could not be primarily observed through ridership volume but needs to consider other contextual factors. However, the purpose of this analysis is aimed to observe ridership trends within each island and identify common trends across all islands.

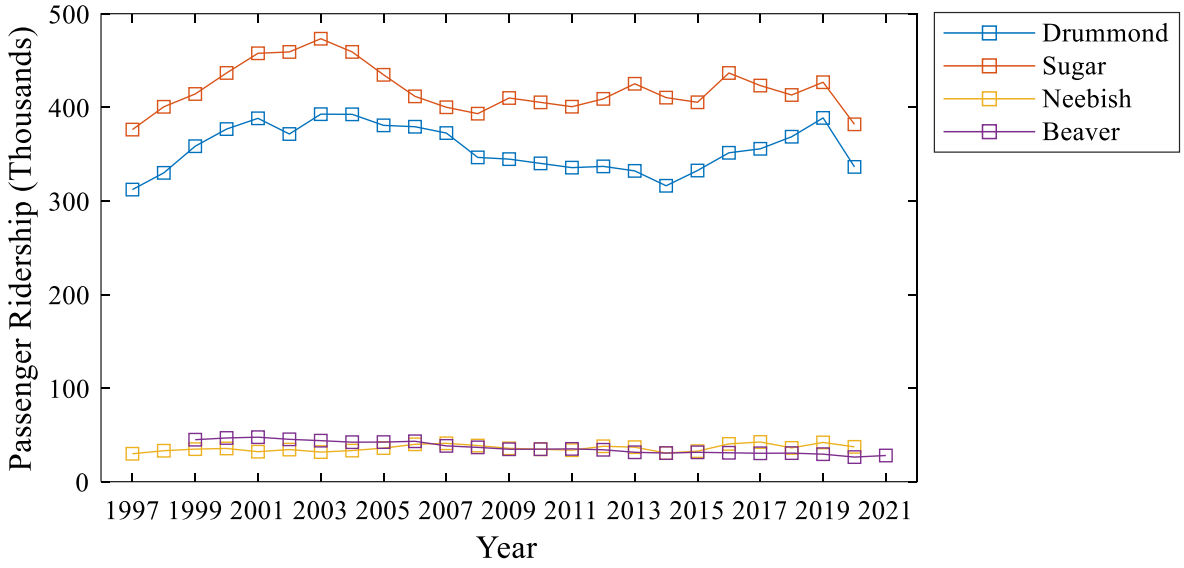


Figure 3-6: Actual passenger ridership for all islands

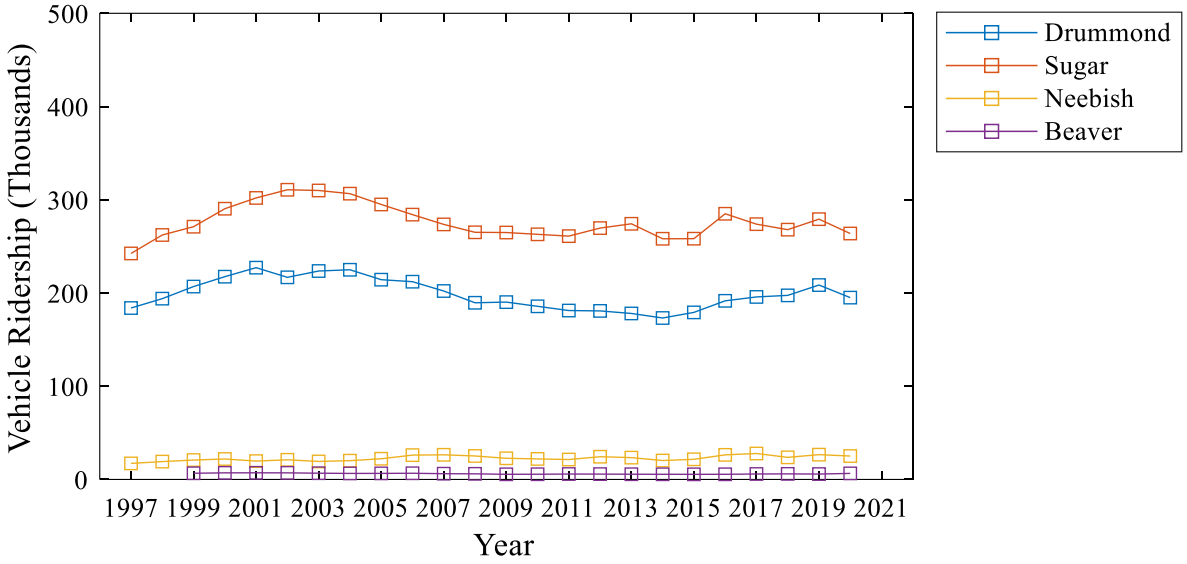


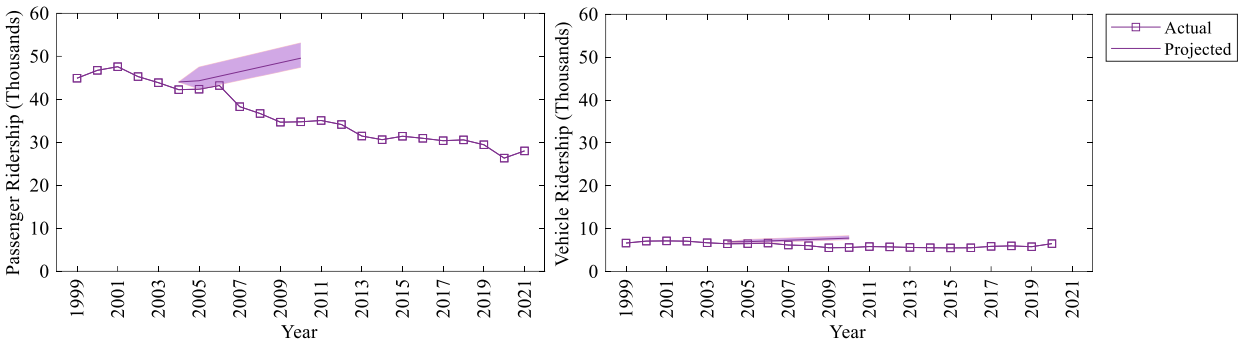
Figure 3-7: Actual vehicle ridership for all islands

Based on *Figure 3-8*, it can be observed that ridership projections for all islands were consistently over-projected compared to actual ridership data. Actual ridership data is even lower than the forecasted low range of ridership. This indicates that ridership trajectory is not only a function of historical trends and population growth, but must consider a myriad of other factors, both direct and indirect parameters. In retrospect, ridership trends have been stabilizing and range-bound, with a slightly decreasing trend for Beaver, Sugar, and Drummond. While Neebish shows

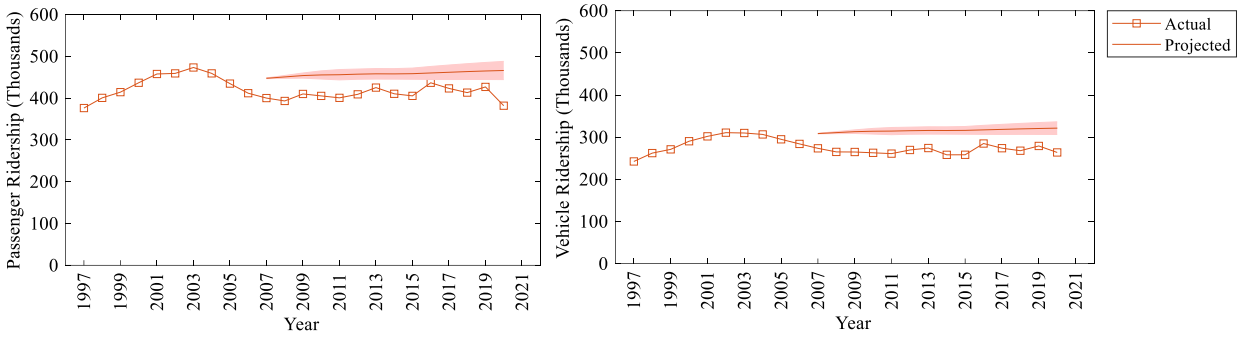
a slightly increasing trend, the trend can be negligible due to low overall ridership volume. Given the fact that Sugar and Neebish are primarily residential and non-tourism islands, it is safe to assume a relatively stable and steady ridership trajectories for the next 10 years (2022-2023), unless presented with external influence such as a township project to promote the island as tourism island, which at the time of study is not present. Beaver Island saw an uptick of ridership during COVID-19 starting in early 2020, as it is host to a sizeable number of seasonal residents.

It can be observed from *Figure 3-9*, that general monthly ridership trends for all ferries throughout the year traces the same pattern back to 1999.This is due to typical seasonal variations that directly affects ferry operation schedule and willingness to travel. December through April presents the lowest ridership volume, with peak ridership from June to August. This monthly variation trend remains true across all islands despite the level of tourism activities present on respective islands. It can also be observed that a steep drop in ferry ridership around March and April of 2020, when COVID-19 first hit. Ridership volume quickly stabilized to its expected monthly variation, but the year 2020 in general remains the year with one of the lowest ridership volumes for all ferry operators. Zooming further into monthly variations of ridership trends, *Figure 3-10* portrays the monthly variation within each month, from 1999 through 2021. It can be observed that non-peak period ridership over the span of 20 years has very small volume variation. On the other hand, monthly ridership volume for peak season (June to August) has a wide variation, given its association with tourism ridership demands.

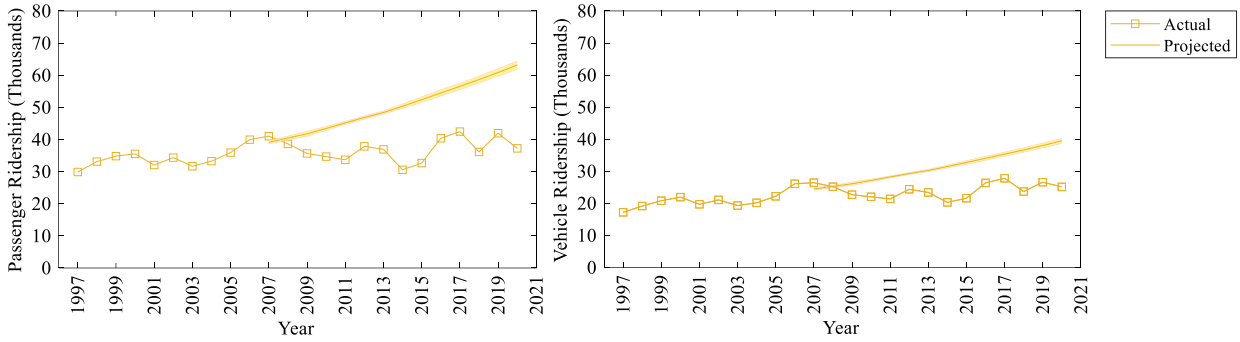
Figure 3-11 plots the ridership percent change year-over-year. EUPTA experienced a period of ridership decline from 2004 through 2014 (in aggregate of all three islands it operates), followed by a strong revival in ridership in 2015 and 2016. It was observed that ridership trends have been stabilizing through 2021, except for 2020 that was affected by COVID-19 stay-at-home order. On the other hand, BITA has seen a constant decline in passenger ridership volume for the past two decades, but vehicle ridership volume has seen stabilizing from 2010 through 2021. BITA 2019 study asserted that while historical ridership trends have shown a declining pattern during the past decade, they do not anticipate ridership volume to further decline and will remain stable in coming years (*72*). The research team also expects EUPTA ferry ridership to remain stable for the coming years, without any significant increase or decrease in ridership volume. This is assuming there are no externalities imposed onto the island, such as COVID-19- like circumstances, or township/local plan to aggressively ramp up tourism activities in the area.



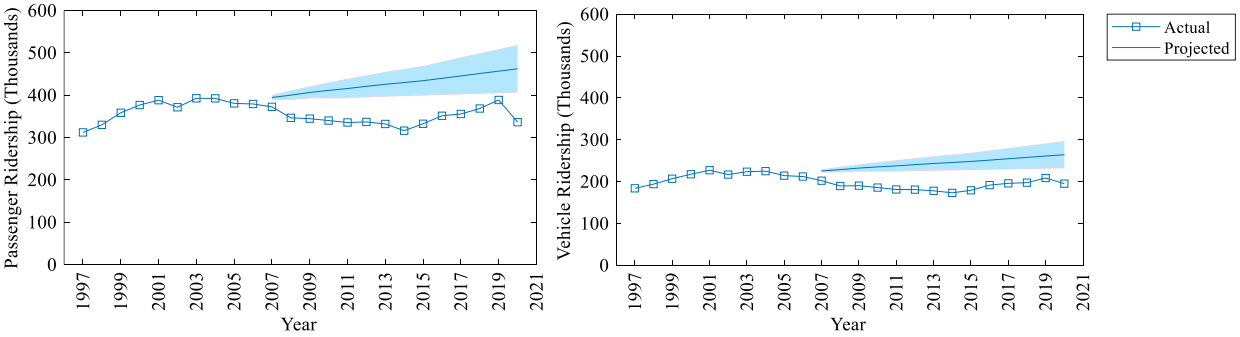
(a) Beaver Island



(b) Sugar Island

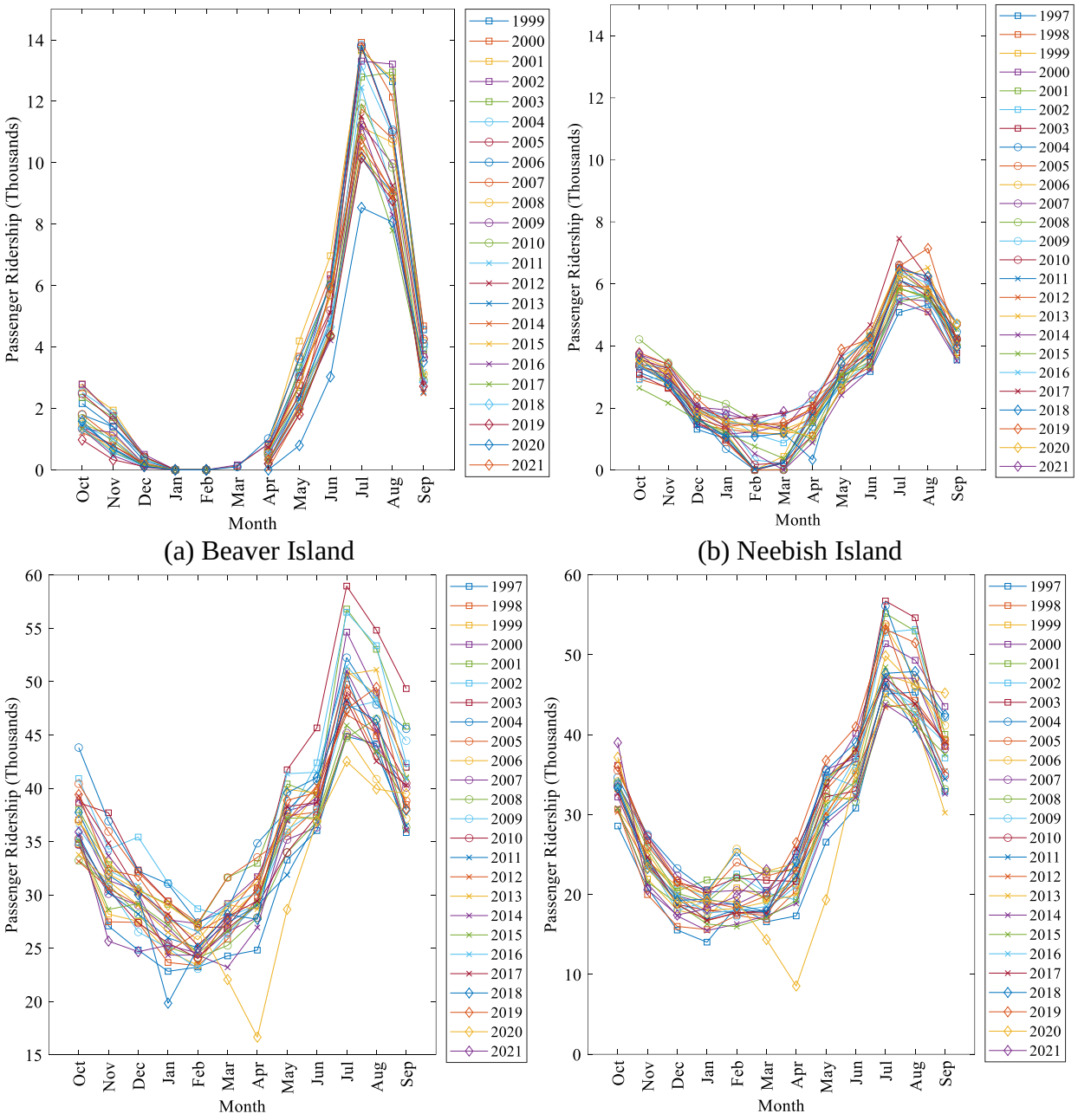


(c) Neebish Island



(d) Drummond Island

Figure 3-8: Actual vs projected passenger and vehicle ridership from previous studies



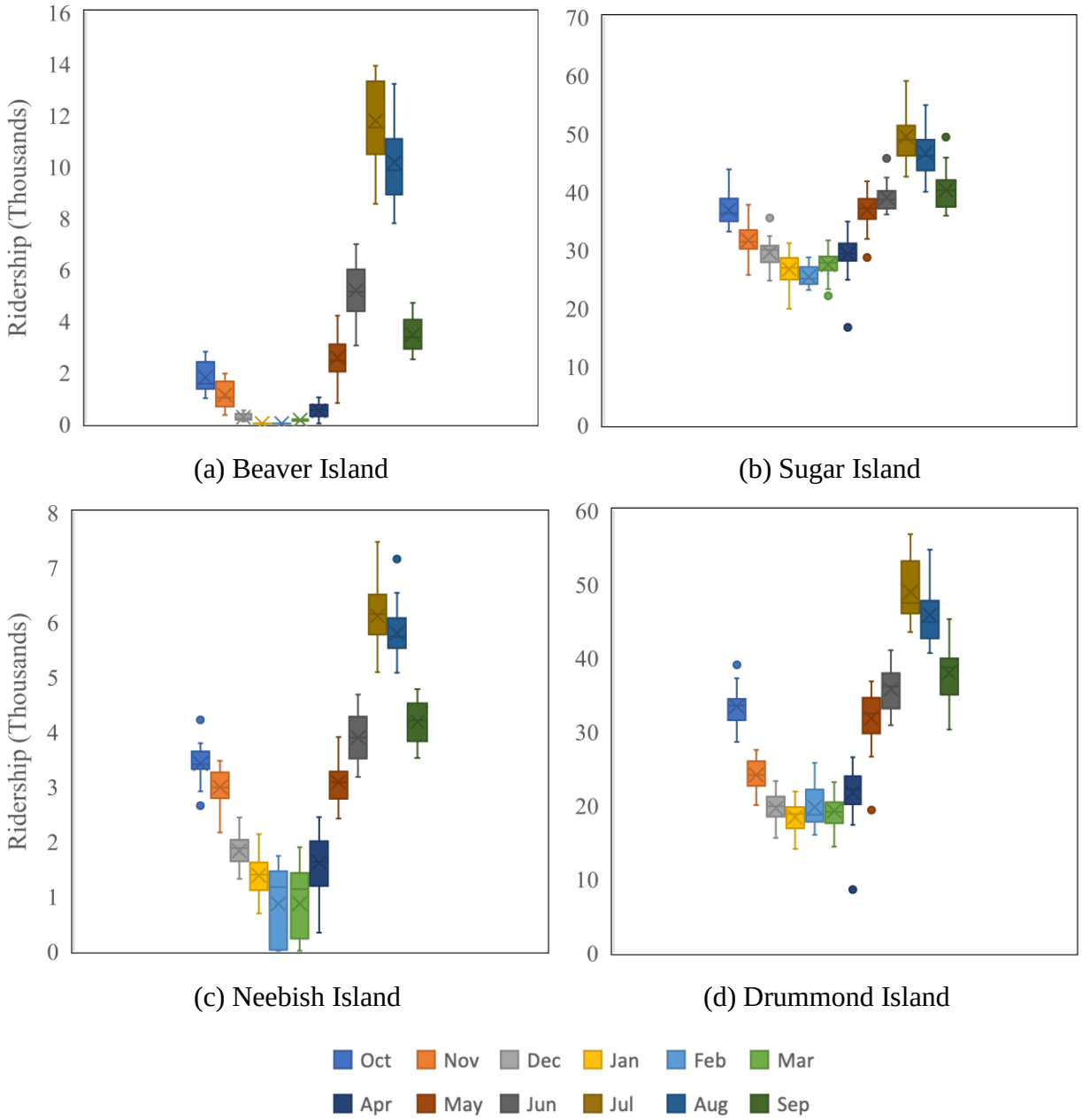
(a) Beaver Island

(b) Neebish Island

(c) Sugar Island

(d) Drummond Island

Figure 3-9: Actual monthly passenger ridership over fiscal year 1999-2021



(a) Beaver Island

(b) Sugar Island

(c) Neebish Island

(d) Drummond Island

Figure 3-10: Monthly variation of total ridership over fiscal year 1999-2021

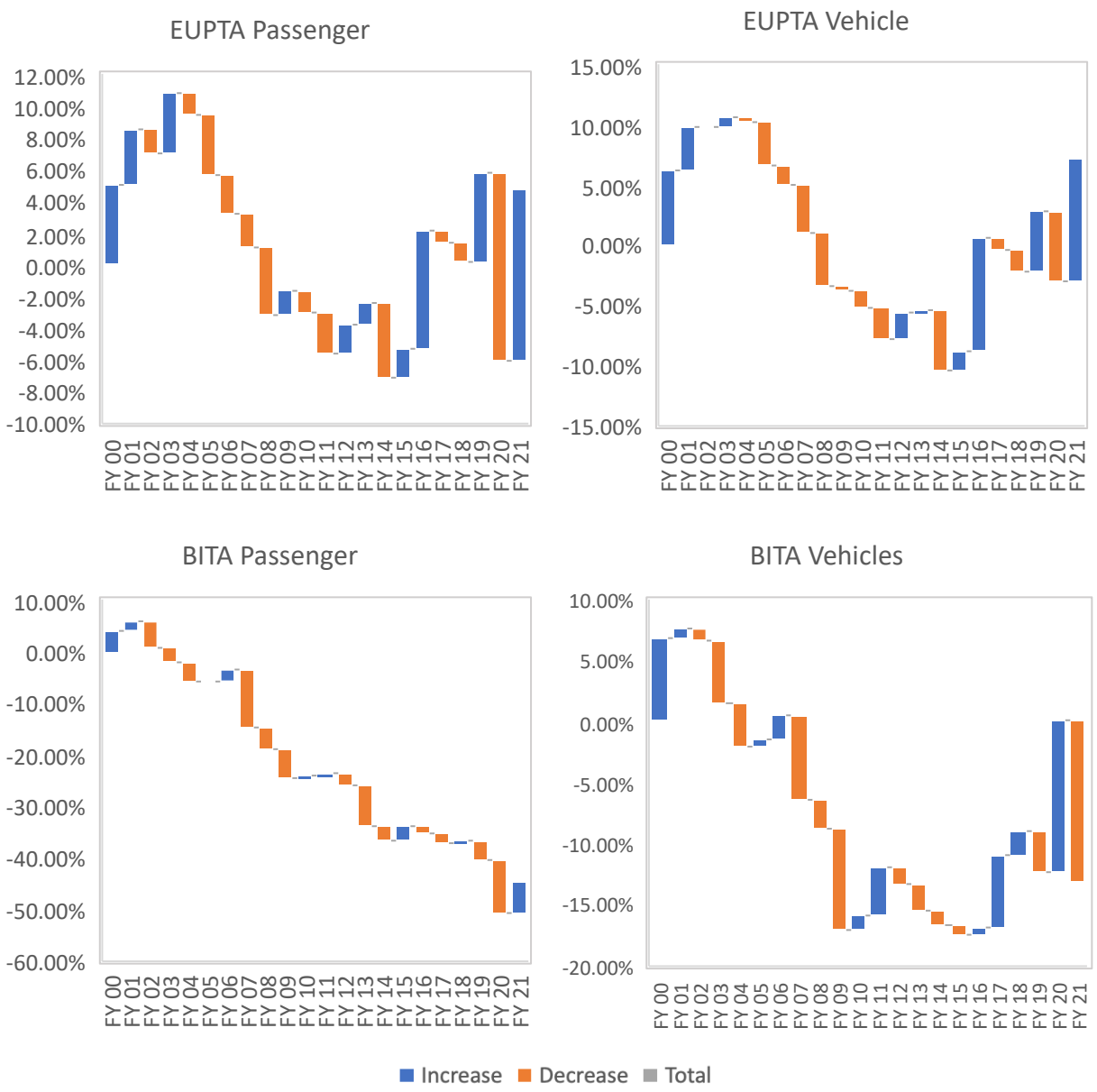


Figure 3-11: Percent of ridership change from previous year

CHAPTER 4 – NATIONWIDE SURVEY OF STATE DEPARTMENT OF TRANSPORTATIONS

4-1- Purpose

Island residents' welfare and economic needs vary greatly across geographies, local context, and many numerous other factors, which affects state authorities' capacity and role to facilitate them. There have been notable state-wide studies in respective states regarding their own ferry operations. This provides an avenue for MDOT to identify best practices and explore operational and governance efficiencies. Consequently, the research team developed and implemented a nationwide survey to investigate current practices related to ferry services in their state. This survey targeted state DOTs across the nation, with ferry operations. According to NCFO- a biennial census of all ferry operators in the United States and its territories conducted by The Bureau of Transportation Statistics (BTS)- there are 37 states that have ferry operations based on 2016 census (*83*). Therefore, the research team focused on these states and obtained point of contacts through various resources and approaches. The nationwide survey, along with literature review conducted as part of *Task 2*, were the primary means to gather a library of best practices that MDOT could utilize to improve Michigan island residents' transportation welfare. The main objectives of the survey were to identify and understand:

- Current state-of-the-practice in other states to better understand the role of state agencies in providing equitable transportation services to island residents
- Best practices and lessons learned for funding strategies, service coordination, and governance structure from other states
- State-specific regulations and unique legislations on ferry services
- Available funding sources for ferry operators that do not qualify for FBP
- State authorities' coordination with ferry systems that are not recipients of state funding

4-2- Survey Design and Administration

The MSU research team developed a survey questionnaire to investigate the state-of-the-practice for ferry operations across the nation. The topics and questions included were developed based on the literature review and were revised based on MDOT Research Advisory Panel (RAP) members' feedback. The survey was designed and implemented in a web-based format through the Qualtrics platform and consisted of six sections that sought the following information:

- Ferry services landscape in their jurisdiction
- Agency's role, governance, coordination, and supervision of ferry services
- Policies and legislations around ferry services
- Ridership data and state funding dynamics
- Previous studies conducted in the areas of funding strategies, tribal consideration, service monitoring methods, and/or responsibility to island residents in general

As per NCFO 2016 survey (*83*), there are 15 states with no ferry operations or with non-island services, and 35 states with ferry services. Therefore, the maximum number of state DOTs that the research team tried to reach out to was 35 states. Through an exhaustive search of publicly available records, and assistance of RAP members, the research team gathered a pool of contacts from state DOTs nationwide, in charge of ferry operations. MDOT assisted the research team to send out a Multi-State Transit Technical Assistance Program (MTAP) alert request, which obtained 10 contact persons in various state DOTs ferry divisions. The research team also reached out to American Association of State Highway and Transportation Officials (AASHTO) Council on Water Transportation members, which consists of 75 contacts. Web-searches on official state DOT websites were also done to identify key personnel overlooking ferry services in their respective state. These web-searches yielded contacts from 14 states DOTs.

The survey was first distributed on August 13, 2021, with a survey deadline of September 17, approximately one month of survey response period. In between, several rounds of reminders were sent out to survey invitees, namely on August 23 and September 10. After the survey response collection had ended, the research team analyzed response previews and conducted a follow-up survey from September 18 through October 19, to ramp up complete response rate. The survey officially closed on October 19, with a total running duration of two months. Several respondents also provided the research team with supplemental documentation and information, and the

provided data was manually input into their survey responses. The list of survey questions is provided in the *Appendix A* of this report.

4-3- Summary of Results

4-3-1 Overview of the responses

Out of 35 states with ferry operations, the survey received responses from 20 state DOTs, which translates to a 57% response rate. 15 state DOTs (43%) were not able to be contacted, even after numerous attempts and through different points of contact. Out of the 20 responses received, three states (Kentucky, Pennsylvania, Louisiana) did not have ferry services servicing islands, rather simply ferries crossing rivers or large channels or water bodies. The research team decided to include KY, PA, LA in survey analysis as questions and inputs seemed to be relevant. However, any aspect of analysis intended to specifically study services to islands were conducted only for the remaining 17 states. Figure 4-1 displays a map of states who responded to the survey.

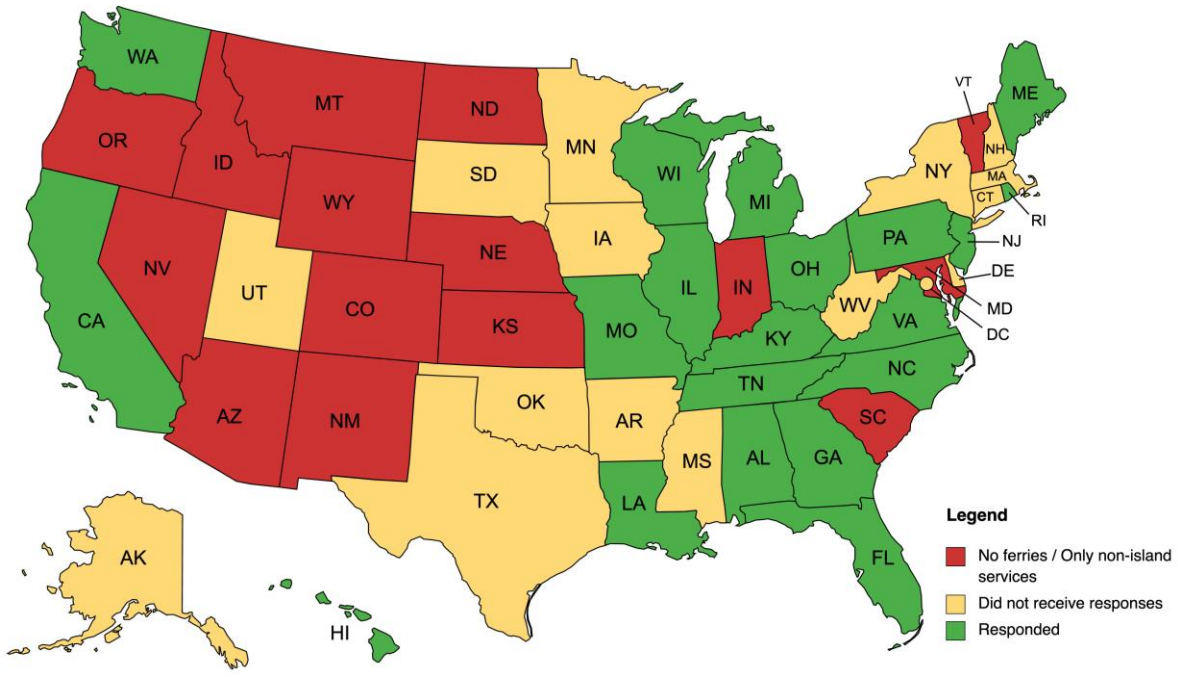


Figure 4-1: Spatial distribution of state DOTs that responded to the survey

4-3-2 Survey Analysis & Insights

This section tabulates responses of state DOTs nationwide, and each state is identified via its two-alphabet postal code abbreviations. The state DOT departments are simply referred to as 'agency' or 'respondents' for brevity. Survey results are presented following the survey original structure:

- Section 1: Introduction
- Section 2: Respondents background and organizational details
- Section 3: Service coordination and operations
- Section 4: Policies and legislations
- Section 5: Ridership and funding

Section 2: Background and organizational details

When asked about ferry services oversight within respective state of jurisdiction, it was indicated that 85% of respondents only oversee operations that receive federal or state funding (*Figure 4-2*). It was also noted that some agencies simply act as an intermediary to relay federal funding such as FBP to ferry operators without enforcing any oversight. The degree and structure of oversight in each state may also vary. Respondents were then asked if they were provided or collected data from private ferry operators. 95% indicated they collect neither ridership nor financial/funding data from private ferry operators (*Figure 4-3*).

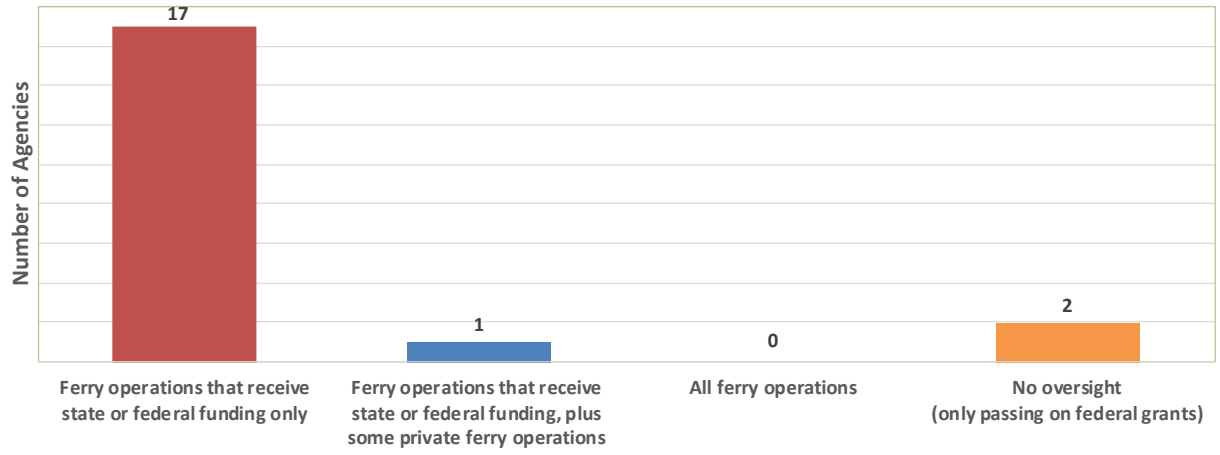


Figure 4-2: Number of agencies and their oversight over ferry operations

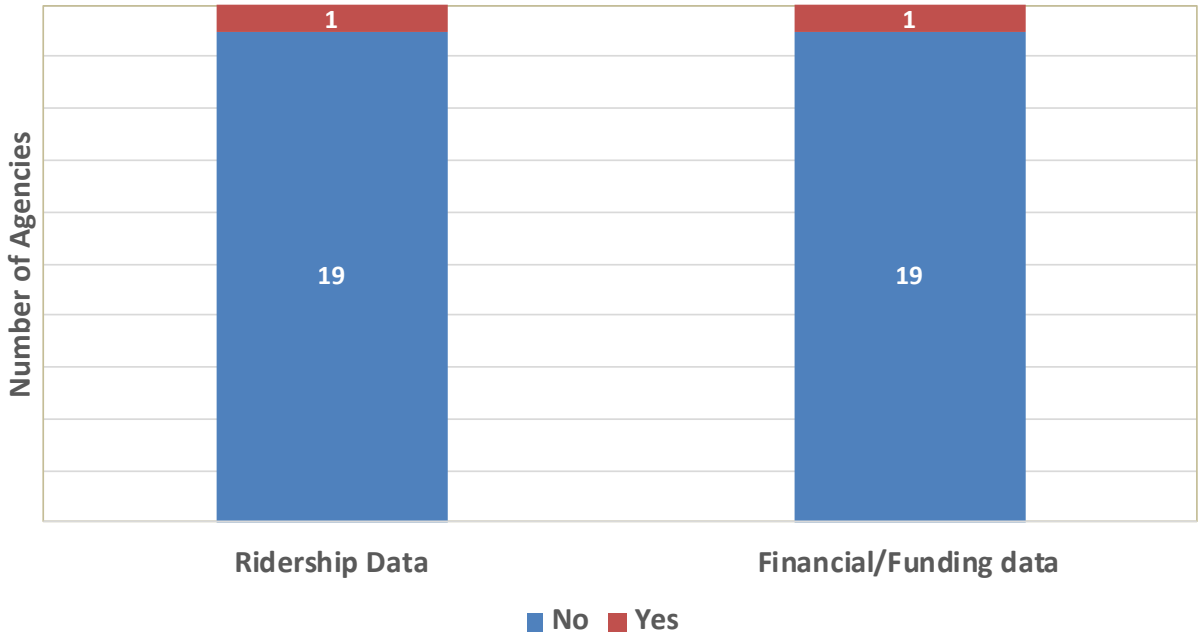


Figure 4-3: Availability of ridership and financial/funding data for private ferry operators to State DOT

The survey also inquired on the number of ferry operators that receive state and/or federal funding, and the number of vessels that are under purview of those funding sources. *Table 4-1* tabulates how many ferry operators correspond to each category of funding recipient, and how many vessels they collectively own. The responses provided are not exclusively mutual and not evenly distributed, and some agencies have a higher proportion in certain funding categories compared to others. Empty cells indicate that the number is zero, while 'N/A' implies that data was not reported. The results show that different states have distinct operational conditions and agreements.

Table 4-1: Number of ferry operators and cumulative number of vessels by various funding categories

		AL	CA	FL	GA	HI	IL	KY	LA	ME	MI	MO	NC	NJ	OH	PA	RI	TN	VA	WA	WI
FUNDING	Ferry operators receiving **only** federal funding		13	5			2	1	2	1	1			5	2						
	Ferry operators receiving **only** state funding							7	1				1	2					2		
	Ferry operators receiving **both** federal & state funding	1			2		2	6	2	2	3	2					1	4	1	1	
	Ferry operators privately funded (**neither** federal nor state funded)					1	6	2							5		7		2		2
VESSELS	Vessels owned by operators receiving **only** federal funding		N/A	5			N/A	1	4	2	1			1	3						
	Vessels owned by operators receiving **only** state funding							9	1				21						2		
	Vessels owned by operators receiving **both** federal & state funding	N/A			2		3	8	12	12	6	2					1	4	4	21	
	Vessels owned by operators privately funded (**neither** federal nor state funded)					1	6	4							9				2		10

Section 3: Coordination & Operation

To understand ferry governance in other states, the survey also inquired on agency's asset ownership and operations that are directly handled by the agency themselves. According to *Figure 4-4*, nine agencies neither own nor operate their own ferry services. Seven agencies have oversight on ferry operations that receive state or federal funding, and two states only pass on federal funding, and have no oversight on services. *Table 4-2* displays the number of vessels owned by each agency and how many ferry operations are directly managed and operated by the agency. It is noted that the majority of agencies do not operate their own ferry operations. They are either contracted out their services to private operators or formed a transportation/local authority to run the operations as a non-profit. The state of Washington and North Carolina are two states with significant number of vessels owned by the agency, given their extensive ferry operations in the state- both for islands, and river crossing.

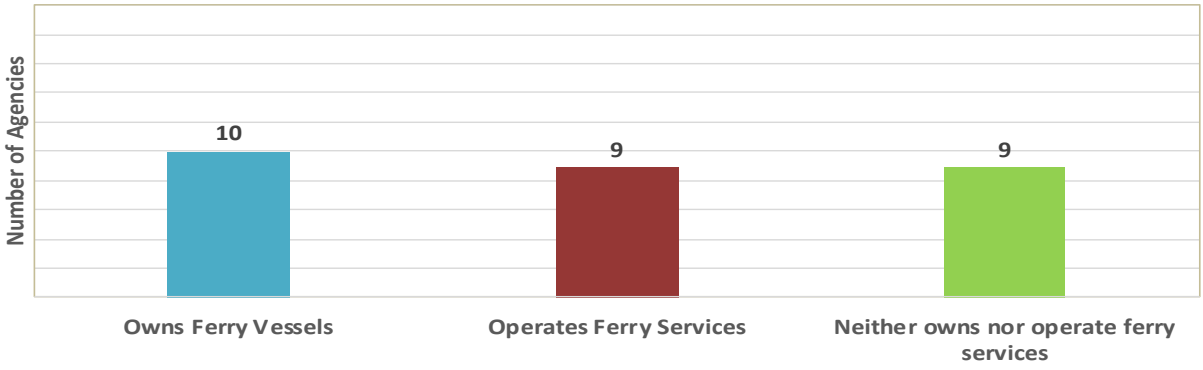


Figure 4-4: Vessel ownership and ferry operations by agencies

Table 4-2: Breakdown of vessel ownership and service operations by state

	# Agencies	AL	CA	FL	GA	HI	IL	KY	LA	ME	MI	MO	NC	NJ	OH	PA	RI	TN	VA	WA	WI
Number of **ferry vessels owned by your agency**	**10**	2	2	0	0	0	2	2	12	7	0	0	21	0	0	0	0	4	6	21	0
Number of **ferry operations directly operated by your agency**	**9**	0	0	0	0	1	2	1	3	7	0	0	1	0	0	0	0	4	3	9	0

The extent of oversight and governance of ferry operations are also inquired from respondents. *Table 4-3* tabulates a list of roles that state agencies play in their respective state, according to most selected ones at the top of the list. It was noted by five agencies (FL, CA, GA, NJ, RI) that they assist, review, request, and channel FBP grants to operators. They also enforce federal compliance, apart from hosting regular meetings with operators to determine eligible projects for federal and state funding. Public engagement is also a top key role played by state agencies, where

they conduct public hearings to obtain feedback regarding state policies and laws. Another key aspect of governance is operations, where agencies provide and review operating agreements with service providers or contract out operations by purchasing a turn-key service from private operators with flat fee subsidies. Another key role agencies play is regarding emergency services, where they impose governance in activities such as mobilizing for evacuations and recovery efforts.

Table 4-3: Roles of State DOTs towards ferry operators in their state

Roles of State DOT by Order	# Agencies
Funding/Subsidy Assistance & Oversight	17
Vessel/Dock Improvement Procurements	14
Facility/Infrastructure Maintenance Funding	13
Oversee/Enforce Safety Programs	10
New Vessel Procurement Financing/Funding	10
Monitoring System Performance/ Level of Service	10
Oversee/Enforce Federal Compliance	9
Asset Management Plans/Studies	8
Operational Standards & Specifications	8
Regional Ferry Studies	7
Ridership Demand Studies/Surveys	6
Emergency Evacuation Plans	6
Monitor/Assess/Maintain Level of Users' Satisfaction	5
Contracting out Ferry Operations	3
Capital Expenditure Review	1
Marine Dredging	1

Different agencies have noted different mechanisms of oversight, and performance measures being used to monitor service performance and reliability in general. *Table 4-4* tabulates key types of performance measures being used by state agencies to monitor ferry services. Six states indicated that they have no performance monitoring measures in place. WSF is amongst the longest-established ferry operations governing agency with the most extensive operations in the nation. WSF provided the research team with a list of key performance measures being used by their agency to monitor ferry services actively or passively in their state (*Table 4-5*), which are also available in an elaborated report published in 2020 (*84*).

Table 4-4: Performance or level of service measures used to monitor ferry services

Performance Measures used by State DOTs	# Agencies
Ridership Volume Growth	9
Service Downtime/Resiliency (Percent sailings cancelled or delayed)	6
User Satisfaction Survey Results (Comfort, Satisfaction, etc.)	5
Service Reliability (Likeliness of schedule adherence or on-time performances)	5
Operating Cost Per Passenger	3
Service Cost (Relative cost to other transportation modes)	3
Accommodation to Users with Disabilities (User satisfaction or convenience towards services and facilities)	2
Service Access Time (Time taken from ticket purchasing, queueing/waiting/walking to onboarding)	1
Travel Time (Ferry travel time relative to other transportation modes)	1
Emission/Pollution Cost	0

Table 4-5: Notable performance measures by Washington State Ferry

Capital Effectiveness
Percent of terminal projects completed on time
Percent of terminal projects completed on budget
Percent of contracts completed on time
Percent of contracts completed on budget
Terminal and Vessel Engineering Costs as Percentage of Total Project Costs
Average vessel out-of-service time
Safety Performance
Passenger injuries per million passengers
OSHA recordable crew injuries per 10,000 revenue service hours
Cost Containment
Annual operating cost estimate per passenger mile compared to budgeted cost
Annual operating cost estimate per revenue service mile compared to budgeted cost
Overtime hours as a percentage of straight time hours compared to budgeted overtime hours
Gallons of fuel consumed per revenue service mile compared to budgeted fuel consumption
Service Effectiveness
Passenger satisfaction with WSF Staff customer service
Passenger satisfaction with cleanliness and comfort of WSF terminals, facilities, and vessels
Passenger satisfaction with service requests made via telephone or WSF website
On-time performance level (percent of trips departing within 10 minutes of scheduled time)
Service reliability level (percent of scheduled trips completed)

Section 4: Policies and legislations

The research team then explored what segments of policies and legislations that exist specifically for ferry services in other states. *Figure 4-5* displays the categories of policies and legislations that exist in their respective states. Most policies that exist are closely framed and fall under the economic support, social welfare, and emergency services. Examples of key policies instated in other states were also provided. The State of Maine indicated that for the emergency services, the state or ferry operator are reimbursed for the cost of emergency trips either by individuals' insurance or from the island municipality. Florida and Louisiana indicated that the state agency is authorized to acquire, control, operate, and regulate ferries, barges, or other means of transportation as it thinks necessary to the public. Uniquely for Rhode Island, all ferry services are regulated as a utility through the Public Utilities Commission (PUC), where purchased transportation operator must gain permits from PUC. Some states like Virginia and North Carolina have a provision for a free ferry service across certain routes of ferry services. Maine has a provision that 100% of the capital investments comes from state and federal funding, and 50% of operating budget comes from the state, and the rest from service fares. Similar arrangement of federal-state-local funding match exists for many states, but with varying degrees of percentage composition. For example, New Jersey has a provision that designates 20% match is required by the state agency for all federally funded projects through Federal Highway Administration (FHWA).

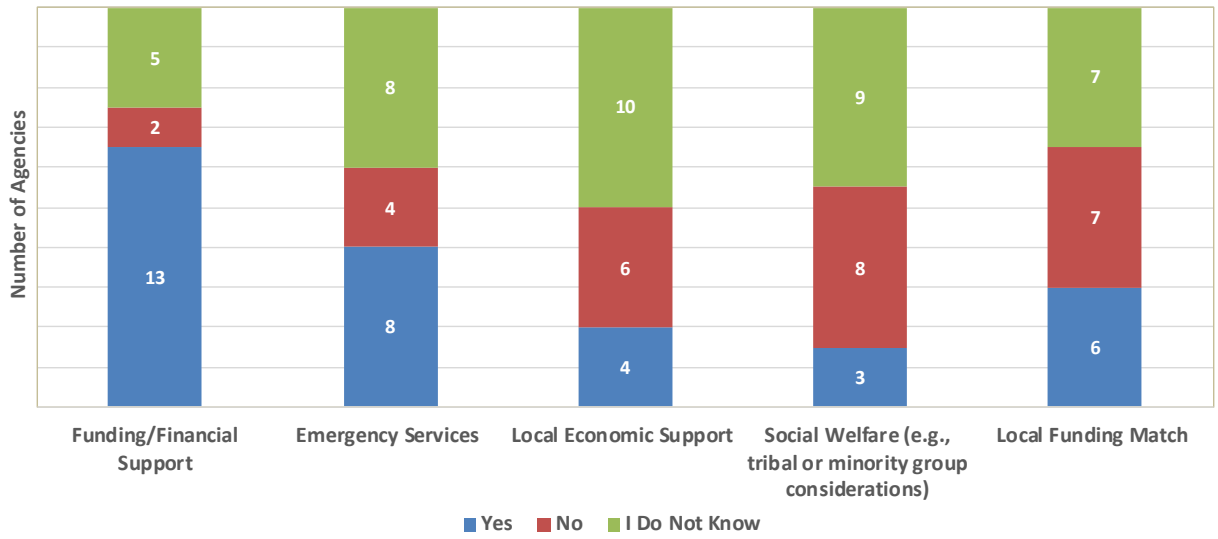


Figure 4-5: Availability of policies and legislations regarding ferry services.

Section 5: Ridership and funding

The survey also explored state and federal contributions to ferry operations in respective states. The research team had broken down funding periods around two landmark funding legislatives: Fixing America's Surface Transportation (FAST) Act, established 2015 and Moving Ahead for Progress in the 21st Century Act (MAP-21) established in 2012. This is to capture variability imposed by different funding criteria and FBP program criteria weightage, where from MAP-21 to FAST Act, formula funding weightage for numbers of passengers carried increased by 15%, vehicles carried decrease by 10% and total route miles served decreased by 5%. Different weightage to these components would induce different eligibility of various ferry operators depending on their operation scale and size.

As per *Table 4-6*, state and federal funding for each state is tabulated for 2014 (surrogate year for MAP-21), and 2019 (surrogate year for FAST Act, and before COVID-19). Responses received from the survey are cross-referenced with data from FHWA FBP grand distribution report. Along with state and federal contributions data, the table also tabulated the % of total FBP grant received by respective state. Respondents' data of 20 out of 35 states (maximum number of states with ferry operations, as per NCFO) constitutes more than 50% of federal funding recipient. This asserts a meaningful level of response size credibility for the survey.

For a more meaningful observation of relative state contribution, *Table 4-7* tabulates the annual state/federal funding ratios. While there are no coherent trends in state/federal funding ratio, Michigan has a below average state funding contribution relative to federal funding, implying other states are allocating larger state funding size relative to federal funding. Federal funding for Michigan remained relatively stable (marginal increase of 13.92%) from 2014 and 2019, with a tandem move of state funding size that rose 12.19%. The percentage of overall FBP grant received by most states is about the same in 2014 and 2019, except for CA (grew 2x), NJ (grew 2x) and OH (shrunk 4x).

Table 4-6: Annual state and federal funding

	Annual Funding in 2014 (After MAP-21 and Before FAST Act)			Annual Funding in 2019 (After FAST Act & before COVID)		
	State	Federal	% of Total FBP Grant	State	Federal	% of Total FBP Grant
AL	$35,000	$131,478	0.2%	$28,000	$146,766	0.2%
CA		$1,765,194	2.8%		$3,179,628	4.4%
FL		$100,325	0.2%		$402,153	0.6%
GA		$160,421	0.3%		$27,661	0.04%
HI		$71,976	0.1%		$100,000	0.1%
IL	$300,000	$1,047,789	1.6%	$300,000	$1,108,458	1.5%
KY		$391,492	0.6%		$450,346	0.6%
LA	$13,942,791	$2,843,417	4.5%	$11,173,428	$3,195,655	4.4%
ME	$10,100,000	$666,546	1.0%	$13,100,000	$865,082	1.2%
MI	$2,083,849	$1,230,178	1.9%	$2,337,870	$1,401,472	1.9%
MO	$176,000	$66,603	0.1%	$176,000	$100,000	0.1%
NC	$43,607,507	$1,551,780	2.4%	$50,039,535	$1,488,453	2.1%
NJ	$2,000,000	$1,844,724	2.9%	$4,000,000	$4,360,214	6.0%
OH	$0	$807,146	1.3%	$0	$207,546	0.3%
PA		$92,594	0.1%		$0	0.0%
RI		$160,596	0.3%	$26,288	$396,532	0.6%
TN		$95,682	0.2%	$2,400,000	$100,000	0.1%
VA	$13,352,436	$1,319,113	2.1%	$13,900,183	$1,512,816	2.1%
WA	$236,583,000	$15,566,404	24.5%	$261,600,600	$16,959,462	23.5%
WI		$411,365	0.6%		$372,396	0.5%
						% Change
FBP Sum for 20 states		**$30,324,823**			**$36,374,640**	**20.0%**
FBP Overall Grant Size		**$63,583,000**			**$72,080,000**	**13.4%**

* Source of federal funding from survey is cross-referred with data from FHWA FBP Grant Distribution Report

Table 4-7: Annual state and federal funding ratios

	Ratio of State/Federal Funding 2014	Ratio of State/Federal Funding 2019	% Change in State Funding 2014 vs 2019	% Change in Federal Funding 2014 vs 2019
AL	0.27	0.19	-20.00	11.63
CA				80.13
FL				300.85
GA				-82.76
HI				38.94
IL	0.29	0.27	0.00	5.79
KY				15.03
LA	4.90	3.50	-19.86	12.39
ME	15.15	15.14	29.70	29.79
MI	1.69	1.67	12.19	13.92
MO	2.64	1.76	0.00	50.14
NC	28.10	33.62	14.75	-4.08
NJ	1.08	0.92	100.00	136.36
OH				-74.29
PA				-100.00
RI				146.91
TN				4.51
VA	10.12	9.19	4.10	14.68
WA	15.20	15.43	10.57	8.95
WI				-9.47
AVG	7.95	8.17	13.15	29.97

In addition to the funding data, the research team inquired about ferry ridership data, where out of 20 agencies responded, only seven had provided complete ridership data. Therefore, ridership analyses are only conducted for these seven agencies (VA, NC, MI, ME, NJ, WA, MO). Based on *Figure 4-6* and *Figure 4-7*, passenger ridership trends on average decreased from 2010 to 2019, with an average 55.62% drop in 2020 (COVID Period). NJ and NC experienced a more drastic passenger ridership drop during COVID compared to other states. On the other hand, vehicle ridership on average remained relatively stable from 2010 to 2019, with an average drop of 18.86% in 2020 (COVID period). WA and NC experienced the most drastic drop in vehicle ridership during COVID.

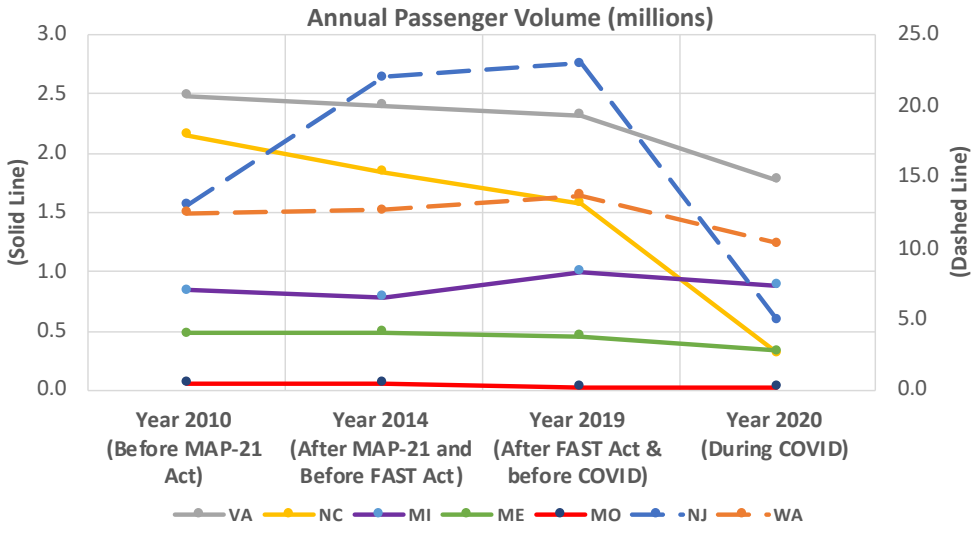


Figure 4-6: Passenger ridership trends for seven states in various funding periods

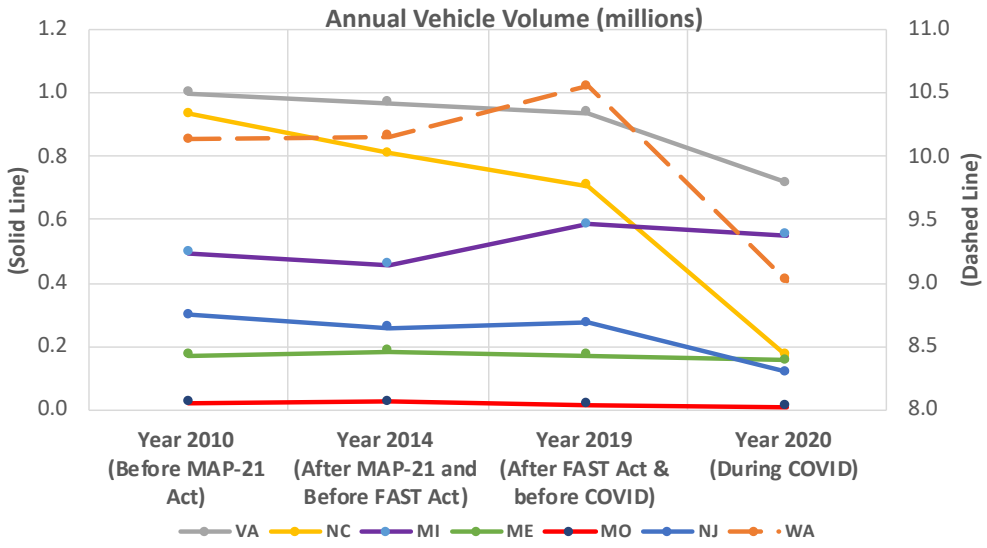


Figure 4-7: Vehicle ridership trends for seven states in various funding periods

NJ has the highest number of passenger ridership, followed by WA, VA, NC, MI, ME then MO. For vehicle ridership, WA has the highest number of vehicle ridership, followed by VA, MI, NJ, ME, MO. It can be observed that passenger ridership and vehicle ridership volume may not be proportionally at the same level for ferry operators, where high passenger volume may not necessarily translate to high vehicle volume. Some ferry operators may predominantly transport vehicles more than passengers, and vice versa. This confirms the assertation that FBP formulation weightage change for passengers and vehicle ridership volume under MAP-21 and FAST Act had different impacts for different ferry operators' funding eligibility. *Figure 4-8* depicts ratio of state/federal funding before and after FAST Act for the seven states. NJ and MO experienced the most decrease in state/federal funding ratio, while the rest of the agencies observed negligible changes, or a slightly decreasing pattern. No funding ratio increase was observed.

Based on *Figure 4-9*, the total funding (federal + state) from 2014 to 2019 increased for all states. However, ridership for VA, NC, ME decreased for the same period. MI ridership grew 27.22% (passenger) and 27.89% (vehicle), but total funding size only grew 12.83%. This portrays a disparity between ridership growth change and the amount of federal funding allocations among receiving states.

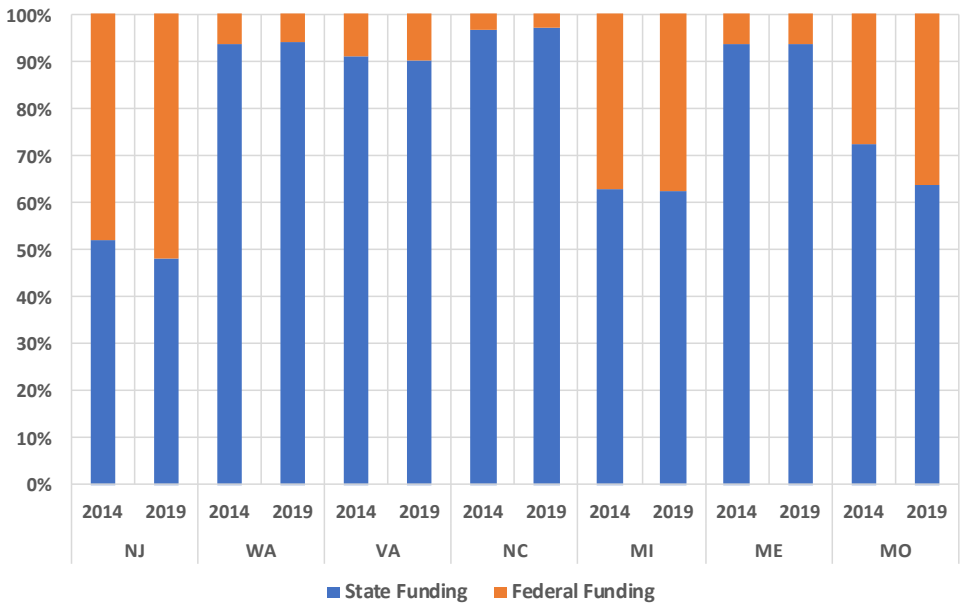


Figure 4-8: Annual state and federal funding ratios before and after FAST Act

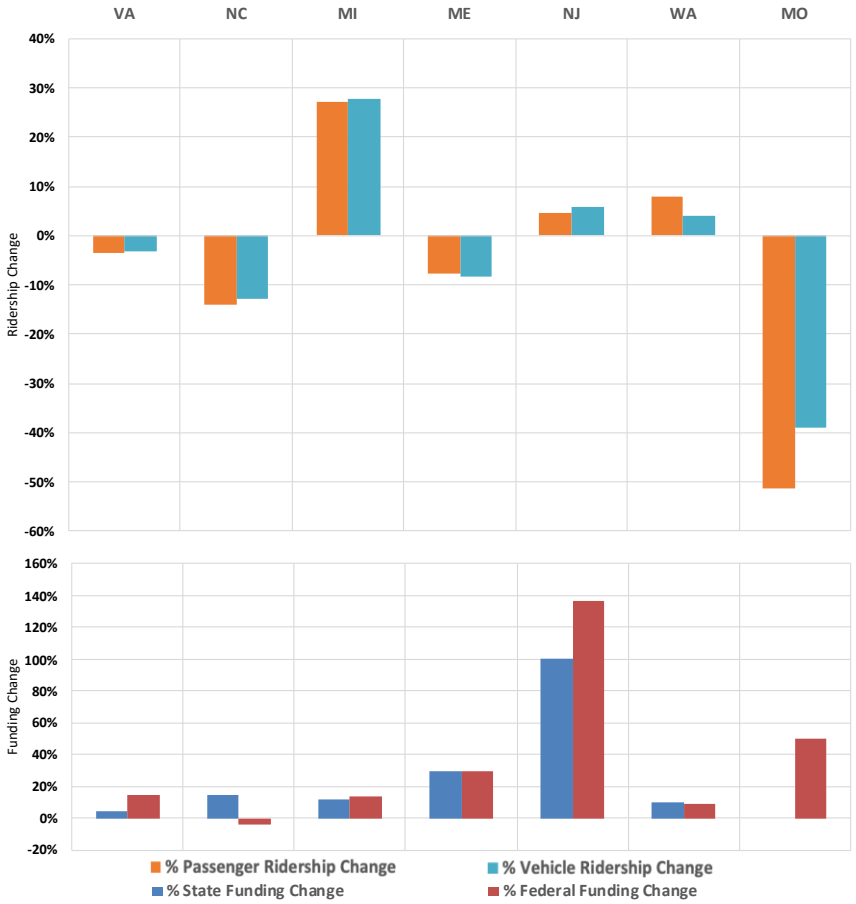


Figure 4-9: Ridership and funding change in 2014 (MAP-21) vs 2019 (FAST Act)

The research team then combined ridership and funding data to observe a normalized funding cost per ridership for the mentioned seven states above. In determining total ridership, weightage of passenger to vehicle ridership is assumed to be equal, in accordance with FAST Act funding formulation. According to *Table 4-8*, MI has a below average state funding per ridership both in 2014 (MAP-21) and 2019 (FAST Act), while federal funding for MI in 2014 was above average and close to the average in 2019. This implies that the growth of federal funding received by MI is not mirrored by growth in state funding contribution. Another perspective of normalized funding would be from the basis of nautical miles served, but this question was not asked in the survey due to high variability in expected responses that would jeopardize quality of analyses.

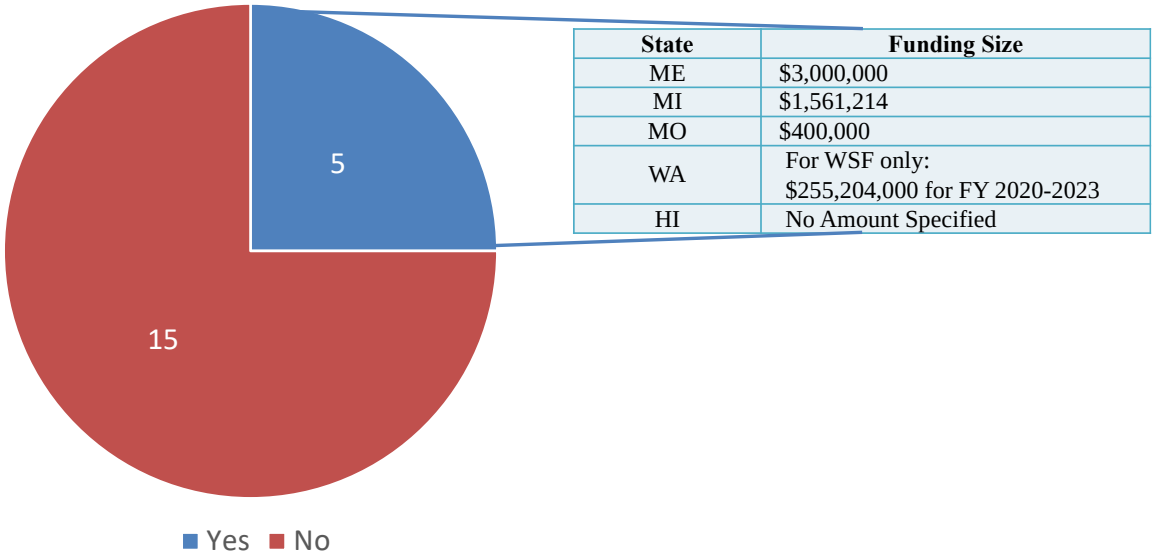
Table 4-8: Funding value per ridership (passenger + vehicle)

Year		VA	NC	MI	ME	NJ	WA	MO	AVG
2014	State Funding per Ridership	$3.96	$16.45	$1.67	$14.94	$0.09	$10.35	$2.02	$7.07
	Federal Funding per Ridership	$0.39	$0.59	$0.99	$0.99	$0.08	$0.68	$0.77	$0.64
2019	State Funding per Ridership	$4.27	$21.89	$1.47	$21.01	$0.17	$10.79	$3.86	$9.07
	Federal Funding per Ridership	$0.46	$0.65	$0.88	$1.39	$0.19	$0.70	$2.19	$0.92
2014	Total (Federal + State) Funding per Ridership	$4.35	$17.04	$2.66	$15.92	$0.17	$11.03	$2.79	$7.71
2019	Total (Federal + State) Funding per Ridership	$4.73	$22.54	$2.36	$22.40	$0.36	$11.48	$6.05	$9.99

The survey further explored topics regarding operational funding, including funding sources, key measures and eligibility criteria. At the time of survey execution, ferry operations had been detrimentally impacted in an adverse manner with demand destruction that comes with COVID stay-at-home orders and isolation mandates. Farebox revenue is a key source of operational funding for ferry operators, and there are still overhead costs that need to be maintained despite the absence of it. Therefore, the survey inquired state agencies if their state had any COVID relief funding provided to ferry operators. *Figure 4-10* shows that 15 states (75%) of respondents indicated their state have no such relief funding. The five states that had COVID circumstantial or relief funding are ME, MI, MO, WA, and HI.

Table 4-9 tabulates the most common source of federal funding that ferry operators in respective states receive. The list of options for the survey was generated based on funding sources listed available in NCFO survey reports. According to respondents, FBP is the single most

common source of funding, with other sources being the National Park Services (NPS) and various other formula grants or trust funds that have specific grant objectives and funding allocations for eligible ferry services. *Table 4-10* tabulates other sources of fundings beyond state and federal sources, that are being used for ferry operations. Most ferry operators rely on ticket fares (farebox revenue) as their main source of operational funding.



State	Funding Size
ME	$3,000,000
MI	$1,561,214
MO	$400,000
WA	For WSF only: $255,204,000 for FY 2020-2023
HI	No Amount Specified

Figure 4-10: Availability of COVID relief funding

Table 4-9: Most common federal funding sources

Fund Name	# Agencies
Ferry Boat Program	16
COVID Relief Program	3
National Park Service Funds	1
Transportation Trust Fund	1
Port Security Grant Program (Department of Homeland Security)	1
Congestion Mitigation and Air Quality Improvement (CMAQ) Program	1
Urbanized Area Formula Grants- 5307	1
US DOT Maritime Administration (MARAD)	1
State of Good Repair Grants- 5337	1
U.S. Postal Service Funds	0
Highway Trust Fund	0
Environmental Protection Agency (EPA)	0
Tribal Transportation Program (Bureau of Indian Affairs)	0

**3 agencies did not provide any information*

Table 4-10: Most common funding sources other than federal or state funding

Fund Name	# Agencies
Ticket Fares	10
Freight Fares	5
Private Postal/Delivery Service Companies	2
Private Contracts	1
Advertising Contracts	1
Public Contracts	0
City/County/Township Funding	0
Residents Associations	0

**7 agencies do not have such information*

Agencies were then asked to select key criteria being considered in granting state funding to ferry services. According to *Table 4-11*, operational assistance needs, economic growth, asset maintenance and aging infrastructure needs are the top key measures indicated to be considered in awarding state funding. Respondents were then asked to score each key criteria from a scale of (0: Not important), to (4: Very Important). The sum of scores for each funding criteria is tabulated in *Figure 4-11*. It is notable that the frequency of selection has a direct correlation to the weightage of funding criteria. While this is not necessarily the case for the rest of the funding criteria, the top three of highest-scored funding criteria are the same as the top three of highest selected criteria.

Table 4-11: Key measures considered in providing funding to ferry services

Criteria	# Agencies
Operational Assistance Needs	6
Economic Growth & Demands	5
Asset Maintenance & Aging Infrastructure Needs	5
Region Connectivity	4
Access to Education and Healthcare	3
Labor Productivity & Mobility	3
Growing Service Needs	3
Access to Natural Resources	2
Social Welfare & Social Service	2
Access to Freights, Goods, and Services	2
Federal Funding Formula	1

**8 agencies do not have such information*

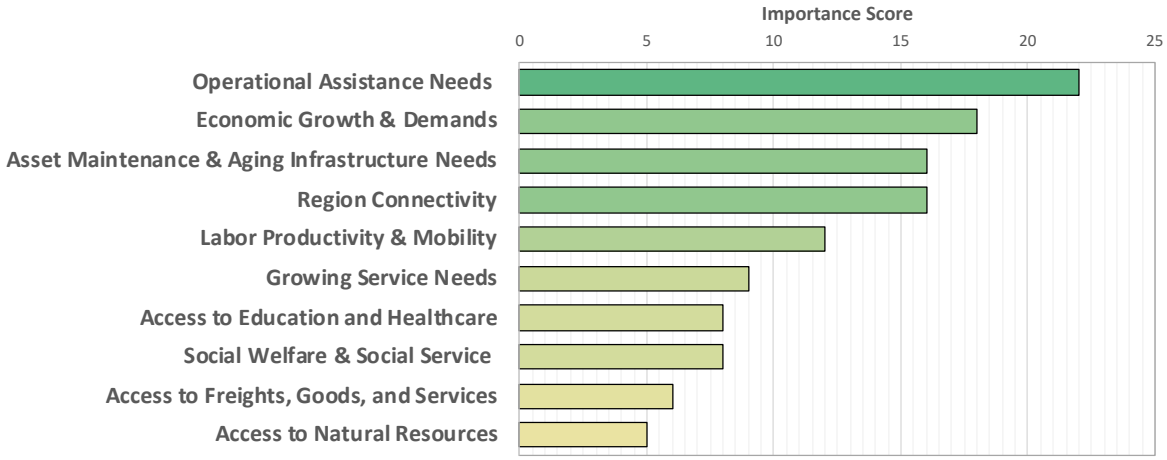


Figure 4-11: Total score of various funding criteria

The survey proceeded to inquire about funding growth expectations in upcoming years, where respondents were asked if they expect their respective state fiscal allocation towards ferry services would increase or decrease in upcoming years. According to *Figure 4-12*, four agencies (20%) indicated that they do not foresee any notable or drastic changes in funding levels, while six agencies (30%) expect funding appropriation for ferry services in their state to increase. Only one agency (5%) expected the budget to decrease. Nine agencies (45%) had no information either to expect for a budget increase or decrease in their states. Notably, NJ expects a 25% budget increase over the next three years, while WA expects a 15% budget decrease over the same period. Based on *Figure 4-8*, NJ is amongst the state with lowest state funding allocation per ridership, and WA has amongst the highest state funding allocated per ridership. This in part explains the directional budget increase and decrease NJ and WA may be expecting in the next three years. The survey further inquired about reasons for budget increase or decrease. *Table 4-12* and *Table 4-13* tabulates key reasons for budget size changes. It was noted that aging infrastructure was the top key reason for the budget increase, while general state budget size contraction being a key reason for the funding size decrease.

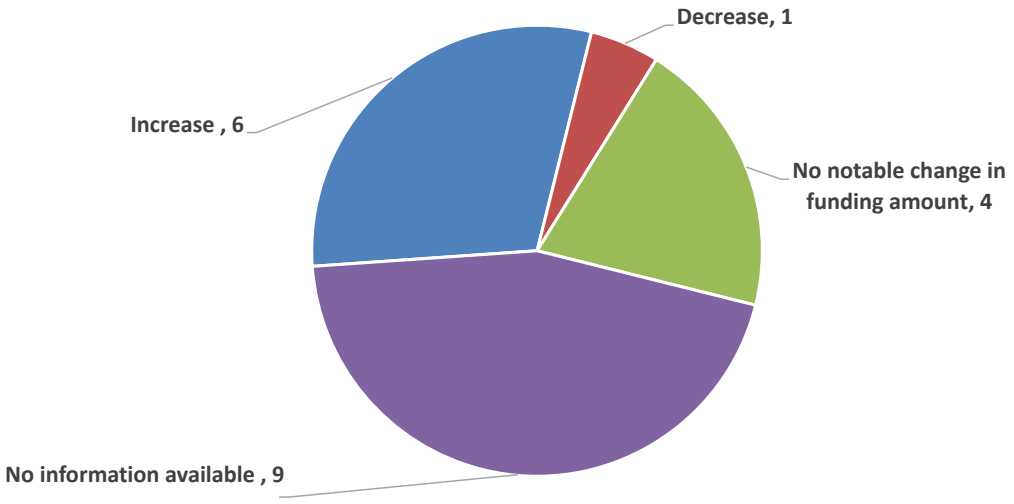


Figure 4-12: Budget size change expectations

Table 4-12: Reasons for the budget size increase

Reasons for Budget Increase	Number of Agencies
Aging Infrastructure	4
Economic Activity Growth	2
Increase Due to One-time Capital Investment for New Vessels	2
Higher Projected Service Demand	1
Targeting a Certain Level of Service (LOS)	1
Increase Due to One-time Capital Investment for Docks/Terminals	1
Increasing Labor Cost	1
Ad-Hoc Funding (i.e., COVID Funding)	1
General State Budget Expansion	0

Table 4-13: Reasons for the budget size decrease

Reasons for Budget Decrease	Number of Agencies
General State Budget Contraction	1
Lower Projected Service Demand	1
Targeting a Certain Level of Service (LOS)	1
Economic Activity Contraction	1

In summary, a vast breadth and depth of insights were obtained through the nationwide state DOT survey, including best practices in several key areas of interest in this project. A brief of the key survey findings are as follows:

Section 2 & Section 3: Governance

- Most agencies oversee only ferry operators that receive state/federal funding.
- Oversight is extended to certain private operators due to (i) service significance, (ii) broad oversight as public transportation in general, or (iii) oversight only on specific aspects of operation (i.e., state regulatory compliance).
- Ridership and operational data are generally not collected by state agencies, but they have the authority to request them if needed.

Section 4: Coordination & Operation

- The top three roles of state agencies towards ferry operators are (i) funding assistance, (ii) vessel/dock improvement procurements, and (iii) facility/infrastructure maintenance funding.
- 30% of agencies did not use any performance measure to monitor ferry services; the top measures used are ridership volume growth and service resiliency (% sailing cancelled/delayed).

Section 5: Ridership & Funding

- States with larger services to island residents did not experience much ridership drop during COVID (i.e., MI and ME).
- State/federal funding ratio for MI is vastly below average, implying other states are allocating larger state funding relative to federal funding.
- Total ridership for MI from 2014 to 2019 showed a relatively larger % growth compared to other states within the same period, but total funding did not grow as much.
- All agencies with funding information indicated they received FBP as main federal funding source, except for three agencies that did not provide any information. There is no other federal funding source that is equally utilized across all states- each state may utilize additional federal funding programs that fit their needs and special conditions.

- Other than federal or state funding, most agencies indicated they rely on ticket and freight fares (farebox revenues) to finance operations.
- Highest rated and most selected funding criteria for state funding allocation are (i) operational assistance need, (ii) economic growth & demands, (iii) asset maintenance & aging infrastructure need, and (iv) region connectivity.
- The top reasons for the expected budget increase for the next three years are due to aging infrastructure, followed by economic activity growth and new vessel capital investment.

CHAPTER 5 – FERRY USERS SURVEY AND ISLAND COMMUNITY INTERVIEWS

5-1- Ferry Users Survey

To better understand the mobility demands and unmet transportation needs of Michigan island residents, the research team conducted a survey with the residents and ferry users of Drummond, Neebish, Sugar, and Beaver islands (four main islands of interest in this study). This survey is necessary to obtain ground information regarding current services and identify ridership demands and expectations.

5-1-1- Survey Development & Administration

The questions and topics of survey questions were formulated based on the information obtained in *Tasks 1, 2, and 3* of the research plans. The drafted survey questionnaire was provided to MDOT RAP members for review and feedback. The essence of topics and questions inquired includes:

- Demographics and status as permanent/seasonal residence or tourist on the island
- Ferry user trip purposes, frequencies, modes, and other usage behaviors accounting for various seasons of the year
- Perception and experience of existing ferry services, and the satisfaction level across various aspects of service and operation
- Perception on the ideal role of MDOT and state authorities to island residents
- Environmental sustainability in ferry operations
- Other general comments on ferry services

The research team structured and planned for the survey distribution timing such that passengers in different seasons represented could be captured and represented. Survey distribution was of a hybrid composition including online-based and paper-based approaches. Upon MDOT RAP members' approval, the survey was developed on a web-based platform, Qualtrics- a similar platform used to conduct the nationwide state DOT survey (*Task 3*).

The online survey was distributed via various mechanisms, including through passenger mailing lists or ferry operators' social media, printing out QR codes of the survey link on a pocket-

sized card to be handed out, and handing out paper copies to be filled on the spot. For QR code cards (*Figure 5-1*), BITA and EUPTA administrators were proactive to facilitate the distribution of survey cards with each ticket purchase on their counters. QR code business cards were also distributed to individuals encountered on the islands. The online survey was kept open from May 2022 through July 2022, a total of three months of response collection.

For the paper-based approach in Beaver Island, the research team handed out paper surveys on board for ferry trips to/from the island, given the long ferry ride duration. However, for Sugar, Neebish and Drummond Islands, where ferry rides are less than 15 minutes, the paper copies were handed out during vehicle onboarding queues and collected upon getting off the ferry (*Figure 5-2*). Survey distribution timing was structured to cover daily peak and off-peak hours, as well as weekdays and weekend commuters. The intent was to capture various types of commuters with different trip schedules and purposes, to avoid skewed responses to only a certain segment of commuters and respondent demographics.

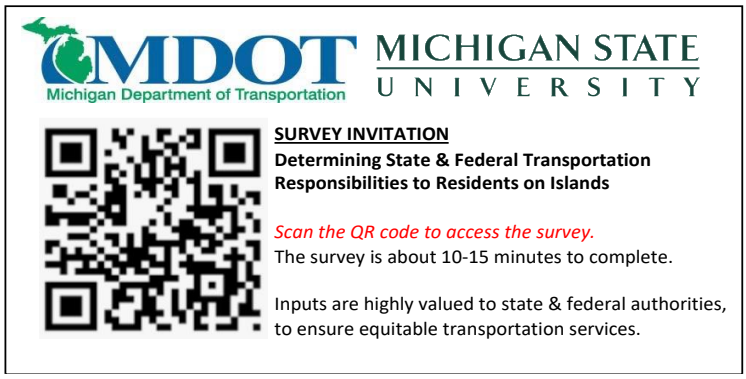


Figure 5-1: Online survey invitation via QR code cards

Figure 5-2: MSU research team distributing survey to vehicle queuing at Drummond Island dock

To supplement survey response representation and count, research team also distributed paper copies to resident's mailboxes on the islands. Through this combination of methods and distribution strategies, the research team aimed to capitalize on and capture as much ridership representation as possible. These suites of strategies were carried out on all islands and repeated for the spring and summer seasons. At the end of summer data collection, the research team determined that substantial responses had been obtained and had captured sufficient respondent demographics and user types. The on-site survey distribution schedule for each island is as per *Table 5-1*.

Table 5-1: On-site survey distribution mechanism and schedule

Season	Island	Mechanism	Date
Spring	Beaver	Ground Survey Business Owner Interview	May 12-14, 2022
	Sugar	Ground Survey	May 28-30, 2022
	Neebish	Ground Survey	
	Drummond	Ground Survey Business Owner Interview	
Summer	Beaver	Ground Survey	June 23-25, 2022
	Sugar	Ground Survey Business Owner Interview	July 7-9, 2022
	Neebish	Ground Survey Business Owner Interview	
	Drummond	Ground Survey Business Owner Interview	

Completed paper surveys were manually entered into Microsoft Excel, to match the formatting of online response tabulations. While there is less room for fraudulent and malicious response attempts (to skew response weightage) for paper copy surveys, online versions are prone to spam responses. The research team acknowledged the potential threats and risks of public online surveys, which the team had subsequently taken proactive measures to install response filtering and quality control measures.

To ensure the quality of online responses, several parameters have been set on Qualtrics settings pre and post survey. The Qualtrics settings are set to prevent multiple online submissions from the same device with submission times close to each other. Qualtrics system also has the capacity to detect bot responses- an automated process to submit responses multiple times- by analyzing respondents' browser, operating system, and approximate geolocation. However, this information is not made available to the research team, as it is merely part of the system algorithm and only marks responses as 'bot', if any. These measures are necessary to prevent or hinder fraudulent responses from respondents with malicious intents (if any), that could adversely skew response weightage and response representativeness. The research team has also set up post-survey response filtering criteria to remove duplicate responses with similar IP/geolocation and those with similar qualitative response inputs. Responses that have a response completion time below 120 seconds were also removed, as it is improbable to have read and navigated the whole survey with a complete response in less than 120 seconds. The research team also removed responses with completely empty demographic questions, as those responses would have no contextual value to the analysis.

5-1-2- Survey Findings

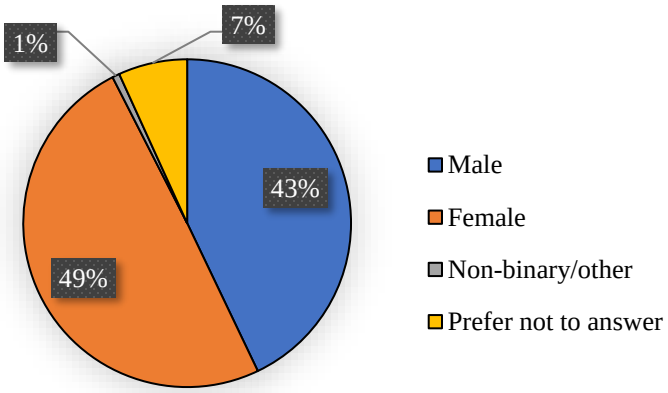
A total of 1,813 responses were collected from four islands of interest. After filtering incomplete or duplicate responses, 1,529 valid responses were used for further analyses. *Table 5-2* represents the distribution of survey responses among islands and survey types (e.g., paper and online) as well as comparing the number of responses with the islands' population as per census data. It is noteworthy that the total responses received may exceed the population in each island, given the survey is open to ferry users beyond residents only.

Table 5-2: Survey response count for each island relative to island population

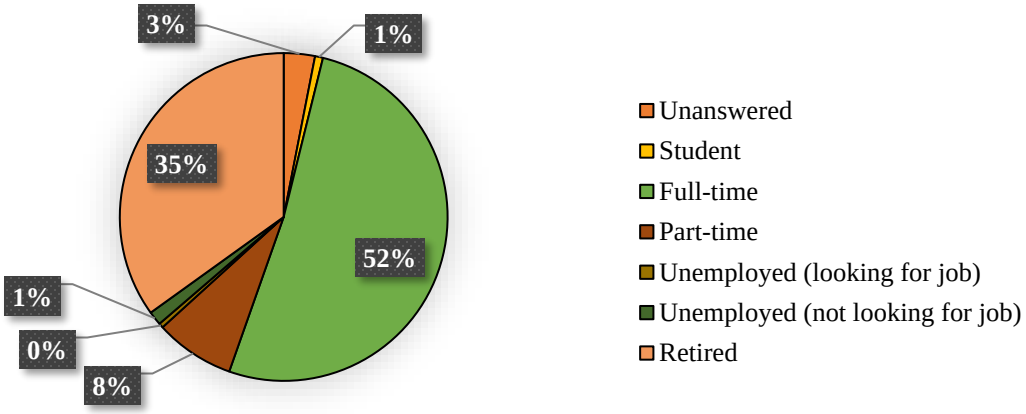
Island	Paper	Online	Total	Island Population
Drummond	82	472	554	1,058
Sugar	153	274	427	652
Beaver	75	344	419	657
Neebish	30	99	129	89
Total	**340**	**1,189**	**1,529**	**2,456**

Demographics

Respondents were asked to provide general socio-economic information including gender, age, employment, income, etc. *Figure 5-3a* shows the gender distribution of the respondents 92% of which identify themselves as male or female, while 1% select non-binary and 7% prefer not to answer. *Figure 5-3b* presents the employment status of the respondents, where most of them have full-time jobs or are currently retired (52% and 35%, respectively).



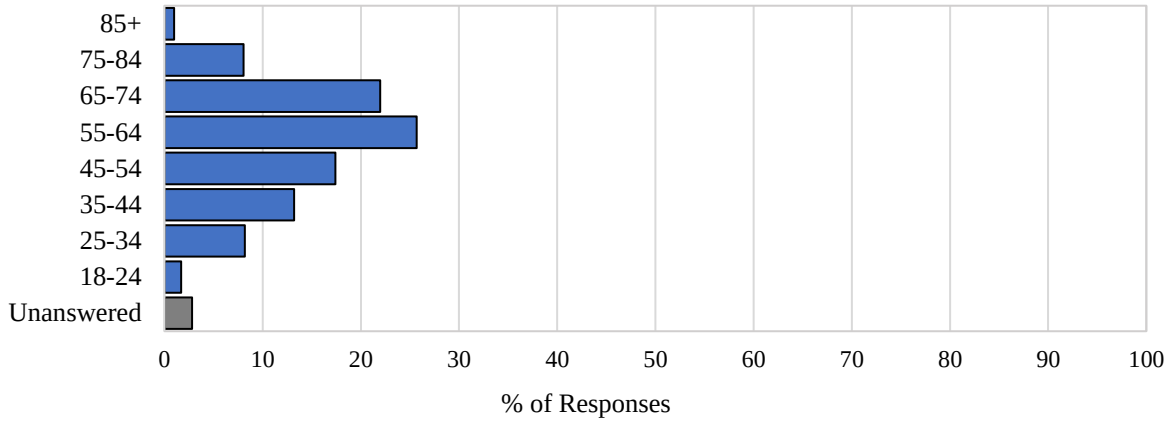
(a) Gender



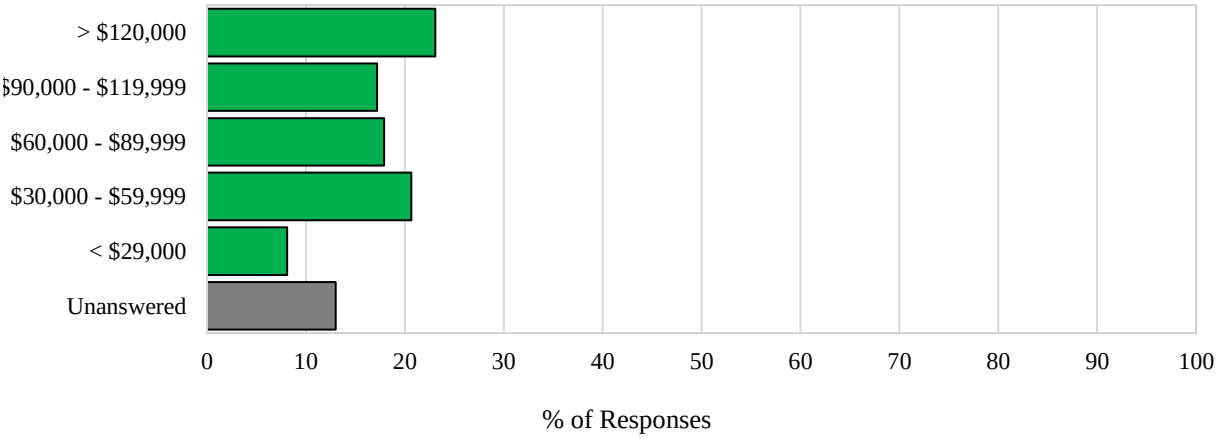
(b) Employment

Figure 5-3: Respondents demographics: (a) gender; (b) employment

Figure 5-4a depicts the distribution of respondents among different age groups. About half of the sample (i.e., 48%) are between 55 and 74 years old. *Figure 5-4b* shows the respondents' annual household income. Income distribution is mostly uniform, except that there are fewer respondents with income less than $29,000.



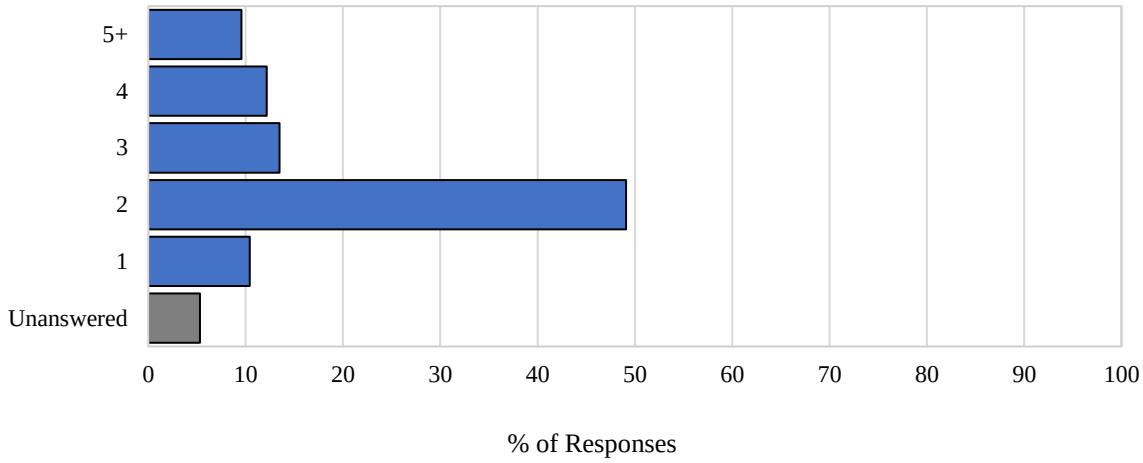
(a) Age group



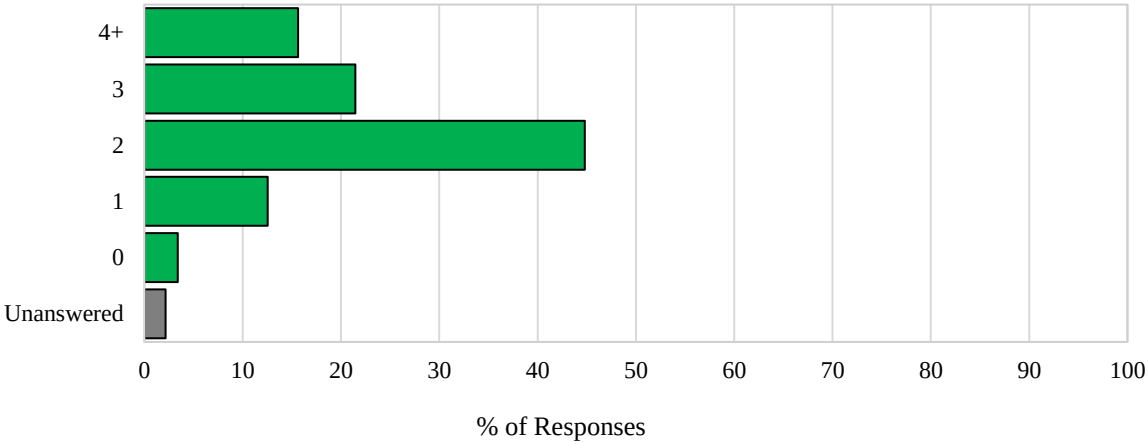
(b) Annual household income

Figure 5-4: Respondents (a) age, (b) income

Figure 5-5a illustrates the distribution of the number of people in households. The results suggest that two-person households are the most common (49%), followed by three and four-person households (25% combined). The proportion of households with only one occupant or households with five or more occupants are relatively low (10% each). *Figure 5-5b* displays the distribution of the number of vehicles owned by households. The data reveals that the majority of households (45%) own two vehicles, while only a small proportion of households (3%) do not own any vehicle.



(a) Household size



(b) Number of vehicles in household

Figure 5-5: Respondents demographics: (a) household size; (b) number of vehicles

Figure 5-6 displays the distribution of respondents' residency status across the four islands. In Beaver and Drummond Islands, the largest proportion of respondents are visitors, while in Neebish and Sugar Islands, seasonal and permanent residents are the largest respondent group respectively. Respondents who are employees on those islands are the smallest proportion of respondents on all four islands.

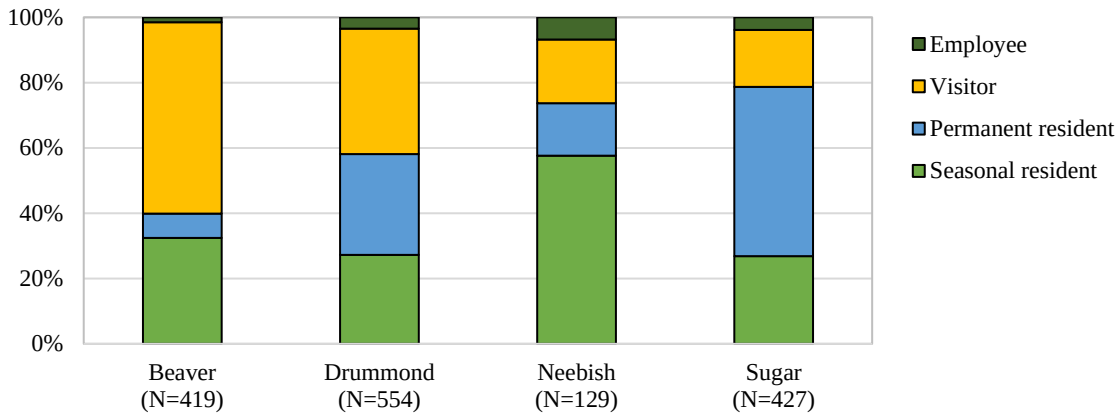


Figure 5-6: Residency status of respondents

Figure 5-7 displays the purpose of using ferry services. Overall, the most popular purpose for using ferry services is tourism, with the highest proportion among Beaver Island respondents at 46%. Access to services is also significant across all islands, with the highest proportion on Neebish Island at 20%. It is noteworthy that the purpose of commuting to work/daily activities have a relatively low percentage in all islands, except for Sugar Island, with the highest proportion at 22%. *Appendix D* illustrates more detailed results of the demographic profile of each island separately.

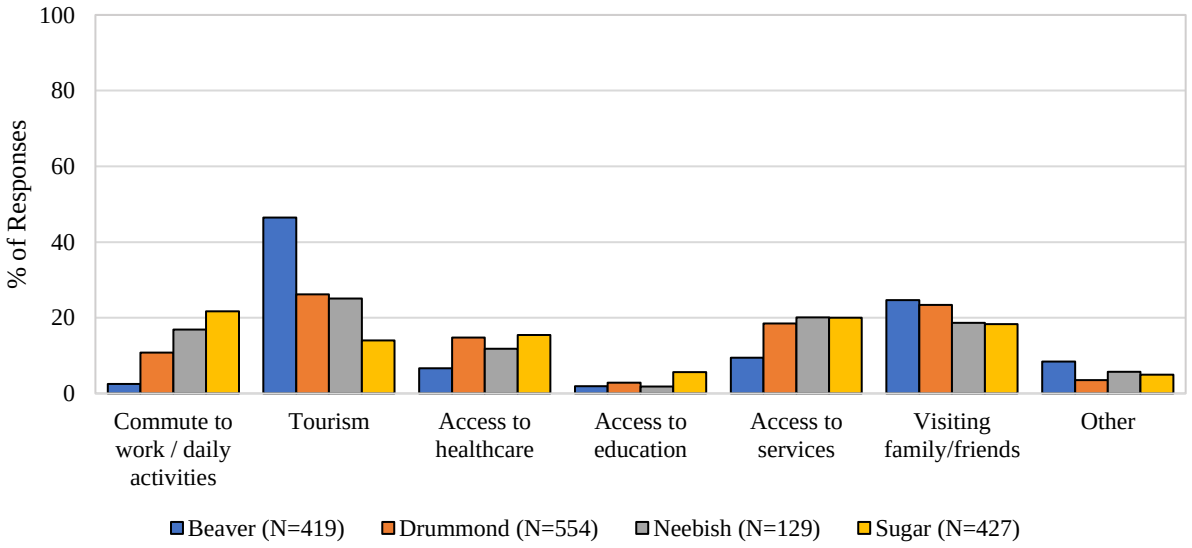


Figure 5-7: Purpose of using ferry services

Service Satisfaction

Respondents were also asked to provide their level of satisfaction with several aspects of the existing ferry services in all four islands. They rated each aspect from 1 (very dissatisfied) to 5 (very satisfied). *Figure 5-8* shows the average satisfaction rate per aspect for each island. It indicates that ferry services in Beaver and Drummond are generally rated higher than in Neebish and Sugar. Reliability, quality of vessels, ticket price, and accommodation for people with disabilities are all rated higher in Beaver and Drummond than in Neebish and Sugar. In terms of overall waiting, Beaver has the highest rating (most satisfaction), while the other three areas are fairly close. Overall, Beaver has the highest average rating across all measures, followed closely by Drummond, then Neebish, while Sugar Island has the lowest average ratings. For further detailed results of the service satisfaction, refer to *Appendix D*.

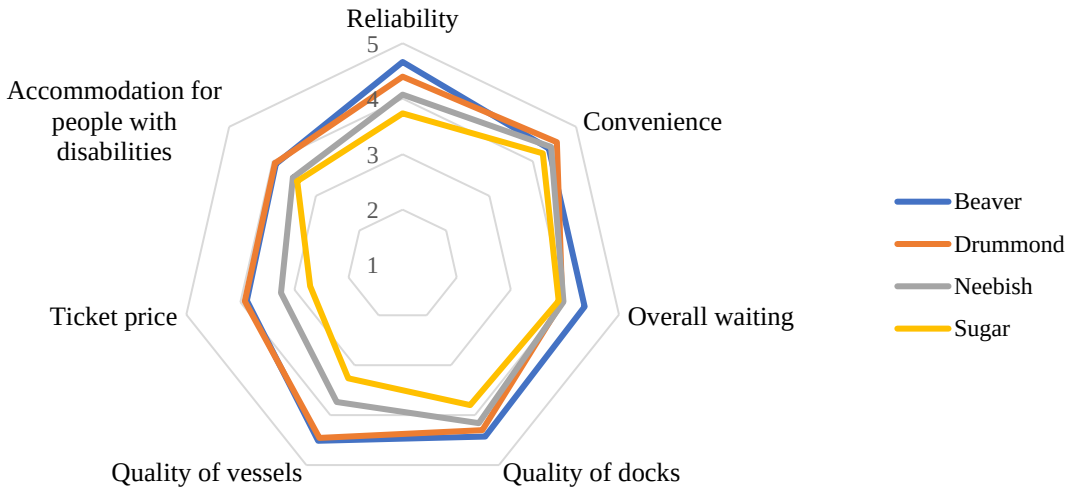


Figure 5-8: Level of satisfaction with ferry services

Users' Opinion

Respondents were also asked to provide their level of agreement with statements regarding the adequacy or quality of the ferry services. They rated each statement from 1 (totally disagree) to 5 (totally agree). *Figure 5-9* illustrates the average level of agreement per statement for each island. Key findings from users' level of agreement are listed as follows:

- Overall, respondents seemed to agree that frequency on weekdays is adequate. The highest rating is for Drummond Island, while Neebish Island has the lowest rating. Respondents are slightly less positive about the adequacy of frequency on weekends. For weekends, Sugar Island has the highest rating, and Neebish Island has the lowest rate.
- Respondents generally felt that the terminals are accessible via public transit. The highest agreement was in Drummond Island, while the lowest agreement was again in Neebish Island.
- When it comes to paying extra for more frequency or vessel quality, ferry users across all four islands seemed to disagree. Sugar Island ferry users show the highest disagreement, while Beaver users are more interested in paying extra for either more frequency or vessel quality.
- All EUPTA users agreed that a 24/7 ferry service for emergency situations is needed. While Beaver Island ferry users showed less agreement on this statement, mainly due to a longer ferry travel distance for Beaver Island compared to the other ones.

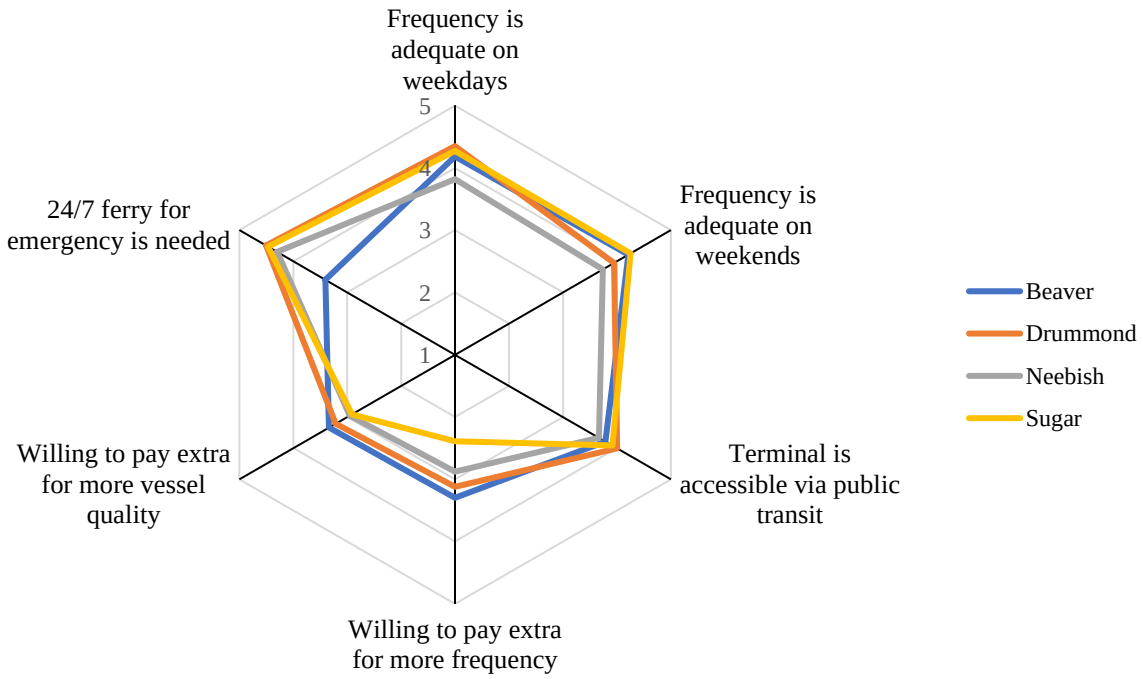


Figure 5-9: Users' opinion on ferry services

Service Inconvenience

Ferry users were also inquired about how often they experience different types of inconvenience. They rated each at 1 (never), 2 (rarely), 3 (occasionally), 4 (often), and 5 (very frequently). *Figure 5-10* presents the average frequency of each type of incidence per island. It

seems that Sugar Island ferry users have generally experienced more inconvenience, while Beaver Island users are least impacted by these inconvenient occasions. Results are consistent with demographics since Sugar Island respondents are mainly permanent residents while Beaver Island respondents are dominantly tourists. Thus, Sugar Island users are prone to have unpleasant experiences more frequently. The most frequent inconvenience of all is being unable to get onto the ferry due to full vessel, which has almost the same frequency for all three EUPTA services. For further detailed results, refer to *Appendix D*.

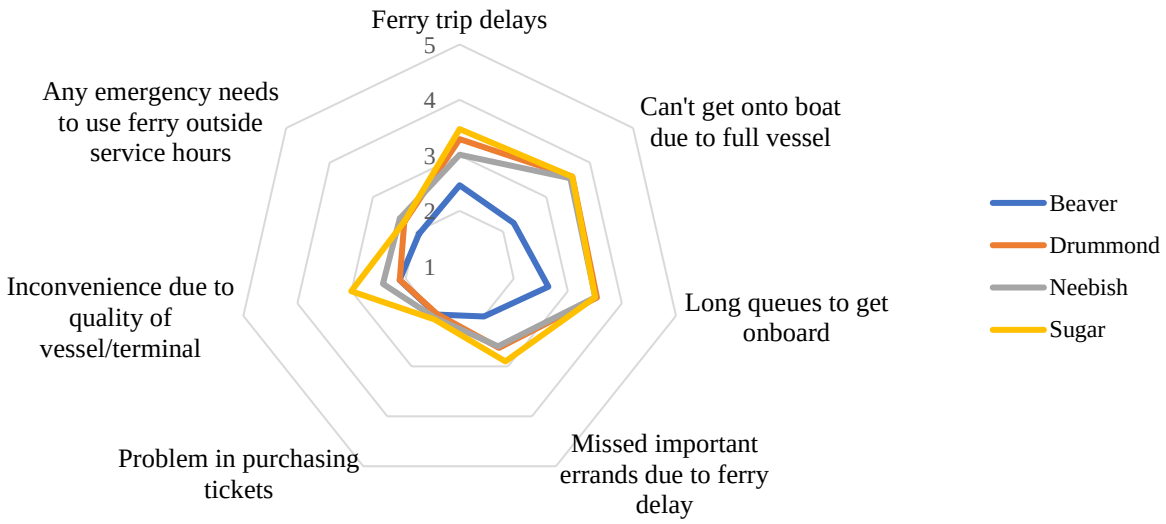


Figure 5-10: Frequency of inconvenient experiences

MDOT Role

Respondents were also asked to indicate their opinion regarding MDOT's role in funding ferry services. They disclosed their opinion by selecting one of the following options: being indifferent, partially fund all islands, partially fund selective islands, and not fund any ferry services. Overall, most of the respondents believe that MDOT should fund ferry services. However, Beaver and Drummond Island users showed more interest in partial funding of selective islands. This might be due to their confidence in the importance of ferry services for Beaver and Drummond Island, which would most likely be qualified as selected islands to receive MDOT funding. On the other hand, Neebish and Sugar Island users are more toward partially funding of all islands. A sign that they presume Neebish and Sugar Island might be among those islands that will not receive funding

if MDOT chooses to fund selective islands only. *Figure 5-11* summarizes these results for each island, where "N" denotes the number of responses received.

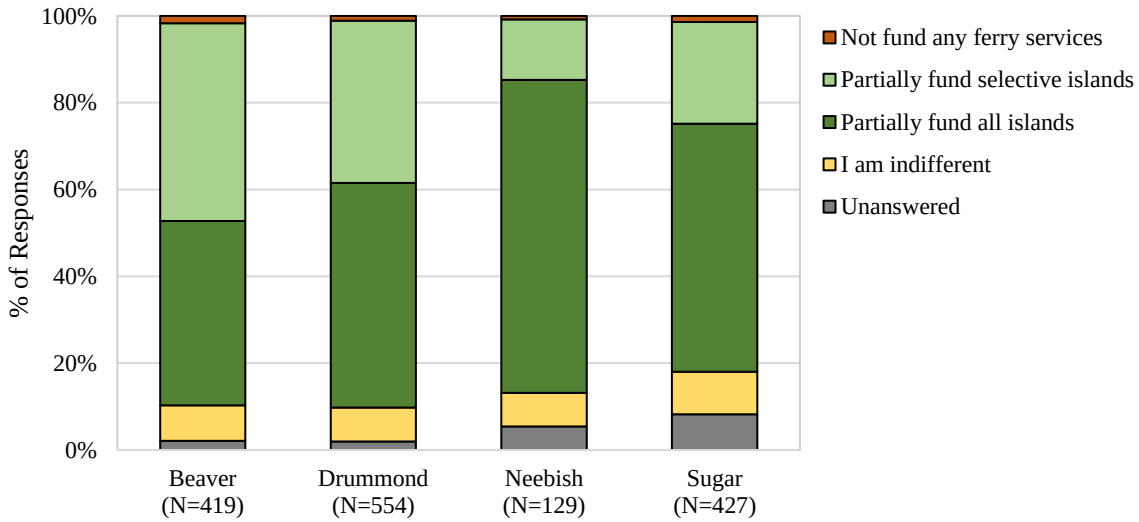


Figure 5-11: MDOT role in funding ferry services

Sustainable Future

Sustainability of the ferry services was another topic that was explored from users' point of view. First, the survey respondents were asked if they agree vessels should be upgraded to become more environmentally friendly. As shown in *Figure 5-12*, most of the users in all four islands stated that they neither agree nor disagree with the requirement of such an upgrade, while 20 to 30 percent of respondents agree with such upgrades. The level of disagreement (somewhat disagree and strongly disagree combined) is much higher for the Beaver Island ferry users compared to EUPTA users. One possible explanation can be that Beaver Island users are mainly tourists; thus, they have less concern about the future of vessels compared to EUPTA where users are more attached to ferry services. Second, respondents were asked to indicate the percentage of fare increase they are willing to pay to fund the sustainable upgrades. 669 out of 1,529 respondents stated that they are willing to pay some extra fare for these upgrades. *Figure 5-13* represents the number of respondents in each interval of fare increase percentage. For instance, as per second interval, 96 respondents are willing to pay 21% to 40% extra fare for sustainable upgrades.

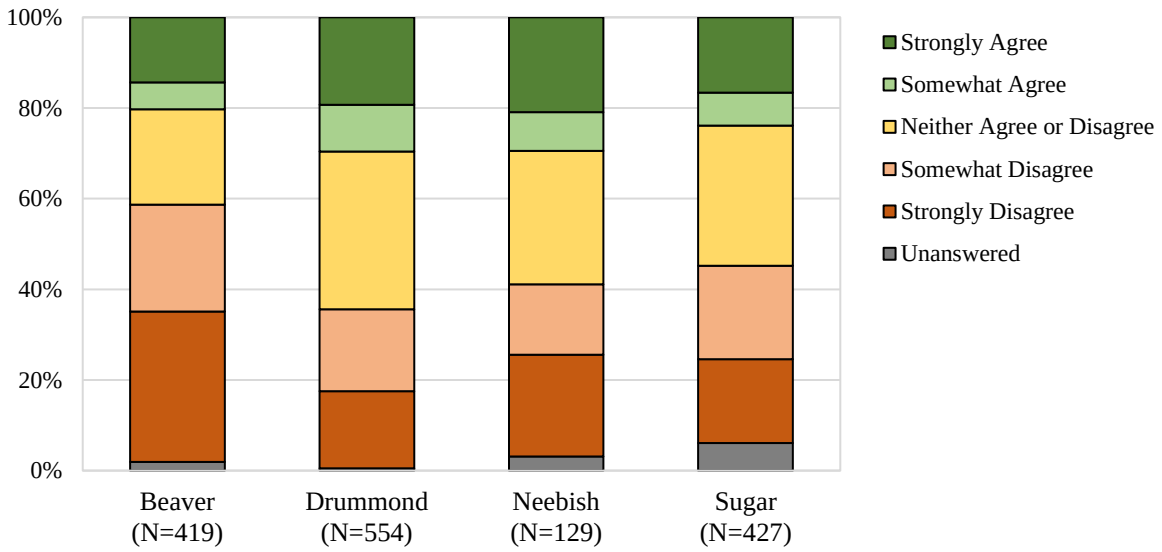


Figure 5-12: Users' opinion toward upgrade to more environment-friendly vessels

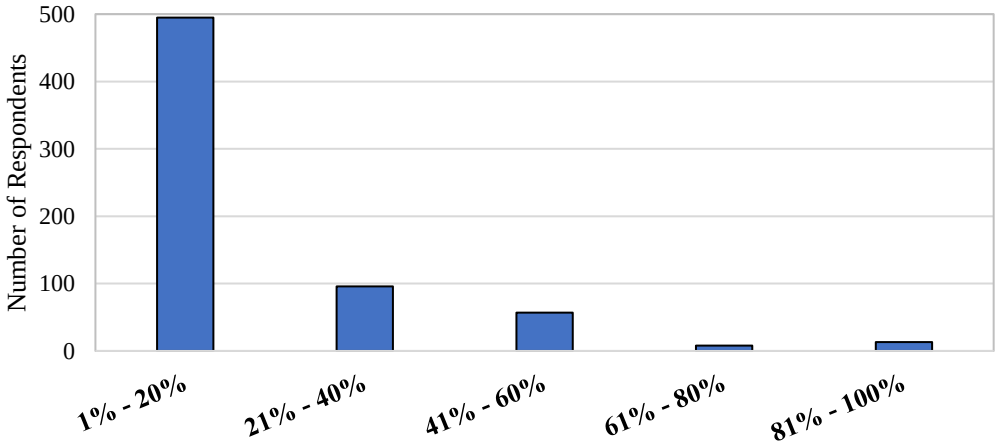


Figure 5-13: Users' willingness to pay extra fare for environment-friendly upgrades (N=669)

5-1-3- Cross Analyses of Survey Results

This section presents some cross-analyses of the data collected through the ferry user survey. These analyses help better understand the interrelation between demographics and user's opinions, satisfaction, experience, etc. *Table 5-3* lists cross-analyses conducted and the corresponding figure number, and the major findings of each analysis.

Table 5-3: Ferry Users Survey Cross-Analyses

Category	Cross Analysis	Figure #	Findings
MDOT's role in supporting island residents and visitors	Age	*Appendix D-10*	No significant difference among the age groups.
	Annual household income	*Figure 5-14*	Users with annual household income more than $120,000 are more in favor of partially funding selective islands.
	Type of residency on island	*Appendix D-11*	Tourists are more inclined towards partially funding of selective islands.
Vessel upgrade to be more environmentally friendly	Gender	*Figure 5-15*	Females and non-binaries are more in favor of the sustainable vessel upgrades.
	Age	*Appendix D-12*	More agreement/less disagreement among middle age groups.
	Annual household income	*Appendix D-13*	Higher the income, higher the disagreement with requirement of vessel upgrades.
Service satisfaction	Type of residency on island	*Figure 5-16*	Tourists are more satisfied overall. Permanent residents are least satisfied with most aspects.
	Type of respondents	*Appendix D-14*	No significant difference in satisfaction of foot passengers vs. vehicle passengers.
Satisfaction with ticket price	Annual household income	*Figure 5-17*	Lower the income, higher the dissatisfaction with ticket price.
	Annual household income (permanent and seasonal residents)	*Appendix D-15* *Appendix D-16*	Permanent residents are overall less satisfied with ticket price compared to seasonal residents
Satisfaction with convenience to access to docks/terminal	Age	*Appendix D-17*	Older the age group, higher the level of dissatisfaction with convenience of access to docks.
Satisfaction with accommodation for people with disabilities	Age	*Figure 5-18*	Older the age group, higher the level of dissatisfaction with accommodation for people with disabilities.
Type of residency on island	Purpose of using ferry services	*Figure 5-19*	Permanent residents are more concerned about commute to work and access to healthcare and education.
Agreement on "24/7 emergency services are required"	Type of residency on island	*Figure 5-20*	Permanent residents expressed the highest level of agreement with requirement of having a 24/7 emergency ferry.
Experience of "emergency needed out of service hours"	Type of residency on island	*Figure 5-21*	Most users never experienced emergency needed out of ferry service hours, but those who have had such experience are distributed almost the same across all type of residency

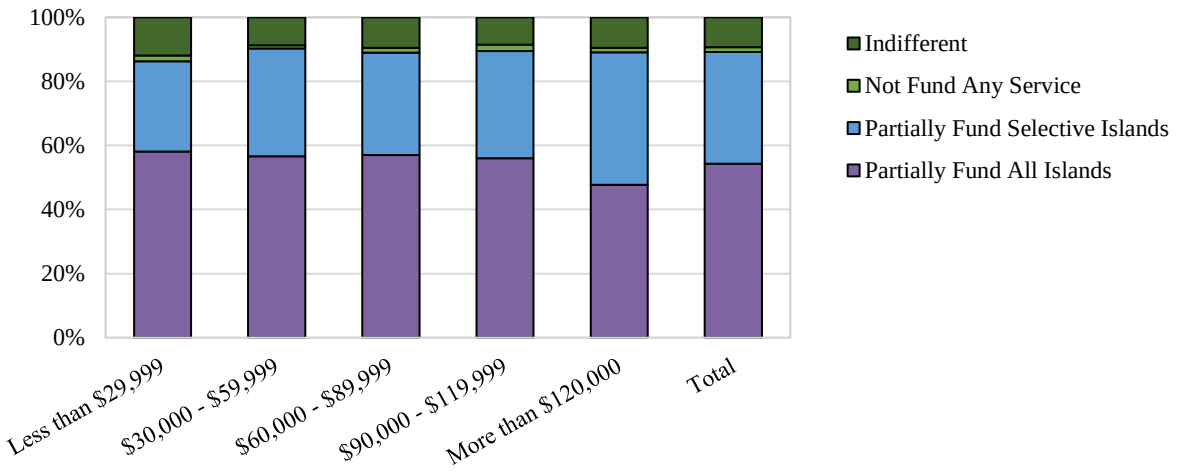


Figure 5-14: Users' opinion on MDOT role in funding ferries vs. annual household income

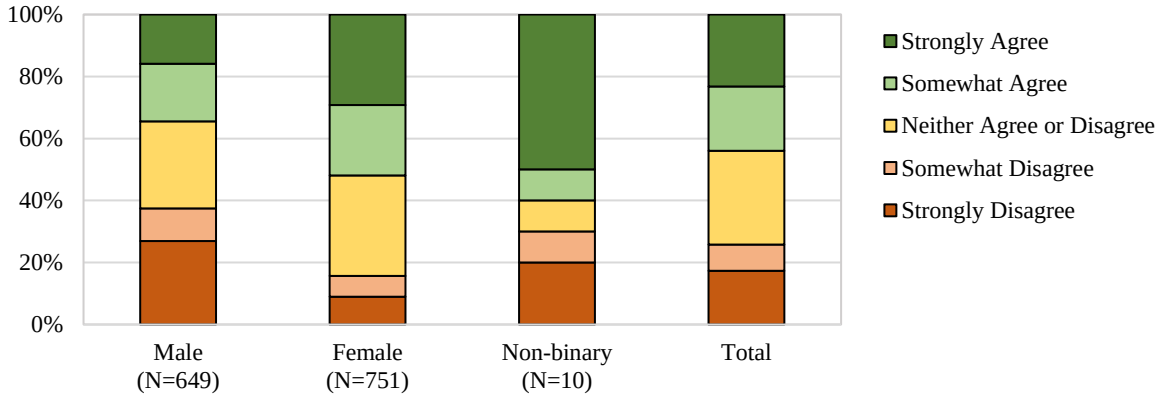


Figure 5-15: Users' opinion on vessel upgrade to be more environmentally friendly vs. gender

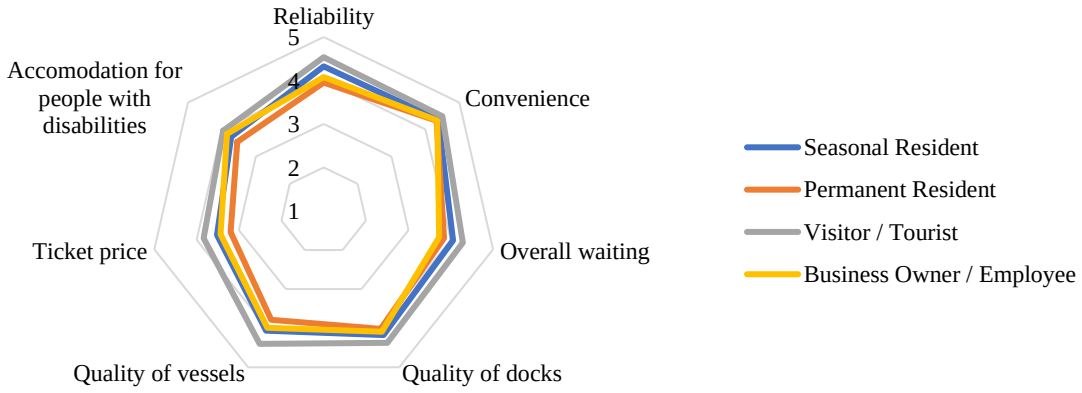


Figure 5-16: Users' satisfaction vs. type of residency on island

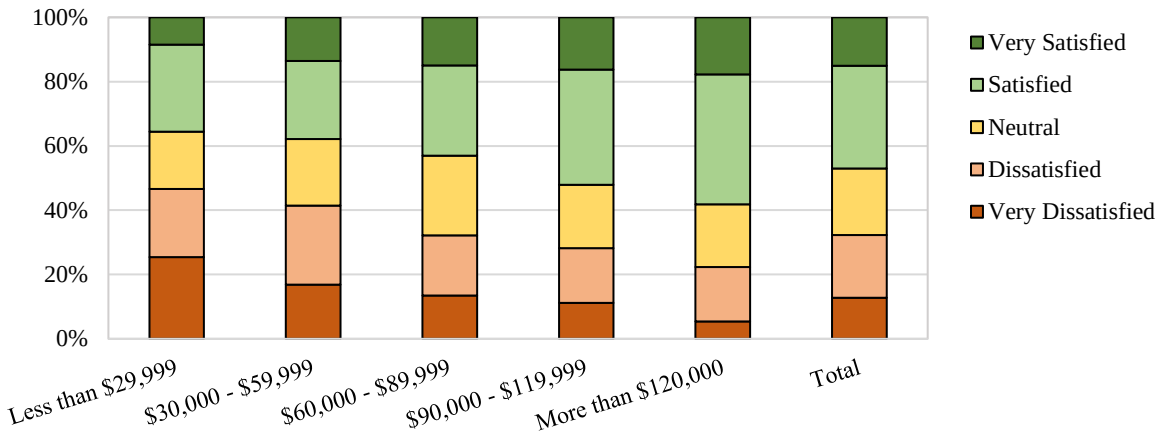


Figure 5-17: Users' satisfaction with ticket price vs. annual household income

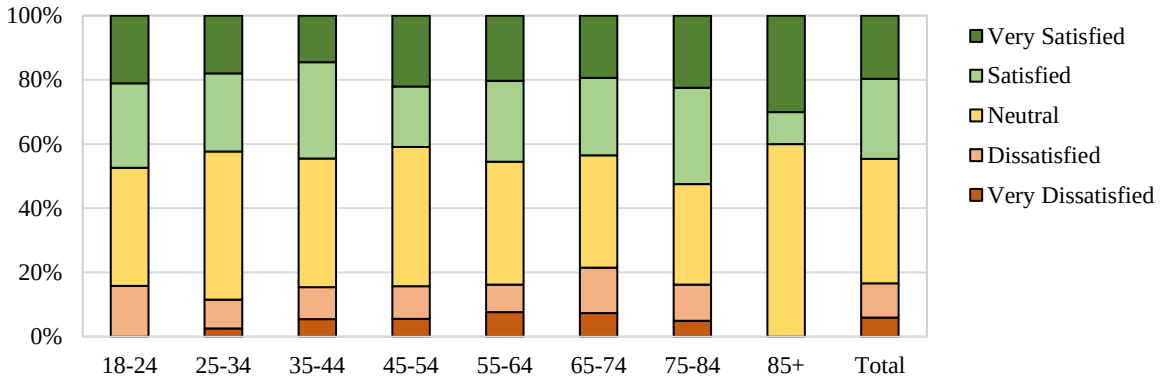


Figure 5-18: Users' satisfaction with accommodation for people with disabilities vs. age

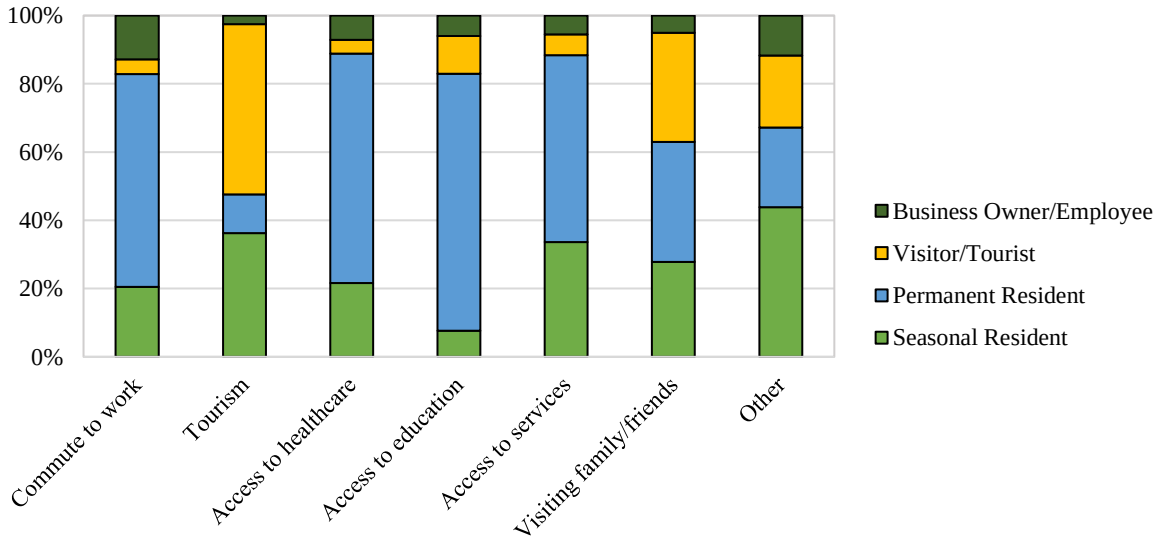


Figure 5-19: Purpose of using ferry services vs. type of residency on island

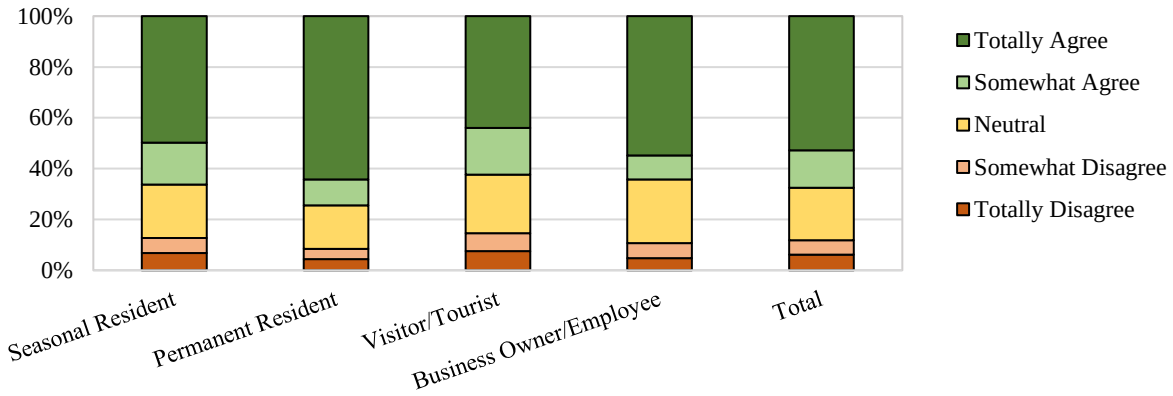


Figure 5-20: Users' agreement on requirement of having 24/7 emergency ferry services vs. type of residency on island

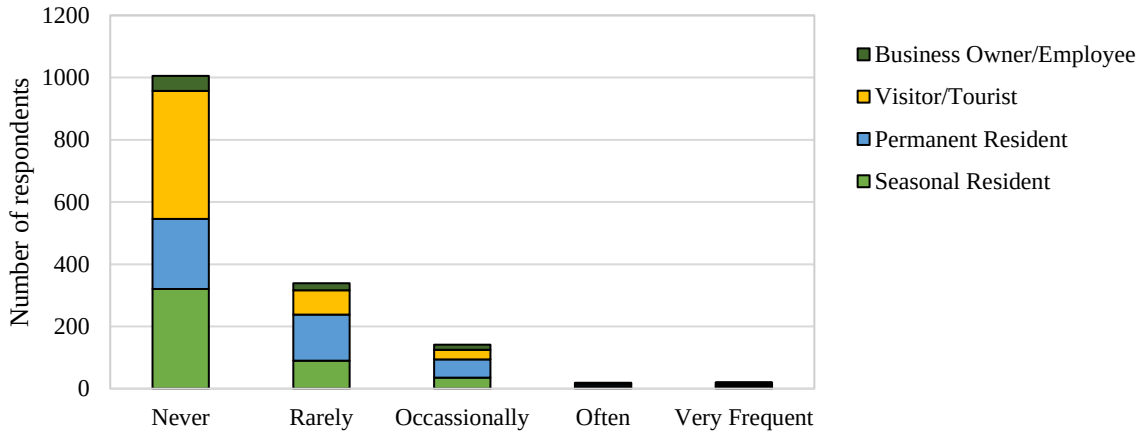


Figure 5-21: Users' frequency of experienced emergency out of service hours vs. type of residency on island

5-1-4- Qualitative Responses & General Comments

The survey also contained sections where respondents could provide qualitative comments on diverse topics. While qualitative responses were made optional, they provided valuable insights to the research team on key issues and concerns for users. Responses presented in this section are clustered together in common topics and paraphrased for conciseness. Note that the responses provided are of anecdotal opinions, and not of the research team's observation and analyses findings. While all comments have been accounted for analysis, actual findings may or may not support those anecdotal claims. Responses are summarized for each island in *Table 5-4* through *Table 5-7*.

Since Sugar, Neebish and Drummond Islands are managed by EUPTA, there were general comments that are not island-specific, rather to the whole operation. The following comments around EUPTA's general operation were recorded, categorized, and paraphrased:

- The decision to consider similar fare rates across all three islands needs to be reevaluated, given the different operating costs and economic context of each island. There is a sentiment that Sugar/Neebish residents have been subsidizing services to Drummond Island
- Prices for ferries are perceived as too high, and EUPTA should consider not using external funding to subsidize bus operations that have low utility and allocate more funds for ferry services.
- Priority loading lanes should be considered (e.g., for residents, medical trips, etc.). Some residents are willing to pay extra, especially during heavy summer queues.
- There is a small segment of residents (mainly Neebish Island) that expressed a certain level of distrust towards current EUPTA management.
- EUPTA should reinstate discounted fares for disabled people, as they are also on fixed income just as senior citizens.
- Currently EUPTA offers discounted fare through commuter/bulk tickets. Discounted fare rates should be considered for property taxpayers or year-round residents, without the need to purchase bulk tickets.

Table 5-4: Beaver Island survey qualitative responses summary

Category	Responses
Infrastructure	- Dock on the mainland is very **congested** (constricted access, inconvenient & expensive parking). - Need more covered waiting space outside in Charlevoix dock.
Vessel	- **Small vehicle capacity**, which sometimes requires booking months in advance.
Services	- **Service quality in general is considered adequate** and reliable, with the exception for **low-capacity freight transport.** - **Inconvenient low frequency schedule**, especially when vehicle queue could require more than 1 sailing per day.
Ticket	- Various **additional charges rack up cost** easily (pets, coolers, bicycles, etc.). - Helpful to have **senior discounts** during off-peak season. - **Freight charges are high**, especially when most goods need to be imported from the mainland to the island. - Should **consider resident-pricing** for tickets (regular commutes / property taxpayer discounts). - Should **consider lowering cost to bring in bicycles/motorcycles** to reduce vehicle loading congestion.
ADA	- The **Beaver Islander is not ADA friendly**. Emerald Isle has accommodations due to larger size. Commuters would have to work around the schedule. - An **alternative boarding method** is needed for those who can't get up long stairs.
Miscellaneous	- **24/7 emergency crew is not necessary**, given long sailing time and availability of air transport.

Table 5-5: Sugar Island survey qualitative responses summary

Category	Responses
Infrastructure	- Mainland **queue line is dangerous**- confusing road lines, queue building up into incoming traffic. - Ramps often break down & pose frequent downtime and monetary losses. Need backup hand-hoisted ramps. - Need **better ice-breaking equipment.**
Vessel	- Sugar Islander II has been in dry dock since July/August 2021. **Loan vessel from Drummond Island is not capable of. efficient maneuvers**, of smaller capacity and has made the service very unreliable. - **Dry-docking** should not be done in the summer.
Services	- **Winter services have generally improved** in recent years. - **The ferry is constantly full** during typical work and school commute hours, and not able to maintain a timely schedule. - **Service reliability and quality have not been in line with fare rate increases.** - There is significant enough population size to **consider 24/7 ferry runs.**
Ticket	- Punch tickets should never expire (or at least their **validity duration should be extended).** - The last **rate hike (100% increase) was unfair to people with fixed income** and senior citizens. - **Prices are too high**, and people living nearby (on mainland) avoid going to the island due to this reason.
ADA	- **No accommodation and access for passengers on wheelchair** (as passenger seating area is upstairs) and there are safety concerns for remaining downstairs at the vehicle area (open area).
Miscellaneous	- The crew does a **great job accommodating emergency runs** whenever needed. - When Coast Guard breaks up ice up-stream for Canadian cargo freights, there will be ice jams at Sugar Island crossings and **causes service interruption.**

Table 5-6: Neebish Island survey qualitative responses summary

Category	Responses
Infrastructure	- **Portable potties are recently added** on the mainland and island, which is a huge convenience given the long queue.
Vessel	- Vessel **capacity is too small**, that captain needs to do a second sailing to pick up residual queue, since sailing is every 2 hours.
Services	- **A more frequent schedule** is needed; the current schedule makes it impossible to have a regular day time job, and children can't participate in school activities. - People have moved out of this island because ferry **schedule makes it hard for them to get a job**. - Service **schedule needs to consider real-life needs**. E.g., the school bus arrives at the dock at 4.20pm, but since the ferry is scheduled to run at 4.15pm, kids must wait for 2 hours till the next run. - Had several incidents where **captain made unilateral decision** about ice condition and refused to run the ferry.
Ticket	- Ticket **validity period is too short.** - Neebish has the shortest ferry run compared to Sugar and Drummond, yet they pay the **same ferry rate.** - Current **pricing is discriminatory against residents on fixed income**, and below poverty line (which a handful of Neebish population is).
ADA	- **No special consideration towards people with disabilities or medical conditions**. Many have missed medical appointments due to sparse and unreliable schedule.
Miscellaneous	- Neebish Island ferry is the only service **contracted out by EUPTA**, thus employees are not entitled for the same benefit and are not held to EUPTA's quality standards. - A considerable number of **personal complaints towards the captain and certain deckhands** with unfavorable attitude. - **Some people have moved off the island** to avoid dealing with the captain who controls the ferry runs. - **Emergency runs are available as needed**, as the captain lives near the dock. However, the captain picks and chooses, when someone with an emergency need requires a sailing.

Table 5-7: Drummond Island survey qualitative responses summary

Category	Responses
Infrastructure	- **Queue buildup** on the island and mainland sometimes **impede regular road traffic.** - Need **more portable toilets** to accommodate waiting times in long queues.
Vessel	- **Vessel condition** is deemed acceptable. - Should **avoid vessel inspection during summer**.
Services	- Ferry **frequency is generally adequate**, except for weekends and peak season. - The ferry **schedule is extremely reliable** and predictable. - **Wait time is unbearable** on weekends and peak season. - Used to run on 2 vessels, but currently, one of them is on loan to Sugar Island, which renders **current service inadequate.** - Drummond relies on tourism economy; **long wait time is a huge deterrent for a conducive tourism.** - **Priority lanes for residents, and emergency trips** should be considered in peak seasons.
Ticket	- Ticket price is acceptable, but **punch ticket validity needs to be extended.**
ADA	- The way vehicles are cramped on the boat makes **it dangerous for people with disability to get out of vehicles** in the case of an emergency.
Miscellaneous	- **Favorable comments on captain and deckhands**: friendly, accommodative, and skillful. - **Emergency 24/7 service is currently available** upon request and must be maintained that way.

Another aspect of the survey question intended to understand the perceived ideal role of MDOT, or state authority, towards mobility welfare of island residents. Graphical representations of survey responses are displayed in *Figure 5-11* and *Figure 5-14*. Respondents were given the option to provide additional comments to follow through with their chosen answers. Comments in regard to MDOT's role are summarized and paraphrased below:

- Island residents are taxpayers and should be able to enjoy affordable public transportation, just as those living on the mainland.
- MDOT should consider contributing to ferry services similar to its contribution to bridges and other transportation infrastructure.
- Ferries are a key link in the transportation system for island residents; thus, operational subsidies are vital to maintain the affordability and quality of their services.
- Island communities accommodate tourism activities that generate revenue for the state. Thus, MDOT subsidies for ferry services are needed.

- The current funding level is inadequate (for EUPTA), as rates are not affordable for some regular commuters (this would most likely be exacerbated in the future due to recent gas price increases).
- Funding a bridge for shorter commutes with high demand like Sugar Island should be considered as an option.
- Given the limited availability of medical, retail and education centers on islands, ferry service is the only way to access these basic needs- thus needs to be affordable.
- According to about 1% of respondents, it is not the government's responsibility to subsidize the cost, as people live on these islands based on their choice. Some residents prefer to not have MDOT involved, to avoid management politics and operational bureaucracies. However, this is not consistent with the majority of responses received via the survey.

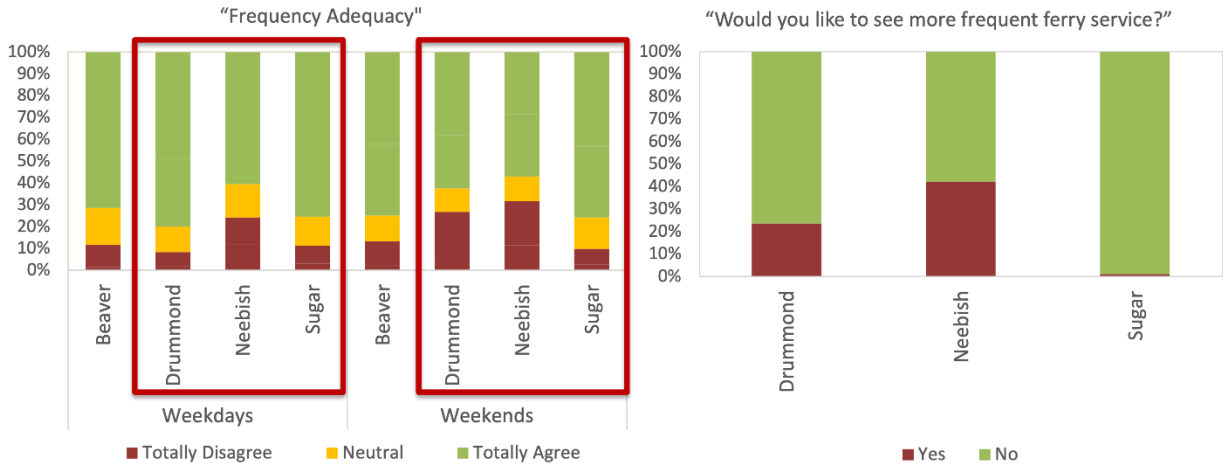
5-1-5- Ferry Satisfaction Surveys in other States

In this section, results obtained from conducted ridership surveys are compared with previously conducted surveys in the state of Michigan and other states. This comparison provides insights on spatial and temporal variations in ferry service quality. While the survey in this study is not meant to be a follow-up to previous surveys, a comparison can be drawn to observe how ferry users' general satisfaction has changed over time. The research team gathered the most recent passenger surveys available for Beaver, Sugar, Neebish, and Drummond Island, and identified comparable questions and statistics. Main source of survey results for Sugar, Neebish, and Drummond Islands are obtained from a 2007 study of St. Mary's River Ferry System Master Plan (*44*), while survey results for Beaver Island were obtained from a Transportation Coordination Study conducted in 2004, and another similar survey conducted in 2021 (*38*, *45*).

In tandem to comparison with previous studies in Michigan, the research team also expanded the comparison initiative to other states beyond Michigan. The objective is to understand how ferry service satisfaction in Michigan compares to general ferry service satisfaction in other states. The research team selectively identified well-established ferry satisfaction surveys from states that had responded to the nationwide state DOT survey (*Task 3*). Given each ferry operation across the nation and island communities being served are unique from each other, comparison results are viewed simply as a broad barometer of relative service satisfaction and to identify key trends and insights.

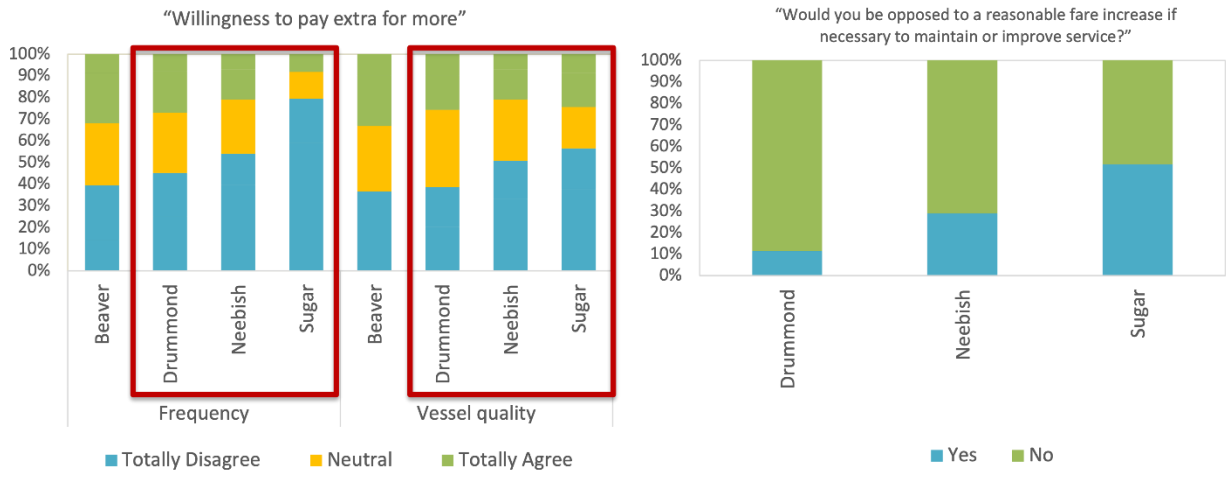
Comparison with Previous Michigan Surveys

The 2007 St. Mary's River Ferry System Master Plan report contains a short 10-question survey to gauge ferry service adequacy and the economic impact of ferry services at large. The survey was not designed as a ferry satisfaction survey. However, there are comparable questions that can be observed, such as service adequacy for Sugar, Neebish and Drummond Islands. *Figure 5-22* shows service adequacy for each island. It can be observed that relative to each other, Sugar Island's service frequency is the most adequate one in both surveys, followed by Drummond and Neebish. In 2007, over 40% of Neebish Island passengers indicated the need for more service frequency; however that number had dropped to 20% based on the current survey. Another comparable aspect of the survey is when respondents were asked about their willingness to pay more for an improved service quality, service frequency, or vessel quality. According to *Figure 5-23*, Similar trends were observed in both surveys, where Sugar Island users were most hesitant to undergo fare rate hikes for improved service, followed by Neebish, then Drummond. This is due to the nature of ridership profiles of each island, where Sugar and Neebish ridership are primarily of regular commuters who value affordable service price over service quality, while Drummond ridership have a higher mix of non-residents, who may value better quality at a marginal fare rate increase.



(a) (b)

Figure 5-22: (a) Service frequency adequacy from current survey, (b) Service frequency question from 2007 survey



(a) (b)

Figure 5-23: (a) Willingness to pay more for increased frequency or vessel quality based on the current survey, (b) Willingness to pay more for improved service based on the 2007 survey

Another aspect of the 2007 survey that is comparable with the current survey is the qualitative portion, where respondents were given a chance to state additional comments and general service satisfaction. The research team identified common recurring themes that exists in both 2007 and current surveys. Notable comments for each island include:

Sugar:

- "Fares too high for people who work every day in town."
- "No expiration date on tickets."
- "Passes should not expire in six months."

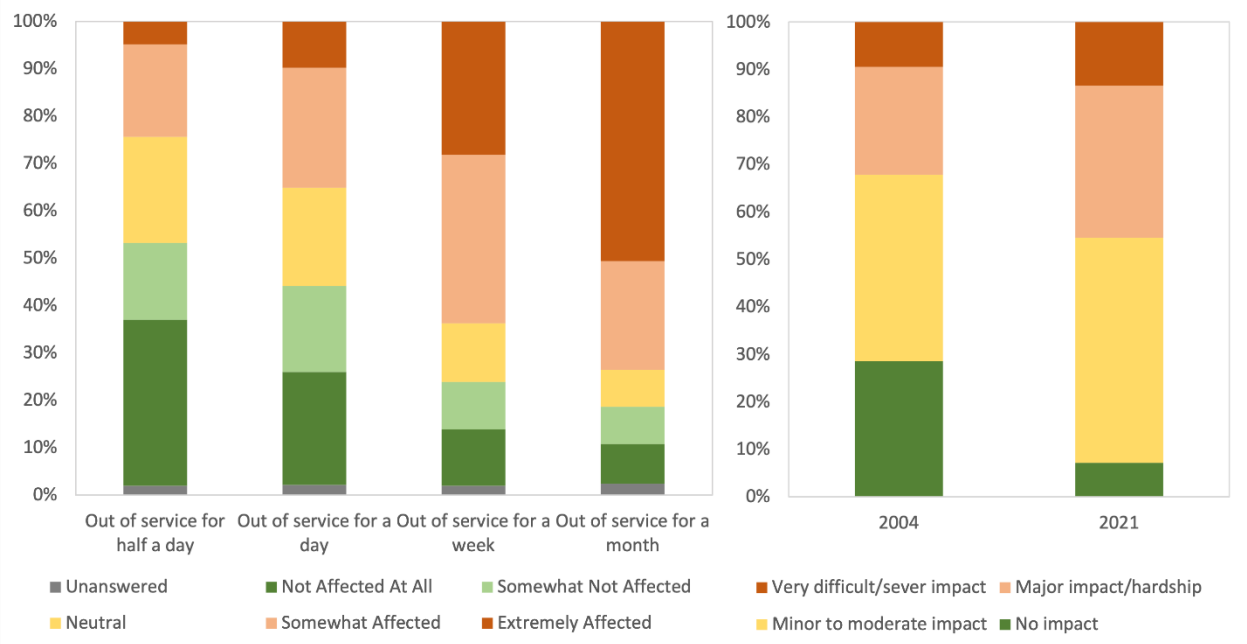
Neebish:

- "Need additional hours at night and weekends."
- "Senior discount should be increased."
- "Would like to see a 9:00 a.m. and 3:00 p.m. ferry. Can't make it into town between two ferry runs."

Drummond:

- "Raise fares for tourists, maintain for islanders. Hold a public meeting to discuss fares."
- "Run two boats when needed during the heavy season."

For Beaver Island, previous surveys that have been conducted were also geared towards assessing ferry service adequacy, economic impacts, and future needs- not designed as a user satisfaction survey. Therefore, there are no comparable questions to gauge users' satisfaction over time. However, one similar question that exists between the current study and previously conducted surveys was about how users are affected if the ferry is out of service. *Figure 5-24* shows how users are affected if ferry services are out of service for various durations, and how their responses compare to the statistics obtained from BITA's 2004 and 2021 studies. In general, BITA's 2004 statistics indicated that the absence of ferry services affects 70% of respondents, but that number grew to about 90%. This indicates a growing reliance on ferry services over the period. The research team's survey further breaks down ferry reliance to observe that about 50% of respondents have little to no impact if the ferry is out of service for less than a day. Another notable comment identified from the 2005 survey is that 54% of property owners on Beaver Island indicated that a faster ferry with a travel time of about an hour would increase their likelihood to use ferry services. A similar comment was received from the current survey.



(a) (b)

Figure 5-24: How riders are affected if ferry is out of service from (a) current survey, (b) 2004 and 2021 BITA survey

Comparison with Surveys in Other States

The research team inquired state DOTs that had responded to the nationwide state DOT survey (*Task 3*), if they have conducted any ridership satisfaction survey. It was noted that most state agencies do not handle ferry satisfaction surveys themselves. Most satisfaction surveys are conducted by ferry operators themselves on an as-needed basis and for internal use. None of the result findings are for regular publication, nor do the state agencies require them to be submitted. Most satisfaction surveys are also conducted as part of any masterplan development or island masterplan studies instead of an annual ridership satisfaction survey. However, there are some state agencies that conduct regular satisfaction surveys, such as WSF and North Carolina DOT (NCDOT). The state of Washington has the most extensive record of users satisfaction survey, through its Ferry Ridership Opinion Group (FROG) program, conducted triennially (*85, 86*).

The state of North Carolina also conducts an annual general transportation service survey, which includes ferry services as well (*87*). In 2019-2020 survey, 28% of respondents indicated that they have used ferry services in the state. The report indicated that the top two most important ferry service traits are (i) frequency of ferry services on desired routes, and (ii) availability of ferry schedule and information. NCDOT also conducted a Ferry System Long Range Plan, where tourists, residents, and employees were surveyed on a range of topics including ferry service enhancement, loading/unloading convenience, informational alerts and customer service (*88*). While the survey indicated that overall wait times are reasonable (less than 30minutes), it was noted that there is a need for priority loading for pass holders. This insight resonates to the survey findings that the research team obtained from Beaver, Sugar, Neebish and Drummond Islands. *Figure 5-25* portrays service satisfaction of various modes of transportation under the governance of NCDOT. It is reported that the ferry system has the highest service satisfaction rating among other modes. While the survey conducted in Michigan contains service satisfaction question, a direct comparison with NCDOT's results cannot be drawn given the granularity of questions being asked. However, service satisfaction for Michigan islands can be referred to in *Figure 5-8* and *Figure 5-16, Figure 5-17,* and *Figure 5-18.* where users' satisfaction in various aspects of operation are tabulated. At large, service reliability, convenience, waiting time, quality of docks and vessels for Beaver, Sugar, Neebish, and Drummond Islands were rated in the top 25th percentile. While ticket prices on average were rated below the top 25% percentile, with some islands reporting starkly higher ticket price dissatisfactions than others.

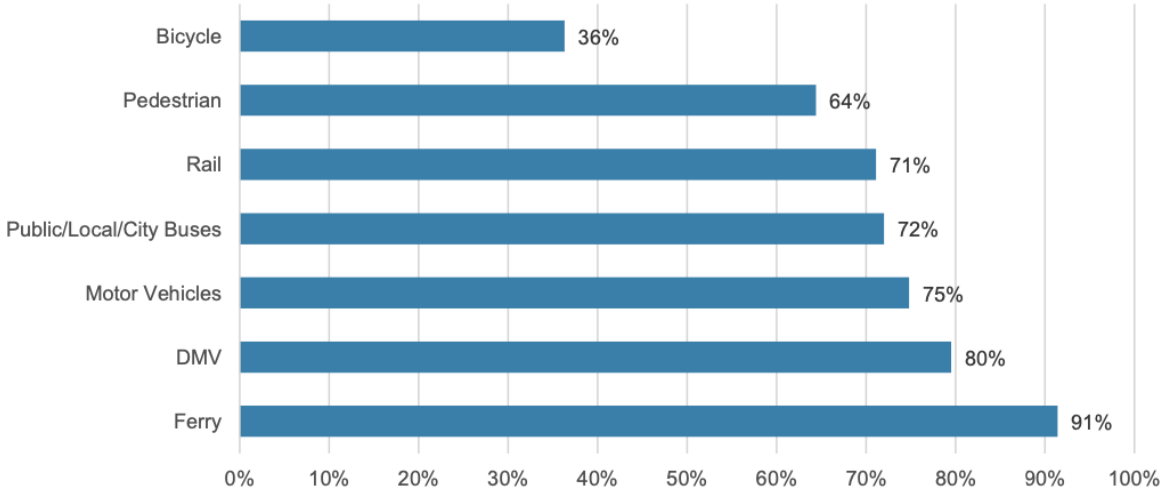


Figure 5-25: Service satisfaction of various modes in North Carolina (*87*)

The annual survey conducted by WSF (FROG Program) is a comprehensive set of questionnaires that covers a variety of topics including overall satisfaction and service or vessel reliability. According to their 2022 survey, service satisfaction in Summer 2022 is at 41%, which indicates a significant decrease in service satisfaction compared to a historically 60-65% satisfaction from 2014 through 2018. Their Winter 2022 satisfaction was also notably lower (39% satisfaction) compared to the historical levels of 65-80% satisfaction for 2012-2021 winter seasons (*85*, *86*). *Figure 5-26* presents WSF service satisfaction over various periods. In comparison, Michigan islands (Beaver, Sugar, Neebish and Drummond) ferry service satisfaction obtained through the conducted survey can be reported as about 85% service satisfaction across all service aspects. *Figure 5-27* indicates an aggregate of service satisfaction across various measures for all four islands in this study. Another notable insight obtained from WSF's FROG survey is the need for better schedule coordination with other modes, which was noted to be a rising concern-doubling since 2019 (*85*). Similar concern was noted for Michigan islands, especially Neebish Island, where there is a lack of integration and service schedule coordination between other modes of transit, such as public buses and school buses.

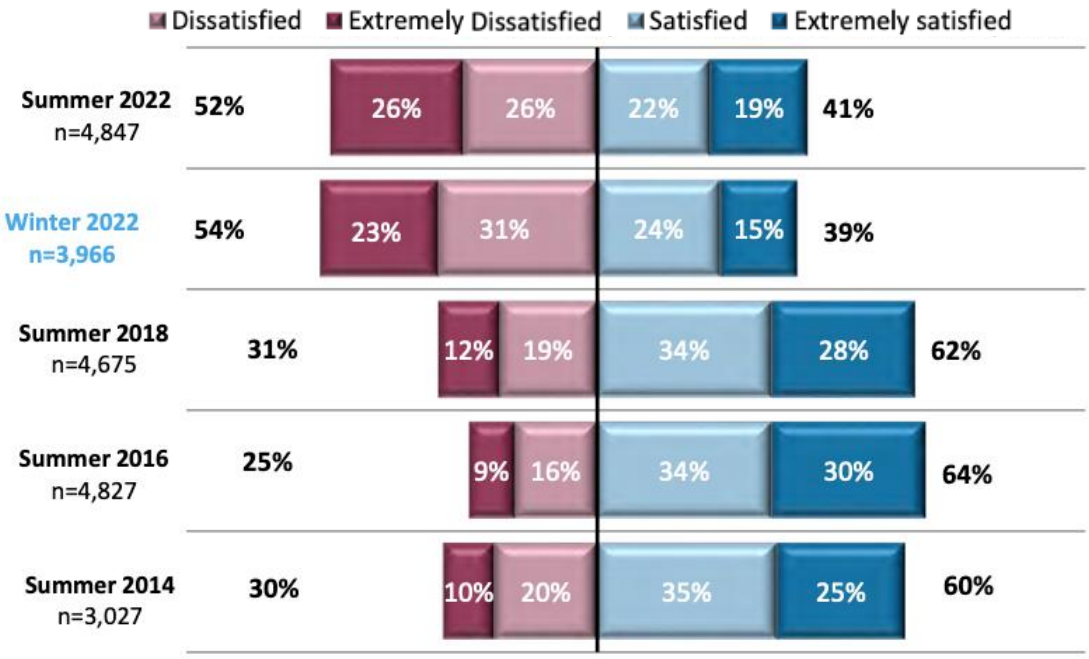


Figure 5-26: Overall satisfaction with WSF (*86*)

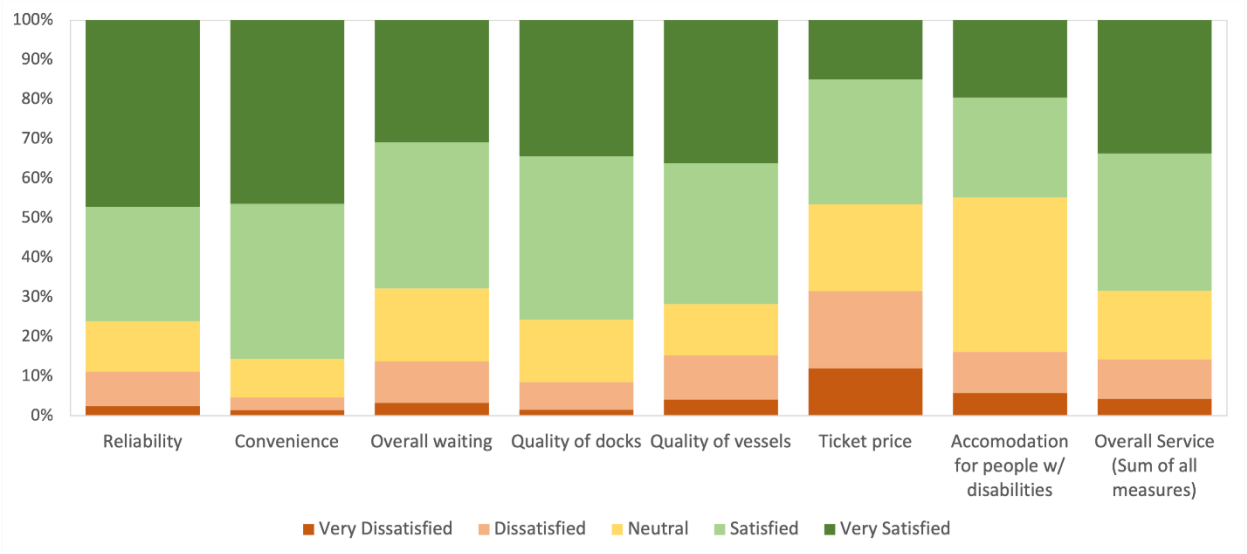


Figure 5-27: Service satisfaction for Beaver, Sugar, Neebish and Drummond Island

Overall, while the research team was able to obtain similar insights from service satisfaction surveys in other states, the specific performances are not directly comparable as each operation is unique, and the different context of survey wording provides a different background to reported statistics. Nonetheless, several key trends were able to be identified. Ferry services for Beaver, Sugar, Neebish and Drummond Island were rated positively and did not show any service concern overall, especially when compared with ferry services in states with sizeable ferry operations.

Key takeaway from comparisons made with WSF and NCDOT are (i) there is a need for better service schedule coordination with other mode of transit, (ii) willingness to pay for improved service varies greatly according to what aspect of service could be improved, (iii) service satisfaction in other states in general had declined over recent years and (iv) Michigan islands' ferry services were rated with above average satisfactory compared to NCDOT and WSF. It should be noted that service satisfaction survey is best to be done periodically to gauge meaningful service improvements over time.

5-2- Island Community Interviews

The ferry users' survey conducted as part of *Task 4 (Chapter 5-1),* is one of two crucial aspects of the proposed plan for data collection. The other approach was intended to understand the needs and challenges of ferry services, from the perspective of business owners and island community at large through a qualitative understanding. A holistic narrative of transportation needs is required to yield a meaningful and representative analysis of mobility needs. Especially, when there are economic activities involved in Beaver, Sugar, and Drummond Islands (Neebish Island is predominantly residential). There is also a considerable size of tribal communities on some islands and their neighboring regions. Therefore, business owners, island community, and other organization representatives on Beaver, Sugar, Neebish, and Drummond Islands were interviewed to qualitatively understand business, local economy, and special group needs. To that end, the research team designed and conducted a series of interviews to explore key topics that includes:

- Understanding community diversity and business landscape on the island
- Adequacy of freight transport services and other special transport needs
- Alternative modes of transportation and their feasibility/practicality
- Service quality, rates, restrictions, and bottlenecks
- Ideal MDOT role and contributions for business owners and special groups towards transportation equity and welfare

5-2-1- Interview Development & Administration

The research team has listed out a spectrum of business representatives, local and township officials, chamber of commerce and island resident representatives to be interviewed. Interviews

were conducted to coincide with on-site ferry ridership survey. BITA and EUPTA representatives were cooperative to connect the research team with local business owners and community representatives. The research team also walked and drove around the island to talk to people for inclusive ethnographic data collection. Interviews with business owners were recorded for post-interview analysis, while exchanges with other community representatives were transcribed and documented on-site.

Table 5-8: List of business owner and community representative interviewed

Island	Type of Business	Date
Beaver	Restaurant, Party Store, Gas Station Owner	May 13, 2022
	Construction Company	May 13, 2022
Sugar	Convenience Store/Gas Station	July 8, 2022
Neebish	Convenience Store	July 8, 2022
Drummond	Souvenir/Convenience Store	May 29, 2022

In addition to on-site interviews, the research team also engaged with established organizations that have played roles in the lives of island communities. Amongst many others, the research team got in touch with representatives from Great Lakes Islands Alliance (GLIA), and Michigan Department of Environment, Great Lakes, and Energy (EGLE). GLIA is a voluntary network of island organizations that threads island communities together, including Beaver, Sugar, Neebish, Drummond, Bois Blanc, and Harsens Islands. It serves as an avenue for discussions on a wide array of issues from tourism to local festivals, and environmental issues. GLIA Membership extends to island members, township officials, school principals, chamber of commerce, library representatives, and many others. GLIA representatives were highly supportive of the project by connecting the research team to various resources, organizations such as Passenger Ferry Association (PFA), and local individuals whom the research team was able to further interview.

5-2-2- Interview Findings

Discussion of findings, notable issues, and recommendations from the perspective of interviewees are articulated in this section. Interview summaries are presented for each island separately.

Beaver Island

Amongst the top employers on Beaver Island are Central Michigan University (CMU), construction companies, and grocery/party store owners. These employers, along with many others, contribute to the island's economy in a myriad of ways. Therefore, ferry services that are business-friendly are essential to ensure livelihoods on the island. Furthermore, economic activities on the island are considered somewhat self-sustaining, given its distance to the mainland- regular commute is not an option.

Construction is the second largest ferry freight user by volume, next to McDonough's grocery store, where construction materials are brought in almost daily. Gas/propane and some heavy machineries are brought in via a private barge instead of ferries due to insufficient BIBCO boat opening size. Construction freight demand is considered inelastic- regardless of the fare imposed by the ferry operator. However, any ticket price increase would be relayed as a higher service cost to the island residents. This may not necessarily be the case for tourists or other types of ferry riders, where demand is more elastic.

Freight services can be reserved upfront with BIBCO. Companies will specify a certain volume to be reserved for a specific day or week. Despite upfront reservations, cargos and freights tend to undergo long queues (more than 1 day) on docks for loading, especially during peak summer season where commercial freight transport needs meet with tourism ridership. It is noted that BIBCO are able to schedule additional sailings in between scheduled sailings, if needed. Alternatively, there are two operational airlines servicing Beaver Island Airport (SJX). For businesses on the island, airlines are predominantly used as the sole means of transport off the island during the winter, when ferries are not operational, especially to transport perishable goods and groceries. Construction companies bring in essential materials that are within a certain size limit such as paints and drywalls. Additionally, airlines are also the preferred method of bringing skilled labor onto the island for specific jobs or machinery repairs. This is due to scarce ferry schedules, where skilled labor that is being paid per hour would need to be paid overnight if ferry services are no longer available at the end of the day. Several notable concerns and operational restrictions that has been noted by businesses includes:

- Storage at docks have limited roofed space- causing issues for some materials and freight that are weather sensitive (woods, cardboards, etc.).
- The onsite freight queue could take up to several weeks due to an insufficient boat schedule.

- Vessel opening dimension and weight allowance are major constraints for freight transport.
- An alternative for freight transport is via St. James Towing Company on Beaver Island, which offers flat barge and tugboats to be chartered, but very costly.
- Chartering BIBCO's ferry for a special/additional sailing is not possible given the organizational structure between BIBCO-BITA that prohibits such an arrangement.

Sugar Island

There is only one convenience store/gas station on the island. The refuel trucks bring approximately 2,000 gallons of gas every two weeks, with no priority loading for ferries. Refuel tanks would queue to get on the ferry just as any other regular vehicle riders. Logging trucks are the most frequent type of freight being transported, but they also have no priority loading. There are no USPS, UPS or other postal services that directly get onto the island, but there is a local individual contracted to pick up packages on the island and deliver mail. There are no Emergency Medical Technicians (EMT) on the island, which calls for service coordination with the captain to arrange transport to the mainland if necessary. Currently, special emergency sailings are assessed on an ad-hoc basis, and upon the discretion of the ferry captain. Over the years, residents and businesses on the island have adapted to the freight constraints by ferry capacity or schedule limitations.

Neebish Island

There is one convenience store, one fire department/garage, but no gas stations on the island. There is not much economic activity on the island, and it was noted that life on Neebish Island is of self-sufficiency. It was noted that a portion of residential houses have no access to electricity due to high electricity setup costs, or residents simply chose not to be equipped with electricity for their own personal reasons. It is also noteworthy that the permanent resident and year-round population of the island is less than 100 but could go up to 500 in the summer when recreational visitors would come onto the island to occupy campgrounds and seasonal residencies. There are no delivery trucks (UPS/USPS) going onto the island. There would be a period in the winter (typically late December through early March) where they could not get off the island, but island residents have adapted and became accustomed to the lifestyle. There are no EMTs on the island, which calls for service coordination with the captain to arrange transport to the mainland if

necessary. Residents have noted inconsistent considerations being given by the captain to special sailing needs. Establishing a standard of procedures (SOP) would eliminate conflicts between residents and the captain, such that special sailing approval criteria are available in black-and-white, of what qualifies and does not qualify for special/emergency sailing.

Drummond Island

The research team interviewed three business owners- all owners of gift shops. Given the considerable size of tourism and visitors on the island, the interviews were able to provide a holistic perspective of business needs on the island, beyond their specific operations. Insights were provided for groceries, general commodities, and goods transport needs. Interviewed business owners were mostly satisfied and tout the ferry service being highly reliable for their business needs and the community at large. However, there are often bottlenecks due to the low capacity of vessels, especially in the summer when demands for goods are higher. Occasionally, one of the two vessels being used to serve Drummond Island is lent to Sugar or Neebish Island, especially during dry-docking. In such instances, the capacity of Drummond Island ferry transport is greatly diminished and would induce severe congestion. It was noted that there is not enough vehicle capacity to keep up with peak period demands- queue buildup could be up to 4-5 departures in the summer. Drummond Island is an exporter of dolomite using EUPTA's ferry service. One circumstances that could disrupt an optimal service, is when trucks with dolomite quarry blasting materials need to be transported. In such cases, the trucks would need to be transported by the vessel on its own, with no other vehicles on board. Trucks carrying dolomite, along with other courier trucks, such as UPS or USPS, would get in queue with other regular vehicles to get on and off the island. It should be noted that EUPTA currently does not have any priority loading system.

Figure 5-28: Fuel truck (3rd from front) in queue with regular vehicles to get on Drummond Island ferry

CHAPTER 6 – INTERVIEW OF FERRY OPERATORS NATIONWIDE

This chapter explores ferry services from point of view of ferry operators. To this end, the research team conducted multiple interviews to identify adoptable best practices in various aspects of operation, funding, and State DOT governance. While ferry services are unique to geographic and local community needs, the research team aims to deduce lessons learned that MDOT and ferry operators in Michigan can adopt wherever applicable. Interview candidates comprised of ferry operators from various categories that provides a contextual background to their responses and insights shared. Topics explored in the interview includes:

- Service scope, governance structure
- Funding mechanism and strategies
- Level of service supervision
- Emergency services coordination
- Specific freight demands/service
- Infrastructure/docks/vessels maintenance and replacement
- Public group consideration
- Other management & coordination issues with state DOT
- Service strengths, weaknesses, opportunities & threats

6-1-Methodology

The interview was conducted in two phases. Phase 1 included interviews with EUPTA and BITA, while Phase 2 included interviews with selected ferry operators in other states. Inputs from the Phase 1 interview session were used to improve interview question setup for Phase 2, based on feedback provided by EUPTA and BIBCO. Prior to conducting interviews, the research team had drafted a list of questions and general categories of discussion topics to be shared with MDOT RAP members. Upon finalizing interview questions, the research team had streamlined a process to determine candidates for Phase 2 interviews:

1. Define categories of ferry operators based on type and level of funding received according to the State DOT survey
2. Identify available pool of candidates based on the state DOT survey responses and NCFO
3. Determine and shortlist multiple ferry operators for each category as viable candidates to be interviewed
4. Assess each candidate ferry operator to determine ferry operators from different categories that has service or operation that is comparable to the islands of interest in Michigan (Beaver, Sugar, Neebish, Drummond, Manitou, Bois Blanc, Grand, Harsens)

Defined categories and total number of viable candidate ferry operators are summarized in *Table 6-1*. Out of the total available pool of ferry operators, a total of 15 ferry operators were shortlisted as a suitable candidate that has similar characteristics of ferry operations to Michigan, or that has a well-established operation that the research team could gain a great deal of insights from. However, out of all ferry operators the research team had reached out to, only three were available. Phase 1 and Phase 2 interviews were conducted online, through web-conferencing software Zoom or Microsoft Teams. The final list of interview candidates and interview dates are as per *Table 6-2*.

Table 6-1: Defined categories of ferry operators and size of candidate pool

Category	Funding Type	Total # of Candidates (From Survey & NCFO)
1	Receives Federal Funding Only	32 Operators (From 9 states)
2	Receives State Funding Only	13 Operators (From 5 states)
3	Receives Both Federal and State Funding	32 Operators (From 13 states)
4	Private Funded (Neither Federal nor State Funded)	22 Operators (From 6 states)

Table 6-2: List of Phase 1 and Phase 2 interviewees

Phase	Category	Operator	Interviewee	Date
1		EUPTA	Pete Paramski, *Executive Director* Akemi Gordon, *Finance Director*	02/23/2022
		BITA & BIBCO	Mary Cook, *BITA Executive Director* Tim McQueer, *BIBCO President & General Manager*	02/22/2022
2	Receives **State Funding Only**	North Carolina Ferry System NCFS (NC)	Catherine Peele, *Planning & Development Manager* Jed Dixon, *NCFS Deputy Director*	03/04/2022
	Receives **Both Federal and State Funding**	Washington State Ferry, WSF (WA)	John Bernhard, *Sr. Manager Budget & Program Dev.* Carmen Bendixen, *Senior Transportation Planner* Justin Resnick, *Service Planning Manager*	03/25/2022
	Private Funded (Neither Federal nor State Funded)	Delta Ferry Authority (CA)	Dave Forkel, *Director*	03/23/2022

6-2- Interview Findings

Interview findings are articulated around various key topics, as per interview structure. The summary provided in the following section is a synthesis of responses across all ferry operators within each phase. This is aimed to showcase the interview highlights in retrospective view, rather than individual insights for each ferry operator.

6-2-1- Phase 1: EUPTA & BITA/BIBCO

Service Introduction, Governing Structure

- Given BIBCO's low frequency service and capacity, some essential/perishable goods are transported via air, despite higher cost, which is not the case for EUPTA.
- Marginal cost to transport goods and passenger for BIBCO is higher than EUPTA, given much longer distance from the mainland to Beaver Island.

- Due to low service frequency, it makes economic sense for BITA to contract out services to BIBCO- induces cost savings through operational efficiencies (employee benefit, less operational restriction to pursue profit, etc.)
- Freight services for EUPTA hasn't been an issue due to ample vessel capacity, frequent departures, and short commuting distances.

Funding Sources, Mechanism, Strategies

- Fuel, and labor (healthcare and pension) are considered as major expense categories.
- EUPTA and BIBCO have not seen the need for drastic fare rate increase (by the time of interview), beyond cost of living and fuel cost. However, BIBCO has recently imposed a circumstantial fuel surcharge to ticket prices in offsetting recent rising fuel cost.
- The structure of non-profit transportation authority enables self-subsidizing practices (summer revenue surplus subsidizes winter operational costs) without the need to impose fare rate hikes, or seasonal/dynamic rates.
- Most spending forecasts done are only short term (1-2 years ahead), and more towards employee needs (healthcare, pension, etc.). Retaining the workforce is critical in an industry that is very trade specific.

Emergency Services & Specific Freight Demands

- There is no formal agreement and obligation for EUPTA/BIBCO to provide services during emergency conditions, but there is a mutual understanding between medical agencies, U.S. Coast Guard, and fire departments that EUPTA/BIBCO would be there to step in if needed.
- Costs for emergency runs that have happened before are reimbursed in an ad-hoc manner.

Asset Maintenance Strategies

- To preserve and extend the life expectancy of ferries, the ideal practice is to rebuild their engines every 10 years or based on a certain engine-hour.
- Increasing oil sampling intervals and monitoring engine performance based on oil analyses may increase the life expectancy of ferry engines.

- Given limited resources (financially), incremental maintenance is preferred over large and major works, unless necessary. However, this strategy could render some imminent major works to be costlier and more critical, due to imposed delays through minor works.

Tribal/Public Groups Considerations

- Beaver Island has a small tribal community (the Little Traverse Bay Band of Odawa Indians), but no special consideration is needed in terms of ferry operations.
- The Upper Peninsula, where EUPTA operates is home to largest Native American population (the Sault Tribe of Chippewa Indians), but no special consideration is needed in terms of ferry operations.
- Tribal groups' need is no different than regular individuals, however, the group can negotiate discounted rates for their members, during special events or other special needs.

Perceived MDOT Responsibility on Island Residents

- As non-profit transportation authorities (TA), BITA & EUPTA are highly reliant on federal/state funding to sustain their operations.
- There are certain federal and state mandated procedures that impinge efficient operations and adversely affect time-sensitive issues (especially procurement procedures).
- MDOT has showcased an exceptional level of involvement with EUPTA & BITA, to support tourism and address island residents' needs.

Strengths, Weaknesses, Opportunities, and Other Issues

- Strengths: BIBCO, being a private operator, strives to be operationally lean and able to limit financial waste. EUPTA can operate with stable funding and adjust their services accordingly.
- Weaknesses: Labor is one of the major concerns for ferry operators, due to trade-specific tasks and needs that limits the number of licensed captains and qualified personnel.
- Opportunities: BIBCO is interested in studies for multi-use vessels (for instance, designing vessels that can act as an oil spill response vessel, or Great Lakes research vehicles), and ready to collaborate with universities, authorities, or organizations.

- Opportunities: While EUPTA is concerned with the performance of electric/hybrid vessels due to cold temperatures and lack of charging infrastructure, BITA is actively researching the feasibility of adopting an environmentally friendly vessel.

6-2-2- Phase 2: Other Ferry Operators

Funding Sources, Mechanism, Strategies

- There is a trade-off between TA structure and incorporating private operation for ferry services:
    - Pros: TA structure provides relatively stable funding, where services can be adjusted according to the anticipated available funding levels.
    - Cons: TAs are bound by various requirements, and there are more bureaucratic frictions to seek approval for implementing operational changes.
- Funding allocation for ferry services are categorized into operational funding and capital funding with separate sources of funding.
- WSF distinguishes funding for capital maintenance projects vs capital preservation projects. This distinction does not exist at the federal level.
    - Maintenance: work done to maintain service, so that asset is capable to reach its expected lifespan (depreciation control).
    - Preservation: work done to extend asset life.
- Most funding requirement forecasts are done based on service schedule & ridership growth, with fluctuations on labor & fuel costs.
- NCDOT does not currently allow for fuel hedging (a contractual tool to reduce exposure to volatile or rising fuel cost)- but is exploring it as an option for future.
- Amongst funding mechanisms for Delta Ferry Authority (DFA) is county/township annual contribution, that depends on the property valuation for any given year.

Level of Service & Supervision

- DFA does not monitor service satisfaction (other than word of mouth).
- WSF conducts annual passenger satisfaction surveys in summer, fall and winter seasons (triannual survey).

- NCDOT has a dashboard that shows scheduled/completed/missed sailings, to give a simple measure of service reliability for reporting purposes.
- NCDOT shares service reports to legislators, and to other planning organizations, local media, and local community.
- WSF data are reported to FHWA for National Transit Database (NTD) and publishes agency quarterly performance report.

Emergency Services & Specific Freight Demands

- NCDOT has a standby vessel that is used for emergency services, and to resume role of any drydocked vessels.
- NCDOT has an annual $150 priority pass that allows priority loading anytime.
- North Carolina also has a state bill (legislation) for ferry system vendor/business priority pass, intended to stimulate the economy and increase ease of doing business.
- WSF has an emergency plan/document that outlines ferry system operational procedures to move people/material and relief supplies.
- WSF considers ferry services as a marine highway, since some islands served by WSF mainly rely on ferry systems as the main mode of transport. WSF has priority loadings and special sailings, but with no 24/7 services. For priority loading, there is a priority rating, and for high priority there will be immediate departures and deviate schedules (e.g., life-saving cases).

Infrastructure & Vessel Replacement/Maintenance

- Washington state requires new vessels to be built in Washington shipyards, when state dollars are in use. These requirements justify higher annual ferry funding and appropriations.
- Marine procurement is a unique procedure. It is notably agreed that it is not fair to treat ferries with the same standards as other modes of transit. There are lack of parts supplies due to trade specific nature of ferry services, dealers are very specialized, and labor is also trade specific.
- New WSF vessels are expected to be all hybrid electric, and state legislatures are allocating funds to support providing charging stations on docks. In this regard, WSF has comprehensive "System Electrification Plan" published in 2020 ***(89)***.

DOT's Responsibility to General Ferry Users

- NCDOT has DOT newsletters, community meetings, and Metropolitan Planning Organization (MPO) meetings regularly throughout the year to connect with users of different transportation modes, and local elected officials.
- WSF conducts virtual townhalls on as-need bases.
- Washington state has legislative orders to not charge transit fees on youths (18 and below).

Strengths, Weaknesses, and Ferry Governance

- For small private operators: small size could be an advantage- nimble to service needs, changes, and less stakeholder bureaucracies to navigate through.
- For large ferry operators: aging employees, and the need to secure pool of skilled trade-specific labor are main concerns.
- The Public Private Partnership (PPP) model is great when procuring a new service or exploring a route. This provides the opportunity to get into a lease agreement before purchasing all the assets. In addition, it is more convenient to implement internet technology (IT) projects by PPP, since they are more advanced and nimbler for exploratory projects.

CHAPTER 7 – FUNDING OPPORTUNITIES FOR MANITOU, BOIS BLANC, GRAND AND HARSENS ISLAND

Beyond the main islands of interest in the study (Beaver, Sugar, Neebish, and Drummond Islands), the project scope also includes an additional four islands to be studied. These additional islands with ferry operations serving them, are not recipients of state funding, unlike BITA and EUPTA, which receive an annual state funding allocation and FBP grants. Therefore, the research team intended to explore their opportunities and eligibility to access federal funding, or other sources of funding. These four islands are Manitou, Bois Blanc, Harsens, and Grand Islands.

7-1- Island Profile & Existing Ferry Operations

The study scope for Manitou, Bois Blanc, Grand, and Harsens Islands is different than the study scope for Beaver, Sugar, Neebish, and Drummond Islands. Nonetheless, it remains imperative to understand backgrounds of island profile and their current ferry services. The research team first evaluated the island background and community's social dynamics, and concurrently understood the existing ferry operations serving the community. *Figure 7-1* identifies the geographic location of these islands. The ferry operators serving each island were cooperative with the research team to provide various operational data on their services. However, there are certain types of data that the research team were not able to obtain, in response to Freedom of Information Act (FOIA) exercised by those private ferry operators. Alternatively, the research team relied on publicly made available data and information as surrogate measures.

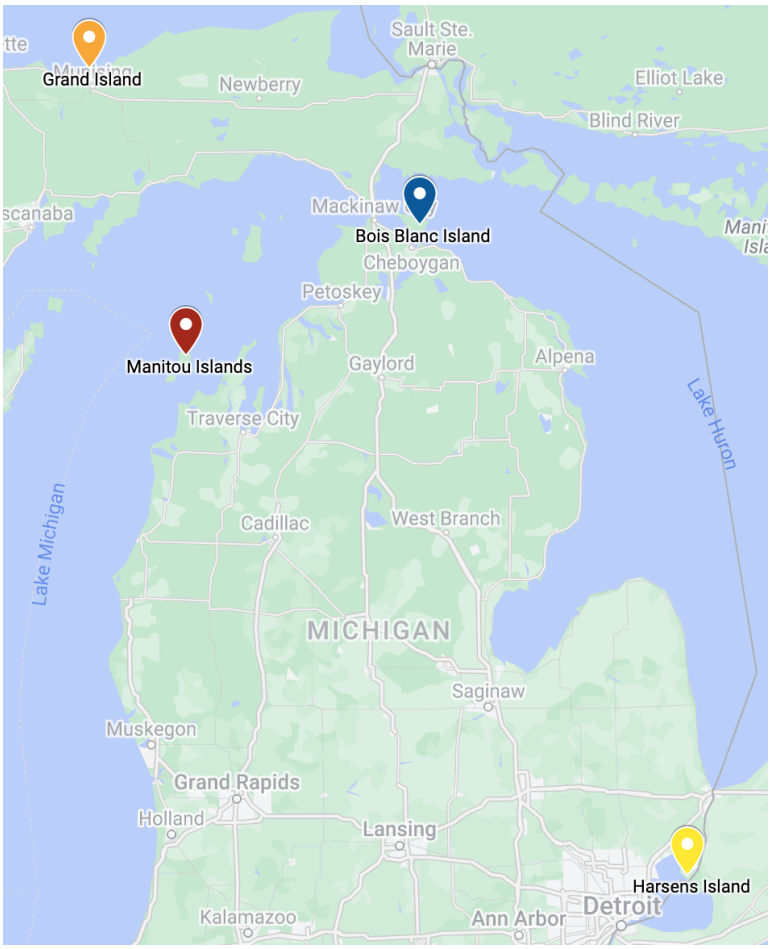


Figure 7-1: Location of Manitou, Bois Blanc, Grand, and Harsens Island (*Source: Google Maps*)

7-1-1- Manitou Islands

Located in Lake Michigan, Manitou Islands consist of North Manitou and South Manitou, where the land areas are 22.35 sq. mi. and 8.28 sq. mi. respectively. Both islands are inhabited (no year-round residents), rather there are campgrounds for recreational purposes. There are 2-3 privately-owned properties on the islands, but seasonally occupied. Manitou Islands are primarily tourism and recreational islands.

Ferry services to the islands are served by Manitou Island Transit, contracted by National Park Services (NPS) every 10 years. The ferry operator pays NPS a certain percentage of proceeds annually, as part of their contract to exclusive rights to service Manitou Islands. The ferry ride to the islands would typically take 1.5 hours, being served by one vessel with three docks (one on the mainland, one on South Manitou, and one on North Manitou). Service frequency in the summer is

one round trip per day and runs daily. In non-summer periods, services are offered on selective dates, commonly 2-3 days per week or historically about seven days a month.

Annual passenger ridership fluctuates steadily over the years at approximately 10,000 passengers per year. The vessel does not transport vehicles. Annual gross direct and indirect operating expenses for Manitou Island Transit was reported to be approximately $460,000 to serve the route. Manitou Islands have neither a hospital, an airport, bridges nor schools.

7-1-2- Bois Blanc Island

Bois Blanc Island has a land area of approximately 35.3 sq. mi., with less than 50 year-round residents. This directly implies a population density of 1.33 residents per square mile. Bois Blanc Island is primarily a tourism island, with both seasonal and year-round residents.

The island is serviced by Plaunt Transportation Ferry, a privately-owned business that has been serving Bois Blanc for three generations. Plaunt Transportation Ferry renews their contract with Bois Blanc Township every 5-6 years. A one-way trip would typically take 45 minutes, across a span of five miles. The service schedule runs every day from May to November. Service frequency during spring season is historically three round trips per day, while in the summer it is six round trips per day. Plaunt Transportation Ferry serves the island with one vessel that is privately owned and operated. Docks on the mainland are also owned by them, while the dock on the island is owned by Bois Blanc Township and is leased for operation. No funding data, operating budgets nor ridership data were able to be disclosed by the ferry operator. Bois Blanc has an airport with two airline operators, but has no hospitals, bridges nor schools.

7-1-3- Grand Island

Located in Lake Superior, Grand Island is under the jurisdiction of U.S. Forest Services (USFS) as part of Hiawatha National Forest, which consists of land area approximately 22.5 sq. miles in size, with year-round population of approximately 44 residents. This translates to a population density of about two residents per sq. mile. Grand Island is primarily tourism and recreational island with small number of seasonal and year-round residents.

Grand Island Ferry Services (GIFS) is contracted by USFS to exclusive rights to service Grand Island. Service crossing spans about 0.5 miles from the mainland to island. GIFS is privately owned and operated, with one vessel owned by GIFS and one vessel leased from U.S. Forest

Services. Docks on the mainland and island are owned by U.S. Forest Services and are leased to GIFS for operations. GIFS services run from the end of May through mid-October. Service frequency runs seven days a week, with five round trips per day in spring and 10 round trips per day in the summer. The main source of revenue and operational funding are solely farebox revenue. Ridership for ferry services to Grand Island is approximately 10,000 passengers a year, with an operating budget of $200,000 per year. Grand Island has neither hospitals, airports, bridges nor schools.

7-1-4- Harsens Island

Harsens Island has a land area of approximately 17.90 sq. mi, with approximately 1,000 year-round residents. The population was reported to be 5-fold in summer seasons when seasonal residents are on the island. This translates to a population density of approximately 60 residents per sq. mi in the off-peak season, and up to 280 residents per sq. mi. during the summer season. Harsens Island is tourism in nature, with seasonal and year-round residents.

Harsens Island is serviced by Champion's Auto Ferry, a privately owned and operated ferry company that serves the island with four vessels. Champion's Auto Ferry owns both docks on the mainland and island. The ferry service runs seven days a week, 365 days a year. In the summer, the services are provided continuously every 15 minutes from 6am till midnight, and every 30 minutes from midnight to 6am. Sailing duration is about 1 hour and 10 minutes from Detroit, and five minutes from Algonac. No funding data, operating budgets nor ridership data were able to be disclosed by the ferry operators. Harsens Island used to have an airport, which was decommissioned in 2019. There is no hospitals, bridges, nor schools on the island.

7-2- Interview & Outreach Initiatives

This task partly synthesizes governance best practices and lessons learned from previous tasks (Task 3: Nationwide State DOT Survey, Task 6: Interview of Ferry Operators Nationwide). As part of this task objective, a series of interviews and engagements were conducted with ferry operators serving the island, local township authorities, and community representatives to understand current ferry operations and island background. Collected information was then qualitatively analyzed and weaved together to assess feasible options to access various funding sources, and any recommendations to be made for MDOT. *Table 7-1* showcases the list of correspondence made by the research team throughout the data collection and interview process. Interview objectives and contents are tailored to understand:

- Local dynamics of island community
- Existing ferry operations, and other modes of transportation
- Role & reliance of ferry services
- Funding structure
- User perception towards existing ferry services and pertinent issues

Table 7-1: List of organizations interviewed

Island	Organization
Manitou Islands	Manitou Island Transit
Bois Blanc Island	Plaunt Transportation
	Bois Blanc Township
Harsens Island	Champion's Auto Ferry
	Harsens Island Transportation Authority (HITA)
Grand Island	Grand Island Ferry Services

7-2-1- Outreach Outcome

Given a vastly different nature of profile amongst these four islands, the research team had summarized the conducted interviews into two categories based on island types:

1. Tourism with year-round residents: Harsens & Bois Blanc Islands
2. Mainly tourism & recreational: Manitou & Grand Islands

Harsens & Bois Blanc Islands

- While Ferry operators for both islands were cooperative to the research team's request for an interview, no ridership or funding data could be disclosed in accordance with Freedom of Information Act (FOIA).
- Both Harsens and Bois Blanc ferry operators are for-profit operators, that have been serving the two islands for generations.
- Plaunt Transportation (Bois Blanc) has no public assets, but leases a public dock from the Bois Blanc Township. The dock owned by the township is the only asset eligible for FBP funds.
- Champion's Auto Ferry (Harsens) has no public assets, therefore does not qualify for FBP capital and operational funding.
- Neither private operators are interested in receiving state/federal funding assistance, as they would like to retain operational control and financial flexibility without the need to adhere to public funding recipients' bureaucracies.
- While FBP fund stipulates that fund disbursements are to be supervised by a public authority, Michigan Act 51 excludes township authorities as eligible fund recipient. Therefore, Bois Blanc Township has not been able to utilize allocated FBP funds, despite having eligible assets.
- Ferry operators stated that they strive to provide a satisfactory level of service to island residents, as they need to maintain rapport as long-serving establishment. However, the public perception is that there is ample room for improvements by existing ferry operators in being a good steward to the community.
    - The services provided by a single service operator who has pricing power with lack of any competition might not be perceived positively by the public. These conditions might lead to a natural local monopoly that hurts public welfare when there is lack of accountability to serve with a satisfactory level of service.
    - The current level of service is deemed by some island residents as below satisfactory due to concerns regarding safety, aging infrastructure, service reliability, and high service cost.
- It seems there is a need for state authorities to step in to improve service quality and affordability, as local/township authorities have little influence on their operations according to the provided feedback by some residents.

- As expected, state authority should respect existing ferry services' private operations, however an oversight mechanism should ensure operators are providing an acceptable level of service, especially when there are no other modes of transportation available for island residents.

Grand & Manitou Islands

- Grand and Manitou Islands are mainly tourism & recreational islands.
    - Manitou Islands (North Manitou and South Manitou) are part of Sleeping Bear Dunes National Lakeshore, under the supervision of National Park Service (NPS). The lands are federally owned, except for several small parcels that are privately owned (less than three acres in aggregate).
    - Grand Island is a national recreation area under the jurisdiction of USFS, part of Hiawatha National Forest. There are some private land parcels that are in the process of ownership transfer to USFS.
- Ferry operations are contracted out by respective authorities (NPS & USFS) every 10 years.
- Funding sources are mainly farebox revenue and any funding allocated by NPS & USFS.
- Both ferry operators are for-profit.
- Each operator has at least one public dock or vessel, which renders them eligible for FBP. However, given their low ridership volumes (approx. 10,000 passengers/year), they are considered uncompetitive amongst other FBP applicants nationwide. Thus, they have only been allocated a small amount of federal funds in recent years.
- Interviewees also noted that procedural requirements to obtain allocated FBP is cumbersome. The expertise, resources and documentations that are needed to justify project approvals to state authorities render the whole process as tedious. Moreover, they do not have designated personnel with sufficient expertise to navigate the bureaucratic requirements seamlessly.
- Ferry operators showed interest in any MDOT contribution and/or involvement towards ferry services as part of transportation equity initiatives.
- Currently there are no pertinent issues on service quality and ticket rates, as users are mostly tourists and one-off users.

7-3- Funding Sources Beyond Ferry Boat Program (FBP)

While FBP remains the sole largest source of funding to ferry operators nationwide, its weightage criteria may render smaller ferry operators as uncompetitive given the sheer competition with other larger ferry operators with much greater ridership volume. The research team explored feasibility of ferry operators in Manitou, Bois Blanc, Grand and Harsens to receive alternative funding sources. There are several strategies that may be feasible to be explored, which may also be applicable beyond the four islands of interest:

1. **Local and Township Grants:** Many townships have fiscal allocations towards local infrastructure, roadways, and other fundamental community welfare needs. These opportunities provide additional sources of funding pool for ferry operators, beyond the typical marine transportation funding. Township fiscal appropriations would typically come from fuel taxes, property taxes, sales taxes and bonds. While availability of funding specifically for ferry services may not exist, state authorities could assist ferry operators in negotiating a mutually benefiting structure for both the township and island residents, through ferry operators.

2. **Private Financing:** Private ferry operators may seek private financing through loans, bonds or equity investments from financial institutions or private investors. These private financing can be utilized towards capital projects such as new vessel acquisition, dock upgrades and general service improvements. Another subset of private financing may also be done in the form of crowdfunding. While this may not be the most typical financing structure, ferry operation that serves a very specific group of people, or for specific purpose may resort to crowdfunding to finance service improvements or capital needs.

3. **Public-Private Partnerships (PPP):** A PPP model is a contractual agreement between a private entity and a public agency, for any provision of public service. PPP model is appropriate when there is yet any local transportation authorities (TAs) established. A PPP model enables ferry operators to retain its full administrative control and ownership, while having a public agency oversee their operations, in return for public funding. PPP model offers a certain extent of cost savings to both parties and allows for risk sharing. However,

it is noteworthy of the existing legislative requirement that only public assets (docks or vessels) are eligible to receive federal funds, and its corresponding state funding match. Thus, the dynamics of asset ownership are to be strategized for optimal fund eligibility.

4. **Economic Development Programs:** Ferry services have been proven to be highly essential to island residents, on top of regional tourism industry. A quality service increases labor productivity and enhances tourism opportunities. Ferry operators could apply for grants related to economic development from various agencies including the Economic Development Administration (EDA) or the Community Development Block Grant (CDBG) program. These funding opportunities are targeted to promote economic development in the region.

While availability, eligibility and feasibility of proposed funding mechanisms may vary for ferry operators, there are funding avenues beyond FBP that private ferry operators could resort to, to support their financial needs. State authorities and MDOT could assist connecting private ferry operators with agencies and programs that may be suitable for their needs.

CHAPTER 8 – MOBILITY GAPS ON MICHIGAN ISLANDS

The research team fully explored ferry operations in Michigan islands by studying both ferry demand (user expectations) and provided supply (service capability and constraints) through different defined tasks in the research plan. By synthesizing all the information collected in these prior tasks, the research team was able to (i) identify island residents' unmet transportation needs and (ii) develop a trade-off matrix of the transportation modes for islands being studied. Main outcomes of the data synthesis include qualitative analyses for each island regarding transportation equity and service adequacy, along with a trade-off matrix of ferry services with other modes of transportation.

First, all data from previous tasks were compiled. This includes findings with ferry operations nationwide, business owners and residents, along with ferry ridership survey results. Compiled data were then summarized and synthesized into clusters of topics, according to study objectives. Various qualitative and quantitative data were then reviewed concurrently to obtain and create a comprehensive narrative for each island. Finally, the research team conducted a mobility gap analysis given the system supply and demand for each island. To compliment the qualitative results of mobility gap analysis, the research team also developed a trade-off matrix of various modes of transportation. This trade-off matrix is particularly useful in reviewing a set of solutions from a prioritization and cost trade-off perspective.

The mobility gap analysis is conducted for eight islands: Beaver, Sugar, Neebish, Drummond, Manitou, Bois Blanc, Grand and Harsens Islands. However, given the scope of the project, the trade-off matrix was only developed for the four main islands of interest in this study: Beaver, Sugar, Neebish and Drummond Islands. These analyses would revolve around:

- Level of service to provide to the island residents
- Requirement to repair/maintain docks on the island
- Number of backup ferries needed
- Requirement/need to maintain 24/7 crew for emergency services
- Tribal considerations
- Economic activities
- Bridge feasibility

8-1- Summary of Mobility Gaps and Mobility Trade-off Matrix

8-1-1- Methodology

Trade-offs are considered integral to project and decision-making sustainability (*90*). The rationale of a trade-off matrix assumes a limited pool of resources or competing opportunity cost, specifically, funding and pool of beneficiaries. Ideally, any given public investments or funding allocated to address mobility issues, are to maximize welfare benefit. However, maximizing benefits often comes with certain constraints such as limited available funding. Thereby, suggests the need to account for investment optimality: areas in which the minimum amount of investment can benefit the largest group of public beneficiaries.

The research team utilizes a 2 by 2 matrix that correlates public welfare versus cost. Public welfare is defined in the Y-axis scale, as how large (or how specific/targeted) of a public group could benefit from the proposed solution. Benefits defined in the trade-off matrix considers both direct and indirect benefits, along with second order consequences (macroscopic ripple effects) of solution implementation. The cost in the X-axis scale is defined as general cost of solution implementation, both to ferry operators and MDOT. The matrix is not intended to indicate cost distribution between ferry operator or MDOT, as specific deployment and implementation cost burden could be devised in a myriad of ways.

To substantiate the matrix, the research team synthesized data collected throughout the prior project tasks to narrate major mobility issues in each island. The summary of major mobility issues is then categorized into key themes of notable mobility gaps. A set of feasible solutions are then proposed for aforementioned mobility gaps. Once a set of feasible solutions is available, the research team refers to the survey results and interview insights to qualitatively assess appropriate placement of those solutions onto the matrix. Qualitative placements are meant to indicate relative positioning of different feasible solutions.

8-1-2- Results & Discussions

Given Sugar, Neebish and Drummond Islands are served by the same ferry operator, EUPTA, there are some overlaps of key mobility issues between the three islands, however, their relative placement on chart may differ, given island-specific needs. The trade-off matrix charts are as per *Figure 8-1* through *Figure 8-4*. Major mobility issues, as a descriptive summary of the trade-off matrix for each island along with proposed solutions are as follows:

Beaver Island

1. **Resident Ticket Pricing:** Assess the feasibility and mechanism to offer discounted ticket prices for residents, and other frequent commuters.
2. **Deck Barge:** Given the limited freight capacity and low sailing frequencies, service collaboration with other private barge operators could be explored. BITA/BIBCO could also explore the feasibility of operating their own barge.
3. **Sailing Schedule Revision:** While current peak season sailing schedule is optimized to accommodate tourism travel demands, the non-peak schedule is optimized for island residents making day trips to the mainland. The trade-off between schedule optimality for tourists and residents in peak and non-peak seasons present a gap for service satisfaction variation throughout the year. This warrants a schedule revision or review to optimize for year-round economic needs and tourism demands.
4. **Roofed Storage:** Expanded roofed freight-storage on the mainland dock may compensate long freight queues and reservation backlogs, especially for weather-sensitive cargos.
5. **Priority Freight loading Pass:** To offer annual/seasonal priority loading pass to business owners or residents that are willing to pay for priority loading.

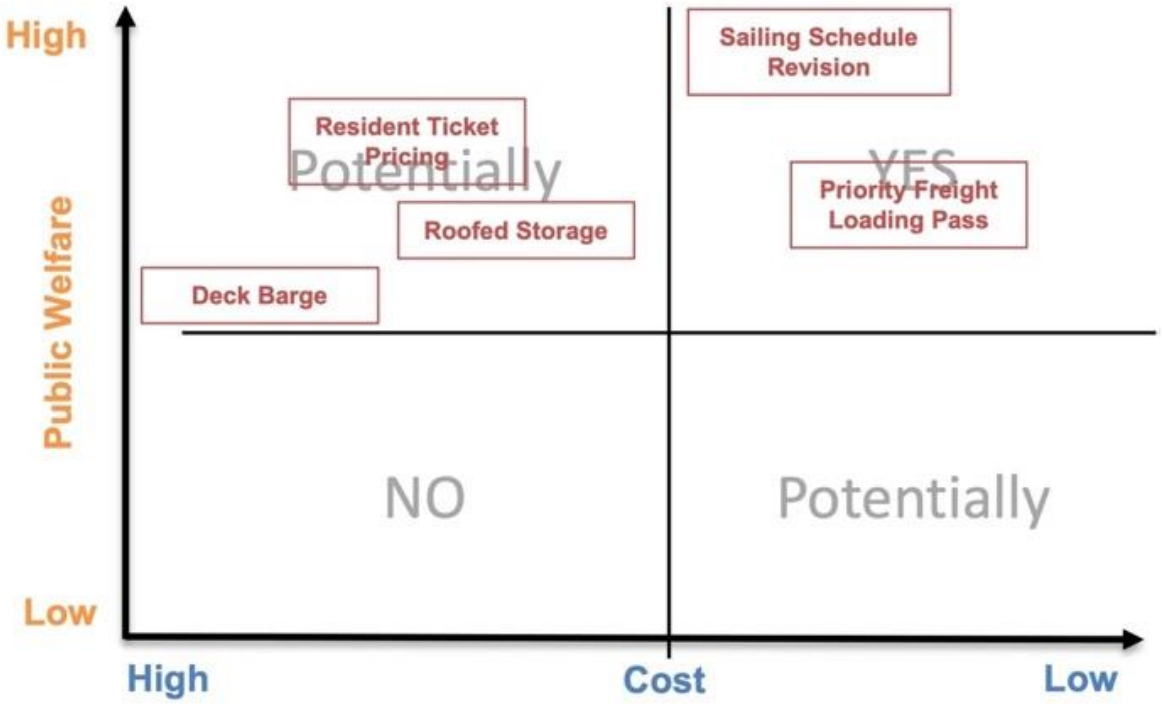


Figure 8-1: Beaver Island mobility gap trade-off matrix

Sugar Island, Neebish and Drummond Islands

1. **Ticket Price Assessment/Resident Ticket Pricing:** Current rates are relatively high for Sugar and Neebish Island commuters compared to Drummond Island (with higher tourism ridership) considering the sailing distances. Ticket rates for residents versus tourists and the ratio of ticket rates for the three islands can be reassessed. Current sentiment indicates that Sugar and Neebish Island residents feel like they are subsidizing operations for Drummond Island with similar rates. Discounted single-trip fare for residents and property owners should be explored beyond the existing discount scheme of bulk tickets which are non-transferable and has expirations.
2. **Schedule Coordination:** To assess schedule timing with other transit services for a seamless mobility experience. Especially for Neebish Island ferry dock that is relatively at a more remote location, compared to other islands that their docks are closer to the main traffic circulation.
3. **Ticket Validity Extension:** To extend ticket validity for residents or eliminate expirations.
4. **Priority Loading Pass:** To offer annual/seasonal priority loading pass to business owners or residents that are willing to pay.
5. **Emergency Services Standard of Procedures (SOP):** To develop guidelines for ferry operators and residents regarding emergency services and special sailings.

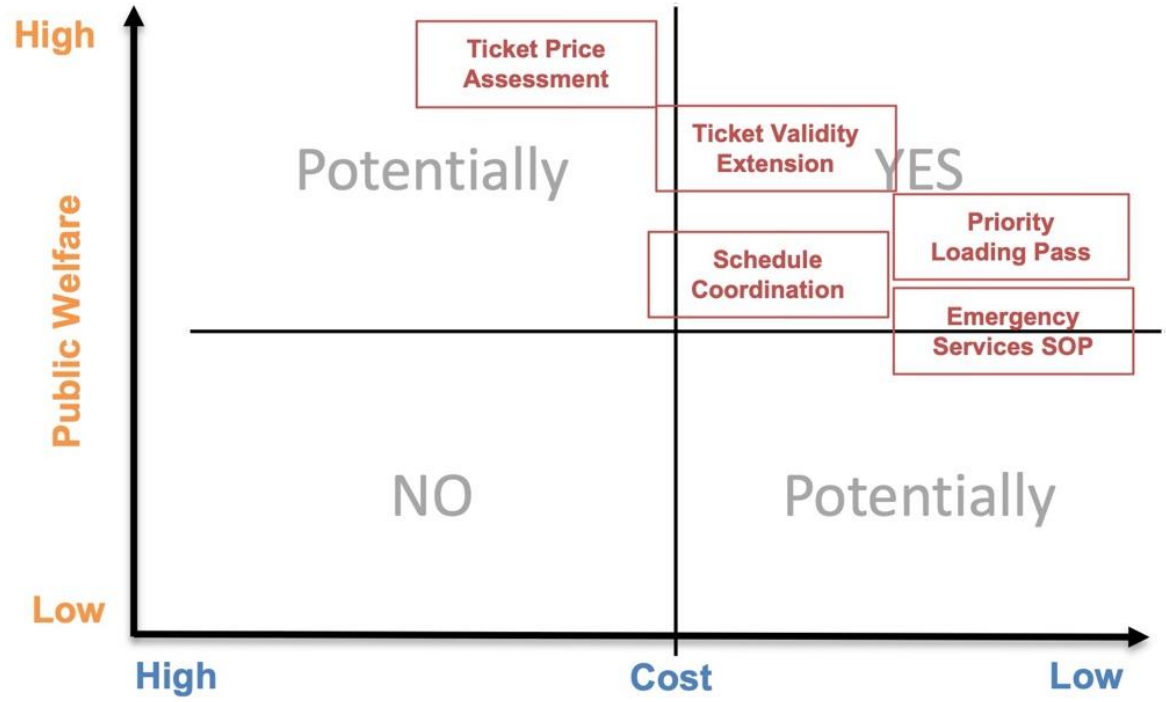


Figure 8-2: Sugar Island mobility gap trade-off matrix

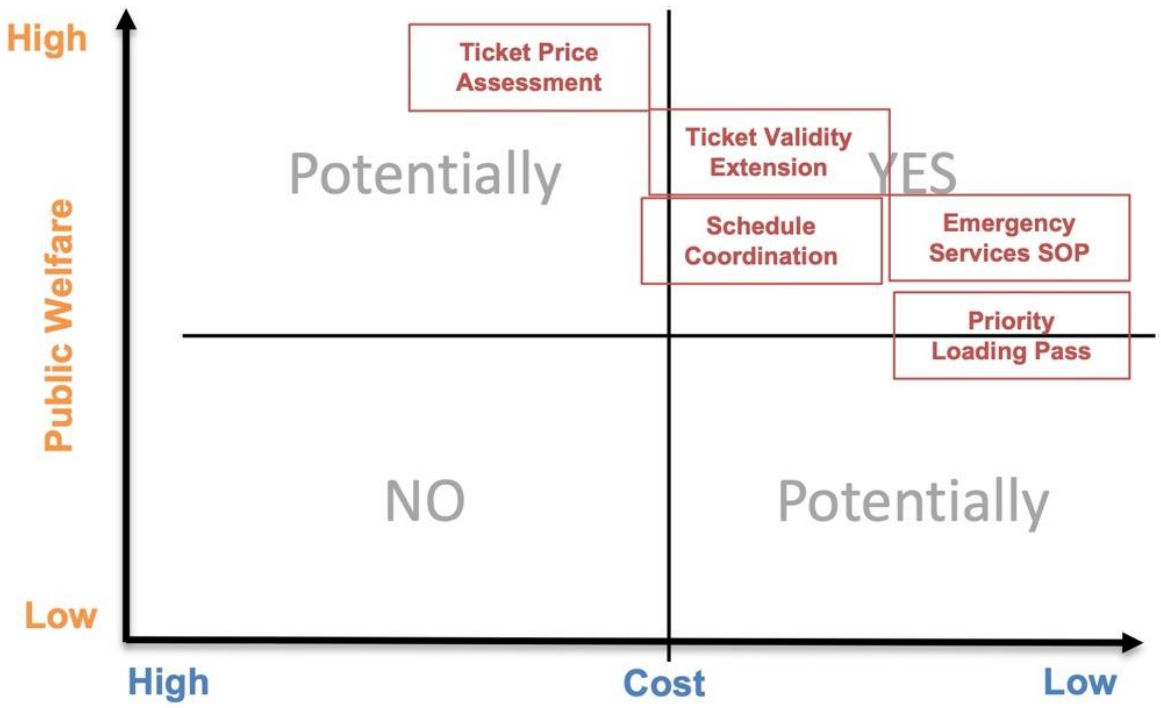


Figure 8-3: Neebish Island mobility gap trade-off matrix

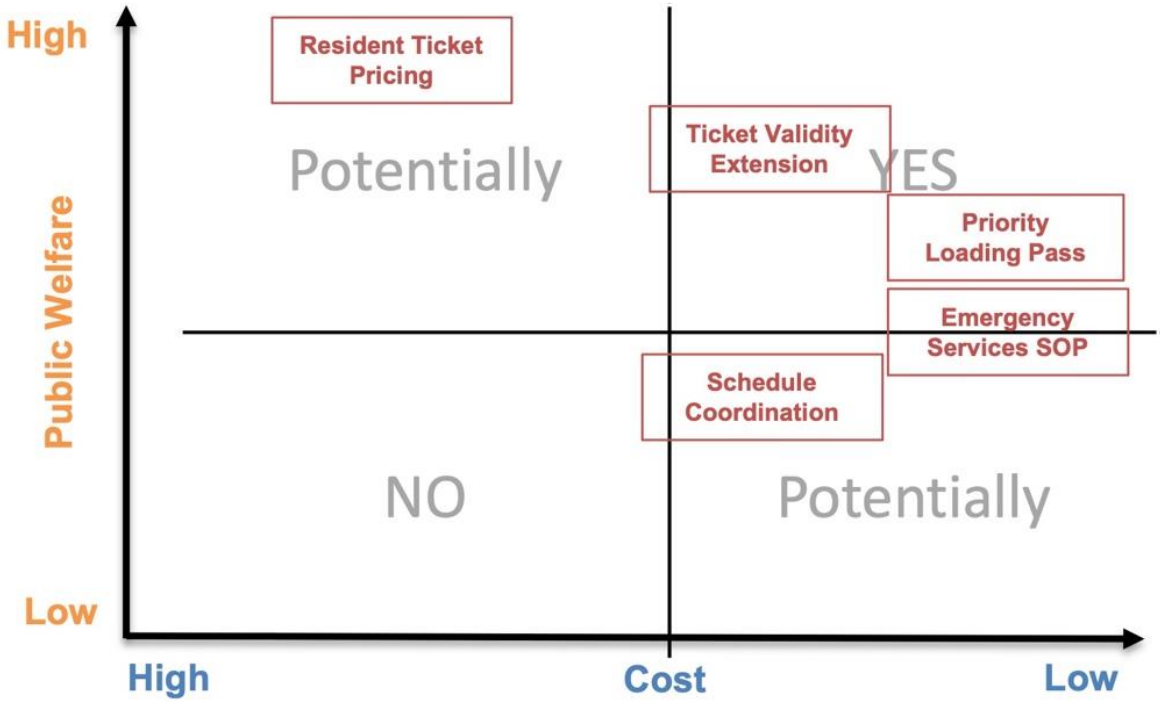


Figure 8-4: Drummond Island mobility gap trade-off matrix

CHAPTER 9 – FERRY SYSTEM MAINTENANCE ANALYSIS

It is imperative for MDOT to obtain a holistic understanding of current ferry system operations and infrastructure needs, in order to project state funding needs. This is to ensure uninterrupted ferry services are being offered to island residents to provide equitable transportation to the public. While MDOT maintains an open line of communication with EUPTA and BITA, a periodic comprehensive review, such as the one conducted through this research, is needed. In this regard, the research team assessed historical allocated state funding, and compared it with actual EUPTA and BITA ferry operations and maintenance needs, to identify any funding gaps, inefficiencies, and room for strategic improvements.

This section corresponds to *Task 6 "Assessment of Current Ferry Operations and Developing Maintenance Plan"* of the project research plan. The main objective is to assess and project future costs and replacement needs of vessels and docks for Beaver, Sugar, Neebish and Drummond Island ferry operations. The task outcomes include (i) vessel/dock maintenance plan and cost projections and (ii) preservation or capital funding requirements by MDOT for upcoming years.

MDOT provided the research team with relevant funding award documentations, and the research team coordinated with EUPTA and BITA to obtain historical maintenance records from their end. Primary documents obtained and analyzed are as follows:

- MDOT Project Authorization documents
- MDOT Master Agreement for Public Transportation Projects
- EUPTA & BITA Spending/Maintenance Reports FY2010-FY2021
- EUPTA & BITA balance sheet, profit/loss statements, asset depreciation schedules FY2010-FY2021
- EUPTA & BITA boat inspection certifications and historical drydock spending

Through various available data sets, the research team approached the analysis by first understanding historical maintenance spending and doing cross analyses with various data points. A cost projection was then proposed, once historical data points were accounted for.

9-1- Historical Maintenance Analysis

9-1-1- Methodology

The research team extracted maintenance spending and capital project records from the documents shared by EUPTA and BITA, including through its fiscal audit documents, asset

depreciation schedules, profit/loss statement and spending reports. The spending is categorized into vessel spending, and infrastructure spending which includes docks and ramps. These numbers provide an understanding of how much is being spent (actual spending needs). At the same time, the research team extracted funding awards disbursement values, from project authorization documents obtained from MDOT, which contains a breakdown of marine capital funding grant awards and their respective local match. This provides a facet of understanding of much ferry operators receive and for what purpose. The fundamental objective is to observe and understand (i) maintenance spending trends over previous years, (ii) growth rate of state funding award, (iii) trends from various spending categories, and (iv) identify the gap between federal/state funding and actual maintenance needs. Once various data points were obtained from multiple sources, the research team conducted cross analyses between data categories to yield meaningful insights. The research team also consulted ferry operators to identify key inputs that might not be reflected in published reports, or un-quantifiable parameters that are advised to be considered in understanding their expenses.

9-1-2- Results

Extracted funding data from MDOT Project Authorization documents from FY2010 to FY2020 were summarized into a table that categorized them by program type, and amount received. It is to be noted that analysis for EUPTA is an aggregate analysis (i.e., not broken down between Sugar, Neebish and Drummond operations) due to high data variability. Aggregate analysis would yield a more meaningful trend for MDOT and state agency's use.

Table 9-1 tabulates the federal funding (FBP, FHWA, Operating Assistance Grant) and State of Michigan's marine capital funding received by EUPTA and BITA. While the amount of FBP funding received varies based on the formulation weightage, the total funding size for marine capital has been fixed at $400,000 per fiscal year. Up until FY2019, the designated fundings were distributed equally amongst BITA and EUPTA (each receive $200,000 per year). It is noteworthy that starting FY2020, marine capital funding is legislatively designated as FBP match, and the pool of funds are to be distributed 60-40 amongst EUPTA and BITA, per the legislative boilerplate. However, starting FY2024 onwards, the legislative boilerplate language for 60-40 split between EUPTA and BITA will be removed.

Marine capital funding is then further broken down into categories of its award appropriation, based on transit agency's application: Vessels, docks, architectural and engineering, facility improvements and terminal support equipment (*Table 9-2*). On average, more than half of the state funding was used towards vessel maintenance and upgrade by both EUPTA and BITA, except for 2020. The year 2020 when COVID hit the nation, a heavier portion of the funding was funneled to dock and infrastructure maintenance since vessel upkeep is lower given low ridership demands. It is noted that the categorical trends are not reflective of the recent federal COVID relief funding.

Table 9-1: Summary of EUPTA and BITA funding

Operator	FY	Program	Authorization	Expiration	Funding Type	Federal Grant ($)	State ($)	Local ($)	Total ($)	% Change
EUPTA	2010	Ferry Boat Discretionary Fund	9/19/12	9/18/15	Capital	$238,000		$59,500	$297,500	
	2011	Ferry Boat Discretionary Fund	8/30/18	8/30/21	Capital	$87,942	$21,985		$109,927	-63.0%
	2013, 2014, 2015	Ferry Boat Construction (FHWA)	8/30/17	5/29/21	Capital	$1,297,486	$324,372		$1,621,858	1375.4%
	2015, 2016, 2017	Ferry Boat Construction (FHWA)	1/29/19	1/29/21	Capital	$1,953,497	$488,374		$2,441,871	50.6%
	2016	Ferry Boat Construction (FHWA)	7/26/16	7/26/20	Capital	$16,000	$4,000		$20,000	-99.2%
	2019, 2020	Ferry Boat Construction (FHWA)	7/26/19	7/25/22	Capital	$674,920	$168,730		$843,650	4118.3%
	2020	Section 5311 Operating Assistant Grant	5/1/20	10/30/20	Operation	$561,852			$561,852	-33.4%
	2020	Ferry Boat Construction (FHWA)	8/18/20	8/17/20	Capital	$629,437	$157,359		$786,796	40.0%
	2021	Section 5311 Operating Assistant Grant	10/1/20	9/30/21	Operation	$98,974			$98,974	-87.4%
BITA	2012	Marine Capital	3/26/12	3/25/16	Capital		$200,000	$22,222	$222,222	
	2013	Marine Capital	2/8/13	2/7/17	Capital		$200,000	$22,222	$222,222	0.0%
	2014	Marine Capital	3/21/14	3/20/17	Capital		$200,000	$22,222	$222,222	0.0%
	2015	Marine Capital	12/8/14	12/7/17	Capital		$200,000	$22,222	$222,222	0.0%
	2016	Marine Capital	1/21/16	1/20/19	Capital		$200,000	$22,222	$222,222	0.0%
	2017	Marine Capital	3/23/17	3/16/20	Capital		$200,000	$22,222	$222,222	0.0%
	2018	Marine Capital	4/19/18	4/18/21	Capital		$200,000	$22,222	$222,222	0.0%
	2019	Marine Capital	3/29/19	3/28/22	Capital		$200,000	$22,222	$222,222	0.0%
	2020	Marine Capital	12/19/19	12/18/22	Capital		$600,000	$66,666	$666,666	200.0%
	2015, 2016	Ferry Boat Construction (FHWA)	8/30/17	8/29/20	Capital	$196,355	$49,089		$245,444	
	2016	Ferry Boat Construction (FHWA)	7/22/16	12/31/19	Capital	$221,228	$55,307		$276,535	12.7%
	2017	Ferry Boat Construction (FHWA)	1/29/19	1/28/22	Capital	$84,613	$21,153		$105,766	-61.8%
	2018	Ferry Boat Construction (FHWA)	7/26/19	7/25/21	Capital	$93,627	$23,407		$117,034	10.7%
	2020	Ferry Boat Construction (FHWA)	8/18/20	8/17/23	Capital	$91,280	$22,820		$114,100	-2.5%
	2020	Section 5304 Metro Planning Research	6/17/20	6/16/23	Capital	$68,000	$17,000		$85,000	-25.5%
	2020	Section 5311 Operating Assistant Grant	5/1/20	9/30/20	Operation	$125,582			$125,582	47.7%
	2021	Section 5311 Operating Assistant Grant	3/28/21	3/27/24	Capital	$56,250			$56,250	-55.2%
	2021	Section 5311 Operating Assistant Grant	10/1/20	9/30/21	Operation	$125,582			$125,582	123.3%
	2012	Marine Capital	3/26/12	3/25/15	Capital		$200,000	$22,222	$222,222	
	2014	Marine Capital	3/21/14	3/20/17	Capital		$200,000	$22,222	$222,222	0.0%
	2015	Marine Capital	12/10/14	12/9/17	Capital		$200,000	$22,222	$222,222	0.0%
	2017	Marine Capital	3/23/17	9/22/20	Capital		$200,000	$22,222	$222,222	0.0%
	2018	Marine Capital	2/22/18	2/21/20	Capital		$200,000	$22,222	$222,222	0.0%
	2019	Marine Capital	2/28/19	2/27/22	Capital		$200,000	$22,222	$222,222	0.0%
	2020	Marine Capital	1/30/20	1/29/23	Capital		$400,000	$44,444	$444,444	100.0%

Table 9-2: Breakdown of marine capital funding FY2012-FY2020

		Funding Itemization					
		Vessel Upgrade/Maintenance	**Dock Upgrade/Maintenance**	**Architectural & Engineering**	**Facility Improvements**	**Terminal Support Equipment**	**SUM**
EUPTA	**2012**	$158,478		$12,000		$51,744	**$222,222**
	2013	$219,722		$2,500			**$222,222**
	2014	$222,222					**$222,222**
	2015	$208,009	$2,991			$11,222	**$222,222**
	2016	$143,714				$78,508	**$222,222**
	2017	$118,741	$40,000			$63,481	**$222,222**
	2018	$194,450	$27,772				**$222,222**
	2019	$165,000	$57,222				**$222,222**
	2020	$382,125	$204,541			$80,000	**$666,666**
BITA	**2012**	$197,222	$25,000				**$222,222**
	2013						**$0**
	2014	$198,557	$9,671			$13,994	**$222,222**
	2015	$202,222		$20,000			**$222,222**
	2016						**$0**
	2017	$60,214		$45,000	$32,000	$85,008	**$222,222**
	2018	$222,222					**$222,222**
	2019	$205,258	$2,000		$14,964		**$222,222**
	2020	$137,444	$307,000				**$444,444**

The annual maintenance costs for EUPTA and BITA are shown in *Figure 9-1*, where it can be observed that EUPTA's annual maintenance cost is on average five times of BITA. *Figure 9-2* and *Figure 9-3* are plots of EUPTA and BITA's annual maintenance spending by categories. Given the different documentation process by EUPTA and BITA, and documents made available to the research team, their categorical spending breakdown could not be tallied between both operators- EUPTA maintenance spending is broken down by funding source utilized, while BITA maintenance spending is broken down by their spending types. While there is no evident and consistent year-over-year maintenance spending increase, the linear trendline indicates an overall increasing pattern of maintenance spending. This is implied, with aging infrastructure to maintain good upkeep of assets, increasing labor cost, and increasing cost of parts and materials for ferries.

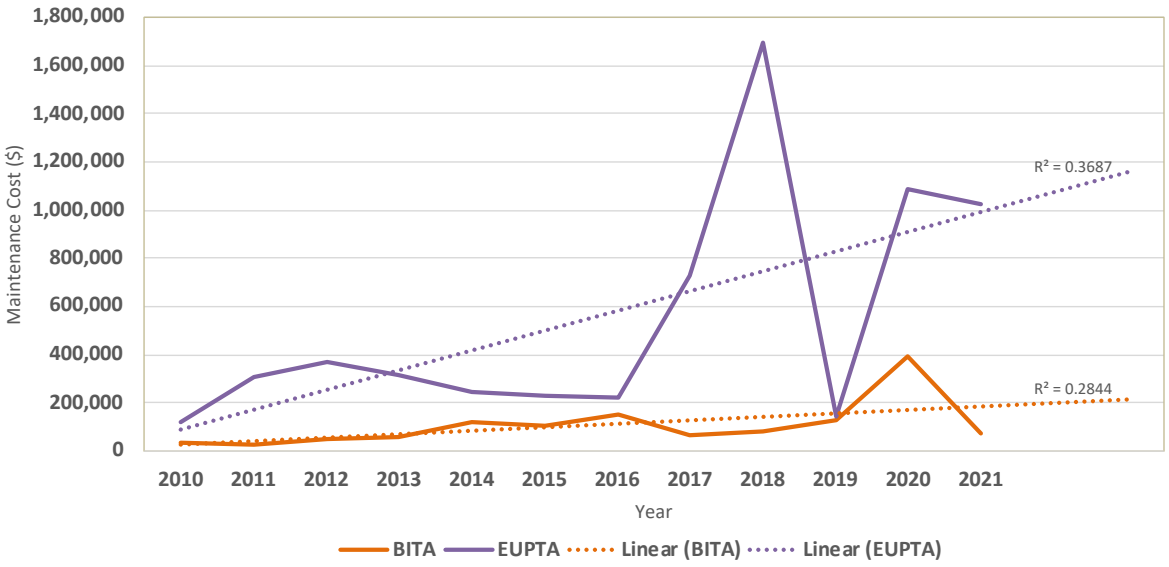


Figure 9-1: EUPTA & BITA Annual Maintenance Cost

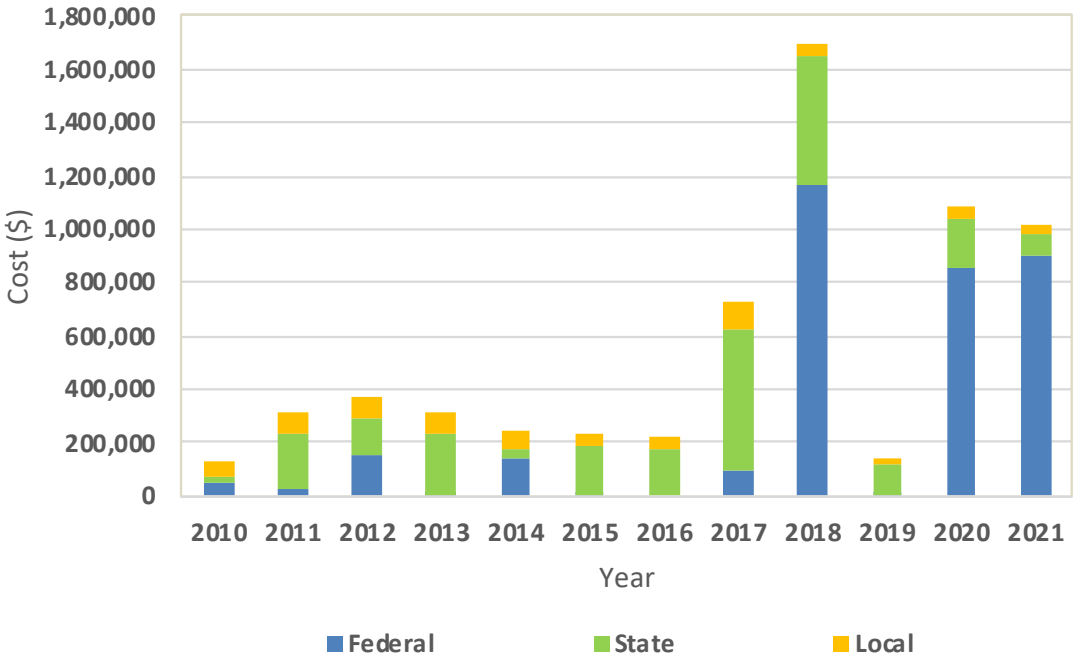


Figure 9-2: EUPTA maintenance expense by funding source

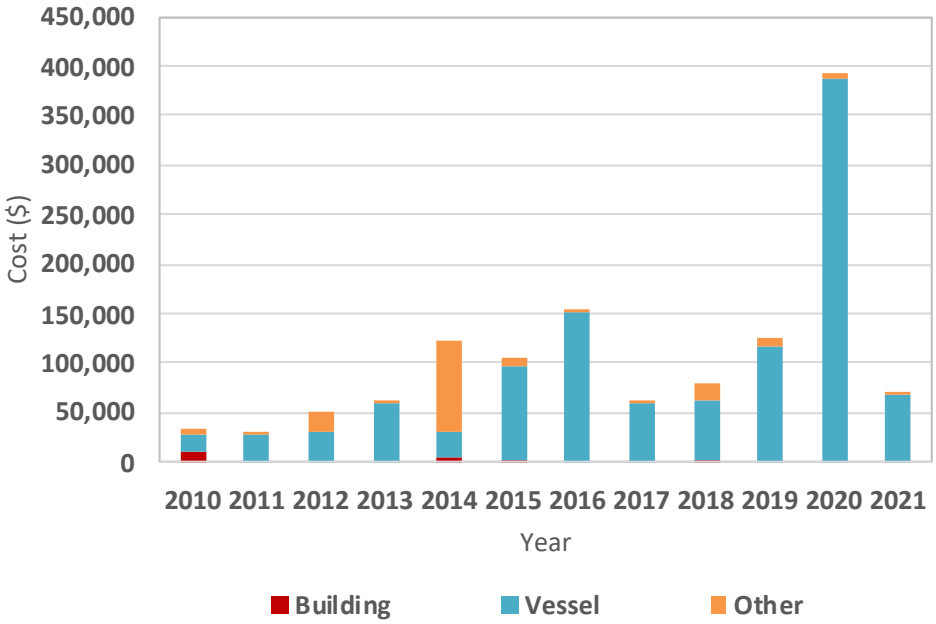


Figure 9-3: BITA maintenance expense by spending category

Given the different dynamics of operation between each island, the research team tabulated ridership data for EUPTA versus BITA (*Figure 9-4*) and annual state operating funding of EUPTA versus BITA (*Figure 9-5*). It can be observed that the average passenger ridership of EUPTA is 22X of BITA, and the average operating cost per year of EUPTA is 4.89X of BITA. Contextually,

EUPTA has eight docks & four vessels, while BITA has two docks and two vessels. However, marine capital funding used to be split evenly (50%-50%) between EUPTA and BITA from FY-2012 to FY-2019 (*Figure 9-6*), despite the stark differences in asset and operation size between EUPTA and BITA. This does not necessarily imply that EUPTA should receive more percentage of marine capital funding compared to BITA, as BITA's ageing asset and high operational cost have rendered marine capital funding received at current level as insufficient, despite receiving a large portion of funding pool compared to EUPTA. It is appropriate to assume that the maintenance cost requirement would only grow as asset depreciates in value and age. This non-linear growth in maintenance cost needs is further amplified by labor/service cost inflation, and rising material costs. All in all, it renders that a fixed amount of funding year-over-year for the past decade is unsustainable for ferry operators, especially with EUPTA and BITA being a non-profit transportation authority. The research team noted that starting FY2020, marine capital funding is used to match FBP funds, with an updated legislative boilerplate language that provisions a 60-40 split between EUPTA and BITA (previously 50-50). This updated funding ratio is in line with conclusions derived from historical funding analyses and is believed to be a positive progress. However, given the funding structure change in the middle of the project period, no further analysis could be done with 1-year data point.

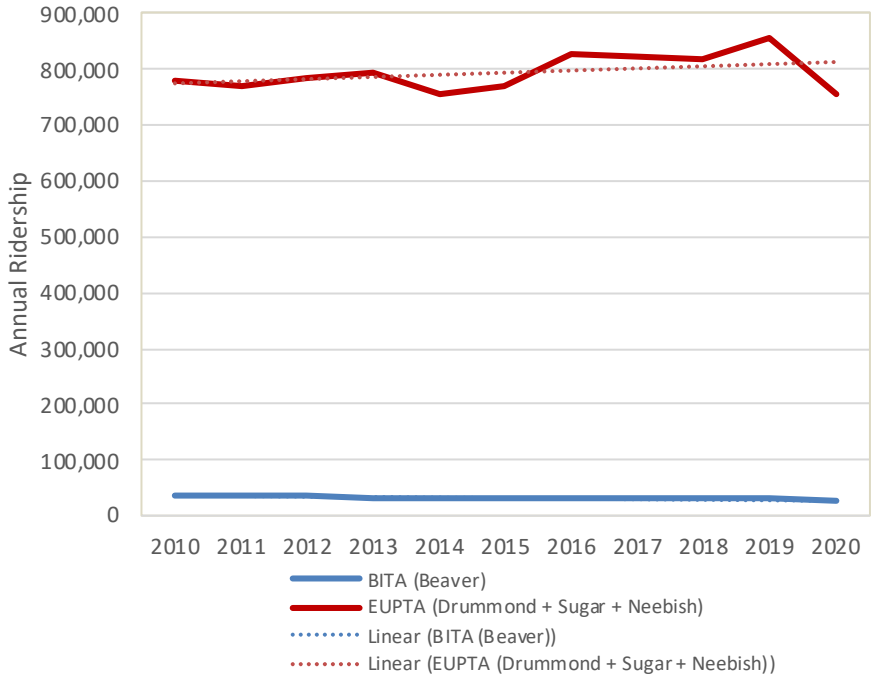


Figure 9-4: Annual passenger ridership

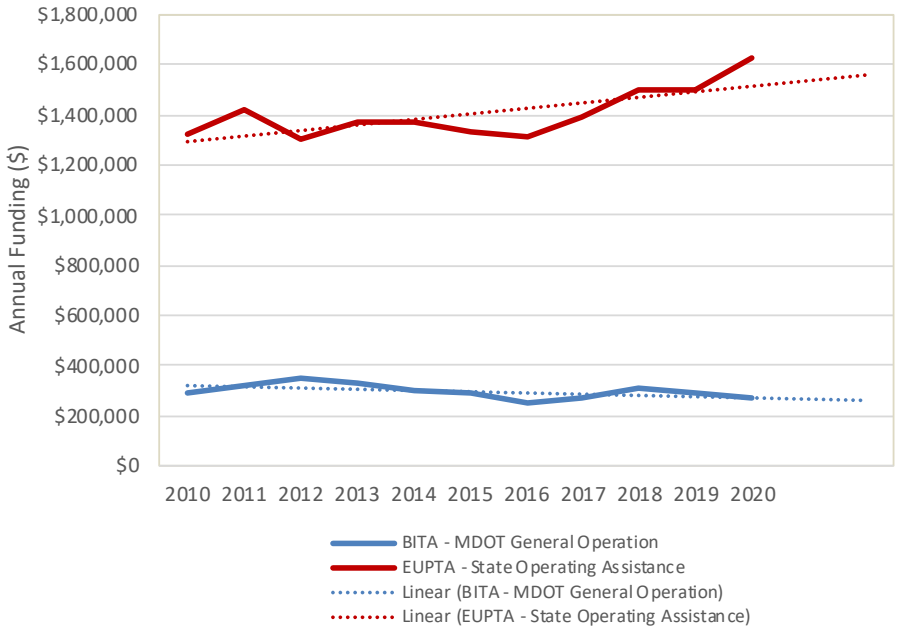


Figure 9-5: Annual state operational funding

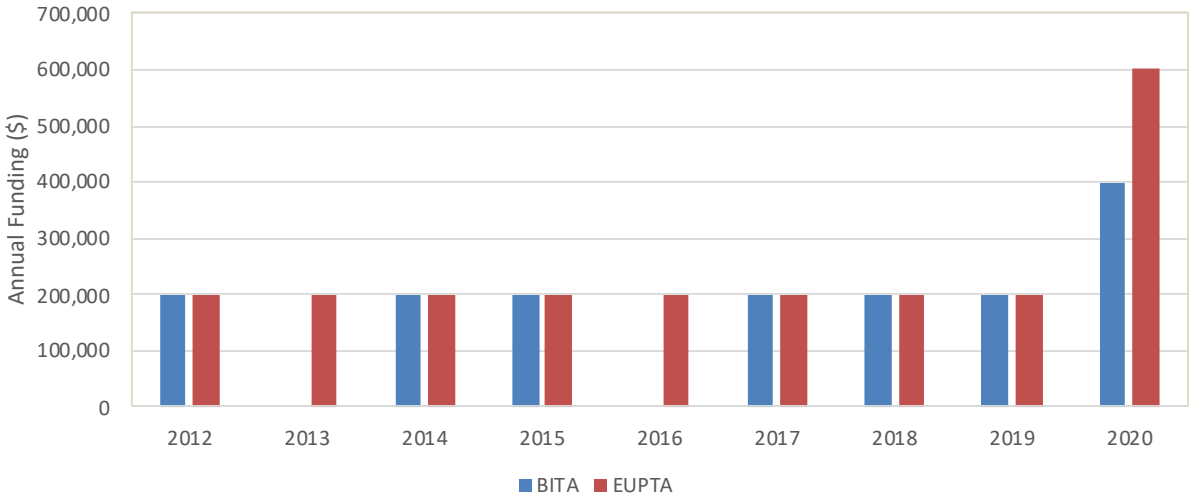


Figure 9-6: Marine Capital funding FY2012 - FY2020

Specific cost details for each ferry operator are then analyzed by tabulated maintenance cost with ridership data. *Figure 9-7* and *Figure 9-8* depict EUPTA's and BITA's maintenance cost in tandem with their ridership trends. For EUPTA, the pace of maintenance cost rose at a faster pace than the ridership volume. This is intuitive with aging infrastructure, decreasing asset efficiency, and increasing cost of parts and maintenance materials. For BITA, ridership has shown a declining overall trend, but the recent BITA 2021 study indicated that they do not anticipate ridership volume

to further decline and will remain stable in coming years (*38*). Regardless of the ridership trend, maintenance costs will continue to increase over time, as vessel and docks continue to weather and age.

A normalized maintenance spending cost per ridership is tabulated in *Figure 9-9*, where it can be observed that the cost per ridership-mile for EUPTA is increasing at a steeper rate than BITA. The maintenance cost per ridership for BITA is on average 7x more than EUPTA, but when normalized by ridership-mile, the cost per ridership-mile for BITA is only 1/3 of EUPTA. This is due to BITA's operational nature of low ridership volume with long nautical miles served.

This proves a valid concern by some ferry operators, that suggests FBP funding formulation that puts an emphasis on nautical miles served, may not truly be a representative measure of operational funding needs. For instance, BITA's Emerald Isle vessel sails for 60 miles per round trip, for approximately four hours of engine run, with only two round trips per day. This corresponds to a total of 120 miles served per day, at eight engine hours. Compared to EUPTA's Sugar Islander that runs only 0.2 miles per sailing but runs almost 24/7, two round trips per hour. So, a total sailing of 9.6 miles, but with 24 engine hours. Since vessel depreciation is directly related to engine hours, nautical miles served being used as a formula funding weightage ignores the running engine hour as a critical component to funding and maintenance needs.

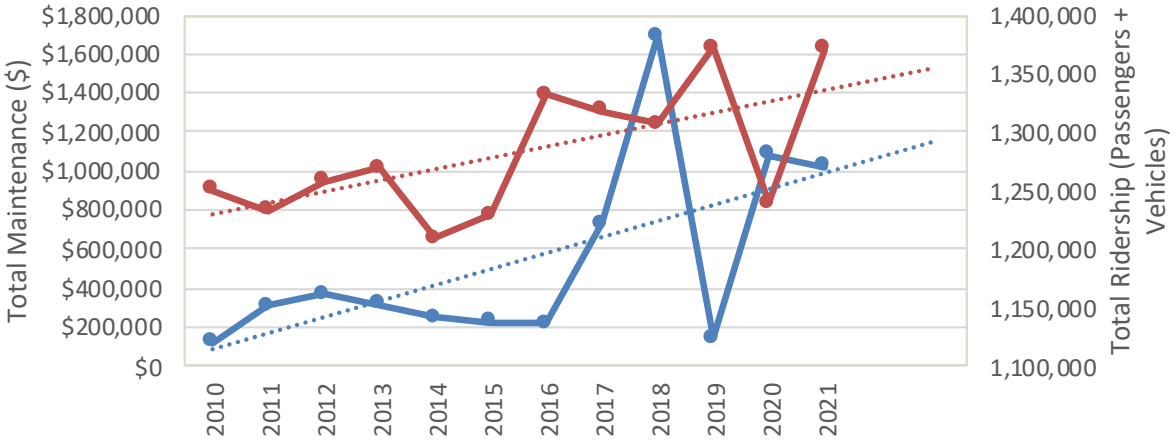


Figure 9-7: EUPTA total maintenance vs total ridership

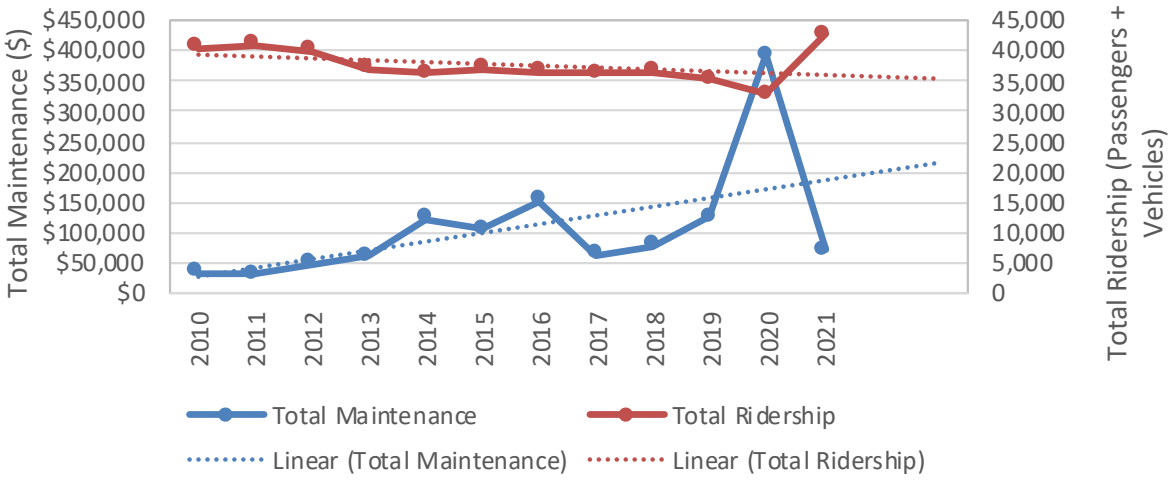


Figure 9-8: BITA total maintenance vs total ridership

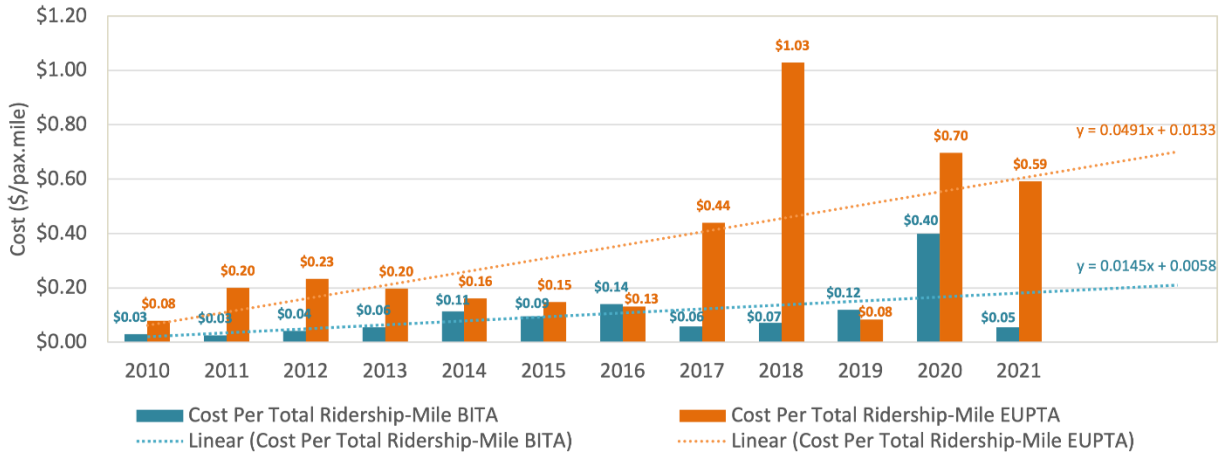


Figure 9-9: Cost per ridership-mile EUPTA vs BITA

9-2- Maintenance Cost and Funding Need Projection

9-2-1- Methodology

Future maintenance cost projections were developed based on historical maintenance spending. There are several assumptions made before developing the projection model: (i) asset performance and quality does not deteriorate beyond typical/average rate of depreciation, (ii) rising labor, material, and service cost environment, and finally (iii) a steady rate of 2-5% year-over-year price inflation. Given the multitude of externalities that could affect maintenance spending needs, the maintenance projection is not intended to provide an exact value of spending expectation, rather an estimated range of funding needs to maintain an optimal upkeep of asset operation lifespan and avoid service interruptions.

To provide a more stable and realistic cost projection, projection authorizations effective for three-year periods are showcased. The three-year block cluster was specified by the research team, to be consistent with the spending timeframe of marine capital funding historical practice. Projections based on a cluster of fiscal years also allow room for anomaly maintenance spending, where variations and volatilities of any given fiscal year can be buffered with fiscal allocations for the year before and after it. Projected values are reported in future value, and their present values corresponding to a range of 2% and 5% year-over-year average inflation.

A second order polynomial regression model was used to project a 10-year maintenance cost projection (2023-2032). This is due to non-linear maintenance spending needs with aging asset and infrastructure, as historically indicated. Based on 2010-2020 spending data, a second order polynomial regression model yielded the lowest coefficient of determination (R^2) value, where a lower R^2 value indicates a better fit trend-line. A +/-10% margin of variable is then marked to account for spending pattern uncertainties. Drydocking schedule is overlaid onto the cost projection for context as years with drydocking works tend to demand higher expenses.

Aside from the maintenance cost projections, the research team coordinated with EUPTA and BITA to list major projects for maintenance and capital improvements in the next 10 years, and their corresponding year of execution, and associated cost. This aspect of data provides a complimentary funding need projection, accounting for future needs- while cost projections are based on historical data. These two aspects of data are to be used in tandem by MDOT, for well-informed planning.

9-2-2- Results

Figure 9-10 and *Figure 9-11* present the maintenance cost projection for EUPTA and BITA from 2023 through 2032, with three-fiscal-year blocks being marked. The total funding need within each fiscal year block is simply the total area under the polynomial curve. It can be observed that the projection trendline for EUPTA increases at a steeper slope than the projection trendline for BITA. This is partly due to EUPTA's larger fleet size, where at least one vessel is scheduled for drydocking almost every year- hence higher annual maintenance expense projections. Tentative years with drydocking scheduled are labeled with a blue '*drydock*' label underneath corresponding year. A numerical tabulation of the maintenance cost projection is then shown in *Table 9-3* and *Table 9-4*, where funding values in present value and future value, along with a 10%

margin of variability are provided. These ranges of maintenance cost projections can be used by MDOT to plan for future state funding and contributions for capital and maintenance project needs. It can be observed that between FY2010-FY2021, EUPTA maintenance cost is on average 5x of BITA, but looking ahead, between FY2023-FY2032, EUPTA maintenance cost is forecasted to be 7-8x more than BITA's. This is due to EUPTA's larger asset size, thereby, the rate of maintenance spending need increases at a higher pace than BITA.

Table 9-5 and *Table 9-6* tabulates the major expense, maintenance, and capital improvements that EUPTA and BITA expect to undergo in the next 10-year period. These data are to be observed in tandem with historical data, where maintenance cost projections (*Table 9-3*, *Table 9-4*) are to be used as the base case for funding needs. The list of future projects is then accounted and considered as an ideal list of projects that is expected to be executed for an optimal asset and operation upkeep, where their cost and corresponding year are then overlaid onto the maintenance cost projections.

It is to be noted that despite one of EUPTA's vessel, Neebish Islander II, was replaced by Neebish Islander III in late 2022, the maintenance cost projections provided should not be skewed significantly- as data being used make projections are of historical maintenances made on vessels. Thereby, regardless of the new vessel, regular maintenance still needs to be conducted at similar frequencies and expenses. If any, the new vessel had levied the need for a significant maintenance and upkeep cost in the future. A recent 2021 Transit Master Plan study conducted by BITA contains an exhaustive list of operational assets and their lifecycle/replacement schedule at any given year through 2050 (*38*).

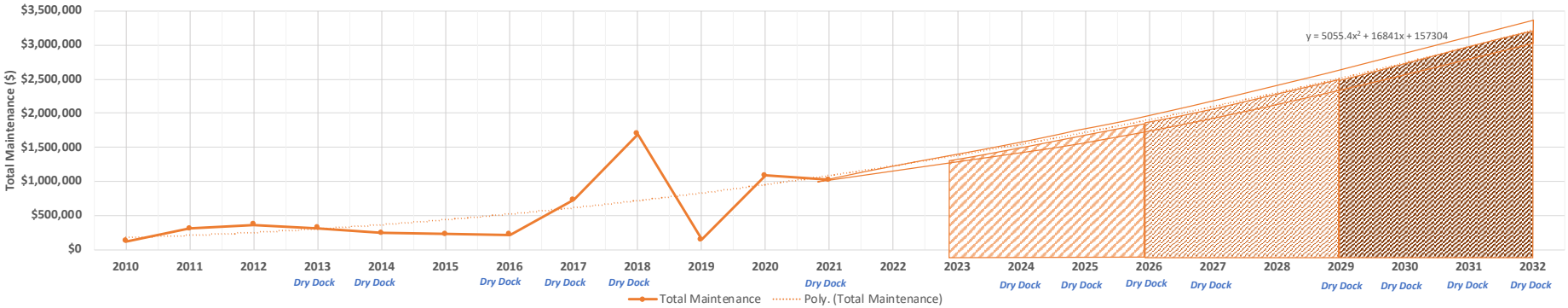


Figure 9-10: EUPTA maintenance cost projection

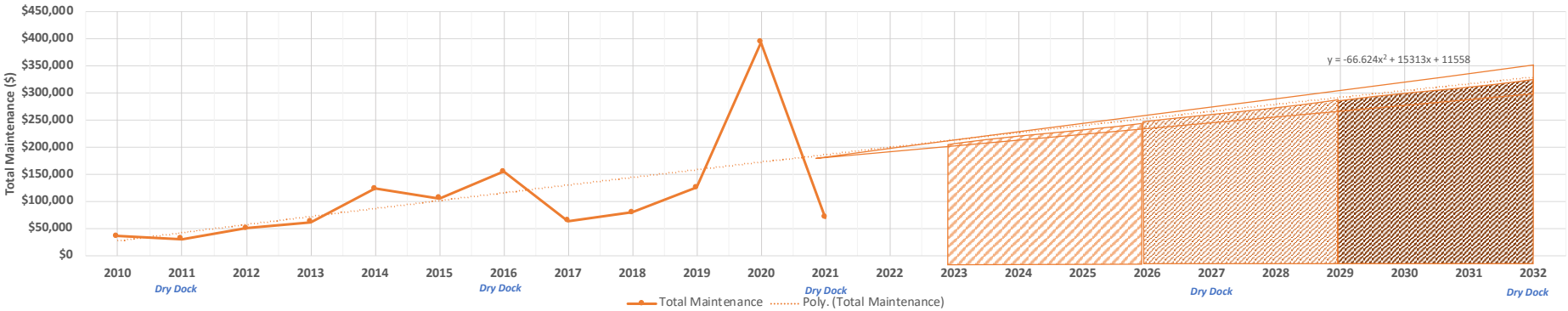


Figure 9-11: BITA maintenance cost projection

Table 9-3: EUPTA maintenance expense projection tabulation in present and future values

Value, Inflation %	Fiscal Year Cluster	Sum of Maintenance Expense	Upper Bound (+10%)	Lower Bound (-10%)	% Change
Future Value (FV)	FY23, FY24, FY25	$4,875,000	$5,362,500	$4,387,500	
	FY26, FY27, FY28	$6,562,500	$7,218,750	$5,906,250	+ 34.62%
	FY29, FY30, FY31	$8,625,000	$9,487,500	$7,762,500	+ 31.43%
Present Value (PV) at 2%	FY23, FY24, FY25	$4,593,821	$5,053,203	$4,134,439	
	FY26, FY27, FY28	$5,827,312	$6,410,043	$5,244,580	+ 34.62%
	FY29, FY30, FY31	$7,075,504	$7,783,054	$6,367,953	+ 31.43%
Present Value (PV) at 5%	FY23, FY24, FY25	$4,211,208	$4,632,329	$3,790,087	
	FY26, FY27, FY28	$4,897,039	$5,386,742	$4,407,334	+ 34.62%
	FY29, FY30, FY31	$5,295,002	$5,824,501	$4,765,501	+ 31.43%

Table 9-4: BITA maintenance expense projection tabulation in present and future values

Value, Inflation %	Fiscal Year Cluster	Sum of Maintenance Expense	Upper Bound (+10%)	Lower Bound (-10%)	% Change
Future Value (FV)	FY23, FY24, FY25	$675,000	$742,500	$607,500	
	FY26, FY27, FY28	$806,250	$886,875	$725,625	+ 19.44%
	FY29, FY30, FY31	$1,068,750	$1,175,625	$961,875	+ 32.56%
Present Value (PV) at 2%	FY23, FY24, FY25	$636,068	$699,674	$572,460	
	FY26, FY27, FY28	$715,927	$787,519	$644,334	+ 19.44%
	FY29, FY30, FY31	$876,747	$964,421	$789,072	+ 32.56%
Present Value (PV) at 5%	FY23, FY24, FY25	$583,090	$641,399	$524,781	
	FY26, FY27, FY28	$601,636	$661,799	$541,472	+ 19.44%
	FY29, FY30, FY31	$656,120	$721,731	$590,507	+ 32.56%

Table 9-5: EUPTA Asset Maintenance and Improvement Schedule 2024-2033

	Item	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	*Cost Range*	Remarks
1	Dock Maintenance & Repair	X	X	X	X	X	X	X	X	X	X	*$100k - $250k*	Per year
2	Vessel Maintenance & Repair	X	X	X	X	X	X	X	X	X	X	*$100k - $250k*	Per year
3	Dry Dock and Repowering of Vessels	X	X	X	X		X	X	X	X		*$1mil - $5mil*	$1.5 mil/yr.
4	Sault Ste. Marie/Mainland Dock Repair	X										*$250k - $500k*	
5	Sugar Island Dock Relocation (Design)		X									*$100k - $250k*	
6	Sugar Island Dock Relocation (Construction)			X								*$1mil - $5mil*	
7	Structural Steel Painting/Repair at all Docks				X							*$4mil - $5mil*	
8	Replace Sugar Islander II Ferry Boat	X										*$10mil*	Design done
9	Additional Ferry Boat for Drummond Island		X									*$10mil*	Design done

Table 9-6: BITA Asset Maintenance and Improvement Schedule 2024-2033

	Item	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	*Cost Range*
1	M/V Emerald Isle/engine and transmission rebuild	X									X	*$500k - $1mil*
2	Plow trucks		X									*$100k - $250k*
3	Ticketing/reservation/phone system		X									*<$100k*
4	New Vessel			X								*>$5mil*
5	Dock repairs/engineering/high water damage/slip for new vessel			X								*>$5mil*
6	BITA Building (siding/doors/carpeting/landscaping/sidewalk)			X								*<$100k*
7	Pole Barn/additional storage			X								*$250k - $500k*
8	M/V Emerald Isle drydock/five-year inspections				X					X		*$250k - $500k*
9	Storage Building parking lot redone				X							*<$100k*
10	BITA Building parking and drive redone				X							*<$100k*
11	Shuttle Bus					X						*<$100k*
12	M/V Emerald Isle passenger area/seating/flooring/ceiling	X						X				*$100k - $250k*
13	M/V Emerald Isle radar equipment					X						*<$100k*
14	M/V Emerald Isle vessel painted						X					*$100k - $250k*
15	M/V Emerald Isle wheelchair lift						X					*<$100k*
16	M/V Emerald Isle generator rebuilds									X		*<$100k*
17	Storage Building furnace							X				*<$100k*
18	Forklifts									X		*$100k - $250k*

CHAPTER 10 – SUMMARY AND RECOMMENDATIONS

10-1- Summary of Findings

This section summarizes the findings from conducted nationwide state DOT survey, interview insights from ferry operators nationwide, ferry ridership survey, maintenance and capital need projection analysis, island mobility gaps, and access to fundings.

Nationwide State DOT Survey

1. Most agencies oversee only ferry operators that receive state/federal funding.
2. Oversight is extended to certain private operators due to (i) service significance, (ii) broad oversight as public transportation in general, or (iii) oversight only on specific aspect of operation (i.e., state regulatory compliance).
3. The top three roles of state agencies towards ferry operators are (i) funding assistance, (ii) vessel/dock improvement procurements, and (iii) facility/infrastructure maintenance funding.
4. State/federal funding ratio for MI is vastly below the average ratio nationwide, implying other states are allocating larger state funding relative to provided federal funding.
5. Total ridership for MI from 2014 to 2019 showed a relatively larger percentage growth compared to other states within the same period, but total state funding did not grow as much.
6. Highest rated and most selected funding criteria are (i) operational assistance need, (ii) economic growth & demands, (iii) asset maintenance & aging infrastructure need, and (iv) region connectivity.
7. The top reasons for the expected budget increase for the next three years are due to aging infrastructure, followed by economic activity growth, and new vessel capital investment.

Insights from Ferry Operators Interview

1. WSF distinguishes funding for capital maintenance projects vs capital preservation projects. Maintenance funding is for work done to ensure asset is capable to reach its expected lifespan, while preservation fundings are for work done to extend asset life.

2. Most funding requirement forecasts are done based on service schedule & ridership growth, with fluctuations on labor & fuel cost.
3. Washington state requires new vessels to be built in Washington shipyards, when state dollars are in use. These requirements justify higher annual ferry funding and appropriations. A similar mechanism could be explored for the state of Michigan, where an avenue for job creation or increased state revenue can be induced to justify more funding towards ferry systems.
4. The Public Private Partnership (PPP) model is a great model for state agencies to utilize when procuring a new service and exploring feasibility of a route or service, where assets can be leased prior to acquisition, or prior to setting up a transportation authority to govern the service. PPP model provides a hybrid governance where private operators can retain full control over their operations, while still having state/local authorities on board for accountability measures. This structure introduces a shared-risk model for both parties in agreement and provides an avenue to capitalize on both private and public funding. However, asset ownership structure needs to be strategized in order to be eligible for public funds.

Ferry Ridership Survey

1. Services in Beaver Island and Drummond Island are generally rated higher than in Neebish and Sugar Islands. Reliability, quality of vessels, ticket price, and accommodation for people with disabilities were all rated with higher satisfaction in Beaver and Drummond Islands. In terms of overall waiting time satisfaction, Beaver Island had the most positive rating, while the other three islands were fairly close to each other. Overall, Beaver Island had the highest service satisfaction rating across all satisfaction measures, followed closely by Drummond, and Neebish.
2. When it comes to paying extra for more frequency or vessel quality, ferry users across all four islands seemed to disagree. Sugar Island ferry users show the highest disagreement, while Beaver Island ferry users are more interested in paying extra for either more frequency or vessel quality. Lower the income passengers indicated a much higher dissatisfaction with the existing ticket price, and permanent residents are also overall less satisfied with the ticket prices compared to seasonal residents.

3. All EUPTA ferry users agreed that a 24/7 ferry service for emergency situations is needed. While BITA users showed less agreement on this statement, mainly due to the longer ferry travel distance compared to the other three islands.
4. Tourists are more satisfied with the ferry services offered, and permanent residents are least satisfied with existing ferry services, which stems from their higher expectations due to their frequent use of services.
5. Most users have never experienced emergency services needed out of ferry service operational hours, but those who have had such experience are distributed almost the same across all type of residency.

Maintenance and Capital Need Projection Analysis

1. Average passenger ridership of EUPTA is 22X of BITA, and the average operating cost per year of EUPTA is 4.89X of BITA.
2. The maintenance cost per ridership for BITA is on average 7x more than EUPTA, but when normalized by ridership-mile, the cost per ridership-mile for BITA is only 1/3 of EUPTA.
3. Due to EUPTA's larger asset size, the rate of maintenance spending needs increases at a higher pace than BITA. Currently, EUPTA's annual maintenance cost is on average 5x of BITA but is forecasted to grow at a higher pace to 7-8x of BITA.
4. EUPTA and BITA are expected to incur a maintenance expense increase of 10% year-over-year, through FY 2032. Between FY 2029 – FY 2031, EUPTA is expected to require an ideal maintenance spending budget of approximately $2.5 million per year in future value (~$2 million in present value, at 2% average annual inflation). BITA is expected to require an ideal maintenance spending budget of approximately $300,000 per year in future value (~$250,000 in present value, at 2% average annual inflation).
5. Vessel depreciation is directly related to engine hours more than it does to nautical miles served. Therefore, a more realistic measure for asset depreciation and ferry maintenance funding should consider running engine hours instead of solely relying on nautical miles served.

Mobility Gaps (Beaver, Sugar, Neebish, Drummond Islands)

1. Beaver Island most pertinent mobility gaps are (i) high ticket price for residents and regular commuters, (ii) low freight transport capacity, (iii) inefficient timing and low frequency of sailing schedule, (iv) inadequate roofed storage on the mainland dock to accommodate weather-sensitive cargo, and (v) long freight transport queues.
2. Sugar, Neebish, and Drummond Islands most pertinent mobility gaps are (i) high ticket prices for residents and regular commuters, (ii) poor schedule coordination with other modes of public transit, (iii) short season ticket validity, (iv) absence of priority loading scheme for business owners and (v) the need for emergency services SOP.

Access to Funding (Manitou, Bois Blanc, Grand, Harsens Islands)

1. Grand and Manitou Islands ferry operators are eligible for FBP funds but are rendered uncompetitive due to low ridership volumes. They are currently allocated a small amount of FBP funds, but primarily rely on fundings provided by National Park Services, USFS, and farebox revenue. A feasible pool of funding could be drawn from any grants or programs related to economic and tourism/ecotourism developments.
2. Harsens Island ferry operator currently does not qualify for FBP, as it does not own any eligible public asset. Bois Blanc Island ferry operator is eligible for FBP funding but is only allocated a small amount due to a low ridership volume. However, both ferry operators indicated that they are not interested in receiving state/federal funding to remain operational with financial flexibility and without the need to adhere to state/federal requirements and bureaucracies.

10-2- Recommendations

In general, it can be deduced that state and federal authorities do have responsibilities towards island residents in various aspects. The need for sufficient supervision and enforcement is critical to ensure accountability by ferry operators to provide quality and acceptable level of service to island residents. The lack of supervision and governance may pose a serious threat to island residents' welfare and culminate distrust towards local electives and authorities. State DOTs in particular, have a more specific responsibility to ensure mobility and transportation welfare of island residents and the community. While responsibility may vary across different islands and communities, general aspects of ideal and optimal involvement are as follows:

1. Ensuring ferry services meets the need of island residents, by means of facilitating service procurement, contracting, operations, governance, and enforcement.
2. Ensuring roads and bridges for island communities are well maintained at a similar level as roads and bridges on the mainland.
3. Ensuring public transit, including non-ferries on the islands are sufficient for community needs and mobility welfare at large, including service integration with other modes of transits for region connectivity.
4. Ensuring emergency services such as EMTs, ambulances, fire trucks and police vehicles can access island communities in a timely manner.
5. Facilitate planning and coordination between island residents and relevant parties to develop transportation plans and strategies that highlight any unique needs of the island community.

To this end, the research team synthesized two sets of recommendations tailored to (i) Beaver, Sugar, Neebish, and Drummond Islands, and (ii) Manitou, Bois Blanc, Grand and Harsens Islands. The recommendations are provided separately due to the different scopes considered in this for these two groups of islands. Each group of recommendations are broken down into key categories and type of recommendations accordingly.

Recommendation categories for Beaver, Sugar, Neebish, and Drummond Islands:

- State Funding Appropriation
- State Funding Match for FBP
- Operational Issues (Ticket Pricing, Freight Services, Priority Loading)

- Emergency Services
- Backup Ferry Requirements
- Procurement & Bureaucracy issues
- Economic and Tribal Group Considerations
- Green Mobility
- MDOT Opportunity for Governance

Recommendation categories for Manitou, Bois Blanc, Grand, and Harsens Islands:

- Opportunities to Access Funding
- Service Reliability
- Governance & Coordination

10-2-1- Final Recommendations for Beaver, Sugar, Neebish and Drummond Islands

State Funding Appropriation

1. The annual state funding appropriation ratio between EUPTA versus BITA, and state funding match for FBP needs to be reassessed. marine capital funding used to be divided equally between them, but EUPTA's annual maintenance need is on average 5x of BITA, and the gap is projected to grow up to 7-8x in the next 10 years. Currently, the marine capital funding is structured to match FBP funding level received by each ferry operator. However, current funding received by BITA has also been rendered insufficient- prompting for a program capacity expansion to increase the ratio of state funding match. Funding equality (ensuring beneficiaries receive the same amount) and equity (ensuring beneficiaries receives the amount they deserve) needs to be balanced. The removal of funding split mandate going forward, presents an opportunity for MDOT to strategize a new funding ratio framework, utilizing the provided insights in *Chapter 9* of this report.
2. Given FBP funding formulation that has given higher weightage to passenger ridership volume and lower weightage to vehicle ridership and nautical miles served, BITA and EUPTA's FBP funding is adversely impacted to a certain extent. EUPTA has a high vehicle ridership count, while BITA has a high nautical mile served. MDOT is advised to account for these opportunity losses that may need to be offset in some manner.

3. MDOT is encouraged to upkeep constant engagements with EUPTA and BITA on their need for upcoming vessel replacements and financing strategies. In the next 10 years, it was reported that BITA has one vessel that is near its optimal lifespan (Beaver Islander), while EUPTA has one vessel (Sugar Islander II) near its useful lifespan and the need for an additional vessel to cater Drummond Island.
4. MDOT is advised to revise the level of marine capital funding and other state funding appropriation size to account for service price inflation and bottom-line cost of ferry operations (increasing labor and input cost) over time.
5. The current operational funding level is inadequate for EUPTA, as rates are not affordable for regular commutes. Especially when ferry is the only mode of transportation available for Sugar, Neebish, and Drummond Islands. EUPTA had to increase fare rates for their operation in July 2020 to cover a higher cost of operating. Therefore, state operating funding match needs to be reassessed.
6. MDOT are to explore the feasibility for a special subsidy for Drummond Island ferry services, since the route is part of M-134 (state-owned highway). Tapping into Michigan Transportation Fund (Act 51) could be a potential avenue to be explored further.

State Funding Match for FBP

1. Other states have been increasing their state funding size over recent years; However, Michigan's state funding growth rate is not at par with the rate of ridership increase.
2. Michigan has a relatively low ratio of state/federal funding compared to other states. It is advised to increase the ferry system state funding match to a more appropriate rate.
3. A steady ridership pattern for Beaver, Sugar, Neebish and Drummond Islands suggests that MDOT will be able to reliably estimate state funding match requirement for FBP funding. This allows for more prudent fiscal projections to be made.
4. The revised FBP formulation from MAP-21 to FAST Act reduced the weightage for number of vehicles carried and miles served. This had adversely put EUPTA and BITA at a disadvantage- majority of EUPTA's ridership are vehicles, and BITA has high nautical miles served. While the FBP program is unlikely to be retired in the foreseeable future, its eligibility criteria and total fiscal allocation size may vary. In such cases, MDOT is advised

to assess those changes and reevaluate the corresponding state funding match level, to offset any abrupt gap in funding that will affect ferry operators in Michigan.

Operational Issues (Ticket Pricing, Freight Services, Priority Loading)

1. Resident versus tourist ticket pricing should be explored, along with stipulation of who would qualify for it (age criteria, property tax record, etc.). EUPTA and BITA may not have the necessary tools, data and resources to assess pricing strategies. It is noteworthy that pricing strategy needs to account for demand elasticity, as it can only be raised up to a certain extent before demand is destroyed, and reciprocally, it can only be reduced to a certain level before it yields no marginal benefit.
2. Sugar and Neebish ferry ticket prices are relatively high compared to Drummond Island's ticket price that serves greater sailing length. The ratio of price tickets with respect to service distance is to be revised.
3. Paid priority loading pass can be explored for business owners, and to residents of certain special needs. Mechanisms of utility are to be explored.
4. The current capacity for freight services and logging truck accommodations for EUPTA is sufficient and satisfactory. However, there is a bottleneck for BITA's freight transport capacity. This directly impacts economic productivity.

Emergency Services

1. A 24/7 crew for emergency services on Beaver, Sugar, Neebish and Drummond are currently not an imminent need, as ferry operators can attend to emergency needs on an ad-hoc basis and cater for additional services if needed. However, a black-and-white emergency services SOP is needed.
2. Emergency services SOP needs to be developed by TA, then reviewed and approved by MDOT & USCG. A framework that can be referred to by island residents allows them to remain well-informed prior to any emergency needs and eliminate any dispute tensions.
3. Having a designated SOP in place avoids any potential conflict between ferry operator and residents about which type of emergencies are qualified for a special run by the captain

(currently ad-hoc assessment basis). It also reduces tension between residents and ferry operators, knowing the SOP have been reviewed and approved by a state authority body.

Backup Ferry Requirements

1. EUPTA: Existing practice of rotating vessels across Sugar, Neebish and Drummond Islands to accommodate any dry-docked vessel is financially sustainable without the need for a new vessel, but at the expense of user satisfaction and service reliability. While additional backup ferries are not critically required to ensure uninterrupted ferry operations, maintaining an additional vessel after they are retired could be an option. However, further cost and economic analyses need to be done to ensure retired vessel upkeep is financially feasible and practical.
2. BITA/BIBCO: Beaver Islander is not able to accommodate freight transport and summer tourism ridership demands as optimal as Emerald Isle. The retirement of Beaver Islander and acquisition of an improved vessel may impose a positive service improvement, even when one vessel is dry-docked. An additional backup vessel may impose significant financial liability, as the backup vessel needs to be of a certain specification to cater unique demands for Beaver Island. Therefore, the new vessel to replace Beaver Islander needs to be strategically designed to eliminate the need for an additional backup vessel and ensure optimal service efficiency.

Procurement & Bureaucracy Issues

1. Ferry services are currently bounded by procurement requirements as any other land transit modes. Marine procurement is uniquely different from land transit, thereby suggesting the need to introduce special exclusion, statute of limitation or special provision to reduce bureaucracies. While project authorizations with federal funding are subject to FTA procurement requirements, modifying certain aspect of requirements for project authorizations with full state funding could be explored.
2. MDOT is currently working case by case with both EUPTA and BITA to address issues and challenges associated with the procurement process due to the specific nature of ferry operations. Significant improvement can be made to increase efficiency (for both MDOT

staff and ferry operators) if certain aspects of the procurement process can be identified to be facilitated and legislated accordingly, while still ensuring quality and equity standards.

3. While legislative statutes and federally mandated SOPs are hard to change, small internal changes within MDOT can also be introduced to reduce friction and make changes without the need for a grandiose legislative overhaul that might consume time/resources.

Economic and Tribal Group Considerations

1. The Eastern Upper Peninsula of Michigan is heavily reliant on tourism and the service sector economy, but the region has noted challenges in attracting talent to the area, given poor public mobility. A reliable ferry service, including an integrated coordination with other modes of public transit would enhance the overall intra-region connectivity.
2. Beaver Island's economy is highly reliant on tourism and the construction industry, where efficient passenger and freight transport is crucial for the local economy. State financial assistance is highly needed to sustain the high operating cost to service Beaver Island.
3. Special planning is needed for BITA's new boat in regard to its freight capacity (cargo opening dimension, maximum tonnage, etc.), to maximize mobility productivity and enhance capacity for economic growth in the region. MDOT could also explore service improvement coordination with airline providers on Beaver Island to supplement the overall mobility needs of island residents, beyond ferry services.
4. There are no notable demands or special considerations for tribal communities on Beaver, Sugar, Neebish, and Drummond Islands with respect to transportation/mobility needs. It was reported and understood that their needs are just as essential as other residents. Currently, any special needs by tribal communities are well accommodated by BITA and EUPTA.
5. Nonetheless, MDOT is advised to engage with tribal community representatives and keep an open line of communication, in case of any future consideration needs.

Sustainability and Green Marine Mobility

1. From interviews & surveys inputs, MDOT is advised to explore the feasibility, economic and environmental benefits of green/hybrid vessels in the future, and to explore available funding opportunities.

2. MDOT should capitalize on the current national mood of green energy, environmental and social governance (ESG), and transition to zero-carbon mobility, where there are ample avenues of federal funding and motivation to approve project grants. While the current infrastructure in Michigan is not conducive for mass adoption of sustainable marine mobility, feasibility studies need to be conducted to identify optimal landscape. It is imperative for state agencies to be prepared with adoption policies ahead of time, in order to capitalize any window of opportunities down the line.

MDOT Opportunity for Governance

1. MDOT should maintain a good rapport with local elected officials, in the need to source information and gauge ferry service satisfaction from island residents.
2. MDOT may also keep an open line of communication with community organizations or non-profit organizations beyond elected officials, such as GLIA that could provide a macroscopic insight, for any MDOT planning considerations.
3. To enhance state oversight efficiency, MDOT is advised to engage, coordinate and collaborate with other state agencies, such as EGLE or other agencies that oversee islands in the state. While MDOT is specifically responsible to ensure the mobility welfare of island residents, inter-departmental information sharing, and collaboration could increase planning impact, personnel productivity and resource allocation efficiency.
4. The nature of ferry system operation is volatile (ridership trends, demand and cost profile, user satisfaction, funding availability). Thereby, state agencies need to actively revisit/monitor the state of ferry systems periodically (ideally every 5-10 years).

10-2-2- Final Recommendations for Manitou, Bois Blanc, Grand and Harsens Islands

Opportunities to Access Funding

1. Grand and Manitou Islands: Any MDOT contribution and/or involvement towards ferry services as part of transportation equity initiative (or other eligible state programs) are welcomed by ferry operators, as by current FBP funding criteria, they are not competitive enough to receive a meaningful amount of funding given their low ridership volumes. MDOT could also coordinate with ferry operators to explore if they may qualify for other state funding programs beyond ferry services in particular (e.g., rural transit program, or

economic development grants). However, operators have noted that they do not have sufficient internal resources and personnel expertise to navigate through bureaucratic procedures and obtain access to public funds.

2. Harsens and Bois Blanc Islands: Both ferry operators are not interested in receiving state and federal funding assistances, as they would like to remain independent, for-profit operators and not attached to any state/federal bureaucracies.
3. Despite the finite resource of state funding, it is imperative for state authorities to allocate sufficient fiscal resources towards ferry services that remains elemental for some island communities. State funding may be designed beyond the nomenclature of 'Marine Service'. Funding appropriation may be broadened up to enable ferry operators to compete in a *laissez-faire* manner. For example, re-defining eligibility or scope for state tourism funding that would enable islands/ferry operators to qualify, or re-defining semantics of 'roadway' such that it includes a segment of two roads separated by a water body. This way, ferry operators that are not receiving FBP or marine capital funding will now have access to some sort of funding. Those who need it would be incentivized to provide reciprocal value to the state, in order to qualify and utilize public funds.

Service Reliability Issue on Bois Blanc and Harsens Islands

1. The services provided by a single service operator who has pricing power with lack of any competition and high barrier for entry are not perceived positively by the public. These conditions lead to a natural local monopoly that hurts public welfare when there is a lack of accountability to serve with a satisfactory level of service.
2. There is a need for state authorities to step in to improve service quality and affordability, as local/township authorities have little influence on their operations according to feedbacks provided by island community representatives.
3. MDOT is advised to explore avenues for residents in the respective island to put forth transportation issues and concerns. This aids MDOT to monitor if service is deteriorating below the acceptable level of service, and step in if necessary. A direct line of communication could be set up with island/township authorities, such as assigning a liaison from MDOT to oversee ferry operators or islands that do not receive federal funding.

Governance and Coordination

1. Given the lack of direct authority to govern private operators, MDOT is advised to set up a guideline for private ferry operators to incentivize an appropriate level of service being offered and avoid a complete disregard of local community needs and welfare.
2. Enforcement mechanisms and governance structures such as a local TA or PPP model could be explored, to provide oversight and ensure accountability from private operators.
3. Some township authorities have been actively looking for ways to enforce service improvements and expressed interest to actively consult MDOT as part of the initiative.
4. Given the decentralization of governance for private operators that does not receive federal funding, there is a need for the state authority to develop a compliance framework to ensure regardless of governance structure, basic public welfare, mobility needs, and safety concerns are top priorities.

LIST OF REFERENCES

1. U.S. Customs Management Centers. *Guidelines For Ferry Operations in The United States*. 2014.
2. Bruzzone, A. TCRP Report 152: Guidelines for Ferry Transportation Services. *Transportation Research Board*, 2012.
3. McFadden, J., A. Barrows, and C. Reschovsky. *2016 Highlights of Ferry Operations in the United States*. 2017.
4. Bureau of Transportation Statistics (BTS). The National Census of Ferry Operators (NCFO) 2020 Highlights. https://data.bts.gov/stories/s/5dqg-uz62. Accessed Feb. 28, 2023.
5. Office of the Federal Register, N. A. and R. A. *Definitions of Terms Used in This Subchapter*. Office of the Federal Register, National Archives and Records Administration, 46 CFR 175.400, 2005.
6. U.S. Customs Management Centers. *Guidelines For Ferry Operations in The United States*. 2014.
7. U.S. DoT. Passenger Travel Facts and Figures, Bureau of Transportation Statistics. *U.S. Department of Transportation Bureau of Transportation Statistics*, 2016.
8. McFadden, J., A. Barrows, and C. Reschovsky. 2016 Highlights of Ferry Operations in the United States. Vol. 424, No. August, 2017, pp. 928–929.
9. Bureau of Transportation Statistics. Ferries Carried 132 Million Passengers in 2019.
10. Michigan Dept. of Environmental Quality. SOM - Does Michigan Have the Longest Coast Line in the United States? https://www.michigan.gov/som/0,4669,7-192-26847-103397--,00.html. Accessed Oct. 11, 2020.
11. U.S. Census Bureau. City and Town Population Totals: 2010-2019. https://www.census.gov/data/tables/time-series/demo/popest/2010s-total-cities-and-towns.html. Accessed Oct. 12, 2020.
12. Brinckerhoff, P. *TCRP Report 165: Transit Capacity and Quality of Service Manual*. Transportation Research Board, 2013.
13. Payne, T., D. Rose, and H. Scher. *TCRP Synthesis 102: Integrating Passenger Ferry Service with Mass Transit*. Transportation Research Board, 2013.
14. Bruzzone, A. TCRP Report 152: Guidelines for Ferry Transportation Services. *Transportation Research Board*, 2012.
15. Congressional Research Service. *Federal Public Transportation Program: In Brief*. 2020.
16. U.S. Department of Transportation. Guidance - Ferry Boat Formula Program (FBP) | Federal Highway Administration. https://www.fhwa.dot.gov/map21/guidance/guidefbp.cfm. Accessed Oct. 10, 2020.
17. Federal Highway Administration (FHWA). Ferry Boat and Terminal Facilities Construction Program (FBP). In *A Guide to Federal-Aid Programs and Projects*, pp. 60–62.
18. Federal Highway Administration. *A Guide to Federal-Aid Programs and Projects*.
19. Friends of Frog Ferry. *Passenger Ferry Best Practice Case Studies for the Portland-Vancouver Market: How Cities Are Taking Advantage of Underutilized Waterways to Reduce Traffic Congestion, Improve Air Quality and Strengthen Community Connections*. 2019.

20. U.S. Department of Homeland Security. Port Security Grant Program. https://www.fema.gov/grants/preparedness/port-security. Accessed Mar. 15, 2023.
21. U.S. Department of Transportation. U.S. Maritime Administration Federal Ship Financing Program (Title XI). https://www.maritime.dot.gov/grants/title-xi/federal-ship-financing-program-title-xi. Accessed Mar. 15, 2023.
22. Kentucky Transportation Center. *Analysis and Assessment of the Reimbursement Rates and Mechanisms for Kentucky's Publicly Funded Ferries*. 2020.
23. Michigan State Transportation Commission. The Michigan Transportation Policy Plan (MTPP). 1992.
24. State of Michigan. *Michigan Transportation Fund Act (Act 51)*. 1951.
25. Boyd, L. Recovery Act Grants Will Dramatically Expand Ferry Service in Michigan. https://www.michigan.gov/formergovernors/0,4584,7-212-96477_57648_21974-218208–,00.html.
26. Michigan Department of Transportation. *FY2020 MDOT 5304 Work Program Approval*. 2020.
27. Friends of Frog Ferry. *Passenger Ferry Best Practice Case Studies for the Portland-Vancouver Market: How Cities Are Taking Advantage of Underutilized Waterways to Reduce Traffic Congestion, Improve Air Quality and Strengthen Community Connections*. 2019.
28. Boston Harbor Now. *Comprehensive Boston Harbor Water Transportation Study & Business Plans*. 2017.
29. Mittleman, J. *Keeping Passenger Ferry Systems Afloat: What Can Boston Learn from Other Water Transportation Systems around the Country?* 2018.
30. NYC Economic Development Corporation. *Citywide Ferry Study 2013 Final Report*. 2013.
31. The New York City Economic Development Corporation. *Comprehensive City-Wide Ferry Study*. 2011.
32. NYC Ferry. 2021 Expansion - New York City Ferry Service. https://www.ferry.nyc/nycferry-2020-2021-service-route-expansion/.
33. Washington State Ferries. *Washington State Ferries 2040 Long Range Plan*. 2019.
34. Virginia Department of Transportation. Ferry Boat Feasibility Study. *2012*. http://www.virginiadot.org/projects/studynova-ferrychap6.asp.
35. Michigan Department of Transportation. *St. Mary's River Ferry Study*. 1984.
36. Corradino group. *St. Mary's River Ferry System Master Plan-Final Report*. 2007.
37. Corradino Group. Beaver Island Transportation Coordination Study. 2005.
38. Mp2planning LLC. *Beaver Island Transportation Plan Update 2021*. 2021.
39. NYC Ferry. Reports & Statistics - New York City Ferry Service. https://www.ferry.nyc/reports-statistics/.
40. Halcrow Inc. *Interagency Study of Regional Private Passenger Ferry Service*. 2011.
41. Washington State Ferries. *Washington State Department of Transportation Ferries Division Final Long-Range Plan 2009-2030*. 2009.
42. The San Francisco Bay Area Water Emergency Transportation Authority (WETA). *2017 On-Board Passenger Survey*. 2018.
43. Michigan Department of Transportation. *St. Mary's River Ferry Study*. 1984.
44. Corradino Group. *St. Mary's River Ferry System Master Plan-Final Report*. 2007.

45. The Corradino Group. *Beaver Island Transportation Coordination Study-Final Report*. 2005.
46. Texas Department of Transportation. *Overview of State Ferry System Operations*. 2019.
47. Washington State Ferries. *Washington State Ferries 2040 Long Range Plan*. 2019.
48. Elliott Bay Design Group. *Ferry Replacement Plan*. 2013.
49. BMT Fleet Technology Limited. *Newfoundland and Labrador Vessel Replacement Strategy*. 2006.
50. Cedar River Group, L. *Auto-Passenger Vessel Sizing and Timing (2009-2030) Draft Report*. 2009.
51. McQuaid, R. W. The Impact of Improved Ferry Services on an Island Economy. *European Regional Science Association*, 2005. https://doi.org/10.1108/13527619610129485.
52. et al. Adams, T. M. *Economic Impact Analysis of Ferry Operations in Wisconsin*. 2006.
53. The McDowell Group. *The Economic Impacts of the Alaska Marine Highway System Prepared for Alaska Marine Highway System*. 2016.
54. Michigan Department of Transportation. *Area Economic Significance of Rail Car Ferry Service Across the Straits of Mackinac*. 1971.
55. Michigan Department of Transportation. *Economic Benefits of Lake Michigan Car Ferry Service - Vol 1*. 1976.
56. Michigan Department of Transportation. *Economic Benefits of Lake Michigan Car Ferry Service - Vol 2*. 1976.
57. Michigan Department of Transportation. *Cross Lake Michigan Ferry Study*. 1985.
58. Eastern Upper Peninsula Regional Planning and Development Commission. *2019 Annual Performance Report for Eastern Upper Peninsula's Comprehensive Economic Development Strategy (CEDS)*. 2019.
59. Eastern Upper Peninsula Regional Planning and Development Commission. *Eastern Upper Peninsula's 2015-2019 Comprehensive Economic Development Strategy*. 2019.
60. Michigan Department of Transportation. *St. Mary's River Ferry Study*. 1984.
61. Larose Research & Strategy. *Socioeconomic Impacts of BC Ferries*. 2014.
62. Eastern Upper Peninsula Regional Planning, and D. Commission. *Eastern Upper Peninsula's 2015-2019 Comprehensive Economic Development Strategy*. 2019.
63. Eastern Upper Peninsula Regional Planning, and D. Commission. *2019 Annual Performance Report for Eastern Upper Peninsula's Comprehensive Economic Development Strategy (CEDS)*. 2019.
64. Eastern Upper Peninsula Regional Planning and Development Commission. Eastern Upper Peninsula's 2015-2019 Comprehensive Economic Development Strategy. *2015*.
65. The Sault Tribe of Chippewa Indians Official Web Site. https://www.saulttribe.com/.
66. W. Hoffman. R. Sawyers. Long Range Transportation and Capital Improvement Plan 2018-2038. 2018.
67. 114th Congress. Fixing America's Surface Transportation (FAST) Act. *PUBLIC LAW 114–94—DEC. 4, 2015*. 1–491.
68. Charlevoix County Transit. *Charlevoix Country Transit Master Plan*. 2020.
69. Michigan Department of Transportation. *St. Mary's River Ferry System Analysis - Fare Impact and Demand Estimation*. 2018.
70. (EUPTA), E. U. P. T. A. Eastern Upper Peninsula Transportation Authority Financial Profile 2018. 2018, p. 49783.

71. Federal Transit Administration. Eastern Upper Peninsula Transportation Authority Annual Agency Profile. https://www.transit.dot.gov/ntd/transit-agency-profiles/eastern-upper-peninsula-transportation-authority.
72. Land Information Access Association. *Beaver Island Master Plan 2017*. 2017.
73. Beaver Island Transportation Authority. *Beaver Island Transportation Authority Financial Statement 2016*. 2016.
74. Beaver Island Transportation Authority. *Beaver Island Asset Summary 2015-2016*. 2016.
75. Beaver Island Transportation Authority. *Beaver Island Transportation Authority Financial Statement 2018*. 2018.
76. J. Jessup. H. Bunch. *Analysis of Drummond Island Ferry System*. 1986.
77. Michigan Department of Transportation. *A Study of the Feasibility of a Proposed Ferry Service Between Detour Village, MI and Meldrum Bay, Manitoulin Island*. 1978.
78. Sugar Island Township Planning, and Z. Commission. *Sugar Island Township Master Plan*. 2018.
79. U.S. Census Bureau. City and Town Population Totals: 2010-2019. https://www.census.gov/data/tables/time-series/demo/popest/2010s-total-cities-and-towns.html.
80. US Census Bureau. State Population Totals: 2020-2021. https://www.census.gov/data/tables/time-series/demo/popest/2020s-state-total.html. Accessed Oct. 21, 2022.
81. Beaver Island Boat Company (BIBCO). https://www.bibco.com/. Accessed Mar. 24, 2022.
82. Eastern Upper Peninsula Transportation Authority (EUPTA). https://www.eupta.net/. Accessed Mar. 24, 2022.
83. US Department of Transportation. National Census of Ferry Operators (NCFO).
84. Washington State Department of Transportation Ferries Division. *FY 2020 WSDOT Ferries Division Performance Report*. 2020.
85. Washington State Transportation Commission. *WSTC FROG-2021 WSF Winter Ferry Performance Study Washington State Transportation Commission Ferry Riders' Opinion Group*. 2021.
86. Washington State Transportation Commission. *WSF Summer Recreational and Performance Survey 2022 Report*. 2022.
87. Mccaleb, E., J. Davis, and D. Findley. *NCDOT Statewide Customer Service Survey 2019-20*. 2021.
88. Aaron, T., J. Dixon, A. Fountain, T. Grubbs, C. Peele, K. Stegall, H. Thomas, M. Willis, L. Winslow, S. Baker, J. White, J. Abel, H. Borkenhagen, R. Brown, R. Dewhurst, H. Fuchs, J. Goodwin, C. Hill, T. Jennette, J. Mathias, K. Pistel, A. Brannan, B. Mercier, and B. Jones. *North Carolina Department of Transportation Ferry Division Long-Range Plan 2050*. 2020.
89. Washington State Ferry. *WSF System Electrification Plan*. 2020.
90. de Magalhães, R. F., Â. de M. F. Danilevicz, and J. Palazzo. Managing Trade-Offs in Complex Scenarios: A Decision-Making Tool for Sustainability Projects. *Journal of Cleaner Production*. Volume 212, 447–460.

APPENDIX A – NATIONWIDE STATE DOT SURVEY QUESTIONS

Responsibilities Towards Provision of Ferry Services to Islands Residents

| Michigan Department of Transportation | Michigan State University |

SURVEY DESCRIPTION

The Michigan Department of Transportation (MDOT) is performing research to evaluate **state and federal responsibilities towards the provision of ferry services to residents of islands**, including funding, level of service to be provided, dock maintenance, and need for emergency services, among other areas.

To this end, the research team is **evaluating the current state-of-the-practice to better understand the role state agencies should play in providing equitable transportation services for island residents**. This survey is critical to identifying nationwide best practices, and we appreciate your response.

We advise completing this survey from a computer as it may require you to gather data from other sources (e.g., funding and ridership data). This survey will take you approximately 30-45 minutes to complete. Additional time may be needed to look up for requested information.

Should you have any questions or comments about this survey or the associated project, you may contact Dr. Ali Zockaie, at zockaiea@egr.msu.edu.

Survey Link:
https://msu.co1.qualtrics.com/jfe/form/SV_2a9nFObsIwYPJ0G

SECTION 1: RESPONDENT DETAILS

Q1.1 Please share your name and contact information:

- **Your Name** _____
- **Agency** _____
- **Position in Agency** _____
- **Email** _____
- **Contact Number** _____

SECTION 2: BACKGROUND

In the next set of questions, we would like to understand:

General landscape and oversight of ferry operations in your state

Q2.1 Please select which statement is true about your agency:

- Our agency oversees only ferry operations that receive state or federal funding
- Our agency oversees all ferry operations that receive state or federal funding, plus some private ferry operations
- Our agency oversees all ferry operations
- Others (please specify) _____

Please provide the following information to the best of your ability.
(*You may provide a **range of values**, or **"N/A" if the information is not available** or not applicable*)

Q2.2 For the following funding categories, please specify the **total number of ferry operators**:

- Total number of ferry operators that receive **only federal funding** _____
- Total number of ferry operators that receive **only state funding** _____
- Total number of ferry operators that receive **both federal and state funding** _____
- Total number of ferry operators that are **privately funded (*neither federal nor state funded*)** _____

Q2.3 For the following funding categories, please specify the **total number of ferry vessels** (including back-up vessels) operated by ferry operators in your state:

- ○ Total number of vessels owned by operators that receive **only federal funding** _____
- ○ Total number of vessels owned by operators that receive **only state funding** _____
- ○ Total number of vessels owned by operators that receive **both federal and state funding** _____
- ○ Total number of vessels owned by operators that are **privately funded (*neither federal nor state funded*)** _____

Q2.4 For private (neither federal nor state-funded) ferry operators in your state, does your agency have information on their:

	Yes	No
Ridership Data	○	○
Financial/Funding Data	○	○

SECTION 3: COORDINATION & OPERATION

In the next set of questions, we would like to understand:

Your **agency's coordination and roles** for ferry services in your state

Q3.1 Please share the following details about **state-owned** vessels or **state-operated** services:
(Note: Enter N/A if no data is available)

- ○ **Number of ferry vessels owned by your agency** _____
- ○ **Number of ferry operations directly operated by your agency** _____

Q3.2 Please select all applicable **roles that your agency plays** for all ferry operations in your state (***including non state-owned ferry operations***):

- ☐ Funding/Subsidy for Ferry Operations
- ☐ Oversee/Enforce Federal Compliance
- ☐ Oversee/Enforce Safety Programs
- ☐ Contracting out Ferry Operations
- ☐ New Vessel Procurement Financing/Funding
- ☐ Vessel/Dock Improvement Procurements
- ☐ Facility/Infrastructure Maintenance Funding
- ☐ Funding/Subsidy for Ferry Operations
- ☐ Regional Ferry Studies
- ☐ Ridership Demand Studies/Surveys
- ☐ Emergency Evacuation Plans
- ☐ Asset Management Plans/Studies
- ☐ Monitor/Assess/Maintain Level of Users' Satisfaction
- ☐ Monitoring System Performance/ Level of Service
- ☐ Operational Standards & Specifications
- ☐ Others 1 (please specify) _____
- ☐ Others 2 (please specify) _____

Q3.3 Please share any comments in regard to the role(s) that your agency plays towards residents on islands, or towards ferry operations in general.

_____
_____
_____

Q3.4 Which **performance or level of service measures** does your agency use **to monitor** the performance of ferry services for public transportation?

- ☐ We do not use any indicative measures to monitor ferry performances
- ☐ Ridership Volume Growth
- ☐ Operating Cost Per Passenger
- ☐ Emission/Pollution Cost
- ☐ User Satisfaction Survey Results (*Comfort, Satisfaction, etc.*)
- ☐ Service Access Time (*Time taken from ticket purchasing, queueing/waiting/walking to onboarding*)
- ☐ Accommodation to Users with Disabilities (*User satisfaction or convenience towards services and facilities*)
- ☐ Travel Time (*Ferry travel time relative to other transportation modes*)
- ☐ Service Downtime/Resiliency (*Percent sailings cancelled or delayed*)
- ☐ Service Reliability (*Likeliness of schedule adherence or on-time performances*)
- ☐ Service Cost (*Relative cost to other transportation modes*)
- ☐ Others 1 (please specify) _____
- ☐ Others 2 (please specify) _____

SECTION 4: POLICIES & LEGISLATION

In the next set of questions, we would like to understand:

Policies and legislation around ferry services in your state

Q4.1 Does your state have any **policies/legislation** for ferry services in regard to:

	Yes	No	I Do Not Know
Funding/Financial Support	○	○	○
Emergency Services	○	○	○
Local Economic Support	○	○	○
Social Welfare (e.g., tribal or minority group considerations)	○	○	○
Local Funding Match	○	○	○

Q4.2 Please share any **other notable policies/legislation for ferry services** that has been established in your state:

_____
_____
_____

Q4.3 For the policies/legislation you indicated your agency has in the previous question,

Please **provide comments or online links** to the related policies:
(e.g., policy name, objectives, etc.)

Q4.3.1 Funding/Financial Support

_____
_____

Q4.3.2 Emergency Services

_____
_____

Q4.3.3 Local Economic Support

_____
_____

Q4.3.4 Social Welfare (e.g., tribal or minority group considerations)

_____
_____

Q4.3.5 Local Funding Match

_____
_____

BLOCK 5: RIDERSHIP & FUNDING

In the next set of questions, we would like to understand:
Ridership and funding information for ferry services in your state

Q5.1 What was the **annual funding from state and federal** (in Dollar value) for all ferry services in your state during the following periods:
(Please share the amount of funding provided across different programs and agencies, not just the amount for a particular programs)

Notes:
MAP-21 Act was established in 2012
FAST Act was established in 2015

	State Funding($)	Federal Funding($)
Annual Funding in 2010 (Before MAP-21 Act)		
Annual Funding in 2014 (After MAP-21 and Before FAST Act)		
Annual Funding in 2019 (After FAST Act & before COVID)		

Q5.2 For ferry operators that receives either federal or state funding, what is the **annual ferry ridership** volume in your state during the following periods:

(*If no exact value is available, a **range/approximation would be useful***)
Notes:
MAP-21 Act was established in 2012
FAST Act was established in 2015

	Year 2010 (Before MAP-21 Act)	Year 2014 (After MAP-21 and Before FAST Act)	Year 2019 (After FAST Act & before COVID)	Year 2020 (During COVID)
Number of **Passengers** Carried by Ferries				
Number of **Vehicles** Carried by Ferries				

Q5.3 In **2019** (*after FAST Act and before COVID*), what was the **total annual ridership** (*passengers and vehicles carried by ferries*) of all ferry operators for the following funding categories:

(*If no exact value is available, a **range/approximation would be useful** as well.*)

	Number of Passengers	**Number of Vehicles**
Total annual ridership of ferry operators that receive federal funding only		
Total annual ridership of ferry operators that receive state funding only		
Total annual ridership of ferry operators that receive both federal and state funding		
Total annual ridership of ferry operators that receive only fares/local/private funding *(neither federal nor state funded)*		

Q5.4 Did your agency/state offered any COVID relief funding or programs to ferry operators?

- ○ Yes (*Please specify total budget amount to all operators*) _____
- ○ No

Q5.5 What are the most common **federal funding source(s)** utilized by ferry operators in your state? (*Please select all that apply*)

- ☐ I do not have such information
- ☐ Ferry Boat Program
- ☐ National Park Service Funds
- ☐ U.S. Postal Service Funds
- ☐ Highway Trust Fund
- ☐ Transportation Trust Fund
- ☐ Environmental Protection Agency (EPA)
- ☐ Tribal Transportation Program (Bureau of Indian Affairs)
- ☐ Port Security Grant Program (Department of Homeland Security)
- ☐ COVID Relief Program
- ☐ Others 1 (please specify funding name) _____
- ☐ Others 2 (please specify funding name) _____

Q5.6 For the selected federal funding source(s), what is the **average annual funding amount for each program** after FAST Act and before COVID (2016-2019)?

*(An **approximate or range of funding is also useful**. Input 'N/A' if funding amount is not known.)*

	Annual Funding Amount ($)
Ferry Boat Program	
National Park Service Funds	
U.S. Postal Service Funds	
Highway Trust Fund	
Transportation Trust Fund	

Environmental Protection Agency	
Tribal Transportation Program (Bureau of Indian Affairs)	
Port Security Grant Program (Department of Homeland Security)	
COVID Relief Program	
Others 1	
Others 2	
Others 3	

Q5.7 **Besides state and federal funding,** what are the most common funding source(s) utilized by ferry operators in your state? (*Please select all that apply*)

- ☐ I do not have such information
- ☐ Ticket Fares
- ☐ Freight Fares
- ☐ Private Postal/Delivery Service Companies
- ☐ Private Contracts (please specify details) _____
- ☐ Public Contracts (please specify details) _____
- ☐ Advertising Contracts
- ☐ City/County/Township Funding
- ☐ Residents Associations
- ☐ Others 1 (please specify funding name) _____
- ☐ Others 2 (please specify funding name) _____

Q5.8 Please select the **key measures that your agency considers in providing funds** for ferry services in your state:

- ☐ Our agency does not have any particular funding criteria
- ☐ Access to Education and Healthcare
- ☐ Access to Natural Resources
- ☐ Social Welfare & Social Service
- ☐ Economic Growth & Demands
- ☐ Labor Productivity & Mobility
- ☐ Region Connectivity
- ☐ Asset Maintenance & Aging Infrastructure Needs
- ☐ Operational Assistance Needs
- ☐ Growing Service Needs
- ☐ Access to Freights, Goods, and Services
- ☐ Others 1 (please specify) _____
- ☐ Others 2 (please specify) _____
- ☐ Others 3 (please specify) _____

Q5.9 Please **rate the level of importance** of the following key measures in providing funds for ferry services in your state:

	Not Important	Slightly Important	Important	Fairly Important	Very Important
Access to Education and Healthcare	○	○	○	○	○
Access to Natural Resources	○	○	○	○	○
Social Welfare & Social Service	○	○	○	○	○
Economic Growth & Demands	○	○	○	○	○
Labor Productivity & Mobility	○	○	○	○	○
Region Connectivity	○	○	○	○	○
Asset Maintenance & Aging Infrastructure Needs	○	○	○	○	○
Operational Assistance Needs	○	○	○	○	○
Growing Service Needs	○	○	○	○	○
Access to Freights, Goods and Services	○	○	○	○	○
Others 1	○	○	○	○	○
Others 2	○	○	○	○	○
Others 3	○	○	○	○	○

Q5.10 Any comments regarding key measure(s) that is(are) being used by your agency in state funding allocation?

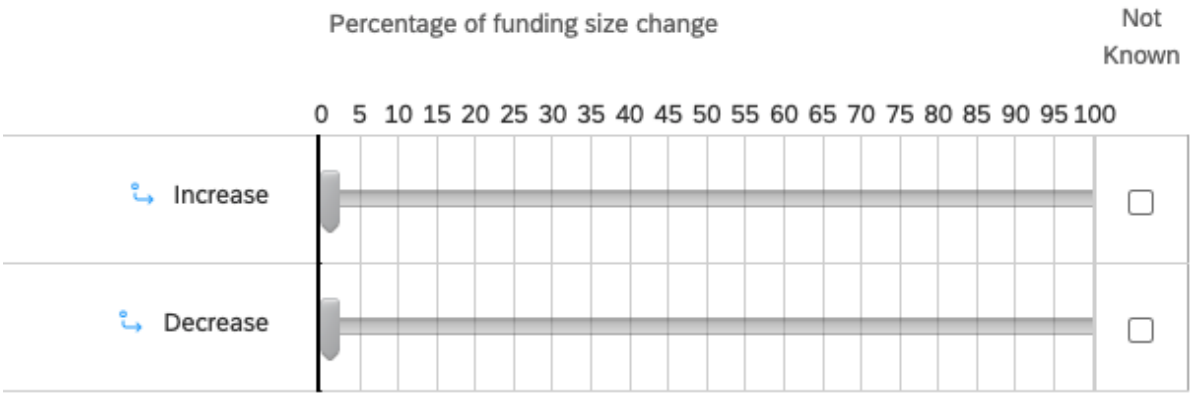
_____

_____

Q5.11 What is the **projected change in your state funding** for ferry services over the next 3 years?

- ○ Increase
- ○ Decrease
- ○ We do not expect any notable change in funding amount for ferry services
- ○ We do not currently have such information available

Q5.11 What is the **projected change in your state funding** for ferry services over the next 3 years?



Q5.12 What are the reasons for the increase in your state's provided funding for ferry operations?

- [ ] General State Budget Expansion
- [ ] Aging Infrastructure
- [ ] Higher Projected Service Demand
- [ ] Targeting a Certain Level of Service (LOS)
- [ ] Economic Activity Growth
- [ ] Others 1 (please specify) _____
- [ ] Others 2 (please specify) _____

Q5.13 What are the reasons for the decrease in your state's provided funding for ferry operations?

- [ ] General State Budget Contraction
- [ ] Lower Projected Service Demand
- [ ] Targeting a Certain Level of Service (LOS)
- [ ] Economic Activity Contraction
- [ ] Others 1 (please specify) _____
- [ ] Others 2 (please specify) _____

SECTION 6: MISCELLANEOUS

Q6.1 If available, please share any links to **previous studies** on ferry services that your agency has conducted in the following areas:

- Ferry Services Funding Strategies
- Responsibility to Residents on Islands
- Tribal Considerations in Transportation Planning
- Statewide Ferry System Performance Monitoring Methods

_____
_____
_____
_____
_____

Q6.2 Please provide any general comments you may have **regarding the survey**, or notable **remarks about ferry operations in your state**:

_____
_____
_____
_____
_____

END OF SURVEY

APPENDIX B – FERRY RIDERSHIP DATA

Sugar Island

Table B- 1: Passengers carried by month (Sugar Island)

	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21
Oct	37,046	37,998	40,920	38,652	43,822	40,424	36,910	34,700	33,238	34,936	35,266	35,596	33,144	33,774	38,924	35,136	36,254	39,264	37,732	39,416	37,042	35,904
Nov	31,360	32,844	34,276	37,704	36,906	35,946	33,084	30,110	30,962	30,762	30,489	30,216	30,618	31,328	33,664	28,636	32,312	34,844	31,860	32,312	31,972	25,670
Dec	30,346	30,464	35,428	32,338	32,242	32,134	30,248	29,028	28,180	26,524	27,363	28,202	29,052	29,040	30,180	29,188	30,874	30,312	30,018	31,768	30,466	24,678
Jan	27,662	29,124	31,148	29,424	31,040	29,372	27,822	26,878	25,136	25,026	25,498	25,970	24,598	26,506	24,352	27,164	27,724	28,174	19,844	27,842	29,024	25,278
Feb	27,312	27,228	28,706	26,938	27,412	27,378	25,788	24,140	24,128	23,074	24,060	25,046	26,538	24,528	24,366	24,548	26,534	25,256	25,012	24,004	27,110	24,548
Mar	29,194	31,634	27,942	27,008	28,616	31,636	29,076	26,546	25,260	26,354	26,862	27,370	28,104	29,080	23,208	26,602	29,124	27,964	28,154	27,524	22,060	27,774
Apr	31,712	32,964	29,048	30,662	34,842	33,520	31,192	27,880	27,858	29,096	29,063	29,030	31,650	28,670	26,940	29,236	30,212	29,432	27,720	30,458	16,661	29,302
May	37,892	40,408	37,062	41,736	37,894	35,530	37,592	35,188	33,976	36,104	33,990	31,876	36,920	39,912	37,018	37,194	41,372	38,278	39,572	38,872	28,640	35,516
June	38,624	39,384	42,398	45,664	40,730	38,118	37,002	36,354	36,858	37,958	37,428	36,898	40,236	39,532	39,178	37,254	41,504	38,676	41,010	39,622	36,914	36,968
July	54,650	56,816	56,508	58,966	52,252	48,768	44,976	45,180	44,752	47,504	49,020	50,536	46,926	50,664	50,980	45,890	51,430	48,200	47,876	47,442	42,520	44,446
Aug	48,946	53,034	53,380	54,826	47,858	43,082	40,854	43,988	46,508	48,152	45,786	43,420	45,202	51,118	45,434	43,468	48,482	42,534	46,384	49,466	39,932	41,390
Sept	41,970	45,812	42,338	49,346	45,580	38,816	37,160	40,074	36,342	44,464	40,480	36,496	36,044	40,986	36,110	41,032	40,866	40,288	37,952	38,070	39,500	37,760
Total	**436,714**	**457,710**	**459,154**	**473,264**	**459,194**	**434,724**	**411,704**	**400,066**	**393,198**	**409,954**	**405,305**	**400,656**	**409,032**	**425,138**	**410,354**	**405,348**	**436,688**	**423,222**	**413,134**	**426,796**	**381,841**	**389,234**

Sugar Island

Table B- 2: Vehicles carried by month (Sugar Island)

	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21
Oct	24,892	25,578	28,100	25,970	28,992	26,822	25,800	24,064	23,474	23,718	23,590	23,462	21,892	23,384	23,920	22,088	23,846	25,000	24,588	25,286	25,418	24,994
Nov	21,216	22,350	23,578	24,328	24,210	24,658	23,024	20,816	21,032	20,580	20,545	20,510	20,850	21,584	20,818	18,202	21,002	22,378	21,024	20,998	21,588	18,676
Dec	20,656	20,352	23,766	21,440	21,416	21,670	20,696	19,894	19,102	17,728	18,241	18,754	19,674	19,584	18,822	18,388	20,578	19,824	19,558	20,664	20,070	17,946
Jan	18,736	19,496	21,098	19,842	20,514	19,844	19,362	18,918	17,616	17,128	17,480	17,832	17,088	18,098	15,632	17,350	18,598	18,648	13,600	18,312	19,688	17,214
Feb	18,350	18,852	19,100	17,776	18,434	18,602	17,482	17,076	19,134	15,780	16,535	17,290	17,912	16,722	15,684	15,738	17,874	16,586	16,864	15,642	18,274	16,810
Mar	19,916	21,376	18,434	18,366	19,264	21,826	19,910	18,946	17,536	18,286	18,519	18,752	19,524	19,398	14,836	17,012	19,092	18,652	19,060	18,072	14,966	18,852
Apr	21,162	21,224	21,228	20,170	23,092	22,734	21,312	19,478	19,436	19,594	19,246	18,898	21,018	19,560	18,394	18,886	20,282	19,502	18,592	19,940	12,332	20,184
May	24,564	26,352	26,550	27,684	25,220	24,544	25,964	24,802	23,404	23,352	22,482	21,612	24,426	26,270	23,430	24,090	27,818	24,862	25,720	25,396	20,426	24,698
June	25,262	26,616	29,898	30,790	28,458	26,226	25,716	25,944	24,374	24,602	24,512	24,422	25,772	25,574	24,668	24,820	27,682	25,432	25,814	25,556	26,412	26,838
July	34,698	35,382	35,760	37,634	34,552	31,864	31,004	29,256	27,472	28,288	28,807	29,326	28,910	30,148	29,870	28,534	31,358	29,884	29,164	30,398	28,810	30,972
Aug	33,484	34,840	34,058	34,178	32,082	29,832	28,514	28,688	28,580	28,540	27,549	26,558	28,746	29,096	28,354	27,046	30,966	27,374	29,288	30,950	28,436	29,218
Sept	27,448	29,526	29,160	31,756	30,304	26,340	25,254	25,680	23,918	27,258	25,414	23,570	23,822	24,802	23,720	26,094	25,860	25,690	24,658	27,964	27,350	25,262
Total	**290,384**	**301,944**	**310,730**	**309,934**	**306,538**	**294,962**	**284,038**	**273,562**	**265,078**	**264,854**	**262,920**	**260,986**	**269,634**	**274,220**	**258,148**	**258,248**	**284,956**	**273,832**	**267,930**	**279,178**	**263,770**	**271,664**

Neebish Island

Table B- 3: Passengers carried by month (Neebish Island)

	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21
Oct	3,316	3,396	2,908	3,074	3,410	3,426	3,666	3,720	4,210	3,362	3,340	3,318	3,338	3,442	3,358	2,644	3,352	3,574	3,640	3,784	3,564	3,756
Nov	2,892	2,984	3,008	2,630	2,778	3,230	3,312	3,412	3,466	3,326	3,084	2,842	2,948	2,736	2,858	2,160	2,874	3,272	2,770	3,410	3,092	2,978
Dec	1,460	1,670	1,902	1,570	1,802	1,688	1,966	2,030	2,432	1,912	1,671	1,430	2,034	1,924	1,898	1,610	2,088	2,058	1,650	2,306	1,848	2,020
Jan	1,148	1,112	1,772	962	680	898	1,568	1,938	2,130	1,618	1,358	1,098	1,388	1,420	1,402	1,212	1,534	1,640	1,078	1,494	1,606	1,784
Feb	1,236	0	1,162	0	0	0	1,432	1,518	1,576	324	175	26	1,520	1,230	524	760	1,470	1,730	1,080	1,428	1,414	1,630
Mar	1,436	16	872	236	0	2	1,309	1,316	1,408	210	229	248	1,436	1,126	0	374	1,768	1,826	1,188	1,534	1,252	1,888
Apr	1,924	1,110	1,582	1,110	1,396	1,592	1,658	2,438	984	2,004	1,896	1,788	2,006	1,514	882	1,532	2,264	2,116	330	1,980	1,098	2,506
May	3,300	3,004	2,748	2,580	2,922	3,184	3,458	3,108	2,652	3,130	3,097	3,064	3,040	3,090	2,412	3,076	3,654	3,675	3,436	3,898	2,614	3,928
June	3,738	3,504	3,510	3,476	3,724	4,452	4,412	4,138	4,320	3,992	3,846	3,700	4,332	4,104	3,226	3,352	4,190	4,676	4,288	4,228	3,928	4,718
July	5,532	5,418	5,546	6,536	6,354	6,512	6,618	6,612	5,842	6,144	6,135	6,126	5,936	6,154	5,416	5,852	6,396	7,458	6,460	6,566	6,362	7,884
Aug	5,446	5,616	5,658	5,722	5,732	6,230	5,830	6,088	5,610	5,446	5,605	5,764	5,902	6,526	5,072	5,556	6,016	6,194	6,246	7,146	5,738	6,930
Sept	4,106	4,222	3,680	3,776	4,454	4,720	4,720	4,706	4,012	4,180	4,231	4,282	3,980	3,660	3,518	4,536	4,770	4,234	3,952	4,180	4,714	4,734
Total	**35,534**	**32,052**	**34,348**	**31,672**	**33,252**	**35,934**	**39,949**	**41,024**	**38,642**	**35,648**	**34,667**	**33,686**	**37,860**	**36,926**	**30,566**	**32,664**	**40,376**	**42,453**	**36,118**	**41,954**	**37,230**	**44,756**

Neebish Island

Table B- 4: Vehicles carried by month (Neebish Island)

	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21
Oct	2,090	2,132	1,986	1,998	2,106	2,120	2,690	2,448	2,884	2,210	2,209	2,208	2,288	2,266	2,310	1,886	2,314	2,378	2,490	2,556	2,476	2,560
Nov	2,048	2,070	2,036	1,832	1,798	2,154	2,248	2,404	2,554	2,206	2,127	2,048	2,018	1,920	1,984	1,534	1,998	2,248	2,086	2,518	2,142	2,102
Dec	950	1,068	1,274	1,030	1,158	1,094	1,332	1,354	1,758	1,234	1,127	1,020	1,358	1,286	1,376	1,098	1,450	1,324	1,204	1,558	1,274	1,424
Jan	806	726	982	656	428	564	1,102	1,238	1,446	1,096	934	772	1,006	1,048	1,006	876	1,096	1,116	846	1,050	1,190	1,188
Feb	810	0	796	0	0	0	976	1,046	1,062	226	135	44	1,126	886	394	524	1,072	1,178	848	996	998	1,074
Mar	956	10	594	162	0	2	964	924	988	148	163	178	1,002	756	0	242	1,268	1,222	870	1,072	862	1,268
Apr	1,280	706	976	716	898	1,042	1,072	1,606	608	1,332	1,299	1,266	1,396	1,044	632	1,048	1,562	1,466	230	1,334	790	1,616
May	1,982	1,894	1,738	1,622	1,820	1,954	2,338	2,050	1,642	2,090	2,035	1,980	2,026	2,060	1,724	2,100	2,508	2,412	2,356	2,480	2,144	2,544
June	2,274	2,170	2,136	2,114	2,258	2,802	2,890	2,678	2,772	2,620	2,502	2,384	2,688	2,624	2,310	2,626	2,736	3,076	2,836	2,736	2,838	3,204
July	2,992	2,996	3,244	3,588	3,604	3,826	3,918	3,978	3,476	3,610	3,564	3,518	3,406	3,458	3,346	3,478	3,788	4,538	3,656	3,674	3,748	4,694
Aug	3,206	3,196	3,100	3,302	3,328	3,726	3,610	3,794	3,466	3,214	3,292	3,370	3,488	3,700	2,910	3,328	3,554	3,940	3,656	3,922	3,538	4,178
Sept	2,542	2,730	2,214	2,292	2,758	2,918	2,964	2,926	2,518	2,702	2,642	2,582	2,578	2,360	2,312	2,862	3,034	2,922	2,610	2,706	3,124	3,138
Total	**21,936**	**19,698**	**21,076**	**19,312**	**20,156**	**22,202**	**26,104**	**26,446**	**25,174**	**22,688**	**22,029**	**21,370**	**24,380**	**23,408**	**20,304**	**21,602**	**26,380**	**27,820**	**23,688**	**26,602**	**25,124**	**28,990**

Drummond Island

Table B- 5: Passengers carried by month (Drummond Island)

	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21
Oct	32,200	33,406	34,010	36,170	34,648	35,528	34,154	33,698	33,916	33,686	33,502	33,318	30,326	30,704	30,800	30,734	33,560	32,606	33,356	36,022	37,174	39,008
Nov	23,584	24,320	26,582	26,782	27,494	27,254	24,210	27,310	25,778	23,994	24,064	24,134	23,492	25,260	21,344	21,568	23,302	24,666	23,258	26,106	23,380	20,596
Dec	19,856	20,420	21,282	21,498	23,258	21,700	20,994	22,320	20,162	18,000	18,758	19,516	19,906	19,848	17,328	18,874	20,010	18,730	19,260	21,616	18,916	17,426
Jan	18,784	21,816	19,522	20,588	20,468	19,950	20,058	20,286	19,042	19,136	18,013	16,890	16,732	18,018	15,480	16,302	17,672	16,770	19,412	19,058	19,226	18,232
Feb	18,784	22,138	22,566	22,064	25,308	24,022	25,696	20,512	22,140	17,278	17,704	18,130	17,694	18,246	16,304	15,972	18,000	17,736	18,704	18,312	19,082	19,776
Mar	20,540	22,854	20,206	21,768	20,174	22,298	22,900	20,242	19,314	18,116	17,962	17,808	17,372	19,066	17,350	17,150	18,490	17,700	17,868	19,862	14,364	23,102
Apr	24,668	23,018	19,306	21,642	25,160	23,348	23,924	23,018	22,034	21,056	21,714	22,372	23,110	19,994	18,878	19,238	23,802	25,680	24,112	26,484	8,546	30,998
May	33,942	34,110	29,378	34,628	34,858	33,048	34,318	35,648	32,568	34,998	32,229	29,460	30,186	31,666	28,846	31,234	30,600	33,556	35,520	36,776	19,334	39,054
June	40,166	37,946	35,562	37,622	36,630	37,090	38,070	37,068	31,660	33,484	32,959	32,434	35,286	32,232	32,114	34,162	37,198	38,178	39,022	40,982	35,186	44,668
July	51,386	55,184	52,802	56,734	56,130	53,788	47,500	47,100	43,860	46,002	46,204	46,406	43,450	44,986	43,796	48,444	47,274	47,146	47,684	53,198	49,864	56,060
Aug	49,314	52,962	53,174	54,638	46,170	43,296	46,268	47,048	42,852	43,634	42,118	40,602	43,876	41,826	41,336	41,276	42,520	43,840	47,904	51,500	46,044	50,820
Sept	43,526	40,048	37,084	38,528	42,186	39,376	41,158	38,258	33,160	35,252	34,865	34,478	35,460	30,232	32,606	37,524	38,986	39,050	42,472	38,756	45,210	44,934
Total	**376,750**	**388,222**	**371,474**	**392,662**	**392,484**	**380,698**	**379,250**	**372,508**	**346,486**	**344,636**	**340,092**	**335,548**	**336,890**	**332,078**	**316,182**	**332,478**	**351,414**	**355,658**	**368,572**	**388,672**	**336,326**	**404,674**

Drummond Island

Table B- 6: Vehicles carried by month (Drummond Island)

	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21
Oct	18,162	19,109	18,690	20,820	22,638	18,238	18,612	18,044	18,210	18,776	18,251	17,726	16,384	16,148	16,866	16,196	17,774	17,650	17,874	19,550	19,896	23,178
Nov	13,262	14,466	15,176	14,962	15,402	14,808	13,340	14,790	13,474	12,506	12,554	12,602	12,522	12,622	11,368	11,352	12,336	13,276	12,542	13,750	12,516	12,206
Dec	11,904	12,134	12,282	12,020	12,598	11,654	11,262	11,438	10,214	9,082	9,590	10,098	9,884	9,858	9,072	9,656	10,360	9,714	9,800	11,010	9,706	10,442
Jan	12,010	14,112	11,228	11,734	11,418	10,664	11,074	10,304	10,004	10,688	9,690	8,692	8,742	9,238	8,376	8,284	9,080	8,768	8,964	10,048	10,164	9,728
Feb	12,010	15,132	13,516	13,556	15,448	14,660	16,120	10,816	12,692	10,816	10,177	9,538	9,598	9,788	9,458	8,490	9,620	9,488	9,450	10,614	10,472	10,692
Mar	11,940	14,180	12,232	12,472	11,480	13,026	12,448	10,416	10,582	9,608	9,416	9,224	9,222	9,784	9,626	8,934	9,598	9,236	9,880	11,128	8,220	12,158
Apr	14,624	13,186	12,688	11,986	13,572	12,358	12,240	12,120	11,570	11,514	11,601	11,688	11,778	9,938	9,356	10,022	13,396	13,972	12,722	13,466	5,396	17,362
May	19,312	19,526	18,456	19,948	19,246	19,176	18,922	20,468	18,056	17,994	16,932	15,870	16,328	16,856	16,128	17,252	16,540	18,718	18,384	19,538	14,686	21,962
June	23,801	23,010	21,842	22,728	21,796	22,500	22,540	21,324	18,454	18,876	18,853	18,830	19,632	18,992	18,686	19,642	21,108	22,040	22,470	23,052	21,736	26,534
July	29,268	30,980	29,772	31,712	31,664	31,008	26,900	26,444	24,398	25,834	25,981	26,128	23,832	24,750	24,048	26,798	26,722	27,038	27,304	28,190	28,946	32,674
Aug	27,456	29,628	29,826	30,534	26,374	25,016	26,300	25,698	23,820	23,816	23,173	22,530	23,862	23,544	23,040	22,718	23,820	24,730	26,776	27,662	27,050	29,712
Sept	23,740	21,690	21,076	21,116	23,284	21,164	22,352	20,248	18,032	20,716	19,484	18,252	18,994	16,524	17,146	19,840	21,242	21,136	21,266	20,508	26,246	25,700
Total	**217,489**	**227,153**	**216,784**	**223,588**	**224,920**	**214,272**	**212,110**	**202,110**	**189,506**	**190,226**	**185,702**	**181,178**	**180,778**	**178,042**	**173,170**	**179,184**	**191,596**	**195,766**	**197,432**	**208,516**	**195,034**	**232,348**

Beaver Island (Emerald Isle + Beaver Islander)

Table B- 7: Passengers carried by month (Beaver Island)

	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21
Jan																						
Feb																						
Mar	127		160				97															
Apr	847	774	837	407	674	579	1,016	649	549	478	523	539	726	276	27	278	314	310	199	202	0	330
May	3,696	4,196	2,744	3,322	3,079	3,029	3,610	2,798	2,728	2,285	2,459	2,285	2,436	2,314	1,825	2,139	2,049	1,952	2,019	1,804	795	1,979
June	6,349	6,967	6,216	6,053	5,698	5,190	5,991	5,699	5,668	4,342	4,352	4,913	5,119	4,779	4,475	4,553	4,218	4,335	4,656	4,364	3,030	5,911
July	13,917	13,650	13,307	12,792	13,143	13,772	13,826	11,751	11,164	11,213	11,921	12,445	11,504	10,162	10,472	10,292	11,233	10,850	10,180	10,158	8,539	10,774
Aug	12,133	12,749	13,211	12,950	10,919	11,008	11,068	10,776	10,652	9,965	9,848	9,067	9,255	9,029	9,089	8,899	8,307	7,790	8,622	8,769	8,065	8,999
Sept	4,685	4,211	3,764	3,910	4,010	4,257	4,110	3,661	3,116	3,665	2,922	3,194	2,768	2,538	2,494	3,104	2,930	3,054	2,853	2,719	3,515	3,562
Oct	2,792	2,670	2,784	2,359	2,528	2,478	1,791	1,806	1,484	1,339	1,676	1,431	1,359	1,501	1,210	1,348	1,331	1,331	1,350	977	1,584	2,252
Nov	1,770	1,942	1,755	1,708	1,839	1,608	1,401	1,010	1,135	1,215	918	1,002	791	698	790	636	464	563	560	326	672	987
Dec	413	418	502	358	347	423	290	127	194	174	142	188	172	152	220	156	79	178	119	108	114	293
TOTAL	**46,729**	**47,577**	**45,280**	**43,859**	**42,237**	**42,344**	**43,200**	**38,277**	**36,690**	**34,676**	**34,761**	**35,064**	**34,130**	**31,449**	**30,602**	**31,405**	**30,925**	**30,363**	**30,558**	**29,427**	**26,314**	**35,087**

Beaver Island (Emerald Isle + Beaver Islander)

Table B- 8: Vehicles carried by month (Beaver Island)

	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21
Jan																						
Feb																						
Mar																						
Apr	300	226	219	135	202	240	230	218	193	155	187	195	211	118	25	121	135	165	113	126	0	206
May	601	729	695	702	565	556	607	466	616	510	465	495	490	507	490	503	425	506	474	530	417	703
June	1,029	1,010	1,100	1,006	894	866	933	905	933	760	722	770	840	738	877	765	795	812	929	861	859	1,239
July	1,669	1,571	1,600	1,590	1,588	1,603	1,586	1,522	1,410	1,446	1,570	1,681	1,588	1,502	1,575	1,436	1,623	1,675	1,593	1,672	1,642	1,897
Aug	1,514	1,585	1,558	1,597	1,334	1,401	1,511	1,450	1,448	1,355	1,346	1,308	1,283	1,377	1,375	1,328	1,327	1,310	1,435	1,439	1,669	1,592
Sept	750	666	587	615	650	620	660	605	513	531	512	535	531	511	488	567	518	640	606	568	823	771
Oct	597	589	582	585	561	593	548	482	390	379	423	465	419	452	392	423	398	435	479	305	562	570
Nov	458	545	504	468	519	460	405	384	382	300	296	263	268	304	253	272	232	225	265	194	390	394
Dec	165	212	223		147	160	149	140	135	93	66	99	107	95	62	81	72	89	74	81	133	172
TOTAL	**7,083**	**7,133**	**7,068**	**6,698**	**6,460**	**6,499**	**6,629**	**6,172**	**6,020**	**5,529**	**5,587**	**5,811**	**5,737**	**5,604**	**5,537**	**5,496**	**5,525**	**5,857**	**5,968**	**5,776**	**6,495**	**7,544**

APPENDIX C – ISLAND RESIDENT SURVEY & INTERVIEW QUESTIONS

Determining State and Federal Transportation Responsibilities to Residents on Islands

INTRODUCTION

This survey is **intended for groups who regularly, occasionally or previously have used the ferry services to/from** Neebish Island, Sugar Island, Drummond Island.

You are being asked to participate in a research study by Michigan State University **to determine state and federal transportation responsibilities to residents on islands.** This project is funded by Michigan Department of Transportation (MDOT).

It should take about 10-15 minutes. Your participation is voluntary. You must be 18 or older to participate. For any inquiries, you may contact the project primary investigator, Dr. Ali Zockaie, at zockaiea@egr.msu.edu.

You may also take a picture and upload your response online, by scanning the QR code with your phone's camera:

SECTION 1: Ferry Usage

Q1.0 Please specify the ferry services you are utilizing during this survey invitation:

- ○ Drummond Island
- ○ Neebish Island
- ○ Sugar Island

Q1.1 Specify your **corresponding status**:
(Only for the island you are heading to/from currently)

	Never used ferry services to/from this island	Seasonal resident of the island	Permanent resident of the island	Visitor / tourist	Business owner / employee on the island
Drummond island	☐	☐	☐	☐	☐
Neebish Island	☐	☐	☐	☐	☐
Sugar Island	☐	☐	☐	☐	☐

Q1.2 What is/are the most common purpose(s) of using the ferry services?
(select all that applies)

- ☐ Commute to work / daily activities
- ☐ Tourism / Leisure
- ☐ Access to Healthcare
- ☐ Access to Education
- ☐ Access to services (airports, shopping malls, etc.)
- ☐ Visiting families and friends
- ☐ Others *(please specify)* _____

Q1.3 You usually use ferry services on:

	Weekdays only	Weekends only	Weekdays and Weekends	Not Applicable
Ferry Service for **Passengers**	○	○	○	○
Ferry Service for **Vehicles**	○	○	○	○

Q1.4 During which season have you ever used the ferry services?
(*select all that applies*)

- ☐ Fall (September-November)
- ☐ Spring (March-May)
- ☐ Winter (December-February)
- ☐ Summer (June-August)

Q1.5 Please choose the closest category of usage frequency for following services:
(1-way trip and round trips are considered as 1 use)

	Never	1-2 times the past year (for tourism)	Once every 1-3 months	1-3 times a week	4-7 times a week
Ferry Service for Passengers	○	○	○	○	○
Ferry Service for Vehicles	○	○	○	○	○

Q1.6 Please comment **if you have a travel pattern that is not reflected** in the previous question:

_____

_____

Q1.7 Other than public ferry services being provided, **select all other modes of transportation** you have ever used to get to/from the island:

- ☐ I have never used any modes of transportation other than public ferry services
- ☐ Private Boats
- ☐ Airlines
- ☐ Others _____

Q1.8 Select the reasons of why you would utilize other modes of transportation.

- ☐ I have never used other modes of transportation
- ☐ Comfort and Convenience of Travels
- ☐ Better Schedule & Service
- ☐ Shorter Travel Time
- ☐ More Reliable Service
- ☐ Weather Restrictions
- ☐ Others _____

SECTION 2: Perception Toward Ferry Services

Q2.1 What do you think of the existing ferry services being provided in terms of the following aspects:

	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied	Not Applicable/Don't Know
Reliability of ferry services *(on-time services, service interruption, full boat when boarding)*	○	○	○	○	○	○
Convenience to access docks/terminal	○	○	○	○	○	○
Overall waiting time / queue	○	○	○	○	○	○
Quality of docks / terminal / infrastructure / waiting area	○	○	○	○	○	○
Quality of vessels	○	○	○	○	○	○
Ticket Prices	○	○	○	○	○	○
Accommodation for People with Disabilities	○	○	○	○	○	○

Q2.2 State your opinion regarding the following statements:

	Totally Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Totally Agree	Not Applicable/Don't Know
Ferry trip frequency on **weekdays** is adequate	○	○	○	○	○	○
Ferry trip frequency on **weekends** is adequate	○	○	○	○	○	○
The terminal is accessible via public transportation	○	○	○	○	○	○
I am willing to pay extra for more trip frequency	○	○	○	○	○	○
I am willing to pay extra for improved vessel quality	○	○	○	○	○	○
Ferry services are **getting better** over the past years	○	○	○	○	○	○
Ferry services are **getting worse** over the past years	○	○	○	○	○	○
24/7 ferry crew for emergency services is needed	○	○	○	○	○	○

Q2.3 Please share any additional comments you may have regarding Q2.1 and/or Q2.2

Q2.1: _____

_____

Q2.2: _____

_____

Q2.4 Have you ever experienced:

	Never	Rarely	Occasionally	Often	Very Frequently
Ferry trip delays	○	○	○	○	○
Not been able to get on board due to full vessel	○	○	○	○	○
Long queues to get on board	○	○	○	○	○
Missed an important errand due to ferry delays	○	○	○	○	○
Problem in purchasing tickets	○	○	○	○	○
Any inconvenience due to quality of terminal / vessel	○	○	○	○	○
Any emergency needs to use ferry services outside of typical service hours	○	○	○	○	○

Q2.5 Please share any additional comments you may have regarding the statements above:

_____

_____

SECTION 3: State Responsibilities Toward Residents on Islands

Q3.1 How **affected** are you if the ferry service is:

	Not Affected at All	Somewhat Not Affected	Neutral	Somewhat Affected	Extremely Affected
Out of Service for half a day	○	○	○	○	○
Out of Service for 1 day	○	○	○	○	○
Out of Service for 1 week	○	○	○	○	○
Out of Service for 1 month	○	○	○	○	○

Q3.2 How dependent are you and your family on ferry services for the following purposes:

	Not Dependent at All	Slightly Dependent	Moderately Dependent	Very Dependent	Extremely Dependent
Household Income	○	○	○	○	○
Access to Retail, Goods and Services	○	○	○	○	○
Access to Leisure	○	○	○	○	○
Access to Education	○	○	○	○	○
Access to Healthcare	○	○	○	○	○

Q3.3 MDOT currently provides partial funding to certain ferry operators in Michigan, to ensure ferry services are made available to island residents and visitors.

Please select the statement that best represents your opinion toward **MDOT's role in supporting island residents and visitors in Michigan** in terms of funding:

- ○ MDOT should partially fund/subsidize ferry services to **all islands**
- ○ MDOT should continue to partially fund/subsidize ferry services to **selective islands** (e.g., high population islands, high economic activity)
- ○ MDOT should not fund/subsidize any ferry services
- ○ I am indifferent whether MDOT funds ferry services or not

Q3.4 Please share any comments regarding the ideal role of MDOT toward island residents and its communities:

_____

_____

SECTION 4: Sustainability

Q4.1 Majority of vessels on waterways today are diesel-powered. **Do you agree vessels should be upgraded to become more environmentally friendly** and of lower carbon emissions?

- ○ Strongly agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Strongly disagree

Q4.2 If vessels were to be upgraded to become more environmentally friendly, how much fare rate increase are you willing to pay to fund these upgrades?

Additional % of fare increase: _____
(from 0% to 100%)

SECTION 5 : Respondents' Background

Q5.1 What is your gender identification?

- ○ Male
- ○ Female
- ○ Non-binary / Other
- ○ Prefer not to answer

Q5.2 What is your age?

- ○ 18 - 24
- ○ 25 - 34
- ○ 35 - 44
- ○ 45 - 54
- ○ 55 - 64
- ○ 65 - 74
- ○ 75 - 84
- ○ 85 or older

Q5.3 What is your employment status

- ○ Student
- ○ Employed full-time
- ○ Employed part-time
- ○ Unemployed looking for work
- ○ Unemployed not looking for work
- ○ Retired

Q5.4 Please specify your annual household income range:

- ○ Less than $29,000
- ○ $30,000 - $59,999
- ○ $60,000 - $89,999
- ○ $90,000 - $119,999
- ○ More than $120,000

Q5.5 Please share:
Number of people in your household, including you:

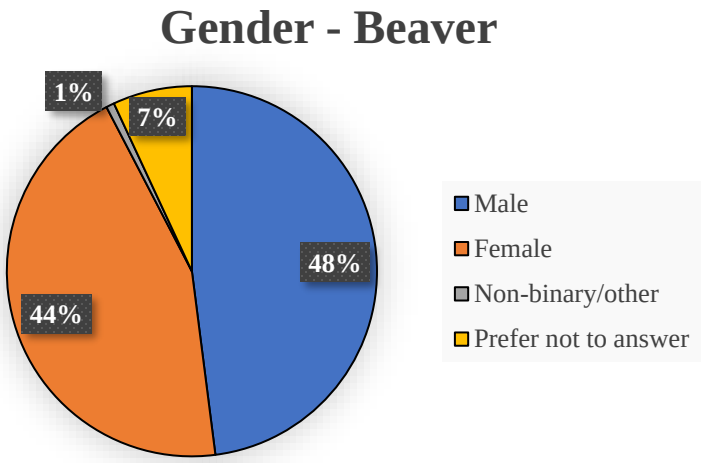
_____

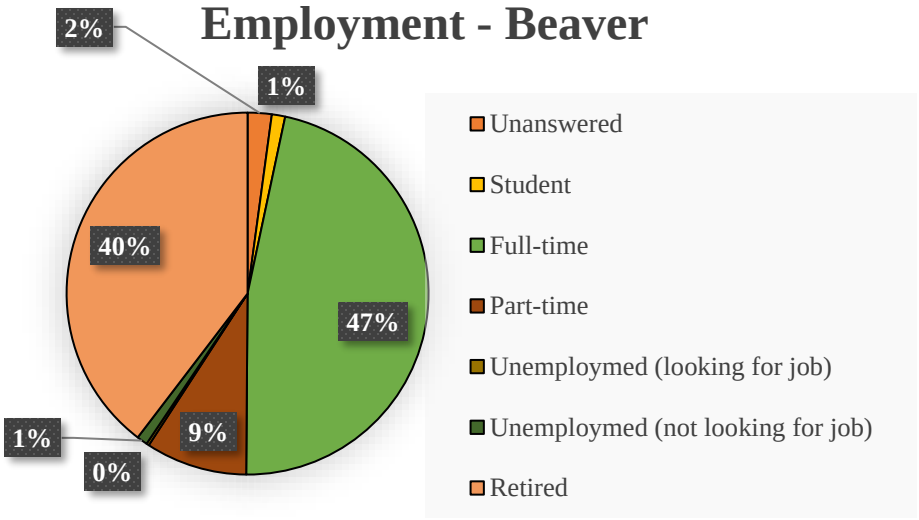
Number of vehicle(s) in your household:

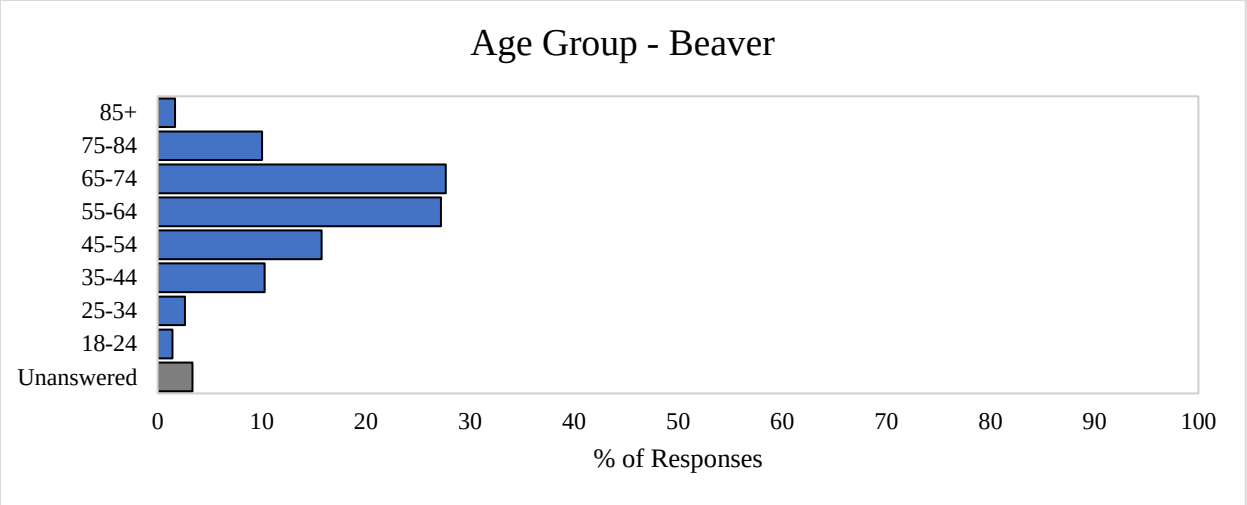
_____

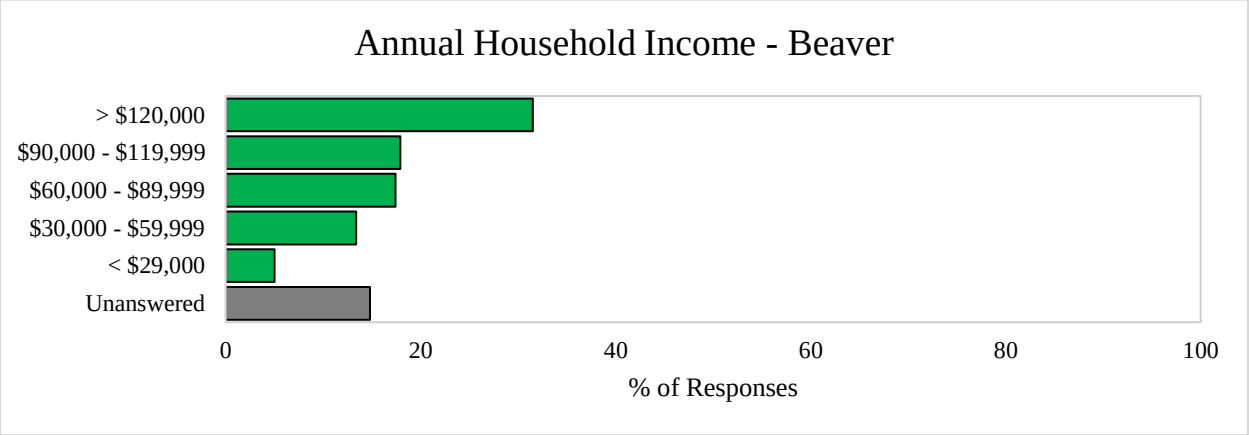
APPENDIX D – FERRY RIDERSHIP SURVEY RESULT CHARTS

Figure(s) D- 1: Demographics of Beaver Island respondents

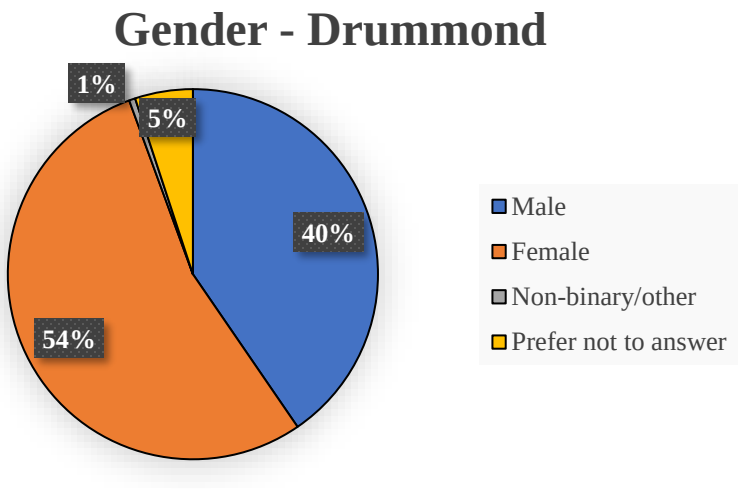


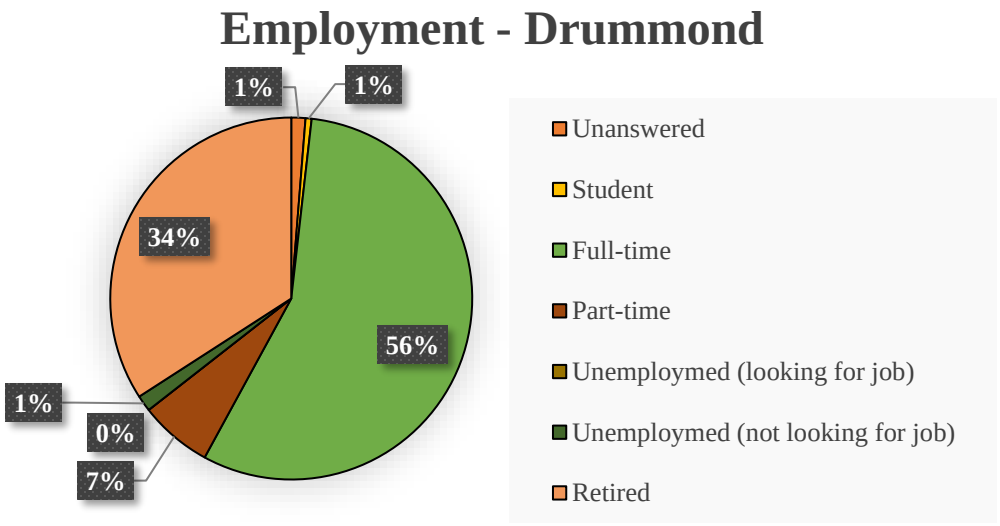


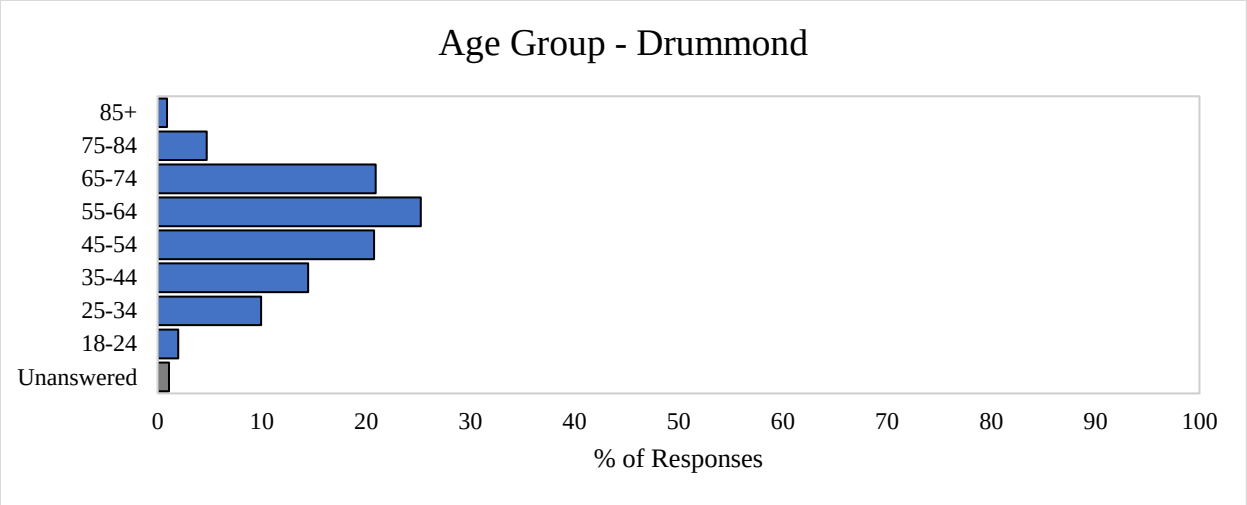

Age Group - Beaver
85+
75-84
65-74
55-64
45-54
35-44
25-34
18-24
Unanswered
0
10
20
30
40
50
60
70
80
90
100
% of Responses

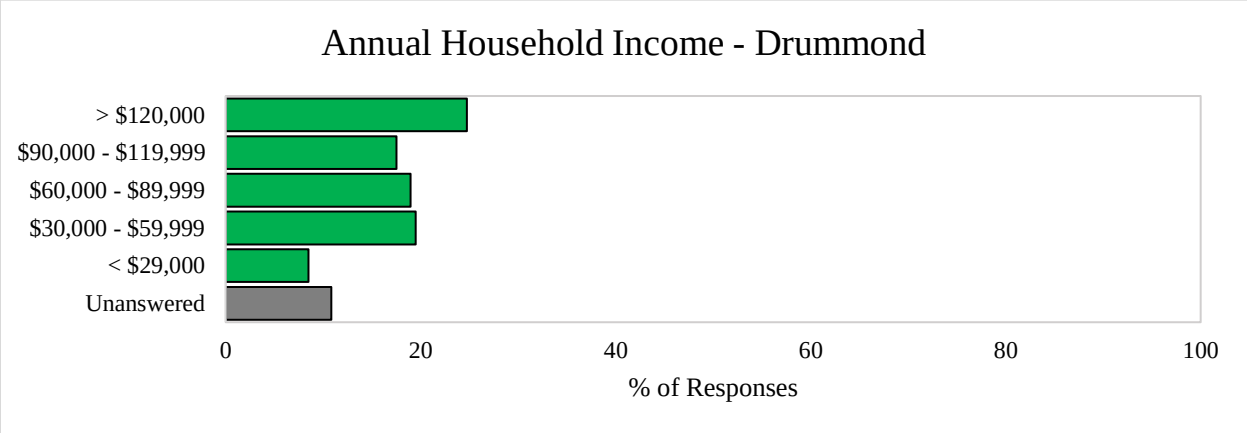

Annual Household Income - Beaver
> $120,000
$90,000 - $119,999
$60,000 - $89,999
$30,000 - $59,999
< $29,000
Unanswered
0
20
40
60
80
100
% of Responses

Figure(s) D- 2: Demographics of Drummond Island respondents

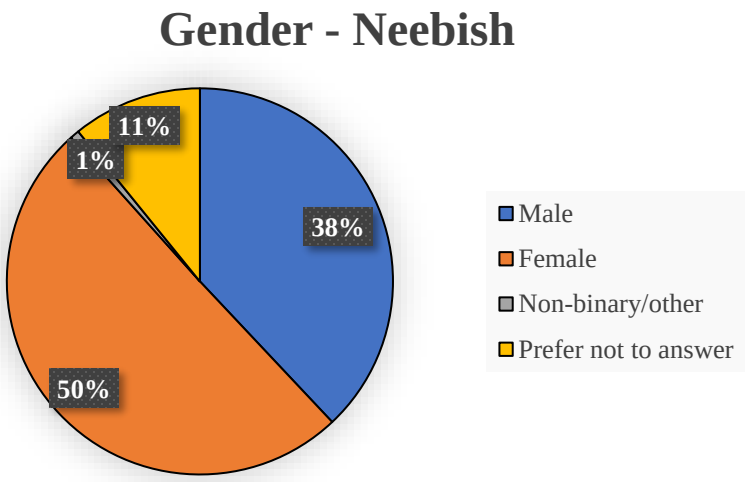


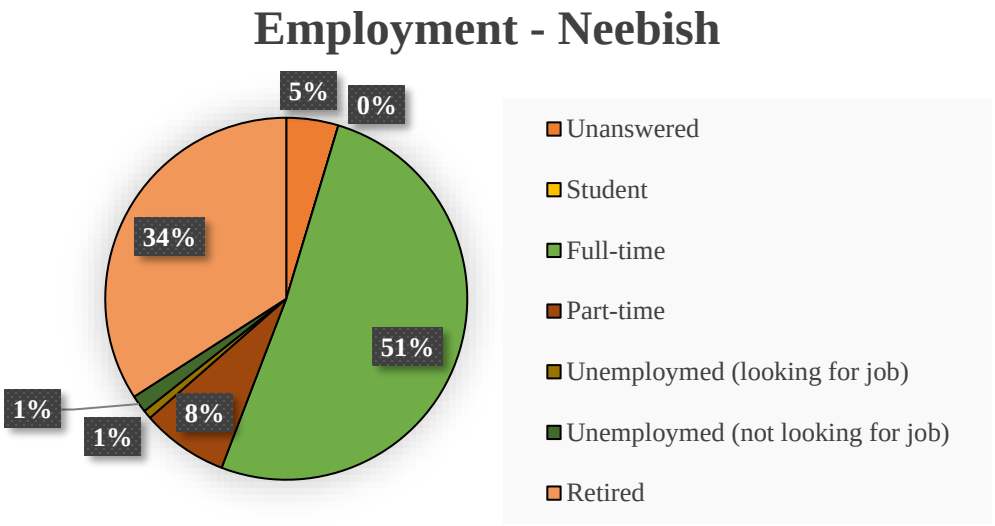


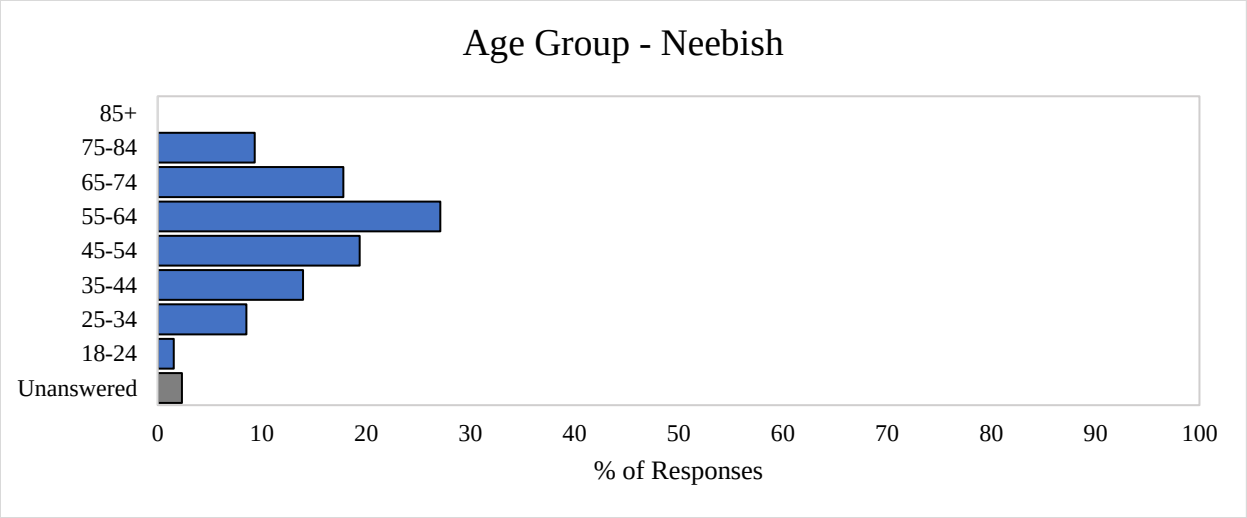

Age Group - Drummond
85+
75-84
65-74
55-64
45-54
35-44
25-34
18-24
Unanswered
0
10
20
30
40
50
60
70
80
90
100
% of Responses

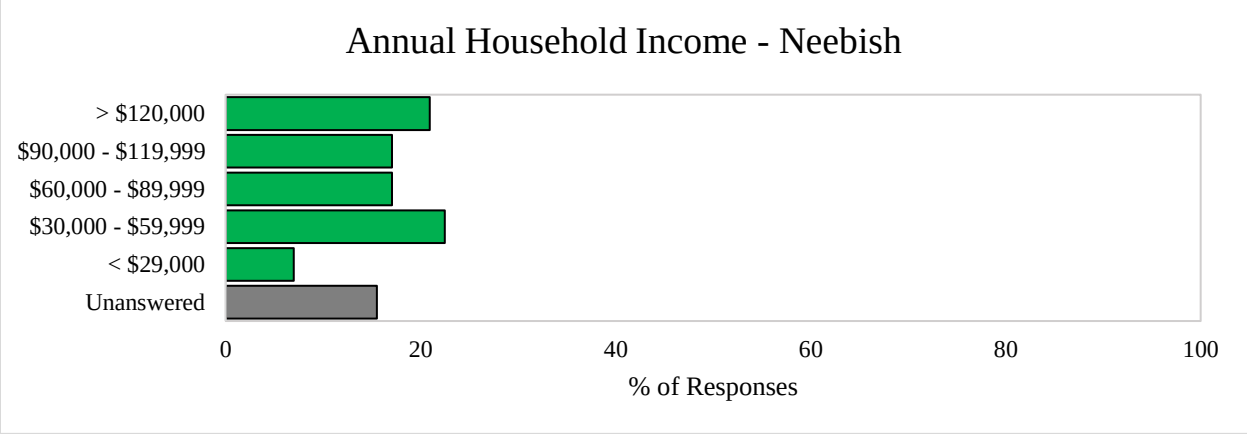

Annual Household Income - Drummond
> $120,000
$90,000 - $119,999
$60,000 - $89,999
$30,000 - $59,999
< $29,000
Unanswered
0
20
40
60
80
100
% of Responses

Figure(s) D- 3: Demographics of Neebish Island respondents

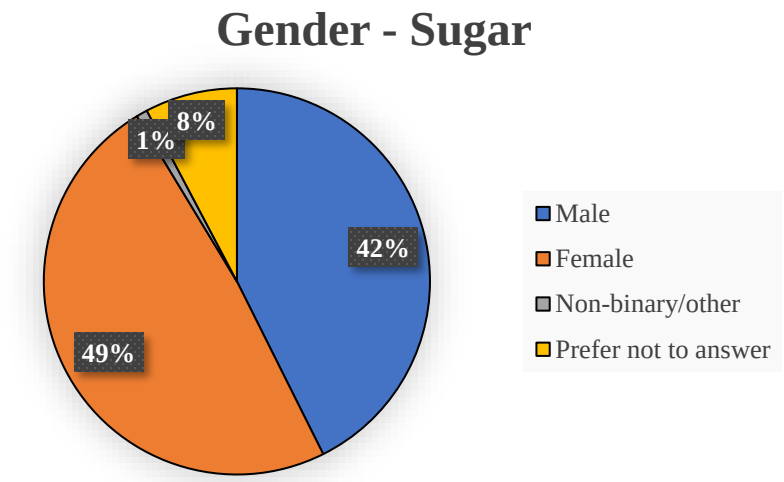


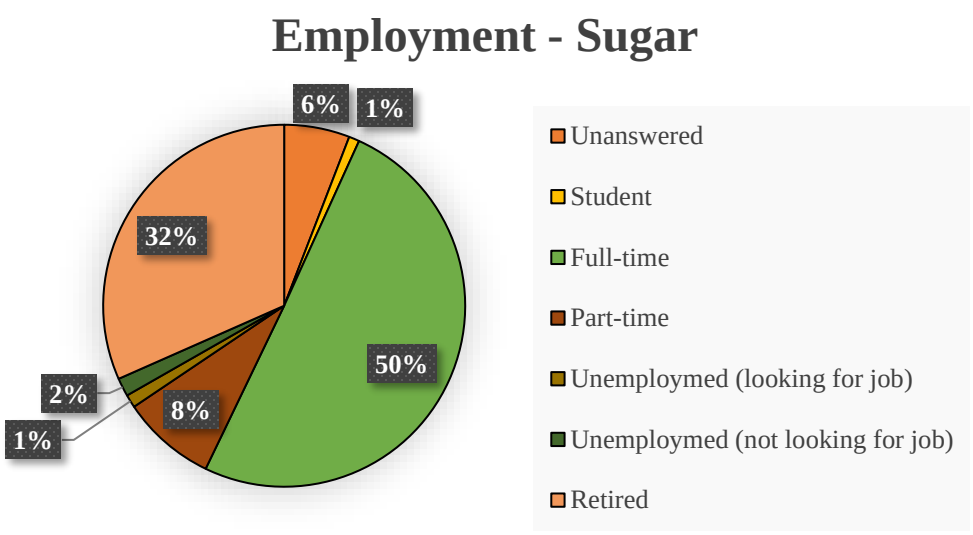


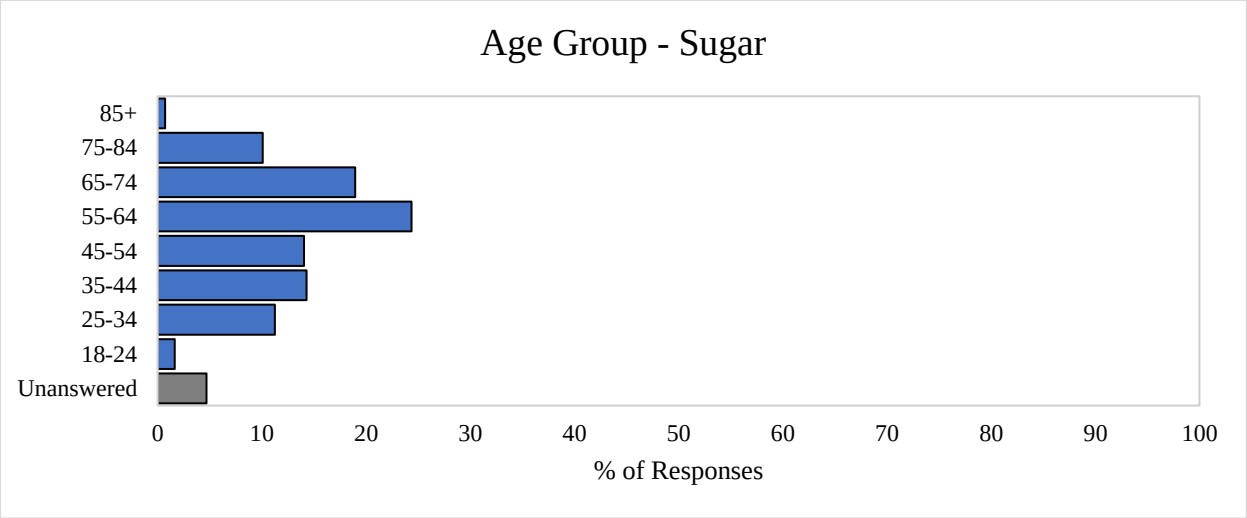

Age Group - Neebish
85+
75-84
65-74
55-64
45-54
35-44
25-34
18-24
Unanswered
0
10
20
30
40
50
60
70
80
90
100
% of Responses

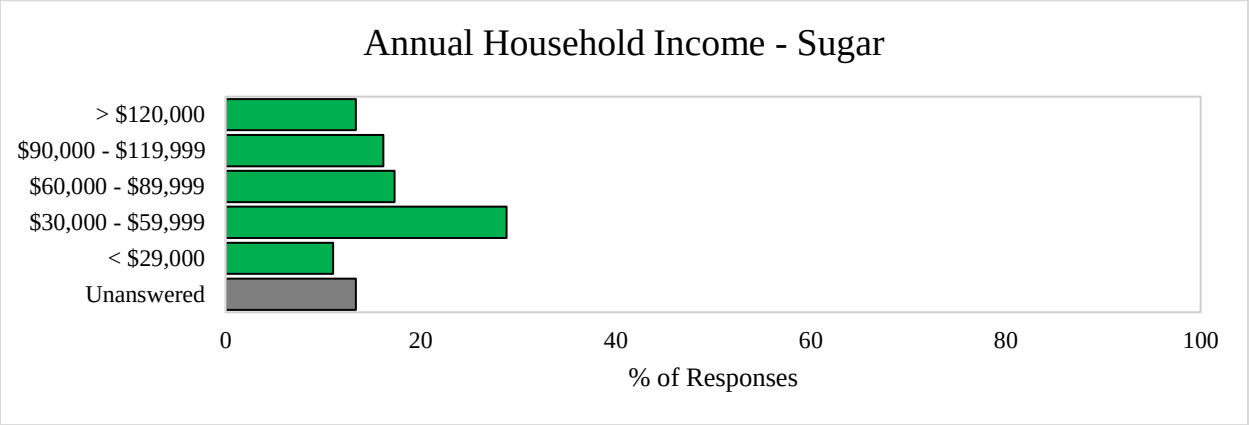

Annual Household Income - Neebish
> $120,000
$90,000 - $119,999
$60,000 - $89,999
$30,000 - $59,999
< $29,000
Unanswered
0
20
40
60
80
100
% of Responses

Figure(s) D- 4: Demographics of Sugar Island respondents



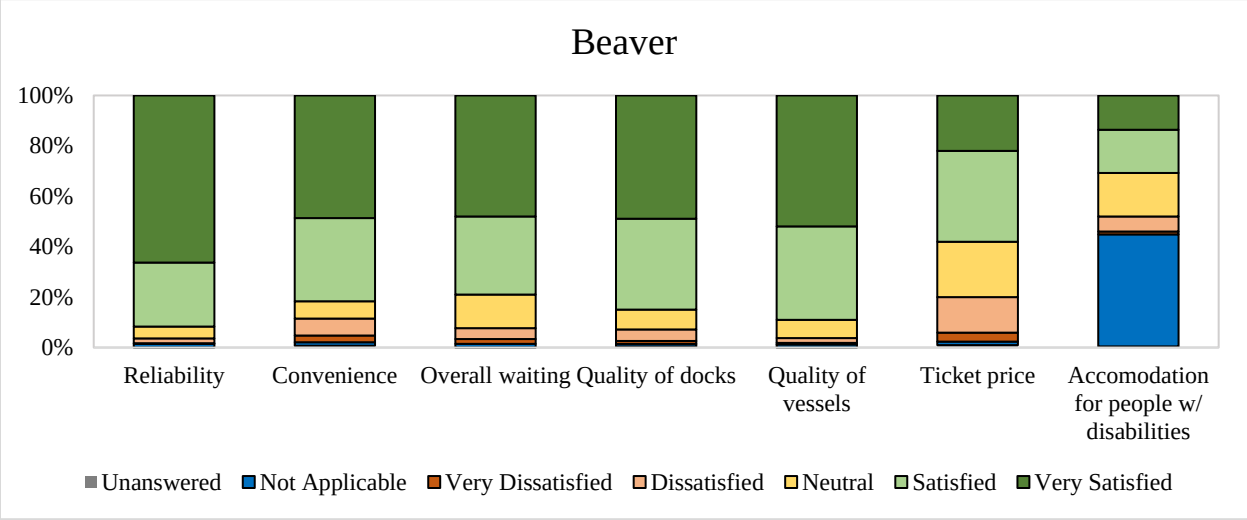


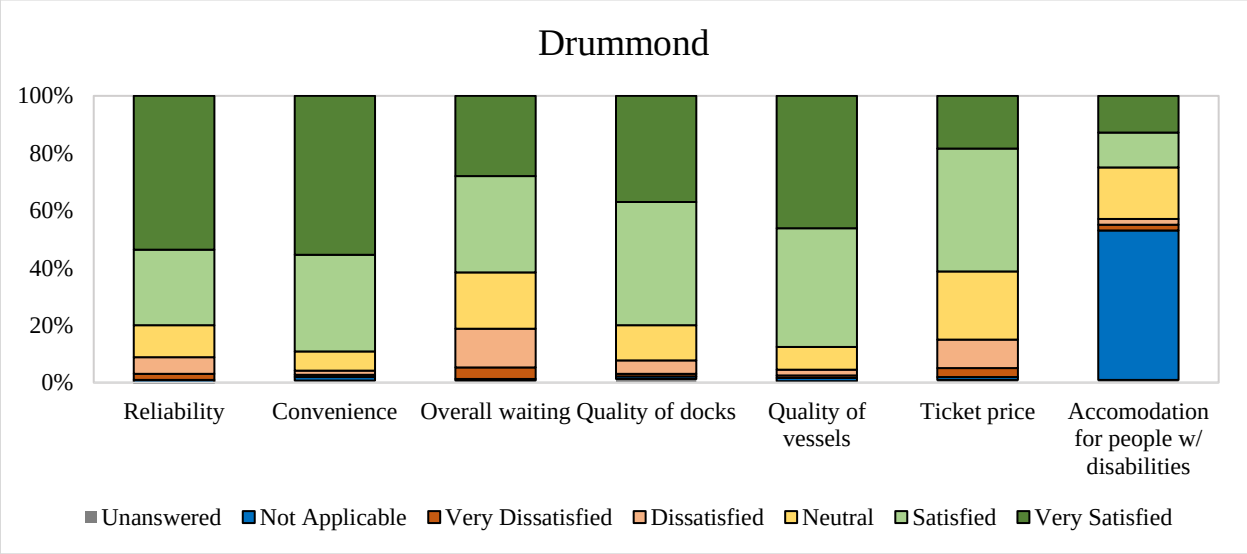

Age Group - Sugar
85+
75-84
65-74
55-64
45-54
35-44
25-34
18-24
Unanswered
0
10
20
30
40
50
60
70
80
90
100
% of Responses

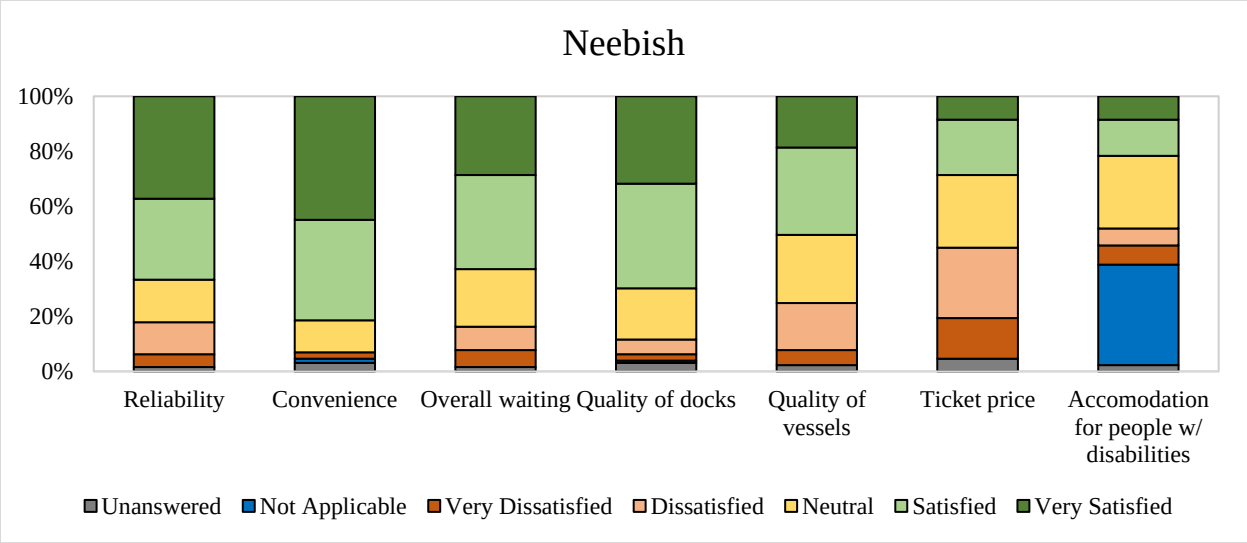

Annual Household Income - Sugar
> $120,000
$90,000 - $119,999
$60,000 - $89,999
$30,000 - $59,999
< $29,000
Unanswered
0
20
40
60
80
100
% of Responses

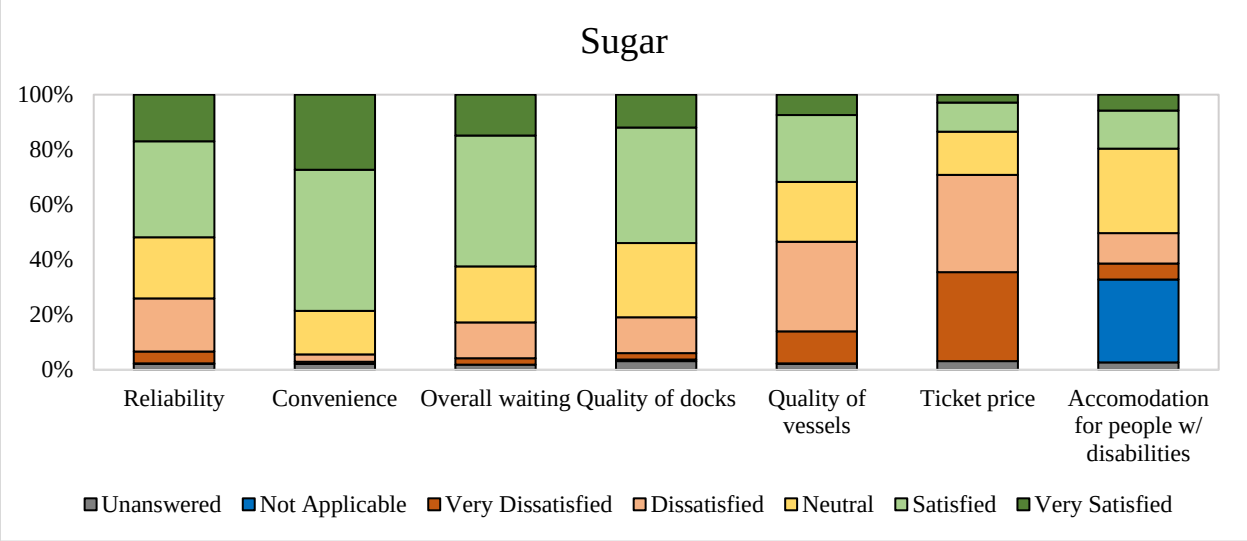
Question: Please rate your level of satisfaction with the following aspects of ferry services.

Figure(s) D- 5: Level of satisfaction with various aspect of ferry services



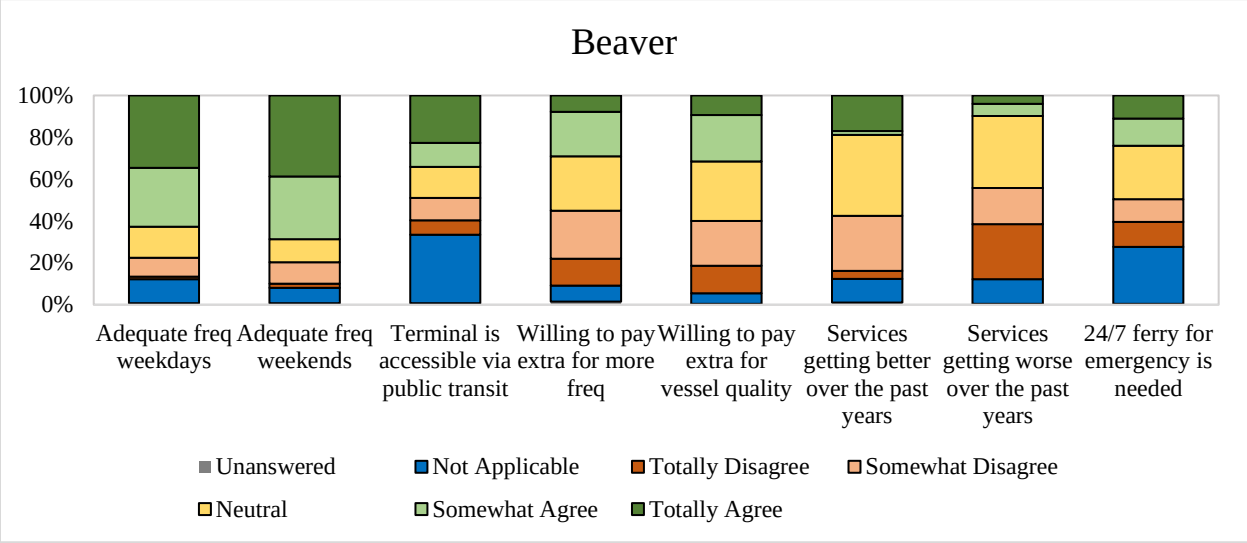


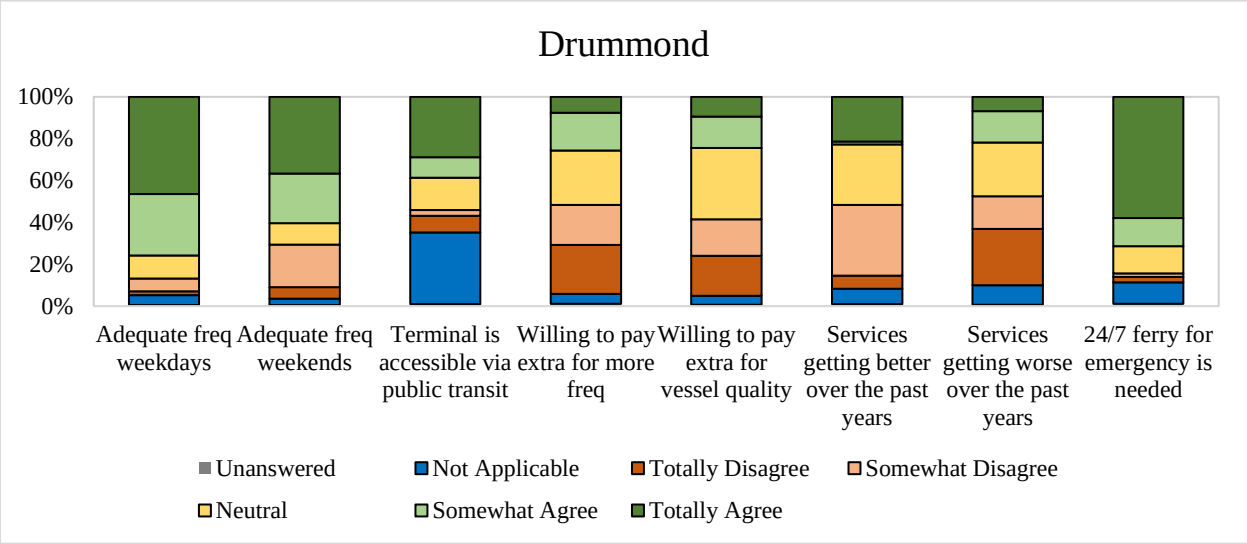

Neebish
100%
80%
60%
40%
20%
0%
Reliability
Convenience
Overall waiting
Quality of docks
Quality of vessels
Ticket price
Accomodation for people w/ disabilities
Unanswered
Not Applicable
Very Dissatisfied
Dissatisfied
Neutral
Satisfied
Very Satisfied

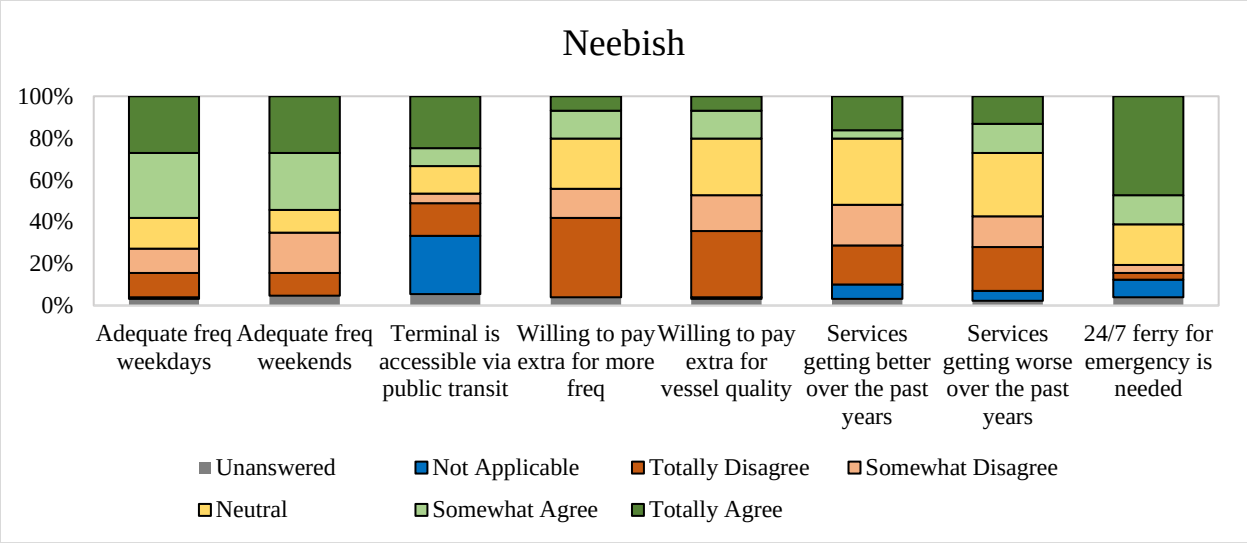

Sugar
100%
80%
60%
40%
20%
0%
Reliability
Convenience
Overall waiting
Quality of docks
Quality of vessels
Ticket price
Accomodation for people w/ disabilities
Unanswered
Not Applicable
Very Dissatisfied
Dissatisfied
Neutral
Satisfied
Very Satisfied

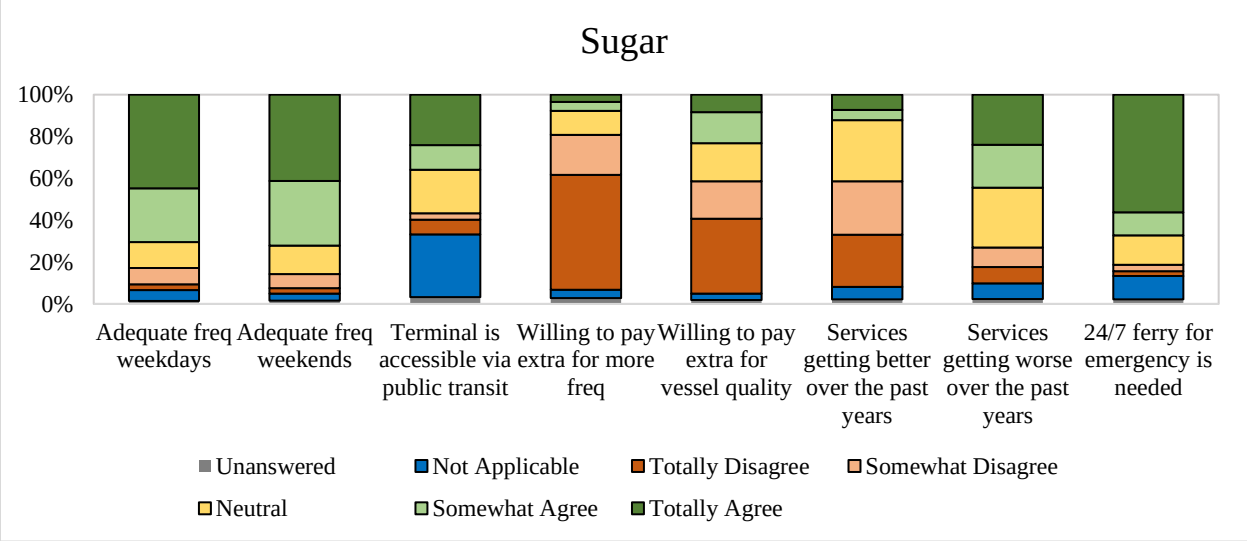
Question: Please state your level of agreement with the following statements.

Figure(s) D- 6: Level of agreement with various questions



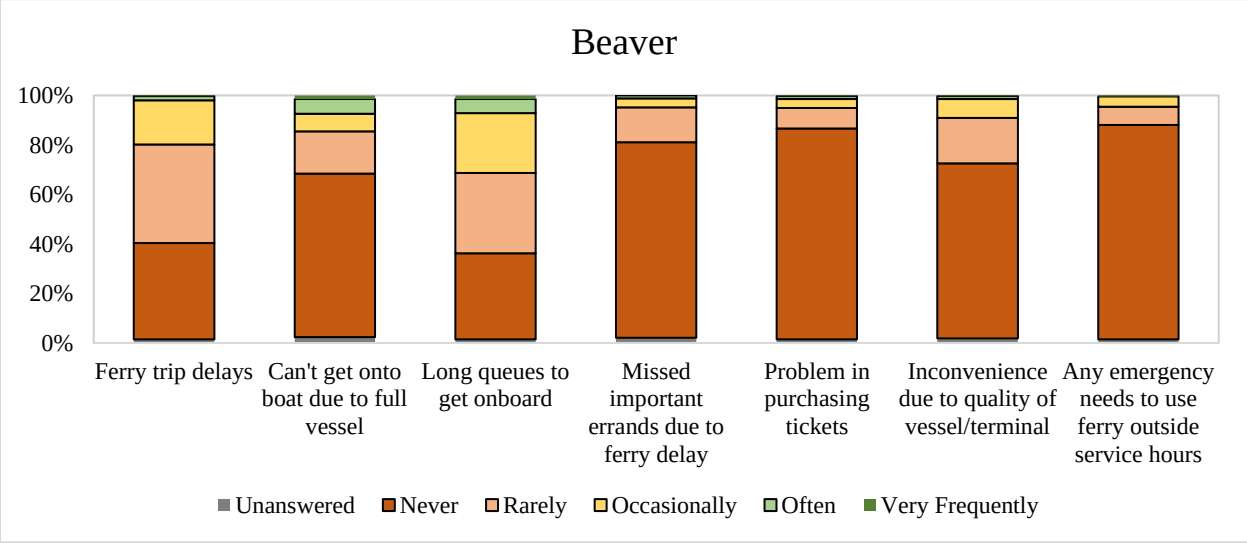


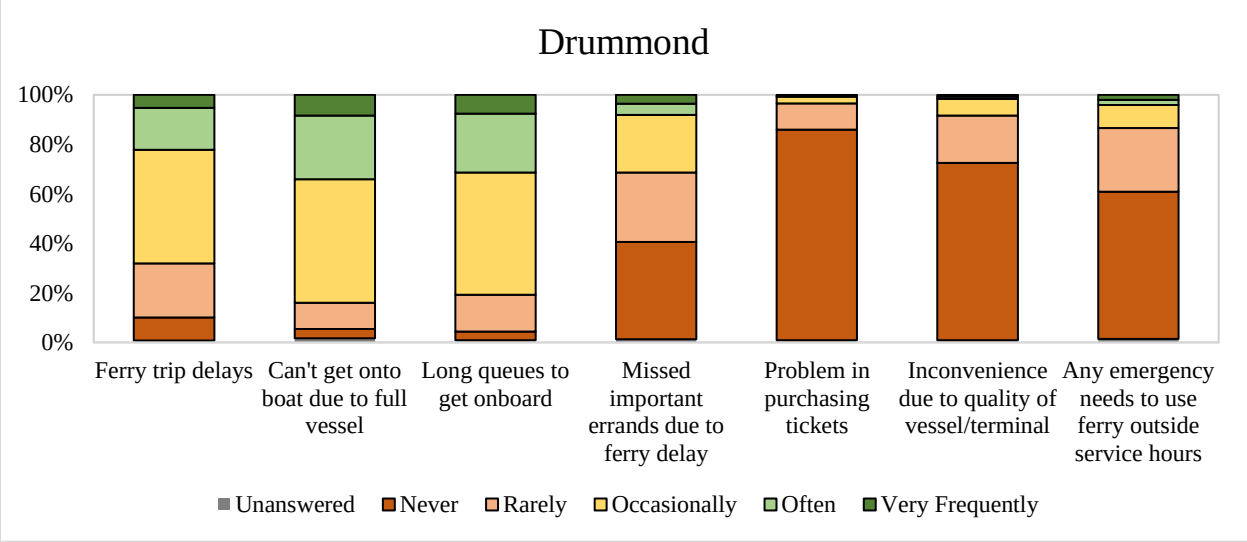

Neebish
100%
80%
60%
40%
20%
0%
Adequate freq weekdays
Adequate freq weekends
Terminal is accessible via public transit
Willing to pay extra for more freq
Willing to pay extra for vessel quality
Services getting better over the past years
Services getting worse over the past years
24/7 ferry for emergency is needed
Unanswered
Not Applicable
Totally Disagree
Somewhat Disagree
Neutral
Somewhat Agree
Totally Agree

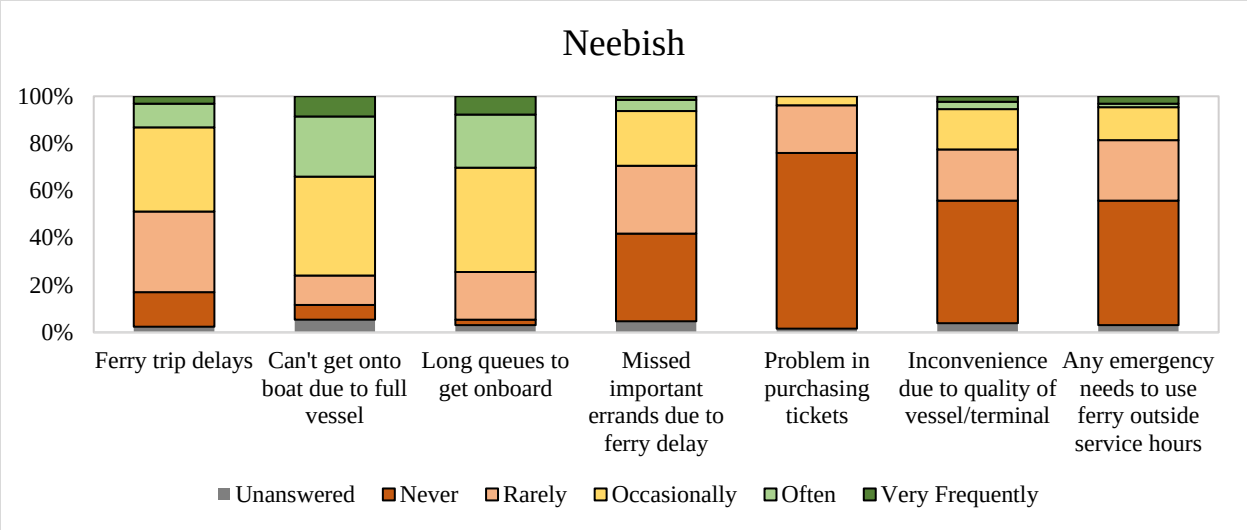

Sugar
100%
80%
60%
40%
20%
0%
Adequate freq weekdays
Adequate freq weekends
Terminal is accessible via public transit
Willing to pay extra for more freq
Willing to pay extra for vessel quality
Services getting better over the past years
Services getting worse over the past years
24/7 ferry for emergency is needed
Unanswered
Not Applicable
Totally Disagree
Somewhat Disagree
Neutral
Somewhat Agree
Totally Agree

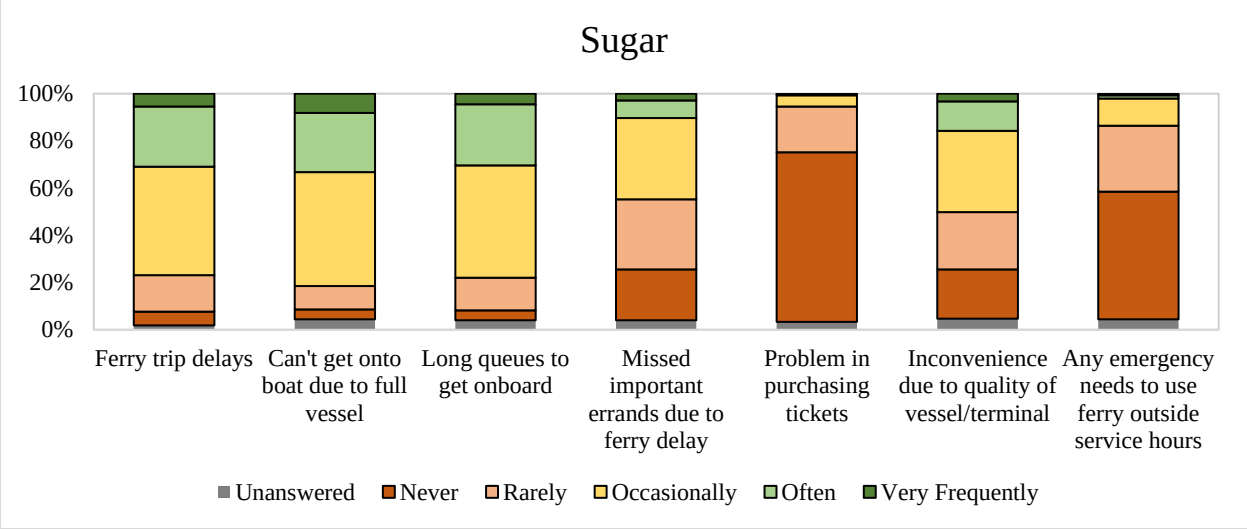
Question: How often have you experienced the following inconvenient occasions?

Figure(s) D- 7: Frequency of experiencing inconvenient circumstances



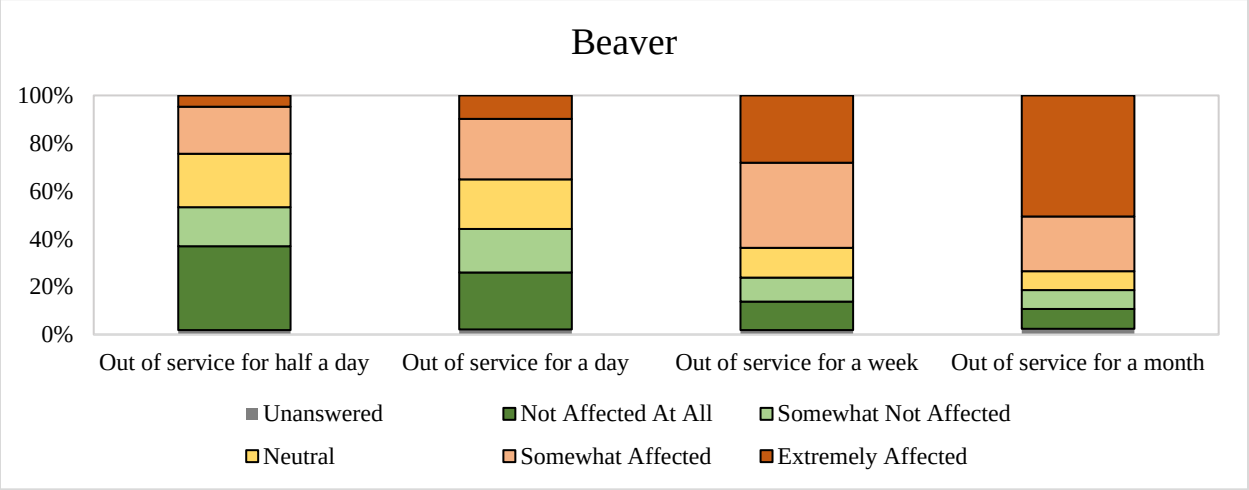


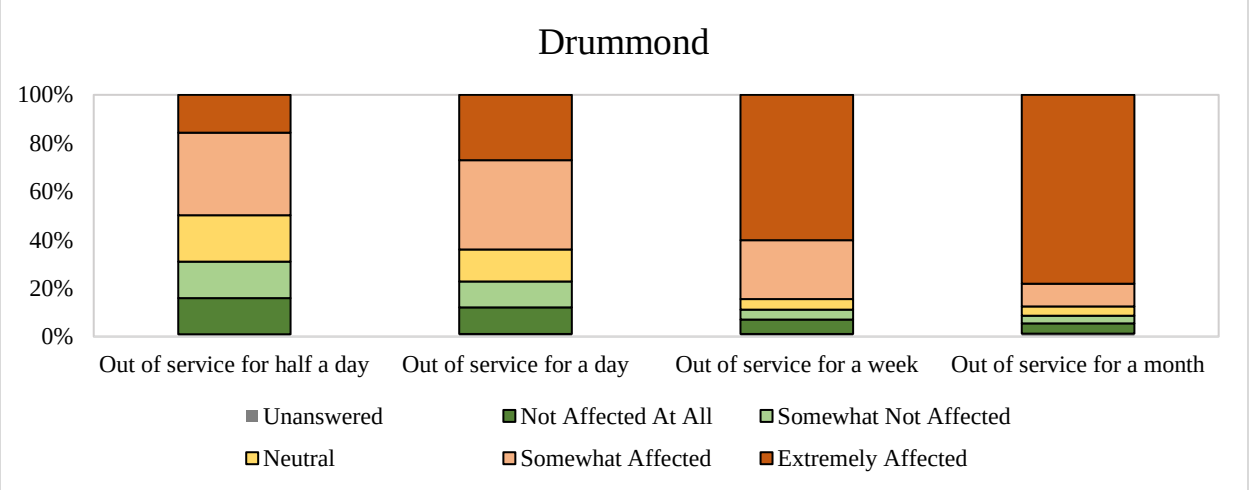

Neebish
100%
80%
60%
40%
20%
0%
Ferry trip delays
Can't get onto boat due to full vessel
Long queues to get onboard
Missed important errands due to ferry delay
Problem in purchasing tickets
Inconvenience due to quality of vessel/terminal
Any emergency needs to use ferry outside service hours
Unanswered
Never
Rarely
Occasionally
Often
Very Frequently

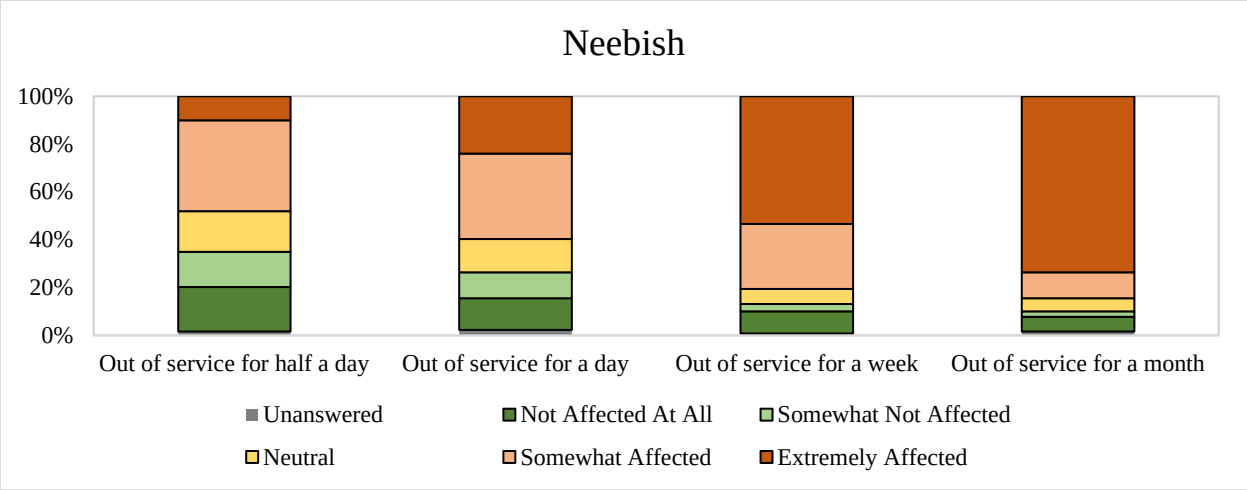

Sugar
100%
80%
60%
40%
20%
0%
Ferry trip delays
Can't get onto boat due to full vessel
Long queues to get onboard
Missed important errands due to ferry delay
Problem in purchasing tickets
Inconvenience due to quality of vessel/terminal
Any emergency needs to use ferry outside service hours
Unanswered
Never
Rarely
Occasionally
Often
Very Frequently

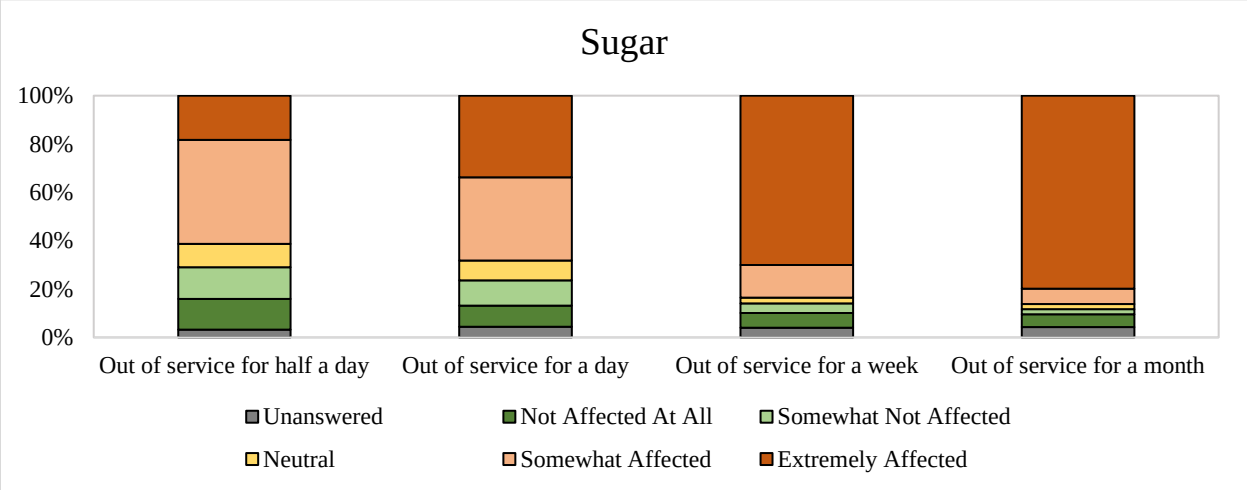
Question: How affected are you if ferry is out of service for various timeframe?

Figure(s) D- 8: Effects of ferry service outage on ridership



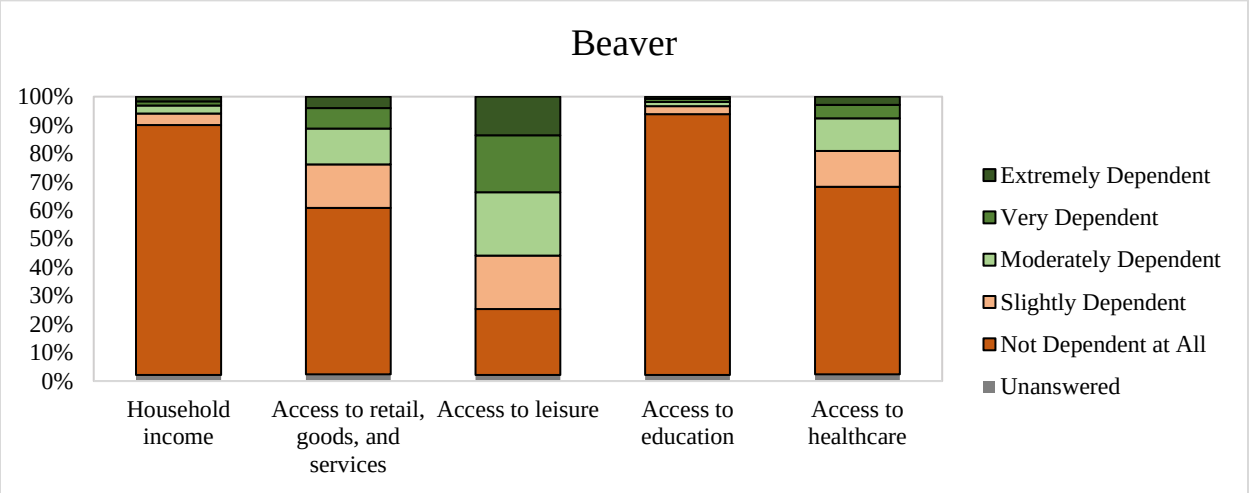


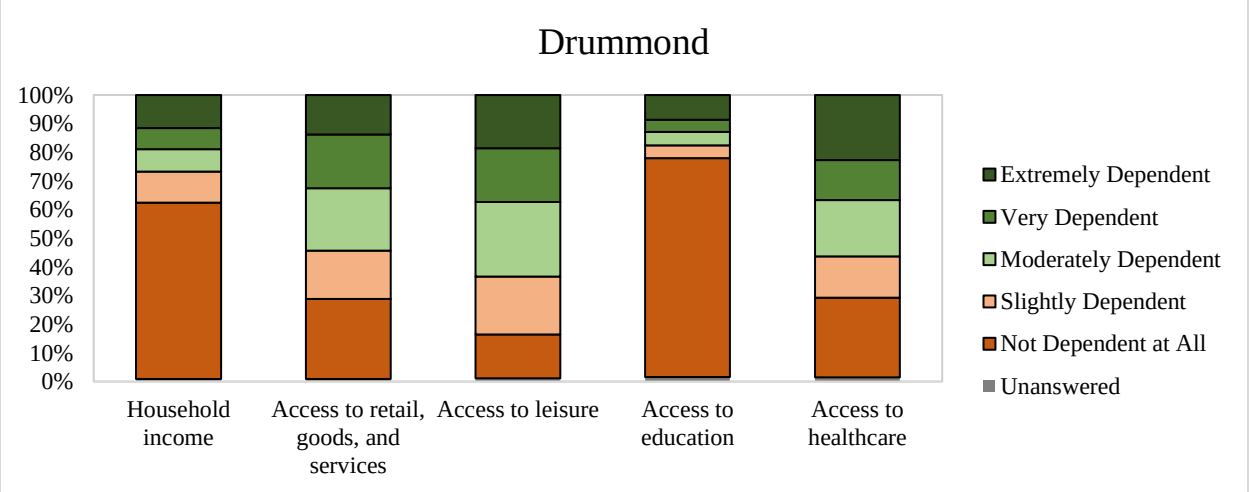

Neebish
100%
80%
60%
40%
20%
0%
Out of service for half a day
Out of service for a day
Out of service for a week
Out of service for a month
Unanswered
Not Affected At All
Somewhat Not Affected
Neutral
Somewhat Affected
Extremely Affected

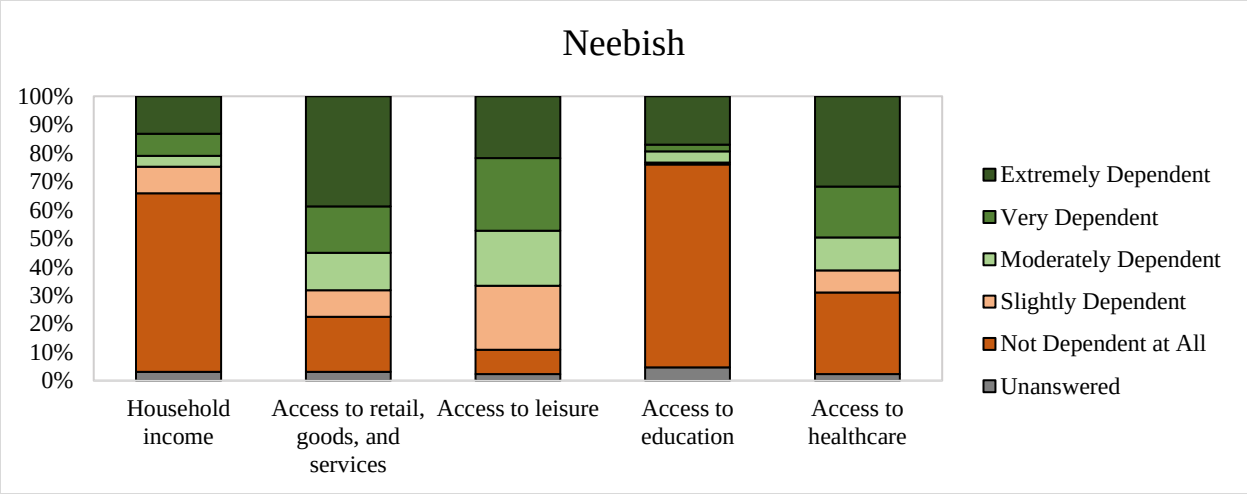

Sugar
100%
80%
60%
40%
20%
0%
Out of service for half a day
Out of service for a day
Out of service for a week
Out of service for a month
Unanswered
Not Affected At All
Somewhat Not Affected
Neutral
Somewhat Affected
Extremely Affected

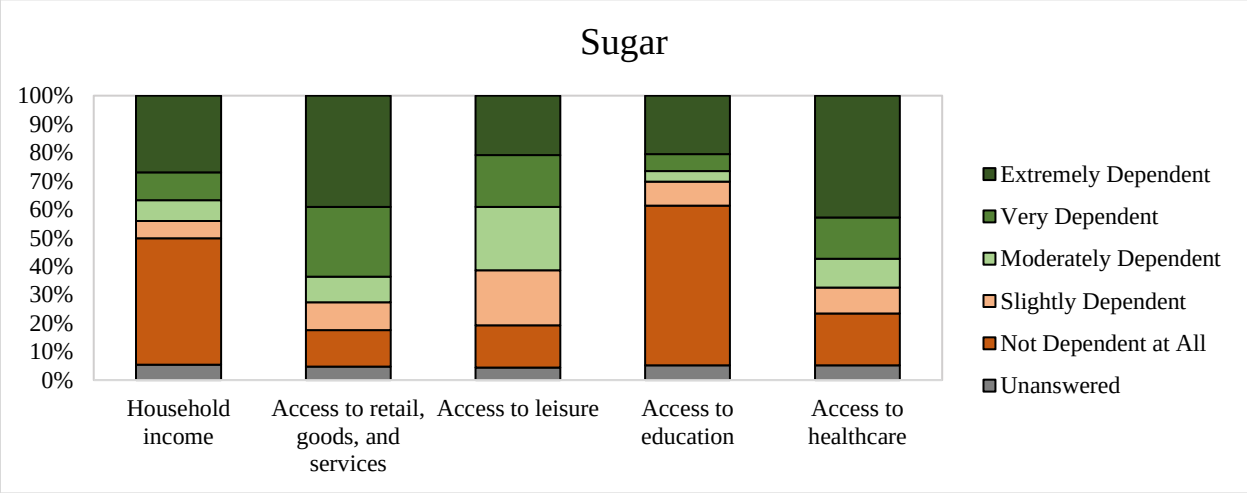
Question: How dependent are you on ferry services are you and your family for following purposes?

Figure(s) D- 9: Dependence of ferry services for various trip purposes






Neebish
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Household income
Access to retail, goods, and services
Access to leisure
Access to education
Access to healthcare
Extremely Dependent
Very Dependent
Moderately Dependent
Slightly Dependent
Not Dependent at All
Unanswered


Sugar
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Household income
Access to retail, goods, and services
Access to leisure
Access to education
Access to healthcare
Extremely Dependent
Very Dependent
Moderately Dependent
Slightly Dependent
Not Dependent at All
Unanswered

Cross-Analyses

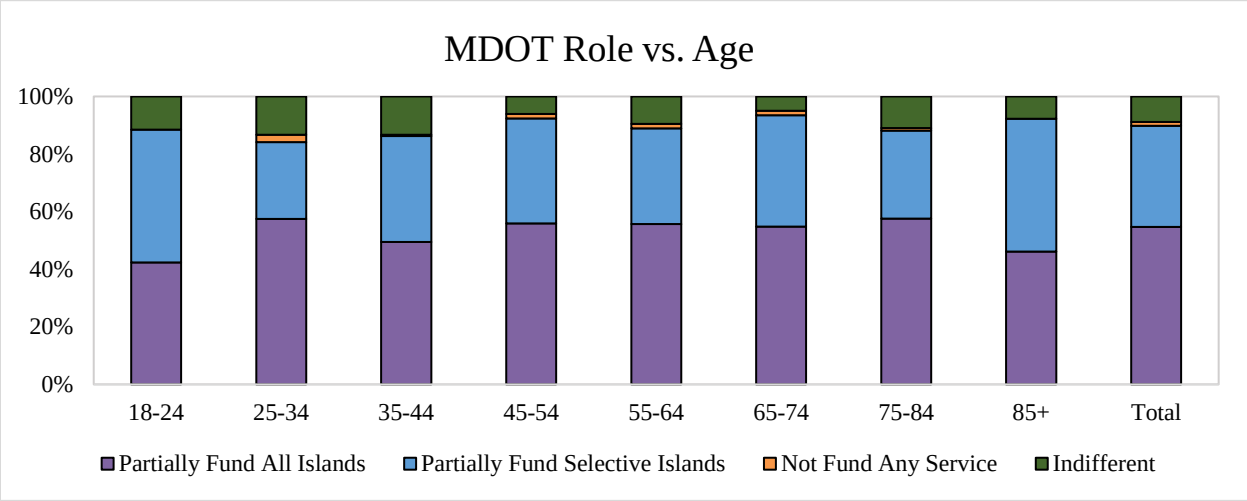


Figure D- 10: Role of MDOT vs age of respondents

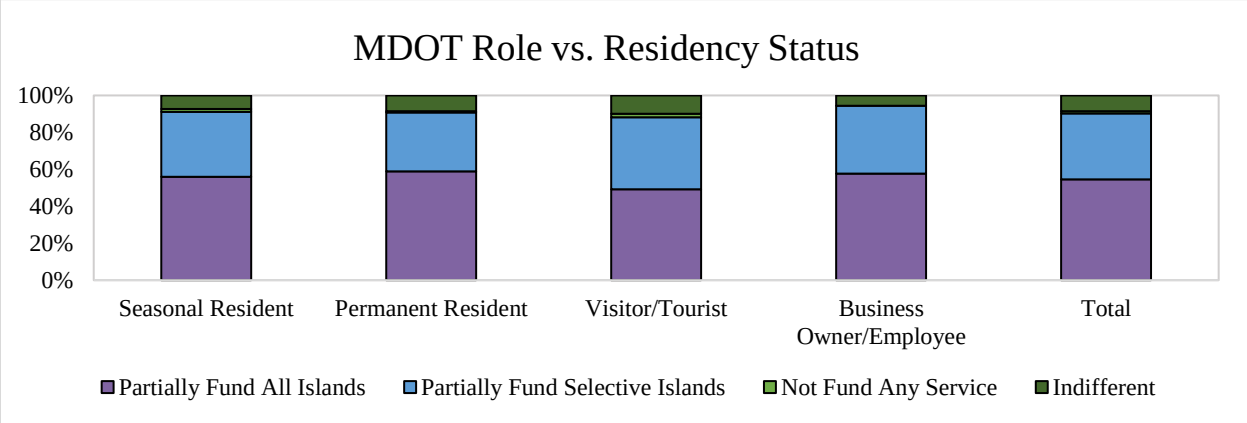


Figure D- 11: Role of MDOT vs residency status

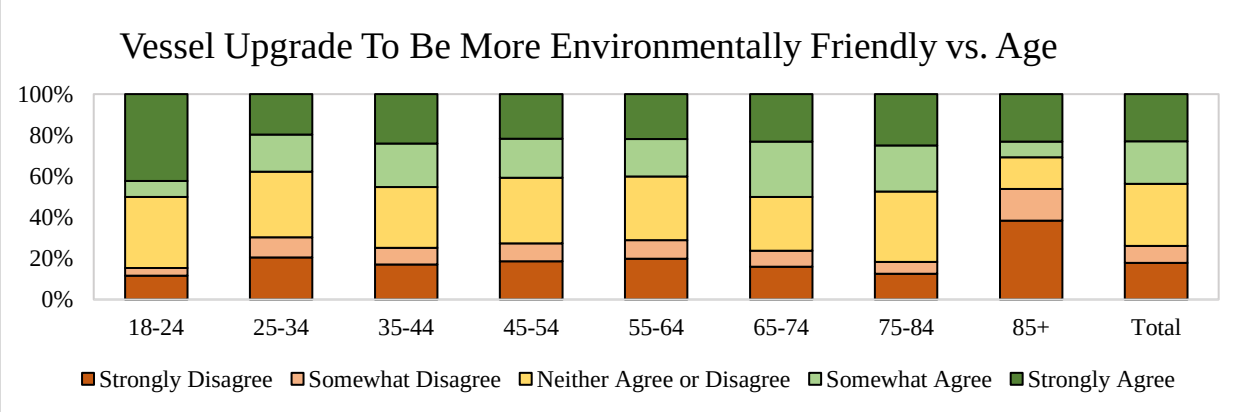


Figure D- 12: The need for environmentally friendly vessel vs age

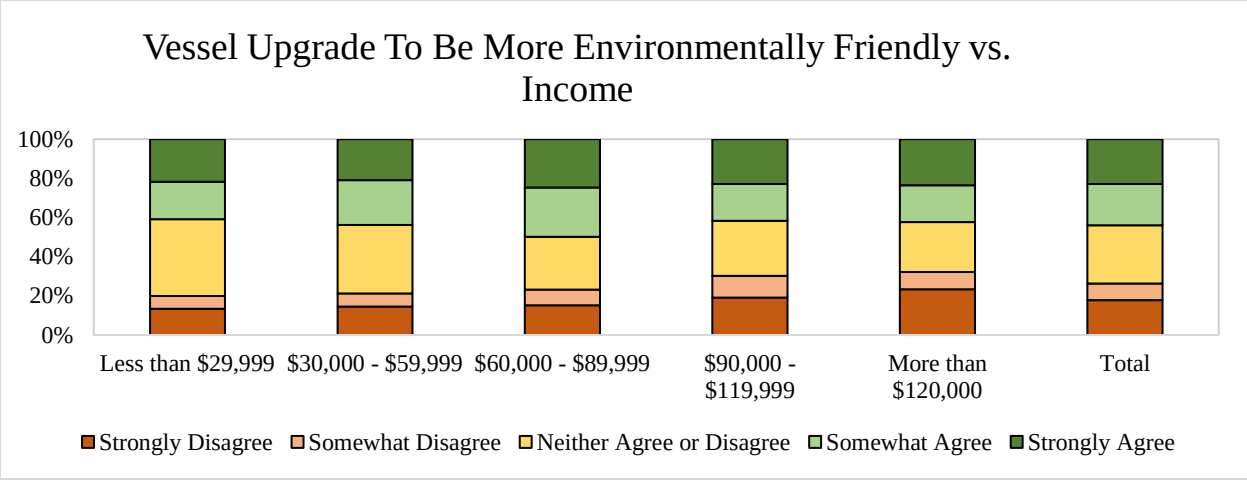


Figure D- 13: The need for environmentally friendly vessel vs income

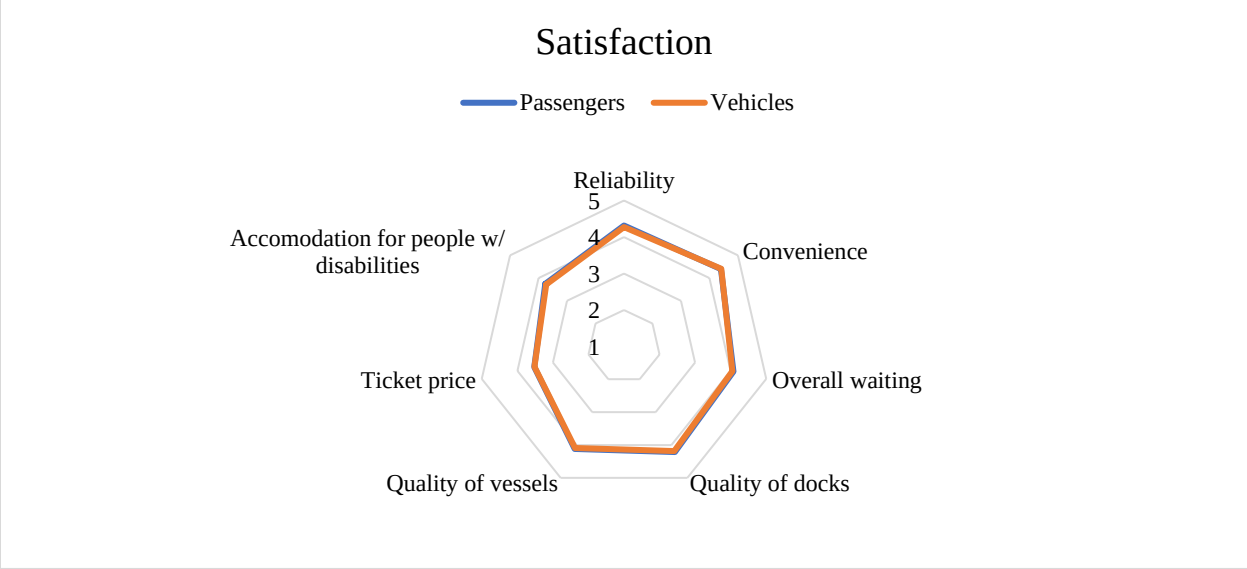


Figure D- 14: Passenger and vehicle ridership satisfaction towards various aspects

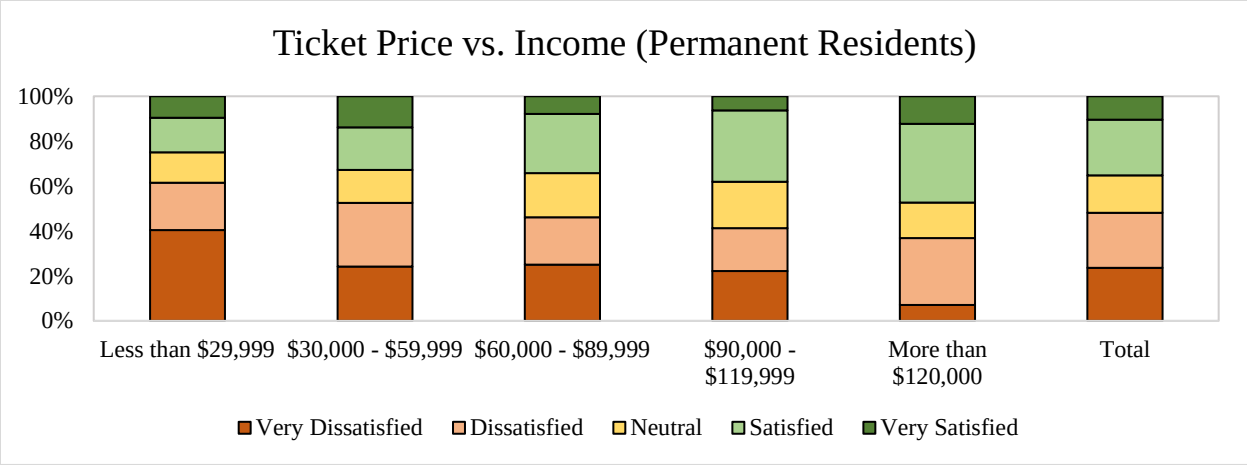


Figure D- 15: Ticket price satisfactions vs income of permanent residents

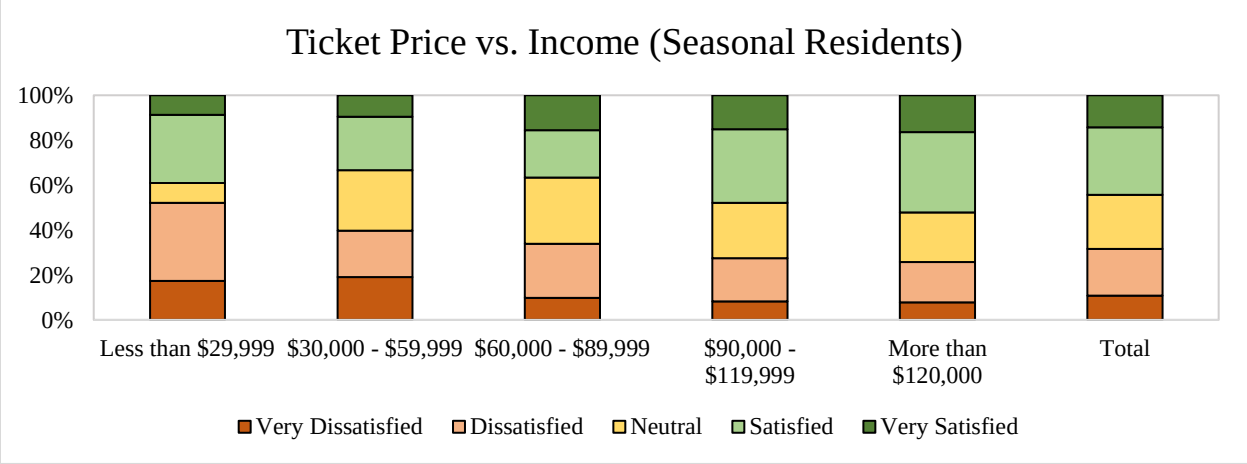


Figure D- 16: Ticket price satisfactions vs income of seasonal residents

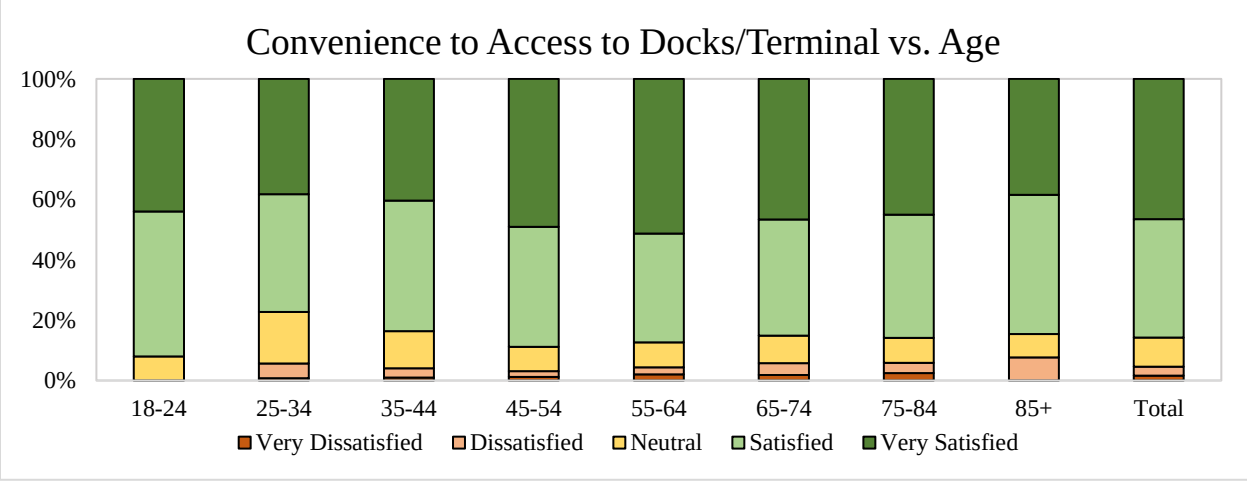


Figure D- 17: Convenience of dock/terminal access vs age