

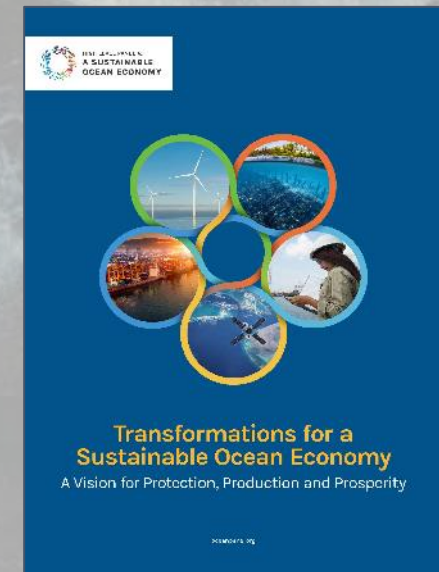
# The Norwegian Ocean Technology Centre



# Norway is an ocean nation

Around 70 percent of Norway's export revenues comes from the ocean industries.

The blue economy faces a big global transition in the green shift.



## Energy crisis

### World facing 'first truly global energy crisis', report says

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Russia's invasion of Ukraine will have long-lasting effects on energy supply and markets, a new report suggests.

The International Energy Agency (IEA) said the world faces its first "truly global energy crisis" as a result.

It added that unaffordable energy bills remain a huge problem, driven up as the exports of oil and gas have been restricted.

## Climate crisis

### Central banks raising interest rates makes it harder to fight the climate crisis

*Thomas Ferguson and Servaas Storm*

Higher rates slow the renewable energy transition and shield oil and gas producers from competition by low-carbon producers



Climate crisis and the general drift to a belligerently multipolar world are likely to further stress global supply chains ... Photograph: Bloomberg/Getty Images

## Nature crisis

### Are we living in an age of extinction?

Scientists have warned that we are entering the sixth mass extinction, with whatever we do now likely to define the future of humanity. The other five mass extinctions include the asteroid strike that killed off the dinosaurs and many species in the sea.

"We have no time to wait. Biodiversity loss, nature loss, it is at an unprecedented level in the history of mankind," says Elizabeth Mrema, the executive secretary of the Convention on Biological Diversity.

"We're the most dangerous species in global history."



GETTY IMAGES

The destruction of forests is altering ecosystems

Humans are pushing other species to extinction through hunting, over-fishing and cutting down forests and grasslands.

We are almost entirely responsible for extinctions of mammals in past decades, according to one recent study.

## Civil protection

HOME > MILITARY & DEFENSE

### Russia has a plan to sabotage European wind farms, gas pipelines, and internet cables, report say

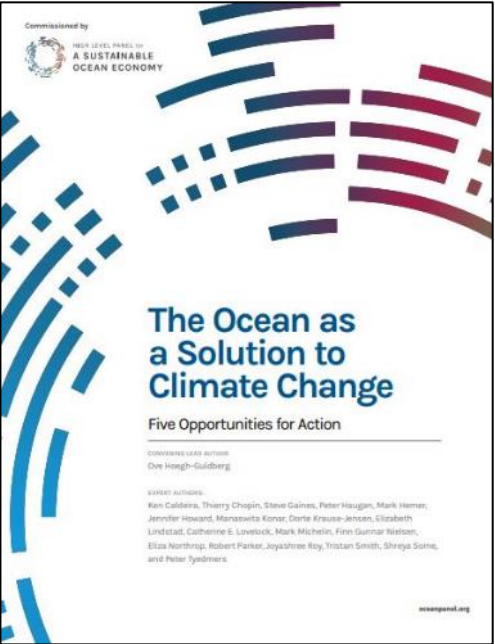
Sinbad Baker April 19, 2023, 6:13 PM CEST



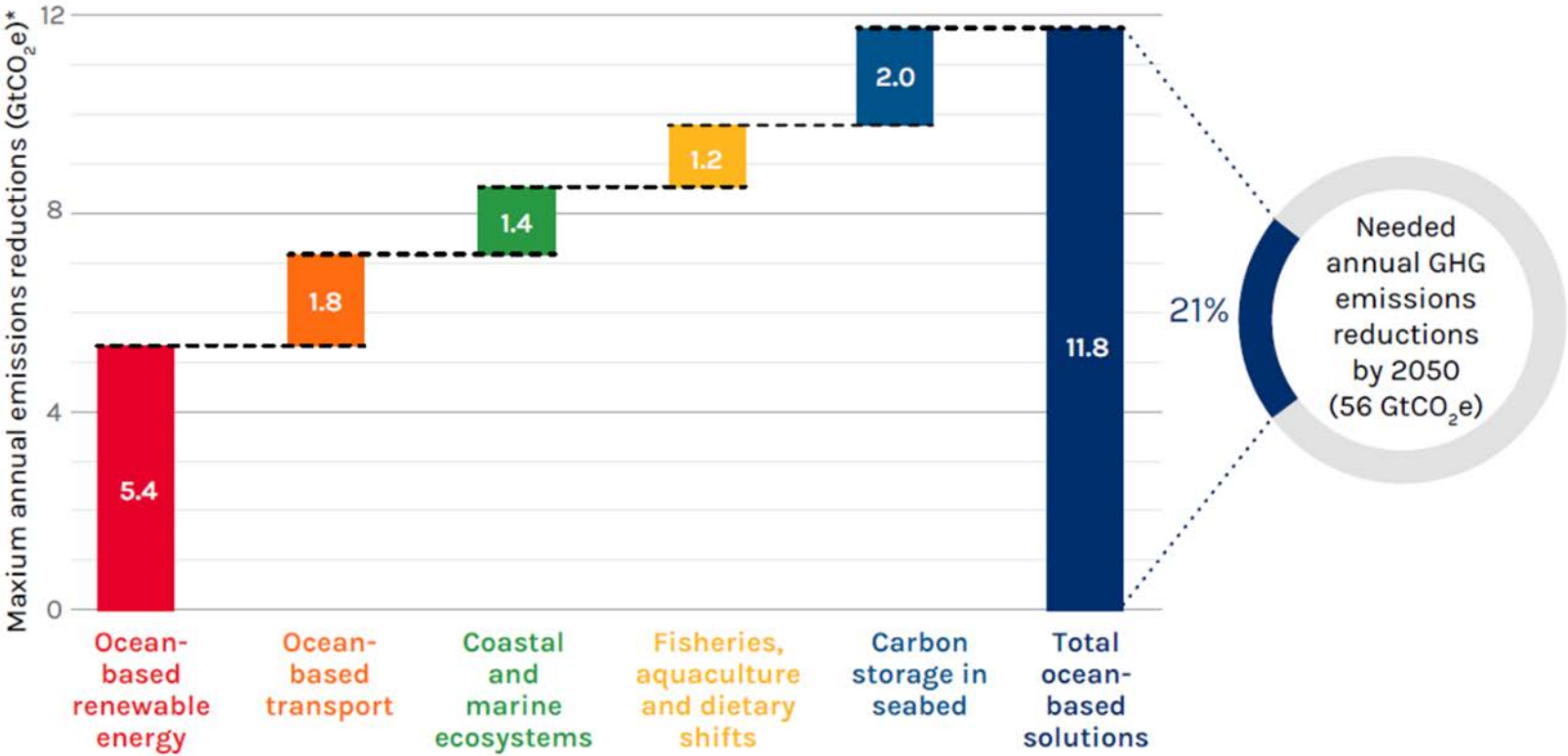
Russian Navy research vessel "Admiral Vladimirsky" outside St.Petersburg, Russia in July 2020. The ship is now accused of spying for Russia. Alexei Druzhinin, Sputnik, Kremlin Pool Photo via AP

- Russia has been using ships to spy in Nordic waters, a joint investigation by four countries' public broadcasters found.
- They are collecting intel on wind farms, gas pipelines, and power and internet cables, report said.
- Norway's NRK reported at least 50 Russian ships gathered intelligence there in the last ten years.

# The ocean industries can cut 20 percent of the worlds CO<sub>2</sub>-emissions



The ocean as a solution to climate change. 2019. High Level Panel: A sustainable ocean Economy



# The Marine Technology Centre

## Societal gains in numbers

135

new bachelor- og master candidates a year

15

new PhD's a year

400

scientific publications a year

More than

1130

Ocean structures tested and improved

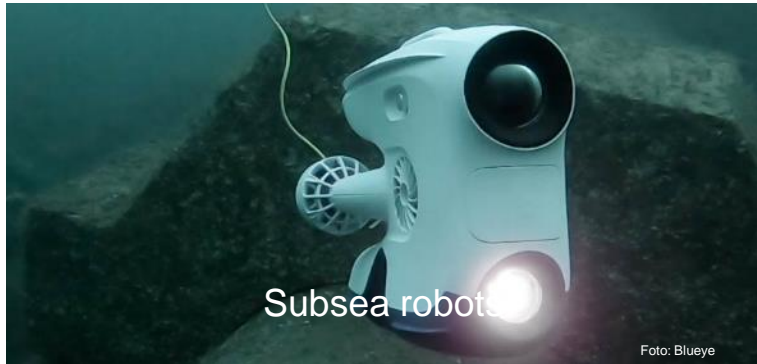
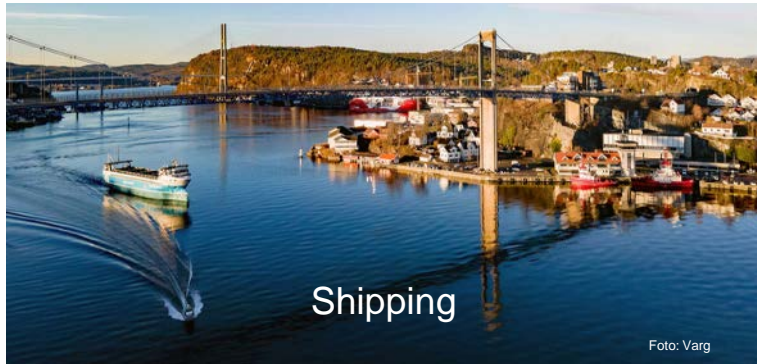
More than

3250

Ship models tested and improved

# The Marine Technology Centre

World leading in several areas and has contributed to develop the ocean industries to become the most important export industries



## The future demands advanced laboratories

- Modern and appropriate laboratories are needed to continue to have world leading competence which can contribute to Norway's strong position in the ocean industries.
- The towing tank and the Ocean basin is more than 80 and 40 years old. They were state-of-the-art back then. Not anymore.
- The laboratories have been used to test more than 4000 models in the oil and gas-installations, ships and aquaculture structures.
- Simulation and numerical models can not replace experiments in a controlled laboratory environment.









Arkimedes' hus

Professor Mørchs hus

Bassengbygget

Bassengparken

Tankplassen

Kavitasjonslaboratoriet

Tankhodet



**August 2022**  
Construction start  
Tyholt

**3Q 2023**  
Machine lab opens

**2025**  
Moving in to the House of Professor Mørch

**2027**  
Moving into the Basin Building



**October 2022**  
New temporary workshop

**March 2023**  
K-lab in use at Torgard

**2026**  
Possible start of Fjordlab

**2028**  
Moving into Tankhodet and  
the House of Arkimedes'



# Laboratories

## The Structures Laboratory

Tests structural components and materials used in the ocean industries

Works with

- underwater solutions and – cables and floating wind structures
- fish cages
- oil and gas-installations

## The Cavitation Laboratory

Studies the current around items in the water

Testes everything from

- thrusters to rudders
- ship hulls
- how fish swims effectively

## The Ocean Basin

Tests and simulates the behavior of

- ships
- fish cages
- floating bridges
- floating solar panels
- floating wind structures and subsea infrastructure

## The Machine Laboratory

Tests energy- and propulsion systems for ships, aquaculture, wind turbines and oil rigs.

Works with fuel and loading systems, both fuel engines, electrical and hybrid engines.

Also tests fuel cells, batteries, control systems, fuel rig development and technology for cleaner emissions.

## The Seakeeping Basin

Tests and simulates the behaviour of ships and other marine structures in realistic conditions with waves and wind.

The tests contributes to document the vessels need for energy and their properties from still water up to extreme weather conditions.

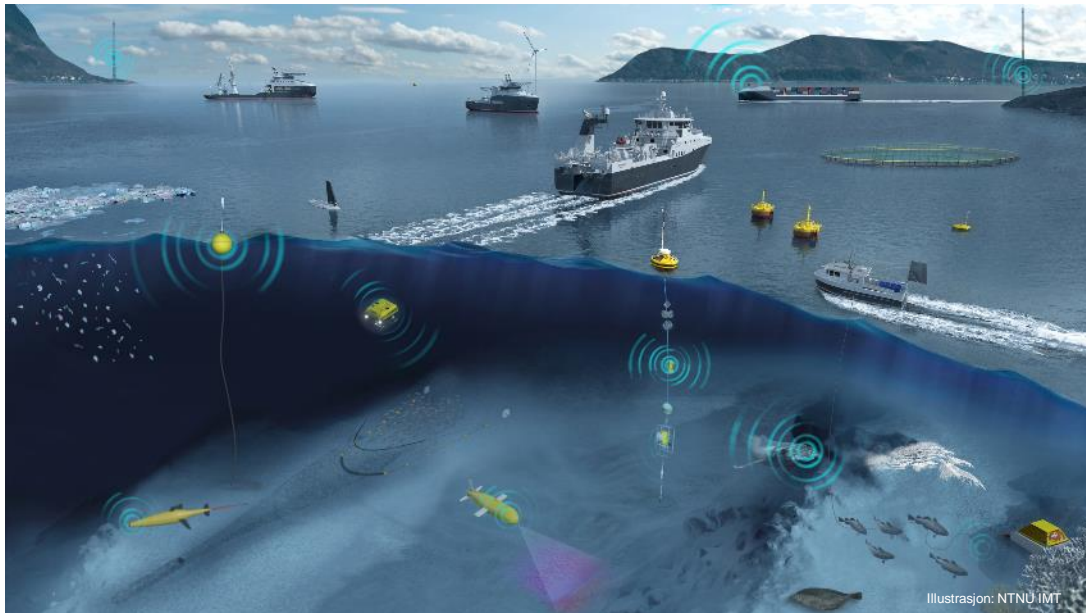
## Fjordlab

Researches

- Subsea robotics and subsea infrastructure and installations
- Autonomous ships and ship operations
- Aquaculture, and the development of seaweed farms
- Ocean observation, mapping, monitoring, security and preparedness

# Fjordlab

Full scale testing and research in the ocean environment



- Fjordlab consists of five laboratories both in the water and on land.
- They are placed in Heggdalen in Trondheim, in Ålesund, in the Trondheimsfjord and outside Hitra and Frøya.
- Fjordlab researches, develops and tests subsea robots, subsea infrastructure, autonomous ships and ship operations. It contains infrastructure for full scale testing of ships
- Fjordlab also researches aquaculture, seaweed farming, does environmental monitoring and monitoring for security preparedness and general observations of what goes on in the ocean environment.

# Machine Laboratory



- The future energy and propulsion systems for ships, aquaculture and oil rigs.
- How to replace diesel as the energy source, with biofuel, synthetic fuel, ammonium, batteries and hydrogen.
- Ready for use in the autumn 2023.
- Placed in Torgard in Trondheim.



# The Basin Building

Contains the ocean basin, the sea keeping basin and workshops. Also a place for storage and parking.

# Ocean Basin

**Length:** 60 meters

**Width:** 50 meters

**Depth:** 0 - 12 meter

In the centre of the basin there is an adjustable depth to 30 meters.



Tests and simulates the behaviour of ships, offshore structures, floaters, aquaculture cages, floating bridges and subsea installations.

Testing of models are used to improve security, reduce costs and energy, and prolong the lifespan and durability of the structures.

The ocean basin is equipped with advanced current, stream and wind facilities, and can test the structures in the exact same conditions they are calculated to handle.







# The House of Archimedes'

Consists of smaller wet and dry laboratories. The laboratories are a central part of the education and research at NTNU, and gives the students and researchers access to smaller, but world-class laboratories.

Thank you!

