Ready to roll?

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The Baltic Sea liner market's ferry and ro-ro sectors are highly developed, offering abundant and frequent connections and services, handling the lion's share of the regional intra-short sea shipping trade. Within the Baltic, the island-like Finland heavily depends on such services. Due to the country's geography, scattered population, long distances and thin logistical streams, road haulage predominates as the overland transport mode.

Along with the greening of the maritime sector, ports, terminals, shipowners and operators are expected to adjust their operations in line with environmental and sustainability considerations. How could ro-ro ports, apart from providing necessary quayside facilities, extend their role and responsibility further as an integral part of the entire transport chain, alleviating externalities generated beyond the port boundaries, further to hinterlands and land-based modes?

Various mechanisms and measures available to ports have been identified: pricing tools, investments in technology and dedicated infrastructure, and regulatory instruments. Still, **a comprehensive study** conducted among global ports indicates that only about a fifth of them implemented measures to improve the environmental performance of hinterland transport.

Unexploited potential

Typical challenges and bottlenecks caused by the entire ro-ro multimodal transport chain encompass uncoordinated road traffic (ebbs and flows of heavy-duty lorries) and congestion within ports at ship arrivals/departures as well as in urban areas and their main approach roads. These problems are unlikely to diminish with the expansion of residential and recreational areas closer to attractive seafronts and the, in many cases, subsequent shrinkage of the port facilities and stowing areas. Furthermore, ferries and ro-ros are likely to grow in cargo capacity, further adding to the overcrowding of the road network.

Traffic jams, in turn, give rise to idling and unnecessary emissions. Due to relatively short distances over sea and ship turnaround times in ports, the wheeled cargo segment is more time-sensitive regarding timely and efficient loading and unloading procedures, as delays may be difficult to compensate for with speed out at sea. Accumulation of trucks in the harbour area and using it as a waiting/parking space long before the actual departure is also an unwanted phenomenon. This is mainly a consequence of a limited number of dedicated resting and parking areas for trucks in the port's vicinity.

Ports are increasingly implementing innovative technologies and digital applications, providing new opportunities for greater collaboration, sustainability, safer and better-optimised operations, and improved business performance. However, **most research** and development efforts have focused on measures and solutions introduced by large container ports, while (smaller) ro-ro ports and terminals have received lesser scrutiny. Hence, the potential of inter-organisational alignment and integration, data sharing, communication, and collaboration among actors within the entire end-to-end (intermodal) transport chain has not been fully exploited.

An ideal situation

Introducing an integrated just-in-time (JIT) solution (or 'optimal arrival time') offered by ro-ro shipping lines (in collaboration with ports specialised in taking care of wheeled traffic) to their road haulage customers would benefit all stakeholders' operations and performance.

The general concept of JIT truck arrival is to introduce a slot system (already in use in bigger container ports) to proportionally distribute the arrivals of lorries approaching the terminal for departure. Truck drivers would be informed and called in when their vehicles could drive to the port area through a dedicated application or another interface. Such interfaces could be integrated with other applications used by truckers for relevant procedures and information like automated remote vehicle and driver check-in, gate access and booking verification, dynamic situational awareness (traffic disturbances, weather conditions, delays, etc.), and other services (location of close-by tanking stations and rest areas). To a pre-determined degree, the given slot times would enhance the arrival of specific trucks in certain batches, orderly and timely, befitting the actual – optimal – onboard stowing plan and order.

The development and scope of the JIT concept could be taken even further. The language proficiency of a fair share of truck drivers is low, causing unnecessary communication barriers (primarily upon port arrival). Furthermore, these people may use a certain ro-ro service sporadically and therefore be unfamiliar with the settings and procedures, complicating the situation. A language translation solution interface integrated with the JIT concept could facilitate communication and comprehension of relevant information, streamlining the cargo flow.

An ideal situation would be when trucks could wait for their slot announcement outside the port at a dedicated parking area. The distance to the harbour should be reasonable and the driving time easily assessed and predictable, both under normal traffic circumstances and at peak hours. Even better, an adaptable, smart traffic light management



Photo: Jarmo Piironen/Port of Turku

system would facilitate smooth traffic flows and hinterland access. Frequent stops, idling, and accelerations due to uncoordinated/unsynchronised traffic light intervals and prioritisation would affect travel time and increase emissions and air pollution. Both elements are at least partly the responsibility of municipalities: to find and point out suitable places for truck parking and manage the traffic flows whilst minimising the externalities caused. While these may not belong to the municipalities' scope 1 (or 2) emissions, this is a prime example of how the available infrastructure impacts the value chain (scope 3) footprint.

Implementing a JIT solution would bring many benefits. Cities would get better air quality and enjoy less congested roads, becoming more pleasant places to live. Shipping lines would take advantage of better fleet utilisation by maximising the use of their lane metres cargo capacity while minimising port stays. Specific cargo-loading would be optimised, which will only grow in importance as more and more electric vehicles that will require charging while en route between ports will be transported in the future. Road haulage companies will improve their operational efficiency and cut fuel bills. Last but not least, ports will gain the upper hand by offering swifter handling and making more of their existing (hardware) infrastructure. Environmental gains cannot be overstated in each of these cases.

Holistic abatement gaps

Actors across society, whether private or public, are implementing, revising, and augmenting their sustainable development strategies, which will affect the transport sector, a significant greenhouse gas emitter. The development of the transport system is a complex process, engaging several multilevel actors striving to satisfy alternative traffic demands, contributing to unhindered node accessibility and efficient and smart transport/mobility solutions.

Mitigating ro-ro transport's externalities seems siloed, limited to each actor's measures. This situation leaves holistic abatement gaps in the transportation systems and logistics chains. Poor or modest collaboration and alignment of activities and measures among players, who do not reach beyond their organisational scope and boundaries, is one of the main culprits here. Ferry companies, port authorities, terminal operators, road hauliers, and digital solution providers are central in improving the overall performance of ro-ro operations and services. That said, there are other, more indirect stakeholders whose engagement and input cannot be undermined or overlooked.

It may not be evident for a political decision-maker why and how the municipality could engage itself stronger to enable better functioning and more sustainable ro-ro operations. Still, it should – as it would ultimately contribute to the municipality's own sustainability goals and strategies. ■

The idea and concept of JIT truck arrival in ro-ro ports have been researched as part of the Smart Terminals (SMARTER) project. It is a Business Finland-financed initiative aiming to develop solutions that benefit ferry and ro-ro harbours by optimising operations to reduce emissions. The project seeks broad societal influence by providing research-based recommendations on business and data usage & sharing – in and outside the port environment – to prepare for future steps towards smart and autonomous maritime transportation. SMARTER focuses on experiments speeding up ship turnaround times, optimising truck traffic, and improving terminal passenger flows. The project consortium includes cruise-ferry and ro-pax operators in trade between South-West Finland and Sweden, port authorities, research institutions, and various digital solution providers.