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REISFER

REDUCING CO_2 EMISSIONS IN ISLAND FERRY TRAFFIC

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Passengers' views on emission reduction in island ferry traffic in the Central Baltic Region

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List of Acronyms

BBAB	Blidösundsbolaget AB has provided passenger ferry services in the Stockholm Archipelago for over a century. As part of Transdev corporation, it currently operates 38 ships and has 300 employees.
CBR	Central Baltic (Sea) Region
CO_2	Carbon Dioxide
EE	2-letter country code for Estonia
EU	European Union
FI	2-letter country code for Finland
Finferries	Finferries is the marketing name of Finland's fully state-owned operator of island and road ferry services. The company was officially established in 2010 as Suomen Lauttaliikenne Oy. Its island ferry operations are managed through its subsidiary, Suomen Saaristovarustamo Oy.
GHG	Greenhouse Gases
HFO	Heavy Fuel Oil
IMO	International Maritime Organization
Island ferry	A ferry operating on a route that is not part of public road network, typically linking islands in the archipelago to a mainland port and/or to some other islands
Road ferry	A ferry operating on a route that is part of public road network. These ferries typically carry 10 to 100+ vehicles and have capacity to take passengers
Ro-Pax (ferry)	A roll-on/roll-off (Ro-Ro) ferry that can take both passengers and vehicles
SE	2-letter country code for Sweden
WÅAB	Waxholms Ångfartygs AB, also known as Waxholmsbolaget, is a shipowner company owned by Region Stockholm in Sweden

Keywords List

- Island ferry services
- Emission reduction
- Carbon emissions
- Social acceptability
- Public transport
- The Baltic Sea
- Central Baltic Region

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REISFER as part of Interreg Central Baltic Programme

As part of the Interreg Central Baltic Programme, the 3-year REISFER project (2024–2027) aims to significantly reduce the carbon footprint of island ferry transport, a vital connector of mainland areas with islands across the Central Baltic Region (CBR) (**Error! Reference source not found.**).

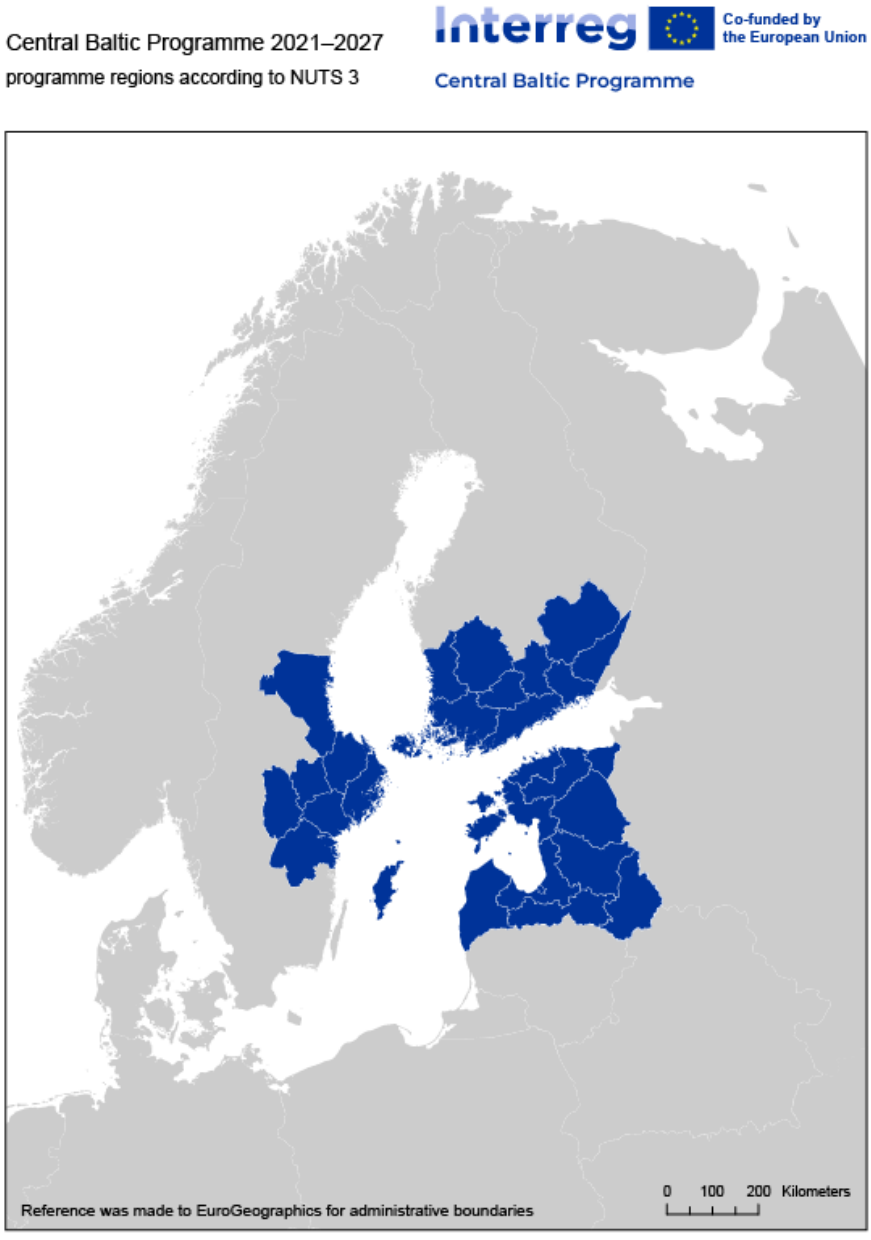


Figure 1: Participating regions in the Central Baltic Programme 2021–2027.

The primary objective of the REISFER project is to achieve a 10–20% reduction in CO_2 emissions on selected ferry routes by introducing a combination of technological and operational innovations.

The project's work plan is divided into two work packages (WPs), each focused on delivering outcomes that contribute to lowering CO2 emissions in key ferry transport areas:

1. **WP 1 – CO_2 reduction possibilities and potential in CBR island ferry traffic**
2. WP 2 – CO_2 emission abatement methods and technologies on ferries

This report focuses on the ferry passengers' views and preferences related to emission reduction of the island ferries. The report falls under the WP 1 in the REISFER project.

Previous REISFER reports provide information on the set-up and governance structures of island ferry services in the Central Baltic Region and the seagoing staff's views on decarbonisation methods and practices. All public REISFER reports are available here.

This study was conducted by **the University of Turku (UTU)**, **the Swedish National Road and Ferry Transport Research Institute VTI** and **Tallinn University of Technology** in cooperation with the ferry operators participating in the REISFER project: **Kihnu Veeteed** in Estonia, **Finferries** and **Suomenlinnan Liikenne** in Finland, and **Blidösundsbolaget** in Sweden.

The authors would like to thank all project partners for their cooperation and, in particular, all survey respondents and interviewees whose valuable contributions made this study possible.

1. Introduction

The Baltic Sea is one of the world's busiest maritime regions, featuring a dense network of ferry routes connecting countries, islands, and mainland ports in both domestic and international traffic. While large car-passenger vessels sailing cross-border routes are perhaps the most prominent ferries in the region, smaller vessels operating between islands and/or the mainland along the coastlines play an equally important role. Although the emissions of island ferry services are modest compared with those of large vessels, their cumulative annual emissions are nonetheless significant.

The European Union (EU) and its individual Member States have set ambitious emission reduction targets for the current and coming decades. Reducing environmental impact is becoming increasingly important also in the island ferry sector for both the companies providing ferry services and the authorities responsible for procuring, subsidising, and regulating the sector. While green logistics research is largely focused on large cargo and cruise vessels, the smaller-scale island ferry sector is often overlooked.

The island ferries provide essential local and regional transport links, serving as a vital part of domestic road and ferry services in countries such as Estonia, Finland and Sweden that have a considerable island population who depend on the island ferry services for everyday mobility and access to services. In all three countries, the archipelago is also one of the key tourism destinations that is actively being developed and promoted through different national and regional initiatives.

The permanent and seasonal island residents, domestic and international tourists, and employees in different enterprises form a diverse group of end-users for island ferry transportation and, consequently, for the low-emission technologies and methods. Depending on the measures implemented, the transition to low-emission ferry services may range from being largely unnoticed by passengers to having a more direct impact on travel experience and accessibility.

There are two primary approaches to reducing greenhouse gas emissions from maritime vessels: lowering fuel and energy consumption through operational optimisation or replacing diesel with alternative energy sources such as electricity and alternative fuels.

On the one hand, electrification and the adoption of alternative fuels are often associated with significant investment costs, which may, depending on funding arrangements, be reflected in passenger ticket prices. On the other hand, operational measures such as speed reduction and schedule optimisation typically involve little or no additional investment but affect passengers through longer travel times and reduced departure frequencies.

To assess the feasibility of emission reduction measures in island ferry traffic, it is important to understand also the views and preferences of the passengers as the end-users.

Public acceptance matters because transport technologies and policies produce their intended environmental and social benefits only when they can be implemented and people

are willing and able to use the resulting services. Consideration should be taken to ensure satisfaction of passengers during and after the transition. The passengers have considerable bargaining power in the market and related policymaking. Surveying their acceptance also helps identify barriers in service quality, affordability, trust, and fairness that may otherwise limit uptake or exclude some groups.

However, not only is the research on emission reduction in the island ferry sector scarce, but it is also focused on technological innovation, regulation, operations and economic aspects. As a result, public opinion has received relatively little attention in the development and implementation of new technologies and other measures.

To address this gap, the REISFER project conducted a cross-country survey on selected ferry routes or networks in Estonia, Finland, and Sweden. This study investigates the following question: **“How do passengers view emission reduction in island ferry traffic and its effects on their travel in the Central Baltic Region?"**

This research question is explored through the key service attributes – price, departure frequency and travel time – and the broader objective of reducing greenhouse gas emissions. Attention is paid to understand whether, and what kinds of, trade-offs passengers are willing to accept in relation to the transition towards low-emission ferry transport.

By examining passengers’ preferences and priorities, this study provides ferry operators and policymakers with insights into the social acceptability of different decarbonisation measures. These findings can support the development of emission-reduction strategies that are both environmentally effective and socially feasible.

This report draws on 202 survey responses from island ferry passengers in **Estonia**, **Finland**, and **Sweden**. Following an overview of the main emission-reduction measures and the study methodology, the report presents the findings of the cross-country study and complementary data and concludes with recommendations for policymakers and ferry operators, as well as directions for future research. The literature used as source material is listed in the reference list.

2. Main emission-reduction methods and impact on passengers' travel

The mission to reduce ferry emissions can essentially be approached from two primary directions: operational optimisation and alternative energy solutions. Smaller-scale approaches include measures such as the implementation of energy-efficient heating, cooling, and lighting systems on board ferries, as well as the use of antifouling coatings to minimise water resistance and improve energy efficiency. This study focuses on alternative energy solutions and eco-driving and voyage optimisation.

2.1 Eco-driving and voyage optimisation

Operational optimisation measures, such as eco-driving and voyage optimisation, are designed to improve efficiency and reduce fuel consumption through changes in driving practices, speed management, route optimisation, and scheduling.

Eco-driving and voyage optimisation are among the most straightforward methods for reducing emissions. Their main advantages are cost effectiveness, immediate applicability, and the possibility of implementation without major technological modifications to existing vessels. Implementing operational measures may result in an increased travel time or decreased ferry departure frequency possibly causing inconveniences for passengers.

Eco-driving refers to operating a vessel as fuel-efficiently as possible. A key component here is slow steaming, which involves sailing at reduced speeds. Since slower speeds require less energy, this directly decreases CO_2 emissions per nautical mile. The relationship between fuel consumption and vessel speed is typically exponential, meaning that lower speeds can generate disproportionately large fuel savings and, consequently, lower greenhouse gas emissions. In principle, a 10% reduction in vessel speed reduces power demand by approximately 27%, corresponding to roughly 19% fuel savings per voyage when the longer travel time is taken into account. Actual savings nevertheless depend on the vessel characteristics, operating speed, auxiliary loads, and prevailing conditions.

The downside of slow steaming is that it results in longer travel times, which can reduce convenience for passengers and other end-users.

Despite this drawback, slow steaming remains a low-cost, low-barrier strategy for emission reduction. One of the key benefits of eco-driving is cost efficiency – using less fuel not only lowers emissions but also reduces operating expenses for ferry operators and contracting authorities, which again decreases the impact for the passenger. Ultimately, adjusting vessel speed represents a trade-off between faster service and lower environmental impact.

Voyage optimisation is an operational strategy designed to minimise fuel consumption and emissions by optimising routes and schedules. This may involve selecting shorter or more

efficient routes, reducing the frequency of underutilised voyages, or concentrating operations during peak travel times – daily, weekly, or seasonally. Emissions associated with a cancelled voyage are avoided entirely, while shortening a route reduces both fuel consumption and emissions in proportion to the distance travelled.

Island ferry services generally operate along optimal routes already, but on some connections, there is still potential to reduce sailing distances, thereby lowering both fuel consumption and emissions. Schedule optimisation, however, is especially relevant in the context of island ferries in the Central Baltic Region, where some services may run with very few passengers or routes may vary in popularity over the year. Additionally, voyage optimisation can include weather-based routing, although this approach is typically more applicable to long-distance, open-sea travel.

2.2 Electrification of ferries and alternatives fuels

Another approach to decarbonisation involves addressing the source of emissions: the fuel itself. By replacing fossil fuels with cleaner alternatives or eliminating fuel use altogether through electrification and battery-powered propulsion, it is possible to achieve zero operational emissions.

Electrification of maritime vessels refers usually to replacing traditional fuel entirely with batteries and electricity as the vessel's primary energy source. This kind of full electrification results in a battery-powered ferry that produces zero emissions during operation, as no combustion of any fuel takes place. In **hybrid systems**, electric motors operate alongside conventional combustion engines, allowing both to be used as needed.

Electrification offers many advantages, including cost-efficient operation, zero emissions if the electricity is produced sustainably, and a vessel that runs more smoothly and quietly compared to those with fossil fuel engines. Electrification is nevertheless expensive and has certain limitations.

The feasibility of electric ferries is highly route-specific, depending on factors such as distance, port infrastructure, and financial capacity. The difficulty and cost of implementation are the limiting factors for fully battery-powered vessels. Some island routes in the Central Baltic Region are relatively long and serve remote islands, making the establishment and maintenance of charging infrastructure both difficult and expensive. These factors may impact the passenger’s experience of the ferry service due to potential change in departure frequency, travel time or ticket prices.

Hybrid vessels are another option. Typically, a hybrid vessel combines electric and fossil fuel-based propulsion, allowing operators to benefit from batteries without being overly dependent on charging infrastructure. The emission reduction achieved by a hybrid vessel depends on how much the vessel uses each propulsion.

Furthermore, a hybrid vessel can also utilise alternative fuels, potentially making it a zero-emission vessel regardless of the propulsion source. The main drawback of a hybrid is that

accommodating two energy sources increases both the vessel's weight and technical complexity. Overall, hybrid vessels are a practical solution for many routes in archipelago settings where full electrification is not feasible.

Emissions can also be reduced by replacing Heavy Fuel Oil (HFO) and Marine Diesel Oil (MDO) with lower-emission fuels. Some of these **alternative fuels** are already in active use while others are still being developed for large-scale implementation. While a detailed comparison of the available options is beyond the scope of this study, some of the main alternatives are briefly introduced below.

Biofuels are renewable fuels derived from biological sources such as biomass, vegetable oils, and bio-waste. Among them, Hydrotreated Vegetable Oil (HVO), also known as renewable diesel, is one of the most suitable and widely used options for island ferry operations in the Central Baltic Region. HVO is readily available and compatible with diesel-powered ferries, although higher fuel costs remain a challenge.

Liquefied Natural Gas (LNG) can reduce CO_2 emissions by around 25% compared to conventional marine fuels, but it remains a fossil fuel with methane leakage risks and limited long-term emission-reduction potential. Although commercially available, LNG is generally considered a transitional fuel.

Hydrogen is a chemical element with the potential to serve as a zero-emission energy source. In maritime applications, hydrogen must be converted into electricity using a fuel cell. While hydrogen is often cited as a promising energy carrier for the future, significant challenges related to its production, storage, transport, and safety are not yet solved. Unlike drop-in fuels such as HVO, hydrogen requires dedicated vessels through retrofitting or newbuild procurement.

Alternative fuels and electrification offer clear environmental benefits, but their implementation is often constrained by high costs, limited fuel availability, infrastructure requirements, and technical challenges. Many alternatives also lack established supply networks, and their lifecycle emissions must be considered when assessing their overall sustainability.

In this context, retrofitting existing vessels plays an important role, ranging from minor efficiency improvements to extensive conversions such as hybridisation or battery-electric propulsion. Where retrofitting is not feasible or cost-effective, fleet renewal provides a longer-term solution. However, both approaches may affect passengers through higher ticket prices and, in the case of retrofitting, temporary service disruptions.

3. Island ferry transport in the Central Baltic Region

3.1 Natural environment and seasonal variation

This report focuses on island ferry operations in the Central Baltic Region, and more specifically on selected ferry routes or networks in Stockholm Archipelago in Sweden, Helsinki and Turku Archipelago in Finland, and ferry lines to some of the largest islands in Estonia (Figure 2).

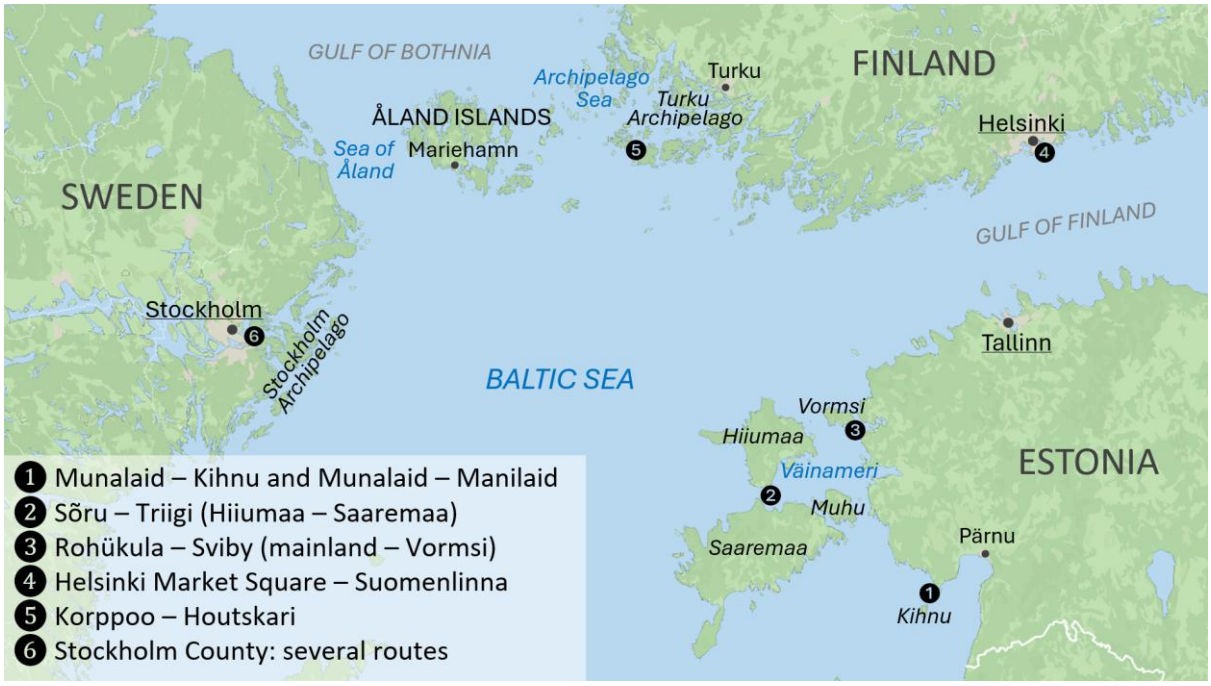


Figure 2: Map of the study region and locations of the ferry routes this study concerns. (Map by M-L Ojala; basemap: Maptiler)

The maritime region extending from the Stockholm Archipelago through the Sea of Åland to the Turku Archipelago consists of a nearly continuous chain of islands and islets, characterised by sheltered inner archipelagos, narrow straits, and more exposed outer sea areas. Though containing fewer islands, similar contrasts are found in the Gulf of Finland and around the Estonian islands of Saaremaa, Hiiumaa, and Muhu, where shallow inland waters transition into deeper and more open coastal zones.

The region experiences strong seasonal variation due to its northern location. Summers are characterised by long daylight hours, moderately warm temperature and relatively calm sea conditions. During autumn and winter, air and sea temperatures decline considerably, daylight hours become much shorter, and winds are typically strongest. Although winters have become milder and ice cover has declined in recent decades, severe winters with extensive ice conditions still occur occasionally.

Winter ice conditions increase energy consumption and operational demands for ferries as can be seen from Figure 3. While open-sea routes are more exposed to wind, waves, and drifting ice, sheltered archipelago routes are more prone to ice formation. Both can lead to higher energy use, longer transit times, and occasional delays in island ferry services.

While the unique natural environment attracts both residents and visitors, the archipelago and the Baltic Sea constitute a fragile ecosystem with valuable habitats and several endangered species. Across the region, there are many nature reservations, historical sites, and national parks, but also archipelago trails designed to promote tourism. These attractions are popular among visitors seeking active holidays with access to the coastline. Examples include Vaxholm Fortress and Nämdöskärgården National Park in Sweden, Lahemaa National Park in Estonia, and Archipelago National Park in Finland.



Figure 3: Aerial view over the northern parts of the Stockholm archipelago illustrating the navigation conditions during a cold winter. (Photo: Belola80, CC BY-SA 3.0)

The strong seasonal variation in climate and weather conditions affects both ferry operations and travel demand. Passenger volumes increase substantially during summer, when tourism, second-home use, and multilocational living are at their peak in all countries. In contrast, winter demand is more strongly driven by the travel needs of permanent residents and essential services. As a result, ferry operators must accommodate significant seasonal fluctuations in passenger and vehicle traffic alongside changing weather and sea conditions in the Central Baltic Region.

3.2 Island ferry transport in Estonia

3.2.1 Demand for island ferry services

Estonia has a population of nearly 1.4 million, with much of the population concentrated in and around the capital, Tallinn. However, smaller coastal cities such as Pärnu and Haapsalu also constitute important population centres. The inhabited archipelago, in turn, consists of the three main islands, Saaremaa, Hiiumaa, and Muhu, together with 17 smaller inhabited islands (Figure 2). More than 40,000 people live permanently on these islands, making island ferry services an essential part of everyday mobility and regional accessibility.

Ferry traffic is heavily concentrated on the routes connecting the two largest islands, Saaremaa and Hiiumaa, with the mainland. These routes transported approximately 2.5 million passengers and more than 1.2 million vehicles in 2024–2025, while ferries serving smaller islands carried tens of thousands of passengers. The ferry user base includes permanent residents, domestic and international tourists, seasonal residents such as second-home owners and remote workers, and local businesses.

Tourism plays a major role in sustaining demand for island ferry services. In Estonia, both inbound and domestic tourism have increased considerably since the early 2000s. The archipelago is a popular destination for leisure travel, and seasonal living has become increasingly common in Estonia.

Consequently, ferry demand is highly seasonal, with traffic volumes peaking during the summer months when tourism and second-home occupancy are at their highest levels. Although Estonia's population is gradually decreasing, growth in tourism and multilocational living continues to maintain and increase demand for island ferry services.

3.2.2 Operational environment

The Estonian island ferry market can be divided into two segments: ferry services connecting the large islands of Saaremaa and Hiiumaa to the mainland, and services to smaller inhabited islands, such as Vormsi and Kihnu (Figure 2).

Saaremaa and Hiiumaa are served by relatively large car-passenger ferries, while the smaller routes are operated by a variety of vessels with differing capacities and service levels. Unlike Finland and Sweden, Estonia has no distinct category of road or cable ferries; instead, ferry services are primarily designed to connect inhabited islands with the mainland.

Island ferry services are strongly influenced by the public sector. Publicly funded ferry services are procured either by the Ministry of Regional Affairs and Agriculture or by local municipalities, and public subsidies play a significant role in financing operations. Passengers and vehicles generally pay fares on Estonian island ferries. Ticket revenues form part of the funding structure, although the revenue is directed to public authorities rather than the operators themselves.

The legal and political environment is currently relatively permissive regarding CO_2 emissions from island ferries, and emission levels are not yet a major factor in public procurement. Nevertheless, the government has demonstrated a growing commitment to decarbonising maritime transport through initiatives such as green ferry procurement and investments in shore-power infrastructure. Environmental requirements are expected to become more stringent in the coming years.

The technological environment of Estonian island ferry transport is largely controlled by the public sector. The Estonian State Fleet (ESF), a government agency under the Ministry of Climate, owns most island ferries and is responsible for procuring new ships, while state-owned company AS Saarte Liinid manages small ferry ports. As a result, technological development depends heavily on public investment decisions.

Estonia is actively pursuing lower-emission ferry technologies. The country is investing in charging infrastructure for battery-electric and hybrid ferries, with the aim of installing charging facilities at most island ferry ports by 2028. Interest in hydrogen as a future marine fuel is also growing, although the supporting infrastructure remains under development. Current plans therefore focus primarily on battery-electric propulsion supported by biofuels and other low-emission technologies.

Competition in the market is relatively limited. The state-owned TS Laevad OÜ operates the high-volume Saaremaa and Hiiumaa routes, while smaller island services are operated by private companies, such as Kihnu Veeteed, under public contracts. Procurement remains strongly price-focused, with environmental and quality criteria playing a secondary role. However, the transition toward more sustainable ferry services is likely to increase the importance of environmental performance and technological innovation in future procurements.

3.3 Island ferry transport in Finland

3.3.1 Demand for island ferry services

The population in Finland is heavily concentrated in coastal urban centres, particularly in the Helsinki metropolitan area, but a significant number of people also live permanently in the archipelago. Island ferry services play a vital role in the accessibility of archipelago areas, regional vitality, and tourism.

Of Mainland Finland's more than 200,000 islands, around 1,000 are permanently inhabited. Nearly half of these inhabited islands lack a fixed road connection but are home to approximately 8,800 permanent residents. Ferry services provide these communities with an essential link to the mainland, enabling both daily mobility and the transportation of goods.

The Archipelago Sea is the most significant archipelago region, containing more than 24,000 islands. The area is home to approximately 30,000 permanent residents and more than

32,000 second homes. The Archipelago Sea with its Archipelago Trail routes is also an important touristic destination.

The importance of the area is reflected in traffic volumes too: Finland's busiest road ferry routes are in the Archipelago Sea. In 2023, for instance, the Parainen – Nauvo (Pargas – Nagu) route carried more than half a million vehicles, while the Nauvo – Korppoo (Nagu – Korpo) route transported nearly 300,000 vehicles.

Another important archipelago region is the Gulf of Finland, which contains approximately 15,000 islands. Permanent settlement is concentrated in coastal cities, including the capital, Helsinki, while many of the islands primarily function as tourism and leisure destinations.

Finland's most well-known island ferry route connects Helsinki with the fortress island of Suomenlinna, a UNESCO World Heritage Site, with approximately 800 permanent residents. The 15-minute ride to Suomenlinna is made by over two million passengers annually, making it by far the busiest archipelago ferry route in Finland.

Overall, island ferry passengers appear to be highly satisfied with the services they use. Customer satisfaction surveys from both Finferries and Helsinki Regional Transport Authority have consistently reported excellent overall ratings in recent years. Staff performance, reliability, safety, punctuality, cleanliness, and disruption-free operations have been among the most highly valued aspects of these services.

As in Estonia, the role of archipelago is changing in Finland. Permanent populations are declining and ageing, while the number of second homes continues to grow. Currently, more than 150,000 summer cottages are located in the archipelago areas. Their use is highly concentrated during the summer season, when also tourism levels increase substantially, further intensifying demand for ferry transport services.

The cultural and natural heritage of the archipelago is widely regarded as offering substantial opportunities for tourism growth, which is why Finland's archipelago and coastal areas have been designated as nationally important tourism development regions. Prior to the Covid-19 pandemic, the area recorded more than seven million overnight stays annually, and tourism has since recovered towards pre-pandemic levels.

3.3.2 Operational environment

Finnish archipelago transport is strongly based on public funding and government guidance both in Mainland Finland and in the Åland islands. The entire system consists of road ferries, island ferry services, and municipally procured ferry services, most of which are publicly funded.

As this study does not contain passenger survey data for the Åland islands, this autonomous region is treated here only superficially. In Åland islands, the Government of Åland is the competent authority in island and cable ferry issues.

For Mainland Finland, the Archipelago Act[1] is the regulatory foundation for island ferries, while road ferries are governed as part of the national road network. Based on the current Archipelago Act, transport connections between the serviced islands and the mainland are generally free of charge. The primary purpose of island ferry services is to secure mobility for residents rather than operate on purely commercial principles.

In recent years, public procurement criteria have shifted from a strong emphasis on price towards greater consideration of service quality, environmental performance, and low-emission technologies in Finland. Contract periods have also been extended to provide operators with better opportunities to invest in modern vessels and new technologies.

The market has nevertheless become highly concentrated around the state-owned operator Finferries, which operates most of Finland's road ferries and island ferry services. This concentration has been driven partly by the economic challenges faced by the industry, which have caused several smaller operators to exit the market. At the same time, pressure to reduce public spending may slow investments in infrastructure such as charging facilities for electric ferries, despite increasing expectations for emission reductions.

Traditionally, Finnish ferry and island ferry services have relied on vessels powered by fossil fuels, many of which are already ageing. However, climate targets and increasingly stringent environmental policies are driving the search for more sustainable solutions. Finland's goal of achieving carbon neutrality by 2035 also applies to the maritime sector, meaning that emission reductions will increasingly affect archipelago transport.

Electrification has emerged as the most visible emission-reduction measure, particularly on short road ferry routes. Finferries has already introduced several electric and hybrid vessels and has committed to further reducing greenhouse gas emissions. However, not all routes are suitable for electrification. Many island ferry routes extend to remote islands and involve journeys lasting several hours, making battery capacity and the lack of charging infrastructure significant obstacles. Consequently, alternative propulsion solutions are being developed alongside electrification.

The use of renewable fuels is on the rise. HVO renewable diesel is already used on some Finferries vessels and in ferry services to Suomenlinna in Helsinki. Larger Ro-Pax ferries have also begun adopting similar solutions. Finland benefits from a strong domestic renewable fuel industry, with companies such as Neste among the world's leading producers of renewable fuels.

As Mainland Finland's ferry network is geographically dispersed across the Archipelago Sea, the Gulf of Finland, and inland waterways, investments such as charging infrastructure are costly and utilising economies of scale is limited. Consequently, the transition to low-emission

[1] The Archipelago Act is currently undergoing revision. The Finnish Government submitted its proposal for a new Act to Parliament on 15 September 2026, with the legislation expected to enter into force in 2027. The new Act would largely retain the principles of the existing legislation, including the possibility of introducing fees for archipelago transport services. However, such fees are unlikely to be implemented in the foreseeable future.

ferry services require not only action from operators but also long-term public investment, supportive procurement policies, and strategic infrastructure development.

3.4 Island ferry transport in Stockholm County, Sweden

3.4.1 Demand for island ferry services

Stockholm County comprises 26 municipalities including the nation's capital. Only five of these municipalities are landlocked and is home to approximately 2.5 million residents. The Stockholm Archipelago consists of roughly 30,000 islands, of which around 200 are inhabited. Even the city of Stockholm spans multiple islands, interconnected by bridges, a subway system, and a well-developed ferry network.

Stockholm attracts millions of tourists annually. In 2024, accommodations in Stockholm County recorded nearly 8.4 million tourist arrivals. July and August are peak travel months, while January and February experience the lowest visitor numbers. In 2024, about 32% of tourists were international, with the remaining 68% being Swedish residents. Around 20% of tourists visit the archipelago during their stay.

The public transport system includes four ferry commuter routes in central Stockholm, which carried over 4.8 million passengers in 2022. The archipelago ferries, operating across a broader area from Arholma in the north to Landsort in the south, serve around 1.5 million passengers annually calculating to an average of 4,100 boardings per day (SL, 2023.) In addition to island ferries, road ferry routes connect several of the largest islands to the mainland (Figure 4).

In Stockholm County, approximately 9,000 residents live on islands that lack a bridge connection to the mainland. While most of these islands are served by road connections, several inhabited islands have neither a road ferry nor a bridge. Instead, the islands are accessed by archipelago ferries, taxi boats, and private vessels.

Fourteen of the islands with limited access have been designated as Core Islands (kärnöar) and prioritised in regional planning as service hubs for surrounding islands and tourism. The Core Islands are home to approximately 1,500 permanent residents, and the regional standard includes daily, year-round ferry access to these islands.

However, the regional aim is to strengthen infrastructure and services further, thereby increasing their capacity for both permanent settlement and business development in the archipelago. Organisations such as *Levande skärgård* (Living Archipelago) push interests of those living on the Core Islands as well as aiding people moving there. Most of these islands are also included in another regional development initiative: the Stockholm Archipelago Trail that covers 20 islands and offers 270 km of hiking routes, all accessible via the public ferry network.

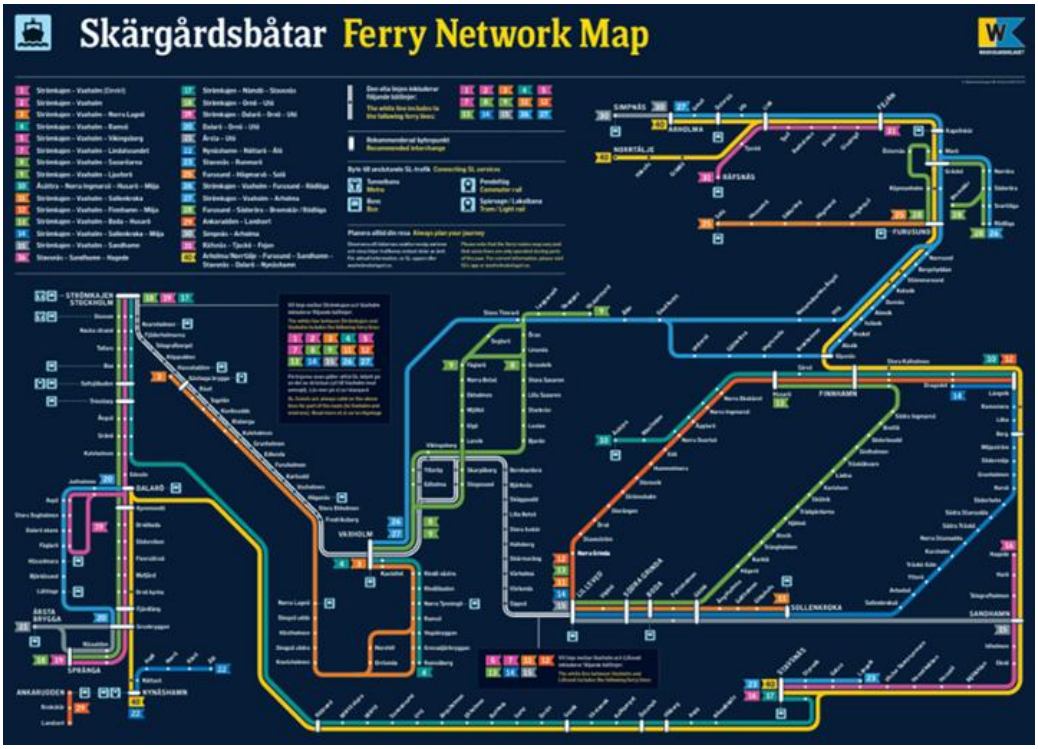


Figure 4: Stockholm County has well established ferry connections as illustrated by the ferry network map. (Source: Waxholmsbolaget)

Traveler satisfaction of the island ferries has risen since 2024 according to Region Stockholm. Satisfaction rates of both the island ferries and commuter boats lie at 98% which is very high in relation to the satisfaction of other transport modes offered in Stockholm County. Determining satisfaction rates was based on various factors such as safety, personal, crowdedness, cleanliness, and schedule. Departure frequency was the lowest rated factor.

3.4.2 Operational environment

Sweden is subject to the same EU and IMO regulations as Estonia and Finland, but domestic ferry services, however, are under national rather than international regulation when it comes to, for example, navigational safety or GHG emissions. Previously, the public procurement of island ferry services has been price-focused, but the procuring authority will consider environmental criteria in the future.

Authorities in Stockholm County have demonstrated a strong desire to reduce emissions from the public transport services they provide by arranging charging infrastructure for not only island ferries, but also for larger ferries, such as those heading to Gotland, Finland, and Estonia. These policies are in line with Sweden's national emission reduction goal of reaching net zero greenhouse gas (GHG) emissions by 2045. The Core Islands, which are being developed according to the hub-and-spoke model, are one example how regional planning directly shapes how the island ferry transport is organised.

Region Stockholm owns a shipowner company Waxholms Ångfartygs AB (also known as Waxholmsbolaget, WÅAB) and procures ferry services from private companies. The role of WÅAB is to own vessels and govern contracted operators, not to operate the vessels itself. The company has a fleet of 25 vessels, which are not enough for the high demand. Thus, Region Stockholm is also procuring ferry services from companies operating their own vessels.

The economic and competitive environment for island ferry services in Stockholm County can be described as robust and dynamic, particularly when compared to other regions within the Central Baltic. The market is competitive, with multiple operators actively involved in providing services, and financially capable of investing in environmentally sustainable technologies, including the electrification of vessels.

Unlike regions such as mainland Finland – where a single dominant operator (Finferries) holds a significant market share – Stockholm County does not have a monopolistic market structure. Although Blidösundsbolaget AB (BBAB) is currently the market leader, several other companies operate in the region, ensuring healthy competition in public tenders. The presence of multiple capable operators contributes to an innovative business environment, fostering progress in sustainable ferry operations.

The technological environment in Stockholm County is slightly more advanced in terms of emission reduction when compared to other regions in this study. HVO is commonly used by island ferries, and a HVO supply network for ferries is in place. Island ferries are predominantly HVO-compatible, which means the technological preconditions exist for a complete biofuel transition. The main issue is cost as the fossil option, Diesel MK1 (a mixture of fossil and biodiesel), currently sells at roughly half the price of HVO.

There are also a few electric and hybrid ferries operating in Stockholm County. BBAB is the largest ferry operator in the region and leading the way regarding electrification. BBAB recently converted a 50-year-old vessel, *M/S Silverö*, to fully electric. The old engine and all fuel-powered appliances were removed, and the vessel is now fully battery-powered, emitting zero emissions in operation. This project demonstrates what is possible but also highlights regional limitations. *M/S Silverö* was selected for its lightweight design, suitability for retrofitting, and operation on a route with sufficient shoreside power on Vaxholm Island.

Stockholm County faces similar issues as Finland regarding electrification, as the ferries need to cover a vast archipelago. For the broader electrification of Stockholm County's ferries, a more extensive network of charging stations would need to be established. The strategic locations of the City of Stockholm and Vaxholm, for instance, where many of the region's ferry routes lead, is an advantage, but the archipelago is too large for ferries to make voyages far into the islands and back without recharging.

As the local authority, Region Stockholm will play a key role in allowing or setting up sufficient charging infrastructure across the archipelago. The technology and know-how to convert a vessel to use batteries exist, albeit at an expensive cost to the operator.

4. Data and methods

4.1 Cross-country survey and complementary data sources

The primary data collection for this report was conducted through a cross-country survey that was designed to examine passengers' values, views, and travel behaviour related to emission reduction in island ferry transport. The survey was distributed on selected ferry routes or networks in Estonia, Finland and Sweden and through online channels.

The questionnaire was developed jointly for all participating regions to ensure the comparability of results with only country-specific adaptations regarding the available languages, the wording of the invitation letter, and certain questions on ferry use and willingness to pay. These deviations are marked in the questionnaire form (Appendix 1).

The questionnaire included questions on respondents' background characteristics, travel purpose, and ferry use to enable comparisons between different user groups. Environmental and climate-related views were assessed using Likert-scale statements. The survey also explored the acceptability of key emission reduction measures, including longer travel times, reduced service frequency, and higher fares. The respondents were also asked to rank the importance of ticket price, travel time, service frequency, and low-emission travel. In addition, they had the opportunity to provide further comments through an open-ended question.

The scope of the questionnaire was intentionally kept relatively narrow to preserve respondent engagement and minimise survey fatigue.

In **Finland** and **Estonia**, the analysis incorporates emission reduction-related questions from the annual customer surveys conducted by Finferries and Kihnu Veeteed. In **Sweden**, complementary insights were obtained from interviews conducted as part of another REISFER work package during the summer of 2025.

In addition to the cross-country survey, this report draws on complementary data to provide further context for interpreting passengers' views on ferry decarbonisation across the study regions. These additional data sources are described in greater detail in the following subsections.

4.2 Data collection and studied ferry routes in Estonia

In **Estonia**, the passengers were reached digitally by two means: a QR code to the online questionnaire was presented on onboard screens of three vessels during July and August 2026, and a post about the survey with the QR code was also shared in three relevant Facebook groups in early August. The questionnaire link was closed on 10 September 2026.

Majority of the responses were attained from the onboard QR codes. All routes are operated by AS Kihnu Veeteed and provide essential connections between islands and the mainland. The routes are served by double-ended Ro-Pax ferries, *M/S Soela*, *M/S Ormsö* and *M/S Kihnu Virve*, each with a capacity of 200 passengers and up to 30 passenger vehicles (Figure 5).



Figure 5: Sister ships M/S Ormsö (left) and M/S Kihnu Virve (right). (Photos: Kihnu Veeteed)

M/S Soela serves the Sõru – Triigi route that connects the islands of Hiiumaa and Saaremaa. The crossing takes approximately one hour over a distance of 9 nautical miles, equivalent to almost 17 kilometres, with two departures per day year-round and increased frequency during the summer season.

M/S Ormsö links Vormsi Island with the mainland on the Sviby – Rohuküla route. The crossing time is approximately 45 minutes over 12 kilometres, and the service operates up to five times per day throughout the year. This is the shortest route among the three.

M/S Kihnu Virve operates on the Kihnu – Munalaid and Manilaid – Munalaid routes connecting Kihnu island and Manilaid island with the mainland. The former has a crossing time of approximately 1 hour and 5 minutes over a distance of 20 kilometres, and the latter is a shorter 10-minute route. The service to Kihnu island operates two to three times per day year-round, with additional departures during the summer season. The connection between Manilaid and mainland is operated three times a week.

Annual traffic volumes on the three routes range from approximately 50,000 to 87,000 passengers per route. Kihnu – Munalaid connection records the highest passenger volume, whereas Sõru – Triigi between islands Hiiumaa and Saaremaa has the lowest.

The service frequency is largely determined by contracted schedules and available funding for island ferry transport and does not fully reflect existing demand on the studied routes. The service arrangements allow an extra sailing when a certain number of vehicles is left behind due to capacity constraints. The latter, however, is only possible if operational conditions permit. In practice, crew working-hour restrictions often limit the ability to provide additional departures and additional crew has not been tendered from the operator.

Furthermore, as passengers can check ferry capacity online and avoid travelling to the port when departures are fully booked, the full extent of unmet demand may not be reflected in passenger statistics. Nevertheless, there are indications that additional departures can quickly generate increased passenger and vehicle traffic, particularly when introduced on a regular basis.

All three vessels feature indoor passenger lounges, outdoor deck areas, and small cafés offering refreshments and snacks. A standard adult ticket costs EUR 4 for journeys from the mainland to Vormsi or Kihnu, EUR 3 between the islands of Hiiumaa and Saaremaa, and EUR 2 for the short, 10–15-minute crossing between the mainland and Manilaid. Reduced fares are available to eligible passenger groups, including local island residents. Transporting a standard passenger car costs EUR 2–4 for island residents and EUR 9–16 for other passengers, depending on the route. Local schoolchildren, students and people with disabilities are entitled to travel free of charge.

4.3 Data collection and studied ferry routes in Finland

In **Finland** the survey responses were collected using two complementary approaches: direct contact with passengers and online distribution. The survey was available in Finnish, Swedish, and English from August until 6 of September 2026.

Online distribution included publishing the survey invitation on the website of Suomenlinnan Liikenne Oy as well as in three Facebook groups related to ferry services in Helsinki and in the Turku archipelago.

Direct contact involved a researcher being present either on board a ferry or at the ferry dock to invite passengers to participate in the survey. Data collection was conducted during one day on board *M/S Suomenlinna II*, which operates a 15-minute route between Helsinki Market Square and Suomenlinna, and on one day on board the road ferry *M/S Stella*, which serves a 30-minute route in the Turku Archipelago.

This approach also allowed the researcher to discuss the project with passengers and answer any questions regarding the survey. In addition to completing the questionnaire on their own devices, passengers were offered the opportunity to fill out the survey using a paper questionnaire or a tablet provided by the researcher.



Figure 6: M/S Stella and M/S Aura at Galtby harbour in Korppoo. (Photo: M-L Ojala)

M/S Stella is a 65-metre road ferry carrying up to 250 passengers and 65 cars (Figure 6). *Stella* originally entered service in 2012 as a diesel-electric ferry and was converted into a hybrid vessel in early 2026. *M/S Stella* is operated by Finferries, and, as part of Finland's publicly funded archipelago transport system, boarding the ferry is free of charge for passengers and vehicles. Most passengers board the ferry with a vehicle.

M/S Stella serves a 9.5 km route between Korppoo and Houtskari (Korpo – Houtskär), which is Finferries' longest route in the Turku archipelago. Crossing time is 30–35 minutes and, depending on the weekday and season, the ferry traverses it approximately 16–26 times a day. During the summer season, *M/S Stella* also offers a small onboard café on the upper deck.

M/S Suomenlinna II, built in 2004, is a 34-metre diesel-electric ferry primarily designed for passenger transport (Figure 7). She can take almost 400 passengers but only two vehicles. The vessel is operated by Suomenlinnan Liikenne Oy between Helsinki Market Square and the Suomenlinna island. *M/S Suomenlinna II* serves the 15-minute route almost nonstop from 06:00 to 02:20 the following day throughout the year. The ferry operates as part of the Helsinki Regional Transport Authority (HSL) public transport network, and passengers are required to hold a valid HSL ticket. In summer 2026, a single adult ticket for zones AB needed for the ride, valid for 80 minutes, cost EUR 3.30. Reduced fares are available to eligible passenger groups, while season tickets and multi-journey tickets offer additional fare options.



Figure 7: Passengers boarding M/S Suomenlinna II at Helsinki Market Square. (Photo: M-L Ojala)

M/S Stella and *M/S Suomenlinna II* are double-ended vessels with symmetrical bow and stern configurations, allowing efficient loading and unloading at either end without the need to turn around. Both are designed for year-round operation, including challenging winter conditions. Passenger volumes on both routes vary considerably by season and time of day, with the vessels frequently operating at or near full passenger capacity during peak periods.

4.4 Data collection and studied ferry routes in Sweden

In **Sweden**, survey responses were collected using two complementary approaches: direct contact with passengers and online distribution. The survey was open for responses from 15 June – 6 September 2026 resulting in 42 responses in Sweden.

Direct contact involved a researcher being present either on board a ferry or at the ferry dock to invite passengers to participate in the survey by distributing information flyers. This approach also allowed the researcher to discuss the project with passengers and answer any questions regarding the survey. These visits took place on two separate occasions, first in June and again at the end of August 2026 (Figure 8). The timing was chosen to reach respondents traveling on the ferries as tourists and as commuters.

The digital contact with passengers included sharing an invitation to the survey via different platforms chosen due to their focus on those living or visiting the archipelago. Consequently, the survey was shared on three Facebook groups matching that description.



Figure 8: Pictures taken during data collection in the Stockholm Archipelago. (Photos: M.C. Einarsson)

For the physical contact, no specific route or ferry was pre-selected for the study. Instead, data collection was carried out on ferries chosen at random after the researcher's arrival at the ferry terminal in Stockholm.

Consequently, surveys were distributed on board ferries such as *M/S Dalarö* and *M/S Varmdö*, amongst others. All of these ferries are owned by Waxholmsbolaget and most operated by Blidösundsbolaget. Vaxholm island, located approximately 20 km from central Stockholm, was part of many of the surveyed journeys as it serves as an important transport hub linking several islands and ferry routes in the archipelago.

The island ferries in question are one-directional passenger ferries without the ability to board cars. Their size ranges from around 10 to 40 metres in length with a capacity between 150 and 500 passengers. The medium-sized and largest ferries typically provide both indoor and outdoor seating areas, as well as a small café where passengers can purchase refreshments and snacks during the crossing.

Tickets are sold via Stockholm's public transportation system, SL. The price is determined based on travel time and if the traveller belongs to a group eligible for discount such as pensioners or students. One ticket allows using any combination of SL's transport modes – metro, certain commuter trains, bus, ferry or tram – during the ticket validity. A single adult ticket, valid for 75 minutes, cost SEK 43 (EUR 3.92) in 2026. Reduced fares are available to eligible groups, and season and multi-journey tickets offer additional fare options.

The **interviews** carried out in **Sweden** were conducted by two researchers on board *M/S Silverö*, owned and operated by Blidösundsbolaget, in summer 2025, shortly after the vessel was converted into an electric ferry. The interview guide and overview of interviewees are presented in Appendices 2 and 3.

4.5 Analytical approach and limitations

The statistical analysis of the cross-country survey responses was primarily based on descriptive statistics, including measures of central tendency (e.g. mean and mode) and frequency distributions, such as counts and the relative share of the dataset represented by a specific value. These measures were used to summarise respondent demographics, travel patterns, and views related to emission reduction in island ferry transport.

The data were further analysed by country and age group to explore variation in attitudes and preferences among different respondent segments. Selected cross-tabulations were also conducted to examine relationships between key variables, such as respondent characteristics and attitudes towards environmental issues and emission reduction measures.

As the sample size is relatively limited, the analysis focused on describing patterns and trends within the dataset rather than conducting advanced statistical testing. This approach provides an overview of passenger perspectives while highlighting potential areas for further research.

Results from the companies' own customer surveys are presented alongside the main results where relevant. The analysis of open comments and interviews was conducted separately using thematic content analysis. Interview findings are included as a complement to survey data gathered from Sweden, while findings from open comments are reported separately.

Certain limitations should be considered when interpreting the findings of this study.

First, the survey sample (N = 202) is relatively small, which means that the findings should be interpreted as indicative insights into respondent views and preferences rather than definitive conclusions about the wider population of ferry users in certain country or the Central Baltic Region.

In addition, ferry services differ considerably between studied regions in terms of route characteristics, travel times, departure frequencies, and fare structures, limiting the direct comparability of passenger preferences across study areas. Furthermore, Finland accounted for a substantially larger share of responses than Sweden and Estonia, which may affect the comparability of the country-specific results.

As participation in the survey relied primarily on digital tools, the sample may be biased towards more digitally active individuals, potentially under-representing certain population groups, such as older people or those less likely to engage online. Furthermore, self-selection and non-response bias may have affected the results, as individuals who chose to participate in the survey may have been more interested in the topic than those who did not respond.

Like all survey research, this study is also subject to response bias. Participants may provide inaccurate, incomplete, or socially desirable answers, and reported opinions do not necessarily correspond to actual behaviour in real-life situations. Although the questionnaire was anonymous, this limitation should be considered when interpreting the findings.

5. Results with regional comparison

5.1 Respondent profiles

The total number of respondents was 202, of which 45 responses were collected in Estonia, 115 in Finland and 42 in Sweden. Overall, the respondent sample consisted largely of Estonian (45), Finnish (96), and Swedish (31) nationals in each surveyed country, while 18 respondents in the Finnish sample and 11 in the Swedish sample were non-residents. Respondent profile for each country is described in more detail in Appendix 4 and the following sub-chapters.

5.1.1 Respondents in Estonia

A total of 45 respondents participated in the survey in Estonia, and all of them reported Estonian nationality. Around 62% of the respondents identified as female and 38% as male.

The largest age group was 19–34 years old, representing one-third of respondents. Respondents aged 50–64 formed the second-largest group, followed by those aged 35–49. The sample was dominated by these working-age adults, as only a small proportion of respondents were aged 65 or older or 18 years and under.

Most respondents reported using the 45-minute Rohuküla – Vormsi ferry route between mainland and Vormsi island. The route connecting the large islands Hiiumaa and Saaremaa was used by 16% of respondents. Passengers of the Munalaid – Kihnu and Rohuküla – Hiiumaa connections are represented by a very small number of respondents.

In Estonia, the respondents were primarily permanent archipelago residents (40%), followed by seasonal residents (29%) and domestic tourists (24%). Those traveling for work in the archipelago constituted the smallest group with only a couple of respondents.

The respondent sample included both frequent and occasional ferry users. Travelling by ferry several times a month was the most common pattern (36%), while approximately one quarter of respondents reported travelling several times a year. Daily users and those travelling less than once a year formed relatively small groups, with 11% and 7% of respondents, respectively.

5.1.2 Respondents in Finland

Of the 115 respondents in Finland, 96 reported Finnish nationality. Among the other nationalities reported, German, Italian, British, and American were all represented by three respondents. Austrian, Danish, Estonian, Japanese, Swedish, and Swiss nationalities were represented by one respondent each.

56% of the respondents identified as male, and 40% as female while three respondents did not want to specify their gender, and one identified it as other.

114 respondents reported to which age group they belong to. The largest age group was 19 to 34 years old, accounting for 27% of respondents. Respondents aged 50 to 64 represented 23%, while those aged 35 to 49 accounted for 22%. Participants aged 65 years or older made up 19% of the sample, and respondents aged 18 years or younger represented less than 10% percent of the sample. Overall, the survey captured a relatively balanced distribution of age groups, although young adults formed the largest group.

Most respondents (63%) reported using ferry services in the Helsinki area, while 42% used services in the Turku Archipelago. Since respondents could select more than one area, the total number of responses exceeds the number of respondents here. Seven respondents chose both Helsinki and Turku archipelago. Other areas mentioned included Saimaa and Espoo in Finland.

Almost half of the respondents identified themselves as tourists or other visitors. Permanent residents accounted approximately one-fourth of respondents, while one-fifth were second-home owners or seasonal residents. Those working in the archipelago represented small proportion of the sample. Overall, the respondent sample was relatively balanced, with approximately half consisting of tourists and other visitors and half of individuals with a more permanent connection to the archipelago, including residents, second-home owners, seasonal residents, and those working in the area.

The survey included both frequent users and occasional passengers. The largest group of respondents (23%) were frequent travellers who use the ferries daily or almost daily, but three of the other options – several times a month; several times a year; once or twice a year – were each represented by approximately one-fifth of the sample. The smallest group was formed by those using the ferries less than once a year.

5.1.3 Respondents in Sweden

In total, 42 respondents participated in the survey in Sweden, of whom 31 were residents of the country. Other respondents included Finnish, English, Danish, German, Norwegian, Japanese and Canadian nationalities.

Just over half of the respondents identified as men, while 38% identified as women. The remaining either identified with another gender or preferred not to disclose their gender.

The largest age group represented amongst the respondents in Sweden was those aged between 50–64 (36%) followed by those 65 and older (28%). The remaining three age groups decreased in response in relation to their age: 35–49 (19%), 18–35 (14%) and 18 or younger (2%).

Tourism was the most reported purpose of ferry travel with over half of the respondents identifying themselves as tourists. 11% of respondents stated that they owned vacation homes in the archipelago, and the remaining 14% stated their trip purpose as 'other'. The smallest groups represented were those living in the archipelago and those working there.

Most of the respondents were occasional travellers. The largest groups consisted of those taking the ferry several times a year (33%) or less seldom than annually (30%). Those taking

the ferry once or twice a year were equally represented as those traveling a few times a week (14%). The smallest group was those travelling daily or almost daily.

Most of the **interview** respondents were residents in Stockholm and of retirement age (Appendix 3). The second largest group representing the interviewees were those using the ferries for tourism or pleasure purposes such as meeting friends or shopping in the archipelago. The third represents interviewees riding the ferries as a mode of transport in their commute to work. Of this third group, the majority resided in the archipelago.

5.2 Environmental attitudes and views on emission reduction

The following section provides insight into the values and perceptions that may influence respondents' attitudes towards environmental sustainability and ferry decarbonisation. Respondents were asked to indicate their level of agreement with a series of statements. The statements capture both environmentally conscious consumer behaviour (Statement 1) and general environmental attitudes and perceptions (Statements 2-4).

The four statements used in the survey were:

1) As a consumer, I aim to choose the most environmentally friendly option available.
2) I am concerned about climate change.
3) Global average temperature has increased due to greenhouse gas emissions.
4) Reducing greenhouse gas emissions from ferry traffic is important to me.

The mean levels of agreement to these four statements per survey country are represented in Figure 9. The statements are abbreviated as:

1) Green choice,
2) Climate concern,
3) GHG warming, and
4) Ferry emission reduction.

Overall, respondents in **Finland** and **Sweden** expressed relatively high levels of agreement with all statements. In contrast, agreement levels were consistently lower among respondents in **Estonia**. Agreement was highest for the statement on greenhouse gas emissions causing global warming, while the statement related to making environmentally friendly travel choices received the lowest level of agreement in **all countries**. **Finland** generally showed the highest agreement levels, especially regarding the reduction of ferry emissions.

Despite the differences between countries, the mean score for each statement remained at or above the scale midpoint, suggesting generally positive attitudes towards environmental issues among respondents in **all three countries.** In addition to reporting mean scores, response distributions are examined more closely to provide a more comprehensive picture of respondents' attitudes and views in each region.

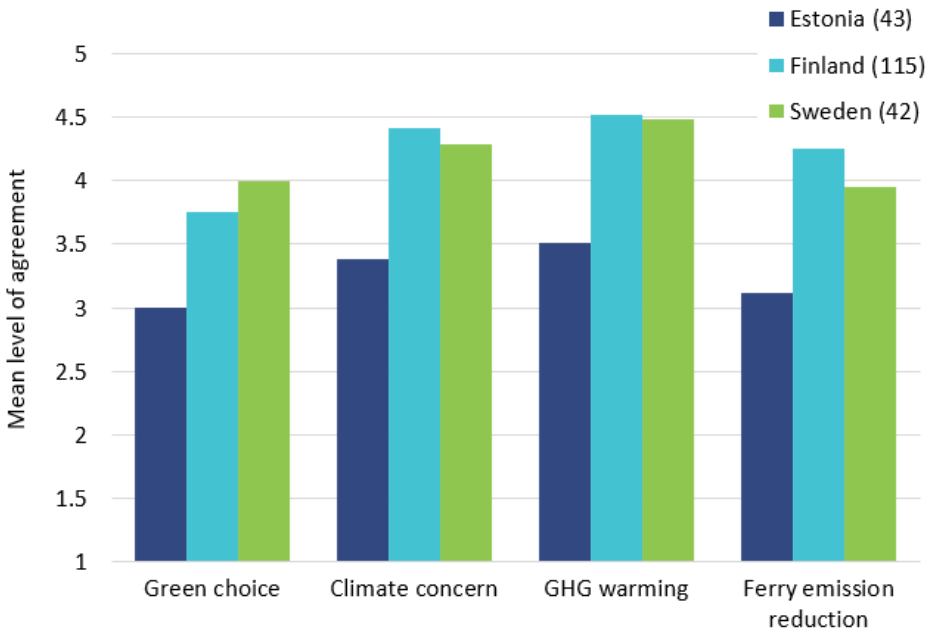


Figure 9: Mean agreement on environmental statements. Response scale: 5-point Likert scale (1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree).

Slightly over half of the respondents in **Estonia** stated being concerned about climate change, while 49% agreed and 22% disagreed with the statement that global average temperature has increased due to greenhouse gas emissions. It is noteworthy that across all four statements, over a quarter of respondents selected either "Neutral" or "No answer", suggesting a lower degree of certainty or engagement with the topics covered. In addition, the responses from **Estonia** showed greater variation than those from **Finland** and **Sweden**. For instance, 20% of the respondents in Estonia strongly agreed and another 20% strongly disagreed that reducing emissions from ferries is important for them.

Complementary data collected by Kihnu Veeteed (N=144) in **Estonia** indicates a slightly higher level of support for reducing ferry emissions. In that survey, slightly over half of the respondents agreed or strongly agreed that reducing CO_2 emissions from ferries is important to them, including 37% who agreed and 17% who strongly agreed with the statement, while 19% disagreed or strongly disagreed.

In **Finland**, respondents expressed high levels of environmental concern and awareness across all four statements. Agreement was particularly strong regarding the link between greenhouse gas emissions and global warming, with 89% of respondents agreeing or strongly agreeing with the statement. Similarly, 90% reported being concerned about climate change. A large majority also considered reducing greenhouse gas emissions from ferry traffic important for them (82%), while almost two-thirds agreed that they aim to choose the most environmentally friendly option available as consumers. Neutral responses were relatively uncommon for the climate-related statements but more frequent regarding environmentally friendly consumer choices (25%).

Complementary data collected by Finferries among its customers (N=5,793), indicate an even higher level of support for reducing ferry emissions in **Finland**. In that survey, 86% of respondents agreed with the statement "Reducing CO_2 emissions from ferries is important to me", including 57% who stated strong agreement. Only 3% disagreed with the statement (1.6% disagreed and 1.7% strongly disagreed), while 11% selected a neutral response.

In **Sweden**, respondents demonstrated high levels of environmental concern and awareness, although the responses were slightly more varied than those observed in Finland. Agreement was strongest for the statement that global average temperature has increased due to greenhouse gas emissions, with 88% of respondents agreeing or strongly agreeing and none disagreeing. Similarly, over 83% reported being concerned about climate change. Support for reducing greenhouse gas emissions from ferry traffic was somewhat lower, with 69% expressing agreement, while 76% agreed that, as consumers, they aim to choose the most environmentally friendly option available. Compared with **Finland**, a larger share of the respondents in **Sweden** selected neutral responses, particularly regarding the importance of reducing emissions from ferry traffic (21%), suggesting greater variation in views on this topic.

Most **interviewees** in **Sweden** described themselves as environmentally conscious. When asked about environmentally friendly practices in their daily lives, many mentioned recycling their household waste or choosing public transportation as often as possible. One interview respondent said, "*Sometimes you don't have a choice.*" When discussing the electrification of ferries, most participants were able to identify environmental benefits associated with the transition, with reduced greenhouse gas emissions being the most frequently cited advantage.

When the survey results across all countries are examined by gender, women appear to exhibit slightly stronger pro-environmental attitudes than men across all four measures. These differences are more pronounced in environmental beliefs and attitudes (Statements 2–4) than in environmentally conscious consumer behaviour (Statement 1 in Table 1).

Table 1: Gender differences in climate and environmental attitudes and views (Female n=87, Male n=108). Response scale: 5-point Likert scale (1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree).

Statement	Female average	Male average	Difference
1) As a consumer, I aim to choose the most environmentally friendly option available	3.68	3.55	+0.13
2) I am concerned about climate change	4.34	3.91	+0.43
3) Global average temperature has increased due to greenhouse gas emissions	4.46	4.08	+0.38
4) Reducing greenhouse gas emissions from ferry traffic is important to me	4.17	3.56	+0.61

The greatest difference was found for the statement about the importance of ferry emission reduction (female mean = 4.17; male mean = 3.56), followed by climate concern (4.34 vs.

3.91) and the link between greenhouse gas and global warming (4.46 vs. 4.08). The smallest gender difference was observed for the behavioural statement about choosing environmentally friendly options (3.68 vs. 3.55).

The most notable difference, however, was not the average level of agreement but the variation in responses. Standard deviation measures how closely respondents' answers cluster around the mean, and a high standard deviation indicates greater disagreement among respondents.

Male respondents exhibited particularly high variability in their responses to statements concerning climate change, belief in human-induced global warming, and support for reducing ferry emissions, with a standard deviation of 1.07. In contrast, female respondents expressed more consistent pro-environmental views, with a standard deviation of 0.75. These findings suggest that while women generally held somewhat stronger pro-environmental attitudes, the more pronounced gender difference lay in the greater heterogeneity of environmental attitudes among men.

5.3 Acceptance of longer travel times

Slow steaming is a relatively straightforward measure for reducing both emissions and energy consumption in ferry transport, while requiring little or no additional investment costs. Because fuel consumption increases exponentially with vessel speed, even small speed reductions can generate significant fuel savings and emission reductions. However, slow steaming directly affects passengers by increasing travel times beyond the fastest possible journey as the speed is reduced.

Survey respondents were asked if they are willing to accept additional travel time to reduce emissions on different average trip times. Since the ferry routes vary considerably in length across the three countries, three representative trip lengths were selected to capture the effects of journey duration: 15, 30, and 60 minutes, corresponding to relatively short, medium-length, and longer ferry journeys. As ferry routes in **Estonia** are generally longer, the 15-minute journey scenario was included only in the surveys collected in **Finland** and **Sweden**.

For each journey length, responses analysed by trip purpose provided valuable insights into passengers' willingness to accept increased travel times as part of the transition to low-emission ferry services (Figures 10–12). The figures distinguish between tourists and non-tourists, with the latter group comprising permanent and seasonal residents of the archipelago, as well as those travelling to the archipelago for work.

For a 15-minute ferry journey (Figure 10), most respondents were willing to accept an additional 3–10 minutes of travel time in exchange for lower emissions. Across trip purposes, tourists generally expressed the greatest willingness to accept longer journeys. The most pronounced difference between tourists and non-tourists was observed in **Sweden**, where

tourists were more receptive to extended travel times. In **Finland**, acceptance levels were more similar between the two groups for travel time increases of 3–10 minutes.

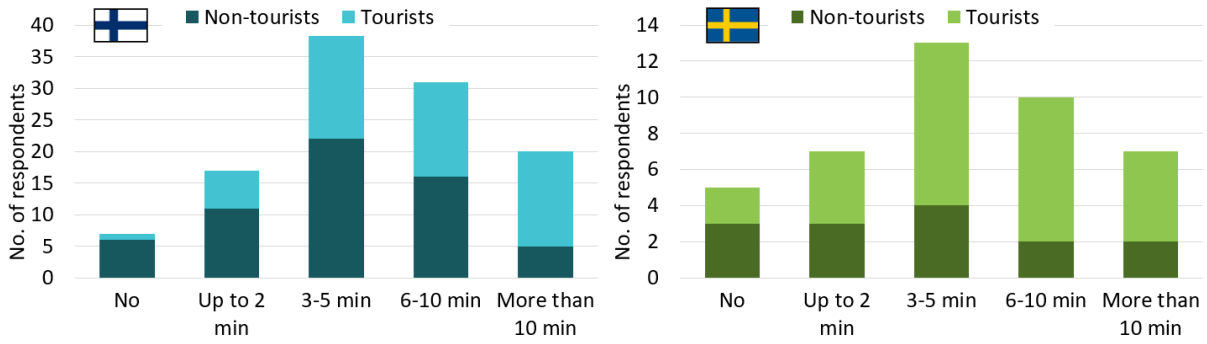


Figure 10: Acceptance of longer travel time based on a 15-minute trip among respondents in Finland and Sweden.

For a 30-minute ferry journey (Figure 11), many respondents in both **Finland** and **Sweden** were again willing to accept an additional 3–10 minutes of travel time in exchange for lower emissions.

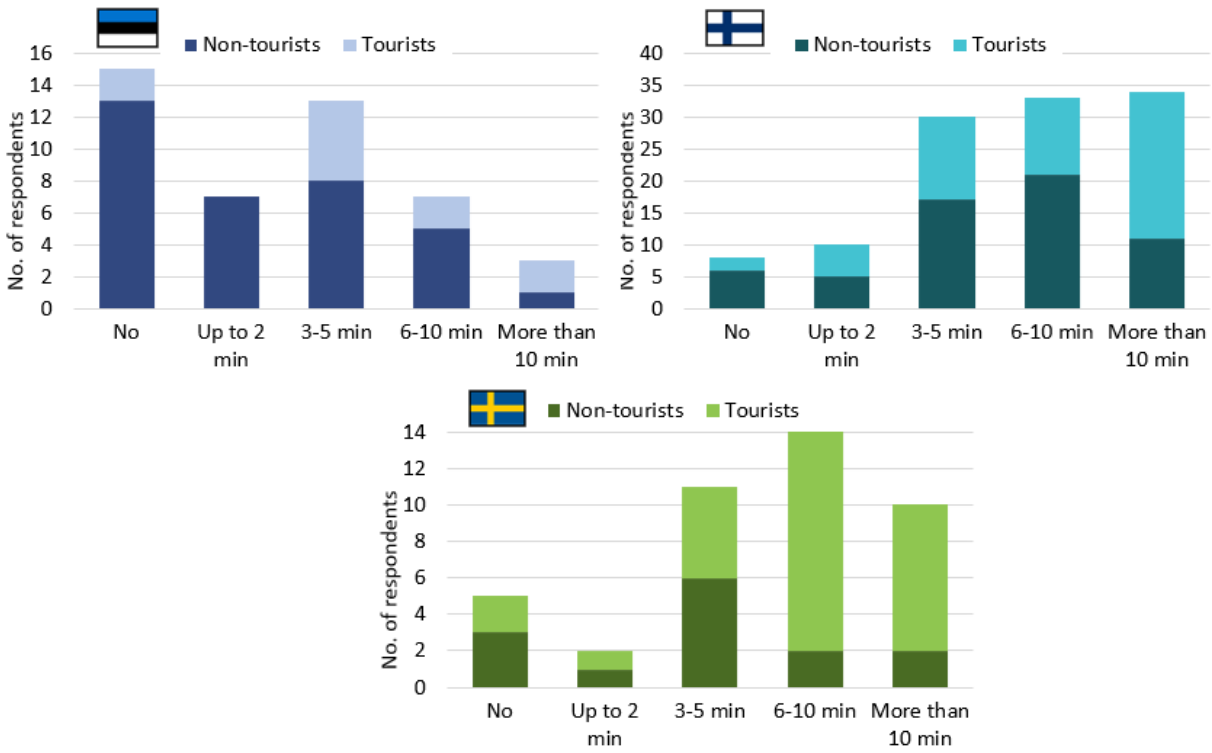


Figure 11: Acceptance of longer travel time for a 30-minute trip among respondents in Estonia, Finland and Sweden.

As with the 15-minute journeys, tourists in **Sweden** were the most willing to accept longer travel times on a 30-minute ferry journey, with the majority indicating a willingness to accept an additional 6–10 minutes or more. Interestingly, in **Finland**, most non-tourists, representing more local ferry users, were willing to accept an increase of 3–10 minutes. However, tourists showed greater willingness to accept extensions exceeding 10 minutes on a 30-minute journey.

The vast majority of respondents in Estonia, most of whom were non-tourists, expressed little willingness to accept additional travel time on a 30-minute ferry journey. Their willingness decreased further as the proposed extension of travel time increased. Tourists accounted for the majority of those willing to accept additional travel time only when the proposed extension exceeded 10 minutes. However, even in this case, only two tourists were willing to accept such an increase.

The last trip scenario asked survey respondents how much time they would be willing to add to a 60-minute trip in order to decrease ferry emissions (Figure 12).

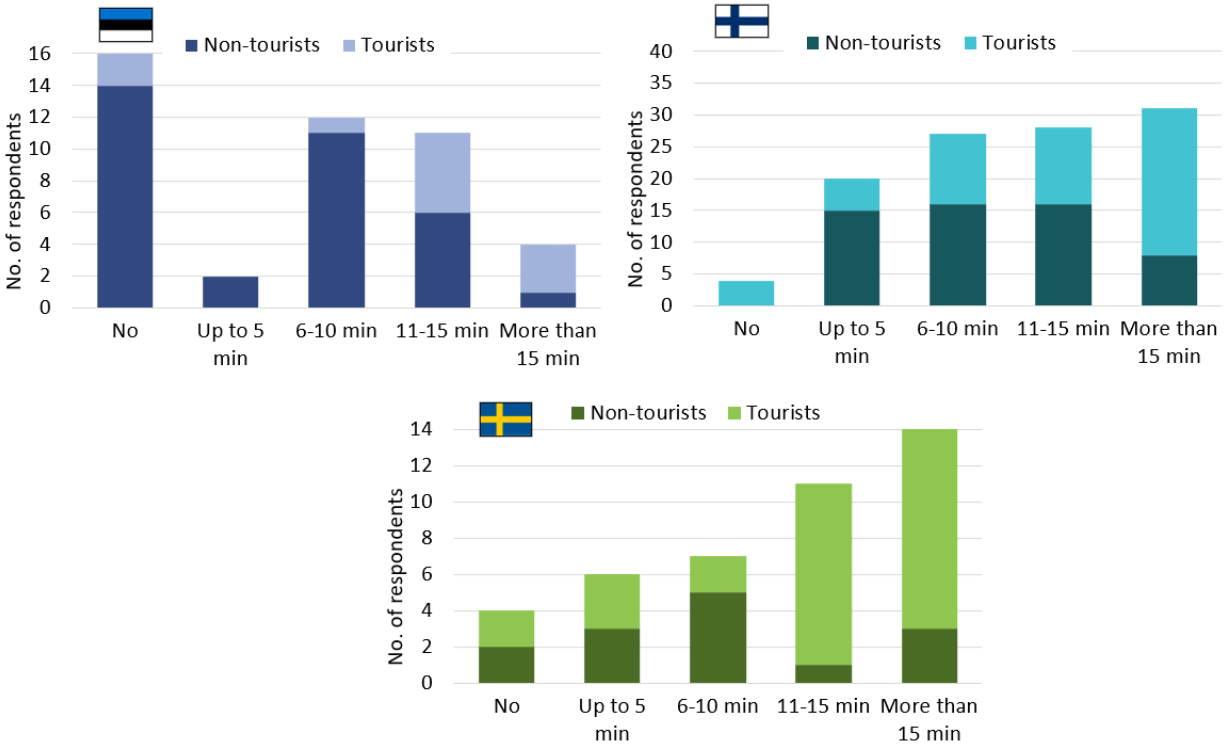


Figure 12: Acceptance of longer travel time for a 60-minute trip among respondents in Estonia, Finland and Sweden.

In **Sweden**, more than half of the respondents indicated that they would accept an additional travel time of 11–15 minutes or more to reduce emissions. Not surprisingly, tourists appeared to be the group least affected by longer travel times. However, the majority of respondents

living or working in the Swedish archipelago were also willing to accept longer ferry journeys in exchange for lower emissions.

The interviews conducted in Sweden indicated that frequent ferry users, particularly those relying on ferries for commuting, were less willing to accept longer travel times, whereas those travelling for leisure or tourism often expressed no clear opinion. A few interviewees indicated that they would be willing to accept longer journeys in exchange for reduced greenhouse gas emissions, although none elaborated on the reasons behind their willingness.

In **Finland**, tourists were the most receptive to longer travel times, with the majority willing to accept an additional 11–15 minutes or more on a 60-minute ferry journey. However, all non-tourists were also willing to accept some increase in travel time. Their responses were relatively evenly distributed across categories ranging from up to 5 minutes to 15 additional minutes, while acceptance declined for extensions exceeding 15 minutes.

In **Estonia**, many respondents were again unwilling to accept longer travel times. Interestingly, non-tourists accounted for the majority of respondents willing to accept an additional 6–10 or 11–15 minutes. By contrast, tourists constituted the majority of those willing to accept extensions exceeding 15 minutes.

Overall, opposition to longer travel times was relatively limited, although differences between countries were evident. Only 4% of respondents in **Finland**, 10% in **Sweden**, and 27% in **Estonia** were unwilling to accept any additional travel time. These findings indicate that the large majority of respondents across all three countries were willing to accept at least a modest increase in travel time in exchange for lower emissions from island ferry operations.

The survey responses in Sweden suggest that the shorter the original ferry journey, the less willing passengers are to accept longer travel times in exchange for lower emissions. In Finland, both tourists and non-tourists were more receptive to extending travel times to reduce emissions. Ferry passengers in Estonia expressed the strongest opposition to longer travel times, with non-tourists being particularly reluctant to accept additional travel time, while tourists showed greater acceptance.

5.4 Acceptance of fewer departures

The most effective way to lower emissions is to reduce or cease the activity that generates them. In ferry transport, this would imply fewer departures or even the discontinuation of services altogether. To explore public acceptance of the former possibility, respondents were asked: “Would you accept a lower frequency of ferry departures to reduce emissions?”.

In **Finland** and **Sweden**, respondents could select “Maybe” in addition to “Yes” or “No” and provide comments to explain their views. In **Estonia**, however, the “Maybe” option was not available. This difference in questionnaire design should be considered when comparing results across the three countries, as some Estonian respondents may have selected “No”

despite holding more neutral or conditional views. Consequently, the proportion of negative responses in **Estonia** may not be directly comparable to those in **Finland** and **Sweden**.

The results indicate limited support for reducing ferry departure frequencies as a means of lowering emissions, with "No" being by far the most common response in **all three countries** (Figure 13).

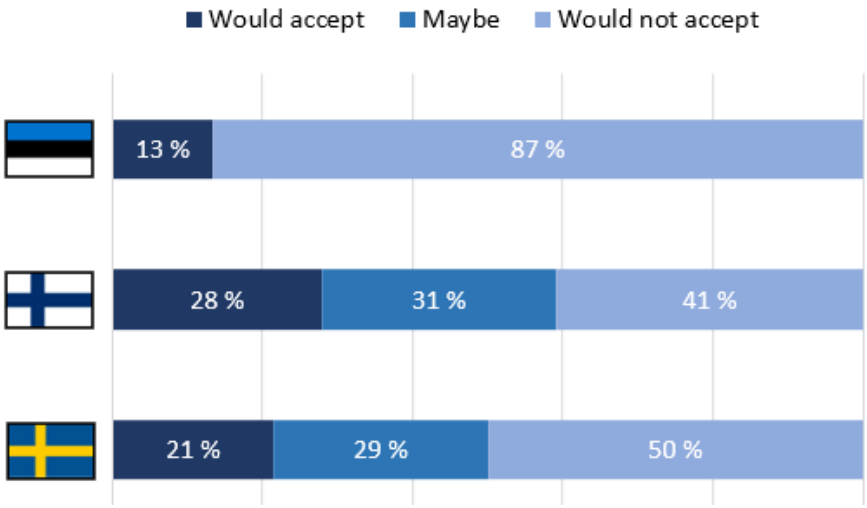


Figure 13: Respondent's acceptance of fewer ferry departures to reduce emissions (Estonia n=45, Finland n=115, Sweden n=42). The survey in Estonia had no "Maybe" option.

Nevertheless, a considerable share of respondents were willing to accept fewer ferry departures in exchange for lower emissions. This view was expressed by 28% of respondents in **Finland**, 21% in **Sweden**, and 13% in **Estonia**. A closer examination reveals that more than half of those supporting this measure were occasional ferry users, travelling once or twice a year or less frequently. By contrast, frequent ferry users, travelling daily or weekly, accounted for only one-quarter of those who answered "Yes".

When the results are examined by trip purpose, tourists accounted for two-thirds of those willing to accept fewer ferry departures. However, the mean response among tourists as a whole was slightly on the negative side of the scale. This suggests that tourists were generally not in favour of reducing ferry departure frequencies, although their opposition was less pronounced than that among residents and commuters.

An examination of responses by gender reveals that men were generally more opposed to reductions in ferry departure frequencies, whereas women tended to be more receptive to this measure. Women also provided considerably more open-ended comments on this topic than men. By contrast, no notable differences were observed across age groups.

In **Finland** and **Sweden**, respondents also had the option to select "Maybe" and provide additional comments explaining their views. Nearly one-third of respondents in both countries selected this option, with tourists accounting for a slight majority of those who did so.

Overall, 15 respondents in **Finland** and one in **Sweden** provided additional comments explaining why they had selected "Maybe". These respondents generally expressed support for demand-based scheduling. While tourists tended to express their views rather briefly, residents and commuters provided more detailed explanations. Accommodating the mobility needs of local residents, particularly commuting to work and school, was commonly emphasised as a precondition for any adjustments to ferry schedules. Similar comments were also provided in the final section of the questionnaire, as discussed in Chapter 5.7.

Several **interviewees** in **Sweden** remarked that ferry services were already too infrequent and expressed a preference for increasing rather than reducing the number of departures. As one interviewee stated, "No - I am dependent on the ferry frequency, so I prioritise that it runs more often before environmental concerns." Those favouring more frequent departures also indicated a willingness to pay slightly higher fares. Overall, service frequency and travel convenience appeared to take precedence over the potential environmental benefits of optimising ferry operations to reduce greenhouse gas emissions.

5.5 Willingness to pay for low-emission ferry transport

Decarbonising ferry transport requires investment. Although these investments may be financed through passenger fares only to a limited extent, if at all, passengers' willingness to pay provides an important indication of the perceived value and social acceptability of decarbonisation measures.

Accordingly, respondents in **Sweden** and **Estonia** were asked whether they would opt for a low-emission ferry service if it entailed higher ticket price. Respondents expressing a willingness to do so were subsequently invited to indicate how much more they would be willing to pay.

In **Finland,** the Suomenlinna ferry is integrated into Greater Helsinki region public transport fare system, but Finferries' routes are free of charge. To maintain consistency and avoid confusion among respondents, this question was omitted from the survey in **Finland**.

When investigating the results from **Estonia** and **Sweden**, similarities are found. A little over half of the respondents in both countries were willing to pay more for their journey.

In **Estonia**, tourists and non-tourists as groups were equally willing to pay more for low-emission travel. One of the tourists emphasised their stance by commenting that one cannot put a price on saving the environment. The acceptable additional fare among respondents was typically between EUR 0.50 and 1.00. Although this study does not indicate the ticket price to which the respondents referred, the suggested additional fare represents a proportionally substantial increase for local residents, whose fares typically range from EUR 2 to 4 (without a vehicle), but a relatively minor increase for other passengers paying EUR 9–16 per trip.

Complementary data collected by Kihnu Veeteed (N = 145) in **Estonia** suggest an even lower willingness to pay higher fares. When asked whether they would choose a more environmentally friendly ferry even if the ticket were more expensive, only 1% of respondents strongly agreed and 14% agreed with the statement. Meanwhile, 63% disagreed or strongly disagreed, while 22% selected the neutral option.

Of those who indicated a willingness to pay more in **Sweden**, most stated that they would be willing to pay between SEK 10–50 (EUR 0.89–4.43) more for the trip, representing approximately 23–116% of the regular single-ticket fare of SEK 43 (EUR 3.92). Tourists typically indicated a higher acceptable additional fare than non-tourists in **Sweden**.

From the **interviews** conducted in **Sweden**, many respondents said they would be willing to pay more but there was a limit to how much they thought would be reasonable. However, none gave examples of such a limit. One interviewee nevertheless stated that they believed that pensioners should be able to ride the ferries for free.

5.6 Ranking of priorities

Respondents were asked to rank four service attributes related to the transition towards low-emission ferry transport according to their importance: frequent departures, low-emission travel, low travel cost, and short travel time.

The respondents assigned a unique rank from 1 (most important) to 4 (least important) for each attribute, meaning that they were required to make explicit trade-offs between the attributes. Therefore, assigning a high priority to one attribute automatically resulted in lower rankings for the remaining attributes.

This ranking approach resulted in a clearer representation of respondents' underlying priorities, as participants were required to make direct comparisons between competing service attributes rather than evaluating each attribute independently. The approach reduces the tendency for respondents to assign similarly high importance to multiple attributes and provides greater insight into which factors are considered most important.

In **Estonia**, frequent departures were clearly the highest priority among respondents (Figure 14), with slightly over half ranking it as the most important factor.

Low cost was selected as the top priority by 22% of respondents, followed by short travel time and low-emission travel. Low-emission travel was also most frequently ranked as the least important factor, with over two-thirds placing it last. In contrast, only a couple respondents ranked frequent departures or low cost as the least important factor.

Based on these results, service frequency was the dominant concern among respondents in **Estonia**, whereas environmental performance was generally given lower priority when compared with operational and cost-related factors. However, when comparing the results from **Estonia** with those from **Finland**, it is worth noting that ferry services to the islands

included in the study are considerably less frequent, with substantially fewer daily departures than on the routes included in the Finnish sample.

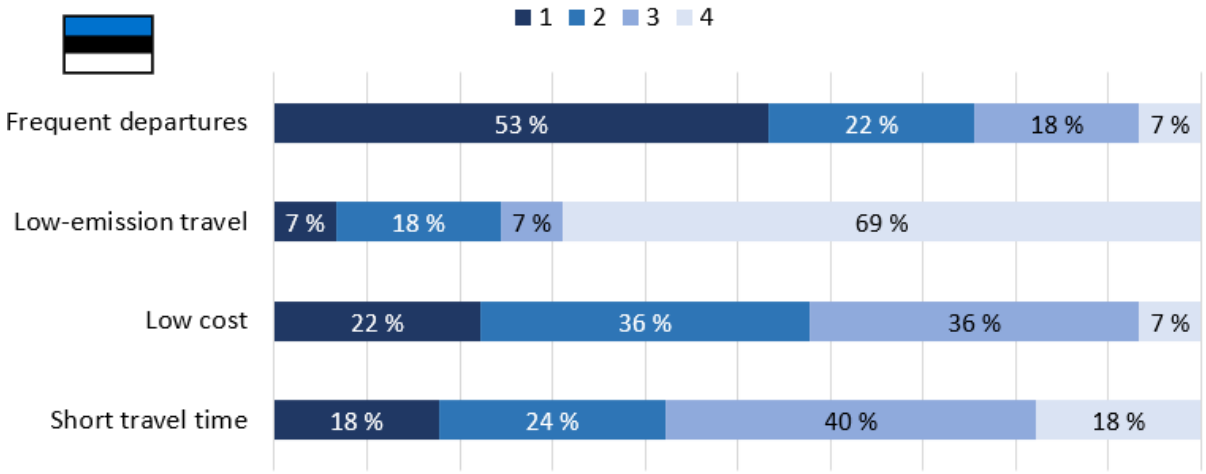


Figure 14: Ranks given to priorities in Estonia (n=45). Response scale from most important to least important (1=Most important, 2=Second most important, 3=Third most important, 4=Fourth most important).

In **Finland**, affordable pricing (low cost) emerged as the most frequently selected top priority, with over one-third of respondents ranking it first (Figure 15). However, low cost was more frequently identified as the most important priority among respondents using the Suomenlinna ferry than among those travelling on the free-of-charge ferries in the Turku Archipelago. In the latter group, frequent departures was the top-priority for the majority. When considering the full sample, frequent departures and low-emission travel emerge almost equally important. In contrast, short travel time was clearly the least important factor in **Finland** as only few ranked it first, while 42% ranked it last.

Based on these findings, the passengers in **Finland** place greater importance on affordability, service availability, and environmental performance than on minimising travel time. Here, it should be noted that respondents were reached mainly on relatively short routes with crossing times of 15 and 30 minutes, whereas in **Estonia**, the respondents were mainly travelling on routes with a crossing time of 45 minutes or more.

In **Sweden** (Figure 16), the highest ranked priority was frequent departures with 43% of respondents ranking it first. Ticket price was the second most important consideration, receiving the highest priority from almost one-fourth of respondents.

Low emission travel and short travel time were considered less important overall, with only 19% and 14% ranking them first, respectively. Short travel time was also relatively often ranked among the least important factors, while low-emission travel received the highest share of second-place rankings.

The **interviews** seem to confirm this priority ranking in **Sweden**: many interviewees placed departure frequencies and costs above ensuring fossil-free travel, and dissatisfaction concerning the timetables and high ticket prices seemed to take precedence.

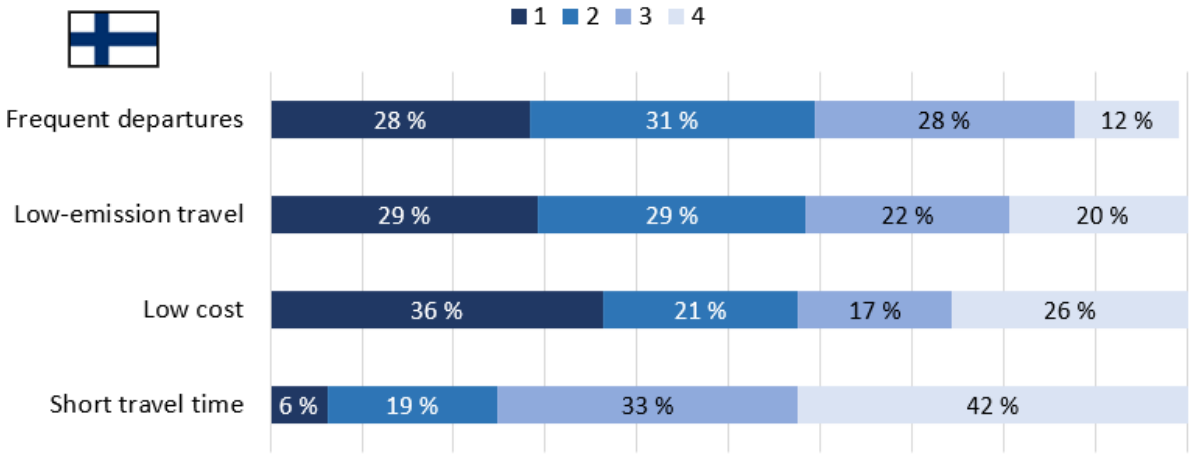


Figure 15: Ranks given to priorities in Finland (n=113). Response scale from most important to least important (1=Most important, 2=Second most important, 3=Third most important, 4=Fourth most important).

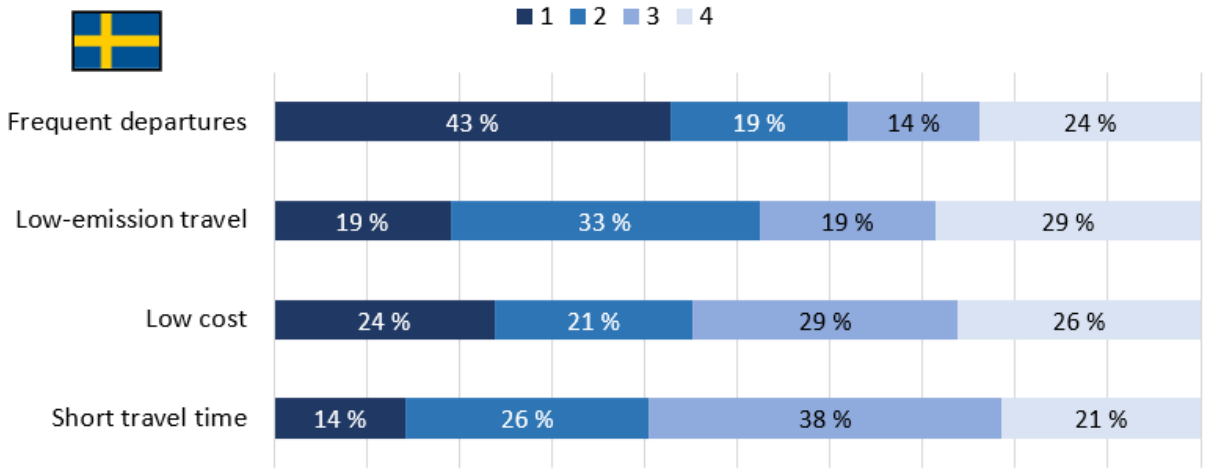


Figure 16: Ranks given to priorities in Sweden (n=42). Response scale from most important to least important (1=Most important, 2=Second most important, 3=Third most important, 4=Fourth most important).

Based on this data, passengers in **Sweden** place the greatest emphasis on service availability, while ticket affordability also remains important. In contrast, environmental performance and short travel time appear to be lower priorities.

5.7 Insights from open comments

In all regions, the respondents had the opportunity to provide open comments on emission reduction and ferry services in general.

In **Estonia**, nine people shared their thoughts. In general, their comments indicate support for reducing emissions and introducing low-emission ferry technologies. However, the dominant theme was the importance of maintaining service levels and meeting the mobility needs of island residents. Many respondents noted that current ferry services are already challenged by issues such as limited capacity, travel times, and affordability.

While some respondents expressed support for ferry decarbonisation, others questioned its effectiveness or priority relative to efforts to reduce emissions from larger sources. Overall, the responses suggest that environmental sustainability is generally supported, provided that measures to achieve it do not compromise accessibility, affordability or the viability of island communities. However, one respondent emphasised that preserving the natural environment should take precedence over economic considerations.

A total of 25 respondents from **Finland** provided open comments. The stances and themes identified are largely similar to those found in the Estonian responses. Many respondents emphasised the importance of maintaining affordable fares and adequate service frequency, particularly for permanent residents who rely on ferry services for daily travel. Some of these respondents emphasised that fare levels in Helsinki were already excessive for residents.

Some respondents in **Finland** expressed support for electric and hybrid ferries or a gradual transition towards lower-emission operations. Comments also highlighted the importance of reliable connections with other modes of transport, taking new renewable energy sources (e.g., solar, tidal and wave energy) and residents' needs into consideration in future service planning. Some of the open comments were feedback targeted directly for the operator.

In **Sweden**, eleven respondents provided open-ended comments, some of which appeared to be influenced by the upcoming national elections. Some questioned the value of reducing emissions from island ferries or using public funds for such measures, noting that larger emission sources or different allocation of costs should be addressed instead. A couple of respondents supported further electrification of the ferry fleet, and another few expressed a desire to maintain or even increase the number of vessels in the archipelago to preserve accessibility and a vibrant archipelago. The rest of the comments were outside the scope of this study, as they related to the services of the local public transport authority.

6. Conclusion

This study examined how island ferry passengers in **Estonia**, **Finland** and **Sweden** perceive emission reduction measures in island ferry transport and their potential implications for key service attributes, including travel time, service frequency, fares, and the overall travel experience. The primary data collection method was a cross-country survey conducted both on board ferries and online, yielding a total of 202 responses.

Given the relatively small sample size in relation to the overall passenger population on the surveyed ferry routes and in the three countries, the findings should be interpreted with caution, and broad generalisations should be avoided. Nevertheless, the study provides indicative findings and valuable insights into passengers' attitudes towards ferry decarbonisation and their willingness to accept potential changes in ferry services.

The results show that environmental considerations were particularly important among respondents in **Finland** and **Sweden**, while responses from **Estonia** reflected a greater diversity of views.

The findings also indicate broad support for reducing emissions from island ferry services in **all three countries**, although the level of environmental concern varied across the regions, and passengers' willingness to accept service-related trade-offs was often conditional on maintaining existing departure frequencies. These differences may be partly explained by variations in service levels, fare structures, and route characteristics across the regions studied.

Overall, most respondents **in all three countries** were willing to accept at least some increase in travel time to reduce ferry emissions and energy consumption. Moderate increases in travel time, particularly on shorter routes, were considered acceptable by the vast majority of respondents. However, acceptance decreased as journey length increased, with respondents in **Estonia** generally less willing to accept longer travel times than their counterparts in **Finland** and **Sweden**.

In contrast, reducing departure frequencies received limited support among respondents in all three countries. Frequent departures were consistently ranked among the most important service attributes, while both open-ended comments and interview findings highlighted the importance of maintaining connectivity, particularly for residents, commuters and other regular ferry users.

When asked about their willingness to pay more for low-emission ferry services, approximately half of the respondents in **Estonia** and **Sweden** indicated a willingness to do so. However, affordability emerged as a more important consideration when respondents were asked to prioritise different service attributes. Affordability was also highly valued in **Finland**, where low cost was the most frequently selected top priority.

When examined by trip purpose and travel frequency, tourists and occasional ferry users generally displayed greater flexibility towards operational changes. By contrast, permanent and seasonal residents, as well as those travelling to the archipelago for work, were more likely to oppose service reductions or make their acceptance conditional on maintaining adequate service levels.

Future research could build on these findings by using larger and more balanced samples covering a wider range of ferry routes. Selecting routes with more comparable characteristics, particularly in terms of journey length, would facilitate more meaningful cross-country comparisons. Furthermore, studies examining actual rather than stated passenger behaviour, complemented by longitudinal research following the implementation of emission reduction measures, could provide valuable insights into how passengers adapt to the decarbonisation of island ferry services.

Concluding summary

The results suggest that passengers in the Central Baltic region generally support the transition towards low-emission island ferry transport. However, this support appears to be conditional on maintaining the accessibility, affordability, and reliability of ferry services.

Technological solutions may therefore offer more socially acceptable pathways towards decarbonisation than operational measures that adversely affect service quality or availability. This interpretation is supported by the considerable opposition among respondents to reduced departure frequencies and higher fares, even when such measures could contribute to lower energy consumption and emissions.

Nevertheless, the widespread willingness to accept moderate increases in journey duration across **all three countries** is particularly noteworthy, as even modest reductions in operating speed can yield substantial savings in energy consumption and associated emissions.

As island ferries serve not only tourists but also permanent residents and workers who rely on these services for their daily mobility, successful decarbonisation requires balancing environmental objectives with the transport needs of island communities. Incorporating passenger perspectives into transport planning and policymaking can help ensure that future emission-reduction measures are both environmentally effective and socially acceptable.

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- Finferries (FI): https://www.finferries.fi
- Suomenlinnan Liikenne (FI): https://suomenlinnanliikenne.fi
- Kihnu Veeteed (EE):https://www.veeteed.com

Appendices

Appendix 1: Survey in English

Age: 18 or under 19–34 35–49 50–64 65 or older

Gender: Female Male Other Prefer not to say

Nationality:

In which region are you traveling with island ferries? (Wording varied between countries.)

What best describes your reason for visiting the archipelago?

- Permanent resident
- Work in the archipelago
- Seasonal resident
- Tourist or other visitor

How often do you travel with island ferries?

- Daily or almost daily
- Several times a month
- Several times a year
- Once or twice a year
- Less than yearly

Please, indicate how much you agree or disagree with the following statements:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	No answer
As a consumer, I aim to choose the most environmentally-friendly option available.	○	○	○	○	○	○
I am concerned about climate change.	○	○	○	○	○	○
Global average temperature has increased due to greenhouse gas emissions.	○	○	○	○	○	○
Reducing greenhouse gas emissions from ferry traffic is important to me.	○	○	○	○	○	○

Main methods to reduce emissions include electrifying vessels, using more environmentally friendly fuels, operating the routes at lower speeds, and reducing the frequency of departures. Implementing these measures may require investments, longer travel times, or fewer departures.

Would you be willing to pay an additional fee for the ferry service if it resulted in lower emissions? (This question was not included in the survey conducted in Finland.)

- Yes, up to additional _____ EUR/SEK
- No

Would you accept additional travel time to decrease ferry emissions on a 15-minute journey? (This question was not included in the survey conducted in Estonia.)

- No
- Yes, up to 2 minutes
- Yes, 3–5 minutes
- Yes, 6–10 minutes
- Yes, more than 10 minutes

Would you accept additional travel time to decrease ferry emissions on a 30-minute journey?

- No
- Yes, up to 2 minutes
- Yes, 3–5 minutes
- Yes, 6–10 minutes
- Yes, more than 10 minutes

Would you accept additional travel time to decrease ferry emissions on a 60-minute journey?

- No
- Yes, up to 5 minutes
- Yes, 6–10 minutes
- Yes, 11–15 minutes
- Yes, more than 15 minutes

Would you accept a lower frequency of ferry departures to reduce emissions? (The “maybe” option was not included in the survey conducted in Estonia.)

- Yes
- No
- Maybe (optional comment)

What is most important to you when using island ferries? Please rank the following (1 = most important):

- Frequent departures
- Low-emission travel
- Low cost
- Short travel time

Optional feedback on the ferry services, emission reduction or this survey: (Wording varied between countries.)

Appendix 2: Interview guide (SE)

Below is the interview guide used for the interviews that provided complementary data in Stockholm County, Sweden. The interview was structured around six themes: general use and travel habits; experiences of the boat travel and electric vessel operation; environment and sustainability; safety; acceptance and future developments; and demographic information.

1. General Use and Habits

- What is the purpose of your trip?
- Where did you board and where are you going?
- What type of ticket are you traveling with?
- How often do you travel with archipelago ferries?
- How do you usually travel in your daily life, and by which mode of transport? Why do you choose to travel that way?
- Have you travelled with M/S Silverö before?

2. Experience of the Boat Trip / Electric Operation (onboard an electric ferry)

- What is your general impression of the trip? What is positive and what is negative?
- How do you perceive the noise level onboard? (What can be heard, e.g., if there are many people?)
- How do you perceive the comfort?
- How do you perceive the driver's driving style? (Weather?)
- If you compare this trip with other trips you've taken on traditional ferries – do you notice any differences, and if so, what?
- Did you know that the ferry you are on today is electric (if it is an electric ferry)?

3. Environment and Sustainability

- What is your view on climate change? Are you concerned about it?
- Would you describe yourself as environmentally conscious?
- How does that manifest? (e.g., buying organic, recycling, choice of transport)
- Does information about climate impact affect your choice of transport?
- How important is it to you that the ferry is environmentally friendly? Are there other factors that are more important to you? Which ones?
- Are you aware of any specific environmental benefits of electric ferries?
- Are there other environmental aspects in the archipelago environment that you think are important to consider? (e.g., fish stocks, seabed life, oil spills/leakage)

(continued...)

4. Safety

- Now that the ferry is electric, how do you perceive the safety onboard?
- How do you perceive the information provided?
- Are there any safety aspects you think could be improved?

5. Acceptance and the Future

- What expectations would you have of an electric ferry? Does today's trip meet those expectations?
- Would you be more inclined to choose the archipelago ferry if you knew it was electric?
- If operating the boat with fossil-free fuels meant a higher cost, what would you choose: the same cost or fossil-free? What higher cost would be acceptable?
- If operating the boat with fossil-free fuels meant a longer travel time, what would you choose: the same travel time or fossil-free? What longer travel time would be acceptable?
- If operating the boat with fossil-free fuels meant reduced frequency, what would you choose: the same frequency or fossil-free? What reduced frequency would be acceptable?
- What would you like to see improved or developed in future sustainable ferry solutions?

6. Demographic Information (used for analysis)

- Age
- Residence (permanent resident, owner of a vacation home, tourist – country)

Appendix 3: Overview of interviewees (SE)

ID	Age	Residency	Trip Purpose
1	65+	Stockholm (SE)	To vacation home
2	75	Stockholm (SE)	Family lives in archipelago
3	Between 20–30	Stockholm (SE)	To vacation home
4	56	Stockholm (SE)	Work
5	57	Stockholm (SE)	Tourism
6	24	Germany	Tourism
7	53	Waxholm (SE)	work
8	63	Stockholm (SE)	To vacation home
9	70+	Stockholm (SE)	Other
10	N/A	N/A	Tourism
11	N/A	N/A	To Stockholm
12	78	Both Stockholm and archipelago (SE)	Other
13	73	Archipelago (SE)	Other
14	51	Stockholm (SE)	Tourism
15	64	Örebro (SE)	Tourism
16	75	Archipelago (SE)	Other
17	75	Tynningö (archipelago) (SE)	Other
18	75	Stockholm (SE)	Tourism
19	54	Stockholm (SE)	Other
20	70–60	Örebro (SE)	To vacation home
21	75–80	Stockholm (SE)	To vacation home
22	46	Nörrtälje (SE)	Work
23	66	Stockholm (SE)	To vacation home
24	74	Stockholm (SE)	Tourism
25	20	Nacka (SE)	To vacation home
26	43	Stockholm (SE)	Work
27	32	Knivsta (SE)	Tourism
28	50	USA	Tourism

29	25	Germany	Tourism
30	53	New Zealand	Tourism
31	65–70	Italy	Tourism
32	63	England	Other
33	53	Archipelago (Vaxholm) (SE)	Commute home
34	57	Stockholm (SE)	To vacation home
35	38	Stockholm (SE)	Other
36	89	Stockholm (SE)	To vacation home
37	59	Lidingö (SE)	To vacation home
38	82	Stockholm (SE)	Tourism
39	60	Huddinge (SE)	To vacation home
40	25	Uppsala (SE)	To vacation home
41	68	Linköping (SE)	To vacation home
42	71	Stockholm (SE)	Tourism
43	26	Solna (SE)	Tourism
44	73	Ramsö (archipelago) (SE)	Commute home
45	58	USA	Tourism
46	70	Ramsö (SE)	Other
47	50	Germany	Tourism
48	83	Stockholm (SE)	Tourism
49	19	Germany	Tourism
50	80	Stockholm (SE)	Other
51	63	Austria	Tourism
52	32	Stockholm (SE)	Tourism
53	79	Skarpöborg (SE)	Other
54	80	Stockholm (SE)	Other
55	69	Stockholm (SE)	To vacation home

Appendix 4: Respondent profiles (EE, FI, SE)

Estonia

		n	%
Nationality	Estonian	45	100.00 %
Gender	Female	25	55.6 %
	Male	19	42.2 %
	Other / Prefer not to say	1	2.2 %
Age	18 or under	2	4.4 %
	19–34	15	33.3 %
	35–49	11	24.4 %
	50–64	14	31.1 %
	65 or older	3	6.7 %
Route	Rohuküla – Vormsi	33	73.3 %
	Hiiumaa – Saaremaa	7	15.6 %
	Munalaid – Kihnu	3	6.7 %
	Rohuküla – Hiiumaa	2	4.4 %
Ferry use frequency	Daily or almost daily	5	11.1 %
	Several times a month	16	35.6 %
	Several times a year	12	26.7 %
	Once or twice a year	9	20.0 %
	Less than yearly	3	6.7 %
Reason for visiting archipelago	Permanent resident	18	40.0 %
	Seasonal resident	13	28.9 %
	Work	3	6.7 %
	Tourist	11	24.4 %

Finland

		n	%
Nationality	Finnish	96	83.5 %
	Other / Prefer not to say	19	16.5 %
Gender	Female	46	40.0 %
	Male	65	56.5 %
	Other / Prefer not to say	4	3.5 %
Age	18 or under	10	8.7 %
	19–34	31	27.0 %
	35–49	24	20.9 %
	50–64	27	23.5 %
	65 or older	22	19.1 %
	No answer	1	0.9 %
Region	Helsinki	65	56.5 %
	Turku	38	33.0 %
	Helsinki & Turku	8	7.0 %
	Turku & Other	2	1.7 %
	Other	2	1.7 %
Ferry use frequency	Daily or almost daily	27	23.5 %
	Several times a month	23	20.0 %
	Several times a year	23	20.0 %
	Once or twice a year	25	21.7 %
	Less than yearly	17	14.8 %
Reason for visiting archipelago	Permanent resident	30	26.1 %
	Seasonal resident	22	19.1 %
	Work	8	7.0 %
	Tourist	55	47.8 %

Sweden

Nationality	Swedish	31	73.8 %
	Other	11	26.2 %
Gender	Female	16	38.1 %
	Male	24	57.1 %
	Other / Prefer not to say	2	4.8 %
Age	18 or under	1	2.4 %
	19–34	7	16.7 %
	35–49	8	19.1 %
	50–64	14	33.3 %
	65 or older	12	28.6 %
Route (with several stops)	Stockholm – Värmdö island	24	57.1 %
	Stockholm – Finham island	5	11.9 %
	Other	13	31.0 %
Ferry use frequency	Daily or almost daily	2	4.8 %
	Several times a month	6	14.3 %
	Several times a year	14	33.3 %
	Once or twice a year	6	14.3 %
	Less than yearly	14	33.3 %
Reason for visiting archipelago	Permanent resident	3	7.1 %
	Seasonal resident	6	14.3 %
	Work	5	11.9 %
	Tourist	28	66.7 %