

# Strategy



## Maritime DTU Centre for Maritime Activities

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## Introduction and background

90% of the world's trade is carried on board merchant vessels and maritime transport is the backbone of globalization. Danish shipowners account for the transport of approximately 10% of all world trade, and the maritime sector, "the Blue Denmark", is one of the most important industries in Denmark. It employs around 100,000 people and the industry's impact on the Danish economy is significant: the Blue Denmark contributes with about 10% of the total national production value. Also internationally, the impact of the Danish companies is impressive: Danish shipping companies own 3% of the world merchant fleet and control 6-7% of it. Growth is predicted for shipping as well as shipping related sectors and in the offshore sector. This creates the potential for generating new Danish maritime jobs and economic growth at sea and on land.

Through the years the Blue Denmark has adapted to the changes and challenges of time and utilized new business opportunities. Shipping is the main activity of the Blue Denmark, but the shipping industry is challenged globally by new conditions. The development in energy prices is unpredictable and generally on the rise and, together with the current significant fleet over-capacity, influences the earnings of the shipping industry negatively. The regional and international regulations carry with them a row of requirements for ships' energy efficiency as well as requirements to the emissions of, among others, SO<sub>x</sub>, NO<sub>x</sub>, particulate matter, ballast water and proper scrapping of ships. The task of adapting the vast existing fleet of ships to the new requirements through retrofitting of green technologies is a very large technical and economical challenge. The handling of this challenge requires advanced technology and precise insight into the commercial conditions of the business.

The challenges of the industry are complex and global and Danish businesses are in fierce international competition. In order to survive this competition and turn the challenges into opportunities, the right technologies, and business and management solutions must be developed, selected and implemented. This requires a high degree of innovation and cross-disciplinary thinking as well as access to a highly qualified technical work force. These challenges on the other hand also imply new business opportunities for Danish shipowners and providers of maritime equipment and services. At the same time, new opportunities in the Arctic and in the offshore industry have also come into play and the Blue Denmark is thus a very diverse industry with a broad range of activities and potentials.

To meet the challenges and opportunities the Blue Denmark is facing a maritime centre at DTU has been established: Maritime DTU. The centre shall strengthen the four main focus areas of DTU: Research, education, innovation and research-based consultancy with the purpose of increasing the value creation in the Blue Denmark. DTU's maritime research and education is extensive and expanding, but it is also fragmented. Teaching in maritime topics and cases at DTU is spread at different departments, research groups and individual researchers. There is great potential for knowledge sharing and coordination, improved integration of maritime research and education, and the creation of a coherent profile in the maritime area.

The centre is an open platform that coordinates maritime activities at DTU and provides clear interfaces for collaboration with businesses, policy-makers and researchers. Maritime DTU aims to strengthen applied maritime research and education at DTU. Furthermore, the aim is for DTU to be a strong partner for the Danish and international maritime sector as well as for other universities and research institutions. Maritime DTU will bring research-based knowledge into play with the aim of facilitating technical, managerial, strategic, and policy development in a global sector undergoing significant transformations. Maritime DTU provides the relevant stakeholders in the Blue Denmark access to international state-of-the-art research and research-based education.

## Mission and vision

- To develop and create value using the natural sciences and the technical sciences to benefit the maritime industry and the society at large
- To offer world-class maritime research and education
- Hosted by an elite university, Maritime DTU will be the “lighthouse” of Danish maritime technical research and education living up to the highest international standards
- To facilitate active and close interaction between the technical sciences, the natural sciences, and adjacent scientific disciplines; between practice, theoretical and empirical research; between researchers and students, and between the university and society in general
- To collaborate extensively and with synergy across DTU departments and centres and with the industry
- To educate a sufficient number of maritime graduates with competence profiles matching the needs of the industry
- To extensively collaborate with other leading international universities within the maritime field

## Objectives

Maritime DTU will

- Coordinate and strengthen the four main missions of DTU: research, education, innovation and research-based consultancy within the maritime field
- Facilitate interdisciplinary knowledge sharing and collaboration among DTU Faculty
- Organize maritime education programmes across engineering fields at BSc, BEng and MSc level which match the current and future requirements of the maritime industry
- Warrant the best possible degree of synergy across research and educational activities at DTU within the maritime field
- Facilitate close collaboration and value creation for the industry through business orientated research
- Strengthen education cooperation with national and international universities, including joint courses and exchange of students, PhD students and faculty
- Be the one point-of-contact at DTU for the maritime industry, DTU faculty and students providing easy and simple access to DTU resources
- Provide awareness and transparency of DTU’s maritime activities in the broader maritime sector in Denmark
- Attract elite students, PhD students and faculty to DTU
- Identify needs for education, research, innovation and research-based consultancy in cooperation with the maritime industry
- Strengthen research cooperation with national and international universities
- Act as a platform for financing interdisciplinary research activities and encourage a high degree of external funding
- Provide information to the education system including secondary schools and high schools about the maritime sector

## Strategy

Maritime DTU will develop an interdisciplinary and collaborative forum for maritime research programmes and projects, maritime education and outreach activities and ensure a strong link between education and research.

## Research

Maritime DTU will seek to strengthen maritime research at DTU by bringing researchers and industry closer together through meetings, workshops and conferences and facilitate knowledge sharing.

Maritime DTU will facilitate the development of interdisciplinary research projects at DTU as well as collaborate with other, non-maritime research environments at DTU on joint projects.

Nationally, the centre will facilitate and coordinate cooperation between DTU and the maritime centres and groups at the relevant Danish universities.

The centre will act as a platform for the establishment of agreements of research cooperation with other leading universities in the maritime field.

The centre will attract and facilitate employment of guest lecturers and exchange of faculty and PhD students.

The centre will help developing relevant consortia for addressing funding opportunities and support applications.

The centre will identify future strategic maritime research areas in collaboration with the industry.

Maritime DTU has defined a preliminary research strategy identifying strategic areas of maritime research. The research strategy will be used as basis of contingent prioritization of research projects. The research strategy is continuously maintained and updated in collaboration with stakeholders. Some identified strategic research areas of Maritime DTU are outlined below.

Advanced ship design

*E.g. energy efficient design of hulls, propellers and propulsion systems, hydro-dynamics, CFD, design tools and life cycle assessment of ships*

Sensors, automation and communication

*E.g. automation and remote operations, big data, satellite and communication technology, condition monitoring, decision support, sensors and systems for enforcing environmental regulations*

Efficient and sustainable shipping and business

*E.g. ports and terminal operations, supply chain management, shipping pools, route and network optimization, life cycle costing, sustainability and product/service systems*

Safety and safe operations

*E.g. risk management, decision support, safety culture, onboard systems. Minimum safe propulsion power for ships*

Materials

*E.g. glass fibre reinforced plastics and other composites, aluminium, crashworthiness and fire properties for lightweight materials*

Low carbon fuels and alternative energy sources for ships

*E.g. liquefied natural gas and alternative fossil fuels, biofuels, batteries and hybrid system, fuel cells, solar and wind assisted propulsion for ships*

Arctic maritime operations

*E.g. ice loads, ice management, ice monitoring, and communications related to mining activities, oil and gas exploration, shipping and tourism activities in Polar areas*

Machinery and technologies for cleaner shipping

*E.g. ship machinery, machinery systems, fault detection and diagnosis of machinery, waste heat recovery, refrigeration systems. Scrubbers, catalysts and other exhaust gas cleaning technologies, anti-fouling paints, and waste and ballast water treatment systems*

Offshore

*E.g. offshore structures and operations, offshore supply and logistics, offshore renewable energy, offshore aqua-farming*

## Education and continuing education

DTU's educational programmes are research-based. Students learn to adopt a constructive and critical approach to research findings. The programmes translate and mature new research knowledge into student competences.

Maritime DTU will provide the foundation for improved knowledge sharing and coordination across maritime educational programmes and elements as e.g. courses or project work at DTU.

Maritime DTU will ensure a strong link between industry and DTU to ensure that the maritime engineering educations and courses continuously fit the needs of the industry.

Maritime DTU will support the course responsible in collecting maritime industry cases for the relevant courses as well as data and guest lecturers.

The centre will coordinate the current maritime educational activities and continuously create and develop attractive educations and courses across DTU in collaboration with responsible departments.

At the same time the centre will increase the visibility and marketing of the educations toward the students together with relevant programme managers and course responsible and in that way attract more engineering students to the maritime educations and courses.

The centre will act to increase the contact and collaboration between the students and the industry through student projects and thereby make the education more attractive for the students and the graduates more attractive and employable for the industry.

Furthermore, the centre will encourage students to complete part of their DTU study programmes abroad at recognised universities with strong maritime groups.

Maritime DTU will support the establishment of joint courses with other universities and schools with easy transfer of merit.

## Research-based consultancy

Research-based consultancy is one of DTU's core activities targeting primarily the public sector. The consultancy includes advise, risk assessment, preparedness, monitoring, mapping, research and development.

For the Blue Denmark the Danish Maritime Authority is the primary authority, but the Danish Energy Agency and the Danish Environmental Protection Agency are also important and represent Denmark in the UN International Maritime Organisation.

The international rules and enforcement of rules are framing the growth and competitiveness of the Danish maritime sector. Scientific advice and balanced solution scenarios are important in the rule preparatory work attended by the public authorities.

To increase activities within research-based consultancy Maritime DTU will:

- Identify competences at DTU across the maritime disciplines, which meet the needs of the public authorities
- Communicate the relevant competences at DTU to public authorities and business
- Facilitate dialogue and negotiations with relevant external parties in order to increase activities within public sector consultancy

## Innovation

DTU is recognised for its internationally leading innovation environments. Innovation will be an integrated part of the activities of the centre in connection with education, research, and scientific advice. Through research projects, collaborations with industry and student activities Maritime DTU will reinforce the innovation potential of industry.