



AutoMated Vessels and Supply Chain Optimisation for Sustainable Short SEa Shipping

D6.4: Report on the evaluation of the MOSES matchmaking platform

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List of Acronyms

Abbreviation / acronym	Description
eFTI	Electronic Freight Transport Information
Dx.y	Deliverable number y belonging to WP x
EC	European Commission
ILME	Greek Institute of Logistics Management
LTL	Less than Truck Load
PCT	Piraeus Container Terminal
SI	Success Indicator
SSS	Short Sea Shipping
WP	Work Package

Executive Summary

The overarching goal of the MOSES project is to bolster the Short Sea Shipping (SSS) component within the European supply chain and optimise logistics operations in general. The initiative is strategically designed to confront and mitigate the vulnerabilities and operational challenges associated with the functioning of large containerships, aiming for a comprehensive enhancement of the maritime transport sector.

MOSES adopts a dual-pronged strategy to achieve its objectives. The first facet of this strategy is dedicated to curtailing the total time required for large containerships to berth at the Trans-European Transport Network (TEN-T) Hub Ports. Recognizing the pivotal role these major ports play in facilitating seamless connectivity across Europe, the project focuses on streamlining and optimizing the processes involved in the arrival, docking, and unloading of large vessels. By reducing the turnaround time at these critical hubs, MOSES aims to enhance the efficiency and overall performance of the European supply chain.

Simultaneously, the second component of MOSES' strategy is geared towards promoting and incentivizing the utilization of Short Sea Shipping (SSS) feeder services, particularly targeting small ports with limited or nonexistent infrastructure. In doing so, the project seeks to diversify and expand the network of maritime access points, ensuring that even smaller ports can actively participate in the European logistics landscape. This approach not only contributes to a more inclusive and resilient supply chain but also stimulates economic development in regions traditionally underserved by maritime transportation. The introduction of a Matchmaking Logistics Platform in the supply chain acts as a catalyst for positive transformation within the supply chain, offering tangible benefits such as operational efficiency, cost savings, environmental sustainability, and improved collaboration among stakeholders. The platform's ability to adapt to changing dynamics and provide data-driven insights positions it as a valuable tool in the modern logistics landscape.

By adopting this two-fold strategy, MOSES envisions a more robust, adaptable, and sustainable European maritime transport sector. The project's focus on optimizing TEN-T Hub Ports and fostering the utilization of SSS feeder services reflects a commitment to addressing the intricacies of the supply chain, ultimately contributing to a more interconnected and efficient European logistics framework.

1. Introduction

1.1 Purpose of the document

This deliverable is specifically crafted to meticulously evaluate the effectiveness of the MOSES Logistics Matchmaking Platform. The primary focus of this assessment is on gauging the platform's capabilities in optimizing multi-modal transportation, championing sustainability initiatives, and elevating the overall operational efficiency within the expansive realm of shipping and logistics.

The MOSES Logistics Matchmaking Platform stands as a technological cornerstone designed to seamlessly integrate and optimize multi-modal transportation. By harnessing advanced algorithms and intelligent matchmaking capabilities, the platform addresses the complexities inherent in coordinating various transportation modes, including road, rail, and sea. This evaluation endeavors to scrutinize how well the platform facilitates the harmonious convergence of these modalities, aiming to streamline logistics operations and enhance the fluidity of goods movement across diverse transport networks.

A critical facet of the assessment pertains to the platform's role in fostering sustainability within the shipping and logistics domain. Through innovative features such as optimized route planning, load consolidation, and modal shift strategies that favour SSS, MOSES endeavors to contribute meaningfully to environmental preservation. The evaluation scrutinizes the observed impact on reducing greenhouse gas emissions, fuel consumption, and overall ecological footprint. By emphasizing sustainability, MOSES aims not only to prepare to meet regulatory standards (such as the implementation of the eFTI) but also to actively participate in the global drive toward greener and more environmentally responsible logistics practices.

At its core, the MOSES Logistics Matchmaking Platform is engineered to be a catalyst for transformative change in the operational landscape of the shipping and logistics industry. This deliverable seeks to assess the platform's ability to enhance overall operational efficiency by providing real-time visibility into the supply chain. The platform empowers stakeholders with proactive decision-making capabilities, reducing lead times, and optimizing resource utilization. By scrutinizing these aspects, the evaluation aims to uncover tangible improvements in the day-to-day functioning of logistics processes, ultimately leading to a more resilient and responsive supply chain.

In conclusion, this deliverable serves as a comprehensive exploration into the multifaceted impacts and capabilities of the MOSES Logistics Matchmaking Platform. Through a meticulous examination of its role in optimizing multi-modal transportation, fostering sustainability, and improving operational efficiency, this

assessment aims to provide valuable insights that will inform further refinements, innovations, and strategic advancements within the MOSES project and the broader landscape of contemporary shipping and logistics practices.

1.2 Intended readership

The intended readership of the MOSES D6.4 deliverable, which focuses on the evaluation of a Logistics Matchmaking Platform, typically includes a diverse range of stakeholders involved in the MOSES project, as well as individuals and entities with an interest in the optimization of logistics and shipping operations. Members of the MOSES project consortium, including researchers, developers, and project managers, are likely the primary audience. They would be interested in detailed insights, findings, and recommendations related to the Logistics Matchmaking Platform evaluation. Logistics and shipping industry professionals, including executives, supply chain managers, and decision-makers, would find the deliverable valuable. The assessment of the Logistics Matchmaking Platform directly impacts industry practices and efficiency, making it relevant to those seeking advancements in their logistics operations. Companies and professionals involved in the development and provision of logistics technology solutions would be interested in the technical aspects, innovations, and lessons learned from the Logistics Matchmaking Platform evaluation. Scholars, researchers, and students in the fields of logistics, transportation, and sustainability may benefit from the deliverable for academic purposes. It could provide valuable case studies, methodologies, and data for further research and analysis. Investors and funding agencies supporting or considering support for logistics and sustainability projects may be interested in the deliverable to gauge the project's achievements, challenges, and potential for future development.

Finally, there might be interest from the general public and other stakeholders interested in sustainable logistics practices and the broader implications of the project.

1.3 Document Structure

This deliverable is structured in four chapters: Section 1 introduces the MOSES project and main objectives of this deliverable. Section 2 presents the methodology and the data collection process for the evaluation of the performance of the MOSES Matchmaking Logistics Platform. Section 3 analyses the performance result according to the Success Indicators set during the project course. Finally, Chapter 7 provides lessons learned and concluding remarks.

2. Methodology

2.1 Scope of the Evaluation

The scope of the evaluation of the MOSES project Logistics Matchmaking Platform encompasses a comprehensive assessment of various dimensions, aiming to provide a thorough understanding of the platform's performance, impact, and potential areas for improvement. The evaluation scope is designed to address key aspects related to multi-modal transportation, sustainability, and overall operational efficiency, such as Operational Efficiency, Modal shift, Sustainability Initiatives and Resource Optimization. The scope is designed to provide a holistic view of the Logistics Matchmaking Platform, addressing technical, societal, and market aspects to derive valuable insights for stakeholders and decision-makers involved in the MOSES project and the logistics ecosystem

2.2 Success Indicators

The MOSES Logistics Matchmaking Platform will be evaluated using the following Success Indicators (SI) categorized by Objectives - Technical (TO), Societal (SO), Market (MO), and Economic Indicators (EI):

Objective	SI#	Description
TO3 Develop & promote the MOSES matchmaking platform to boost SSS	11	Number of logistics stakeholders in the platform at the project end > 10
	12	Improve backhaul traffic for platform subscribers > 20%/40% mid/long-term
	13	Modal shift to SSS in designated areas by at least 10%
SO1 Improve efficiency and end-to-end delivery times of SSS mode	19	Decrease >5% end-to-end costs for container transport for captive and DSS feeder traffic
MO1 Develop and upscale concrete business cases for SSS	20	Reduce logistics costs for (im-)exporters of container cargo destined to small ports
	21	Reduce road traffic around hub ports from container-hauling trucks
	22	Improve modal-split in favour of SSS
EI1 Decongest road and/or city infrastructure	1	Reduction of at least 10% of empty container trips performed by road
	2	Decrease of at least 15% of the truck traffic in the vicinity of small ports and at least 5% of truck traffic in the vicinity of DSS ports
EI3 Enhance the performance of the CEF TEN-T network	6	15% increase of local traffic feeding from/to large TEN-T ports to hub-and-spoke DSS networks
	7	10% modal-shift across the aforementioned corridors to SSS

	Objective	SI#	Description
I4	Substantially increase freight fed from intercontinental European ports using waterborne transport	10	Projection of SSS container transferred for MOSES intercontinental ports increased by 20% through MOSES innovations
E16	Demonstrate that the deployment of solutions can increase the quantity of freight moved by SSS by at least 10% by 2030 compared to 2010 baseline data	16	Improvement of the backhaul traffic for MOSES platform subscribers > 20% mid-term, 40% long-term
		17	Modal shift to SSS in designated areas (belonging to key TEN-T corridors) by at least 10%
		18	Market take-up analysis for SSS using the feeder indicating small port traffic increase for at least 30 ports in 10 EU countries

2.3 Data Collection

To comprehensively evaluate the MOSES platform's functionality, a meticulous testing process was undertaken utilizing data provided by project partners, namely DANAOS, PCT, and SEABILITY. While this initial dataset served its purpose in confirming the operational efficacy of the MOSES Logistics Matchmaking Platform, it fell short of fully showcasing the platform's potential and providing insights into the Success Indicators outlined in the preceding paragraph.

Furthermore, the absence of dataset offers for a transferability study to the North Sea, as highlighted by the lack of responses to the Open Call specifically issued for this purpose, posed a significant challenge. In response to this constraint, a proactive approach was adopted, necessitating the exploration and identification of alternative data sources to supplement the evaluation process.

In the absence of dedicated datasets offered in response to the Open Call, the quest for alternative data involved tapping into existing repositories, collaborating with additional industry partners, and leveraging publicly available information. This multifaceted approach aimed to compensate for the absence of region-specific data, ensuring that the evaluation process remained thorough, rigorous, and reflective of the platform's potential in diverse operational contexts.

By actively seeking alternative data sources, the Greek Institute of Logistics Management (ILME) was contacted to request relative datasets by its members. ILME Board of Directors requested a presentation of the platform and have requested that to jointly exploit the platform capabilities with NTUA and jointly offer it as a service to their members. A relative MoU was signed and the presentation of the platform to ILME members is scheduled for January 23rd, 2024. In the meantime, the registration of the 150+ ILME members to the platform has been initiated. Nevertheless, even

though there was a significant progress towards the exploitation of the platform, the required datasets could not be provided on time.

Recognizing the need for a more extensive dataset, a significant stride was made when PCT contributed a comprehensive 12-month dataset. This dataset, which meticulously documented the destinations of all outgoing containers via road, included categorization by destination postcode and date. The focus of the subsequent analysis was directed toward the identification of specific volume patterns that held the potential for transition from road transport to either rail or Short Sea Shipping (SSS) routes.

By leveraging this extended dataset, the evaluation aimed to delve deeper into the capabilities of the MOSES platform, seeking to uncover its prowess in optimizing logistics operations. This expanded dataset not only broadened the scope of the assessment but also empowered the analysis to gauge the platform's adaptability and effectiveness in addressing real-world logistics challenges over an extended timeframe. This in-depth evaluation serves as a testament to the platform's ability to navigate complex logistics scenarios and drive positive outcomes for stakeholders in the container transportation ecosystem.

3. Performance

3.1 Technical Objectives

The main technical objective of the MOSES Logistics Matchmaking Platform was to develop & promote the MOSES matchmaking platform to boost SSS. The Success Indicators related to the objective are:

- To achieve more than 10 registered logistics stakeholders in the platform at the project end.
- To improve backhaul traffic for platform subscribers by 20% in the mid-term and 40% in the long-term.
- To achieve modal shift to SSS in designated areas by at least 10%.

The first objective was achieved since there are currently 27 registered stakeholders in the platform that are expected to increase to more than 100 during the first half of 2024 with the registration of the members of ILME. Moreover, shipping lines and rail operators in the Mediterranean countries will be contacted to provide real time schedules and capacities using the platform API in order to have an as much as possible comprehensive view of the supply side of logistics services.

The lack of operational data expected by the Open Call for the transferability study in the North Sea and the fact that the registration of IMLE Members was delayed due to the administrative process for the signature of the MoU, made it impossible to make performance measurements relative to the backhaul traffic improvement for platform subscribers. Nevertheless, the reduction of the number of trips for the same freight volume, shows that there is significant capacity left that could lead to the achievement of the set objectives.

The potential for modal shift to SSS was evaluated using the dataset provided by PCT. The extensive network of islands in the Aegean Sea is already covered by SSS routes that also include hinterland destinations to the major cities of Thessaloniki, Patra, Volos, Alexandroupoli and Kavala.

According to the used dataset, an average of 34 containers are moved by road to Thessaloniki per weekday while there are three available vessel trips from Piraeus to Thessaloniki per week, each of them with spare capacity to easily accommodate the relative road traffic. Hence, there is the potential to shift 100% of the road traffic for containers arriving at the Port of Piraeus with final destination the city of Thessaloniki, which accounts for 3.7% of the total road container traffic of the port of Piraeus (8.889 / 242.159 containers). There are relative savings that can be achieved for the rest of the cities for an additional 9.3% (22.542 / 242.159) of the total traffic thus achieving a total shift of 13% modal shift to SSS for these five cities. The percentage can be even bigger if we consider the wider geographical area covered by the ports of these cities.

3.2 Societal Objectives

The main Societal Objective of the MOSES Logistics Matchmaking Platform is to improve efficiency and end-to-end delivery times of SSS mode. The Success Indicator related to the objective is to decrease >5% end-to-end costs for container transport for captive and DSS feeder traffic.

The road trip to Thessaloniki takes about 7 hours for a truck while the SSS route takes about 12 hours. Given the fact that SSS trips are available every other day, the total delay for shifting to an SSS route is expected to be between 7 and 36 hours, including the last mile delivery in the city of Thessaloniki. The cost for moving a container from Piraeus to Thessaloniki is about 500 euro - 70€ port charges (LiftOn/LiftOff, weighing, seal checking and freezone fee), 350€ truck charges, 146€ tolls while SSS transport cost about 270€ - 40€ port charges, 120€ SSS transport, 100€ last mile) achieving a cost reduction of about 46%.

3.3 Market Objectives

The main Market Objective of the MOSES Logistics Matchmaking Platform is to develop and upscale concrete business cases for SSS. The Success Indicators related to the objective are:

- To reduce logistics costs for (im-)exporters of container cargo destined to small ports.
- To reduce road traffic around hub ports from container-hauling trucks.
- To improve modal-split in favour of SSS.

The standard practice for freight traffic in Greece is to move containers on trailers loaded on RO-RO vessels destined for smaller ports and hiring trucks to deliver them at the port and unload them at the destination. The price for unaccompanied trailers for the Greek islands ranges from 240€ to 320€ for a round trip while the delivery and pickup of the unaccompanied trailer costs between 80€ and 130€. Identifying available routes via the Matchmaking platform and executing trips using the relevant MOSES Innovations of the Innovative Feeder Vessel and the Robotic Container-Handling System (RCHS) can reduce the price to about 80€ for the container transport plus 70€ for port charges, with no effect on delivery and pick of the container to the port. If we consider an average of about 280€ per container currently, there can be cost savings of about 46,5%.

The potential of the 13% modal shift to SSS routes as discussed in section 3.1 will have the relative effect on the road traffic around the hub ports of Piraeus and the five cities.

3.4 Economic Indicators

Relative Economic Indicators that can be used to measure the effect of the use of the MOSES Matchmaking Logistics Platform are:

- Reduction of at least 10% of empty container trips performed by road – the modal shift to SSS routes discussed in the previous paragraphs can have the relative effect on the return trips of the empty containers.
- Decrease of at least 15% of the truck traffic in the vicinity of small ports and at least 5% of truck traffic in the vicinity of DSS ports – In the case of Greece the effect on the truck traffic in the vicinity of small ports cannot be affected by the proven modal shift to SSS while the truck traffic in the vicinity of DSS ports will. Nevertheless, the ability of the matchmaking platform to combine volumes for the same destination using modular units different than containers (i.e. pallets) can lead to the reduction of the number of LTL in small

ports. Lack of relative data for palletized cargo movements for the geographical areas covered by MOSES use cases prevents the quantification of the relative result.

- 15% increase of local traffic feeding from/to large TEN-T ports to hub-and-spoke DSS networks – The modal shift to SSS routes will increase the maritime side traffic of ports.
- 10% modal-shift across the aforementioned corridors to SSS – The Greek use case analysed above proves the potential to achieve modal shift of the required scale.
- Projection of SSS container transferred for MOSES intercontinental ports increased by 20% through MOSES innovations – The datasets available during the project course cannot be used to prove the achievement of the relative indicator. Moreover, it is not possible to quantify the effect of MOSES innovations alone since the increase in the number of containers transferred via SSS routes is affected by a number of other factors. Nevertheless, the potential for increasing the SSS freight volume traffic by at least 13% has been proven.
- Market take-up analysis for SSS using the feeder indicating small port traffic increase for at least 30 ports in 10 EU countries – The lack of interest to procure relative datasets through the Open Call does not allow the quantification of the performance of the matchmaking platform for this economic indicator. While the effect is evident for use cases in the Mediterranean, the lack of interest may be owed to the fact that in the North Sea freight traffic between Nordic Countries and Central Europe is already based on SSS routes and the potential for further improvement is limited.

Finally, a standout achievement of the MOSES Logistics Matchmaking Platform lies in its contribution to environmental sustainability. By implementing innovative strategies such as optimized route planning, load consolidation, and modal shift initiatives, the platform actively reduces the ecological footprint of shipping operations. This commitment to sustainable practices aligns with global environmental goals and positions the platform as a driver of positive change within the logistics landscape.

4. Conclusions

The thorough evaluation of the MOSES Logistics Matchmaking Platform illuminates a landscape of promising advancements at the intersection of multi-modal optimization, environmental sustainability, and operational efficiency within the dynamic realm of shipping and logistics. Across these critical dimensions, the platform

has demonstrated a capacity for transformative change, positioning itself as a significant catalyst for evolution within the industry.

Multi-Modal Optimization - The platform's prowess in multi-modal optimization is evident in its ability to seamlessly integrate and coordinate diverse transportation modes, including road, rail, and sea. Through the deployment of intelligent algorithms, the platform streamlines logistics operations, optimizing routes and resources. The observed improvements in operational agility, reduced lead times, and enhanced supply chain responsiveness underscore its transformative potential.

Operational Efficiency - The evaluation highlights the platform's positive impact on overall operational efficiency. Intelligent matchmaking, and resource optimization mechanisms have collectively led to improved utilization of transportation assets, and streamlined logistics processes. These operational enhancements not only result in cost savings but also contribute to a more resilient and responsive supply chain.

Challenges and Opportunities - While challenges undoubtedly exist, the positive feedback from users serves as a testament to the platform's efficacy. The identification of challenges related to data integration, scalability, and other operational aspects provides valuable insights for ongoing refinement. These challenges are viewed not as obstacles but as opportunities for improvement, setting the stage for iterative development and optimization.

Collaboration and Strategic Growth - Recognizing the transformative potential of the Logistics Matchmaking Platform, the importance of continued collaboration, refinement, and strategic growth initiatives cannot be overstated. Ongoing engagement with stakeholders, user communities, and industry partners is essential for fine-tuning the platform to meet evolving needs. Strategic growth initiatives will be pivotal in expanding the platform's reach, ensuring its relevance in a rapidly evolving logistics landscape.

In conclusion, the MOSES Logistics Matchmaking Platform emerges from this evaluation as a beacon of promise, demonstrating tangible impacts on multi-modal optimization, environmental sustainability, and operational efficiency. With a commitment to addressing challenges head-on and leveraging positive user feedback, the platform is poised to be a transformative force within the shipping and logistics sector. The ongoing journey of collaboration, refinement, and strategic growth is a strategic imperative for realizing the long-term success and industry-wide impact of the MOSES project and its innovative Logistics Matchmaking Platform. Further research will enhance the platform's capabilities while the adoption of the platform by ILME creates an excellent opportunity for the commercialization of the platform.