



# **French Marine Economic Data 2009**

Under the scientific responsibility of Régis Kalaydjian  
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## **Abstract**

The report presents a survey of marine related activities in France and an assessment of their economic weight in terms of value added and employment estimates. A brief outline of the recent past and present economic situation of these activities, and of their position on international markets is given. The survey presents the commercial sector, including marine resource exploitation, manufacturing activities and services, followed by the public sector, including the Navy, state intervention at sea, coastal environment protection and marine sciences. A summary gives an overall estimation of marine value added and employment.

Key words: economy, marine, value added, employment, industry, services.



## Content

	Pages
Introduction	7
<hr/>	
Industrial sector	9
Seafood products	11
Marine aggregate extraction	27
Energy	31
Shipbuilding and repair	37
Marine and river civil engineering	49
Submarine cables	51
Offshore oil and gas-related industry	53
Coastal tourism	55
Maritime and river transport	59
Maritime insurance	71
<hr/>	
Non-commercial public sector	73
French Navy	75
Public intervention	79
Coastal and marine environmental protection	87
Marine research	101
<hr/>	
Summary: the French marine economy in 2007	109
References	113
Acronyms and abbreviations	117

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## Introduction

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The objective of « French marine economic data » report is to assess the weight of the French maritime economy, its position with respect to international competition and its role within public services in France.

The marine economy's definition and scope remain unchanged with respect to the previous publication, with the exception of the banking sector which was not taken into account here due to insufficient information. For the sectors examined, recourse to estimations is inevitable in order to compensate for the lack of data on the « marine or maritime segments » of these activities. The 2009 edition carries on in efforts to improve both the quality and the traceability of estimations.

It assesses the marine economy in 2007, which is the last year for which data were available for all the sectors covered by this scope. Therefore, the reader will find here a marine economy at the top of its cycle. The effects of the 2008 recession which occurred after a period of strong global growth are still being felt.

The report includes two parts: a description of the industrial sector, followed by a description of the non-commercial public sector. A set of indicators is used to evaluate each industrial activity: the sector-based turnover, value added and employment, as well as the number of companies and the export rate when there is data for this. The public sector is above all described by the budget and workforce allotted for the various remits, making it possible to appraise the effort devoted by the Nation to achieving these missions. A brief, more qualitative, look at each activity's situation supplements the key figures, providing a concise indication of its position with respect to the international competition. In these cases, the additional information focuses on the 2008-2009 period and, insofar as possible, take account of the effects of the recession.

The assessment shows that the top of the cycle meant strong growth in value added and employment in the maritime realm over the period from 2005-2007. This was mainly attributable to shipping, but also to boat building, offshore oil-related industries and coastal tourism. The marine economy exports a great deal and is globally oriented, so was able to take advantage of the favourable economic context. It is highly dependent on the European context, which is why this report frequently draws a link between the French marine economy and that of Europe. This dependence was clearly seen as some maritime activities entered the period of recession.

Although it is too early to accurately measure the impacts of the crisis on all aspects of French marine output and jobs, there is no lack of publications reports and papers on the difficulties that several sectors encountered as of 2008, such as merchant ship and boat building or maritime transport. Internationally, these difficulties were all the more severe in that the crisis suddenly interrupted a period of particularly sustained growth of the global GDP and

international trade, highlighting overcapacities immediately following a phase of tension on the markets. Private individuals are cutting back on their leisure investments to the detriment of boat building, but the cruise operators are apparently basing their predictions on positive growth perspectives, proving the attractiveness of some forms of marine recreation activities in spite of economic difficulties.

In a context of an increasing number of vessels in both 2009 and 2010, and forecasts of weak growth for world trade, the time required to absorb overcapacities in the sectors most hard hit by the crisis, remains an issue of concern.



**Industrial Sector**

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## Seafood products

### 1. Marine fisheries

#### 1.1. Definition

All categories of marine fisheries (from small coastal fisheries to high sea tuna fisheries) are taken into account here. They land fresh or frozen seafood, fish, cephalopods, crustaceans, shellfish and seaweed.

#### Key figures for marine fisheries

	2001	2002	2003	2004	2005	2006	2007
Yield (tonnes) <sup>(2)</sup>	620 432	626 418	658 059	596 860	545 330	551 831	476 244
Turnover (million euros)	1 072	1 137	1 334	1 093	1 036	1 042	1 015
Value added (million euros) <sup>(3)</sup>	741	758	900	687	643	634	634
Labour force <sup>(4)</sup>	12 919	12 983	13 213	12 484	11 937	11 403	11 396
Fleet <sup>(5)</sup>	5 744	5 710	5 641	5 411	5 360	5 232	5 187

(1) Metropolitan France not including Corsica (approximately 200 vessels)

(2) including seaweed yields

(3) A mean rate of added value has been estimated from a representative sample.

(4) IFREMER data for the North Sea-Channel-Atlantic seafront in full time equivalents. OFIMER data for the Mediterranean seafront (number of seamen working aboard for at least 9 months at a time).

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

Sources: FranceAgriMer, ministry of Agriculture and Fisheries, IFREMER-SIH

#### French marine fisheries structure in 2007

	Yield (tonnes)	Turnover (million euros)	Average price (euro/kg)
Fresh fish	224 977	630	2.8
Crustaceans	12 368	72	5.8
Shellfish	42 581	81	1.9
Cephalopods	23 526	75	3.2
Seaweed (1)	9 410	2	0.2
<b>Sub-total fresh fish</b>	<b>312 862</b>	<b>861</b>	<b>2.8</b>
Tropical tuna (2)	91 074	126	1.4
Other frozen fish (3)	72 309	28	0.4
Sub-total frozen fish	163 383	154	0.9
<b>Total fisheries*</b>	<b>476 245</b>	<b>1 015</b>	<b>2.1</b>

\* including seaweed

(1) Amounts 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: FranceAgriMer

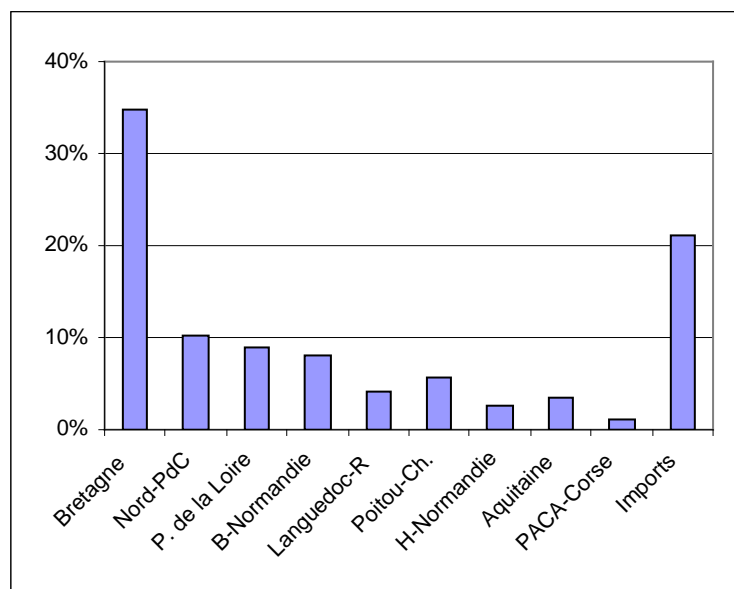
## 1.2. Trends in activity

French marine fisheries involve numerous fleets and target a wide range of species. This leads to diversity in techniques used: dredging, pots, trawling, netting and line fisheries.

The French fleet on the North Sea, Channel and the Atlantic seafronts make two thirds of their catches in EC waters (Celtic Sea, Western Scotland, English Channel, North Sea and the Bay of Biscay). It 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 departments and territories: French Guyana (prawns), Reunion Island (tuna and swordfish) and in southern and Antarctic territories (Patagonian toothfish and spiny lobster).

The Ministry in charge of fisheries has estimated French production at about a billion euros, unequally broken down in both tonnage and value, with Brittany in the fore (35% of value produced), far ahead of the Nord-Pas-de-Calais (10%) and Pays de la Loire (9%) regions. The value of yields is underestimated in official landings data and Ifremer estimates this gap in value at 29% for vessels smaller than 24 metres LOA on the North Sea, Channel and Atlantic seafronts. Yield value has decreased since 2003, and the landing volumes have dropped markedly.

### Sale of metropolitan French marine catches per region Fresh, frozen, processed catches (not including seaweed) Year 2007

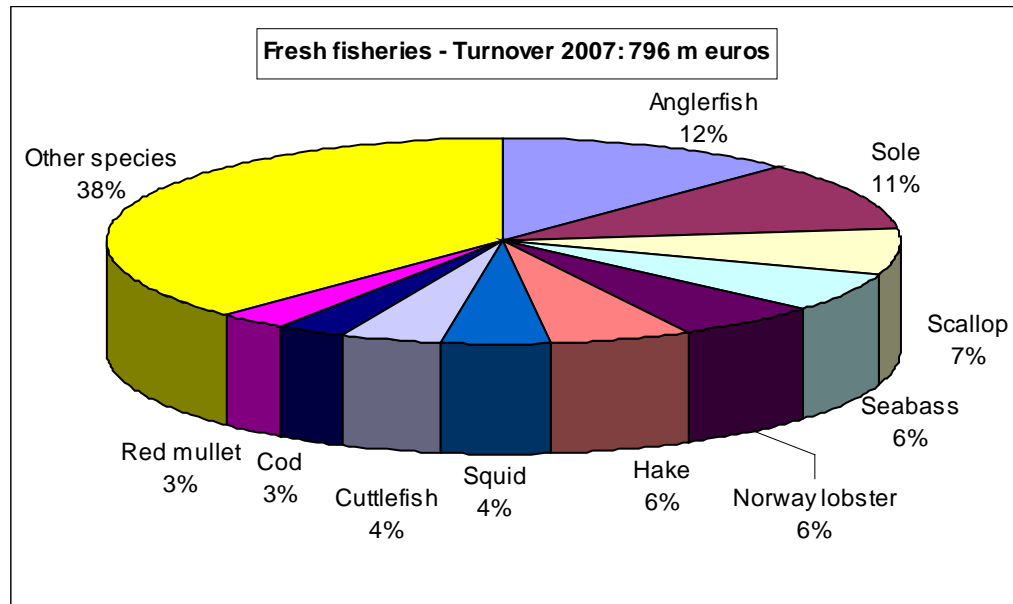
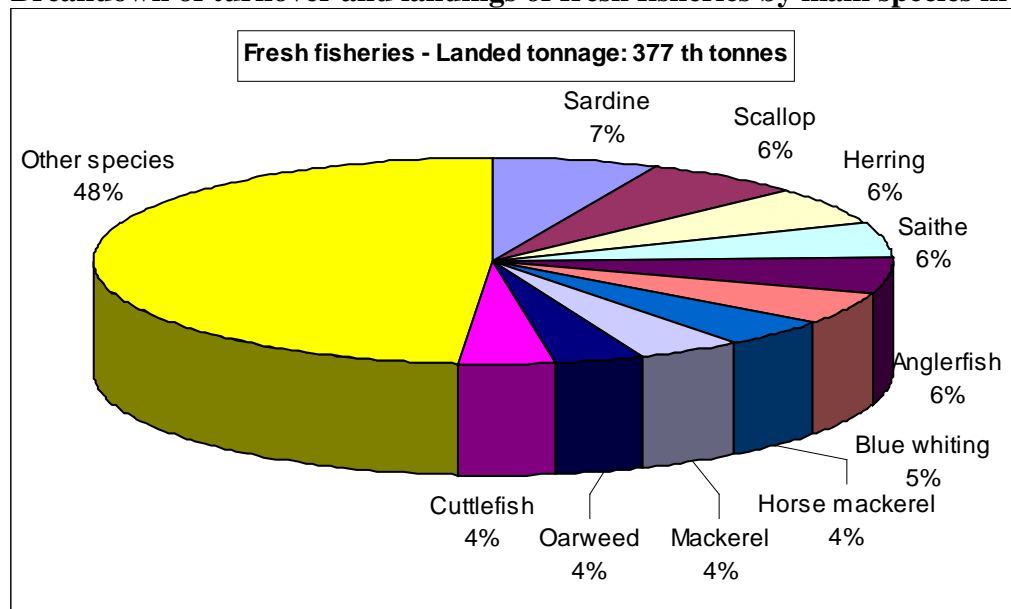


Source: FranceAgriMer, 2007 production statistics.

Since the turn of the 1990s, the marine fisheries production structure has hardly changed. Fresh fisheries predominate, representing nearly 61% of amounts landed and 86% of the total turnover.

Fresh fish make up 41% of landings in terms of tonnage, and over 57% of turnover. In the fresh fisheries category, sardines, scallops, herring and saithe were the species most caught in 2007, in tonnage. The most important species in terms of turnover are monkfish sole and seabass (so called noble species, averaging high prices) along with scallops. In frozen fisheries, tropical tuna is the species caught most.

### Breakdown of turnover and landings of fresh fisheries by main species in 2007\*



\*Not including tropical tuna

Sources: SIH / Synthèse des flottilles 2007 (<http://www.ifremer.fr/sih>). Ministry of Agriculture and Fisheries for Landed tonnage (source: "Flux declarations") and Turnover (source: "Sales").

French production in overseas departments and territories is assessed at 22,400 tonnes (source: FranceAgriMer).

**Marine fisheries in overseas departments and territories, 2007**

	<b>Yield (tonnes)</b>	<b>Yield- value (M euros)</b>	<b>Imports (tonnes)</b>	<b>Imports- value (M euros)</b>	<b>Exports (tonnes)</b>	<b>Exports- value (M euros)</b>
Guadeloupe (1)	10,100	82.0	6,640	na	126	na
Martinique (2)	6,200	52.4	7,500	na	0	0
Reunion island	3,122	12.6	9,695	45.3	3,430	34.6
Guyana (3)	4,864	22.3	na	na	1,917	na

(1) Imports and exports for all products. Data for 2006.

(2) Imports for all products. Estimations.

(3) Exports for all products. Data for 2005.

na: not available.

Sources: FranceAgriMer/"Chiffres-clés 2007", DPMA data on fresh and frozen fisheries; French Customs for imports and exports.

Metropolitan France (not including Corsica) ranks third in the EU and provides 16% of total production in value, estimated at nearly 7.8 billion euros. The two leading producers are Spain (1.7 billion euros) and Italy (1.4 billion), totalling 39% of EU production in terms of value.

**European marine fisheries production in 2007**

	<b>Turnover (million euros)</b>	<b>Landings (1 000 tonnes)</b>	<b>Average price (euro/kg)</b>	<b>Number of seamen (FTE)</b>	<b>Number of vessels</b>
<b>European Union 15 total</b>	<b>7 884</b>	<b>3 853</b>	<b>2</b>	<b>138 896</b>	<b>69 934</b>
<i>including</i>					
Spain	1 720	837	2.1	35 274	13 310
Italy	1 365	277	4.9	25 426	13 804
France <sup>(1)</sup>	1 259	415	3.0	13 155	4 661
United Kingdom	959	610	1.6	8 064	6 852
Netherlands	398	473	0.8	1 966	831
Denmark <sup>(4)</sup>	352	1 072	0.3	3 200	1 242
Portugal	435	199	2.2	17 021	4 806
Greece	795	124	6.4	24 745	18 058
Ireland	177	219	0.8	3 838	1 699
Germany	163	118	1.4	2 044	1 617
Sweden	142	223	0.6	1 879	1 527
Belgium	90	22	4.1	501	102
Finland <sup>(2)</sup>	28	102	0.3	1 783	1 425
<b>Other European countries<sup>(3)</sup></b>	<b>125</b>	<b>293</b>	<b>0.4</b>	<b>8 580</b>	<b>4 888</b>
<i>including</i>					
Cyprus	14	2	5.9	747	529
Malta		1			1 395
Estonia	44	94	0.5	3 421	1 021
Latvia	20	84		1 632	877
Poland	44	108	0.4	2 664	891
Slovenia	2	3		116	175

(1) Provisional estimation of data for metropolitan France, not including Corsica

(2) Data for 2006.

(3) Cyprus, Malta, Estonia, Latvia, Poland, Slovenia

(4) Data for 2004.

Sources: Scientific, Technical and Economic Committee for Fisheries; Eurostat for Spain's landing tonnage.

The EC/199/2008 regulations have updated the « Data Collection Framework » which set up an EC frame in 2001 for collecting, managing and using data from the fisheries sector. The

data are summed up in an EC annual economic report which gives the economic performance of European fishing fleets.

### 1.3. The fleet

The French fisheries fleet, totalling 5,187 vessels as of 31/12/2007, is mostly made up of boats less than 12 metres LOA. In terms of vessel engine power, the coastal and high sea fleet percentages are equivalent. The Mediterranean fleet represents 30% of vessels in metropolitan France and 20% of total horsepower.

Since 1990, fleet characteristics have shown a significantly changing trend, with vessels under 7 m dropping by half in number while their mean horsepower rose by 30%. There has also been a sharp drop in the number of vessels of more than 40 metres LOA.

#### The fishing fleet of metropolitan France from 1990 to 2007

Length classes	Number of vessels			Mean motor power (kW)		
	1990	2007	Variation	1990	2007	Variation
Under 7 metres	2672	1258	-53%	29	38	31%
7 to 9 m	2173	1269	-42%	62	77	24%
9 to 12 m	1787	1407	-21%	110	128	16%
12 to 16 m	856	452	-47%	184	215	17%
16 to 20 m	584	255	-56%	286	312	9%
20 to 24 m	332	281	-15%	383	400	4%
24 to 40 m	248	205	-17%	521	479	-8%
Over 40 m	85	52	-39%	1942	2153	11%
Total	8737	5179	-41%	132	159	20%

Source: SIH Ifremer

The metropolitan fleet is ageing; with an average vessel age of 16 years in 1983 and 24 years in 2008 (28 years in the Mediterranean). However, the French fleet remains one of the youngest in Europe. The activity of the metropolitan fleet is mainly coastal in nature; 87% of vessels work exclusively, mainly or regularly in territorial waters.

The fisheries fleet in French overseas counties was made up of 2,409 vessels as of 31 December 2007, i.e. 32% of the metropolitan fleet. This fleet is based in the West Indies (French Antilles) which accounts for 80% of vessels and total rated power, Reunion Island (12%) and French Guyana (7%).

### 1.4. Employment

Trends in the French fisheries labour force are closely linked to fleet 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 11,396 seamen in full time equivalents working on the Channel, North Sea and Atlantic seafronts in 2007. Data from FranceAgriMer based on the length of time on board supplemented this initial source for the Mediterranean.

## 1.5. Market trends

Total yields for French fisheries have dropped by 16% over the past 10 years. This decrease affects both fresh and frozen fisheries. The volumes put on sale in fish auctions have dropped by 26% in 10 years, with a price rise of 13%.

French imports are growing strongly, and mainly concern processed (frozen) products. The main species imported – salmon, prawns, white fish – are used for end consumers and in the processing industry. Over the past ten years, imports of freshwater fish have appeared (Nile perch, panga and tilapia).

Over the same period, export volumes have been relatively stable; the slight increase in value is due to higher mean prices of exported products. The European Union is far and away the main market for French products: 75% of French exports are intra-EC. Frozen products make up a very high share of exports in volume, but fresh products account for the majority in value, particularly with high quality, high added-value fish sold in Spain and Italy. Nationwide, apparent consumption of aquatic products has grown sharply in recent years, reaching 35 kg per inhabitant per year (in equivalent live weight).

## 1.6. Outlook

In a context of enduring rises in fuel costs, the end of subsidies to modernise the fleets, more demanding requirements for product quality, much thought and reflection is focused on the future of the marine fisheries sector.

The most recent Common Fisheries Policy (CFP) reform dates back to 2002. It has made some progress possible in long term resource management and involving the sector in managing the resource; the regional advisory councils in each region or for some fisheries, bring together various stakeholders who are asked to take part in drawing up of European Commission projects.

Since the 2002 Johannesburg world summit for sustainable development, international requirements have aimed for sustainable maximum exploitation of marine resources and the management plans should enable this objective to be reached by as of 2015: the « maximum sustainable yield » is the largest amount of biomass which can be extracted continuously on average of a given stock under existing (or average) environmental conditions, without affecting the breeding process.

The 2002 reform did not achieve all its goals and its main failure lies in overfishing, which still characterises most European Union fisheries. 88 % of stocks fished in EC waters are caught in quantities greater than their capacity for renewal. In many fisheries, the activity relies on catching juveniles which have not reached sexual maturity. The main cause of this overfishing is due to the overcapacity of the European fishing fleet. There are too many vessels plying a dwindling resource. For fishermen, this means low income or even economic losses. This makes them more vulnerable in economic crises (fuel price, lower purchasing power) and makes them more dependent on public support.

The European Commission is preparing a reform to adapt the CFP to the new challenges facing the sector. The new reform is being launched for application by 2013.



## 2. Mariculture

### 2.1. Definition

The marine aquaculture, or mariculture, sector producing food for humans is composed of two sub-sets:

- shellfish farming or rearing (mainly oysters and mussels),
- “new” seafarming 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 pearls.

### 2.2. Trends in activity

Worldwide, aquaculture supplied 50.3 million tonnes of fish, molluscs and crustacean in 2007, i.e., a share of 36% of total fish farming and mariculture production (not including seaweed) (source: FAO). In value, aquaculture yields reached 87 billion dollars (63.5 billion euros) in 2007. Aquaculture yields are divided between farms in inland waters (62% of volume) and farms at sea (38%). During the period from 1998-2007, contributions from aquaculture grew sharply, by 77% in volume.

On the European scale, marine aquaculture is most widespread (81% of aquaculture volume and value overall) and reached a yield 1.9 million tonnes in volume and 6.6 billion dollars (4.8 billion euros). This is mainly shared by two types of activity, i.e. fish farming (1.2 million tonnes, 3.8 billion euros) and shellfish farming (700 thousand tonnes, one billion euros). From 1998 to 2007, European mariculture's progression (+27% in volume) was mainly due to the rise in fish farm production. The principal European players in marine finfish farming are Norway (57% of yields in value in 2007), the United Kingdom (16%) and Greece (10%). Farmed shellfish production, predominantly from mussel farming and oyster farming, showed signs of a slowdown. The main European producer countries are France (39% of yields in value in 2005), Italy (31%), Spain (7%), the Netherlands (7%) and Ireland (6%).

France owes its position, behind Norway, amongst the top European mariculture production countries to the scope of its shellfish farming sector. French oyster farming, which makes up 85% of European oyster production, contributed nearly half of French mariculture turnover in 2007. Mussel farming is also an important component (20%), followed by pearl farming in French Polynesia (14%) in 2007. French marine finfish farming, mainly turned towards rearing seabass, bream, turbot and marine salmonids, is an activity providing nearly 12% (including hatchery activity) of the sector's turnover.

The trend in aquaculture production over the past five years reflects the fluctuations in mussel farming's contributions, the relative stability of oyster farming yields and some progression in marine finfish farming. Overall, the aquaculture turnover in metropolitan France is on the rise, but income from aquaculture activities in the overseas departments and territories, after recording a peak in 2005 has shown a downturn. A new drop in pearl prices on the world market and a slowing of farmed tropical shrimp production are responsible for this.

### Key figures for aquaculture

Unit: million euros

	2003	2004	2005	2006	2007
Turnover for metropolitan France	428	460	465	461	492
Turnover for DOM-TOM	102	113	127	117	118
Total turnover	529	573	592	578	610
Value added*	371	401	414	404	426

\*Average value added rate estimated at 70%.

Sources: Aquaculture survey by DPMA-BCS, Ifremer, SFAM, ISPF

### Production volumes in French mariculture

Unit: tonne

	2003	2004	2005	2006	2007
Oysters	115950	118660	119400	112677	113215
Mussels	64650	67780	66250	72698	76611
Other shellfish	1700	3370	3650	3777	3820
Marine and amphihaline finfish	6 748	7229	7998	7429	7985
Tropical marine finfish	342	309	318	298	262
Tropical shrimp	1748	2256	2483	2323	1888

Sources: Aquaculture survey by DPMA-BCS, IFREMER, SFAM

### Turnover in French mariculture

Unit: million euros

	2003	2004	2005	2006	2007
Oysters	257	267	272	258	268
Mussels	95	102	97	108	117
Other shellfish	8	15	17	15	15
Marine and amphihaline finfish	41	48	51	50	53.2
Tropical marine finfish	2.0	1.7	1.9	1.8	1.6
Farmed pearls	87	95	108	101	102
Tropical shrimp	13	17	17	14	15
Marine finfish hatcheries	17	16	15	14	17
Shellfish hatcheries	11	12	14	16	21

Sources: Aquaculture survey by DPMA-BCS, IFREMER, SFAM, ISPF

## 2.3. Employment and companies

Enterprises and employment in mariculture mainly come from shellfish farming (95% of jobs). The last comprehensive data available come from the DPMA 2006 aquaculture survey. For the shellfish farming sector, the survey counted 19,168 permanent, part-time or seasonal jobs, corresponding to a total of 9,887 full time equivalents. Compared to the 2001 census data, a drop of 13% is seen in the number of companies, and a smaller decrease in the number of jobs (-6%). Most of these shellfish farming firms have sole proprietor status and a family-based labour force. Nearly three-quarters of shellfish farms are also ship shellfish and have been approved by health authorities to sell their finished products for human consumption. Shellfish farming is spread over almost the entire coast, with a larger number of enterprises and jobs on the Atlantic seafront (respectively 66 and 62%).

### Geographical distribution of enterprises and jobs in shellfish farming in 2006

	Nb of enterprises	Percentage of enterprises	Nb of jobs (FTEs)	Share of shellfish farm jobs
North Normandy	317	10%	1,393	14%
North Brittany	263	8%	1,196	12%
South Brittany	485	15%	1,494	15%
Pays de la Loire	325	10%	862	9%
Poitou-Charentes	1,018	31%	3,142	32%
Aquitaine	315	10%	682	7%
Mediterranean	521	16%	1,119	11%

Source: DPMA-BCS/aquaculture survey for 2006

39 enterprises in metropolitan France involved in marine finfish farming were counted during the same survey for 2006. They employed 611 people in all, i.e. 507 full time equivalents. Seabass and bream farming mainly take place in the Mediterranean and North of France regions. Turbot farming, which has fewer people involved, is done on the Atlantic seafloor (Pays de la Loire, Poitou-Charente) while salmonid production, on the rise since salmon rearing has been revived, is concentrated in Brittany and Normandy.

#### 2.4. Outlook

In metropolitan France, the regulatory and political context for use of the coastal zone limits mariculture's expansion. Competition from other European producers (mainly Greek) has hindered the development of the seabass and bream grow-out supply chain in France. Any development strategy for this sector must therefore take the two major constraints of access to sites and adaptation to markets into account.

The shellfish farming sector, confronted with problems related to the management of the maritime public domain (overloaded basins), is pursuing its experiments for deep water oyster farming and asking for new authorisations to expand farms seaward. However, these perspectives for changes in rearing techniques have been suspended for the moment, following the two mortality crises that swept through the French oyster farming sector in 2008 and 2009. These mortality episodes, which mainly affected juveniles, should lead to a drop in market supply from 2010 on and may entail termination of businesses. They could speed up the restructuring underway in the sector, against a demographic backdrop with numerous departures for retirement and starting up conditions which are not very favourable for young entrepreneurs.

### 3. Seafood trade

#### 3.1. Fish auctions

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.

Key data

- France has 44 fish auctions, 42 of which in metropolitan territory.

- In 2007, the top four in terms of value were: Boulogne, Le Guilvinec, Lorient and Erquy.
- In 2007, 234,000 t of seafood (690 million euros) were sold in fish markets (production of French-flagged vessels), including 173,000 t of fish, 52,000 t of shellfish and cephalopods and 9,000 t of crustaceans.
- Ifremer estimates: 60 million euros turnover; 50 million euros value added; 1,500 jobs.

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. The auctions are also where catch statistics are recorded. In some fisheries, fish must transit through the auction.

### 3.2. Fish and seafood trade and wholesaling

Wholesale trade of seafood is done by traders and many small trading businesses. Along with processors and wholesale sellers, fish traders are the main middlemen between fishermen and retail fishmongers. They perform technical (batching, processing and packing) and commercial operations. Their status is set out in the 1997 act on marine fisheries and mariculture.

#### Key figures for seafood wholesale trade

	2001	2002	2003	2004	2005	2006	2007
Turnover (million euros)	3,653	3,991	4,181	4,149	4,302	4,322	4,009
Value added (million euros) (1)	377	407	423	429	433	445	447
Employment (2)	8,735	8,402	8,801	9,084	8,579	8,469	7,740
Number of companies (3)	1,189	1,159	1,169	1,171	1,115	na	na
Level of exports (%)	14.9%	na	16.3%	15.0%	14.8%	14.4%	14.6%

(1) Revised data. Gross value added to market price.

(2) Salaried staff.

(3) Including 130 to 150 one-man enterprises, depending on the year.

na: not available

Source: INSEE/SUSE, SIRENE (companies with turnover greater or equal to 0.1 million euros)

According to FranceAgriMer, the fish trade involves nearly 5,500 people in 380 firms in France. Its turnover has been assessed at 2 billion euros for an added value of 260 million euros. The enterprises are mainly located on the Atlantic-Channel-North Sea coasts. Most of the turnover is made in the Nord-Pas-de-Calais and Brittany regions.

## 4. Exploiting and processing seaweed

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

### 4.1. Harvesting seaweed and algae

Conditions for seaweed exploitation are regulated by decree; moreover, harvesting is subject to inter-professional regulations. A large part of the national supply is provided by the mechanised harvesting of kelp beds. This is mainly done in the Finistère county of Brittany, while fucus, chondrus and other species are collected on foot in scattered sites along the coast.

According to the Chamber of the marine plant and seaweed union:

- harvesting by boat produces 40,000 to 60,000 t/yr for turnover of about 1.7 to 2.7 million euros.
- For harvesting on foot, a survey was made of companies buying seaweed and algae in 2008. It indicates that: a) black kelp is collected on foot by some twenty people, for a total turnover of 300,000 euros; b) algae and seaweed used as food are mainly collected by approximately 300 occasional harvesters, making a turnover of about 300,000 euros.

Seaweed farming has remained a very marginal activity in France, whereas seaweed farming and harvesting respectively produce 11.5 and 2 million tonnes worldwide.

#### **4.2. Processing seaweed and algae**

Processing is an activity with a strong research and development component. The companies are principally located in Brittany. Outlets are mainly found in the fields of

- cosmetics (producing alginates, colloids and natural gelling agents, some of which are also used in food),
- food industry (processing, canning and packing of some species),
- to a lesser extent, in agriculture (natural fertiliser).

According to the Brest Chamber of Commerce and Industry, processing and marketing of products made with seaweed and marine plants:

- involved 67 firms in 2007,
- for 1,635 non-agribusiness jobs, and
- a total turnover of 424 million euros.
- The value added can be estimated at about 110 million euros (source: Ifremer, estimation using the value added rate of the NAF code 2003 24.5C).

Colloids are produced by three establishments belonging to international chemical groups, while small-sized enterprises are involved in processing of edible seaweed.

### **5. Seafood processing industry**

#### **5.1. 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. The industry does not include those enterprises which only fillet fish (fish traders) or those specialised in seaweed processing.

### Key figures for the sea product processing industry

Units: million euros, percentage

	2003	2004	2005	2006	2007
Turnover	3,076.6	3,048.5	3,149.6	3,405.6	2,801.3
Value added	650.1	631.2	638.0	642.2	511.5
Nb of jobs	14,104	13,887	13,986	13,869	11,150
Nb of firms*	152	150	144	147	107
Export rate**	9.8%	10.4%	10.2%	9.9%	11.8%

\*Firms of 20 salaried staff or more, or with a turnover greater of equal to 5 million euros.

\*\*Exports/turnover.

Source: Agreste

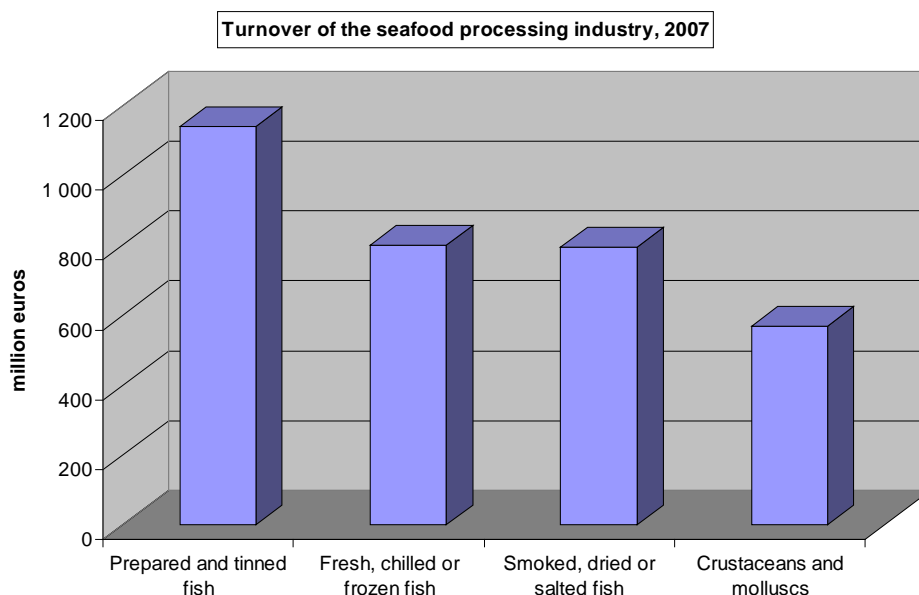
### 5.2. Trends in the sector

The seafood processing industry is a small component of the French food processing industry. According to the food ministry statistical service (SSP) data, the turnover for the activity amounted to 2.8 billion euros in 2007, i.e. 2.3% of that of all agrifood industries. The data indicate a drop in the number of companies and of salaried employees from 2003 to 2007, of 8 and 12% respectively and a drop in turnover of 9%, while the agrifood industry as a whole showed a rise in turnover (11%) over the same period. The drop is mostly due to a change in the statistical nomenclature used for annual business inquiries: a new category of "manufacturing of ready-to-eat meals" (code 10.85Z, NAF 2008) now holds companies that the NAF 2003 put into other categories, particularly in that of processing and canning of products from the sea. According to the SSP, up to 20% of the seafood processing sector's turnover could now fall under this new category.

### 5.3. Indicators for the seafood processing industry

Seafood processing is therefore partially covered by business inquiries based on the new nomenclature. FranceAgriMer set up a complementary survey of the branch in order to take account of small enterprises or those for which seafood processing is not the main activity. This survey identified a clearly larger total population for the year 2006 of 287 firms and a turnover related to the activity which was much higher (3.75 billion euros). However, it does not provide sufficient hindsight to indicate any trend.

According to the Prodcum data on groups of processed seafood products, the segment with the largest turnover is that of preparations and canned foods made with fish, followed by those of fresh, chilled and frozen fish; with the smoked, dried or salted fish segment dominated by smoke salmon production.



Source: PRODCOM database, based on Agreste, ADEPALE-FIAC French confederation of canned food industries, and FICT French federation of meat processors and delicatessen industries.

From 2003 to 2007, all the segments showed growth in marketed production by both volume and value, with the exception of that of fresh, chilled and frozen fish, which fell in quantities but progressed in turnover, thanks to good value enhancement of fish fillets. The excellent performance of the smoked, dried or salted fish segment was driven by smoked salmon. The canned seafood segment has started to rise again. Both crustaceans and molluscs made much less headway in value than in volume, which shows the difficulty of enhancing these products.

### Breakdown of processed seafood production

	<b>Breakdown of production value, 2007</b>	<b>2003-2007 trend in turnover</b>	<b>2003-2007 trend in quantities sold</b>
Prepared and tinned fish	34.5%	2.9%	6.0%
<i>Including canned tuna, mackerel and sardines</i>	<i>12.0%</i>	<i>7.3%</i>	<i>10.3%</i>
Fresh, chilled or frozen fish	24.2%	11.6%	-2.7%
<i>Including fish fillets</i>	<i>18.0%</i>	<i>22.7%</i>	<i>6.0%</i>
Smoked, dried or salted fish	24.1%	57.3%	44.3%
<i>Including smoked salmon</i>	<i>19.5%</i>	<i>68.1%</i>	<i>58.0%</i>
Crustaceans and molluscs	17.2%	3.3%	13.5%
<b>Total*</b>	<b>100.0%</b>	<b>14.7%</b>	<b>7.5%</b>

\*Not including fish meal and other (liver, roe, soft roe, caviar)

Source: Prodcocom database, from Agreste, Adepale-Fiac, FICT

**Sales to end consumers**

	<b>2008 breakdown of sales in value</b>	<b>Trend in 2005-2008 sales in updated value (euros 2008)</b>
Frozen	33.7%	5%
Tinned	22.2%	2%
Smoked, dried or salted fish	15.5%	9%
Other refrigerated delicatessen products	13.7%	19%
Cooked prawns or shrimp	8.4%	18%
Surimi	6.5%	-3%

Source: FranceAgriMer and TNS-Worldpanel.

The industrial statistics indicators can be compared to the estimations by FranceAgriMer of sales to end consumers, via consumer panels monitored by TNS-Worldpanel, apart from the meals taken outside of the home, which represents a small share overall. Consumption of processed seafood in French households is dominated by the segment of chilled delicatessen products, which make up 44% of total consumption in 2008. This is the segment showing the strongest growth rates compared to 2005, with ready-to-eat meals (+30%), salads (+58%) and raw fish preparations including sushi (+74%), as well as with cooked shrimp or prawns (+18%) or smoked salmon (+14%). A slight drop (-3%) was recorded for surimi consumption. The other two large segments seem closer to their maturity, since frozen products only progressed by 5% and canned products by 2%.

**5.4.The industry's concentration**

According to data from the SSP, in 2007, the sector had 5 companies with more than 500 salaried employees and 10 others with over 250. The level of concentration of the sector seems high: the top 10 firms accounted for nearly 40 % of sales and employed approximately 34 % of the sector's labour force. Following the pattern which predominates in the food processing industry overall, very large numbers of SMEs coexist with a few large companies of national or even international renown.

**5.5.Geographical breakdown**

Companies in this branch are almost exclusively located on the coast. According to data from the SSP for the year 2007, the five regions of Brittany, Nord-Pas-de-Calais, Pays de la Loire, Lower Normandy and Aquitaine, hold 69 % of the active firms in the processed seafood sector, 76 % of salaried manpower and 76 % of turnover.



**Breakdown of seafood processing companies by region in 2007**

	Nb of firms	Total salaried manpower	Net turnover (million euros)	Value added (million euros)
Brittany	36	4305	938	188.5
Nort-Pas de Calais	32	2128	600.4	82.7
Pays de la Loire	12	813	151.5	30.9
Ile-de-France	9	185	44.2	9
Aquitaine	8	2123	398.5	94.1
Lower Normandy	7	1139	204.8	50.4
Languedoc-Roussillon	7	189	33	7
Provence-Alps-Côte d'Azur	7	271	157.7	13.2
Upper Normandy	5	167	24.6	5.1
Alsace	3	120	na	na
Burgundy	3	142	16.5	4.8
Centre	3	37	na	na
Poitou-Charentes	3	38	na	s
Midi-Pyrénées	2	-	-	-
Auvergne	1	61	na	na
Picardie	1	79	na	na
Rhône-Alps	1	43	na	na

Source: Agreste

na: not available (confidential data)



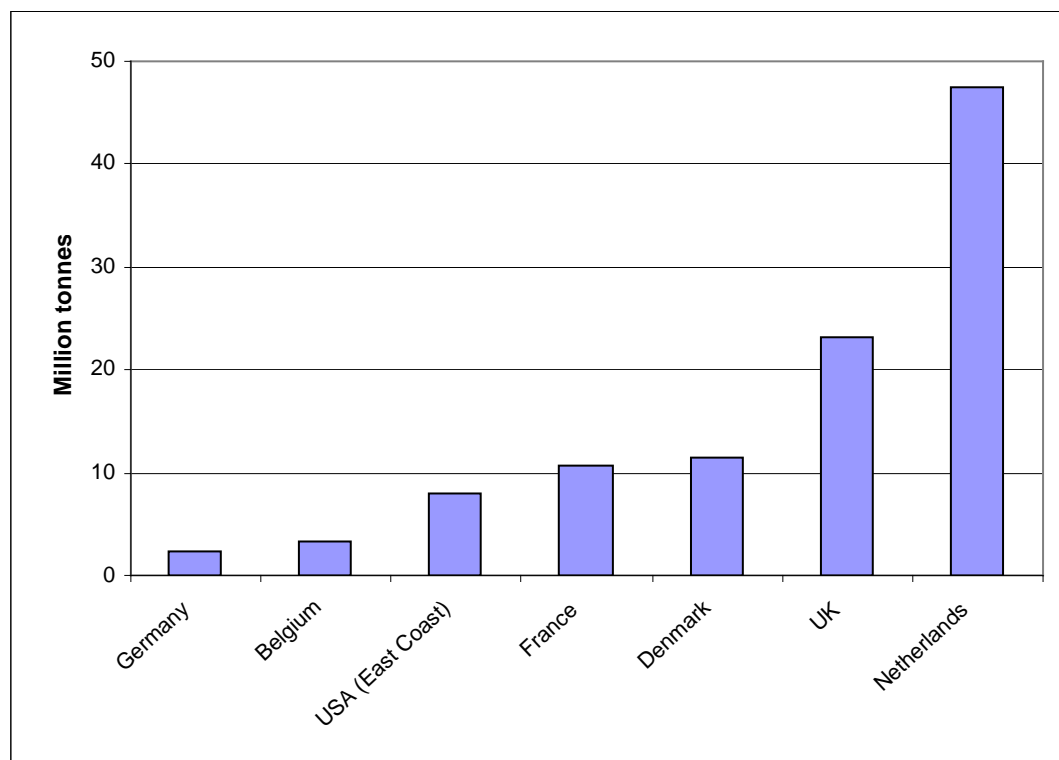
## Marine aggregate extraction

Marine aggregates mined in metropolitan France include silica sands and gravels and calcareous sand and maerl. The first category is used for construction, engineering and public works and the second mainly in agronomy (soil improvement) and to filter drinking water. There are also extraction operations in Guadeloupe (mixed volcanic and calcareous sands used for construction and civil engineering) and at Saint-Pierre-et-Miquelon (siliceous sand and gravels).

### 1. Production in Europe and worldwide

Marine aggregate extraction is mainly a Japanese and European activity which is focused in just a few countries. Some European nations, like Finland and Sweden, have recently stopped extraction or limited it to small quantities, as in Spain. In the North Atlantic area, production is regularly monitored by the International Council for Exploration of the Sea (ICES) especially for ecological reasons. In northern Europe (The Netherlands, Denmark, Belgium, Germany), marine aggregates are mainly used to replenish or nourish beaches, while this type of use is limited in scope in the United Kingdom and marginal in France, where construction and civil engineering outlets take precedence.

#### Main marine aggregate extraction countries in Europe and the US in 2007



Source: ICES / WGEXT Report 2008

## 2. Production in France

Marine aggregate production in France made up slightly less than 1.9 % of national production of building materials, itself estimated at 447 million tonnes in 2007 (source: French aggregate producers union). The ratio was 20% in England-Wales in 2005 (source: British Marine Aggregate Producers Association).

### Extraction of marine silica aggregates in metropolitan France

Unit: thousand tonnes

	2001	2002	2003	2004	2005	2006	2007
English Channel	1230	1240	1160	1190	1220	1300	1400
Brittany	35	10	30	30	0	0	0
Atlantic seafront	4100	4150	4730	4650	5310	5400	5700
Total	5365	5400	5920	5870	6530	6700	7100

Source: UNPG

Extractions can be broken down into:

- siliceous materials, making up over 7 million tonnes in metropolitan France, mainly found between the Seine-Maritime and Gironde counties, in shallow areas with depths less than 30 metres. Along with this growing production is that of 300,000 tonnes from a site mined in Guadeloupe, a very low yield from Saint-Martin and production from Saint-Pierre-et-Miquelon amounting to 20,000 tonnes;
- and calcareous materials, with approximately 500,000 tonnes mined in 2007-2008 in metropolitan France. The production is mainly composed of shell sand, and marginally, of maerl. Shelly sands are used unprocessed for agricultural soil improvement, for water treatment and animal feed.

Producing building materials, industrial sands and filtering materials requires processing of the raw material. Producing sands for beach nourishment and fill or drainage materials utilises raw products which are often graded. If we assess only the first phase, i.e., extraction, landing, drying, grading and loading for delivery, not including processing, the overall turnover in France is about 60 million euros (Ifremer estimation after consulting professionals).

### Key figures for marine aggregate extraction, 2007

Turnover (1)	75 M euros
Value added (2)	25 M euros
Employment (1)	100

(1) Estimate after consulting professionals

(2) Estimate, using value added rate for sector 14.2A (NAF 2003)

Sources: industry, SOES, Ifremer estimations

For siliceous and calcareous marine aggregates, the Unicem accounts for 12 extracting firms, for some 15 sand dredging vessels, 200 seamen and 100 onshore jobs (administration and sales reps). Out of this group, according to professionals, there are 7 companies commissioning 9 vessels for sand extraction which are French-flagged – delivery of a new vessel is slated for 2010. They employ about 50 seamen and onshore staff. The share of imports in production unloaded in French harbours is difficult to identify.

### 3. Regulations in France and Europe

Most of the countries with this business regulate operation/extraction using similar principles (United Kingdom, Netherlands, Belgium and France):

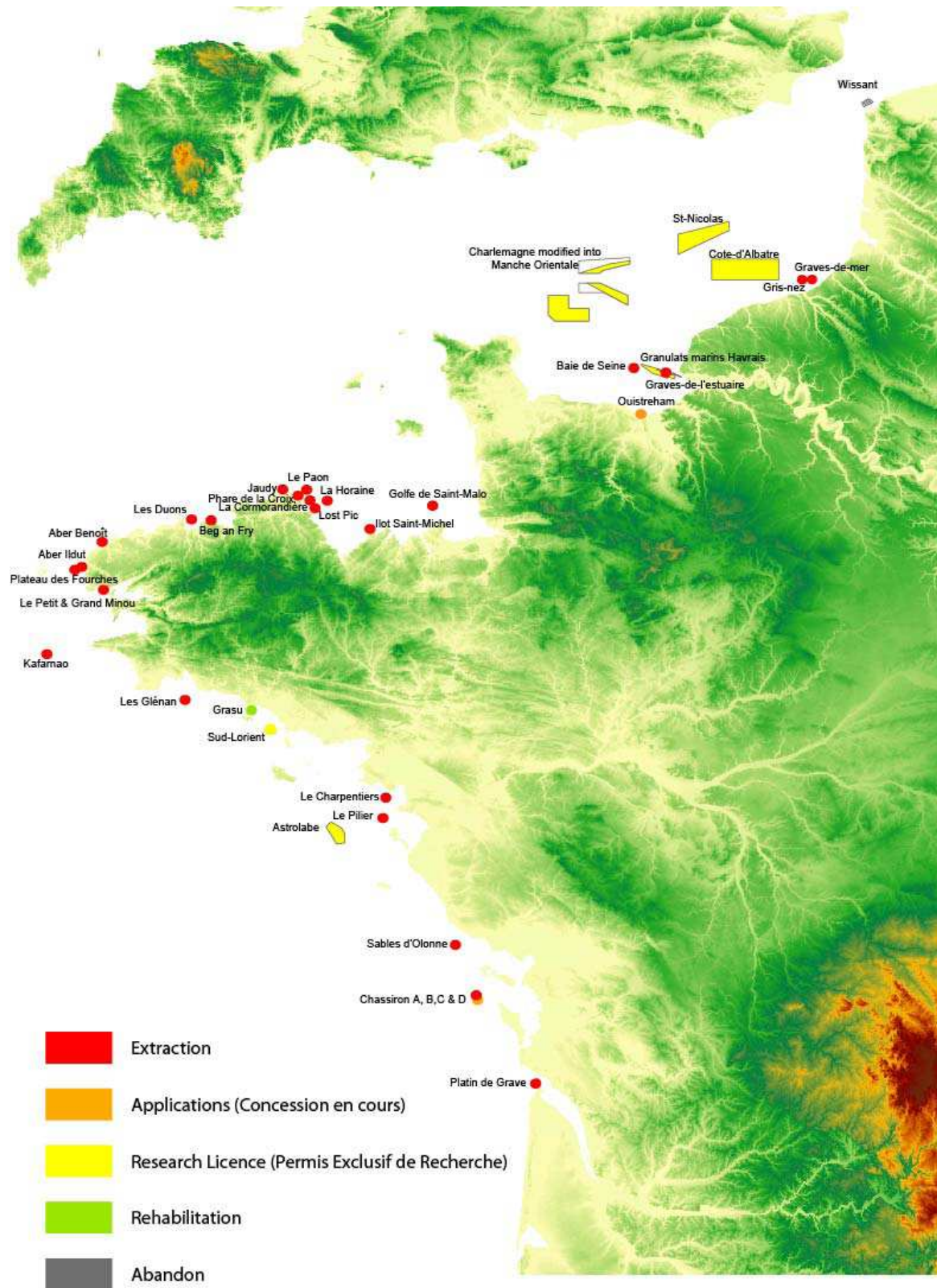
- dredging /extraction operations are subject to obtaining a mining deed from the owner of the subsoil or the holder of mining rights (the State or the Crown Estate);
- extraction work is done under licensing which is dependent on an impact assessment involving the advice of users and administrations concerned. This concerns a limited, specifically determined area.
- Conventions on marine environmental protection (Ospar and Barcelona) and European environmental legislation (« Habitat » and « Strategic Environmental Assessment » directives) are increasingly influencing the formulation of national regulations.

Practices vary from one country to another:

- in England and Wales, the Crown Estate (as the owner of most of the zones exploited) grants a licence for exploration and extraction based on statutory advice dependent on an environmental impact assessment with royalties paid per tonne. The « Marine and Coastal Access Bill » being drafted in 2009 aims to coordinate the marine licensing system and management of uses through a single organisation.
- In Belgium, exploration and extraction is done under paid licences in predefined zones. The licences are granted by the federal government and the royalties received are used to monitor the activity, its impacts and for resource assessments.
- In the Netherlands, authorisations to exploit aggregates are subject to environmental impact assessments and the amounts extracted are subject to multi-annual quotas. Since considerable amounts are needed to replenish beaches, special studies are carried out for this on the impacts on the ecosystem.
- In France, aggregate exploitation is governed by environmental and mining laws. It is subject to a mining deed being issued, a national permit and an authorisation by the Prefecture authority to begin work, requiring an impact assessment. The inquiry procedure provides for consultation involving Ifremer, users of the zone and operators. Exploitation of calcareous sand is subject to quotas.

### Aggregate extraction activities and projects in France

Map: document from Ifremer / Laure Simplet



## Energy

The electricity generation units located on the French coasts are conventional thermal power stations, nuclear power plants and wind turbines. The choice of an electrical production site depends on its possibilities for cooling or diluting effluents discharged by the plant. The natural, stable cold reservoir provided by the sea makes coastal access highly attractive for building nuclear or thermal power stations. This location also enables the cost of transporting fuel to be lowered. Finally, the sea provides power, as seen by the tidal power plant in an estuary and projects for wind farms and marine current turbines off our shores.

### 1. Coastal thermal and nuclear power plants

The large power plants on the coast supply a significant part of the installed power in metropolitan France, in particular, slightly over 30% of total power from nuclear production. This represents a relatively small number of jobs (6,475), as is generally the case in electrical power plants. Installed power will grow in the short and medium term, with the construction of a combined cycle unit and an EPR plant.

#### Electric power plants set up on the coast

Site	Generating units	Net power (MW)	Energy source	Operation start	Employment (7)
Dunkirk (harbour)	1 and 2	2 x 400	Combined cycle gas turbine	2005	35
Gravelines (1) (outer harbour of Dunkirk)	1 2 3	3 x 910	Nuclear power	1980	1,631
	4	910	Nuclear power	1981	
	5	910	Nuclear power	1984	
	6	910	Nuclear power	1985	
Penly (East Channel) (2)	1	1,330	Nuclear	1990	634
	2	1,330	Nuclear	1992	
Paluel (East Channel)	1 and 2	2 x 1330	Nuclear	1984	1,250
	3	1,330	Nuclear	1985	
	4	1,330	Nuclear	1986	
Le Havre (harbour) (3)	1	250	Coal	1968	340
	2	600	Coal	1969	
	4	600	Coal	1983	
Flamanville (4) (West Channel)	1	1,300	Nuclear	1985	671
	2	1,300	Nuclear	1986	
Rance estuary		240	Tidal power	1966	28
Cordemais (5) (Loire estuary)	1	490	Coal	1970	458
	2 and 3	2 x 685	Fuel oil	1976	
	4	580	Coal	1983	
	5	inactive	Coal	1984	
Le Blayais (Gironde)	1	900	Nuclear	1981	1351
	2	900	Nuclear	1982	
	3 and 4	2 x 900	Nuclear	1983	

Martigues (6)	1	250	Fuel oil	1971	141
	2	250	Fuel oil	1972	
	3	250	Fuel oil	1973	
TOTAL		25,320			6,539

(1) Footprint: 150 ha, two thirds of which were reclaimed from the sea.

(2) Project, officially confirmed in January 2009, to build a European pressurized reactor (EPR) from 2011 on; commissioning slated for 2017; 1,650 MW power.

(3) Fuel-powered Tranche 3 dismantled. Project to build two coal-fired plants of 860 MW and 800 MW to be operational in 2012-2013.

(4) EPR being built, commissioning in 2012.

(5) Inactive Tranche 5 of 580 MW.

(6) Footprint: 52 ha. 4th unit withdrawn from operation since 1985. Upgrading of plant underway: replacing existing units by two combined cycle gas turbines (930 MW in all); commissioning announced from 2011-2012.

(7) Except for services providers on sites.

Sources: EDF, ASN, CLI.

## 2. Marine renewable energies

By ratifying the Kyoto Protocol in 1997, the European Union committed to help reduce greenhouse gas emissions. The 2001/77/EC directive, for EU-15, stipulated that the share of electrical power production from renewable sources in gross national electricity consumption should reach 22% in 2010, and this percentage was confirmed at 21% after the EU's enlargement. The distribution of the effort by Member State implied that France would reach the ratio of 21% by that date. In France, the transposition led to the act 2005-781 of 13 July 2005 on energy policy guidelines and "multi-annual scheduling of investments" (PPI) for electricity generation (order of 7 March 2003) which set electrical generation from wind sources at an installed power of 2 000-6 000 MW in 2007.

Marine renewable energy sources – some of which supply non-electric power – are developing more slowly than onshore technologies, but Kyoto renewed interest in them and feasibility studies in various supply chains. The prospective forward study by Ifremer on the subject (Paillard, Lacroix, Lamblin, 2009) distinguished between the following categories:

- offshore wind turbines, using marine wind energy to generate electricity (excluding shipping and routing),
- stream turbines, wave power turbines and tidal power plants using marine currents, waves and tides respectively, to produce electricity from the kinetic energy in marine waters,
- ocean thermal energy, using temperature gradients between the surface and deep water, mainly to produce electricity and cooling power for air conditioning,
- using marine biomass from microalgae cultures to produce biofuels while trapping carbon gas, and
- using energy obtained from salinity gradients in areas where fresh and marine waters meet, using techniques which are currently being tested.

Wind energy is the supply chain which is operational and already well developed onshore. The second category above has given rise to installing stream and wave turbine prototypes, but it is tidal power plants, albeit in small numbers, which are now operational. The three other chains are still in the study phase. The following sections are limited to the supply chains which have at least prototypes in activity.



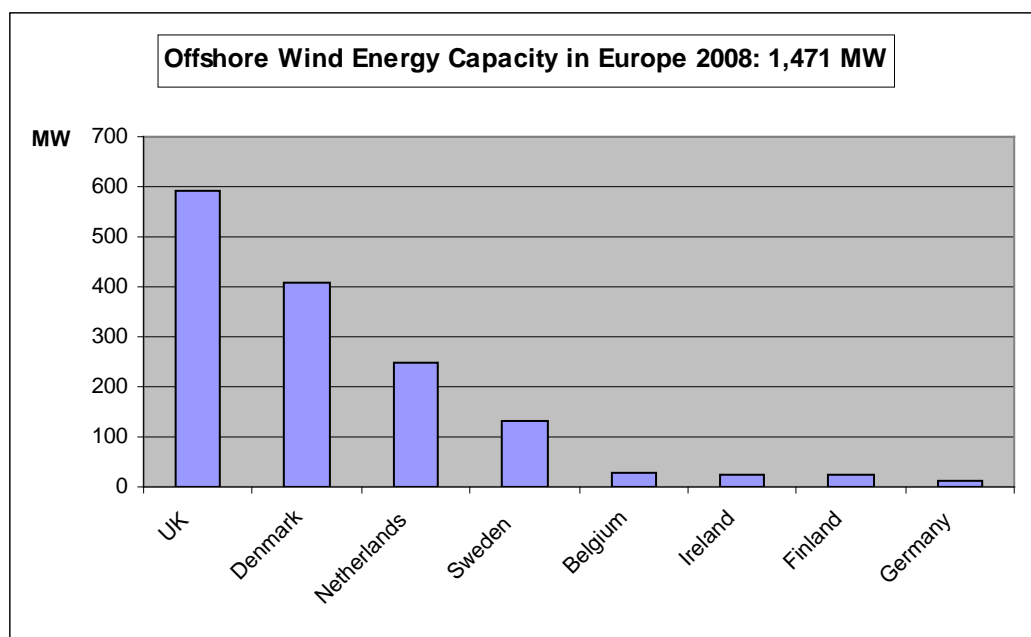
## 2.1. Offshore wind farms

Wind energy was mainly European until 2006, but in 2008, comparable amounts were invested in Europe, North America and Asia (China and India): 8,500 to 9,000 MW. Europe represented nearly 55% of installed capacity in late 2008, but the significant efforts by the United States and China should progressively modify this state of affairs. In Europe, Germany and Spain concentrated nearly two thirds of installed power, but 36% of new capacity in 2008. The activity is growing in other countries (Italy, France, the United Kingdom, as well as the Netherlands, Sweden, Portugal and Denmark). France, although ranking second in wind energy potential in Europe, behind the UK, did not invest much. Recently, its efforts have been increased, with an installed capacity of 3,300 MW in 2008 (source: Ademe) and a total of 4,000 MW are planned, in projects mainly located in Champagne-Ardennes (over 700 MW) and Picardie (500 MW) (source: Global Wind Report). The Grenelle environmental summit set the target of installed 25 GW from wind energy in 2020, 6 GW of it offshore.

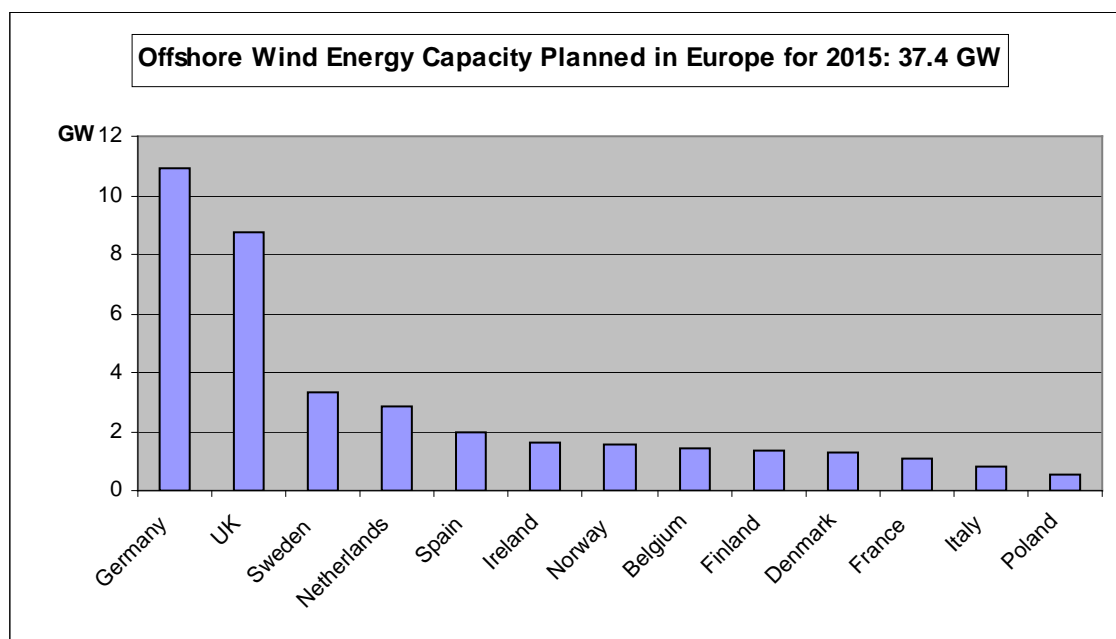
Europe is a pioneer, worldwide, for wind energy at sea. Offshore projects increasingly contribute to new capacities. Until now, this type of production was an exclusively Northern European phenomenon (United Kingdom, Denmark, Netherlands and Sweden) and it plays a major role in projects for the medium-term. However, other stakeholders are appearing (Spain, Ireland, Finland, France, Italy and Poland). In France, the first offshore wind farm (on the "alabaster coast") was to be commissioned in 2009-2010. There are also offshore projects outside of Europe, notably in China with 7 GW.

The wind power potential, the geographical distribution of consumption and the technical conditions of access to the electrical grid are determining factors for the supply chain's development. However, regulations also play a key role in incentives to invest - like that of feed-in tariffs - which exist in varying degrees in most developed countries and in France in particular. Furthermore, this concerns a zone with numerous uses and where the policy for occupation of space and the seabed requires clarification, as was indicated in a report by the Secretariat General for the Sea in 2002.

Offshore wind energy has a higher cost than that from onshore farms. The location and depth of the structures, the use of heavy equipment to install and maintain them, the infrastructures for connection and maintenance, as well as procedures for authorisation and impact studies all explain the unit surcharge. However, this decreases with the size of the wind farm. The baseline costs used by the Ademe depend on hypotheses for the discounting rate and on the ratio of operation-maintenance-repair costs to the initial investment costs; these decrease with time and productivity gains. This gives an offshore wind baseline cost which was 37% higher than that of onshore wind in 2007, and 100% in 2030, the horizon at which wind power's profitability compared to fossil energy should be very different from what it is today.



Source: EWEA



Source: EWEA

## 2.2. Tidal power plants

The tidal power plant on the Rance estuary, with 240 MW installed and 540 GWh/year produced, was the only large plant in the world for a long time, since the other units (Nova Scotia, China and Russia) did not exceed 20 MW. However, South Korea has undertaken a large-scale marine energy programme following the Kyoto protocol, and inaugurated the Sihwa power plant (254 GW and estimated production of 550 GWh/year) in 2009, for an estimated cost of 355 million dollars. The system combines a dam with a plant, like in the Rance, but uses different generating techniques. Other projects are being studied in Korea, the

United Kingdom (Severn project), Canada, India and Russia. A competing technique like that of the tidal lagoon aims to avoid the considerable environmental impacts of dams on estuaries.

### **2.3. Stream and wave power turbines**

In Europe, the energy generated using marine currents is an exploitable resource, 75% of which is located near British coasts, 20% near French coasts (Brittany and Cotentin peninsula) and the rest in Italy, Greece and Norway. Several demonstration prototypes have been set up in Europe and elsewhere (particularly in the United States, Canada and Korea) and several European, American and Canadian technologies are in competition. In Europe, the British firms are most active; other players are Italian, Irish, Norwegian and to a lesser extent, French.

In France, a « Sabella » demonstration unit (10 kW) was submerged in the Odet estuary – but not connected to the grid – for a series of trials lasting several months. In addition, EDF announced the commissioning for 2011-2012 of a demonstrator made up of four 500 kW turbines off Paimpol-Bréhat using an Irish technique.

Demonstration prototypes of wave turbines have also been built in Europe (notably in the UK) and in the world. As regards France, a project is being developed near the coasts of Reunion Island using Australian technology, as in neighbouring Mauritius. The Bay of Biscay has been inventoried as one of the places on the globe with an abundant physical resource.



## Shipbuilding and repair

The sector covers shipbuilding and repair of civilian and military vessels, naval outfitting and boat building. 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 and their cooperative or competitive relations.

### 1. Merchant shipbuilding

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

#### Key figures for civilian shipbuilding (1)

	2001	2002	2003	2004	2005	2006	2007
Turnover (million euros)	1485	1856	1163	828	617	1324	1065
Value added (million euros) (2)	298	263	254	87	77	110	211
Employment (3)	6260	6143	5333	4403	3708	4434	3538
Number of companies (4)	32	33	33	32	32	36	27
Level of exports (%)	83%	84%	77%	27%	61%	59%	87%

(1) Data for the branch 35.1B (NAF 2003). Enterprises with 20 or more employees.

(2) Rate of VA for sector 35.1B

(3) Mean annual manpower.

(4) Number of company fractions.

Source: SESSI/Annual business inquiries

#### Civilian shipbuilding: regional data 2007 (1)

Region (2)	Number of companies (3)	Salaried labour force (4)
Brittany	6	318
Nord-Pas-de-Calais	2	108
Lower Normandy	2	38
Upper Normandy	1	34
Pays de la Loire	13	3083
Total for metropolitan France	29	3650

(1) Enterprises with 20 or more employees.

(2) Main regions with respect to salaried manpower

(3) Establishments of all sizes with the same main activity

(4) Use of sector-based data explains the differences with the key figures

Source: SESSI/Annual business inquiry (data for sector 35.1B)

### 1.1. Activity trends up to 2007

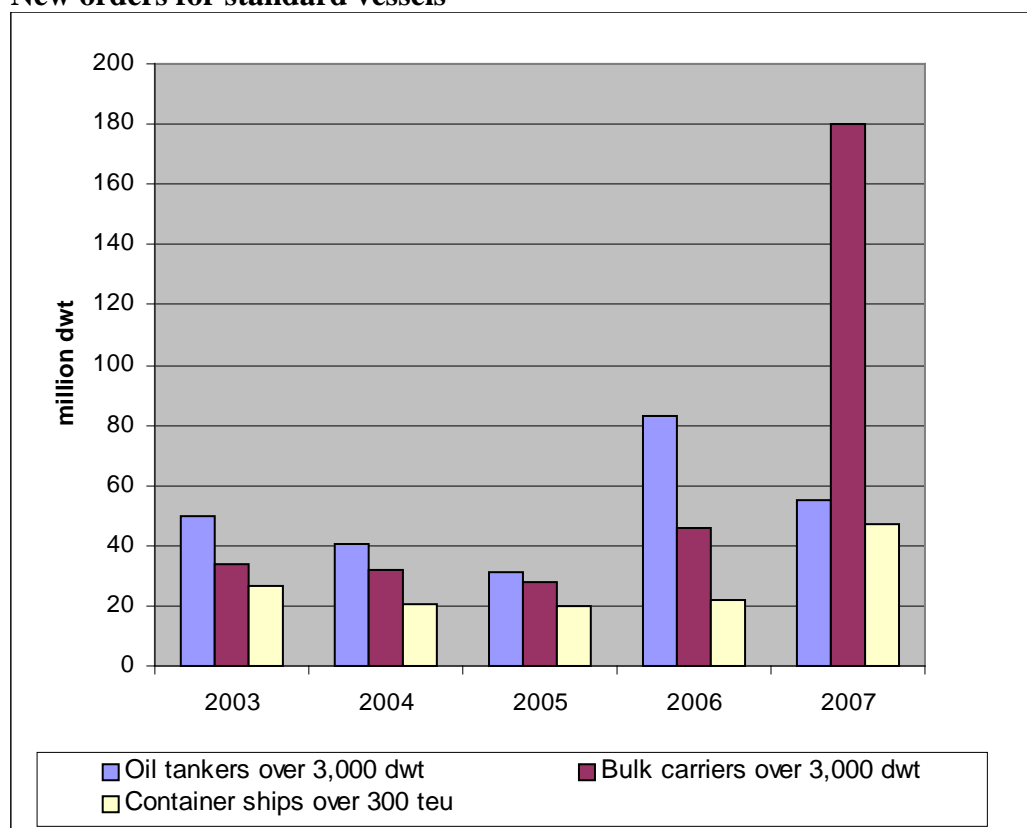
#### 1.1.1. International context

From 2003 to mid-2008, the activity showed a period of strong growth in a context of global economic growth (particularly in Asia) and intense international exchanges which stimulated maritime shipping. The very high levels of freight carriage were incentives to order new

ships, particularly standard vessels. World orders in 2007 were nearly four times that of 2000 in tonnage and nearly the double of that in 2004. These developments occurred against the backdrop of a dual trend: a) rising costs of raw materials accentuated the rise in shipbuilding costs in dollars and b) the depreciation of the dollar against the main currencies did not compensate for raw material prices and moderately eroded the competitiveness of European shipyards, still buoyed by world demand before the end of the cycle.

Orders for large standard ships in 2007 exceeded those of 2006, which were already very numerous. Those for specialised vessels recorded different trends, depending on the markets: the dynamic automobile and cruise markets stimulated orders for car carriers and for cruise liners. The tensions between supply and demand explain in great part the climb in the price of new and second-hand vessels.

### New orders for standard vessels



Source: BRS

### 1.1.2. World supply

Asian shipyards confirmed their market domination for standard ships and in 2007 they obtained over 90% of orders for bulk carriers and oil tankers (in tonnage) and 80% of those for container ships. Korea, as top world shipbuilder, dominates the standard ship markets, especially that of container ships. China, where considerable investments have been made by shipyards, has recorded impressive growth and taken second place worldwide for orders in tonnage and first place on the bulk carrier segment. However, Japanese production has progressed and remained second worldwide in production volume, in spite of the drop in its

market shares for standard vessels. Vietnam has become more competitive on the bulk carrier, oil tanker and cargo ship markets.

The global offer is increasingly competitive, thanks to the growth over the past few years, particularly in emerging countries which are aiming to reduce their foreign dependence in the manufacturing sector. Amongst them are Brazil and Russia who are seeking to develop a national supply of oil tankers and other ships.

### 1.1.3. European shipyards

European shipyards and the subcontracting firms they outsource to have maintained the production of specialised ships with high value added, like cruise liners and high-speed passenger vessels (Europeans dominate passenger shipbuilding), some types of specialised container ships and large yachts.

Eurostat assessed the turnover of shipbuilding and repair at 30 billion euros in 2006 for EU-27; the CESA assessed job levels in European shipyards for its members at approximately 149,000 in 2007 (145,000 in 2008).



\*For Europe, orders to CESA member shipyards (about 85% of European production), end of calendar year.

Source: Lloyd's Register – Fairplay, CESA

Germany is the leading shipbuilder in Europe, with an order book totalling about one quarter of orders in tonnage for European shipyards. For 70% of the tonnage, in 2007, it produced specialised container ships, the rest being mostly cruise liners and large ferries. German companies play a predominant role in the large yacht market. Elsewhere in the EU, Italian

(cruise liners and offshore service vessels) and Romanian (bulk carriers, container ships) yards, showed their drive during the growth period. Polish shipyards were wrestling with restructuring problems and had a sharp drop in orders in 2007.

Outside of the EU, Croatian (ro-ro ships) and Turkish (small container ships, oil tankers and bulk carriers) shipyards recorded high growth recently.

French shipyards supply cruise liners, large ferries, fishing vessels, dredgers and other service vessels (offshore, corvettes, etc.). Ships are mainly produced in the Pays de la Loire region. As regards markets, the divide is less and less clear between merchant and military vessels, as shipyards adopted increasingly diversified strategies. Likewise, the boundary between shipbuilding and boat building is blurred, with shipyards in both categories tacking the market for large yachts.

## 1.2. Effects of the economic crisis

The effects of the crisis were felt from mid-2008 by the activity through two channels: by demand, since shipowners reduced their investments with respect to the drop in their markets and perspectives of lower profitability, and by a lack of credit and banks failing to finance their projects. After a still dynamic first semester 2008, the fall in orders hit container ships and specialised vessels, including cruise liners. It also affected the equipment and engine makers. Some Asian, especially Chinese and South Korean, shipyards which were financially fragile had to stop their activities. In several countries in Asia and Europe, banks linked to the State granted companies loans and payment guarantees.

European shipyards also have the rise in the euro, which affects their competitiveness. Many companies have made workforce cutbacks, especially in Croatian, Polish and Turkish yards. The short to medium term outlook is uncertain, although orders for large cruise ships seem to be starting up again in late 2009 and that the service vessel market has not been affected much by the economic context.

## 2. Naval shipbuilding

### Key figures for naval shipbuilding (1)

	2001	2002	2003	2004	2005	2006	2007
Turnover (2) (million euros)	1227	2248	1754	2311	2324	2214	2126
Value added (3) (million euros)	720	841	688	907	912	869	834
Employment (4)	15272	14831	13004	13119	12159	11945	11995
Level of exports	84%	67%	24%	na	19%	13%	17%
Number of companies	10	9	8	na	na	na	na

(1) Ifremer estimations based on data from branches 35.1A, B, C, E and E11 (NAF codes 2003). Enterprises with 20 or more employees.

(2) Amount of DCN turnover and tax-excl. sales of the branch, not including DCN in 2001-2002. Sales excl. tax of the branch from 2003.

(3) VA rates used for the estimation: sector 35.1A not including DCN and DCN enterprise for 2001-2002; VA rate for sector 35.1A in 2006 (39%) extrapolated to the 2003-2007 period.

(4) Mean workforce employed in the branch 35.1A not including DCN and in DCN enterprise in 2001-2002; in branch 35.1A from 2003 on.

na: not available.

Sources: SESSI/Annual business inquiries, company accounts, Ifremer estimations.



## 2.1. Situation of the activity

In France, and even more so in other European countries, enterprises work on both civilian and military shipbuilding markets. In Europe, as in the United States, they also work on the naval electronics and IT equipment. The differences between the civilian and naval markets are more due to the characteristics and purposes of the equipment and facilities, as well as the obvious weight of national interests in shipbuilding for Defence, which makes these markets special.

## 2.2. Trends and investments

In France, the Defence White Paper in 2008, recommended that the Armed Forces tighten their formats and specifically for the Naval component recommended modernisation which would promote underwater equipment. This scheme has already entailed some disarmament without replacements, to the benefit of maintenance operations: this may impact the way the largest firms in the sector will adapt their offer.

In Europe, a slow reduction of Defence budgets expressed in GDP points is being observed in several countries, including France. Military investments are dropping, particularly in the current context of recession, as in the United States. Emerging countries (China, India, Brazil) display ambitious investment programmes, but the national offers are at various stages of competitiveness with respect to the big exporters (United States, Russia, United Kingdom and France); in Europe, Italy and Spain are maintaining large new build programmes.

## 3. Marine equipment industry

The marine equipment industry gathers a highly diverse range of activities, suppliers of shipbuilding and repair yards and shipowners; which can be put into two categories:

- manufacturing technical equipment, particularly propulsion machinery, electrical and electronic equipment, shipboard handling, navigation and bridge equipment, pumps, ventilation and air conditioning,
- supplying shipbuilding yards with assembled and tested equipment as modules, either prefab or in their technical setting, and complete systems or functions like installing ventilation and air conditioning or fitting out public areas and cabin areas in passenger ships.

### Key figures for marine equipment, 2007-2008

Turnover (million euros)	2300
Value added* (million euros)	600
Employment	22000

\*Rate of VA for the sector in capital goods for 2007

Sources: Gican (2008 data for Gican members), Sessi.

A recent survey of marine equipment firms belonging to the Gican about the activity in 2008 indicated a turnover of 2,300 million euros, which seems to correspond to a period of high activity.

On the European scale, the EMEC (European Marine Equipment Council) estimated that there were 287,000 direct jobs that same year, with a turnover of 26 billion euros and an export rate of 46%. Therefore, this sector of activity is similar to shipbuilding in terms of turnover.

According to the profession, there was a clear downturn in 2009. Requirements for better energy performance of vessels and diversification of fuel sources, ceilings for SOx and NOx emissions imposed by the IMO, as well as the increasing sophistication of cruise vessel equipment and fittings, can open up perspectives for the innovative firms in the sector.

#### 4. Ship repair

The ship repair activity includes:

- maintenance and repair of civilian vessels (not including pleasure boats);
- conversion of ship structures;
- breaking or scrapping of declassified ships.

Maintenance and repair is mainly a service operation, incorporating supply of (replacement) equipment, whilst conversion is closer to shipbuilding, and thus mostly a manufacturing operation. Ship breaking is a service for shipowners and a supply of materials for downstream users like the steel industry. Repair services are different from construction-conversion due to the short intervention times.

The previous nomenclature (NAF 2003), used in this report, limits the scope of the activity to repair-maintenance of merchant vessels, whereas the new nomenclature (NAF 2008) includes naval vessels and pleasure boats.

##### Key figures for ship repair (1)

	2001	2002	2003	2004 (2)	2005	2006	2007
Turnover (3) (M euros)	186	245	251	228	213	226	302
Value added (4) (M euros)	67	95	88	87	76	74	99
Employment (5)	1822	2599	2356	2194	1667	1471	1533
Level of exports (%)	36%	34%	34%	na	35%	43%	49%
Number of companies (6)	45	52	49	48	44	43	36

(1) Data for branch 35.1C (NAF code 2003)

(2) Uncertain data. Large number of no-replies to the 2004 Annual Business Inquiry

(3) Sales excl. tax

(4) Rates of VA by sector 35.1C used: SESSI/EAE for 2001-2004; INSEE/SUSE for 2005-2007

(5) Mean annual manpower

(6) Number of company fractions with 20 or more employees

Sources: SESSI/Annual business inquiries (data from branches, companies with 20 or more employees); INSEE/SUSE (enterprises with turnover of 0.1 M euros and more)

In France, there are about 30 to 50 firms with more than 20 staff, however there are some 500 companies with a turnover of more than 0.1 million euros as a main or secondary activity (source : INSEE).

**Ship repair: regional data 2005 (1)**

Regions (2)	Number of companies (3)	Salaried staff
Aquitaine	4	141
Brittany	10	659
Nord-Pas-de-Calais	4	298
Upper Normandy	5	120
Provence-Alps-Côte-d'Azur	14	397
Metropolitan France	48	1809

(1) Enterprises with 20 or more employees.

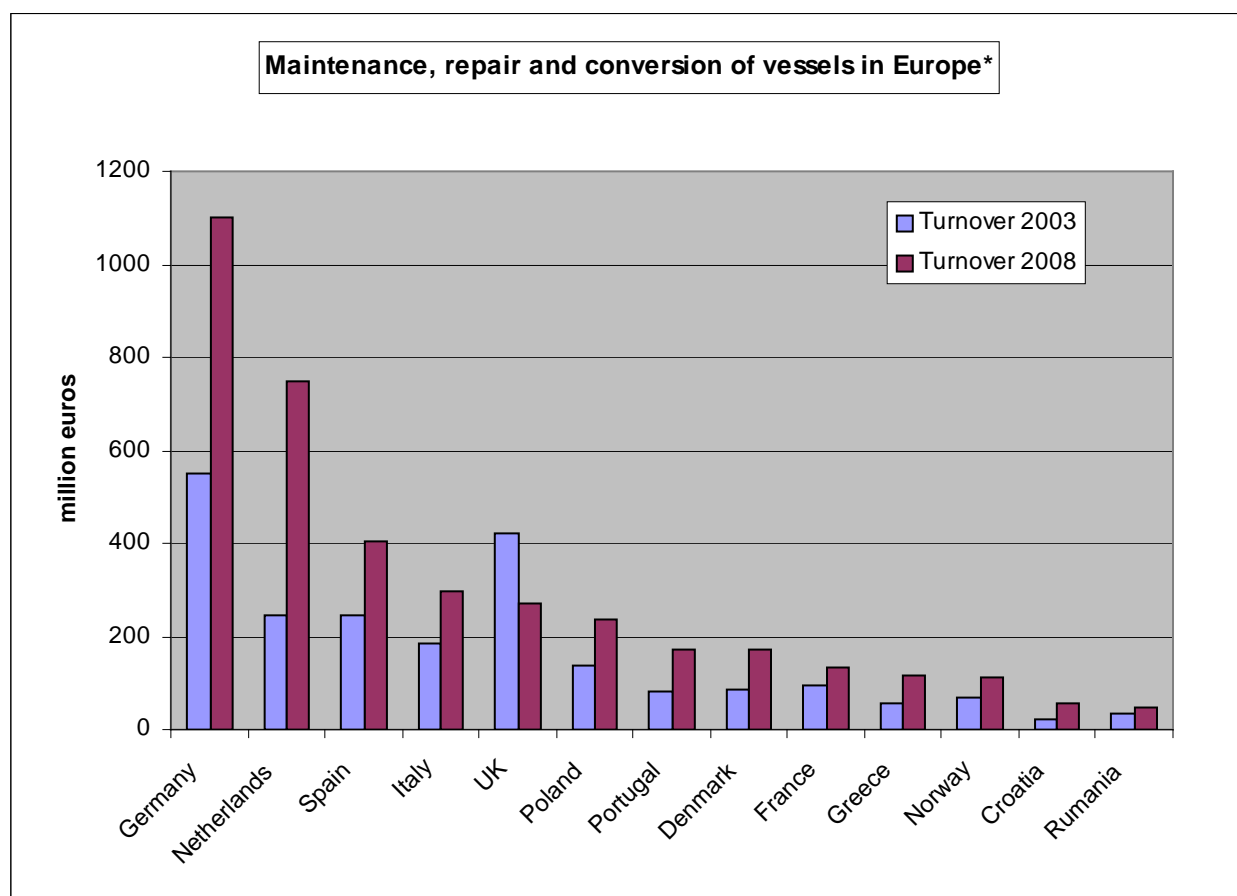
(2) Main regions with respect to salaried manpower

(3) Establishments of all sizes with the same main activity

Source: Sessi (data for sector 35.1C)

**4.1. Situation and trends in activity**

In Europe, results for the activity rose until 2008, with some tensions appearing on the employment market. According to data from CESA-member yards, the most important countries in ship repair are Germany and the Netherlands, followed by, at a lower turnover level, Spain, the United Kingdom, Italy and Poland. In France, ship repair is small in scope; it is specialised in military vessels (Toulon), methane carriers (Brest) and offshore vessels (Dunkirk).



\*CESA shipyards only

Source: CESA

At the end of 2008, the crisis first impacted ship conversions, an operation for which the shortage of funding quickly appeared. The sharp drop in freight prices then affected ship repair, with shipowners trying to defer the costs of this type of operation. In spite of declassifications starting up again and the growing number of unused ships during this recession period, the world fleet rose significantly in number in the recent economic context and will continue to grow in the short term. This means a significant potential customer base for ship repair yards. Dwindling markets however have led repair firms to diversify their market niches towards exports, engineering, industrial services, cruise liners and pleasure boats.

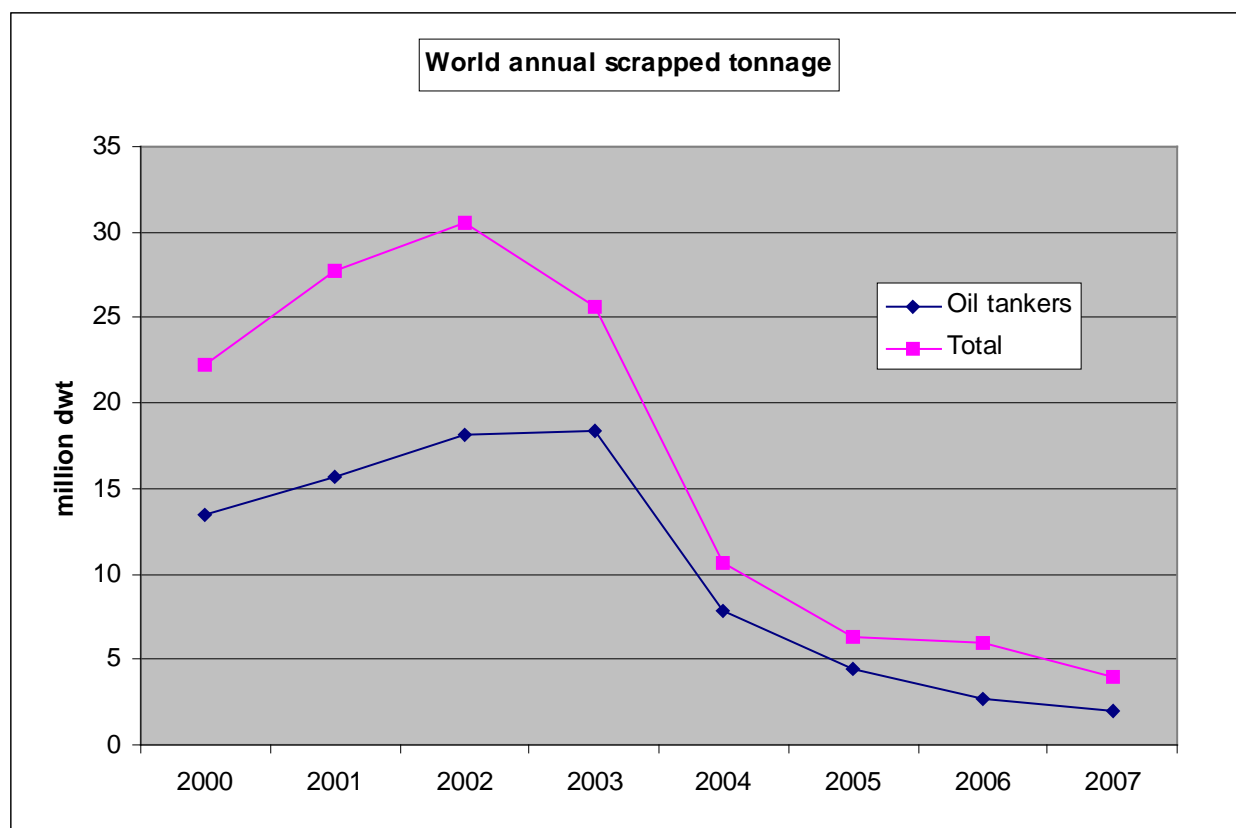
#### **4.2. The ship-breaking issue**

Demolition of merchant vessels is a marginal activity in Europe, even though the latter is the principle shipowner worldwide. The largest ship-breaking yards working in Europe are in Belgium, Italy and the Netherlands, with others in the United Kingdom, Denmark, Greece Lithuania, Poland, Spain and Bulgaria. Most of the EU countries also have demolition site for the scrapping of fishing vessels and yachts. Taken together, this represents a small capacity of some 500,000 dwt, which should be doubled following the granting of the necessary permits for the Hartlepool site (600,000 dwt) in Britain. EU sites do not have sufficient capacity to deal with large merchant vessels. And this difficulty, which is general in OECD countries, is not mitigated by the presence of yards in Turkey (1 million dwt). As for the United States, they have sites which do not take foreign vessels. The large capacities are outside of the OECD: Bangladesh, China, India and Pakistan perform nearly 90% of dismantling.

The ship demolition market runs in cycles, with ships being declassified according to their age and the cargo market, but also to the local price of the scrap metal recovered. In South Asia, this price has been tenfold that in Europe over the past few years. From 2005 to 2007, freight costs peaked, the ship-breaking rate hit historic lows and the average age of declassified ships exceeded 30 years. The overcapacities which appeared with the recession have changed the state of affairs and will affect the demolition rate.

Scrapping work done on beaches, without protection systems, of vessels containing hazardous waste substances (asbestos, paint, metal, oil residues, PVC, etc.) raise ecological and health problems which are becoming more important as the world fleet grows. Applying the environmental standards in effect in Europe and on several Chinese sites, makes scrapping yards less competitive: the additional costs of protection lead to a lower purchase price for wrecks.

The EU is the first political entity to have applied, through Regulation 1013/2006, the principles of the Basel Convention (1989), the OECD Council decision (2001) and their amendments on prohibiting shipments of hazardous waste. The first international text specifically dealing with ship dismantling is the Hong-Kong Convention, prepared by the IMO (May 2009). The text requires that the vessel be controlled and inspected throughout its life cycle (design, operational, maintenance and recycling) and control of recycling facilities. The ratification process is underway.



Source: Cnuccd / RMT 2008, Fearnley Review, Lloyd's Register-Fairplay

## 5. Boat building

### 5.1. Definition

Boat building includes the construction of sail boats, motor boats, inflatable craft with flexible or semi-rigid hulls and other pleasure or sport craft like small boats, canoes, kayaks and skiffs (not including equipment for water sports and windsurf boards). The sector includes their repair, fitting-out and maintenance.

#### Key figures for boat building (1)

	2001	2002	2003	2004	2005	2006	2007
Turnover (2) (million euros)	978	1060	1086	1185	1271	1384	1573
Value added (3) (million euros)	314	365	350	376	410	461	528
Employment (4)	7151	7598	7705	8065	8573	8853	9251
Number of companies (5)	65	69	73	75	76	76	78
Level of exports (%)	57%	56%	57%	59%	60%	61%	58%

(1) Data for branch 35.1E (NAF code 2003) Enterprises with 20 or more employees.

(2) Sales excl. tax

(3) Rate of VA for sector 35.1E

(4) Mean annual manpower.

(5) Number of company fractions.

Source: SESSI/Annual business inquiries

**Boat building: regional data 2007 (1)**

<b>Regions (2)</b>	<b>Number of companies (3)</b>	<b>Salaried labour force (4)</b>
Aquitaine	5	745
Brittany	11	614
Pays de la Loire	31	4809
Poitou-Charentes	23	1901
Provence-Alps-Côte d'Azur	24	609
Metropolitan France	111	9531

(1) Enterprises with 20 or more employees.

(2) Main regions with respect to salaried manpower

(3) Establishments of all sizes with the same main activity

(4) Use of sector-based data explains the differences with the key figures

Source: SESSI/Annual business inquiry (data for sector 35.1E)

**5.2. Companies**

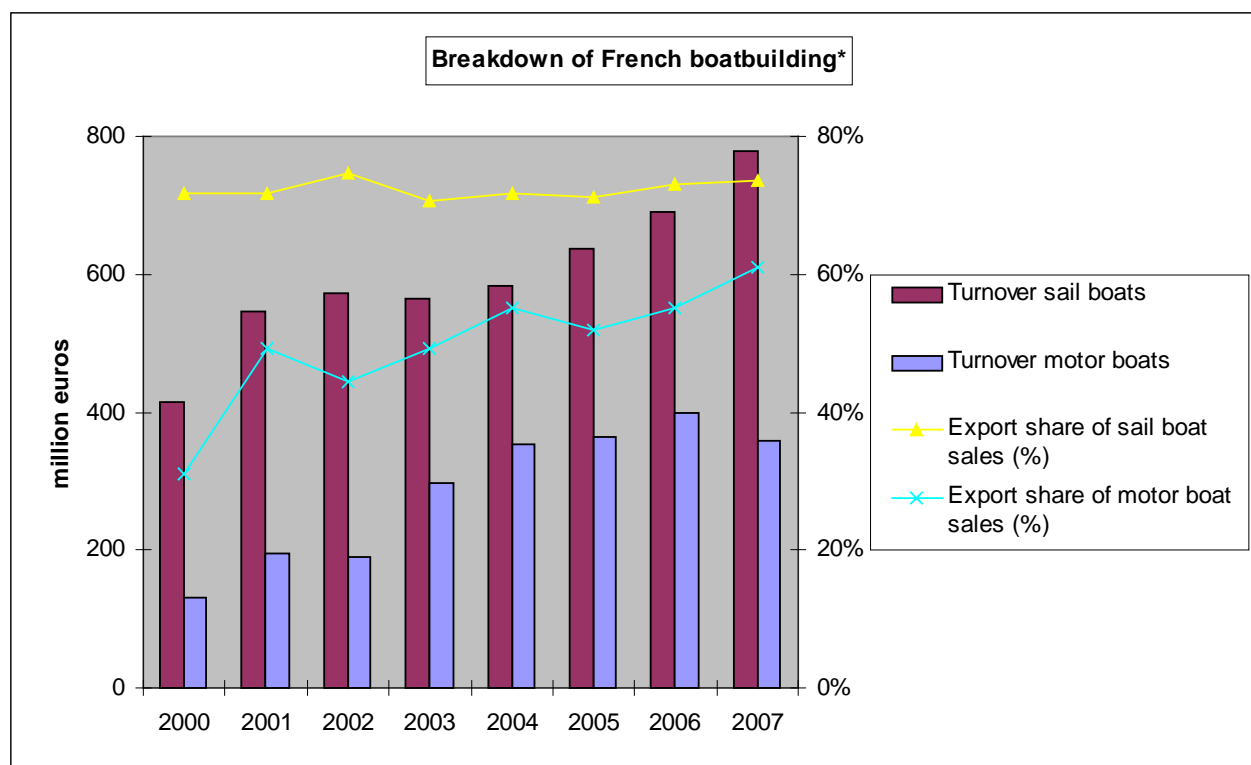
Many very small enterprises are involved in this activity in France. In late 2005, there were 1,680 firms in the sector with turnover equal to or greater than one hundred thousand euros, of which 694 were individual entrepreneurs and 1,444 of these companies had 5 employees or less. However, the sector is highly concentrated, with the top three companies providing over 55% of the jobs (source: INSEE, SESSI).

**5.3. Situation and trends in activity**

The key figures indicate remarkable growth for this activity until 2007, driven by the impressive success of yachting in industrialised countries. The two main production categories are motor boats (the largest) and sail boats. In fact, boat building, including repair and servicing has enabled several European shipyards to diversify or even convert their activity to a buoyant market niche.

Boat building is a de-localised activity since some boatyards and many of their suppliers work in non-coastal regions. However, on many coastal sites, building and yachting practices there stimulate a supply chain, with marinas, subcontractors, servicing, shipchandling, fuel, brokering, boat sales and haulage.

The United States are number one in the sector worldwide and dominate motor boat production. Their main competitors are European boatyards: the Italians, Germans, Dutch, British and French compete intensely, especially on the yacht market and are investing in Turkish and Polish boatyards. French boatyards are world leaders in the sail boat market and are also making inroads in the motor boat market, leading them to export a growing share of their production.



\*Not including production of river boats, prams, inflatable dinghies, canoes, kayaks and various pleasure boating equipment

Source: FIN/Annual business inquiries

Because it is sensitive to households purchasing power and expected income, the activity was hard hit by the recession since the second quarter of 2008. This particularly concerned the motor boat, large yacht and equipment markets. The more specialised sail boat market has been less affected. Repair and maintenance has been relatively spared as well, since some maintenance operations are inevitable, even when a boat is not used. But many firms in Europe and the United States find themselves in difficulty. The soundest of them are implementing strategies of diversification and innovation.





## Marine and river civil engineering

### 1. Definition

The activity covers construction and engineering work performed at sea, in rivers or bodies of water inland. This involves building with natural or artificial riprap and developing or regulating navigable or non-navigable waterways.

#### Key figures for maritime and river civil engineering

	2001	2002	2003	2004	2005	2006	2007
Turnover (million euros)	463	na	1260	1045	954	1291	1296
Value added (million euros)	100	na	274	252	291	342	381
Employment (1)	2454	3225	4175	3676	3499	4400	4720
Number of companies (2)	224	229	235	243	232	na	na
Level of exports (%)	23.4%	na	43.8%	55.7%	60.2%	61.6%	61.2%

(1) Salaried personnel as of 31/12.

(2) Companies active on 31/12.

na: not available.

Source: SUSE, SIRENE (INSEE), sector 45.2R (NAF 2003), companies with turnover of 0.1 M euros or more.

The following types are classified as maritime and river engineering works:

- building harbours, seawalls, navigable canals, water inlets, locks and other structures to regulate water courses;
- carrying out work in water (erecting cofferdams, constructing bridge piles), dredging, or underwater (by divers or other means);
- clearing ditches, stream bank developments and reed and weed cutting.

These works require special techniques and materials. Work at sea involves construction, maintenance and repair.

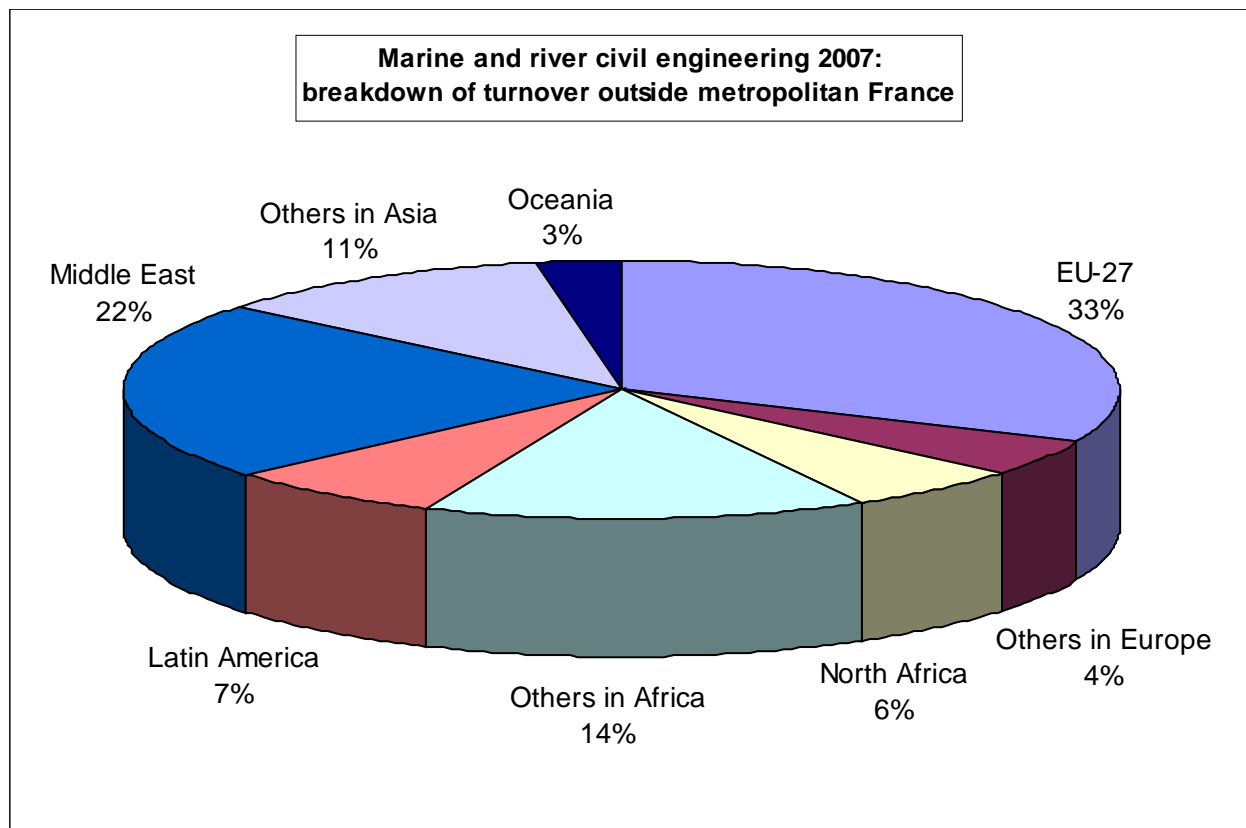
### 2. Situation and trends in activity

Maritime and river civil engineering makes up only a very small part of the public works sector, with less than 1% of firms in 2006, less than 2% of salaried employees and under 3% of the turnover in the sector. This means that the sample used in surveys is small, making their results less reliable.

In metropolitan France in 2007, maritime and river works were mainly concentrated in the Île-de-France area around Paris (over 48% of total turnover for the sector) and in Brittany (over 22%).

The civil engineering firms working in the sector export over half of their total turnover. For several years now, they seem to have exported much more than the average civil engineering companies. One third of their export markets were located in EU-27 in 2007, and 80% in the Europe-Africa-Near East zone. It should be noted that in this breakdown, America is under-represented and Asia over-represented with regard to civil engineering exports overall.

However, the relative share of various countries in exports varies greatly from one year to another.



Source: FNTF

Independent of the current recession which has slowed down work in Europe, Asia and the Near East in particular, projects to modernise harbours are an important stake for French maritime civil engineering firms and give them medium- to long-term perspectives. In France, the harbours of Marseille (Fos terminals 2XL, 3XL and 4XL) and Calais (Calais 2015), amongst others, are launching large projects. Equally large investments are being made abroad, particularly in the Near East and Asia, where French companies are also present.

## Submarine cables

### 1. Definition and key figures

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. Commercial services associated with the setting up of projects are included here.

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

	2001	2002	2003	2004	2005	2006	2007
Turnover (million euros) (1)	2301	647	288	316	613	519	758
Value added (million euros) (2)	395	84	-	-	110	67	150
Employment (3)	4678	2414	1403	1396	1641	1300	1419

(1) Sources: submarine cable manufacturing, laying and maintenance firms

(2) Value added of some companies; VA rate of sectors 31.3Z and 45.2F (NAF code 2003)

(3) Revised data. Employment in some companies; estimations based on data for sector 31.3Z

-: negligible

Sources: Sessi, Sycabel, INSEE, companies.

### 2. The activity's situation

In 2007 in France, 71 firms with more than 20 employees were involved, for all or part of their activities, in the manufacture of submarines or terrestrial cables. They were mainly located in the Rhone-Alps and Ile-de-France regions which together account for more than a quarter of the labour force. Taking this as a whole, very few enterprises were involved in the field of submarine cables, according to Sycabel.

Submarine cable markets are international. The two activities of electric power cables and telecommunication cables require different manufacturing techniques and growth logics, although they have both shown a highly cyclical nature over the past ten years.

- As regards cable manufacturing in general, the recession's effects were felt and production which had been stable from 2003 to 2007, dropped by 7% in volume in 2008.
- For transcontinental telecommunications, currently the main activity is maintenance of submarine cables. Laying tends to concern replacement of cables: some firms have announced new projects for installation, but they are often small scale operations. According to the ICPC (International Cable Protection Committee), no major investment in new lines comparable to those in the 1990s is scheduled today. Requirements for ADSL broadband cabling should provide a buoyant market for the short- and medium-term for submarine telecommunications cables.
- For electrical power cables, activity is buoyed by the need for cross-border exchanges between regions producing in excess and those in deficit, equipping islands with tourist infrastructures, as well as offshore wind farm projects which will need to be connected to the onshore grid.

- The service activity of cable laying and upkeep is performed by a small number of operators worldwide (ICPC has counted less than twenty). Some of them are vertically integrated with cable manufacturing firms; others are part of telecommunications companies and still others have set up as independent enterprises. They may be specialised in laying and maintenance, or diversified over a large number of offshore services (oil installations, navy vessels, offshore energy installations, etc.).
- There were 11 cable-laying ships belonging to French firms as of 1 July 2009, 9 of them flying the French flag and 2 foreign flagged vessels.

## 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. Distribution, use and transport of hydrocarbons are not concerned. Work or facilities concerning transport such as laying pipelines or building methane carriers are taken into account.

#### Key figures for the offshore oil and gas-related industry (1)

	2001	2002	2003	2004	2005	2006	2007	2008
Turnover (million euros)	5200	5800	5500	5700	6100	7300	8000	9100
Value added (million euros)	1690	1760	2080	2025	2110	1960	2300	na
Value added rate (1)	32%	30%	38%	36%	35%	27%	29%	na
Employment (thousand)	24.0	25.2	25.5	25.5	26.2	26.5	27.8	28.0

(1) Ifremer estimations, after breakdown of turnover (GEP-IFP) and VA rate (INSEE, SESSI) for sectors EE (NES 16 code), 45.2R, 11.2Z, and 74.2C (NAF 2003 codes)

na: not available.

Source: GEP-IFP / Annual survey of oil-related sector, INSEE, SESSI

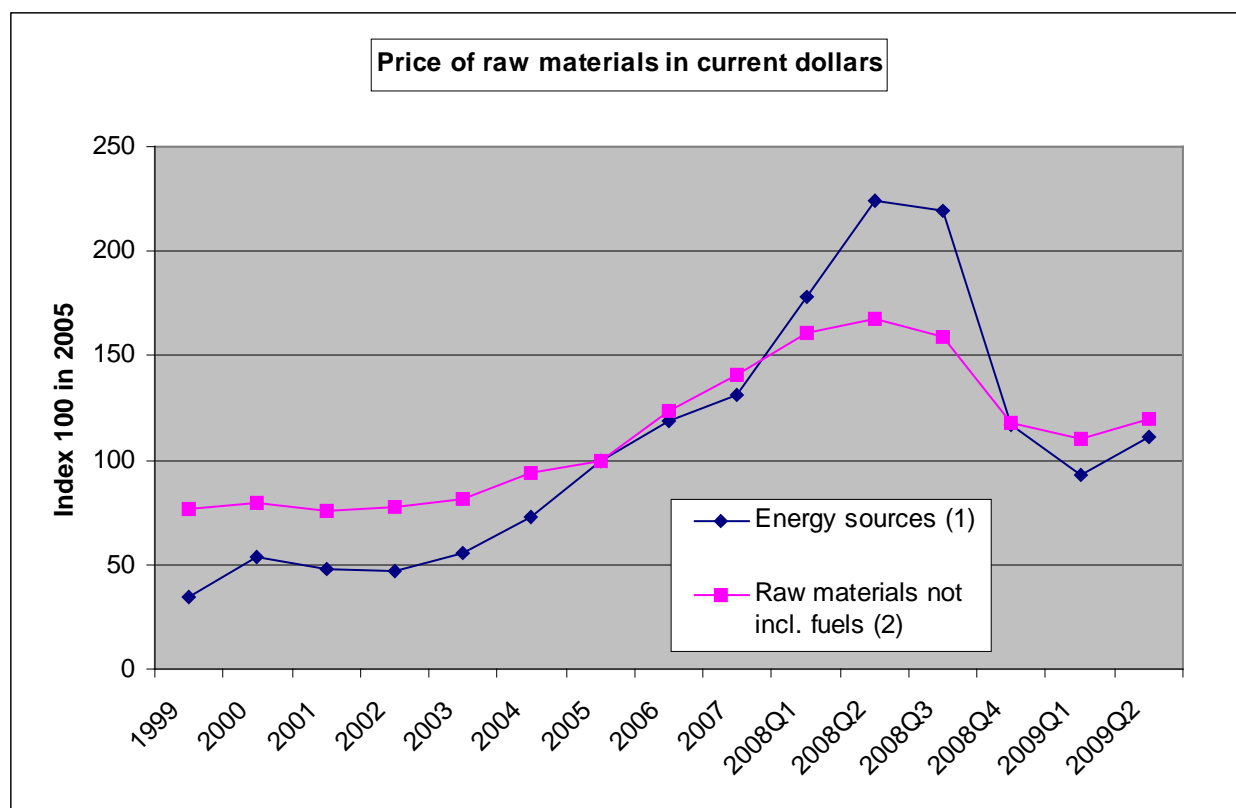
This sector covers very different activities (services, equipment and construction), which are placed together here because of their production shares the same industrial objective.

The source data used – from IFP – present accounts that double up shipbuilding and maritime and river civil engineering. They included the building of LNG carriers, with two vessels delivered in 2006 and 2007, for a unit cost estimated at 200 million euros, and the construction of offshore platforms. However, the IFP data are the only available source that enables an aggregated turnover for offshore oil-related industry in France to be estimated.

### 2. Situation of the activity

Until mid-2008, offshore oil- and gas-related services showed remarkable growth, making it the most dynamic sector of the marine economy over some fifteen years in terms of employment and value added. This growth was fed by oil and gas exploration-production investments (+18% in 2007 and in 2008), which themselves arose from the long period of global growth, booming economies in Asia and the tension on raw materials markets.

As the recession spread mid-2008, forecasts for raw material demand were lowered and from 2009 on, particularly in North America, oil and gas investments dropped (-16%), going back to their 2007 level at the end of 2009. These adjustments took place in a context where energy prices were extremely volatile, with a sudden sharp fall in 2008, followed by a rising trend at the start of 2009.



(1) Average of several prices for crude oil, natural gas and coal

(2) Mean price of foodstuffs, non-food agriculture and forestry products and metals

Source: IMF, annual data, quarterly data for 2008 and 2009

On the global front, the oil industry context is related to investments in exploration-production. Until 2007 and early 2008, the sector was very active, with clear regional differences depending on the markets.

- The geophysics market was up 25% in 2007 and 10% in 2008. In 2009, in spite of sustained activity, its turnover should drop by approximately 20%.
- Offshore drilling, which had risen by 8% in 2006, stagnated in 2007 in volume, whilst increasing its turnover by 40% thanks to the euro/dollar exchange rate. In 2009, it is less affected than onshore drilling by the recession and the number of wells drilled should fall by 11%. Latin America, the Near East and above all, China offer the best perspectives for activity.
- The turnover for offshore platform construction doubled from 2005 to 2008. In spite of a rise in the number of platforms being built, the global turnover fell slightly in 2009; however, the largest companies managed to grow theirs further.

The French oil-related industry exports considerably. It recorded sustained growth of its turnover for several years, until 2008, when offshore's share grew by 14%. The workforce grew slightly. For 2009, a drop of nearly 10% of the global sector's turnover is foreseen. Seen symmetrically, the forecast drop in manpower is small, about 1%.

As regards the outlook, high growth zones like Asia, and particularly China, will take on considerable importance, both in terms of investment locations for exploration-production and of companies' financial capacity for investment.

## Coastal tourism

### 1. Definition

Tourism is defined by the World Tourism Organization as all activities of people who « travel to and stay in places outside their usual environment for more than 24 hours and not more than one consecutive year, for leisure, business and other purposes ». In France, summer stays in seaside resorts are the main mode of French tourist consumption. The tourist offer comprises various types of paid accommodation and a series of hospitality services for private individuals like restaurants, cafés and travel agencies.

*Caveat: during the preparation of the present report, the French tourism accounts were being revised. The estimations presented herein are based on accounting data before revision. They should therefore be taken as a rough estimate. This chapter presents the key figures and highlights two dynamic sectors of coastal tourism, i.e., pleasure boating and cruises.*

### 2. General data

Coastal tourism is the major sector of the marine economy in terms of turnover and jobs. The coast is the top-ranking tourist destination in France for the number of overnight stays, representing over one quarter of total tourist spending.

#### Key figures for coastal tourism

	2000	2001	2002	2003	2004	2005	2006	2007
Tourist consumption (bn euros) (1)	26.24	26.30	27.41	28.07	27.84	28.55	32.61	33.87
Value added (bn euros)	8.45	8.52	8.87	9.13	9.05	9.22	10.51	11.08
Value added rate (2)	32.2%	32.4%	32.4%	32.5%	32.5%	32.3%	32.2%	32.7%
Salaried labour force (3)	185,114	190,812	196,639	205,308	203,139	207,684	233,200	242,558
« Coastal » share of tourist spending (4)	26.8%	26.7%	26.7%	27.4%	26.3%	26.4%	28.9%	28.8%

(1) Estimation depending on « coastal » share of total tourist consumption

(2) Average value added rate: Ifremer estimation based on by-sector breakdown of tourist spending and by-sector VA rates

(3) Revised data. Estimation depending on « coastal » share of tourist consumption. Salaried manpower in full time equivalents in typically tourist activities

(4) Estimation based on annual visitors inquiries.

Sources: Tourism accounts, "Tourism Key Figures"; Unedic for employment figures

### 3. Pleasure boating

Yachting, or pleasure boating, is an important activity for coastal tourism in terms of the jobs and expenditure flows it produces. This section brings together some data on the yachting sector in France.

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

		Year of reference
Estimated number of boaters	4 million	2008
Marine yachting fleet (numbers)	906 591	2008
Including motor boats (75%)	680 000	2008
Inland waters and waterways yachting fleet (1)	35 000	2008
Registration of new boats, not including Dom-tom	23 434	2008
Sales of second-hand boats	62 568	2008
Number of marinas and yachting installations	470	2007
Number of marinas with « Blue flag » label	76	2009
Number of berths and moorings in marinas	165 000	2007
Number moorings outside of marinas	60 000	2007
Boat building - boat repair turnover (million euros)	1 573	2007
Jobs in boat building- boat repair	9 250	2007
Number of enterprises in boating sector	4 933	2007
Total employment in water sport industry	45 227	2007
Total turnover in boating sector (million euros)	4 160	2007

(1) Some vessels sail at sea and on inland waterways

Sources: Transport Ministry, FIN

### 4. Cruise tourism

Cruise tourism grew by 7.2% per year from 1990 to 2008 (source: Cruise Lines International Association – CLIA). On this particularly dynamic market, the supply and demand are mostly North American; European demand is lower, but increasingly significant, making up the second share of the market. According to some projections, the American predominance will continue in coming years.

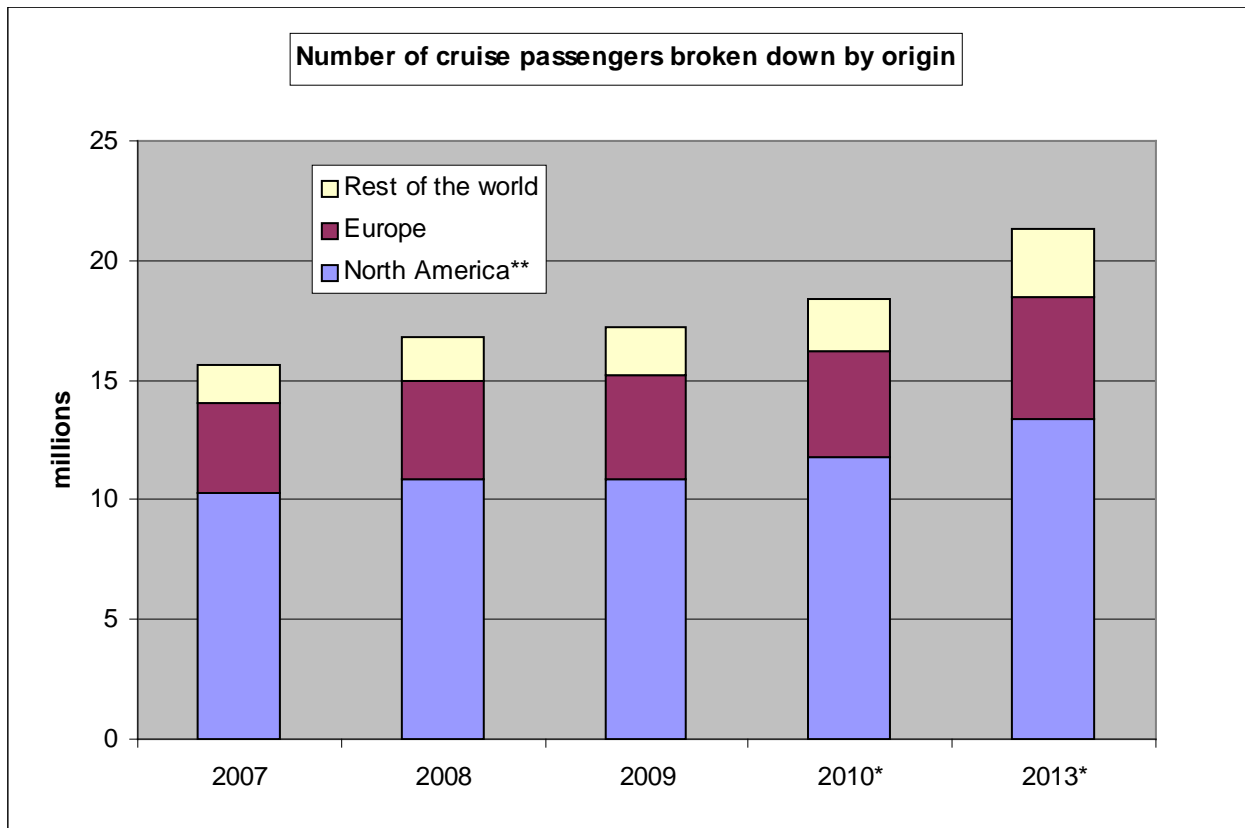
European demand is mostly British (1.4 million passengers in 2008), German (0.9 million), Italian, Spanish and finally, French (0.3 million). The demand from other countries, whose estimated growth for 2009 to 2013 should be about 40%, is mainly from Asia.

According to predictions, the 2008 recession will not have prolonged effects on the market. The global turnover in 2008 was assessed at 17 billion dollars coming from North America and 10.5 billion from the rest of the world. It is estimated to have dropped by 9.5% in 2009 (largely due to the fall in demand on the American market), while an upswing of 7% is foreseen for 2010.

Supply is concentrated: the top two cruise operators control over 80% of the market directly or through various subsidiaries, and the top three control approximately 90%. Orders for vessels made before the recession are no taking effect, with delivery of some 25 ships planned



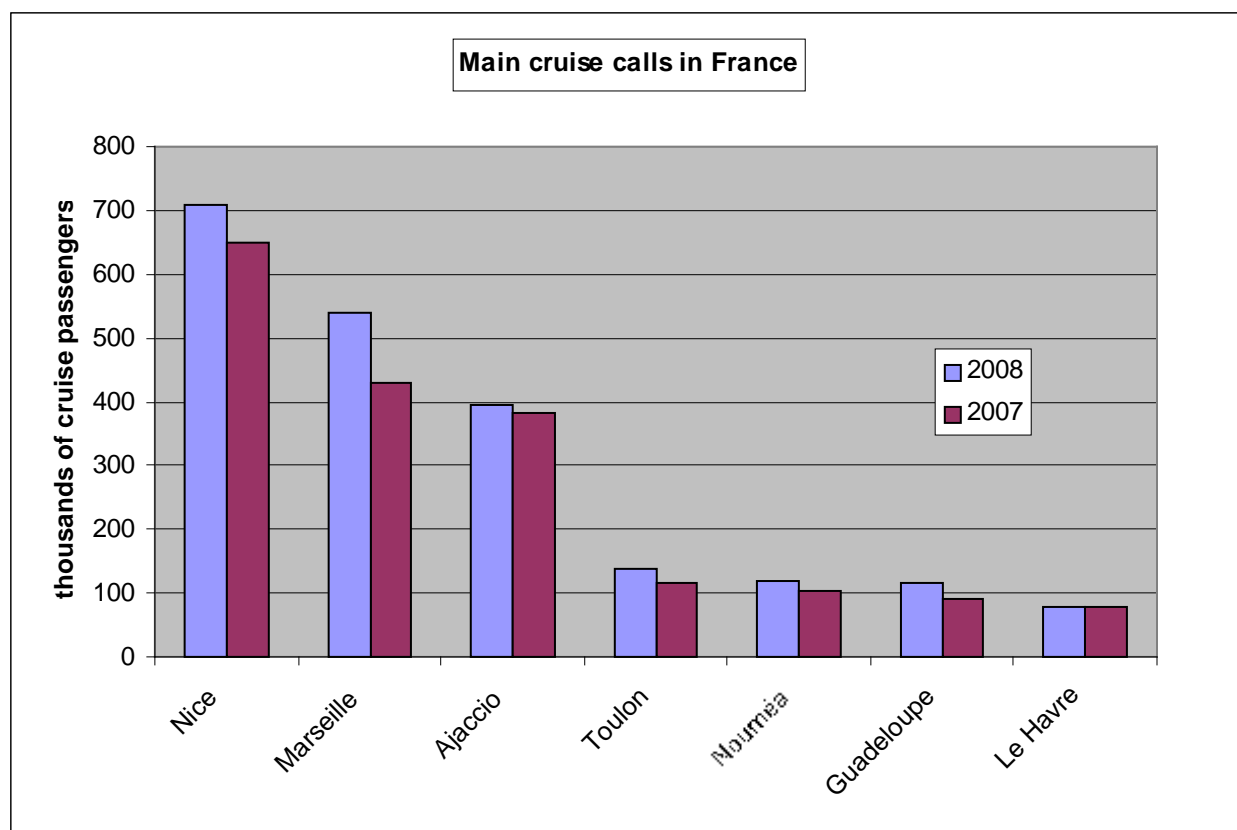
from 2010 to 2012, able to carry nearly 29,000 passengers. In 2010, the total capacity on offer was assessed at 254 vessels for a carrying capacity of 417,000 passengers (+7% from 2009).



\*Forecasts

\*\*Including 5% from Canada in 2010

Source: Cruise Market Watch



Source: Le Marin/ports, Cruise-Europe

Increasingly large liners enable a mass market effect for cruises. In the short term, the vessels slated for delivery can often carry 2,500 passengers or more, reaching 5,400 for the largest of them (capacity also reached by the largest cruise liner currently in service).

For international destinations, the Caribbean is most popular, followed by the Mediterranean, Europe, Alaska and Mexico. In France, the most numerous calls are made in Mediterranean ports. In Europe, outside of the Mediterranean, the most visited ports are:

- Baltic and Scandinavia: Copenhagen (550,000 passengers in 2008), Oslo, Stockholm, St Petersburg, Tallinn, Helsinki and Bergen,
- Atlantic: Lisbon
- English Channel: Southampton (one million passengers in 2008) and Dover.

## 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 harbours are excluded.

### 1. Maritime transport throughout the world

Maritime shipping depends closely on international trade which is itself a function of economic growth and amplifies movements in the latter.

Since the 1990s, shipping has grown soundly and steadily along with international trade; this led to a significant rise in harbour capacities, as standard vessels have become increasingly larger. The growing use of containers to transport goods has had an impact on the numbers, size and number of orders for container ships. The outlooks of bunker prices remaining high and seeking economies of scale have encouraged shipowners to prefer to purchase very large vessels, especially container ships.

Europe remains a key stakeholder in maritime transport (in spite of smaller growth than in Asia), since it uses shipping for domestic and international trade, by the number of its sea ports and the size of the largest of these, by the world rank of many operators (shipowners, brokers, classification societies, etc.) and by the interests it holds in large ship ownership. It represented 18% of outward freight and 23% of inward freight in 2007 (source: UNCTAD). However, Asia is preponderant in trade (40% and 48% of incoming and outgoing freight).

With the recession, the drop in international trade immediately affected shipping, freight, the number of laid up or scrapped ships, and the financial situation of many firms in the sector. These effects differ depending on the category of ship and cargo and are passed on to the order books for shipbuilding.

Above and beyond these difficulties due to the economic context, there is a fundamental debate on pollution emissions from shipping. These emissions are much lower, per tonne carried, than those of other modes of transport, but raise the problem of their relatively significant growth due to the dynamic shipping market and the chemical nature of bunker fuels, which are high in sulphur and release greenhouse gases (GHG). In 2008, the sulphur content of marine fuels, targeted by Annexe VI of the Marpol Convention for ships sailing in SECA (Sulphur Emission Control Areas), have been further limited, effective in 2010: this regulation comes in addition to Directive 2005/33/EC of July 2005.

Another sensitive topic in growth periods concerns the worsening difficulties in recruited skilled sea-going personnel. This leads to growing security risks for vessels and risks of tension between shipowners' supply and charterers' demand.

## 2. Merchant sea ports in France

### 2.1. French harbours

Organisation of ports was reformed by Act 2008-660 of 4 July 2008.

- Harbours in metropolitan France that previously had the status of autonomous harbour (Dunkirk, Le Havre, Rouen, Nantes Saint-Nazaire, La Rochelle, Bordeaux and Marseille) have become “Large sea ports” (GPM): as public, State-owned entities with financial autonomy. Guadeloupe remains an “autonomous harbour” (PA). GPM ports act as harbour authorities, while the management of tools and facilities is to be transferred to private enterprises working in stevedoring and cargo handling and terminal management.
- The (over 500) marinas, fishing and other commercial ports are supervised by the relevant local authorities, with management most often granted to Chambers of Commerce.
- Other ports in the overseas DOM counties are under State responsibility and their management is granted to Chambers of Commerce.

#### Key figures for maritime and river port services (1)

	2001	2002	2003	2004	2005	2006	2007
Turnover (million euros)	1109	1270	1339	1219	1271	1344	1297
Value added (million euros)	783	923	1003	892	920	966	949
Jobs (2)	10639	10482	10465	9951	9685	9725	8706
Number of companies (3)	244	282	304	292	280	285	242

(1) NAF code 63.2C: operation of maritime and river ports (including harbour establishments), activities of ship consignees, ship maintenance and overhaul services (not including repair), pilotage, towage, boatage, rescue at sea, salvage of vessels and signalling by lighthouses and beacons. From 2006 on, the scope changed (NAF code 52.22Z) to: servicing and maintenance fall under ship repair.

(2) Salaried and non-salaried employees, annual mean in full time equivalents.

Source: SOES/Annual business inquiries

### 2.2. Harbour services for vessels

Services for vessels comprise:

- berthing of the vessels (piloting, towing, boatage),
- onshore operations: representation, maintenance, repair, other services (ship chartering, consignment, provisions and bunkering, waste recovery, onshore services for seafarers).

Several onshore services are not taken into account in the key figures, since in the national statistics they are consolidated with services which are not only maritime in nature.

### 2.3. Harbour services for goods

They involve:

- transport agents, forwarding agents, customs agents and commodity brokers.
- Companies working in cargo consolidation and deconsolidation, warehousing and distribution, inspection, sample analysis and security-guarding are also part of this activity.
- Port handling companies are responsible for loading and unloading, receiving, acknowledgement and guarding of goods.

A part from stevedoring, other services (packaging, consolidation, Customs, administrative formalities and inspections) are measured separately from the means of transport in national

statistics. Ministry data can be used all the same to refine the estimates of harbour employment.

### Direct employment in large seaports

	2004	2005	2006	2007	2008
State services (1)	1282	1307	1477	1477	1673
Including customs	484	484	608	608	789
Port authorities	5408	5415	5203	5203	5079
Port businesses (2)	22644	22455	22571	24578	28441
Including:					
Pilotage	523	521	510	515	522
Towage	645	725	664	664	705
Boatage	382	353	360	360	369
Total	29344	29177	29251	31258	35193

(1) Including Maritime Affairs administration

(2) Pilotage, towage, boatage, handling, shipping companies, shipping agencies, brokerage, consignment, transit.

Source: Transport Ministry, survey of autonomous ports, maritime services and Customs services (different survey from the annual business inquiries used for key figures).

### Key figures for port handling operations (1)

	2000	2001	2002	2003	2004	2005	2006	2007
Turnover (million euros)	852	824	778	816	921	901	1031	1035
Value added (million euros)	494	508	487	503	602	590	669	694
Jobs (2)	5209	4791	4734	5119	5568	5192	5537	5638
Number of companies (3)	125	117	128	131	123	131	130	140

(1) Data from revised sources. Code NAF (2003) 63.1A. From 2006, code 52.24A, with no change to the number of firms

(2) Salaried and non-salaried employees, annual mean in full time equivalents.

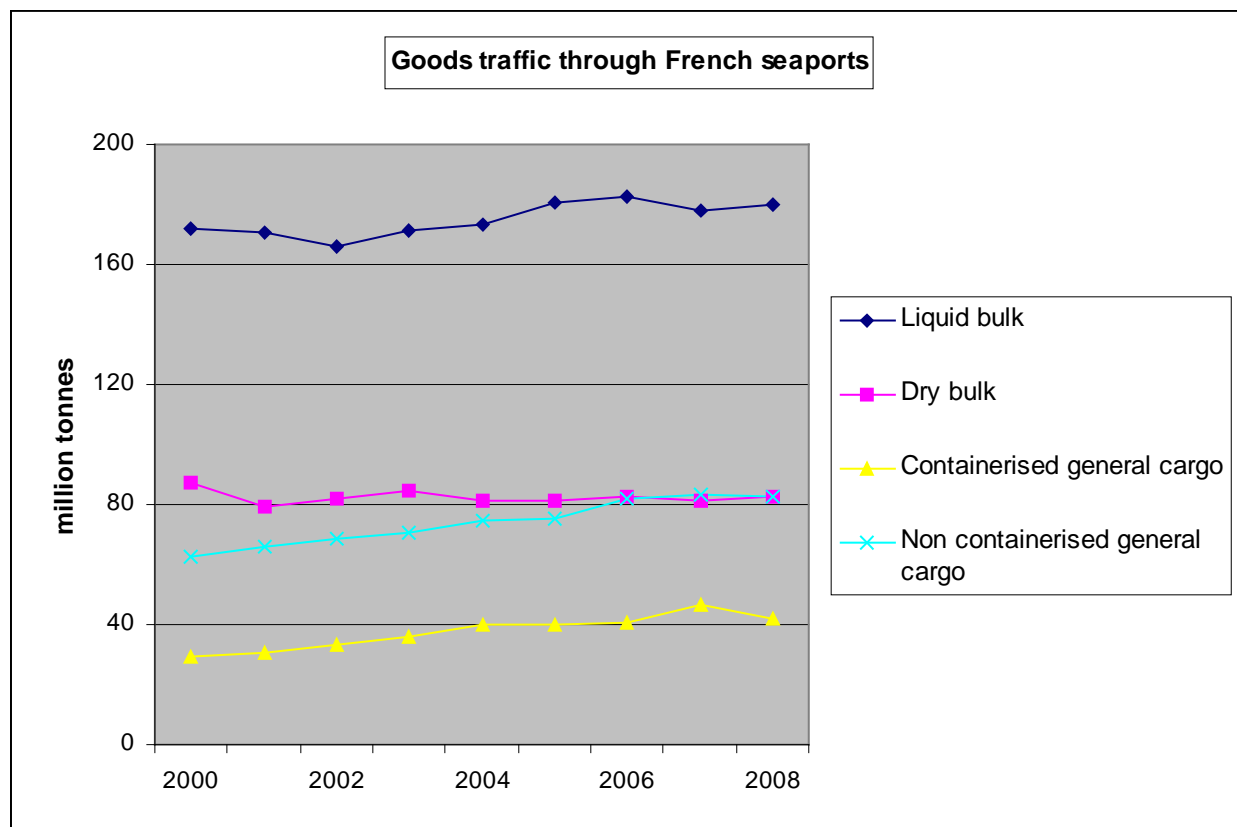
Source: SOES/Annual business inquiries

## 3. Port traffic

### 3.1. Traffic through French ports

Goods traffic is dominated by liquid bulk cargoes (approximately half the total), particularly oil. It is slowly adapting to the significant growth in international traffic of general cargo and containers.

- The general cargo traffic has increased since the turn of the decade, due to the progression of roll on-roll off traffic (Calais, Dunkirk) and containerised traffic (Le Havre, Marseille). The latter was hit by the 2008 recession.
- In liquid bulk, crude oil and refined petroleum products are mostly processed at Marseille and Le Havre (Antifer and Fos for petrochemicals). LNG is principally imported through Nantes and Marseille.
- The dry bulk traffic has stagnated over the decade since 2000. It is mostly operated through Dunkirk and Marseille (ore and coal for steel production), Rouen (number one European port for grains) and Nantes.



Source: Transport Ministry (total of top 28 harbours: inward + outward freight)

Large scale investments have been made in several strategic domains, especially containerisation and the LNG supply chain.

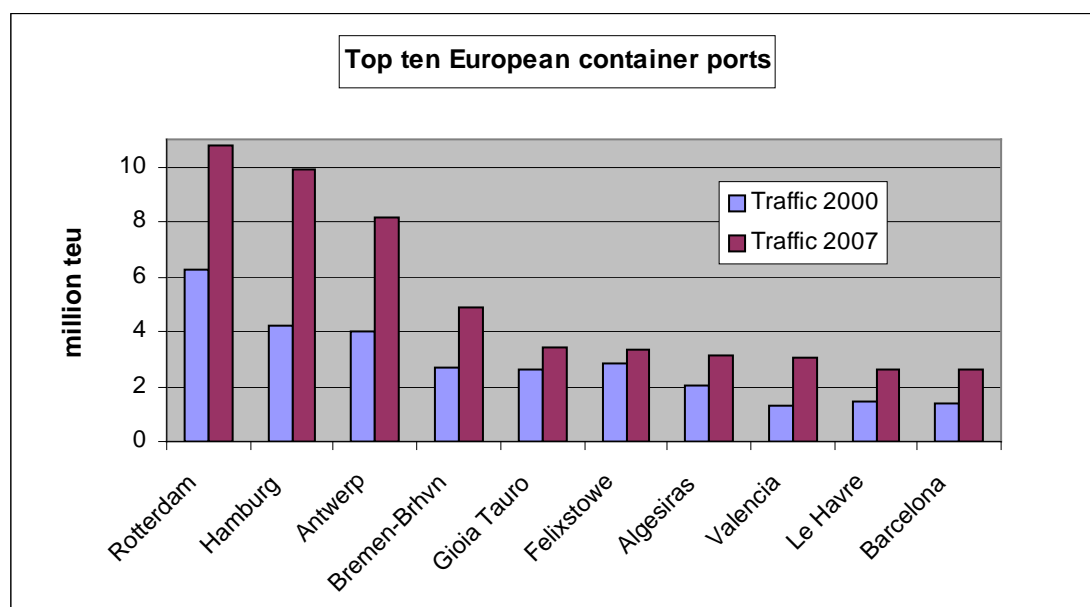
- The biggest investments in container terminals were made at Le Havre (Port 2000, completed in 2006) and Fos (the two Fox 2XL terminals will be put into service in 2011 and two others, 3XL and 4XL, in 2013 and 2015). The aim is to reach a capacity of 6 million teu (twenty-foot equivalent units) at Le Havre and 4 million at Fos. Since 2002, Dunkirk has extended its container terminal to increase the capacity (600 000 teu) and accommodate vessels with greater draught.
- The increasing importance of gas in national energy strategies is leading harbours to set up LNG terminals. Several projects are either completed (Fos Cavaou) or currently being examined for approval (Antifer, Dunkirk, Montoir extension).
- “Calais 2015” will closely follow the Dover project (2012); the extension of Calais harbour, partially on reclaimed land, will mainly target Ro-ro traffic and ferries.

Passenger traffic in French ports is mainly generated by the cross Channel link and the Mediterranean, principally with Corsica.

- On the cross-Channel link, the trend for travel by sea is a stabilised market share. The slight drop in maritime traffic in 2008 at an annual rate runs parallel with the drop in tourist demand.
- Activity in the Mediterranean progressed modestly in 2008. This is due to the strong hike in cruise traffic (+13% in 2008) which prolongs the rise of previous years.

### 3.2. Traffic through European ports

During the period from 2000-2007, when international trade grew sharply and intra-European competition grew stronger, two zones were particularly dynamic. They were the "North Range" harbours from Hamburg to Antwerp, well connected to riverways, which have greatly invested in containerisation, and the Spanish ports on the Mediterranean whose investments in container traffic were stimulated by the growth of their domestic market. British and French ports have benefited from growth, but respectively went from 19% to 16% and 11% to 9.5% of the EU-15 traffic; while the share of Italian harbours remained stable at about 15% (source: Eurostat).



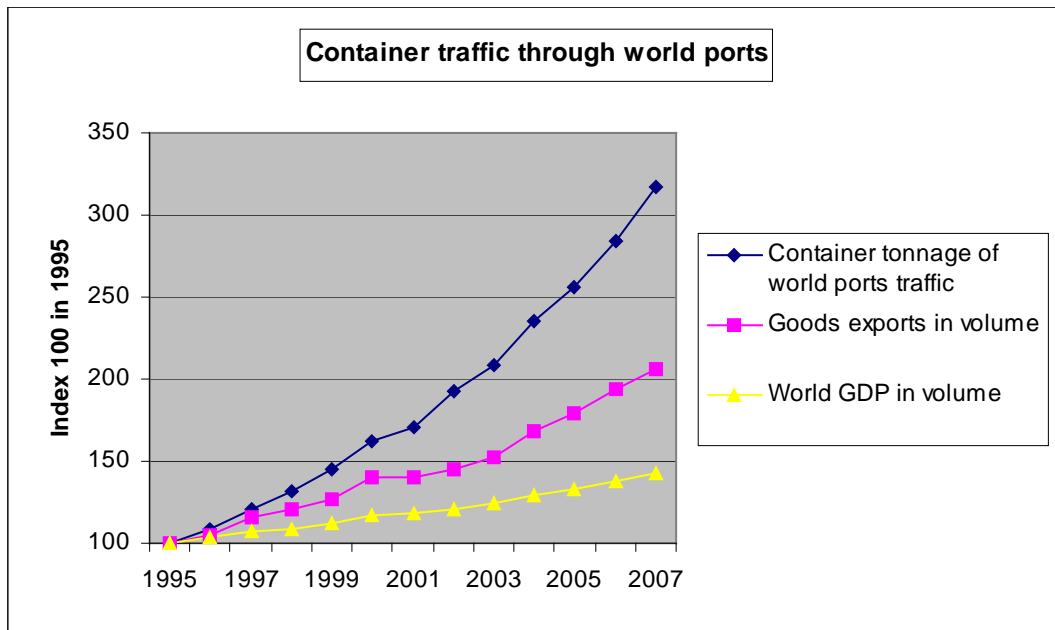
Source: UNCTAD/Review of Maritime Transport

### 3.3. Traffic through world ports

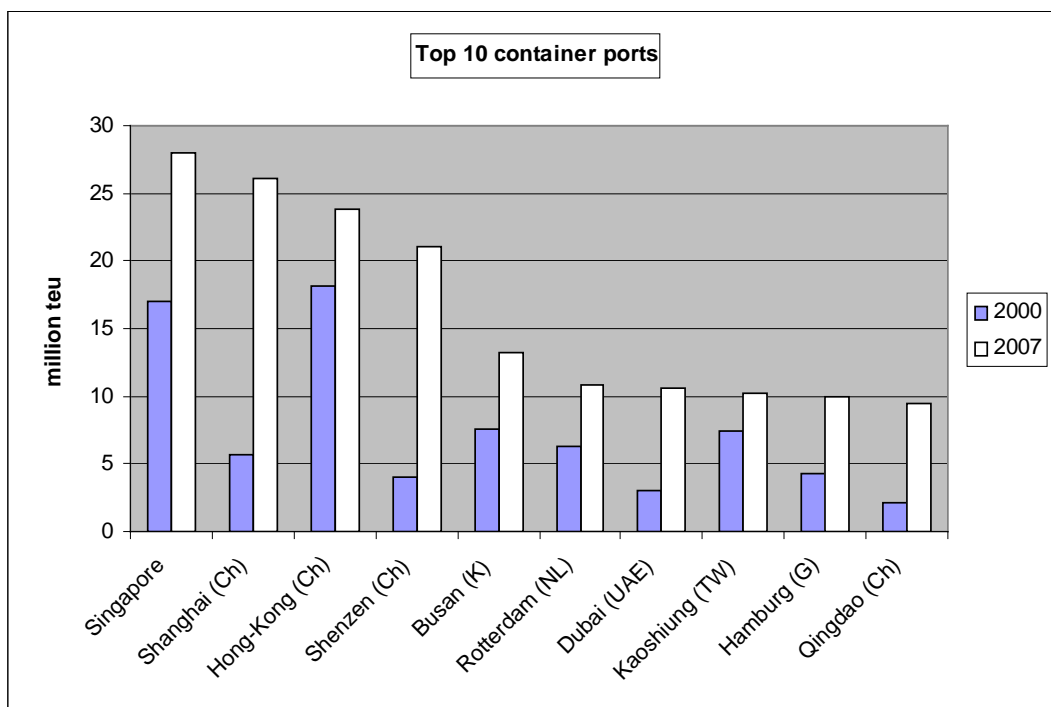
On the global scale, port traffic was marked, from the 1990s until 2007, by the rapid development of harbours, above all in Asia, in keeping with the economic development of the zone and progress made in containerisation. 13 of them, 7 of the Chinese (including Hong-Kong), were amongst the top 20 container ports in 2007; 4 were European. Operating container terminals has become a major activity several of the large groups are Asian. Whereas expert reports highlighted the risks of saturation in 2006-2007, in 2008 the fall in international trade affected terminal operators' activity and strongly reduced the rate of use of port capacities.

Liquid bulk and dry bulk traffic remained sensitive to the raw materials market, whose prices have shown great fluctuation in the recent context, with oil product and non-energy raw material markets picking up in 2008, supported by continuing growth in China. Several projects for harbour investments require long-term programming, beyond the fits and starts due to the recession. This is the case for LNG terminals, for which projects seem to be holding, in spite of the gas market being slack in 2009. World capacity for liquefaction is slated to more than double between now and 2015 (Russia, Qatar, Niger, Trinidad, etc.). There are many planned gasification terminals in the United States, Asia (China, India) and

Europe (North Sea, Channel, Mediterranean and Black Sea). They are very costly and are coping with the current problems on financial markets.



Source: UNCTAD/Review of Maritime Transport, World Trade Organisation



Ch: China. K: South Korea. TW: Taiwan. UAE: United Arab Emirates. NL: Netherlands. G: Germany  
 Source: UNCTAD / Review of Maritime Transport



#### 4. The merchant fleet

##### Key figures for maritime and coastal transport (1)

	2001	2002	2003	2004	2005	2006	2007
Turnover (million euros)	5039	5255	5515	6700	7726	8712	10469
Value added (million euros)	2168	2081	2218	2806	1999	3288	4712
Employment (2)	12595	12046	13447	13677	13307	13659	14346
Number of companies	418	475	484	462	501	476	506

(1) Freight and passengers. 2001-2005: NAF codes (2003) 61.1A and 61.1B grouped together. 2006-2007: NAF codes (2008) 50.10Z and 50.20Z grouped together.

(2) Salaried and non-salaried workforce, full time equivalents.

Source: SOES/Annual business inquiries

##### 4.1. French merchant fleet

As of 1 July 2009, it had the following features (source: Transport Ministry):

- 215 vessels of over 100 UMS used for transport, down by 5 units compared to 2007;
- a capacity of 6.18 million grt and 8.1 million dwt, i.e., +4% and +8% from 2007;
- 5,357 ships of all tonnages and all activities
- 286 vessels registered on the French international register (RIF), including 96 vessels of over 100 UMS (same figure as on 1/7/2007);
- an average age of 6.8 years (7.2 years on 1/7/2007), with those of the world fleet and the EU fleet being respectively 16.1 and 13.5 years old (source: ISL).

The recent trend thus shows a slight drop in the number of large ships and an increase in their capacity but the mean trend acknowledges significant differences from one category of vessel to another. In addition, it is a quite recent fleet on average.

The weakness of French shareholdings in the oil fleet and the cruise fleet can be noted.

The recession leads to overcapacities, lower profitability for shipowners and risks for maintaining the French fleet at its current numbers; however, the situation is different, depending on the types of freight and between shipping lines.

##### Merchant fleet flying French flag (1)

	Nb of vessels	Capacity (1,000 grt)	Deadweight tonnage (1,000 dwt)	Nb of vessels	Capacity (1,000 grt)	Deadweight tonnage (1,000 dwt)
	01/07/2009			01/07/2007		
<b>Oil fleet</b>	<b>54</b>	<b>3272</b>	<b>5588</b>	<b>57</b>	<b>3112</b>	<b>5093</b>
<i>Oil tankers</i>	42	2795	5144	43	2490	4509
<i>LNG carriers</i>	12	477	445	14	621	585
<b>Fleet not including oil tankers</b>	<b>93</b>	<b>2105</b>	<b>2407</b>	<b>95</b>	<b>2023</b>	<b>2313</b>
<i>Chemical tankers</i>	15	99	157	11	69	103
<i>Other tankers</i>	1	7	10	1	7	10

<i>Bulk carriers</i>	2	175	346	3	175	348
<i>Other dry bulk carriers</i>	1	2	3	1	2	3
<i>Full container ships</i>	26	1627	1789	24	1591	1749
<i>Ro-ro vessels</i>	25	157	71	25	111	61
<i>Cargo ships</i>	21	21	25	24	21	25
<i>Specialised carriers (2)</i>				4	29	7
<i>Other (3)</i>	2	17	6	2	17	6
<b>Passenger ships</b>	<b>68</b>	<b>805</b>	<b>148</b>	<b>68</b>	<b>787</b>	<b>137</b>
<i>Liners</i>	4	28	7	4	76	11
<i>Ferries (passenger Ro-ro)</i>	43	764	140	43	700	125
<i>Passenger launches</i>	6	2	0	6	1	0
<i>Other</i>	15	11	1	15	10	1
<b>Grand total</b>	<b>215</b>	<b>6182</b>	<b>8143</b>	<b>220</b>	<b>5922</b>	<b>7543</b>

(1) Vessels over 100 grt, used to transport passengers or goods on deep or short sea.

(2) Carriers of non-Ro-ro heavy lifts and vehicles.

(3) Not including service vessels.

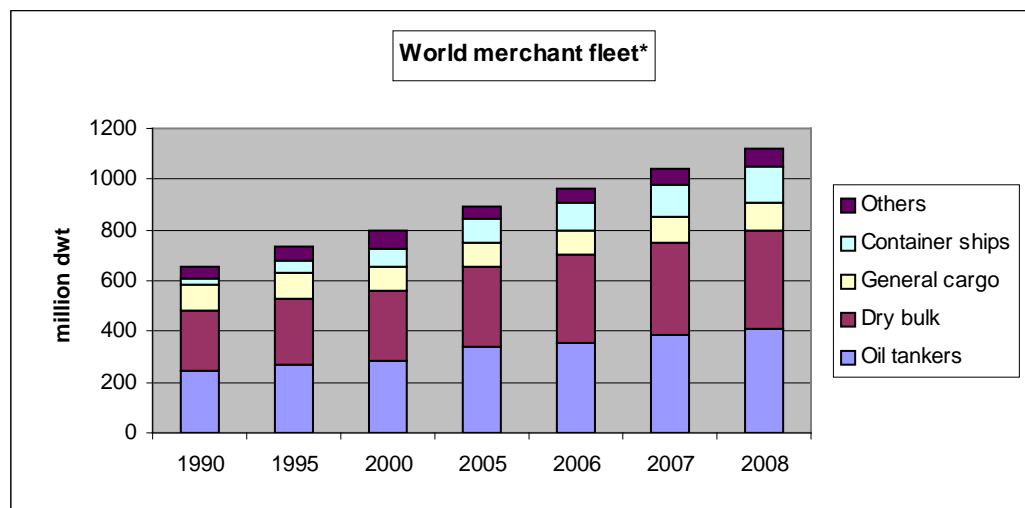
Source: Transport Ministry

#### 4.2. The world merchant fleet

For the main types of freight, international trends indicate the essential factors influencing the French-flagged fleet's situation. The 2008 recession suddenly interrupted the period of strong growth for international trade and economies, which had been characterised by a significant rise in freight and orders for ships. The container ship fleet grew in tonnage by 125% from 2000 to 2008; that of dry and liquid bulk carriers grew by about 42-45%. With the recession, the world fleet's overcapacity was increased, since ship deliveries are not in phase with orders. By late 2008, they were equal to about 50% of the tonnage of the active fleet.

At the end of 2007, freight rates peaked for containerised conventional cargo and above all dry bulk. In 2008, the recession and the perspective of overcapacities made these rates fall, with significant differences depending on the lines and the periods. Shipowner profitability was hard hit; the rate of demolition and the number of unused ships grew sharply, as the price of second-hand vessels collapsed (by 60 to 75% in one year's time for bulk carriers). A compensating phenomenon was that without financing from banks, some ship orders were cancelled.

For liquid bulk, and particularly oil transport, the activity was influenced by the volatility of crude oil prices and fluctuations in demand, which is itself sensitive to the price levels and to the seasoning rebuilding of stocks. Continuing growth in emerging countries should maintain the Asian demand. However, the tonnage on offer should rise strongly in 2009-2011, following recent orders. According to forecasts, the elimination of single hulled vessels will not have significantly mitigated the risks of an unbalanced market.



\*Ships over 100 grt

Source: UNCTAD, Lloyd's Register-Fairplay

## 5. Inland shipping

Inland shipping is the transport of goods and passengers by navigable waterways. Navigable waterways 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.

### Key figures for river transport (1)

	2001	2002	2003	2004	2005	2006	2007
Turnover (million euros)	423	432	493	541	571	523	633
Value added (million euros)	175	172	213	216	216	211	235
Employment (2)	3344	3519	4105	4001	3912	3642	3822
Number of companies (3)	1070	1064	1109	1079	1094	968	964

(1) Code NAF 61.2Z for 2000-2005. Codes NAF (2008) 50.30Z and 50.40Z for 2006-2007

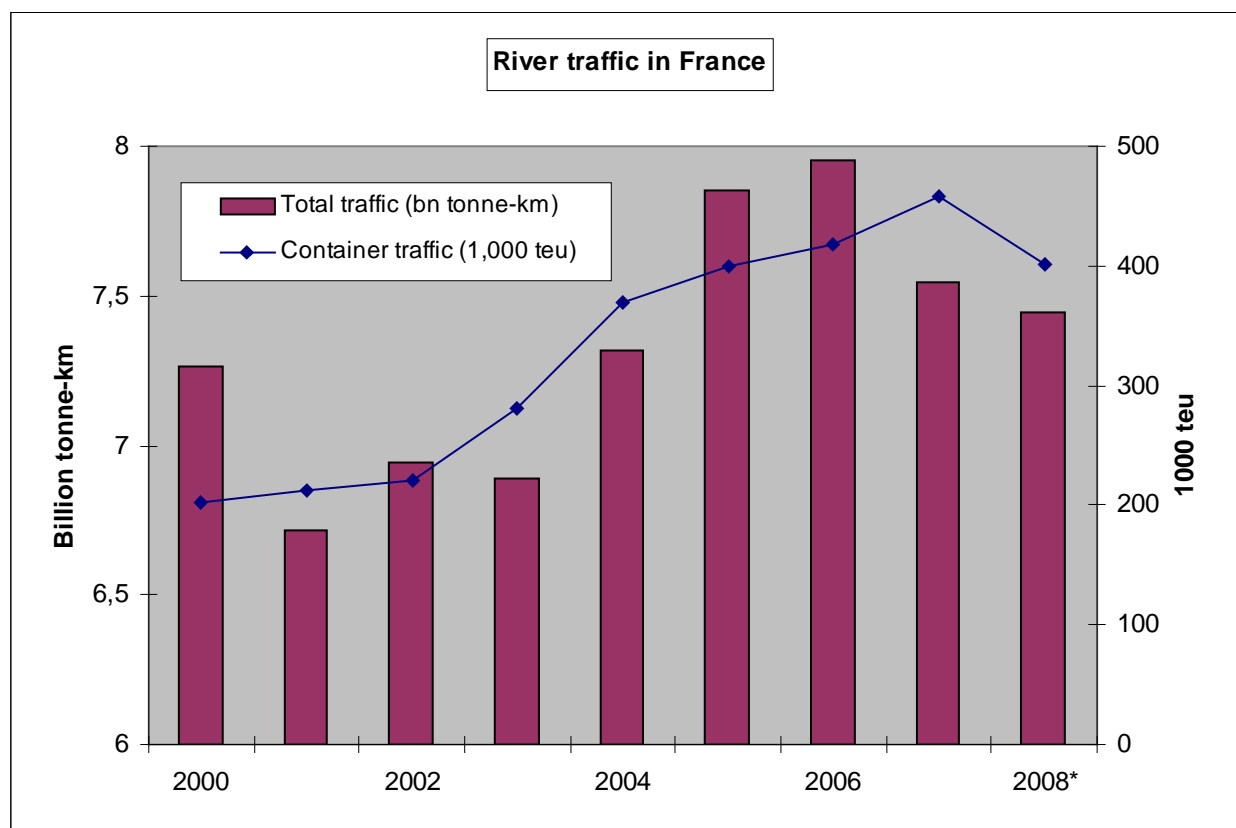
(2) Salaried and non-salaried staff, full time equivalents..

Source: SOES/Annual business inquiries

French river traffic of goods was situated around 7.5 billion t-km per year in 2007-2008, making a small share of domestic freight (43 bn t-km for rail in 2007 and 323 bn t-km for road haulage). In spite of a drop in 2008, it is on a rising trend (+12.8% since 1998), with road haulage growth being smaller and rail growth being negative for the same period.

The main components of inland shipping are building materials (one third in 2007), agricultural produce and food products (one quarter) and energy and ore products (20%). It is highly sensitive to grain harvesting performances, climate hazards (for energy consumption) and the economic context for activities like steel making and civil engineering and construction. Containerised traffic has grown almost continuously since the beginning of the decade and doubled in volume from 2000 to 2008.

Nearly a thousand enterprises are involved in this activity (to be compared to 500 maritime shipping firms). They are usually small: approximately 90% of them had less than 6 salaried employees in 2006.



\* Estimates

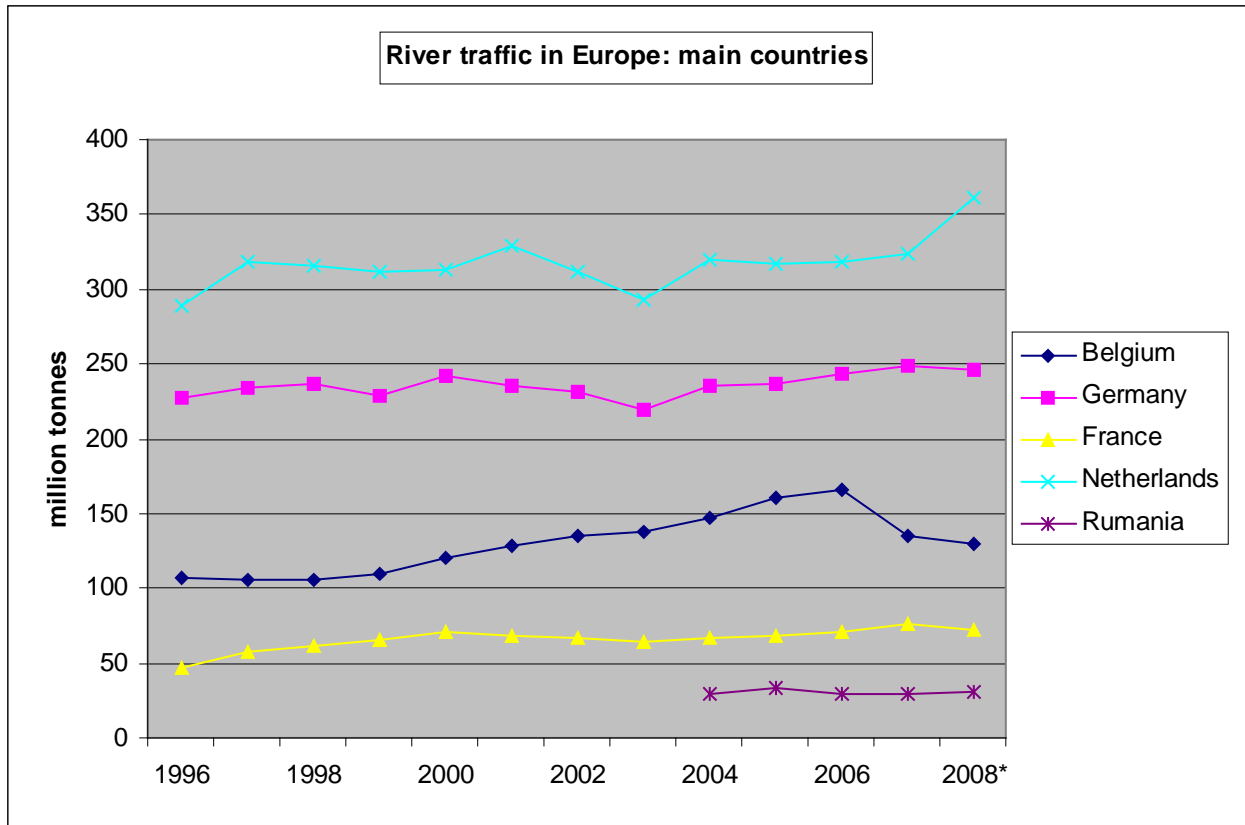
Source: Transport Ministry

French inland shipping concerns the north and the east of the country. There are several navigable networks of widely varying importance: the Moselle (8% of traffic in t-km in 2006), Rhine (nearly 16%), North (nearly 12%), Rhone (17%) and the Seine (over 43%) (source: Voies navigables de France).

In Europe, although only representing a small share of EU-27 domestic traffic (an estimated 600 Mt for 2008 and a network of about 35 000 km), inland shipping plays a strategic role in areas with corridors:

- the North Range zone linking Dutch, Belgian, Rhine, northern Germany as far as Poland, serving major sea ports like Rotterdam, Hamburg and Antwerp;
- the Danube zone;
- several networks of national or regional scope, e.g., the Mediterranean (Rhone, Po rivers), the North Sea (the Thames), and the Atlantic (Severn, Guadalquivir, Loire and Garonne).

Crude minerals and energy-source products make up the majority of tonnage carried by waterways in Europe. Promoting inland shipping is part of the EU strategy for trans-European networks and the Marco Polo II programme.



Source: Eurostat



## Maritime insurance

### 1. Definition

Maritime insurance includes: a) « hull » insurance for losses and material damage suffered by vessels; b) « cargo » insurance for risks to good transported by sea and during their additional or preliminary transport by land, air or waterways, including the phases of loading and unloading and of stays in transit; c) civil liability and contractual insurance of the shipowner, the carrier and the charterer or freighter; d) offshore energy insurance to cover risks, damage and liability in operations of exploration, construction, drilling and production of energy at sea (oil and gas) and its distribution. Thus, maritime insurance also extends to intermodal transport operations and to activities outside of transport or shipping.

### Key figures for maritime and shipping insurance in France

	2001	2002	2003	2004	2005	2006	2007
Hull insurance turnover (million euros)	537	595	483	451	498	495	498
Cargo insurance turnover (million euros)	684	821	783	734	758	746	779
Total turnover (1) (million euros)	1221	1416	1267	1185	1256	1241	1277
Value added (2) (million euros)	452	559	586	538	553	541	508
Employment (3)	6092	6315	4934	4392	4398	3951	4183

(1) Cash balance for gross premiums. Ordinary risks and war risks, direct writing and assumed reinsurance, including river and pleasure boats, cargoes carried by river and by land, not including land transport liability

(2) Estimations based on production and value added of the insurance branch, NAF 2003, code 66, revised data

(3) FTEs. Estimation based on full time equivalent jobs and turnover of the insurance branch. Revised data.

Sources: French federation of insurance companies (FFSA), INSEE (semi-definitive data for 2006, provisional for 2007)

### 2. National and international situation

In 2007, for French insurers, transport insurance (maritime, air and space) represented nearly 2% of all non-life collection: a ratio comparable to those of the main European markets, with the notable exception of the United Kingdom (over 13%). For France, transport insurance subscriptions (direct writing and acceptance) have been cyclical over the past ten years. They began to rise again in 2008 after falling for two years (source: FFSA).

In 2008, the world market for marine insurance dropped in volume by 3.6% after two years of rises; hull insurance was the only market showing growth. Europe maintained its top rank with 59% of the market share, but this primacy is eroding.

- The past two years, hull insurance rose simultaneously with the number of claims and the cost of damages, which limited the market's profitability.
- Cargo insurance was marked by the increase in value carried until the 2008 crisis; the attraction of this market explains the growing competition and lower premiums.

In 2007 and 2008, on the maritime and shipping insurance market, France took 5th place behind the United Kingdom (Lloyds), Japan, the United States and Germany. For hull

insurance, France ranked 4th worldwide in 2007, behind Norway, the UK (Lloyds) and Japan and 3<sup>rd</sup> for cargo insurance, after Japan and Germany. Its presence in offshore energy insurance is small. Overall, the French sector exports significantly.



**Non-Commercial Public Sector**



## French Navy

### 1. Definition

At sea, the Navy contributes to national defence and security through the operational deployment of naval forces. Its remits are dissuasion, knowledge and anticipation, prevention, projection, protection and intervention.

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

Historically, the budget share of operations involving the Navy accounts for 19 to 20% of the Defence budget, including investments in armament programmes and in facilities.

The military budget voted in 2009-2014 provides for a financial contribution of 184.8 billion euros 2008 for the ministry. Priority is given to modernisation of equipment and facilities, their availability and transitioning to future equipment, in particular, enabling the upgrading of the ocean component of French deterrence capacity (completing fleet renewal with the 4th new generation SSBN in 2010, and adapting weaponry with the commissioning of the M51 missile). Credits devoted to scheduled maintenance of facilities and to Defence personnel will reach 2.9 billion 2008 euros on average from 2009 to 2014.

The second phase (2015-2020) should focus more on air-sea operations (completing the delivery of FREMM frigates until 2022, programmes for high seas BATSIMAR patrol boats and AVSIMAR maritime surveillance aircraft and the future anti-mine warfare system).

#### French Navy budget

	2006	2007	2008	2009		2006	2007	2008
Operations (million euros)	4448	4477	4519	4572	Investment* (million euros)	2429	2178	2362
Payroll	36%	36%	36%	38%	Deterrence	28%	29%	28%
Social contributions	28%	24%	24%	21%	Fleet air arm construction	24%	26%	17%
Maintenance of equipment	26%	30%	27%	30%	Development	24%	22%	25%
Current operations including operational fuel costs	10%	10%	13%	11%	Shipbuilding	13%	11%	20%
					Miscellaneous	7%	12%	6%

\*From 2009 on, the Armed Forces equipment programme will be managed without distinguishing in detail between the different forces. The naval shares of the main items will no longer appear.

Source: Naval staff

The professionalisation of the Armed Forces has led to a sharp change of format for the Navy. From 1996 to 2002 military and civilian personnel went from 70,000 to 55,000. The cutbacks are continuing as the recommendations from the General review of public policies (RGPP) and the White Paper are implemented.

### Payroll of Navy military and civilian personnel

	2002	2003	2004	2005	2006	2007	2008*	2009*	2010*
Civilian personnel	10157	10296	10291	10064	8511	8636	8122	7365	6305
Military personnel	44276	44267	44131	43195	40849	40643	41396	40641	39895
Total	54433	54563	54422	53259	49360	49279	49518	48006	46200

\*Ceiling set by the ministry for authorised employment (PMEA): all personnel employed by the Ministry of Defence.

Source: Naval staff

The large proportion of petty officers (over 65% of military personnel) is due to the highly technical nature of jobs in the Navy, since the ratings, seamen and volunteers act as operators. Civilian staff, many in support services (supply department, fleet support service, naval air bases), represent about 16% of the Navy's personnel. The operational reserve (6,400 posts in 2008, 7,100 in 2012) provides the Navy with the additional human resources required in times of crisis or for specialists needed on an ad hoc basis.

### 3. Challenges and outlooks

#### 3.1. Modernisation and investment projects

The "LPM" Military Programming Law 2009-2014 aims to reconcile several objectives:

- the recommendations of the White Paper on national defence and security, published in 2008, gave Defence 186 billion euros, 102 billion of which are devoted to equipping the armed forces;
- the objectives of recent administrative reforms: for Defence, cutbacks to eliminate 54,000 military and civilian jobs (6,000 for the Navy) are planned;
- and managing State budget constraints.

The LPM budget confirms the creation of a Council for national security and defence, as well as a specialised formation for it, i.e. the national intelligence council. This will authorise share floating for some armament companies, especially DCNS.

As regards the Naval component, the White Paper gives an essential role to knowledge, controlling areas of interest, intelligence gathering capability and prevention capability. It considers that renewing the nuclear-powered attack submarines is a strategic priority. Its aim by 2020 is a 44,000 person-strong French Navy, with 4 SSBN, 6 SSN, an aircraft carrier and its air wing, 18 first rate frigates and 4 command and force projection ships. These objectives drive the projects for naval and aero-naval facilities provided for in the LPM 2009-2014 budget.

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 (SPATIONAV). The aim of the latter is to strengthen facilities for surveillance and protection of maritime approaches to help fight terrorism and smuggling, along with the traditional actions of the State at sea.

### Naval and naval aviation facilities

Main equipment	2009	2014*
Aircraft carrier (1)	1	1
Carrier-based aircraft	72	49
Maritime patrol aircraft	22	22
Combat helicopters	45	50
SSBN	4	4
SSN	6	6
Anti-aircraft frigates	2	4
Multi-mission frigates, ASM (2) and La Fayette	13	11
Surveillance frigates	6	6
Amphibious ships: TCD (3), BPC (4)	4	4
Mine warfare countermeasure ships	14	11
Support ships (5)	5	3
Light transport and patrol boats (6)	31	18

\*End of LPM

(1) The decision on the second aircraft carrier should be made in 2011-2012.

(2) Anti-submarine frigates

(3) TCD Landing platform docks

(4) Command and Force Projection Ship

(5) Supply tankers and repair and maintenance ships

(6) Including aviso frigates converted into high sea patrol boats.

Sources: White Paper, LPM, Naval staff

### 3.2. The French Navy and Europe

The Navy's action is and will increasingly be part of a series of operational commitments with our European partners, following the guidelines of the European Council of Helsinki in 1999. France participates in Euromarfor, which was activated in 2002-2004, alongside Spain, Italy, and Portugal, and in the French-German naval force (FNFA). These European commitments will continue to grow and thought is being given to fit them into a broader framework with the EUMARC (EU Maritime Reaction Capability) concept. The Atalanta operation, the first maritime operation of the European Security and Defence Policy (ESDP), deployed to fight piracy in the Gulf of Aden, illustrates the will to act on the European level.

In the field of weaponry, the French Navy's contribution to the emergence of a Europe of armament by jointly organising cooperation for armament (OCCAR) bringing together the United Kingdom, Germany, Italy and France), for the PAAMS (Principal Anti Air Missile System) air defence systems based on the Aster missile (future surface to air family).

### 3.3. Hydrographic and scientific expertise

Tomorrow's challenges also depend on naval research and operational oceanography. The SHOM naval hydrography and oceanography department, became a public administrative entity in 2007. Its board of directors is chaired by the naval chief of staff, and it ensures its general hydrographic mission, particularly for the safety of maritime navigation, within the framework of the SOLAS convention. It gathers and processes nautical data, plots marine charts and maintains hydrographic data bases and provides expertise on the aero-marine environment. It contributes to the action of the State at sea in monitoring and forecasting the

drift of pollution slicks, delimiting maritime borders, preventing natural disasters, in operational oceanography and mapping the coastline.

Work with civilian marine research organisations focuses on physical oceanography, marine geosciences and underwater intervention. Collaboration also exists in terms of research resources. The Navy's hydrography and oceanography vessel Beautemps-Beaupré (investment: 95% from the Navy, 5% from Ifremer), is used by Ifremer at sea on average 10 days a year. Ifremer's research vessel "Pourquoi pas?" (investment: 55% from Ifremer, 45% from the Navy), is used by the Navy at sea on average 150 days a year.

## Public intervention

The State intervenes in several aspects of maritime activity: economic and social realms (seafarer's labour schemes, social protection), regulations (concerning seafarers) and education (seafarer training). It also fulfils technical missions, such as signalling, surveillance and safety at sea. Here, these interventions are assessed in terms of the national budget outlay.

### 1. Public efforts in the maritime field

The three main fields of action are:

- maritime safety and security, seafarers and maritime training, support for the merchant fleet, inspecting and controlling fisheries and recreational activities, combating marine pollution;
- dealing with harbours and coasts by promoting intermodal development;
- social protection for seafarers.

#### Public interventions in the maritime field

Unit: million euros

	2006	2007	2008	2009
Maritime safety and security	23.94	27.07	28.78	27.46
Seafarers and maritime training	10.50	10.91	10.44	11.88
Merchant fleet	72.71	73.52	75.29	75.72
Inter-ministerial action for the sea	9.57	9.78	9.60	8.83
Support for funding programme	10.04	10.32	10.38	9.72
Total	126.76	131.6	134.49	133.61

Source: Maritime Affairs Directorate

From 2007 to 2009, the increase in public interventions is principally due to the launching of a multi-annual plan in 2007 to modernise the CROSS regional operational search and rescue centres and the French overseas system. Support for the merchant fleet has also been increased.

With participation of local authorities for some 2 million euros and the funds corresponding to the payrolls of the Maritime affairs authority, public interventions in the maritime field reached the sum of 308.6 million euros in 2009.

### 2. Maritime affairs administration

#### 2.1. The services of the Maritime Affairs Directorate

The central administration is the maritime affairs directorate (DAM). The decentralised services of the administration dealing with the sea include:

- Local Maritime affairs services: regional and county-level divisions, maritime safety services (CROSS, vessel safety centres);
- County-level services responsible for maritime signalling (lighthouse and beacons service) and for combating oil pollution of the sea and shore (Polmar-terre).

## 2.2. Staff

- 1) The personnel of the Maritime affairs directorate ensure
  - administrative missions for seafarers (labour schemes, social protection, disciplinary and penal aspects and occupational training for seamen);
  - technical assignments for vessel safety (safety centres), maritime navigation (CROSS centres), economics (regulating maritime fisheries and mariculture, managing the public maritime domain used for mariculture, health and technical inspections of seafood, fisheries statistics and quotas);
  - policing and judicial duties in courts dealing with maritime and trade disputes.
- 2) Personnel in charge of maritime signalling ("Lighthouses and Beacons") and oil pollution response.
  - For maritime signalling, they study, draw up proposals and implement the appropriate nautical (navigational aids) and physical (small towers and buoys) solutions. They maintain these navigational aids and take part in disseminating nautical information (works, defective equipment, repairs).
  - Pollution: the same personnel also manage the inter-county centres where equipment for accidental oil pollution response (this concerns 11 out of 13 Polmar centres). They contribute to training exercises organised on the county level.
  - Not including the Lighthouse and Beacon department, other administrative services act as relays for the DAM to maintain the Orsec/Polmar-Terre system. A reminder of the importance of the county Polmar mission was given in the DAM directive of 27 October 2008.

The total number of agents working for maritime affairs is assessed at 3,256 in 2009.

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

### Maritime safety and security

Unit: million euros

	2006	2007	2008	2009
Operating expenses	6.42	12.6	10.33	13.54
Investment costs	15.35	12.25	16.27	11.62
Expenditure for intervention (1)	2.17	2.22	2.17	2.30
Total	23.94	27.07	28.78	27.46

(1) Economic and social financial support

Source: DAM

### 3.1. Signalling: the Lighthouse and Beacon service

The system of aids to navigation on the coasts of France and its overseas territories comprises around 6,450 maritime signalling establishments (ESM), including 120 lighthouses and 1,381 lights, 2,350 marker buoys (1,309 of which are light buoys), and 2 radio-navigation systems (8 DGPS stations and 2 Loran-C stations). These navigational aids for shipping fulfil France's commitments under the convention for Safety of Life at Sea (SOLAS).

The maritime signalling policy (creating, removing or modifying ESMs, modernisation, maintenance, nautical information, control and inspection) is implemented with support from a ministry technical and training network. The 45 operations vessels have been managed since



2007 by the Lighthouse and beacons corporation (APB), which is also responsible for seagoing personnel (training and equipment).

### 3.2. Safety, surveillance, rescue

The CROSS regional operational search and rescue centres are DAM specialised services, placed under the line authority of the Maritime affairs regional directors. There are five CROSS in Metropolitan France (Gris-Nez, Jobourg, Corsen, Etel and La Garde) and two overseas CROSS (West Indies-French Guyana and Reunion Island. They have six missions in their zones of jurisdiction:

- search and rescue of people in distress at sea
- shipping surveillance
- surveillance of maritime fisheries
- marine pollution surveillance
- disseminating information for maritime safety
- monitoring vessel security alerts

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

The CROSS centres are equipped for detection, transmission and communications. The network's radio component is extended by a satellite segment with global coverage which is integrated with the global maritime distress and safety system (GMDSS). They can make use of naval and airborne facilities of the administrations which contribute to the State action at sea (French Navy, Air Force, Gendarmerie nationale, Customs, Civil security and Maritime affairs), and the means of the National sea rescue society (SNSM).

In 2007, the DAM launched a plan to modernise the CROSS centres, to adapt the facilities to GMDSS developments, extend the surveillance capabilities and improve maintenance.

### 3.3. National sea rescue society

The French SNSM sea rescue society, a State-approved private body, carries out a large part of rescue operations on a volunteer basis under CROSS control. It secures prevention of risks, offshore rescue operations by volunteer crewmen, and train volunteer lifeguards who ensure safety on beaches.

#### **The SNSM in figures**

4,100 permanent volunteer crew members specialised in offshore rescue operations;  
 1,200 volunteers providing the running of the stations, managing and training of lifeguards in training centres;  
 1,300 volunteer lifeguards on secondment in summer to ensure safety on beaches,  
 48 salaried employees, working at both the headquarters in Paris and at the CERO (regional maintenance and repair centre for western France) in Saint-Malo;  
 223 rescue stations along the coasts of metropolitan France and the overseas Dom-Tom;  
 30 training centres located all over France.

Source: SNSM activity report 2008/2009

As a non-profit organisation, the SNSM is financed for nearly half by private donations and the rest by subsidies from State, regional and local authorities.

#### 4. Means implemented for seafarers and maritime training

##### Budget for seafarers and maritime training

Unit: million euros

	2006	2007	2008	2009
Operations	0.22	0.35	0.59	0.49
Investments	0.91	0	0.01	0.55
Intervention	9.37	10.56	9.80	10.84
Total	10.50	10.91	10.44	11.88

Source: DAM

The seafarer training system trains seamen for the maritime sectors trade, fisheries, commercial yachting and aquaculture. All levels of training are offered, from secondary to higher education courses (from the vocational training certificate for basic fisheries jobs to degrees for Masters of merchant vessels) and in both initial and further training, in metropolitan and overseas France for some courses. These training courses are prepared within the network of maritime establishments formed by:

- the twelve maritime vocational high schools (LPM) providing initial and further training for qualified seamen, aquaculture professionals and some fisheries officers;
- the four French merchant navy schools (ENMM) in Le Havre, Saint-Malo, Nantes and Marseilles train officers who will serve aboard merchant vessels;
- private schools or approved associative establishments.

A reform of higher maritime education is currently underway. It aims to broaden the training courses offered, and make them better adapted to new international constraints, with the central focus of awarding engineering degrees and to be a structuring research component. In 2009 the French Parliament voted to create the national maritime college (ENSM), a public establishment which will federate the four existing merchant navy schools. The laws to put it into application are currently being prepared for implementation on 1 January 2011.

##### Funding allocated to seafarer training

Unit: million euros

	2006	2007	2008	2009
ENMM subsidy	1.70	1.75	2.00	2.50
Including operations	1.70	1.75	2.00	2.50
Including capital expenditure	0	0	0	0
Subsidies for maritime vocational high schools	2.40	2.53	2.00	2.24
Including operations	2.20	2.53	2.00	2.24
Including capital expenditure	0.20	0	0	0
Private schools	1.10	1.02	1.02	1.01
Seafarers sub-total	5.20	5.30	5.02	5.75
Grants and further vocational training	2.80	2.42	2.46	1.80
Total Maritime training	8.00	7.72	7.48	7.55

Source: DAM

### Annual budget of national merchant navy schools

Unit: million euros

	2006	2007	2008	2009
<b>Le Havre</b>	1.50	1.57	1.64	1.54
Saint Malo	1.10	0.98	0.85	0.80
Nantes	1.60	1.00	0.95	0.84
Marseilles	2.10	1.98	2.06	2.10
<b>Total</b>	<b>6.30</b>	<b>5.53</b>	<b>5.50</b>	<b>5.28</b>

Source: DAM

### Initial training in maritime and aquaculture training high schools

Unit: number of students as of 30 September

	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
<b>Fisheries</b>	797	707	639	589	561	540
Shellfish farming	276	318	265	264	255	207
Merchant seaman	175	194	195	204	186	242
Fisheries and merchant navy	421	414	448	513	607	654
<b>Total</b>	<b>1669</b>	<b>1633</b>	<b>1547</b>	<b>1570</b>	<b>1609</b>	<b>1643</b>

Source: DAM

### Breakdown of enrolment by school

Unit: number of students as of 30 September

	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
<b>LPM initial training</b>	1669	1633	1547	1570	1609	1643
ENMM initial training	998	1010	880	923	1011	1246
<b>Total</b>	<b>2667</b>	<b>2643</b>	<b>2427</b>	<b>2493</b>	<b>2620</b>	<b>2889</b>

Source: Bureau of education and maritime training, DAM

## 5. Resources implemented for merchant fleet

### Intervention for merchant fleet

Unit: million euros

	2006	2007	2008	2009
<b>Operation budget</b>	<b>72.71</b>	<b>73.52</b>	<b>75.29</b>	<b>75.72</b>

Source: DAM

Intervention for the merchant fleet involves:

- a subsidy to the Compagnie générale maritime et financière to supplement retirement pensions paid to the personnel of the former maritime company CGM;
- subsidies for ENIM, the state agency for unemployment and the Central Agency for Social Security, to compensate for exonerations or reimbursements of employer contributions for crew working on French-flagged merchant vessels, assigned to maritime shipping activities subject to international competition;

- reimbursement of part of social contributions to passenger transport companies subject to this international competition.

## 6. Resources for inter-ministerial action for the sea

### Inter-ministerial action for the sea

Unit: million euros

	2006	2007	2008	2009
Operations	5.24	6.08	6.45	7.00
Investments	4.33	3.70	3.15	1.83
Total	9.57	9.78	9.60	8.83

Source: DAM

### 6.1. The control and surveillance system (DCS)

The DCS, as well as taking part in State action at sea and in implementing contingency plans (POLMAR, passenger rescue plans, etc.), mainly carries out its remit in the following frame of activities:

- marine fisheries (including the onshore supply chain and mariculture);
- shipping,
- yachting and recreational water sports;
- ship safety policing;
- marine environment policing.

The DCS has 27 operational units (275 staff) divided into two components, one offshore (2 maritime affairs patrol boats and 3 regional surveillance launches) and the other, more multipurpose, working in inshore waters and on shore (22 coastal units of the Maritime affairs services).

Located on the three seafronts of metropolitan France (19 units) and overseas (3 units), the Maritime affairs coastal units (ULAM) have 7 agents on average and mainly work to police fisheries (60% to 70% of their activity on land and at sea), shipping, or inspecting vessel safety standards. They have different types of seagoing facilities (coastal launches from 7 to 17 metres LOA, semi-rigid high speed crafts from 5 to 7.5 metres) and other specialized vehicles.

### 6.2. Polmar-terre onshore contingency plan

Polmar action has two components: Polmar-mer at sea and Pomar-Terre for shore. The aspects of the latter which fall under the aegis of the ministry in charge of the sea, are managed by the DAM.

In each county, a Polmar correspondent, working in collaboration with the head of "crisis management" or "safety-defence", is in charge of:

- keeping the ORSEC/Polmar-Terre county-level contingency plans up to date, as concerns aspects under the jurisdiction of the ministry in charge of the sea, i.e., determining which sites can be protected by floating booms, helping organise shoreline clean-up and the waste treatment supply chain;
- organising training exercises to deploy equipment and material. The DAM finances these exercises. The "post-Erika" regulations provide for their being scheduled once every three

years per county (this includes "head of staff exercises", which comes under the Prefectures alone).

In crisis periods, the Polmar correspondent or his line manager will be the Prefect's technical advisor.

In addition, the DAM, with the help of the Marine and river technical studies centre (CETMEF), manages eight "inter-county centres for storage and Polmar-terre intervention" in metropolitan France and five centres overseas. This action mainly consists in ensuring the maintenance of the special equipment and materials stored, adding to the lengths of floating booms available and replacing equipment which is too old.

To keep the Polmar-terre network operational, the DAM finances training for county correspondents and the personnel in the 13 inter-county centres for storage and intervention. These training courses are almost always provided by the Cedre (Centre for documentation, research and experimentation on accidental water pollution). The DAM also encourages the organisation of local training courses which are open to local authorities.

The DAM orders studies from Cedre and CETMEF. It is essential to increase knowledge and improve techniques that will provide better response to oil spills.

## 7. ENIM

The provident fund for naval personnel (ENIM) is a public administrative entity, manned by civilian staff and financially independent. It manages the special social security and retirement system for seafarers.

### ENIM budget

Unit: million euros

	2005	2006	2007	2008
<b>Costs</b>	<b>1528</b>	<b>1551</b>	<b>1568</b>	<b>1577</b>
Benefits, health and social action, transfers	1461	1489	1498	1500
Others costs and operations	67	62	70	77
Including staff costs	21	21	21	22
<b>Products</b>	<b>1559</b>	<b>1561</b>	<b>1537</b>	<b>1577</b>
Contributions and other income	737	729	710	683
State subsidy	822	658	653	719
CNAMTS subsidy (1)	0	174	174	175

(1) Financially secured with the general scheme. The CNAM covers part of the subsidy for the "Health and illness" aspect.

Source: Enim

The ENIM is the social security scheme for all professional seagoing personnel, in the merchant fleet, fisheries and commercial yachting. This special scheme covers all branches, except family insurance and offers protection for:

- risks of illness, maternity, invalidity, death and occupational accidents;
- and old age coverage.

Those insured are

- seamen working on merchant vessels and commercial yachts (15,400 in 2008), fishing and shell fishing vessels (20,200) and seamen who are authorised to validate their services on shore, and their beneficiaries;
- students in maritime courses (ENMM, occupational high schools);
- pensioned seafarers (123,000) and their beneficiaries.

## Coastal and marine environmental protection

Coastal environments are subject to numerous disturbances due to natural causes or related to human activities. To address the consequences of these disturbances, coastal and marine environmental protection policies have been set up both nationwide and in the framework of international institutions where France takes part. They focus on preventing, reducing and eliminating pollution; repairing damage; collecting, processing and disseminating environmental data.

### 1. Types of environmental protection spending

France has the second largest marine area under jurisdiction in the world, with over eleven million km<sup>2</sup> in eight of the 64 major marine ecosystems on earth. It holds 10% of coral reefs, 20% of atolls and 6% of seamounts and covers a range of very different environments such as the Southern seas, tropical zones in three oceans, the North Atlantic and the Mediterranean.

Assessing expenditure for protection is based on a typology breakdown of spending, depending on category of agents bearing the costs (households, private sector companies and public administrations) and their purpose.

- a) Expenditure by companies: compliance with environmental standards imposes additional costs on companies, but also stimulates certain economic activities associated with the protection of environmental quality. These costs correspond to spending on investments and to operations contributing to prevention, reduction or elimination of pollution generated by their activities.
- b) Expenditure by households: this mainly concerns the funding of individual or collective wastewater treatment, waste treatment and response to pollution (e.g. air, noise).
- c) Expenditure by administrations: spending on protection is generally incurred at the initiative and under the responsibility of public bodies, where local authorities shoulder almost one third of this expenditure.

The purposes for the spending for production fall under the following categories, in accordance with the Environmental economics and accounts committee's typology:

- a) Sustainable management of exploiting living resources, enabling exploitation and conservation to be compatible.
- b) Protecting natural assets, including several types of actions: (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) creation and management of marine protected areas (MPAs), (iii) restoring the coast (action against the erosion of the coastline, and replenishing beaches); and (iv) maintaining ecological balance (for example combating proliferating species)
- c) Pollution prevention and management. 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.

- d) Monitoring and management of natural hazards. For instance, water and phycotoxin monitoring networks, or systems for the detection of extreme climate events.
- e) Waste management: collection of macro-waste, management of dredging spoil.

Data on environmental protection spending are collected at national level. However, the coastal and marine subset of such expenditure is not systematically determined. This chapter presents the categories for which assessments are available and in so doing shows the gaps for which information is still needed

## **2. Expenditure related to sustainable management of the exploitation of living resources**

The intervention by public authorities in managing commercial exploitation of living resources is justified by the need to implement regulatory and financial mechanisms to ensure its sustainability. There are numerous items of expenditure for this management due to the large number of administrations and bodies involved at local, regional, national and international level. Amongst the cost elements to consider are:

- Administrative costs. Fishing and aquaculture industries are administered by the DPMA Marine fisheries and aquaculture directorate, DAM Maritime affairs directorate and other State administrations such as veterinary services. Their budget is not used exclusively for this purpose.
- Funding of scientific research required to take decisions: an overall estimate of public sector marine research spending in France is found in the next section.
- Inspection costs to ensure compliance with regulations. Control and inspection at sea requires extensive and costly resources. 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. Other types of control are carried out onshore.
- Other costs to support the industry involve aid for the regulation of markets and for innovation.

## **3. Expenditure concerning the protection of natural assets**

### **3.1. Protecting natural assets: coastal ecosystems**

Amongst actions taken for the protection of coastal ecosystems, financed in part by public funding, are the creation and maintenance of parks and reserves, inventories, regulatory protection, contractual protection, and land protection mechanisms.

The budget of the Ministry of Ecology, Energy, Sustainable Development and the Sea (MEEDDM) was 20 billion euros in 2009. Its breakdown reflects the priority given to the actions set out following the public consultation process and summit meetings for the Environment and for the Sea in 2007 and 2009.

The MEEDDM's programme for "Urban planning, landscapes, water and biodiversity" has been granted €333.3m. In this budget, biodiversity takes priority. So, after two successive increases of 30% in 2007 and 25% in 2008, the credits devoted to biodiversity progressed by 17% in 2009, bringing the budget to €205m.



France has undertaken to participate in action conducted on a global scale to stop the loss of biodiversity by 2010. This commitment is particularly linked to the outstanding natural assets it has in the overseas marine zones. The two main objectives set in the marine realm are:

- to implement a nationwide Marine Protected Area strategy to reach a coverage of 10% of territorial waters and the creation of 6 new marine nature parks by 2011;
- strengthening knowledge on marine and overseas areas, particularly by continuing studies on the Nature and landscapes information system (SINP).

### **3.2. The Agency for marine protected areas**

Under the aegis of the MEEDDM, the Agency for marine protected areas (AAMP) was created by the Act 2006-436 of 14 April 2006 concerning national parks, regional nature parks and marine nature parks. Its creation went along with the State project to create marine nature parks and shows the will to develop a national network of marine protected areas, with all their components and all the stakeholders involved. The Agency's main functions are:

- supporting public policies to create marine protected areas,
- co-ordinating the network of marine protected areas,
- allocating resources for marine nature parks,
- participation in setting up Natura 2000 at sea,
- and developing France's potential in international negotiations concerning the sea.

In 2009, the Agency will have the benefit of 77 full time equivalent jobs and a 12 million euros budget. The aim is to provide the Agency with 101 full time equivalents and 22.4 million euros by 2011.

The AAMP intervenes in the various categories of marine protected areas which are listed in the Act 2006-436 of 14 April 2006 concerning national parks, marine nature parks and regional nature parks: nature reserves, national parks, public maritime property allocated to the Coastal conservatory, Natura 2000 sites, and orders for the protection of biotopes and marine nature parks. Each MPA has its own organisation and budget.

### **3.3. National nature reserves (RNN) and of Corsica**

In May 2008, there were 327 nature reserves covering in all over 2,849,242 ha.

The Southern lands nature reserve was created in 2006, with a surface area of 2.27 million hectares off Antarctica, including 1,570,000 ha at sea. Two new RNNs were created in 2007 in the overseas Dom. They are the M'Bouzi islet RNN in Mayotte, covering 142 ha of which 60 ha are at sea and the marine RNN of Reunion Island, with its 3,500 ha. Finally, some thirty projects to create RNNs are being set up, of which one third concern the coast and mostly the coast of overseas France (nearly 11,000 ha).

### **3.4. National parks**

Following the Act 2006-436, two new national parks were created, i.e. the Amazon park in French Guyana and Reunion Island national park, neither of which have marine sections. However, a revision was begun in 2007 of the orders behind the creation of the existing parks, providing the opportunity for the public institutions of the Guadeloupe and Port-Cros national parks to redefine their scope. In Guadeloupe, several sectors, including the "Grand Cul-de-Sac marin" national nature reserve, could become "core park areas". Port-Cros national park has

defined a study area to identify its future adjacent marine area. In 1999, a public interest grouping was set up to prepare the creation of a new national park on the chalky hills of the rocky inlets of Marseille and Cassis, making 5,500 ha on land and 2,200 ha for the sea area

### **3.5. Public land acquisition**

The Coastal and lakeshore conservatory 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 becomes inalienable and cannot be resold. The Conservatory's range of intervention concerns 22 regions, 46 counties and 1,140 towns.

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

From its creation in 1975 until 1<sup>st</sup> June 2009, the Conservatory bought up more than 125,000 ha of property in 600 natural coastal sites, i.e. 1,000 km of shores (in metropolitan and overseas France, lakes and coastal lagoons). The Conservatory's amount of resources is estimated at 36 million euros in 2008, to which are added 5.8 million euros in equity and 0.9 million euros from subsidies and various allocations. This income is used for 71% as investment expenditure, 11% for staff costs and 18% for operating costs.

The estates purchased by the Conservatory are restored and developed for a cost evaluated at about 100 euros per hectare for 2006. According to the Conservatory, this relatively small sum can be explained by the use of low-intervention techniques aiming to foster the recovery of natural processes but also by intervention work of limited scope.

The Conservatory examined the site management overhead costs in a report published in 1995 (see bibliography). The report highlighted the difficulties of assessing costs with respect to management targets and the management structure itself. At an average of 380 euros per hectare (converted 1995 value), site "operating costs" (= costs – management earnings) vary from one to ten.

Two other public operators work in coastal land management:

- the National forestry office manages State-owned land;
- the counties buy up and manage land to be protected, using the optional county tax on sensitive natural areas, levied since 1985.

### **3.6. Contracts for protection: Natura 2000, Ifremer**

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 comprises 1,334 sites (4.6 million ha on land, i.e. 8.4% of metropolitan French territory), proposed to apply the European "Habitats" Directive, and 371 special protection areas (4.3 million ha on land, i.e. 7.8% of the French territory) designated for application of the "Birds" Directive. In application of the National Biodiversity Strategy adopted in 2005, this network should now be complemented for marine environments.

In late 2008, 76 marine sites (24,000 km<sup>2</sup>, out of the 320,000 km<sup>2</sup> of marine areas in metropolitan France) legally became part of the Natura 2000 network at sea.

Ifrecor ("French initiative for coral reefs") was launched in 1998 to protect the coral reefs in the seven French overseas communities (Guadeloupe, Martinique, Mayotte, Reunion Island, New Caledonia, French Polynesia and Wallis & Futuna). The State is directly financing Ifrecor over the period from 2006-2010 to the amount of some 500,000 euros per year.

### **3.7. Biotope protection orders**

Biotope protection orders allow the state administration to establish measures to promote the conservation of biotopes on all or part of the territory that are required for feeding, breeding, resting or survival of protected species. These biotopes can be ponds, swamps, marshes, hedgerows, copses, moors, dunes, swards or any other natural formations that are not exploited by humans much. 600 biotope orders cover more than 300,000 ha of French territory. 24 orders concern coastal and halophilic habitats (i.e. 4.5%).

### **3.8. Marine nature parks**

Act 2006-436 created a new type of marine protected area: the marine nature park establishes a management mode associating local elected officials, State services, users and professional users of the sea, scientists and environmental NGOs.

The Iroise park, created in 2007, is located at the west tip of Brittany, stretching from the south of the isle of Sein to the north of Ushant island and seaward to the boundaries of French territorial waters. Its surface area covers 3,500 km<sup>2</sup>. The management board must develop and implement an action plan that aims to acquire knowledge on the marine environment, protect the marine area and develop sea dependent activities. Other marine nature parks off the coasts of metropolitan France and overseas are being studied.

### **3.9. Regional nature parks**

The regional nature parks (PNR) are vast areas managed under a 12-year charter approved by the local authorities and the State. Ten regional natural parks include portions of coastline (mainland or overseas).

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 the maritime parts of its coastline. When a PNR is neighbouring a marine nature park, the two entities should have coherent objectives and, wherever possible, take coordinated measures.

## **4. Combating invasive species**

Some species have been accidentally introduced to coastal ecosystems. When their development brings about significant changes in the characteristics of these ecosystems and creates nuisances for coastal users, measures to stop their spread are required. Both public and private sector spending contributes to protecting the coastal environment.

This type of problem arises for certain species of macroalgae. Besides ulva, other known cases involve some brown algae and a tropical green algae called *Caulerpa taxifolia*.

The crepidula, or slipper limpet, now occupies a significant place in shallow, sheltered areas like bays and estuaries. The gulf between Normandy and Brittany is the most colonised sector, particularly the Saint Brieuc and Mont-Saint-Michel bays. The mean unit cost of removing them was estimated at nearly 12 euros excl tax per tonne collected in 2005.

## **5. Expenditure for pollution prevention and management**

Many human activities are directly or indirectly affected by phenomena of coastal water pollution through the contamination of aquatic ecosystems. This vulnerability has led to various nationwide measures to protect water quality being implemented. The core measures include monitoring networks, action taken by the Water Agencies and programmes for waste water management.

### **5.1. The water framework directive (WFD)**

The directive of the European Parliament and Council 2000/60/EC of 23 October 2000, establishing a framework for community action in the field of water policy, has the overall objective of achieving “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 to classify ecological status, specifying the compulsory parameters for coastal waters.
- The standard setting definitions of environmental status for rivers, lakes transitional waters and coastal waters, as well as the definitions of maximum, good and moderate ecological potential and chemical quality standards.

The WFD was transposed into French law on 21 April 2004 (Act 2004-338). It shall be applied by the Water Agencies, through the new multi-annual programme (2007-2012) which allocates a budget of 12 billion euros per year. The ONEMA national office for water and aquatic environments, created by the law 2006-1772 on water and aquatic environments, has the remit to improve knowledge of aquatic environments and develop and monitor the working of hydro-systems.

### **5.2. Coastal water and resource monitoring networks**

The main aims of these networks are: a) prevention through monitoring of health and environmental hazards, b) building fundamental scientific knowledge required to draw up 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; and benthic flora and fauna.

### 5.2.1. The recreational water quality inspection network

Recreational waters inspections are carried out under the authority of the minister in charge of Public health, by the DDASS county-level directorates for health and social affairs. Coastal and fresh water monitoring is done in 1,760 coastal towns in metropolitan France and overseas during the summer holiday season. The number of monitoring points at sea went from 591 in 1975 to 1968 in 2008.

### 5.2.2. Monitoring networks operated by Ifremer

At national level, Ifremer is one of the main players in coastal environmental monitoring.

- In 2008, the monitoring network for coastal chemical contamination (ROCCH) followed on from the RNO national seawater monitoring network, set up in 1974 by the Ministry in charge of the Environment and coordinated by Ifremer. It produces monitoring data on chemical contaminants (heavy metals, PCB, PAH, pesticides) in water, including in shellfish farming zones, in application of the WFD and response to the OSPAR and Barcelona conventions. Water quality parameters are monitored in 12 sites, two of which are in the West Indies.
- The phytoplankton and phycotoxin monitoring network (REPHY) was created in 1984 with the following objectives: (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 the state authority to prohibit the sale and harvesting of shellfish.
- The aim of the national REBENT network is 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 laws 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, following expert assessment by Ifremer. 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, is used to assess performance of survival, growth and quality of Pacific oysters, by rearing area and over time. It has two objectives: as a shellfish farming ecosystem management aid and in providing historical series to be used for scientific studies. It is based on annual monitoring of two batches of oysters in the main French oyster-farming areas.
- The mollusc pathology network (REPAMPO), 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 monitors diseases which must be declared and farmed and wild bivalve mollusc populations, studies causes of abnormal mortality and inspects molluscs traded with European or third countries

The annual overall cost of the monitoring programme varies from 10.7 and 12.2 M€ (staff costs included). Monitoring manpower resources represent 140 full time equivalents on average. Temporary workforce requirements account for between 9 and 12% of Ifremer's permanent staff time.

### **5.2.3. Other monitoring networks**

Local measurement networks have been set up on the scales of estuaries or county coastlines. 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 coordinate 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 seafront.

In the field of sanitary microbiology, the DDASS is in charge of monitoring the healthiness of recreational shellfish harvesting area along the French coasts. The CQEL coastal water quality units are in charge of monitoring harbour water quality and hydrological features of major estuaries under Ifremer's coordination. The national sea port surveillance network (REPOM), is implemented by these units and covers 186 ports in metropolitan France and three overseas harbours.

The INSU National Institute for Earth Sciences and Astronomy, 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.

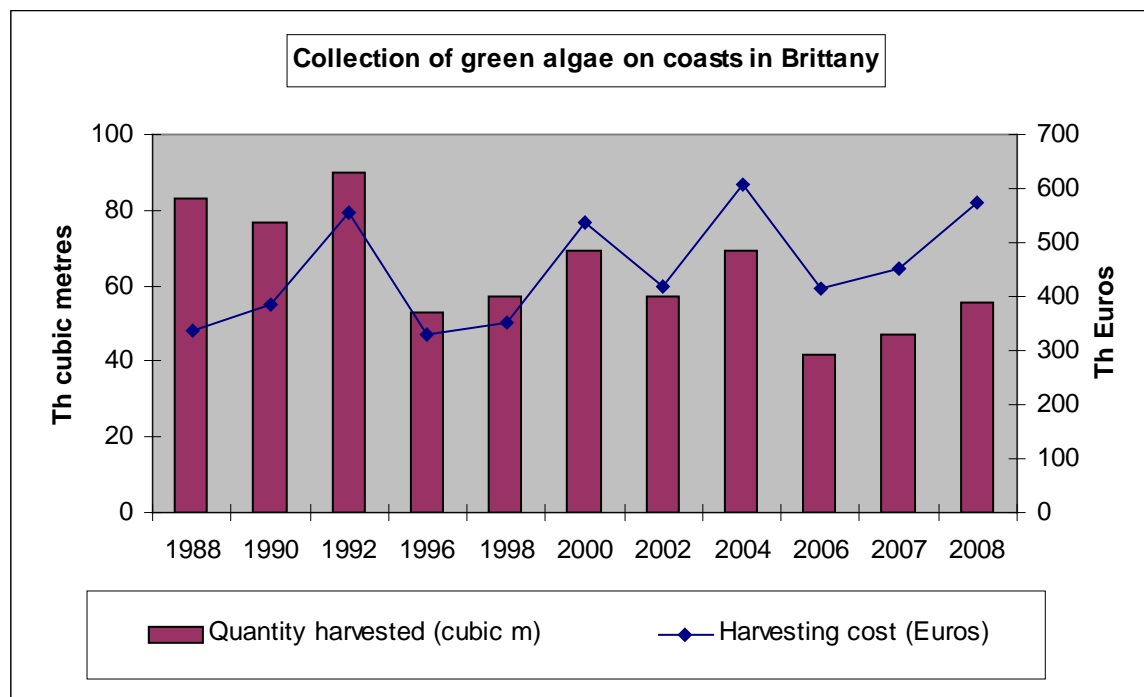
### **5.3. Green algae proliferation response**

Blooms of macrophytic green algae (notably ulva and enteromorphs) mainly occur in late spring and early summer, affecting many coastal sites in Europe. In France they have affected lagoons in the Languedoc, the Arcachon basin and above all the shores of Brittany.

Their proliferation 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 algae blooms have far-reaching economic and social consequences for regional tourism: they release foul-smelling volatile sulphur compounds into the air and physically hinder recreational activities on the coast. They affect shellfish farming and certain fisheries by making harvesting difficult and through ecological disturbances resulting from high densities of macroalgae.

The "Prolittoral" programme (2002-2006) was implemented by local and regional authorities in Brittany and the Water Agency to respond to the phenomenon through prevention (limiting nitrogen inputs from farming), collecting and recycling the algae and environmental monitoring. Total spending from 2002-2006 was estimated at nearly 10 million euros, 5 million of which are used for preventive action (source: CEVA).

On average, the volume of ulva collected 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 amount collected was recorded in 1991 - nearly 100,000 m<sup>3</sup>; 2006 was a low point (due to a bloom of shorter duration), with 42,000 m<sup>3</sup> collected. The seaweed removed is generally spread fresh on fields, composted or put into land-fill, in that order of importance.



Source: CEVA

#### 5.4. Accidental marine pollution response

The organisation of accidental marine pollution response still in effect today is based on 12 October 1978 POLMAR instructions. The objective was to set up an operational pollution prevention and response system. The arrangement comprises:

- “POLMAR-mer” (seagoing action component), which is the responsibility of the state authorities at sea and involves several ministries, mainly that of Defence;
- and “POLMAR-terre” (on shore action component), which is the responsibility of the state authorities at county level, with, for most, participation of the Ministry of Transport and the Sea.

POLMAR is part of the Orsec maritime plan (Act 2004-811 “for modernisation of civil security”).

The main onshore structures of the POLMAR system are:

- 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 per year, including 686,000 euros in operating costs and 1.9 million euros in investments. On average, the DAM spends from 125,000 to 155,000 euros per year on studies and research. The French Navy’s CEPPOL anti-pollution practical studies commission is in charge of evaluating the needs for

response at sea, and purchasing and managing POLMAR-mer plan equipment, material and product stocks. The Cedre is in charge of documentation, research and on-going experimentation on pollution response techniques, equipment, material and products, as well as providing operational advice in emergency situations.

- At county and local levels: the county subdivisions of the DAM act as a local relay for the state administration. They also play an important role in linking POLMAR-mer and POLMAR-terre. Other county divisions of the state administration play a role in operations using pollution prevention and response equipment.
- At inter-county level: there are 13 storage centres across the country (8 of them in metropolitan France) for specialised equipment ready for use in the event of alert.

Since the sinking of the Erika and the Ievoli Sun, changes have been made in the POLMAR system regulations. Decree 2002-84 of 16 January 2002 concerning the powers of state authorities in the zone, along with several instructions aim to streamline use of existing organisations and resources to better combat pollution.

Along with monitoring and action plans to prevent and fight pollution, expert studies on damage and health, food and environmental risks following the pollution event are provided for.

The European “Stand-by Oil Recovery Vessel Network”: the European Maritime Safety Agency tenders for bids 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).

#### **Spending to protect and improve the health of marine waters in 2007**

Total	9 million euros
Pro littoral greentide response programme	37%
POLMAR-terre	32%
POLMAR-mer	12%
Cedre	19%

Sources: Cedre, SOES

## **6. Fighting coastal erosion**

The processes of erosion present risks for the equilibrium of ecosystems, as well as economic ones since they can destroy infrastructures, inhabitable areas or those used for human activities. These problems affect coastal regions to varying degrees: approximately 20% of the world's coastline consists of beaches, 20% of which are relatively stable, 70% are being eroded and 10% are advancing. These processes are often reinforced by human activities, such as changes to water courses, construction of dams, clearing of coastal land, urban development on the shore or building badly designed protective structures. The protection mechanisms used often consist in artificially replenishing or building-up the shore or constructing defences.



One fourth of the French coastline, i.e. 1,700 km is subject to erosion, mainly on sandy coasts. Nearly 44% remains stable. 9.5% of it is advancing on the sea, involving mud flats and marshes which accumulate marine and terrestrial sediments.

In 2004, nearly 20% of the European coastline underwent erosion. The European Commission- funded Eurosion study estimated the public spending of EU Member States for the protection of coastlines at approximately 3.2 billion euros in 2001, of which 53% went to new investments, 38% for maintenance and 9% for the acquisition of land and property threatened by coastal erosion.

## **7. Waste management expenditure**

### **7.1. Water agencies and waste water management**

Hydrographic networks are a major vector for polluting phenomena impacting the coastal environment and waters. Therefore, action taken by water authorities upstream from the coast is vital in this field.

The six agencies (Adour-Garonne, Artois-Picardie, Loire-Brittany, Rhine-Meuse, Rhone-Mediterranean and Corsica, Seine-Normandy) collect contributions from corporations or individuals for water abstraction (potable water, industrial uses, irrigation) and for industrial (wastewater spills in natural habitats or public sewage treatment networks) and domestic pollution (paid by towns).

The proceeds from these contributions are redistributed as aids to finance operations of pollution response, environmental protection or improving access to water resources. The authorities distribute the funds on the basis of a five year intervention programme.

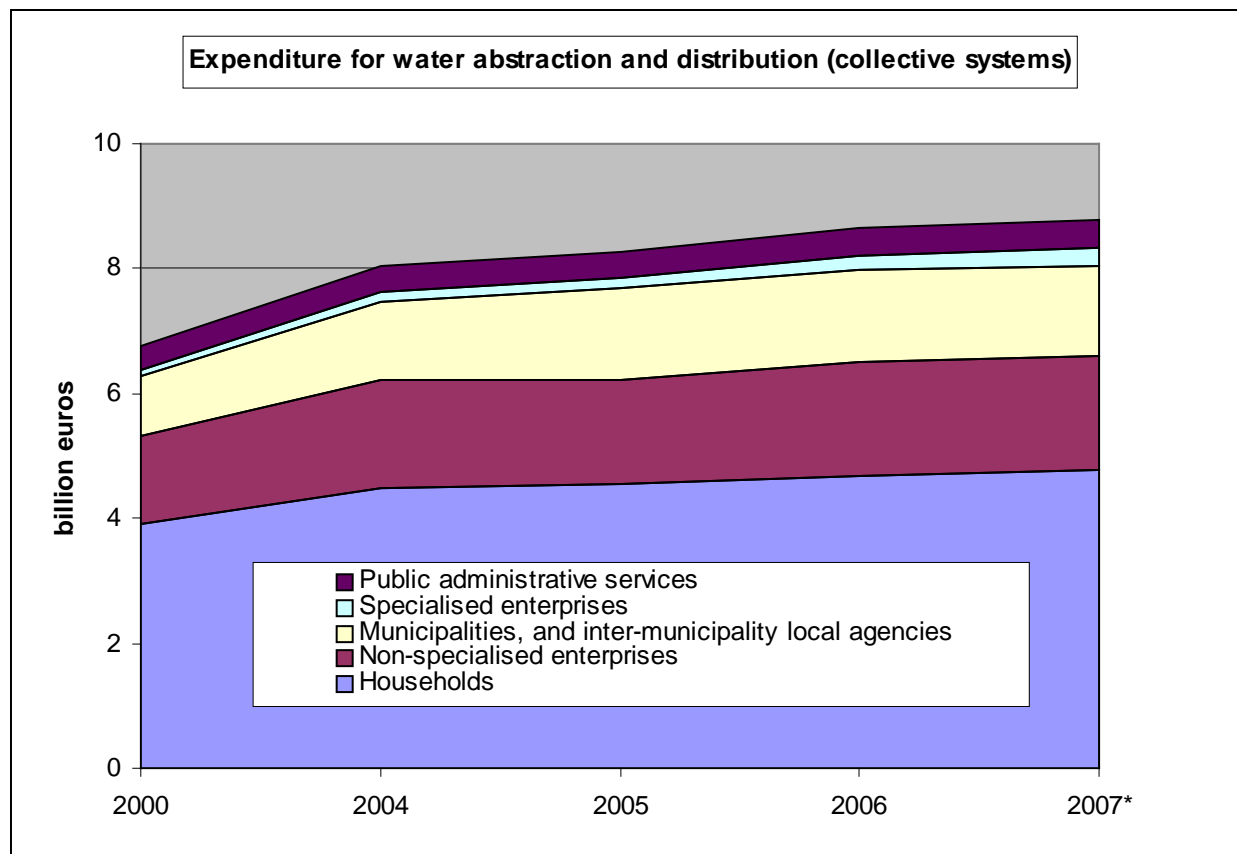
#### **Investment aids for pollution response by user category**

Total	1,077 million euros
Industry	11%
Agriculture	7%
Local authorities	82%

Source: Draft Budget 2008

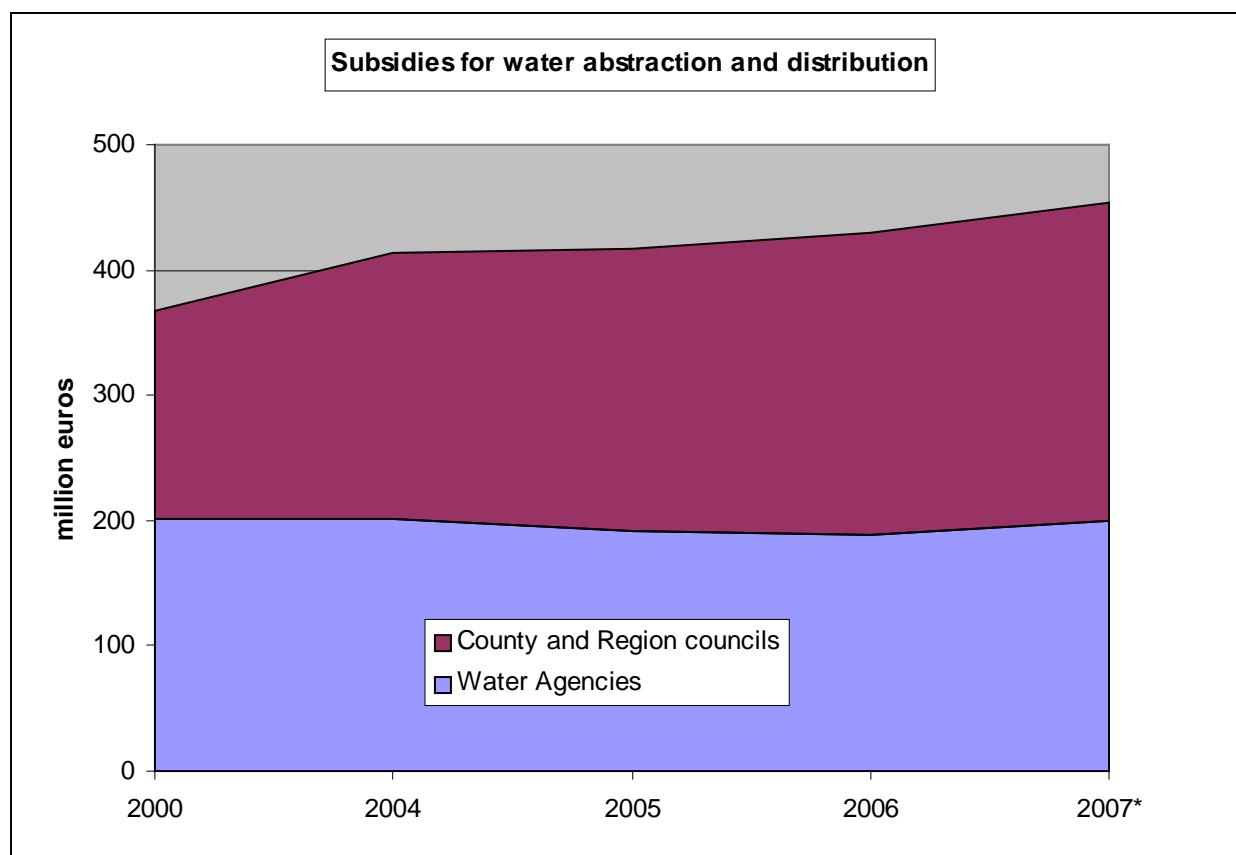
## 7.2. Waste water management expenses

The proportion spent on wastewater management has sharply dropped with respect to overall spending. This is financed by firms, households, public administrations and companies specialised in collecting and treating wastewater. Communal and inter-communal services for wastewater management receive financial assistance from water authorities as well as from county or regional councils. In some areas, special funding is available from the ministry of Agriculture or the European Commission.



\*Forecast

Source: Report of the Environmental economy and accounts committee



Source: Report of the Environmental economy and accounts committee

### 7.3. 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 in recent studies have shown that this type of pollution has become usual along all seafronts. 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 macro-waste seems to be in the Mediterranean. Collecting and processing the waste is the only way of dealing with this form of pollution.

A decree from 14 May 1974 states that cleaning the coast, and particularly beaches, falls 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.



## Marine research

Marine research and operational oceanography cover several specialities, most often developed within international programmes, in keeping with the scale of the problems for ocean and environmental status. The activity involves a small number of public organisations, some of which work in several fields.

### 1. Marine research themes and organisations

Ifremer, university and CNRS (National Centre for Scientific Research) oceanography laboratories, the SHOM French Navy hydrographic and oceanographic service, the IRD Research Institute for Development and the IPEV Paul-Emile-Victor Polar Research Institute are the main scientific organisations in public-sector ocean and marine research. Earth-observation satellites provide an additional spatial component for oceanographic research. They are financed by the CNES National Centre for Space Studies, generally in the framework of bilateral or multilateral co-operation.

Ifremer also creates and manages 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. Through Génavir, it commissions coastal and deep sea vessels.

The national ocean-going research fleet includes five Ifremer vessels, two of them RV “Pourquoi pas?” and RV Beautemps-Beaupré shared with the French Navy, an IPEV vessel and two vessels for the IRD. The coastal fleet includes three inshore vessels managed by INSU National Institute for Earth Sciences and Astronomy and owned by CNRS, and four for Ifremer.

Ifremer implements and programmes its deep sea vessels, joint resources like seismic equipment and underwater vehicles (Nautile, Victor 6000 and SAR) for:

- studying ocean circulation,
- studying carbon, nitrogen and phosphorus cycles and budgets,
- studying and exploring the ocean floors,
- studying deep benthic ecosystems in the hydrothermal domain and on continental margins,
- fish stock assessments, relations between stocks and their environment,
- complementing the inshore vessels in studying marine environment contaminants, matterflows, nutrients and impacts from human activities.

Ifremer operates several monitoring networks for the coastal marine environment and takes parts in fish stock assessments. It conducts research programmes on the environment, resources and their use. Genavir is an economic interest group which operates a large part of the ocean research fleet on its own and other partners' behalf.

Oceanography research conducted at the CNRS is mainly devolved to the Department of Earth sciences and astronomy and the INSU. It focuses on the ocean, climate, global environment, marine biosphere, dynamics of the solid earth and the coastal environment.

They involve over forty laboratories (CNRS or associated). Thirteen marine stations work on marine species biology, marine ecosystems, ocean circulation and flows, marine environmental chemistry and marine geology.

Several universities are involved in ocean research, like Bordeaux I, Brest, Lille I, Marseille II, Paris VI, Caen, La Rochelle, Littoral-Côte d'Opale and Perpignan.

Oceanography's spatial dimension is provided by the Earth observation satellites launched by the CNES and the ESA European Space Agency. By gathering satellite data, the CNES can study the mesoscale ocean, coastal regions and continental waters and ice.

The SHOM had 675 staff members as of 31/12/2008 (i.e., approximately 660 fte), including 155 sea-going personnel and conducts research on the physical marine environment. As a hydrographic service, it exercises State assignments for hydrography in zones under French jurisdiction; as a State service, it provides expertise to operationally support both Defence and State action at sea. The military oceanography centre (CMO) supplies French Navy forces with ocean and meteorological data and the means to use them. The CMO holds the BRESM (SHOM-Météo research and study office). The SHOM's main establishment (EPSHOM) is in charge of centralising, processing, formatting and disseminating data on operational hydro-oceanography.

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, marine ecosystems, living resources and their exploitation.

#### Civilian marine research effort by main organisations

	Total spending (million euros)		including staff costs (million euros)		Labour force	
	2007	2008	2007	2008	2007	2008
IFREMER (1)	210.5	217.3	102.1	106.9	1526	1546
CNRS-INSU-universities (2)	100	100	65	65	1100	1100
IPEV	10.1	10.1	0.2	0.2	6	6
IRD	23.9	26.5	16.2	17.3	204	219
INRA	13.3	13.3	7.4	7.4	153	153
Genavir (3)	35.5	36.7	21.9	22.6	376	334
<i>Genavir crew manpower (3)</i>					262	221
<b>Total</b>	<b>393.3</b>	<b>403.9</b>	<b>212.8</b>	<b>219.4</b>	<b>3365</b>	<b>3358</b>

(1) Full time equivalents, all Ifremer activities, scientific and administrative staff; labour force not including Genavir

(2) Ifremer estimations based on information from CNRS.

(3) Budget 2007, provisional budget 2008, number of salaried employees

Sources: IFREMER, CNRS, IPEV, IRD, INRA

The IPEV is a public interest grouping created in 1992, which selects, finances and implements scientific programmes in polar and sub-polar regions. Its research mainly focuses

on internal and external geophysics, physics of the upper and lower layers of the atmosphere, glaciology, marine and continental biology, oceanography and medicine.

The other principal research bodies involved in ocean studies are:

- Météo-France (French Meteorological office), on ocean-atmosphere interactions and climate fluctuations;
- INRA: biology of farmed fish species, their physiology, nutrition, genetics, pathology; assessing global impacts of aquaculture; hydrobiology and aquatic ecosystems and the ecology of migratory fish species;
- CIRAD Agricultural Research Centre for Development: fisheries and coastal biodiversity;
- BRGM Office for Geological and Mining Research, amongst other subjects, working on geological mapping of the continental shelf, knowledge about phenomena at the ocean-continent interfaces, such as inputs from catchment areas.

## **2. Operational oceanography**

Operational oceanography aims to supply a real time description of the 3D hydrological structure of the ocean and marine currents. It uses data from in situ measurements on buoys or vessels, or from satellites. Numerical models are used to forecast oceans trends (wind, waves, surface currents, tides, sea ice, and surface temperature). Final products are disseminated to private end users and to public bodies.

### **2.1. Participants and activities**

Ifremer's operational activity falls into three main fields: managing coastal water quality monitoring networks, ocean circulation and cruises related to physical oceanography and fisheries science.

Deep sea circulation studies include three components:

- Routine in situ ocean measurements. The Coriolis project (Ifremer, CNES, CNRS, IPEV, IRD, Météo France and SHOM) aims to collect, validate and provide real time availability of ocean temperature, salinity and current profiles. The project coordinates the French contribution to the Argo world ocean observation programme.
- Satellite altimetry missions, with Jason 1 launched in 2001 and Jason 2 in 2008 (partnership: CNES, Nasa, Eumetsat, NOAA), take routine sea level measurements accurate to a few centimetres, for purposes of ocean, climatology, marine meteorology and geophysical studies on a global scale.
- Modelling the ocean. Observation data are used by several secondary data producing systems for ocean analysis and forecasts. One of them is "Mercator Océan", a public interest grouping created in 2002 (CNES, CNRS, Ifremer, IRD, Météo-France and SHOM).

Météo-France works in operational oceanography on ocean-atmosphere interactions. It supplies marine forecasts for offshore safety and for the protection of French coasts. It is involved in:

- in situ data acquisition in an international framework and nationwide through Coriolis,
- satellite data acquisition and processing,
- routine production of sea surface temperature analyses, using in situ data and satellite images,

- forecasting dangerous ocean phenomena (waves, tropical cyclones, low levels, surges) and technological hazards (drifting oil slicks or wrecks),
- global and regional ocean modelling within Mercator-Ocean's activities, as well as in European programmes such as the MFS (Mediterranean Forecasting System),
- data archiving and satellite imaging.

In this way, the organisation takes part in the Global Maritime Distress and Safety System (GMDSS), covering the eastern Mediterranean and part of the Atlantic and Indian oceans. For the POLMAR-mer contingency scheme, it is in charge of predicting drifts, along with Cedre.

## 2.2. Operational oceanography programmes

They aim to both refine and integrate services proposed on a world scale and to refine services on a more local scale.

- Coriolis, Jason projects and Mercator modelling contribute to the international programmes Godae (Global Ocean Data Assimilation Experiment) for modelling and Argo for in situ measurements.
- The EU MERSEA (Marine Environment and Security for the European Area, 2004-2008) project has set up a European system to monitor and forecast the world ocean and European regional seas, and their physical and bio-geochemical properties. The goal is to monitor the global environment's state and climate change, seasonal forecasting, safety at sea, developing applications for offshore industry and fisheries, responding to accidents or pollution and defence requirements, as well as drawing up and following international conventions. MERSEA has federated the European contribution to Godae to produce services required for GMES marine applications.
- The GMES (Global Monitoring for Environment and Security) system, as the European component for Earth observation has a marine strand, supplying pre-operational data since 2008 and entering its operational phase in 2011. It makes up the European contribution to the Global Earth Observation System of Systems (GEOSS) (February 2005).
- MyOcean (2009-2011) is the setting up of GMES core marine services. It is co-funded by the European Commission and aims to supply the most comprehensive information about the state of oceans on global and regional scales.
- Previmer produces real time (in situ and remote sensing) observations, modelling tools and forecasts for the marine environment in coastal zones on spatial scales ranging from seafront to bay, with the ability to zoom in locally. These applications are performed in partnership between public marine research (Ifremer, SHOM, Météo-France, IRD and IUEM), industry (consultancies, ocean instrumentation engineering firms) and the Brittany regional council.

Previmer aims to provide coastal services which are mainly turned towards the needs of local authorities, environmental management organisations and users of coastal areas for boating, rock pool fishing and other recreational activities, microbiological water quality, monitoring terrigenous flows, strengthening maritime and naval safety, assistance for accidental pollution response, impact studies for coastal activities, scientific knowledge of the environment, including its biological aspects and coastal "climatology".



### 2.3. The ocean research fleet

Along with satellites and autonomous floats, ocean research vessels and submarine vehicles are essential facilities for acquiring the scientific data required for marine research. As both needs and equipment become increasingly sophisticated, the cost of facilities is a major constraint for scientific organisations holding their own vessels, making up 40 to 50% of total costs of marine research.

The solutions being sought aim to optimise the use of facilities through coordination: the OFEG (Ocean Facilities Exchange Group) is a ship-time exchange system involving six European countries: the United Kingdom, Germany, France, the Netherlands, Spain and Norway. The EC encourages coordinated use of research infrastructures through the *Integrated Infrastructures Initiative* (I3), which provides a contract-based framework for the networking of these facilities.

The EU-funded Eurofleets project was launched in September 2009, bringing together 24 institutes in 16 European and associated countries. It will study: a) networking for better coordination of research vessel use; b) transnational access to vessels by research teams and c) pooling research activities to upgrade vessels and improve their interoperability. The total budget is 7.2 million euros over four years.



**Summary**

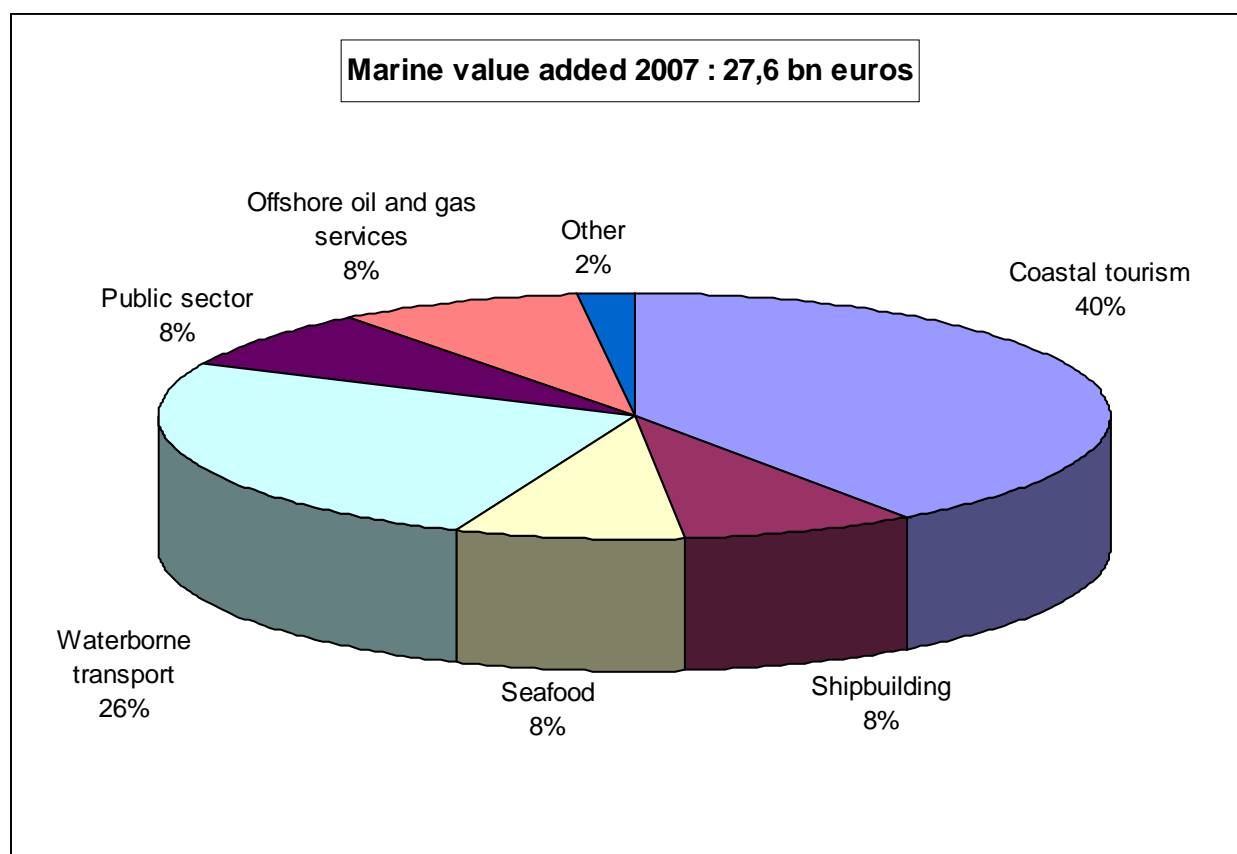
**Bibliography**

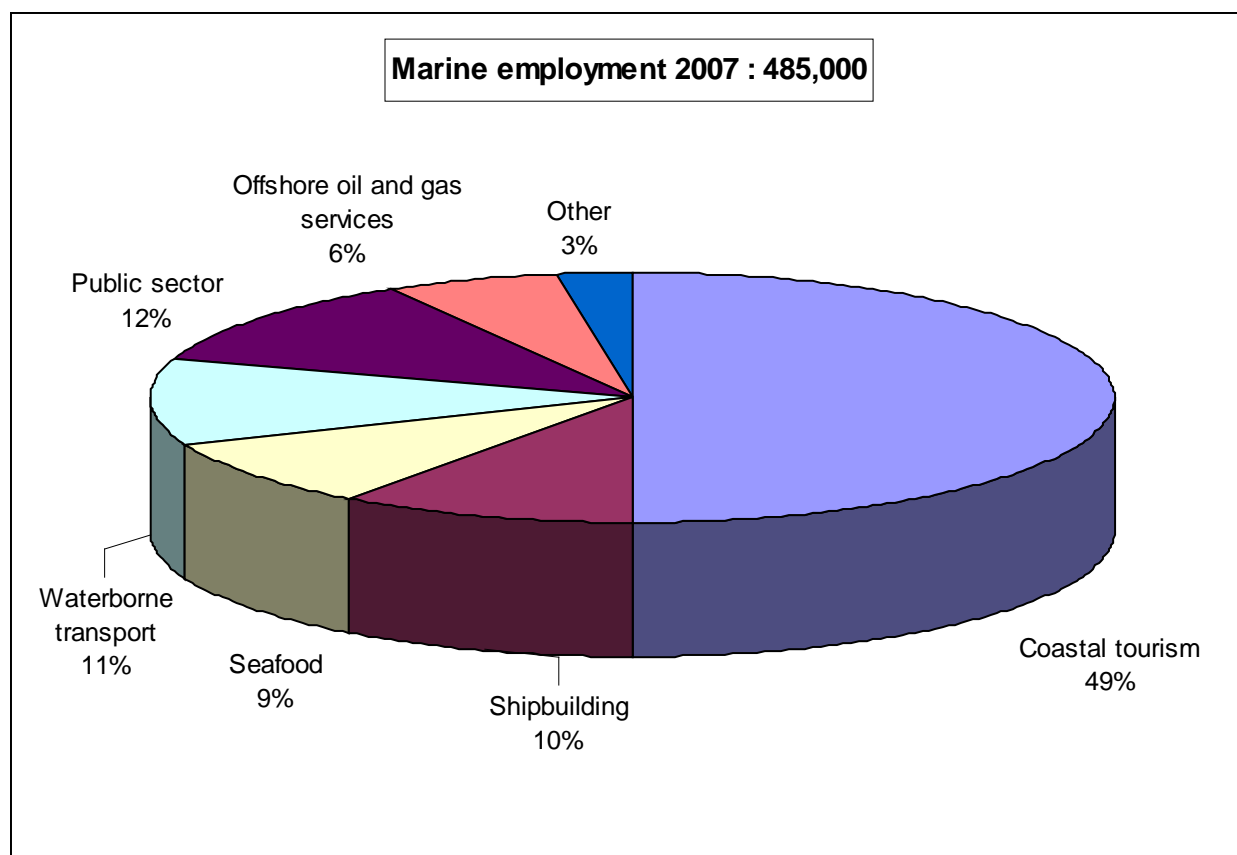


## Summary: the French marine economy in 2007

The assessment focuses on 2007, the last year for which a full set of data was available during the preparation of the present report. In 2007, the French marine economy displayed the following features:

- A value added of nearly 28 billion euros
- A labour force of nearly 485,000 jobs
- Tourism remains the predominant activity, representing nearly half of maritime employment.
- In terms of output, inshore and sea shipping and sea ports make up the second aggregate by size, with one quarter of the added value.
- The offshore oil-related industry, shipbuilding, the seafood sector and the public sector are the other fundamental aggregates making up the French marine economy.
- Coastal tourism contributes more to employment than to value added. Conversely, shipping and offshore oil contribute much more to the value added.





With respect to the revised data for 2005, the year described in the previous edition of this report, strong growth in value added (+25%) and a clear, albeit more moderate, rise in marine and maritime employment (+9%) can be observed. This fact shows how sensitive the marine economy is to the international economic context. In particular, three key factors should be emphasised:

- the very high growth in added value for shipping, in phase with that of international trade during the period 2005-2007;
- equally strong growth in tourist spending over that period;
- the continuing dynamic growth in boat building.

The other points to note are:

- a downturn in value added and employment in the seafood supply chains in 2005-2007,
- an ongoing decrease in the numbers of French Navy personnel.

Finally, a reminder of the problematic points for the estimates presented in this report is necessary. Firstly, those concerning coastal tourism are based on the tourism satellite accounts, constructed using a method which is undergoing modification. It will be essential to adjust our results – and our appraisal of the marine economy – to this significant development. Secondly, some double accounts could not be eliminated. This is the case for construction of offshore platforms and LNG carriers, respectively taken into account in maritime civil engineering and in shipbuilding, and taken from initial sources in estimations for the offshore oil-related industry.

**Marine activities 2005-2007**

Units: million euros, number of jobs

	2007			2005 (7)		
	Turnover	Value added	Employment	Turnover	Value added	Employment
<b>Industrial sector</b>		<b>25 435</b>	<b>428 604</b>		<b>20 126</b>	<b>383 837</b>
<b>Coastal tourism (1)</b>	<b>33 870</b>	<b>11 080</b>	<b>242 558</b>	<b>28 550</b>	<b>9 220</b>	<b>207 684</b>
<b>Seafood sector</b>		<b>2 129</b>	<b>42 335</b>		<b>2 313</b>	<b>47 489</b>
<i>Marine fisheries</i>	1 015	634	11 396	1 036	643	11 937
<i>Mariculture</i>	610	426	10 394	592	414	11 187
<i>Seaweed harvesting and processing</i>	425	110	1 655	300	185	1 800
<i>Wholesale trade (2)</i>	4 009	447	7 740	4 302	433	8 579
<i>Processing</i>	2 801	512	11 150	3 150	638	13 986
<b>Shipbuilding</b>		<b>2 272</b>	<b>48 429</b>		<b>1 775</b>	<b>38 107</b>
<i>Merchant vessels</i>	1 065	211	3 650	617	77	3 708
<i>Navy vessels</i>	2 126	834	11 995	2 324	912	12 159
<i>Marine equipment</i>	2 300	600	22 000	1 000	300	12 000
<i>Ship repair</i>	302	99	1 533	213	76	1 667
<i>Boat building</i>	1 573	528	9 251	1 271	410	8 573
<b>Maritime and river transport</b>		<b>7 098</b>	<b>54 704</b>		<b>4 278</b>	<b>52 642</b>
<i>Sea and coastal waterborne transport</i>	10 469	4 712	14 346	7 726	1 999	13 307
<i>Inland navigation</i>	633	235	3 822	571	216	3 912
<i>Maritime insurance</i>	1 277	508	4 183	1 256	553	4 398
<i>Sea and river port services (3)</i>	1 297	949	8 706	1 271	920	9 685
<i>Port handling and stevedoring</i>	1 035	694	5 638	901	590	5 192
<i>Other harbour businesses (4)</i>			18 009			16 148
<b>Marine aggregate extraction (5)</b>	<b>75</b>	<b>25</b>	<b>100</b>	<b>25</b>	<b>10</b>	<b>100</b>
<b>Electricity generation</b>	<b>na</b>	<b>na</b>	<b>6 539</b>	<b>na</b>	<b>na</b>	<b>6 475</b>
<b>Maritime civil engineering</b>	<b>1 296</b>	<b>381</b>	<b>4 720</b>	<b>1 000</b>	<b>308</b>	<b>3 499</b>
<b>Submarine cables</b>	<b>758</b>	<b>150</b>	<b>1 419</b>	<b>613</b>	<b>110</b>	<b>1 641</b>
<b>Oil and gas offshore services</b>	<b>8 000</b>	<b>2 300</b>	<b>27 800</b>	<b>6 100</b>	<b>2 112</b>	<b>26 200</b>
<b>Non-commercial public sector (6)</b>		<b>2 163</b>	<b>55 944</b>		<b>1 861</b>	<b>59 570</b>
<b>Navy</b>		<b>1 750</b>	<b>49 279</b>		<b>1 481</b>	<b>53 259</b>
<b>Public intervention</b>		<b>200</b>	<b>3 300</b>		<b>200</b>	<b>3 300</b>
<b>Civilian marine research</b>		<b>213</b>	<b>3 365</b>		<b>180</b>	<b>3 011</b>
<b>Grand total</b>		<b>27 598</b>	<b>484 548</b>		<b>21 987</b>	<b>443 407</b>

(1) Source data being revised

(2) Including fish auctions

(3) Including port authorities and shipping agents

(4) Employment not including port authorities, handling, pilotage, boatage, tow age. Shipping agent jobs included.

(5) Extraction only: not including processing.

(6) Ifremer estimation of value added based on personnel costs. Sources: Naval chief of staff, ministries and research organisations.

(7) Revised data

na: not available





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## Acronyms and abbreviations

AAMP	Agency for marine protected areas
ACOSS	Central agency for social security organisations
Ademe	Agency for the environment and energy management
APB	Lighthouse and beacon service
ASM	Anti-submarine frigate
ASN	Nuclear security authority
BPC	Command and Force Projection Ship
BRESM	Shom-Météo France research and study bureau
BRS	Barry-Rogliano-Salles
BTP	Civil engineering and public works
CEDRE	Centre of documentation, research and experimentation on accidental water pollution
CELRL	Coastal and lake shore conservatory
CEPPOL	French Navy commission for practical studies in anti-pollution response
CERO	Western France centre for maintenance and repair
CESA	Community of European Shipyards' Associations
CETMEF	Marine and river technical studies centre
CEVA	Seaweed technology research centre
CGT	Compensated gross tonnage
CIRAD	Centre for international cooperation in agricultural research for development
CLI	Local information commission
CMO	Navy oceanography centre
CNAMTS	National health insurance fund for salaried workers
CNES	National space research centre
CNRS	National centre for scientific research
CNUCED	United Nations conference on trade and development
CQEL	Coastal water quality unit
CROSS	Regional search and rescue centre
DAM	Maritime Affairs directorate
DCS	Control and surveillance system
DDAM	County-level division of Maritime affairs
DDE	County-level directorate for public amenities
DGITM	General directorate of infrastructures, transport and the sea
DGPS	Differential global positioning system
DOM-TOM	French overseas administrative counties and territories
DPMA	Maritime fisheries and aquaculture directorate
dwt	Deadweight tonne
EAE	Annual company survey
EDF	French electricity board

EEZ	Exclusive economic zone
EMEC	European Marine Equipment Council
ENIM	National provident fund for seafarers
ENMM	French merchant navy school
ENSM	National maritime college
EPA	Public administrative establishment
EPIC	State-funded industrial and commercial establishment
EPSHOM	Main French navy hydrographic and oceanographic department
ESDP	European Security and Defense Policy
ESM	Marine signalling establishment
EUMARC	EU Maritime Response Concept
EUROMARFOR	European maritime force
EWEA	European Wind Energy Association
FFPP	French federation of yachting harbours
FFSA	French federation of insurance companies
FIN	Federation of nautical industries
FNFA	Franco-German naval force
FNTP	National federation of public works
FREMM	Multi-mission frigate
FSU	Floating Storage Unit
GDP	Gross Domestic Product
GICAN	French naval industry group
GMDSS	Global maritime distress and safety system
GMES	Global Monitoring for Environment and Security
GODAE	Global Ocean Data Assimilation Experiment
GT	Gross tonnage
GWEC	Global Wind Energy Council
HELCOM	Helsinki Commission created by the Helsinki Convention in 1992
HT	exclusive of taxes
ICES	International Council for the Exploration of the Sea
IFP	French petroleum institute
IMO	International maritime organization
INRA	French national agronomic research institute
INSEE	National institute for statistics and economic studies
INSU	National institute for Earth sciences and astronomy
IPEV	Paul-Emile-Victor polar institute
IRD	French research institute for development
ISEMAR	Higher institute of maritime economics
ISL	Institut für Seeverkehrswirtschaft und Logistik (Bremen, Germany)
ISPF	French Polynesia statistics institute
IUA	International Underwriter Association

IUEM	European institute for marine studies
IUMI	International Union of Marine Insurance
JORF	Official journal of the French republic
LEMA	Marine and aquaculture vocational high school
LFI	Initial finance act
LNG	Liquified natural gas
Loran	Long range navigation
LPM	Military programming law
LPM	Maritime vocational high school
lwd	Lightweight displacement tonne
MDCN	Navy cruise missile
MEEDDM	Ministry of Ecology, Energy, Sustainable development and the Sea
Mersea	Marine Environment and Security for the European Area
MFS	Mediterranean Forecasting System
MPA	Marine protected area
MRCC	Maritime Rescue Co-ordination Centre
NAF	French activities nomenclature
NES	Summarised economic nomenclature
NOAA	National Oceanic and Atmospheric Administration
NUTS	Nomenclature of statistical territorial units
OCCAR	Organisation for joint armament cooperation
OECD	Organisation for Economic Cooperation and Development
OFEG	Ocean Facilities Exchange Group
OJ	Official Journal of the European Communities
Orsec	Civil security response organisation
OSPAR	Oslo-Paris commission
PAAMS	Principal Anti Air Missile System
PACA	Provence-Alps-Côte d'Azur region
PIG	Public interest grouping
PLF	Draft budget
PMEA	Employment ceiling set by the ministry
PNR	Regional nature park
RES	Renewable marine energy sources
RGPP	General review of public policies
RIF	French international register
RMT	Review of Maritime Transport
RNN	National nature reserve
ROV	Remotely Operated Vehicle
SAR	Towed acoustic system
SFAM	French mariculture society
SHOM	French navy hydrographic and oceanographic service
SIH	Fisheries Information System (Ifremer)

SINP	Information system on nature and landscapes
SIRENE	Computerized system for the directory of companies and enterprises
SNSM	National sea rescue society
SOES	Observation and statistics service
SOLAS	Safety of Life at Sea
SSBN	Nuclear-powered ballistic missile submarines
SSN	Nuclear-powered attack submarine
SSP	Statistics and prospective studies service
STCW	Standards of Training, Certification and Watch keeping for seafarers
SUSE	Unified system for enterprise statistics
Sycabel	French cable manufacturers' trade association
TCD	Landing platform docks
TEU	Twenty-foot equivalent units
ULAM	Maritime affairs coastal unit
UMS	Universal Measurement System
UNPG	National aggregate producers union
WFD	Water framework directive
WTO	World Trade Organization
WTO	World tourism organization