

M^oSES



autoMated vessels and supply chain Optimisation for sustainable short SEa Shipping



Exploitation workshop on

M^oSES

AutoDock System

01 December 2023 10.00-12.00 CET

Online, via Zoom platform



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 861678. The content of this document reflects only the authors' view, and the Agency is not responsible for any use that may be made of the information it contains.

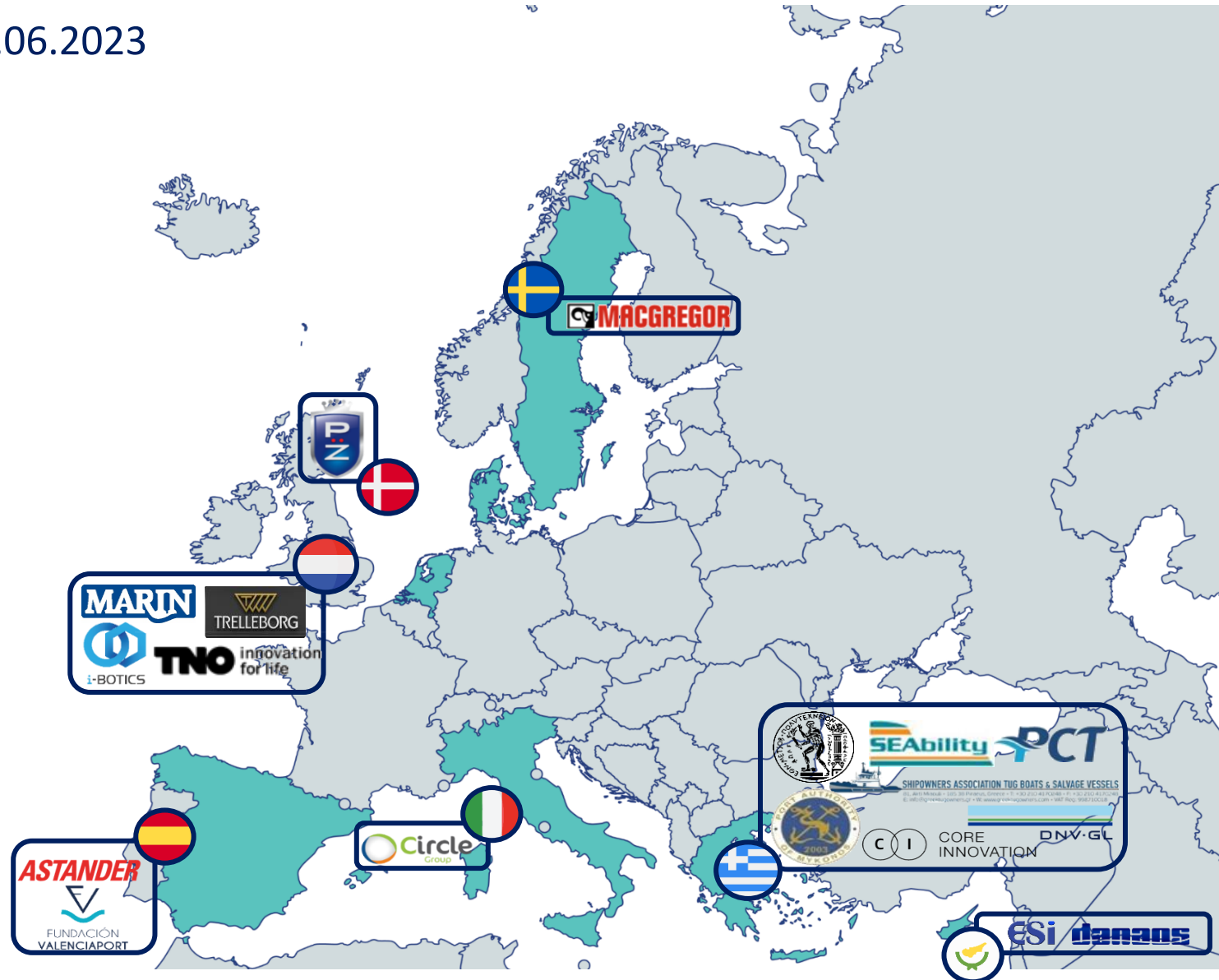
Konstantinos Louzis
Researcher, PhD Candidate,
School of Naval Architecture & Marine Engineering

National Technical University of Athens



Facts about the MOSES project

- **Duration:** 01.07.2020 - 30.06.2023
(36 months) – *extension*
31.12.2023 (42 months)
- **Budget:** 8 million €
- **Consortium:** 17 Partners
- **Coordinator:** NTUA



MOSES aims to...



Containerised cargo



Create sustainable feeder services from large container terminals to small ports with no infrastructure to replace trucks on Ro-Ro ships

Pax traffic slowed down by cargo traffic

The MOSES concept



The MOSES Use Cases



Northern Case

MOSES
Open Call
Submit by 31-Aug-2023 (05:00:00 PM CEST)

[SUBMIT HERE](#)

Western MED-Spain

Decongest truck transport traffic in Valencia port and connect it to Sagunto and Gandia satellite ports



Eastern MED-Greece

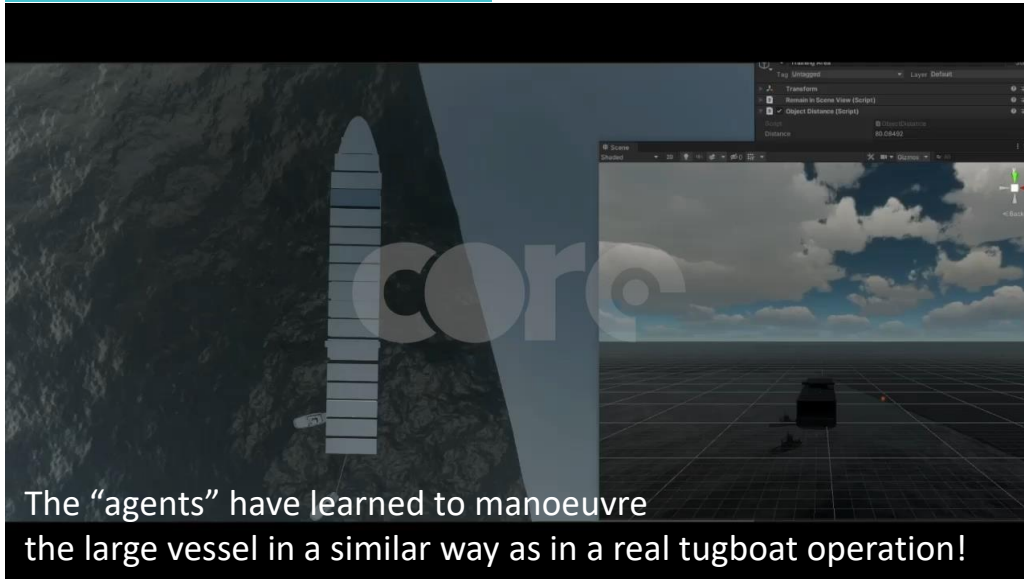
Decongest Piraeus container terminal and integrate small Greek ports into the container supply chain



MOSES AutoDock System

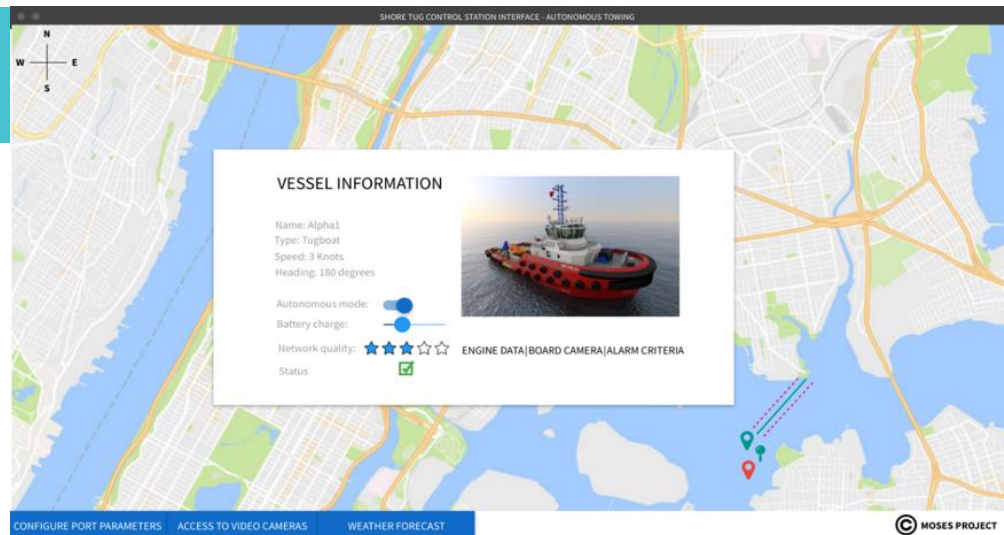


Autonomous tugboats



The “agents” have learned to manoeuvre the large vessel in a similar way as in a real tugboat operation!

Shore Tugboat Control Station



Automated Mooring



Prototype innovations:

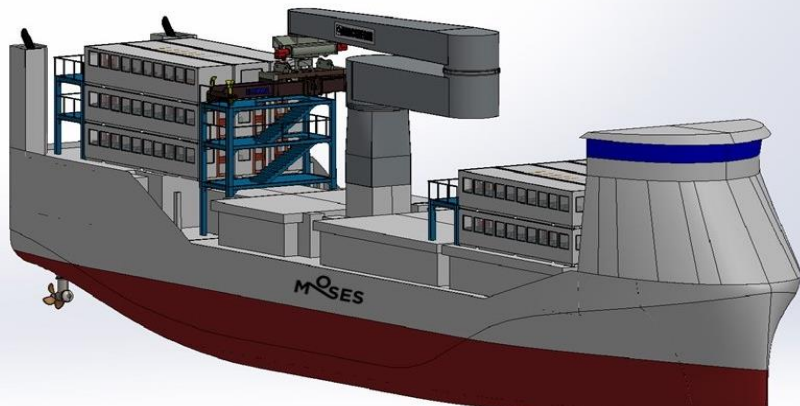
- Small-scale
- Surge motion control
- Energy harvesting
- Communication with tugboats

MOSES Innovative Feeder



Greek concept I

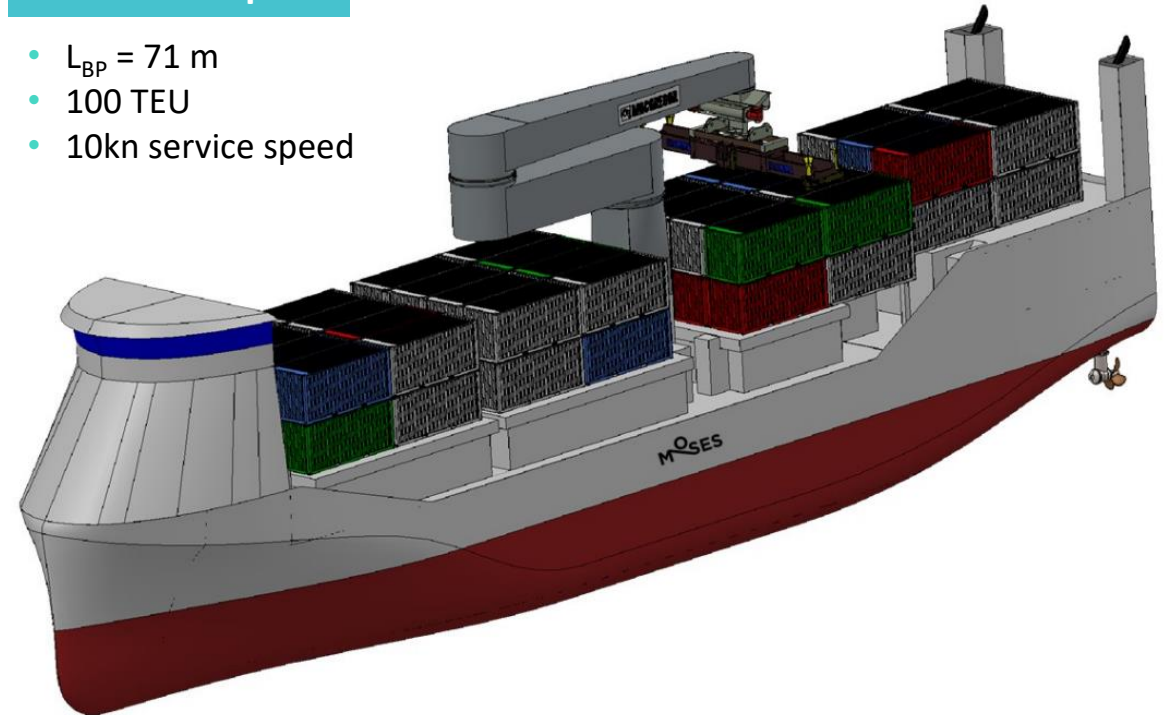
- $L_{BP} = 80$ m
- 180 TEU
- 10 kn service speed



Modular concept design for pax transport

Greek concept II

- $L_{BP} = 71$ m
- 100 TEU
- 10kn service speed



Innovations:

- Sustainable propulsion (Hybrid – methanol ICE + batteries, Full electric)
- Azimuth thrusters for enhanced manoeuvrability
- Automated cargo-handling, *as first step towards higher autonomy*

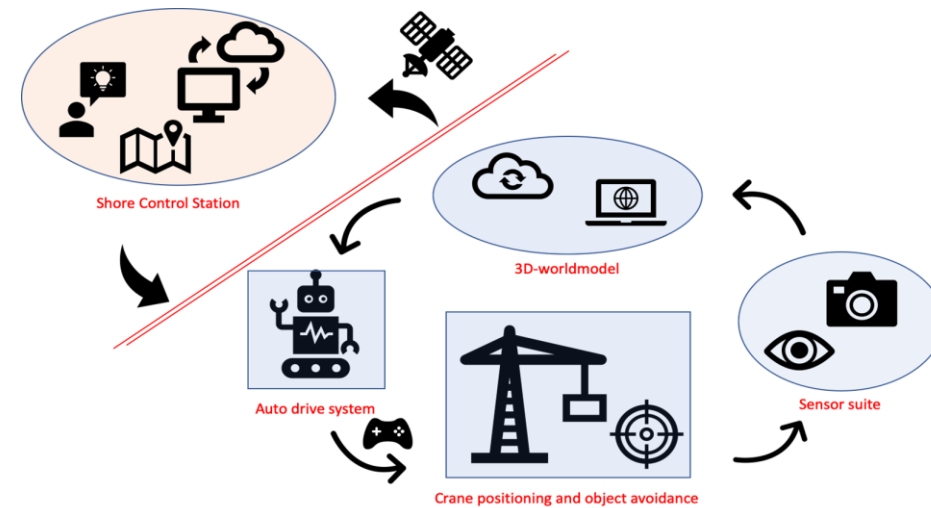
MOSES Robotic Cargo Handling System



Automated Crane

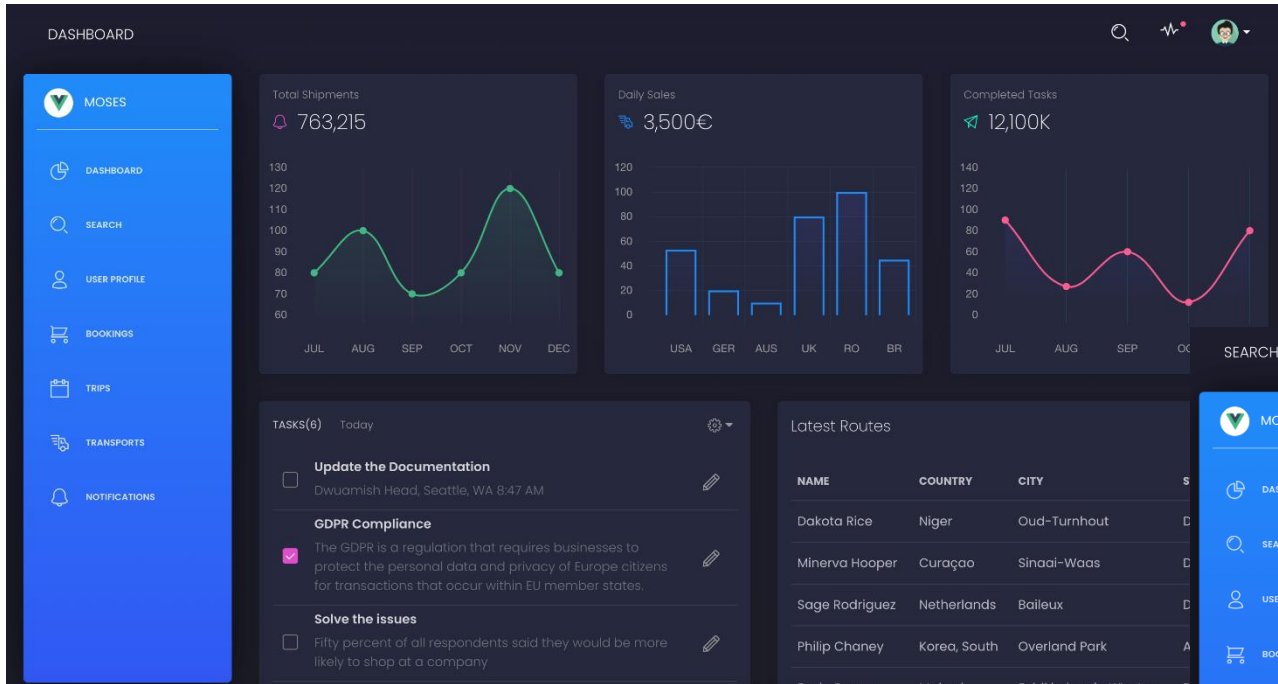
- Compensation of pendulation (ship motions, weather conditions)
- Identification of container to load

Intelligent Operator Support System (IOSS)



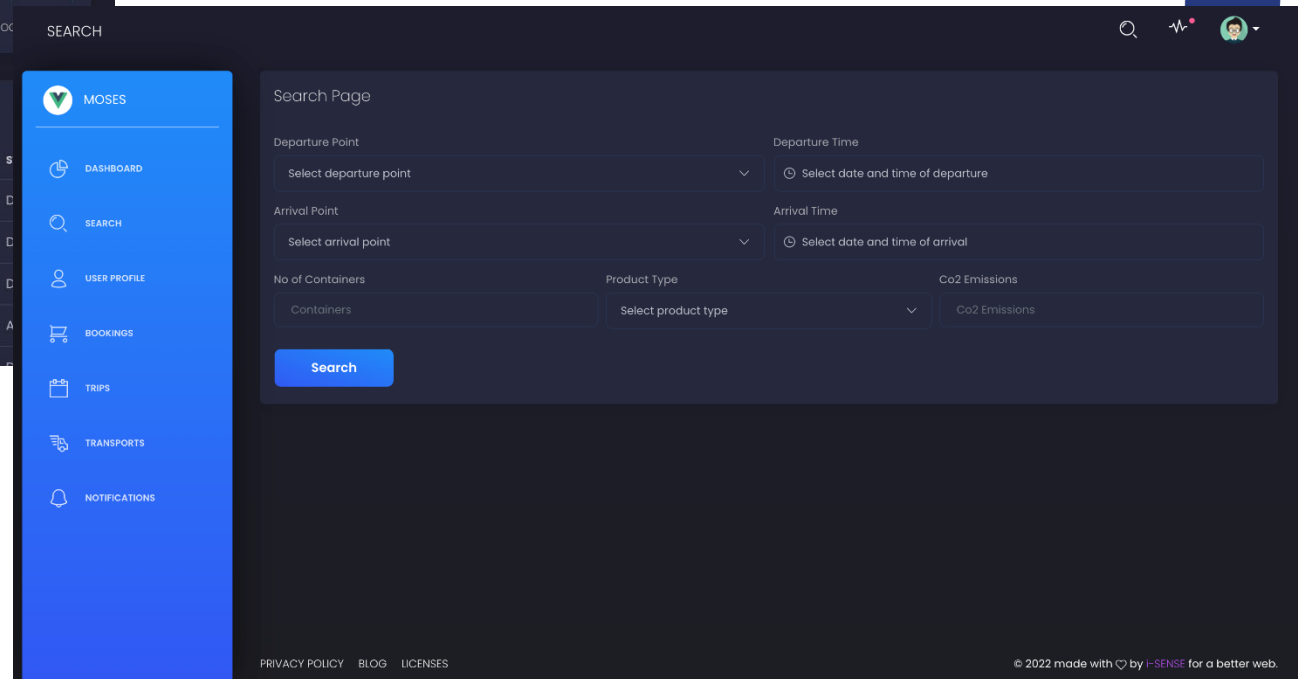
- Enabling local situation awareness – anomaly detection
- Robot self awareness in problem detection
- Control Intelligence
- Dynamic task allocation (One-to-many)
- Risk assessment for problem solving

MOSES Matchmaking Platform



The platform will implement horizontal collaboration among logistics stakeholders and will match demand and supply of cargo volumes


AI-based optimization of distribution routes and improvement of empty container management



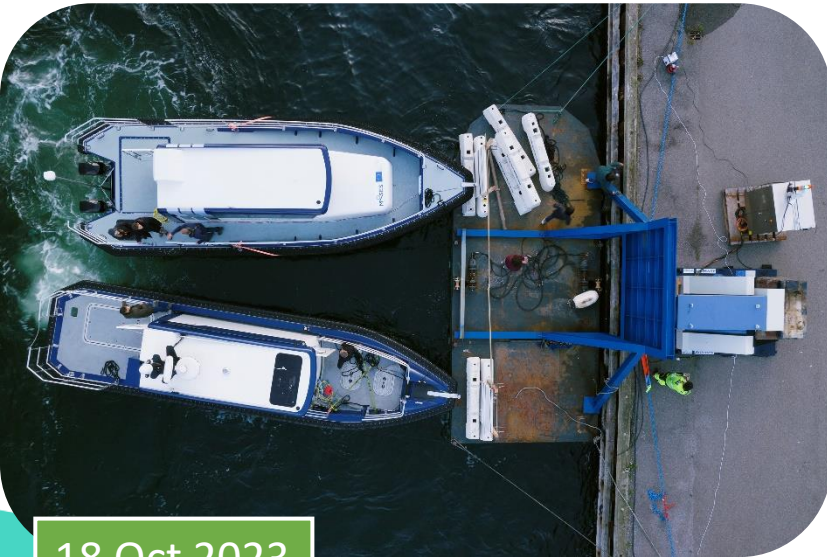
Pilot Demonstrations – Proof of Concepts



Pilot demonstration #1


 Autonomous “tugboat swarm” and automated docking

 Denmark

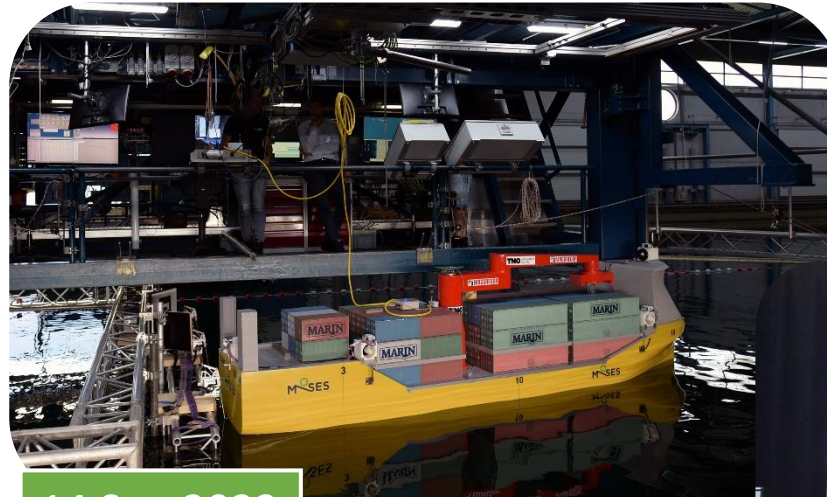


18 Oct 2023

Pilot demonstration #2


 Dock-to-dock, fully autonomous operation of the MOSES feeder


 Netherlands



14 Sep 2023

Pilot demonstration #3

 Autonomous operation of the Robotic Container-Handling System and remote monitoring with the IOSS

 Sweden, Netherlands



28 Sep 2023

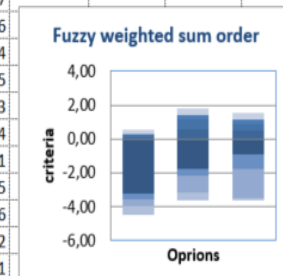
Pilot Demonstration results

- The pilot demonstration results will provide input to the **sustainability framework** developed by MOSES
- The objective is to evaluate the **sustainability and added value to SSS of the MOSES Innovations**, based on specific criteria (incl. cost, environment, safety etc.)



Attributes		E1		E2		E3		E4		E1		E2		E3		E4		Weighted		x1	x2	x3	
Code	Description	Asses	Type	BAU	MOSES	BAU	MOSES	BAU	MOSES	BAU	MOSES	BAU	MOSES	BAU	MOSES	BAU	MOSES	wi	x1	x2	x3		
A1	COST	O	cost	900	500	900	500	900	500	900	500	1	9	9	9	0,381	-0,333	-0,185	-0,090	0,056	0,944	0,000	Fuzzy
A2	ENVIRONMENT	LS	Benefit	VL	VH	VL	M	VL	M	VL	VH	1	1	1	1	0,067	-0,243	-0,090	0,120	0,880	0,648	Crisp	
A3	SAFETY	LS	Benefit	VL	VH	VL	L	VL	M	VL	VH	1	1	1	1	0,066	0,051	0,034					
A4	COMPLIANCE	LS	Benefit	L	H	VL	M	VL	M	L	H	1	1	1	1	0,039	0,021	0,032					
A5	REGULATION	LS	cost	L	M	VL	M	L	L	M	L	1	1	1	1	0,097	-0,080	-0,056					
A6	HEALTH	LS	cost	M	M	VL	M	VL	M	L	M	4	4	4	4	0,206	-0,142	-0,150					
A7	SOCIAL VALUE	LS	cost	M	VH	H	M	H	M	VH	M	1	1	1	1	0,070	-0,047	-0,052					
A8	BUSINESS VALUE	LS	Benefit	M	VH	VL	M	L	M	VH	H	1	1	1	1	0,061	0,044	0,042					

enter weight of attribute as number or linguistic
In next line enter yr knowledge level for the



Microsoft Excel
and the winner is X2 And the FUZZY winner is x2
OK

MOSES Exploitation Workshops



Exploitation workshop on

MOSES
AutoDock System



01 December 2023



10.00-12.00 CET



Online, via Zoom platform



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 861678. The content of this document reflects only the authors' view, and the Agency is not responsible for any use that may be made of the information it contains.



Exploitation workshop on

MOSES
the autonomous sailing of MOSES
Innovative Container Feeder Vessel



02 November 2023



10.00-12.00 CET



Online, via Zoom platform

Exploitation workshop on

MOSES
Robotic Container Handling System



15 November 2023



10.00-12.00 CET



Online, via Zoom platform



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 861678. The content of this document reflects only the authors' view, and the Agency is not responsible for any use that may be made of the information it contains.





MOSES

Thank you for your attention!

If you have any questions or require further information, please contact me:

Konstantinos Louzis
(*klouzis@mail.ntua.gr*)

National and Technical University of Athens - NTUA

 www.moses-h2020.eu

 MOSES project2020

 @mosesproject20

 MOSES Project



This project has received funding from the European Union's horizon 2020 research and innovation programme under grant agreement No. 861678.