





# FOOD TOWARDS A SUSTAINABLE HARVEST FROM THE SEAS

*"Scientific knowledge, advice and innovation are critical for the future sustainability of fisheries and aquaculture in Europe, supporting jobs, protecting coastal communities and providing safe and healthy seafood products."*

## Europe today

- Europe is a major consumer (22 kg/person/year) and a world's top three importer of fishery and aquaculture products.
- In terms of value, the annual output of the European fish processing industry is €23 billion, or three times that of the catch sector <sup>[1]</sup>.
- The EU aquaculture industry produced 1.3 million tonnes of fish, shellfish and crustaceans in 2006, generating a turnover of €3.2 billion and supporting 65,000 jobs <sup>[2]</sup>.
- Globally, marine and inland aquaculture production is fast catching up with fisheries, representing 47% of food-fish output in 2006 <sup>[3]</sup>. EU aquaculture production, however, is static.
- Science programmes are beginning to focus on the significant opportunities for discovery and extraction from marine organisms of food and functional food ingredients for human consumption and animal feeds.

## Europe tomorrow

- Marine research and technology could be a critical driver towards:
  - The management of European fisheries according to the best available science, utilising an ecosystem approach at relevant local and regional scales and supported by integrated and dynamic policies at EU and national level;
  - A European aquaculture sector producing high quality, high value food products, utilising science-based management and advanced technologies and occupying marine space according to the best principles of marine spatial planning;
  - Europe achieving the status of world leader in aquaculture technologies, exporting knowledge and services to a globally expanding aquaculture sector;
  - A coordinated, sustainable and ethical framework for bioprospecting for bioactive molecules and compounds from marine organisms for delivery of new food additives and ingredients, creating commercial opportunities and healthy food products.



<sup>[1]</sup> Facts and figures on the Common Fisheries Policy - Basic Statistical Data (2010 Edition), European Commission Publication, 456 ISBN 978-92-79-14127-0  
<sup>[2]</sup> Building a sustainable future for aquaculture - A new impetus for the Strategy for the Sustainable Development of European Aquaculture (2007), Communication from the Commission to the European Parliament and the Council COM(2007) 162 final  
<sup>[3]</sup> The state of world fisheries and aquaculture - 2008 (2009), Food and Agriculture Organisation (FAO) (ISSN 1020-5498)

# OCEANS AND HUMAN HEALTH RISKS AND REMEDIES FOR HUMAN HEALTH AND WELL-BEING

*"Life on earth is fundamentally and inextricably linked to the oceans. Oceanic processes affect climate, influence the spread of pathogens and determine food and material resource upon which we depend. How we use the sea can influence those processes to our benefit or detriment."*

John Stegeman, Director, Woods Hole Center for Oceans and Human Health (USA)

## Europe today

- Harmful Algal Bloom (HAB) events have increased over the past decades along the European coasts, leading to an increase of related diseases and economic losses in the fisheries and aquaculture sector <sup>[1]</sup> with a total cost estimated at €64 million/year in the US and more than €627 million/year in the EU <sup>[2]</sup>.
- More than 100,000 chemicals are currently on the EU market; some of which eventually end up in the marine environment as a micro-pollutants. The effects of this chemical cocktail on the marine ecosystem and human health remain largely unknown <sup>[3]</sup>.
- Around 15 natural products from marine organisms are currently in clinical development for novel drugs (mainly for treatment of cancers) with several already on the market <sup>[4]</sup>. The oceans and seas – although hardly explored – have a high potential for discoveries of bioactive compounds, given the rich marine biodiversity <sup>[5]</sup>.
- Seafood is an important component of a healthy balanced diet, e.g. providing a vital source of omega-3 fatty acids.



<sup>[1]</sup> Gilbert, P.M., Anderson, D.M., Bertoni, P., Driessens, F.C., and S. Selver (2005). The global, complex phenomena of harmful algal blooms. Oceanography 18(5): 124-127  
<sup>[2]</sup> Adapted from: Hoegh-Guldberg, O., S. Selver, S. (2004). The economic effects of harmful algal blooms. In: S. Selver, S. (2004). Toxicology of harmful algal blooms. Biological Sciences, analysis and synthesis, 189 pp. 391-402, and exchange rate to € 6, September 2010  
<sup>[3]</sup> <http://www.vliz.be/imis/research/portal/portal.asp?docid=1510101>  
<sup>[4]</sup> Marine Board - ESP Position Paper 15 (2010), Marine Biotechnology: A new Vision and Strategy for Europe  
<sup>[5]</sup> Farnell, W. (2004). Marine pharmaceuticals – Past, present and future. Oceanography 17(2): 111-119

# MARINE OBSERVATIONS AND INFORMATION TOWARDS AN INTEGRATED EUROPEAN OCEAN OBSERVING SYSTEM

*"We need sustained observations because today's observations cannot be taken tomorrow."*

## Europe today

- The annual costs of ocean observations in Europe amount €1 billion for in situ data and €0.4 billion for space data <sup>[1]</sup>.
- Marine observations and data are essential for monitoring the rate and scale of environmental change. For instance it is estimated that a 25% reduction in uncertainty in future sea-level rise alone would save €100 million annually in European coastal defenses <sup>[2]</sup>.
- Marine observations are limited to a small number of parameters (mainly physical) and have large spatial and temporal gaps especially at shelf and coastal areas.
- Some components of the global ocean observing system are addressed through large international research efforts whilst others rely on uncoordinated national initiatives, resulting in a very fragmented picture.
- Numerous European initiatives aim at mobilising and coordinating the marine data management field, and developing common standards and protocols for quality control procedures, metadata formats and descriptions, and data exchange formats.



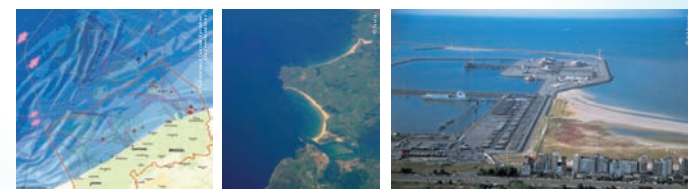
<sup>[1]</sup> Global Ocean Observing System: A Summary for Policy Makers (2010), IOC-UNESCO  
<sup>[2]</sup> European Commission (2010), Forecasting Marine Knowledge 2011-2015  
<sup>[3]</sup> Marine Board - ESP Vision Document 1 (2008), Joint Marine Board and EuroGOSS perspective on the European Marine and Observation Data Network (2008)

# MARINE SPATIAL PLANNING TOWARDS EFFECTIVE MANAGEMENT STRATEGIES OF HUMAN ACTIVITIES IN THE MARINE ENVIRONMENT

*"Marine Spatial Planning has emerged as a means to address growing competition for finite marine space and reducing human pressure on marine ecosystems and habitats."*

## Europe today

- Seas and oceans represent over 50% of the territory of the European Union.
- In 2008, the European Commission produced a roadmap for Marine Spatial Planning (MSP) which provides the framework for Member States to implement management strategies of human activities <sup>[1]</sup>.
- Some coastal Member States have already implemented MSP strategies and practices (e.g. UK, Greece, Poland, France, and Germany) <sup>[2]</sup>.
- Despite the growing interest of Member States to implement MSP, the scope to do so is limited in international waters (beyond 200 nautical miles) <sup>[3]</sup>.
- Improving MSP could generate up to €1.3 billion of revenue by 2020 <sup>[4]</sup>.



<sup>[1]</sup> European Commission (2009), Legal aspects of maritime spatial planning - Summary Report  
<sup>[2]</sup> European Commission (2008), Roadmap for Maritime Spatial Planning: Achieving European Potential in the EU  
<sup>[3]</sup> Maria Damaski, Member of the European Commission, responsible for Maritime Affairs and Fisheries - speech at "The Integrated Maritime Policy as a catalyst for sustainable economic development for the EU maritime industry" Global Maritime Environmental Congress (GMEC) Hamburg, 4 September 2010  
<sup>[4]</sup> Marine Board - ESP Position Paper 14 (2010), Science dimensions of an Ecosystem Approach to Management of the EU's Marine Resources (SEA-MAP)

# MARINE RESEARCH INFRASTRUCTURES TOWARDS WORLD-CLASS MARINE RESEARCH INFRASTRUCTURES IN EUROPE

*"As a research arena, the ocean is special in two distinct ways: it is costly to access, and highly variable and unpredictable."*

*Marine Research Infrastructures provide unique facilities to the international scientific community to address major marine scientific challenges."*

## Europe today

- Marine Research Infrastructures (MRI) include research vessels and associated equipment, satellites, observing and monitoring networks, data, computer centres and laboratories.
- The total construction costs of all the research infrastructures listed in the European Strategic Forum for Research Infrastructures (ESFRI) roadmap represent 70% of EU-27 capital expenditure on R&D in one year <sup>[1]</sup>.
- The average age of regional research vessels is more than 20 years in Europe. Without decisive planning and investment, the regional research fleet will decline significantly in the next decade <sup>[2]</sup>.
- Almost 2,000 research institutes, data holding centres, monitoring agencies, governmental and private organisations are engaged in oceanographic and marine research activities, data acquisition and information management <sup>[3]</sup>.



<sup>[1]</sup> European Commission (2009), A more research-intensive and integrated ERA - key figures report 2008/2009  
<sup>[2]</sup> Marine Board - ESP Position paper 10 (2007), European Ocean Research Plan - SEA-MAP  
<sup>[3]</sup> SEA-MAPNET - European Directory of Marine Organisations (EDMO)

# MARITIME TRANSPORT MAINTAINING EUROPE'S POLE POSITION IN SUSTAINABLE SHIPPING

*"As a major European industry, sustainable shipping should meet new transport needs, deliver and use innovative technologies, and minimise environmental impacts."*

## Europe today

- Almost 90% of external freight trade in the EU is carried by sea. 40% of internal trade is by short sea shipping <sup>[1]</sup>.
- Around 3,500 million metric tonnes of cargo <sup>[2]</sup> and 350 million passengers <sup>[3]</sup> pass through Europe's ports each year.
- The maritime transport sector in Europe employs 303,000 people directly and 88,000 in related services <sup>[4]</sup>.
- Emissions from maritime transport - Carbon dioxide (CO<sub>2</sub>), Nitrogen oxides (NO<sub>x</sub>), Sulfur oxides (SO<sub>x</sub>) - represent 4.5% of global emissions <sup>[5]</sup>.
- European investment in maritime research amounts to €1.5 billion each year <sup>[6]</sup>.



<sup>[1]</sup> European Parliament (2007), Towards a future maritime policy for the Union: a European vision for the waters and seas (2004/0270/INF)  
<sup>[2]</sup> The Atlas of European Seas and Oceans (Spanish Ministry of Education and Science, 2007)  
<sup>[3]</sup> <http://ec.europa.eu/maritimeaffairs/>  
<sup>[4]</sup> [http://ec.europa.eu/transport/main/index\\_en.htm](http://ec.europa.eu/transport/main/index_en.htm)  
<sup>[5]</sup> Intergovernmental Panel on Climate Change (2008)  
<sup>[6]</sup> Marineres 2008 - Vision 2020 (Maritime transport & operations - a key sector for Europe's Development and Future)