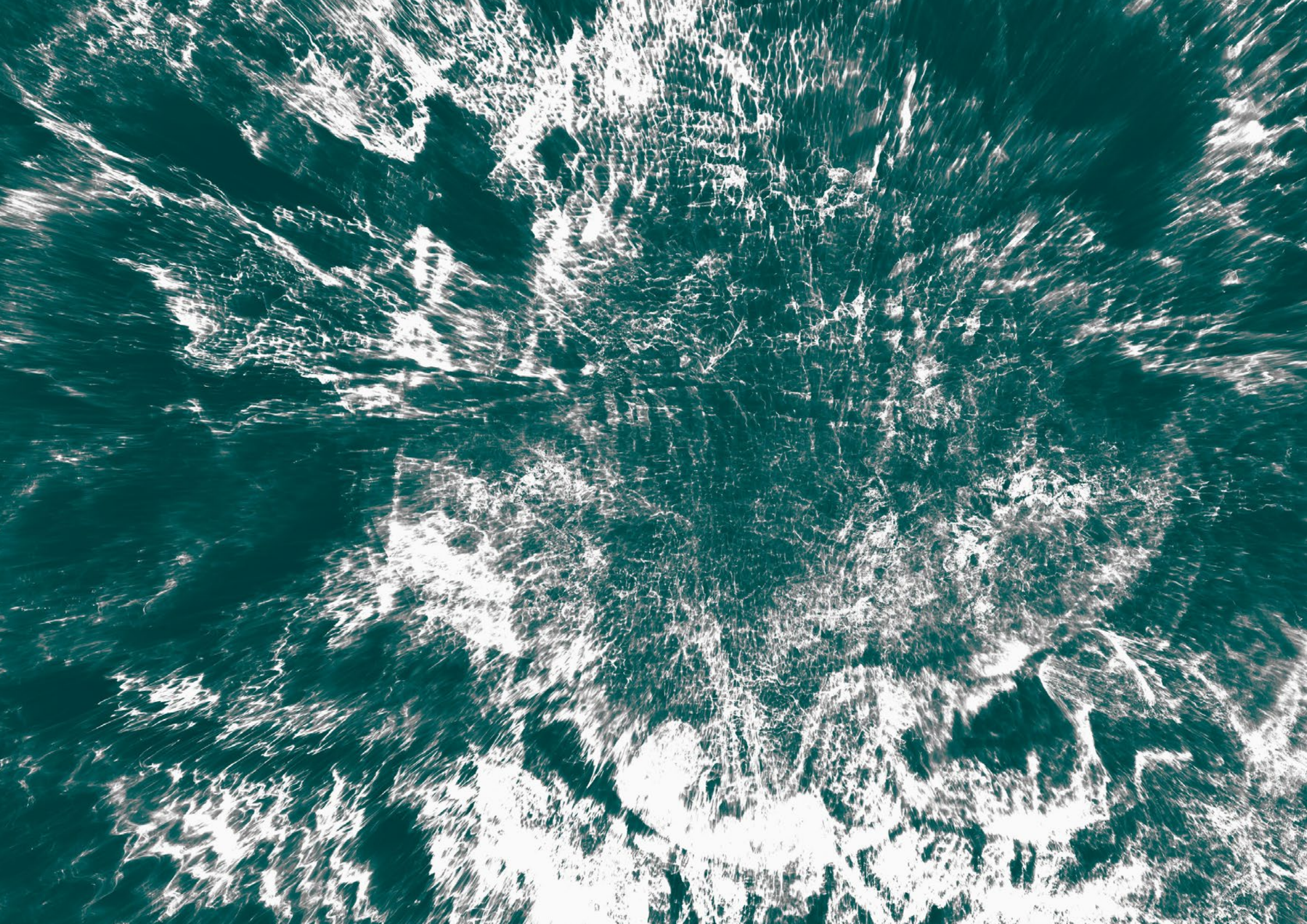
GreenConnect

Connecting green transition to new competitive advantage in transport solutions

Final report 31.12.2025

UNIVERSITY OF TURKU



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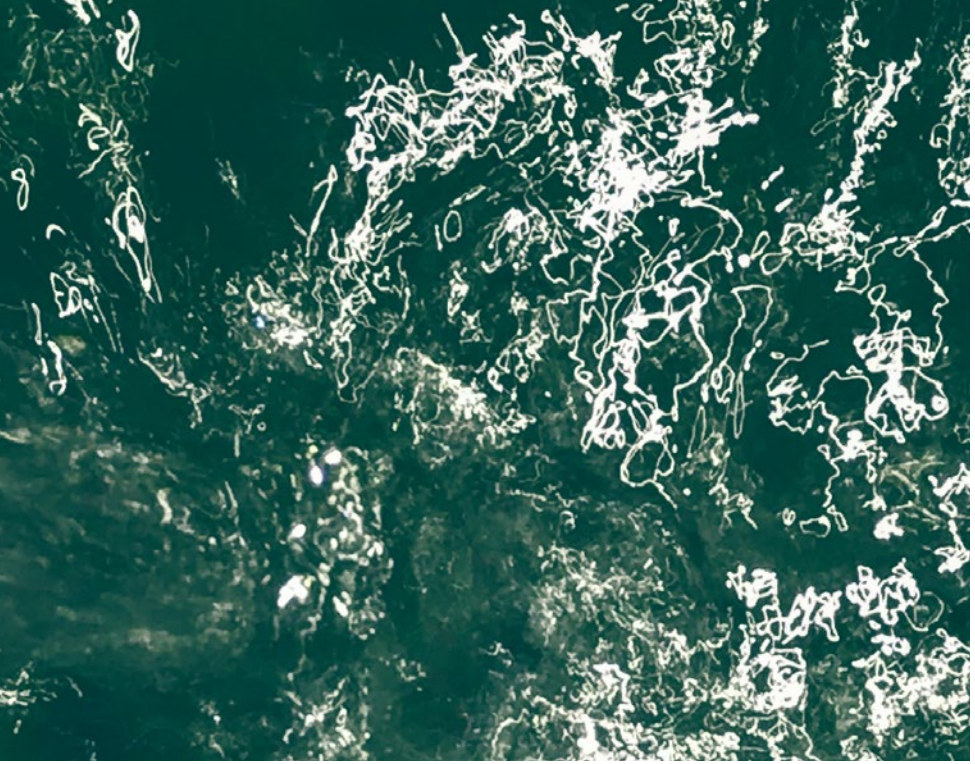
1 Introduction

The transport sector is facing increasing pressure to cut greenhouse gas (GHG) emissions. On one hand, regulations and standards at different geographical levels are pushing transport companies to cut emissions, while on the other, emission reductions have now gained a foothold in transport customers' strategies and actions. Wider societal pressures are also having an impact. Although sustainability measures generate positive outcomes for the environment, businesses are partly conflicted regarding the ways to balance environmental and commercial concerns. This is particularly evident in often complex, dynamic and multistakeholder environments such as international supply chains.

Many of the current sustainability measures being considered and implemented by transport sector companies are intended to meet the tightening emission standards by regulations. The focus of such companies is largely on solving the challenges related to achieving these standards, and many therefore have only limited options through which to differentiate themselves or seek an environmentally-based competitive advantage in their markets. A green transition in the transport and logistics context can, however, offer wider business opportunities to those who are capable of responding to the increasing environmental demands and may provide solutions for those who benefit from the value of green services that reach beyond normative standards.

Globally, cargo customers, such as manufacturers and retailers, are increasingly launching sustainability strategies and setting emission targets to cut their environmental footprints, including their value chains and transport operations. There are several reasons for this. For many, value chains provide significant impact potential in cutting the total emissions of a company[1]. In addition, technological developments offer new possibilities for low-carbon solutions. Importantly, global emission standards and emission reporting legislation efforts, such as the Corporate Sustainability Reporting Directive (CSRD) in the European Union (EU), have made companies' environmental footprints transparent, visible and comparable, all of which can be seen as both a challenge and an opportunity for the transport sector.



In recent years, some observers and scholars have started to highlight the increasing need to focus on a systems-level perspective of decarbonisation as well as entire supply chains instead of single transport modes[2]. Specifically, for transport customers seeking to reduce their supply chain emissions – and particularly in the case of international, multimodal and complex supply chains, it is the total supply chain that should count and not the environmental performance of a single transport mode or a part thereof. Accordingly, this calls for different approaches compared to mode-specific transport regulations or the sub-optimisation of the operations of a single transportation stakeholder.

Overall, the transport and logistics sector has had challenges in balancing environmental and commercial targets – and particularly with reducing emissions in an economically viable manner[3]. In an ideal scenario, logistics service providers would provide an

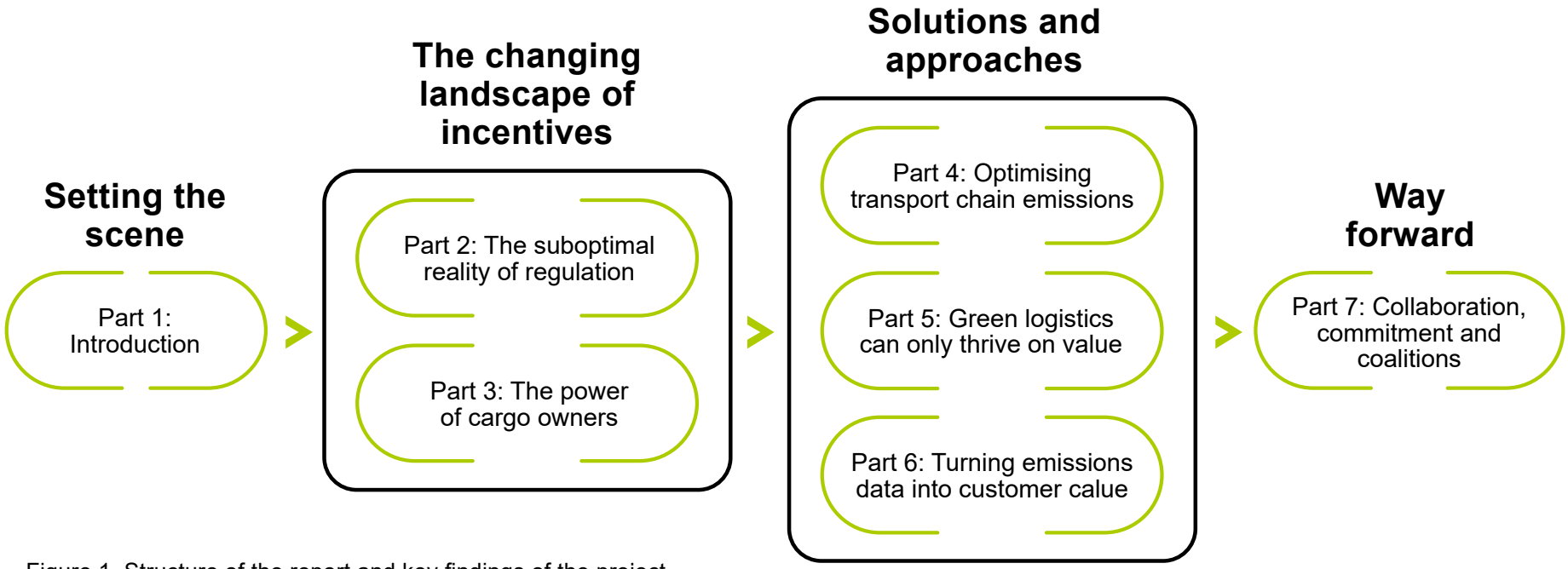


Figure 1. Structure of the report and key findings of the project.

expanding range of environmentally friendly transport solutions and would benefit from the concomitant increased number of customers and volumes and perhaps higher service prices (and profits). Meanwhile, transport sector customers, like those in manufacturing and retail, would increase their business competitiveness by supplying products that generate fewer emissions compared to their rivals, increase their market share, gain new environmentally-conscious customers and grow faster, which would at least partly compensate for their increasing logistics costs. However, in practice, this logic tends to turn on the question of willingness to pay, the division of the additional costs and commercial constraints rather than the strategic approach, the possibility for differentiation or the commercial value of being green(er). These are some of the key factors that are developed further in this report.

This is the public final report of the GreenConnect research project. During this project, possibilities and approaches to introduce green transport concepts, which possibly extend beyond regulative measures and market standards, were investigated and analysed from the perspective of multimodal transport chains. Such efforts would involve multiple stakeholders and transport modes, be framed by extensive transport legislation and standards and be directed by commercial arrangements and agreements between customers and transport service providers. In this fast-developing environment, the **GreenConnect** project examined the needs and incentives for green transportation services, possibilities for green differentiation, operational solutions for decarbonisation, and business model re-elevation and impacts, among other topics. All this was done in close and systematic collaboration with the companies involved in the project.

This report brings together the key findings from the **GreenConnect** project, which have been organised into six main parts (figure 1). Two important green transition factors, regulations (Part 2) and transport customer demands (Part 3), which drive and impact decarbonisation efforts in the transport sector in various ways, are introduced and discussed. Further, three solutions that can support both emission reductions and the development of green transportation services from operational and commercial perspectives are presented, namely, emission optimisation (Part 4), finding the right value elements (Part 5) and utilising data in the design of green services (Part 6). Finally, the report concludes the ways the transport chain stakeholders should jointly commit towards the emission reduction efforts in the future (Part 7).

[1]See, for example, World Economic Forum (2021). Net-zero challenge: The supply chain opportunity. Insight report, January 2021. https://www3.weforum.org/docs/WEF_Net_Zero_Challenge_The_Supply_Chain_Opportunity_2021.pdf

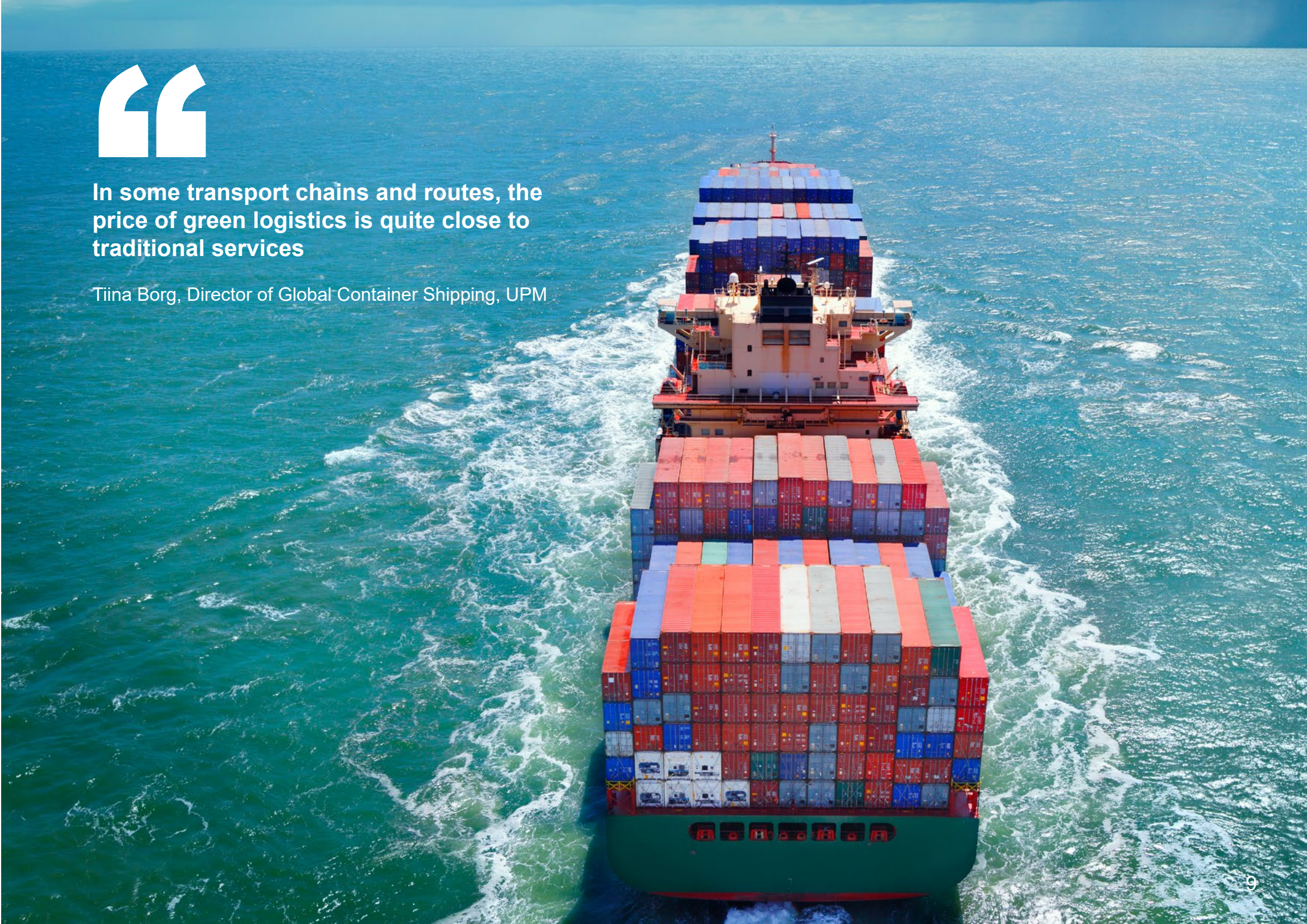
[2]See, for example, Ellram, L.M. and Tate, W.L. (2025), "Impact pathways: A call for impactful research in supply chain GHG emissions reduction", International Journal of Operations and Production Management,
Vol. 45, No. 1, pp. 236–245, doi: 10.1108/ijopm-07-2023-0574.

[3]Bertelè, A., Pacca, M. and Weber, B. (2024), "Making green logistics services profitable", McKinsey & Company articles, March 26, 2024, https://www.mckinsey.com/industries/logistics/our-insights/making-green-logistics-services-profitable#/

2 The suboptimal reality of regulation

Within the GreenConnect project, approximately 20 distinct regulatory initiatives addressing GHG emissions across transport chains were identified. Of these, four operate at the global level, while the remainder are primarily EU-wide or national in scope. This distribution reflects the EU's long-standing ambition to act as a global leader in climate policy; however, from the standpoint of international transport chains and globally operating firms, this fragmented regulatory landscape poses potential competitive disadvantages. Specifically, firms based outside the EU – or those able to shift operations to pollution havens – may benefit from more lenient environmental standards.

The lack of coordination between regional and global regulations, and among different actors within the transport chain, introduces inefficiencies that may undermine the effectiveness of climate policy. Currently, the level of ambition in terms of GHG reduction as well as the implied cost of emissions varies across industries, modes of transport and regulatory regimes. This inconsistency risks triggering market distortions, where emission reductions are achieved in suboptimal segments of the chain without regard for economic efficiency or marginal abatement costs. From the perspective of a multimodal transport chain, this may lead to suboptimal behaviour regarding emissions in cases in which commercial logic conflicts with the goals of the regulation.



In some transport chains and routes, the price of green logistics is quite close to traditional services

Tiina Borg, Director of Global Container Shipping, UPM

Regulation, voluntary

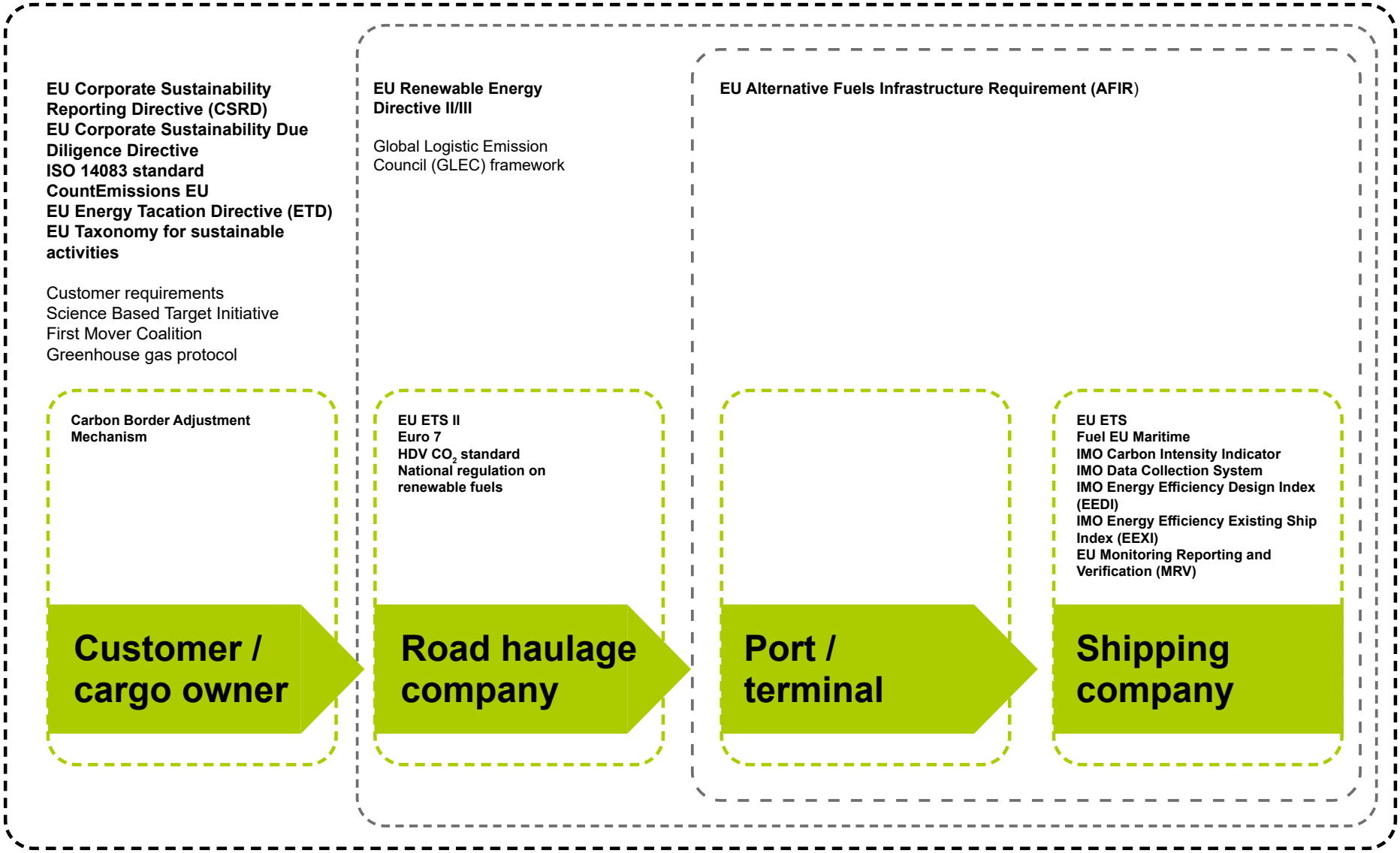
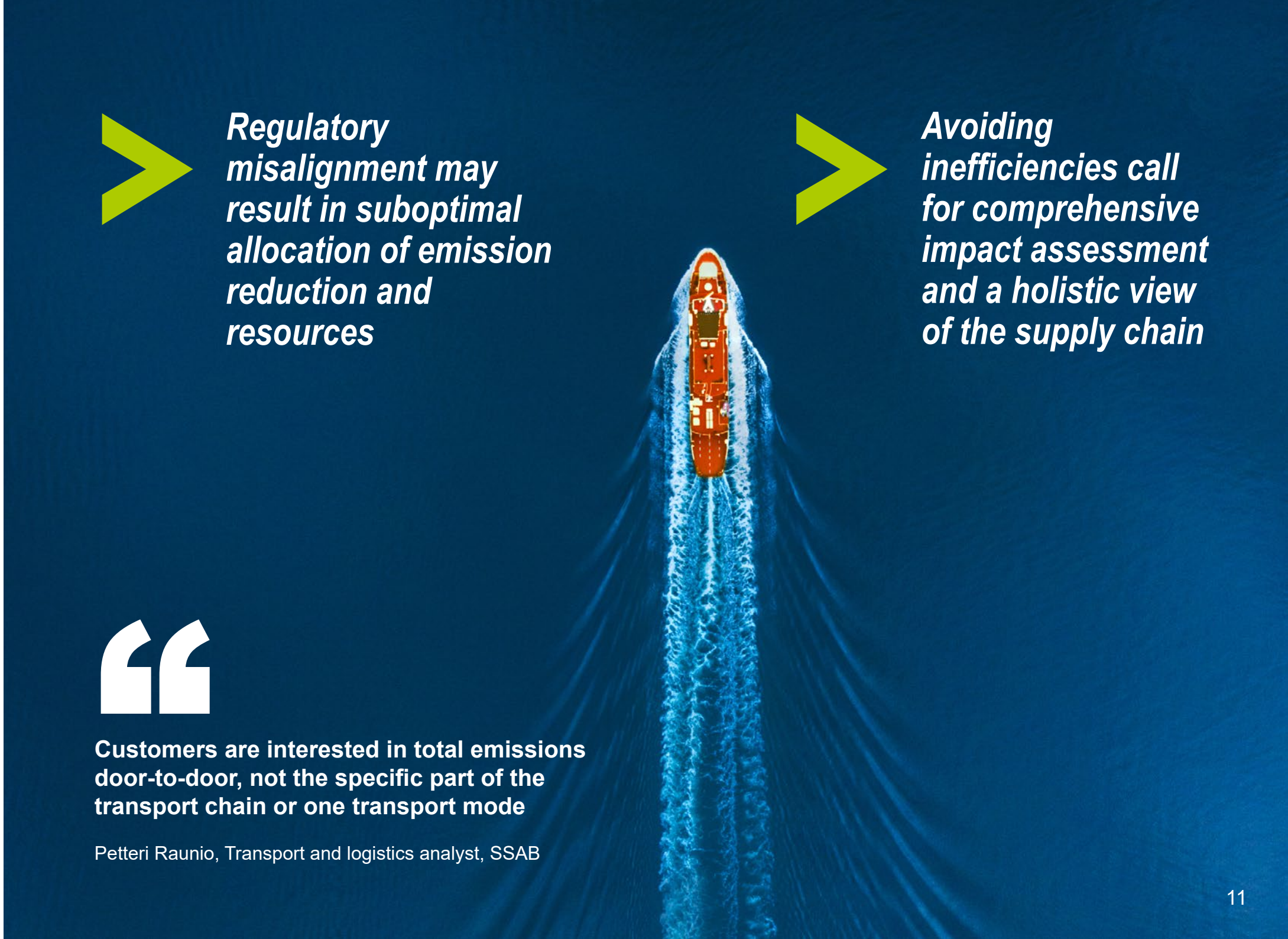


Figure 2. GHG-motivated regulations targeting different parts of the transport chain identified in the project



Regulatory misalignment may result in suboptimal allocation of emission reduction and resources

Avoiding inefficiencies call for comprehensive impact assessment and a holistic view of the supply chain

Customers are interested in total emissions door-to-door, not the specific part of the transport chain or one transport mode

Petteri Raunio, Transport and logistics analyst, SSAB

3 The power of cargo owners

Besides regulations, voluntary and market-driven emission control measures have been increasingly adopted worldwide. Cargo owners as customers of logistics and transport service providers have started to introduce emission reduction targets and strategies for the transportation of their raw materials and products. While interest to cut transport-related emissions is not new, the scope and depth of expectations and target-orientation has recently developed further across industry sectors. If not globally, at least regionally, as in the case of Finland, these can direct decarbonisation demands further beyond regulative standards.

As an increasing number of companies collect and report emission data systematically and openly, it can be expected that emission target-setting strategies and new expectations will devolve to transport chains. This has been evident especially in Europe after EU recently introduced CSRD from 2022 that has made corporate sustainability reporting visible, comparable, transparent, and auditable. Among other things, this includes so called scope 3 emissions, the indirect emissions both upstream and downstream of an organization, including transportation and distribution. This development has made transport industry to be subject to dual impact: sustainability regulations and increasing sustainability demands by the customers. Depending on customer demands, the cargo owners can have substantial impact to decarbonisation efforts.

The Finnish case study conducted in the GreenConnect project seek to understand on the current efforts of cargo owners in transport decarbonisation via collecting a nationally representative sample of 300 Finnish large and medium-sized companies and analysing emission reduction targets and drivers in 2024. Figure 3 shows that the three most crucial driving forces behind companies' pursuit of carbon neutrality are customer demands, responsibility towards the environment, and regulatory requirements. On the other hand, only few consider new business opportunities and especially tightening financial requirements as essential drivers.

In terms of emission reduction targets, about one-third of Finnish companies had set scope 3 targets by mid 2024 and about half of them were set for the year 2030 (see figure 4). Further on, every fifth company had set

Future is more about transport mode -specific emission targets rather than one-fix-to-all

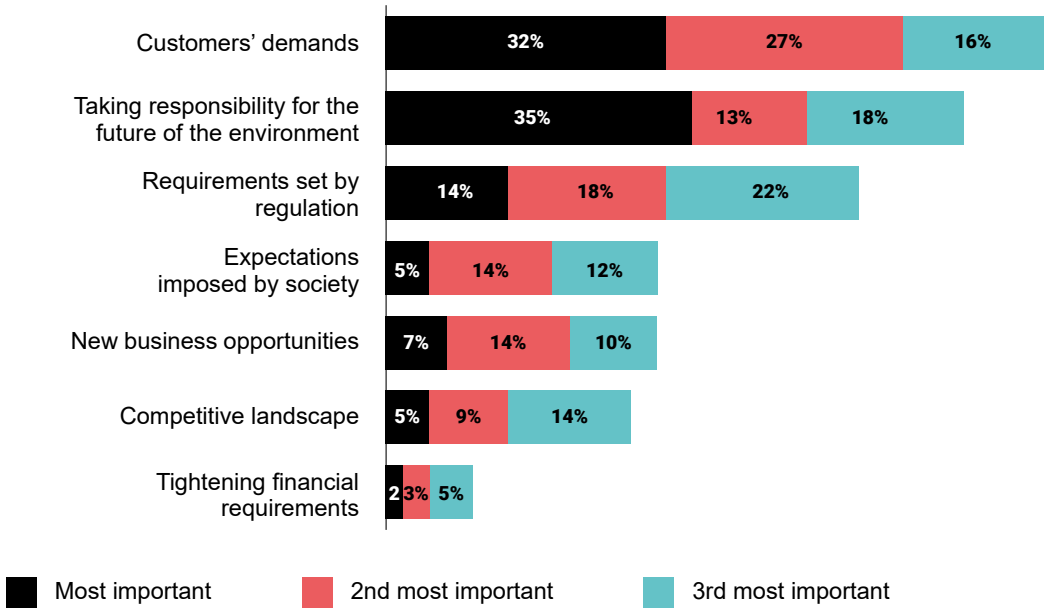


Figure 3. Respondents' views on their company's most important reasons for pursuing low-carbon or carbon-neutrality (n = 300). Do not know/not available are not shown.

31%
Of cargo owners have overall scope 3 emission targets

21%
Of cargo owners have specified targets to scope 3 transportation

60%
Of cargo owners expect transport emission cuts between 30–100% by 2030

Figure 4. Key indicators from the Finnish large and medium-sized industries (manufacturing, construction, and wholesale and retail) in 2024. N = 300. Source: National industry survey by the GreenConnect project in 2024.

scope 3 emission targets for transportation, half of these again for the year 2030. Despite the fact that many respondents of survey had difficulties stating the exact targets, the data suggests that those cargo owners with transport-specific targets expect transport emission reductions relatively soon in the future. Importantly, the level of reductions for transport operations are far from modest: among the cargo owners with transport emission reduction set for 2030, about 60% aim at emission reductions between 30-100%. These levels are more ambitious compared to regulatory levels.

Overall, we consider the results an indication of true efforts to make substantial cuts in transport-related emissions. This can be seen as important emission reduction driver towards the future especially if regulations and standards become stuck or postponed. Realistically, there are also doubts if the 2024 results represent culmination peak in sustainability and future targets are shifted towards more modest levels due to economic, technical and political reasons. In any case, the authors expect more focused and exact targets by cargo owners towards the future. Indeed, as different transport modes have different possibilities and economics for emission reductions, intelligent and sagacious transport customers likely consider transport mode -specific targets rather than one-fix-to-all.

Customer demands is a major driver towards the future

Current economic, technical and political factors can reshape current customer targets towards more modest ambition levels

Most importantly, despite any challenges the difference between regulatory levels and customer demands might create to logistics and transport industry, the difference is a business opportunity: to generate new green solutions and business models that enable concrete differentiation in the market and help them to grow.

The difference between the regulative base-level and customer-driven target level is a business opportunity

4 Optimizing transport chain emissions

Transport chains are motivated to reduce emissions in multiple ways. National and international regulatory frameworks increasingly set reduction targets. At the same time, the increasing environmental awareness of consumers directs the demand for sustainable, environmentally friendly products. These requirements have directed firms to make voluntary commitments to reduce emissions in addition to regulatory requirements.

At the same time, different parts of the transport chain are in different positions regarding their possibilities of reducing emissions. Land-based transport is moving towards electrification, whereas long-distance modes, such as shipping and aviation, are still mostly relying on fossil fuels, with limited commercially or operationally viable alternatives.

Most of the regulation merely an additional cost without impact on pace of emission reduction

Optimal emission reduction strategy prioritizes land-based modes

Green Connect approached emission reductions from the perspective that the entire transport chain would have a joint emission target. In this approach, the transport chain would have the possibility to allocate emission reductions based on cost effectiveness – postponing reductions where they would be more costly. To support decision-making and to estimate the optimal emission reduction pathway for a transport chain, an optimization model was constructed. The model included various emission reduction alternatives, including low-carbon and carbon-neutral fuels and alternative technologies. The analysis was supplemented by including the estimated impacts of various GHG-related regulations, including ETS and FuelEU Maritime.

The higher the share of sea transport, the higher the cost for the transport chain

The level of ambition of emission reduction target has a large cost impact

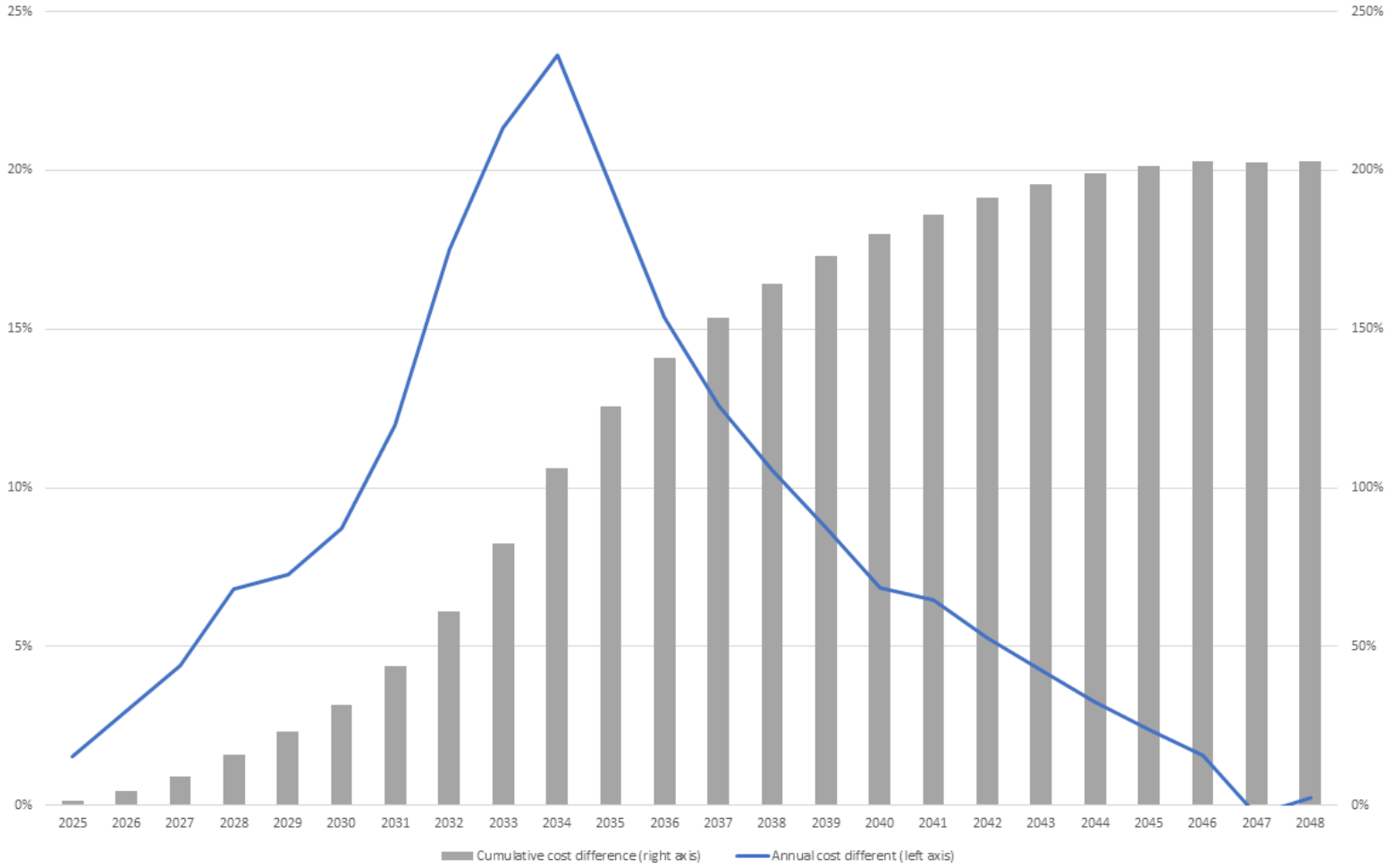
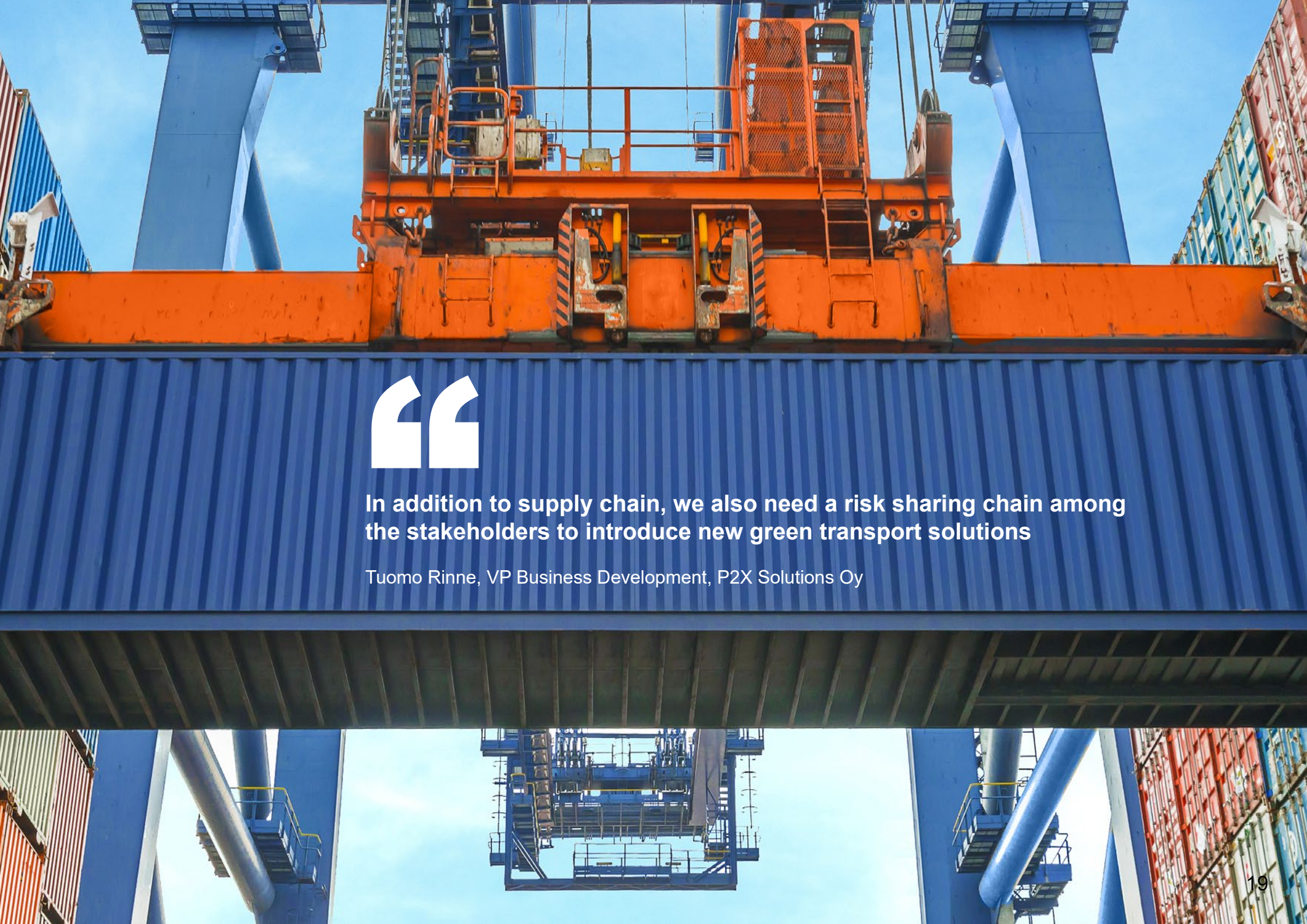


Figure 5. An illustrative example of cost difference between 2035 and 2050 zero carbon emission targets (baseline: annual cost of 2024).



In addition to supply chain, we also need a risk sharing chain among the stakeholders to introduce new green transport solutions

Tuomo Rinne, VP Business Development, P2X Solutions Oy

5 Green logistics can only thrive on value

Green logistics cannot compete on price. When transport and logistics service providers struggle to capture the value from low-emissions, they need to add functional and emotional dimensions alongside price to their value propositions.

Transportation logistics providers are faced with demands from both regulations (see chapter 2) and from customers (see chapter 3 and CCR Insights), and providers must innovate products and services to accommodate them. Green logistics, namely low-emission transportation, is one such innovation that can be achieved among others through reduced fuel consumption, swapping fossil fuels for alternatives, fleet upgrades or operational excellence. Green logistics—especially in the Nordic countries—have been available for years. New is customers' increased demand for them (without the willingness to pay premiums) and the sophistication of demands (e.g. emission reporting). On the value creation front, there are numerous solutions. Yet, logistics providers struggle to capture value they create value for customers—meaning they need to be more innovative on this front, too.

With green logistics, transportation can be reshaped into a value-added activity

Stakeholders interviewed during the GreenConnect project were upfront about the challenge they faced: customers demand green transport solutions across customer segments, but too few would be willing to pay premiums. However, there was also a cost to inaction. Cargo customers could pay for low-emission services or penalties for exceeding GHG limits. Results from the GreenConnect project show that from a value proposition point of view, functional and emotional dimensions were also present—yet latent.

It's insufficient to create value; companies need to devise innovative strategies for value capture, as well

Using the Jobs-to-Be-Done framework, we set out to investigate the requirements for green logistics and uncovered ties to digitalisation and data requirements (see chapter 6). Elements in the functional dimension concerned emissions from a variety of vantage points: prior to green logistics purchase (what can be expected given known parameters such as fleet and fuel performance), during transportation (customers' own allocations reporting) and post-transportation (realised emissions and their quality assurance). Together, these elements not only reveal customers' pain points but also uncover opportunities for service design that captures the value green logistics create for the customer. Another functional element relates to purchase ease—green logistics must become easier and more convenient to buy than competing alternatives. This is particularly critical in the pre-purchase phase, when cargo customers contrast and compare different transportation services. Leveraging the interaction with the customer here is a prerequisite for purchasing.

Price and convenience appeal to the emotional dimension of the customer value proposition, and the goal for green logistics is to elicit positive emotions. Here, trust aspects were predominant. The results from GreenConnect suggest that partnerships with

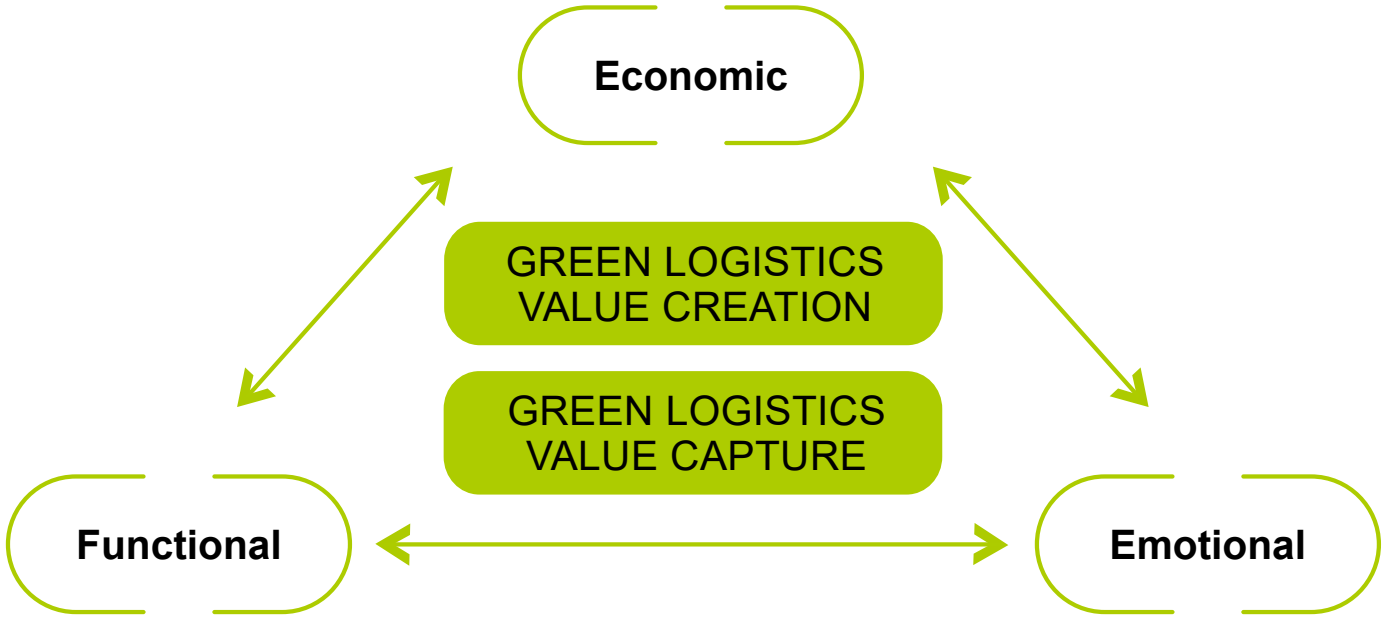


Figure 6. Green logistics value proposition dimensions.

trusted partners are key because they manifest themselves in reliable service operations. This, in turn, encourages commitment to decarbonisation efforts from both logistics service providers and cargo owners.

Going forward, these results would inform providers to structure coherent value propositions to capture the value afforded by green logistics. Only through combining the different value proposition dimensions will providers and cargo owners be able to innovate on the value capture side, too.

To capture value, value propositions cannot rest on price alone but also require functional and emotional dimensions; all three elements reinforce each other

6 Turning emissions data into customer value

Emissions data are rapidly evolving from a regulatory requirement into a source of customer value. When structured and leveraged systematically, they can support better reporting, operational optimisation, new service models, and market differentiation.

As reporting requirements tighten and supply chain decarbonisation accelerates, customers increasingly expect emissions data that are not only accurate but also useful, actionable, and aligned with their own climate targets. This turns emissions measurement from a compliance task into a strategic capability. When structured and developed systematically, emissions data can facilitate better reporting, improve operational performance, support new service offerings, and ultimately differentiate companies in the market.

Figure 7 illustrates this transformation by showing how emissions data evolve through five stages – credible, transparent, scalable, optimisable, and differentiable – each unlocking new forms of customer value.

1. Credible: Establishing the foundation through verified data

The first stage in the figure – **CREDIBLE** – forms the essential baseline. Verified, standardised emissions data remove uncertainty and eliminate greenwashing risks.

For customers, credible data ensure reliable sustainability reporting, particularly for Scope 3.

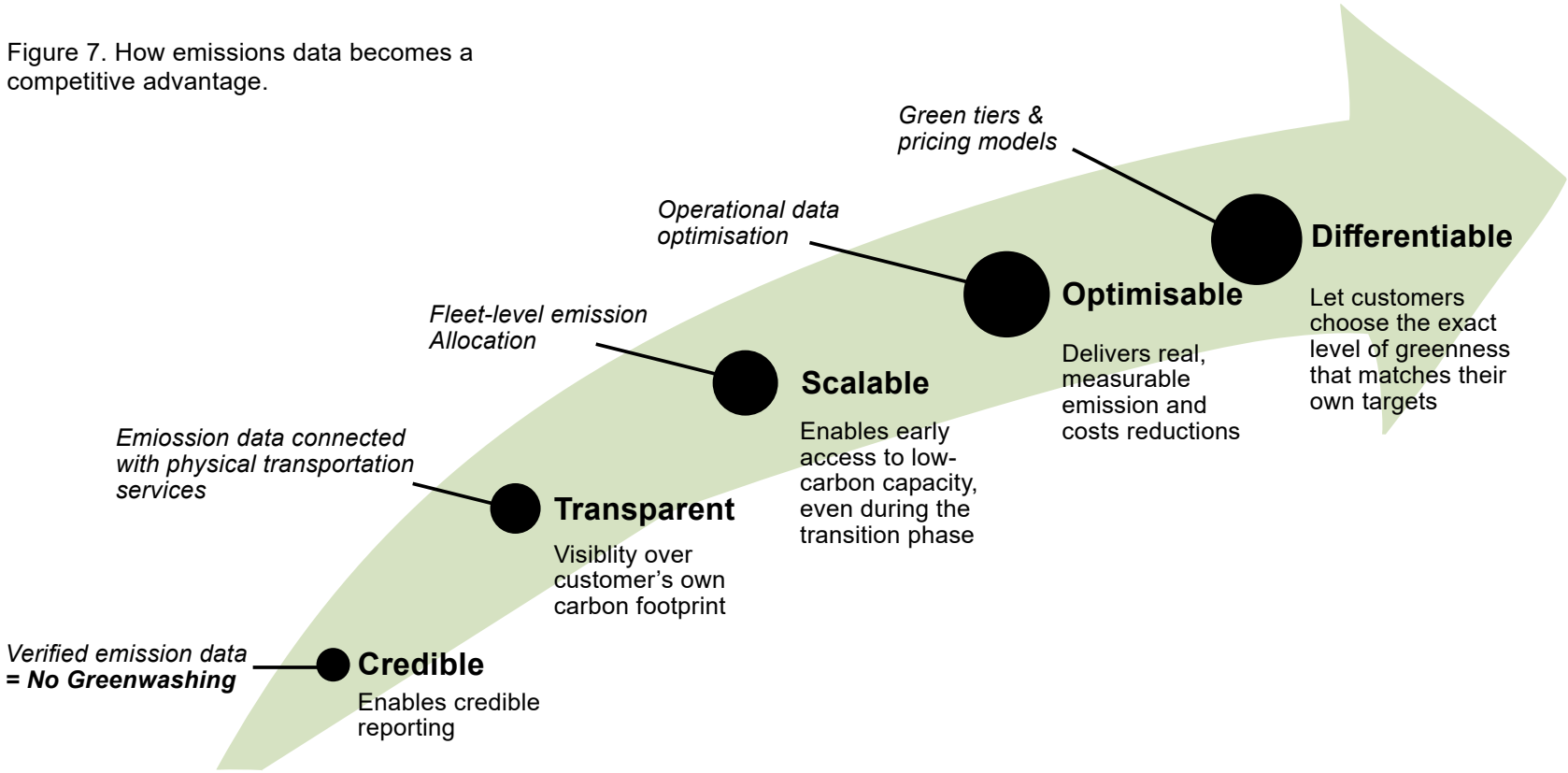
Credibility is essential not only for compliance but also for building confidence in subsequent data-driven services.

2. Transparent: Increasing visibility over the customer's footprint

The next stage is **TRANSPARENT**, where emissions data become more visible, interpretable, and tied to actual transport activities. Transparency goes beyond providing annual emission totals. It means presenting data that are traceable across routes and transport events.
When emissions data are connected with physical transportation services, customers can begin to understand the following:

- how their logistics choices influence emissions and
- where emission hotspots occur.

Figure 7. How emissions data becomes a competitive advantage.



This stage enhances customer value by allowing more informed decision-making and deepening the dialogue between logistics providers and their clients.

3. Scalable: Enabling early access to low-carbon capacity

The third stage, **SCALABLE**, enables early access to low-carbon capacity even during the transition phase. This refers to the ability of operators to use fleet-level emission allocation, allowing them to sell "green capacity" even if all individual journeys are not yet decarbonised. With mass balance approaches or fleet-level carbon-attribute models, we derive the following benefits:

- customers can secure low-carbon transport options earlier,
- providers can balance supply and demand for greener services, and
- low-carbon capacity can be bundled, scheduled, or allocated more efficiently.

4. Optimisable: Delivering measurable emissions and cost reductions

At the fourth stage called **OPTIMISABLE**, emissions data become a tool for operational optimisation. By integrating emissions data with speed profiles, routes, port congestion, fuel consumption, load factors, as well as weather and market data, companies can begin

implementing practices such as Just-in-Time or virtual arrival and load and route optimisation.

This stage provides logistics companies as well as customers with quantifiable improvements in both sustainability performance and cost efficiency, that is:

- lower emission per shipment,
- more predictable performance, and
- lower fuel costs.

5. Differentiable: Creating tailored green service offerings

At the **DIFFERENTIABLE** stage, emissions data support fully developed commercial offerings and green-tiered pricing models. This allows customers to choose the exact level of greenness that matches their own targets, making customisation the key differentiator. Differentiation may include the following:

I. Green delivery profiles:
Customers can choose a service level that optimises for one more of the following:

- the share of alternative fuels,
- emissions,
- a fast, green transport option ("fast & green"), and
- full fossil-free delivery.

II. Company-specific green transport quotas:
Customers can reserve, for example, 1,000 tonnes of fossil-free transport per year.
→ Easy to purchase as an annual budget.

III. Company-specific service-level agreements (SLAs):
The service commitment includes a minimum emission level per tonne as well as penalties/credits linked to performance.

IV. Joint optimisation with the customer:
The supply chain is analysed together, and minimum emission and schedules are jointly agreed.

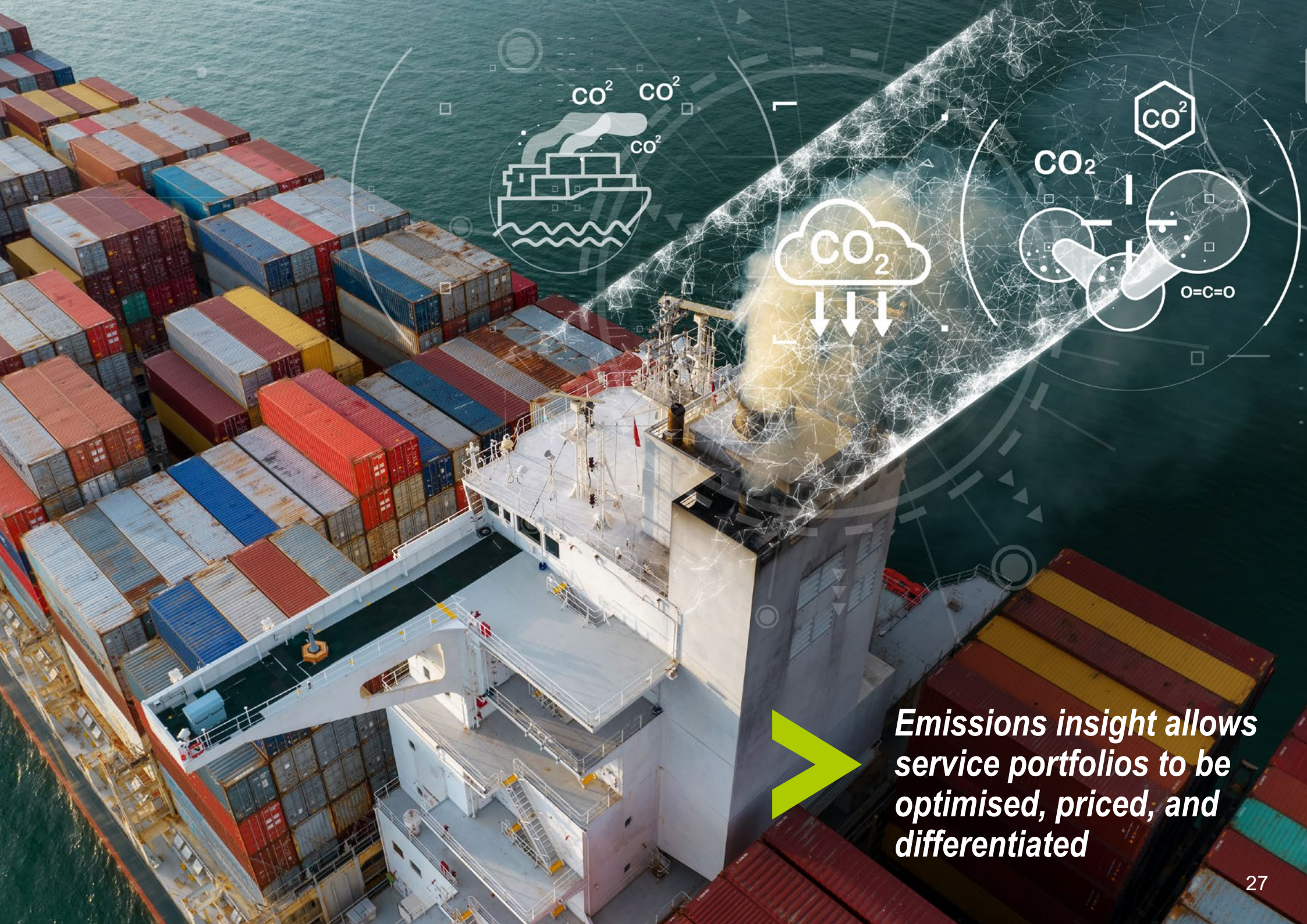
V. Compensation models:
In some chains, a customer may indicate certain preferences such as the following:

- the emissions are first minimised using data or
- the remaining emissions are compensated through agreed methods.

Differentiable offerings create value by furthering the following:

- market differentiation for transport providers,
- customisation for sustainability-driven customers,
- new revenue models and green premiums, and
- stronger strategic partnerships across the supply chain.

Emissions data, when turned into insight, are reshaping the logic of value creation



Emissions insight allows service portfolios to be optimised, priced, and differentiated

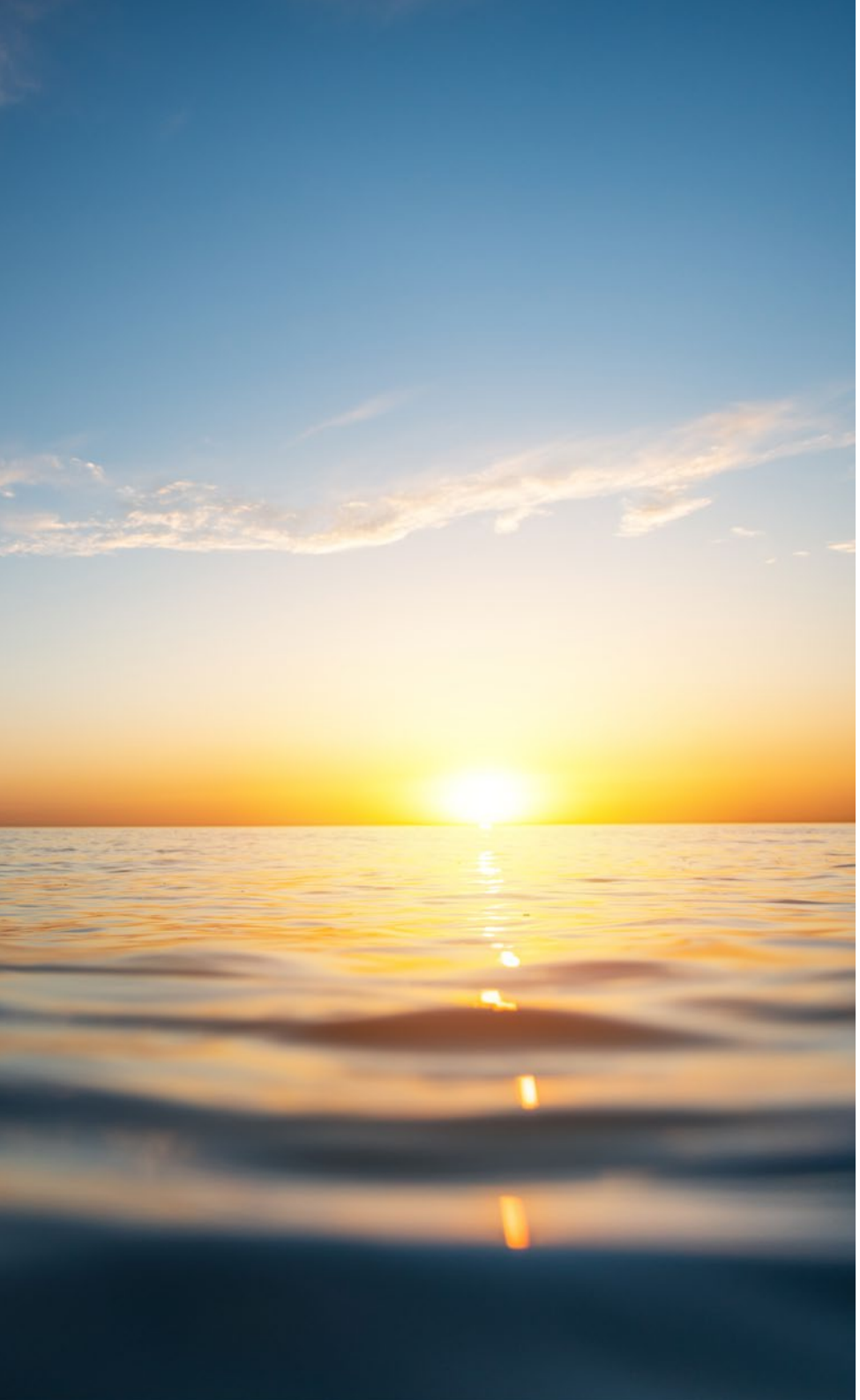
7 Collaboration, Commitment and Coalitions – Key Drivers of Decarbonisation

Transportation decarbonisation represents a significant transformation for all stakeholders in the transportation chain. To achieve significant emission reduction impacts, companies must reassess existing processes rather than merely introducing new technologies into the current operational frameworks. The processes themselves must evolve in tandem with technological advancements.

Effective transportation decarbonisation requires a holistic overhaul of existing processes for significant emission reduction impacts

Addressing the complex challenges of transportation decarbonisation requires diverse areas of specialisation. The need for expertise underscores the importance of **collaboration** in developing green transport concepts and networks. Although multiple technologies for decarbonisation are available, the primary obstacles that companies must tackle are not technical but related to business. Thus, collaboration is the first key driver and crucial for identifying mutually beneficial, economically viable solutions throughout the transport chain.

Only economically viable arrangements can scale effectively and drive real reductions in GHG emissions. Coordination across various transport modes often results in optimal economic solutions, as demonstrated in earlier sections of this report. By fostering collaboration,



Sustained commitment across the transport chain and collaborative long-term strategies are essential for accelerating decarbonization

individual actors across the transportation chain can uncover the most financially sound decarbonisation strategies. This joint effort enhances the visibility of different perspectives, deepening our understanding of interorganisational dynamics and our choices' effects on one another.

While collaboration may manifest as a contractual matter, at its core, it is a mindset shift. The historical lack of cooperation across transportation chains presents challenges, but these can be overcome. Transportation service providers can facilitate collaboration by supporting their customers throughout the decision-making process – before, during and after service delivery – while clearly communicating the emission reduction impacts of their services. Open dialogue regarding expectations and operational constraints is essential for identifying potential solutions.

Commitment is the second key driver in transportation decarbonisation. Given the scale and complexity of this challenge, sustained commitment across the chain is vital for making progress. Significant investments are needed, particularly in equipment and fuels, and commitment to decarbonisation objectives helps manage the risks and uncertainties associated with these investments.

Decarbonisation of freight transport is a journey that takes time. All stakeholders must buy into a long-term strategy to translate emission reductions into value. Roadmapping or phased implementation plans can help cultivate joint commitment among transportation chain partners. For transportation service providers, engaging with early adopters can foster innovation through mutual trust and shared responsibility.

For example, customers with ambitious decarbonisation roadmaps are already building strategic partnerships with transportation service providers to secure access to lower-emission services, anticipating a future scarcity of such options when a larger volume of customers is willing to commit to decarbonised services. Moreover, internal accountability for decarbonisation is critical; aligning key performance indicators (KPIs) and organisational goals is essential for driving progress.

Finally, **coalitions** of stakeholders with similar GHG reduction ambitions are the third key driver and vital for effective transportation decarbonisation. Formed by two or more companies sharing common goals, these coalitions amplify impact and leverage. Whether formal or informal, coalitions allow participants to combine their unique areas of expertise and networks, facilitating innovative solutions for emission reductions.

Sharing expertise and insights in coalitions helps uncover business opportunities and identify actionable initiatives

The success of coalitions hinges on aligned interests and shared objectives, with members actively scouting for potential partners. By operationalising collective commitment through targeted, actionable initiatives, coalitions strengthen decarbonisation efforts. Exchanging insights and information within these groups mitigates risks and uncertainties, promoting a deeper understanding of one another's needs and requirements. Ultimately, the shared insights position participating companies to better anticipate future developments and unlock emerging business opportunities.

All in all, the three key drivers – collaboration, commitment and coalitions - are tightly interconnected and can have synergistic effects on transportation decarbonization. In particular, commitment is critical for collaboration and coalitions to flourish.

Evidently, the green solutions require enormously collaboration in transport chains

Jani Arala, Maritime Commercial Manager, Gasum Oy

Collaborative approach to transport chains enables more economically viable emission reductions

Transportation chains are undergoing transformation

Shared commitment to emission reduction and longer-term contracts are key to accelerating decarbonisation

Joint understanding of the level of ambition

Each party brings one's own expertise to decarbonisation

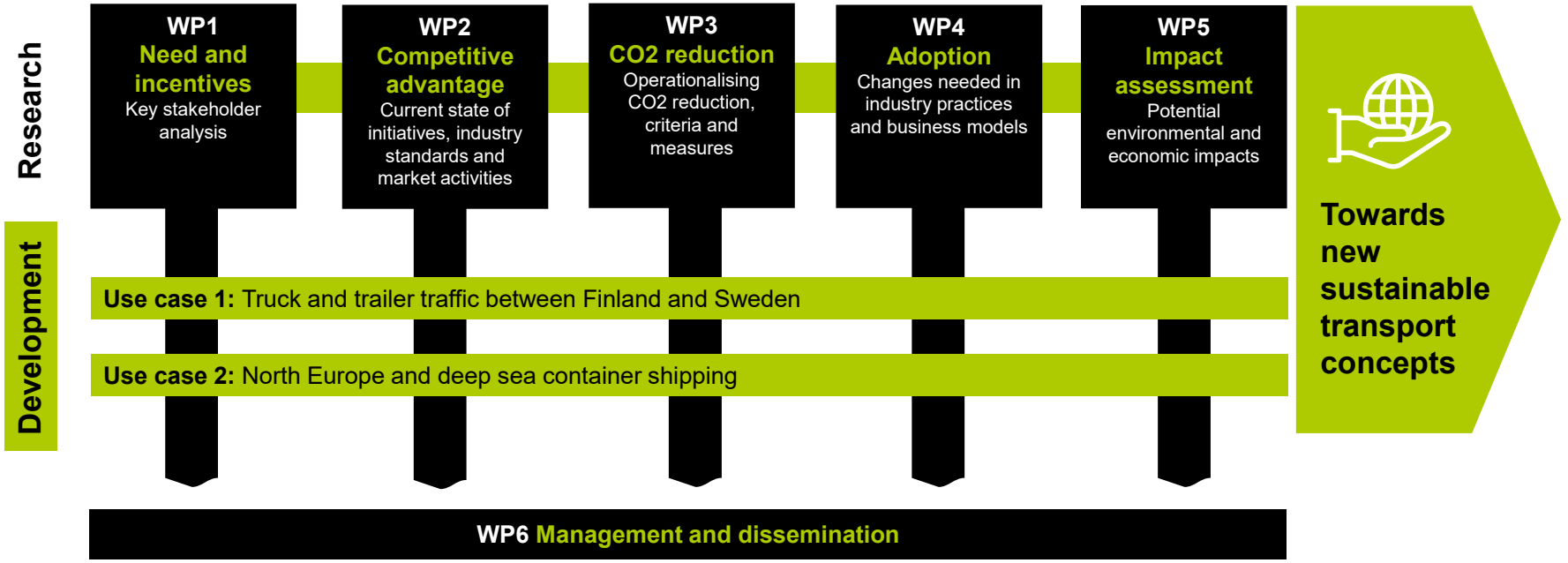
Transportation chain actors need to join forces

Dialogue with various stakeholders to find partners that share similar decarbonisation ambitions

Risk- and value-sharing models – proven mutual economic and environmental benefits

Figure 8. Interconnected key drivers of decarbonisation.

Project structure and work packages



Industrial partners in the GreenConnect project

GreenConnect has been co-financed by Business Finland (https://www.businessfinland.fi) and has been part of Wärtsilä Corporation's Zero Emission Marine (ZEM) program (https://www.zemecosystem.com).

BUSINESS FINLAND

ZEM ECOSYSTEM

TSE project team

Taina Eriksson	WP1 and WP2 leads
Riikka Franzen	WP5 lead
Marikka Heikkilä	WP4 lead
Kristel Edelman	Expert
Titiana Ertiö	Expert
Fuad Khan	Expert
Sini Nordberg-Davies	Expert
Junya Otani	Expert
Antti Saurama	Project leader and WP6 lead
Tomi Solakivi	WP 3 lead

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Public dissemination activities

Project findings and results have been *externally* disseminated via the following forms and events:

- Mid-term project event in Helsinki 28.11.2024 in collaboration with Suomen Osto- ja Logistiikka yhdistys LOGY ry: Vihreä siirtymä ja päästövähennykset toimitusketjuissa
- Academic paper presentations in seven scientific conferences
- Collection of published academic papers in Turku School of Economic's website: utu.fi/ccr
- Project presentations in public seminar events during the project life-span
- Project highlights in social media

Scientific conferences including presentations of project results

The 38th Bled eConference, Maribor, Slovenia, in June 2025.

The International Association of Maritime Economists (IAME) annual conference in Bergen, Norway, in June 2025.

World Conference on Transport Research Society (WCTRS) SIG A2 – Maritime Transport and Ports, Antwerp, Belgium, in May 2025

The 37th Bled eConference, resilience through digital innovation: enabling the twin transition, Maribor, Slovenia, in June 2024.

The International Association of Maritime Economists (IAME) annual conference in Valencia, Spain, in June 2024.

NOFOMA (The Nordic Logistics Research Network) annual conference in Stockholm, Sweden, in June 2024.

The International Association of Maritime Economists (IAME) annual conference in Long Beach, USA, in September 2023.

List of publications produced by the project

Academic peer-reviewed full papers

Solakivi T, Saurama A & Ojala LM (2025). Contradictory emission regulations across transport chains: challenges for international supply chains. *International Journal of Physical Distribution & Logistics Management*, Vol. 56 No. 11, pp. 1-33 https://doi.org/10.1108/IJPDLM-12-2024-0482

Heikkilä M, Edelman K & Franzén R (2025). Green(ing) of transport chains: implications to business models, In *Proceedings of the 38th Bled eConference*, June 8 – June 11, 2025. University of Maribor University Press, Maribor, Slovenia https://doi.org/10.18690/um.fov.4.2025.26

Eriksson T, Ertiö T & Khan F (2025). Stakeholder requirements for goods transportation decarbonization – An examination of transportation chains. *Cleaner Logistics and Supply Chain*, under review (submitted 12/25)

Solakivi T, Otani J, Saurama A, Ojala L (2025). How to reduce transport emissions with alternative fuels and power systems – an optimization approach on a transport chain level. *Transportation Research Part E*, under review (submitted 12/25)

Heikkilä M (2025). Chain-Level business model patterns for the green logistics transition. *Business Strategy and the Environment*, under review (submitted 11/2025)

Otani J, Solakivi T & Ojala L (2025). Combined Impacts of EU and IMO Regulations on GHG Emission Reductions in Maritime Transport. *Maritime Policy & Management*, under review (submitted 9/25)

Khan F, Eriksson T, Heikkilä M, & Ertiö T (2024). Exploring the Sustainable Value Propositions in Logistics Services – How digitalization and data support greener services?, In *Proceedings of the 37th Bled eConference*, resilience through digital innovation: enabling the twin transition, June 9 – June 12, 2024. University of Maribor University Press, Maribor, Slovenia https://urn.fi/URN:NBN:fi-fe2025082790133

Other academic papers

Solakivi T, Otani J, Saurama A, Ojala L (2025). How to reduce transport emissions with alternative fuels and power systems – an optimization approach on a transport chain level. IAME 2025 conference. Extended abstract

Saurama A, Ertiö T, Solakivi T (2025). The relevance of cargo owners' emission reduction targets to decarbonize shipping: A case study from Finland. IAME 2025 conference. Extended abstract

Otani, J (2025). Economic incentives for ships using alternative fuels at a fleet level. IAME 2025 conference. Extended abstract

Saurama A, Solakivi T (2024). Comparison of the anticipated shipping emission reduction pathways and targets by regulators and manufacturers by 2030. IAME 2024 conference. Extended abstract

Solakivi T, Saurama A, Otani J (2024). The role of shipping in emission reductions of a multimodal transport chain. IAME 2024

conference. Extended abstract
Solakivi T, Saurama A, Ojala L (2024). Emission regulation on a transport chain level - Implications for an international supply chain. NOFOMA 2024 conference. Extended abstract

Solakivi T, Saurama A, Saarni J & Ojala LM (2023). Emissions allocation optimization for cargo and passengers in Ropax-vessels. IAME 2023 conference. Extended abstract.

Managerial reports and other publications
Heikkilä M, Edelman K & Franzén R (2025). Green shift in transport chain: Business model renewal. Project managerial report

Solakivi T (2025). Reducing emissions on a transport chain level – an optimization approach. Project managerial report

Eriksson T & Ertiö T (2024). Strategic requirements for green transportation concepts - Opportunities in the value chain. Project managerial report

Ertiö T & Saurama A (2024). Outlook on Finnish cargo owners' scope 3 emission reductions. CCR Insights 2/2024. University of Turku, School of Economics. 28pp. https://www.utu.fi/sites/default/files/public%3A//media/file/ccr_insights_2_2024.pdf

(List of publications as of 12/2025)

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