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MARTEC

ERA-Net Maritime Technologies

Co-ordination Action

ERA-Net

D2.2 State of the art report

(Analysis of gaps, priority areas, technology transfer and synergistic use of maritime research)

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PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Content

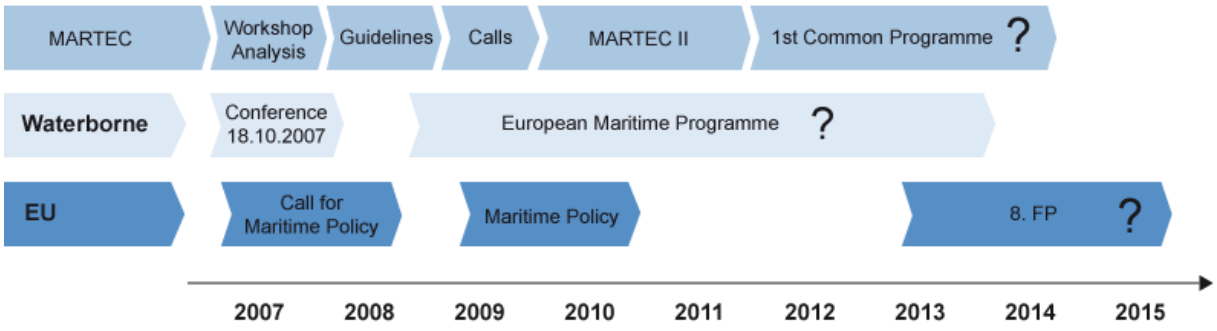
Executive summary

The ERA-NET MARTEC (2006 – 2009) is an EU funded project in the 6th Framework Programme. The MARTEC partnership consists of 12 partners and 4 observers from 11 European countries. The first aim of the report is to deliver some details of different European maritime programmes. The future aim is to prepare first steps for a common European maritime research programme (see figure below).
There are different networks, who tried to establish a common future maritime programme. MARTEC just started to collect first information of national programmes with this document.

The European Network of Maritime Clusters (Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Poland, Spain, Sweden, United Kingdom) already initiated a network of national funding agencies. The Waterborne Technology Platform, the European Network of Maritime Clusters, the Maritime Industries Forum in close cooperation with MARE FORUM and the European Commission, organised a one-day conference in order to discuss the future strategy for a European Maritime Research Policy in October 2007. It was decleared that the programme definition is a subject of the Waterborne mirror group.

On 7 June 2006, the European Commission adopted a Green Paper on a Future Maritime Policy for the European Union. On 10 October 2007, the European Commission presented its vision for a Integrated Maritime Policy for the European Union. The vision document – also called the Blue book – was accompanied by a detailed Action Plan and a report on the results of the broad stakeholder consultation.

Different ways to a common European maritime research programme:



1 Definition of MARTEC priority areas

Basic priority areas were defined in work package 1. It was decided to distinguish between thematic priority areas and horizontal priority areas during the workshop at London on 20 June 2007.
Eight thematic and three horizontal priority areas are structured in MARTEC at the moment.

Thematic priority areas	**Horizontal priority areas**
shipbuilding	safety and security
maritime equipment and services	environmental impact
ship and port operations	human elements
inland water and intermodal transport	
offshore industry/offshore technology	
offshore structures for renewable energy	
polar technology	
fishing/aquaculture	

1.1 MARTEC basic priority areas

1.1.1 Shipbuilding

1.1.1.1 New ship types, structures, ship design and construction

new ships, hull concepts, structures and components, next generation ships, new floating structures, risk based design, simulation and planning tools, computational fluid dynamics

1.1.1.2. Production processes and technology

standardisation, modularisation, optimisation, mechanisation, robotisation, production control, forming, cutting and joining techniques, laser welding, surface treatment technologies,
production methods, networking, simulation, software tools, productivity, use of new materials, supply chain management, recycling, life-cycle approach

1.1.2 Maritime equipment and services

bridge systems, information and communication technologies, telematic applications, engine and propulsion systems, automation systems, cargo handling, maintenance

1.1.3 Ship and port operation, services

vessel traffic services, manoeuvring, cargo handling, waste & ballast water facilities

1.1.4 Inland water and intermodal transport

1.1.4.1 Shipbuilding

1.1.4.2 Maritime equipment and services

1.1.4.3 Ship and port operation

1.1.4.4 Transport chains, hinterland connections, short sea shipping, Traffic management

1.1.4.5 Transport logistics, intermodality, interoperability

1.1.5 Offshore industry/offshore technology

new structures, design and construction, production processes and technology, equipment and services, maintenance and decommissioning of offshore structures, offshore operations, underwater process technology, underwater technology, underwater robotics (AUV, ROV)

1.1.6 Offshore structures for renewable energy

1.1.6.1 Water power, wave, tidal and current energy technology

1.1.6.2 Wind power, wind energy technology, installation technology

1.1.7 Polar technology

arctic sea transport, shipbuilding, equipment and services for polar regions, operation of ships, offshore structures

1.1.8 Fishing/aquaculture

platforms and devices, fish farms in open sea, new generation of fish-farms, teledetection, information and communication technologies, automation and monitoring

1.2 MARTEC horizontal priority areas

1.2.1 Safety and Security

1.2.1.1 Ship safety

collision, grounding, evacuation, fire safety, search and rescue, manoeuvring, cargo handling and lashing, tracking and tracing, first aid

1.2.1.2 Ship and port security

preventive measures against terrorism, piracy

1.2.2 Environmental impact

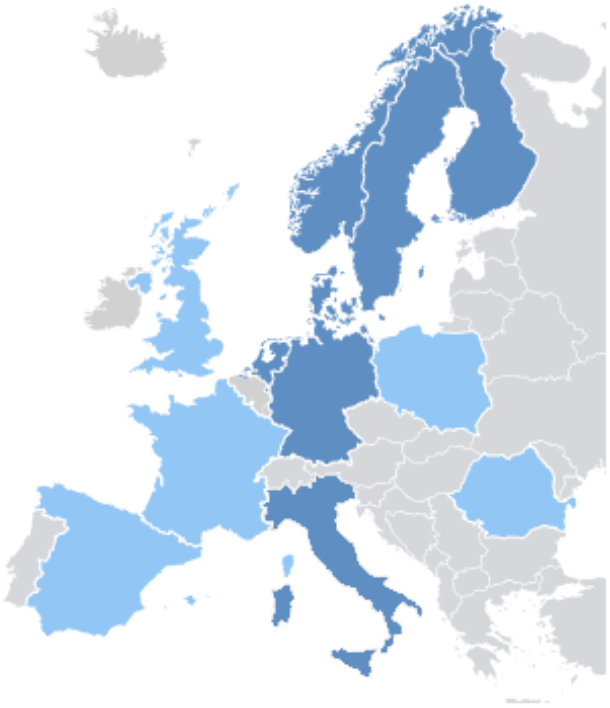
reduction and improvement of the efficiency of fuel and energy consumption, anti fouling, ballast water handling, wash waves, waste management, recycling, monitoring, reduction of emission, prevention of contamination, noise and vibration

1.2.3 Human elements

training aspects, education, improvement of working conditions, intellectual property rights (IPR)

2 Analysis of national maritime research programmes

There are only a few European countries (Norway, Sweden, Finland, The Netherlands, Denmark, Germany and Italy) which have a real maritime research programme.



Landscape of known maritime research programmes in Europe

Overview national maritime programmes

Country	Maritime Programme	Programme Duration	Budget 2007	Calls year	Programme Owner	Programme Manager
Germany	**Shipping 21st**	**2005– 2010**	**21 Mio. €**	**open**	**BMWi**	**PtJ**
Finland	**MERIKE**	**2003 – 2007**	**5 Mio. €**	**open**	**Tekes**	**AFMI**
France	PREDIT	2002 – 2007	50 Mio. €*	one	MTETM	ADEME, OSEO
Norway	**MAROFF**	**2002 – 2009**	**11 Mio. €**	**two**	**RCN**	**RCN**
Poland	Technology	open since 2005	21 Mio. €*	not fixed	MSHE	MSHE
Spain	PROFIT	2004 – 2007	67 Mio. €*	one	MEC, MITyC	INNOVAMAR
Denmark	Innovation Consortia	open since 1995	17 Mio. €*	two	DMA	DMA
	Strategic Research	open	45 Mio. €*	One or two	DCSR	Programme committees
	Danish Maritime Trust Fund	**open since 2006**	**9 Mio. €**	**open**	**Private**	**Private**
Netherlands	**New**	**plan 2007**	**-**	**-**	**MinEZ**	**Senter-Novem**
UK	Technology	2005 - 2008	120 Mio. €*	two	DTI	DTI

* Budget for the whole national programme, not just for maritime

2.1 Germany

Maritime Programme	**“Shipping and maritime technologies for the 21st century” 2005 - 2010**
Programme owner:	**Federal Ministry of Economics and Technology (BMWi)**
Programme manager:	**Project Management Organization Juelich (PtJ)**

2.1.1 MARTEC thematic priority areas

The research program 2000 to 2004 „Shipping & Maritime Technology for the 21st century” was extended after evaluation by external experts for the years from 2005 to 2010. With the programme a broad range of topics can be covered further by R&D. This will integrate projects with a high complexity of maritime products and interdisciplinary for shipbuilding and maritime technologies. Projects will be funded, which improve the efficiency, safety and environmental protection in shipbuilding, shipping and maritime technologies in three main areas (Research and development in shipbuilding technology, Movement of transportation to offshore waters and inland waterways, Research and development in maritime technologies).

2.1.1.1 Shipbuilding - New ship types, structures, ship design and construction

Development of new ship types
New ships with the highest possible efficiency, higher safety and reduced emissions, decreased noise and optimization of the ship hydrodynamics, are one main focus of the shipping and maritime research programme of Germany.

Improved ship design and constructions
Development of innovative, highly specialised ships will be very important in the future of German ship industry. Based on a holistic analysis of the different transport problems, new components and ship concepts with higher quality standards are necessary. For example ground effect vehicles, catamarans or SWATH-ships could be used to transport people and goods as alternative to airplanes or usual ships. The construction of a ship must have a high stability which is permanently to optimize. Development of the physical effects on the ship construction in extreme situations like collisions, grounding, or over the whole lifetime of a ship is very important for the ship industry. It is also a goal to integrate information technologies in the use and development of engineer’s knowledge.

Advancement in ship hydrodynamics
The development in the field of numeric ship hydrodynamics is essential for a better quality and efficiency of the products. The development should enable a more exact prognosis of the following attributes: the resistance of the ship, the demand of engine output, the behaviour and pressures in sea disturbance, the manoeuvrability, the stability, the interaction of the ships between each other and in limited waters. To shorten the design process of new ships the development should focus also the

virtual ship design and simulation of shipbuilding production. LNG transport is another point in the German programme.

2.1.1.2 Shipbuilding -Production processes and technology

Increased productivity of shipyards
To accelerate the design, construction and production processes and to decrease the costs, for a higher productivity, a good working cooperation between shipyards and suppliers is necessary. New tools for information and communication will accelerate the processes, force a higher quality and overcome existing barriers of communication between the different companies.

Development of software-based tools for the production process
Software based tools, like CAD and CAM-systems will cause a higher efficiency in the ship production.

Reduction of ship design duration
Development of virtual reality techniques will reduce the construction time in the future. Here is a big chance to reduce costs in the process of ship building.

Standardisation and modularity of construction units/groups
Series manufacturing is hardly to implement, because the most ships are unique. But the development of a flexible system of standard modules to decrease the production steps and number of units will enable economies of scale.

Details manufacturing, new adding techniques
Modern joint technologies are in a phase of rapid development. The cost decrease potential is high but it requires the use of simulation techniques in addition to specific welding technology and a profound knowledge of joint technologies.

2.1.1.3 Maritime equipment and services

- Increased reliability of ship systems
- Condition base maintenance
- Satellite based remote diagnostics
- Simulation tools
- Extension of life time of wear parts by use of new materials and production technique

Losses of ship systems can have further effects. Because of the long run time of ship systems (e.g. propulsion systems) there are high requirements for economy, functionality and reliability. High automated systems should have the ability to recognise possible damages in advance. Therefore innovative technical solutions, which increase the higher availability of systems should be developed (condition base maintenance).

2.1.1.4 Ship and port operation, services

Telematic and satellite based applications
Several topics in this area are described in the national research programme under the headlines “Increased reliability of ship operation” and “improvement of ship safety” (included in topic 9.1). Telematic and satellite based applications can be important for ship and port operations as well as for ship and port services.
Focuses of the national development are navigation systems based on satellite, radar and radio location techniques. The increase of traffic at sea and the higher dynamic of fast ships require very exact systems.

Vessel traffic services
One of the main tasks for vessel traffic services and management systems is the improvement of ship safety in national waters.

Simulation tools
Furthermore simulation tools for the improvement of ship operations are an important issue.

2.1.1.5 Inland water and intermodal transport

Faster inland water transport and short-sea-shipping
The combination of inland water, rail and road transport will accelerate the hinterland transport. For a good cooperation between these different ways of transport, the development of flexible transport chains is ongoing since 1997. Another point is the expansion of inland waterways, which means a better usability of existing waterways with actually too low bridges, not constantly removed ice in the wintertime, not permanently manned (or automated) locks.
Another point to accelerate the water transport is the development of ships with higher speed and to shorten the wait time or lay days in the ports.

Ship constructions for existing width of lock chambers/bridge heights
In Germany a lot of waterways are not usable for cargo ships, because of the low height of the bridges. Smaller ships with a lower height could help to increase the usability of the existing waterways. A focus lies on the production of standardised “EU-Containers”.

Applications of telematics for inland waterway shipping
Electronic data transmission is a good help to implement necessary processes of modernisation. It helps to use higher capacities of the locks and it increases the traffic security. One goal of development is the implementation of a guidance system.

Ships for coastal and hinterland traffic
Ships with usability on inland and coastal traffic are to develop. It makes transport more efficient, because of less transhipping time.

Bulk carrier transport

A relocation of bulk cargo from the road to the waterways will relieve the road traffic and makes the bulk cargo transport more efficient. Another focus is the optimisation of the existing bulk handling installations.

Cargo handling
Technological, logistical or organisational flows can be examined for cargo handling applications. Transport solutions for hinterland connections as well as interfaces between sea going vessels, inland water vessels and other surface transport modes are important. Fundable are also unifications of transport technologies between the different transport modes.

2.1.1.6 Offshore industry/offshore technology

Underwater process technology for the production of oil and gas
To the field of development in this sector count: platforms for oil and gas production, pipe installer, drilling technology, maritime technologies for ice covered areas.

System solutions in offshore and deep water technologies
Swimming technologies, like production ships, multi-phase transportation systems with a wide range of components and materials and underwater technologies are necessary to satisfy the demand on the offshore market.

Underwater robotics
To decrease the costs the conventional platform technologies will be exchanged by swimming systems, like multi-phase underwater pumps or unmanned remote-operated vehicles (ROV) and autonomous underwater vehicles (AUV) for different tasks.

2.1.1.7 Offshore structures for renewable energy

None

2.1.1.8 Polar technology

- Development of economic ice-breaking tanker (ice-going LNG-tanker)
- Development of offshore oil loading terminals for arctic areas
- Development of oil and gas production terminals for ice areas with extremely shallow water
- Ice remote sensing and route optimization
- Navigation in ice
- Environmental protection in ice

Research and development in maritime technologies cover also the sub-area polar technology. Fundable are ice technology projects in case of further development in new icebreaking technology, in the development of offshore oil loading terminal for arctic areas and the development of oil and gas production systems for ice areas with extremely shallow waters. Also fundable are projects for ice remote sensing and route optimization, developments for navigation and environmental protection in ice.

German companies and research institutes already have experiences in polar research as well as in development of ice going maritime transport systems. Many research projects were funded twenty and thirty years ago, but only few in the last 15 years. There were projects for ice-breaking resistance, for the development of ice-breaking tankers for northern sea route, for modular development of drilling platforms and ice barriers under technical aspects and for the determination of ice loads at a ship (Polarstern). Knowledge's will be used for the conceiving of the new Research ice-breaker Aurora Borealis.

Future topics for polar research are the exploration and extraction of hydrocarbons in deep water and ice-covered areas, in particular multiphase pump technology, autonomous underwater vehicles (AUV) and, last but not least, the "Economic use of the northern sea route (NSR)". Therefore Russia can be a potential partner in case of polar research. In context of NSR ice breaking assistance, ice remote sensing, route optimization, navigation in ice and other priority areas of topic 3 are still valid for the future.

2.1.1.9 Fishing/aquaculture

- none

2.1.2 MARTEC horizontal priority areas

2.1.2.1 Safety and Security

Ship safety

- Improvement of ship safety by design
- Increasing traffic situations
- Increasing traffic situations, limited waters
- Applications for high speed vessels and inland water crafts
- Ship and land based navigation and control systems
- Collision, grounding, evacuation, fire safety, search and rescue, manoeuvring
- Men-machine interfaces

German double hull tankers as well as other construction details in ship building are already a state of the art in passive ship safety. Concepts for active ship safety in the connection of crew and ship are more and more important in situations of increasing traffic situations. This is even more dangerous in dangerous situations with faster ships and in limited waters. Research and development in navigation systems for high speed vessels and inland water crafts are important. Topics are also innovative radar, radio navigation and control systems in ship applications as well as in land based vessel traffic services. In the national research programme are also included systems and services for ship safety (collision, grounding, evacuation, fire safety, search and rescue, manoeuvring). The optimisation of men-machine interfaces on ship bridges for ship safety reasons is a further aspect.

Ship and port security

2.1.2.2 Environmental impact

Decrease of the noise load and ship oscillation

The decrease of acoustic noise is an important criterion for the optimisation of ship construction. Especially the noise in passenger vessels and high speed vessels should be as low as possible. Numeric methods and knowledge about the materials make it possible to calculate and give a prognosis about noise levels already in the phase of ship construction. New propulsion systems, new ship types, faster ships and new materials make it necessary to continue the development in this sector.

Environmental protection
The development of innovative technologies for the reduction of emissions, decrease the fuel and energy consumption, is an important goal to protect the environment.

Early recognition and accident management systems
Environmental protection includes the prevention of accidents, which result often irreparable damages to the ecosystem. A fine net of data logging based on new measuring instrumentation and monitoring systems should afford to prevent accidents on the sea and react in case of accidents early.

Accident prevention systems
New technologies should be developed to prevent or limit oil accidents or other chemical disasters.

Recycling- and waste management
Waste is an increasing cost factor and environmental problem in the future. A lot of offshore platforms will be not required anymore and are to remove. New ideas and recycling programmes are necessary to overcome this problem.

2.1.2.3 Human elements

Human factors are not a main focus of the national research programme. Innovative training methods and systems for ship guidance are fundable with the topic “improvement of ship safety”.

2.2 Spain

Maritime Programme **"PROFIT" 2004 – 2007**

Programme owner: **MEC, MITyC**

Programme manager: **Fundación Instituto Tecnológico para el Desarrollo de las Industrias Marítimas (INNOVAMAR)**

2.2.1 MARTEC thematic priority areas

2.2.1.1. Shipbuilding - New ship types, structures, ship design and construction

Rising demands of more sophisticated vessels, with more technology incorporated, lower operational and maintenance costs and lower prices are the key factors which require stronger technological investments. Components provided by suppliers have a rising importance in the final value of the vessel.

Priority lines to fulfil these objectives are the following:

- Improvement of the design and construction process of ships and their components.
- Technological development of new advanced ships.
- Vessels with higher levels of safety, security and environmental protection.
- Cruise ships, for the transport of rolling load and passage, including sport and recreational crafts
- Advanced ships for transport of all kinds of load including natural liquefied or pressurized gas ships and naval devices for supporting off-shore facilities, rescue and protection of the marine environment, robots and unmanned vehicles and different vehicles for special services, including submarines for civil use.

2.2.1.2 Shipbuilding -Production processes and technology

Naval construction operates as synthesizer industry in which shipyards, responsible of the vessel design as a whole complete system, integrate a series of subsystems, equipment and components provided by supply industry. The same scheme applies for nautical and leisure activity vessels.

Priority lines to fulfil these objectives are the following:

- Development, implantation and application of advanced tools of design, including those of numerical calculation for the optimization of the forms of the ship, and those for analysis and process simulation.
- Integration and optimization of the design and manufacture processes, including the supply chain.
- New developments for ship equipments and systems manufacture.
- Automation of the manufacturing processes.

- Design for modular manufacturing.
- New materials for application in the ships and their components.
- Standardization of elements and integration of components in sets.
- Cost analysis tools and applications for the budgeting.
- Cost optimization of exploitation, reparation, maintenance, recycling and inspection in ships

2.2.1.3 Maritime equipment and services

The systems given by the auxiliary industry have a growing importance in the total value of the ship, being able to reach in certain cases the seventy five per cent of their value. Although the auxiliary industry is linked partly to multinational groups, a notable presence of companies of national capital that need to develop its own technologies to compete with its products and services in the international markets.

Priority lines to fulfil these objectives are the following

- Improvement of the efficiency of equipments and systems, including propulsion systems.
- Crafts for fishing, its transport and distribution, including those to transport living species, as well as the development of auxiliary appliances for marine aquaculture.
- Equipments for the protection of the environment.
- Remote sensing systems.

2.2.1.4 Ship and port operation, services

The shipping companies, as shipyards' clients and lenders of services of transport, play a crucial role in the definition of the benefits that should develop the ships. They cooperate therefore, in the identification of specific areas where innovation is required in the design processes and construction, as well as in the technologies to incorporate for facilitating the ship operation. In addition, they contribute from the user's point of view, with their valuable experience as users of systems, determinant to get a permanent technological improvement of them. On the other hand, they should make sure that ships operate according to the rules of security and environment.

Ports and harbours play a key role in the transport chain between maritime and terrestrial transport. Technology developments of infrastructure and port services are key elements in the logistic and intermodal function.

Priority lines to fulfil these objectives are the following:

- Development of port management technologies.
- Development of new materials for port infrastructures.
- Development of technologies for the environmental management in ports.
- Logistics and maintenance of all types of ships and naval objects and port services
- Active and passive systems for controlling movements.

- Telematics and satellite based applications

2.2.1.5 Inland water and intermodal transport

Short Sea Shipping can help curb the forecasted substantial increase in heavy goods vehicle traffic, rebalance the modal shares, bypass land bottlenecks, and it is safe and sustainable.
To make full use of Short Sea Shipping in Europe, it needs to be seamlessly integrated into logistics chains and offer door-to-door solutions to customers. Such logistics chains should be managed and commercialised by one-stop shops offering the customers a single contact point that takes responsibility for the whole intermodal chain. Further, the notion of competition between modes should be replaced by complementarity because co-operation between modes is vital in door-to-door chains involving more than one mode

- Promotion of short distance maritime transport
- Improvement of ships to the needs of traffic and freights, its safety and its environmental protection.
- Technological developments favouring the intermodal logistics services.
- Improvement of the services associated with the maritime traffic, as well as of procedures used at port.
- Feasibility studies of sectors involved in the chain of transport.
- Development of the infrastructures, technologies and systems necessary in ports for Short Sea Shipping.
- Development of designs optimized for Short Sea Shipping (SSS).
- Development of new systems for mooring, loading and unloading.
- Integration of the Short Sea Shipping in the logistics intermodal European chains.

2.2.1.6 Offshore industry/offshore technology

The industry off-shore is focused to the exploitation of oil and gas in the marine environment and to the design and construction of perforation platforms, exploitation and process of these products, as well as advanced ships of support.
The areas that will have primordial importance in next years in the off-shore world will be the production in ultra-deep waters.
The challenge of our industry is in being able to lead these aspects of the technology off-shore adding more added values to the products. Product is challenged to include not only the marine part of the artefact, but the process shall be included also with the aim of that Spanish industry could be main contractor of the big projects offshore that will develop in next years.
Additionally Spain must develop the areas of exploitation of the marine energy resources, mineral resources, etc.

Priority lines to fulfil these objectives are the following:

- Development of a new generation of drilling platforms, storage and unloading for a safer, cleaner and efficient operation in ultra-deep waters.
- Design of industrial floating plants.

- Manufacture, assembly and tuning of modules for process plants of oil and gas.

2.2.1.7 Offshore structures for renewable energy

- Offshore structures for renewable energy development

2.2.1.8 Polar technology

None

2.2.1.9 Fishing/aquaculture

A rising effort in R&D&I is needed in order to reach the economical and environmental viability of fishing and aquaculture. This effort is also necessary to reduce the technological dependence of the exterior in the design and equipment supply for these facilities.

Priority lines to fulfil these objectives are the following:

- Development of fish farms in open sea
- New generation of fish-farms with large capacity of production for deep waters or removed from the coast line
- Applications of remote sensing by means of satellites
- Instrumentation to quantify biomass
- Development of applications for the analysis of the fishing methods
- Applications of information and communication technologies to the fishing.
- Automation of the manipulation of fish on board and management of fish terminals
- Automation and monitoring of different modalities of fishing

2.2.2 MARTEC horizontal priority areas

2.2.2.1 Safety and Security

Ship safety
For improve the maritime safety, it is necessary to have reliable ships with all the salvage means and equipment and systems developed for addressing safety at the sea, but also are important human elements interfering at all levels of maritime transport; crew, port and control systems operators shall have the adequate formation which will guarantee the minimal risk levels.

Priority lines to fulfil these objectives are the following:

- Development of methods to assure a more secure work at the marine sector
- Development of tools for training ship operators.
- Improvement of ship communication systems and the systems of control and identification, interfaces or protocols of communication between devices of automatic identification of ships (AIS) and the systems of satellite communication.
- Design of personal radio buoys and equipments of individual protection, especially for utilization in the fishing ships crews, which will permit a higher degree of survival for people fallen overboard.
- Improvement of the systems, equipments and procedures of evacuation in cruise ships, and the safety of the human life in the sea.
- Developments in the measures taken to minimize the impact of noises, vibrations and any other type of emission on health.

Ship and port security
Every time more emphasis is taken in addressing and enhancing security at ships and ports. Development of tools and adequate practices for inspection of all types of freight are needed.

Priority lines to fulfil these objectives are the following:

- Research and technological development of sheltered areas
- Improvement of security and protection against illicit acts in the maritime transport.
- Development of advanced decision-making procedures in emergency situations.
- Development of methods for predicting the behaviour of the ship in break down.
- Research and analysis of maritime accidents.

2.2.2.2 Environmental impact

The aim of these lines is the minimization of contamination risk developed from maritime transport and make available tools and efficient elements to fight its effects in case of incidents.

Priority lines to fulfil these objectives are the following:

- Pollution prevention and environmental protection at sea and coastal areas to prevent contamination and to promote the environment protection
- Development and improvement of remote sensing technologies for spots of pollution detection, by means of the utilization of satellites, radar, or any other system that allows it.
- Development of simulation, modelling and prediction technologies for pollution prevention in emergency situations.
- Development of systems and equipments for the reduction of gas emissions.

2.2.2.3 Human elements

Topics related with human factors are included along the entire programme such as improvement of working conditions or Intellectual Property Rights issues.

2.3 Poland

Maritime Programme **"Technology" open since 2005**

Programme owner: **Ministry of Science and Higher Education (MSHE)**

Programme manager: **Ministry of Science and Higher Education (MSHE)**

2.3.1 MARTEC thematic priority areas

The National Framework Programme addresses to the shipbuilding and shipping within the two following general thematic priorities:

- Design, production, operation and safety of transport means and systems
- Management of transport processes

However It has to be noticed that the Polish National Framework Programme is composed of defined horizontal priority areas. This enables linking the marine technology issues with different groups of topics such like:

- Environment protection
- Safety and security
- Transport means and systems
- Innovative materials
- Information technology.

These aspects are addressed below.

2.3.1.1 Shipbuilding - New ship types, structures, ship design and construction

Designing of new, innovative, specialised ships and other floating structures enhances the competitiveness of Polish shipyards and stimulates the development of marine technology. The innovation in ship design addresses primarily the following issues:
development CA of design methods, taking into account the period of ship operation, presumed area of navigation, dominating weather conditions and other relevant constraints,

- increasing safety requirements (e.g. on the way of improvement of a ship manoeuvrability and sea-keeping qualities, ship construction and construction materials properties),
- reduction of the unwanted influence of a ship on the environment, (e.g. by reduction fuel consumption in various operating conditions due to decreased ship resistance or increased propulsion system efficiency) especially by the application of the entire life cycle approach including the idea of a "green passport" for a ship,
- development of efficient propulsion and manoeuvring systems,
- application of the alternative fuels – including fuel cells,

2.3.1.2 Shipbuilding - Production processes and technology

Standardisation and modularisation of a ship equipment either during ship design or production stage serve as the key issues with regard to the development of ship technology. The research priorities of the industry include among the others the following topics:

- new, innovative technologies for material joining and cutting applied during ship production and repair, enhancement of welding technologies with regard to the new construction materials, joining of different materials and influence of welding on the construction,
- increase of application range of new materials in shipbuilding, e.g. hig tensile steel, aluminium, composite materials, sandwich materials with controlled physical properties
- development of corrosion protection technologies and coatings especially with respect to their impact on the marine environment,
- enhancement of the metrology methods applied during ship production processes and aiming on the ship construction optimisation,
- improvement of the organisation of the supply chain in shipbuilding and ship repair process.
- virtual modelling of production processes, increase of the application IT on every stage of shipbuilding process.

2.3.1.3 Maritime equipment and services

The following thematic priorities should be mentioned:

- further development of the modular approach towards design, manufacture and recycling of the marine equipment,
- application of innovative, safe and recyclable materials,
- increase of application of nanotechnology based and intelligent materials in maritime equipment,
- computer aided systems supporting ship master decisions with regard to the ship stability and general strength during her operation,

2.3.1.4 Ship and port operation, services

Concerning the ship and port operation the research priorities include among the others:

- Improvement of the ship mooring and unloading systems and procedures,
- Modelling of the potentially dangerous situations with regard to the increasing number of ships entering ports,
- Modelling of the influence of ships manoeuvres on the port infrastructure – quays, minimising the wash wave effects
- Development of ballast water utilisation methods, facilities and devices in ports,

2.3.1.5 Inland water and intermodal transport - transport infrastructure

The development of inland water transport serves as an important thematic area especially with regard to the possibility of decongestioning of roads. Therefore the following topics should be mentioned:

- Development of new types of propulsion (pushing or pulling) and cargo vessels taking into account the draught seasonal and long-term variations caused by the climate changes
- Application of fuel cells
- Development of the cargo handling interfaces between the rail-road and inland waterways transport system,
- Modernisation and enhancement of inland waterways and inland ports infrastructure and operation.

2.3.1.6 Offshore industry/offshore technology

The research priorities concentrate on the investigation of the sea bottom resources as well as the modelling of the processes occurring in marine environment. The research topics include among the others the following:

- methods of marine environment monitoring are developed,
- underwater technologies for the production of oil and gas are developed,
- underwater, unmanned robotics.

2.3.1.7 Offshore structures for renewable energy

The studies on the utilisation of renewable energy in coastal zones are conducted. The design methods for wind mill power stations and “windmill farms” are conducted. The thematic priorities corresponds with the area entitled “Renewable energy resources” within National Framework Programme.

2.3.1.8 Polar technology

2.3.1.9 Fishing/aquaculture

The research areas include:

- Design of the innovative, safer and more efficient fishing vessels and their equipment,
- Design of fish farms,
- The study of the natural resources and fish population,

2.3.2 MARTEC horizontal priority areas

2.3.2.1 Safety and Security

Ship safety

- development of IT based systems for assessment of a ship safety in rough seas and off-design operation and weather conditions taking into account ship sea-keeping properties and her construction integrity,
- improvement of CAE tools supporting the assessment of a ship survivability in extreme events i.e. fire, explosion, collision, icing or grounding,
- enhancement passenger and crew safety.

Ship and port security

- development of procedures, ITC tools, facilities and devices increasing the safety of port operation,
- development of the intelligent monitoring systems for control of shipping especially in restricted waters and coastal navigation areas,
- new concepts of vessels for navigation security enhancement.

2.3.2.2 Environmental impact

- new recycling and waste management technologies applied during ship operation,
- new production technologies reducing harmful emission, noise, and volume of production waste generation,
- environmentally friendly scrapping technologies maximising recycling of the ship construction materials and on-board equipment,
- monitoring and early warning systems for sea pollution control

2.3.2.3 Human elements

- next-generation network companies – distributed resources and competence
- internationalisation and specialisation
- new forms of organisation
- new business ideas; knowledge management

2.4 France

General Programmes: **“pôle Mer PACA”, «pôle Mer Bretagne», “EMC2”, “Filière Produits Aquatiques”, “Nov@log” (Regional innovative competitiveness clusters)**

“PREDIT” 3: 2002 – 2007 (finished), “PREDIT” 4: 2008-2012 (under preparation) (Land Transport Research and Innnovation Programme)

Programme managers: **Regional innovative competitiveness clusters (project initiation, label, financial engineering) and The ministry of Economy, Finance and Employment (project selection and monitoring)**

“PREDIT” permanent secretariat

Programme owner and funding: **“PREDIT” (funded by the Ministry for Ecology and Sustainable Planning and Development (MEDAD), the Ministry for Higher Education and Research, Ministry for the Economy Finance and Employment, and their agencies: Environment and Energy Management Agency (ADEME), OSEO (Innovation Agency), National Research Agency (ANR))**

For the competitiveness clusters: interministerial fund (FUI) managed by the ministry of Economy, Finance and Employment and local authorities (region, departement, town)

As already indicated in deliverable 1.1, various public entities deal with the maritime research policy. There is no dedicated maritime programme but R&D projects receive public funding through several competitiveness clusters and marginally by the Land Transport Research Experiment and Innovation Programme (PREDIT).

In 2006, the French government created Competitiveness Clusters in order to gather public and private stakeholders in innovative sectors and so strengthen the competitiveness of French companies. Researchers from public research institutes and from education centres (universities, engineering or business schools), and enterprises set up collaborative R&D projetcts with at least two companies and a research center or a laboratory of a higher education centre. The competitiveness clusters evaluate these projects, label them and make the engineering for funding. The labeled projects are partly funded by the state mainly through an interministerial fund (FUI) which opens two calls for proposals a year, but also through thematic programmes, and partly by local authorities (region, département, town).

The main maritime Competitiveness Cluster are “pôle Mer PACA” and “pôle Mer Bretagne. Internationally-oriented business and innovative twin clusters, they are closely coordinated through an interregional coordination and steering committee

Their strategic action fields are the construction of ships and leisure craft, maritime safety and security, ship engineering, maintenance and shipyard services, marine energy and resources (offshore oil and gas industry and renewable energy), marine biological resources (fish industry, aquaculture, blue biotechnologies), the environment, and finally coastal engineering (water resources in coastal area, climate change, coastal erosion…).

Other competitiveness clusters carry out research in maritime or marine technologies:

EMC2 focuses on materials for different application including shipbuilding
"Pôle Filière Produits Aquatiques" (aquatic products) focuses on new ways to treat aquatic products (fishing, packaging, conservation, quality...)

At last, we have to indicate here another competitiveness cluster called "Nov@log" which deals with logistics but also port operations. A short description of the topics it supports is provided in some the paragraph about river and intermodal transport. Its research agenda, with a precise description of research priorities of the cluster, is in the redaction phase.

The following paragraphs give a list of the priority areas of MEDAD (Martec partner) and of the competitiveness clusters active in the maritime and marine sectors. The way how research and development on the following MEDAD priorities will be funded is under discussion and should be known during autumn 2007.

2.4.1 MARTEC thematic priority areas

2.4.1.1 Shipbuilding - New ship types, structures, ship design and construction

The Ministry for Ecology and Sustainable Planning and Development (MEDAD) promotes intermodal transport and inland navigation. It supports R&D activities on:

- the design of innovative and competitive inland and short-sea ships,
- the development of new ships adapted of small waterways,
- the development of new ships dedicated to the transportation of specific goods.

The propulsion of these new ships shall be environmentally respectful. Their design shall be improved (notably by using innovative materials) and their maintenance shall be easier and cheaper...

Competitiveness cluster "Mer PACA" supports the development of yachts and race ships.

2.4.1.2 Shipbuilding - Production processes and technology

Through the competitiveness cluster "Pôle Mer-PACA" and its topic "maritime security and safety", new ships types will be designed. But this MARTEC thematic priority areas is more precisely addressed by the competitiveness cluster EMC2 (Metallic Structures and Complex Composites), which associates notably the

shipbuilders Aker Yards and DCNS, SMEs and public education and research institutes. Two major topics of EMC2 address the shipbuilding industry (including also recreational craft building):

- metallic and composite structures, elaboration of materials and associated processes,
- complex processes and systems: systems engineering, concurrent engineering, simulation and optimisation of structures.

2.4.1.3 Maritime equipment and services

Though the competitiveness clusters “Pôle Mer-Bretagne” and “Pôle Mer-PACA”, this MARTEC topic is addressed by several projects regarding ship design, maintenance and services. In fact, the ships of the future will rely on innovative developments such as eco-design and risk prevention. Maritime operations will increasingly call on e-maintenance and automation when at sea and on modelling and structural diagnostics to facilitate maintenance when in port. Projects regarding corrosion protection or environmental friendly antifouling paint are addressed by the clusters.

2.4.1.4 Ship and port operation, services

These topics are of major importance for the Ministry for Ecology and Sustainable Planning and Development (MEDAD) which intends to increase the competitiveness of French shipping and ports and the security and safety of maritime navigation and cargoes. So research topics are:

- the development of more efficient cargo handling systems and operations,
- the development and implementation of ship operation and identification systems (AIS, LRIT),
- the development of tools for a safer management of ro-ro linkspans.

Other topics regarding ship and port operations are indicated in the horizontal topics. Competitiveness cluster “Nov@log” wants to support RDI projects dealing with the optimisation of port operations, and shipment security in collaboration with the customs. The use of RFID system and tomorrow of Galileo GPS-compatible system are anticipated in several projects of the two clusters Mer.

2.4.1.5 Inland water and intermodal transport

To promote intermodal transport, the Ministry for Ecology and Sustainable Planning and Development (MEDAD) funds RD&I on the improvement of the interfaces between transport modes (design, organization...), the efficiency of transshipments and also new services to develop the transport offer. For the inland waterway transport, MEDAD wants the competitiveness and the safety of the mode to be improved, and the environmental impacts to be reduced. Research and development actions and studies will concern the following topics:

- the reduction of the cost of the transshipment systems and the handling techniques for combined and waterway transport,

- the tracing systems like RFID tags,
- river information systems: tracking and tracing, anti-accident systems, aid to navigation...
- the knowledge of the cost structure and the competitiveness of river transport,
- the design of intermodal platforms,
- how to promote inland waterway transport.

Another important topic for the MEDAD is the development of motorways of the sea. It contains critical analysis of existing lines of short sea shipping, design studies for the implementation of new lines, the development of new technologies especially dedicated for this type of maritime transport...

In Normandy, competitiveness cluster “Nov@log” on logistics will set up R&D and innovation projects regarding:

- the future information systems, linked with GALILEO (for a better tracing and more competitive transport and port processes),
- the optimization of intermodality, notably of transshipments and intermodal platforms,
- the sustainable development of inland waterway transport and of associated corridors.
- At last, some inland and intermodal transport topics were already quoted in the shipbuilding section.

2.4.1.6 Offshore industry/offshore technology

This activity is mainly developed by competitiveness cluster “pôle Mer PACA”. Various SMEs develop innovative solutions for the oil industry in deep offshore conditions (exploration, construction, exploitation, inspection, repair and maintenance). A wide range of deep underwater robot (AUV) and teleoperated (ROV) vehicles have already been developed for deep sea operations. Acoustic sensors and transmission devices (data and images) are also under developement.

2.4.1.7 Offshore structures for renewable energy

Research at competitiveness clusters “Pôle Mer-Bretagne” and “Pôle Mer-PACA” deal with the exploitation of marine energy resources. As the need to diversify energy sources and to reduce greenhouse gas emissions grows, the sea appears as a source of renewable energy worth developing. Certain skills developed for the offshore oil industry can be adapted in the field of renewable energy. The development of marine energy especially in Brittany is based on the significant natural potential for power generation to be found along its coastline (wind, wavestide, thermal energy) as well as on the presence of research institutes and companies specialized in oceanography and marine engineering and of numerous manufacturers of maritime equipment.

2.4.1.8 Polar technology

Most of the underwater technologies used and developped in the §2.4.1.6 are transferable in this field.

2.5.1.9 Fishing/aquaculture

Through the competitiveness clusters “Pôle Mer-Bretagne” and “Pôle Mer-PACA”, sustainable fishing and fish farming is addressed by several projects. For fish and shellfish farming, the future is bound up with new breeding techniques which will benefit from the high water quality standards which apply to all coastal water users and take account of shared space and respect for the environment. The topics deal with fish detection sonar, data on stock levels, impacts of the fish industry on ecosystems, water quality standards...

Moreover, several topics are supported by competitiveness cluster “Pôle Filière Produits Aquatiques” (aquatic products). Its research priorities are the following:

- to exploit rationally and sustainably perennial aquatic species and to develop products of higher added value (evaluation of marine resources, new products development with nutritional properties or using innovative technologies, by-products utilisation...),
- the strengthening of existing technologies, especially regarding tracing and packing,
- improvement of training,
- improvement of food quality and safety

Al last, the laboratories of Ifremer, the “Institut universitaire européen de la mer” (University of Western Brittany) and the National Center of Scientific Research (CNRS) notably, have expanded their knowledge of a variety of marine organisms and have gathered unrivalled collections of marine microbes. They are now ready to develop these economically in collaboration with biotechnology firms to discover new molecules for the health, cosmetics, food and materials sectors, mainly through the “Pôle Mer Bretagne” cluster.

2.4.2 MARTEC horizontal priority areas

2.4.2.1 Safety and Security

Regarding ship safety, MEDAD is interested in:

- Satellite-based monitoring systems for global maritime safety,
- Analysis of maritime accidents to diminish the risk of sea transport. These analyses will depend of the type of ships, the cargoes, the maritime routes...
- Development of systems for goods and especially dangerous goods tracking and tracing including geofencing and explosives detection
- Development of identification and tracking systems (ships, pollutions...)

Regarding ship and port security, MEDAD is interested in:

- Satellite-based monitoring systems for global maritime security,
- Secure maritime data exchange and treatment,
- Development of identification and tracking systems (ships, pollutions...)

Competitiveness clusters “Pôle Mer-Bretagne” and “Pôle Mer-PACA” are highly interested and already involved in this MARTEC topic. In fact, demand appears to be high for:

- more effective monitoring of the sea (homeland security),
- better protection of cargo and seamen,
- better protection of coastal areas and their inhabitants
- prevention of catastrophic risks such as tsunamis, oil and chemical pollution …

So the research topics are innovative equipment and new services, like new underwater vehicles, new detection systems, signal processing...
Competitiveness cluster “Nov@log” on logistic will set up R&D and innovation projects for safe port operations.

2.4.2.2 Environmental impact

Both the PREDIT program and different competitiveness clusters want to decrease the environmental footprint of the whole maritime transport. This appears by the implementation of the following topics:

- innovations for the eco-design of future ships,
- abatement of the environmental nuisances due to ship exploitation (ballast water, painting, air emissions, energy supply in port, ship wastes…), ship recycling,
- abatement of the nuisances due to port operations (dredged material, cathodic protection of the infrastructures, air emissions).

Competitiveness cluster “Nov@log” is interested in supporting research activities aiming at decreasing the environmental impacts of logistic (and notably intermodal) platforms.

Competitiveness clusters “Pôle Mer Bretagne”, “Pôle Mer PACA” and “Pôle Filière Produits Aquatiques” (aquatic products) support R&D activities dealing with:

- development of high water quality standards for fishing and aquaculture,
- improvement of aquatic foods safety.

Some topics of clusters “Mer-Bretagne” et “Mer-PACA” deal especially with environmental and coastal management. Monitoring the coastal environment to avoid and manage risks and to balance shared use and space constitutes an essential element of sustainable development as well as a highly competitive emerging market. This includes some projects like the development of new technologies for the monitoring or the observation of marine ecosystems, the creation of integrated management processes and the management of water resources in the coastal zone (management of waste water for big coastal cities, desalinization of water, reuse of sew water after biological and chemical treatments…). A new topic is also oriented on the influence of climat change on the coastal area and the potential solution for the design of leisure harbours and buidings located on shore.

2.4.2.3 Human elements

MEDAD funds the development of simulation tools for seafarers' education and training. One project of competitiveness cluster “pôle Mer PACA “ is also dedicated to this issue.

2.5 Finland

Maritime Programme: **"MERIKE" 2003 – 2007**

Programme owner: **National Technology Agency (Tekes)**

Programme manager: **Association of Finnish Marine Industries (AFMI)**

2.5.1 MARTEC thematic priority areas

2.5.1.1 Shipbuilding - New ship types, structures, ship design and construction

- new hull concepts
- modelling the flow around ship hull
- efficient design in scattered surroundings

2.5.1.2 Shipbuilding - Production processes and technology

- standardisation
- production control
- new cutting and joining techniques
- automatization of outfitting and requirements new materials pose
- developing new production methods and manufacturing technologies for the
- manufacture
- mechanisation and robotisation of the production
- networking in the shipbuilding process
- use of laser welding in all steel sandwich panels
- simulation of ship hull steel production
- 3D-CAD

2.5.1.3 Maritime equipment and services

- ICT Solutions for maritime industries

2.5.1.4 Ship and port operation, services

- logistics of materials and personnel

2.5.1.5 Inland water and intermodal transport

- improved transport efficiency

2.5.1.6 Offshore industry/offshore technology

2.5.1.7 Offshore structures for renewable energy

2.5.1.8 Polar technology

2.5.1.9 Fishing/aquaculture

2.5.2 MARTEC horizontal priority areas

2.5.2.1 Safety and Security

Ship safety

- ship fire safety
- improved damage stability in passenger vessels

Ship and port security

2.5.2.2 Environmental impact

- environmental safety
- maintenance of biodiversity and sustainable use of marine resources
- recycling and handling of waste

2.5.2.3 Human elements

2.6 Denmark

Maritime Programme: **"Innovation Consortia" open since 1995**

Programme owner: **Danish Agency for Science, Technology and Innovation**

Programme manager: **Danish Agency for Science, Technology and Innovation**

"Innovation Consortia" is a horizontal program, also covering the maritime sector. The horizontal nature of the programme and the fact that there only have been one or two maritime projects does, that it gives no meaning to make a comparison with the Martec priority areas.

Maritime Programme: **"Strategic Research Programme" open since 2004**

Programme owner: **Danish Agency for Science, Technology and Innovation**

Programme manager: **Programme committees**

A maritime program under the Strategic Research Programme is under preparation. The overall vision is:

Reduction of emissions from ship transportation by developing environmental and energy effective maritime technologies and systems.

The vision has the following sub-themes:

- Energy efficient energy systems for ships, including development of existing technologies, use of natural gas and fuel cells.
- Efficient and optimized propulsion of ships, including hull types, propellers and coatings.
- Efficient operation and maintenance of ships.
- Planning and optimising the transport chain

A maritime strategic research paper was submitted to the Ministry of Science, Technology and Innovation in October 2007. Similar papers have been submitted from other ministries and agencies. All these proposals for strategic research will have to compete to get financing. The final prioritising will be done at the end of 2008.

At this stage is not possible to make a comparison with the Martec priority areas.

Maritime Programme: **“The Danish Maritime Fund” open since 2006**
Programme owner: **private (DMF)**
Programme manager: **private (DMF)**

DMF has a wider scope than research

A comparison between Martec priority areas and projects supported from DMF leads to the result that apart from Polar technology and Fishing/aquaculture there is a good correlation.

2.7 United Kingdom

Maritime Programme: No maritime technology programme [or any sectoral programmes], as UK policy is to support generic technologies that are applicable across a number of sectors. Maritime technology is therefore integrated within the "Technology Programme" covering all technology sectors. Research projects are covered under "Collaborative Research & Development [CR&D]" and maritime companies can [and do!] apply and receive funding under this heading

Programme owner: Department of Innovation, Universities & Skills (DIUS) [n.b. DTI no longer exists due to reorganisation]

Programme manager: Technology Strategy Board (an agency funded by DIUS)

2.7.1 MARTEC thematic priority areas

2.7.1.1 Shipbuilding - New ship types, structures, ship design and construction

- covered under CR&D (see above)

2.7.1.2 Shipbuilding - Production processes and technology

- covered under CR&D (see above)

2.7.1.3 Maritime equipment and services

- marine equipment - covered under CR&D (see above)
- propulsion systems - covered under CR&D (see above)

2.7.1.4 Ship and port operation, services

- covered under CR&D (see above) or Department of Transport (DfT) as commissioned research in support of "policy".

2.7.1.5 Inland water and intermodal transport

- shipping policy incl. ports and waterways
- inland waterways might be funded by DEFRA [see below] or by Department for Transport as commissioned research.

2.7.1.6 Offshore industry/offshore technology

- offshore operations
- submersible and offshore marine structure design
- ship and submarine design
- covered under CR&D (see above)

2.7.1.7 Offshore structures for renewable energy

- covered under CR&D (see above)

2.7.1.8 Polar technology

- covered under CR&D (see above)

2.7.1.9 Fishing/aquaculture

- Fish stock protection
- aquaculture
- Department of Environment, Food and Rural Affairs (DEFRA) provide Grants “to help the fishing industry restructure onto a more sustainable basis”.
- DEFRA also commission research into “fisheries science”. This research is primarily undertaken in research laboratories and universities

2.7.2 MARTEC horizontal priority areas

2.7.2.1 Safety and Security

Ship safety

- offshore health and safety
- Ro-Ro and high-speed vessel safety
- Formal safety assessment
- research into ship safety/FSA is commissioned by the Marine & Coastguard Agency or Department for Transport (DfT) under their Research Programme. This will be 100% funded and undertaken by universities, research laboratories and consultants to support or implement policy offshore health and safety funded as commissioned research by Health & Safety Executive (HSE)

Ship and port security

- Commissioned by Department for Transport (FfT) as commissioned research into transport security

2.7.2.2 Environmental impact

- marine ecology and ecotoxicology
- DEFRA and Natural Environment Research Council (NERC) commission research into “marine environmental science”. This research is primarily undertaken in research laboratories and universities to support and/or implement policy

2.7.2.3 Human elements

2.8 Netherlands

Maritime Programme:	**Maritime Innovation Programme, MIP (start 2007). Aid scheme on innovation for shipbuilding industry (start 2007). Subsidy program for Maritime Innovation, SMI (start 2007).**
Programme owner:	**Ministry of Economic Affairs (MIP and aid scheme innovation for shipbuilding). Ministry of Transport, Public works and Water management (SMI).**
Programme manager:	**MIP SenterNovem**
Programme manager:	**Innovation for shipbuilding: Agency for international Business and Cooperation (EVD)**
Programme manager:	**SMI SenterNovem**

SenterNovem and the EVD are both part of the Dutch Ministry of Economic Affairs.

2.8.1 MARTEC basic priority areas

Maritime innovation programme
The Dutch maritime cluster has written an innovation programme in the field of water construction (dredge), offshore and the maritime industry (yards and subcontractors) to reinforce their international knowledge and export position. The Ministry of Economic Affairs provides a contribution to the realisation of this programme.

Within this maritime innovation programme (MIP) the cluster has chosen for a number of niche markets, where the position of the Dutch companies is strong. The maritime industry has chosen for specials, such as dredgers, short sea ships, mega yachts and ships for law enforcement on sea, and for process innovation in design and production. The offshore industry wants to anticipate on the large need within the oil - and gas industry for new techniques and installations for working under extreme circumstances (deep water and/or inaccessible circumstances). Moreover the offshore industry sees possibilities for the development of the service and construction for the extraction and transhipment of liquified natural gas (LNG). At this moment these markets are growing and the possibilities for the Dutch industry to develop itself are good. The dredging industry is also part of this programme. This industry wants to develop more knowledge on the ecological impact of wet water construction.
To realise these goals, initiatives in four areas are necessary: 1. develop new knowledge and technology; 2. intensify cooperation between SME's, larger companies and institutions and stimulating innovation by the SME's; 3. reinforce the training, education and knowledge; 4. remove obstacles to innovation in legislation and stimulating the introduction of new technology.

Only Dutch companies can apply for subsidy within the MIP. One condition of MIP is that companies have to work together with other companies or knowledge institutes

in the innovation projects they submit. These organisations can be Dutch or foreign (e.g. if a foreign party has the best knowledge, the Dutch company can invite this party to cooperate in the project). An innovation project must have more than one partner. The quality of cooperation between the project partners is one of the criteria.

Aid scheme on innovation for shipbuilding industry
Like other European countries the Dutch government uses of the possibility of the EU-framework on state aid to shipbuilding to support the Dutch shipyards with their innovation projects. The regulation reinforces the competitiveness of the Dutch shipyards, the maritime subcontractors and the maritime sector. The cooperation between maritime companies, other companies and institutions is also stimulated. With this support the Dutch shipbuilding industry must be able to maintain its competitive position.

Subsidy program for Maritime Innovation (SMI)
Transport over sea increases. Sea shipping is indispensable for import and export of goods. Moreover sea shipping plays an important role for other sectors, for example shipbuilding and subcontractors.
It is important that transport over sea happens in a durable and safe manner and that sea shipping continues to develop as a service provider in logistical chains. To realise these points, the Dutch Ministry of Transport, Public works and Water management wants to stimulate the development of knowledge and innovations in sea shipping.

The most important objective of the SMI program is that important technological breakthroughs become available in the field of durable and safe shipping, and logistical efficiency. Another objective is to stimulate that middle and small companies start to innovate.

The development and application of innovations in sea shipping is a responsibility of the sea shipping sector itself. The SMI program supports the sector to innovate. The program started in May 2007 and lasts until 2010. The government subsidises the development of knowledge and innovation projects within the topics sustainability (e.g. fuel saving, emission reduction), security and/or logistical efficiency. Feasibility research, industrial research or pre-competitive development and knowledge transfer can be subsidised by the SMI program. Only shipping companies can submit individually or jointly a claim for subsidy.

2.8.1.1 Shipbuilding - New ship types, structures, ship design and construction

- Development of new technology and knowledge. For example:
- new types of ships (e.g. dredgers, yachts, short sea ships),
- new techniques for extraction of oil and gas (LNG) at large depths and transhipment at sea,
- lower fuel consumption,
- lower emissions,
- propulsion,
- new materials,
- ICT,
- cargo systems, and better operationality of ships.

2.8.1.2 Shipbuilding - Production processes and technology

Develop knowledge to optimise the complete process from design to engineering, production, logistics and cooperation with subcontractors for complex products.

2.8.1.3 Maritime equipment and services

See also maritime innovation programme (MIP).

2.8.1.4 Ship and port operation, services

A program for port operation is under development at this moment (Dutch Ministry of Transport, Public works and Water management).

2.8.1.5 Inland water and intermodal transport

A program for inland waterways is under development (Dutch Ministry of Transport, Public works and Water management).

2.8.1.6 Offshore industry/offshore technology

See also maritime innovation programme (MIP).

2.8.1.7 Offshore structures for renewable energy

2.8.1.8 Polar technology

2.8.1.9 Fishing/aquaculture

A Fishery Innovation Platform (VIP) has been set up by the minister of Agriculture, Nature and Food quality for a period of three years. The platform stimulates a favourable innovation climate within which the North sea fishing industry and the associated sector can develop durable and profitable. The VIP supports innovation projects of fishermen and/or associated organisations. These innovations are aimed at energy saving, reduction of the infestation of nature and increase of quality and the turnover.

The ministry of Agriculture, Nature and Food quality will start early 2008 with a fishery innovation program. This program still has to be notified by the Commission in Brussels. Projects within this program must be aimed at the development and/or testing of innovating techniques which make the fishery or fish industry more durable and/or economically more profitable.

2.8.2. MARTEC horizontal priority areas

2.8.2.1 Safety and Security

Ship safety
Improve maritime safety.

Ship and port security
See also 2.8.1.4.

2.8.2.2 Environmental impact

2.8.2.3 Human elements

- Improve the current level of education and training
- Improve the transfer of knowledge and experience between large companies and SME's

2.9 Norway

Maritime Programme **"MAROFF" 2002 – 2009**

Programme owner: **Research Council of Norway (RCN)**

Programme manager: **Research Council of Norway (RCN)**

2.9.1. MARTEC thematic priority areas

The overall goal for the MAROFF program is to support research which will contribute to better innovations and increased value creation in the maritime sector.

2.9.1.1. Shipbuilding - New ship types, structures, ship design and construction

- conceptual design
- next generation of ships and ship systems
- hull
- floating structure
- modul-based design
- use of gas in ships
- hydrodynamics
- propulsion

2.9.1.2. Shipbuilding - Production processes and technology

Increased efficiency in the shipbuilding industry by modul-based Design, Hull, Systems as well as Contracts, Business relations and International relations, including:

- modular construction
- lean construction

2.9.1.3. Maritime equipment and services

Increase delivery to worldwide shipbuilding by National cooperation and International networking, including:

- maritime ICT
- eNavigation
- cargo handling

2.9.1.4. Ship and port operation, services

Emphasise is put on Reliable, Safe, Efficient and Sustainable maritime transport with Focus on logistical chains, D-2-D, including:

- ship transport and operations for ships
- logistics
- fairleads and traffic management

2.9.1.5. Inland water and intermodal transport

- efficient and sustainable maritime transport
- logistical solutions for short sea shipping
- safe, efficient and sustainable maritime transport with focus on logistical chains

2.9.1.6. Offshore industry/offshore technology

- Maritime and offshore operations
- Heave compensation and dynamic positioning
- ROV-operations
- Maritime technology

2.9.1.7. Offshore structures for renewable energy

2.9.1.8. Polar technology

Ship Transport and Operations for Ships, Floating structure, Sub-sea structure and Terminals In Arctic areas and cold weather, including:

- Navigation in ice
- Ice remote sencing

2.9.1.9. Fishing/aquaculture

- Fishing vessels
- Offshore fish-farms and equipment

2.9.2. MARTEC horizontal priority areas

2.9.2.1. Safety and Security

- Health, environment and safety
- D-2-D (Doctor to Doctor – Communication Tools)

2.9.2.2. Environmental impact

- reducing emissions to air, CO_2, NO_X, SO_X, VOC
- reducing discharge to the sea; ballast water, washing water etc.
- anti foulings
- accidental oil spills prevention and recovery

2.9.2.3. Human elements

- next-generation network companies – distributed resources and competence
- internationalisation and specialisation
- new forms of organisation
- new business ideas; knowledge management
- Organisation and Market understanding
- Simulator training

2.10 Sweden

Public sector funding of R&D is takes place both through grants paid directly to higher education institutions and through support for research councils and sectoral research agencies. In addition there are a number of research foundations that administer public funds.

Maritime Programme **Maritime Safety Programme (2001-2007)**

Programme owner: **VINNOVA Swedish Governmental Agency for Innovation Systems**

Programme manager:

2.10.1 MARTEC thematic priority areas

2.10.1.1. Shipbuilding - New ship types, structures, ship design and

Construction

Shipbuilding in Sweden is concentrated in the use of new and light type of materials. The industry is limited.

2.10.1.2 Shipbuilding - Production processes and technology

2.10.1.3 Maritime equipment and services

Marine equipment and propulsion systems.

2.10.1.4 Ship and port operation, services

Development of eco-ships.

2.10.1.5 Inland water and intermodal transport

None

2.10.1.6 Offshore industry/offshore technology

None

2.10.1.7 Offshore structures for renewable energy

None

2.10.1.8 Polar technology

A Swedish-Finnish programme for winter navigation is ongoing since about 30 years. It aims to improve and facilitate winter navigation in the Baltic Sea. (One year ice).

2.10.1.9 Fishing/aquaculture

None

2.10.2 MARTEC horizontal priority areas

The competence centre Lighthouse has a continuous strong development in Gothenburg. The centre is focusing on the eco, ergo, safe, cargo, and business ship.

2.10.2.1 Safety and Security

Ship safety
In ERA-Net Transport, an international programme focusing on maritime safety has started. The projects in the SURSHIP programme is aiming to present and inform IMO about upcoming research results in order to improve IMO:s basis for future development of safety rules.

Ship and port security

2.10.2.2 Environmental impact

Due to the fact that Sweden has a system of fairway fees that can be reduced by using low sulphur bunker and low volume of NOX exhaust, the development of environmentally friendly systems is developing. Some research programmes are focusing on these questions.

2.10.2.3 Human elements

A HF-group is working in Sweden with experts at different disciplines. An international network is established.

2.11 Romania

Maritime Programme: "CEEX" open since 2004

Programme owner: National Authority for Scientific Research

Programme manager: National Authority for Scientific Research

"CEEX" is a horizontal program, also covering the maritime sector. The horizontal nature of the programme and the fact that there only have been two or three maritime projects does, that it gives no meaning to make a comparison with the MARTEC priority areas.

Maritime Programme: "PN2" open since 2007

Programme owner: National Authority for Scientific Research

Programme manager: National Authority for Scientific Research

"PN2" is a horizontal program, also covering the maritime sector. The horizontal nature of the programme and the fact that there only have been two or three maritime projects does, that it gives no meaning to make a comparison with the MARTEC priority areas.

2.11.1 MARTEC basic priority areas

2.11.1.1 Shipbuilding - New ship types, structures, ship design and construction

- conceptual design
- next generation of ships
- hull
- module-based design
- hydrodynamics
- propulsion (propellers)

2.11.1.2 Shipbuilding - Production processes and technology

- new technologies for materials fabrication
- modular construction

2.11.1.3 Maritime equipment and services

- eNavigation
- cargo handling
- floating bows for navigation
- new traffic management systems for Danube navigation

- intelligent transport systems

2.11.1.4 Ship and port operation, services

- logistics

2.11.1.5 Inland water and intermodal transport

- logistical solutions for Danube shipping

2.11.1.6 Offshore industry/offshore technology

None

2.11.1.7 Offshore structures for renewable energy

None

2.11.1.8 Polar technology

None

2.11.1.9 Fishing/aquaculture

- Danube fish-farms and equipment

2.11.2 MARTEC horizontal priority areas

2.11.2.1 Safety and Security

Ship safety

- ship safety
- ship and port security

Ship and port security

2.11.2.2 Environmental impact

- reducing discharge to the sea; ballast water, washing water etc.
- accidental oil spills prevention and recovery

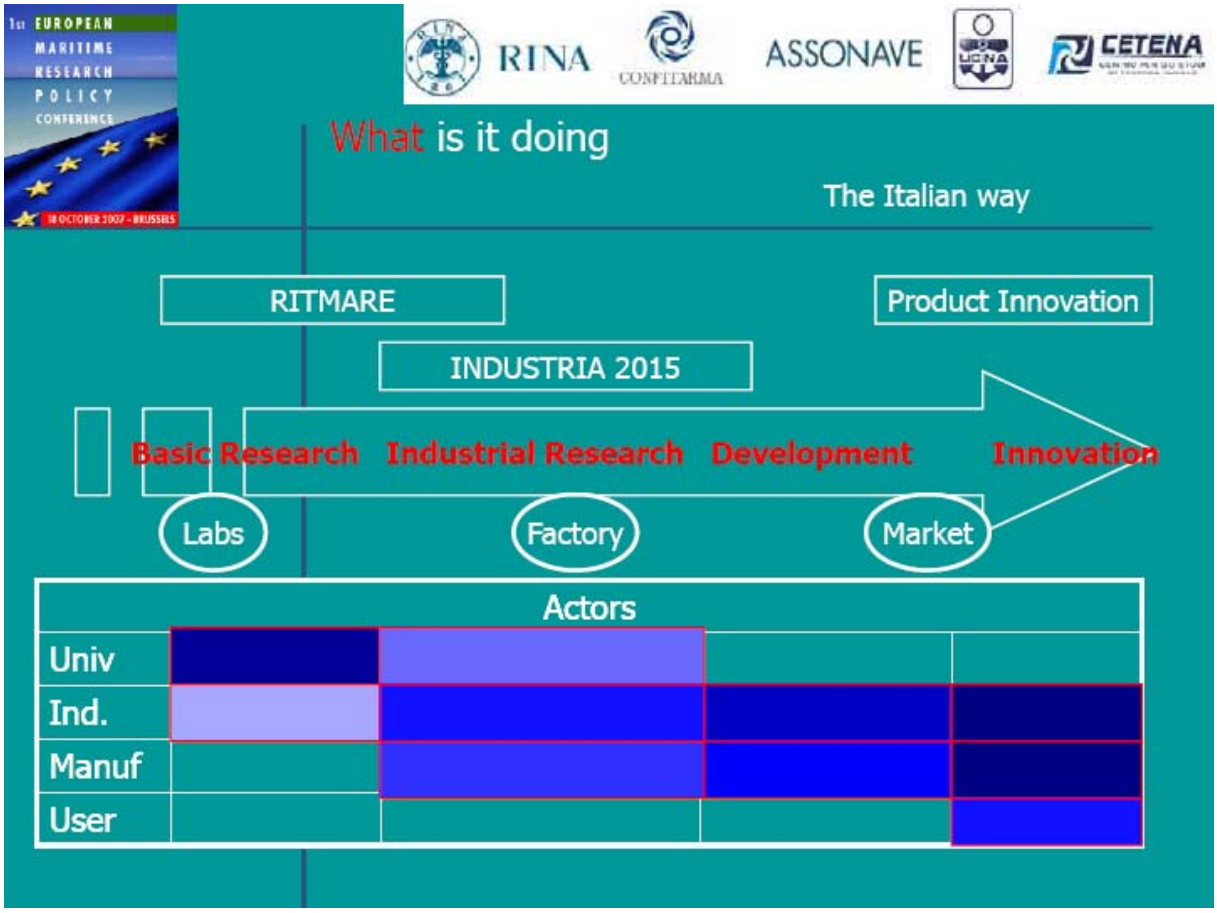
2.11.2.3 Human elements

- Simulator training
- Improve the transfer of knowledge and experience between large companies,
- SME’s and Universities.

2.12 Italy

There are mainly three maritime programmes in Italy (RITMARE, INDUSTRIA 2015 and Product Innovation). Research related programmes are RITMARE and INDUSTRIA 2015 (see picture below). The programmes will be funded by different ministries (Ministry of Transport, Ministry of Economic Development, Ministry of University & Research, Ministry of the Environment and by regions.

Basic structures of Italian maritime research programmes:



3 Analysis of complementarities and gaps

3.1. Common priority areas, technology transfer

3.1.1. MARTEC basic priority areas

New ship types, structures, ship design and construction

Germany:
New ship types: highest possible efficiency, higher safety and reduced emissions, decreased noise and optimization of the ship hydrodynamics
Improved ship design and constructions: innovative, highly specialised ships, new components and ship concepts with higher quality standards, ground effect vehicles, catamarans or SWATH-ships Development of the physical effects on the ship construction in extreme situations like collisions, grounding, or over the whole lifetime of a ship, integrate information technologies in the use and development of engineer's knowledge
Advancement in ship hydrodynamics: development in the field of numeric ship hydrodynamics, enable a more exact prognosis of the resistance of the ship, the demand of engine output, the behaviour and pressures in sea disturbance, the manoeuvrability, the stability, the interaction of the ships between each other and in limited waters, shorten the design process of new ships, virtual ship design and simulation of shipbuilding production, LNG transport

Spain:
Improvement of the design and construction process of ships and their components. Technological development of new advanced ships. Vessels with higher levels of safety, security and environmental protection. Cruise ships, for the transport of rolling load and passage, including sport and recreational crafts, Advanced ships for transport of all kinds of load including natural liquefied or pressurized gas ships and naval devices for supporting off-shore facilities, rescue and protection of the marine environment, robots and unmanned vehicles and different vehicles for special services, including submarines for civil use.

Poland:
development CA of design methods, taking into account the period of ship operation, presumed area of navigation, dominating weather conditions and other relevant constraints, increasing safety requirements (e.g. on the way of improvement of a ship manoeuvrability and sea-keeping qualities, ship construction and construction materials properties), reduction of the unwanted influence of a ship on the environment, (e.g. by reduction fuel consumption in various operating conditions due to decreased ship resistance or increased propulsion system efficiency) especially by the application of the entire life cycle approach including the idea of a "green passport" for a ship, development of efficient propulsion and manoeuvring systems, application of the alternative fuels – including fuel cells

France:
the design of innovative and competitive inland and short-sea ships, the development of new ships adapted of small waterways, the development of new ships dedicated to the transportation of specific goods

New ship types, structures, ship design and construction

Finland: new hull concepts, modelling the flow around ship hull, efficient design in scattered surroundings
Denmark: hull forms, propellers, operation and coatings
United Kingdom: Covered under CR&D
Netherlands: new types of ships (e.g. dredgers, yachts, short sea ships), new techniques for extraction of oil and gas (LNG) at large depths and transhipment, at sea, lower fuel consumption, lower emissions, propulsion, new materials, ICT, cargo systems, better operationality of ships
Norway: conceptual design, next generation of ships and ship systems, hull, floating structure, modul-based sign, use of gas in ships, hydrodynamics, propulsion
Sweden: new and light type of materials
Romania: conceptual design**,** next generation of ships, hull, module-based design, hydrodynamics, propulsion (propellers)

Shipbuilding - Production processes and technology

Germany:
Increased productivity of shipyards
Good working cooperation between shipyards and suppliers, new tools for information and communication , **Development of software-based tools for the production process**
Software based tools, like CAD and CAM-systems , **Reduction of ship design duration** Virtual reality techniques, **Standardisation and modularity of construction units/groups** Development of a flexible system of standard modules, **Details manufacturing, new adding techniques** Modern joint technologies, simulation techniques in addition to specific welding technology and a profound knowledge of joint technologies

Spain:
Development, implantation and application of advanced tools of design, including those of numerical calculation for the optimization of the forms of the ship, and those for analysis and process simulation,
Integration and optimization of the design and manufacture processes, including the supply chain.
New developments for ship equipments and systems manufacture, automation of the manufacturing processes, design for modular manufacturing, new materials for application in the ships and their components, standardization of elements and integration of components in sets, cost analysis tools and applications for the budgeting, cost optimization of exploitation, reparation, maintenance, recycling and inspection in ships

Poland:
new, innovative technologies for material joining and cutting applied during ship production and repair, enhancement of welding technologies with regard to the new construction materials, joining of different materials and influence of welding on the construction, increase of application range of new materials in shipbuilding, e.g. hig tensile steel, aluminium, composite materials, sandwich materials with controlled physical properties, development of corrosion protection technologies and coatings especially with respect to their impact on the marine environment, enhancement of the metrology methods applied during ship production processes and aiming on the ship construction optimisation, improvement of the organisation of the supply chain in shipbuilding and ship repair process, virtual modelling of production processes, increase of the application IT on every stage of shipbuilding process

France:
metallic and composite structures, elaboration of materials and associated processes, complex processes and systems: systems engineering, concurrent engineering, simulation and optimisation of structures

Finland:
Standardisation, production control, new cutting and joining techniques, automatization of outfitting and requirements new materials pose, developing new production methods and manufacturing technologies for the manufacture, mechanisation and robotisation of the production, networking in the shipbuilding process, use of laser welding in all steel sandwich panels, simulation of ship hull steel production, 3D-CAD

Denmark:
making enterprise more effective

United Kingdom:
Covered under CR&D

Netherlands:
optimise the complete process from design to engineering, production, logistics and cooperation with subcontractors for complex products

Norway:
modular construction, lean construction

Romania:
new technologies for materials fabrication, modular construction

Maritime equipment and services

Germany:
increased reliability of ship systems, condition base maintenance, satellite based remote diagnostics, simulation tools, extension of life time of wear parts by use of new materials and production technique

Spain:
Improvement of the efficiency of equipments and systems, including propulsion systems,
Crafts for fishing, its transport and distribution, including those to transport living species, as well as the development of auxiliary appliances for marine aquaculture,
Equipments for the protection of the environment,
Remote sensing systems

Poland:
further development of the modular approach towards design, manufacture and recycling of the marine equipment, application of innovative, safe and recyclable materials, increase of application of nanotechnology based and intelligent materials in maritime equipment, computer aided systems supporting ship master decisions with regard to the ship stability and general strength during her operation

France:
Ship maintanance and services, eco-design, risk prevention, e-maintenance, automation at sea and in port, corrosion protection, environmental friendly antifouling paint

United Kingdom:
marine equipment - Covered under CR&D
Propulsion systems - Covered under CR&D

Finland:
ICT Solutions for maritime industries

Netherlands:
Maritime innovation programme (MIP)

Norway:
maritime ICT, eNavigation, cargo handling

Sweden:
Marine equipment and propulsion systems

Romania:
eNavigation, cargo handling, floating bows for navigation, new traffic management systems for Danube, navigation, intelligent transport systems

Ship and port operation, services

Germany: telematic and satellite based applications, Vessel traffic services, simulation tools
Spain: port management technologies, development of new materials for port infrastructures., development of favoring technologies for the environmental management in ports, logistics and maintenance of all types of ships and naval objects and port services,active and passive systems for controlling movemants, telematics and satellite based applications
Poland: further development of the modular approach towards design, manufacture and recycling of the marine equipment, application of innovative, safe and recyclable materials, increase of application of nanotechnology based and intelligent materials in maritime equipment, computer aided systems supporting ship master decisions with regard to the ship stability and general strength during her operation
France: more efficient cargo handling systems and operations, ship operation and identification systems (AIS, LRIT), tools for a safer management of ro-ro linkspawns, optimisation of port operations
Finland: logistics of materials and personnel
United Kingdom: Covered under CR&D or Department of Transport as commissioned research support of “policy”
Netherlands: Program for port operation is under preparation
Norway: ship transport and operations for ships, logistics, fairleads and traffic management
Sweden: eco-ships
Romania: logistics

Inland water and intermodal transport

Germany:
faster inland water transport and short-sea-shipping, ship constructions for existing width of lock chambers/bridge heights, applications of telematics for inland waterway shipping, ships for coastal and hinterland traffic, bulk carrier transport, cargo handling

Spain:
Promotion of short distance maritime transport, improvement of ships to the needs of traffic and freights, its safety and its environmental protection, technological developments favouring the intermodal logistics services, improvement of the services associated with the maritime traffic, as well as of procedures used at port, feasibility studies of sectors involved in the chain of transport, development of the infrastructures, technologies and systems necessary in ports for Short Sea Shipping, development of designs optimized for Short Sea Shipping (SSS), development of new systems for mooring, loading and unloading, integration of the Short Sea Shipping in the logistics intermodal European chains

Poland:
Development of new types of propulsion (pushing or pulling) and cargo vessels taking into account the draught seasonal and long-term variations caused by the climate changes, application of fuel cells, development of the cargo handling interfaces between the rail-road and inland waterways transport system, modernisation and enhancement of inland waterways and inland ports infrastructure and operation

France:
the reduction of the cost of the transshipment systems and the handling techniques for combined and waterway transport, the tracing systems like RFID tags, river information systems: tracking and tracing, anti-accident systems, aid to navigation, the knowledge of the cost structure and the competitiveness of river transport, the design of intermodal platforms, how to promote inland waterway transport, the development of motorways, the future information systems, linked with GALILEO (for a better tracing and more competitive transport and port processes), the optimization of intermodality, notably of transshipments and intermodal platforms, the sustainable development of inland waterway transport and of associated corridors

Finland:
improved transport efficiency

Denmark:
Planning and optimising the transport chain

United Kingdom:
shipping policy incl. ports and waterways, inland waterways

Netherlands:
Program for inland waterways is under preparation

Norway:
efficient and sustainable maritime transport, logistical solutions for short sea shipping, safe, efficient and sustainable maritime transport with focus on logistical chains

Romania:
logistical solutions for Danube shipping

Offshore industry / offshore technology

Germany:
underwater process technology for the production of oil and gas, system solutions in offshore and deep water technologies, underwater robotics

Spain:
Development of a new generation of drilling platforms, storage and unloading for a safer, cleaner and efficient operation in ultra-deep waters, design of industrial floating plants, manufacture, assembly and tuning of modules for process plants of oil and gas

Poland:
Development of new types of propulsion (pushing or pulling) and cargo vessels taking into account the draught seasonal and long-term variations caused by the climate changes, application of fuel cells, development of the cargo handling interfaces between the rail-road and inland waterways transport system, modernisation and enhancement of inland waterways and inland ports infrastructure and operation

United Kingdom:
offshore operations, submersible and offshore marine structure design, ship and submarine design

Netherlands:
Maritime innovation programme (MIP)

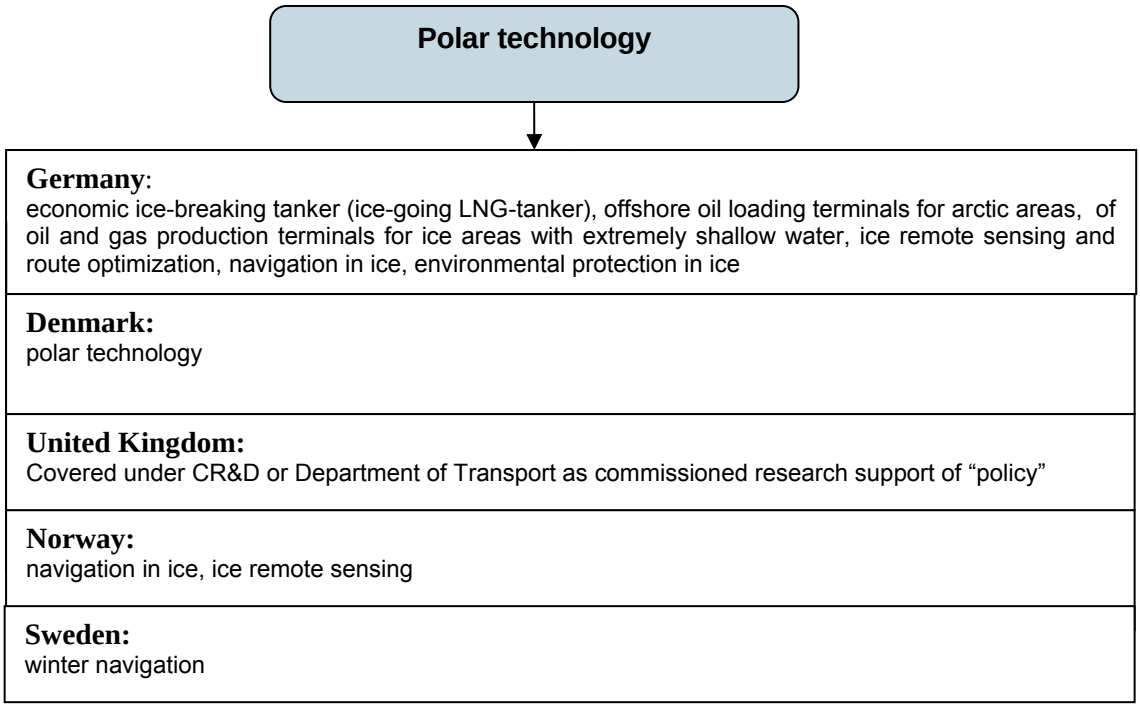
Norway:
Maritime and offshore operations, heave compensation and dynamic positioning, ROV-operations, maritime technology

Offshore structures for renewable energy

Spain:
offshore structures for renewable energy

France:
offshore technologies for the exploitation of renewable energies

United Kingdom:
Covered under CR&D or Department of Transport as commissioned research support of “policy”

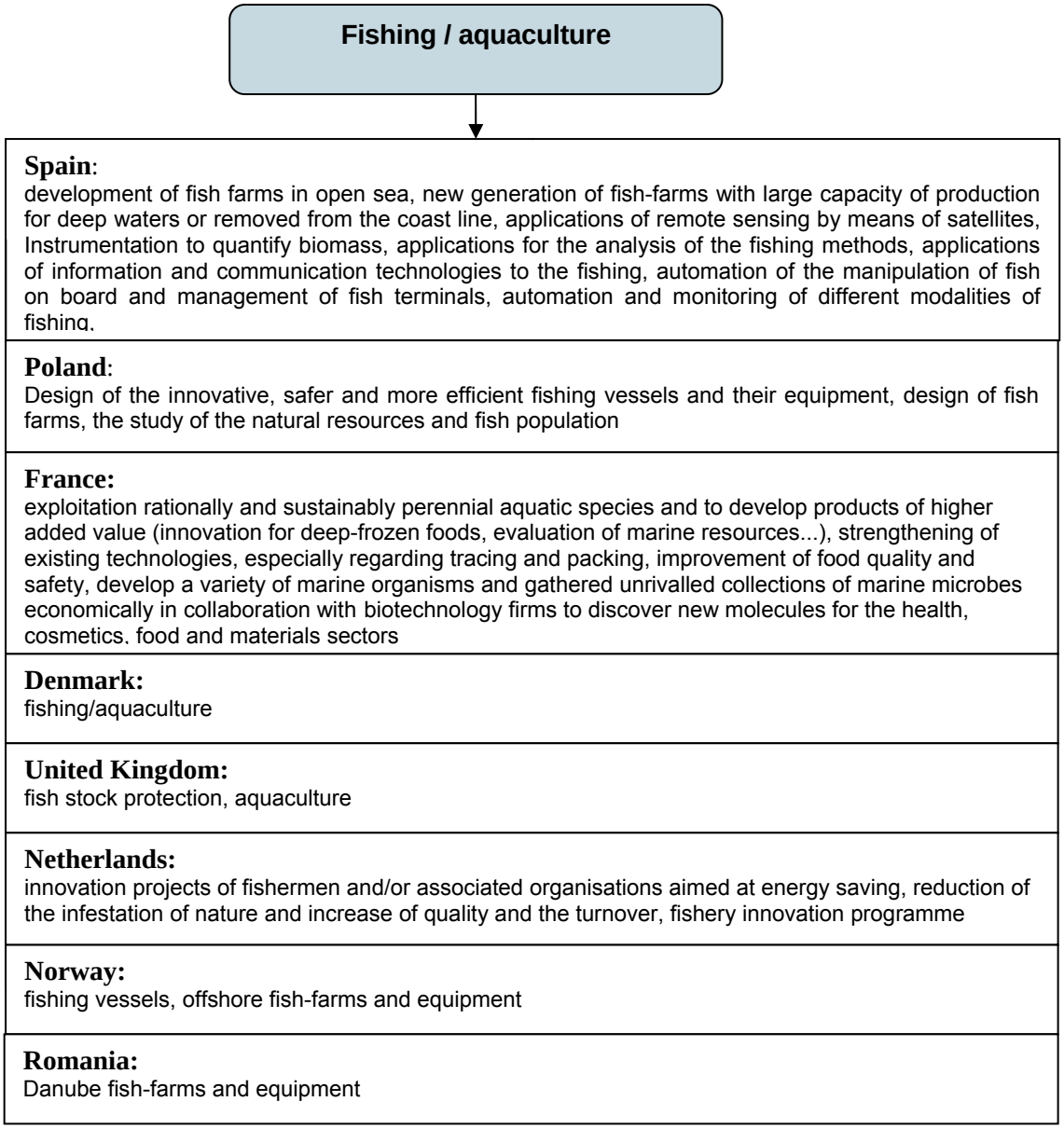


The EUROPOLAR ERA-NET includes in the Work Package 3 (Strategic Activities in Europe's Polar RTD Programmes) a task (Task 3.4) about the technology programmes. The content of the deliverable has been drafted as:

- Overview of the initiatives in partner countries about RTD in polar technology
- Analysis of common objectives in different countries and identification of possible areas of common research
- Summary of the possibilities to develop a joint RTD programme in polar technology.

The document includes details of polar programmes of the countries:

- Denmark
- Finland
- Germany
- Netherlands
- Norway
- Sweden
- United Kingdom

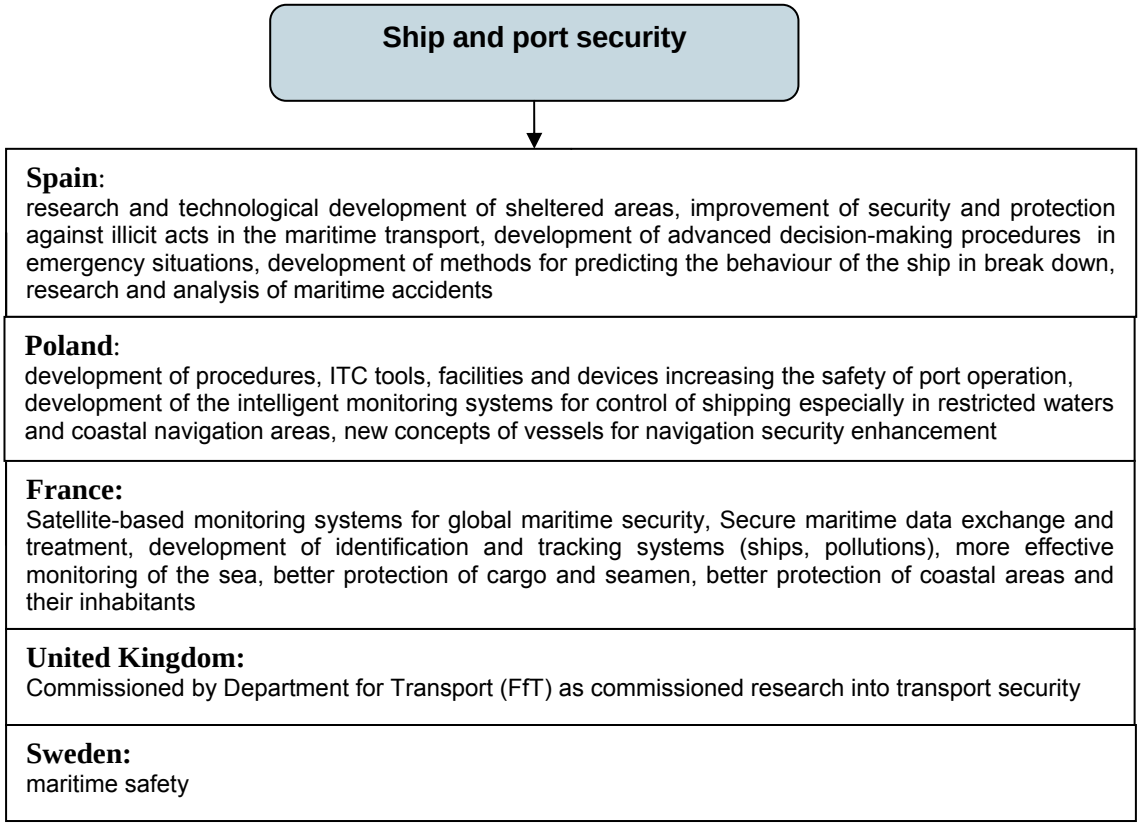


The ERA-NET MariFish brings together the major European national funders of marine fisheries research to form an effective partnership. MariFish will focus on that research which provides evidence to managers for the development of strategies for sustainable fisheries, including links with aquaculture, set within the ecosystem based principle.

3.1.2. MARTEC horizontal priority areas

Safety and Security
Ship safety

Germany: improvement of ship safety by design, increasing traffic situations, increasing traffic situations, limited waters, applications for high speed vessels and inland water crafts, ship and land based navigation and control systems, collision, grounding, evacuation, fire safety, search and rescue, manoeuvring, men-machine interfaces
Spain: Development of methods to assure a more secure work at the marine sector, development of tools for training ship operators, improvement of ship communication systems and the systems of control and identification, interfaces or protocols of communication between devices of automatic identification of ships (AIS) and the systems of satellite communication, design of personal radio buoys and equipments of individual protection, especially for utilization in the fishing ships crews, which will permit a higher degree of survival for people fallen overboard, improvement of the systems, equipments and procedures of evacuation in cruise ships, and the safety of the human life in the sea, developments in the measures taken to minimize the impact of noises, vibrations and any other type of emission on health
Poland: development of IT based systems for assessment of a ship safety in rough seas and off-design operation and weather conditions taking into account ship sea-keeping properties and her construction integrity, improvement of CAE tools supporting the assessment of a ship survivability in extreme events i.e. fire, explosion, collision, icing or grounding, enhancement passenger and crew safety
France: satellite-based monitoring systems for global maritime safety, accident analysis for the risk abatement of sea transport, goods and especially dangerous goods tracking including geofencing and explosives detection
Finland: ship fire safety, improved damage stability in passenger vessels
United Kingdom: offshore health and safety, Ro-Ro and high-speed vessel safety, formal safety assessment, research into ship safety/FSA is commissioned by the Marine & Coastguard Agency, or Department for Transport (DfT) under their Research Programme. This will be 100% funded and undertaken by universities, research laboratories and consultants, to support or implement policy, offshore health and safety funded as commissioned research by Health & Safety, Executive (HSE)
Netherlands: improve maritime safety
Norway: health, environment and safety, D-2-D (Doctor to Doctor – Communication Tools)
Romania: ship safety, ship and port security



There is a workpackage of ship safety, called SURSHIP within the ERANET Transport. The partners of SURSHIP are convinced that it is possible to build safer ships if a joint R&D effort is taken on the improved survivability of the entire ship, in a holistic meaning. The comprehensive and coordinated approach of all countries participating in SURSHIP will lead to gains in efficiency, competitiveness and will have severe scientific, political and economical impacts. It is not possible for one single country alone to accomplish this ambitious task of creating a new comprehensive maritime safety approach. SURSHIP will create an improved know how of a more generic, holistic ship safety approach which will influence ship owners, ship builders, suppliers and national administrations as well as the work on IMO.
SURSHIP has the following three strategic objectives:

- Development of a holistic maritime safety concept
- Strengthening of the competitiveness of the European maritime industry
- Improvement of sustainability and safety of ships and of marine environmental protection

Environmental impact

Germany:
decrease of the noise load and ship oscillation, environmental protection, early recognition and accident management systems, accident prevention systems, recycling- and waste management

Spain:
pollution prevention and environmental protection at sea and coastal areas, to prevent contamination and to promote the environment protection, development and improvement of remote sensing technologies for spots of pollution, detection, by means of the utilization of satellites, radar, development of simulation, modeling and prediction technologies for pollution, prevention in emergency situations, systems and equipments for the reduction of gas emissions

Poland:
new recycling and waste management technologies applied during ship operation,
new production technologies reducing harmful emission, noise, and volume of production waste generation, environmentally friendly scrapping technologies maximising recycling of the ship construction materials and on-board equipment, monitoring and early warning systems for sea pollution control

France:
abatement of the nuisances due to ship emissions (ballast water, painting, air emissions), ship recycling, abatement of the nuisances due to port operations (dredged material, cathodic protection of the infrastructures, air emissions), innovations for the eco-design of future ships, high water quality standarts for fishing and aquaculture, improvement of aquatic foods safety, monitoring technologies for the observation of the maritime ecosystems, creation of integratet management processes

Finland:
environmental safety, maintenance of biodiversity and sustainable use of marine resources, recycling and handling of waste,

Denmark:
environmental and energy effective maritime technologies and systems, reduction of emissions from ship transportation by developing environmental and energy effective maritime technologies and systems

United Kingdom:
marine ecology and ecotoxicology

Netherlands:
environmental safety

Norway:
reducing emissions to air, CO_2, NO_X, SO_X, VOC, reducing discharge to the sea; ballast water, washing water etc., anti foulings, accidental oil spills prevention and recovery

Sweden:
environmentally friendly systems

Romania:
reducing discharge to the sea; ballast water, washing water etc, accidental oil spills prevention and recovery

Human factors

Germany:
innovative training methods and systems for ship guidance are fundable with the topic “improvement of ship safety

Poland:
next-generation network companies, distributed resources and competence, internationalisation and specialisation, new forms of organisation,new business ideas; knowledge management

France:
simulation and management tools for seafarers' education and training

Netherlands:
improve the current level of education and training, improve the transfer of knowledge and experience between large companies and SME’s

Norway:
next-generation network companies – distributed resources and competence, internationalisation and specialisation, new forms of organisation, new business ideas; knowledge management, Organisation and Market understanding, simulator training

Sweden:
international network

Romania:
Simulator training, improve the transfer of knowledge and experience between large companies, SME’s and Universities

3.1.3. Overview table: partner countries – priority areas (x)

	D	SP	PL	F	FI	DK	UK	NL	NO	S	RO
shipbuilding- new ship types, structures, ship design and construction	X	X	X	X	X	X	X	X	X	X	X
shipbuilding- production process and technology	X	X	X	X	X	X	X	X	X		X
maritime equioment and services	X	X	X	X	X		X	X	X	X	X
ship and port operation services	X	X	X	X	X		X		X		
inland water and intermodal transport	X	X	X	X	X		X	X	X		X
offshore industry/ offshore technology	X	X	X				X	X	X		
offshore structures for renewable energy		X		X			X				
polar technology	X					X	X		X	X	
fishing/ aquaculture		X	X	X		X	X	X	X		X
safety	X	X	X	X	X		X	X	X		X
security		X	X	X			X			X	
environmental impact	X	X	X	X	X	X	X	X	X	X	X
human elements	X		X	X				X	X	X	X

3.2. MARTEC – FP7 - Waterborne

Eight thematic and three horizontal priority areas are structured in MARTEC at the moment, representing the National Programmes of the MARTEC participants.

The WATERBORNE SRA (WSRA) addresses three Pillars as follows:

- Safe, Sustainable and Efficient Waterborne Operations
- A Competitive European Maritime Industry
- Manage and Facilitate Growth and Changing Trade Patterns

This demonstrates that the WATERBORNE SRA is directly relevant to the National Programmes of the MARTEC participants in the prime maritime transport areas, however, when it comes to offshore oil and gas, renewable energies and polar technology, the relevance is dependent on the specific research objectives. For example, if the research relates to "marine technologies", such as structures, materials, hydrodynamics, etc, the WSRA is relevant, but if the research is non-maritime, e.g. petrochemicals, power distribution, marine science, then the WSRA is not relevant. In the case of fishing/aquaculture, there is no relevance at all.

The following table demonstrates complementarities and gaps between the National Programmes (MARTEC priority areas), FP7 and the WATERBORNE SRA.

Table 1: Comparison of National Programmes, FP7 & WSRA

MARTEC priority areas	FP7 SST Activity	FP7 non-SST Theme	Waterborne SRA
Shipbuilding **1.1 New ship types, structures, ship design and construction** new ships, hull concepts, structures and components, next generation ships, new floating structures, risk based design, simulation and planning tools, computational fluid dynamics **1.2 Production processes and technology** standardisation, modularisation, optimisation, mechanisation, robotisation, production control,	Greening of Surface Transport Strengthening competitiveness	Information & communication technologies - Co-operative systems, Robotics, Intelligent Vehicle Systems Nanosciences, Nanotechnologies, Materials and New Production Technologies	**2.1 Safe, Sustainable and Efficient Waterborne Operations** **2.1.3 The "Crashworthy" Vessel** **2.1.4 "Low Emission" Vessels and Waterborne Activities** **2.2 A Competitive European Maritime Industry** **2.2.1 Innovative Vessels and Floating Structures** **2.2.2 Innovative Marine Equipment and Systems** **2.2.3 Tools for Accelerated Innovation** **2.2.4 Next Generation Production Processes**

forming, cutting and joining techniques, laser welding, surface treatment technologies, production methods, networking, simulation, software tools, productivity, use of new materials, supply chain management, recycling, life-cycle approach			**2.2.5 Effective Waterborne Operations** **2.2.6 Technologies for New and Extended Marine Operations**
Maritime equipment and services bridge systems, information and communication technologies, telematic applications, engine and propulsion systems, automation systems, cargo handling, maintenance	Greening of Surface Transport Strengthening competitiveness		**2.1 Safe, Sustainable and Efficient Waterborne Operations** **2.1.4 "Low Emission" Vessels and Waterborne Activities** **2.1.5 Enhanced Waterborne Security** **2.2 A Competitive European Maritime Industry** **2.2.1 Innovative Vessels and Floating Structures** **2.2.2 Innovative Marine Equipment and Systems** **2.2.3 Tools for Accelerated Innovation** **2.2.4 Next Generation Production Processes** **2.2.5 Effective Waterborne Operations** **2.2.6 Technologies for New and Extended Marine Operations** **2.3 Manage & Facilitate Growth and Changing Trade Patterns** **2.3.1 Accelerated Development of New**

			Port and Infrastructure Facilities **2.3.2 Interoperability between Modes** **2.3.3 More Effective Ports and Infrastructure** **2.3.4 Intelligent Transportation Technologies and Integrated ICT solutions**
Ship and port operations vessel traffic services, manoeuvring, cargo handling, waste & ballast water facilities	Greening of Surface Transport Encouraging and increasing modal shift and decongesting transport corridors Improving safety and security	Security	**2.1 Safe, Sustainable and Efficient Waterborne Operations** **2.1.1 Implementing Goal Based / Risk Based Frameworks for Cost Efficient Safety** **2.1.2 The "Zero Accidents" Target** **2.1.3 The "Crashworthy" Vessel** **2.1.4 "Low Emission" Vessels and Waterborne Activities** **2.1.5 Enhanced Waterborne Security** **2.2 A Competitive European Maritime Industry** **2.2.5 Effective Waterborne Operations** **2.2.6 Technologies for New and Extended Marine Operations** **2.3 Manage & Facilitate Growth and Changing Trade Patterns** **2.3.1 Accelerated Development of New Port and Infrastructure Facilities**

			2.3.2 Interoperability between Modes **2.3.3 More Effective Ports and Infrastructure** **2.3.4 Intelligent Transportation Technologies and Integrated ICT solutions** **2.3.5 Understand Environmental Impact of Infrastructure Building and Dredging** **2.3.6 Traffic Management Strategies**
Inland water and intermodal transport Shipbuilding **Maritime equipment and services** **Ship and port operation** transport chains, hinterland connections, short sea shipping, traffic management **Transport logistics** intermodality, interoperability	Encouraging and increasing modal shift and decongesting transport corridors Ensuring sustainable urban mobility		**2.3 Manage & Facilitate Growth and Changing Trade Patterns** **2.3.1 Accelerated Development of New Port and Infrastructure Facilities** **2.3.2 Interoperability between Modes** **2.3.3 More Effective Ports and Infrastructure** **2.3.4 Intelligent Transportation Technologies and Integrated ICT solutions** **2.3.5 Understand Environmental Impact of Infrastructure Building and Dredging** **2.3.6 Traffic Management Strategies**
Offshore industry/offshore technology new structures, design and construction, production processes and technology, equipment and	Strengthening competitiveness		**2.2 A Competitive European Maritime Industry** **2.2.1 Innovative Vessels and Floating Structures** **2.2.2 Innovative Marine Equipment and Systems**

services, maintenance and decommissioning of offshore structures, offshore operations, underwater process technology, underwater technology, underwater robotics (AUV, ROV)			**2.2.6 Technologies for New and Extended Marine Operations**
Offshore structures for renewable energy **Water power** wave, tidal and current energy technology **Wind power** wind energy technology, installation technology		Energy	**2.2 A Competitive European Maritime Industry** **2.2.6 Technologies for New and Extended Marine Operations**
Polar technology arctic sea transport, shipbuilding, equipment and services for polar regions, operation of ships, offshore structures	Strengthening competitiveness		**2.2 A Competitive European Maritime Industry** **2.2.6 Technologies for New and Extended Marine Operations**
Fishing/aquaculture platforms and devices, fish farms in open sea, new generation of fish-farms, teledetection, information and communication technologies, automation and monitoring		Food, Agriculture and Fisheries, and Biotechnology	
Horizontal priority areas			
Safety and security **Ship safety**	Improving safety and security	Security	

collision, grounding, evacuation, fire safety, search and rescue, manoeuvring, cargo handling and lashing, tracking and tracing, first aid **Ship and port security preventive measures against terrorism, piracy**			
Environmental impact reduction and improvement of the efficiency of fuel and energy consumption, anti fouling, ballast water handling, wash waves, waste management, recycling, monitoring, reduction of emission, prevention of contamination, noise and vibration	Greening of Surface Transport	Environment	
Human elements training aspects, education, improvement of working conditions, intellectual property rights (IPR)	Improving safety and security		

The analysis above shows the complementarities between the MARTEC priority areas, FP7 and the WSRA. It also demonstrates that if the FP7 Surface Transport sub-Theme is not totally complementary, then another FP7 Theme is, so that there are no obvious gaps.

Identification of innovation aspects in programmes of Waterborne and FP7

There are a number of Themes relevant to the maritime sector in FP7, however the most important is Sustainable Surface Transport. The research scope considers the surface transport system embracing all its constituents: products (vehicles, vessels and infrastructures), services, operations and users integrating organisation, legal and policy frameworks.

It is anticipated that there will be five annual Calls for Proposals, however the Work Programme for each Call is developed prior to each Call, so that it is not known at this stage what specific research topics will be addressed in subsequent Calls.

WATERBORNE itself does not have a research programme, but as a European Technology Programme provides an input and recommendations to the European Commission to influence the structure of the Surface Transport work programmes in relation to the waterborne transport modes.

The Surface Transport sub-Theme is primarily organised into Five Activities, as follows:

Greening of Surface Transport
Developing technologies and knowledge for reduced pollution (air including greenhouse gases, water and soil) and environmental impact on such areas as climate change, health, biodiversity and noise.
Research will improve the cleanliness and energy-efficiency of powertrains (e.g. hybrid solutions) and promote the use of alternative fuels, including hydrogen and fuel cells as mid- and long-term options, taking into account cost-efficiency and energy efficiency considerations.
Activities will cover infrastructure, vehicles, vessels and component technologies, including overall system optimisation. Research in developments specific to transport will include manufacturing, construction, operations, maintenance, diagnostics, repair, inspection, dismantling, disposal, recycling, end of life strategies and interventions at sea in case of accident.

Encouraging and increasing modal shift and decongesting transport corridors
Developing and demonstrating seamless door-to-door transport for people and goods as well as technologies and systems to ensure effective intermodality, including in the context of rail and waterborne transport competitiveness.
This includes activities addressing the interoperability and operational optimisation of local, regional, national and European transport networks, systems and services and their intermodal integration in an integrated approach.
The activities will aim at European-wide strategies, optimised use of infrastructure including terminals and specialised networks, improved transport, traffic and information management, enhanced freight logistics, passenger intermodality and modal shift strategies to encourage energy efficient means of transport. Intelligent systems, new vehicle/vessel concepts and technologies including loading and unloading operations as well as user interfaces will be developed. Knowledge for policy-making will include infrastructure pricing and charging, assessments of Community transport policy measures and trans-European networks policy and projects.

Ensuring sustainable urban mobility
Focusing on the mobility of people and goods by research on the 'next generation vehicle' and its market take-up, bringing together all elements of a clean, energy efficient, safe and intelligent road transport system.
Research on new transport and mobility concepts, innovative organisational and mobility management schemes and high quality public transport will aim at ensuring access for all and high levels of intermodal integration. Innovative strategies for clean urban transport23 will be developed and tested.
Particular attention will be paid to non-polluting modes of transport, demand management, rationalisation of private transport, and information and communication strategies, services and infrastructures. Tools and models supporting policy development and implementation will cover transport and land use planning including the relationship with growth and employment.

Improving safety and security
Developing technologies and intelligent systems to protect vulnerable persons such as drivers, riders, passengers, crew, and pedestrians.
Advanced engineering systems and risk analysis methodologies will be developed for the design and operation of vehicles, vessels and infrastructures.
Emphasis will be placed on integrative approaches linking human elements, structural integrity, preventive, passive and active safety including monitoring systems, rescue and crisis management. Safety will be considered as an inherent component of the total transport system embracing infrastructures, freight (goods and containers), transport users and operators, vehicles and vessels and measures at policy and legislative levels, including decision support and validation tools; security will be addressed wherever it is an inherent requirement to the transport system.

Strengthening competitiveness
Improving the competitiveness of transport industries, ensuring sustainable, efficient and affordable transport services and creating new skills and job opportunities by research and developments.

Technologies for advanced industrial processes will include design, manufacturing, assembly, construction and maintenance and will aim at decreasing life cycle costs and development lead-times.
Emphasis will be placed on innovative and improved product and system concepts and improved transport services ensuring higher customer satisfaction. New production organisation including the supply chain management and distribution systems will be developed.
In the 2007 Work Programme there were a number of generic research topics open that were relevant across all three transport modes, i.e. maritime/waterborne, automotive and rail, however, there were also some topics specific or more relevant to the maritime/waterborne sector, as follows:

3.3 Surface Transport 2007 Call

Greening of Surface Transport

Electric ship technology
Objective: Enlarge the economically viable range of vessel application.
Coverage:

- New generation of power systems
- New electric propulsion concepts
- Electrical actuation of major equipments
- Clean shore power design

Clean and energy efficient marine diesel power trains
Objective: Significantly reduce pollutant emissions and increase overall efficiency of marine diesel propulsion systems.
Coverage:

- Advanced combustion processes
- Numerical models and concepts
- Intelligent engine controls and flexible power-trains
- Advanced after-treatment systems
- Innovative components and auxiliary systems

End of life strategies for vehicles/vessels and infrastructures
Objectives: Develop new methods and processes for vehicle/vessels and infrastructure end of life strategy.
Coverage:

- Clean and safe dismantling
- Clean and safe disposal,
- Cost effective and clean recycling, conversion, retrofitting and re-use
- End of life strategies
- Special emphasis: minimisation of human exposure to harmful substances

ECO-SHIP
Objective: Protect marine eco-systems by minimising and treating waste and water residuals.
Coverage:

- Innovative vessels design
- Cost effective ballast water treatment
- Holistic approach to treat all waste sources
- Waste recovery and re-use within vessels operation
- Solutions to contamination issues deriving from anti-fouling agents

Encouraging and increasing modal shift and decongesting transport corridors

Vehicle/vessels and infrastructure concepts for intermodal freight transport
Objective: Innovative vehicle/vessels and infrastructure concepts for operation in multimodal transportation chains.

Scope:

- Reliability, flexibility and speed of operations
- Vehicles/vessels speed and maximum carrying capacity
- Vehicle/vessels manoeuvrability

Promotion of inland waterway transport (1)

Background: NAIADES Action programme; strengthening the competitive position of IWT and to enhance its integration into intermodal supply and transport chains

Areas: Markets, fleet, job and skills, image and infrastructure

Instruments: Legislative, policy and/or supportive (e.g. RTD)

Objective: Establish a strong knowledge/expertise network involving actively all relevant actors in support of the implementation of the NAIADES action programme

Promotion of inland waterway transport (2)

Scope and expected results:

- Support to the implementation of the NAIADES action programme (identify specific measures and stakeholders, develop knowledge and tools)
- Strong and active participation of all relevant stakeholders and making use of existing expertise
- Workshops, expert meetings, cluster activities, small-scale studies, dissemination, exchange of best practice, knowledge transfer, technology forecast etc.
- Ultimately, a stronger performance and position of IWT in the transport chain

Advanced RIS-based transport management solutions for the IWT sector (1)

Challenges:

- Need to improve the quality of alternative modes such as IWT in terms of efficiency, reliability and responsiveness
- Modern logistics and supply chain management requires enhanced organisation, planning, monitoring and communication
- Managing information flows and integrate transport with other logistics tasks
- Integration of traffic and transport management and ensuring interoperability of different systems, services and applications

Advanced RIS-based transport management solutions for the IWT sector (2)

Scope and expected results:

- Advanced transport management solutions utilising information generated by RIS (River Information Services)
- Interfaces and interoperability between inland navigation, nodal points and other modes of transport
- Facilitation of the collection, distribution and exchange of information between authorities and commercial actors
- Validation in real-life intermodal transport logistic chains in which IWT plays a significant role
- Implementation strategies and business models

Promotion of short sea shipping and intermodality (1)

Objective: Promote SSS, individually and as part of the multi-modal logistics chain, and increase the use of SSS leading to sustainable modal shift

Scope and expected results:

- develop and demonstrate a methodology promoting SSS
- establish promotional campaigns and assess their impacts
- involve Short-sea Promotion Centres
- complement their scope to improve the overall image of waterborne transport.
- extend their scope towards inland transport
- establish best practices to integrate SSS with inland logistics chain

Promotion of short sea shipping and intermodality (2)

Special considerations:

- The “motorways of the sea” actions aiming at new EU intermodal maritime-based logistics
- Ongoing studies of DGTREN on "Extending the scope of Shortsea Promotion
- Centres into Intermodality” such as the MTCP and CIPROC study

Maritime and logistics co-ordination platform (1)

Objective: Gather expertise and knowledge in support of the maritime and logistics industry

Scope and expected results:

- a knowledge base and expertise for an integrated maritime transport policy
- exchange of information, awareness and dissemination of research results
- technology forecasting and assessment
- study obstacles, propose and assess solutions for Europe.
- best practices and recommendations;
- support various policy initiatives such as legislation standardisation, research,
- networking and co-operation between administrations.

Maritime and logistics co-ordination platform (2)

Special considerations: involve significant number of interested parties: industrial (shippers, forwarders, transport providers, banks, insurances, technology providers, promotion centres), governmental (agriculture, health, customs, economic affairs, police, transport authorities) and researchers.

Improving safety and security

Crisis management and rescue operations

Objective: Fast and safe crisis management and rescue operations

Coverage:

- Systems and tools to assist emergency services
- Autonomous and remotely controlled intervention systems
- Operational procedures for notification, rescue and resumption of normal operations

Strengthening competitiveness

Competitive product development
Objective: Advanced design tools and methodologies for competitive processes, products and operations.

Coverage:

- Reduction of development cost and time
- Product modularity
- Product life cycle optimisation
- Goal based design

Cost effective manufacturing and maintenance
Objective: Competitive industrial processes specific to transport products.

Coverage:

- Manufacturing
- Assembly
- Inspection
- Maintenance
- Repair

Special emphasis: low cost, high quality, reliability, intelligent and flexible processes; environmental aspects and working conditions.

3.4 Surface Transport 2008 Call

The draft Work Programme for the 2008 Call is now being circulated for comments, although it is not yet in the public domain. However, it states “Climate Change and CO2 emissions reduction targets are the orientation pillar for the 2008 Call of Surface Transport Research. Achieving ambitious targets for reduction of CO2 emissions due to transport activity is an essential objective of Surface Transport research to mitigate climate change. A holistic approach addressing all possible means to reduce emissions is taken.” The contribution of research is distributed across the different activities of the sub-theme, in particular:

- The Greening of Surface Transport: developing cleaner vehicles, vessels and their infrastructures and ensuring environmental friendly industrial processes (production, maintenance, repair and recycling)
- Encouraging Modal Shift and Decongesting Transport Corridors: promoting the use of cleaner transportation modes and eliminating extra pollution caused by traffic congestion.
- Ensuring Sustainable Urban Mobility: developing new mobility schemes in cities which rationalise the use of the private car, promote public transport and conceive innovative non-polluting urban vehicles.
- Safety and security: innovative structural design concepts deriving from the development of alternative-fuel powered vehicles and vessels.
- Strengthening Competitiveness: developing technologies for a new generation of products and systems which take full advantage of eco-innovations and opportunities to create lead markets.
- Cross-cutting activities: breakthrough technologies, new approaches, models and paradigms leading to radical new solutions for sustainable transport, raising awareness, support to dissemination and stimulating cross-cutting approaches aimed at climate change mitigation.

The draft Work Programme for the 2008 Call has identified the following specific or relevant research topics:

Greening of Surface Transport

More efficient ship propulsion

The aim of the research is to optimise the hydrodynamic performance of new ship propulsion systems. Activities will address integrated hull forms and complex propulsion configurations to maximise the conversion of ship power into thrust. Investigations will target large area propulsion and distributed propulsion concepts coupled with complex hull designs. Radically new concepts, such as biomechanical design, large area propellers will be proposed for the overall maximisation of energy conversion combined with low levels of propeller cavitation, noise and vibration.

Activities will include:

- The development of methodologies based on existing CAE tools for the accurate prediction of thrust conversion, noise and vibration

- Application of the above methodologies to predict the hydrodynamic behaviour of new propulsion systems. Validation through physical model testing.
- Definition and assessment of new propeller concepts integrated with innovative hull forms. The research will consider both mechanical and electric drives, in particular high-efficiency water-jets, and new pod concepts (including considerations on modular design and in-service replacement), propulsion systems to operate in ice.
- Use of non-metallic propulsion materials will be explored and assessed.
- Analysis of operational reliability and economic factors.

New configurations will be investigated under all operational conditions, for example in manoeuvring rough seas. Deliverables will include concepts for large scale propulsion demonstrating high efficiency gains, propulsion designs integrated with hull design models, concepts for large area propulsion integrated with new ship designs, economic and operational analysis.

Preventive and emergency interventions to protect marine, coastal and land environments

Technologies, systems and procedures for preventive and emergency post-accident interventions on vehicles and vessels.

Activities will aim at rapid, effective and safe detection, notification and interventions on vehicles and vessels in emergency situations (e.g. capsized ships, vehicle collisions, oil spills).

Activities will also include the development of technologies, systems and procedures for accident preventive intervention on vehicles and vessels.

Concerning operations at sea, the research will for example address the integration of underwater robotics, advanced sensing and tooling for effective interventions in wrecks and prevention of oil spills. The mechanical removal of spillages (oil, other polluting substances, dangerous goods) at sea and on land may also be addressed as well.

Encouraging Modal Shift and Decongesting Transport Corridors

Effects of climate change on inland waterway and transport networks

Context
Inland Waterway Transport (IWT) is recognised and promoted at national and EU level as a safe and environmentally-friendly mode of transport which can significantly help alleviating Europe's transport problems. In certain geographical areas, IWT plays an important role already, in others such as on the Danube, traffic is expected to grow significantly. However, sustainable Inland Waterway Transport requires an efficient network of inland waterways.

Scope
Climate change may have significant adverse effects on the inland waterway network and consequently on the transport system as a whole. Research should address new ways of thinking in terms of spatial planning, infrastructure planning and regional

economic policy (ports, industries, logistic centres) as well as new technological and operational concepts and developments (new vessel concepts, new materials, new propulsion systems).

Development of a long-term vision and development plan for Inland Waterway Transport and its role in integrated transport systems, in particular in the light of human-induced climate change and the risks of 'very damaging and potentially irreversible impacts on ecosystems, societies and economies'.

The objective is to assess and manage the risks of climate change regarding the transport system (different transport modes and their connexions), using inland waterway transport system as a case study. In particular research should develop different scenarios and policy options and identify and assess the cost/benefits of possible remedial measures.

Efficient interfaces between transport modes

Technologies, equipments and their integration for efficient and safe interfaces between transport modes and within intermodal transportation chains.

Proposals will cover one or more of the following subjects:

- Fast, economic and safe loading/unloading operations for the different types of cargo.
- Systems for cargo transhipment and storage within terminals.
- Systems for the optimal use of storage space in vehicles, vessels and terminals.

Improved services in terminals

Technologies and procedures for improved services delivered by transport terminals.

Particular emphasis will be placed on effective, clean and safe operations in terminals and minimisation of turn-round time and cost.

Proposals will cover one or more of the following subjects:

- Vehicles/vessels manoeuvring assistance within and close to terminals/ports.
- Terminal auxiliary services (e.g. infrastructures maintenance and inspection, mooring, hazards mitigation, information and communication).
- Waste management and reduction (including ballast water in ports).

Continental Shipping

The aim of the research is to promote the development of sustainable waterborne transportation of passengers and goods within Europe, inside its lands and around its coastlines. For the further enhancement of overall transport efficiency, it will be essential to promote alternative transportation modes such as Short Sea Shipping and Inland Navigation, which can decongest European transport networks and offer cleaner transport solutions in terms of CO2 emissions. A new generation of vessel concepts will be studied, conceived and validated along with the necessary

technological developments. In addition consideration will be given to safety and security problems, ship/shore interface, logistics, LCC optimisation and measures for an efficient deployment of the results at fleet level.

Activities will address:

- Innovative vessel concepts and their interfaces with infrastructures
- New ship architectures based on modularisation and standardisation of components for the cost effective design of ship variants, reduction of lead times and sub-system outfitting.
- Innovative hull forms with optimal hydrodynamic performance, reduced resistance and enhanced manoeuvrability in restricted waters.
- Innovative ship structures and new material for optimal transported weight/cost performance and increased crashworthiness.
- New propulsion and auxiliary energy systems which are safe, reliable and energy efficient.
- New specialised cargo handling systems and ship/shore interfaces
- Safe operations with special consideration for limited and shallow water conditions, overtaking manoeuvres, collision and grounding.
- Development of navigation systems for optimal route planning and the logistics of traffic flows within door-to-door multimodal transportation chains.
- Innovative environmentally friendly hull coatings to prevent bio-fouling and corrosion.

Activities will lead to the improved environmental and economic performance of European continental waterborne transportation ensuring its increase in market share and volume. They will also look at consolidating the European industrial leadership in the global market and efficiently responding to forthcoming growth in economic activity and transport demand.

Major deliverables will be innovative ship designs, systems and procedures for their safe operation, integrated logistics concepts for door-to-door transport in EU-27, new concepts for collaborative ship building and harmonised supporting tools for efficient shipbuilding processes.

Strengthening competitiveness

Competitive transport operations

Innovative methodologies and technologies for more competitive transport operations providing reliable, environmentally friendly, efficient an economic services to customers.

Activities will address one or more of the following subjects:

- Holistic strategies for the minimisation of operation, environmental, maintenance and inspection costs.
- Navigation and control systems for optimised planning and routing across the entire transport chain taking into account real time traffic data.
- Weather and sea state conditions (for waterborne applications) for the optimisation of infrastructure capacity.

- Simplified and low cost maintenance and renovation of transport infrastructures providing reliable and high quality services with less equipments, lower life cycle costs and environmental impacts.
- Improved real time information systems for transport operators, end-users andpassengers.

The competitive ship

The objective of the research will be to develop new concepts and technologies for future large and ultra-large passenger ships. Methodologies will employed that are based on a holistic and multi-criteria approach which addresses life-cycle cost optimisation, safety and environmental friendliness.

The research will make use of the most advanced methods and tools available for the; design and production of complex technical systems, integrated resources, life cycle management, risk analysis and collaborative design, as well as the most innovative solutions for critical ship systems. These methods and technologies will be applied to a passenger ship to enable a complete revision and elaboration of new architectural and technical concepts based on optimisation and modularisation of components and sub-systems. Emphasis will be placed on lifetime costs, optimal interactions and interchangeability of ship systems for cost effective production and minimal life time operational costs.

Activities will include:

- Methods and concepts to assess and quantify the impact of ship design parameters on life-cycle costs, safety and environment including feedback from ship operation to design. These will be validated based on real vessels and operational data
- In partnership with operational commercial ship designers the establishment of a framework and tools that enable collaborative multi-criteria and multi-level optimisation taking into account the complexity of large and ultra-large passenger ships together with the real needs and competences of ship design offices
- The tools will incorporate breakthrough technologies and architectural concepts that address the following sub-systems and design criteria:
- Optimisation of space in the different ship areas: public space, passenger cabins and service areas.
- Improving payload to gross tonnage ratio of hull structures and outfitting components to increase customer value.
- Increased modularity of all spaces and systems to reduce building cost and allow cost efficient out-fitting and maintenance.
- Optimisation of the ship propulsion chain, auxiliary systems and overall power management to reduce the consumption of resources and emissions to environment.
- Minimisation of noise and vibration levels both for passengers inside ships and to reduce emissions in the vicinity of ports.
- Optimisation of the entire logistics chain aboard ship and between ship and shore to improve safety, security and reduce operational cost.

- Application of the developed tools within one or more concept vessels, together with a through life cost benefit analysis that demonstrates the competitive advantage compared to existing techniques and designs.

Activities to ensure the operational take up and application of the tools developed within a commercial environment. Establish of performance indicators that will demonstrate the benefit from the technologies developed after the completion of the research.
Deliverables will include: validated new methodologies and tools for life-cycle cost assessment in ship design, framework tools for the optimisation of the ship and its key systems, architectural and technical concepts for ships of the future designed on systems based approach, proof and validation of feasibility of these techniques within an operational commercial environment, concept designs compared to conventional state of the art, prototypes and numerical models for key sub-systems, cost benefit analysis, steps to ensure application of the technologies, performance indicators and measure to ensure continued measurement of the post project impact.

Other FP7 Themes
In addition to Surface Transport, there are other Themes open to opportunities for research into maritime/waterborne technologies, as follows:
Table 2: Other FP7 Themes

Theme	Opportunities
Food, Agriculture and Fisheries, and Biotechnology	• Fisheries • Aquaculture/Mariculture
Information & communication technologies	• Co-operative systems, Robotics, Intelligent Vehicle Systems • ICT for Environmental Management and Energy Efficiency
Nanosciences, Nanotechnologies, Materials and New Production Technologies	• Multifunctional, complex and knowledge-based materials for future vehicles • Flexible production and manufacturing
Energy	• Hydrogen & Fuel Cells • Bio Fuels • Ocean Energy
Environment (Including Climate Change)	• Management of marine environments • Marine technologies/instrumentation
Security	• Security systems for transport applications
Research for the benefit of SMEs	• Support is aimed at SMEs or SME associations in outsourcing research to research service providers, incl. universities, research centres or research performing SMEs (“RTD performers").

4 New and existing networks in order to increase efficiency and enhance synergy of technology transfer within MARTEC

Discussions between Cliff Funnel and the WATERBORNE Secretariat (Paris Sansoglou) confirmed that all the existing European associations/networks have agreed to work under the WATERBORNE umbrella, such that the latter represents both their R&D strategies and implementation plans. Of course, not all of those associations or networks are engaged equally or as interested in contributing to development of a maritime research strategy, however, they have agreed that only one point of contact is necessary for communication with the European Commission, and other organisations, including the MARTEC consortium. However, dissemination of MARTEC information, e.g. the Pilot Call, could be undertaken through individual Associations, as well as WATERBORNE to ensure wide circulation.

WATERBORNE Technology Platform

The WATERBORNE Technology Platform was launched in January 2005, building on the efforts of the Maritime Industry Forum (MIF) in publishing two volumes of maritime R&D Master Plans since 1994. WATERBORNE brings together the industry stakeholders with the EU member states, the European Commission services and stakeholders from science and society.
The WSRA addresses the innovation challenges over the next 15 years, summarised under the 3 pillars of the Waterborne Vision 2020:

- Safe, Sustainable and Efficient Waterborne Operations
- A Competitive European Maritime Industry
- Manage and Facilitate Growth and Changing Trade Patterns

The key priority themes for Research, Development and Innovation (RD&I) are presented under these headings, although some themes have an impact on more than one pillar. The key research themes are not stand-alone issues, but will be integrated through innovative interdisciplinary research into larger demonstrator programmes.

WATERBORNE incorporates and represents all stakeholders involved in the waterborne value chain, including shipbuilders and repairers; systems and equipment manufacturers; ship operators; port operators; classification societies; and the research and academic communities. The Technology Platform is a consensus-based forum. The objective of WATERBORNE is to co-ordinate the efforts of European maritime transport stakeholders in the production of efficient and safe vessels as well as the related systems and equipment, in providing infrastructure and logistics for ports and waterways, in offshore technology and for leisure craft - to continue to create value and high qualification employment opportunities in Europe. Consequently the platform is industry-driven but includes with the same importance universities and research institutes, EU member states, the European Commission and others relevant to society as a whole.

The WATERBORNE strategy to build and consolidate the European maritime cluster's knowledge has been developed in two complementary documents: the Vision 2020 and the Strategic Research Agenda (WSRA). The Vision 2020 lays down the main challenges of WATERBORNE's medium and long-term vision. The WSRA translates into concrete R&D milestones the necessary steps to achieve this vision (Annex 2).

Consequently WATERBORNE has been built on the stakeholders' European associations. These associations had the responsibility of organising and encouraging the participation of their individual members in the different WATERBORNE tasks, working groups and discussions as well as to guarantee their members high-level commitment.

Experts from the individual companies, institutes etc of the stakeholders have specific forums: the (thematic) Working Groups. The conclusions of the Working Groups are discussed and transformed into R & D policy proposals and action plans within the Support Group, into which all stakeholder associations, the member states (en bloc) 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 2-3 representatives into the Support Group. The 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.

The WATERBORNE Strategic Research Agenda (WSRA) Implementation Plan (WIP) has been prepared by a consolidation of a 'bottom up' development from the VISION targets and WSRA priorities, and a 'top down' assessment of product, service and infrastructure needs by industry. The WIP research topics therefore integrate multiple research priorities and sub priorities.

The research topics developed by the Waterborne stakeholders to address the WSRA priorities and industry research needs are presented individually in the following format:

- Waterborne Pillar
- Strategic Research Agenda Priority
- Research Topic
- Research Objectives
- Research Programme
- Pre-requisites
- Research timescales
- Budget estimates
- Technology, Tools and Processes
- Expected research Outcomes & Milestones

The Exploitation Outcomes that deliver the Vision Targets have been developed from a series of workshops that addressed each Waterborne pillar individually. The Research Topics define the objectives and work scope content against the SRA research priorities and deliver robust research outcomes for Route Map milestones. The milestones identify the major achievements that the research programmes will deliver in 5 to 15 year timescales, and combine to create substantial new world leading products and capability.

The European maritime networks with the potential for co-operation with MARTEC are all members of the WATERBORNE European Technology Platform (WATERBORNE):

European Network of Maritime Clusters (ENMC)

http://www.european-network-of-maritime-clusters.eu/

The European Network of Maritime Clusters (Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Poland, Spain, Sweden and United Kingdom) was founded on 4 November 2005 in Paris by maritime organisations of ten countries, with the objective to learn from each other and to promote and strengthen the maritime clusters of member states and Europe as a whole.
The European Network of Maritime Clusters organised itself as a flexible network in which members cooperate on a voluntary basis for issues related to their national agenda's, and in a more structured way for actions at the European level. Meanwhile the Spanish Cluster was officially founded in January 2007 and joined the ENMC as participant.

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5 Synergetic use and technology transfer of maritime research

Recommendations for future cooperation with identified networks

The overall objective of the MARTEC ERA-Net is to form a sustainable network and partnership of key funding agencies and ministries aimed at deepening the understanding of conditions for management of maritime technologies research between the key European countries actively funding RTD in this sector. In cooperation with the European industrial maritime cluster and other stakeholders this network intends to work out a strategy for future maritime technological research funding through trans-national programmes and calls which are coherent with the European research policy and the strengthening of the European Research Area.

The objectives of the MARTEC ERA-Net for the period 2006 – 2009 is to achieve the understanding and the tools for establishing and maintaining a coherent and sustainable R&D strategy across relevant ministries, funding bodies and organizations in the European maritime sector. Either with strategically planned sectoral programmes or more general technological programmes the European maritime cluster is intended to be mobilised by private investment in research and development in shipping and marine technologies and thus efficiently use the limited national funds through co-ordinated activities.

The long-term goal of the MARTEC ERA-Net is to increase the impact of maritime industry oriented research programmes in terms of quality, efficiency and creating new products, processes and markets, competitiveness, employment and modernizing European companies.

MARTEC / WATERBORNE Co-operation

The objectives of MARTEC and WATERBORNE have clear similarities in that whilst MARTEC is seeking to “achieve the understanding and the tools for establishing and maintaining a coherent and sustainable R&D strategy across relevant ministries, funding bodies and organizations in the European maritime sector”, the latter has identified a Research Agenda and associated Implementation Plan through co-operation with industry, academia and government agencies, to be implemented throughout Europe, Therefore, the objectives are entirely complementary and the MARTEC consortium can help achieve implementation of the WSRA through national and transnational programmes, whilst the European Commission and other EU institutions can implement at the European level through instruments such as the Framework Programme.

Potential areas for co-operation include:

MARTEC Member States, individually and co-operatively, can draw on the Implementation Plan, alongside specific national priorities, to develop their own list of research topics.

Many Member States have difficulty in developing national R&D strategies in relation to the maritime area, particularly in identifying industrial priorities. Although the WSRA and WIP have been developed at the European scale, it is obvious that their contents can be utilised in developing a national research agenda. It becomes even more relevant on the transnational scale, when these documents are directly relevant, albeit they can be focussed on the participating Member States

Direct contact with Member State maritime technology programme managers.

Member States are represented within WATERBORNE through the Mirror Group, however, many of the individual representatives or Ministries/Agencies may have a policy responsibility, but not a “maritime technology” or “research programme” responsibility and the WATERBORNE information may not be reaching some important parts of the Member States. Closer co-operation will be of mutual benefit as input from MARTEC participants will supplement that of the Mirror Group.

Dissemination of information

Co-operation provides a valuable opportunity to disseminate information on both MARTEC and WATERBORNE to their respective communities. MARTEC participants have close contact with the research community at the national level, whilst WATERBORNE is close to the community at the European level. With regards to the latter, although European associations represent national associations, the information does not always flow that far, and many individual companies, especially SMEs, are not as aware of WATERBORNE as is supposed. Co-operation will increase awareness throughout the European research community.

Utilise details of the WIP document as an aid or tool for evaluation of project proposals

Many national Programme Managers have a difficulty in obtaining independent and impartial advice in relation to evaluation of proposals, particularly if a bottom-up approach is used in a Call for Proposals. The detail contained within the WSRA and WIP will provide invaluable as a tool for proposal evaluation.