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# **Navigating towards the future: How to create resilient and smart maritime transport?**

MAR MAN Closing seminar,  
Trondheim, 10. December 2025  
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# MARMAN project



## Purposes

Develop a **resilience-based** knowledge foundation for **governance, management** and **work practice** ensuring a safe and secure integrated Maritime Transport Systems (MTS) when **implementing connected and automated vessels (CAV)**

- Influence on *actors* at sea and ports/terminals
- *Preparation* of changes – by actors responsible for maritime transport operational practice (companies, managers and stakeholders)
- Needed resilience *skills and competences*
- Implementation of *integrated traffic management*
- *Proactive* maritime safety management, planning and operations
- *Resilience guidance/ tools* for safe and efficient operation and coordination

## Resilience

Ability to maintain essential system functions prior, during and after changes and sustain required operations under both expected and unexpected conditions.

Woods, 2025:

- **Rebound** – Ability to bounce back to stable state
- **Robustness** – Ability to withstand (known unknown)
- **Graceful extensibility** (Opposite of brittleness) – Ability to stretch beyond performance boundaries
- **Sustain adaptability** (Network architecture) – Ability to anticipate and adapt to future surprises as conditions evolve



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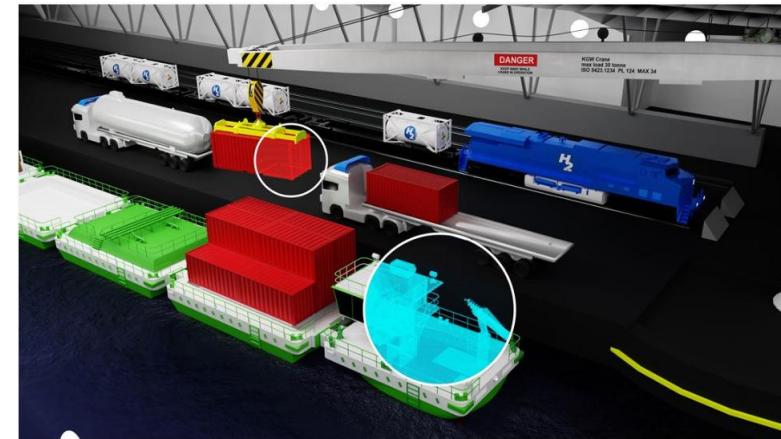
## Maritime Resilience Management of an Integrated Transport System

Project type: Research project financed by Research Council of Norway, additionally from NTNU

Period: 2021-2026

Partners: SINTEF Digital (project management), SINTEF Ocean, NTNU

Reference group: ITS Norway, Massterly, Norwegian Maritime Authority, and Ateo AS



3D graphics by Mikael Sætereid

### Background

Maritime transport systems (MTM) are becoming increasingly interconnected, automated and complex. This development involves new opportunities but will also imply new vulnerabilities and risks.



Ever Given grounding, 2021

### Collaboration

- OHIO State University
- The Swedish National Road and Transport Research Institute (VTI)
- ABB, Sweden
- Gemini Centre CERCIS (Centre for Resilient critical infrastructures and societies)



### Goals & objectives

- The project focuses on implementation and application of vessels with different levels of automation.
- MARMAN explores what forms of regulatory, managerial, and operational competencies that are needed when faced with increased connectivity and automation
- The results related to maritime resilience management are based on a socio-technical approach and are adapted to integrated planning area.
- A resilience-based knowledge foundation for governance, management and work practice are developed



### Status, 2025

- PhD Project: "Maritime Professionals' Trust in Automation and Autonomy: A Socio-Cultural Perspective" 2022-2026
  - Four papers accepted
- Scientific papers
  - 13 (part of book/ proceedings)
  - Three journal articles
- Presentations at conferences, meetings etc
  - 15 lectures





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# Publications and deliverables

## (Projects – The Research Council of Norway)



### Papers (journals)

2024	Ramstad, Lone Sletbakk; Stene, Trine Marie; Fjørtoft, Kay Endre; Holte, Even Ambros	Automation in the Maritime Transport System – A Framework for Planning Resilient Operations Journal of Physics: Conference Series (JPCS) 2867 2024 1/012033
2024	Aalberg, Asbjørn Lein; Holen, Siri Mariane; Kongsvik, Trond Øystein; Wahl, Aud Marit	Does it do the same as we would? How trust in automated shipboard systems relates to seafarers' professional identity Safety Science 172 2024 10.1016/j.ssci.2024.106426
2024	Aalberg, Asbjørn Lein	Pride and mistrust? The association between maritime bridge crew officers' professional commitment and trust in autonomy WMU Journal of Maritime Affairs (JoMA) 2024 10.1007 /s13437- 024-00329-6
2024	Aalberg, Asbjørn	Seamanship in the age of automation: Reduced practical wisdom? Observations from fieldwork on automated car ferries in Norway. Public Anthropologist 342-371 6 2024 2589- 1715 doi:10.1163 /25891715- bja10062
2023	Fjørtoft, Kay Endre; Parvazi, Seyed Parsa; Nesheim, Dag Atle; Wennersberg, Lars Andreas Lien; Mørkrid, Odd Erik; Psaraftis, Harilaos	Assessing the resilience of sustainable autonomous shipping: New methodology, challenges, opportunitie

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## Chapters (Conference proceedings: Peer reviewed papers)

2025	Stene, Trine Marie; Ramstad, Lone Sletbakk	Knowledge Strategies Facilitating Future Port Development and Management , ECKM
2025	Braga, Fjørtoft	MASS Operation in port calls
2024	Mørkrid, Odd Erik; Fjørtoft, Kay Endre; Hagaseth, Marianne; Holte, Even Ambros	Assessment of resilience in a maritime autonomous transport system
2023	Aalberg, Asbjørn Lein; Wahl, Aud Marit; Lamvik, Gunnar Martin	Adopt or adapt? Seafaring communities of practices faced with increased automation
2023	Holen, Siri Mariane; Aalberg, Asbjørn Lein; Johnsen, Stig	Ole Challenges and Opportunities of Implementing the Operators' Perspective: Experiences from Automated Drilling Projects
2023	Fjørtoft, Kay Endre; Holte, Even Ambros; Stene, Trine Marie; Ramstad, Lone Sletbakk	Integrated Planning for safe and efficient maritime autonomous transport operations
2023	Stene, Trine Marie; Fjørtoft, Kay Endre; Ramstad, Lone Sletbakk	Successful autonomous transport – The need for coordination and integration of strategical and operational management
2022	Kongsvik, Trond; Finnestrand, Hanne Gudrun	Changes in Framework Conditions in the Norwegian Petroleum Industry: What Are Their Relations to Safety?
2022	Kongsvik, Trond; Aalberg, Asbjørn Lein	Exploring organizational safety vulnerabilities on naval ships – a comparative quantitative analysis
2022	Stene, Trine Marie; Fjørtoft, Kay Endre; Holte, Even Ambros	Future Maritime Transport Systems and Integrated Planning
2022	Fjørtoft, Kay Endre; Holte, Even Ambros	Implementing operational envelopes for improved resilience of autonomous maritime transport
2022	Stene, Trine Marie; Kongsvik, Trond	The Relevance of Resilience Engineering and Community Resilience for Future Maritime Transport System

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## Popular scientific publication

2025	Fjørtoft, Kay; Holte, Even; Marie Stene, Trine; Ramstad, Lone; Kongsvik, Trond	Den resiliente havna, hva betyr nå det, og hvordan får vi det til? Havnemagasinet, Utgave 4 2025
2024	Aalberg, Asbjørn Lein	Har vi tro på automatisert og autonom teknologi? Smakebiter fra tusenvis av sjøfolks besvarelser. 2024
2024	Aalberg, Asbjørn Lein	Ferjer har skipartens kulaste arbeidsplassar Maritimt magasin 2024
2023	Stene, Trine Marie; Fjørtoft, Kay Endre; Aaberg, Asbjørn; Kongsvik, Trond Øystein	MARMAN prosjektet

## Mass media



2024	Aalberg, Asbjørn Lein	100 på samling for hurtigbåtnavigatører 2024
2024	Aalberg, Asbjørn Lein	Frykter ny teknologi gjør dem til dårlige sjøfolk 2024
2024	Holte Ambros, Even; Kay Fjørtoft,	Kronikk i DN - Klar for fergekø? Utdaterte regler sperrer for fremtidens fergedrift Dagens Næringsliv 2024
2024	Aalberg, Asbjørn Lein; Normannsen, Sølvi Waterloo	Proud seafarers have strong doubts about the safety of autonomous ships 2024
2024	Aalberg, Asbjørn Lein	Selvkjørende skip? Sjøfolk tviler på sikkerheten 2024
2024	Aalberg, Asbjørn Lein; Normannsen, Sølvi Waterloo	Stolte sjøfolk er i sterkt tvil om sikkerheten til selvkjørende skip 2024
2024	Aalberg, Asbjørn Lein	Strong doubts about safety

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## Academic dissemination (Presentations at seminars, conferences etc)

2025	Stene, Trine Marie; Ramstad, Lone Sletbakk	Knowledge Strategies Facilitating Future Port Development and Management. ECKM, European Conference on Knowledge Management, Finland, 4-5 September 2025
2024	Hagaseth, Marianne; Mørkrid, Odd Erik; Fjørtoft, Kay Endre; Holte, Even Ambros	Assessment of resilience in a maritime autonomous transport system 2024
2024	Stene, Trine Marie	The MARMAN project Banedanmark, Visit Trafiktårn Øst, 27/9 2024
2024	Aalberg, Asbjørn Lein	Maritime Bridge Officers' Trust in Automated and Autonomous Technology - a Mixed-Method ,PhD Study 2024
2024	Stene, Trine Marie	Resilient Digital Societies Gemini Centre CERCIS, Open Cafe 6/6 2024
2024	Stene, Trine Marie	Technology Management Projects and Activities Gemini Centre CERCIS - Workshop 15/1 2024
2023	Lamvik, Gunnar Martin	Cultural diversity, seamanship, and conflict solving on board
2023	Fjørtoft, Kay Endre; Holte, Even Ambros; Stene, Trine Marie; Ramstad, Lone S.	Integrated Planning for safe and efficient maritime autonomous transport operations
2023	Aalberg, Asbjørn Lein; Amundstad-Balle, Anders	Seafarers' trust in automation and autonomy - results from the Maritime Safety Survey 2023
2023	Stene, Trine Marie; Fjørtoft, Kay Endre; Ramstad, Lone Sletbakk	Successful autonomous transport – The need for coordination and integration of strategical and operational management.
2022	Aalberg, Asbjørn Lein	Foreløpige resultater fra feltarbeid på høyt automatiserte ferger 2022
2022	Stene, Trine Marie; Fjørtoft, Kay Endre; Holte, Even Ambros	Future Maritime Transport Systems and Integrated Planning
2022	Fjørtoft, Kay Endre; Holte, Even Ambros; Johnsen, Stig Ole	Implementing operational envelopes for improved resilience of autonomous maritime transport
2022	Aalberg, Asbjørn	Lein Safety implications of interplay between technological changes and maritime professional identity
2022	Stene, Trine Marie; Kongsvik, Trond	The Relevance of Resilience Engineering and Community Resilience for Future Maritime Transport Systems





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# Seminar purposes

## Seminar purposes

- Present some project results
- Discussions and dialogue
- Reflect upon:
  - How can autonomy be introduced in a good way
  - What interaction is required in the maritime transport system in the future
  - How theoretical perspectives can help ports to **prepare for** and to **manage** a more automated, integrated and complex system



## Your expectations

- What expectations do you have for the seminar?



# Agenda

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Time	Subject	Responsible
8:30	Registration	
9:00	Welcome and introduction to the day MARMAN – Insight and results	Trine M. Stene
9:15	Increased autonomy of maritime transport: Seafarers voices and practices	Asbjørn Aaberg
10:00	How to facilitate resilient operations when advances in automation continue to lead the maritime industry into uncharted waters?	Kay Fjørtoft Even A. Hole
10:30 COFFE		
10:50	Strategic planning facilitating future port development and management. Guidelines	Lone Ramstad Trine M. Stene
Resilience Engineering in transport		
11:20	Coping with the AI Gold Rush 2 in the Maritime Context: Overplaying Envisioned Benefits, Underplaying Real Risks	David Woods
12:20	LUNCH	
Future key themes and challenges		
13:00	Muligheter innen nasjonal forskning (in Norwegian) Opportunities in national research	Roar Nordvik
13:20	Future transport challenges	Trond Hovland
13:45	Discussions	Project group
14:45	Reflections	
15:05	Summary and end of day	Trine M. Stene
15:30	End of day	

