

The most important sustainability technology?

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For much of the past decade, the maritime industry's decarbonisation debate has focused on technologies, fuels, and regulations. Discussions often revolve around alternative energy sources, batteries, shore power, emissions trading, and carbon intensity indicators. Yet, one critical element is frequently overlooked. New equipment and systems undoubtedly support the transition, but it is the people using them who translate environmental ambitions into measurable outcomes.

Reducing CO₂ Emissions in Island Ferry Traffic (REISFER), a project of the Interreg Central Baltic programme, has provided a unique opportunity to explore this challenge in practice. Bringing together ferry operators, researchers, and public authorities from Estonia, Finland, Sweden, and Åland, the project has demonstrated that the future of sustainable ferry transport depends as much on human expertise, collaboration, and organisational learning as on novel technology.

A unique and complex challenge

Island ferries rarely receive the same attention as large ocean-going vessels and international shipping routes. Their importance to coastal communities is, however, difficult to overstate. Across the Baltic Sea region, they provide essential links between islands and the mainland, supporting daily mobility, tourism, local economies, and access to public services (including education and healthcare), with around 63 million passengers travelling on board these 'community connectors' annually in the Central Baltic region alone.

Unlike deep-sea shipping, island ferries operate under highly specific constraints. Routes are short, schedules are fixed, port calls are frequent, and the weather can change rapidly. Additionally, ferry operators must simultaneously maintain

safety, punctuality, and service reliability. This creates a unique challenge that is far more complex than many policy discussions acknowledge: limited opportunities for traditional fuel-saving approaches make successful decarbonisation largely dependent on operational practices and day-to-day decision-making.

Environmental performance cannot be engineered

Through interviews with captains, mates, and engineers across ferries operating in Estonia, Finland, Sweden, and the Åland Islands, REISFER has produced the first cross-border study focusing specifically on crews' perceptions of decarbonisation. By giving the seagoing staff an opportunity to share their experiences and views, one of the strongest messages from the project emerged: decarbonisation cannot be viewed solely as a technological challenge.

Across all participating countries, crews strongly supported emission reduction efforts. In practice, ferry crews are continuously making decisions that take into account weather conditions and passenger expectations, vessel characteristics, and operational constraints to balance fuel efficiency with safety and service reliability.

The interviews revealed that efficient vessel operation is learned through experience and familiarity with specific routes, and it doesn't rely on standardised procedures

alone. Slight adjustments in vessel handling and daily operations can collectively lead to meaningful reductions in fuel consumption.

Many participants also highlighted the importance of learning from colleagues and exchanging experiences. This finding is particularly important because it challenges a common assumption in decarbonisation discussions: that environmental performance can simply be engineered into operations through technology. This suggests that the human element remains at the centre of maritime sustainability, even as vessels become increasingly digitalised.

Tech helps, but people deliver the results

REISFER has provided numerous examples of technical innovation. Hybrid ferries operating in Finland have demonstrated significant reductions in fuel consumption. Sweden has successfully implemented an electric ferry solution on the over 50-year-old *Silverö*. LED lighting and updated HVAC systems provide additional emission reductions by using less energy. Operators throughout the region are also experimenting with fuel monitoring systems and eco-sailing practices.

These developments are encouraging by all accounts. However, the interviews reveal an important lesson: technology provides opportunities; people create outcomes. Captains and engineers consistently



Photo: Scania

emphasised that monitoring systems only become valuable when crews understand how to interpret and act on the information they provide. As such, these solutions still do not replace professional experience. Similarly, successful electrification requires more than just installing batteries. It requires structured learning, training, and adaptation of new operational routines.

In many cases, crews also highlighted the need to better understand why certain measures are introduced in the first place. When environmental goals are clearly communicated and linked with operational realities, acceptance and engagement improve significantly.

Too complex to solve individually

Perhaps the most important lesson from REISFER extends beyond technology altogether. It highlights the value of cross-border cooperation. The project has shown that ferry operators across the Baltic face remarkably similar challenges despite operating in different national contexts. Weather varies. Governance structures differ. Fleets range from aging diesel vessels to modern hybrids. Yet, crews consistently identified similar obstacles and similar solutions.

The project has created opportunities for operators, researchers, and authorities to learn directly from one another. It is the collective knowledge that cannot be replicated through modelling or policy analysis alone. Practices that prove effective on a Finnish route may inspire solutions in Estonia. Experiences with electrification in

Sweden can inform future investments elsewhere. Åland's operational insights provide valuable perspectives for decision-makers throughout the region.

Maritime sustainability challenges are often too complex for any single organisation to solve independently. Collaboration accelerates learning and reduces the risks associated with innovation. One of the most valuable aspects of the initiative is creating a basis for future decarbonisation steps. Maintaining and expanding such cooperation networks may be just as important as developing new technologies.

A transition – in knowledge, culture, and operational behaviour

The ferry sector's decarbonisation journey is far from complete. Experience from REISFER suggests that future success demands organisational adaptation, continuous learning, and effective collaboration among researchers, policymakers, operators, and crews. The Baltic region's ferry operators already show that meaningful emission reductions are possible today. The next challenge is ensuring that the knowledge generated through projects such as REISFER continues to be shared, developed,

and translated into everyday practice across the maritime sector. Three priorities appear particularly important.

First, involve crews early while introducing new technologies and operational procedures. Different vessels and different routes require different approaches, and crews possess first-hand experience. Second, training deserves greater attention. The maritime sector is investing heavily in new technologies, yet structured education on operational decarbonisation often lags. And third, policymakers and transport authorities should recognise the diversity of ferry operations when designing sustainability measures. Decarbonisation pathways for different routes must reflect operational realities.

Future cross-border projects should continue fostering peer-to-peer learning. Lines learn exceptionally well from other ferry companies facing similar practical challenges. The maritime industry's technological transition is equally a transition in knowledge, culture, and operational behaviour. As the ferry sector continues its path towards lower emissions, the human factor may prove one of the most important sustainability technologies of all. □



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