TEST AREA
TRONDHEIMSFJORDEN

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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

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 Excellent 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
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 Administration
- Norwegian Coastal Administration
Test Area Trondheimsfjorden phase 1-3

**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
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.
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
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
Technology for a better society