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GREEN TRANSPORT CORRIDORS: FROM STRATEGIC NEED TO COMMERCIAL CASE



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FOREWORD

This paper analyses what is required to transition Finland's green transport corridors (GTC) into investable projects. Over the past 5 years, PBI has worked on developing and implementing GTCs. During that time, regulation has placed an actual price on carbon, and security of supply has made decarbonization a question of strategic autonomy as much as an environmental one.

Three things surprised us: We expected shipping decarbonisation to cost more than conventional fuel over the long term, but thanks to FuelEU Maritime the gap can close; We expected battery-electric vessels to be a technical compromise, but today it is not: batteries are cheaper and lighter, and on many routes electrification is competitive; We expected cargo owners to pay a green premium sooner, but only now as the cost gap narrows, the question for them becomes more how they can capitalize on going green.

What holds a GTC back is not technology. Public funders point to investment grants, but what is missing are instruments that derisk the investments. Suppliers require a formal request for quotation to engage, as they are hesitant to invest in developing a business case that a competitor might ultimately win. This creates a cascade of chicken-egg problems.

This report is designed to support your decision-making process. We encourage you to take the leap and secure first mover advantage. Reach out to the others on your corridors and build a shared case that can be contracted and financed.

Studies have done their job - now we need implementation. PBI works actively with energy, marine, and transport, and we are glad to talk and support with anyone wanting to embrace the opportunities GTCs can bring.

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EXECUTIVE SUMMARY

Green Transport Corridors (GTCs) bring transport, infrastructure and energy supply together around a defined route, from origin to destination. The green transition of these corridors is already underway. Renewable fuels are being used, electric vessels are being introduced, and supporting infrastructure is being developed.

The challenge. Finland depends heavily on competitive transport connections. Most of Finland's foreign goods traffic moves by sea, within longer supply chains connecting production and customers. EU emissions trading and FuelEU Maritime are changing the economics of fossil-based shipping, while security of supply has increased the importance of resilient transport and energy systems.

Renewable fuels can often use existing or modified assets but are still very costly to produce and procure. Electrification can offer attractive operating economics on suitable routes, but requires substantial upfront investment in vessels, charging and grid capacity. The technical alternatives are increasingly well understood. The more difficult question is how to make them work commercially.

The business case. Shipowners, ports, energy companies, logistics operators, cargo owners and suppliers make separate decisions and carry different risks, yet those decisions depend on one another. A shipowner may wait for renewable fuel supply or charging infrastructure before ordering a vessel, while a fuel supplier or port may wait for the vessel commitment before investing in infrastructure.

Moving from feasibility to implementation therefore requires coordination across the organizations involved. Each participant keeps its own business case and investment decision, but someone needs to maintain the shared assumptions, track how the investments depend on one another and keep decisions moving on a compatible timetable. Demand also needs to become concrete enough to support investment through volumes, offtake, capacity reservations or other commercial commitments.

The opportunity and way forward. GTCs create demand for new vessels, maritime systems, renewable fuels, energy infrastructure, logistics services and digital solutions. Finland has capabilities across many of these areas, and working GTCs can give Finnish companies experience and references to take to other markets.

The priority should now be to move viable GTCs from feasibility towards investment. Industry needs a clear coordination function across the companies involved. Public actors should support the development work between feasibility and investment, address specific first-mover risks and consider strategic investment support where the wider national case is strong.

The first GTCs will show how commercial arrangements, investments and technologies work together in practice. They can strengthen the transport system that Finnish industry depends on while building experience that Finnish companies can use in future projects globally.



TABLE OF CONTENTS

Foreword	3
Executive summary	4
1. WHY GTCS MATTER FOR FINNISH INDUSTRY	8
1.1 What a green transport corridor is	9
1.2 Finland's trade depends on the whole transport chain	11
1.3 Regulation and security of supply	13
2. WHERE GTCS STAND TODAY	16
2.1 From feasibility to implementation	17
2.2 The Nordic and Baltic position	20
2.3 What we have learned from Decatrip, FUSE and CAST	21
2.4 What changes after feasibility	25
3. THE ECONOMICS OF A GTC: THE INVESTMENT CASE	28
3.1 Different pathways, different business cases	29
3.2 Who invests, who benefits and what do they need?	32
3.3 From individual business cases to an investable GTC	33
3.4 The opportunity for Finnish industry	36
4. THE WAY FORWARD	38
4.1 For industry	39
4.2 For public actors	41
References	44

1. WHY GTCS MATTER FOR FINNISH INDUSTRY



From a trade point of view, Finland is an island. More than 95% of its foreign goods traffic by weight moves by sea, as does around 80% of the value of its goods trade (Traficom, 2026).

Maritime transport is only one part of the wider logistics chain, which also includes road and rail connections to and from ports. Changes in the cost, reliability and availability of maritime transport therefore reach Finnish industry through the whole transport chain.

At the same time, the conditions behind transport decisions are changing. European regulation is raising the cost of fossil-fuelled shipping, and geopolitical events have made

*We refer to **Green Transport Corridors** to reflect a broader, end-to-end sense of the corridor: a defined freight route where lower-emission transport services are developed across the relevant maritime and land legs, together with the energy and infrastructure they require.*

energy availability and security of supply more immediate concerns, together driving new demand for vessels, fuels, infrastructure, equipment and services.

Green Transport Corridors (GTCs) bring these questions together on specific trade routes, providing a practical framework for reducing emissions while keeping

transport reliable and commercially viable, and for considering what this transition means for Finnish industry.

1.1 What a green transport corridor is

The green corridor concept gained prominence through the Clydebank Declaration at COP26 in 2021, which called for zero-emission maritime routes between two or more ports, built through partnerships across ports, operators and other value-chain actors (Clydebank Declaration 2021).

The approach concentrates the different changes that lower-emission transport needs onto a defined route. The Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping describes green corridors as bringing first movers together to develop alternative-fuel supply and offtake, share risk and demonstrate solutions that can later scale (Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping 2022).

We refer to Green Transport Corridors to reflect a broader, end-to-end sense of the corridor: a defined freight route where lower-emission transport services are developed across the relevant maritime and land legs, together with the energy and infrastructure they require.

A GTC is end-to-end, not just the sea leg

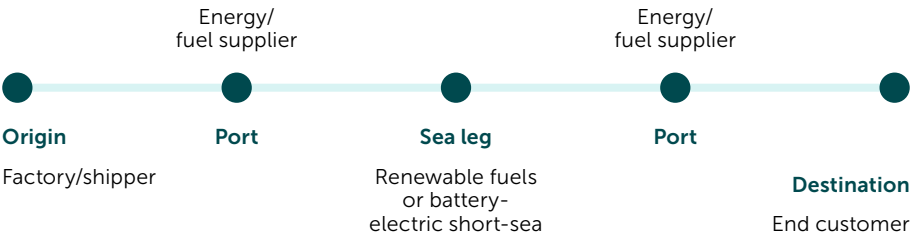


FIGURE 1 GTC VISUALISED.

A GTC is not tied to a single technology or transport mode. Short, frequently operated maritime routes may suit battery-electric vessels, while others rely on renewable fuels such as biogas, methanol or ammonia, alongside electric or renewable-fuel road transport, rail connections, charging or bunkering infrastructure and the energy supply behind them. The right combination depends on factors such as route specifics, the service it needs to provide, and the technical and economic feasibility of possible alternatives for the routes' conditions.

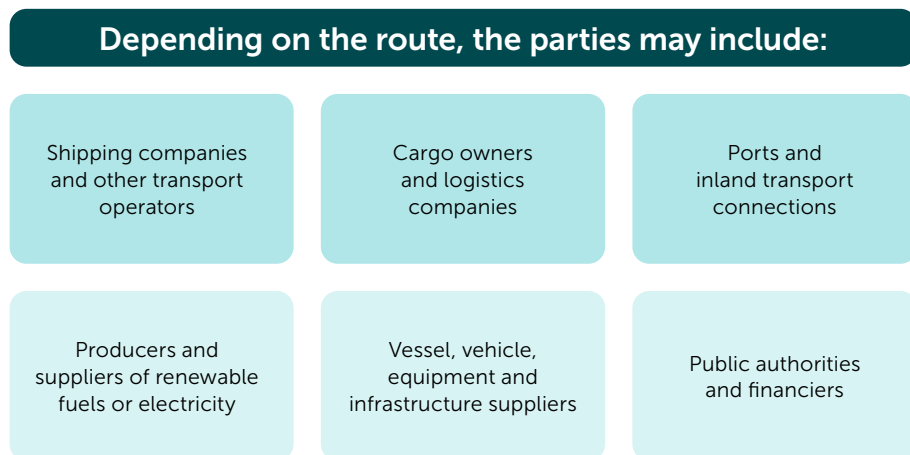


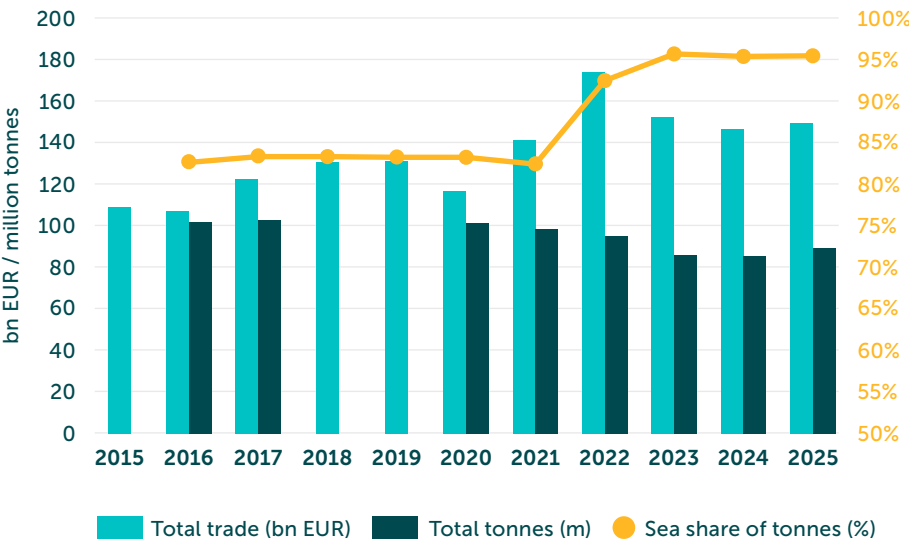
FIGURE 2 USUAL PARTIES IN A GTC.

This paper places particular emphasis on the maritime leg. Lower-emission road transport is generally further developed, while changing the energy and propulsion system of a large vessel can require larger and more interdependent investments. We therefore concentrate on the maritime leg as part of a GTC that determines whether the wider transition can proceed, while still treating the whole chain as what ultimately needs to work.

1.2 Finland's trade depends on the whole transport chain

Sea transport dominates Finland's foreign goods traffic by both weight and value. The goods that move across the border therefore remain heavily dependent on functioning maritime connections (Finnish Customs; Tapaninen 2023).

Trade value, volume and the sea's share of tonnes, 2015-2025



Tonnage share: Finnish Customs, annual "Ulkomaankaupan kuljetukset" reports, 2016–2025 releases. 2015 not published; 2018–2019 interpolated between 2017 and 2020 actuals (estimates). Trade value: Finnish Customs preliminary annual goods-trade statistics. 2015–2017 and 2019 derived by chaining Tulli's published year-on-year % changes back from the nearest confirmed year (approximate). Value share (est.): Tapaninen (2023, 2026), citing Statistics Finland & Tulli (isolated estimates).

FIGURE 3 FINLAND'S TRADE BY SEA, VALUE AND VOLUME.

That dependency runs the length of the logistics and value chain, not just the sea crossing. The transition creates an industrial opportunity across the whole route, from new vessels to renewable fuels, electricity supply, charging and bunkering infrastructure, vehicles, equipment, digital systems and logistics services.

Finland already has industrial capabilities across many of these areas. The Finnish Maritime Cluster brings together shipping and shipbuilding with marine technology, ports, renewable energy, logistics and digital solutions (Finnish Maritime Cluster 2026). GTC projects can also provide operating experience and references for use on other routes.

Fuel production is part of the same opportunity. If lower-emission transport still relies on imported energy, emissions can fall without improving security of supply or creating domestic industrial activity, whereas competitive domestic or regional renewable fuel production could deliver both.

The opportunity is also regional: GTCs elsewhere in the Nordic and Baltic region may carry Finnish goods, create demand for Finnish technology, or set standards Finnish companies later have to meet. Not every GTC relevant to Finnish industry begins or ends at a Finnish port.

1.3 Regulation and security of supply

European regulation is changing the economics of maritime transport. The EU Emissions Trading System (ETS) adds a direct cost to covered shipping emissions, while FuelEU Maritime progressively reduces the permitted greenhouse-gas intensity of onboard energy, and operators that outperform it can bank or pool the resulting compliance surplus (Directive (EU) 2023/959; Regulation (EU) 2023/1805).

Together, these rules improve the relative position of lower-emission alternatives without making them automatically competitive. Renewable fuels often still cost more than conventional marine fuels, and electrification requires significant upfront investment in vessels, charging, storage and grid capacity. The right solution depends on the route, operating pattern and the assets already in place.

The figure below is a generic, illustrative example, not a specific vessel or route. Under the assumptions shown, continuing with fossil fuel increases exposure to EU ETS costs and FuelEU compliance costs as the FuelEU target tightens. Investing reduces ETS exposure and can create a FuelEU compliance surplus that may be banked or used in a pooling arrangement.

Indicative illustration of how EU ETS and FuelEU Maritime affect costs

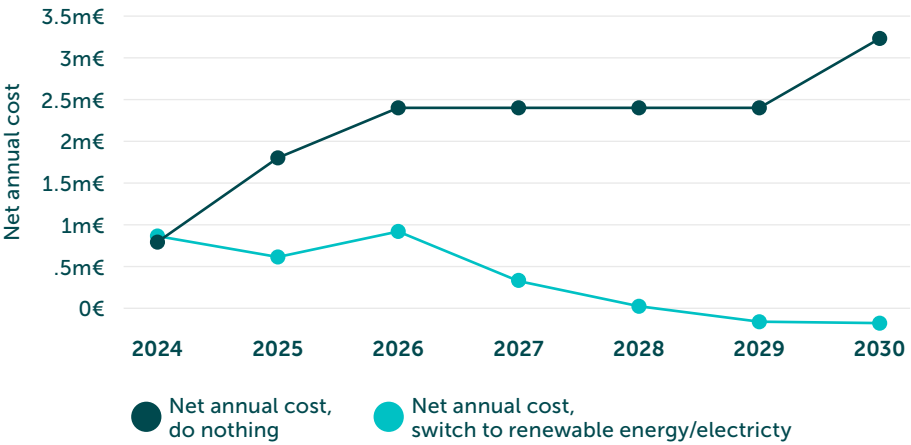


FIGURE 4 NET ANNUAL COST, SWITCH TO RENEWABLE ENERGY/ELECTRICITY.

Companies also face regulatory uncertainty. The IMO approved a draft Net-Zero Framework in 2025, but adoption was postponed that October. Discussions continued in September 2026, with further meetings scheduled for November and December 2026 (IMO 2026).

Security of supply is another consideration. Finland depends on imported fuels and energy, and its trade routes are exposed to conflict, sanctions, production interruptions and market shocks. Domestic and regional renewable-fuel production, electricity, storage and multi-fuel capability can reduce that dependence.

New systems also create dependencies of their own. Electric GTCs may rely on individual grid connections and charging systems, while renewable-fuel GTCs may depend on a limited number of production or storage facilities. Resilience therefore needs to be assessed across the wider transport and energy system, not the GTC alone. A similar conclusion emerged from the GTC Conference organised by PBI and Åbo Akademi University in Turku in October 2025.

Public investment may also be shaped by the role of transport and energy infrastructure in national preparedness. At the NATO Summit in The Hague in June 2025, Allies committed to invest 5% of GDP annually by 2035, including at least 3.5% for core defence and up to 1.5% for defence- and security-related spending such as critical infrastructure, civil preparedness and resilience.³ Transport and energy infrastructure with a genuine role in military mobility, emergency logistics or continuity of supply may therefore serve strategic as well as commercial and environmental purposes.

In summary, the question is not simply how to reduce emissions on existing routes. The transition must also preserve reliable and competitive transport, strengthen energy security and give Finnish companies opportunities to develop solutions for the wider Nordic and European market.

Recent Finnish projects have already answered many of the technical feasibility questions on key routes. **This paper therefore focuses on what comes next: how to move from feasibility to coordinated investment and implementation, and what Finnish industry can gain from doing so.**

In the following chapter we examine how far GTC development has progressed and why many initiatives still struggle to move beyond the feasibility stage.

2. WHERE GTCS STAND TODAY



GTCs have moved from policy commitments into practical development. Many routes worldwide have now been studied, but only four have reached the Global Maritime Forum's realisation stage, where vessels, infrastructure or fuel production are being built or operated. Progress now depends on whether vessels, energy supply, infrastructure and customer demand can be brought together in a way that works commercially for the companies involved.

The Nordic and Baltic regions illustrate this well. Lower-emission transport is in regular commercial use on some routes, while others are still moving from feasibility work towards investment. On these routes, progress depends less on choosing a technology and more on getting the required investments, contracts and operating decisions in place at the same time.

This chapter looks at where GTC development stands today, what the region's projects, particularly Decatrip and FUSE, have taught us, and what changes when a project moves beyond feasibility towards investment.

2.1 From feasibility to implementation

The Global Maritime Forum's 2025 progress report identified 84 active *green shipping corridor* initiatives worldwide, only four of which had reached its Realisation stage, where vessels, infrastructure or fuel production are already being built or operated (Global Maritime Forum 2025). The Global Maritime Forum uses the narrower *green shipping corridor* definition, not chapter 1's defined end-to-end 'GTC' one, but it still illustrates the maturity gap.

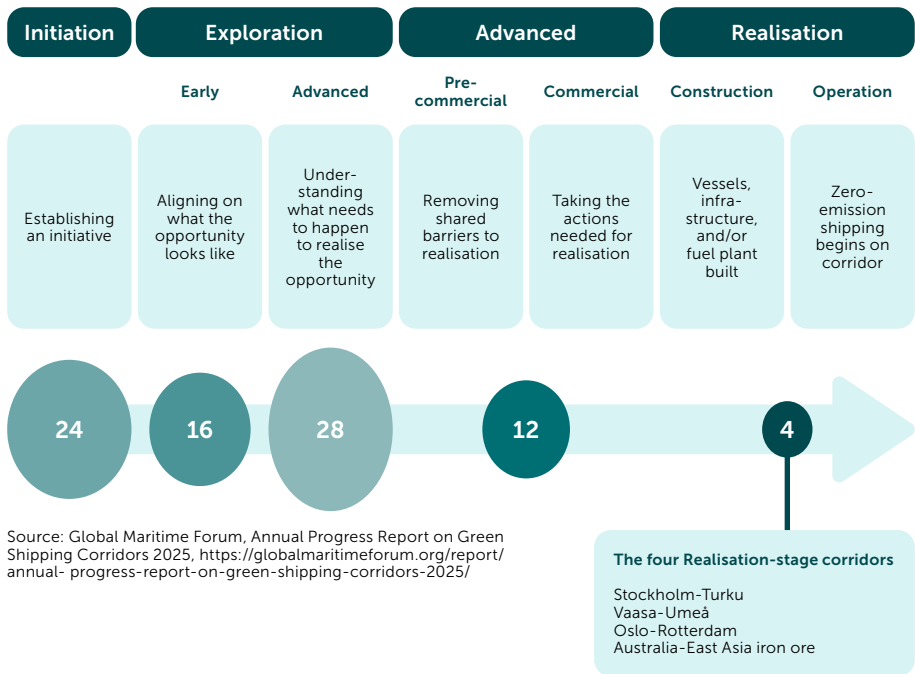
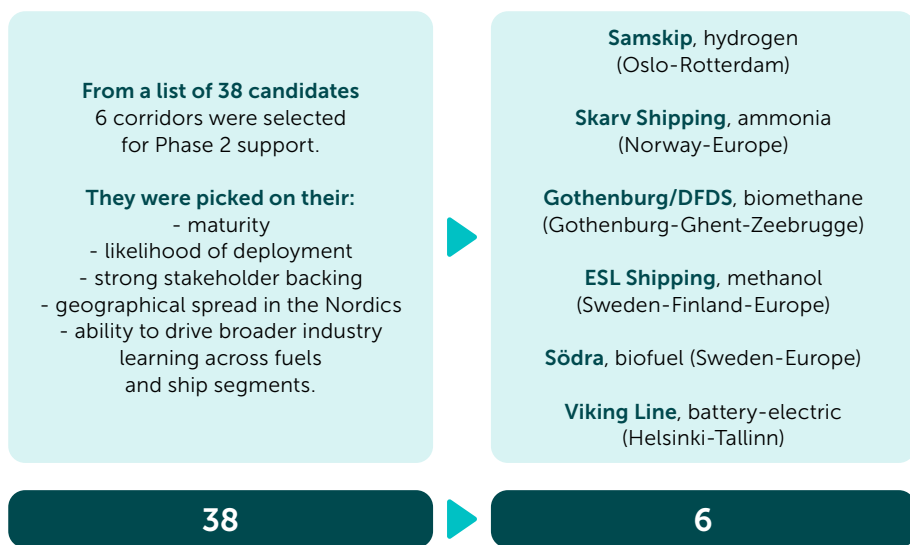


FIGURE 5 GLOBAL MARITIME FORUM, GREEN SHIPPING CORRIDORS.

A similar shift shows up in the Nordic Roadmap, a programme funded by the Nordic Council of Ministers and managed by DNV that brings companies, research organisations and public actors together to accelerate zero-emission shipping in the Nordic region. Its first phase produced a common fuel-transition roadmap and examined potential *green shipping corridors*. Phase 2, running 2025-2027, focuses on implementation, including the cost gap, financing and closer involvement of cargo owners and the finance sector.

In 2026, the programme selected six green shipping corridor cases, covering battery-electric, hydrogen, methanol, ammonia, biomethane and biofuel pathways, for further support, aiming to move them towards final investment decisions or removing the specific barriers still blocking it (Nordic Roadmap 2026).



Source: Future Fuels for Shipping (Nordic Roadmap), "Six Green Shipping Corridors Selected for Nordic Roadmap Phase 2", 7 May 2026, futurefuelsnordic.com.

FIGURE 6 NORDIC ROADMAP.

This matches what we have seen in our own work. Once the technical concept is sufficiently mature, three questions become increasingly important:

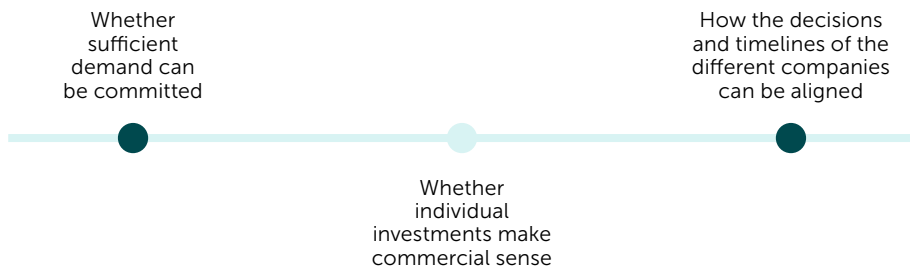


FIGURE 7 WHAT A GTC MUST ANSWER TO MOVE FORWARD.

2.2 The Nordic and Baltic position

The Baltic Sea already has examples of lower-emission transport in regular operation.

On Vaasa–Umeå, the RoPax ship Aurora Botnia combines batteries with biogas. In 2025, operator Wasaline (now part of Stena Line) signed a biogas agreement and a FuelEU Maritime pooling agreement and announced a major expansion of the vessel's battery capacity, completed in early 2026. Wasaline describes Vaasa–Umeå as the first international *green shipping corridor* in operation.

Turku–Stockholm has followed a similar fuel pathway. The operator Viking Line has progressively increased renewable bio-LNG use on Viking Glory and Viking Grace and offers passengers and cargo customers fossil-free transport as an option. In 2025, renewable bio-LNG accounted for around half of the fuel consumption of Viking Grace and Viking Glory, reducing greenhouse-gas emissions by around 50,000 tonnes, according to Viking Line (Viking Line 2025).

Both routes had the advantage that much of the required system was already in place. Their ships could already use alternative energy sources, allowing the transition to begin through fuel procurement and commercial arrangements rather than waiting for new vessels. This allowed the GTC to decarbonise gradually while demand and the commercial model developed alongside it.

Other routes require a larger step. GTCs selected by the Nordic Roadmap include projects where new vessels, energy supply and infrastructure all have to develop together, so the regional work is becoming less about identifying a preferred technology and more about bringing specific routes to the point of investment decisions.

For Finland, the Nordic and Baltic region matters in three ways: it carries part of Finland's own trade; it is already testing the technologies Finland's routes will need; and it gives Finnish companies a nearby market to build a track record before selling elsewhere.

2.3 What we have learned from Decatrip, FUSE and CAST

Our work on Decatrip, FUSE and CAST has given us three different perspectives on the move from feasibility to implementation:

- Decatrip examined how an existing route and fleet could move towards lower-emission operation, focusing on the Turku–Stockholm route.
- FUSE developed a fully battery-electric ship and charging concept requiring substantially larger changes to the vessel and surrounding energy system, focusing on the Helsinki–Tallinn route.
- CAST examined how the emissions performance of the GTC chain can be measured and made useful to the customer.

As set out in chapter 1, Decatrip and FUSE placed much of their attention on the maritime leg, which was the big missing link on these routes. Lower-emission alternatives are already comparatively mature on much of the land side, while changing the energy and propulsion system of a large RoPax vessel can require substantially larger and more interdependent investments.

Decatrip – Decarbonising Transport Corridors

Decatrip (completed in 2024, developed and coordinated by PBI in collaboration with a consortium, funded by Business Finland) examined how the Turku–Stockholm route could shift to renewable fuel, combining vessel hybridisation, onboard EV charging and a new commercial model for operators to sell the green transport service. Consortium partners were Viking Line (commercial model), RMC (vessel modifications), Kempower (onboard charging) and Åbo Akademi University (modelling and wider impacts) (Decatrip 2024).

The route had a head start; Viking Glory and Viking Grace's dual-fuel LNG engines were able to use liquefied biogas (LBG) as a drop-in fuel without any propulsion changes, and their existing LNG fuel provider could supply LBG through their existing LNG infrastructure, more or less on demand.

The commercial model is now in regular use, and Viking Line sells low-emission transport by allocating renewable fuel to a customer's journey. Since 2024, Orkla Suomi, Scandic Trans and Viking Line have used this model for freight between Orkla's Fågelmarå factory and its Turku logistics centre. Trucks use HVO on the road legs, while Viking Line buys matching waste-based LBG for the sea leg. Viking Line reports a 90% reduction in emissions across the 683-kilometre chain compared with the previous fossil-fuel alternative (Viking Line 2025).

Turku–Stockholm has moved past technical feasibility to commercial operation, but renewable fuel still costs more, so how far it scales depends on customer demand, regulation and mechanisms such as FuelEU Maritime.

FUSE – Future Shipping Electrified

FUSE took a different starting point. Instead of changing an existing vessel's fuel, the project developed a concept for a new zero-emission, fully battery-electric RoPax ship between Helsinki and Tallinn. The consortium behind the Business Finland funded project included RMC, Wärtsilä, Viking Line, Carina4, Fortum Spring, DNV, Port of Helsinki, Helen Electricity Network, Åbo Akademi University and Aalto University. PBI developed and coordinated the project and led the business case and business model work, alongside the consortium's technical and research work.

A peer-reviewed study based on the project examined a vessel with around 110 MWh of battery capacity. Battery-electric propulsion needed more capital upfront but had the lowest total cost of ownership among the decarbonisation alternatives assessed under EU ETS and FuelEU Maritime. Total emissions differ depending on whether the vessel is charged with renewable electricity or the Finnish–Estonian grid mix, which still includes fossil generation. The grid mix produces more emissions, and so a smaller benefit under EU ETS and FuelEU Maritime. Renewable electricity produces fewer emissions, and so a bigger benefit.

The practical challenge differs from Turku–Stockholm. A large battery-electric RoPax vessel needs high-capacity charging and sufficient electricity at both ends of the route, so grid capacity, charging equipment, possible shore-side storage and the operating schedule all must align. These assets can have different owners and financing structures, but their timing and capacity still have to match.

Since FUSE, ideas for fully electric vessels on this route have moved further, including a concept Viking Line has put forward under the Helios name (Viking Line 2025).

Helsinki–Tallinn’s selection for Nordic Roadmap Phase 2 moves it into a more implementation-focused phase. The technical concept and its economics are well developed; the open question is whether the vessel, charging, grid and other required investments can be brought to commitment on a compatible timetable.

	Turku-Stockholm	Helsinki-Tallinn
Pathway examined	Renewable fuel in existing RoPax ships	Fully battery-electric new RoPax ship
Starting point	Dual-fuel vessels and existing fuel infrastructure	New vessel and supporting energy system required
Main new requirements	Renewable fuel supply and sufficient customer demand	Vessel, high-capacity charging, grid capacity and potentially energy storage
How transition can proceed	Incrementally as renewable fuel use and customer demand grow	Several investments need to progress within the same timetable
Current position	Lower-emission transport already sold in regular service; GTC is live	FUSE completed, Helios concept presented and Nordic Roadmap support underway
Main question now	How far the commercial model can scale	Whether the required investments can be committed on a compatible timetable

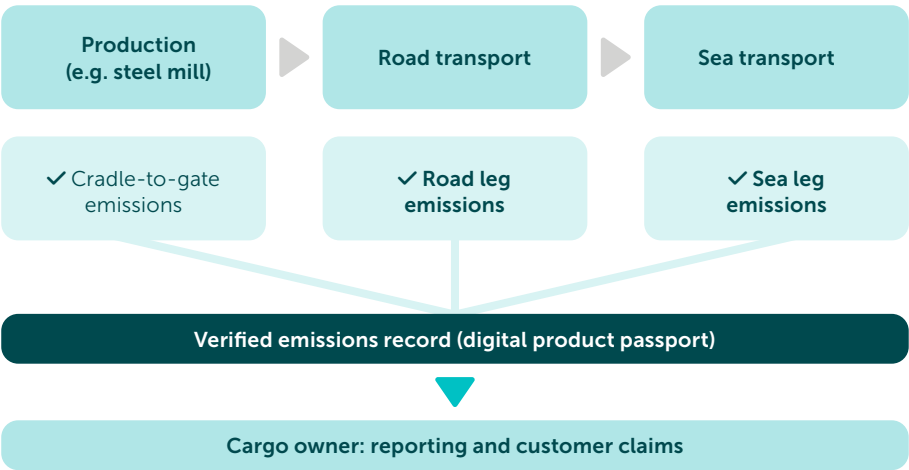
FIGURE 8 TWO ROUTES, TWO PATHS TO IMPLEMENTATION.

CAST – Competitive Advantage from Sustainable Transport

CAST adds another perspective. The Sitra-funded project, initiated and led by PBI, tested how transport emissions could be collected and reported automatically across supply chains involving SSAB and Orkla, using a digital product passport developed by Ioxio, and demonstrated automated post-transport reporting across road and sea transport with standardised emissions data and data-sharing technology (CAST 2024).

CAST matters to GTC development because a cargo owner that pays for lower-emission transport needs proof of what it received: verified emissions data for that specific shipment, comparable against the conventional alternative. Without that proof, it cannot use the purchase in its own emissions reporting or customer commitments. CAST showed that this kind of data can be collected and shared automatically, in a standardised format, across companies and transport modes.

How CAST verifies emissions across the product's full journey



Grey arrows: the physical path of the product, from manufacture to delivery. Teal lines: the emissions data captured at each stage, merged into one verified record.

FIGURE 9 CAST.

2.4 What changes after feasibility

We see an important distinction between GTCs that can develop incrementally and those that require several new investments to become viable at once.

Turku–Stockholm can change gradually, as it already has. The existing dual-fuel vessels can shift towards renewable fuel as supply, demand and the economics allow.

Helsinki–Tallinn is different. Current vessels on this route could in principle switch to renewable fuel too, as Turku–Stockholm's have, if the economics make sense. But over the past few years, full battery-electrification has become an attractive and realistic option as battery and charging technology has developed, battery prices have fallen, and battery energy density has increased, and that transition looks different from a gradual fuel switch. Full battery-electric operation therefore requires the vessel and charging infrastructure to be committed on a compatible timetable.

The amount of coordination required depends on the route. The condition and capabilities of existing vessels and vehicles, together with the fuel and electricity infrastructure already in place, determine how many new interdependent investments are needed and how much techno-economic risk they create. Where existing assets can be used, progress can come through a series of commercial decisions; where several specialised assets are required, each investment depends more on commitments from the others.

A GTC feasibility study can establish the preferred technology, indicative costs and operating requirements. Moving towards investment requires those assumptions to become decisions by the companies involved. Four questions come up repeatedly:

- **Demand:** How much green transport volume can cargo owners commit, for how long and at what price?
- **Transport and energy:** What transport service will the shipowner or operator provide, and what electricity, fuel and infrastructure does that service require?
- **Timing and dependencies:** Which investments depend on one another, and when do the different parties have to decide?
- **Risk and contracts:** Which risks can be carried commercially, which can be allocated through contracts, and which remain unresolved?

These questions cut across company boundaries. Each organisation may understand its own investment and economics well, while still depending on decisions made by others. On

Helsinki–Tallinn, for example, a shipowner may reasonably wait to order a battery-electric vessel until charging infrastructure is committed, while a port or energy company may reasonably

Both decisions are individually rational, and the GTC still does not move forward.

wait to invest in that infrastructure until a vessel order exists to justify it. Both decisions are individually rational, and the GTC still does not move forward.

The companies do not need one common balance sheet or a single combined business case. However, they do need a common understanding of the route:

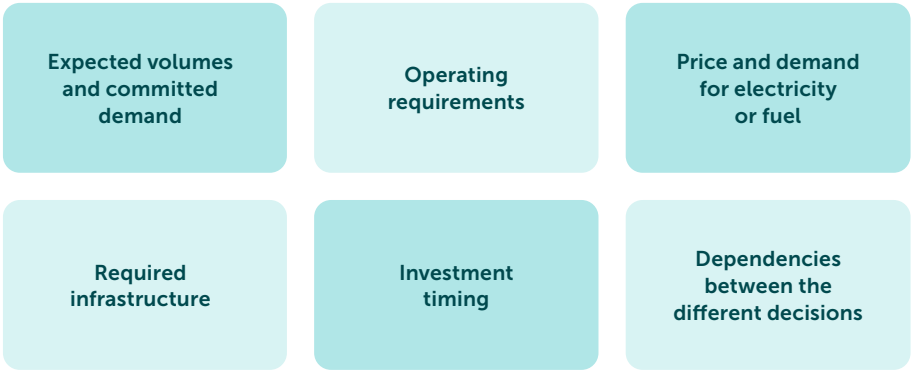


FIGURE 10 THE SHARED BASIS FOR A GTC DECISION.

Each company can then assess the opportunities and risks from its own commercial position.

A GTC can make sense as a transport system even when one or more of the individual investments do not. Charging infrastructure at a port, for example, may not generate enough revenue to justify itself alone, but if it enables a battery-electric vessel to run the route cheaper than the fossil-fuelled alternative, the GTC as a whole can still be worthwhile. The business case must therefore be assessed at both levels: the GTC as an integrated transport system and each investment within it.

Chapter 3 examines these questions in more detail, including what the different pathways cost, who invests and benefits, how risks are distributed and what is required for the separate business cases to become investable at the same time.



3. THE ECONOMICS OF A GTC: THE INVESTMENT CASE



Chapter 2 showed that GTCs can develop along very different paths. Some can be introduced through existing assets and infrastructure, while others require a new vessel, energy supply and infrastructure to be developed within the same timeframe.

These differences create different business cases for those involved. The question is not only the GTC's technical feasibility or the competitiveness of its total cost, but whether each company's own investment, contract or commitment makes sense given the decisions made by others along the same route.

We therefore look at the commercial case at two levels. The first is the GTC as a transport system, including the service needed, its cost, energy requirements, value creation and relevant market, technology and regulatory risks. The second is each company's own position, including the financial, operational, compliance and other risks specific to its role. Moving from feasibility to implementation requires both levels to work at once.

3.1 Different pathways, different business cases

The choice of technology changes where costs arise, how much new investment is needed and which companies carry the key risks. The illustration below captures the difficulty we will describe over the next sections.

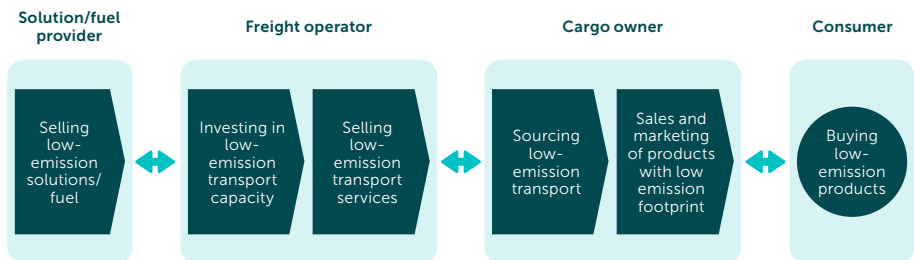


FIGURE 11 THE COMPLEX AND FRAGMENTED VALUE CHAIN OF GTCs.

On Turku–Stockholm, renewable fuel can be introduced largely through existing assets, leaving the operator with a higher fuel cost while new production capacity creates investment risk for the fuel producer. Full electrification on Helsinki–Tallinn requires more upfront investment by the shipowner, ports and energy-infrastructure owners because the vessel and high-capacity charging need to be developed together.

For the GTC business case, three differences are particularly important:

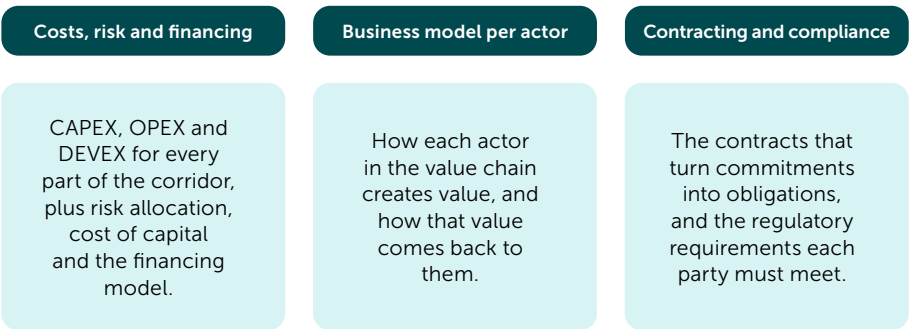


FIGURE 12 GTC BUSINESS CASE.

Renewable fuels offer a relatively direct route to lower-emission operation where existing or modified vessels can use them. Much of the transport system stays in place, and the main additional cost is the fuel itself. The impact depends on the size of the cost gap, how regulation changes it and how much customers are willing to pay.

Decatrip assumed renewable fuel at two to three times the cost of conventional marine diesel, yet for the high-value cargo assessed (> EUR 800/tonne), the resulting increase in final product price came to below one per cent, illustrating that a large cost increase in one part of the transport chain can have a very small impact on the final product price (Decatrip 2024). The real question is whether the cargo owner can capitalise enough on lower-emission transport, through increased market share or premium pricing, to justify buying it despite the higher cost.

The supply side has a separate challenge: an operator can raise renewable fuel use gradually, but a new production facility needs confidence in large volumes over a long period to justify investment. In Decatrip, available liquefied biogas let the GTC build incrementally, while large-scale e-methane production was not viable without sufficient long-term offtake.

Operators may also be reluctant to lock in a long-term renewable fuel price with one producer if market prices could fall as supply expands. This creates a mismatch between the flexibility an operator may want and the long-term certainty a producer needs before investing. Renewable fuel markets are not yet mature enough to offer that stability themselves, even though they should in principle be less exposed to crude oil and gas price swings, unless indexed to them. This gap, between what an operator can commit

to and what a producer needs, is one of the harder coordination problems in a GTC, one that chapter 4 returns to.

A large cost increase in one part of the transport chain can have a very small impact on the final product price.

Battery-electric shipping has a different cost structure; electricity can offer favourable operating

economics on suitable routes, but more capital is committed before the service even begins, since the vessel needs a large battery system and the route needs charging equipment, sufficient grid capacity and, depending on local conditions, shore-side storage.

FUSE illustrates the scale of this. The Helsinki–Tallinn analysis found battery-electric propulsion economically competitive under its assumptions, but the concept still required substantial investment in both the vessel and its surrounding energy system. This shows why favourable operating economics alone do not settle the investment case.

The comparison, then, is not simply expensive fuel versus cheap electricity. Renewable fuel pathways make more use of existing assets but leave a recurring fuel cost and supply question. They also complicate emissions compliance because of often varying fuel qualities and well-to-wake assumptions and calculation methodologies. Electrification can lower energy and operating costs on suitable routes but requires larger, more interdependent investment upfront. E-fuels add further complications of their own: feedstock and sustainability constraints, the cost and scale needed to be competitive, and additional infrastructure, storage and safety requirements.

3.2 Who invests, who benefits and what do they need?

A GTC has no single investor. The companies involved make different commitments, earn returns differently and carry different risks.

Cargo owners hold a particularly important position. They typically make little of the capital investment the GTC itself requires, but their purchasing decisions create much of the underlying demand. Lower-emission transport can be worth something to cargo owners in three concrete ways: it can lower the emissions in their own sustainability reporting, help them win or keep customers who require greener transport, and let them market their products as sustainable.

CAST adds an important practical point: none of that value can be captured unless the emissions reduction can be measured and credibly reported. Without evidence that meets recognised emissions-reporting standards, a cargo owner may not be able to use the reduction credibly in its own reporting or customer claims.

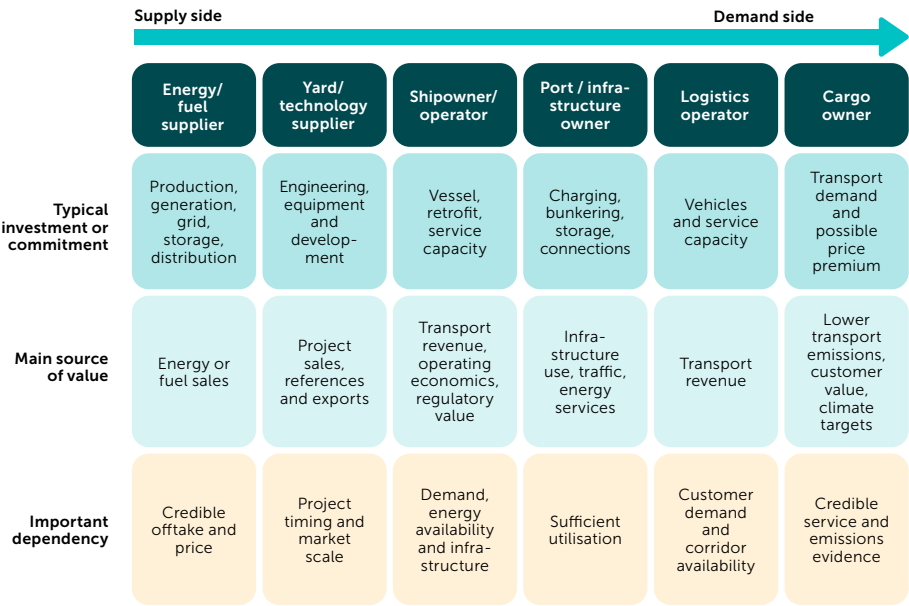


FIGURE 13 BUSINESS CASES ALONG A GTC.

The table also shows a recurring issue in our project work; cost and benefit do not always sit in the same place. An energy or transport asset may require the investment, while the value shows up elsewhere: lower Scope 3 emissions for a cargo owner, lower regulatory exposure for an operator, improved resilience, or an industrial reference for suppliers.

Demand is particularly important because it connects several of the business cases described above. A cargo owner does not normally finance the vessel or fuel-production facility, but a credible commitment to use the service can influence whether those investments have sufficient expected revenue or utilisation.

In our work, the distinction between interest and commitment has repeatedly mattered. General demand for lower-emission transport can support a project, but a company making a large investment needs something sufficiently concrete to include in its own business case.

That does not always mean a long-term transport contract. Depending on the GTC, it may be an agreed minimum volume, an offtake agreement, a capacity reservation, public investment support, or some other commercial arrangement. The relevant question is what level of certainty each company needs before it can proceed.

3.3 From individual business cases to an investable GTC

The difficulty is that each company's business case depends on decisions outside its own control.

An operator considering a new vessel may depend on energy infrastructure not yet approved; an infrastructure owner may depend on a vessel order not yet placed; and a fuel producer may need long-term demand before committing to production, while transport customers hesitate to commit before the service exists.

This uncertainty can show up as larger contingencies, stricter financing conditions, higher required returns, or simply a decision to wait; we have not quantified the effect for the GTCs examined here, and it will vary between projects. What matters is that each company bases part of its decision on what it expects others to do.

We use the following steps as an implementation concept for a GTC rather than only as a way to structure individual business cases. In practice, the steps are iterative, and work may return to an earlier stage as new information emerges.

GTC business-case framework



FIGURE 14 ITERATIVE GTC FRAMEWORK.

The framework does not imply that all companies should use one financial model or share confidential information: each keeps its own business case. They need shared assumptions for the points that connect them, including volumes, service requirements, energy needs, infrastructure capacity, timing and commitments made by other parties.

This also creates a practical coordination requirement. A GTC has no single owner, yet someone has to maintain the shared assumptions, keep the corridor-level case current, track dependencies and ensure changes in one part are reflected in the others. In our experience, this work is difficult to leave to one asset owner alone, since each participant is primarily responsible for its own investment and timetable.

For larger projects, several interdependent actors need to move together, so we see value in a clearly defined coordination function across the individual business cases.

It does not need to be a new organisation and it does not make investment decisions for the companies. Its role is to maintain the common fact base, coordinate the timetable and development gate process, identify unresolved dependencies and support the commercial work needed between the parties.

Once the shared case is established, the main risks can be treated more systematically:

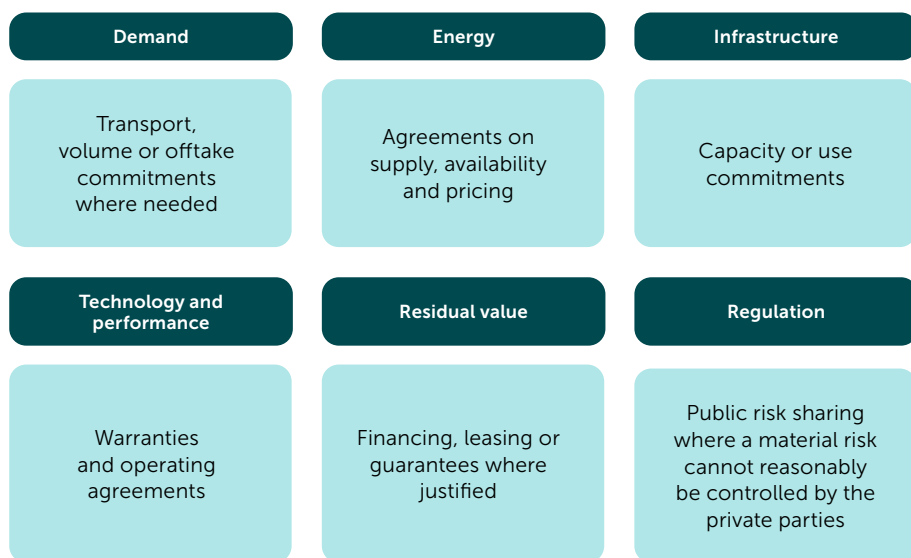


FIGURE 15 MAIN GTC RISKS AND THE INSTRUMENTS THAT ADDRESS THEM.

The purpose is not to remove normal commercial risk. It is to avoid asking one company to carry uncertainty that depends mainly on decisions made by someone else.

3.4 The opportunity for Finnish industry

Developing and enabling GTCs also creates demand for the technologies, energy systems and services required to build and operate them.

We see four GTC areas in particular where Finnish industry can find new business and export opportunities:

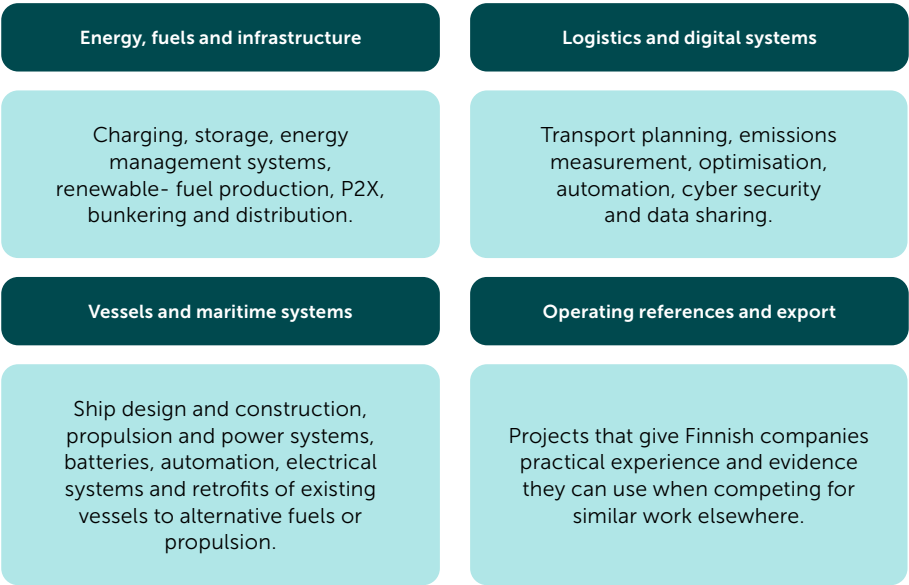


FIGURE 16 THE OPPORTUNITY FOR FINNISH INDUSTRY.

A domestic reference does not guarantee later export sales, and Finnish companies will compete with suppliers from across Europe and beyond, but it can give a company operating experience and customer evidence while technologies and commercial models are still being established.

Energy production connects this industrial opportunity back to the security-of-supply discussion in chapter 1: replacing imported fossil energy with renewable electricity or fuel does not automatically improve resilience, but competitive production, storage and supply within Finland and the region can reduce dependence on a narrow set of imported sources while creating industrial activity.

No published figure sizes this opportunity for Finland or the Nordics in euros. The closest useful anchor is the size of the industrial base it depends on. The Finnish Maritime Cluster reported turnover of EUR 17.3 billion and around 46,500 employees in 2023 (Meriteollisuus ry 2025). This does not quantify the GTC opportunity, but it shows the scale of the industrial base that could benefit from successful corridor investments.

Chapter 4 turns the business-case logic described here into practical actions for cargo owners, operators, energy and infrastructure companies, suppliers and public actors.

4. THE WAY FORWARD



We argue that the main barrier to GTCs is no longer technical feasibility, but the commercial coordination of separate investments, risks and commitments across the transport chain. Solving that problem would not only reduce emissions, but also strengthen security of supply and create an industrial opportunity for Finland.

Our work on Decatrip, FUSE and CAST, and conversations across the value chain, point to the same issue. The technical alternatives are increasingly well understood, although several, particularly e-fuels, remain significantly more expensive than fossil alternatives even after accounting for EU ETS costs and FuelEU penalties. Beyond that cost gap, investment is often held back because several independent companies need to make decisions that depend on one another.

Industry therefore has to turn technical plans into workable commercial arrangements, while public actors should focus on the gaps and risks companies cannot reasonably solve or carry alone.

The main barrier to GTCs is no longer technical feasibility, but the commercial coordination of separate investments, risks and commitments across the transport chain.

what they require from one another, including expected volumes, energy and infrastructure requirements, timing and the main risks if plans change. The investments can remain separate, but each company needs enough certainty about the others to make its own decision.

4.1 For industry

1. Agree on the main dependencies before investing.

Shipowners, transport companies, ports, energy companies and other GTC actors need to agree early on

2. Treat ports as part of both the transport and energy system.

Whether a route uses electricity or renewable fuels, much of the required infrastructure comes together in the port. Energy supply, vessel operations, storage, bunkering or charging and continuity requirements should therefore be considered together rather than as separate projects.

3. Turn cargo demand into commitments.

Where investment depends on future volumes, cargo owners should consider minimum volumes or other commitments that give operators and suppliers better visibility of demand. This does not always require a long-term contract. What matters is that commitments are sufficiently concrete and consistent through the chain, from cargo owner to operator and, where relevant, fuel producer.

The discussion should not sit only with logistics procurement. Sales and marketing may be better placed to see how lower-emission transport can support customer commitments, strengthen market position or differentiate products. That commercial case should feed into the purchasing decision rather than leaving procurement to justify a higher price alone.

For some companies, especially where Scope 1 and 2 emissions are already significantly reduced, transport becomes a larger share of the remaining Scope 3 footprint, so the additional cost of lower-emission transport is better understood as part of the company's wider decarbonisation effort, not simply as a higher freight cost.

4. Make emissions measurable across the whole route.

A lower-emission service needs to show what it delivered. The reduction must be measurable, evidenced and reported against recognised emission standards, not simply asserted. Logistics companies, terminals and operators should use comparable, standards-based reporting across the journey's different legs so cargo owners can include emissions in procurement and reporting.

5. Use the first GTCs as references.

For Finnish yards, equipment suppliers, energy companies and digital-service providers, an operating GTC is also a reference. Early projects provide experience that can be used on other routes and in export markets, and that wider value should factor into the decision to take part in the first projects.

4.2 For public actors

1. Support should not end with the feasibility study.

There is still substantial work between a completed study and an investment decision: developing agreements and financing structures, updating shared assumptions and bringing several companies towards decisions on a compatible timetable. Much of this work sits between organisations rather than clearly inside one of them.

Funding programmes should be able to support this development work as well as the investments that follow, directed at the actual bottleneck, whether that is a vessel, energy infrastructure, renewable-fuel production or another specialised asset.

2. Recognise the additional risk carried by first movers.

A recurring reason for waiting to invest is that the first project is expected to cost more and encounter more problems than those that follow. Later investors can benefit from lower technology costs, more mature suppliers and experience gained from the first installation. Waiting can therefore be commercially rational even when the longer-term case is understood.

Public guarantees, investment support or other risk-sharing arrangements can be justified where this first-mover disadvantage, or a residual-value or regulatory risk that cannot reasonably be carried by one company alone, prevents an otherwise sound investment. Public support should reduce these specific barriers, not take over normal commercial risk.

It's also important to note that being a first mover can have an upside too, beyond the reference and competitive edge already described in 3.4 and in 4.1. Under FuelEU Maritime, ship operators that outperform the GHG intensity compliance requirement can bank a compliance surplus or use it in pooling arrangements with other vessels. The commercial terms of such pooling arrangements are agreed privately between the companies involved, but the surplus can effectively become a significant upside risk and revenue stream for the operator with the surplus at hand.

A related case is the long-term price risk carried by renewable fuel producers, who may not invest even where operators are willing to increase renewable fuel use gradually. Contracts-for-Difference (CfDs) or similar mechanisms can, where appropriate, reduce long-term price risk for producers without shifting all of that risk onto individual transport operators.

3. Consider security of supply alongside emissions.

Some GTC investments can also strengthen the reliability of Finnish trade and energy supply. Domestic or regional energy production, storage and infrastructure can reduce dependence on imported fossil fuels and suppliers and help maintain transport during disruptions.

These benefits do not automatically justify public funding, but should be weighed when a genuine security-of-supply role is assessed, and infrastructure supported on those grounds should be designed to function under disruption.

4. Consider direct investment support from the state where the strategic case is strong.

Finland has used targeted investment support to build capability before, in energy generation, for example. The same logic can apply here. Where a GTC investment is judged nationally important, direct co-investment or subsidy can be considered alongside guarantees and risk-sharing.

This is a step beyond correcting a specific bottleneck; it reflects a deliberate choice about which capabilities Finland wants to build and should be treated as a separate decision from the risk-sharing measures in point 2.

Finland already has much of the knowledge and industrial capability needed to move forward with GTCs. The technologies will keep developing, but the experience needed for the next generation of vessels, fuels, energy systems and infrastructure comes from putting the first solutions into active, regular operation.

For Finland, the value goes beyond cleaner transport; working GTCs can strengthen the routes Finnish industry depends on, improve resilience in transport and energy, and give Finnish companies experience and references to take to other markets.

The first GTCs will also shape what comes after them by establishing working solutions, supplier relationships and ways of sharing investment and risk. Finland does not need to lead every technology, but it has the industrial base, the technical know-how and the capabilities to continue to take an active part in the first GTC routes to be developed, and in those that follow.

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REFERENCES

CAST. Final report, project funded by Sitra, with SSAB and Orkla as cargo owners, 2024.

Clydebank Declaration for Green Shipping Corridors, COP26, Glasgow, 2021.

Decatrip: Decarbonising the Turku-Stockholm transport corridor. Feasibility report, consortium led by Rauma Marine Constructions, 2024.

DNV, Maritime Forecast to 2050 / Energy Transition Outlook.

ESF project report.

European Commission, Sustainable Transport Investment Plan, November 2025.

FUSE, Future Shipping Electrified: feasibility of a battery-electric RoPax on the Helsinki-Tallinn route. Consortium led by Rauma Marine Constructions, 2025.

Getting to Zero Coalition / Global Maritime Forum, Annual Progress Report on Green Shipping Corridors, 2025.

IMO, Fourth IMO Greenhouse Gas Study. IMO, 2023 2019/2 Strategy on Reduction of GHG Emissions from Ships.

IMO, Net-Zero Framework: extraordinary MEPC session, October 2025, and resumed talks scheduled October 2026.

IVL Swedish Environmental Research Institute, New initiatives for green shipping corridors in the Nordic-Baltic region, December 2025.

Jungar, A., Spohr, J., and Wikström, K. (2022). Developing capability to secure sustainable infrastructure. PBI Foundation. ISBN 978-952-65055-1-0.

McKinlay, C., Lloyd's Register Maritime Decarbonisation Hub: Buying green transport. NATO, The Hague Summit Declaration, June 2025; Defence investment and NATO's 5% commitment.

Spohr, J., Wikström, K., and Stenman, J.-E. (2018). Infrastructure investing, beyond the fund model. Foundation for Project Research, Åbo Akademi University.

Tapaninen, U. (2023). On the declining share of sea transport in the value of Finnish exports.

Viking Line, biogas operation on Turku-Stockholm, 2025 to 2026 reporting.

Finnish Customs (Tulli), foreign trade transport statistics; Statistics Finland and Traficom, freight transport statistics.

The Nordic Corridor Funding Database. futurefuelsnordic.com/nordic-corridor-funding-database.

