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MARINE RELATED RESEARCH AND THE FUTURE EUROPEAN MARITIME POLICY

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Marine-related Research and the Future European Maritime Policy

A background document prepared by the services
responsible for the management of relevant projects
under the EC RTD Sixth Framework Programme
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1. INTRODUCTION

Marine research has been identified by the European Commission as a key element of the future Maritime Policy. This has been recognised both in the Communication on Maritime Policy⁽¹⁾ and in the EU's overall strategic objectives for 2005-2009, where it is noted that an all-encompassing maritime policy should be supported by excellence in marine scientific research, technology and innovation.

This paper outlines the challenges and opportunities in marine-related research in Europe with regard to a future EU Maritime Policy. The paper describes the contribution from the European Research Framework Programmes, as well as from other research activities at international level, and their impact on the marine and maritime sector.

Specific challenges arising in the domain are considered, as well as the opportunities offered by the existing schemes; consideration is also given to new activities that could or should be undertaken in support of a future Maritime Policy.

The European Research Framework Programmes contribution and impact on the marine and maritime sector

Research is a cornerstone that supports competitiveness and sustainable development in line with the three pillars of the Lisbon Agenda (Economic, Social, and Environmental). Quality research, which engages with societal stakeholders and communicates in ways that are perceived as being trustworthy and relevant, is a pre-condition for a knowledge-driven economy, and a major contribution to developing robust and sustainable solutions to complex problems. Moreover European Research is contributing to the development of educational horizons, new skills and to the creation of high value-added knowledge-based jobs.

All these aspects are considered as paramount for the development and implementation of the European Maritime Policy. The latter is also an opportunity to demonstrate the benefits for EU citizens arising from European research, as well as further enhancing the definition of the European Research Area.

Research is a cornerstone that supports competitiveness and sustainable development in line with the Lisbon Agenda

EU RESEARCH AND MARITIME POLICIES – MUTUAL BENEFITS

European Research can contribute directly to the objectives of Maritime Policy by means of its **horizontal**, knowledge-intensive **dimension** cutting across the different policy facets.

At the same time European Research will benefit from a Maritime Policy, which will improve the **visibility** of science, technology and development activities, and their impact on the society. Moreover, it contributes to a larger dissemination of **information** and to a better acknowledgement of the benefits arising from the different research initiatives at European and international levels.

The new holistic approach of the Maritime Policy will contribute to integrating the different policies still considered in isolation and to overcoming the present **fragmentation** and lack of cohesion of marine-related research funded at the national level.

⁽¹⁾ Communication of the European Commission President Barroso and Commissioner Borg "Towards a future Maritime Policy for the Union: a European vision for the oceans and the sea" adopted by the Commission in February 2005.

2. MARINE-RELATED RESEARCH – CHALLENGES AND OPPORTUNITIES

2.1 MAIN CHALLENGE: USING THE FULL POTENTIAL OF THE OCEANS RESPONSIBLY

Oceans represent the last under-explored domain on Earth. They inspire our curiosity and awe with their sheer size and power, but also their beauty and fragility. They cover two-thirds of our planet and yet in many cases are represented as almost blank areas on our maps. They offer a huge potential of under-exploited resources, economic activities and for the well-being of the citizens.

Oceans offer huge potential by developing and using under-exploited resources

But some of the oceans' ecosystems have been significantly degraded over the last hundred years or so, particularly through unsustainable and destructive forms of exploitation and serious pollution of coastal waters. Oceans are also a fundamental component of the European and global climate systems; the Gulf Stream is considered the driver of Europe's moderate climate. Changes in ocean currents and other dynamics are an indicator of global climate change. Therefore oceans need not only to be investigated, but also to be used responsibly.

A better understanding of the marine environment is a condition for the related economy to develop in a sustainable way

The maritime economy is much more significant and strategic than it is generally perceived. It includes diverse – and sometimes conflicting – exploitation of the marine resources and economic use of the sea. Moreover, today perhaps only about 5% of the marine biodiversity is known, though global public documentation and archiving initiatives are underway to study what exists. Thus, the marine environment represents a potentially vast reserve of as yet under-explored natural resources. Studying what is there, understanding its nature and dynamics and developing adequate technologies is a condition for this economy to develop in sustainable ways.

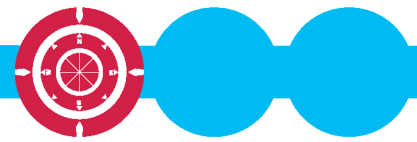
The European shipbuilding industry is the world market leader, investing 10% of annual turnover in research and innovation

In the maritime field, the manufacturing industries supply the largest amount of resources to research, development and innovation. European shipyards are world market leaders in terms of turnover and innovative products and processes, investing 10% of their annual turnover in research and innovation. It is a high-tech industry. In most maritime fields of activity, improved functions are driven by innovative ships and other floating structures.

A competitive European shipbuilding industry is a crucial factor towards improved maritime performance, which leads to exploiting growth opportunities in several related maritime fields.

A competitive maritime transport is crucial for increased growth opportunities

This is particularly the case for the transport industry. Maritime transport is growing at a very high rate: around 80-90% of global trade and European import/export is transported by sea; more than 40% of EU internal trade is waterborne. High quality waterborne transport is less costly and more environmentally friendly than road transport, and a shift between the two modes could lead to millions of euros of savings. The development of innovative,



efficient, safe and environmentally sustainable ships, as well as appropriate consideration to hinterland connections in expanding port capacities, is paramount to meeting this target.

The EU is one of the world's major fishing powers, and a major market for processed and aquaculture products imported from third countries. In 1998, the value of the whole production chain (fishing, aquaculture, processing and marketing) reached approximately €20 billion (0.28% of EU GDP).

Aquaculture has been one of the fastest growing areas in the food sector. The value of the Member States' production is currently about €3 000 million each year. Aquaculture constitutes about 17% of the volume and 33% of the value of the total EU fishery production. Within the EU-15, the total employment in the fishery and aquaculture sector (according to the most recent figures available) is over 500 000 people. Marine fishing accounts for the largest share of direct employment in the sector (241 010 jobs), followed by fish processing (89 468) and aquaculture (61 898, of which over 80% are in marine aquaculture). These activities play a significant role, especially in regions where alternative job opportunities are scarce.

The importance of fishery and aquaculture in European economy and employment

Marine biotechnology in Europe has huge potential for innovative, sustainable research with a view to providing solutions to societal needs. The global market has been valued at \$2.4 billion with a predicted growth rate exceeding 10% per annum, making marine biotechnology one of the most exciting emerging technology sectors. Marine biotechnology will contribute to nearly every industry sector, from healthcare to bioremediation and from cosmetics to nutraceuticals (i.e. nutritional supplements). Furthermore, marine metagenomics provide a novel approach to the exploitation and understanding of an, as yet, poorly understood marine biodiversity, and nutraceuticals is a major growth area for both the pharma, food and feed sectors.

Marine biotechnology: an emerging sector with huge potential to provide solutions to a number of societal needs

The oceans and marine environment also provide a range of intangible goods and features that cannot be easily quantified in commercial terms but nonetheless have an intrinsic environmental, economic and social value. There is a need to expand the basic understanding of ocean ecosystems, and the mutual influence of the marine ecosystems and human activities.

The intrinsic, intangible, environmental, economic and social value of the oceans

Integrated ecosystem-based approaches across scientific disciplines and sectoral types of expertise, involving engagement with the full range of stakeholders, can unlock this high potential, the sustainable exploitation of which is the main challenge of the proposed innovative approach.

2.2 SPECIFIC CHALLENGES

Europe is facing specific challenges for which innovative cutting-edge research and new technologies – guided through multi-stakeholder dialogue – are crucial.

COMPETITIVENESS: SUSTAINABLE ECONOMY AND WEALTH GENERATION

Research provides the scientific knowledge base that supports the safe and sustainable development of marine resources, services and industries in a more integrated way for the benefit of EU citizens. It promotes employment and maintains Europe's knowledge-based competitive advantage within the maritime sector, thus contributing towards the achievement of the Lisbon Agenda.

Consolidated sectors and new economic opportunities in the maritime field

Consolidated economic sectors in which advanced research can significantly contribute to sustainable development and economic growth are, among others, restoring degraded marine ecosystems and developing sustainable forms of marine aquaculture, fishery, shipbuilding and maritime transport, port management, energy and tourism.

New economic opportunities can be offered by biotechnology research for new pharmaceuticals and food-related compounds; by the exploitation of renewable energy sources (tidal and wave power, offshore wind farms); by the further development of environmentally compatible technologies for the utilisation of natural resources (seabed minerals, water desalination).

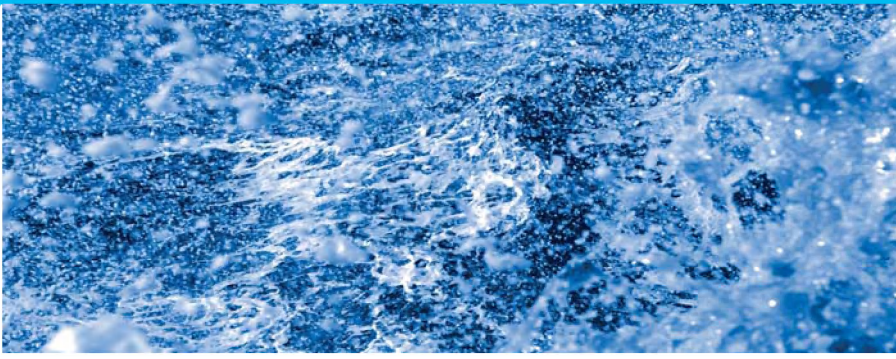
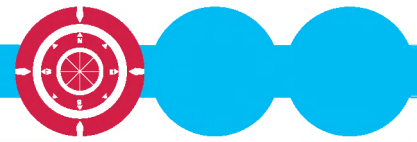
Publicly funded or co-funded research supports the sustainable management, production and use of natural resources to provide new competitive products, whilst decreasing the environmental impact and maximising social benefit.

Research agenda and priorities have been set up by way of consultation with industry stakeholder groups (i.a. the Waterborne Technology Platform and the Maritime Industry

Forum) and in collaboration with the European Commission services in charge of sectoral policy making in order to ensure that the research is correctly targeted. Mutually, the related competitiveness policy areas can gain maximum benefit from European research activities.

Robust and widely acceptable solutions, supported by scientifically validated knowledge, require continued engagement with the full spectrum of stakeholders, from government, civil society organisations and movements, and the private sector.

A continued engagement with the full spectrum of stakeholders is necessary to achieve scientifically sound and widely acceptable solutions



ENVIRONMENT AND SOCIETAL GOALS INCLUDING BIODIVERSITY: CLIMATE CHANGE, POLLUTION, NATURAL AND MAN-MADE PHENOMENA AND HAZARDS

Research provides the necessary scientific underpinning to the formulation and implementation of workable policies and strategies for marine governance at local, regional and global levels, and contributes to the dissemination of appropriate best practices and technological solutions. To be most effective, this relies on an ecosystem-based approach which fully engages all the relevant stakeholders.

An ecosystem-based approach is the most effective for the implementation of policies and strategies for marine governance

The specific areas in which the contribution of research is needed include: developing the ecosystem-based management approach, including marine spatial planning; the development of technical and managerial/institutional solutions for coastal zone protection and management; sustainable management of resources and restoration of degraded marine ecosystems; environmental monitoring technologies – GOOS (Global Ocean Observing System), GMES (Global Monitoring for Environmental Security); assessment tools; safe maritime transport, ship disposal and secure maritime structures.

Furthermore, research helps in fighting the pollution of seas (oil, SO₂, NO_x, acidification) and of eco-systems, including species transfer, mitigation or preparedness for natural disasters (tsunami, typhoon, flooding), and understanding the global climate change. Land-shore interfaces (especially discharges to the sea) are also a main concern of research activities, as well as marine safety and security (cf. the new international port security rules), piracy (a real, current problem in some parts of the world traversed by European shipping) and terrorist threats.

Research helps in fighting pollution and in setting international standards

The development and implementation of international standards is also based on the results of advanced research projects, in particular when these are considered within a global framework, such as the Group on Earth Observations (GEO) initiative to develop the Global Earth Observation System of Systems (GEOSS).

The European fisheries and aquaculture research community needs to grow further to be capable of addressing the new challenges facing Europe, where the move towards an ecosystem-based management of natural resources will require answers to very complex questions.

SUPPORTING CAPACITIES AND DECISION MAKING: HUMAN RESOURCES,
DISSEMINATION, AWARENESS AND EDUCATION, KNOWLEDGE TRANSFER,
NEED AND EFFECTIVE USE OF EUROPEAN RESEARCH INFRASTRUCTURE

A well-communicated research encourages the creation of new opportunities

Research results provide the necessary science-knowledge base and communication strategy to inform citizens and the society at large on marine resource development, restoration, conservation and sustainable use, contributing to the quality of life. It will ensure that knowledge generated by research directly and visibly contributes to socio-economic development and innovation, and that Europe has the necessary research infrastructure to tackle Europe's research and societal challenges effectively. These are some of the answers to the objectives set up by the Barcelona European Council in March 2002, which aim at a competitive economy based on knowledge combined with responsible international co-operation.

The development of future policies demands an early scientific input in the process. Well-communicated research provides the knowledge enabling the formulation of realistic and enforceable regulations and the creation of new opportunities. The dimension and mechanisms where research can provide support should be specifically considered within each policy area.

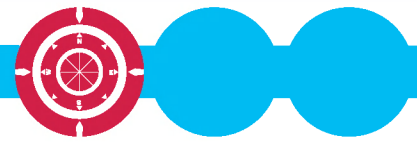
The development and successful implementation of the ongoing Common Fisheries Policy reform, for example, is highly dependent on research and scientifically based advice. The Scientific Support to Policy theme in the European Community's Sixth Research Framework Programme has been a successful tool; considerable benefits are expected from this activity, which is proven to be a cost-effective mechanism, capable of effectively bringing new concepts and management tools into policy actions. (cf. Showcase – Research in Support to Policy.)

2.3 OPPORTUNITIES OFFERED BY EUROPEAN RESEARCH TO THE MARITIME POLICY

Research activities in Europe and with partners in other parts of the world are undertaken by the EC Research Framework Programmes (FPs), as well as by national research programmes and private initiatives. However, European research is still fragmented, with duplicated efforts and often poor communication between programmes.

The European Research Area addresses the fragmentation of European research and aims at avoiding duplication of efforts

Consequently the efforts to build a European Research Area (ERA) are a major change in approach to address these weaknesses. ERA aims at integrating research efforts, better structuring research capacity and coordinating European research activities, while at the same time working towards increasing the impact potential of research through links with education and innovation, and by placing an emphasis on multi-stakeholder engagement and effective communication. The EC Research FPs are a major driving force in building the ERA.



Structuring, strengthening and coordinating effects and the consequent increased impact can be achieved through:

CONNECTIVITY: BETWEEN SECTORS AND POLICY DOMAINS

The crosscutting nature of research is reflected in the Maritime Policy: the extent and mechanisms where research can provide support are specifically considered within each policy area. The development of the future policies requires an early scientific input to the process, as research provides the necessary knowledge to enable the formulation of realistic and enforceable regulations, and the creation of opportunities.

Research is crosscutting the various aspects of the maritime policy

Within the logic of the innovative comprehensive approach, the sectoral separation of research activities can be overcome by a trans- and interdisciplinary cross-fertilisation – including socio-economic research – to be developed in the framework of a marine research agenda. Moreover, engagement with the full range of stakeholders is to be encouraged to facilitate uptake of results and increase impact.

A marine research agenda can contribute towards overcoming the sectoral separation by means of a trans- and interdisciplinary cross-fertilisation

Research in support of Community Policies (Specific Support to Policies activity in FP6), Technology Platforms within an industrial context and ERA-NET activities (networking of national or regional research programmes) within a science-driven context are important examples of how 'connectivity' is being improved at European, national and regional levels. These instruments can be fully exploited within a European Maritime Policy.

By its very nature, marine research has many international aspects and will have to be further internationalised in line with globalisation trends. This implies a need to both attract talent and experience from other parts of the world to work with European teams in pursuit of knowledge and viable solutions in Europe, and to bring European expertise to bear on problem solving in the socio-economic context of international co-operation partner countries.

All Framework Programme instruments are relevant for supporting a European Maritime Policy

COMPLEMENTARITY: EXPLOITING THE SYNERGIES AND COMPLEMENTARITIES AT INTERNATIONAL, EUROPEAN, NATIONAL AND REGIONAL LEVELS

Commonalities are recognised between different EU policy areas which may previously have operated in isolation: Regional Aid support, under the Interreg II programme, and research activities in coastal regions; research projects that relate to the clean disposal of ships managed by the Directorate General for Research, which are of a direct interest to the Directorate General for Environment. Ocean monitoring systems arising from advanced communication technologies can provide data for both the environmental programmes and for monitoring the movements of ships for security and regulatory purposes, not only in Europe but also in other parts of the world.

The Maritime Policy provides a focus for coordinating different initiatives and can be a catalyst for further actions

The multi-annual programme for fisheries data collection may also be beneficial to others users (DG ENV, RTD). EUREKA, COST and national programmes can provide a complement at a European level. Specific international co-operation actions are an integral part of FPs and will facilitate addressing some of the international dimensions of any marine policy.

The development of an ERA that is open to the world reduces these overlaps and ensures complementarities as a longstanding goal for European Research. The Maritime Policy provides a focus for these coordination activities and can be a catalyst for further actions.

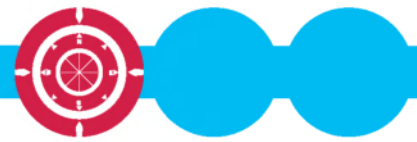
The regions are becoming increasingly more important in Europe, as are globalisation processes and interconnectedness between different regions and countries in the world; this is also well reflected in research.

The Regions of Knowledge initiative supports the development of research-driven regional clusters

Building on the successful pilot scheme initiated under FP6, the Regions of Knowledge action in FP7 aims at strengthening the research potential of European regions, in particular by encouraging and supporting the development of research-driven regional clusters, associating regional authorities, universities, research centres and enterprises. Such clusters would cover joint analysis of regional research agendas; regions with a less developed research profile would be mentored by highly developed ones based on an R&D focused cluster building; these are initiatives to improve the integration of research actors and institutions in regional economies, via their interactions at cluster level.

The complementary role of European Structural Funds

In this context, the role of European Structural Funds will have an increased importance, focusing on knowledge, research and innovation in the future in order to fully implement growth and employment, as indicated in the Lisbon strategy. It is possible to envisage that a number of activities related to research and innovation – such as regional clusters, poles of excellence, technology transfer, business support services and human capital development – can be financed from the Structural Funds, with a major gearing effect on more specific scientific research activities.



International co-operation in research, but also in other relevant policy areas from foreign relations and development to trade and environment, is particularly pertinent to marine issues, which are by their nature international to a very large degree.

CURIOSITY: EXPLORING THE NEW FRONTIERS OF KNOWLEDGE

The oceans, like space, have a role to stimulate human beings' fundamental desire to explore and understand their environment. The greatest proportion of our planet is covered by oceans and is still largely unexplored. There is a vast potential for curiosity-driven research to advance knowledge and understand the sea and maritime phenomena, which often have a huge social or economic impact (cf. for example the effects of 'El Niño', sea ice, etc). This innate curiosity provides underlying fundamental knowledge, which is of unknown future benefit, but cannot be ignored.

Fundamental knowledge of unknown future benefit can not be ignored

Such curiosity-driven explorations have been the basis for creating new knowledge and advancing existing understanding, thereby also leading to many innovations. A wide range of basic maritime research opportunities is available in Europe, and the involvement and engagement of European scientists is crucial. In particular, the proposed FP7 foresees support for basic, knowledge-driven research of this type, and this will be carried out by the European Research Council.

The European Research Council will support basic, curiosity-driven research

3. COMMUNITY'S SUPPORT TO MARINE-RELATED RESEARCH

3.1 INTRODUCTION

European marine research is well developed, in terms of both human resources and infrastructures. The EU Research Framework Programmes and other initiatives have strengthened European co-operation in this field.

In financial terms, however, the European Community Framework Programmes for research, technological development and demonstration account for a modest percentage of the total public effort. This means that most of the marine-related research is going on through a variety of programmes and activities.

THE ADDED VALUE OF R&D ACTION AT EU LEVEL: OVERCOMING THE FRAGMENTATION OF R&D INVESTMENT

- Community research is a vehicle that streamlines R&D investments, adding value through coordination and the transfer of knowledge across frontiers.
- EU R&D fosters excellence through training, mobility, career development and competition at European level.
- EU research funding has a significant economic impact: each euro invested in Framework Programmes leads to a mid- to long-term economic return of between four and seven euros

Participants at EU level are willing to invest additional resources of their own to have access to foreign researchers and output in a way that national funds cannot provide; EU projects have large economic multipliers associated with them, as the pooling of competencies and resources increases the likelihood of a breakthrough in a given area.



3.2 EUROPEAN RESEARCH FRAMEWORK PROGRAMMES

European Community Research, Technological Development and Demonstration Framework Programmes concentrate RTD efforts towards specific challenges faced at a European and international level within a limited number of strategic thematic priorities.

Within each priority, detailed research topics and themes are identified. The FP also supports research for the formulation and implementation of Community Policies, by providing scientific contributions that are targeted on precise needs and are coherent across various policy areas.

The European Community research Framework Programmes evolved within their scientific and technical approaches

There has been an evolution of the underlying approaches of FPs from a largely technology-driven approach (FP4: 1994-1998), through problem solving (FP5: 1998-2002) to the establishment of the European Research Area within FP6 (2002-2006).

Examples of the different approaches in the marine-related sector are given below.

In the aquatic/marine areas there are some noteworthy initiatives of organising and archiving basic knowledge on marine life in publicly accessible forms supported by the research and co-operation activities of the European Commission. One example is the web-based archive of scientifically validated information, FishBase, which serves more than 2 million users each month (>20 million hits) and has more than 1 000 voluntary collaborators from all over the world. (www.fishbase.org)

Storing and disseminating basic knowledge

Initiatives for promoting the progressive adoption of an ecosystem-based approach to fisheries management, notably through the use of area-based fishery management tools, are also of relevance. Specific and complementary research projects funded under FP6 investigate the potential of different regimes in protected areas as a measure to preserve sensitive and endangered species, habitats and ecosystems from the effects of fishing. (see page 16).

An ecosystem-based approach to fisheries management

Work on species transfers through ballast water have also involved Europeans in leading positions and involved dynamic international collaborations.

However, as previously mentioned, European research is still often fragmented with research efforts being partially duplicated at the national level.

Consequently, building the ERA is a major initiative to address these weaknesses. It aims at integrating and coordinating European research efforts, at better structuring research capacity and engages with a range of stakeholders both within Europe and internationally.

ECOSYSTEM CONSERVATION AND FISHERIES MANAGEMENT VIA MARINE PROTECTED AREAS

Marine protected areas (MPAs) are seen as an option for improving both fishery management and marine environmental protection. MPAs enhance the prospect for greater survival of animal and plant species, and the preserved habitats are expected to provide for increased biodiversity. Although such theoretical benefits are often easily identified, there is little empirical evidence to demonstrate the real effectiveness of MPAs, due to insufficient information and MPA design, monitoring and evaluation tools.

Two projects, PROTECT (Marine Protected areas as a tool for ecosystem conservation and fisheries management) and EMPAFISH (European Marine Protected Areas as tools for Fisheries management and conservation), funded under FP6, aim at providing European policy-makers with improved tools for the identification, design and management of MPAs as a tool to protect sensitive and endangered species and habitats against the effect of fishing.

The main objectives of the projects are:

- To review the effectiveness of different MPA regimes across Europe in protecting sensitive and endangered species, habitats and ecosystems from the effects of fishing
- To formulate integrated policy proposals and practical measures for establishing MPAs in the Atlanto-Mediterranean area
- To develop and evaluate indicators for assessing the biological and socio-economic effects and effectiveness of MPAs.

PROTECT (<http://www.mpa-eu.net>) focuses on specific ecosystems in the Baltic Sea (top-down controlled ecosystem dominated by cod, *Gadus morhua*, as the top predator, sprat, *Sprattus sprattus*, and herring, *Clupea harengus*, as its most important prey), the North Sea (a wasp-waist ecosystem – North Sea sand eel areas) and the North East Atlantic (deep-sea coral reefs).

EMPAFISH (<http://www.um.es/empafish/index.php>) is organised in an integrated way between 14 partners with different backgrounds in ecology, fisheries, modelling and economics. It investigates the performance of different regimes of Marine Protected Areas based on 20 already well-established MPAs all over the Mediterranean (Italy, Spain, France, Malta), the Azores and Canary Islands through a set of appropriate tools and models (indicators, protocols, procedures, eco-modelling tools, etc.).

The main outputs will include provision of guidelines for the definition of objectives, design, location, management and monitoring of European MPAs, based on a multidisciplinary scheme, using the best empirical information available to date. Results and recommendations from these two projects will be communicated to a broad audience at a European scientific symposium on MPAs co-organised with ICES (International Council for the Exploration of the Sea), to be held 25-28 September 2007 in Murcia (Spain).



ERA-NET BONUS FOR THE BALTIC SEA NETWORKING OF FUNDING AGENCIES

Our oceans and seas have always put international co-operation to the test. Borders can be drawn on a map, but waves, currents and sea creatures go where they please! The marine environment is not subject to territorial waters, so its protection and sustainable development will always require international agreement.

Marine science in the Baltic Sea would particularly benefit from a coordinated approach of this kind. Nine countries surround this 422 000 km² sea, Europe's largest internal body of water, and eight of these are EU Member States. European policies for the sustainable use and development of this heavily industrialised region must be founded on solid scientific knowledge. A coherent trans-national strategy is essential to ensure that research is cost-effective, of high scientific quality, and addresses the real needs of policy-makers and of the Baltic region's economy and people.

Despite a long history of co-operation between scientists from the countries bordering the Baltic, the strategic planning of national programmes was still not coordinated between countries.

Under the ERA-NET scheme, BONUS aims at creating a forum for a joint oversight of national or international research programmes through the pooling of resources and the coherent planning of projects to complement policy development. BONUS will bring together all of the key research funding organisations: ten bodies representing eight countries and one international organisation. BONUS' goal is the creation of conditions for joint Baltic Sea research programmes, which will substantially improve the effectiveness of environmental and sustainable development policies for the entire region.

Four work packages pave the way to fully integrated research programmes:

1. Take stock of ongoing research funding mechanisms, and ways of disseminating the results, with the purpose of sharing best practice among the participants. The partners also plan to create a central Internet-based resource where researchers and funders can access information about current research, funding opportunities, databases and marine research facilities in the Baltic Sea region.
2. Bring about greater co-operation and collaboration between national programmes. The partners will analyse and remove the administrative and legal barriers that hinder joint programme and research activity. This process will lead to a coordinated use of research infrastructures. In addition, the participants will identify gaps in knowledge, in terms of both basic science and its management.
3. An action plan for joint activities that will direct the creation of joint research programmes, establish agreed procedures for the management and shared use of research facilities, and will set up a joint postgraduate training programme.
4. Complete the transition to joint research funding in the Baltic Sea. It will define management and decision-making systems for long-lasting co-operation at programme level.

ARTICLE 169 INITIATIVE – JOINT BALTIC SEA RESEARCH PROGRAMME – BONUS-169

The consortium has signed the 'Letter of Interest' regarding a joint Baltic Sea research programme under Article 169, and firmer commitments have been negotiated within respective ministries. More funding organisations will be invited to join the initiative in the near future, with possible funding under FP7, according to budget availability.

The activities of BONUS-169 are organised in eight work packages reflecting research related to redressing the major environmental, fisheries and ecosystem-related challenges in the Baltic Sea. Special emphasis is placed on the synthesis and dissemination of information concerning findings and products. The above-mentioned challenges in the Baltic Sea region are inherently linked to socio-economic activities, such as agriculture, fisheries, coastal industries, power generation, coastal engineering and land reclamation, sand and gravel extraction, dredging and dumping of materials including litter and garbage, oil and gas exploration and production, shipping and military activities. Thus, a special work package is dedicated to 'Socio- and ecological economics', which encourages interdisciplinary research approaches concerning socio-economic development, and the sustainable utilisation and conservation of ecological 'goods and services'

The Framework Programme needs to be complemented with substantially increased Member State investment and stronger connection between research and society

Europe could enjoy better socio-economic benefits when the Framework Programme is complemented with substantially increased Member State investment in research and a stronger connection between research and society. A recent model calculation shows that doubling the EU research budget would cause Europe's GDP in 2030 to be 1.6% larger than under a 'business as usual' scenario. This figure would be as large as 4.8% if Member States doubled their growth rates of research investment during the duration of FP7 (2006-2013).

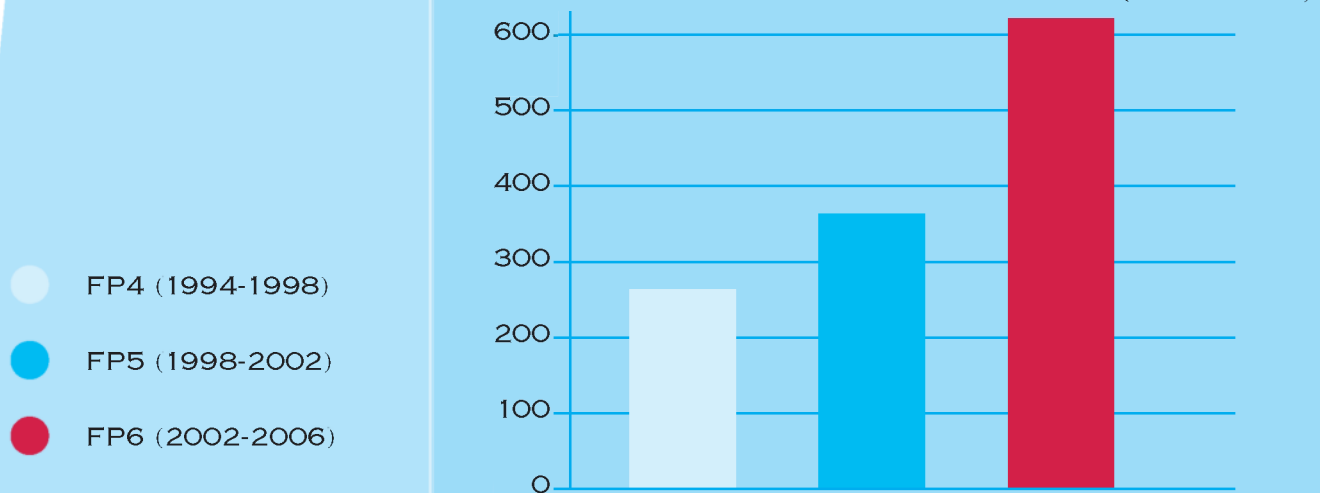
Stakeholders engagement and specific attention paid to communication beyond the scientific community are essential to achieve uptake of research results

R&D investments are a clear driver for growth and innovation, but a study of the European Environment Agency in 2001 ("Late lessons from early warnings") showed that it can take between 30 and 150 years to achieve uptake of research results, unless there is stakeholder engagement and specific attention paid to communication beyond the scientific community. Therefore, financing European research co-operation together with the structuring influence of the EU research programme on national funding schemes adds value.

MARITIME RESEARCH IN FPs 4-6

Due to the complexity of the challenge at European and international levels, there has been increased support for research activities within the maritime field over the FPs (Figure 1).

EC SUPPORT TO MARITIME RELATED RESEARCH (IN MILLION €)

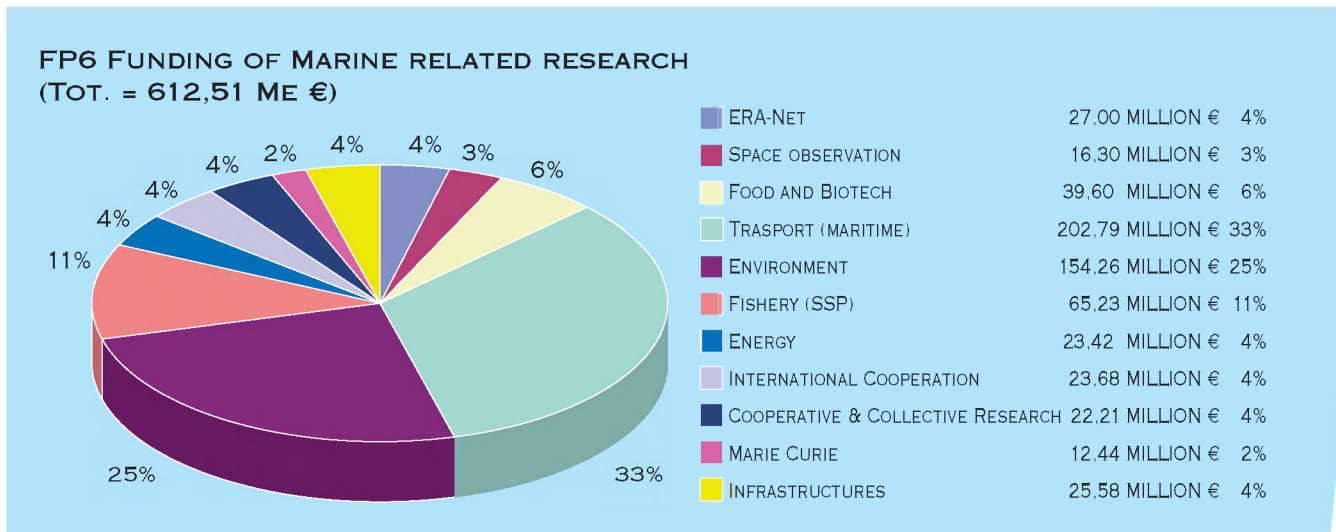


A significant amount of EC RTD funding has been devoted to marine-related research projects in FP6

Although maritime research is not a single thematic priority within FP6, a wide range of marine-related research activities are undertaken under the different thematic priorities managed by Directorates responsible for Ecosystems, Sustainable Transport and Energy, Space, Biotechnology, Food Quality and Safety, International Co-operation and research for Policy Support (reflecting its crosscutting nature).



An analysis of these activities shows that within FP6 more than **€600 million** of European funding has been provided to date towards research projects in the maritime domain (Figure 2).



Within FP6, emphasis is given to activities enhancing and structuring synergies within the ERA. A significant instrument in building the ERA is the **ERA-NET** scheme. Initiatives such as *BONUS (Baltic Sea Science Network of funding agencies)* and *Marine-ERA (Marine RTD programmes in Europe)* stimulate and support programme coordination and joint activities at both national and regional levels (see page 17).

FP6 introduced new concepts and tools, such as the **Networks of Excellence**, to structure thematic research domains better by supporting long-lasting collaborations and integration, and **Integrated Projects**, aimed at gathering the necessary multidisciplinary critical mass around a specific research theme. (Ref. project show case: *EUR-OCEANS; MERSEA.*)

GALWAY DECLARATION

This is an initiative following the 2004 Galway European conference, led by the Irish EU presidency and bringing together environmental research bodies and commercial operators on a common declaration concerning marine research.

The Galway declaration calls on the European Commission and the Member States to recognise:

- the crucial role of the oceans in climate patterns, carbon cycle and life on Earth;
- the major contribution that maritime industries can make to the achievement of the objectives outlined in the Lisbon Agenda;
- the essential role of marine science and technology in generating the knowledge needed to fuel this economic achievement in harmony with the environment;
- the critical role the European Research Area and the Seventh Research Framework Programme must play in supporting the world-class excellence in marine science and technology.

www.eurocean2004.com/pdf/galway_declaration.pdf

THE SEVENTH RESEARCH FRAMEWORK PROGRAMME (FP7)

The Commission's ambitious proposals for FP7 are designed to meet the needs of the Lisbon Strategy to build a Europe of Knowledge. FP7 represents a flagship programme for enhancing knowledge in Europe with also considerable potential for partner countries and regions.

Crosscutting relevance of marine and maritime issues in the 'Co-operation' Specific Programme

The core of the proposed FP7 is the **Co-operation** Specific Programme which will support research in a number of thematic areas corresponding to major fields of knowledge and technology where trans-national co-operation can address European social, economic, environmental and industrial challenges.

Research relating to marine and maritime issues is integrated into all of the Themes, but in particular into those on Food, Agriculture and Biotechnology; on Environment (including Climate Change) and on Transport (including Aeronautics).

The definition of the research to be supported under the Themes builds upon the input received from a wide range of stakeholders, such as contributions from policy Directorates General, international commitments of the Union, and **Technology Platforms**. In the context of maritime research, particularly relevant contributions were the Galway Declaration (see page 19) and the Waterborne Technology Platform (see page 22).

Support to collaborative research will be granted through a range of funding schemes

The implementation of FP7 foresees both a need to coordinate marine and maritime research across the relevant Themes and the flexibility to respond to new policy needs as they arise.⁽¹⁾

This will be achieved by supporting collaborative research through a range of funding schemes: Collaborative Projects, Networks of Excellence, Coordination/Support Actions.

Relevant environmental marine issues are included in the FP7 Themes

The Environment Theme will support research targeted at the sustainable management of the environment and its resources through advancing our knowledge on the interactions between the biosphere, ecosystems and human activities, and developing new technologies, tools and services in order to address global marine issues in an integrated way.

Emphasis will be put on the prediction of climate, ecological, earth and ocean systems changes; and on tools and technologies for the monitoring, prevention and mitigation of environmental pressures and risks.

Research will also help to develop **an ecosystem-based approach**, "whereby human activities affecting the marine environment will be managed in an integrated manner promoting conservation and sustainable use in an equitable way of oceans and seas". Marine spatial planning will also play an important role in developing the ecosystem-based approach to the management of Europe's marine resources.



In addition, coordination of national research programmes will be strengthened, including a possible initiative for a joint programme according to **art. 169** of the Treaty⁽²⁾ concerning Baltic Sea research (see page 17).

Further relevant elements have been reinforced in the FP7 proposal, including promotion of researcher training and careers within the 'People' programme (see page 23), and strengthened support to European research infrastructure and new activities to address research potential at a regional level (within the 'Capacities' programme).

European research infrastructures are a key factor in increasing competitiveness in both fundamental and applied research

The access to effective research infrastructures in Europe is a key factor in increasing competitiveness in both fundamental and applied research. A strategy on research infrastructures at European level provides added value by pooling talent, maximising resources and generating a strategic vision for research in the European Research Area. European support for infrastructure may be relevant to maritime research, such as support for marine research vessels, climate modelling super-computing facilities, a pan-European multi-disciplinary sea-floor observation network, etc.

The Seventh Research Framework Programme is designed to have strong links to other Community Programmes supporting the knowledge economy and society, in particular the proposed Structural Funds, the Competitiveness and Innovation Programme and the educational programmes. In order to achieve the desired level of impact, it will require stronger R&D efforts on the part of Member States, with more effective coordination between the EU, national and regional levels.

FP links with Structural Funds, Competitiveness and Innovation Programme and educational programmes

⁽¹⁾ It is explicitly mentioned that "special attention will be paid to priority scientific areas which cut across themes, such as marine science and technologies..."

⁽²⁾ "In implementing the multiannual framework programme, the Community may make provision, in agreement with the Member States concerned, for participation in research and development programmes undertaken by several Member States, including participation in the structures created for the execution of those programmes".

THE WATERBORNE TECHNOLOGY PLATFORM

A EUROPEAN STRATEGIC INNOVATION ALLIANCE

In December 2003, the Maritime Industry Forum (MIF) initiated the process for the establishment of an Advisory Council for Waterborne Transport Research in Europe (subsequently named **WATERBORNE^{TP}**). This would function as a forum where all the stakeholders would agree on a medium to long-term Vision (Vision 2020), assess the key challenges for the maritime industry and waterborne transport and operations, formulate the R&D actions to be fulfilled for meeting these challenges in a Strategic Research Agenda (SRA), and promote the mobilisation of the necessary resources.

The Technology Platform **WATERBORNE^{TP}** was launched during the MIF-plenary on 25 January 2005 in Bremen, in the presence of Günter Verheugen, Vice-President of the European Commission.

The European waterborne industry consists of thousands of companies, as well as related organisations and bodies including ship owners, barge owners, shipyards, equipment manufacturers and systems suppliers, classification societies, ports and port services, engineering services and other knowledge providers, which all engage in a wide range of activities. Many of these individual companies are SMEs, several are international leaders in their business and sub-sectors and intend to remain so.

Between them they serve Global and European supply chains through shipping services, operate passenger transport, offer the related infrastructures and logistics, provide coastal and other dredging works, provide ships and equipment, including for modern navies, as well as for the exploration and exploitation of the oceans, and satisfy the demand for holidays and leisure at sea. At the same time, these industries hold many common elements, commercial interests and often also have a customer-supplier relation.

STAKEHOLDERS AND OBJECTIVES

WATERBORNE^{TP} includes all actors along the waterborne value chain: those who build ships, boats and their systems and equipment, those who use and operate them for transport and services, those who provide the related infrastructure and ports and those who organise the exploitation of ocean resources.



Apart from general business objectives and management, **WATERBORNE^{TP}** is mainly building on the know-how of navigators, naval architects and marine engineers who drive the development in all the sub-sectors included in the technology platform.

The Waterborne Technology Platform is a consensus-based forum. The objective of **WATERBORNE^{TP}** is to bundle the efforts of the European waterborne actors, to remain champions, in maritime transport, 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 highly qualified employment opportunities in Europe.

Consequently the platform is industry-driven but includes, with equal importance, universities and research institutes, EU Member States, the European Commission and other stakeholders relevant to society as a whole.

THE **WATERBORNE^{TP}** STRATEGY

The **WATERBORNE^{TP}** strategy to build and consolidate the European maritime cluster's know-how is developed in two complementary documents: the Vision 2020 and the Strategic Research Agenda (SRA). The Vision 2020 lays down the main challenges of **WATERBORNE^{TP}**'s medium and long-term vision. The SRA translates the necessary steps to achieve this vision into concrete R&D milestones.

Both Vision 2020 and SRA are tools rather than position papers and they need to be dynamic in order to accommodate modified scenarios and other changes, as often as necessary, to increase the likelihood of realisation of the Vision 2020. For this reason both documents will be regularly reviewed, updated and widely distributed throughout the entire European waterborne industry, as part of the **WATERBORNE^{TP}** process.

Consensus is a major asset and a prerequisite for the success of our strategy. In particular we make sure that the main elements of the strategy, the Vision 2020 and the SRA, are widely supported.

4. THE WAY FORWARD

4.1 A VISION FOR MARINE-RELATED RESEARCH IN EUROPE

Need to tackle all aspects referring to the marine sphere in an integrated way

In the marine sphere, there is a need for more science, more research and more knowledge to better understand the complex interactions between marine ecosystems, their resources and their sustainable exploitation, and also for more generalised engagement with and service to the public. Long-term data, better observation and data collection capacities are needed to provide the necessary input for science, as well as interpretations and presentation of results and their implications that speak to policy-makers.

Better technology and innovation is needed to develop the huge wealth coming from ocean and sea-related activities in a more sustainable manner. All these aspects must be tackled in an integrated way, taking into account environmental, industrial, energy, transportation, social, economic and regional development aspects. Such an approach will confirm Europe's leadership position, thus fulfilling regional and European as well as global knowledge requirements.

4.2 DIALOGUE WITH SOCIETAL ACTORS AND POLICY-MAKERS

Research is fundamental in fostering a conscious dialogue with societal actors and an advised, fully informed decision-making process at governmental level.

One of the main challenges that policy-makers face when developing an integrated Maritime Policy is coordination between different policy sectors, such as fisheries, environment, transport, energy, industry, etc. and between demands expressed by different groups in society, not all of which are easily reconcilable.

An effective communication of scientific knowledge to decision-makers and civil society

The same challenge is valid as regards research activities, in order to provide integrated and independent advice based on excellence in the different marine sciences. The scientific community needs to provide science that will address subjects in a holistic manner, communicate them effectively and act on this from the early stages of the political process. This means closer co-operation between different scientific/technological institutions engaged in ocean affairs, ranging from coastal issues, ecosystem conservation and rehabilitation, shipbuilding, ship operation, oil and gas engineering to oceanography, hydrology, meteorology, biology and space observation technology.

This also means that the knowledge about the fundamentals of the oceans and society produced by researchers need to be explained in ways that connect to the perceptions and experiences of other stakeholders in government, private enterprise and civil society who have their own historical home-grown experience with maritime affairs.



For example, the International Council for the Exploration of the Sea (ICES) has gained a reputation for providing impartial and reliable scientific advice to fisheries and environmental policy. Its main role is to coordinate and promote marine research in the North Atlantic, including adjacent seas such as the Baltic Sea and the North Sea. Furthermore, ICES provides advice and information on issues related to the marine ecosystem with focus on the impact of fisheries. This includes some of the largest databases in the world on these subjects. It should also be noted that there is no similar organisation for the Mediterranean Sea or the Black Sea which provides the same quality of advice, and with the same impartiality and regularity.

The International Council for the Exploration of the Sea provides impartial, reliable scientific advice to fisheries and environmental policy

An integrated and holistic approach should serve to achieve objectives at regional level (broad knowledge- and technology-related questions of common interest), European level (best use of research facilities, technology transfer and research in support of Community Policies) and global level (knowledge of international concern such as climate change, operational oceanography, polar, tropical and marine ecosystem research for restoration and conservation, Earth observation, ocean research, drilling, transport, etc).

An integrated and holistic approach achieves the objectives at all levels, from regional to global

4.3 ENHANCING COORDINATION

Coordination of crosscutting maritime activities in line with the Maritime Policy is foreseen within FP7 with the aim of fostering cross-fertilisation between themes and priorities. As the programme develops, these activities will be considered within the relevant Specific Programmes. In addition to collaborative research, the opportunity for Article 169 initiatives is now foreseen, as well as technology platforms and the launching of new research infrastructures. The Seventh Framework Programme offers powerful tools to contribute to the Maritime Policy. The European Community Framework Programme acts as a catalyst, drawing the European research community together to make a stronger whole and maximise European added value for sustainable prosperity.

The European Community Framework Programme acts as a catalyst, drawing together the European research community

Within the context of the discussions on the Maritime Policy Green Paper, Europe should consider the need for a 'Strategy for European marine-related research' that would take into account all marine-related research in Europe, both inside the European Community RTD FPs and outside, in order to secure enhanced and sustained commitments to marine research and development in support of a European Maritime Policy. Such a strategy would contribute to avoiding the duplication of marine research, and to closing gaps and creating synergies in this domain, thereby establishing a true European marine research area.

4.4 EXPLOITING RESEARCH RESULTS FOR THE BENEFIT OF THE EUROPEAN ECONOMY

The European paradox

It is commonly acknowledged that Europe produces almost one third of the world's scientific knowledge. At the same time, Europe is less successful in converting these achievements into commercial technologies and socio-economic innovation.

Among the reasons for this are:

- The slow co-evolution of a whole range of areas which need to reach a 'tipping point' before new technologies can be adopted on a broad front
- A relatively weak effort in communicating science on a sufficiently broad front and in a manner that facilitates uptake and appropriation
- A growing gap between the perceptions of social actors about challenges and opportunities, and those of researchers working on the fundamentals of nature and society.

The 'knowledge triangle': research produces knowledge to be diffused through education, and used and applied through innovation

If Europe's high social expenditure and environmental costs are to be turned into an asset, Europe's competitiveness and growth must be based on creativity and ideas, investment in people and institutions, and on a healthy environment. The focus must remain, if not be intensified, on improving the 'knowledge triangle': the way knowledge is produced through research, diffused through education, and used and applied through innovation and policy implementation.

Public spending in RDI represents the best possible investment in Europe's future.

The creation of a knowledge-based economy will allow the safeguarding of the European model of society, without having to find compromises between economic growth, social cohesion and environmental protection.

4.5 COMMUNICATING RESEARCH – RAISING PUBLIC AWARENESS

People feel poorly informed on S&T matters

The launch of the consultation on a European Maritime Policy is an opportunity to demonstrate the benefits from research, both at home and through international co-operation to European citizens. In the process, efforts are also warranted to further enhance the coordination and visibility of European research in line with the European Research Area open to the world.

Research has the potential to address and respond to society's pressing needs and concerns. However still a significant number of people feel poorly informed on S&T matters. Others associate scientific progress, such as productivity gains, with negative consequences – job losses or breaching of ethical and moral boundaries.



A public that is better informed and more engaged could lead to a transparent culture of explanation, consultation and dialogue, which means democratic governance based on a degree of trust. Foremost, researchers need to acquire better communication skills or seek support from people with such skills, as a constituent part of the way science needs to be done under today's conditions. Societal debate could also naturally lead to new avenues in science through new questions raised by concerned stakeholders.

A better informed and more engaged public leads to societal debate, thus opening new avenues in science

The Green Paper, *Towards a future Maritime Policy for the Union: a European vision for the oceans and the seas*, examines all activities linked to or influencing the oceans and seas. The wide consultation launched with this Green Paper is targeted to both stakeholders and the general public, with the aim of getting fresh input for the optimisation of ways of getting most benefits from the oceans in a sustainable manner.

The consultation launched with the Green Paper, entitled *Towards a future Maritime Policy for the Union*, is an opportunity to communicate research and engage with the public

Research is a cornerstone in the development of such a policy, therefore communicating research and engaging with the public is more than a priority. It is an obligation in order to put the potential of the oceans at the right level of public perception and to ensure that citizens experience the benefits of this common heritage of humankind, and understand the need for public research into its better understanding and sustainable use.

WHAT DO EUROPEANS ACTUALLY THINK ABOUT SCIENCE?

Two Eurobarometer reports published in June 2005 demonstrated that 71% of EU citizens agree that collaborative research at EU level is growing in importance and 59% consider that the EU should spend more money on scientific research.

In spite of the overall result, some critical messages came out of the survey:

- Europeans tend to resist some technologies. For example, 54% of Europeans consider that food made from genetically modified organisms is dangerous.
- Although there is an overwhelming recognition of what science and technology have done for society until now, people also see negative impacts, for example on the environment and employment. A majority of people believe that computer technologies eliminate more jobs than they create.
- There is still a comprehension gap between science and society. Europeans feel badly informed and not very involved in science and technology issues. Efforts still need to be made to bring science and technology closer to people and to foster communication between scientists and the public.
- This duality is also valid for the image Europeans have of scientists: people recognise the positive role scientists play in society but there is also some criticism of the way scientists explain their achievements and handle information towards the public.

At the same time, 64% of Europeans agree that our economy can only become competitive by applying the most advanced technologies and acknowledge the role S&T play today in industrial development.

Eighty-seven percent agree that science and technology have improved their quality of life and 77% believe they will continue to do so for future generations.

Europeans expect more investment in scientific research, both at national and at EU level, a more intensive collaboration between researchers in Europe, and more coordination between Member States, in which the EU must play a key role.

Regarding science and technology decision-making, 73% of EU citizens want politicians to rely more on expert scientists.

MARITIME ACTIVITIES UNDER COST



Founded in 1971, COST is an intergovernmental framework for European Co-operation in the field of Scientific and Technical Research, allowing the coordination of nationally funded research on a European level. COST Actions cover basic and pre-competitive research as well as activities of public utility.

Actions related to the maritime sector can be found in the following domains:

ENVIRONMENT:

Action 635: INTERCAFE : Conserving Biodiversity – interdisciplinary initiative to reduce pan-European cormorant-fisheries conflicts

The successful protection of cormorants in recent years is causing a growing number of conflicts with commercial fisheries. To avoid these conflicts, the achievements of research of cormorant ecology should be implemented in combination with practical fishing management policies. The main objective of the Action is to improve European scientific knowledge of cormorant-fisheries interactions.

METEOROLOGY:

Action 719: The use of geographic information systems in climatology and meteorology

GIS has shown a great potential in the fields of climatology and meteorology. The main objective of the Action is to broaden and enhance the potential of GIS in those fields by developing applications, with emphasis on the procedures and capabilities for integrating and adding value to data from various sources, and on quality control and presentation of climate and other related data. The Action tries to foster European co-operation in the development of operational applications of GIS in meteorology and climate research, and to strengthen the links between National Meteorological Services, the research community and GIS industry.

Action 720: Integrated ground-based remote sensing stations for atmospheric profiling


To study and forecast atmospheric phenomena at increasingly finer scales, both in research and operational activities, aerological measurements with adequate resolution in space and time are needed. Atmospheric numerical modelling at increasingly finer scales requires high-quality measurements with high temporal and spatial resolution. In this respect, ground-based remote-sensing techniques are best suited to complement existing measurement techniques with satellites, commercial aircraft and radiosondes. The Action works on the integration of various techniques into one profiling station, which will enable the improvement of the quality of standard outputs, control procedures and the derivation of additional parameters.

Action 722: Short range forecasting methods of fog, visibility and low clouds

Meteorological forecasting at very short notice (up to 12 hours) is called nowcasting. Numerous customers, particularly from transport companies, request nowcasting of fog, which is a limiting factor concerning visibility. The main objective of the Action is to develop advanced methods for very short-range forecasts of fog, visibility and low clouds, adapted to characteristic areas and to user requirements. This overall objective implies the development of pre-processing methods of the necessary input data together with the development of the appropriate forecast models and methods, and adaptable application software for the production of forecasts.

Action 723: Data exploitation and modelling for the upper troposphere and lower stratosphere

The upper troposphere and lower stratosphere (UTLS) is the region of the atmosphere formed approximately five kilometres above and below the tropopause. This region of the



Earth's atmosphere plays an important role in the Earth's climate and in possible climate change. Several strong feedback mechanisms in the climate system are strongly influenced by the processes in the UTLS but the sparse knowledge of these processes is one of the weaknesses in current climate prediction. The Action is trying to advance the understanding of the state of the global UTLS, in order to provide an improved basis for policy advice in connection with global change.

Action 724: Developing the basis for monitoring, modelling and predicting space weather

Space weather is succinctly defined as: conditions on the sun and in the solar wind, magnetosphere, ionosphere, and thermosphere that can influence the performance and reliability of space-borne and ground-based technological systems and can endanger human life or health. The impact of space weather ranges from technical problems with satellites arising from charged particles to problems experienced by power transmission grid operators on the ground during geomagnetic storms.

The main goal of the Action is to develop a European framework for the science underpinning space weather applications, as well as exploring methods for providing a comprehensive range of space weather services to a variety of users, based on modelling and monitoring of the Sun-Earth system.

AGRICULTURE:

Action 867: Welfare of fish in European aquaculture

The welfare of farmed fish is a subject of increasing concern within Europe. This Action is focused on the provision of a secure foundation for the development of operational welfare indicators, in order to monitor and safeguard the welfare of farmed fish. Identifying and measuring welfare requires a better scientific understanding of the fundamental physiological and behavioural capacities of fish.

URBAN CIVIL ENGINEERING:

Action C22: Urban flood management

The main objective of the Action is to increase knowledge required for preventing and mitigating potential flood impacts to urban areas by exchanging experiences, developing integrated approaches, and by promoting the diffusion of best practices in urban flood management.

CHEMISTRY:

Action D28: Natural products as a source for discovery, synthesis and application of new pharmaceuticals

The main objective of the Action is the target-orientated discovery of new natural products with an important biological profile based on new and unusual sources, e.g. secondary metabolites of bacteria or marine organisms combined with efforts to synthesise these molecules by the use of novel strategies and methods. The development of new strategies to synthesise complex natural products is the second main objective. As a result, a broad screening of analogues will be possible. Structure activity data will then be used to refine the pharmacophore model further, enabling the rational design and synthesis of more focused active compounds.

Action D33: Nanoscale electrochemical and bio-processes (corrosion) at solid-aqueous interfaces of industrial materials

The main objective of the Action is to develop the understanding of biochemical processes at solid-aqueous interfaces leading to a universal approach to all biofouling-related issues. For more information on COST and individual Actions: <http://www.cost.esf.org/>

MARITIME ACTIVITIES UNDER EUREKA



EUREKA is a pan-European network for market-oriented, industrial R&D. A number of initiatives in the maritime field are EUREKA labelled:

INNOFISK (UMBRELLA)

The InnoFisk Umbrella aims at the creation of a European-wide platform to combine research and development capabilities and expertise in order to generate projects in the area of fish breeding throughout the entire fish production chain, assuming sustainability and transparency as clear preconditions, and reinforcing the all-encompassing fork-to-farm approach in which high quality and safe food prevails. The following principles lie at the basis of the InnoFisk Umbrella:

1. Animal well-being: create a breeding environment with sufficient freedom of movement and minimise stress in order to avoid outbreak of diseases.
2. Sustainability: avoid environmental pollution and avoid the use of antibiotics and harmful chemicals. Make use of natural organic resources where possible and try to reach an optimal feed conversion ratio.
3. Biodiversity: avoid escapes of farmed fish to natural populations and find alternative solutions for the use of fishmeal and fish-oil.
4. Consumer acceptance: produce high-quality farmed fish with a good texture and make the fish farming chain transparent, for instance by developing a hallmark.

LOGCHAIN (UMBRELLA) – BUILDING OF ADVANCED FREIGHT CHAINS AND LOGISTICS TECHNOLOGY

LOGCHAIN is aimed at improving international freight transport within Europe through the development and optimisation of continuous logistic chains between shipper and receiver. This can be achieved by integrating innovative techniques, advanced forms of organisation, efficient operating procedures and novel IT applications. Central to the initiative is the concept known as intermodal transport – a mixture of different modes of transportation (road, rail and inland waterways). The overriding political objective of LOGCHAIN is to shift freight traffic from Europe's roads and highways to rail and waterways. It provides actors in the European transport sector and transport research community with a platform for launching co-operative research projects, aimed at redesigning cross-border freight transport in such a way so as to make it friendlier to the environment, more efficient and more customer-oriented (www.eureka.be/logchain).

EUROGIA (CLUSTER) – EUREKA OIL AND GAS INDUSTRY INITIATIVE FOR SUSTAINABLE DEVELOPMENT AND A SECURE ENERGY SUPPLY FOR A CLEANER/SAFER FUTURE

EUROGIA is an Oil and Gas Industry Initiative for sustainable development and a more secure energy supply for a cleaner and safer future. EUROGIA's primary purpose is to initiate the technological developments that are fundamental to ensuring a better management of fossil fuels, in order to facilitate a rapid migration towards the hydrogen economy. This will be achieved in the following two ways:

- Reserving management optimisation by adding up new reserves, which is, therefore, an essential element of the energy strategy
- Decarbonising the fossil energy chain, moving instead towards a wider use of natural gas and, in the long-term, migration towards the hydrogen economy.

EUROGIA was initiated by a group of European industrialists representing the largest possible market segments. They are supported by public and private research institutes specialised in the accompanying disciplines of geosciences, information technology, materials, fluids mechanics, marine science, etc. (www.eurogia.com).

INDIVIDUAL PROJECTS:

E!3194 FORCE 8 – Broadband Satellite Services and Technologies for Maritime Communications – Duration: 36 months Total Cost: €3.09 million

The project aims are to provide broadband satellite services for maritime environments, based on standards and infrastructure of European satellite network operators (Ip, Dvb, Mpe). It will use innovative antenna technologies.

E!3065 INCOWATRANS – Environmentally Friendly Inland and Coastal Ships for Polish East-West Waterways – Duration: 43 months Total cost: €7 million

A study of the technical conditions of Polish inland and coastal waterways and its modernisation perspectives, economical analysis of transport conditions and needs. The development of environmentally friendly inland waterways and coastal ships.

E!3593 SAFEPASEA – Safe Passenger Transport at Sea – Duration: 21 months Total cost: €3.1 million

Develop and validate methodologies and tools for the safer design, construction and operations of the next generation of cruise and ferry ships with specific attention to propulsion and steering devices.

E!3509 EUROAGRI+ SLURRY ICE (Sub-umbrella) – Advanced Technology for a Compact, Low-energy Expenditure Wiped Surface Crystalliser System – Duration: 12 months Total cost: €0.5 million

To develop a new wiped surface crystalliser system that produces liquid slurry ice using innovative technology. The product will have small dimensions making it suitable for installation in supermarkets and fishing vessels, thus using a minimum amount of valuable space.

EI2278 WVEC – R&TD for the Wavebob Wave Energy Converter (Finished - 19 August 2002) – Duration: 12 months Total cost: €0.5 million

Wavebob is a novel wave energy-converter that generates up to three times more power from the sea than previous models. With the buoy placed far offshore, it can be rapidly tuned to the waves' frequency for maximum efficiency.

EI2600 SALINITY POWER – Power Production based on the Osmotic Pressure Difference between Fresh Water and Seawater (Finished-18 October 2004) – Duration: 43 months Total cost: €2.69 million

The objective is to develop a technical foundation for the development of salinity power as a competitive power source for the production of electricity.

EI2835 SAFENVSHIP – Safe And Environmentally Friendly Passenger Ships – Duration: 42 months Total cost: €15.33 million

Develop, evaluate and validate methodologies and tools for design of the next generation cruise/ferry ships related to: 1. safety – fire protection, structural (hydro-elasticity) and wind effects/evaluation; 2. environment – clean sea/air.

EI2326 GPSFISH – Positioning System for Marine Fauna – Duration: 36 months Total cost: €0.89 million

Fish are tagged with a positioning tag which can receive acoustic sounds transmitted by sonar. By modulating the signal with the GPS position, the tag attached to the fish can receive the sonar position and define that position.

EI2772 BALTECOLOGICALSHIP – Environment Friendly Ships for the Baltic Area – Duration: 38 months Total cost: €7.12 million

Development of environmentally friendly diverse cargo ship types, ecological construction processes, technological and business risk management models, and cost-effective Polish/Swedish infrastructure.

For more information about the Eureka initiative: www.eureka.be



PROJECT SHOWCASE

This section is aimed at illustrating the impact of research on the various challenges faced by Europe through some examples of FP funded projects. The examples also show how the different programmes contribute to the common goals.

- Environment and Societal goals
- Competitiveness
- Improved understanding of the Marine Environment and supporting Infrastructure
- Towards Coordinating and Structuring ERA
- The International Dimension of Marine Research
- Research in Support to Policy

ENVIRONMENT AND SOCIETAL GOALS: CLIMATE CHANGE, POLLUTION, NATURAL AND MAN-MADE PHENOMENA AND HAZARDS

HERCULES: CREATING CLEANER, MORE ENERGY-EFFICIENT MARINE ENGINES

The Integrated Project HERCULES develops new technologies to reduce emissions from marine engines and increase engine efficiency and reliability, thereby reducing fuel consumption, CO₂ emissions and engine lifecycle costs. The objective is to reduce related NOx emissions by 60% by 2020 and to reduce other components (such as particulates) by 40%. This is achieved through developments in thermodynamics and mechanics of 'extreme' parameter engines, advanced combustion concepts, multistage intelligent turbo charging, 'hot' engines with energy recovery and compounding, internal emission reduction methods and after treatment techniques, as well as new sensors.

SAFEDOR: SAFETY AND SECURITY FOR WATERBORNE TRANSPORT

SAFEDOR is an Integrated Project that will provide solutions to increase the safety and security of waterborne transport cost-effectively by treating safety as a design objective, not as a constraint. A risk-based regulatory framework will link performance prediction with risk assessment. Using state-of-the-art first-principle analysis tools within an integrated and holistic design approach, partners believe a balance between costs, safety and performance can be achieved. In the end, risks will be reduced to as low as is reasonably practical whilst accounting for other design priorities and constraints. (<http://www.safedor.org>)

BIOTAXMARIN: TOOLS FOR RISK MANAGEMENT AND TRACEABILITY SYSTEMS FOR MARINE BIOTOXINS IN SEAFOOD

Outbreaks of poisoning from eating shellfish with toxins accumulated in their tissue have become a worldwide problem with significant economic consequences for the coastal population. Fast, simple and cost-effective detection methods for marine biotoxins in food, as well as in patient sera, will mitigate the consequences of such outbreaks that are often caused by environmental pollution of coastal waters. Innovative biosensor technology, in combination with user-friendly chip assay methods, will enhance competitiveness of European industry.



DAMOCLES: ARCTIC MODELLING AND OBSERVATION FOR LONG-TERM ENVIRONMENTAL STUDIES

Damocles is an Integrated Project that addresses uncertainties concerning the rate and the predicted possible disappearance of Arctic sea ice and the consequent social economic impacts. The effect of this disappearance would be a 40% increase in the summer heat absorbed by the Arctic ocean, and the large environmental consequences of this change would particularly affect the inhabitants of Europe, North America and Russia. Damocles brings together 47 institutions (including 10 SMEs) in 12 EU countries to identify the on-going changes, evaluate the confidence in simulation models and predict the socio-economic impacts. Ultimately the project will increase the timeframe for the forecasting of extreme environmental events in the Arctic and consequently improve societies' ability to mitigate for their impacts.

QUANTIFY: QUANTIFYING THE IMPACT ON CLIMATE FROM EUROPEAN TRANSPORT SYSTEMS

The Integrated Project QUANTIFY determines the impact on global climate from European transport modes, using both the current situation and a number of future scenarios. Of particular interest are emissions of ozone precursors, CO₂, N₂O and particulates from shipping. In addition, the project examines contrails and ship tracks. The project is expected to contribute to better emission inventories and provide a sound underlying body of knowledge to support policy.

CARBOOCEAN: MARINE CARBON SOURCES AND SINKS ASSESSMENT

This Integrated Project aims at an accurate assessment of the marine carbon sources and links. Its targets include reducing the present uncertainties in the quantification of net annual air-sea CO₂ fluxes of the world's ocean. The project is based on three elements – observations, process studies and integrative modelling – equivalent to description, understanding and prediction. It will deliver a marine carbon balance for the last 200 years based on high quality observations; a process-based understanding of the marine carbon cycle response to a change in forcing as derived from process studies in the field, in the laboratory, and through modelling; integrated carbon budgets for the interval -200 to +200 years from now by synthesis of a modelling network.

(<http://www.carboocean.org/>)

COMPETITIVENESS

SUSTAINABLE ECONOMIC AND WEALTH GENERATION

INTERSHIP: IMPROVING EUROPEAN SHIPBUILDING

InterSHIP is an EU-funded project aimed at increasing EU shipbuilders' competitiveness by improving the integration of tools and methods used to design and manufacture complex vessels. It will enable shipyard engineers to analyse simultaneously leading-edge knowledge in environmental aspects, safety, comfort and cost-efficiency, ensuring that optimum solutions can be obtained for the total life cycle of vessels such as cruise ships or gas carriers. The project brings together a significant proportion of the European production capacity, and proposes a programme that will advance the integration of production processes in shipyards and reinforce future research and industrial co-operation among Europe's shipyards.

SEAFOODPLUS: THE CONSUMER-DRIVEN CONCEPT FOR PROMOTING HEALTH WITH SAFE, HIGH QUALITY SEAFOOD

The benefits to human health of regularly eating seafood have led to an increase in fish farming and market demand, which needs to be further developed by maintaining the quality and safety of farmed and caught seafood, and tailoring products to consumers' wishes. The concentration on six main themes (seafood and nutrition, consumer health, safety and risk-benefit analysis, new products, aquaculture, traceability) will enable promoting the production, marketing and consumption of better and safer fish of all kinds.

CHITOMED: SEAFOOD WASTE THAT HEALS

The processing of shrimp and similar crustaceans by the seafood industries generates large volumes of shells, generally as a waste product. However, this material contains a potentially useful chemical, chitin, which is an abundant biodegradable fibrous polymer that could be used in a number of industrial and medical applications. The CHITOMED project is investigating the production of biomedical textiles from dibutylchitin and chitin, aiming to produce biocompatible dressings that will aid the healing of wounds.

ENDOW: EFFICIENT OFFSHORE WIND FARMS

Europe has large offshore wind energy potential that can contribute substantially to providing a clean, renewable and secure supply of energy. The ENDOW project will reduce uncertainties in estimating power production due to wake effects in large offshore wind farms. By evaluating wake models in offshore environments, ENDOW will produce a tool that can assist planners and developers in getting the most out of offshore wind farms.



WAVE DRAGON: TURNING WAVES INTO ENERGY

Offshore waves carry a great deal of power and the Wave Dragon project is developing ways to turn this power into clean energy. The concept is based on a wave energy converter. Two wave reflectors focus the incoming waves towards a ramp leading to a reservoir that collects the seawater and then the water reservoir flows out through hydro turbines, like a hydropower plant. The main aims are the development and testing of the floating structure, of small head hydro turbines operational in seawater and of a control strategy to maximise power generation. A prototype was built and launched in a Danish fjord and connected to the grid, thus becoming the world's first offshore wave energy plant to deliver electricity.

VIRTUE: VIRTUAL TANK UTILITY IN EUROPE

VIRTUE will develop new and improved components and software tools to deliver concise and comprehensive numerical analysis of marine hydrodynamic behaviour. It constitutes an EU-wide initiative of leading marine Computational Fluid Dynamics (CFD) players to create a 'Virtual Basin' by integrating advanced numerical fluid analysis tools to tackle multi-criteria hydrodynamic performance optimisation of ships in a comprehensive and holistic approach. It aims to complement model testing in real basins and thus substantially enhance the provision of current services to the marine industry, and nurture development of innovative design techniques and concepts. This will help increase the competitiveness of the EU shipbuilding and shipping industries, promote a truly European co-operation with strong structuring and integration effects, strengthen SMEs through involvement in leading-edge developments as a means to gaining and sustaining competitive advantage and leadership, and enhance quality and safety in waterborne transportation.

IMPROVED UNDERSTANDING OF THE MARINE ENVIRONMENT AND SUPPORTING INFRASTRUCTURE

SEADATANET: A PAN-EUROPEAN INFRASTRUCTURE FOR OCEAN AND MARINE DATA MANAGEMENT

SeaDataNet is an Integrated Infrastructure Initiative (I3) that brings together a group of 47 major oceanographic institutes from 36 countries bordering the Baltic, the Black Sea, the Mediterranean and the North-East Atlantic, to develop a distributed pan-European marine data management infrastructure. All the partners are skilled in marine data management and added value services, covering physical oceanography, marine biology and marine chemistry. SeaDataNet will incorporate and enhance the currently existing marine data information infrastructures in Europe. The networking in a unique virtual data management system will provide on-line access to integrated data sets from the various sources. (<http://www.seadatanet.org/>)

HERMES: HOTSPOT ECOSYSTEM RESEARCH ON THE MARGINS OF EUROPEAN SEA

HERMES is an Integrated Research Project that is designed to gain new insights into the biodiversity, structure, function and dynamics of ecosystems along Europe's deep-ocean margin. The project brings together expertise in biodiversity, geology, sedimentology, physical oceanography, microbiology and biogeochemistry, so that the generic relationship between biodiversity and ecosystem functioning can be understood. Study sites will extend from the Arctic to the Black Sea and include open slopes and biodiversity hotspots, such as cold seeps, cold-water coral mounds, canyons and anoxic environments. (<http://www.edu-hermes.org/>)

EMSO: EUROPEAN MULTI-DISCIPLINARY SEAFLOOR OBSERVATORY

A major new element of the proposals is the strategic approach that is foreseen to support the construction of new research infrastructure, which will complement the continued support for the optimal use of existing research infrastructure. The European Strategy Forum on Research Infrastructures (ESFRI) has identified EMSO as a candidate research infrastructure. ESFRI noted that through the concerted action ESONET (The European Sea-floor Observatory Network) and an existing fleet of seafloor observatories (GEOSTAR, ASSEM, etc.) that the European deep-sea observatory community has matured, and is ready to establish a multi-disciplinary seafloor observatory network to be integrated with land-based and satellite networks.



MARBEF: MARINE BIODIVERSITY AND ECOSYSTEM FUNCTIONING

The MARBEF network will address the long and large-scale changes in marine ecosystems, including the rising of anthropogenic pressures on marine biodiversity. The creation of this network aims at integrating research efforts by forming a particular group of marine scientists and institutes, and creating a virtual European institute with a long-term research programme and dedicated links with industry and the public at large. MARBEF will also contribute to fill gaps in the information needs of a large and growing number of stakeholders that depends on the sustainable use and exploitation of marine biodiversity. This includes tourism, fisheries and aquaculture but also new industries which explore and commercialise marine genetic and chemical products. (www.marbef.org/)

TOWARDS COORDINATING AND STRUCTURING ERA

ERA-NET MARINERA:

THE ERA-NET COORDINATES NATIONAL AND REGIONAL MARINE RTD PROGRAMMES IN EUROPE

MarinERA brings together 13 of Europe's leading marine science-funding agencies responsible for a combined annual investment of some €100 million. With the participation of a further seven international research organisations and two national bodies, almost all European maritime nations are represented. MarinERA maps European marine research programmes, improves networking, contributes to the development of European marine science research policy, provides a basis sharing resources and addresses issues beyond the capabilities of individual Member States, promoting mutual opening of national marine research programmes. (<http://www.marinera.net/>)

NETWORK OF EXCELLENCE: EUR-OCEANS

EUR-OCEANS seeks to achieve lasting integration of European research organisations within the fields related to global change and pelagic marine ecosystems. One hundred and sixty researchers within EUR-OCEANS are now scattered in 69 member organisations, located in 25 countries. These researchers belong to three research communities (pelagic ecosystems, biogeochemistry and marine resources) which have often worked independently. Bringing these research organisations and excellent researchers together within the EUR-OCEANS network is expected to establish Europe as a leader within the field. (<http://www.eur-oceans.org/>)

HTA: AN ALLIANCE TO ENHANCE THE MARITIME TESTING INFRASTRUCTURE IN THE EU

This Network of Excellence aims at structuring the European Marine Testing capacity. The target is to build a lasting and complimentary relationship between major marine testing facilities and shipbuilders. This will provide Europe and its researchers with a complete, comprehensive, efficient and integrated set of advanced marine testing services (including inland navigation) and that will define R&D priorities in marine testing. This will ensure Europe as a world leader within the field of marine testing and, as a consequence, contribute to a successful European waterborne transport sector.



THE INTERNATIONAL DIMENSION OF MARINE RESEARCH

SPEAR: SUSTAINABLE OPTIONS FOR PEOPLE, CATCHMENT AND AQUATIC RESOURCES

SPEAR aims to develop and test an integrated framework for interpreting coastal zone structure and dynamics, in areas where communities primarily depend on marine resources. This framework accounts for watershed interactions, ecological structure and human activities. The interdisciplinary approach combines natural and social sciences, and addresses the complex scaling issue inherent in integrated management.

Two contrasting systems in China are being studied: Sanggou Bay, part of a rural watershed, and Huangdun Bay, located in an industrialised area south of Shanghai. In both systems, large-scale cultivation of seaweed, shellfish and finfish are of paramount importance for community income and livelihood.

INCOFISH: RECONCILING MULTIPLE DEMANDS ON COASTAL ZONES WITH EMPHASIS ON AQUATIC ECOSYSTEMS AND FISHERIES

This international S&T co-operation focuses on conducting specifically targeted strategic research suitable to contribute to the goals set by the World Summit for Sustainable Development in Johannesburg, such as restoring healthy fish stocks and ecosystems by 2015. Thirty-five research institutions and private enterprises from 22 nations worldwide (12 European, 12 Latin American, 6 Asian, 5 African) participate in 10 Work Packages. These are Data, Tools and Outreach; Shifting Baselines; Biodiversity Mapping; Ecosystem Modelling; Marine Protected Areas; Coastal Transects; Indicators for Sustainable Fisheries; Valuation of Coastal Ecosystem Products and Services; Impact of Ecotourism on Ecosystems; Legal Instruments for Sustainable Fishing.

The tools and concepts resulting from INCOFISH research will be tested in real-world scenarios in selected coastal systems worldwide. Together they will form a package with the potential to impact on solving societal problems in the coastal zones in Europe and in developing countries. All data and tools will be available online at www.incofish.org.

RESEARCH IN SUPPORT TO POLICY

UNCOVER: UNDERSTANDING THE MECHANISMS OF STOCK RECOVERY

Many EU fish stocks are defined as being outside safe biological limits. UNCOVER investigates the failures and successes of previous stock recovery activities, and tries to define optimal strategies for recovery plans for the future. The main objectives of UNCOVER are to identify changes experienced during stock decline and their consequences for the prospects of stock recovery, to enhance the understanding of mechanisms of fish stock recovery, and to provide recommendations for the recovery of EU fish stocks. Results will be integrated into a modelling framework in order to evaluate and develop management strategies that incorporate biological and environmental factors, as well as technical and socio-economic constraints. Recovery strategies developed in UNCOVER will be area- and ecosystem-specific and tuned to key species and their fisheries in the Barents Sea, North Sea, Baltic Sea and the Bay of Biscay.

AQUAFIRST: COMBINED GENETIC AND FUNCTIONAL GENOMIC APPROACHES FOR STRESS AND DISEASE RESISTANCE MARKER-ASSISTED SELECTION IN FISH AND SHELLFISH

The overall aim of the project is to identify genes in sea bream, sea bass, oyster and rainbow trout which have an expression associated with disease and stress resistance, and to use this information to develop genetic approaches that allow characterisation of genetic markers for marker-assisted selective breeding of disease and/or stress resistant individuals. The main objectives are: the characterisation of sea bream, sea bass, trout and oyster, and stress- and disease-responsive genes as potential candidate gene markers for desirable traits; seeking associations between (i) variations in response to stress and resistance to pathogen, and (ii) selected candidate genes and microsatellite markers by segregation analysis in appropriate families (QTL analysis); mapping these genes in linkage and gene maps. (<http://aquafirst.vitamib.com>)

COASTAL AND WATER MANAGEMENT GETS A BOOST FROM MARIE CURIE.

With support from the Marie Curie Programme, HR Wallingford, a renewed international research organisation based in Oxfordshire, is making progress on a number of coastal and water-related issues, including the development of new guidelines for exposed jetties and risk assessment for flood and coastal defence systems.

WENTECH is a Marie Curie Industry Host Fellowship, under which research has been undertaken in three main areas:

- Guidelines for the hydraulic design of exposed jetties
- Risk assessment for flood and coastal defence systems for strategic planning
- Post-project appraisal of Sustainable Drainage Systems.

Over the past four years, HR Wallingford has welcomed a total of four Marie Curie Fellows within the framework of its WENTECH project.

EXPOSED JETTIES:

Coastal trade activities rely on jetties for the shifting of marine cargo. Traditionally, these facilities are constructed in naturally sheltered locations or are protected by artificial breakwaters.

Recent years have seen demand increase for the development of large single-use industrial terminals, especially for the loading and unloading of liquid natural gas (LNG) and liquid petroleum gas (LPG). These terminals require deep water, but are often located in remote areas where there is no existing infrastructure, no wave shelter, and where the construction of new protective structures would not be cost-effective.

Thus, modern jetties now have to be built in such exposed locations, requiring new design and better understanding of the dynamics of wave-current-structure interaction.

A photograph of a white lighthouse with an orange lantern room, situated on a rocky island. The sky is blue with scattered white clouds. A seagull is visible on the rocks to the left of the lighthouse. The image is framed by a blue horizontal bar at the top with three white circles, and a red and blue graphic element at the bottom.

FP6 FUNDED PROJECTS IN THE MARITIME SECTOR

LIST OF FP6 FUNDED PROJECTS IN THE MARITIME SECTOR

(TOTAL FUNDING = € 612.5 MILLION)

ERA-NET (COORDINATION ACTIONS)

TOTAL FUNDING: € 27 MILLION

BONUS	BONUS for the Baltic Sea – network of funding agencies	3.00*
ECORD	European Consortium for Ocean Research Drilling	2.40
MarinERA	Coordination of national and regional marine RTD activities in Europe	2.95
AMPERA	European Concerted Action to foster prevention and best response to accidental marine pollution	1.68
BiodivERsA	An ERA-Net in biodiversity research	2.84
EUROPOLAR	The European Polar Consortium: strategic coordination and networking of European polar RTD programmes	3.00
COASTAL	Control Objectives and Shellfish Target Assurance Levels	0.19
CIRCLE	Climate Impact Research Coordination within a Larger Europe	2.96
CRUE	Coordination of research financed in the EU on flood risk management	3.00
MARTEC	Maritime technologies	2.00
MARIFISH	Coordination of European marine fisheries research programmes	3.00

SPACE (PRIORITY 1.4)

TOTAL FUNDING: € 16.3 MILLION

MERSEA	Marine Environment and Security for the European Area	14.00
PEARL	Port environment information collector	0.89
INSEA	Data integration system for eutrophication assessment in coastal waters	1.38

FOOD (PRIORITY 1.5)

TOTAL FUNDING: € 39.6 MILLION

INTEGRATED PROJECTS (IP)		
SEAFOODplus	Promoting health, together with safe, high quality seafood in a consumer-driven fork-to-farm concept	14.40
Imaquanim	Improved immunity of aqua-cultured animals	8.02
AQUAMAX	Sustainable aquafeeds to maximise the health benefits of farmed fish for consumers	10.60
SPECIFIC TARGETED RESEARCH OR INNOVATION PROJECTS (STREP)		
BIOTOXMARIN	Development of novel analytic tools for the detection of marine biotoxins	1.32
DETECTOX	Development of an SPR-based biosensor for the detection of lipophilic phycotoxins in shellfish residues	0.81
BIOTOXMARIN	Development of cost-effective tools for risk management and traceability systems for marine biotoxins in seafood	3.00
COORDINATION ACTIONS (CA)		
CONSENSUS	Consensus	1.45

* in Million €

TRANSPORT (PRIORITY 1.6.2) TOTAL FUNDING: € 202.79 MILLION

INTEGRATED PROJECTS (IP)		
HERCULES	High efficiency engine R&D on combustion with ultra low emissions for ships	15.00
InterSHIP	Integrated collaborative design and production of cruise vessels, passenger ships and Ropax	19.00
SAFEDOR	Design, operation and regulation for safety	12.00
VIRTUE	The Virtual Tank Utility in Europe	10.50
EFFORTS	Effective operation in ports	8.00
FLAGSHIP	European framework for safe, efficient and environmentally-friendly ship operations	10.21
MC-WAP	Molten carbonate fuel cells for waterborne application	9.90
FREIGHTWISE	Freight transport management systems	7.93
MOSES	Motorways of the sea	8.00
NETWORKS OF EXCELLENCE		
MARSTRUCT	Network of Excellence in marine structures	6.00
VISIONS	Visionary concepts for vessels and floating structures	5.00
HTA	An alliance to enhance the maritime testing infrastructure in the EU	6.50
SPECIFIC TARGETED RESEARCH OR INNOVATION PROJECTS (STREP)		
CREATING	Concepts to reduce environmental impact and attain optimal transport performance by inland navigation	2.70
DSS-DC	Decision Support System for ships in Degraded Condition	2.40
ECODOCK	Environmentally friendly coatings for ship building and ships in operation	2.00
LOGBASED	Logistics-based design	1.90
NG2SHIPI/F	New generation natural gas ship interfaces	2.00
POP&C	Pollution prevention and control of safe transportation of hazardous goods by tankers	1.60
ROTISII	Remotely Operated Tanker Inspection System II	1.70
SAFECRAFTS	Safe abandoning of ships, improvement of current lifesaving appliance systems	2.90
SAFEICE	Increasing the safety of icebound shipping	1.10
SAFETOW	Strategic Aid For Escort Tugs at Work	1.30
SHIPMATES	Ship repair to maintain transport which is environmentally sustainable	2.30
ADOPT	Advanced decision support system for ship design, operation and training	1.90
CAS	Cost-effective inspection and structural maintenance for ship safety and environmental protection throughout its life cycle	1.60

LIST OF FP6 FUNDED PROJECTS IN THE MARITIME SECTOR

DIFIS	Double Inverted Funnel for Intervention on Shipwrecks	1.80
EU-MOP	Elimination Units for Marine Oil Pollution	1.90
GIFT	Gas Import Floating Terminal	2.30
HISMAR	Hull Identification System for Marine Autonomous Robotics	1.10
OSH	Oil Sea Harvester	2.00
SAFE OFFLOAD	Safe offloading from long floating platforms	2.00
ShipDismantl	Cost-effective and environmentally sound dismantling of obsolete vessels	1.50
SUPERPROP	Superior life-time operation economy of ship propellers	1.00
BaWaPla	Sustainable ballast water management plant	1.70
CHINOS	Container Handling in Intermodal Nodes – optimal and secure	1.50
Cleanmould	Boat hulls with enhanced performance	1.40
CREATE3S	Production to improve total efficiency of new generation short sea shipping	2.50
DE-LIGHT Transport	Development of lightweight modules for transport systems, featuring efficient production and lifecycle benefits of structural and functional integrity using risk-based design	2.50
HANDLING WAVES	Decision support system for ship operation in rough weather	1.70
IMPROVE	Design of improved and competitive products using an integrated decision support system for ship production and operation	2.50
OFIENGINE	Development of new thermal spraying equipment and technology for production of components for marine transport engines	1.00
POSSEIDON	Progressive Oil Sensor System for Extended Identification Online	1.20
SECURCRANE	Design of an innovative system for the drive and control of port cranes for safe remote operation	2.20
SMOOTH	Sustainable methods for optimal design and operation of ships with air-lubricated hulls	1.50
KITE	Passenger intermodality knowledge base	1.25
COORDINATION ACTIONS (CA)		
INMARE	Technologies and methodologies for safe, environmentally friendly and efficient shipping operations in the future	0.80
ACMARE	Coordination Action to implement an advisory council for maritime transport research in Europe	1.00
CAREMAR	Coordinated academic RTD and education-supporting innovation in marine industries	0.70
SPREEX	Spill response experience	0.90
ALERT	Assessment of life-cycle effect on repairs to tankers	0.60
CAPOEIRA	Coordination Action on ports for the integration of efficient innovations and development of adequate research, development and innovation activities	0.50
MTCP	Maritime Transport Coordination Platform	2.74
PROMIT	Intermodal technologies and strategies	2.81
LINK	European passenger intermodality forum	2.00

SPECIFIC SUPPORT ACTIONS (SSA)		
CRONET-DAYS	Promoting and facilitating ERA-networking between European Contract Research Organisations (CRO)	0.05
ENCOMAR - TRANSPORT	Enhanced Co-operation between EU Member States and Associated Candidate Countries in maritime research on transport	0.30
ICOMOB	Icebreaker Co-operation on the Motorway of the Baltic Sea	0.14
EUROMAR-BRIDGES	Building bridges between EU Member States and Candidate Countries in maritime research on transport within the framework of the European Research Area	0.26

ENVIRONMENT (PRIORITY 1.6.3)

TOTAL FUNDING: € 154.26 MILLION

INTEGRATED PROJECTS (IP)		
CARBOOCEAN	Marine carbon sources and sinks assessment	14.50
HERMES	Hotspot Ecosystem Research on the Margins of European Seas	15.00
MODELKEY	Models for assessing and forecasting the impact of environmental key pollutants on marine and freshwater ecosystems and biodiversity	8.40
DAMOCLES	Developing Arctic Modelling and Observing Capabilities for Long-term Environmental Studies	16.10
SESAME	Southern European Seas: Assessing and Modelling Ecosystem changes	10.00
SPICOSA	Science and Policy Integration for Coastal System Assessment	10.00
ECOOP	European coastal-shelf sea operational observing and forecasting system	7.00
NETWORKS OF EXCELLENCE		
EUR-OCEANS	European Network of Excellence for ocean ecosystems analysis	10.00
MARBEF	Marine biodiversity and ecosystem functioning	8.71
MARINE GENOMICS	Implementation of high-throughput genomic approaches to investigate the functioning of marine ecosystems and the biology of marine organisms	10.00
EDIT	Towards the European Distributed Institute of Taxonomy	11.90
ESONET	European Seas Observatory NETWORK	7.00
SPECIFIC TARGETED RESEARCH OR INNOVATION PROJECTS (STREP)		
COBO	Integrating new technologies for the study of benthic ecosystem response to human activity: towards a Coastal Ocean Benthic Observatory	2.00
ELME	European Lifestyles and Marine Ecosystems	2.50
ESTTAL	Expressed Sequence Tags of Toxic Algae	1.40
FISH & CHIPS	Towards using DNA chip technology as a standard analytical tool for the identification of marine organisms in biodiversity and ecosystem science	1.60
HABIT	Harmful Algal Bloom species In Thin layers	0.95
SEED	Life history transformations among HAB species, and the environmental and physiological factors that regulate them	1.50
EXOCET/D	Extreme ecosystems studies in the deep ocean: technological developments	2.00
FACEIT	Fast Advanced Cellular and Ecosystems Information Technologies	3.69
ECODIS	Dynamic sensing of chemical pollution disasters and predictive modelling of their spread and ecological impact	3.50

LIST OF FP6 FUNDED PROJECTS IN THE MARITIME SECTOR

COORDINATION ACTIONS (CA)		
ENCORA	European network on coastal research	3.00
SPECIFIC SUPPORT ACTIONS (SSA)		
GRAND	GRAND GOOS (Global Ocean Observing System) regional alliances network development	0.52
SEPRISE	Sustained, Efficient Production of Required Information and Services within Europe is our only justification	0.33
ESONIM	European Seafloor Observatory Network Implementation Model	0.43
ASCABOS	A supporting programme for capacity building in the Black Sea region towards operational status of oceanographic services	0.46
SIMORC	Proposal to establish a System of Industry Metocean data for the Offshore and Research Communities	0.50
SEARCH for DAMOCLES	Study for Environmental Arctic Change – Developing Arctic Modelling and Observing Capabilities for Long-term Environmental Studies	0.60
BASIN	Resolving the impact of climatic processes on the ecosystems of the North Atlantic basin and shelf seas: integrating and advancing observation, monitoring and prediction	0.11
TENATSO	Tropical Eastern North Atlantic Time-Series Observatory	0.55

ENERGY (PRIORITY 1.1.6 – 1.1.6.1.3)

TOTAL FUNDING: € 23.42 MILLION

INTEGRATED PROJECTS (IP)		
BEATRICE WINDENERGY	Beatrice offshore deepwater wind farm project	2.00
LOWEC	Low offshore wind energy cost	4.00
SPECIFIC TARGETED RESEARCH OR INNOVATION PROJECTS (STREP)		
Wave SSG	Full-scale demonstration of robust and high-efficiency wave energy converter	1.00
SEEWEC	Sustainable Economically Efficient Wave Energy Converter	2.30
Wave Dragon MW	Development and validation of technical and economic feasibility of a multi MW Wave Dragon offshore wave energy converter	2.43
AWS-MKII	Deployment, monitoring and evaluation of a prototype advanced wave energy device	2.17
WaveStar	High-efficient, low-weight, pile-supported 500 kw wave energy converter	1.71
BREAKWAVE	BREAKWAVE – OWC in Breakwater Douro	2.50
AquaBuOY	Demonstration offshore wave energy plant	1.37
NEREIDA MOWC	OWC integration in the new Mutriku breakwater	0.83
ALDA	Demonstration plant of a tunnelled wave energy converter	1.36
COORDINATION ACTIONS (CA)		
CA-OE	Coordinated Action on Ocean Energy	1.50
SPECIFIC SUPPORT ACTIONS (SSA)		
STANDICE	Standardisation of ice forces on offshore structures design	0.24

POLICY SUPPORT SSP (PRIORITY 1.8)

TOTAL FUNDING: € 65.23 MILLION

SPECIFIC TARGETED RESEARCH OR INNOVATIVE PROJECTS (STREP)		
EFIMAS	Operational evaluation tools for fisheries management options	4.50
FISBOAT	Fisheries Independent Survey-Based Operational Assessment Tools	1.50
COMMIT	Creation of multi annual management plans for commitment	1.51
NECESSITY	Nephrops and Cetacean Species Selection Information and Technology	4.27
CAFE	Capacity, F and Effort	1.80
CEVIS	Comparative Evaluations of Innovative Solutions in European fisheries management	1.20
DEGREE	Development of fishing Gears with Reduced Effects on the Environment	2.00
POORFISH	Probabilistic assessment, management and advice model for fishery management where only poor data is available	1.00
PRONE	Precautionary risk methodology in fisheries	1.10
UNCOVER	Understanding the mechanisms of stock recovery	3.70
SHEEL	Secure and Harmonised European Electronic Logbook	1.20
CEDER	Catch, Effort and Discard Estimates in Real-time	1.30
WEALTH	Welfare and health in sustainable aquaculture	2.53
AQUAFIRST	Combined genetic and functional genomic approaches for stress and disease resistance in marker-assisted selection of fish and shellfish	3.80
EUROCARP	Disease- and stress-resistant common carp: combining quantitative, genomic, proteomic and immunological makers to identify high performance strains, families and individuals	1.09
FASTFISH	Farm assessment of stress levels in fish	1.10
BECAUSE	Critical interactions between species and their implications for precautionary fisheries management in a variable environment – a modelling approach	2.96
EMPAFISH	European Marine Protected Areas as tools for FISHeries management and conservation	2.39
PROTECT	Marine-protected areas as a tool for ecosystem conservation and fisheries management	2.00
ECASA	Ecosystem Approach for Sustainable Aquaculture	2.48
AFRAME	A framework for fleet and area-based fisheries management	1.32
Fine	Fisheries-induced evolution	1.80
AFISA	Automated fish ageing	0.60
SARDONE	Improving assessment and management of small pelagic species in the Mediterranean	1.10
COBECOS	Cost and Benefit of Control Strategies	1.40
BeneFish	Evaluation and modelling of benefits and costs of fish welfare interventions in European aquaculture	1.26
SEACASE	Sustainable extensive and semi-intensive coastal aquaculture in Southern Europe	1.55
IMAGE	Indicators for fisheries MAnagement in Europe	1.00
RECLAIM	REsolving CLimATIC IMpacts on fish stocks	1.70

LIST OF FP6 FUNDED PROJECTS IN THE MARITIME SECTOR

COORDINATION ACTIONS (CA)		
AQUAGENOME	Genomics in fish and shellfish: from research to aquaculture	0.79
INDECO	Developing indicators of environmental performance of the Common Fisheries Policy	0.50
DIPNET	Disease interactions and pathogen exchange between farmed and wild aquatic animal populations – a European network	0.50
GENIMPACT	Evaluation of genetic impact of aquaculture activities on native populations – a European network	0.50
IN EX FISH	Incorporating the extrinsic drivers into fisheries management	1.50
ISTAM	Improve Scientific and Technical Advice on fisheries Management (West Africa)	0.61
IMPASSE	Environmental impacts of invasive alien species in aquaculture	0.54
PANDA	Permanent network to strengthen expertise on infectious diseases of aquaculture species and scientific advice to EU policy	0.49
RANA	Risk assessment of new and emerging systemic Iridovirus diseases for European fish and aquatic ecosystem	1.18
SPECIFIC SUPPORT ACTIONS (SSA)		
IMPACT FISH	Impact assessment of the FP4 and FP5 Research Programmes on fisheries, aquaculture and seafood processing research area and the fishery industry	0.17
ICES-FishMap	Update and revision of the ICES atlas of North Sea fishes: a web-based application	0.10
AQUAFUNC	Integrated knowledge on functional genomics in sustainable aquaculture	0.17
ENVIEFH	Environmental approach to essential fish habitat designation	0.53
PROFET POLICY	A European platform for the communication of European RTD results to stakeholders in fisheries and aquaculture	0.76
SAMI	Synthesis of Aquaculture and Marine ecosystems Interactions	0.16
SLIME	Restoration of the European eel population: pilot studies for a scientific framework in support of sustainable management	0.19
REPROFISH	Integrating basic and applied knowledge on finfish reproduction	0.14
IBEFish	Interaction Between Environment and Fisheries - a challenge to management	0.16
AQUA Breeding	Towards enhanced and sustainable use of genetics and breeding in the European aquaculture industry	0.23
OATP	Evaluation of the promotion of Offshore Aquaculture through a Technology Platform	0.20
FEUFAR	The Future of European Fisheries and Aquaculture Research	0.49

CO-OPERATIVE AND COLLECTIVE RESEARCH (SMEs)

TOTAL FUNDING: € 22.21 MILLION

FINE FISH	Reduction of malformations in farmed fish species	3.02
CORALZOO	The development of an SME-friendly European breeding programme for hard corals	2.61
RACEWAYS	A hyperintensive fish farming concept for lasting competitiveness and superior production	0.89
COMPETUS	Genetic improvement of farmed sea bass, <i>Dicentrarchus labrax</i> : strain testing and response to selection	0.52
SPONGES	Sustainable production, Physiology, Oceanography, Natural products, Genetics and Economics of Sponges	1.44
IntelFishTank	Development of an intelligent fish tank for cost effective aquaculture through the control of water quality in different fish tanks	0.62
AQUAETREAT	Improvement and innovation of aquaculture effluent treatment technology	1.38
CRAB	Collective Research on Aquaculture Biofouling	1.58
TURPRO	Biological optimisation and development of processing methods for turbot farming	0.75
OCEANSAVER	Dramatically reducing the spreading of invasive, non-native exotic species into new ecosystems through an efficient and high volume capacity Ballast Water Cleaning System	0.70
SUBFISHCAGE	Development of a cost-effective submersible fish cage system	0.70
FPSO-INSPECT	Non-intrusive in-service inspection robotic system for condition monitoring of welds inside floating production storage and offloading vessels	1.09
DOLFIN	Development of innovative plastic structures for aquaculture using a new composite with crop waste as reinforcing filler	0.61
PROTENCH	Intensive and sustainable culture of the freshwater species <i>Tencii</i>	0.94
ALFA	Development of an automated innovative system for continuous live feed production in aquaculture hatchery units	1.14
MusselHarvest	Development of a cost-effective technique for mussel harvesting combined with product control and re-tubing	0.52
HULL INSPECTOR	Development of an autonomous mobile inspection vehicle for detecting structural defects in ships' hulls	1.03
KEYZONES(R)	To investigate sustainable biological carrying capacities of key European coastal zones	0.75
MAPO	Enhancing research and development projects to find solutions to struggle against various marine pollutions	0.75
FISH	Facilitating innovation for sustainable fisheries and marine resources	0.51
ALGADEC	Development of an rRNA-biosensor for the detection of toxic algae	0.59

INTERNATIONAL CO-OPERATION (INCO)

TOTAL FUNDING: € 23.68 MILLION

CLEAN BLACK SEA	Clean Black Sea working group	0.04
GEWAMED	Mainstreaming gender dimensions into water resources development and management in the Mediterranean region	1.25
MELIA	Mediterranean dialogue on integrated water management	2.00
MANGROVE	Mangrove ecosystems, communities and conflict: developing knowledge-based approaches to reconcile multiple demands	0.85
ECOST	Ecosystems, societies, coincidences, precautionary principles: development of an assessment method of the societal cost for best fishing practices and efficient public policies	3.1
ECOMANAGE	Integrated ecological coastal zone management system	1.40
INCOFISH	Integrating multiple demands on coastal zones with emphasis on aquatic ecosystems and fisheries	4.40
PASARELAS	Discovery Modelling Mediation Deliberation: interface tools for multi-stakeholder knowledge partnerships for the sustainable management of marine resources and coastal zones	0.28
REEFRES	Developing ubiquitous restoration practices for Indo-Pacific reefs	1.70
TBTIMPACTS	Assessing impacts of TBT on multiple coastal uses	0.80
SPEAR	Sustainable options for people, catchments and aquatic resources	1.50
TRANSMAP	Transboundary networks of marine-protected areas for integrated conservation and sustainable development: biophysical, socio-economic and governance assessment in East Africa	1.70
PUMPSEA	Peri-urban mangrove forests as filters and potential phytoremediators of domestic sewage in East Africa	1.65
CENSOR	Climate variability and El Nino southern oscillation: implications for natural coastal resources and management	3.00

MARIE CURIE ACTIONS (HUMAN RESOURCES AND MOBILITY)

TOTAL FUNDING: € 12.44 MILLION

RESEARCH TRAINING NETWORKS		
FISHACE	FISHeries-induced Adaptive Changes in Exploited stocks	2.87
MOMARNET	Monitoring deep seafloor hydrothermal environments on the Mid-Atlantic Ridge	2.62
WAVETRAIN	Research training network towards competitive ocean wave energy	1.82
INTRA-EUROPEAN FELLOWSHIP		
BIO-ENGINEERS	Influence of biological and physical processes on intertidal sediment dynamics and on the release of pollutants trapped in sediments, and the toxicity of these pollutants	0.15
BIOECOTOX	Biomarkers: the early warning sentinel of chemical pollution risk assessment	0.15
BIOWARM	Marine sponges as models for assessing biological effects of the Mediterranean Sea warming	0.14
CAESAR	Capillary electrophoresis separation of dissolved carbohydrates of the aquatic realm	0.14
CD-PALEO	Development of Cadmium isotopic measurements by MC-ICP-MS using a double spike approach: Application to marine sediments and palaeoceanography	0.14

CHARMAD	Chemical characterisation and cycling of marine dissolved organic matter	0.15
DINO-CULT	Calcareous dinoflagellate culturing experiments: understanding the life cycle of oceanic species	0.15
HYDRAMED	Geological assessment of gas hydrates in the Mediterranean Sea	0.19
ISOCLIV	Exploring the influence of intraseasonal oscillations on the climate variability in the Indo-Pacific sector during boreal summer	0.15
LIST	Larvae in situ tracking: detection and identification of early-life-stages of marine organisms using in situ hybridisation with oligonucleotide probes	0.14
MACRO-MSAA	Synthesis of marine Macrolides and hybrid structures as novel Microtubule Stabilising Anticancer Agents	0.16
MARCYAN2	Ecological control of nitrogen fixation in marine Cyanobacteria	0.14
MIDIA	Molecular indicators of DNA damage in aquatic organisms	0.17
MOSEVEM	Modelling sedimentation and vegetation patterns in tidal marshes	0.14
MT GENOME G.SALARIS	The mitochondrial genome of the fish parasite Gyrodactylus salaris – characterisation and utility	0.15
PLAICELIFE-LINE	Determination of plaice lifetime movements in the North Sea by linking natural and electronic data records	0.15
S.ATLANTIC PLUME	The characterisation and temporal evolution of the South Atlantic plume	0.16
VENTSULFUR-MICDIV	Biodiversity of microbial communities involved in sulphur cycling at a shallow water hydrothermal vent	0.14
OUTGOING INTERNATIONAL FELLOWSHIP		
LOTUS	Long time-series Undersea Surveillance	0.25
INCOMING INTERNATIONAL FELLOWSHIP		
AUVI	Autonomous vehicle for underwater inspections	0.06
ECCRE	Biodiversity and vulnerability of European cold-water coral reef ecosystem	0.16
EUROPEAN RE-INTEGRATION GRANTS		
CLOWNFISH EVOLUTION	Molecular phylogeny and evolution of specialisation in anemone fishes and in their host sea anemones	0.03
FISH CONDITION	Effects of environmental and habitat characteristics on condition and reproduction of exploited marine fish populations	0.02
PHYTODEATH	Effect of ultraviolet radiation on programmed cell death in phytoplankton: impact on biomass cycling and biodiversity	0.04
EARLY-STAGE TRAINING		
RISICO	Risk assessment of surfactants in coastal environments	0.71
TRANSFER OF KNOWLEDGE		
PARAQUAM	Parasite pathogens in new species of Mediterranean aquaculture: an experimental approach	0.28
SEAPAID	Sea grass production and isotopic discrimination	0.13
SPECIFIC SUPPORT ACTIONS (SSA)		
DOCREG	Development of oceanographic research in Greece	0.04
SERIES OF EVENTS		
AQUALABS	Advanced laboratory training courses in aquaculture for early-stage researchers	0.53

INFRASTRUCTURES

TOTAL FUNDING: € 25.58 MILLION

INTEGRATING ACTIVITIES AND TRANSNATIONAL ACCESS		
SEADATANET	A pan-European infrastructure for ocean and marine data management	8.74
Black Sea SCENE	Black Sea scientific network	2.00
HYDRALAB-III	Integrated Infrastructure Initiative	11.81
SALVADORE	Seismic analysis of the lithosphere via advanced processing techniques and access to deep ocean recorders during exploration	0.68
METRI – 2	Marine Environment Tests and Research Infrastructure – 2	0.70
DESIGN STUDIES AND CONSTRUCTION OF NEW RI		
DesignACT	Designing the European Aquaculture Centre of Technology	0.47
CeMaCE	Centre for Marine Chemical Ecology	0.93
ACCOMPANYING MEASURES		
PLANKTON-NET	An open-access framework for developing and supporting distributed knowledge centres for taxonomic data – a pilot study targeting EU phytoplankton	0.21

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