TEST AREA TRONDHEIMSFJORDEN

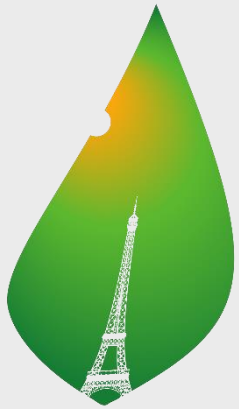
Beate Kvamstad-Lervold, SINTEF Ocean

NAVISP Industry Days, 17-18th of January 2019, ESTEC

SUSTAINABLE DEVELOPMENT GOALS

SINTEF

SUSTAINABLE DEVELOPMENT GOALS

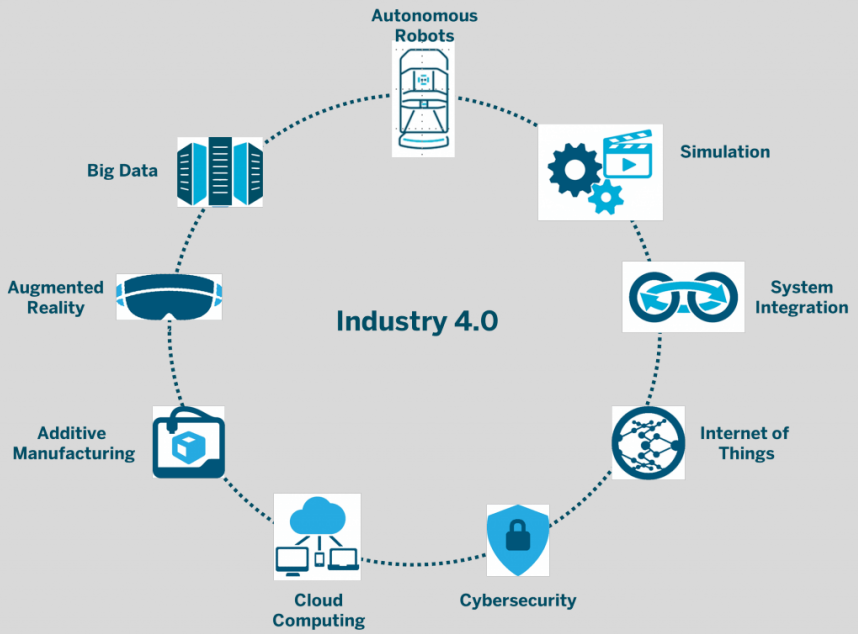


PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

SINTEF

SUSTAINABLE DEVELOPMENT GOALS

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11



SINTEF

FNs BÆREKRAFTSMÅL

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

4.0
Industry 4.0

SINTEF

Drivers for autonomous ships in Norway

A strong maritime cluster and a national strategy for increased value creation in ocean based industries

Strengthening the position in the global market

Increased transport requires new solutions for safe, green and efficient transport systems

Strong maritime research and education institutions

Examples of development actions

NFAS Norwegian Forum for Autonomous Ships

Projects carried out by members of NFAS

- ⇒ 1.4 million EUR to autonomous transport in Møre og Romsdal
- ⇒ Online risk management and risk control for autonomous ships
- ⇒ MAMIME: World's first Maritime 5G communication project
- ⇒ Enable Autonomous Navigation in Close Proximity
- ⇒ Concept development autonomous passenger ferry Ballstad
- ⇒ Signing MoU between Smart Ship Coalition and NFAS
- ⇒ ASTAT - Autonomous Ship Transport at Trondheimsfjorden
- ⇒ Yara Birkeland
- ⇒ Milli-Ampere: Autonomous passenger ferry
- ⇒ Test area Trondheimsfjorden
- ⇒ Test area Grenland
- ⇒ NTNU AMOS - Centre of Excelent Research
- ⇒ MUNIN - Concept study for unmanned bulk ship
- ⇒ AAWA - The Advanced Autonomous Waterborne Applications
- ⇒ AUTOSEA - Sensor Fusion and collision avoidance for advanced ships
- ⇒ ENABLE*3 Shore based bridge concept

INAS International Network for Autonomous Ships

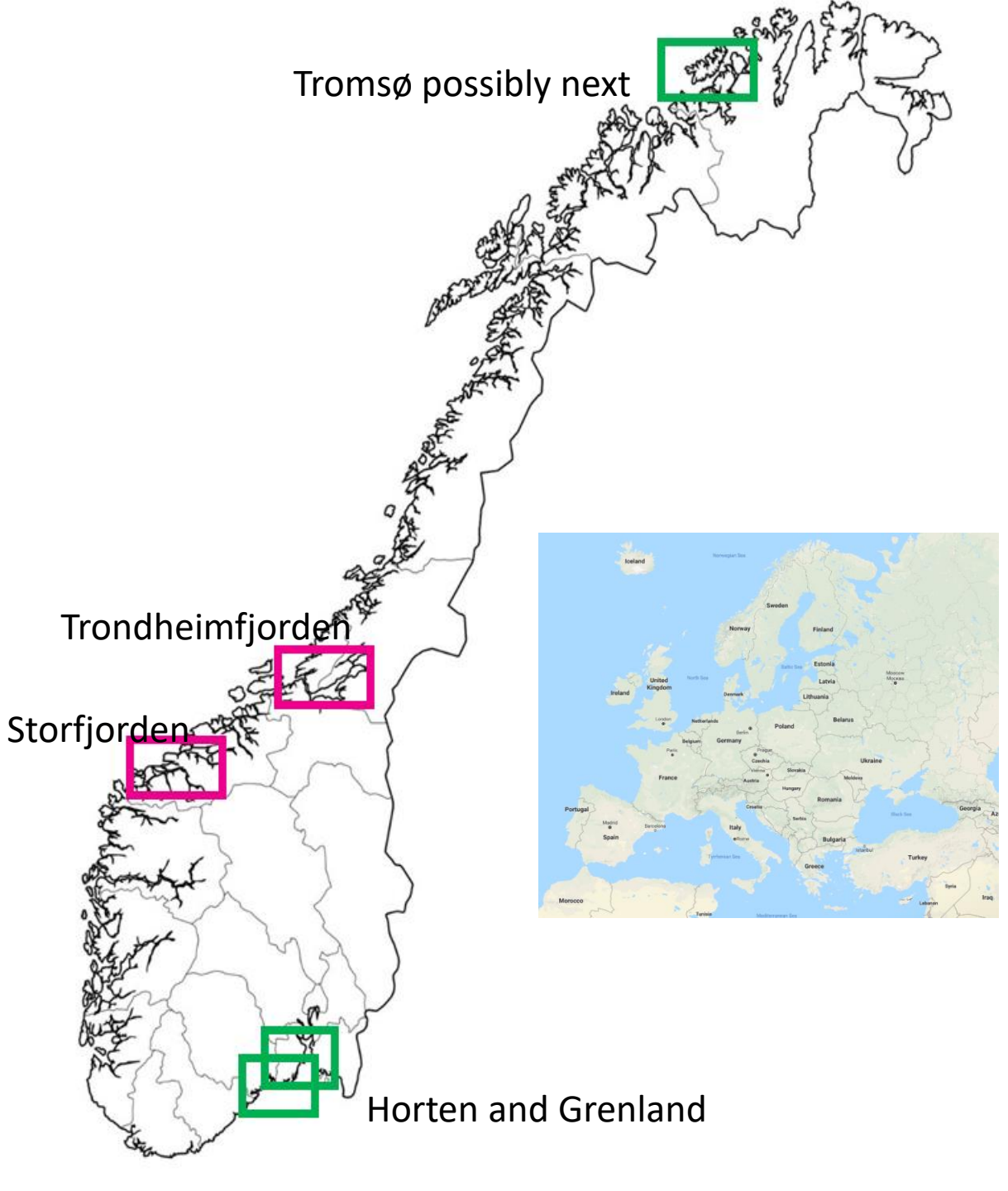
- Maritime UK, with UK Autonomous Systems Regulatory Working Group and related material.
- One Sea. Innovation Ecosystem for autonomous ships in the Baltic.
- NFAS. Norwegian Forum for Autonomous Ships.
- KAUS. Korea Autonomous and Unmanned Ship Forum. Contact is Dr. Kwangil Lee.
- SCAS. Systems and Components for Autonomous Ships. Contact is Dr. Rainer Henking.
- Smart Ship Coalition of the Great Lakes region. Contact is Mr. Travis White.
- Smart Ship Coalition of the Great Lakes region also covers part of Canada (see previous).
- Fyns Maritime Klynge in Denmark is a member of INAS.
- esa Satellite for 5G initiative of the European Space Agency (ESA) has also requested to be listed as members of INAS.
- Belgium (Flanders) - Contact points established.
- Netherlands - Contact points established.
- Estonia - Contact points established.
- China - Contact points established.
- Sweden - Contact points established.
- Singapore - Contact points established.
- Japan - OZT study group is established. Contact Shunichiro Namikawa (shunichiro.namikawa@icloud.com) for information. The Japanese roadmap to realize autonomous ships is available here.
- Australia - Contact points established.

SINTEF


KONGSBERG
Zero Emission
YARA
Yara Birkeland

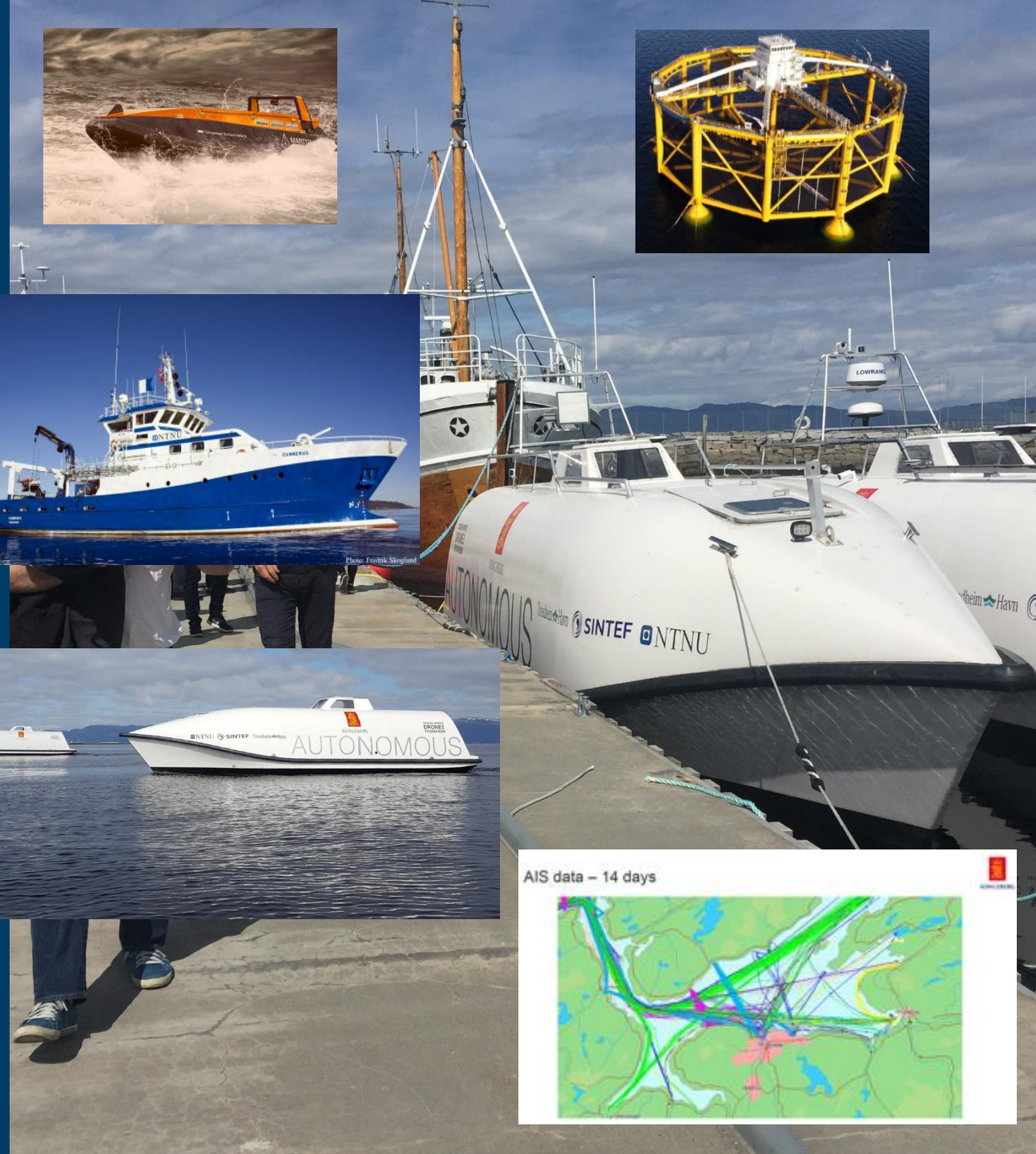
Norwegian autonomous test areas

- Trondheimsfjorden
- Storfjorden
- Horten and Grenland
- Tromsø possibly next



Test Area Trondheimsfjorden

- Established September 30th 2016
- Kongsberg Seatex, Kongsberg Maritime, Maritime Robotics
- SINTEF, NTNU
- Port of Trondheim
- Norwegian Maritime Administra
- Norwegian Coastal Administration



Test Area Trondheimsfjorden phase 1-3

Trondheimsfjorden Test Area for Autonomous Ships
- infrastructure development

2018
Test area infrastructure

Partly access to broadband communication at sea

Access to satellite communication, navigation and observation systems

Limited DGNSS coverage in inner parts of Trondheimsfjorden

OK coverage of AIS base stations and access to AIS data through the Norwegian Coastal Administration

Limited/ad-hoc access to control room functions

No common platform for data sharing and analytics

Infrastructure investments

Phase 1 2018-2020 (NAVISP)
Test Area Control Centre
GNSS monitoring station
DGNSS reference station
AIS base station for test purposes
Mobile Broadband Radio (MBR)
VDE Satellite Terminal
Data Centre

Phase 2 2020-2022 (TBD)
Lidar
Coastal Radar Stations
Camera network
Weather and current buoys
Subsea installations
…

Phase 3 2022 ->
Ocean Space Centre with Ocean Lab

2022
Test area infrastructure

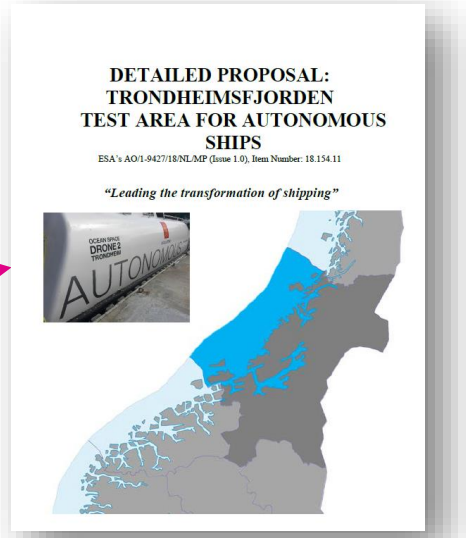
Access to broadband communication in all active parts of the test area

Overall DGNSS coverage in the test area

AIS base station for test purposes

Test Area Control Centre open for users of the test area (remote steering, test area monitoring…)

Open platform for data sharing and access to several analyses



OCEAN SPACE CENTRE

SINTEF

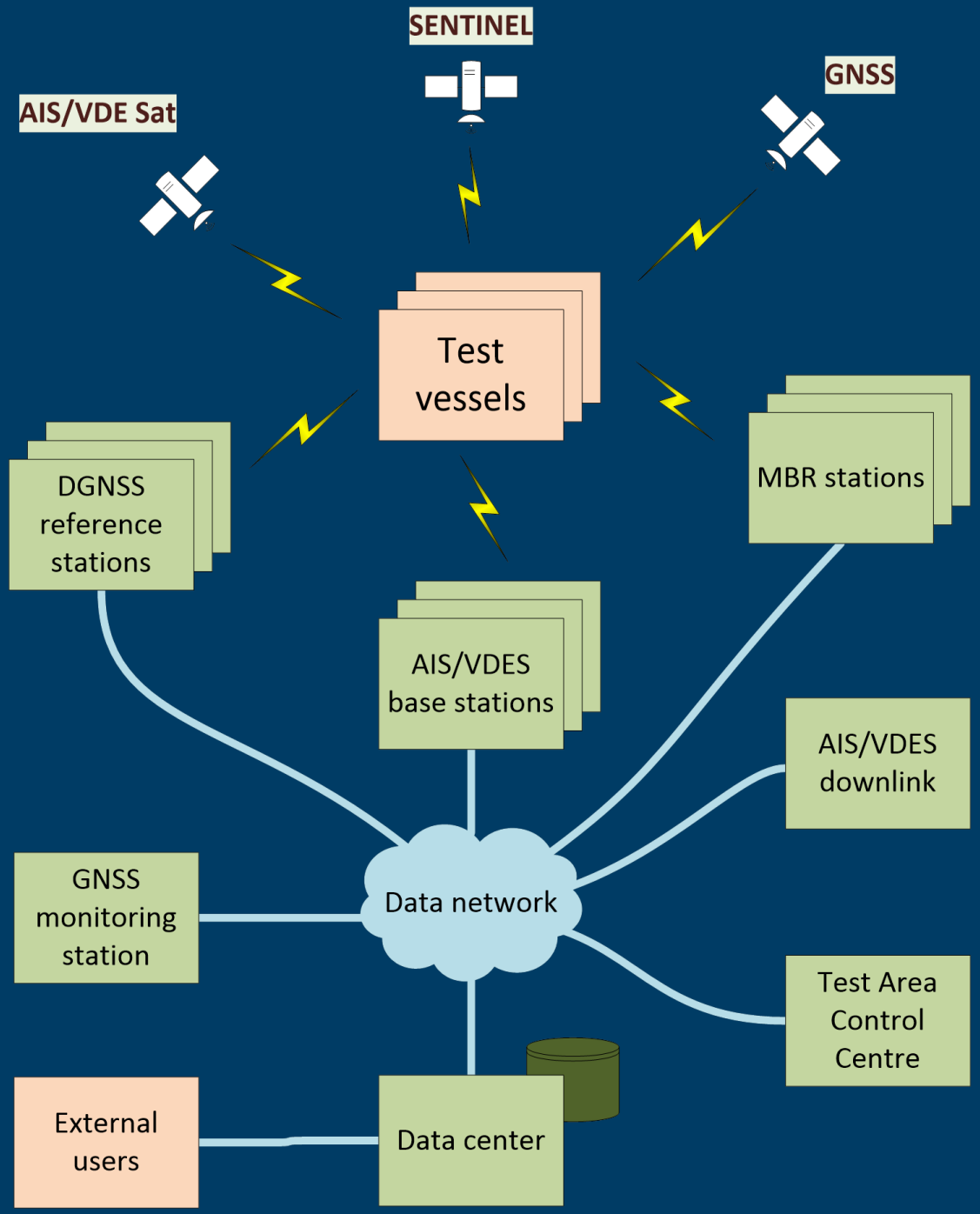
The **mission** of Test Area Trondheimsfjorden

1. Foster knowledge building
2. Stimulate technology development
3. Drive innovation
4. Develop rules and regulations
5. Test and verify concepts and solutions

Equipment

Equipment included in NAVISP Element 3 Project.

Further installations in phase 2 and 3.

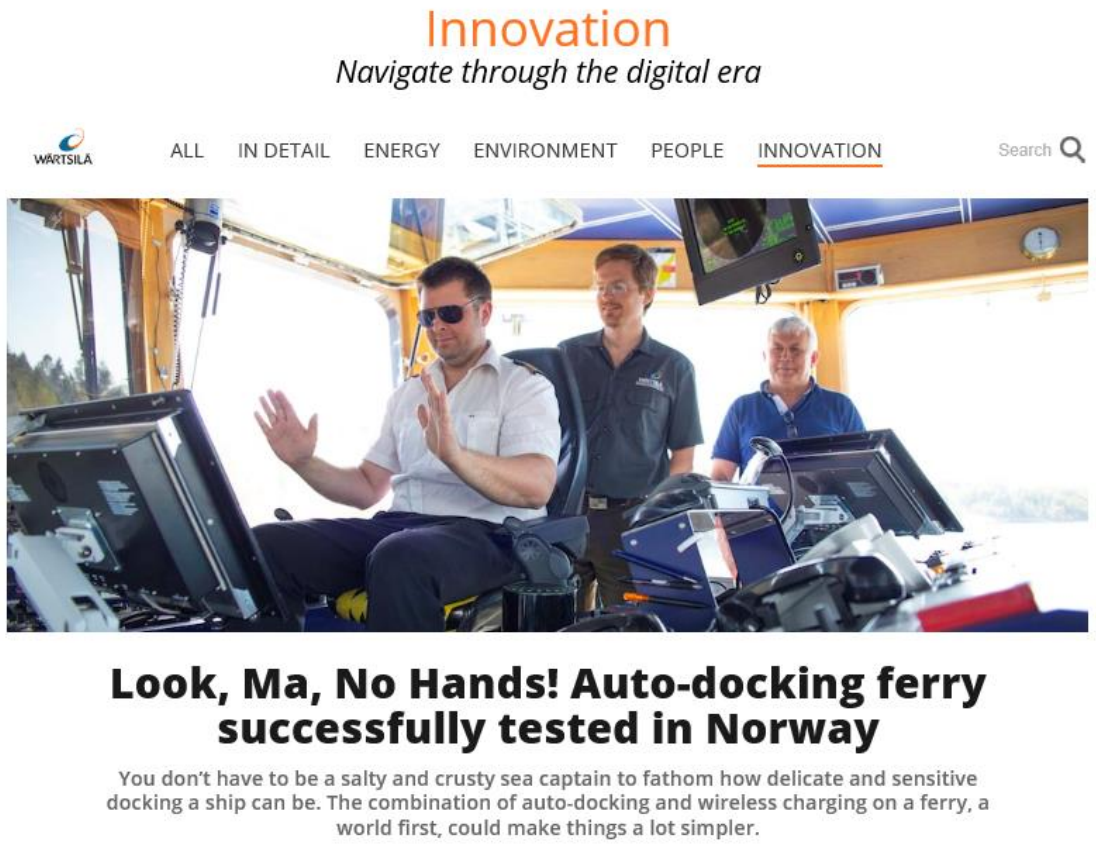


SINTEF

Scenarios

- **Scenario 1 – Fish farming**
  - MBR, SENTINEL, AIS
- **Scenario 2 – eNavigation**
  - SAT-AIS, DGNSS, VDES Sat, MBR
- **Scenario 3 – docking**
  - Radar, Lidar, DGNSS, Relative GNSS including Galileo, MBR, Camera, Sat AIS
- **Scenario 4 – Test of technology**
  - **Camera network, MBR, Sat-AIS, Radar Network**

Photo: Marius Dahle Olsen

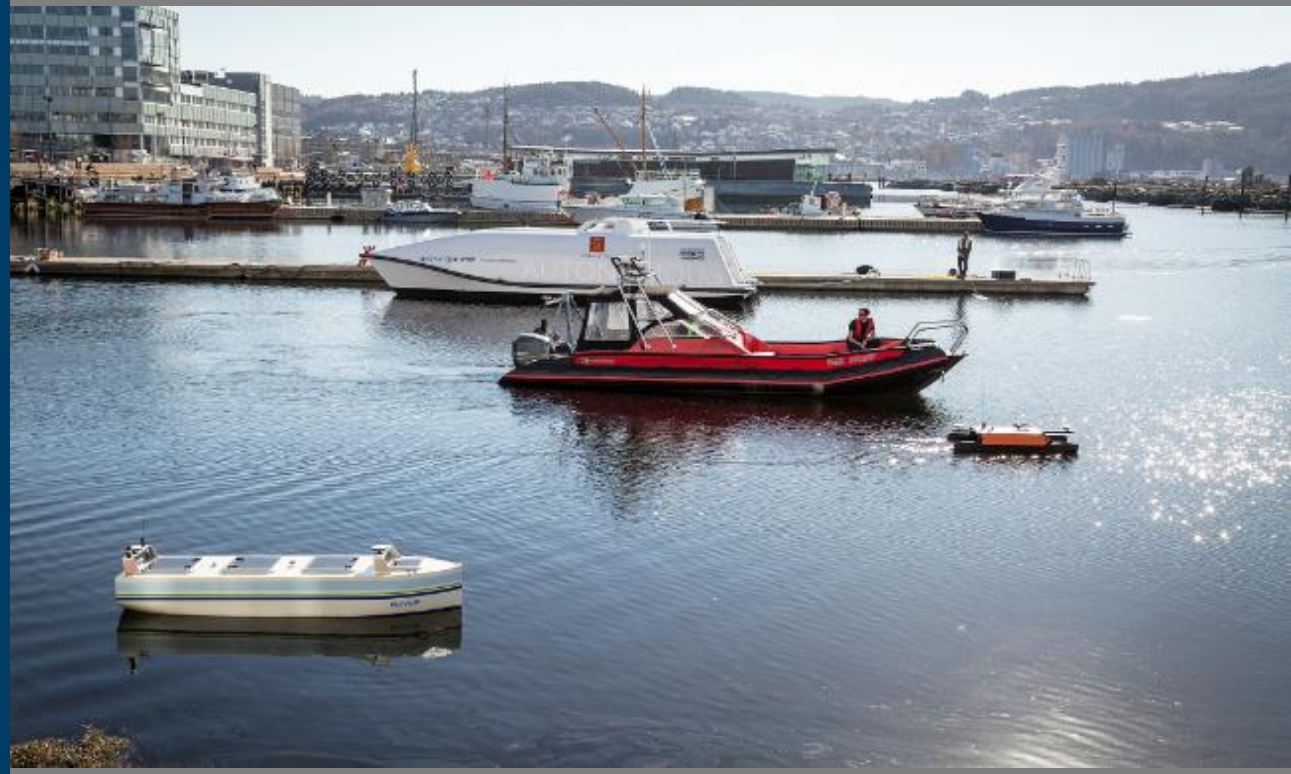


Summary

- Autonomous shipping is a Norwegian strategy – made possible by a strong maritime cluster and collaboration
- The test areas will be important tools for development of technology, rules and regulations
- The NAVISP Element 3 project contributes to this development

Test Area Trondheim -

Leading the transformation of shipping



SINTEF

SINTEF

Technology for a better society