VISION 2025

Waterborne Transport & Operations
Meeting the Challenges through Ambitious Innovation

WATERBORNE
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**WATERBORNE TRANSPORT & OPERATIONS**  
**MEETING THE CHALLENGES THROUGH AMBITIOUS INNOVATION**

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With more than 70% of the planet’s surface covered by water, the oceans are at the heart of life on earth. They drive our climate, shape our environment, generate water and are becoming increasingly important as a source of raw materials, food and energy.

Out of sight and out of mind for the vast majority of people, the oceans are also the primary transportation route for many of our natural resources and the goods that are made from them. Globally, close to 90% of goods travel to their destination by sea and these volumes will continue to increase, also because of the growing complexity of global market and manufacturing centres.

Furthermore, Europe has an extensive continental shelf with a huge potential for exploration.

Given the pivotal role and potential of oceans in the economic and social wellbeing of our planet, their use must be managed sensibly and sensitively in a manner which minimises man’s impact. Our past history of overexploitation and accidental damage bears witness to the difficulties of achieving this.

The Waterborne community, as a major provider of maritime products and services, understands its responsibilities in this regard. A dynamic maritime industry is a key element of healthy societies, economies and environments. Our job is to deliver vital products and services to society.

Our challenge is to do this in a sustainable manner. To succeed, we must continue to improve our infrastructure, our knowledge and our innovation capability in the manufacturing and services chain.

The waterborne sector has developed dramatically over the past century and became increasingly complex in terms of specialised sub-sectors, technology, systems and in global competition. Indeed, globalisation and the need for a continued competitiveness bring threats, but equally offer opportunities to be exploited to the fullest extent.

This paper describes a medium and long term Vision in the true meaning of the word, as initiated by the ‘cluster’ of maritime industries and developed within the “Waterborne” Technology Platform. This Vision aims at categorising where the industries would like to stand by the year 2025, the ambitious targets to be met and the related innovation challenges. These targets cannot be rigid in a dynamic environment and are subject to technological as well as economic feasibility. They, therefore, represent well considered drivers and challenges for innovation towards 2025, not absolutes nor deadlines. There is a responsibility in a joint undertaking.

There is an obvious relation with the EU Lisbon Agenda and the Innovation Union, driving towards growth and employment through innovation, as well as with the Transport White Paper of 2011. Coherent initiatives taken in the waterborne sector to support the continued focus on cooperation, innovation and technology leadership will provide the competitive edge for the European maritime industries required to retain their global leadership.
In the coming years, the Waterborne community will play its own critical role in helping to achieve the “Europe 2020” objective of smart, sustainable and inclusive growth.

We believe that research and innovation are essential to address the dual challenges of societal and economic progress. We declare that

- we will deliver more extensive, integrated, efficient and sustainable waterborne transport systems and infrastructure
- we will provide increased support for the emerging offshore food, energy and minerals sectors
- we will reduce our impact on the environment
- we will play an important role in delivering a more competitive and sustainable low carbon economy
- we will continue to prioritise safety and security within the Waterborne community

To address these challenges, the Waterborne community will demonstrate strong leadership, will foster a co-operative and supportive research environment and will develop clear implementation plans.
3. Partners in Waterborne Transport
A Grown and Proven European Maritime Cluster

The European maritime industry consists of thousands of companies, organisations and professional bodies including ship owners, barge owners, shipyards and boat builders, equipment manufacturers, systems suppliers, classification societies, ports and port services, engineering services and other knowledge providers. Many of these individual companies are SME’s; several are international leaders in their business and sub-sectors and intend to remain so.

They serve Global and European supply chains through shipping services, operation of passenger transport, they are providing related infrastructures and logistics, coastal protection and dredging works, ships and equipment for both merchant and military applications as well as for the exploration and exploitation of the oceans, and they satisfy the demand for holidays and leisure at sea. At the same time, these businesses hold many common elements, commercial interests and often also have a “customer-supplier” relationship.

Despite the diversity of activity and business interests, it is the synergy created by a common environment and by shared challenges that has linked the participants together in a successful “maritime cluster”, long before this jargon became fashion. Also, it could be argued that innovation is primarily a task for individual businesses to further enhance their competitive position. However, it is evident that within the sector, the definition of needs, the setting of targets and the assessment of boundaries in R&D efforts have always and will further benefit greatly from cooperation across the sector.

Quotes from the press:

While scientists and politicians continue to argue about whether global warming is actually global cooling and whether “carbon” is harmful or beneficial and sharp business minds think about the profits generated by “market based methods”, the marine industry just gets on with the design and construction of cleaner and greener ships. It is worth pointing out that this is not some future “pie in the sky” or wishful thinking, but the shipping industry moving surprisingly fast to convert sustainable ideas into the reality of improved ships.

Examine virtually any technical journal in our maritime field and be prepared to be impressed by descriptions of new generations of ships and equipment, along with design breakthroughs that are moving rapidly from the conceptual stage into reality. This is not a maritime industry that has to be dragged kicking and screaming into more sustainable operation, but a technically aware and astute sector that is prepared to embrace innovation which will deliver both sustainability and efficiency.

The medium and long-term vision of the waterborne sector is broad and comprehensive. It seeks to coordinate the efforts of all stakeholders behind a strategy for competitive excellence dedicated to meeting market and society’s most essential needs.
4. A Vision for 2025

The scenario and the related challenges

Building a worldwide scenario with a 2025 horizon is necessarily based on forecasts, assumptions and educated guesses. It is also subject to uncontrollable geopolitical and socio-economical developments and contains a fair degree of uncertainty. However, some global issues, trends and driving forces influencing the future development of waterborne transport and the related industries are relatively clear. They are listed below.

4.1 Defining The Challenges

The major challenges facing the Waterborne sector through to 2025 and beyond are both societal and economic.

- Societal Challenges
  - Developing a low carbon, low emission economy
  - Adapting to climate change
  - Harvesting natural resources
  - Assuring safe and secure supply of goods and services

- Economic Challenges
  - Improving competitiveness
  - Improving innovation and technology transfer
  - Increasing the level of education and skills
  - Addressing new and developing routes and markets

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1 Overview of global issues, trends and driving forces as developed in the frame of the EU-FP6 Thematic Network ERAMAR
4.2 Addressing The Challenges

The Waterborne community proposes to address these challenges by means of both privately and publicly funded research and innovation. This work will support the delivery of the “Europe 2020” objectives and beyond. We will focus our efforts on three main areas:

- **Sustainable Waterborne Transport**
  - Assuring security of supply
  - Increasing the energy efficiency of ships and vessels
  - Minimising the environmental impact of ships and vessels
  - Building safer ships and vessels
  - Increasing competitiveness
  - Recruiting and retaining a skilled workforce
  - Developing advanced waterborne infrastructure including e-maritime solutions

- **Support for the harvesting of offshore resources**
  - Renewable energies: wind, wave and tidal energy
  - Fossil fuels and raw materials
  - Fisheries and aquaculture

- **Minimising impact on the oceans**
  - Developing a better understanding of the oceans
  - Improving products and services for marine monitoring
  - Increasing direct collaboration with the marine sciences
4.3 Three Pillars

The Waterborne medium and long term Vision is carried by three pillars and has been structured accordingly.

1. Safe, Sustainable and Efficient Waterborne Transport
2. A competitive European Waterborne Industry
3. Managing and facilitating the growth in transport volumes and the changes in trade patterns

4.3.1 Pillar 1: Safe, Sustainable & Efficient Waterborne Transport

Given the high-technology nature of the EU-shipbuilding sector and the high EU-wide priority for safety and environmental quality, high global standards and effective international control are important.

E-maritime solutions will be developed as a means to improve the flow of information from ship to ship and ship to shore and to provide the backbone for new products and services. Improved safety and monitoring services will be a high priority in the pursuit of zero accidents.

40% of the EU’s internal trade is already carried by water and this fraction could and should be encouraged to grow as a way of reducing congestion and pollution from land based transport.

Shipping contributes to some 3% of the global CO₂ emissions, despite the production of green house gasses per tonne mile being significantly lower than other means of transport.

The continued growth of global trade makes an absolute reduction in current emission levels very challenging and it will not be achieved by simple evolutionary technical changes. If growth rates average just 2% over the next 30 years, shipping volumes will increase by 80%. Innovative means of reducing emissions such as green house gasses, NOₓ and SOₓ must be explored including the use of alternative fuels and propulsion systems.

Although the exact impact of climate change is unclear, it is apparent that we can expect more extreme weather events, which will lead to a change in the operational envelopes of vessels and offshore structures. New technologies, modelling and validation methods will be required to determine an appropriate engineering and operational response. Current design codes and Classification Rules will need to be changed accordingly.
In **2025**, advanced technologies, procedures and systems for deep and short sea shipping, port services and inland waterways will enable waterborne operations to cope with growing transport and mission demands while enhancing its undisputed position as the most efficient transport mode in terms of cost, resources, low environmental impact and safety. Through this approach, the waterborne transport of goods and people will be secured for the benefit of society.

### 4.3.1.1 Safety & security

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<th>TARGETS</th>
<th>Innovation Challenges</th>
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<tr>
<td><strong>TARGETS</strong></td>
<td><strong>Innovation Challenges</strong></td>
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<tr>
<td>Serious ship accidents in EU waters and by European vessels globally will be extremely remote.</td>
<td>Effective designs, systems, procedures and techniques are to be developed to increase the level and reliability of the ship system's performance with the goal of a &quot;zero accident&quot; record in order to deliver</td>
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<td>- Effective means to avoid accidents</td>
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<td>- Robust ships and reliable equipment</td>
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<td>- Improved survival in extreme conditions (ice, freak, waves, etc.)</td>
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<td>- Competent crew, ship management and shore operations</td>
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<td>Ships built in Europe will be equipped with on board systems for performance monitoring, which are supporting safe operation and life cycle maintenance.</td>
<td>Man-machine interfaces will have to be improved and decision support systems must be developed to minimise the impact of human error.</td>
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<td>Effective monitoring, prevention strategies and systems for corrosion and wear are to be developed.</td>
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<td>Predictive maintenance and inspection capability through the whole life cycle is to be enhanced, efficient tools and systems for such purposes must be developed.</td>
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<tr>
<td>Ships designed and built in Europe will be crashworthy and will be able to operate and survive under the most severe conditions.</td>
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<tr>
<td>The failure mechanisms of maritime accidents must be analysed and new design, material and production principles are to be developed with the so gained knowledge. The knowledge regarding the challenges of changing operational conditions and new (e.g. Arctic) operational areas has to be improved. Designs, technologies and procedures which are sufficiently safe for such challenging operational conditions must be developed.</td>
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<th>A risk-based regulatory framework will be operating, enabling the maritime industry to develop innovative and safe transport solutions.</th>
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<td>Research and support information will be provided in order to specify the high level risk/goal based standards and specify detailed risk acceptance criteria, to be implemented in the international community. Techniques and tools will be developed to increase the practicality and efficiency of risk based design, regulation and approval processes.</td>
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<th>Safe offshore terminals with re-gasification plants will be available to satisfy the increasing demand to deliver Liquefied Natural Gas to EU consumers.</th>
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<td>The load and safety challenges for such floating structures have to be thoroughly analysed by systematic research. Based on the so gained broadened and improved know how, safe designs and technologies for floating structures have to be developed based on risk based principles.</td>
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<th>The larger number of recreational craft will be able to participate safely in waterborne traffic.</th>
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<tr>
<td>Cheap, fool-proof and safe communication and identification equipment has to be developed, which allows small coastal craft (e.g. fishing and recreational craft, craft with amateur crew) to communicate and to be dealt with in traffic management systems. If a political decision should be made to include all small coastal craft into traffic management systems, respective safe and efficient data models and algorithms able to cope with the huge numbers of traffic participants are to be developed as a prerequisite. Alternative safe and user friendly strategies to this approach should be developed.</td>
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<th>Security will be checked and safeguarded along the entire transport chain without creating extra bureaucracy, cost, congestion or delays.</th>
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<tr>
<td>Strategies, methods and procedures for safeguarding security along the waterborne transport chain (port to port), that do not reduce (waterborne) traffic efficiency, will have to be outlined and developed. Such strategies, methods and procedures should consider inter-modal transport chain's needs.</td>
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### 4.3.1.2 Environment Sustainability

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<th>TARGETS</th>
<th>Innovation Challenges</th>
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<tr>
<td>In 2025, the environmental impacts of air and water emissions will be reduced drastically. Efficient and economic techniques will be available for onboard treatment of liquids and solid waste.</td>
<td>A 'zero emission' approach, notably on substances like SO$_x$, NO$_x$, CO$_2$, PM and VOCs is an enormous technological challenge. Reducing one pollutant may well have a negative effect on other pollutants, while no single option will be suitable for all types of ships. Economically viable processes, systems and equipment have to be developed under a holistic approach, ensuring a balanced long term solution. Clean propulsion systems and economic retrofit-packages for existing ships are to be developed, as well as non-fossil based propulsion solutions for economic application on large ships. In ship design and development of ship systems, know how gained by research must be systematically applied for minimising operational polluting discharges into water. The development of more efficient and economic processes and environmentally friendly on-board systems for treatment and disposal of liquid and solid wastes, including ballast water decontamination, would strongly support their rapid adoption.</td>
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<tr>
<td>The pollution impact of maritime accidents will be reduced to a minimum.</td>
<td>The development of more efficient and economic processes and environmentally friendly on-board systems for treatment and disposal of liquid and solid wastes, including ballast water decontamination, would strongly support their rapid adoption. For smaller and recreational craft, cheap, efficient and fool-proof anti-pollution processes, technologies and systems are to be developed with the aim of reducing pollutants by 75% of the current average. Ship designs that allow minimisation of spills as a consequence of accidents have to be developed and made customer attractive. Improved technical solutions for monitoring illegal discharges and occasional spills should be facilitated by implementing latest results of research and new technology, including the use of satellite systems. To protect the coastline from consequences of accidents, which will be rarer but never totally excluded, a new, more efficient and modular usable generation of pollution combating equipment and craft will have to be developed.</td>
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<tr>
<td>Ships designed and built in Europe will be capable of disposal and recycling in a safe and environmentally friendly manner.</td>
<td>Technologies that enable the design and erection of new units for safe and environmentally acceptable recycling must be developed, in cooperation with the suppliers of the materials and equipment. The availability of environmentally acceptable disposal facilities is a prerequisite for new recycling ideas.</td>
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<tr>
<td>New environmentally friendly techniques are implemented for dredging of polluted sediments.</td>
<td>Strategies and technologies for dredging water- and seaways with contaminated sludge have to be developed. More effective and practicable processes and techniques for effective treatment of polluted sediments in rivers, harbour basins and the seabed must be made available.</td>
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### 4.3.1.3 Efficiency

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<th><strong>TARGETS</strong></th>
<th><strong>Innovation Challenges</strong></th>
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<tr>
<td>In 2025, seamless monitoring, identification, communication and vessel traffic management systems will be operational around Europe to improve the coordination and efficiency of operations.</td>
<td>Efficient data models and algorithms, especially for high risk/dense traffic areas as well as for port approaches and port call preparation, are to be developed and tested. Optimal and easy to handle man-machine and communication interfaces for complex integrated traffic management systems must be available. It has to be ensured that information systems are integrated across inter modal boundaries.</td>
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<tr>
<td>In 2025, the cost for sustainable, safe and secure waterborne transport will continue to be clearly lower than other transport modes.</td>
<td>The efficiency of all elements in the waterborne transport chain has to be continuously improved, optimised and missing technologies must be developed, with the goal of maintaining a cost level of approx. 20% (or less) compared to road transport.</td>
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<td>Short sea shipping is fully acting as an alternative transport mode in the supply chain.</td>
<td>Fully integrated European supply chain systems are to be developed and optimised with a systems approach, addressing the combination of the different transport modes in terms of costs, reliability, safety, environmental friendliness, ease of choice, integration, security and market demand.</td>
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4.3.2 Pillar 2: A Competitive European Waterborne Industry

European companies belong to the world leaders in all fields of the maritime industry and waterborne operations. However, constantly changing market, society and environmental conditions create new opportunities and new challenges. The European maritime industry, based in an area of wealth and high social and environment protection standards, must address these challenges by means of technological and commercial research, development and innovation to maintain leadership and competitiveness.

Maritime RDI is one of the keys to European competitiveness and covers parallel development of the supply chains, equipment and materials, manufacturing and support infrastructure. It deals with all vessel types from high volume and specialised cargo vessels, large cruise ships and ferries through special service supply ships, ice breakers, tugs and dredgers, research and coast guard vessels to super yachts, sail and power boats.

High quality, efficient vessels and waterborne systems mean cost effective and environmentally sustainable transport, especially where integration with other transport modes is optimised. On average, the external cost of waterborne transport is less than 1/5 of the cost of road transport. A shift of larger transport quantities from road to waterborne transport could save hundreds of millions of euro in the external costs of transport\(^2\). This modal shift will be enabled by integrated vessel and cargo handling system designs, focused on the cargo, to deliver rapid logistics handling from ship to shore.

By its very nature, the sector is already global in its manufacturing and operations. The major players understand the worldwide differences in regulatory environments and in labour and social conditions. Given the overarching need for a level playing field, the industry’s competitiveness strategy is based on high productivity, the superior performance of its innovative products and services, and an ongoing commitment to developing and implementing new knowledge.

- There is a high level of awareness of the need to reduce our long term dependence on fossil fuels, from both economic and environmental perspectives. Until there are viable alternatives to fossil fuels however, we will need to support the exploitation of the limited remaining resources. More advanced vessels will be required for:
  - Deployment, operation and recovery in extreme conditions

\(^2\) European Commission estimates
• Extreme weather operations, including extreme cold
• Deep water exploration

The development of a sustainable energy position requires the use of more renewable energy (EU goal of 20% by 2020) and the exploitation of alternative energy sources. In the marine environment, we need to provide products and services to support
• Offshore wind farms (fixed and floating)
• Wave, current and tidal energy devices
• Thermal and osmotic energy
• Advanced dredging
• Energy conversion, storage and transfer
• Greater involvement of the classification societies in offshore energy
• Specialised vessels and equipment for installation, maintenance and support
• Specialised repair yards and ports

A rapidly increasing world population is placing ever increasing burdens on the food supply chain. At the same time, natural sources of protein such as fish are declining due to environmental changes and poor long term resource management.

In this climate, aquaculture is becoming increasingly important. The potential for growth in Blue Food in Europe is substantial, in particular as fish farming moves to the open sea. To realise these opportunities there will be a need for greater support from Waterborne technology for
• Specialised factory and support vessels
• Effective monitoring systems
• Good area planning to prevent conflict with other use of the oceans

The World’s oceans are largely unexplored but it is known that there are valuable and necessary resources to be recovered from on and beneath the sea bed. This is an emerging market and exploitation of these resources will require a high level of inventiveness and innovation for
• Site investigations
• Deep water operations
• Advanced simulation and validation
**TARGETS**

In 2025, Europe will remain the leading player in waterborne transport thanks to pro-active planning and investments in the transport chains, the best quality of service, low transport costs.

In 2025, European waterborne transport will continue to play a significant part in meeting the global demand for the transport of goods and transport of passengers in Europe. 50% of Europe’s internal trade will be waterborne.

In 2025, the number of passengers days in cruise business will have doubled and the EU will remain the leading cruise ships builder worldwide. The world annual demand for recreational boats larger than 8m will have tripled.

In 2025, the European marine manufacturing industry will remain to be world leader in systems and equipment as well as in selected high value added ship building market segments. This will be due to its ability to understand emerging requirements, innovate and deliver on time and to the required quality, representing the best choice in performance and costs. The industry will be at the leading edge of competition by mastering the most advanced methods for design, production, networking and knowledge management, optimised value chain and cooperation.

In 2025, world oil and gas demand will have more than doubled, making the exploitation of offshore oil and gas in very deep waters and/or extreme environments economically viable. This will push the demand for highly reliable exploration and extraction equipment and systems and may also lead to safety related fatigue phenomena. This is important in the context of the implementation of new materials, hull and propulsion concepts. It is necessary to understand the related vibration characteristics to be able to develop low noise and vibration solutions.
### 4.3.2.1 Transport and Operations

**TARGETS**

In 2025, European deep-sea shipping will still be leader in maritime transport. European short sea shipping and inland waterway transport will be the favourite choice and the backbone of many existing and new logistic transport chains.

**Innovation Challenges**

Under the conditions of a level playing field, notably also including strict global application of international regulations like on safety and environment (IMO), EU ship-owners will benefit from innovative, highly efficient ships, equipment and systems, capable to comply with the highest international standards and regulatory requirements. Close coordination between the EU ship-owners, shipyards and suppliers in the development of such capability will offer a strong basis for competing globally. Short sea and inland waterway transport operations will be supported by newly developed advanced ships and equipment and, where appropriate, be fully integrated with easily accessible inter-modal interfaces.

### 4.3.2.2 Shipbuilding and Equipment

**TARGETS**

In 2025, Europe’s ship and boat builders as well as the marine equipment manufacturers will work at the world’s highest productivity level and will command the shortest lead and delivery times as important elements to defend their competitiveness in a global market.

**Innovation Challenges**

Strategies, methods, tools and processes in design and production have to be continuously improved, using the latest R&D results, which will enhance the ability to deliver high quality and high performance products and supporting services, with the aim of reducing the overall delivery time of a new build vessel by at least 20%. To reduce the manpower for design and production preparation works by 50% and to increase the productivity of ships and equipment production by 30%.
Meeting the Challenges through Ambitious Innovation

Vessels produced in Europe will be the world’s most advanced, have the lowest energy cost, life cycle cost and the highest customer focus.

The R&D efforts have to be focused on integrated, customer-friendly solutions (vessel, equipment, life-cycle support, recycling). The excellence and performance of products has to be continuously improved, including the implementation of emerging new key technologies.

The energy consumption of the vessel as an entire system as well as of its sub-systems has to be reduced and optimised, using a holistic, integrated approach and develop the necessary energy management strategies and technologies, with the goal of 25% reduction of overall on board energy consumption through increase of system efficiency.

A life cycle approach has to be implemented, translating new technical, regulatory and business requirements into improved materials, production technologies and design.

Integrated life cycle management products have to be developed, including modularity in use, with focus on easy retrofitting, on-line monitoring systems, etc.

Design for easy and environmental sustainable dismantling, recycling and disposal will be a unique sales point for European vessels and requiring the development of the necessary strategies and economic solutions.

The European shipbuilding industry will continue to be the leader in the world market for high tech vessels (new and refurbished) ships.

The development speed for building, converting and repairing complex and high tech vessels must be kept faster than that of competitors, with the goal of defending a market share of more than 90% for high tech and of close to 100% for cruise ships and cruise ferries.

Emerging risk based design principles must be used to obtain competitive advantages (“intelligent concepts and designs”) to provide the world’s most advanced, economic and safe products.

The European shipbuilding industry will offer interesting, motivating and desired professional careers for highly qualified people, without risk for health, safety and environment (HSE).

An excellent HSE record must become one of the main drivers for competitiveness, for the acquisition of contracts as well as for the recruiting of employees.

This includes the responsibility of the general contractors for the selection of subcontractors.

Research and development results supporting a challenging, safe and efficient work environment are to be implemented.

The EU maritime equipment industry will still be the favourite supplier of world shipbuilding and offshore operations. The export share will have increased further on.

The European equipment industry must maintain superiority by maintaining a technological edge and reducing through life cost. The service market share must be increased through innovative after sales, global maintenance and training concepts to at least 60%.
### Waterborne operations

Waterborne operations will have a clear perspective of the feasible and most economic systems for the propulsion of large ships as the supply of fuel oil reduces.

Economic and reliable large-scale applications for alternative power and propulsion systems have to be developed and tested, including higher efficient electric propulsion, use of LNG instead of heavy/diesel fuel, fuel-cell electricity generation by use of hydrogen and/or LNG, sail support, etc.

### Inland waterway transport

Inland waterway transport will be regarded as an efficient, modern, high tech mode.

Multipurpose vessel types and modular concepts in inland waterborne transport have to be developed. Focus on equipment for flexible integrated solutions for D2D-transport chains.

### 4.3.2.3 Offshore Services and Technologies

#### TARGETS

- **In 2025, platforms and technologies to access to marine resources in water depths exceeding 2000 m and in extreme regions of the Arctic will be ready to use.**

  The necessary support ships and high tech solutions for specialised tasks and platforms, especially in challenging environments, must be developed, based on ongoing research regarding e.g. sea keeping, floating platform / vessel interaction and arctic environment.

- **EU operators will be the world leaders in commissioning offshore renewable energy installations.**

  The necessary strategies, solutions, technologies and floating infrastructure must be developed as well as safe operating routines.

- **EU companies are the world leaders in design and construction of elements of the natural gas transport chain.**

  The necessary equipment, technologies for LNG offshore terminals, LNG tanks and carriers and related facilities must be improved and missing items must be developed. Many of the presently used technologies in LNG handling and transport are more than 40 years old and require innovation.
In 2025, the European recreational craft industry will have strengthened its position as a global market leader in the production of sailing boats, powerboats and super yachts.

A sustainable future for the recreational craft industry will be ensured by the intelligent use of true life design and the creative development of environmentally sound products, processes and operations. Global market leadership will be retained by producing competitively positioned craft with high level of innovation, added value and customer satisfaction.

In 2025, European ports are on the leading edge in the use of innovative cargo handling systems and overall efficiency.

New techniques for faster cargo handling have to be developed to maximise port throughput within given infrastructure constraints. This will require also the development of logistics planning tools.

The European dredging industry will remain the world’s leading technology provider and operator, offering the most advanced and environment friendly dredging methods.

The necessary equipment, technologies and ships will have to be developed, with the goal to hold 90% of the free world market of dredging activities. Dredging technology must be improved to minimise impact on the marine and aquatic environment. The knowledge regarding level, extent and duration of suspended sediment concentrations caused by natural events and commercial fishing has to be enhanced through research, relative to those caused by dredging activity. The understanding of the effects of estuarial dispersion or disposal methods will have to be enhanced through long term field trials and measurement. This is essential for enhancing infrastructure planning processes.

EU companies are world leaders in advanced rapid and low cost site investigation methods.

Remote sensing and airborne site characterization and measurement technology and interpretation techniques must be improved, better methods of in situ measurement of density and strength in seabed soils must be found.
4.3.3 PILLAR 3: MANAGING AND FACILITATING THE GROWTH IN TRANSPORT VOLUMES AND THE CHANGES IN TRADE PATTERNS

Growth and dynamics of the global economy are to a large extent driven by changes in the world's demography, productivity, relative welfare, demand and availability of energy, of raw materials and of food. Historically, international waterborne trade has grown much faster than the rate of the global economy, but constraints have occurred and are increasing to be expected in the responding to the rapidly increasing demand for waterborne transport and increasing vessel sizes. This is most notable in infrastructures such as ports and terminals, locks and inland connections, which require long lead times for development to accommodate increasing trades. Europe has the largest single share in global waterborne transport. Maintaining this position requires focused efforts to accommodate and safeguard the growth of trade flows and adapt rapidly to changes in global trade patterns. Europe faces immense challenges to keep its ports and seaways capable with the increased number and size of ships.

A significant proportion of the EU's goods and energy arrive via the oceans: 8 million barrels of oil a day arrive by ship. Maintaining the security of this supply is paramount for the economic and social well being of the community.

Some supply threats are technology or climate based, others are geo-political. With the political stability of countries bordering important shipping routes becoming more uncertain, acts of piracy and terrorism are likely to continue. New solutions for ensuring the security of ships and their crew need to be developed and implemented in addition to reducing our dependence on fossil fuels and increasing the ability of vessels to withstand extreme conditions.
TARGETS

In 2020, advanced scenario planning techniques for world trade growth and trade patterns estimations will be in common use to support public and private planning and investments.

In 2025, the global maritime trade, standing at some 29,000 billion tonne miles in 2005, will have increased by 80%. Europe, as the largest player in waterborne transport, will maintain its leading position and will be fully capable of coping with the consequences of this enormous growth in trade and changing trade patterns. This will be based on the ability of EU waterborne transport stakeholders to assess future trade trends better and quicker than their competitors and to plan their needs and investments accordingly.

4.3.3.1 Technology tools to cope with trade growth and changed patterns

<table>
<thead>
<tr>
<th>TARGETS</th>
<th>Innovation Challenges</th>
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<tbody>
<tr>
<td>In 2020, advanced scenario planning techniques for world trade growth and trade patterns estimations will be in common use to support public and private planning and investments.</td>
<td>The necessary data and support models will have to be developed. Ports, terminals and hinterland connections – not only in Europe - must be subject to adequate and broad based planning and permission procedures for timely construction and availability, also in context with the growth of ship sizes. Visions and scenarios will have to be developed as an ongoing exercise on innovative ships, cargo handling, landside transports to feed data and support models.</td>
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The increased use of unitised cargoes will offer much enhanced streamlined transport operations, avoiding congestion and delays in supply chains. European short sea shipping and inland waterways transport will cater for around 50% of regional trade as well as for the feeding between main and smaller ports, thus alleviating pressure on longer haul road and rail capacity.

Ships, terminals and facilities will have to be developed, which are specifically designed and/or adapted to ensure efficiency of the waterborne transport by short turnaround of ships in ports and a high degree of automation of berthing and cargo handling.

Advanced logistic chain management systems and operational tools will be available, facilitating very fast sea land interchange.

Integrated ICT (Information and Communication Technologies) and ITS (Intelligent Transport Solutions) will have to be developed, to enable much more efficient planning, booking, simulation, routing and control of cargo along the different transport modes as well as other services supporting efficiency, safety and security. A modern network of inland ports and sea ports must be established, to offer the European and Global manufacturers and trade the necessary and reliable operational and information services as required for efficient and economic transport of goods.
5. Cross Industry Common Issues

**Education**

Market leadership is based on competency, know-how, innovation capability and collaboration. It is strongly dependent on the ability to foresee future needs and to forestall problems. People are the main asset. Continuous improvement of human skills is a must. This is true across the whole waterborne sector and is an essential ingredient of the EU knowledge based society.

The need for capable navigators, naval architects, marine engineers and general business managers is evident for most areas of the maritime cluster. Advanced maritime knowledge in research, design, manufacturing and the operation of ships, is a fundamental factor to fuel the EU economy. Therefore, a favourable environment for the education, training and recruitment of qualified resources, including seafarers, should be created and developed.

The maritime sector also needs to be perceived as offering reliable and safe workplaces for highly qualified people and an attractive and challenging career opportunity. This requires appropriate communication and education strategies for young pupils, within and outside the waterborne sector.

The Waterborne industry does not stand isolated with this education challenge. There are wider interests and interrelations, such as with commercial service providers like financial services and not in the last place supporting, controlling and regulating governmental institutions. To fulfil their tasks well, they require personnel that know the maritime industry from the inside. Although not the immediate aim, maritime industry thus in practice also has a role as a training pool for supplying qualified and experienced people to the ‘outside’.

**ICT**

A further factor of crucial importance is the further development of information and communications technologies (ICT). To ensure systematic and integrated development in this field, the Waterborne TP will define specific actions, such as under e-Maritime initiative.

**Policy**

There are many reasons for EU maritime policy initiatives, on issues like:

- Creating an **appropriate balance** between maritime-related economic activities, leisure along the coast lines, environmental concerns, health and food supply, energy supply, coastal defence and maritime related employment. This equates to sustainable economic development for the maritime sector.
- **EU Regulations and Directives:** The waterborne transport sector is heavily regulated; it is of great importance that EU regulations are considered in the context of the regulatory regime worldwide (e.g. the one of the IMO). This is essential to ensure that the European maritime industry is not disadvantaged in the global market place.
Transport and Infrastructure Policy: Waterborne transport is a key link in the trade chain which is Europe’s lifeblood. Recognition of the environmental costs of road transport has drawn attention to the importance of waterborne transport as an alternative. This, together with the relocation of manufacturing activities outside Europe, poses major challenges and opportunities to the European economy, our ports and the maritime industry.

Need for synergies: Considerable resources are needed to develop marine science and research as well as new technologies for improved sustainable uses of the seas. Increased efforts at all EU levels are required in order to create synergies among all the players concerned.

TARGETS
In 2025, a major competitive factor will be the reduced time between research and implementation / market uptake of results. The EU waterborne manufacturing sector will enjoy a short “time to market” because research institutions and universities will be fully integrated in a cluster structure with industry and will be used to teamwork on focused product development.

In 2025, technology transfer from other sectors will be as common as transfer from the maritime to other sectors today. Systematic screening of emerging technologies will be developed and implemented, to accelerate transfers from sectors such as biotechnologies, embedded systems, nanotechnology, materials and wireless communications.

In 2025, naval and civil sectors will share technologies. The organisation of permanent technology screening and assessment will enable the exploitation of military technologies in civilian markets and vice versa.

In 2025, the market will demand skilled seafarers and shore based staff, capable of managing a waterborne transport system which will be fully integrated into the total supply chain. They will be able to manage innovation and to networking with other professionals. EU seafarers will be among the best in the world thanks to their technical and operational skills, supported by continuous professional development schemes. The waterborne sector will be able to draw on a pool of highly qualified individuals including seafaring officers with advanced management skills.
In 2025, the increased technological sophistication of specialised ships, including loading and unloading interfaces, implies the need for ship-type specific training. Waterborne professionals, whether working on short and deep sea, inland navigation, ports and terminals or in the logistic sector, will benefit from customised courses.

In 2025, the shipbuilders, equipment manufacturers and recreational craft builders in Europe as well as the other players in the maritime cluster must be able to recruit an appropriate quality of workforce if they are to maintain their technological edge. The necessary educational and career development schemes need to be enhanced and promoted. In this context, it is essential that EU waterborne research institutions and universities remain attractive to young researchers by working closely with the industry. This will allow the development of leading edge, relevant and exploitable technologies.

For this purpose, it will be necessary to organise permanent network structures between industry, maritime universities and research institutes. Regular meetings of the most qualified and relevant researchers in the different topics will be held, focused on the industry needs.

In 2025, the technology drain from Europe to Asia will be stopped, supported by appropriate regulatory regimes, including international IPR law enforcement. Therefore, it is necessary to develop feasible IPR protection strategies for the waterborne industry, in particular equipment, systems and ship designs.
In order to support the research required by the maritime community in addressing these challenges, a more coherent, collaborative and goal orientated approach is needed.

WATERBORNE TP will provide this support by enhancing research infrastructure and by ensuring better collaboration, technology transfer and implementation of research results through innovation.

WATERBORNE TP will improve synergies between national and international initiatives and amongst the research community. It will facilitate the creation of interdisciplinary innovation partnerships between the stakeholders which will have clear focus and critical mass.

The maritime community will continue its commitment to the WATERBORNE TP and we invite the Member States and the European Commission to join us.

**Stakeholders and Objectives**

WATERBORNE TP includes all parties involved in the waterborne value chain: those who use and operate ships for transport and services, those who build ships, boats and their systems and equipment, those who provide the related infrastructure and ports and those who organise the exploitation of ocean resources. WATERBORNE TP builds on the know how of navigators, naval architects and marine engineers, who are the driving force behind the development in all areas included in the technology platform.

The aim of WATERBORNE TP, which is organised as a transparent and consensus-based forum, is to bundle RDI efforts of the European stakeholders to remain champions in maritime transport. In doing so, it is committed to create high value added products and knowledge based employment opportunities in Europe.
**Steps to Implement the Waterborne TP Strategy**

The medium and long term Vision (called “Vision 2025”) of the waterborne sector is described in this document.

The Waterborne Strategic Research Agenda (WSRA) has been updated in 2011, as well as the Waterborne Implementation Road Map (WIRM).

Both Vision 2025, the WSRA and then WIRM are tools rather than position papers and will be further updated regularly in response to the rapidly changing business environment.

We consider consensus to be a major asset and a pre-requisite for the success of our strategy. We will ensure the main elements of the strategy.

**Dissemination of research outcome - look outward and reach the potential user**

The results of research initiatives and projects may vary, not only in quality but also in their short term applicability and potential for absorption by the market. However, whatever the level, it is important that the results of EU co-financed projects are accessible, in a simple and easily understandable manner. There should be no fear or apology based on intellectual property rights; it is not the formula of the recipe or the precise technical design that is sought, but marketing like description of the product or service and what innovation it brings. This can be simply accompanied by a link for further contact and information.

It will not be sufficient to restrict such report or publication to a project website or a newsletter, the general and targeted reach and distribution of which can be put very much in doubt. In fact, those engaged in industrial applications and potential commercial use will not go through endless websites. All the more so, since most project websites are merely describing the project profile or objectives, not the effective results.
To reach the real potential user, wider publication and promotion is a necessity. This requires a certain editorial skill and PR contacts with the professional press, which may well have to be engaged from the outside. The precise requirements and related investments should be considered as mandatory and part of the management tasks of projects.

An additional benefit of such broader and more public approach is that the publication of research outcomes will have a reach also beyond the ‘own’ sector, bringing ideas and cross fertilisation. Examples could well be between transport sectors as automotive and shipping, but equally energy and shipping.

On a separate point, but also stimulating the dissemination potential, the Advisory Committee of projects – where these exist – should be involved with the project from the very start (kick-off). The project partners and/or the steering committee or project board should explain the approach to be taken in meeting the objectives. The AC should then be able to already make recommendations based on their expertise. The AC should not be a review body being reported to on what has been done in the previous period/year.

The composition of an AC may vary by project topic, but generally should have a good spread of industry users, (national) policy makers, very limited representation of related (past) projects, and preferably not research institutes (as these are already involved in the project).

**Principles and Bodies of the Waterborne Technology Platform**

The guiding principles for the organisation structure of the waterborne technology platform have been

- Transparency and openness
- Consensus based on representative structures
- Effectiveness

Considering the different stakeholders of the waterborne sector and the thousands of companies shaping their industry, a consensus building by individual companies, institutes, etc. would have been unmanageable. Consequently, WATERBORNE has been developed using the structure and the representative opinion building and decision approval mechanisms of the stakeholders’ European associations. These associations have the responsibility to organise and encourage the participation of their individual members in the different WATERBORNE tasks, working groups and discussions as well as to guarantee their members’ commitment, demonstrated by high level attention and participation in the General Assembly. This democratic structure avoids also that WATERBORNE will become a “closed circle” of some individual larger enterprises.

The forum for experts of individual companies and research institutes of the stakeholders are the (thematic) Working Groups. The results of the Working Groups are discussed and transformed into policy proposals and action plans in the Support Group, into which all stakeholder associations, the member states and the Commission services send their representatives. In order to facilitate an easier consensus among the 25 member states, they have their own Mirror Group, which sends “en-bloc” 2-3 representatives into the Support Group. Final approvals and commitments are made by the annual General Assembly, which is formed by high-level representatives of the industry and all other stakeholders.
We are:

Suppliers of safe and efficient transport for goods and passengers on a local, national, continental and intercontinental scale. Close to 90% (by volume) of all global transportation is waterborne.

We also:

- Support the exploitation of energy and raw materials. Predominantly fossil fuels but renewable energies such as wind, wave and tidal are increasing in importance. Exploitation of other raw materials is an emerging sector which will require extensive support from the maritime community
- Support the supply of food from the seas – fisheries and aquaculture
- Support the gathering of marine information through the provision of products and services for oceanographic surveys, global data gathering and marine research
- Provide marine sport and recreation – from small boats to super yachts; there are 6 million recreational craft in the EU enjoyed by 32 million users every year
- Address the needs of and support innovation for navigation on and maintenance of inland waterways
- Provide vessels and equipment for regulatory authorities such as coastguard services, border patrols, policing and customs
- Design and build naval vessels and equipment
- Provide specialised vessels for the construction of new ports and harbours, coastal defences, inland waterways
- Lead the world in cruise liner design and construction
The EU maritime industry cluster has an estimated turnover of €270Bn and directly employs about 1.5 million people. Close to 90% of Europe’s trade with the rest of the world is shipped through its seaports as well as 40% of intra-European trade.

**Shipping**
- More than €120Bn turnover
- More than 400,000 direct employees
- 209 M GT EEA flagged vessels or 23% of the global total
- 381 M GT EEA owned or 40% of global merchant fleet
- 15,000 EU registered ships

**Shipbuilding**
- €30Bn turnover (including naval)
- 120,000 direct employees
- 150 large shipyards
- Global leaders in advanced ship design and construction

**Marine Equipment**
- €42bn turnover
- About 300,000 direct employees in 7,300 companies
- 45% of the total global market
- 46% of products are exported
- Marine equipment comprises up to 80% of a ship’s value

**Ports**
- €20Bn of added value
- 350,000 direct employees
- 1,000 seaports
- 3.5 billion tonnes of cargo per year
- 400 million passengers

**Naval**
- €15Bn turnover
- 82,000 direct and indirect employees
- 12 major companies

**Inland navigation**
- Up to 44% of the total transport share in the catchment areas of major seaports
- 515 million tonnes of freight per annum
- 145 billion tonnes-km

**Dredging**
- €7 billion per annum turnover (doubled since 2000)
- 25,000 direct employees
- 80% share of the available market

**Classification societies**
EurACS members have a 55% share of the global classification of ships

**Recreational marine**
- €24Bn turnover
- 278,000 direct employees
- 22,100 businesses including 2,400 boatyards
Aquaculture
- €3.2 billion added value
- 20.3% of total EU fisheries
- 1.3 million tonnes of product per annum

Offshore Wind
- Supplies 4.8% of EU electricity
- Estimated 161 GW by 2020 including 40 GW offshore

Oil and Gas
- €30Bn in the global services and supplies market
- 70% of the European market
- Just 2% of prospective resources have been explored in deep and ultra-deep waters
- 40% of the future oil & gas will come from water depths to 500m, 20% between 500 and 1500m and 40% from 1500 to 3000m

Fisheries
- 84,909 vessels with a gross tonnage of 1,844,292 tonnes
- 141,110 direct employees

Research Structure
- 40 maritime universities in 17 countries
- 40 research establishments with more than 3,000 research staff