The Research Council of Norway

Maritim21-strategy

Executive Summary

MARITIM 21

BACKGROUND AND MANDATE

Maritim21 is a strategy for research, development and innovation for the maritime industry and its mandate comes from the Ministry of Trade, Industry and Fisheries (NFD). In this context, maritime industries include the shipping industry, the shipbuilding industry, and service and equipment suppliers for all types of ships and vessels. They also include vessels and maritime technology used in other ocean industries, including aqua-culture, fisheries, offshore oil and gas production, offshore renewable energy, as well as knowledge-building in research groups on topics in technology and social sciences that are significant to the Norwegian maritime industry.

The goal of the strategy is to foster research, development and innovation that can contribute to sustainable growth and value creation, increased competitiveness and export from the maritime industry, as well as realisation of the maritime potential of developing green shipping and digital solutions.

The intention is to encourage a holistic way of thinking about investments in maritime research, development and innovation by strengthening the ties between public authorities, the policy implementation system, trade and industry, organisations and research groups.

The Maritime21 strategy group has been broadly composed of representatives from the industry, academia, directorates and employers' organisations and trade unions.

Photo: Edelpix

GOALS, PRIORITIES AND REQUIREMENTS

Goals

The Maritime21 strategy provides an important direction for the development of the Norwegian maritime industry. The strategy is based on the ambition that

Norway shall be a world-leading maritime nation by 2030 through taking on a leading position in the green transition

For this ambition to succeed, the following must be ensured:

- that the maritime industry and research groups are among the first to spearhead research, development, demonstration and commercialisation work relating to digital technologies and sustainable solutions
- that competitive and coordinated funding schemes are available to the industry
- that Norway can be a pioneering country in terms of developing national and international regulations for safe green solutions

The strategy will contribute to increased value creation, employment and the green transition. In the strategy, this is specified as three sub-goals for 2030:

- at least 50 % growth in the industry's value creation and export revenues in Norway (from 2019)
- at least 10 % growth in the industry's level of employment in Norway (from 2019)
- realise the emission targets adopted for the maritime industry and support the industry's own ambitions

Value creation and employment in Norway must be included as assessment criteria throughout the industry-oriented policy implementation system, including the Research Council and the instruments of other R&D agencies.

PRIORITY STRATEGY AREAS

MARITIME 4.0

Digital technologies make the green transition possible. Basic digitalisation technologies have the potential to increase innovation capacity and efficiency in the maritime value chains and to accelerate and reinforce the green transition. An extensive digital investment in Maritime 4.0 is necessary to increase competitiveness and ensure efficient operations.

Recommendations for realising Maritime 4.0:

- Strengthen research efforts relating to digitalisation of the maritime sector, especially in artificial intelligence, autonomy and digital twins of shipyards, vessels, fleets and logistics systems.
- Strengthen research efforts in digital security, vulnerability and risk analysis, as well as the redundancy level of digital solutions that are critical to operations. These areas will be crucial to safe operations.
- Strengthen research efforts in Human-Technology Interaction (HTI). More autonomy, increased access to operational data through more measurements and the development of decision support systems based on artificial intelligence increase the need for trust in the digital solutions. Innovation projects must be developed that use augmented reality technology for operating vessels and that use experience from various industries.
- Support the development of digital platforms for exchanging information and optimising maritime logistics systems nationally (in aquaculture, for example) and for international maritime transport.
- Develop models for digital design of new energy-efficient vessel concepts and models for exchanging production data and energy optimisation along the value chain through collaboration between clusters and academia.
- Develop robotic and automated solutions for efficient and competitive suppliers through collaboration between clusters and academia.
- Establish a national initiative for developing standards for maritime data and methods for increased utilisation of data in technical and commercial operations, accident prevention, maintenance and design.
- Ensure that research results and concepts can be implemented and commercialised as quickly as possible by investing in digital infrastructure and testing facilities that are available to all parties.

LOW AND ZERO EMISSON TECHNOLOGIES AND SOLUTIONS

One ambition should be that the maritime industry is able to design, build, equip and operate the low and zero emission technologies of the future. There is a need to develop technology and solutions that enable recycling of materials, and sustainable and safe operations of vessels. One export opportunity is the development of emission-free solutions. Coordinated efforts and collaboration are required across the maritime value chains in order to utilise and transfer technology and solutions between value chains..

Recommendations for realising low and zero emission technologies and solutions:

- Establish and strengthen interdisciplinary research and innovation projects across maritime value chains in:
  - fuel cell technology for hydrogen and solutions for using ammonia, as well as the further development of maritime battery systems and the next generation of maritime batteries
  - new energy carriers for maritime transport, e.g. nuclear power
  - storage and transport of energy carriers for emission-free vessels
  - energy efficiency, development of methods and systems for vessel solutions and maritime operations, including the use of wind assisted propulsion, new knowledge of hydrodynamics, hull design, materials and other energy efficiency technology
  - sustainable fuel solutions with pertaining life-cycle analyses, as well as knowledge of HSE, preparedness, evacuation and technical security in relation to these solutions
  - sustainable production processes for emission-free vessels
  - development of offshore wind power with pertaining emission-free vessels and operations
  - conversion of the offshore fleet and vessels used in the aquaculture industry to realise low and zero emission solutions
- Establish Maritime2000 modelled on DEMO2000 and in collaboration with the Green Platform for the purpose of demonstrating and qualifying new technologies and systems through close collaboration between shipyards, the supplier industry, shipping companies and research groups.


Photo: SFL Corporation Ltd

GREEN AND SAFE MARITIME TRANSPORT

The shipyards should stay one step ahead of the green transition to develop new markets, e.g. in transport and use of new energy carriers. There is a need to remove barriers for implementation of zero emission technology and new fuel solutions. Examples of such barriers include infrastructure and access to alternative fuels and electricity. The barriers can also be financial in nature, such as profitability and a lack of incentives in contracts.

Safety is a challenge, especially in the High North, where Norway has a particular interest in ensuring safe operations. It is important to address safety challenges to secure support for new solutions among seafarers, port authorities, shipping companies and society at large. Solutions are needed that contribute to safe use of green technologies and that focus on user interests.

Recommendations for green and safe maritime transport:

- Establish interdisciplinary research projects in digital technology, logistics, nautical operations, economics and law for the purpose of reducing energy consumption in maritime logistics systems and operations.
- Develop infrastructure and logistics systems for transport and distribution of new energy carriers.
- Develop a forward-looking maritime logistics system that is better equipped to handle disruption to the supply chains caused by pandemics, extreme weather events and variation in demand.
- Enhance research on the design and effects of international maritime environmental regulations and link it to Norway's negotiation position in IMO.
- Targeted financial research on how more stringent environmental requirements, digital technology and the phasing in of zero emission solutions will affect markets and international trade.
- Safety and health challenges relating to new fuel solutions must be addressed, and research efforts relating to technical safety, accident prevention, preparedness, rescue operations and HSE for employees and passengers must be strengthened.

REQUIREMENTS FOR SUCCESS

COMPETITIVE MARITIME VALUE CHAINS

Norwegian authorities, the industry and academia must establish partnerships with a view to further developing robust and comprehensive value chains and maritime clusters. This can boost the innovation culture, increase knowledge sharing and improve competitiveness. Steps must be taken to ensure that maritime clusters act as accelerators.

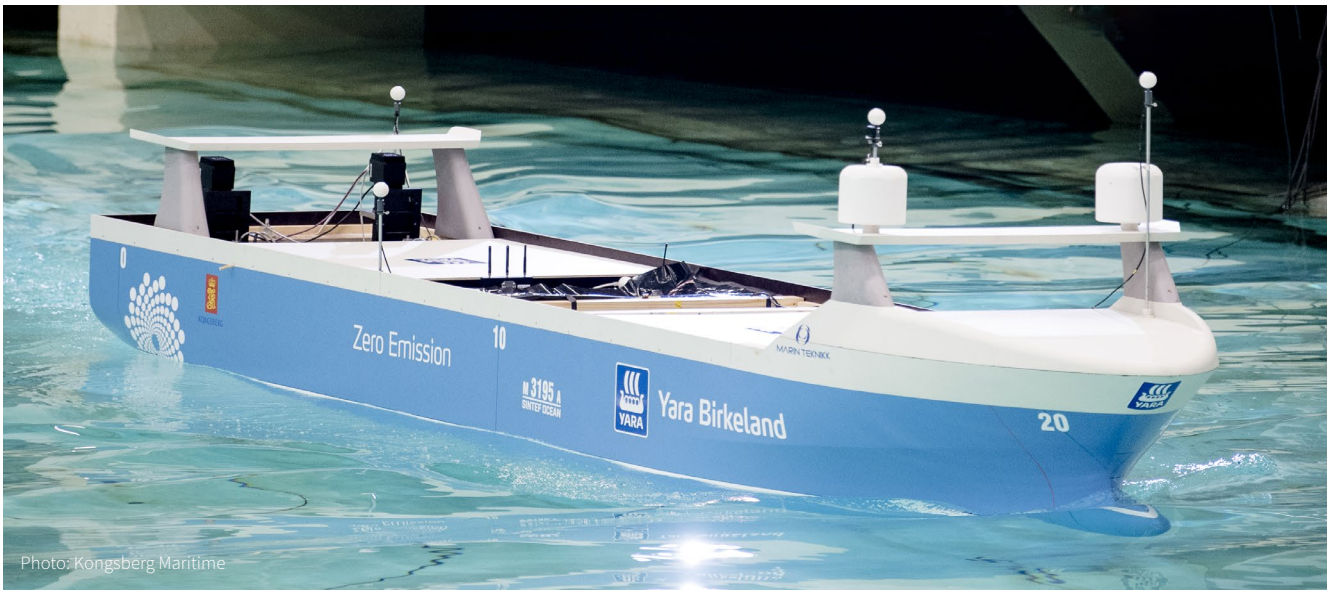
There is a need to further develop complete value chains within the following ocean industries in particular:

- offshore energy, with emphasis on utilisation of offshore wind
- seafood, with emphasis on low and zero emission solutions for aquaculture and fisheries
- travel and tourism, with emphasis on low and zero emission solutions for expedition cruises and express boats
- maritime transport, with particular emphasis on realising the ambition of ordering zero emission vessels across all segments from 2030

By sharing and transferring technology, knowledge and solutions between value chains, the chains will become more competitive. At the same time, cross-chain technologies and solutions will in themselves represent commercial and scalable opportunities. Regional maritime clusters must be able to support knowledge sharing and innovation, and testing and piloting centres, as well as other arenas for cooperation, are needed. It is a precondition:

- that R&D, collaboration and knowledge sharing is facilitated between actors in the value chains
- that a domestic market for Norwegian solutions is created where possible
- that steps are taken to establish infrastructure, licensing schemes and regulations that are important to the development of robust value chains
- that the funding schemes are competitive, and that framework and regulations enable an internationally competitive and labour-intensive industry in a high-cost country such as Norway
- that policy instruments are implemented for scaling and internationalisation in order to accelerate development
- that measures and policy instruments are implemented to compensate for any weak links or gaps in value chains

The shipyards play a key role as integrators and collaboration arenas and form an important link in the value chain. If this link is further weakened and the number of shipyards continues to decrease, it may have major consequences for Norwegian suppliers' ability to engage in innovation as a result of fewer



collaboration arenas. This means less Norwegian equipment on the vessels that are no longer built in Norway, and it will lead to a diminishing competitive advantage as technology and know-how relocate abroad..

THE NORWEGIAN AUTHORITIES AS INNOVATION PARTNER

The public sector can help to create an early market for new technology and new solutions for zero and low emissions through public-private innovation collaborations and procurements, and by making strategic use of its purchasing power. This will make the industry more competitive. Public policy instruments, including public procurement budgets, must be coordinated and designed to ensure that value creation mostly takes place in Norway.

The Norwegian authorities can contribute to increased innovation and commercialisation of new technology and solutions by:

- preparing coordinated, long-term and binding plans for low and zero emission solutions for public procurements of vessels (including for the navy) and ferry/route operating contracts
- using the licensing schemes to promote the green transition in aquaculture, fisheries, offshore wind energy production, extraction of oil and gas and other activities that require a licence
- ensuring broad access to infrastructure that enables development, piloting and scaling
- examining the possibility of introducing new instruments aimed at implementing new technology that support the green transition and facilitate value creation, such as
  - using the income from carbon taxes to stimulate the development and implementation of green technology through allocations to a CO_2 fund and in line with the EU taxonomy for sustainable activities
  - using the flexibility of the state aid regulations to encourage the development and implementation of green technology
  - examining funding solutions for the building of zero emission vessels

ESTABLISHING GREEN CORRIDORS

The Norwegian authorities must use national and international collaborations to invest in green corridors and infrastructure that give shipping companies, ports and goods owners incentives to invest in low and zero emission vessels for passenger and goods transport – which will in turn form the basis for increased value creation among sub-contractors. An initiative is needed that involves a variety of actors with a view to establishing infrastructure for new energy solutions along the coast that can be used for passenger and goods transport.

Important areas:

- The further development of international collaboration that enables demonstration and testing of green solutions through zero emission marine transport corridors. This must include collaboration to improve the safety of new solutions and collaboration on port infrastructure.
- Establishing green corridors as a regulatory sandbox where relevant.
- Experience from the Green Shipping Programme. The authorities must facilitate national green corridors and hubs for finding solutions for moving goods transport from the road to the sea.

RELEVANT COMPETENCE FOR THE WHOLE INDUSTRY

Robust and relevant research and education environments are needed to achieve the goal of safe marine transport, the green transition and value creation. Targeted efforts in applied research and development have the potential to increase export and create jobs within the priority focus areas. Educational institutions and the industry itself must join forces to make the industry more attractive

to young talents and develop programmes of high relevance and quality at all levels from first-degree to continuing and further education programmes. Particular emphasis must be placed on maritime programmes of professional study.

Prerequisites for securing relevant competence for the whole industry:

- Maintain strong maritime expert environments by strengthening research efforts and excellent research infrastructure in areas of importance to Maritime 4.0 and a sustainable transition, in close collaboration with the industry.
- Further develop maritime education at all levels, especially the maritime programmes of professional study, in line with shifts in the maritime industry's needs. This includes all levels from upper secondary education and vocational technical colleges to bachelor's, master's and PhD programmes at university colleges and universities.
- Ensure that the educational institutions collaborate closely with the industry to ensure that the educational programmes are developed in line with industry needs.
- Ensure that steps are taken to strengthen digital competence, and entrepreneurship and innovation expertise, both in relevant study programmes and through targeted programmes and courses.
- Strengthen research on safety challenges in maritime operations with particular emphasis on challenges relating to new energy carriers and propulsion systems. Experience from land-based activities cannot necessarily be transferred to maritime activities. Specifically, research is needed on the safe use of green technologies centred around the human perspective. Necessary regulations must also be developed.
- Ensure that the educational institutions collaborate with the maritime industry so that they can use practice-based and realistic simulation tools and other digital tools in teaching and research.
- Ensure that the Ocean Space Center is established as a national research and testing infrastructure for the industry.
- Ensure that infrastructure is made available to the industry and educational institutions for demonstration and testing of solutions.

INTERNATIONAL RESEARCH AND INNOVATION COLLABORATION

Norwegian maritime research groups and enterprises must strengthen their participation in European research and innovation programmes, and Norwegian research groups must become even better at collaborating with world-leading maritime research groups. The Norwegian maritime industry and expert environments must take on a more active role in the EU's research and innovation programmes:

- The Norwegian authorities must endeavour to increase the success rate of Norwegian applications for funding in connection with relevant maritime calls from the EU.
- The Norwegian authorities and expert environments must play an active role in the design of R&D programmes and ensure that the country's maritime interests are safeguarded.
- The Norwegian authorities must work to ensure that the EU's innovation fund is relevant and accessible to Norwegian shipping companies, research groups and the industry.
- The Norwegian authorities must give priority to the collaboration with Zero Emission Shipping Mission Innovation[1] to ensure that Norwegian deep-sea shipping companies contribute to goal attainment.

OTHER RECOMMENDATIONS

ESTABLISH A MARITIME21 FORUM

The forum will contribute to the maritime sector's green transition through focused and coordinated efforts in research and innovation. The forum should have a board appointed by the Ministry of Trade, Industry and Fisheries (NFD) comprising representatives of the industry, organisations and academia, and a secretariat that continuously plans and updates the Maritime21 strategy in collaboration with various resource groups.

1 http://mission-innovation.net/missions/shipping

THE MARITIME21 STRATEGY GROUP, 2021

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