



# **French Marine-Related Economic Data 2007**

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**December 2008**

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The authors are very grateful to the persons they could contact in administrations, public organizations, industry associations and companies, for their major contribution to this report.  
December 2007

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## Foreword by Jean-Yves Perrot, Ifremer Chairman

With the "*French Marine-Related Economic Data*" biennial report being published for ten years now, Ifremer fulfils one of its essential missions complementing its basic missions of research, expertise and marine environment monitoring, so as to support the development of France's maritime economy.

Such a support requires a good knowledge of the matter to be addressed and a most comprehensive description of the characteristics and development of the different sectors of the French maritime economy. This is the purpose of our publication. In this area, progressing is always possible. The present issue shows progress at least in three main areas, so fulfilling the wish I expressed at the publication of the previous edition: a European dimension to be progressively included in the database; more room to be made for environment economy; a more complete approach to the sectors covered by the study, notably inland and maritime transport.

This issue also confirms that the maritime economy of our country includes strong sectors, sometimes unrecognized by the French citizens, such as boat building and offshore services, which play an increasing part, alongside other important sectors (e.g. tourism, fisheries, fish farming, shipbuilding).

However, Ifremer's commitment to supporting our country's maritime economy is not limited to such an economic analysis. Ifremer is indeed – within the scope of its field of expertise – a player in this economy:

- Through the so called competitive clusters. Two such clusters, one in Brittany Region and the other in Provence-Alpes-Côte d'Azur Region, involve a co-operation between enterprises, private and public research centres and high education establishments in the maritime domain. Their objective is to develop the technologies and disciplines which will play an essential role on world markets, for tomorrow's industries and jobs. The working of the two "sea clusters" is co-ordinated, and their actions are programmed under five major topics: maritime safety and security; ship and boat equipment engineering; marine energy resources; biological marine resources and biotechnologies; environment and coastal zone management. Each topic adapts to the geographical and economic specificities of each Regions. Through its participation in research and development projects, Ifremer is involved in the five topics, in co-operation with either of the two clusters, in the marine science areas where the Institute's skills are recognized, notably in biology, marine environment monitoring, and exploration of energy resources.
- Through its action for development, more generally. Our objective for development is to select Ifremer's project with a strong potential to the benefits of the society in general and of business in particular. This mission is included in the four-year contracts of the Institute with the State. Each year, Ifremer applies for more than ten patents including for software, signs research and development contracts with 150-200 private enterprises, 25% of which are foreign groups. Many economic sectors are concerned by the research topics of Ifremer: coastal and offshore environment, submarine interventions, telecommunications, defence, energy and non-energy resources, marine biotechnologies, seafood, fisheries and aquaculture. Patents applications for marine bio-polymers with development in health, cosmetics and environment research; projects on sewage water management in partnership with the water supply industry; technology transfer in the field of aquaculture tanks water management: these are relevant examples of the scope of Ifremer's expertise and of technologies being developed by the Institute.

So, in line with its missions, Ifremer carries on adapting to a new phase of scientific research in a more and more competitive economy.

## Introduction by Regis Kalaydjian, scientific editor of the report

Ifremer launched the publication "*French Marine-Related Economic Data*" ten years ago. Since the first issue, we have tried to reconcile two objectives: to maintain the overall design of the report and its structure, for legibility purposes, and to progress in terms of quality and completeness of data.

We wanted the 2007 issue to meet this dual requirement. Whilst conserving the same subdivision between the industrial sector and public sector, we have concentrated on the strategic sectors of the French maritime economy and on key indicators such as value added, employment and exports, and pursued our efforts to improve our methodology. This effort concerns three essential aspects.

Firstly, the scope of the French maritime economy has evolved. Secondly, in order to harmonise it with other European works, it became necessary to include the rivers: navigation, public works and port services now include a river component. The basic reason for this is the connection between inland shipping and maritime transport, which is certainly much more developed in the Netherlands, Germany and Belgium than in France, but is likely to be developed also in our country, if only for environmental purpose and to relieve road traffic, at the instigation of the European Union. Furthermore, we have drawn the consequences, probably provisional, of the lack of reliable data on sub-contracting in the field of shipbuilding and we have left this activity outside the scope of the report.

Next, our efforts also concerned the reliability of the statistics. More global key figures are provided for submarine cables, public works and port services. They may include data concerning rivers, to give a more exhaustive view of the maritime economy. It was therefore possible to carry out the interannual harmonisation of data and scopes, which enables the evolution of the French maritime economy to be taken into account.

Finally, the effort is also qualitative, insofar as sector-related information seeks to take into account the European dimension of activities and their determinants. This effort, which was largely initiated in the previous issues and which will continue in the future, is of obvious interest: the regulations of the EU and the interdependency of the markets of the Member States bring French maritime activities into a European context, notwithstanding the strategic stakes that the markets outside Europe may represent for them.

This stress on the European dimension meets one of Ifremer's priorities; it takes on all its significance in the political and institutional context of the 2007 issue of the report and which particularly crucial for maritime Europe.

In July 2006, after several months of internal discussions and gather opinions, the European Commission published the "Green Paper" on European maritime policy: "Towards a maritime policy for the Union". This document officially launched an international forum to exchange ideas with a view to defining European maritime policy. Not only the institutions, bodies and European Member States took part in this forum, but also representatives of third countries.

In October 2007, after drawing the conclusions of these discussions in a communication to the Parliament and the Council, the Commission made public the "Blue Book" on a community maritime policy. It would not be appropriate to describe the Commission's project here, but we must mention an important point: the "Action Plan" provided by the "Blue Book" will have consequences on the future form of the "French marine-related economic data" reports published by Ifremer. Indeed, it is in 2009 that the Commission will publish a working document with a view to addressing the inadequacy and lack of harmonisation of statistics on the European maritime economy; it shall set up an integrated data base on the economic and social aspects of the maritime sectors and coastal regions.

No doubt, the French Marine Economic Data report, together with similar works carried out in the United Kingdom, Canada, the United States and Australia, will have had the merit of convincing European decision makers that it was conceivable and technically possible to develop such an integrated maritime data base at national level, despite the lack of statistics that is sometimes difficult to overcome. Better: the data base gradually set up for France will be used directly as a model for that which must be prepared for Europe. But it is no less true that the European initiative will give new impetus to our project. Such a European integrated data base will have the advantage of providing a common analytical framework for all Member States, harmonising the definition of sectors of activities and provide for sounder international economic comparisons between countries of the Union and with third countries.

The report shall therefore be called upon to make even more precise contributions to the setting up of an overall analysis of the European maritime economy. In return, it will evolve positively in terms of form, method and content.

## **A focus on: Renewable marine energy**

The interest manifested by the public authorities and industrialists in Europe for renewable energy, is not unrelated with the objective of limiting emissions of greenhouse gases. Following the Kyoto protocol, the European Union has demonstrated voluntarist objectives in favour of renewable energy. The contribution of the marine sectors to it is still modest, in terms of installed power. But they represent a potentially sensitive case in the exploitation of coastal regions, which could become increasingly important.

Ifremer has completed a prospective analysis of the sources of renewable marine energy, which underscores the economic and social conditions for their development. To echo this work, this chapter briefly reviews the techniques, their stakes and current research.

### **1. The existing techniques**

#### **Offshore wind power**

This is the currently the most developed marine energy throughout the world; it exploits the force of sea winds, which are stronger and more constant than on land. At present, wind power installations are located on the sea bed, no deeper than 30 metres; floating structures are being studied for greater depths.

#### **Energy from marine currents (marine current turbine)**

It uses the kinetic energy of the masses of water displaced by marine currents. Various prototypes are currently being operated.

#### **Tidal power**

The rise and fall of the tide are used to fill or drain a reservoir by operating the turbines of the dam forming the reservoir.

#### **Energy from the waves and swell**

Modules that recover the power of the waves are being tested in pilot installations, on the coast or out to sea, depending on the technique used.

#### **Ocean thermal energy (OTE)**

This technique exploits the difference in temperature between the surface water and the deep water to generate electrical power.

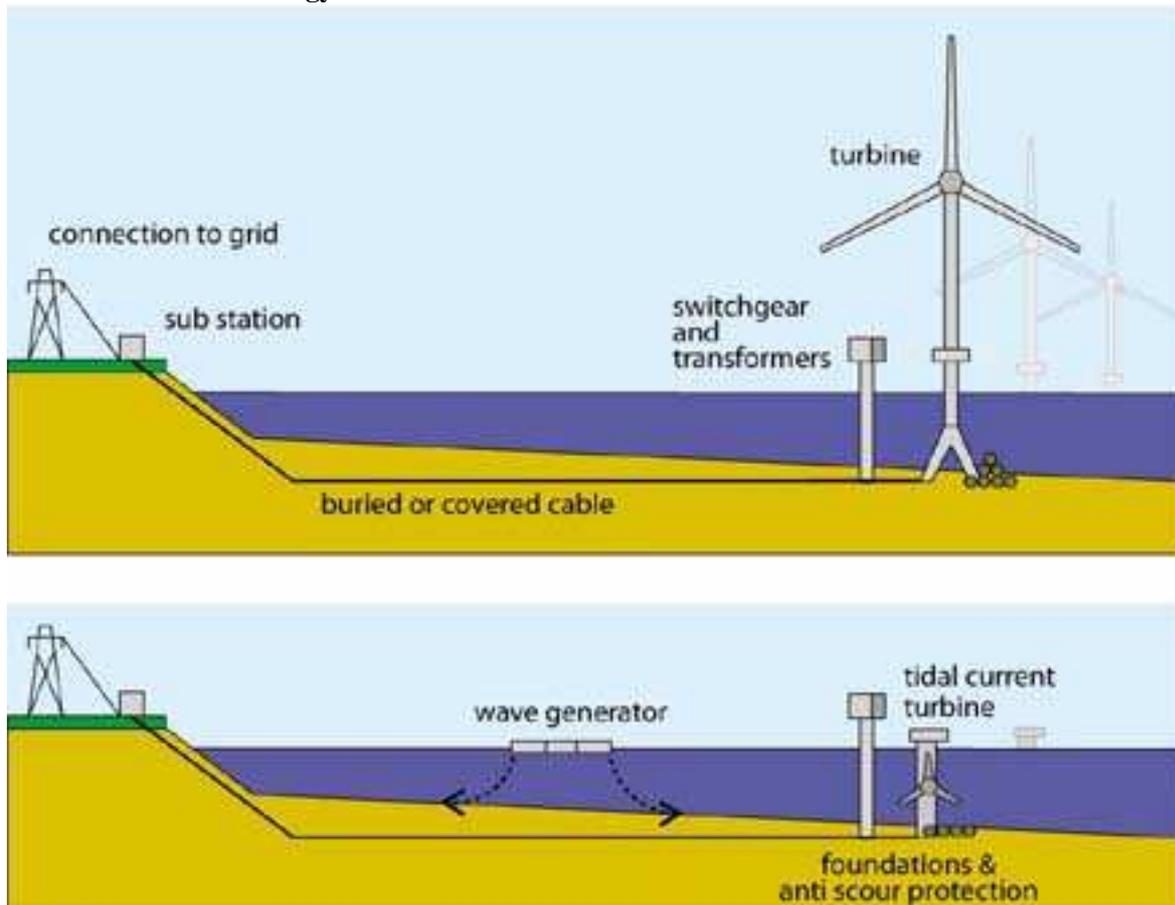
#### **Osmotic energy**

A semi-permeable membrane placed in contact with soft water on one side and sea water on the other, is subject to osmotic pressure used produce energy. This technique is in the research and development phase.

#### **Energy from micro-seaweed**

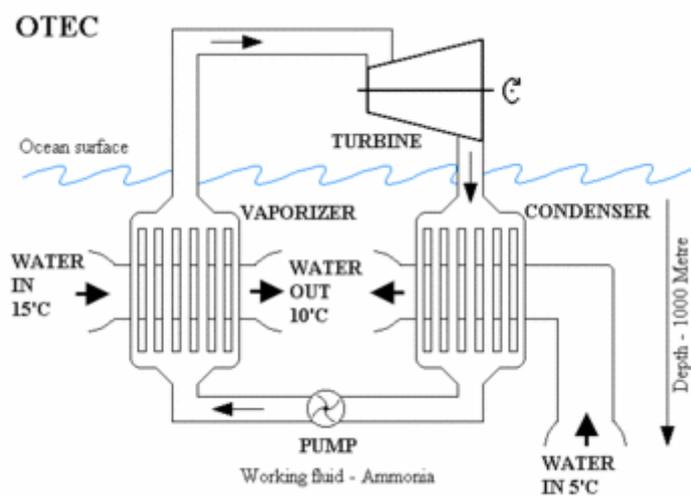
The cultivation of micro-seaweed by photosynthesis (use of solar energy) may be used as a source of biofuel. The biodiesel may be obtained from the lipid in the micro-seaweed.

**Renewable marine energy installations**



Source: Department of Trade and Industry (DTI)

**Ocean thermal energy conversion unit**



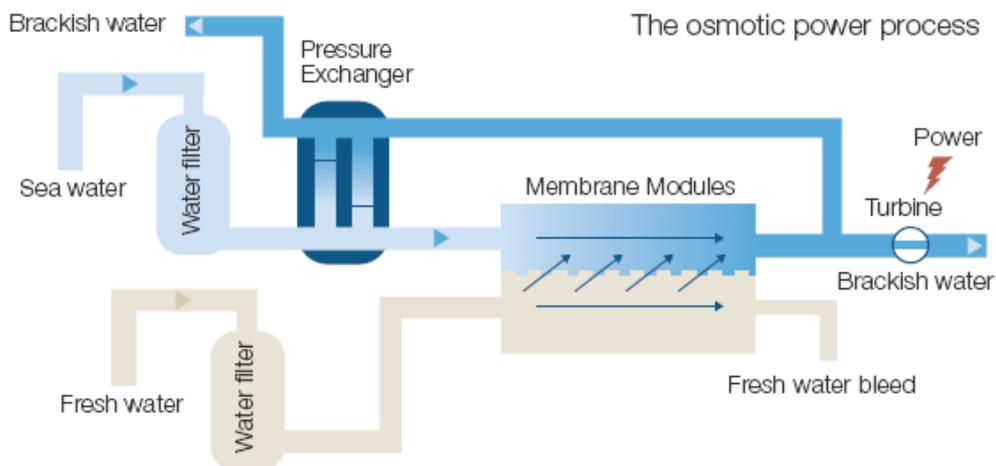
Source: University of the West of England

**Marine current turbines, artist's view**



Source: Marine Current Turbines Ltd.

**Osmotic pressure unit**



Source: Leonardo Energy

**2. The situation of marine energy today**

**2.1. In France**

As early as the 1960s, Metropolitan France introduced tidal power: the power plant on the Rance is still the most powerful tidal power plant currently in service in the world (240 MW). Also in the operational stage, a wind farm offshore the “côte d’Albâtre” is in project stage (21 wind turbines with total installed power of 105 MW, commissioning planned for 2008). In the French overseas territories,

the potential of the marine energy is considered to be high, particularly insofar as wave energy and OTE are concerned.

## 2.2. In Europe

The share of total renewable energy in the primary energy consumption of the countries of EU-25 in 2005 was 6%; it was 14% for their gross consumption of electricity. The directive of the Parliament and Council 2001/77/EC fixes for the Member States objectives for electricity generation by renewable sources, as a percentage of their gross consumption of electricity by 2010; these objectives would lead to an increase of this share to 21% for EU-25.

In Europe, all sectors are concerned by the research: offshore wind energy is in a much more advanced stage of development with more than 1000 MW installed. Apart from France, the European countries committed to marine energy are the United Kingdom (Scotland particularly), Denmark, Germany, Portugal, Ireland, the Netherlands, Belgium, Sweden, Poland, Norway, Spain, Italy and Greece. The United Kingdom, with strong support for R&D, is currently the most committed country (swell and currents particularly).

## 2.3. Throughout the world

As in Europe, research concerns all sectors of marine energy.

- Unlike the Europe, offshore wind power has not yet received operational investments.
- The currents of tides and swell concentrate most R&D efforts and experimentation; the investments are made by large, international energy groups.
- Ocean thermal energy and its derivatives (production of cold or soft water) are the subjects of studies in the United States, Japan and India.

## 3. Outlook

The development of marine energy depends on two factors: i) acceptability for inshore populations and users of coastal regions; ii) policies supporting emerging sectors which are far from industrial maturity.

In terms of political support from the EU, Directive 2001/77/EC is intended to “encourage an increase in the contribution of the renewable sources of energy in the electricity generation on the internal electricity market and lay down the foundations of a future community framework in this field”. The directive requires Member States to promote the increase in the consumption of renewables generated electricity, using appropriate measures to their “national indicative objectives” – namely the share of consumption for 2010 as provided in the directive. Measures include:

- Support plans,
- Guarantees of origin for the supply of final consumers,
- Accelerated, transparent and non-discriminatory administrative procedures,
- Access to electricity networks on a transparent and non-discriminatory basis.

The policies for aid to marine renewables are implemented under different conditions, the most important to which are: the buy-back rate, the green certificate, the system of adjudication and tax incentives. They do not distinguish between terrestrial energy and marine energy.

**Aid plans in favour of the marine renewables\* in the EU**

Type of aid	Description	Advantages	Disadvantages	National policies (situation in 2005)
Buy-back tariff	Special fixed price for a given period, that electricity companies pay to generators. Variant: fixed premium mechanism.	Security of investment, promotion of emerging sectors or deemed to be insufficiently developed.	Difficult to standardize at EU level. May be called into question by the principles of the internal market. Risk of overfunding.	Denmark (over 10 years), Germany (over 20 years), France (over 15 or 20 years depending on source types), Greece (10 years), Ireland, Italy (photovoltaic), Luxembourg (10 or 20 years depending on source types), the Netherlands (10 years), Portugal, Spain (fixed tariff or premium), Czech Rep. (fixed tariff or green bonus), Estonia (7 or 12 years), Hungary, Latvia, Lithuania, Slovenia, Slovakia, Bulgaria, Romania.
Green certificate	Renewables generated power sold at market price. To finance the cost premium of power generation and supply, consumers (resp. producers in certain countries) must buy green certificates from producers at a fixed percentage of their total electricity consumption (resp. production).	Theoretically guarantees return on investment, may operate on a competitive market. Limited risk of overfunding.	Risk for investors. Difficulty in making high cost techniques profitable. High administration costs.	Belgium (Flanders and Wallonia), Italy, Sweden, UK, Bulgaria (proposition).
Call for tender	Public calls for tender for renewables electricity supply. The purchase cost premium is passed on to final consumers in the form of a special tax.	Uses market forces.	Risk of irregularity of calls for tender in time to the detriment of stable generating conditions. Risk of a lowest bidder procedure for certain projects.	Denmark (offshore wind farms), France (electricity generating plants of more than 12 MW).
Tax incentive	Tax exoneration for generators or consumers.	High incentive factor.	Procedure used as add-on policy.	Finland (exoneration from energy tax), Germany, Ireland (for investment in renewables), the Netherlands (investment in renewables and energy tax until 2005), Spain, UK (levy exemption certificates), Malta (low VAT on solar power), Poland, Slovakia, Slovenia (tax on CO <sub>2</sub> ), Bulgaria.

\* All renewable energy sources for electricity generation.

Other examples of support measures: ♦Aids to investment (Austria, Belgium, Finland, Greece, Luxembourg, Portugal, Spain, Sweden, Cyprus, Czech Republic, Estonia until 2015, Lithuania, Slovenia). ♦Minimum price for renewables generated electricity buyback (Belgium). ♦Bonus loans (Germany, Spain). ♦Environmental premiums (Sweden for wind power). ♦Tax on the consumption of electricity (Cyprus). ♦Revision of the electricity tariffs (Czech Rep.). ♦Facilities for access to subsidies (Hungary). ♦Ecological electricity quotas (Latvia since 2002; Sweden: quotas for electricity consumers; Belgium and Italy and UK: quotas for producers). ♦Obligation to purchase renewable energy (Poland, Bulgaria).

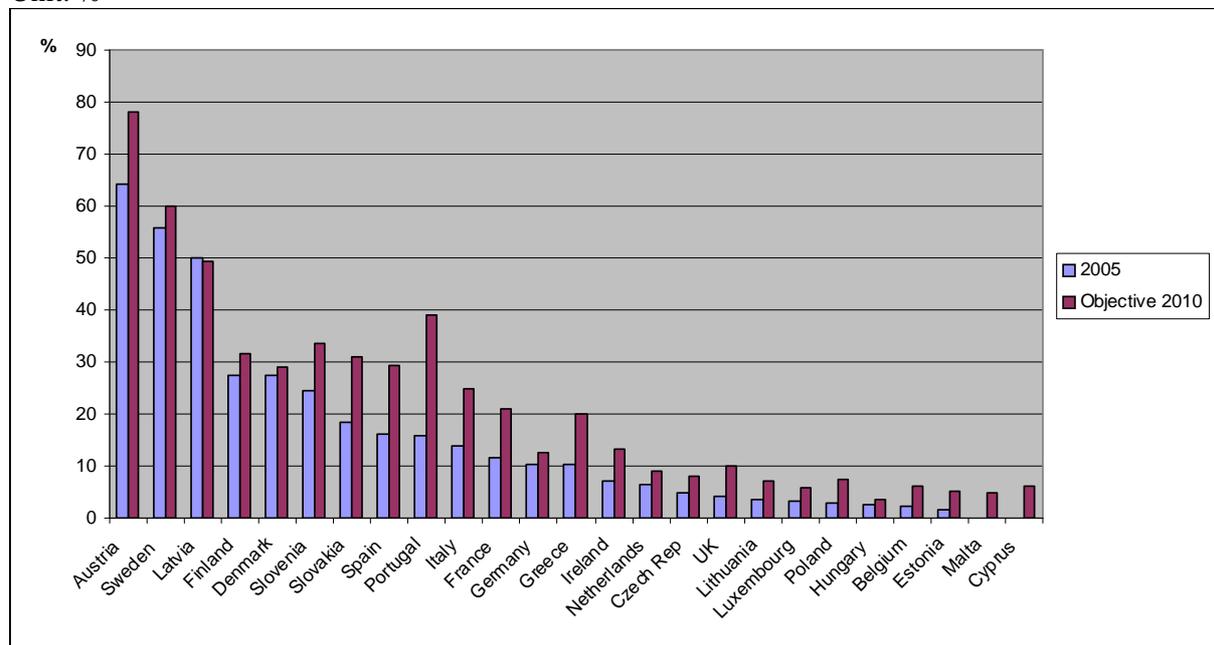
**Offshore wind farms in Europe in 2007**

Country	Number of parks	Installed power	Site and power
UK	8	459MW	Blyth (54MW), North Hoyle (60MW), Scroby Sands (60MW), Kentish Flats (90MW), Barrow (90MW), Moray Firth (10MW), Burbo (90MW), Beatrice Demonstration (5MW).
Denmark	8	426.4MW	Nysted (165.6MW), Horns Rev (160MW), Samsø (23MW), Middelgrunden (40MW), Tunø Knob (5MW), Vindeby (5MW), Rønland (17.2MW), Frederikshavn (10.6MW)
Germany	2	5MW	Rostock (2.5MW), Breitling (2.5MW)
Netherlands	3	126.8MW	Lely (2MW), Dronten (16.8MW), Egmond aan Zee (108MW)
Sweden	3	23.3MW	Bockstigen (2.8MW), Utgrunden (10.5MW), Yttre Stengrund (10MW)
Ireland	1	25MW	Arklow Bank (25MW)
Japan	1	1.2MW	Hokkaido (1.2MW)
Spain	1	10MW	Bilbao (10MW)
<b>TOTAL</b>	<b>27</b>	<b>1,076.7MW</b>	

Source: Ifremer/M.-C. Bégué (2006); Planet (the Netherlands)

**Share of renewable energy\* in the gross consumption of electricity of the countries of the EU**

Unit: %



\* Biomass, geothermal energy, hydroelectricity, wind energy and solar energy.

Source: European Commission, General Directorate for Energy and Transport

## **Industrial sector**

## Seafood products

The sector of seafood products has very diverse forms of production and intermediaries:

- the marine fishery, marine aquaculture (fish farming and shellfish farming), the production of seaweed;
- the fish markets and the fish trade;
- the seafood product processing industry.

### 1. Marine fisheries

#### 1.1. Definition

All categories of marine fishery (from small inshore fishery to the ocean-going tuna fishery) are taken into account here. In the form of fresh or frozen produce, they unload fish, cephalopods, crustaceans, shellfish and seaweed.

#### Key figures for marine fishery <sup>(1)</sup>

	2001	2002	2003	2004	2005
Production (tonnes) <sup>(2)</sup>	606,432	627,453	632,486	597,594	558,304
Turnover (M€)	1,069	1,134	1,144	1,053	1,093
Value added (M€) <sup>(3)</sup>	684	761	776	668	689
Workforce <sup>(4)</sup>	12,919	12,983	13,213	12,484	11,937
Fleet <sup>(5)</sup>	5,539	5,500	5,438	5,216	5,176

(1) Excluding Corsica (approximately 200 vessels).

(2) Including the Seaweed.

(3) Constant value added rate estimated at 67% in 2001, 67% in 2002, 68% in 2003, 63% in 2004 and 63% in 2005.

(4) Ifremer data for the North-Channel-Atlantic seaboard in equivalent full time. OFIMER data for the Mediterranean seaboard (number of seamen working aboard for at least 9 months).

(5) Number of fishing vessels as at 31/12.

Sources: OFIMER, Ministry of Agriculture and Fisheries, Ifremer.

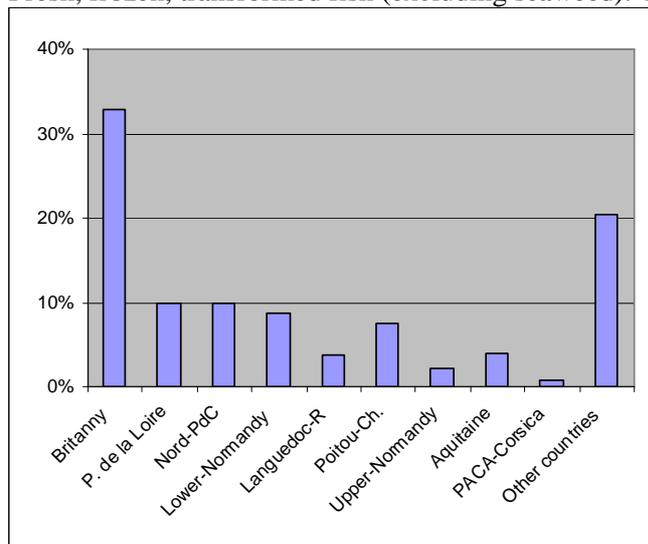
#### 1.2. Trends in activity

French marine fisheries include a wide range of types of vessels and species caught. This diversity is reflected in the fishing techniques used: drag net, pot, trawl, net, lines.

The fleet French of the seaboard of the North-Channel-Atlantic. Two thirds of French catches are made in EC waters (Celtic Sea, Western Scotland, English Channel, North Sea and the Bay of Biscay). The fleet also operates in many other regions of the world. In the framework of the European Union fisheries agreements, the French fleet mainly catches cod and ling off Norway and the Faeroe Islands and tropical tuna off Africa and in the Indian Ocean. It fishes in the French overseas counties and territories: French Guyana (prawns), Reunion Island (tuna and swordfish) and the waters of France's southern and Antarctic territories (Patagonian toothfish and spiny lobster).

### Sale of metropolitan French fisheries by region

Fresh, frozen, transformed fish (excluding seaweed). Year 2005



Source: OFIMER.

Estimated by the Fisheries Ministry at approximately 1 billion Euros, French marine fisheries production was distributed over the entire French coast, led by the Brittany region (33%), well ahead of the Pays de la Loire (10%) and the Nord-Pas-de-Calais (10%) regions. This production is estimated higher by Ifremer: by up to 13% in terms of value for North Sea, Channel and Atlantic vessels under 24 metres. For large Mediterranean vessels, these re-estimates were not affected. The value of production has been dropping since 2003 and the significant reduction in the volume of landings is an area for concern.

Since the early 1990s, the structure of marine fishery production has hardly changed. Fresh fish holds a predominant position for gross income generated by the marine fisheries sector. It accounts for nearly 61% of amounts landed and 86% of total turnover, due to a relatively high average landing price.

Fresh fish make up 42% of landings in terms of tonnage and over 62% of turnover. In the fresh fish category, the species with the highest tonnage caught in 2005 were sardines, scallops and monkfish. The most important species in terms of turnover are monkfish, sole, and hake (so-called noble species, with the highest average prices) along with scallops. In frozen fisheries, tropical tuna is the species caught most.

French production in overseas counties and territories is assessed at 22,400 tonnes (source: OFIMER) and the available information gives breakdowns in volume and value.

**Structure of the production of French marine fisheries in 2005 (including Corsica)**

	Quantity (tonnes)	Turnover (M€)	Average price (€/kg)
Fresh fish	232,596	682	2.9
Crustaceans	16,919	85	5.0
Shellfish	56,695	108	1.9
Cephalopods	20,212	61	3.0
Seaweed <sup>(1)</sup>	14,027	3	0.2
Sub-total fresh fish	340,450	938	2.8
Tropical tuna <sup>(2)</sup>	144,026	122	0.8
Other fish frozen <sup>(3)</sup>	73,852	33	0.4
Sub-total frozen fish	217,879	155	0.7
Total fish *	558,328	1,093	2.0

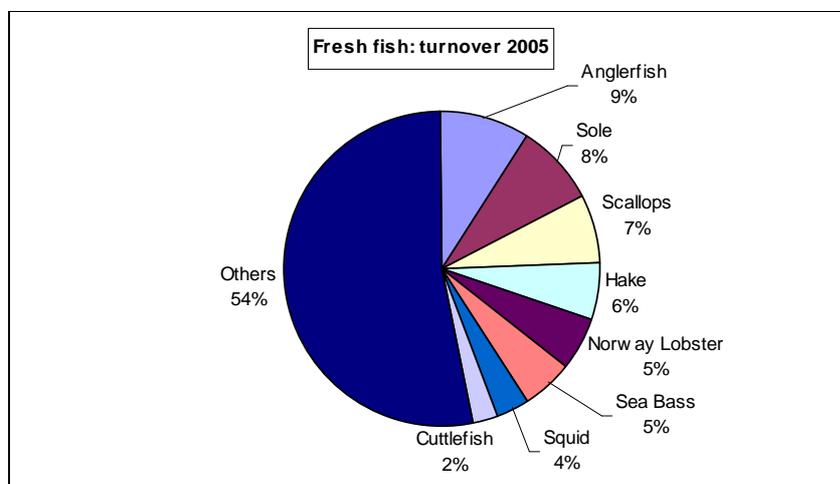
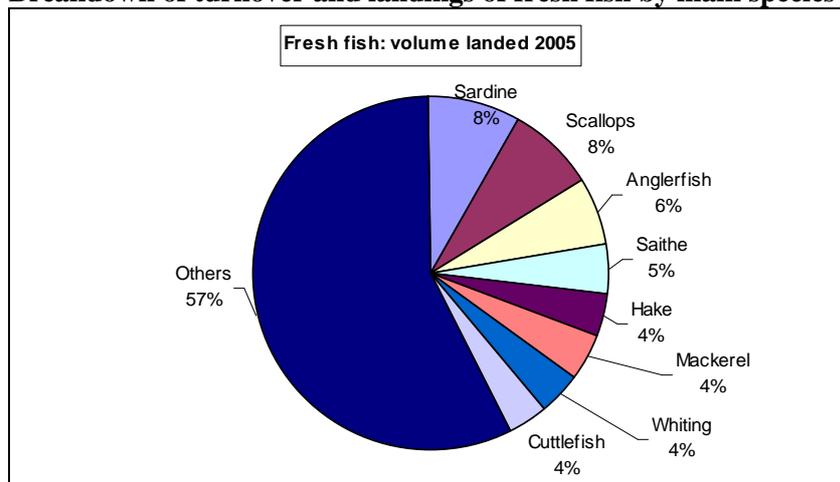
\* Including seaweed.

(1) Quantities expressed in dry weight.

(2) Including amounts landed in countries near fishing zones and counted as exports in foreign trade statistics.

(3) Landings of deep-sea fisheries in the form of frozen filets are measured in the equivalent whole (gutted) landed weight.

Source: OFIMER

**Breakdown of turnover and landings of fresh fish by main species in 2005**


Source: OFIMER

**Production of French overseas fisheries and aquaculture in 2005**

	Quantity (tonnes)	Value (million Euros)
Guadeloupe	10,100	82.0
Martinique	6,200	52.4
Reunion Island	3,146	9.0
French Guyana	2,965	17.3

Source: OFIMER

On the European Union scale, Metropolitan France (excluding Corsica) ranks third and provides 16% of total production in value, estimated at over 6.5 billion Euros. The two leading producers are Spain (1.5 billion Euros) and Italy (1.4 billion), totalling 44% of EU production in terms of value.

**European production of marine fisheries in 2004**

	Turnover (million Euros)	Landings (thousand tonnes)	Average price (Euro/kg)	Workforce	Number of vessels
Total EU-15	6,611	5,254	1.3	175,309	77,704
of which					
Spain <sup>(1)</sup>	1,500	930	1.6	47,757	14,532
Italy	1,380	288	4.8	35,195	14,873
France <sup>(2)</sup>	1,053	598	1.8	12,484	5,216
United Kingdom	740	655	1.1	11,559	6,641
Holland	380	520	0.7	2,245	388
Denmark	352	1,072	0.3	3,200	1,242
Portugal	347	166	2.1	21,345	10,089
Greece	291	91	3.2	30,200	19,022
Ireland	194	316	0.6	5,159	1,414
Germany	176	238	0.7	2,133	2,162
Sweden	91	269	0.3	2,223	1,672
Belgium	86	24	3.6	546	123
Finland	21	87	0.2	574	330
Other European nations					
Norway	1,123	2,374	0.5	9,412	1,913
Iceland	820	1,728	0.5	4,498	1,468

(1) Estimates or data for 2003

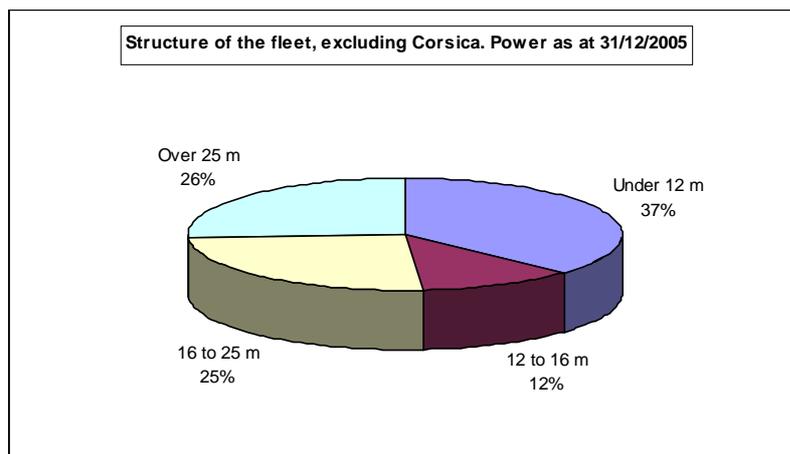
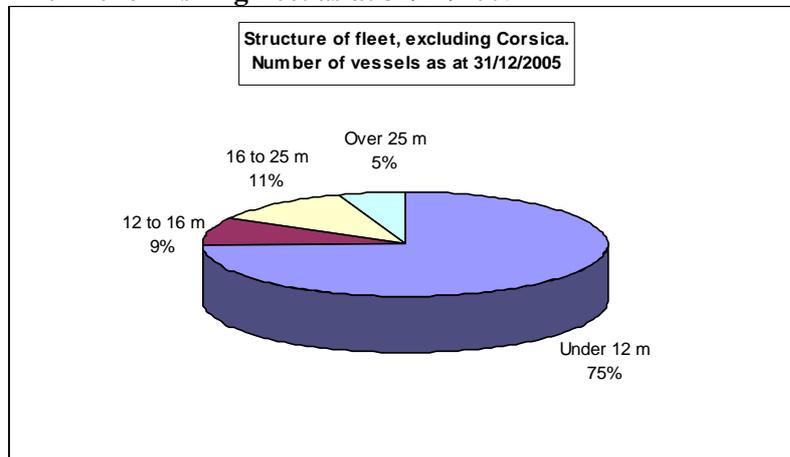
(2) Estimate for Metropolitan France excluding Corsica

Sources: for France: OFIMER, DPMA. For other countries: Concerted European action FAIR PL 97-3541 - Economic Assessment of EU Fisheries - Annual Economic Report 2005.

### 1.3. The French Fleet

The French fisheries fleet, totalling 5,176 vessels as at 31 December 2005, is mostly made up of less than 12 metres vessels. In terms of vessel engine power, the coastal and high sea fleets are equivalent.

#### The French fishing fleet as at 31/12/2005



Source: Ministry of Agriculture and Fisheries

The diagnosis of over-fishing established for a great majority of commercial stock resources led to the setting up of regulatory and incentive measures within the framework of the European Union's Common fisheries policy (CFP). They aim particularly to reduce fishing fleets' catch capacity through fleet exit plans based on the specific or general objectives set out in the MAGPs "multiannual guidance programmes" and, more recently, in the framework of the restoration plan for some specific species like North Sea cod and hake.

More recently, the States undertook, within the framework of the World Summit on sustained development of Johannesburg (2002) to restore fish stocks to the level of MSY (Maximum Sustainable Yield) by 2015. In 2005, France set up the PAP (Plan d'Avenir Pêche – Fisheries Future Plan) to reach these objectives through different measures directly concerning the management of the resource (fishing quotas and permits), measures concerning the selectivity of vessel or, the valorisation of production. In view of the economic context marked by the severe increase in the costs of diesel fuel, other subjects, such as the reduction in energy costs formed part of the discussions.

### Trends in the French fishing fleet from 1995 to 2005\*

Length category	Number of vessels	Power (kW)
less than 12 m	-17%	-6%
12–16 m	-27%	-22%
16–25 m	-27%	-23%
more than 25 m	-4%	-13%
Total	-19%	-14%

\* Excluding Corsica

Source: Ministry of Agriculture and Fisheries

The need to adapt the catch capacity to the condition of European fish stocks has led to French fishing fleet capacity reductions. This has been largely supported by public aid plans to decommission vessels. These trends are measured using the traditional indicators; power and the total tonnage (14% reduction in vessel power since 1995). In view of technical progress, these trends may not reflect actual changes to catching capacity.

#### 1.4. Employment

French fisheries labour force trends are closely linked to fishing capacity cutbacks. Employment data (in full-time equivalents) are difficult to determine on a national level. Ifremer's surveys made it possible to estimate a total of 10,339 seamen in full time equivalents working on the Channel, North Sea and Atlantic seafronts in 2005. The OFIMER data based on the working time on board of seamen complete this initial source in the Mediterranean.

#### 1.5. Outlook

The regulations on access to fish stocks are wide ranging; they go from the selection of the operators to the sharing of capacity between operators. The French fisheries policy is based both on regulation measures by effort (limited number of licenses and effort per vessel) and catches (quotas managed by Producers' Organisations). Certain European countries have opted for ITQs (Individual Transferable fishing Quotas) as an instrument for the management and regulation of fisheries.

The context and objectives of the Johannesburg summit impose the setting up of urgent measures. Recently indeed, scientists have judged the state of certain stocks to be alarming, which has led to measures which resulted in concern in the French maritime sector. This is particularly the case for deepwater species, anchovies in the Atlantic and red tuna in the Mediterranean. The closure of anchovy fishing in the mid-2005 had a negative impact on certain regional fisheries in the Bay of Biscay, which were dependent on it.

Furthermore, the need to set up an eco-systemic approach to the management of fisheries forms part of the recent community obligations.

## 2. Mariculture

### 2.1. Definition

The mariculture sector producing food for humans is composed of two sub-sets:

- shellfish farming or rearing (mainly oysters and mussels);
- “new” mariculture to produce fish (sea bass, bream, salmonids, turbot) and shrimp or prawns (principally tropical shrimp in New Caledonia).

Oysters are also farmed in French Polynesia for pearls.

## 2.2. Trends in activity

Worldwide, aquaculture supplied 48.1 million tonnes of fish, molluscs and crustacean in 2005, i.e. a share of 34% of total fish farming and mariculture production (not including seaweed) (source: FAO). In value, aquaculture yields reached 71 billion dollars (57.1 billion Euros) in 2005. The main forms of mariculture are: fresh water farming (58% volume), marine farming (37%) and farming in brackish water (6%). During the period 1996–2005, the contribution of the aquaculture increased significantly +81% in volume. This growth was due first to land-based aquaculture (an additional 12 million tonnes), then marine aquaculture (7 million tonnes).

In Europe, marine aquaculture is most widespread (79% of the overall value of aquaculture) and reached a yield of 1.7 million tonnes in volume and 4.9 billion dollars in 2005 (4 billion Euros). It is shared mainly between two poles of activity, fish farming (one million tonnes, 3 billion Euros) and shellfish farming (700 thousand tonnes, almost a billion Euros). From 1996 to 2005, the growth of European mariculture (+36% in volume) was mainly due to the growth in production of salmonids, followed by sea bass and sea bream. The main European players in the field of marine fish farming are Norway (57% of production in value in 2005), the United Kingdom (14%), Greece (11%) and Spain (8%). On the other hand, trends in the production of cultivated shellfish, dominated by the mussel breeding and oyster farming, show signs of slowing. The main producer countries in Europe are France (57% of production in value in 2005), Italy (9%), Spain (8%), the Netherlands (8%), Ireland (7%) and the United Kingdom (6%).

As a result of the importance of its shellfish sector, France ranks second among the European mariculture producer countries behind Norway. Oyster farming in France, which represents approximately 90% of the European production of oysters, represented half of French turnover in the field of mariculture French in 2005. Mussel breeding is also an important component (14%), but which is overtake by pearl oyster farming in French Polynesia (18%) in 2005. The marine fish farming in Metropolitan France, mainly concentrated on the farming of sea bass, sea bream, turbot and sea salmonids, contributes for its part 11% (including hatchery activity) to the turnover of the sector.

Trends over the last six years in aquacultural production, in terms of volume, reflects the fluctuations in the contributions of mussel breeding, the relative stability of the production of oysters and the increase in the farming of sea fish in Metropolitan France, which is due partially to renewed activity in the field of salmon farming. Following growth in 2004 and 2005, the production of tropical shrimp in New Caledonia fell back slightly. In terms of value, income from aquacultural activities in overseas counties and territories, which was affected by the crash in pearl prices on the world market in 2003 and 2004, recovered partially in 2005. The data for 2006 show however a further drop in turnover of the pearl oyster farming. In Metropolitan France, the rise in turnover in oyster farming since 2002 is not the result of better paid production but rather a break in a statistical series. Since 2002, estimated production prices have been replaced by prices at shipment (packaged products for consumer sales) to assess the value of commercialised production. The rise in the turnover in 2005 was, on the other hand significant. The hatcheries sector remained stable, if we consider that the drop of the turnover in fish was offset by the increase in turnover in the shellfish sector.

### Key figures for mariculture

Unit: million Euros

	2001	2002	2003	2004	2005	2006
Turnover Metropolitan France	393	457	450	482	475	475
Turnover overseas France	139	141	101	114	126	116
Total turnover	533	598	551	596	601	591
Value added*	373	419	386	417	421	414

\*Average value added rate estimated at 70%

Sources: OFIMER, Ifremer, SFAM, CNC

### Volumes of production in French marine aquaculture

Unit: tonnes

	2001	2002	2003	2004	2005	2006
Oysters	128,500	131,100	129,300	128,500	130,000	130,000
Mussels	59,500	64,500	56,000	64,180	58,000	58,000
Other shellfish	5,100	4,000	3,500	5,000	3,650	3,650
Sea and amphihaline finfish	5,605	6,943	6,748	7,229	7,998	7,998
Tropical sea fish	163	269	342	309	318	318
Tropical shrimp	1,854	1,860	1,748	2,256	2,439	2,278

Sources: OFIMER, Ifremer, SFAM, CNC

### Turnover figures for French marine aquaculture

Unit: million Euros

	2001	2002	2003	2004	2005	2006
Oysters	238	287	286	289	296	296
Mussels	85	91	82	97	85	85
Other shellfish	17	17	16	23	17	17
Sea and amphihaline finfish	34	40	41	48	51	51
Tropical sea fish	0.9	1.5	2.0	1.7	1.9	1.9
Farmed pearls	125	124	86	95	108	101
Tropical shrimp	14	16	13	17	16	13
Sea fish hatcheries	14	15	17	16	15	14
Shellfish hatcheries	6	8	9	10	12	12

Sources: OFIMER, Ifremer, SFAM, CNC

## 2.3. Employment and companies

Enterprises and employment in mariculture mainly come from shellfish farming (94% of jobs).

The last exhaustive data available are from the DPMA survey on aquaculture in 2002. Insofar as labour is concerned, the survey showed a labour force of 19,329 permanent, part time or seasonal jobs in 2002, corresponding to a total of 10,542 full-time equivalents. These firms, most of which (78%) have sole proprietor status, generally employ a family-based labour force. The heads of operations, co-operators and other working family members (including salaried staff) make up 74% of all jobs. Nearly three-quarters of shellfish farms are also involved in shellfish trade and thus have been approved by health authorities to sell their finished products for human consumption.

One third of shellfish farms are found in the Poitou-Charentes region. The Mediterranean and southern Brittany regions are next, with respectively 18% and 13% of French firms. In terms of jobs, the Mediterranean region, owing to a large number of small enterprises, ranks only third for shellfish farming regions, tied with the Northern France-Normandy sector which has the highest jobs/enterprise ratio.

#### Geographical breakdown of companies and employment in the shellfish sector

	North Normandy	Northern Brittany	Southern Brittany	Pays de Loire	Poitou- Charentes	Aquitaine	Mediterranean
Number of companies	311	258	493	376	1 249	368	664
Percentage of companies	8%	7%	13%	10%	34%	10%	18%
Number of jobs (equivalent full time)	1,327	960	1,642	884	3,639	746	1,327
Percentage of the total number of jobs in the shellfish sector	13%	9%	16%	8%	35%	7%	13%

Source: DPMA - BCS - Aquaculture Survey 2002

In addition, 67 enterprises in metropolitan France involved in seafarming activities (finfish, prawns, seaweed) were recorded in that survey. They employ 645 full-time equivalents. Most of their activity is in the fish farming field (52 firms), which covers both the hatchery and grow-out sectors. Seabass and bream farming are mainly done in the Mediterranean and North of France regions. Turbot farming, which has fewer people involved, is done on the Atlantic seafront (Pays de la Loire, Poitou-Charentes) while salmonid production, on the rise since salmon rearing was boosted, is concentrated in Brittany and Normandy.

## 2.4. Outlook

In metropolitan France, the context of regulations and policies for use of the coastal zone limits mariculture's expansion. Marine finfish farming, the most recent activity to get a foothold on the coastal area coveted by many users, has not been able to develop like that of Greek or even Italian and Spanish fish farming, in spite of its lead in terms of scientific research. Yet, market access remains another crucial issue for the development of seabass and bream growout in France, in a context of increasing competition from Greece and Turkey on European markets. The companies use strategies like diversification of production with large sizes or new species like meagre, as well as developing quality approaches to adapt to competition and ensure their market outlets. In the medium term, efforts in genetic selection research should provide significant production gains, while consolidating the advance held by French hatcheries. Overseas, along with shrimp farming, which is well established in New Caledonia, new aquaculture streams based on fast-growing marine finfish are emerging, like that of red drum and perhaps cobia, in Martinique, Reunion and Mayotte. The development of these fish farming sectors is however subject to competition on the export markets, particularly within Europe.

Problems related to the coastal area also affect shellfish farming. They could lead the profession to ask for new authorisations to extend seaward (deep water farms) or to some restructuring on state-owned land on the seafront. The environmental constraints (degraded coastal water quality, climatic factors, toxic plankton blooms) will also influence the cost-effectiveness of shellfish farming enterprises in the long term, especially if health standards regulating the sale and consumption of live shellfish become more stringent. As in the finfish farming sector, genetic selection research programmes are expected to provide solutions to improve animal's survival rate and growth conditions. Monitoring coastal water quality and problems of development and planning of the public maritime domain remain, all the same, at the heart of the system set up by the public authorities and Ifremer to manage the shellfish farming activity

### 3. Landed product trade: fish auctions

#### 3.1. Definition

Fish auctions are where the fishermen offer their supply to buyers, fishmongers and wholesale traders. They are also the place producer organisations exercise their authority and control to set the withdrawal price.

#### 3.2. Situation and trends in activity

Operating conditions for fish auctions are governed by local regulations. They are managed by chambers of commerce and industry (80% of cases), by cooperatives, local marine fisheries committees or semi-public companies.

There are 44 fish auctions in France, 42 of which are in Metropolitan France. In 2006, the first four in terms of value were Boulogne, Le Guilvinec, Lorient and Concarneau.

In 2006, 231,000 tonnes of seafood products (695 million Euros) were sold in fish auctions (production of vessels under the French flag), which corresponds to estimated turnover of approximately 60 million Euros and added value of 50 million Euros (Ifremer estimates on the basis of information from the profession). These 231,000 tonnes are broken down as follows: 170,000 tonnes of fish, 52,000 tonnes of molluscs (shellfish and cephalopods) and 9,000 tonnes of crustaceans.

Fish auctions are not only points of sale, but also points where catch statistics are recorded. In some fisheries, like that of scallops in the Saint-Brieuc bay, sales can only be made through fish auctions.

### 4. Fish trade and wholesale trade of seafood products

#### 4.1. Definition

The wholesale trade of the seafood products is made up of fish trading companies and a large number of small companies involved in the trade. The first are, along with processing firms and wholesale purchasers, the main middlemen between fishermen and seafood distributors. They carry out technical (batching, processing, packaging, etc.) and commercial tasks and are a link in the French fisheries chain. However, this type of intermediary does not exist in other European countries or exists in other forms, similar to wholesaling or processing activities. Their status is set out in the 1997 framework law on marine fisheries and mariculture

#### Key figures for wholesale trade of seafood products

	2000	2001	2002	2003	2004	2005
Total production (m Euros)	3,489	3,654	3,991	4,183	4,144	4,281
Value added* (m Euros)	333	355	386	399	402	404
Employment** (number of staff)	8,689	8,735	8,402	8,801	9,084	8,579
Number of companies***	1,179	1,189	1,159	1,169	1,171	1,115

\* Value added at factor costs

\*\* Salaried employees

\*\*\* Including 130 to 150 sole proprietorships, depending on years

Source: SUSE, SIRENE (INSEE).

## 4.2. Situation and trends in activity

According to OFIMER, almost 5,500 people work in 380 fish trading companies in France. The turnover of the sector is estimated at 2 billion Euros for an added value of 260 million Euros.

Past trends have highlighted considerable restructuring since the late 1980s. The number of firms fell from 680 in 1989 to 322 in 1997, then to 308 in 1999 (source: Ofimer). Along with this concentration, the average size of firms grew, particularly to become compliant with health standards for wholesale fish trade workshops.

The fish trading companies are mainly located on the Atlantic-Channel-North Sea seaboard, but a large part of the sector's turnover is generated in the Nord - Pas-de-Calais region and in Brittany

## 5. Exploitation and processing of the seaweed

### 5.1. Definition

Seaweeds are marine plants gathered on the shore or harvested at sea. The production is mainly used for extracting gelling agents (colloids). It has also outlets in farming, para-pharmaceuticals and the food industry.

### 5.2. Situation and trends in activity

Conditions for seaweed exploitation are regulated by decree; moreover, their harvesting is subject to inter-professional regulations. A large part of the national supply is provided by the mechanised harvesting of laminaria beds. This is mainly done in the Finistère region, while fucus, chondrus and other species are collected on foot in scattered sites along the coast. In 2005, sea fishing reached approximately 14,000 tonnes for a turnover of approximately 3 million Euros. The production covers about two thirds of processors' requirements. Seaweed farming has remained a very marginal activity in France, with less than 100 tonnes produced, whereas seafood farming and harvesting respectively produce 11.5 and 2 million tonnes worldwide.

Seaweed processing (including maerl) generated turnover of nearly 300 million Euros in 2004 for an added value estimated at approximately 185 million Euros. This activity mainly concerns macro-algae (97% of firms' turnover); most of the enterprises are located in Brittany. The main market outlets are cosmetics, colloids and, to a lesser degree, agriculture.

The "seaweed" sector employs nearly 1,800 people. There is a very wide range of types of firms working in the various market segments. Colloids are produced by units belonging to international chemical groups, while small-sized enterprises are involved in processing of edible seaweed.

## 6. Processing of seafood products

### 6.1. Definition

The seafood processing industry includes companies whose activity consists in manufacturing products for human consumption from fish, crustaceans, molluscs and cephalopods. It uses various conservation techniques and manufacturing processes. This scoping does not include those companies which only fillet fish (fish traders) or those specialised in seaweed processing.

### 6.2. Trends of the sector: activity indicators on the rise

The seafood processing industry is a small component of the French food processing industry. In 2005, with 3.2 billion Euros, the turnover from seafood processing accounted for 2.5% of the food

processing industry turnover (almost 126 billion Euros). These data come from the yearly company survey carried out by the SCEES central statistical studies and surveys service on firms in the food processing industry with over 20 employees or making more than 5 billion Euros in turnover. They highlight the dynamic nature of the seafood product sector. Between 2000 and 2005, turnover for the seafood industry on the whole rose by 26%, i.e. two and a half times more quickly than that of the food processing industry as a whole (+10%). However, the levels of exports, although slightly up for the same period, stabilised at just over 10%, which is much less than that of food processing industries overall (18%). The activity is supported by slightly higher French consumption of aquatic products, with an increasing preference for prepared products.

#### Key figures for seafood processing

	2000	2001	2002	2003	2004	2005
Number of companies	128	141	140	152	150	144
Number of staff	12,632	13,347	13,428	14,326	13,614	13,502
Turnover (m Euros)	2,502	2,871	2,858	3,077	3,049	3,150
Value added (m Euros)	424	510	548	650	631	638
Export rate (%)	9.2	9.4	9.7	9.8	10.4	10.2

Source: SCEES.

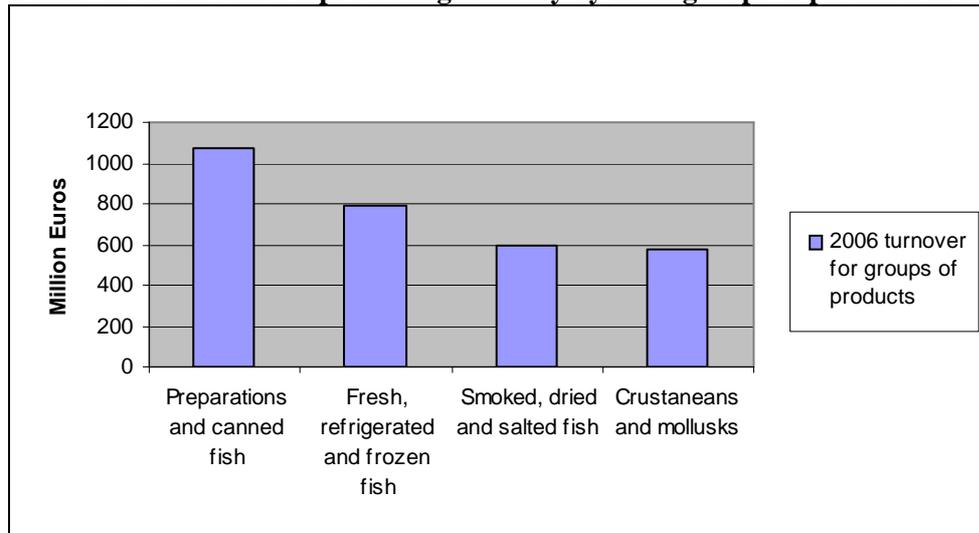
### 6.3. Indicators for the seafood processing industry

Due to the selection criteria used, the SCEES surveys of agrifood processing companies do not perfectly overlap with the seafood processing industry. To improve study of this sector, Ifremer made a branch study which included small enterprises and those for which seafood processing is not the main activity. In comparison with the SCEES sector-based survey, the industry survey for 2005 identified a wider total population (269 companies), which generates a turnover exclusively in the activity seafood processing industry of slightly less (approximately 3 billion Euros), for a slightly higher number of jobs (approximately 14,000 jobs).

For commercialised production, the SCEES uses a branch-based approach to build the Prodcom database, where French seafood production is broken down into groups of products. The largest sales volume segment is that of fish-based canned or prepared foods, with 35% of the sector's turnover, including 10% for canned tuna, mackerel and sardines, followed by fresh, chilled and frozen fish which make up 26% of the sector's turnover, of which 19% is for fish filets. The smoked, dried or salted fish segment, representing 20% of sector turnover, has smoked salmon production in a predominant position (16% of total turnover for the sector).

Between 2002 and 2006, only two segments, smoked, dried and salt fish and fresh, refrigerated and frozen fish, showed growth in marketed production both in terms of volume and value. The performances of the segment of the smoked, dried or salt fish were driven by smoked salmon (+35% in terms of value and +28% in terms of volume over the period) and those of the fresh, refrigerated and frozen fish segment rely on catches (+31% in terms of value and +18% in terms of volume over the period). The canned seafood segment is declining. Finally, shellfish, both crustaceans and molluscs, rose in volume, but dropped in value, which show the difficulty of valorising these products.

### Turnover of the seafood processing industry by main groups of products in 2006



Source: SCEES, based on data from Agreste, ADEPALE Association of processed food industry, FIAC French association of canned food industry, FICT French association of meat processed and traiteur products industry.

### Turnover by type of product in 2006 and trends in marketed production

	Breakdown of production value 2006	Turnover growth 2002-2006	Sales volume growth 2002-2006
<b>Preparations and canned fish</b>	35%	-4%	-6%
<i>Including canned Tuna, Mackerel and Sardines</i>	10%	-12%	-23%
<b>Fresh, refrigerated or frozen fish</b>	26%	22%	9%
<i>Including fillets of fish</i>	19%	31%	18%
<b>Smoked, dried or salted fish</b>	20%	26%	16%
<i>Including smoked Salmon</i>	16%	35%	28%
<b>Crustaceans and mollusks</b>	19%	-1%	12%
<b>Total *</b>	<b>100%</b>	<b>8%</b>	<b>3%</b>

\* Excluding fishmeal and other products (liver, eggs and roe, caviar).

Source: Agreste, ADEPALE, FIAC, FICT.

### Breakdown of retail sales by type of products and trends for 2001–2005

	Breakdown of sales value 2005	Growth in sales value 2001-2005, discounted for 2005
Refrigerated deli products	28%	12%
Frozen fish	27%	3%
Canned fish	18%	-2%
Smoked, salted and dried products	11%	7%
Cooked prawns	6%	11%
Surimis	6%	15%
Other deli products	5%	23%

Source: OFIMER and TNS-Worldpanel.

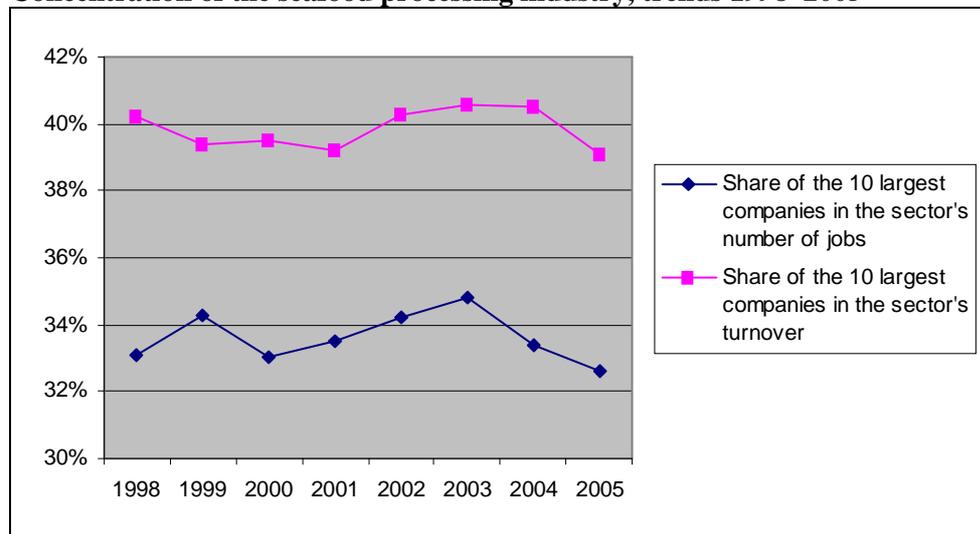
The industry's activity nationwide can be compared with all consumer sales in France, which Ofimer has estimated using consumer panels monitored by TNS-Worldpanel – apart from consumption outside the home, which only represents a small part of the total consumption of processed seafood

products. Four segments dominate the consumption of processed seafood products of French households: chilled deli products, frozen products, canned products and smoked fish (mainly salmon), which accounted for 28%, 27%, 18% and 11% of sales respectively in 2005. However, of these four sectors, only chilled deli products increased significantly (+12% in value since 2001) and smoked, salted and dried fish (+7%) since 2001, while the two other activities seem to be close to maturity (frozen products +3%) or even falling off (canned products (-2%). The growth dynamics of sales of the smaller segments of cooked prawns, surimis and other deli products are high in terms of value.

#### 6.4. Concentration of the industry

According to SCEES data, in 2005, the sector only had 6 companies with more than 500 employees and 14 other which employed more than 250 people. On the other hand, the OFIMER and of Ifremer survey of the industry estimated the number of companies with less than 20 employees at more than one hundred. The level of concentration of the sector is therefore relatively high: the top 10 companies make over 40% of sales and provide more than 30% of the salaried jobs in the sector. Following the pattern which predominates in the food processing industry overall, many small and medium size companies coexist with a few large companies of national or even international renown.

#### Concentration of the seafood processing industry, trends 1998–2005



Source: SCEES.

#### 6.5 Geographical breakdown

The companies in this sector are almost exclusively located along the coast. According to SCEES data for 2005, five regions: Brittany, Nord-Pas-de-Calais, Pays de la Loire, Lower Normandy and Aquitaine, concentrate 67% of the companies, 87% of the salaried workforce and 84% of the turnover. According to the OFIMER-Ifremer industry survey, the counties which have the largest number of companies are Finistère (38), Pas-de-Calais (22), Morbihan (15), Vendée (13) and Loire-Atlantic (11).

**Breakdown of seafood processing companies by France's mainland regions in 2005**

	Number of companies	Average salaried workforce	Net turnover (m Euros)	Value added (m Euros)
Brittany	44	5554	1151	240
Nord - Pas-de-Calais	21	2347	576	96
Pays de la Loire	13	785	163	32
Aquitaine	10	1974	360	96
Lower Normandy	9	1132	397	78
Languedoc-Roussillon	7	256	42	11
Ile-de-France	6	212	42	11
Burgundy	5	195	35	8
Upper Normandy	5	440	59	11
Provence-Alpes-Côte d'Azur	5	182	159	16
Rhône-Alpes	5	146	21	7
Alsace	3	c	c	c
Auvergne	3	c	c	c
Centre	3	175	36	11
Poitou-Charentes	3	110	13	5
Franche-Comté	1	c	c	c
Picardy	1	c	c	c
Champagne-Ardenne	0	-	-	-
Corsica	0	-	-	-
Limousin	0	-	-	-
Lorraine	0	-	-	-
Midi-Pyrénées	0	-	-	-

"c": confidential

"-": nil or close to nil

Source: SCEES

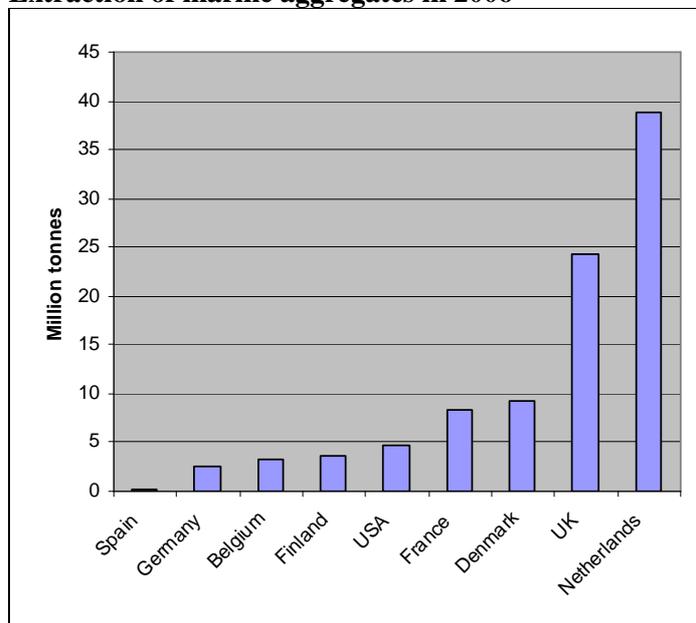
## Extraction of marine aggregates

The marine aggregates exploited in Metropolitan France include silica sands and gravels on the one hand, calcareous sands and maerl, on the other. The first category is used in the construction industry and public works; the second mainly in agriculture (soil improvement) and the filtration of water for human consumption. There are also sites in Guadeloupe (mixed volcanic and calcareous sands for construction and public works) and Saint-Pierre-et-Miquelon (silica sands and gravels).

### 1. Situation of the activity throughout the world

At present, the extraction of marine aggregates is a mainly European activity. Great heterogeneity exists between countries within Europe: from the Netherlands, leading producer with 39 million tonnes, to Spain, with a low production amount.

#### Extraction of marine aggregates in 2006



USA data concern the East coast.

Source: ICES, WGEXT Report 2007

### 2. Situation of the activity in France

#### 2.1. Production

The production of marine aggregates in France represents 1.2% of the national production of construction materials, estimated 557 million tonnes for 2005 (source: UNPG), as compared to a 15.3% ratio in the UK in 2000 (source: ONS).

### Production of marine silica aggregates in Metropolitan France

Unit: thousand of tonnes

	2000	2001	2002	2003	2004	2005	2006
Extraction*							
Channel	690	1,230	1,240	1,160	1,190	1,220	1,270
Brittany	60	35	10	30	30	0	0
Atlantic coastline	3,700	4,100	4,150	4,730	4,650	5,310	5,350
Total	4,450	5,365	5,400	5,920	5,870	6,530	6,620

\* Mostly silica aggregates. Excluding the extraction of maerl.

Source: UNPG

Extraction is shared between:

- silica aggregates, for more than 6 million tonnes in Metropolitan France. To this growing level of production we should add production of approximately 300,000 tonnes from Guadeloupe, from a single site and the very low level of production of Saint-Martin and that of Saint-Pierre-et-Miquelon of 20,000 tonnes;
- calcareous materials, for approximately 420,000 tonnes in Metropolitan France, in 2005. The production is made up of maerl and calcareous sands. The former is used as a processed soil improver, or as a component in animal feed or of fertiliser; the latter as raw soil improver or as an ingredient of animal feed.

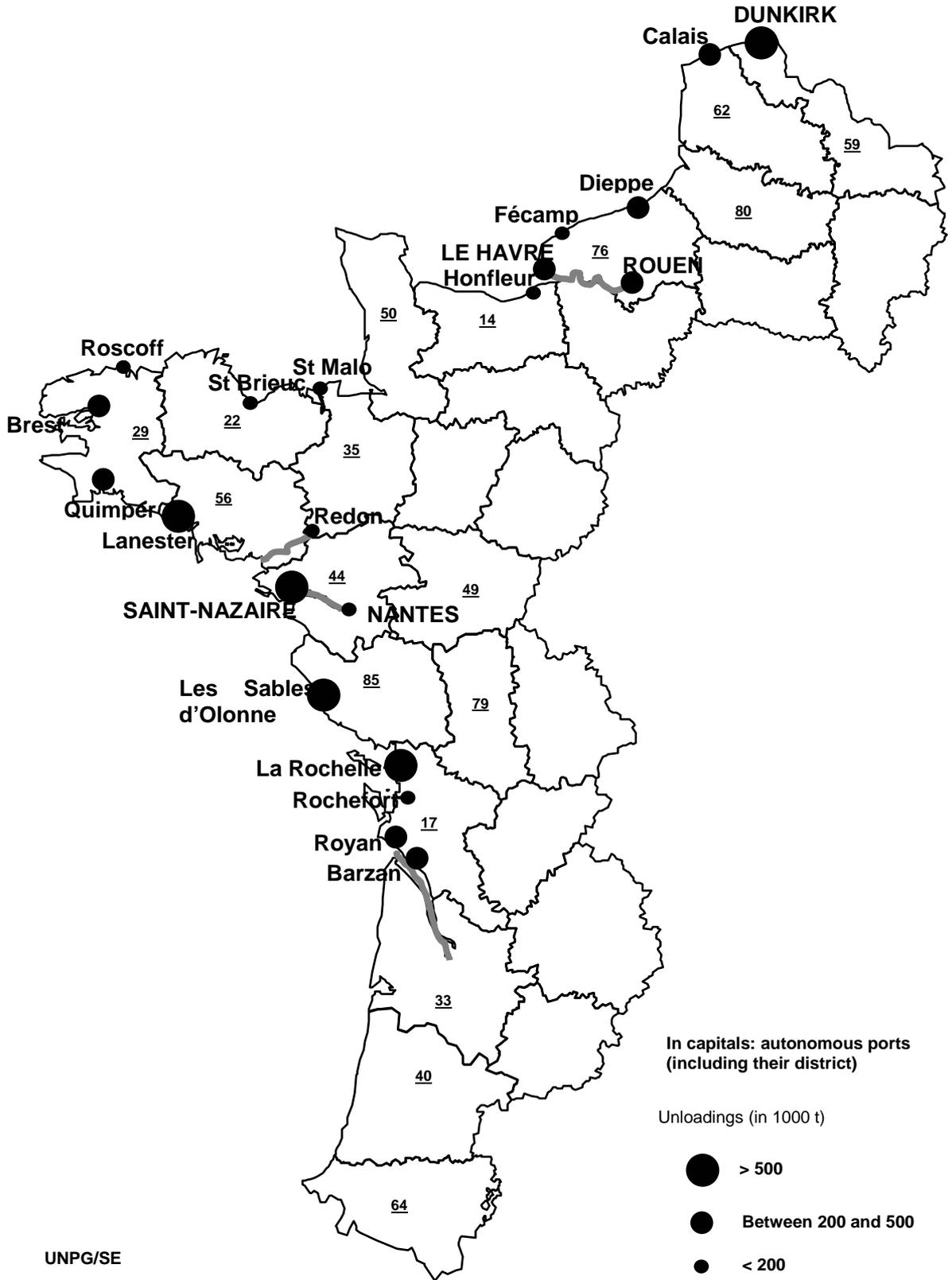
Extraction of marine aggregates is governed by environmental and mining laws, in particular, and requires the issue of a mining title deed, a national permit and authorisation for work to begin, along with an impact study. Extracting maerl and calcareous sand is subject to quotas and authorisation from the prefect. The provisions of the regulation were subject to:

- harmonisation by the law 97-1051 of November 1997, which places calcareous materials under the mining system;
- a simplification of procedures by decree 2006-798 of 6 July 2006 concerning marine aggregates from the public domain and continental shelf in metropolitan France: operators may now submit applications for three claims at the same time. The investigation procedure provides for an enquiry chaired by the investigating prefect and the maritime prefect and in which Ifremer and representatives of the stakeholders of the coastal zone and the project concerned, take part.

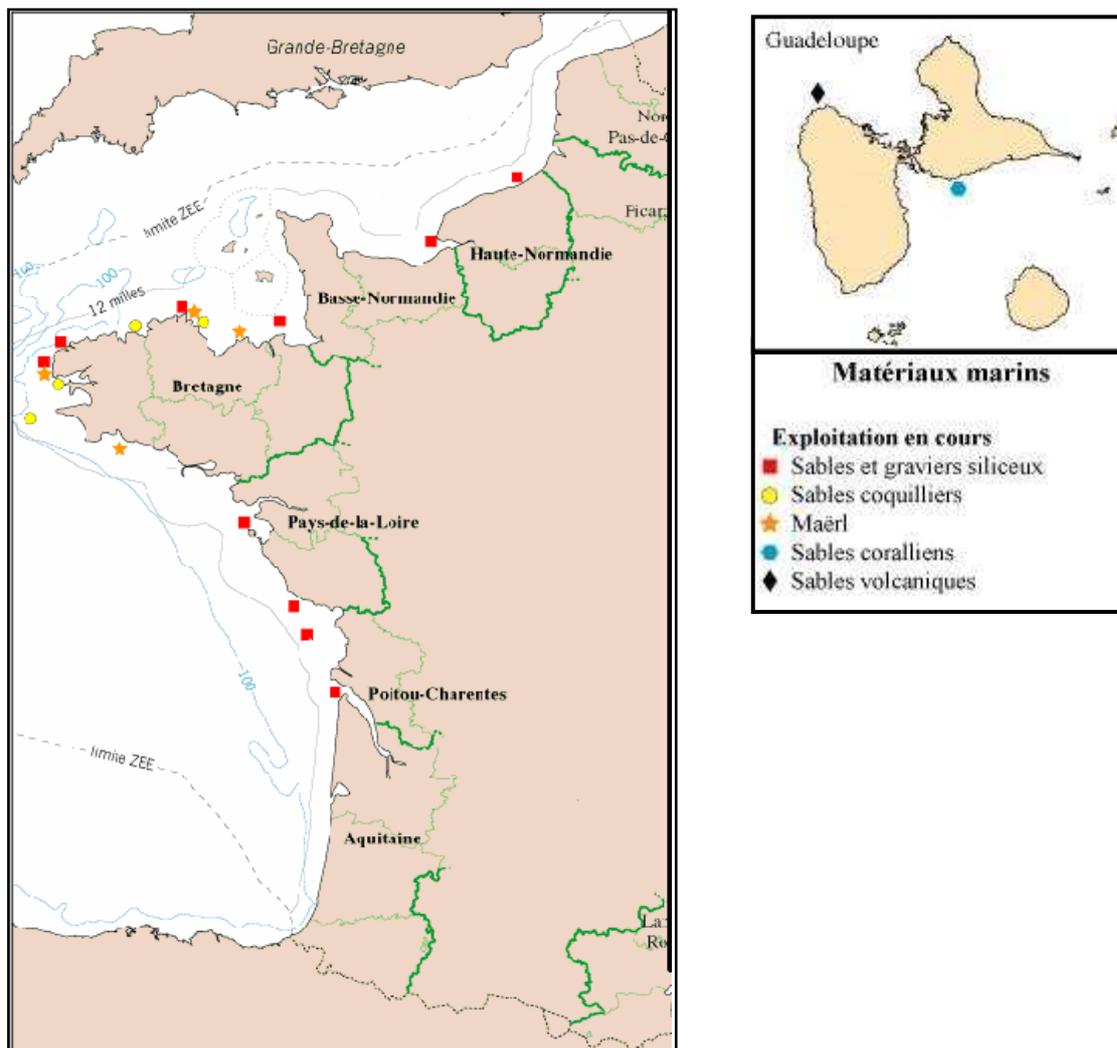
The main centres of production of silica aggregates are between the Seine-Maritime and Gironde counties, in shallow areas (less than 30 metre deep). The production site main is the mouth of the Loire. The production of calcareous materials is located in Brittany, where there are four sites exploiting maerl.

Whilst the scope of the activity is limited to extraction, unloading, drying and calibration, up to loading for delivery for processing, overall turnover is approximately 25 million Euros (Ifremer estimate after consultation of the industry). Value added is approximately 10 million Euros (Ifremer estimate from SESSI data).

French ports unloading mostly silica aggregates in 2006



UNPG/SE



Source: document by Claude Augris, Ifremer.

## 2.2. Employment and companies

For siliceous materials, direct employment is estimated to be approximately 200 seamen and 100 on-shore staff (administrative, sales and technical duties) according to Ifremer. There are dozen firms using 16 sand dredging vessels. Some of these companies process these materials and sell them for ready-to-use concrete or civil engineering operations. Marine materials are also extracted by industrial firms mining land-based deposits, in an effort to diversify their supplies. Extracting can then be subcontracted to specialised international companies. They are also used for construction and civil engineering work.

The shipowners working in calcareous material extraction do so in four companies employing a hundred seaman and ten vessels.

## 2.3. Outlook in France

Ifremer estimates the resources of marine materials in French territorial waters to be 149 billion m<sup>3</sup> on the East Channel coastline and 19.8 billion m<sup>3</sup> on the Loire-Gironde coast, whilst French production remains modest in relation to this great potential, the numbers of applications for extraction permits are now growing, but they are subject to environmental impact assessments of the work.

## Electricity generation

The electricity generating units on the French coast are conventional fossil fuel power plants, nuclear power plants and wind turbines. Additionally, a tidal power plant operates on an estuary. The sea, a natural and stable source of cold, makes the proximity of the coast particularly interesting for the construction of nuclear or fossil fuel power plants. Such locations provide for significant savings in the cost of transport of raw materials. The sea also provides tidal energy. Very windy coastal regions are strategic for the location of wind turbines, for which projects for installation at sea off our coasts exist.

### Activity

Effective employment of the ten French coastal power plants in 2006 was down in relation to 2005 (-2.8%), whilst installed power remained virtually the same. 85% of the employees of the coastal power plants (6,475 to the total) work in the nuclear sector. With 78% of the total, net installed power on the coast of 25,320 MWe, nuclear power is the most important coastal sector. The 18 coastal units represent slightly more than 30% of the French installed nuclear power.

The oldest units are gradually being decommissioned (unit 3 at Le Havre, unit 5 at Cordemais, unit 4 at Martigues) to be replaced by new plants, for example, combined cycle gas turbines (Dunkirk, Martigues project) and pressurised water reactors (EPR project at Flamanville).

By the ratification of the Kyoto protocol in 1997, the Member States of the European Union undertook to contribute to the European objective of reducing greenhouse gases. This objective takes the share of renewable energy in gross domestic energy consumption to the threshold of 12% with, particularly, 21% of renewables generated electricity in the total electricity consumption by 2010 (see 1997 White paper on renewable energy; directive 2001/77/EC). According to the ADEME (French Environment and Energy Management Agency), the French commitment would lead to tripling the share of wind power in its production of renewables generated electricity between 1997 and 2010, taking installed wind power to 14,000 MW in 2010. In France, these commitments were formalised by the programme law of 13 July 2005, which fixed the energy policy guide lines, together with the "multiannual programming of investments" (PPI) of electricity generation (order of 7 March 2003), which fixed the generation of electricity by wind power at 2,000–6,000 of MW installed power in 2007.

Installed wind power capacity is very variable according to the country. In Europe, the units are installed on the coast and at sea.

- The overall installed wind turbine capacity is greater than that of the rest of the World, with Germany occupying the first place (20.6 GW in 2006) in front of Spain (11.6 GW) and Denmark (3.1 GW). The differences between European countries are mainly explained by two factors: national support mechanisms for the sector and territorial wind turbine potential.
- At sea, Europe is a pioneer, with no less than 19 offshore wind farms in activity in 2007 (see chapter "Renewable marine energy"). In France, the first wind farm at sea (côte d'Albâtre), construction work on which will be starting in 2008, shall be commissioned at the end of 2009.

Throughout the rest of the world, the United States, India and China come 3, 4 and 6 respectively in the world rankings for installed capacity. In terms of new capacity, the United States take first place (2.5 GW) ahead of Germany (2.2 GW) and India (1.8 GW).

**Electricity generating plants installed on the coast**

Site	Units	Net power (MWe)		Source of energy	Year commissioned	Employment
Dunkirk (harbour)	1 and 2	2 x 400	800	Combined gas cycle	2005	35
Le Havre (harbour) (2)	1		250	coal	1968	330
	2 (1)		600	coal	1969	
	4		600	coal	1983	
Cordemais (Loire estuary) (5)	1		490	coal	1970	458
	2 and 3	2 x 685	1 370	fuel oil	1976	
	4		580	coal	1983	
	5	decommissioned	0	coal	1984	
Martigues (3)	1		250	fuel oil	1971	141
	2		250	fuel oil	1972	
	3		250	fuel oil	1973	
	4	decommissioned	0	fuel oil	1974	
Gravelines (outer harbour of Dunkirk)	1. 2 and 3	3 x 910	2 730	nuclear	1980	1631
	4		910	nuclear	1981	
	5		910	nuclear	1984	
	6		910	nuclear	1985	
Penly (Eastern Channel)	1		1 330	nuclear	1990	634
	2		1 330	nuclear	1992	
Paluel (Eastern Channel)	1 and 2	2 x 1330	2 660	nuclear	1984	1196
	3		1 330	nuclear	1985	
	4		1 330	nuclear	1986	
Flamanville (Western Channel) (4)	1		1 300	nuclear	1985	671
	2		1 300	nuclear	1986	
Le Blayais (Gironde estuary)	1		900	nuclear	1981	1351
	2		900	nuclear	1982	
	3 and 4	2 x 900	1 800	nuclear	1983	
Rance estuary			240	tidal power	1966	28
<b>TOTAL</b>			<b>25 320</b>			<b>6475</b>

(1) Fuel oil burning Unit 3 decommissioned

(2) Project for the construction of two coal-fired power plants of 860 MW and 800 MW to be operational in 2012–2013

(3) A proposed combined gas cycle power plant (2 x 440 MW) to replace three of the four 250 MW fuel oil units (in service until 2015). The fourth has not been in service since 1984

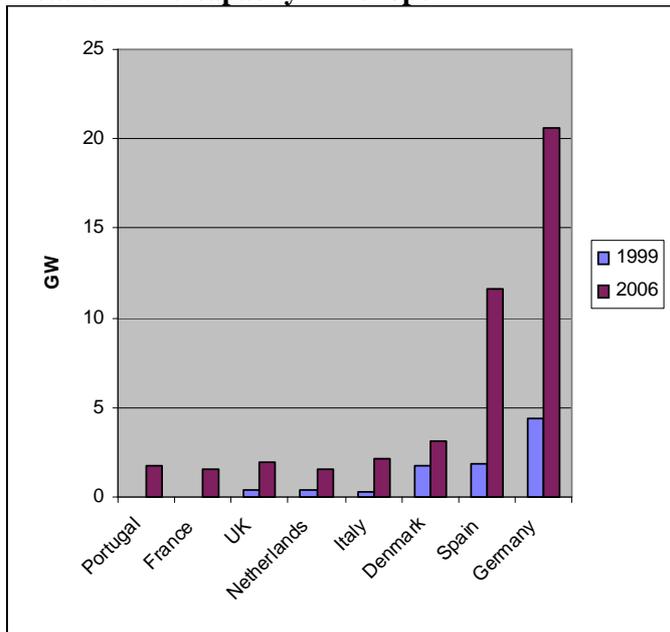
(4) proposed pressurised water reactor in project, commissioning planned for 2012

(5) Unit 5 is no longer in operation

NB: in the Nord-Pas-de-Calais, at Pont-sur-Sambre, a combined natural gas cycle power plant is under construction. Commissioning in 2009

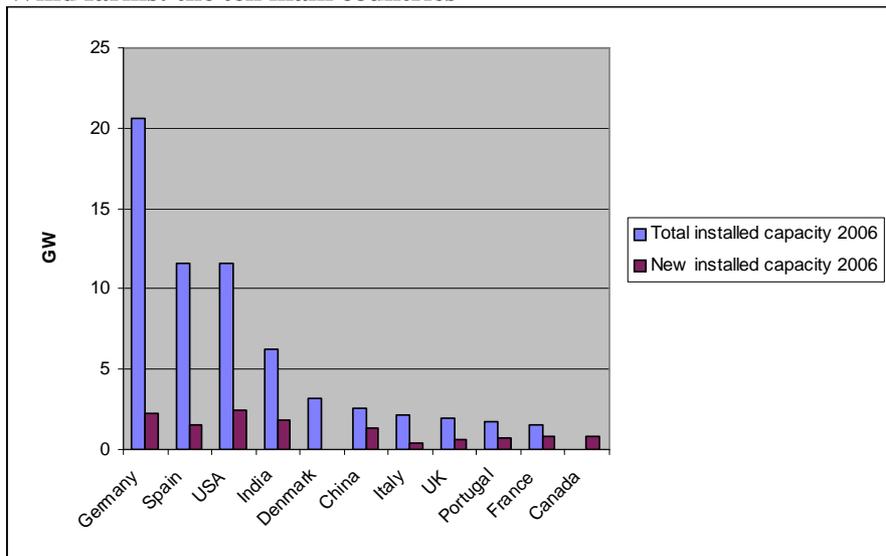
Source: EDF, local authorities, Poweo, Endesa

### Installed wind capacity in Europe



Source: European Wind Energy Association (EWEA)

### Wind farms: the ten main countries



Source: Global Wind Energy Council (GWEC), Annual Report 2006

## Shipbuilding and repair

The sector includes the construction and repair of merchant and military ships, naval outfitting and boatbuilding. These categories of production differ greatly in their organisation, concentration, size and nature of their markets. However, links between them exist through the diversification of companies which are seeking to enter different markets.

### 1. Construction of merchant vessels

Merchant shipbuilding mainly designs and builds merchant ships to transport passengers and cargo, fishing vessels, service vessels and offshore platforms and structures

#### Key figures for construction of merchant vessels

Units: million Euros, workforce

	2000	2001	2002	2003	2004	2005
Turnover	2,127	1,586	1,856	1,163	828	617
Value added	440	318	263	254	87	77
Employment	5,984	6,260	6,143	5,333	4,403	3,708
Number of companies*	33	32	33	33	32	32

\* Fractions of companies exercising this activity (companies with 20 employees and more).

Source: SESSI (annual business inquiries)

### 1.1. Trends in activity

#### 1.1.1. International context

Current world economic growth and the development of trading are increasing orders for ships and the tensions on the shipbuilding market. From 2002 to 2006, on a backdrop of sustained rises in the prices of raw materials (particularly steel and copper), the order book grew by 160% at a regular annual rate and in 2006, new orders stood at an unprecedented level, up 37% in relation to the average for 2003–2005. Annual deliveries, which have been growing steadily since 2000, have been at a two figure rate of growth since 2004 (source: Lloyd's Register - Fairplay).

#### 1.1.2. Asia

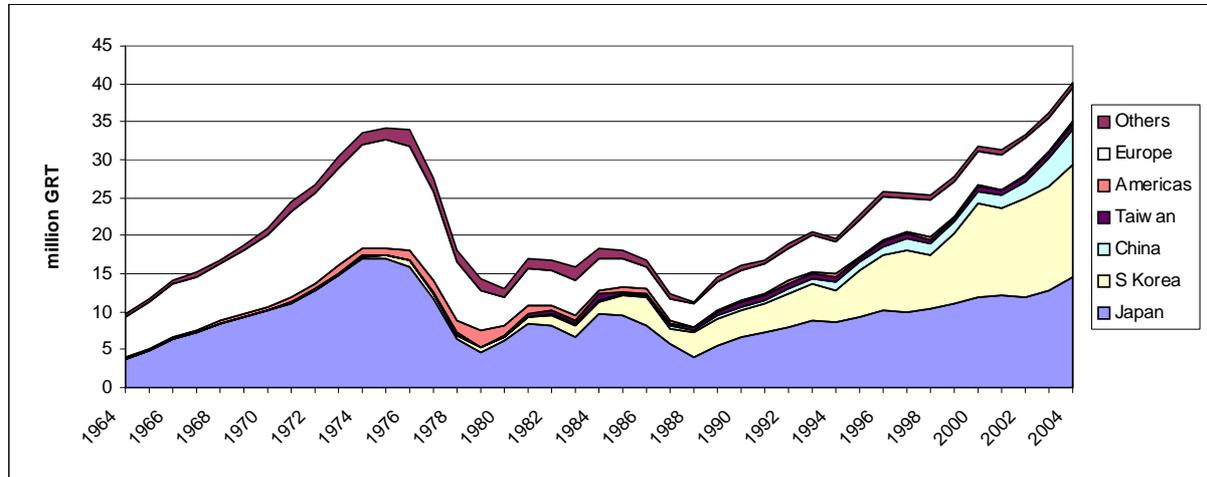
The shipbuilding market, in terms of standard ships, which represent the major share, in terms of tonnage and turnover, is largely dominated by Asia. In the world classification of shipbuilders, Vietnam and Taiwan occupy the 5<sup>th</sup> and 6<sup>th</sup> places, behind South Korea, Japan and China.

For South Korea, the leading shipbuilding country, 2006 was a year record in terms of the volume of new orders. However, the market share of the Korean shipyards (36% in 2006) has been dropping off since 2000, to the benefit of the shipyards Chinese particularly, new powerful players in Asia, for whom for the first time, the volume of new orders (in tonnage) exceeded that of Japanese shipyards in 2006. The latter, in a context of overall growth, are going through a favourable period, despite a lower market share. The strong point of the Korean shipyards is the production of container ships and oil tankers, whilst that of the Japanese years is bulk carriers. China concentrates mainly on the container ships and oil tankers. In addition to its own economic growth it benefits, particularly, from its competitive prices on the standard ship markets and a very attractive Yuan exchange rate, despite its recent rise in relation to the dollar. It is investing in shipbuilding (expansion and creation of shipyards)

and its increasing market share in the sector matches its growth in entire segments of manufacturing industry.

### Market shares\* of the shipbuilding regions

Unit: million GRT



\*Deliveries of vessels of more than 100 GRT

Source: Lloyd's Register - "World Fleet Statistics"

Vietnam has moved from 12<sup>th</sup> to 5<sup>th</sup> place in the world, between 2005 and 2006 and new orders for its shipyards were multiplied by almost 10. Taiwan, which specialises in container ships, has seen its order books grow regularly since 2003.

### 1.1.3 Europe

#### European order books

Unit: million GRT

	2005	2006
Germany	4.7	4.9
Poland	2.6	2.4
Italy	2.5	2.3
Croatia	2.4	2.1
Denmark	na	1.8
Romania	1.4	1.5
Norway	0.58	1.1
Holland	0.98	0.98
Finland	0.88	0.85
France	0.69	0.84
Spain	0.48	0.73
Bulgaria	na	0.22

na: not available

Source: Barry-Rogliano-Salles

Specialised in sectors with high added value, such as cruise liners, chemical tankers, sophisticated container ships of average size and other highly technical vessels and aiming for a high quality of service and unit costs, the European shipyards were able to limit their handicaps due to the Euro and increase their overall turnover in 2006: 13 billion Euros, namely similar to that of Korea (14 billion), Japan (11 billion) and China (10 billion). However, the growth of production in tonnage is much less

in their sectors than on the large standard ship markets. The customer base is mainly European, apart from the American cruise ship owners.

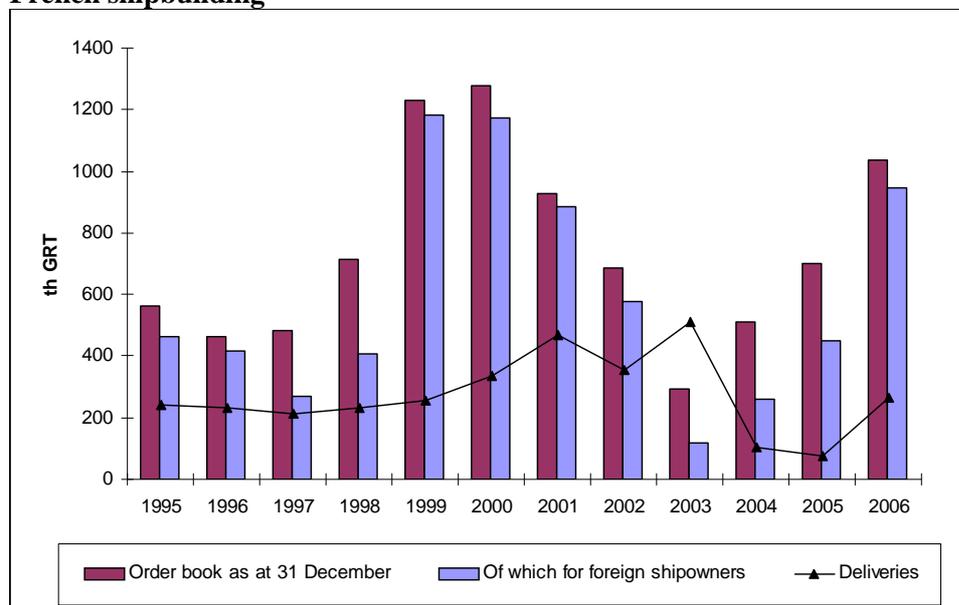
#### 1.1.4 France

Ranked 10<sup>th</sup> in Europe, the French shipbuilding industry is mainly specialised in cruise liners. Approximately 80% of its production is for export. The recent recovery of the cyclical market for large cruise ships has benefited French shipbuilders, particularly and filled their order books.

The delivery of two sophisticated LNG carriers in 2007 could help to maintain French shipbuilding on this specialised market, the growth prospects of which are very good, with respect the forecast world gas consumption: orders represent more than the half of the current operational fleet, almost two thirds having been signed with Korean shipyards.

French activities are centred entirely in Metropolitan France, with the Pays de la Loire region employing 79% of the workforce in front of Brittany (9%).

#### French shipbuilding\*



\*The six first private shipyards

Source: CSCN.

#### Regional breakdown of the workforce of the sector in 2005

	Salaried workforce
Nord-Pas-de-Calais	62
Upper Normandy	88
Brittany	347
Pays de la Loire	3,150
Ile-de-France	120
Total (main regions)	3,767
Total France	3,995

Source: SESSI.

## 1.2 Outlook

In the cyclical evolution of merchant shipbuilding, the period 2003–2006 was characterised by an increase in demand, an ongoing rise in the cost of new construction and order books more spread out in time than in the past (3 to 5 years). We observed a drop in new orders in 2007.

The prospects in the medium term depend on several fundamental factors:

- trends in world growth and the intensity of the exchanges international,
- trends in investments in maritime transport and shipbuilding, in a context of saturation of shipyards and ports and in a period where the profitability of shipowners and of shipbuilders is not very high,
- the price of construction, driven up by increasing costs, particularly those of raw materials and down by the intensity of international competition,
- the exchange rate of the Yuan in relation to the dollar, which may have an effect on competitive conditions.

For Europe, the outlook also depends on maintaining comparative advantages in the profitable sectors of highly technical vessels, which will inevitably be of interest to competing shipyards, as was the case for LNG carriers in the recent past. An analysis market by market is required, according to the nature of the competition and finance capacity of the investors.

## 2. Naval shipbuilding

### Key figures for naval shipbuilding

Units: million Euros, workforce

	2001	2002	2003	2004	2005
Turnover	1,227	2,248	2,030	2,757	2,962
Value added	720	841	766	1,028	1,099
Employment	15,272	1,4831	14,716	13,807	13,461

Sources: SESSI, Ifremer estimates (based on data from companies)

### 2.1. Trends in activity

#### In Europe

European naval shipbuilding is comparable in size to that of the United States. In 2005, it generated turnover of 10 billion Euros and 9 billion in 2006; whilst its American counterpart, generated approximately 12 billion. Its workforce was 40,000 jobs; approximately 60 to 70,000 in the Americans arsenals. It stands apart by the number of operators: there are sixteen main companies in EU-15, whilst two groups own the six large American companies which ensure 90% of production on the other side of the Atlantic. In both cases, these companies are diversifying into other industrial activities (computing, merchant shipbuilding).

Unlike merchant shipbuilding, the military shipbuilding market is characterised, both in many European countries and in the United States, by the downward trend of the national naval equipment acquisition budgets. The increasingly intense competition on a market faced with reductions in naval forces, requires that companies reduce their production costs. The collapse of the European production structure is partially offset by joint ventures between companies, often Europe and by mergers, acquisitions and takeovers at national (France, United Kingdom, Spain) and international level (acquisition of Greek and Swedish companies by German interests). These strategies provide for the alliances between arsenals and equipment manufacturers.

## Naval shipbuilding in Europe

Units: million Euros, workforce

	Turnover 2005	Employment 2005
UK	3,658	11,968
France	2,878	12,755
Germany	1,646	6,380
Spain	740	4,409
Netherlands	730	564
Italy	494	2,100
Sweden*	121	1,090
Greece*	93	715
<b>Total Europe</b>	<b>10,360</b>	<b>39,981</b>

\*Employment 2006

Source: Ifremer estimates after information from the industry

### In France

Whilst most of the production of naval shipbuilding is carried out by a single major company, several civilian shipyards and equipment manufacturers are also involved on the market by the construction of sophisticated ships, detection systems and offensive equipment. For the purposes of reducing costs, joint projects for the design and manufacture of ranges of products have been launched with companies in several countries: Italy (frigates), Spain (submarines), UK (equipment and submarines).

### 2.2. Outlook

In a tight market, the outlook for the sector will depend:

- on the emergency of new markets, particularly in developing countries, according to their naval strategies,
- on the capacity of companies to pursue their efforts for greater productivity by closer alliances.

## 3. Marine equipment industry

This group of activities, suppliers of construction and repair yards, ship owners and the offshore oil industry, includes:

- the manufacture of technical equipment, particularly propulsion machinery, electrical and electronic equipment, handling on-board, navigation and bridge equipment, pumps, ventilation and air-conditioning (HVAC) systems,
- the manufacture of equipment assembled and tested in their technical environment in the form of “modules” or prefabricated and complete systems, such as the installation of ventilation and air-conditioning system or the fitting-out of public areas and cabins of passenger ships.

### 3.1 Trends in activity

The turnover of the marine equipment industry worldwide was approximately 65 billion Euros in 2003. stimulated by the strong growth in shipbuilding throughout the world. China’s market share has increased significantly; however, it, South Korea and Vietnam imported 19% of their requirements in 2003 and this share is increasing.

In the main countries with marine equipment manufacturers (Austria, Croatia, Denmark, Finland, France, Germany, Italy, Poland, Holland, Norway, Spain and United Kingdom), in 2003 the sector represented (source: EMEC):

- 287,000 direct jobs,
- An average annual turnover of 26 billion Euros,
- a market share for export of 46%.

The annual turnover of the French marine equipment industry is estimated at a billion Euros for 2005 and 2006 and the number of jobs 12,000 (source: GICAN).

## 4. Merchant ship repair

The activity includes:

- the maintenance and repair of vessels,
- the conversion of the structures of vessels,
- scrapping.

### Key figures for repair and conversion of merchant vessels

Units: million Euros, workforce, %

	2000	2001	2002	2003	2004	2005	2006
Turnover	197	186	245	251	228	213	na
Value added	82	67	95	88	87	76	na
Employment	2,150	1,822	2,599	2,356	2,194	1,667	1,427
Number of companies*	51	45	52	49	48	44	na

na: not available.

\* Fractions of companies (for the more than 20 employees).

Levels of exports 2005: 35%

Source: SESSI (annual company surveys).

### 4.1. Trends in activity

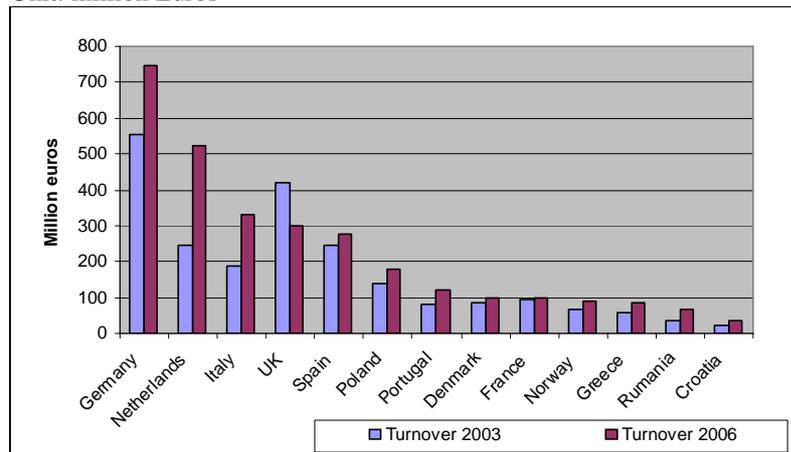
For this service activity, the cost of the labour is an important factor in competitiveness, but the repair of highly technical ships and re-conversion operations require of the qualified personnel. These short term services also demand the ability to manage work loads which may vary greatly and which may imply sub-contracting operations.

These features are found in Europe where, at the bottom of the cycle, the activities of Western shipyards are exposed to competition from countries with low labour costs: Italian and Spanish shipyards are in competition with those of Turkey and the Balkans; to the North, Germany and Great Britain are in competition with Polish, Baltic and Russian shipyards. In the current situation, which is rather favourable (European turnover in the field of repair, maintenance and conversion increased by 35% from 2003 to 2006), shipyards are looking to set up mutual sub-contracting agreements.

In France, the economic situation is also favourable. As elsewhere, French shipyards are looking to smooth out the cyclical nature of orders by diversifying their skills, by extending the categories of their customer base and by looking for long term maintenance contracts. This diversification may go as far as combining ship and boat building or construction and repair.

### Turnover in the field of ship maintenance, repair and conversion in Europe

Unit: million Euros



Source: CESA

### Regional breakdown of the workforce in ship repair

Units: workforce, %

Main regions	Workforce	Total share for Metropolitan France
Aquitaine	141	8%
Brittany	659	36%
Nord-Pas-de Calais	298	16%
Upper Normandy	120	7%
PACA (Provence-Alps-Côte d'Azur)	397	22%
Metropolitan France	1,809	100%

Source: SESSI, companies with more than 20 employees.

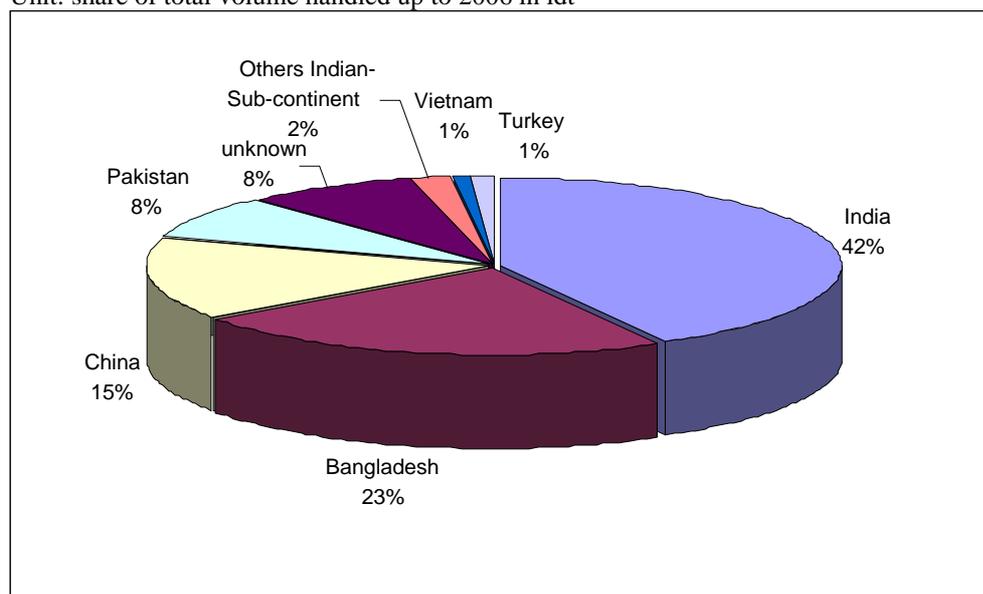
### Ship scrapping

Between 200 and 600 ships of more than 2,000 dead weight tonnes (dwt) are scrapped every year. The activity is sensitive to the economic situation and, particularly to the maritime transport markets of the and to decisions to invest and of de-invest. It is also sensitive to regulations. Therefore, some 6.4 million lightweight tonnes (lw) were scrapped in 1999 (1.5 million in 2005); a peak is forecast for 2010 when 800 single hull oil tankers will be scrapped.

The main problem that scrapping raises is its cost high for the environment and human health, because of the materials removed (heavy metals, paints, asbestos, PVC, oils). The major share of the activity is concentrated in countries with very low labour costs, without strict standards for the protection of workers and the environment. Some shipyards do comply with the standards but are more expensive than the others for shipowners. At present, two thirds of scrapping work is carried out on the beaches and river banks of the Indian sub-continent. India, Bangladesh, Pakistan and China together are responsible for almost 90% of scrapping worldwide. Bangladesh currently has the largest market share; scrapped vessels are the main source of steel for these countries (80 to 90% of national steel requirement).

### Background to ship scrapping

Unit: share of total volume handled up to 2006 in ldt



Source: European Commission

European capacity in the field of scrapping may be found in Italy, Belgium, and the Netherlands; other capacity may be available in the United Kingdom (inactive), Denmark, Greece, Lithuania, Poland, Bulgaria, Spain and Norway. In general, such capacity is very low.

In France, the MIDN Inter-ministerial mission on end-of-life merchant and naval ship scrapping was set up in March 2006. Its role was two-fold: to contribute to the introduction of strict regulations for the scrapping of vessels that are people and environmentally friendly and to identify the conditions for the viability of the scrapping sectors in France and in Europe. It published a report in October 2006.

The questions it raised included the cost premium of clean, safe scrapping. The MIDN estimates it at 50 to 150 dollars a tonne, for a scrapping price that varies from -500 to +500 dollars the lightweight tonne, depending on the state of the vessel, at world level.

The publication of the MIDN report coincided with the calendar of the European Commission, which published a "green paper" in May 2007, on the improvement of ship scrapping practices. In the "blue book" of October 2007 on European maritime policy, the EC announced for 2008 a communiqué which shall set out the results of the consultation exercise launched by the green paper of May 2007. A European shipping scrapping strategy shall be developed on the basis of these results.

## 5. Boatbuilding

Boatbuilding includes the construction of sail boats, motor boats, inflatables with flexible or semi-rigid hulls, windsurf boards. The sector includes their repair, fitting-out and maintenance.

### 5.1 Trends in activity

Boatbuilding worldwide is dominated by the United States, where motor boats take priority over sail boats, whilst the two categories are virtually of the same importance in Europe.

Boat building in France mainly produces sail boats (58.1% of turnover in 2005) and motor boats (23.8%). It is world leader on the market for sail boats and inflatable boats. The production of motor boats is developing quickly.

The French industry has made the most of a strong demand: sales of motor boats and sail boats (excluding maintenance and repair) have more than tripled in ten years. Its growth (more than 7% in 2005) is based particularly on exports: in 2006 the level of exports of pleasure boats was 64%.

### Key figures for boat building\*

Units: million Euros, workforce

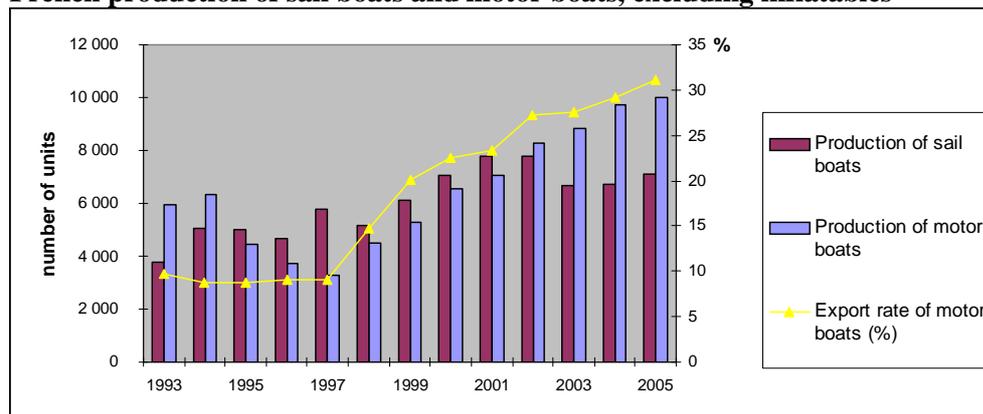
	1999	2000	2001	2002	2003	2004	2005
Turnover	640	793	978	1,060	1,086	1,185	1,271
Value added	210	237	314	337	342	389	423
Employment	5,072	6,174	7,151	7,598	7,705	8,065	8,573
Number of companies**	52	52	65	69	73	75	76

\*Data from companies with 20 employees or more.

\*\* Fractions of companies in the activity.

Source: SESSI (business inquiries)

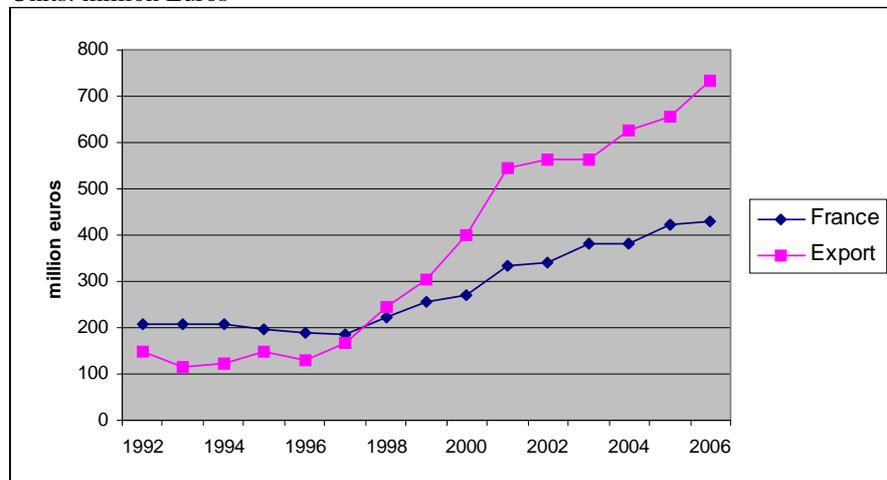
### French production of sail boats and motor boats, excluding inflatables



Source: FIN

### Turnover of French boat building in France and for export

Units: million Euros



Source: FIN (annual business inquiries).

Exports which, until now have been directed towards Europe, are now taking an international dimension. In 2005, sales to non-European countries (US, Canada, Asia, Near East, Australia) have progressed by 30% and those to European countries (UK, Italy, Spain, Germany, Norway) have dropped by 6.2% (Source: FIN).

## **5.2. Jobs and companies**

In 2005, half the workforce of the boatbuilding sector was concentrated in the Pays de Loire region (52%), but also Poitou-Charentes (19%), Aquitaine (8%) and Brittany (6%). In 2005, the industry employed 8,635 employees, up 4.4% in relation to 2004 (source: SESSI). The sector is concentrated: 12 companies with more than 100 employees (545 on average) generate more than 80% of total turnover in construction and repair.

## **5.3. The fleet**

In 2006, the number of boats and sail boats registered stood at 863,000. The active fleet corresponds to approximately half of the registered fleet (463,000 units). The first five regions for new registrations are Brittany (27%), PACA (22.3%), Languedoc-Roussillon (10.3%), Pays de Loire (9.2%) and Aquitaine (7.7%) (source: FIN).

## **5.4. Outlook**

In this consumer equipment industry, innovation is a competitive weapon, particularly:

- in the design and architecture of custom or mass produced boats and the methods of construction;
- in the use of new techniques and materials (composite materials, aluminium, polyester),
- in the integration of computer hardware.

The large international boat building groups are now taking an interest in the markets of developing countries, mainly China.

## Maritime civil engineering

### 1. Definition

“Maritime and river work” includes the construction of installations and work carried out at sea, on rivers or an inland body of water. They are intended for the construction of installations in riprap, whether natural or not, the fitting-out or regulation of water ways, whether navigable or not.

#### Key figures for maritime civil engineering

Unit: million Euros and workforce

	2000	2001	2002	2003	2004	2005
<b>TURNOVER</b>	478	463	na	1,260	1,045	954
Value added	125	100	na	274	252	291
Employment*	2,470	2,454	3,225	4,175	3,676	3,499
Number of companies**	228	224	229	235	243	232

\* Salaried workforce

\*\* Actives as at 31 December.

na: not available

Source: SUSE, SIRENE (INSEE)

The following are classified as maritime and river work:

- the construction of ports, dams, dykes, navigable canals, water supplies, locks and other water course regulation installations,
- the execution of work: in water (construction of coffer dams, construction of the piles of bridges), dredging, underwater (by diver or other means),
- the cleaning of trenches and development of river banks and cutting of water weeds.

Such work involves specific techniques, special materials and may require highly qualified personnel. In addition to new construction, maritime work also concerns maintenance and repair.

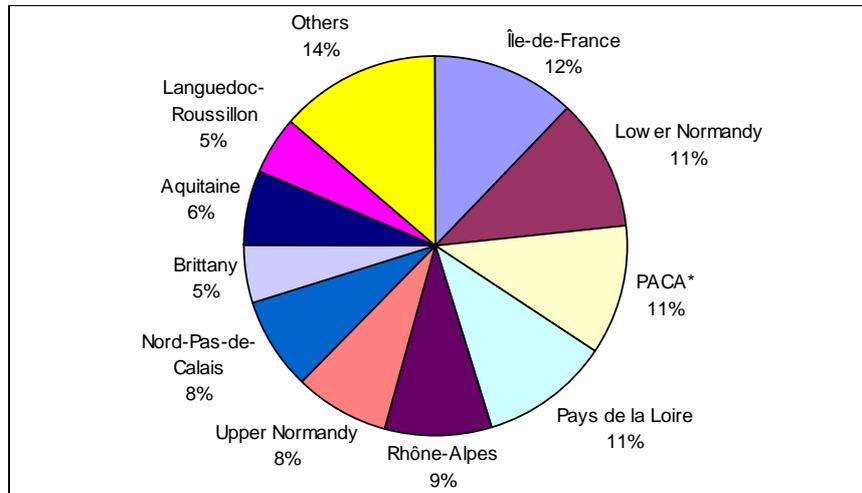
### 2. Trends in activity in Metropolitan France

In 2005, maritime and river work generated a turnover of 430 million Euros in Metropolitan France, namely 1.3% of the public works as a whole. Maritime and river work is concentrated mainly in regions: Ile-de-France, Lower Normandy, PACA, Pays de la Loire and Rhone-Alpes.

Maritime and river work employs 0.8% of employees in public works as a whole (248,000 in 2005). The sector is shared between labourers (56%), technical staff, supervisory (26%) and manager/engineers (18%), whilst the overall workforce in the public works sector includes 66% of labourers.

### Location of maritime and river years in Metropolitan France in 2005

Unit: % of overall turnover



\* Including Corsica.

Source: FNTF.

### 3. Trends in activity outside Metropolitan France

The share of maritime and river work outside Metropolitan France includes activities in the French overseas counties and territories and exports by French companies. In 2005, the zones for exports were North Africa (85%), Europe and Latin America. These activities generated 49 million Euros of turnover, namely the equivalent of 0.3% of total turnover in the Public Works sector outside Metropolitan France. In these zones, the maritime and river sector saw a drop of 20%, whilst Public Works in general rose by 14%.

#### Breakdown of maritime and river work outside Metropolitan France

Unit: million Euros and %

	Turnover	Share of turnover
Europe	4.7	9.7%
Latin America	2.8	5.8%
North Africa	41.0	84.5%
Total	48.5	100%

Source: FNTF.

The 80 companies involved operate on markets more widely dispersed than in Metropolitan France: average turnover per company is lower.

### 4. Outlook

Port modernisation projects are important for the sector, given the volume and duration of the work involved. Whilst most of the work has already been completed at Le Havre, the ports of Marseille and Calais should soon be opening up prospects.

- At the end of 2007, the port of Le Havre commissioned the “Porte Océane” terminal, namely two berths to the West of the France terminal, thus completing the first phase of the work. The second stage planned (six new berths) is currently under construction.

- The port of Marseille is building the Fos 2XL terminal (building cost: 400 million Euros). Two new container terminals shall be commissioned in 2009.
- The “Calais 2015” port project was launched in 2007 by the Nord-Pas-de-Calais region, the owner of the port. Approximately 400 million Euros are due to be invested in the construction of a new outer harbour along 1,800 metres of coastline.

## Submarine cables

### 1. Definition

The activity as a whole includes the manufacturing, laying and maintenance of submarine cables immersed at depth and, generally buried, intended to carry communications or electrical power. The commercial services associated with the setting up of projects are included in the whole.

#### **Key figures. Manufacturing, laying and maintenance of submarine electric and telecommunications cables\***

Units: million Euros, workforce.

	2001	2002	2003	2004	2005
Turnover	2,301	647	288	316	613
Value added	648	189	88	92	154
Employment	12,010	4,811	2,200	1,951	3,631

\*Change of scope. Series revised in relation to previous issues.

Sources: SESSI, Sycabel, INSEE, enterprises.

### 2. Trends in activity

In Europe, total turnover in the manufacturing of cables exceeded 10 billion Euros in 2003 and 2004. As part of this sector, the markets for electric power cables and telecommunication cables, whether submarines or terrestrial, were of comparable volume and each exceeded 2 billion Euros (source: Europacable).

In France, 74 companies are involved, for all or part of their activities, in the manufacture of submarines or terrestrial cables. They are mainly located in the Rhone-Alpes, Ile-de-France and Nord-Pas-de-Calais regions. Their size is very variable: French manufacturers of submarine cables are both small sub-contracting companies and world leaders in their field.

Submarine cable markets are international. The two activities: electric power cables on the one hand and, telecommunication cables, on the other, require different manufacturing techniques and market logics. Both activities' cycle low seems to have occurred in 2003.

For transcontinental telecommunications, the unprecedented phase of growth in investments during the 1990s due to the explosion of the requirements of the Internet (almost 100% of Internet intercontinental communications are transmitted by submarine cables) was followed by a marked slow down as from 2001. Telecommunications activities were limited to maintenance and repair work. Recovery has been perceptible since 2004–2005, but limited by the persistence of over capacity. The ICPC (International Cable Protection Committee) mentions a current significant investment project in the world: a trans-pacific link (between the Far East and the United States), which is due to be commissioned in 2008.

Whilst the use of telecommunication cables for industry purposes is the main explanation of the market dynamics, their use for the transmission of scientific data (oceanographic, seismic) also contributes to their profitability: since the start of the 1990s, several decommissioned submarine cables have been re-commissioned for this purpose. However, commercially operational cables are also used by hydrographic research departments. The problems of safety and protection against external aggression (e.g. burial by ROV) are common to both scientific and commercial applications.

For electrical power, the need for cross border exchanges between regions with excess production and those in deficit, the equipment of islands in tourist infrastructures, but also projects for wind farms at sea, which require cables to transport energy on land, contributed to the dynamics of the activity from 2003–2004.

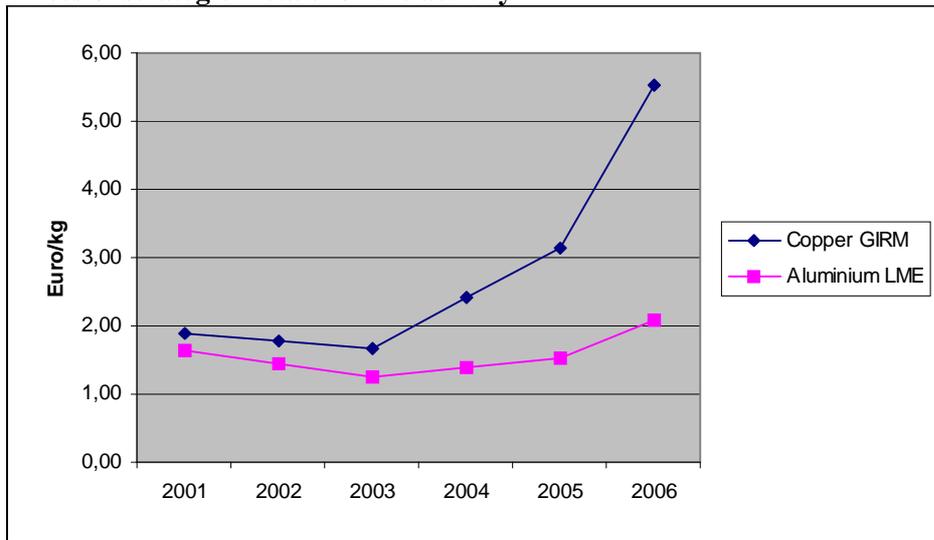
The laying and maintenance of cables, a service activity, is carried out by a small number of operators throughout the world (the ICPC lists less than twenty) and, of these, three European firms or firms of European origin, each operate on seven or eight cable laying ships, of the fifty or so ships in service throughout the world. The operators either form part of companies with a wide range of skills (for example manufacture of cables, telecommunications, defence), or are independent firms. They may be specialised in laying and maintenance, or diversified over a large number of operations at sea: all types of cables (telecommunication and electrical), services for the offshore oil and gas related industries, energy at sea, installations of marine research equipment and naval services.

### 3. Outlook

The short to medium term trends for this activity, where European firms are very well represented in the manufacturing, laying and maintenance of cables, shall be influenced by the following factors:

- The need for ADSL cables should increase significantly in the short to medium term and have a favourable effect on orders for telecommunication cables in general and submarine cables in particular.
- The ever-increasing needs for the exchange and transport of energy, in Europe in particular, are filling the order books for submarine electric power cables for the next five years. 2007 will have been the year of the NorNed project: establishing the longest sub-marine high tension (700 MW) link in the world, namely 580 km between Norway and the Netherlands, for hydroelectric power export.
- This growth of requirements will impose the on-going need to manage problems of relations with other users of coastal regions, such as the extraction of minerals and fishing, which are a risk for cables.
- Prices of raw materials, including copper and aluminium, have continued to rise since 2003 under the influence of market tensions due to a world growth dynamic. It increases production costs in this highly competitive market and contributes to the rise in the unit costs of cables: the turnover of manufacturers increased by 9.5% in 2005, for growth of 1.7% in terms of volume.

**Prices of strategic metals for the activity**



Source: Sycabel.

## Offshore oil and gas-related industry

### 1. Definition

The sector includes the supply of oil and gas-related services and equipment in the fields of exploration and production, refining and petrochemicals. The distribution, use and transport of hydrocarbons are not concerned. Work and equipment concerning transport (pipeline laying, LNG carriers building) are taken into account.

#### Key figures for the offshore oil and gas-related industry

Units: million Euros, workforce

	2000	2001	2002	2003	2004	2005	2006	2007*
Turnover (million Euros)	3,700	5,200	5,800	5,500	5,700	6,100	7,300	8,500
Value added (million Euros)	1,198	1,691	1,776	1,804	1,869	2,001	2,501	2,913
Employment (thousands)	17.0	24.0	25.2	25.5	25.5	26.2	26.5	27.1

Value added rate estimated at 34% after consultation of the IFP and INSEE sector data.

\* Forecasts

Source: French Petroleum Institute (IFP)

### 2. Trends in activity

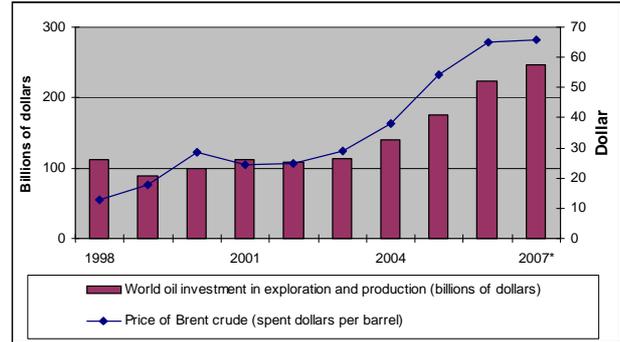
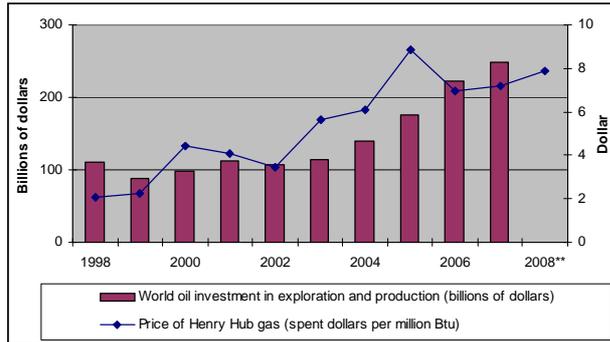
#### 2.1. Throughout the world

Stimulated by market tensions and the rise in the price of hydrocarbons, investments in oil and gas exploration and production (in Russia, China and North America, in particular) grew by 29% in 2006 (25% in 2005). Over the period 2004–2006, the turnover of the main oil-related industries (drilling, construction offshore, geophysics) saw an average increase in 60%. For 2007, forecasts for investments in exploration and production are for 13% (mainly in Latin America, Russia, and China).

The offshore share (3.4% of the 103,000 wells drilled) of investments for 2007 is mainly in Asia (excluding China), North America, Europe, the Middle East, China and Latin America. For wells onshore, the classification is different: North America, China, CIS, Latin America then the Middle East (IFP, October 2007).

The gas market is expanding fast and is stimulating LNG carrier and gas terminal building. Over the ten last years, international exchanges of gas have more than doubled, a trend which appears to be accelerating. Whilst only 20% of gas is transported by LNG carriers, this proportion should rise to 40% by about 2020 according to certain estimates. In 2006, transport by LNG carrier rose by 11.7%, as opposed to an annual average of 7.7% over the last decade, whilst the maritime transport of oil has increased by 2 to 3% every year.

Orders for LNG carriers now stand at 151 units for a current fleet of 228. This would lead to the construction of ships the capacity of which is much higher than the current average (almost double). Insofar as gas terminals are concerned, projects for 2009 are intended to increase European capacity by almost 150% in relation to 2003.

**World investments in exploration and production, prices of Brent crude and Henry Hub gas**


\* Forecasts

\*\* Estimates

Sources: IFP, US Department of Energy.

**Supply of LNG (liquefaction capacity): forecasts for 2015**

Unit: billion cubic metres

	2006	2010	2015
<b>ATLANTIC BASIN</b>	88	113	169
Near East	56	123	186
Pacific basin	100	124	158
Total world	244	360	513

Source: Cedigaz.

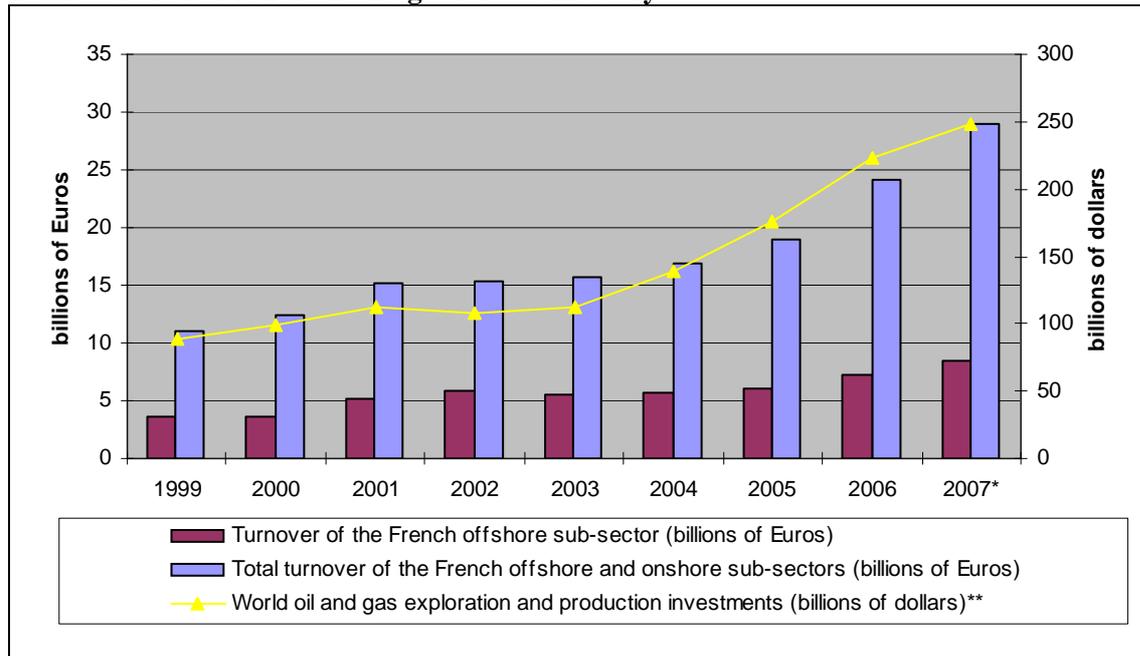
**2.2. In France**

Since 2003, the turnover of the French oil-related industry, stimulated by the worldwide economic situation, has increased by 54%, to reach 24 billion Euros in 2006. Its growth in 2007 is estimated at 20%, a significant performance with the strong Euro. Upstream activities represent approximately two thirds of total production: 39% of overall turnover in production, including gas, 33% in refining and petrochemicals, 20% in exploration and 8% in drilling.

The export markets of the oil-related industry are the Near East (22%), Western Europe (17%), Africa (16%), North America (15%), Asia (13%), Latin America (11%), Eastern Europe and the CIS (6%). Since 2003, we observe growth of the activity towards the Near East and Asia and a drop in exports to Western Europe.

In 2006, activities offshore generated a turnover of 7.3 billion Euros (30% of turnover for the sector) for growth of +20%. Growth of +16% is forecast for 2007. The trend over the last five years would suggest a reduction in the share of offshore sector (38% of turnover for the sector in 2002) according to the IFP. This trend is explained by differences of profitability and the tailing off of certain offshore fields. The current rise in the prices of hydrocarbons should make offshore operations more attractive than in the past.

### Turnover of the French oil and gas related industry



\* Forecasts

\*\* North America, North Sea, Latin America and others. Excluding Russia and China.

Source: IFP

### 3. Companies and employment

The French oil-related sector is concentrated. The eleven largest companies in the sector (turnover more than 150 million Euros) generated 92% of the activity in 2006, 20 average size companies (turnover between 15 and 150 million Euros) and 28 small companies (turnover less than 15 million Euros) represent 7% and 1% of overall turnover respectively.

From between 2003 and 2006, the workforce of the oil-related industry has increased by 3.1% per year, on average, to reach almost 69,000 employees. The share of the offshore sector in the workforce is approximately 40% over the last few years.

#### Share of the offshore sector in the workforce of the French oil-related industry

Unit: thousands of people, %

	2002	2003	2004	2005	2006	2007*
Jobs in the oil-related industry	60.8	61.4	64.5	66.3	68.9	69.8
Jobs in the offshore oil industry	25.2	25.5	25.5	26.2	26.5	27.1
	41%	42%	40%	40%	38%	39%

\* Forecasts

Source: IFP

### 4. Outlook

Despite a recent slowdown, world growth forecast permit to expect a steady hydrocarbon demand which should contribute to the development of the oil and gas related industry in general and to the French sector in particular.

The gas market should continue to expand in the short to medium term, whilst the EU's dependence on imported gas should increase. In France, a new gas terminal is under construction at Fos-sur-Mer and should come into service at the beginning of 2008. The port of Le Havre has a project for a gas terminal at Antifer.

## Coastal tourism

### 1. Definition

According to the World Tourism Organization (WTO), Tourism comprises the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes not related to the exercise of an activity remunerated from within the place visited. In France, coastal tourism accounts for a very important share of the whole of the tourism industry. The latter includes different forms of commercial accommodation and a wide range of services, such as restaurants, cafés and travel agencies.

### 2. Coastal tourism in France

#### Key figures for coastal tourism

Units: million Euros, full-time equivalent workforce

	2000	2001	2002	2003	2004	2005	2006
Tourist spending	19,677	19,525	20,658	21,145	20,919	21,416	24,273
Value added *	8,264	8,201	8,676	8,881	8,786	8,995	10,195
Employment **	196,334	205,757	221,145	236,975	221,826	237,313	na

\* Ifremer estimates on the basis of Tourism Accounts. Average value added rate of characteristic tourist activities.

\*\* Ifremer estimate from Unedic data and coastal tourist spending in relation to total tourist spending. Salaried and unsalaried jobs in characteristic tourist activities.

na: not available.

Source: Tourism Authority, Tourism Accounts, "Key Facts on Tourism", Unedic, INSEE (Annual Business Inquiries).

#### 2.1. Trends for coastal tourist spending

Tourist spending is broken down as follows:

- spending of resident and non-resident tourists in characteristic tourist activities: spending on accommodation, catering, and all-in packages (for the non-residents),
- spending associated with the stays: spending on food, miscellaneous purchases, travel on site (taxi or public transport), services to private citizens, fictive rent.

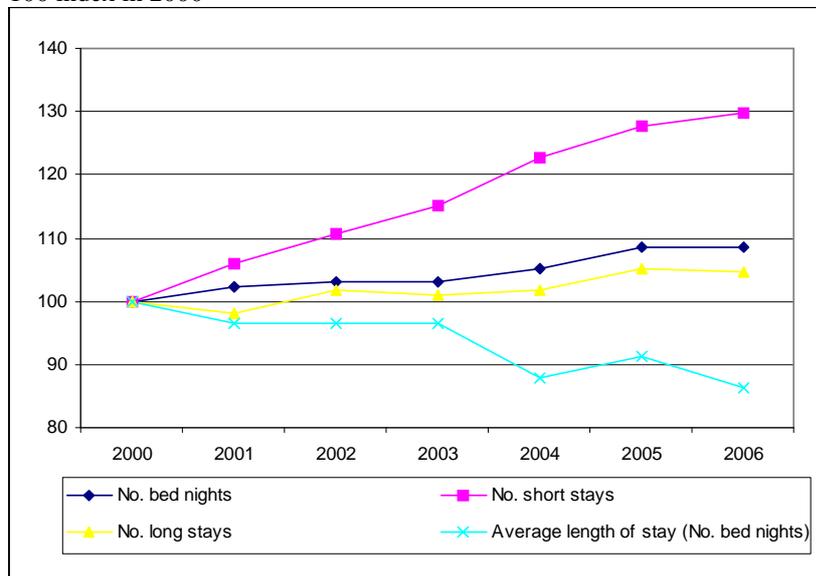
For several years now, growth in tourism in France has been driven alternately by the spending of residents and that of non-residents. Recently, the dynamics of the world economy have favoured tourism:

- French income from international tourism increased by 8.5% in 2006, Annual growth, which has been irregular over the last few years (-1.7% in 2003, +10% in 2004, +3.5% in 2005), attained an average of approximately 5% during the period 1990–2005.
- France is third in the world for tourist income (6.3%) behind the US (11.7%) and Spain (7.0%) (source: WTO).

In 2006, the number of nights and stays remained stable, but long stays dropped off slightly (-1.3%). The trend for "splitting" (travelling more frequently for shorter periods) continues. Short stays have increased by 30% in relation to 2000 and long stays by approximately 5%. The average duration of private trips (5 bed nights) is considerably shorter since 2000 (5.77 bed nights). The rise in the number

of short stays drives up annual tourist income: spending on stays and the cost of transport per bed night are higher for a long stay.

### Evolution of bed nights, short and long stays: people of 15 + residing in Metropolitan France 100 index in 2000



Source: INSEE, Tourism Directorate, regional partners

Private trips are much more frequent than business travel (4.7% of stays for 2.7% of the corresponding bed nights: ratio for 2006 comparable to those of previous years). Non commercial accommodation has progressed regularly since 2001.

### 2.3. The importance of the coast for tourism

French coastal tourism is of great economic significance within the industry. It represents approximately 40% of tourist destinations, way ahead of the countryside (one third of destinations), cities and the mountains. 29% of French tourist expenditure is spent on the coast: in second place after urban tourism (33%).

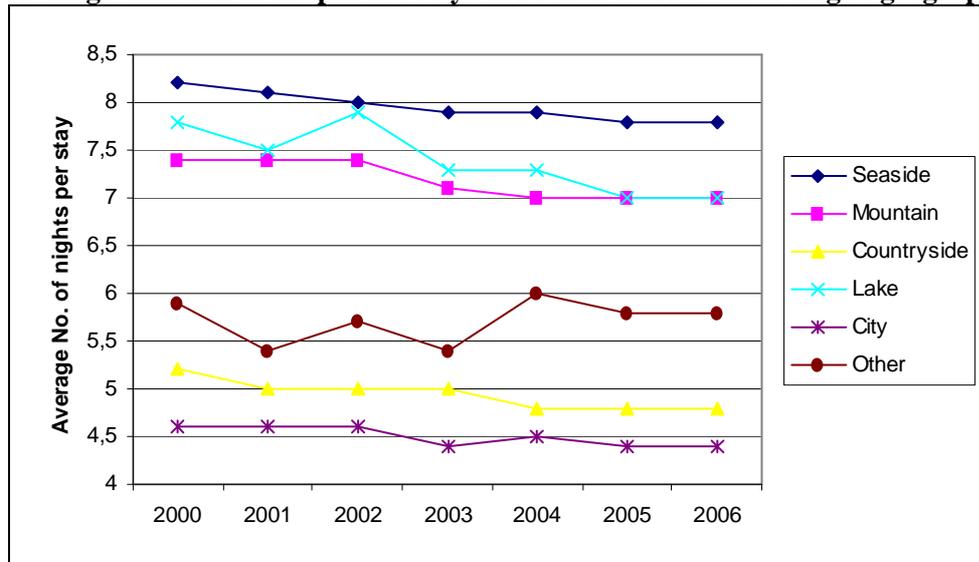
#### Breakdown of tourist spending and number of nights by space in 2006

	Spending	Nights
City	32.8%	29.3%
Seaside	28.9%	40.5%
Countryside	20.6%	32.0%
Mountain	17.7%	19.0%

Source: Tourism Directorate / "Key Facts on Tourism"

Coastal tourism is a seasonal activity lasting from two to four months a year, depending on whether the destination is in northern or southern France. The average duration of stays is higher on the coast than for other destinations. Since 2002, the coastal share in bed nights is on the rise.

### Average duration of the private stays of French tourists according to geographical area



Source: Tourism Directorate, TNS Sofres / Annual Visitor Survey

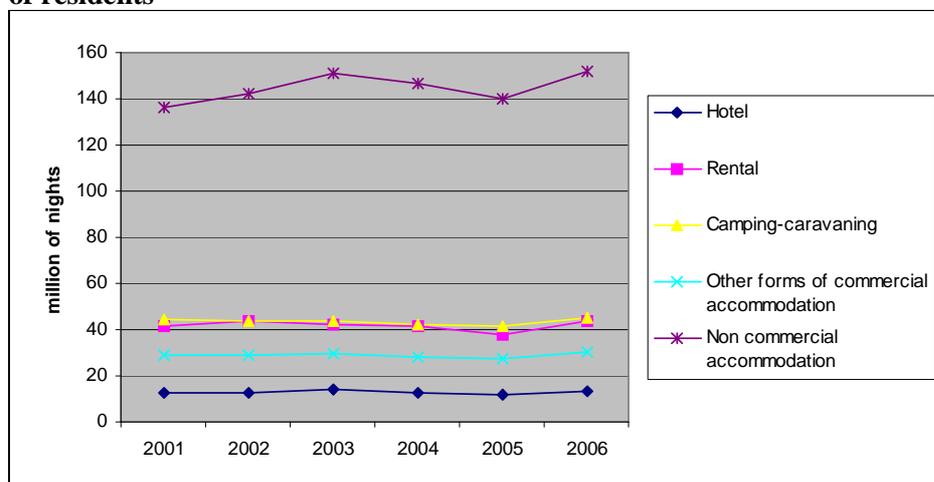
## 2.4. Employment and companies

90% of companies in the field of coastal tourism belong to the category of hotels, cafés and restaurants (HCR) and this proportion has remained stable since 2000. These companies account for 80% of the jobs, for an average workforce of 4.1 employees per company. The annual creation of jobs from 2004 to 2006 (approximately 16,500 new jobs on average) is down in relation to the period 1998–2002 (30,000).

## 2.5. Accommodation on the coast and reception capacity

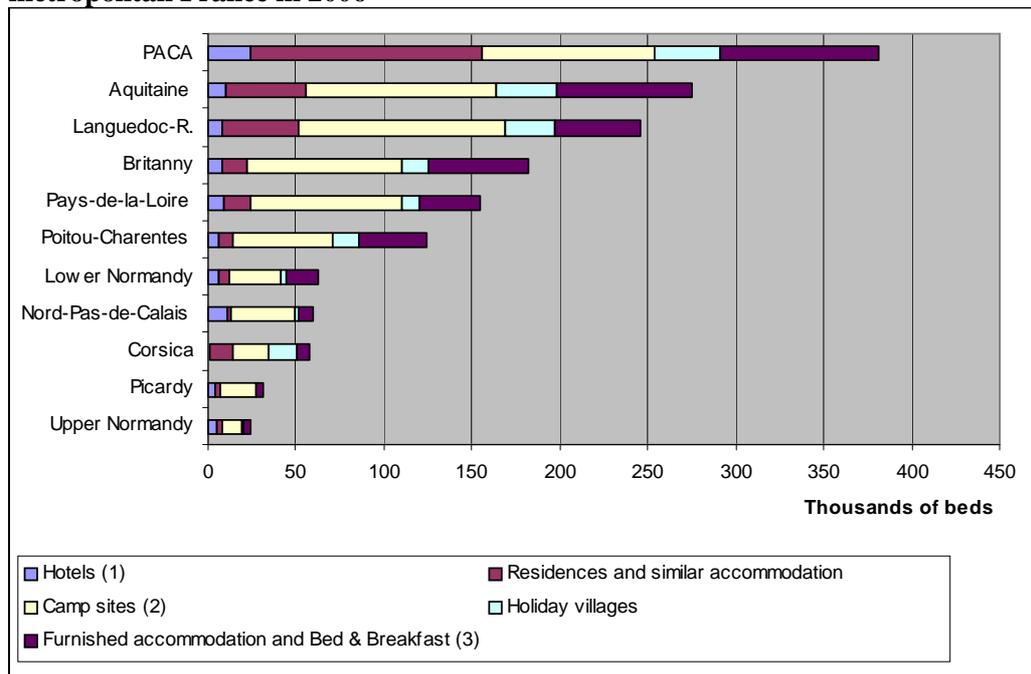
Non commercial accommodation (second homes) is by far the largest sector (63.6% of bed nights in 2006). Camping/caravanning, renting and hotels are the most popular forms of commercial accommodation for tourist stays on the coast. For general tourism in 2006, the occupancy of hotels remained stable and camping recovered; both have gone up the range. The stock of tourist accommodation in 2006 was 500,000 beds (annual growth of approximately 20,000 beds).

### Number of coastal nights according to the type of commercial accommodation for private stays of residents



Source: Tourism Directorate, TNS Sofres / Annual Visitor Survey

### Breakdown of the different types of commercial accommodation by coastal regions in metropolitan France in 2006



(1) 1 room is the equivalent of 2 beds.

(2) 1 tent site is the equivalent of 3 beds.

(3) 1 B&B room is the equivalent of 2 beds.

Youth hostels (7,452 places on the coast) are not taken into account.

Sources: INSEE, Tourism Directorate, regional statistical services

## 2.6. Tourism in overseas France

Tourism is a key sector in the economy of the overseas counties and territories. Reception capacity and the number of tourists are very variable, depending on region.

### Reception capacity and foreign occupancy of approved hotels and chains overseas in 2006

Units: number of rooms, thousand of bed nights\*

	Reception capacity			Foreign occupancy	
	From 0 to 2 stars	More than 2 stars and luxury	Total	Arrivals	Bed nights
Guadeloupe	731	5,341	6,072	136	520
French Guyana	210	884	1,094	18	41
Martinique	1,433	3,413	4,846	25	117
Reunion Island	867	1,608	2,475	23	53
Total overseas	3,241	11,246	14,487	202	731
Total France	371,225	255,686	626,911	32,506	69,552
Overseas share in France	1%	4%	2%	1%	1%

\* 1 room corresponds to two beds.

Source: Insee, Tourist Directorate, regional statistical services.

The hotel reception capacity of Guadeloupe, Martinique and Reunion Island are the highest. Overseas hotels have a total capacity of 14,487 rooms (2% of hotel capacity in France), with a share of top of the range hotels (77.6%) that is higher than in Metropolitan France (39.9%). In terms of the number of bed nights, occupancy by foreign tourists is shared between Guadeloupe (71.1%), Martinique (16%), Reunion Island (7.3%) and French Guyana (5.6%) (source: INSEE).

Guadeloupe, Martinique and French Polynesia have a well established tourism industry. Tourism in Reunion Island, French Guyana and New Caledonia is developing; in Mayotte, Wallis-et-Futuna and Saint-Pierre-et-Miquelon, the activity is fairly marginal in the economy. The new tourist destinations of the Caribbean (Dominican Republic, Cuba, the Bahamas, Jamaica, and Porto Rico) are in competition to with the French overseas counties.

### The pleasure boating sector in France

In 2006, pleasure boating in France employed a fleet of almost 900,000 craft, slightly less than 3.5% of which are registered in the overseas territories. Most of the fleet is made up of motor boats. The 370 marinas in metropolitan France account for approximately 6.7% of the workforce in the boatbuilding sector and their turnover represents 6.2% of its turnover. PACA, Brittany and Languedoc-Roussillon have the highest port reception capacity in Metropolitan France. Of the 24,296 new registrations in 2006, 4.8% were made overseas; in Metropolitan France, they were mainly made in Brittany (26.5%) and in the region PACA (22.5%).

In 2006, port reception capacity in Metropolitan France corresponded to approximately 35% of the active fleet. In February 2006, there were 267 national projects for the extension or reorganization of French marinas (source: "Committee for the development of boating reception capacity"). The development of dry ports (currently 1 to 2% of spaces) is one of the solutions being examined to overcome these difficulties (sources: DTMRF, FIN).

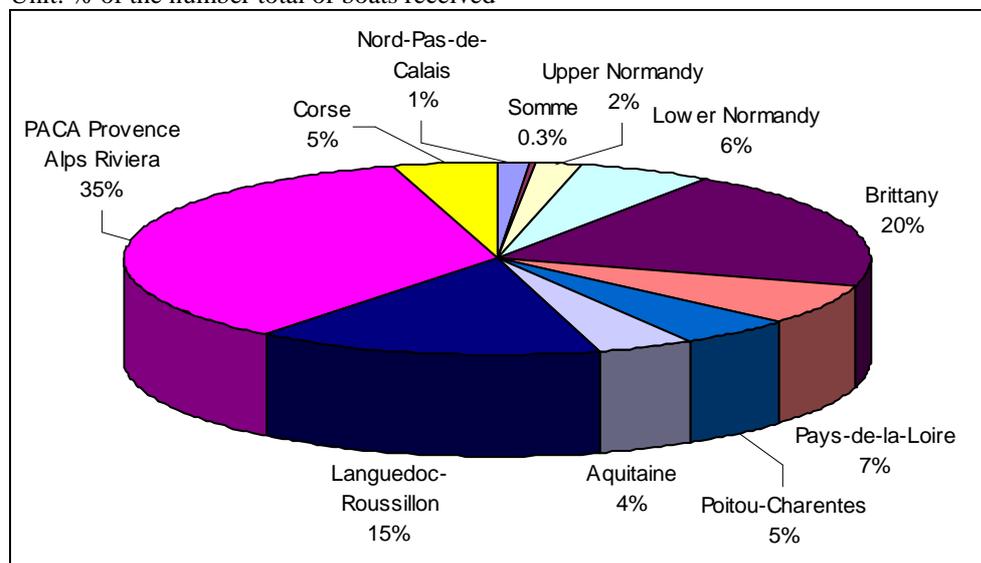
### Key figures for the pleasure boating sector in France

France		Ref. year
Fleet of pleasure boats (growth +2.7%)	893,798	2006
of which sail boats (20.8%)	185,550	2006
of which motor boats (75.4%)	674,248	2006
Fleet Metropolitan France (96.6%)	863,350	2006
Fleet Overseas (3.4%)	30,448	2006
New registrations 2006 (growth +2.9%)	25,473	2007
New registrations Metropolitan France (95.4%)	24,296	2008
New registrations Overseas (4.6%)	1,177	2009
Metropolitan France		
Pleasure boating marinas and installations	466	2006
Ports	370	2006
Turnover marinas (thousands Euros)	257,460	2006
Permanent workforce marinas	2,938	2006
Overall reception capacity	163,795	2003
Number of companies in construction/restoration	174	2005
Turnover in pleasure boat construction and repair (million Euros)	1,076	2005
Workforce pleasure boat construction and repairs	8,764	2005
Employment total boatbuilding sector	44,604	2004
Total turnover boatbuilding sector (million Euros)	4,160	2004

Sources: FIN, AFIT, FFPP, DTMRF, chambers of commerce.

### Regional breakdown of reception capacity of pleasure boating marinas and installations in Metropolitan France in 2006

Unit: % of the number total of boats received



Source: DGMT.

### 3. Coastal tourism in Europe

The Mediterranean coast concentrates the densest tourist activity in Europe. The phenomenon of “coastalisation” is growing:

- in 2000, 176 million tourists (foreign and national) visited the Mediterranean coastal regions; recent projections estimate them at 312 million for 2025 (sources: WTO; "Blue Plan" of the Mediterranean Action Plan under the aegis of the UN Environment Programme);
- in France and Spain, tourism resulted locally in coastal population densities of 2,300 h/km<sup>2</sup> in 2005;
- by 2025, the increase in the summer population is estimated at 40% in the most touristic coastal regions.

Regional tourism on the French and Portuguese Atlantic coasts, the South East Baltic coast and certain areas of the Black Sea coast, is also expanding. The Channel coast is in demand for conference tourism. Urban tourism to historic and cultural cities is also a factor in the “coastalisation” of tourism, since many European capitals are on the coast or close to the sea.

Coastal tourism, like tourist travel in general, is subject to international factors. Therefore, the economic development of certain very densely populated countries (in Asia in particular), the democratisation of Internet and the growth of low cost travel companies are significant factors for the growth in demand. There are also factors of uncertainty: according to a report from the European Environment Agency (EEA) in 2005, factors, such as climate change, fires and drought could attract tourists towards new destinations.

### Cruise tourism

In 2007, the number of cruise passengers was estimated at 12.6 million. The market, which has been very dynamic over the last few years, has almost doubled since 1999.

34 cruise liners (92,000 beds in total) shall be delivered in Europe by 2012 for an equivalent investment of 15 billion Euros, which shall increase the capacity of maritime cruise sector by 40%. The trend is towards building ever larger cruise liners. The largest to date are the *Queen Mary 2* (145,000 tons) and the *Freedom of the Seas* (158,000 tons). The *Genesis* (220,000 tons) is currently under construction for delivery in 2009.

The supply of cruise lines is very concentrated: three international players (American, American/Norwegian and Malaysian) own the major part of the fleet. By 2010, it is estimated that these three companies leaders will control 90% of the supply. Alongside the mass consumption phenomenon of the cruise industry, small companies offer specialised products, such as luxury cruises. More than 80% of cruise passengers come from North America (10.6 million passengers in 2007). The United Kingdom (1.25 million), Germany (0.8 million passengers in 2006), Italy and Spain (0.4 million each) come well in front of France (0.24 million) in the annual number of cruise passengers. The traffic is concentrated mainly in the Baltic ports, the British Isles, Spain and Italy. The busiest ports are Dover (13.8 million passengers in 2006), Helsingborg (10.8 million), Helsinki (8.5 million) and Stockholm (8 million).

## Maritime and river transport

Maritime and river transport includes the activities of the fleet and commercial maritime and river ports. The scope therefore extends to inland shipping, for the purpose of harmonisation with the future European data base on maritime activities. The activity of the fleet includes the transport of goods and passengers. The activities of maritime and river ports include the exploitation and general organisation of ports, port services to vessels and goods. Military ports are excluded.

### 1. Maritime transport throughout the world and in Europe

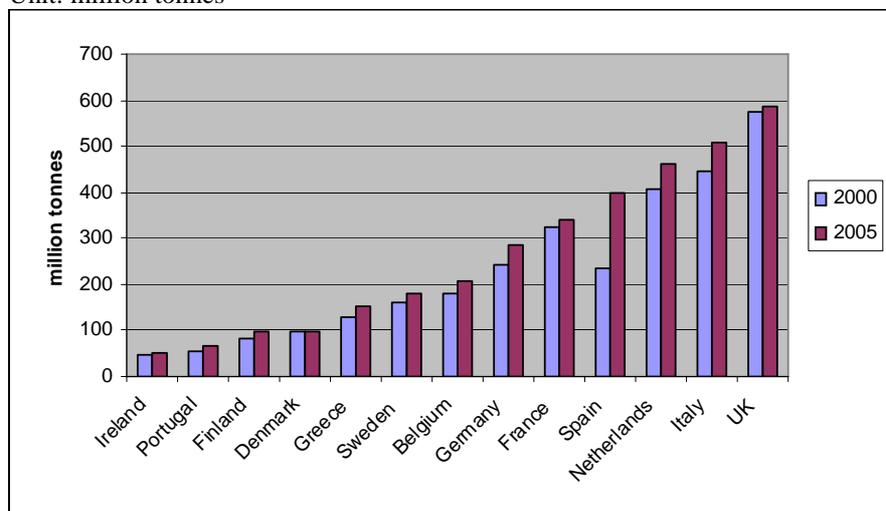
Europe is a major player in the field of world maritime transport, both in its use of this form of transport for its exchanges and in the position and competitiveness of its operators. According to UNCTAD, maritime exchanges with Europe (EU-15, EES, Switzerland, Turkey, and Israel) represented almost 23% of world maritime transport in terms of tonnage in 2005 (North America: 12%, Japan: 7%).

According to Eurostat, 3,718 million tonnes of goods, to or from EU-27, were transported by sea in 2005; that is, handled in sea European ports, which represents a growth of 4.2% in relation to 2004. Port arrivals by far exceed departures (almost the double). For EU-15, the growth in maritime traffic is more than 15% in relation to 2000.

#### Goods transported by sea for EU-15

Gross tonnage handled in all ports

Unit: million tonnes



Source: Eurostat

### 2. Commercial sea ports in France

#### 2.1. Port activities

In France, in 2007, a distinction is made between:

- autonomous ports (PA), of which there are eight (Dunkirk, Le Havre, Rouen, Nantes Saint-Nazaire, La Rochelle, Bordeaux, Marseille, Guadeloupe). They handle more than 80% of the maritime traffic of goods. The rules governing the participation of the State are laid down by the law of 29 June 1965 on autonomy; since 2006, investments made under the terms of

contracts for State-region projects are financed by the AFITF Funding agency for transport facility development;

- there are five State ports (or overseas Ports of national interest);
- decentralised marinas, fishing and commercial ports (more than 500) which depend on territorial local authorities or groupings of them. The transfer of ports of national interest in metropolitan France (namely commercial ports not decentralised in 1983) to the local authorities, was completed on 31 December 2006, in accordance with law No. 2004-809 of 13 August 2004, concerning local liberties and responsibilities. The ports depend mainly on regions, counties and joint ventures for commercial ports; counties for fishing ports, and communes for marinas.

### Key figures for port authorities (1)

Units: million Euros, workforce (full time equivalents)

	2000	2001	2002	2003	2004	2005	2006 (3)
Turnover	707	698	718	829	848	887	709
Value added	529	518	524	663	665	691	561
Employment (2)	5,482	5,426	5,428	7,233	7,231	7,197	5,805

(1) Turnover in metropolitan France until 2002; including overseas counties and territories since 2003.

(2) For "autonomous ports" only until 2002; for all ports from 2003.

(3) Autonomous ports and overseas ports.

Source: Ministry of Transport/DTMRF

### Key figures for sea and river port services\*

Units: million Euros, workforce

	2000	2001	2002	2003	2004	2005
Turnover	1,094	1,109	1,270	1,339	1,219	1,271
Value added	776	783	928	977	892	915
Jobs	10,626	10,639	10,482	10,465	9,951	9,685
Number of companies	273	244	282	304	292	280

\*Exploitation of sea and river ports, including port authorities, activities of ship consignees, ship maintenance and overhaul services, piloting, boatage, sea rescue, salvage of ships, signalling.

Source: Ministry of Transport/SESP.

## 2.2. Services to ships

Services to ships include two types of companies:

- those which are involved in the berthing of the vessels (piloting, towing, boatage),
- those which are involved on shore: representation, maintenance, repair, other services.

Other professions involved in services to ships are: the chartering agent, the ship's consignee, stores and bunkering companies, ship repair companies, companies which recover waste from ships, onshore services to seafarers.

### Key figures for services to ships

Units: million Euros, workforce

	2004		2005		2006	
	Turnover	Workforce	Turnover	Workforce	Turnover	Workforce
Piloting	97	690 of which 100 non-operating employees and 590 seamen (of which 330 pilots)	100	700 of which 120 non-operating employees and 580 seamen (of which 330 pilots)	104	700 of which 120 non-operating employees and 590 seamen (of which 340 pilots)
Towing	100	960 of which 60 non-operating employees and 900 seamen	99	960 of which 60 non-operating employees and 900 seamen	108	900 of which 60 non-operating employees and 840 seamen
Boatage	50	780 of which 280 non-operating employees and 500 seamen	57	770 of which 280 non-operating employees and 490 seamen	61	750 of which 270 non-operating employees and 480 seamen

Source: Ministry of Transport/DTMRF.

### 2.3. Services for goods

The intermediaries involved in services for goods are as follows: transport agents, forwarding agents, customs agents, commodity brokers. Cargo consolidation and deconsolidation, storage and distribution companies, inspection, sample analysis companies, supervision and watch-keeping, insurance companies and banks are also involved in the activity.

Port handling companies are responsible for loading and unloading operation, reception, survey and guarding of goods operations.

### Key figures for port handling

Units: million Euros, workforce

	2000	2001	2002	2003	2004	2005
Turnover net	852	824	778	816	921	901
Net value added*	493	508	503	491	588	589
Jobs**	5,209	4,791	4,734	5,119	5,568	5,186
Number of companies	125	117	128	131	123	129

\* Revised data sources

\*\* Salaried and non-salaried employees, full-time equivalents (revised data).

Source: Ministry of Transport/SOeS (business inquiries).

Direct jobs associated with ports currently represent slightly more than 41,000 people. Port services are extremely diverse. They include both the functions of the port authorities and auxiliary professions associated with ships and goods.

### Direct Port jobs

	2006		
	Autonomous ports	Others	Total
State Services	1,685	2,250	3,935
of which customs	724	533	1,257
Port authorities	5,357	1,642	6,999
Port Professions *	25,192	5,411	30,603
of which:			
Active dockers	3,465	860	4,325
Piloting	519	157	676
Boatage	365	372	737
Towing	673	227	900
Total	32,234	9,303	41,537

\* Piloting, towing, boatage, handling, fitting outs, shipping agencies, consignment, brokerage, transit.

Source: DTMRF, survey of autonomous ports, maritime services and customs services. For services to ships, source different to that for the key figures.

## 3. Port traffic

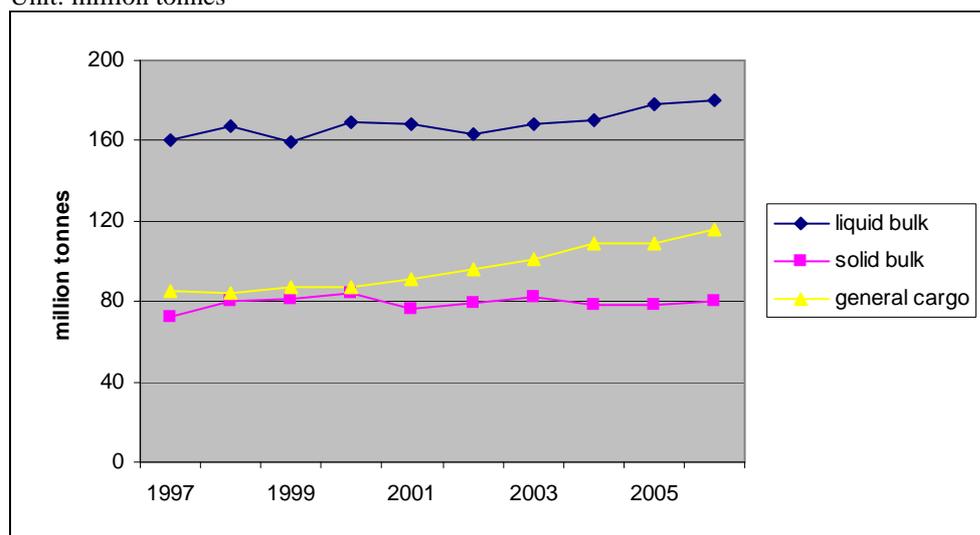
### 3.1. Traffic through French ports

The traffic of goods through French ports (in terms of tonnage) is greatly influenced by the weight of traffic in liquids in bulk (approximately half the total), particularly oil. However, traffic in other goods has had a tendency to increase faster than the rest since the end of the last decade, because of progress in containerised traffic and, more recently, roll-on roll-off traffic.

#### Traffic of goods of the main French ports

Total traffic of the first twenty ports in metropolitan France

Unit: million tonnes

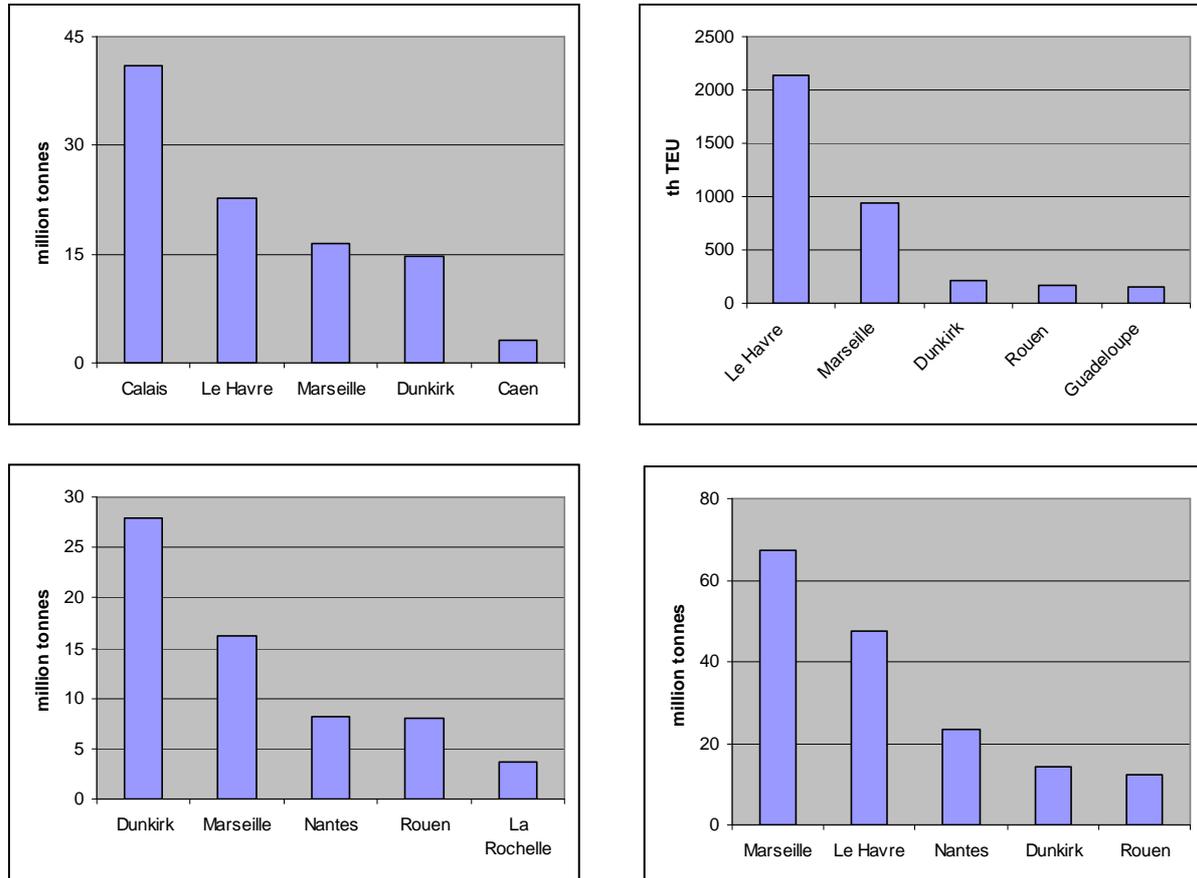


Source: Transport Ministry, DGMT/DTMRF

- Traffic of liquid bulk is mainly handled at Marseille and Le Havre (petrochemicals at Antifer, where new investments have been made and at Fos). We should also note the importance of agrofood liquids at Dunkirk.

- Traffic in solid bulk, which has not changed significantly over the last few years, mainly involves Dunkirk and Marseille for steel making (ore and coal), but also Rouen (first European port for the traffic in cereals) and Nantes.
- General cargo benefits from the current growth in roll-on roll-off traffic through the Channel ports (Calais, Dunkirk, Caen, Dieppe) and the presence of the containerised traffic which is still increasing slowly (Le Havre and Marseille).

### Traffic through the main French ports in 2006



Source: Ministry of Transport/DGMT

Capacity for handling containerised traffic has become essential to the attractiveness of ports and the subject of strong international competition. Since the 1990s, this type of traffic has increased considerably in many European and Asian ports. The investments it requires explain the strategic importance of the Port 2000 (work on which is being completed) and Fos 2XL (work on which is starting) projects, for Le Havre and Marseille.

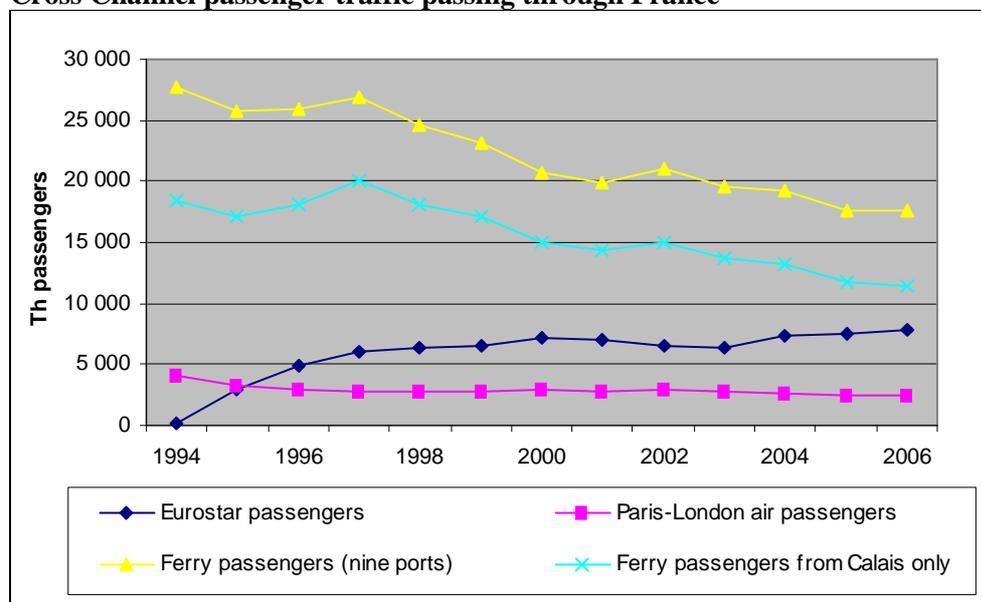
The growing importance of gas in national energy strategies is leading ports to install terminals (currently Fos and Montoir). Several projects for new terminals are being completed (Antifer) or are due to be launched (Fos Cavaou, Dunkirk, extension of Montoir). The investment project for the port of Calais, is intended to fit it out for roll-on roll-off and passenger traffic.

Passenger traffic is mainly due to the cross Channel link (where Calais dominates by a long way) and Mediterranean traffic, mainly with Corsica.

- The sharing of the cross Channel market between rail, air and sea is tending to stabilise and the fall off in sea traffic has been slowed by the recent economic situation. However, the recent low cost air links represent potential competition.

- Activities in the Mediterranean increased strongly and benefited almost all the ports of the area, which also had the benefit of cruise traffic which is becoming a significant component: 625,000 passengers for Nice, between 300 and 400,000 at Marseille and Ajaccio, more than 150,000 for Toulon.

### Cross Channel passenger traffic passing through France



Source: Ministry of Transport/DGMT

## 3.2. Port traffic in Europe and throughout the world

The development of traffic through European ports may be understood on the basis of the logic of international maritime exchanges. These exchanges will have been extremely dynamic in the recent and current economic situation; they explain the maximum use of port capacity and the proposed extension work or work already completed on several sites. In 2006, traffic through several European ports grew significantly.

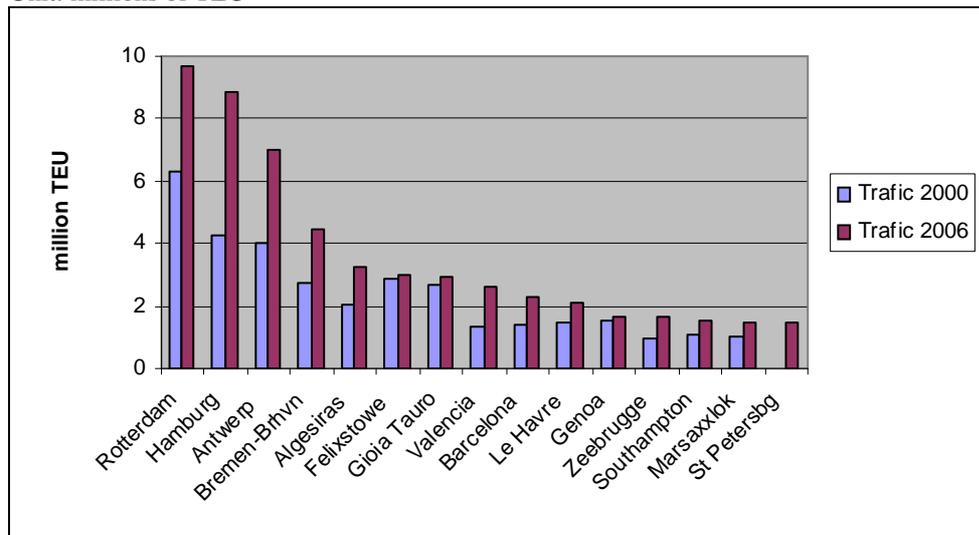
### 3.2.1. In Europe

The problem of the development of European ports lies mainly in two crucial factors:

a) Containerisation. Containerised traffic has been the fastest growing sector in world transport over the last two decades, particularly because of economic development in the Far East and the flow of manufactured goods from there to Europe and the United States, but also the growth in intra-European containerised traffic. This dual trend, the arrival of giant container ships and problems of intermodality with land links (most of which are road links) tends to direct port strategies towards the development of appropriate terminals and the modernisation of logistics.

### Main European container ports

Unit: millions of TEU



Source: ESPO, *Containerisation International*, port authorities

b) Short sea shipping and the rationalisation of the transport of freight in the EU. In 2005, short sea shipping represented 68% of the volume of goods transported by sea in EU-25. UK, Italy, the Netherlands and France are the first four short sea shipping countries with, respectively 354, 323, 253 and 213 million tonnes (source: Eurostat). Liquid bulk (LNG, oil and oil products) play a significant part in the growth of this traffic.

The European Commission considers short sea shipping as a means of responding to the saturation it sees on the European road network and, more generally, for the organisation of a sustainable transport system, the reduction of the emissions of greenhouse gases and the construction of the internal market: the European Union is growing and has to control the unequal distribution of economic growth. This is the purpose of the EC; its recent communication of October 2007 is in line with the objectives of earlier initiatives and announced measures concerning "green corridors" (involving rail and sea transport), the management of infrastructures (trans-European networks), traffic and freight (interoperability), the simplification of the regulations and the quality of transport services.

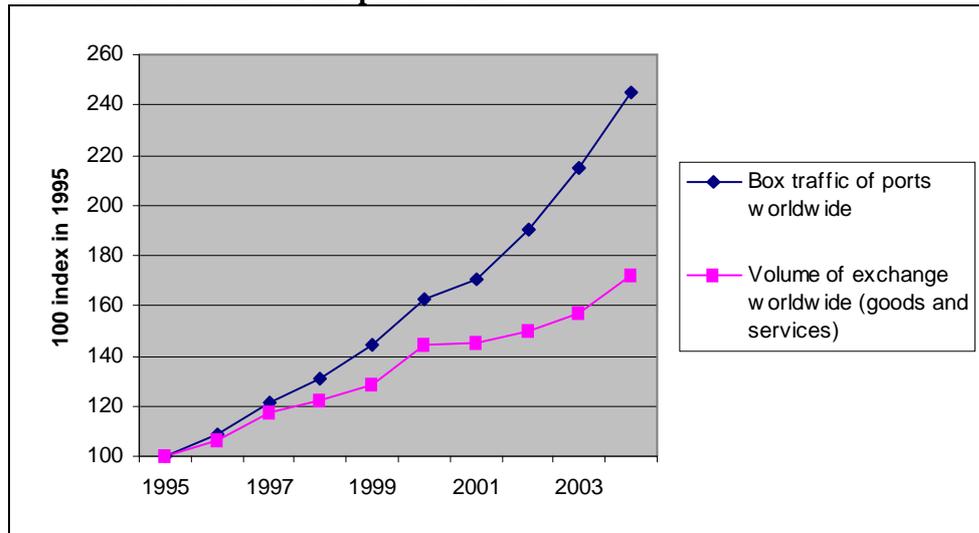
The Marco Polo II programme (2007–2013), with a budget of 400 million Euros, is the community financial aid instrument for dealing with the saturation of the roads, the improvement of intermodality and the launch of "motorways of the sea" projects. In April 2007, a Franco-Spanish call for tenders was launched for the creation of an Atlantic link.

### 3.2.2. In the world

Since the 1990s, port traffic has been marked by the rapid development of ports in the Far East, in phase with the economic development of this area and the progress of containerisation. Of these ports, the Chinese ports have performed remarkably. In 2006, six Chinese ports were among the first fifteen containerised ports in terms of volume of traffic. Another important aspect of the development of ports in the Far East is the traffic in dry bulk, because of China's considerable requirements for raw materials.

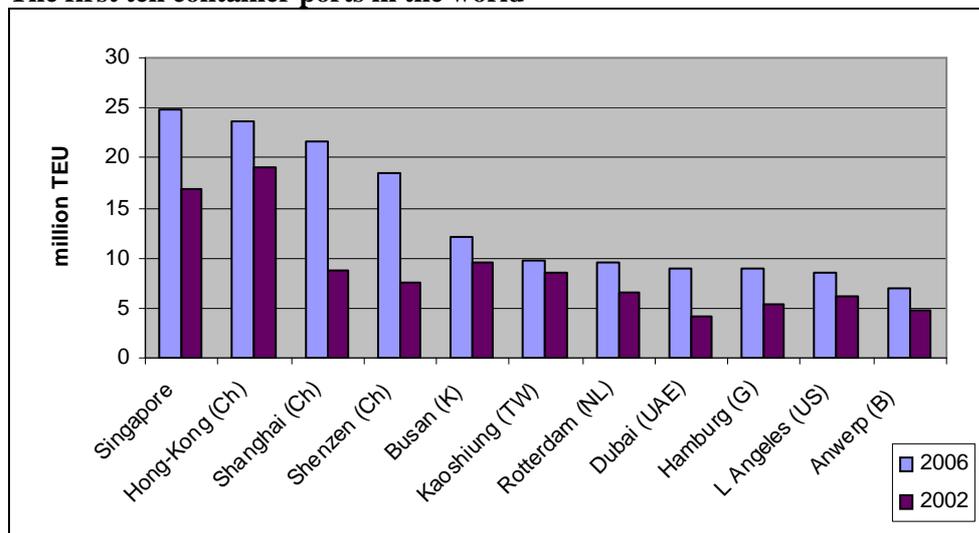
With containerisation, the operation of container terminals has become a major activity and an international market, in which several of the large groups are Asian. Large shipowners also have interests in these activities.

### Containerised traffic of the ports worldwide



Source: IMF, Drewry Shipping Consultants Ltd

### The first ten container ports in the world



B: Belgium. Ch: China. G: Germany. K: S Korea. NL: Netherlands. TW: Taiwan. UAE: United Arab Emirates  
Sources: *Containerisation International*, *Journal de la marine marchande*.

## 4. The merchant fleet

### Key figures for France's maritime and coastal transport

Units: million Euros, workforce

	2000	2001	2002	2003	2004	2005
Turnover	4,998	5,039	5,255	5,515	6,700	7,714
Value added	1,939	2,167	2,096	3,038	2,732	1,982
Employment*	12,273	12,595	12,046	13,447	13,678	13,307
Number of companies	458	418	475	484	462	501

Revised data sources

\* Salaried and non salaried workforce, full time equivalents.

Source: Ministry of Transport / SOeS (business inquiries).

#### 4.1. The French merchant fleet

As at 1 July 2007, the French merchant fleet included 213 vessels, excluding working vessels and auxiliary services. Its capacity was 5.9 million units of gross registered tonnage.

- 96 of these vessels are registered in French international register (RIF). 70 are registered in the register metropolitan France, 47 in overseas territories. None are now registered in the TAAF French southern and Antarctic territories, which the RIF was intended to replace when it was set up in 2005.
- The drop in the number of oil tankers was compensated for an increase in that of the non oil-related fleet. We should note that 52 of the 57 oil tankers have double hulls.
- Following the arrival of five new ships and the withdrawal of vessels of more than 12 years old, the average age of the fleet dropped to 7.2 years, as at 1 July 2007. In 2006, it was 16 years for the fleet of the European Union and 19 years for the world fleet.

This fleet is completed by more than 4,000 specialised vessels, including a wide range of categories, the total capacity of which exceeds three million units of gross registered tonnage.

##### French merchant fleet as at 1 July 2007 (1)

Category	Number	Capacity (1000 grt)
<b>Oil-related fleet</b>	57	3,112
Oil tankers	43	2,490
Liquefied gas carriers	14	621
<b>Non oil-related fleet</b>	95	2,023
Chemical tankers	11	69
Other tankers	1	7
Bulk carriers	3	175
Other multi-purpose dry bulk carriers	1	2,035
Full containerships	24	1,591
Specialised carriers (2)	4	29
Ro-ro	25	110
Cargo ships	24	21
Other types of ships (3)	2	17
<b>Passenger ships</b>	61	787
Cruise liners	5	76
Ro-ro passenger ferries	37	700
Passenger launches	4	1
Others	15	10
<b>Total</b>	<b>213</b>	<b>5,922</b>

(1) Over 100 grt vessels for transport of passengers, ocean trade goods or short sea shipping

(2) Non ro-ro transport of heavy packages and vehicles

(3) Excluding service vessels

Source: Ministry of Transport / DGMT

##### Specialised fleet (2006 data)

Type	Number	Capacity (1000 grt)
<b>FERRIES</b>	25	3.2
Passenger vessels (islands and estuaries)	81	9.9
Launches (pleasure trips)	520	19.9
Oceanographic research vessels	46	21.6
Ocean-going barges	6	11.7

Platform supply vessels	25	50.3
High sea tugs	32	15.8
Harbour and coastal tugs	125	16.3
Pilotage launches	42	1.3
Boatage launches	122	0.7
Pontoons	153	37.4
Suction dredgers	34	16.4
Motor launches/crafts for various services	1,307	10.4
<b>OTHERS</b>	1,751	3,150.8
<b>Total</b>	<b>4,269</b>	<b>3,365.7</b>

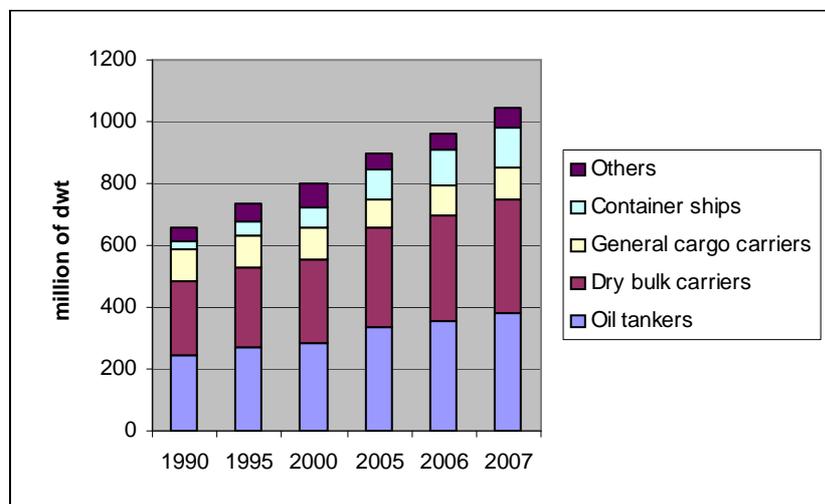
Source: Maritime Affairs Administrative Centre

## 4.2. The world merchant fleet

The world fleet in activity is growing steadily and has accelerated since 2005. At the start of 2007, it included almost 43,000 vessels of more than 300 grt, representing a carrying capacity of more than 1,000 million dwt (source: ISL).

The fleet of container ships continued to grow even more rapidly, at rates which have exceeded 10% almost every year, for more than a decade. At the beginning of 2007, it included almost 3900 vessels of more than 300 grt, for a total capacity of 9.5 million TEU (twenty-foot equivalent units) (source: ISL). Taking vessels of all sizes into account produces an estimate of the total container fleet of 10.7 million TEU, at the end of 2006 (source: Drewry Shipping).

### Trends for world fleet\*



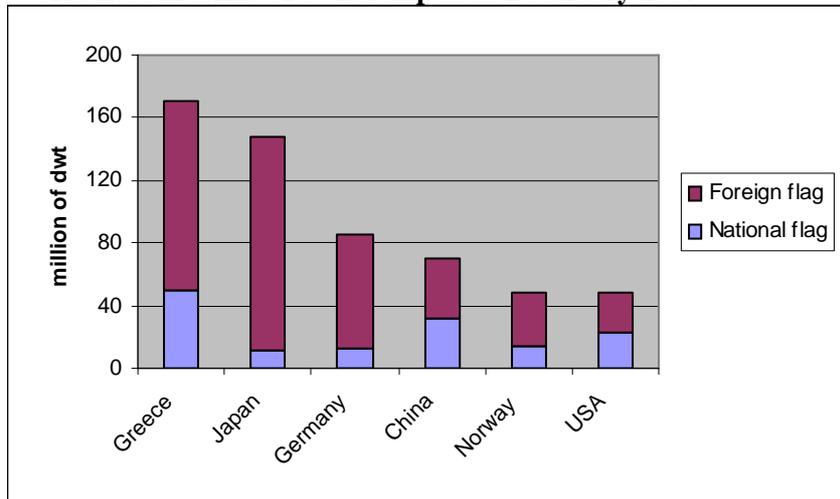
\* Over 100 GT ships

Source: UNCTAD, Lloyd's Register - Fairplay

A very marked trend over recent years has been the strong growth in the average size of container ships, which has more than doubled in twenty years, going from 1,180 TEU in 1987 to 2,440 TEU at the start of 2007. The aims of reducing unit costs lead shipowners to invest in every bigger ships. In October 2007, UNCTAD reported 135 units of more than 8,000 TEU, 7 of more than 10,000, 6 of which with 12,500 TEU. Forecasts of growth of the container fleet by 2010 are based on annual rates of growth in capacity of more than 10% (source: BRS).

Ownership of the world fleet is very concentrated. The developed countries in general and European interests, in particular, are very well represented. The first five ship-owning countries own more than 53% of the carrying capacity; they include three European countries: Greece, Germany, and Norway. China is the only emerging country in this group. France controls 0.6% of the world fleet (source: UNCTAD).

**World fleet in terms of ownership as at 1 January 2007\***



\*Vessels of more than 1,000 grt, excluding the US reserve fleet and US and Canadian Great Lakes fleets.  
Sources: UNCTAD, Lloyd's Register – Fairplay

Foreign flags occupy a considerable place in the ownership of this fleet. More generally, the dominant flags (in terms of carrying capacity) of the world fleet are those:

- of Panama (22.7% of capacity worldwide), used by shipowners in Japan, Greece, China, Taiwan and Switzerland,
- Liberia (10.1% of capacity worldwide), used by Germany, Greece, Russia and Saudi Arabia,
- Next come the Bahamas, Greece, the Marshall Islands, and Hong-Kong, etc.

As far as containerised transport is concerned, concentration in ownership was going on. In 2006, the share of the ten first shippers of containers increased by 26.5% and reached 48.5% of the worldwide container capacity, measured in TEU (source: UNCTAD). European interests are very well represented in this activity: in November 2007, four of the first seven shipowners in the world were European (including the first three), the others being Chinese and Taiwanese.

## 5. Inland shipping

Inland shipping is the transport of goods and passengers by navigable water ways. Navigable water ways are defined as rivers, lakes and canals on which of the vessels the carrying capacity of which is at least 50 tonnes may sail normally when laden (source: Eurostat).

In France, inland shipping grew both in 2005 (7.4%) and 2006 (1.2%) and reached 7.95 billion tonnes.km. At the same time, containerised transport increased by 4.8% in terms of the number of TEU in 2006 (source: VNF French National Office of Navigation).

River traffic in France concerns the North and East of the country. There are several navigable networks of widely varying importance; the most important being the Seine network.

### Key figures for inland shipping

Units: million Euros and workforce

	2000	2001	2002	2003	2004	2005
Turnover	422	423	432	493	541	571
Value added	172	175	179	209	216	208
Jobs	3,469	3,344	3,519	4,105	4,001	3,912
Number of companies	1,122	1,070	1,064	1,109	1,079	1,094

Source: Ministry of Transport / SOeS

### Inland shipping network in France

Units: tonne.km, % (rate of growth)

	Traffic 2006 (t.km)	2006/2005 (%)
Moselle	648.8	17.9
North	937.9	-3
Rhine	1,254.6	-2.8
Rhône	1,354.9	5.5
Seine-North	453.2	4.7
Seine-Oise	3,006.1	-0.3
The entire magistral network	7,655.5	1.5
Regions network	296.3	-6.2
All networks	7,951.8	1.2

Source: VNF

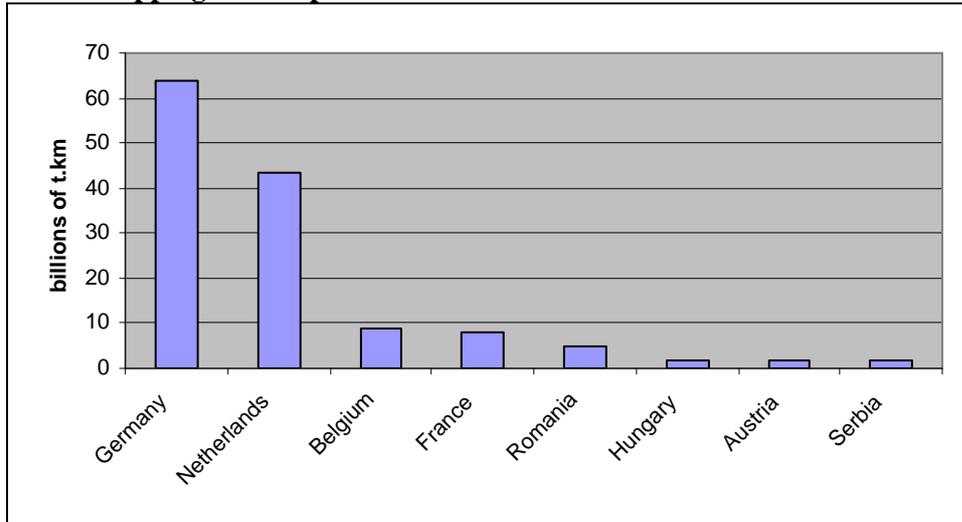
Where it is technically possible, inland shipping is an essential part of intermodal strategy, to clear the road network and limit emissions of pollution. It is open to containerised traffic since in France, inland shipping saw a rise of 4.8% in containerised volume (measured in TEU) in 2006. The Seine (+16.8%), Rhone (+9.8%) and North (+13%) networks are particularly dynamic.

In Europe, although it only represents 3.3% of traffic within EU-25 in 2005, inland shipping is of strategic importance in certain geographical areas and for certain products, particularly certain dry bulk products. Geographically, it concerns:

- the North, which links the Dutch, Belgian, Rhine and North German networks as far as Poland; it is linked to major sea ports, such as Rotterdam, Hamburg and Antwerp;
- the Danube area,
- several regional networks, particularly on the Mediterranean (Rhone and Po networks) and the Channel (Seine).

Inland shipping takes the major share of the inland transport of construction materials in Europe (39%) and important shares for cereals, agricultural produce, coal and ore. The promotion of river traffic is part of the EU strategy for trans-European networks and the Marco Polo II programme.

**Inland shipping in Europe. National and international traffic 2006**



Source: ECMT, Eurostat

## Maritime financial services

### 1. Definition

Maritime financial services here include insurance and banking. Maritime insurance statistics are generated by the industry. Due to a lack of general data, the banking activities taken into account only include a share of that which relates to the maritime sector.

### 2. Maritime insurance

#### 2.1. Definition

This sector includes insuring vessels, including those under construction ("hull insurance") and goods transported by ship ("cargo insurance"). The international standardisation of statistics lead to grouping all categories of maritime and transport insurance together (maritime, river, terrestrial).

#### Key figures for maritime and transport insurance - France

Units: million Euros, workforce

	1999	2000	2001	2002	2003	2004	2005(sf)	2006(f)
Turnover marine hull	473	505	537	595	483	451	498	495
Turnover marine cargo	543	496	567	697	654	593	758	746
Total turnover marine insurance (1)	1,016	1,001	1,104	1,292	1,137	1,043	1,256	1,241
Value added (2)	123	114	111	151	164	142	157	142
Jobs (2) (3)	1,375	1,199	1,379	1,584	1,307	1,091	1,182	na

Data 2003 and 2004 revised.

sf: semi-final. f: forecasts. na: not available.

(1) Gross premiums. Common risks and war risks, direct business and acceptance, including hull insurance for river and pleasure boating, river and terrestrial cargo insurance, excluding civil liability for land transport

(2) Ifremer estimates

(3) Full time equivalents

Source: FFSA, INSEE (industry accounts)

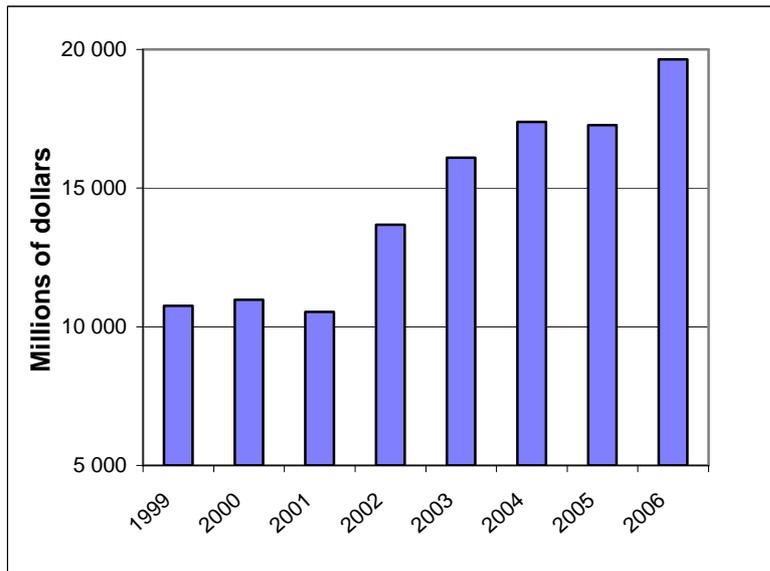
#### 2.2. International situation: the weight of Europe

The recent increase in international trade (8% in 2006) has led to growth in exchanges by sea and an explosion of the marine and transport insurance market (16.9 billion dollars of turnover in 2006, namely growth of 8.7%). Europe is the major centre in the world for marine insurance (63.9%) in front of Asia-Oceania (22.4%) and North America (11.7%).

A reduction in the frequency of shipping losses (0.1% of the world fleet) is combined with an increase in the severity of accidents. The main reasons put forward are the qualifications of crews and climate change. The upward trend in the value of vessels and of the goods transported also contributes to the increase in risks. The increase in underwriters' charges push up the price of reinsurance and premium rates, therefore continuing the cycle of 2001–2002, despite the slow down in 2003. Premiums received in 2006 rose to 14 million Euros (+15.5% as opposed to +5.6% in 2005). The P&I (Protection and Indemnity) group has announced a 15% rise in premiums for 2008.

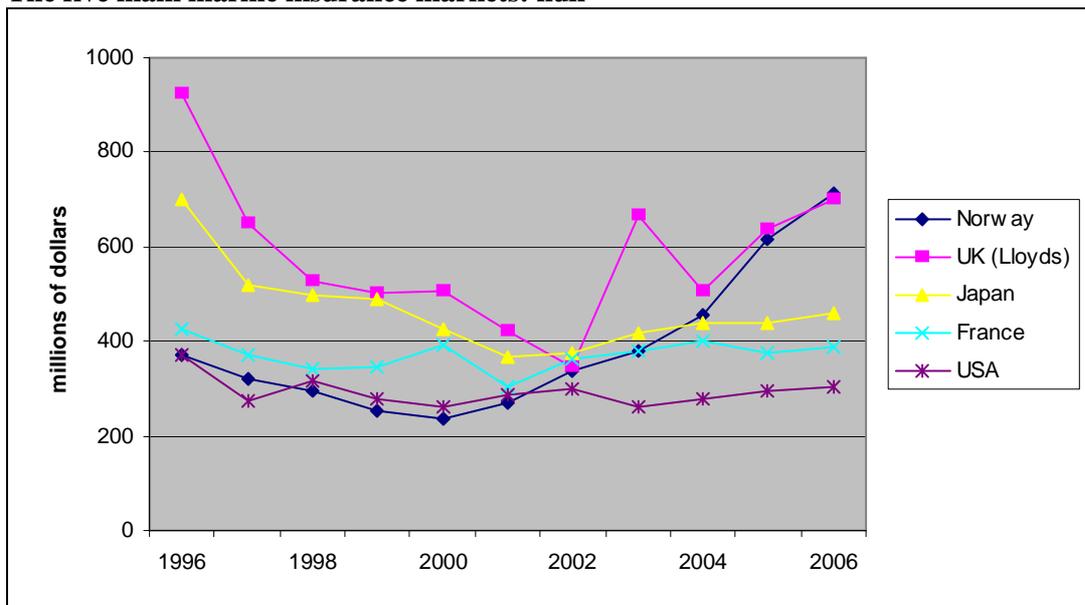
### World turnover in marine and transport insurance

Unit: million dollars



Source: Central Union of Maritime Underwriters.

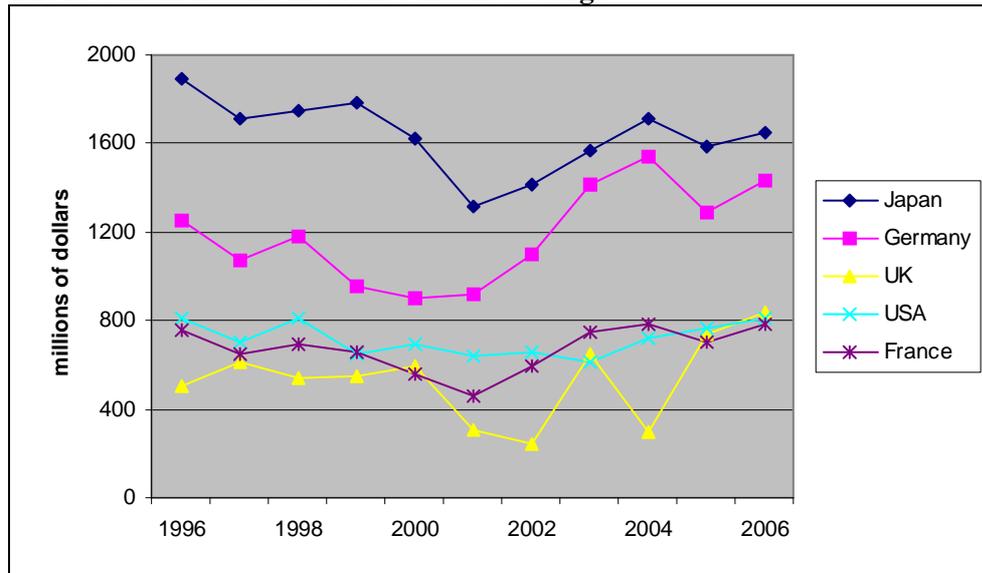
### The five main marine insurance markets: hull\*



\* Excluding offshore energy and hull civil liability.

Source: IUMI.

### The five main marine insurance markets: cargo



Source: IUMI.

### 2.3. French companies: situation and outlook

The French insurance market ranks 4<sup>th</sup> (6.5% of the contributions collected) behind the US, Japan and the UK. Its "Maritime and Transport" branch is very active. In the field of hull insurance, its market share is 8% (10% in 2003) and comes 4<sup>th</sup> in the world behind Norway, the UK (Lloyds) and Japan. For cargo insurance, it is ranked 5<sup>th</sup> in terms of turnover / premiums, with an 8% market share (10% in 2003), behind the UK (Lloyds), Japan, the US and Germany.

The intensity of international competition and the Euro/dollar rate have recently created constraints for the development of the French market which, nevertheless, remains competitive at the international level (80% of the hull business is taken out outside the domestic market, whilst the Japanese market for example, which is more profitable, is mainly domestic) and covers almost one quarter of the tonnage of the merchant world fleet.

### 3. The banking sector

In general, banking services for maritime activities (port activities, merchant shipping, etc.) represent diverse and competitive markets, in which several French banks are active. The main banking activity taken into account here is the financing of marine fisheries, the only activity for which the data available are fairly complete.

#### Key figures for the Crédit maritime mutuel

Units: million Euros, workforce.

	2001	2002	2003	2004	2005	2006
Net proceeds banking	92	92	100	93	95	101
Value added*	62.6	62.6	68.9	64.1	65.5	69.6
Jobs**	900	900	900	1020	966	978

\* Ifremer estimate from operating accounts.

\*\* Full time equivalents.

Source: Crédit maritime mutuel.

In the domain of banking services to the marine fishery and shellfish farming sectors, the “Crédit maritime mutuel”, now an affiliated company of the “Banque fédérale des Banques populaires”, is very active in banking services to fisheries and the boating industry.

The Credit maritime is an important link in the fisheries policy and the only institution that accords loans at discounted rates for investments made within the framework of inter-ministerial circulars. Its activities extend to the finance of pleasure boating, commercial port and camping. In the current worldwide economic situation (high oil prices), the FPAP “fishing contingency fund” offers, together with the Ministry of Agriculture and Fisheries and that of the Budget, to adapt forms of finance previously reserved for commercial vessels to the fishing sector.

## **Non-commercial public sector**

## The Navy

### 1. Definition

At sea, the Navy contributes to the national defence effort and strategic objectives by the maintenance, training, equipment and operational deployment of naval forces. It takes part in the major trends that have been affecting armed forces since the end of the Cold War, namely professionalization and recentring priorities around dissuasion, prevention, projection-action and protection mission.

### 2. The Navy's organisation, financial and human resources

The Navy is, by the financial effort made and its personnel, a major component in the French maritime economy. The scope of French maritime areas and the technicality of the equipment deployed in a particularly severe environment, go a long way to explaining the current format of the Navy and its personnel. It represents one of the biggest investment budgets of the Ministry of Defence. The Navy's budget structure features a strong pre-eminence of investment: 55% of the budget is devoted to the equipment and its maintenance.

The recent past has been marked by the continuity of the effort of recovery to improve the level of availability of the equipment, renew and modernise equipment and support research. The priority is the improvement of the availability of ships. For the six years that cover the military programming law 2003–2008, the greatest expenditure concerns the scheduled maintenance of equipment on ships, submarines and aircraft: it represents approximately 25% of investment and is up 5% in relation to the military programming law 1997–2002. Its operation provides salaries for sailors and current resources. In 2007, the appropriations opened by the initial finance act stood at 4,457 million Euros.

#### Navy Budget 2007

<b>Operation</b>	<b>4,477 million Euros</b>	<b>Investment</b>	<b>2,178 million Euros</b>
Payroll	36%	Deterrence	29%
Social charges	24%	Naval aviation construction	26%
Maintenance of equipment	30%	Development	22%
Current operation	8%	Fleet construction	11%
Operational fuel	2%	Miscellaneous	12%

Source: Naval staff

For the personnel, professionalization has led to a very significant change of format. Between 1996 and 2002, manning levels went from 70,000 to 55,000, both military and civilians.

#### Budget for Navy civilian and military personnel

	<b>2000</b>	<b>2001</b>	<b>2002*</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007**</b>
Civilian personnel	9,502	9,205	10,157	10,296	10,291	10,064	8,511	8,636
Military personnel	49,491	45,387	44,276	44,267	44,131	43,195	40,849	40,643
Including conscripts and volunteers	5,018	1,667	1,613	1,601	1,596	1,515	1,349	1,337
<b>Total</b>	<b>58,993</b>	<b>54,592</b>	<b>54,433</b>	<b>54,563</b>	<b>54,422</b>	<b>53,259</b>	<b>49,360</b>	<b>49,279</b>

\* There are no longer any conscripts since 2002 (professionalization of the Armed Forces).

\*\* Draft budget.

Source: Naval staff

For 2008, the ceilings for manning levels plan for 4,741 officers (including officer cadets), 25,881 petty officers, 7,987 ratings and seamen 1,394 volunteers. The large proportion of petty officers shows the highly technical nature of jobs in the Navy, since the ratings, seamen and volunteers act as operators.

The civilian personnel, many in support services (supply department, fleet support service, naval air bases), represent today 16% of the Navy's personnel. The operational reserve (5,500 posts in 2005, 7,700 in 2012) provides the Navy with the additional human resources required in times of crisis.

### 3. Outlook

#### 3.1. Modernisation and investment projects

The objective of the military spending programming law is to renew the high seas fleet (submarines and surface ships) and back up the naval air fleet renewal: eight multi-missions frigates (FREMM) and two "Barracuda" nuclear-powered attack submarines have been ordered, and seventeen "Rafale" aircraft and the first seven "NH-90" helicopters delivered.

When the military programming budget is complete, the Navy will therefore enjoy an improved anti-air protection capacity, with the delivery of two "Horizon" class frigates. Moreover, the Navy is restoring the permanence of the carrier battle group and improving its projection and command capability, thanks to the delivery of two landing helicopter docks (LHDs).

The Navy has launched programmes in compliance with the new naval strategy orientations, whether they fall under the projection/action function (naval cruise missile) or that of protection (Spatonav):

- 250 naval cruise missiles are to be delivered from 2011 onwards. Aboard multi-mission frigates and submarines, they will provide deep strike capability;
- the means for surveillance and protection of maritime approaches have been strengthened to help fight terrorism and smuggling, along with the traditional actions of the State at sea: the Spationav programme, modernising the string of semaphores and the programme to renew launches belonging to the maritime "gendarmarie" (surveillance, protection, control and rescue service).

For the second aircraft carrier, the choice of conventional propulsion should provide 10% savings on the cost of ownership and open the path to co-operation with the United Kingdom, with a future British aircraft carrier adapted to specific national requirements (deployment of conventional aircraft with catapults and arresting gear). Although British and French air groups and the way they use their aircraft carriers are different, the needs and schedules of these two navies do converge.

The second aircraft carrier will have a larger displacement than her elder sister ship, with significant possibilities to adapt so that future generation aircraft can be used. After moving into the programme phase in 2005, construction of the vessel should begin in mid-2007, to be commissioned in 2015 when the "*Charles-de-Gaulle*" will be due to change its two nuclear cores.

#### 3.2. The Navy and Europe

The Navy's action is and will increasingly be part of a series of operational commitments with our European partners. At the Helsinki European Council in 1999, the fifteen Member States set the objective of a force projection capability which would comprise naval elements if needed.

In the naval field, France made a significant contribution with the aim of providing sufficient operational help to:

- control information in the maritime environment, using in particular, maritime patrol aircraft, anti-aircraft frigates and Hawkeyes;
- take part in the sequence of operations with the command structures, the air-and-sea group organised around the aircraft carrier, its air group, its escort of frigates, a nuclear attack submarine, and amphibious equipment.

### Naval and naval aviation facilities

Main Equipment	2005	2007	2008 (end of military programming law)	Armed forces model 2015
Aircraft carrier	1	1	1	2
Carrier-based aircraft	60	62	61	60
Maritime patrol aircraft	28	28	28	22
Combat helicopters	46	53	52	51
Sub-Surface Ballistic Nuclear SSBN	4	4	4	4
Sub-Surface Nuclear SSN	6	6	6	6
Anti-aircraft frigates	3	2	3	4
Multi-mission frigates (1)	22	22	22	22
Surveillance frigates	6	6	6	6
Amphibious ships: 2 LPDs (2), 3 LHDs	4	4	4	4
Mine warfare countermeasure ships	14	14	14	16
Support ships (3)	5	5	5	6
Light transport and patrol ships	15	15	15	16

(1) These include the multi-mission “land strike” version frigates (FREMM AVT), anti-submarine warfare frigates, “La Fayette” class frigates and A69 Aviso patrol boats.

(2) LPDs Landing Platform Docks.

(3) Supply tankers and repair and maintenance ships.

Source: Naval staff.

It also participates in *Euromarfor*, alongside Spain, Italy, and Portugal, and in the French-German naval force (FNFA). *Euromarfor* was engaged in the Indian Ocean and the Red Sea from February 2002 to December 2004 within the “Enduring Freedom” operation. The French-German naval force also took part (in summer 2003 and since early 2005). These European commitments will continue to grow and thought is being given to fitting them into a broader framework with the Eumarc (EU Maritime Reaction Capability) concept.

In the realm of armaments, the French Navy is making a major contribution to the emergence of a “Europe of armament”, through bilateral or multilateral cooperation (FREMM, Horizon, NH 90) and by jointly organising armament co-operation (OCCAR, which gathers the United Kingdom, Germany, Italy and France), for the PAAMS (Principal Anti Air Missile System) air defence systems based on Aster missiles (future surface to air family).

### 3.3. Hydrographic surveys and scientific research

The future is also based on naval research and operational oceanography. In this respect, the Navy is involved in oceanographic research (see chapter “Marine research”) through the Navy hydrography and oceanography department (SHOM). The SHOM conducts its general hydrographical mission in service of all users, particularly for the safety of maritime navigation, within the framework of the SOLAS convention: the SHOM gathers and processes nautical data, plots marine charts and maintains hydrographical data bases. Placed under the ward of the Ministry of Defence, the SHOM also satisfies requirements for expertise on the aero-marine environment. A service in support of maritime policy, it

contributes to the action of the State at sea (see chapter "Public intervention") in surveillance and forecasting of the drift of pollution slicks, the delimitation of maritime borders, the prevention of natural catastrophes, operational oceanography and mapping of the coastline.

Collaboration between the Navy and the SHOM on the one hand and, civilian marine research bodies on the other, covers several fields:

- Physical oceanography: the SHOM and Ifremer, particularly, exchange data on currents, the characteristics of the environment (temperature, salinity, conductivity), oceanic forecasting, the morphology of the seabed and gravimetric surveys. They take part in joint projects in acoustic, in ocean modelling (Mercator, the marine part of GMES) and *in situ* measurements (Coriolis).
- Marine geosciences: collaboration is developing particularly in the field of sedimentology.
- Submarine work is also a field of collaboration between Ifremer and the Navy, which has limited the scope of its interventions to one hundred metres since the start of the 1990s.

Collaboration also exists in terms of research resources. The Navy's hydrography and oceanography vessel *Beautemps-Beaupre* (investment: 95% by the Navy, 5% by Ifremer), is used by Ifremer at sea on average 10 days a year. The Ifremer research vessel *Pourquoi pas?* (investment: 55% by Ifremer, 45% by the Navy), is used by the Navy at sea on average 150 days a year.

## Public intervention

The State intervenes in several fields of the maritime activity: economic and social (seafarer labour schemes, social protection), regulation and education. It fulfils technical missions (beacons and signalling, surveillance, and safety) through the decentralised services of the Maritime Affairs state administration.

### 1. Public effort in the maritime field

State intervention in the maritime field has been re-organized since the “Incorporating Act concerning finance acts” came into force in 2006, but has kept its main characteristics and functions.

- An essential part of public action concerns maritime safety and security, seafarers and maritime education, support for the merchant fleet and inter-ministerial action at sea (control of fisheries and nautical recreational activities, marine pollution response operations within the framework of the onshore component of the POLMAR system).
- Another domain consists in public intervention concerning ports and the coast, aimed at the development of intermodality.

This chapter will also address seafarer social protection and its budget aspects.

#### Public intervention in the maritime field

Unit: million Euros

Action	2006*		2007*		2008**	
	AE	CP	AE	CP	AE	CP
Maritime safety and security	<b>22.16</b>	23.94	30.29	27.07	27.02	29.57
Mariners and maritime education	10.5	10.5	10.91	10.91	10.66	10.66
Merchant fleet	72.71	72.71	73.52	73.52	75.29	75.29
Inter-ministerial action at sea	10.27	9.57	9.78	9.78	8.73	9.88
Support for the programme	10.22	10.04	10.32	10.32	10.68	10.68
Total	125.86	126.76	134.82	131.6	132.38	136.08

\*: initial budget. \*\*: draft budget. AE: appropriations. CP: payment credits.

Source: Directorate of Maritime affairs (DAM)

Between 2006 and the 2008 draft budget, public intervention in favour of the maritime field has increased by approximately 7.4%. This increase is mainly due to the launch, in 2007, of a multiannual plan for the modernisation of the regional operational surveillance and rescue centres (CROSS) requiring investments of approximately 44 million Euros over three years. This plan shall provide for the renovation of the CROSS' equipment and premises, and an extension of the system overseas, particularly in French Polynesia and New Caledonia.

Support for the merchant fleet has also increased from 2006 to 2008, to improve the competitiveness of the French fleet and increase the employment of seafarers in a highly competitive context.

Including participation of local authorities ("contributions" of approximately 4 million Euros) and credits corresponding to the Maritime Affairs administration staff payroll, the overall estimate of public intervention in the maritime field stands at 337.99 million Euros in 2008.

## 2. Administration of Maritime Affairs

### 2.1. Maritime Affairs services

The central administration for Maritime affairs is the Directorate of Maritime Affairs (DAM).

The decentralised services of the administration responsible for the sea include:

- the decentralised Maritime Affairs services: “general” services (at region and county levels) and operational services specialised in maritime safety (for example CROSS and ship safety centres);
- the local subdivisions of the Equipment administration (DDE), which are competent in terms of maritime signalling (Lighthouses and Beacons Service) and response to accidental oil pollution of the coast and the sea (POLMAR-terre: onshore component of the Polmar system).

#### 2.1.1. Staff

The staff working in the maritime field fall into two categories:

##### **The Maritime Affairs staff**

They have:

- An administrative role in the management of seafarers (working system, social protection, discipline and criminal proceedings, and training);
- A technical role in the field of the safety of ships (safety centres), the safety of maritime navigation (CROSS), economics (Marine fishery and mariculture regulations, management of the public maritime property set aside for mariculture, sanitary and technical control of seafood products, statistics and fishing quotas);
- A policing role and functions in the marine and commercial courts.

##### **The personnel of the DDE and maritime services**

They are in charge of maritime signalling ("Lighthouses and Beacons") and response to pollution by hydrocarbons.

For maritime signalling, they study, draw up proposals and implement nautically (navigational aids) and physically (small towers and buoys) adapted solutions. Their electronics and civil engineering skills are required to repair these navigational aids. They help keep seafarers informed about work underway, defects and repairs.

For oil pollution response operations, the "Lighthouses and Beacons" service is generally responsible for the management of the storage centres for equipment used to fight accidental marine pollution by hydrocarbons (11 of the 13 POLMAR centres are in this case). They take part in the training exercises organised at local level.

In addition to the Lighthouses and Beacons services, other DDE services and autonomous maritime services support the DAM in maintaining the ORSEC / POLMAR-terre system operational: depending on the local organisation, the county's POLMAR-terre contact person is either a staff member of the county service in charge of the coastal water quality files (CQEL) – this is also the case for two of the 13 storage centres – or, more often, of the "Risks and management of safety-defence crises" service, in accordance with the 2004-2007 Ministry directives.

In 2008, the number of Maritime Affairs staff is 3,332.

### 3. Resources used for “maritime safety and security”

#### “Maritime safety and security” operations

Unit: million Euros

	2006		2007		2008	
	AE	CP	AE	CP	AE	CP
Operational expenditure	<b>6.42</b>	6.42	12.6	12.6	9.64	10.64
Spending on investment	13.57	15.35	15.47	12.25	15.21	16.76
Spending on intervention	2.17	2.17	2.22	2.22	2.17	2.17
Total	22.16	23.94	30.29	27.07	27.02	29.57

Source: DAM

#### 3.1. Signals: Lighthouses and Beacons

The signalling system on the French mainland and overseas coasts has some 6,500 maritime signalling establishments, 3,700 lighthouses and lights, 2,580 buoys (1,309 of which are light buoys) and 2 radio-navigation (GPS, Loran C) systems. These navigational aids are developed in application of France’s undertakings under the terms of SOLAS (Safety of Life at Sea).

The maritime signalling policy (creation or suppression of maritime signalling services, modernisation, preventive maintenance, curative maintenance, nautical information, and compliance check) is mainly applied within the county subdivisions of Equipment and the Ministry’s technical and training network.

#### 3.2. Safety, surveillance, rescue

The CROSS are specialised services under the DAM. There are five Mainland CROSS centres (Gris-Nez, Jobourg, Corsen, Etel and La Garde) and two overseas (French West Indies-French Guyana, and Reunion Island).

These centres are responsible for six missions, within their zones of operation:

- search and rescue of people in distress at sea
- surveillance of maritime navigation
- surveillance of Marine fisheries
- surveillance of maritime pollution
- disseminating information for safety at sea
- monitoring security alerts from ships.

Two MRCC “Maritime Rescue Coordination Centres” at Papeete and Noumea coordinate rescue operations in the zones under French authority in the Pacific.

In 2007, the DAM launched a plan to modernise the CROSS. This plan is driven by the need to:

- give the CROSS the benefit of new technologies,
- enable the equipment to keep up with the development of the world wide distress and safety at sea system,
- replace obsolescent equipment,
- extend their surveillance capacity,
- improve the maintenance of their current installations (equipment and infrastructures).

This plan, programmed over three years, has a cost of approximately 45 million Euros.

### Main data concerning Search and Rescue

Units: personnel (unless specified), variations 2006/2005

Activities of the CROSS	2006	2005
Operations at sea in Metropolitan France	8,656	7,880
<i>Eastern Channel, North Sea</i>	+22%	
<i>Central Channel</i>	+1.5%	
<i>Western Channel</i>	+24%	
<i>Bay of Biscay</i>	-6%	
<i>Mediterranean</i>	+15.5%	
Operations overseas	1260	1145
<i>French Polynesia</i>	+197%	
<i>French West Indies-French Guyana</i>	+27%	
International operations (CROSS-MRCC) (1)	918	670
Data on people	2006	2005
Number of people involved in events at sea	13,882	13,246
Number of people rescued	11,019	
Success rate (2)	98%	
Loss of human lives (3)	237	
Losses of professional fishermen	21	
Losses of professional merchant seamen	18	20

(1) Conducted overseas within the framework of regional and bilateral agreements. Provide significant technical and material assistance to States without sufficient resources for search and rescue in areas of responsibility adjacent to French areas

(2) No. people rescued/No. people involved, after rescue operations coordinated by the CROSS

(3) Nautical recreational activities (bathing, underwater leisure, sailing on small hulls such as windsurf boards, kite-surfs, motor boats, dinghies) remain the most accident prone.

Source: DAM

### 3.3. The SNSM (National association for salvage at sea)

The French SNSM lifeboat association is a private, public utility, State-approved private body and carries out a large part of rescue operations on a volunteer basis under CROSS control. It has three operational roles:

- rescue at sea by volunteer lifeboatmen,
- training of volunteers lifeguards who ensure the safety of beaches,
- the prevention of risks associated with marine activities.

#### The SNSM in figures

3,500 permanent volunteer life boatmen specialised in sea rescue,  
 600 volunteers who train those responsible for the lifeboat stations,  
 600 volunteers who train those responsible for the training centres and their lifeguard instructors,  
 1,300 volunteer lifeguards detached in summer to ensure the safety of beaches,  
 45 employees between the headquarters in Paris and the CERO Western regional maintenance and repair centre at Saint-Malo.

229 lifeboat stations rescue on the coasts of Metropolitan France and overseas,  
 30 training centres across the entire country,  
 More than one third of French beaches are supervised by lifeguards.

The SNSM is a non profit-making association financed by private donations for almost the half of its budget, the remainder coming from subsidies from the State, the regions, counties and local authorities.

#### 4. Resources used for seafarers and maritime education

##### **Budget resources for seafarers and maritime education**

Unit: million Euros

	Initial budget 2006		Initial budget 2007		Draft budget 2008	
	AE	CP	AE	CP	AE	CP
Operational expenditure	0.22	0.22	0.35	0.35	0.61	0.61
Spending on investment	0.91	0.91	0	0	0.08	0.08
Spending on intervention	9.37	9.37	10.56	10.56	9.97	9.97
<b>Total</b>	<b>10.50</b>	<b>10.50</b>	<b>10.91</b>	<b>10.91</b>	<b>10.66</b>	<b>10.66</b>

Source: DAM

The training system available for seaman has several levels, from the vocational aptitude certificate for fisheries to officer's degrees from French merchant navy schools.

- The LEMA High schools for maritime and aquaculture training provide initial and further training for qualified seamen, aquaculture professionals and some fisheries officers. Teachers in maritime high schools now have public sector status.
- The four French ENMM merchant navy schools in Le Havre, Saint-Malo, Nantes and Marseilles train officers who will mainly serve aboard merchant vessels.
- Other private or non-profit-making establishments also exist.

To apply the new STCW international training standards and cope with the difficulties of recruiting seafarers (in fisheries and merchant fleets) and their shorter careers, an education reform has been implemented since 2003. It aims to open up maritime professions to new publics, develop seafarer loyalty and to adapt training to changing needs of shipowners and changing expectations of seamen.

##### **Funding allocated to the training of seafarers**

Budgets performed

Unit: million Euros

	<b>2005</b>	<b>2006</b>
ENMM subsidy	2.2	2.0
Of which operation	1.6	1.7
Of which equipment	0.6	0.3
Subsidy for professional maritime high schools	1.7	2.4
Of which operation	1.5	2.2
Of which equipment	0.2	0.2
Private institutions	1.0	1.1
Sub-total Mariners	4.9	5.5
Grants and in-service professional training	2.8	2.8

Total Maritime education	7.7	8.3
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Source: DAM

### Annual budgets of the ENMM

Unit: million Euros

	2005	2006
Le Havre	1.4	1.5
Saint-Malo	1.5	1.1
Nantes	1.0	1.6
Marseille	2.0	2.1
Total	5.9	6.3

Source: DAM

### LEMA initial training courses

Unit: number up students up to 30 September

	2004/05	2005/06	2006/07
Fishing	797	707	639
Shellfish farming	276	318	265
Merchant seaman	175	194	195
Fishing and the merchant navy	421	414	448
Total	1669	1633	1547

Source: DAM

### Breakdown of students by type of establishment

School year	2004/05	2005/06	2006/07
<b>LEMA INITIAL TRAINING COURSES</b>	1,669	1,633	1,547
LEMA in-service training courses	1,802	1,793	1,807
ENMM	998	1,010	880
Total	4,469	4,436	4,234

Source: DAM.

## 5. Budget resources for “merchant fleet” operations

### Interventions in terms of the merchant fleet

	Initial budget 2006		Initial budget 2007		Draft budget 2008	
	AE	CP	AE	CP	AE	CP
Funding allocated	72.71	72.71	73.52	73.52	75.29	75.29

Source: DAM

Budget resources in terms of the merchant fleet concern:

- the payment of a subsidy to top up pensions paid to former employees of the former state owned shipping line CGM;

- subsidies to the bodies concerned in compensation for cash disbursements for exonerations or reimbursement of employer's social security charges for the crews of merchant ships flying the French flag, assigned to maritime transport activities subject, in the first place to effective international competition.

## 6. Budget resources in terms of inter-ministerial action at sea

### Inter-ministerial action at sea

Unit: million Euros

	2006		2007		2008	
	AE	CP	AE	CP	AE	CP
<b>OPERATIONAL EXPENDITURE</b>	5.24	5.24	6.08	6.08	6.65	6.64
Spending on investment	5.03	4.33	3.7	3.7	2.08	3.24
Spending on intervention	0	0	0	0	0	0
Total	10.27	9.57	9.78	9.78	8.73	9.88

Source: DAM

### 6.1. The DCS Control and surveillance system

The DCS, in addition to its contribution to State action at sea and to the implementation of emergency plans (POLMAR, passenger rescue plans, etc.), is mainly involved in the activities listed below:

- marine fisheries (including on shore related activities, and mariculture),
- maritime navigation,
- pleasure boating and nautical leisure activities,
- policing ship safety,
- policing marine environment.

The DCS is made up of 27 operational units (275 staff) broken down into two components, one sea-going, using two patrol boats and three regional surveillance launches, the other operating at sea on the coastal fringe and on shore. These units use patrol boats, coastal surveillance launches, fast semi-rigid crafts and other appropriate vehicles (for towing inter alia).

### 6.2. POLMAR-terre

The POLMAR system comprises a POLMAR-mer component for seagoing action (see chapter "Coastal and marine environmental protection"), and a POLMAR-terre component for onshore action.

The mission of POLMAR-terre is partly entrusted to the DAM. Locally, it continues to be applied mainly by the DDE and maritime services (23 services in Metropolitan France, 5 overseas).

In each county, there is a POLMAR representative who, in collaboration with the "crisis management" or "safety-defence" manager, is responsible for:

- keeping the county ORSEC/POLMAR-terre plans up to date, in terms of coastal site protection, of contribution to cleaning up of the coastline and waste management;
- the organisation of training exercises using the equipment. The DAM finances these exercises, the frequency of which was fixed by the "post-Érika" regulations, to once every three years per county (this includes "staff exercises", which are the sole responsibility of the prefectures).

In time of crisis, the POLMAR representative or his immediate superior shall become the prefect's technical advisor.

Furthermore, the DAM manages, with the help of the CETMEF maritime and river technical study centre, eight "POLMAR-terre inter-county storage and intervention centres" in Metropolitan France and five centres overseas. This action consists mainly in the maintenance of the specialised equipment stored in them, increasing the total length of floating protective booms and in replacing obsolete equipment. This demands a high level of investment.

To keep POLMAR-terre network operational, the DAM finances training courses for the county representatives and the staff of the 13 inter-county storage and intervention centres. The body providing these courses is almost always the CEDRE Centre for documentation, research and experimentation on accidental water pollution. The DAM commissions studies from the CEDRE and CETMEF as an essential contribution to extending knowledge and techniques to improve oil spill response.

## 7. The ENIM

An important player in State intervention in the maritime field, the ENIM provident fund for naval personnel is both a central state service in the Ministry responsible for merchant shipping and a public administrative body:

- as a central state service, the ENIM drafts policy and proposes the legislative and regulatory changes required for seafarers' social security,
- as a public administrative body with a civil personality and financial independence, it manages the social security system for seafarers.

The ENIM is a social security system providing benefits for:

- sickness, maternity, invalidity, death and occupational accidents, covered by the general provident fund,
- old age, covered by the seafarers' pension fund.

### Budget of ENIM

Unit: million Euros

	2005	2006	2007*
Costs	<b>1,528</b>	1,551	1,589
Benefits, sanitary and social action, transfers	1,461	1,489	1,557
Other running costs	67	62	32
Of which staff costs	21	21	22
Earnings	1,559	1,561	1,589
Contributions and other products	737	729	696
State subsidy	822	658	719
Subsidy from the CNAM**	0	174	174

\* Initial budget

\*\* Financial support for the public plan has led to the CNAM sickness pension fund complementing State budget to balance the "sickness" branch of the social benefit scheme for seafarers.

Source: ENIM

The ENIM develops social action, with the payment of individual aids and subsidies for homes for old aged or handicapped people. It takes part in preventive action by supporting associations. ENIM pensioners are:

- seafarers on board merchant ships, fishing vessels and pleasure craft or seafarers authorised to validated services on shore and their beneficiaries,
- students following a maritime education (national Merchant Navy schools, professional maritime high schools),
- retired seafarers and their beneficiaries.

## Coastal and marine environmental protection

Coastal environments are subject to many disruptions of natural origin or due to human activities. Faced with the consequences of such disruptions, coastal and marine environmental protection policies have been set up at national level, but also within the framework of international institutions in which France takes part. They concern in particular, the prevention, reduction and elimination of pollution; the repair of damage and the acquisition, processing and circulation of information on environment.

### 1. How to assess the cost of coastal and marine environmental protection?

The approach developed in this report is intended to describe the economic importance of the sectors of activity associated with the sea and is based on conventional macroeconomic indicators, concerning the creation of wealth by these sectors (value added) and the corresponding economic activity (employment). Now, these sectors of activity are liable to have an impact on coastal and marine ecosystems. Some of them are also highly dependent on the quality of these ecosystems for their development; this quality being affected by many uses, including terrestrial. The sustained nature of the economic development associated with coastal and maritime activities is potentially affected.

Therefore, for these activities as for the economy as a whole, it is important to develop additional macroeconomic indicators to appraise the state of the ecosystems on which economic development and its sustainability depend. The international methodological framework for national accounts, developed by the United Nations following the conclusions of the Rio Earth Summit in 1992, is intended to develop satellite accounts as made up of: i) economic accounts (spending on protection, taxes, jobs), ii) physical accounts which summarise the flows of materials generated by economic activities, iii) integrated accounts to make the link between economic information and its environmental impact. In France for example, the IFEN French Institute for Environment draws up satellite accounts for air, from the National statistical office's input-output tables and the accounts of atmospheric emissions from the CITEPA inter-industry technical centre for the study of atmospheric pollution.

An initial approach, very widely developed in France and internationally, consists in measuring the cost of the expenditure incurred by three large categories of agents (state administrations, companies and households) to prevent or correct damage to the ecosystems. This approach provides a lower bound estimate of the loss of value due to such expenditure. In France, overall spending on protection of the environment was estimated at almost 36.2 billion Euros in 2006, namely 2.1% of GDP (source: IFEN); they are almost evenly shared by the three categories of agents.

This approach is based on an breakdown of spending on protection, described below and illustrated by case studies.

### 2. Breakdown of spending on protection

- a) Expenditure of companies.- Compliance with environmental standards imposes additional costs on companies, but also stimulates certain economic activities associated with the protection of the quality of the environments. These costs correspond to spending on investments and to operations contributing to prevention, reduction or elimination of pollution generated by their activities.
- b) Expenditure of households.- This mainly concerns the funding of individual or collective water cleaning, the treatment of waste and response to pollution (e.g. air, noise).

- c) Expenditure of administrations.- Spending on protection is generally incurred at the initiative and under the responsibility of public bodies, where local authorities play an increasingly important role (almost one third of such public expenditure).

Administrations' expenditure falls into the following categories:

- 1.- Management of living resources exploitation.
- 2.- Protection of natural assets, including: (i) the land policy applied by the Coastal and Lakeshore Conservatory to acquire land on the coast for the protection of landscapes and ecosystems, (ii) the creation and management of marine protected areas (MPAs), (iii) restoring the coast (action against the erosion of the coastline, and beach re-sanding); (iv) maintaining the ecological balance (for example actions against proliferating species).
- 3.- Measures for the prevention and management of pollution. This involves for example measures to restore the quality of the sea and estuary waters and to prevent and control accidental and chronic pollution. Several forms of action should be considered: the implementation of the water framework directive (WFD), measures against the proliferation of green algae, response to oil spills, and sanitary surveillance.
- 4.- The monitoring and management of natural hazards. This involves, for example, water and phycotoxin monitoring networks, or systems for the detection of extreme climatic events
- 5.- Waste management (collection of macro-waste, management of dredging spoil).

Data on protection spending at national level, for all categories, are gathered by Ifen. However, there is no equivalent system to identify the coastal and marine subset of such expenditure. Information is often fragmented and incomplete. The purpose of the next section is not to provide a global figure for spending on protection, but to illustrate certain categories in view of the limits of the information available gathered from specialised bodies and public institutions.

### 3. Examples of spending on protection

#### 3.1. Expenditure concerning the management of the exploitation of living resources

The intervention of the public authorities in the management of the exploitation of living resources is justified by the need to implement regulatory and financial mechanisms to ensure a sustainable exploitation. The accounting of all expenditure for such tasks is extremely complex because of the large number of administrations and bodies involved at local, regional, national and international level.

The following key elements of cost must be mentioned:

- Administrative costs.- State authorities in the area of fishing and aquaculture resources are the DPMA Marine fisheries and aquaculture directorate (Agriculture and Fishing Ministry), DAM Maritime affairs directorate, and other bodies such as veterinary services. Their budget is not however exclusively used for the management of these sectors and would require a breakdown of costs (not available for this analysis).
- The costs of scientific research required to take decisions (see overall estimate of marine research budget in France in next chapter).
- The cost of control.- Control is aimed at ensuring compliance with regulations. The control at sea requires very extensive, costly resources. However, this often involves the provision of ships and personnel to meet other objectives such as the surveillance of maritime traffic. In general, costs are allocated globally, which makes it difficult to identify each subset. Apart from surveillance at sea, other types of control are carried out on shore.
- Other costs in support of the industry.- They concern aid for the regulation of the markets and innovation.

#### 3.2. Expenditure concerning the protection of natural assets

### 3.2.1. Preservation natural heritage: coastal ecosystems

Public-funds-supported actions for the protection of coastal ecosystems include the creation and maintenance of parks and reserves, inventories, regulatory protection, contractual protection, and land protection mechanisms.

With the creation of the Ministry of Ecology, Energy, Sustainable Development and Land Management, the budget for 2008 reflects the government's will to prioritise biodiversity protection policies. With an overall of almost 190 million Euros, the financial resources allocated to these policies are up by almost 30% compared to 2007, which permits to reinforce both the network of protected areas and the partnerships aimed at the preservation of fauna and flora and their habitats.

31% of this budget is allocated to support for the national parks, 24% to financing the Natura 2000 network, 9% to natural reserves, 8% to programmes for the improvement of knowledge of natural assets and landscapes, and 6% to the Agency for marine protected areas, responsible for setting up a network of ten natural marine parks by 2012.

### 3.2.2. Regional natural parks

The regional natural parks (PNR) are vast areas for which a territorial project combining the preservation of the natural, cultural and landscape assets, formed part of a 12-year charter approved by the local authorities and the State. In total, ten regional natural parks include portions of coastline: the Capes and marshes of the Côte d'Opale (Pas-de-Calais), the marshes of the Cotentin and Bessin, Armorique, La Brière, the "landes" of Gascony, Narbonnais, Camargue, Corsica, Martinique and French Guyana.

A PNR must not include a marine part or public maritime property. However, since the decree of 2 May 2007, the park's charter may give guidelines for action and measures concerning maritime parts of its coastline; they are variable according to the local situations and the capacity and technical skills of the mixed association managing the PNR, with the agreement of the State authorities. When a PNR is the neighbour of a marine natural park, the two entities shall have coherent objectives and, wherever possible, take coordinated measures.

### 3.2.3. National parks

Following the law of 14 April 2006 concerning national parks, regional natural parks and natural marine parks, two new national parks have been created: the Amazonian park of French Guyana and the national park of Reunion Island, which do not have any marine parts. Nevertheless, the review of the decrees setting up the existing parks, started in 2007, is the opportunity for public bodies like the national park of Guadeloupe and Port-Cros, to redefine their scope and integrate or develop their marine part (called "adjacent marine areas", or "buffer areas" around the park centres). Therefore, in Guadeloupe, several sectors are likely to be classified as "park centre". In the national park of Port-Cros, which did not have a peripheral area, a study zone was defined to identify the future adjacent marine area, with the view to creating a coastal and island park. Finally, a public association was set up in 1999 to prepare the creation of a new national park on the limestone massif of the Calanques region, near Marseille and Cassis, which would extend over on 5,500 ha for the land part and 2,200 ha for the marine part.

### 3.2.4. National natural reserves and Corsica

The "Southern and Sub-Antarctic" natural reserve, created in 2006, has a surface area of 2.3 million hectares, including a marine area of 1,570,000 ha, and helps to protect coastal areas in the southern seas. Two new natural reserves were created overseas in 2007: the reserve of M'Bouzi near Mayotte Island (142 ha, including 60 ha of marine reserve), and the marine reserve of Reunion Island (3,500

ha). Finally, some thirty projects to create reserves are being examined, one third of which concern coastal, mainly overseas, regions (almost 11,000 ha).

### 3.2.5. Natural marine parks

The category of “natural marine park” was created by the law of 14 April 2006. The first marine natural park, the Iroise Sea park, was created by decree of 28 September 2007 for a surface area of 3,550 km<sup>2</sup>. Another project is being examined near Banyuls (Vermeille Coast project). The aim of the government’s “Biodiversity Strategy” is to create ten natural marine parks by 2012.

### 3.2.6. Contracts for protection (Natura 2000, Ifrecor)

The Natura 2000 network aims to preserve the most threatened habitats and species in Europe through a concerted, contract-based approach on these sites. It is now complete for the land environments and includes, as at 31 May 2007, 1,335 sites (4.6 million hectares on land, namely 8.39% of the French territory), proposed in accordance with the European “Habitats” Directive and 371 special protection areas (4.8 million ha on land, namely 7.79% of the French territory) designated for application of the “Birds” Directive. In application of the Biodiversity Strategy adopted in 2005, in compliance with EU policy, this network should now be completed for marine environments.

Ifrecor.- Aiming to protect the coral reefs in the French overseas territories and counties (Guadeloupe, Martinique, Mayotte, Reunion Island, New Caledonia, French Polynesia and Wallis & Futuna and other islands), the government launched the Ifrecor “French initiative for coral reefs” in 1998. The Ifrecor committee was created and made up of national and local stakeholders. Direct State finance for Ifrecor over the period 2006–2010 will amount to approximately 500,000 Euros per year, with half of the funds coming from the Ecology Ministry and half from the Overseas Territories Ministry.

### 3.2.7. The management of natural assets: example of the Gironde

The management of natural assets is decentralised to a large number of bodies, particularly local authorities. The interest of the coast of Aquitaine is due to the presence of the ONF (national forestry authority), which works over a wide area of this region and has much valuable information, on which researchers from Cemagref are working. The appendix in the end of this chapter summarises the information available on a case study: the Gironde county.

### 3.2.8. Action against proliferating species

Some species have been introduced into coastal ecosystems accidentally. When their development brings about significant changes in the characteristics of these ecosystems and creates nuisances for coastal users, measures to contain their spread are implemented.

This type of problem is raised for certain species of macro-algae. Apart from ulva, other known cases involve some brown algae and a tropical green algae called *Caulerpa taxifolia*.

The case of the gastropod mollusc called crepidula, or slipper limpet, is also well known. It now occupies a significant place in shallow, sheltered areas like bays and estuaries. The Gulf of Saint Malo is the most colonised sector, particularly the Saint-Brieuc and Mont-Saint-Michel bays.

Until recent years, the response to crepidula was limited to occasional clean-up operations by dredging oyster beds, then discarding the limpets in abandoned areas of water or in dumps on land. But a large scale programme to restore the sea bottom has been implemented in northern Brittany since 1998 by the Areval association for harvesting and recycling of crepidula, formed by the regional maritime fisheries committee of Brittany and the northern Brittany regional shellfish farming section. This means extracting and recycling slipper limpets industrially for use in animal feed or as calcareous soil enrichment for farm land.

Nearly 34,000 tonnes of crepidula were removed in 2004. Forecasts for 2005 were between 25,000 and 30,000 tonnes (source: Côtes-d'Armor general council). Based on current yields, the unit cost of production has been estimated at an average of 12 Euros (excl. taxes) per tonne collected. Co-financing of this collection by professional fishermen and shellfish farmers reached 10% of the total cost. The other partners were the European Commission (50%), Brittany's regional council and the counties of Côtes d'Armor and Ile-et-Vilaine.

### **3.2.9. Acquisition of public land for the protection of nature**

The Coastal and Lakeshore Conservatory (a public agency) implements a land-buying policy to protect wildlife and coastal landscapes. It purchases threatened land, which is then restored to be made accessible to the public. The land acquired in this way becomes inalienable and cannot be resold. The Conservatory's scope for intervention concerns 2,380 local authorities, 1,046 of which have a seafront.

Funding for these expenditures mainly comes from State budget allocations and special ministry programmes, contributions from European funds and outside partners (local authorities, donors and sponsors). Local authorities manage the Conservatory's lands, employing wardens to monitor and maintain sites.

From its inception in 1975 to 15 December 2007, the Conservatory has bought up more than 111,000 ha of property in 400 natural coastal sites, making 900 km of coastline (metropolitan France, overseas, lakes and coastal lagoons). Until 2005, it had the benefit of an annual allocation from the Ministry of the Environment, for its operation and investments. The Conservatory's budget for 2007 amounted to almost 48 million Euros as a result of a considerable increase.

In addition to State funding, regions, counties, communes and the European Union provide an important contribution through operating subsidies, shares in acquisitions and development work subsidies. The participation of local authorities is approximately 3.5 million Euros per year.

The estates acquired by the Conservatory are subject to restoration and development work, the cost of which is estimated at approximately 100 Euros by hectare for 2006. According to the Conservatory, this, more modest amount, is explained, inter alia, by relatively non invasive techniques aimed at encouraging the resumption of natural processes.

In 1995, the general management costs of the Conservatory's sites were the subject of a study (carried out by the Institute of regional management and of environment); the study underscored the difficulties in assessing management costs, depending on the specific objectives of management, and on the managerial structure itself. At about an average 380 Euros per hectare (1995 value converted), "operating costs" (i.e. costs minus earnings of management) vary from one to ten.

Two other public operators are involved in the management of the environment coast:

- The ONF National Forest Office manages an estate, whether national or public, comparable to that of the Conservatory;
- The counties acquire land under the terms of the county tax on sensitive natural areas. This "optional" tax, set up in 1985, is intended to use the proceeds of urban development to acquire and manage areas to be protected.

### **3.3. Expenditure on the prevention and management of pollution**

Many human activities are affected, whether directly or indirectly, by the pollution of coastal waters due to the effects on aquatic ecosystems. This phenomenon has led to the setting up of various measures for the protection of water quality at national level, of which monitoring networks, the action of Water Agencies and the sewerage management programmes are key.

### 3.3.1. The application of the Water Framework Directive (WFD)

The Directive 2000/60/EC of the European Parliament and Council of 23 October 2000 provides a framework for a community policy on water. Its overall objective is to achieve "good status" for groundwater, surface waters and coastal waters (transitional waters of estuaries, coastal waters, territorial waters) across the EU by 2015.

Each Member State defines the "good" ecological and chemical status of surface water bodies on the base of scientific work, whilst remaining within a standardised framework. The directive stipulates:

- The quality criteria for the classification of ecological status, specifying the compulsory parameters for coastal waters;
- the normative definitions of the ecological status classifications (in five classes: high, good, moderate, poor and bad) for rivers, lakes, transitional waters and coastal waters, as well as the definitions of maximum, good and moderate ecological potential and the setting of chemical quality standards.

The WFD is aimed at harmonising the EU water policy since 1975. It has replaced several earlier directives, but those concerning drinking water, bathing water, urban waste water and agricultural nitrates are maintained.

The WFD was transposed into French legislation by law 2004-338 of 21 April 2004. It shall be applied by the Water Agencies, through the new multi-annual programme (2007-2012) which allocates it a budget of 12 billion Euros per year. ONEMA National office for water and aquatic environments was created by the law on water and aquatic environments of December 2006 and its decree of application of March 2007. With the objective of good ecological status, the role of ONEMA will concern the improvement of knowledge of aquatic environments, the organisation of the inter-basin solidarity, the development and monitoring of the working of hydro-systems.

### 3.3.2. The coastal waters and resources monitoring networks

The main aims of these networks are: (i) prevention through the monitoring of health and environmental hazards, based on the gathering of data which form the basis of programmes informing coastal users about the quality of the environment; (ii) the constitution of scientific knowledge fundamentals required to elaborate and adjust standards and to assess the efficiency of environmental policies.

Monitoring concerns general parameters for water quality (salinity, temperature, turbidity; more specifically eutrophication, nutrients, chlorophyll a and dissolved oxygen); chemical contaminants (metals, pesticides, polycyclic aromatic hydrocarbons); health-related microbiology; phytoplankton and phycotoxins; benthic flora and fauna.

#### 3.3.2.1. The recreational water quality inspection network

Recreational waters inspections are carried out under the authority of the ministry for Public health, by the DDASS county-level administrative services for health and social matters. The inspections help determine the quality of recreational areas which have not been permanently closed and identify those presenting a health hazard, mainly related to poor bacteriological quality.

648 coastal municipalities in France mainland and overseas are monitored during the holiday season. The number of inspection points at sea went from 591 in 1975 to 1,869 in 2002. On average, more than 13 samples are taken on each site during the bathing season (making a total of 24,890 seawater samples in 2002). The ministries for Environment and for Health have assessed the annual cost of the network at over €4.5 m, not including labour costs.

### 3.3.2.2. Monitoring networks managed by Ifremer

At national level, Ifremer is one of the main players in coastal environmental monitoring, managing several networks for the observation and monitoring of coastal water quality.

- The national seawater monitoring network (RNO) was set up in 1974 by the ministry of the Environment and coordinated by Ifremer, produces monitoring data which France disseminates to international organisations like the ICES International council for exploration of the sea, Ospar and Barcelona conventions. Water quality parameters are monitored in 12 sites, two of which are in the West Indies. Contaminants (heavy metals, PCB, PAH, pesticides) are measured in marine organisms (approximately 80 sampling points) and sediments.

Such monitoring has led to measures to protect public health. RNO data is also used to classify shellfish farming areas in terms of chemical contaminant levels (mercury, lead and cadmium).

- The phytoplankton and phycotoxin monitoring network (Rephy) was created in 1984, with the objectives of: (i) taking inventory of all phytoplankton species in coastal waters, as well as exceptional occurrences (coloured water, harmful species); (ii) protecting consumers, by detecting the phytoplankton species which produce toxins and monitoring these toxins in shellfish. The Rephy network has about 200 sampling points. Toxicity test results can lead state authorities to prohibit the sale and harvesting of shellfish.
- Implementation of the WFD will lead to benthic monitoring being organised on a coastal scale, with Ifremer as delegated contracting authority. The nationwide Rebent network will be based on the methods of the Rebent-Bretagne network coordinated by Ifremer in Brittany to monitor benthic communities and subtidal and intertidal flora and fauna. This national network also aims for compliance with the “Habitats” and “Natura 2000” directives and with legislation on accidental pollution
- REMI, the microbiological monitoring network for shellfish farming zones was set up by Ifremer in 1989, for microbiological monitoring and health watch in shellfish farming areas in accordance with the European directives 79/923/EC and 91/492/EC. The areas are classified by order of the prefect, following expert assessment by Ifremer.

There are four quality classes. Shellfish can only be harvested for direct human consumption in Class A zones. Marketing of shellfish from Class D zones is prohibited. Those from B and C zones must undergo cleansing or be relayed in an A class zone. REMI monitors Class A, B and C zones (328 sampling points as of 1 January 2005). The sampling schedule depends on the estimated quality and on risk of deterioration.

An alert system is triggered when monitoring results exceed quality standards, there is a risk of contamination or in epidemics either reportedly or assumed to be due to shellfish

- The farmed mollusc yield network (Remora), created in 1993, makes it possible to assess performance of different oyster rearing areas, considering the farm’s biological yield and the quality of oysters produced. The network has two purposes: helping shellfish farming ecosystem management and providing historical series to be used for scientific studies. It is based on annual monitoring of a given batch of oysters in the main French oyster producing areas
- The mollusc pathology network (Repamo), created in 1986, to meet the requirements of European directives 91/67/EC and 95/70/EC for health and hygiene inspections of shellfish. It carries out monitoring of diseases which must be declared, monitoring of farmed and wild

bivalve mollusc populations, studies of causes of abnormal mortality and inspections of molluscs traded with European or third countries

### 3.3.2.3. Other monitoring networks

Local measurement networks have been set up on smaller scales. They supply data required in connection with local issues, like the nutrient monitoring programme in the Nord-Pas-de-Calais region, the “automated measurement network for the coastal environment in the bay of Seine estuary” (MAREL) or the “the Normandy coast hydrological network”, or to co-ordinate monitoring activities on a regional scale, like the Mediterranean coastal network, which includes that of Rinbio, keeping a chemical contamination watch which was selected to ensure WFD chemical monitoring on the Mediterranean seaboard.

In the field of sanitary microbiology, supplementing the REMI and recreational waters network data, the DDASS is responsible for monitoring the healthiness of recreational shellfish harvesting areas along the French coasts. The CQEL coastal water quality units are responsible for monitoring harbour water quality and hydrological variables in major estuaries under Ifremer’s co-ordination. Co-ordination of unit strategies is nationwide in scope. The ministry of the Environment, as the contracting authority of the Repom national seaport monitoring network, has entrusted the units to implement this. It covers 186 metropolitan harbours and three overseas ports.

The INSU National institute for sciences of the universe, in the framework of its national network of marine stations has set up a “coastal environment observation service” called Somlit, to manage the permanent observation activities run on six French coastal sites.

### 3.3.3. Response to green tides

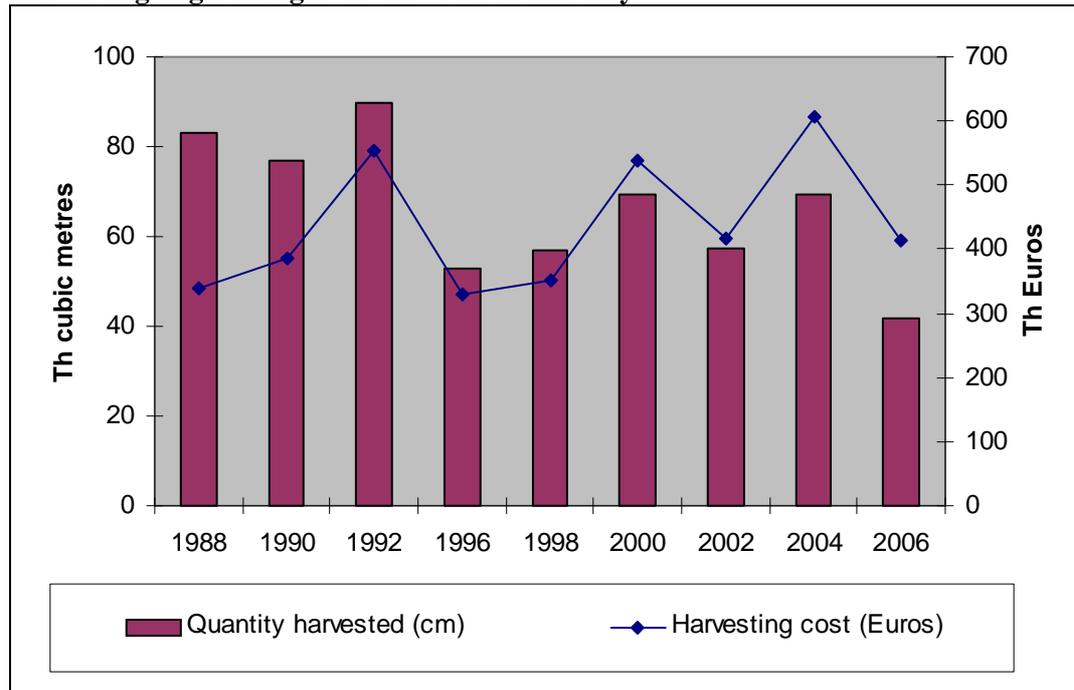
So called “green tides” are coastal blooms of macrophytic green algae (notably ulva and enteromorpha) which grow in water. Blooms mainly occur in late spring and early summer, on many coastal sites in Europe. In France they have affected lagoons in the Languedoc, the Arcachon basin and above all, the shores of Brittany.

The development of such algae is fostered by the combined action of human and natural factors: physical and climate-related coastal features, with excessive nutrient inputs carried by streams into the sea. Along with the complex ecological consequences on the foreshore and in the benthic ecosystem, green tides have far-reaching economic and social consequences for regional tourism, because they release foul-smelling volatile sulphur compounds into the air and physically hinder recreational activities on the coast. They also affect shellfishing activities by making harvesting difficult and through ecological disturbances created by high densities of macroalgae.

The Regional Council of Brittany, the Loire-Brittany water authority and the Breton counties have implemented the “Prolittoral” programme (2002–2006) to respond to green tides. Its “preventive” strand aims to reduce inputs of nitrogen from farming; its “cure” strand involves collecting and recycling seaweed; and a “cross-cutting” strand aims to provide technical support and environmental monitoring. Out of a planned 16.7 million Euros, 10, 3.8 and 2.9 million Euros are respectively budgeted for the three strands. Total expenses engaged from 2002 to 2004 were on average 1.8 million Euros.

On average, the volume of ulva harvested in the coastal communes of Brittany has hovered around 60,000 m<sup>3</sup> per year over the last decade, for an average annual cost of 500,000 Euros. The maximum quantity recorded was in 1991 with almost 100,000 m<sup>3</sup>. In 2006, the volume collected was 42,000 m<sup>3</sup> for the region as a whole, for a total cost of 415,000 Euros. These results represent the lowest level since 1987 and are explained by the late start of the natural proliferation process.

### Harvesting of green algae on the coast of Brittany



Source: CEVA.

The seaweed harvested is generally spread fresh on fields, composted or put into land-fill, in that order of importance.

#### 3.3.4. Response to accidental pollution

The organisation of accidental marine pollution response still in effect today is based on 12 October 1978 POLMAR instructions. Their objectives were mainly to set up an operational pollution prevention and response system and improve it through research studies and coordination between the administrations. This system (see also previous chapter) is made up of “Polmar-mer” (seagoing action component), which is the responsibility of the maritime “prefects” (i.e. state authorities) and involves several ministries, mainly Defence, and “Polmar-terre” (on shore action component), which is the responsibility of the state authority at county level, with, for most, participation of the Ministry of Transport and the Sea. The prefect of the maritime area concerned is responsible for the co-ordination of these two systems in the event of alert.

The following main organisations work within the Polmar system:

- In terms of central administration: the DAM purchases the equipment needed for pollution prevention and response. In 2005 and 2006, the funds specifically earmarked for the Polmar system amounted to 2.5 million Euros (running and investment costs). In addition, the DAM spends a yearly 125,000 to 150,000 Euros on average for studies and research. The French Navy’s CEPPOL anti-pollution applied studies office is responsible for evaluating the needs for response at sea, and purchasing and managing Polmar-mer equipment and material stocks. The Cedre is responsible for documentation, research and ongoing experimentation on pollution response techniques, equipment and material, as well as providing operational advice in emergency situations.
- At county level: Polmar local co-ordinators ensure communication between the stakeholders involved. The local DAM subdivisions act as a local relay for the Equipment ministry and the ministry of Agriculture and Fisheries. They also play an important part in Polmar-mer and

Polmar-terre links. The DDEs local subdivisions of the Equipment administration play an important role in operations using pollution prevention and response equipment.

- At inter-county level: there are 13 storage centres for specialised equipment ready for use in the event of alert, across the entire country. These centres which have the technical skills required to intervene, if needed.

Since the sinking of the *Erika* and the *Ievoli Sun*, changes have been made in the POLMAR system. Decree 2002-84 of 16 January 2002 concerning the powers of state authorities in the zone, along with several instructions aim to make existing organisations and resources more comprehensive to better combat pollution. Closer collaboration is planned: (i) between local state authorities in managing the POLMAR system; (ii) to implement action at different levels:

- nationally: co-ordination between ministries,
- on county level: implementing and organising rescue plans,
- at the defence zone level: conducting rescue operations on land and sea.

Along with monitoring and action plans to prevent and respond to pollution, expert studies can be prepared on damage and health, food and environmental risks following the pollution event.

POLMAR now falls under the maritime component of the ORSEC system, based on law No. 2004/811 of 13 August 2004 concerning the upgrading of civil safety and decree No. 2005-1157 of 13 September 2005.

To strengthen national systems for accidental marine pollution response, the European Maritime Safety Agency has contracted with private and public firms to make vessels available for oil recovery operations in the case of oil spills. The contracts are signed for a period of three years, with an annual budget of 18.4 million Euros. The operational zones are the Baltic Sea, Atlantic-Channel and the Mediterranean Sea (East, Centre and West).

### **3.4. Spending on prevention, monitoring and management of hazards**

#### **3.4.1. Fight against erosion**

The processes of erosion are natural mechanisms caused by natural phenomena (swell, wind, currents, land slides); they are at the origin of changes to terrestrial and coastal landscapes which may, in certain cases, represent risks for the equilibrium of ecosystems and economic risks, due to the destruction of infrastructures, inhabitable areas or those exploited by human activities. These problems are obviously not specific to France and affect coastal regions to varying degrees: approximately 20% of the world's coastline consists of beaches, 20% of which are relatively stable, 70% are eroding and 10% advancing. These processes are often reinforced by human activities, such as changes to water courses, the construction of dams, the clearing of coastal land, urban development of the coast or, again, the construction of badly designed protective structures. The protection mechanisms routinely used consist in the artificial build-up of the shore or the construction of defences.

Of the 7,124 km of French coastline, 24% (1,702 km) is subject to erosion and mainly concern sandy coasts. Almost 44% are stable. Finally, only 9.5% are advancing on the sea: this concerns mud flats and marshes which accumulate marine and terrestrial sediments.

In 2004, 20,000 km of coast (almost 20% of the European coastline) were affected by erosion. The extent of the phenomenon led the European Commission to finance a study of the impacts, trends and required action in all European countries: the EuroErosion project (2002-2004) estimated the public spending of the member states of the EU for the protection of coastlines at approximately 3.2 billion Euros in 2001, including which 53% for new investments, 38% for maintenance and 9% for the acquisition of land and property threatened by coastal erosion.

### 3.5. Spending on the management of waste

#### 3.5.1. The Water agencies and the management of waste water

The hydrographical networks represent a major vector for pollution affecting the coastal environment and coastal waters. The action taken by the Water agencies, prior to coastal problems, is therefore essential in this field.

##### 3.5.1.1. Water agencies' spending and revenue

The six Water agencies (Adour-Garonne, Artois-Picardie, Loire-Brittany, Rhine-Meuse, Rhone-Mediterranean and Corsica and Seine-Normandy) collect service charges from public bodies or private citizens for the use of water (drinking water, industrial use, irrigation) and for industrial pollution (discharging waste water into the natural environment or public sewers) and domestic pollution (paid for by the communes).

##### Revenue of the Water agencies in 2006

Amount 2006	2,058 m Euros
Charge for pollution	66%
Charge for consumption	15%
Reimbursement of advances	16%
Other revenues	3%

Of which, by user category:

	Local authorities	Industry	Agriculture
Service charge for consumption	76%	20%	4%
Service charge for pollution	89%	10.3%	0.7%

Source: draft budget 2008

The proceeds of the service charges are redistributed in the form of aid to finance anti-pollution operations, protection of environment or improving access to water resources. The agencies distribute these funds according to a five-year intervention programme.

##### Spending of the Water agencies in 2006

Amount 2006	2,141 m Euros
Aids for anti-pollution investments	51%
Aids for water resource investments	14%
Aids for operations	18%
Other expenses	17%

\* including: exceptional contributions, studies and control measures, exceptional spending on interventions, operation, depreciation expenses

Source: draft budget 2008

##### Aids to investment for response to pollution by user category in 2006

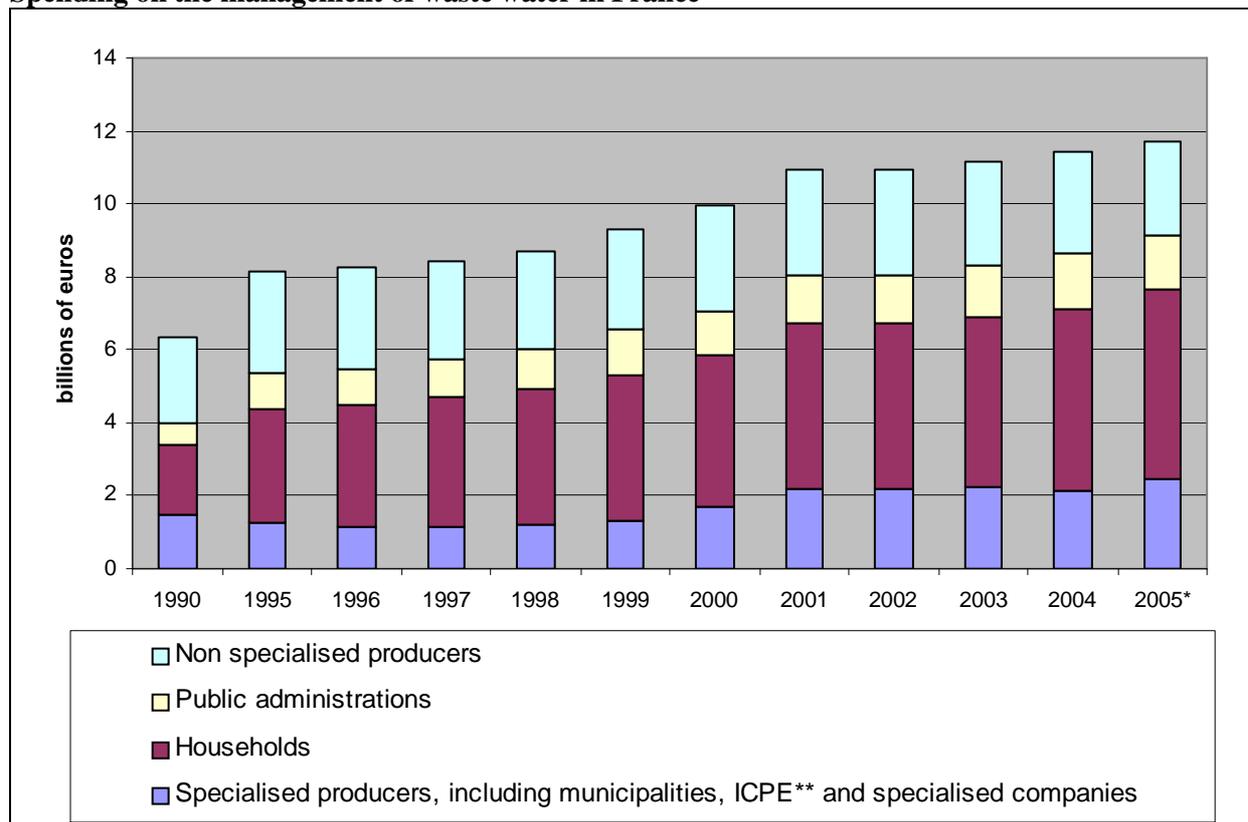
Amount 2006	1,077 m Euros
Agriculture	7%
Industry	11%
Local authorities	82%

Source: draft budget 2008

### 3.5.1.2. Spending on waste water management

Since 1990, nationwide spending on wastewater management has grown steadily at an average annual rate of 5%, reaching 11.7 billion Euros in 2005, or 33.2% of total expenditure for environmental protection in France that year (sources: IFEN, draft budget 2008). This is financed by firms, households, public administrations and companies specialised in the collection and treatment of waste water.

#### Spending on the management of waste water in France



\* Provisional data.

\*\* ICPE: « Environment Protection »-classified industrial establishments (based on a classification of industrial establishment according to their environmental risks and impacts, put in place in 1976, prior to the EU IPPC classification, 1996, of the most polluting industry units).

Source: Ifen

The local authorities' wastewater management services accounted for nearly 82% (9.6 billion Euros) of nationwide spending in this sector in 2005. They receive financial assistance from Water agencies as well as from county or regional councils. In some areas, special funding is available from the Ministry of Agriculture or the European Commission.

### 3.5.2. Macro-waste

Macro-waste is found floating or submerged in seawater. The types and sources vary greatly, the most widespread being plastic waste carried from catchments. Sometimes this waste takes a very long time to degrade and can contribute to the mortality of large marine animals who can ingest or be wounded by it.

Analyses have shown that this type of pollution has been extended along all seaboard. Measurements taken on 11 study sites indicate that the amounts of debris on beaches can range from 400 kg to 4

tonnes per kilometre of shoreline. The highest density of macrowaste seems to be in the Mediterranean. Collecting and processing the waste is the only way of dealing with this form of pollution.

As provided by a circular of 14 May 1974, cleaning the coast, and particularly beaches, comes under the authority of coastal municipalities. In some cases, clean-up can be co-financed by funds from the county, region, state and sometimes Europe.

### 3.5.2.1. Examples cleaning operations and their costs

Data on this type of spending are not gathered on a regular basis. Furthermore, the existing information is fragmented and the accounting rules differ from one local authority to another. The findings of a study carried out in the South-West counties are set out below.

In the Gironde county, towns do the cleaning themselves. The county council takes on 50% of the cost of mechanically cleaning beaches, with a ceiling of 4,000 Euros per kilometre of shoreline. This rate rises to 80% in the case of manual cleaning, with a view to encouraging this approach which is less harmful to the environment. Note that beach cleaning in the Gironde county will be considered below in the appendix to this chapter.

Since the early 90s, coastal clean-up in the Landes county is done on about a hundred kilometres year round, and more intensively during summer. On the “wild” spots of the coast, cleaning is done once a month to avoid the effects of accumulation which would lead to more costly remedial operations in the long term. The county council, as contracting authority, allocates a budget to municipalities. Nearly 47.5% of the spending comes from coastal towns and 52.5% from the county council. To this should be added a lump-sum contribution from the ministry of Defence for the bi-annual clean-up of its testing centre located in the Landes county.

#### Cost of coastline clean up operations in the Landes county

	2001	2002	2003*
Spending (Euros)	1,218,500	1,164,029	837,949
Volume (m <sup>3</sup> )	13,485	12,885	11,445

\* Estimate over seven months only. The Polmar plan operated during five months.

Source: Landes county council

The Pyrénées-Atlantiques county conducts clean-up operations on land and sea. Every two days during July and August, collection by a trawler is combined with air surveillance. The cost is estimated at 100,000 Euros per year, for a volume of nearly 7 tonnes collected each season (financed by the county, the region and the Basque coast intercommunity joint consortium of coastal towns). Furthermore, the annual cost of cleaning beaches shouldered by coastal municipalities is estimated at nearly 1.5 million Euros (source: cabinet Wertheimer, 2001).

## Appendix. The management of natural assets. Example of the Gironde county

by Jeffrey Dehez, Bénédicte Rulleau (Cemagref)

As announced in a section above, this appendix includes a case study on natural asset protection costs.

The coast of the Gironde county is a remarkable area:

- 126 kilometres of ocean coastline,
- Only 20% is developed as urban areas around seaside resorts.
- Land public control is longstanding.

There are three emblematic types of environment:

- The ocean,
- Sandy beaches (with dunes behind),
- Pine forests.

The land is managed with several objectives:

- Protection of the environment (Natura 2000 areas inter alia),
- Protection of the soil (against erosion in particular),
- Production (wood),
- Reception of the public.

In all 12 municipalities, 36 beaches were surveyed; they are mainly in a “natural” environment (10 are untouched and 19 managed with facilities) and account for almost 80% of total occupancy (source: ONF National Forest Office), the remainder are concentrated in the seaside resorts.

### 1. An estimate of the cost of managing the Gironde coastline

In the absence of organised collection of economic data, the cross referencing of several studies and sources of information permits to make an overall inventory. The amounts in table A1 are given in Euros 2005 excluding tax.

**Table A1. General features of the Gironde county coastline**

	Surface area (ha)	Length of coastline (km)	Non urban areas
Public ownership	20,441	87	86.1%
Coastal and Lakeshore Conservatory ownership	303	7.3	7.2%
County ownership	20	< 1	< 1%
<b>Total</b>	<b>20,764</b>	<b>94.3</b>	<b>93.3%</b>

Source: Cemagref / Dehez, Rulleau

#### 1.1. Beaches

The two important measures are the monitoring of bathing and cleaning.

Municipalities are responsible for monitoring and also bear the financial burden of it. This results in the delimitation of bathing areas, the setting up of a police lifeguard station and means of evacuation

(helicopter pads). A recent survey of the communes attempted to make an estimate of the amounts involved.

- The annual cost varies between 0 (no monitoring) and 373,000 Euros.
- These figures represent a lower estimate (not all items of spending were included) in which spending on personnel (70%) dominates.

Beach cleaning is carried out by the communes through local public agencies, with the exception of pre-season cleaning, which is partially contracted out to a private company. The ONF National Forest Office controls manual operations. In 2005, a study of this system was carried out (Andre, 2005). The author estimated that overall the 12 communes along the coast spent at least 963,840 Euros on the year (excluding waste treatment). The differences are large: between 6,000 and 286,026 Euros, depending on communes. The explanations of the differences include:

- The frequency of cleaning,
- The type and number of cleaning machines,
- The length of the beaches.

Pre-season cleaning amounted to 139,690 Euros (excluding treatment and management costs), with waste treatment costs coming in addition: by way of comparison, the general council of the neighbour Landes county allocated between 20% and 39% of total costs to the latter, the remainder going to collection and transport.

The report estimates that spending on cleaning in the Gironde county have increased considerably since the *Prestige* (oil spill) disaster in 2003. This is due to the combined effect of both the massive equipping of the communes and the communes' wish to improve communication on the cleanliness of their beaches.

The Gironde county council pays a subsidy for manual and mechanical operations separately. The amount of aid is determined pro rata to spending, and capped at 4,000 Euros/km. Manual operations (subsidised at 80%) or those carried out by the communes jointly (subsidised at 60%) are preferred to mechanical operations (subsidised at 50%). In 2005, total subsidies stood at 516,252 Euros, namely approximately 43% of declared expenditure (including treatment).

## 1.2. Dunes

Just behind the beaches lies the line of dunes, an area that is little frequented but essential for the ecological and sedimentary balance. Created by man in the XIXth century to slow down the retreat of the coastline and protect plantations from the effects of the wind, the dunes are maintained continuously by the ONF.

In 2005, the cost of maintenance amounted to almost 200,000 Euros (including personnel costs), namely 2,413 Euros/km. This average should not hide local, sometimes very great disparities (Dehez, 2003). The State pays a subsidy for missions of general interest. Spending mainly concerns maintenance work (83%), monitoring and information (13%).

## 2. Reception of the public

The "Beach Plan" policy launched at the start of the 1980s provided for the creation of 15 reception sites in 9 communes, for a total amount of 14.6 million Euros (2005).

- In 2005, financing was provided by the State budget and the ONF (17 and 15% respectively), the Gironde county council (37%), the Aquitaine Region (13%), the communes (12%) and the EU. (6%).
- The maintenance of sites is subject to annual planning. The ONF and the communes assume the prime contractorship for a total cost of 1.03 million Euros in 2005. Finance is shared between the communes (57%), the county council (29%) and the ONF (14%). This spending

has increased continuously over the last 15 years, due mainly to the replacement of equipment and, to a lesser extent, to the creation of new sites. Locally, the costs vary due to combined effect of the developed area of coastline or the level of occupancy (Dehez, 2003). At the end of the 1990s, the occupancy of these sites exceeded 100,000 people per day at peak times (Metayer, 1999).

The County network of cycle tracks:

Part of the circuit runs through national forestry land (190 km), for maintenance costs of 191,000 Euros in 2005. In 2005, finance was provided by the communes (68%) and the county (32%).

Main additional actions of the ONF (Dehez, 2003):

- Monitoring of reception sites,
- Setting up of guided tours,
- Maintenance of the forest environment.

### 3. Finance and social demand

This organization of coastal management as described above, depends mainly on State and local authorities' action, first of which is that of the communes. Now budget restrictions (sale of wood, communal budgets) together with an increase in spending are leading to the reconsideration of this organization.

A visitor survey, carried out during the summer of 2006, of 775 "Beach Plan" site visitors opened a new perspective. The sample was made up mostly of tourists: 54.19%, as opposed to 4.52% part-time residents and 41.29% full-time residents (12 visits per year for tourists, as opposed to 41 and 44 respectively for the others).

The attractiveness of these sites is varied. Few visitors reside in the communes, the natural sites of which they visit.

**Table A2. Users residing in communes of the "Beach Plan"**

"Beach Plan" site / Origin of visitors	Le Petit Nice	Le Gressier	Carcans Plage	All sites
Tourists	19.42%	61.87%	92.00%	62.24%
Part-time residents	9.09%	12.50%	92.86%	59.57%
Full-time residents	9.09%	5.99%	18.64%	9.27%

We are therefore confronted with a classic "free-rider" problem (use of public goods without bearing the cost). Two options, amongst others, can be considered to solve it:

- Rebalancing public funding between communes, by re-allocating state budget to local authorities and to local state administrative services; this re-allocation may involve a tax policy through the local tax on sensitive natural assets;
- Direct participation of visitors, such as pay car parks. 57% of visitors were opposed to this option in 2006.

Another aspect to be considered is the non-market value of the services provided. In terms of leisure in particular, the lack of market prices does not mean an absence of value. For rock-pool fishing for example, Bonnieux and Rainelli (2002) have shown that the value assigned to this non-commercial activity was far from negligible. In the Gironde, research on this theme applied to other leisure activities, is underway.

## Marine research

This chapter summarises the activities of French public bodies in the field of marine research and operational oceanography. Marine research in France is carried out by several bodies with very different specialities. It contributes to European and international programmes, driven by the fundamental problems of the state of the oceans and the environment.

### 1. Research bodies

Ifremer, university and CNRS-INSU oceanography laboratories, the SHOM Navy hydrography and oceanography department, the IRD Research Institute for Development and the IPEV Paul-Emile-Victor institute for polar research are the main scientific organisations in public ocean and marine research. Earth-observation satellites provide an additional spatial component for oceanographic research; they are funded by the CNES National Space Research Centre, generally in the framework of bilateral or multilateral cooperation. There are many fields of collaboration in marine research between these bodies and several universities.

At Ifremer, marine research deals with the coastal environment, exploiting living resources, ocean and climate and exploring the deep sea.

Ifremer is also responsible for creating and managing major scientific facilities of general interest on behalf of the scientific community: a fleet of research vessels, underwater vehicles, ship-borne equipment, computing and testing facilities and experimental set-ups for mariculture. It outfits coastal and deep sea vessels.

The national, ocean-going research fleet includes five Ifremer vessels, two of which are shared with the SHOM, the *“Pourquoi pas?”*, 55% funded by Ifremer, as well as the *Beautemps-Beaupré*, 95% financed by the Ministry of Defence and made available to Ifremer ten days a year; an IPEV vessel and two vessels for the IRD. The coastal fleet includes three inshore vessels managed by the CNRS/INSU, three for Ifremer and one for the IPEV. The SHOM has research vessels which are capable of taking part in nationwide surveys, such as the *“Beautemps-Beaupré”*, commissioned in 2004.

Ifremer implements and programmes its deep sea vessels, joint resources like seismic equipment and underwater vehicles (*“Nautile”*, *“Victor 6000”* and *“SAR”*) to the benefit of the French scientific community:

- to study ocean circulation and the mechanisms behind its variability;
- to study carbon, nitrogen and phosphorus cycles;
- to explore and study sea floors;
- to study deep benthos ecosystems in hydrothermal zones, and continental margins;
- to assess fish stocks and study their relations with environment;
- in the coastal environment domain, to study contaminants and their development, matter flows, and impacts from human activities.

Coastal vessel are operated in co-operation with the INSU in the framework of two inter-regional committees.

Ifremer operates several coastal marine environment monitoring networks (see chapter on coastal environment protection) and participates in fish stock assessment at international level. It conducts research programmes on the environment, resources and their exploitation.

Ifremer's annual budget provides funding for research and research-support activities (including fleet operation) in France mainland and overseas counties. Genavir is the organisation which operates the ocean research fleet. Oceanography research conducted at the CNRS National Centre for Science Research is mainly devolved to the Department of sciences of the universe and the INSU National Institute for Sciences of the Universe. This research focuses on the ocean, on climate and global environment, on the marine biosphere, solid earth dynamics and the coastal environment. Over forty of the CNRS's own labs and university laboratories associated with CNRS are involved in this research.

The thirteen INSU "marine stations" are ocean research laboratories set up along the coast. Their main research themes are: the marine biology of species, marine ecosystems, ocean circulation and flows, marine environmental chemistry and marine geology. Six of these stations are classified as OSU Science of the Universe Observatories.

Several universities are involved in the oceanographic research, including Bordeaux I, Brest, Lille I, Marseille II and Paris VI, conjointly supervising the six OSUs with the INSU, and Caen, La Rochelle, Littoral-Côte d'Opale and Perpignan.

The spatial dimension of oceanographic research is based on the use of the Earth observation satellites launched by the CNES and the ESA European space agency. In December 2005 the CNES announced they were launching a new programme called AltiKA, high resolution altimeter; in combination with those of the Jason-2 mission, the data gathered will be used to study the mesoscale ocean, coastal regions, continental water and ice. AltiKa will be placed on board the Saral satellite, developed in co-operation with Indian Space Agency and which is due to be launched in 2010.

The SHOM, with 708 staff in 2004, including 132 sea-going personnel, mainly conducts research on oceanography for military purposes (marine environment and its physical phenomena, bathymetry and sedimentology). The military oceanography centre CMO is also specialised in naval oceanography, supplying French Navy forces with ocean and meteorological data and the means to use them. The SHOM-Meteo research and studies office (BRESM) is within the CMO.

The SHOM's main office (EPSHOM) is responsible for centralising, processing, formatting and disseminating data on operational hydro-oceanography. It carries out R&D work in collaboration with several organisations (Météo-France, CNRS, Ifremer, universities). The other fields of EPSHOM's studies deal with physical oceanography, sedimentology, geophysics and marine chemistry.

The IRD conducts research on intertropical environments. The main multidisciplinary research themes related to the sea are:

- tropical climate variations and ocean-atmosphere interactions;
- uses of coastal areas with respect to the environment, resources and societal aspects;
- tropical aquaculture;
- and marine ecosystems, living resources and their exploitation, impact of human activities

The IPEV is a research organisation created in 1992 on polar and sub-polar research. It selects and promotes scientific programmes in polar and sub-polar regions, as well as financing and implementing these programmes in sub-Antarctic islands, in the Arctic and the Antarctic. Its research principally addresses: internal and external geophysics, physics of the upper and lower layers of the atmosphere, glaciology, marine and continental biology, oceanography and medicine.

The other main research bodies involved in ocean studies are:

- Météo France (French Meteorological office), for research on ocean-atmosphere interactions and climate fluctuations, carried out in co-operation with university and CNRS laboratories and with several other bodies which are active in the ocean-atmosphere-biosphere environment (CNES, IRD, Ifremer),

- INRA: marine hydrobiology and ecosystems, migrating fish species ecology, research related to marine and freshwater finfish farming (especially pathology) and to upgrading of products either fished or farmed in fresh or brackish waters;
- Cirad, whose main marine research themes are fisheries and coastal biodiversity;
- BRGM Geology Research Office: amongst other subjects, geological mapping of the continental shelf, and the study of phenomena at the ocean-continent interface, such as inputs from catchment areas.

Apart from oceanographic research, mariculture research is mainly carried out at Ifremer, INRA and IRD. The AFSSA French Food Safety Agency also works on aquaculture-related pathology

### Spending from the main public marine research bodies

Units: million Euros and number of staff

	Total spending		Including spending on personnel		Personnel	
	2005	2006	2005	2006	2005	2006
IFREMER (1)	180.9	190.0	85.6	89.6	1705	1705
CNRS-INSU-universities	96	96	63	63	1100	1100
IPEV	8.6	9.7	0.2	0.2	6	6
IRD (2)	31.4	31.4	26.0	26.0	98	98
INRA	7.6	7.6	5.1	5.1	102	102
Total	324.5	334.7	179.9	183.9	3011	3011

(1) All Ifremer activities: 1,385 Ifremer employees and 320 Genavir employees. Scientific and administrative personnel.

(2) Data 2004. Research staff (80) and seafarers (18) specifically assigned to marine research forces.

Sources: marine research bodies, Ifremer estimates.

## 2. Operational oceanography

Operational oceanography aims to supply a description in almost real time of the 3D hydrological structure of the ocean and marine currents. This work process includes using observation data and their assimilation into models used to forecast ocean trends. The outputs of these models are “secondary” data, often applied at a local level. The final products are distributed to private users and to public bodies. The raw data comes from *in situ* measurements made on buoys or vessels, as well as from spatial observations.

This activity includes several fields: measurements and forecasts, especially concerning the speed and direction of sea winds, wave height and direction, surface currents, tides, sea ice, and surface water temperature. Several public organisations are involved in operational oceanography.

### 2.1. Programmes

Ifremer’s activity falls into three main fields: managing coastal water quality monitoring networks (see previous chapter on “Coastal and marine environment protection”), ocean circulation, cruises to study physical oceanography and fish stocks.

Ocean circulation is being studied in a deep sea operational oceanography programme for climate purposes, with the participation of several French research bodies, with three components:

- Routine *in situ* ocean measurements “Coriolis” is a project co-ordinated by Ifremer in co-operation with the CNES, CNRS, IPEV, IRD, Météo France and SHOM, the object of which is to collect, validate and provide real time availability of ocean temperature, salinity and current profiles. The main user is the Mercator model (see below), which assimilates the data

supplied each week by Coriolis. The project co-ordinates the French contribution to the world ocean observation programme “Argo”.

- In addition to “measurements at sea”, Coriolis includes an “instrumentation” sub-project which has made drifting profiler design progress, and a “data centre” which mainly involves linking up to international networks in order to collect, check and disseminate most of the data.
- Satellite altimetry. Since Jason’s launch, sea level centimetre resolution measurements are taken routinely. This French-American programme is led by the CNES.
- Global ocean modelling. Observation data are used by several secondary data producing systems (analysis and ocean forecasts). One of them is “Mercator Océan”, an organisation created in 2002 by CNES, CNRS, Ifremer, IRD, Météo-France and SHOM. It describes and forecasts ocean phenomena (currents, temperature and salinity) in real time, with high resolution, at the surface and in deep water. A 15-day forecast has been published weekly since 2001. Forecast has become increasingly accurate as the model is improved.

The SHOM is also involved in operational oceanography, and is an active partner in *Coriolis* and *Mercator*.

Météo France is also involved in operational oceanography and has made this one of its priorities for the period 2000–2010, particularly through the study of the ocean layer affected by ocean-atmosphere interactions.

Météo France honours France’s operational commitments in terms of maritime safety, marine pollution, forecasting the tropical storms and the management of data from drifting buoys. This body therefore is part of the Global Maritime Distress and Safety System (GMDSS), covering the eastern Mediterranean and part of the Atlantic and Indian oceans. In Mediterranean and Atlantic, it contributes to response to marine pollution within the framework of the emergency intervention system.

Météo France provides marine weather forecasts for safety sea and protection of the coastline in Metropolitan France and overseas. A permanent ocean monitoring system generates alerts if necessary (e.g. "special weather bulletins" for ship safety, high wave and surge warnings for invasions of the coast by the sea) and makes weather-oceanographic forecasts: shipping forecasts, modelling and forecast of the State of the sea, of marine surges, of drifting objects and pollutants. Météo France takes part in the Polmar plans and is responsible, with the Cedre, for drift forecasts.

For oceanography and the marine meteorology, Météo France is involved in:

- the acquisition of *in situ* data (ships and buoys), within an international framework and at national level through Coriolis, in co-operation with Ifremer and five other bodies,
- the acquisition and the processing of satellite data,
- carrying out routine analyses of sea surface temperature, using *in situ* data and satellite images,
- the operational implementation of forecast models for dangerous ocean phenomena (waves, low levels and surges) or technological hazards (drifting oil slicks, wrecks, etc.),
- the global and regional oceanic modelling within the framework of the activities of the “Mercator-Ocean” public interest grouping, together with European programmes, such as the MFS (Mediterranean Forecasting System),
- data archiving, and satellite images.

### 2.3. Trends

Operational oceanography programmes aim to both refine and integrate services proposed on a world scale and to refine services on a more local scale.

Coriolis, Jason satellite altimetric data and the models supplied by Mercator are three components which are already contributing to the international Godae ("Global Ocean Data Assimilation Experiment") and ARGO programmes, respectively for modelling and *in situ* measurements.

MERSEA (Marine Environment and Security for the European Area), a four year integrated project (2004-2008), brings together 50 laboratories from sixteen European countries, working under Ifremer's co-ordination. Its objective is to set up a European system to monitor and forecast the world ocean and European regional seas, and their physical and bio-geochemical properties. It will supply the data and information on the state of the ocean needed to monitor the global environmental state and climate change, seasonal forecasting, safety at sea, developing applications for offshore industry and fisheries, responding to accidents or pollution, and to defence requirements, as well as drawing up and following international conventions.

MERSEA federates the European contribution to Godae. More broadly speaking, it produces the services required for GMES marine applications: key part of the system in coming years.

The GMES (Global Monitoring for Environment and Security) programme, to be set up by the European Space Agency and the EC in 2008, will effectively have a marine component. Its general objective is to create a decision-making aid and support network for the public and political decision makers to acquire and interpret the geospatial information which is useful for the environment and security in general. This will particularly focus on the ocean environment and its natural resources. Thus, it has been designed as the European contribution to the Global Earth Observation System of Systems (GEOSS), set up at the world Earth observation summit (EOS III) in February 2005 in Brussels.

The Previmer project should provide the observations, modelling tools and real time forecasts that the ever-increasing number of users of coastal regions require, based on the existing regulatory framework.

Operational developments and their deployment are carried out within the framework of a partnership between the public sector (SHOM, Météo France, IRD, IUEM) and the private sector (consultancies, small and medium size enterprises of the oceanography instrument manufacturing sector).

Previmer activities should foster the development of service supply, directed mainly at meeting the requirements expressed by local authorities, institutions responsible for environmental management and the various users of coastal regions. Previmer's main objective is to develop and set up the various components of an information system performing analyses and making forecasts of the state of the marine environment in coastal areas in real time, at various spatial scales, with the possibility of local zooming. Time scales cover both analyses of the present state and short term forecasts (48 hours, which correspond to Météo France's fine forecasts), with the possibility of hindcasting.

The applications are numerous and varied: public information for boating, rock-pool fishing and other leisure activities; assessment of the microbiological quality of waters; quantification of the transport the eggs and larvae of marine organisms, monitoring of the terrigenous flows; study of the proliferation toxic plankton and macroalgae; reinforcement of the maritime and military safety; assistance to accidental pollution response authorities; impact studies of coastal activities; improvement of the scientific knowledge of the environment, and coastal "climatology".

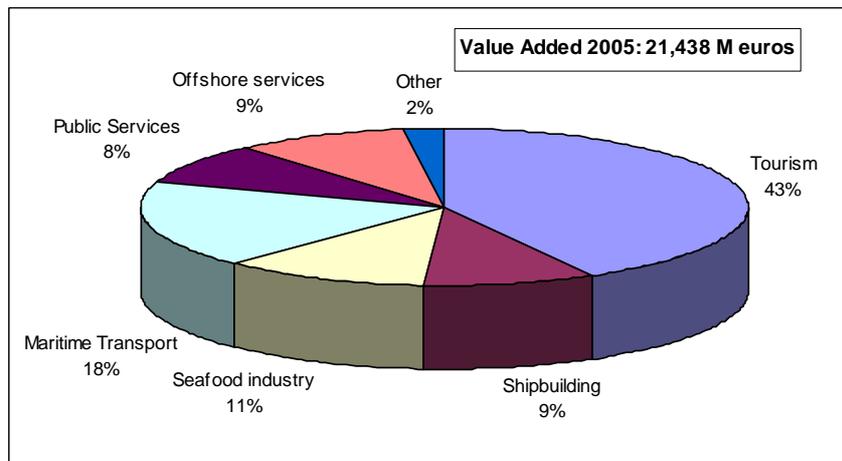
## Summary

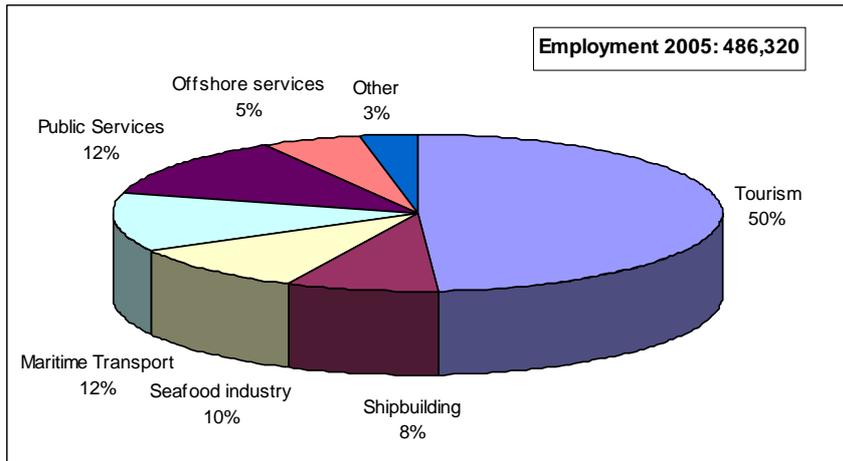
### 1. The French maritime economy in 2005

In 2005, the French maritime economy has the following characters:

- Value added of almost 21.5 billion Euros.
- A workforce of more than 486,000 (full-time equivalents).
- Tourism remains dominant and represents almost the half of maritime jobs.
- For production, waterborne transport and the sea ports represent the second aggregate, in order of importance, with 18% of the value added.
- Seafood products, shipbuilding and boatbuilding, offshore oil and gas services, together with the public sector, are the other fundamental aggregate making up the French maritime economy.
- However offshore oil and gas services, which are highly productive, create less jobs than other equivalent sectors by the production.

It is important to note the review of the scope of the maritime economy in relation to our previous issue. It now includes inland navigation and public river works in addition. However, due to the lack of reliable data, it excludes sub-contracting in the shipbuilding sector, an activity which is important in terms of value added and employment.





**French maritime activities in 2005**

	Turnover (millions of Euros)	Value added (millions of Euros)	Number of jobs
<b>Industry</b>		<b>19 717</b>	<b>426 047</b>
<b>Coastal tourism</b>	<b>21 416</b>	<b>9 022</b>	<b>237 313</b>
<b>Seafood industry</b>		<b>2 387</b>	<b>48 505</b>
<i>Marine fisheries</i>	1 093	689	11 937
<i>Mariculture</i>	601	421	11 187
<i>Seaweed fishing &amp; processing</i>	300	185	1 800
<i>Fish auctions</i>	60	50	1 500
<i>Fish trade</i>	4 281	404	8 579
<i>Seafood processing</i>	3 150	638	13 502
<b>Shipbuilding</b>		<b>1 975</b>	<b>39 409</b>
<i>Merchant shipyards</i>	617	77	3 708
<i>Military vessels</i>	2 962	1 099	13 461
<i>Marine equipment</i>	1 000	300	12 000
<i>Ship repair</i>	213	76	1 667
<i>Boat building</i>	1 271	423	8 573
<b>Maritime and inland shipping</b>		<b>3 877</b>	<b>59 815</b>
<i>Maritime transport</i>	7 714	1 982	13 307
<i>Inland navigation</i>	571	208	3 912
<i>Maritime insurance</i>	1 256	157	1 182
<i>Port services (1)</i>	1 271	915	9 685
<i>Stevedoring</i>	901	589	5 186
<i>Other harbour businesses (2)</i>	100	26	26 543
<b>Sand and gravel extraction (3)</b>	<b>25</b>	<b>10</b>	<b>300</b>
<b>Electricity generation</b>	na	na	<b>6 475</b>
<b>Maritime works</b>	<b>954</b>	<b>291</b>	<b>3 499</b>
<b>Submarine cables</b>	<b>613</b>	<b>154</b>	<b>3 631</b>
<b>Offshore oil and gas services</b>	<b>6 100</b>	<b>2 001</b>	<b>26 200</b>
<b>Banks</b>	na	na	<b>900</b>
<b>Non commercial public sector</b>		<b>1 748</b>	<b>60 273</b>
<b>French Navy</b>		<b>1 481</b>	<b>53 259</b>
<b>Public intervention</b>		<b>87</b>	<b>4 003</b>
<b>Public marine research</b>		<b>180</b>	<b>3 011</b>
<b>Grand Total</b>		<b>21 465</b>	<b>486 320</b>

(1) Including port authorities

(2) Excluding port authorities, stevedoring, pilotage and boatage. Including production and VA of towage.

(3) Extraction only, excluding sorting and processing.

na: not available.

## 2. The growth of the French maritime economy

In terms of growth, a slow down has appeared since 2003. That year, employment reached an unprecedented level of almost 500,000. In 2004 value added was at its highest with more than 21.5 billion Euros. Several factors are at the origin of this slight slowdown in growth in 2005, which remains nevertheless a very active year:

- slowing in the growth in tourism, despite satisfactory overall results;
- a drop in the value added of maritime transport, due to the increase in costs, particularly those of fuel oil, whilst turnover grew significantly;
- a fall off in activities and employment in shipbuilding and repair: new orders for cruise liners had not yet had an impact on turnover; this impact shall be visible as from 2006;
- a slowdown in the growth of the offshore oil and gas services which, despite the unfavourable euro / dollar rate, maintained a high level of activity;
- a slight drop in the number of Navy personnel.

On the other hand, certain factors stimulated maritime activities, particularly boatbuilding, the production of which increased by more than 23% between 2003 and 2005 and employment by more than 11%.

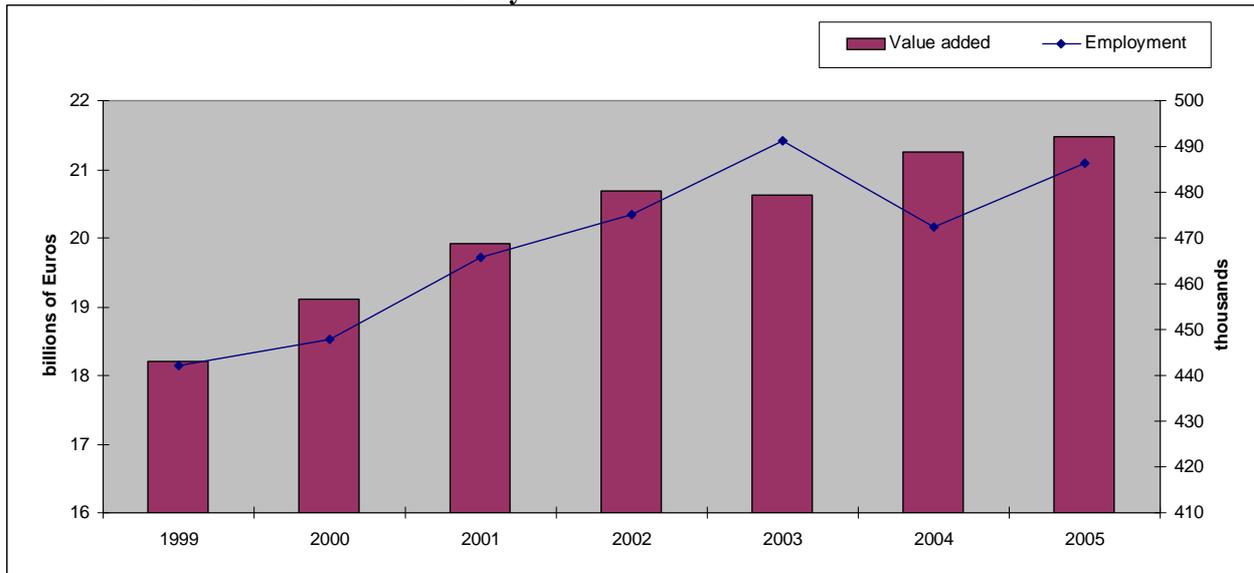
Over a longer period, the French maritime economy, which is highly export-driven, is stimulated by world growth, but is inevitably confronted with the problem of the Euro/dollar rate and the rise in the price of the hydrocarbons and non energy commodities, particularly metals. Some aspects must be pointed out:

- It is clear that any variation in the activities in coastal tourism has a determining impact on the overall results of the French maritime economy. Particularly, the tourism indicators show the sector's steady growth, at least since the end of the 1990s.
- Independently of the specific sectors, growth in production appears to have been steady since the early 2000s, although the rise in energy and raw material prices impacts each maritime activity in different ways.
- In terms of employment, the rise is more limited, which is the probable consequence of general constraints due to international competition; a slight drop in employment occurred for shipbuilding.

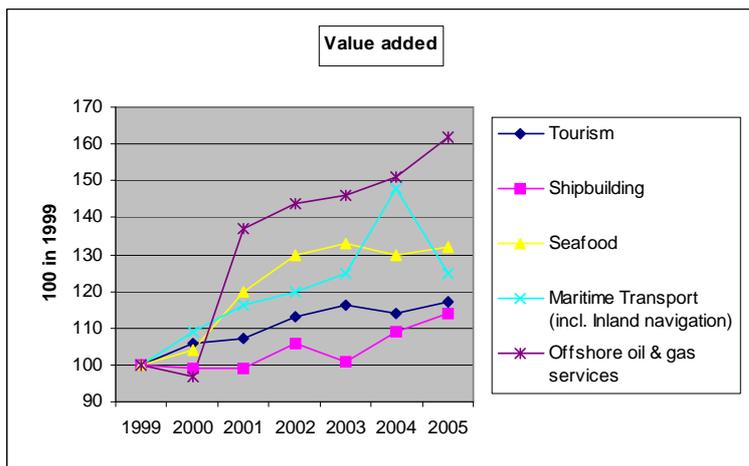
It is difficult to give an accurate picture of trends for 2006 and 2007, in the absence of a complete set of data. However, the trends already known suggest growth in merchant shipbuilding, a high level of activity in the maritime transport sector due to the continued dynamism of world exchanges and growth in the oil exploration and production investments which will have stimulated the French oil and gas services. Other factors should have a negative impact: the rise in energy prices may have posed profitability problems in certain maritime transport sectors, and the weakness of the dollar against the Euro has handicapped tourism and certain export industries. The rise in the price of non energy commodities, the peak of which the IMF would situate in 2007, is also unfavourable to the profitability of certain manufacturing sectors.

For 2008, the problem appears rather to concern very moderate growth forecasts in Europe and North America. If such a slowdown was the case and persisted, it could loosen the grip of the prices of energy and non energy raw materials, but also reduce the demand on export driven sectors, such as maritime transport, oil and gas services, and tourism. Nevertheless, the IMF forecasts on world growth (which should attain 2005 levels) and international exchanges (same rate of growth as 2007) are a favourable factor for exporting industries, provided that they can attract the demand.

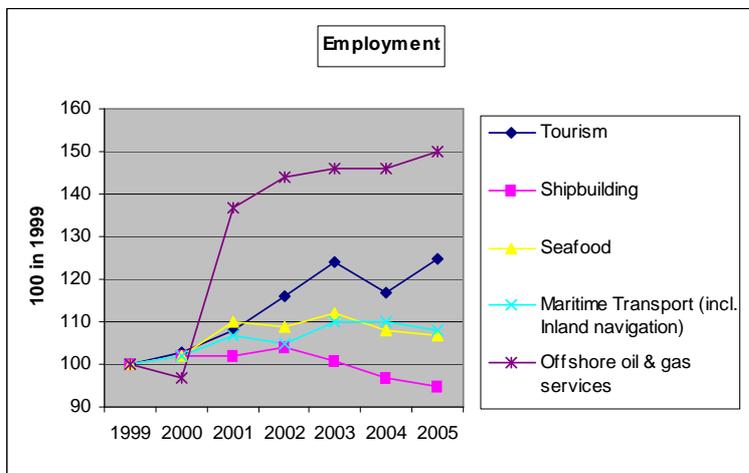
**Growth of the French maritime economy**



Reconstituted data with a constant scope



**Growth of some maritime sectors**



Reconstituted data with a constant scope.



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## Acronyms and abbreviations

ADEME	French environment and energy management Agency
ADEPALE	Association of processed food industry
ADSL	Asymmetric Digital Subscriber Line
AFIT	French association of tourism engineering
AFITF	Funding agency for transport facility development
AFSSA	Food safety agency
Agreste	Agriculture, fisheries, aquaculture and seafood industry database
APPA	Association of renewable energy producers (Spain)
BCS	DPMA Central Statistical Office
BRESM	SHOM-Meteo research and studies office
BRGM	Geology research office
CEDRE	Centre of documentation, research and experimentation on accidental water pollution
CELRL	Coastal and lakeshore conservatory
CEMAGREF	Research institute for engineering of agriculture and environment
CEPPOL	Navy's anti-pollution applied studies office
CERO	Western regional maintenance and repair centre
CESA	Community of European Shipyard's Associations
CETMEF	Maritime and river technical study centre
CEVA	Centre for seaweed processing
CFP	Common Fisheries Policy
CITEPA	Inter-industry technical centre for the study of atmospheric pollution
CMO	Military oceanography centre
CNAM	National provident fund
CNC	National committee for shellfish farming
CNES	National space research centre
CNRS	National centre for science research
COWI	Consultancy within Engineering, Environmental Sciences and Economics
CQEL	DDE service in charge of coastal water quality
CROSS	Regional operational surveillance and rescue centres
CSCN	French shipbuilding and ship repair association
CUMU	Central Union of Marine Underwriters (Norway)
DAM	Directorate of maritime affairs
DCS	Control and surveillance system
DDASS	County-level administrative services for health and social matters
DDE	County-level subdivisions of the Equipment administration
DGMT	Sea and transport directorate general (subdivision of the Equipment and Transport Ministry)
DPMA	Directorate of fisheries and mariculture
DTI	Department of Trade and Industry (UK)

DTMRF	Directorate of maritime, road and river transport (former Equipment Ministry subdivision)
dwt	Dead weight tonne
E&P	Exploration and production (of crude oil)
EC	European Commission
ECMT	European Conference of Ministers of Transport
EDF	French electricity generation, transmission and distribution utility
EEA	European Environment Agency
EES	European Economic Space
EEZ	Exclusive Economic Zone
EMEC	European Marine Equipment Council
ENIM	Provident fund for naval personnel
ENMM	Merchant navy schools
EOS	Earth Observation Summit
EPSHOM	SHOM main office
ESPO	European Sea Ports Organisation
EU	European Union
Eurostat	Statistical Office of the European Communities
EWEA	European Wind Energy Association
FAO	Food and Agriculture Organisation
FFPP	Association of French boating ports
FFSA	French association of insurance companies
FIAC	French association of canned food industry
FICT	French association of meat processed and traiteur products industry
FIN	French nautical industry association
FNFA	French German naval force
FNTP	Civil work industry national association
FPAP	Fishing contingency fund
FREMM	Multi-missions frigate
FREMM AVT	Multi-mission frigate – “land strike” version
GDP	Gross Domestic Product
GEOSS	Global Earth Observation System of Systems
GICAN	French association of naval shipbuilding and equipment industry
GMDSS	Global Maritime Distress and Safety System
GMES	Global Monitoring for Environment and Security
GODAE	Global Ocean Data Assimilation Experiment
GRT	Gross Registered Tonnage
GW	Gigawatt
GWEC	Global Wind Energy Council
ICES	International Council for the Exploration of the Sea
ICPC	International Cable Protection Committee
ICPE	« Environment protection »-classified industrial establishments

IEA	International Energy Agency
IFEN	French institute for environment
IFP	French petroleum institute
Ifrecor	French initiative for coral reefs
IMF	International Monetary Fund
INRA	National institute of agronomic research
INSEE	National institute for statistics and economic studies
INSU	National institute for sciences of the universe
IPEV	Paul-Emile Victor Institute
IPPC	International Plant Protection Convention
IRD	Research institute for development
ISL	Institute of Shipping Economics and Logistics (Bremen)
ITQ	Individual Transferable fishing Quota
IUEM	European university institute for the sea
IUMI	International Union of Marine Insurance
JORF	Official journal of the French republic
ldt	Light displacement tonnage
LEMA	High schools for maritime and aquaculture training
LHD	Landing Helicopter Dock
LNG	Liquefied Natural Gas
LPD	Landing Platform Dock
MAGP	Multi-Annual Guidance Programme
MAREL	Automated measurement network for the coastal environment in the Seine estuary
MERSEA	Marine Environment and Security for the European Area
MFS	Mediterranean forecasting system
MIDN	Inter-ministerial mission on end-of-life merchant and naval ship scrapping
MPA	Marine protected area
MRCC	Maritime Rescue Co-ordination Centre
MW	Megawatt
OCCAR	Jointly organising armament co-operation (UK and France)
OFIMER	National Office for the Seafood and Aquaculture Industry
ONEMA	National office for water and aquatic environment
ONF	National forest office
ONS	Office of National Statistics (UK)
ORSEC	Civilian safety response organisation
OSPAR	Oslo-Paris Commission / International Convention (1992)
OSU	Science of the universe observatories
OTE	Ocean Thermal Energy
OTEC	Ocean Thermal Energy Conversion unit
PAAMS	Principal Anti Air Missile System
PACA	Provence-Alpes-Côte d'Azur region
PNR	Regional natural park

POLMAR	Maritime pollution response scheme
PPI	Multi-annual programming of investments
R&D	Research and Development
REMI	Microbiological monitoring network for shellfish farming zones
REMORA	Farmed mollusc yield network
REPAMO	Mollusc pathology network
RIF	French international register
RINBIO	Biointegrator network
RNO	National seawater monitoring network
ROV	Remotely Operated Vehicle
SCEES	Central service of statistical surveys and studies (Agriculture & Fisheries Ministry)
SESSI	Service for industry studies and statistics
SFAM	French association of mariculture
SHOM	Navy hydrography and oceanography department
SIRENE	Computerised system of businesses and production units directory
SNSM	National association for salvage at sea
SOeS	Survey and statistics service (Equipment and Transport Ministry)
SOLAS	Safety of Life at Sea
STCW	Standards of Training, Certification and Watchkeeping for seafarers
SUSE	Unified system of business statistics
Sycabel	Association of electric and communication wire and cable manufacturers
TAAF	French southern and Antarctic territories
TEU	Twenty-foot equivalent unit
UNCTAD	United Nations Conference for Trade and Development
Unedic	National association for employment in industry and commerce
UNPG	National union of sand and gravel producers
VA	Value added
VAT	Value added tax
VNF	French national office of navigation
WFD	Water framework directive