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edited by Régis Kalaydjian  
Ifremer, Marine Economics Service

# French marine-related economic data

# 2003

**Ifremer**



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Marine Economics Service

## **Contributions**

Ifremer: Régis Kalaydjian, Guillaume Bihet, Fabienne Daurès, Sophie Girard,  
Olivier Guyader, José Antonio Pérez Agundez, Olivier Thébaud.

Cemagref: Jeffrey Dehez.



The authors express their gratitude to their Ifremer colleagues and their contacts in public and trade bodies, companies and administrations, for all their help in writing this book. Their warmest thanks are also extended to the Ifremer Communications directorate for its support and cooperation.

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# Foreword

The *French marine-related economic data 2003* provides a coherent summary of the maritime sphere's economic dimension. Thereby, it pursues the efforts begun in 1997. There is a fundamental justification for such an effort, since promoting the development of the maritime world is part of Ifremer's remit. This alone gives our Institute the duty to know about the economic situation and to make it known.

Beyond the technical difficulties which will always be with us in assessing the costs of marine-related activities, this document is full of lessons to be drawn.

First of all, it holds a wealth of information about recent developments and trends in the marine economy which has grown considerably in the past two years, benefiting from the favourable economic situation worldwide.

Secondly, it supplies important information about the maritime economy's structure: things are changing in terms of input from the large aggregates forming it, and the recent situation has favoured industries which make extensive use of leading edge technologies. They now have a greater share in the group of sectors analysed here. This shows the significance of innovation in the maritime economy.

The publication also provides greater accuracy in the cost assessment of coastal environment preservation, notably for managing protected areas and cleaning up macrowaste. This expresses how important sustainable development has become in Ifremer's action.


Lastly, it leads us to think about the driving economic force of maritime activities: in the study carried out in the port of Dunkirk, the analysis of the different categories of activities shows the great importance of firms revolving round a harbour. This timely example illustrates the strategic role played by the marine economy for our country.

Some sea-related activities are currently confronted with difficulties. These difficulties can be structural, due to pressure on the coastal environment and on marine resource stocks, or temporary, caused by the drop in international demand and the slowdown for some exports. Nevertheless, readers of this report will draw the idea of a marine economy which is dynamic, since it is oriented towards world markets, as well as varied, multifunctional and strongly linked to the national economy. It is the very opposite of a marginalised economy on the sidelines.

It is a good thing that Ifremer contributes, through its applied research, to highlighting these strong points; and it is highly beneficial, for a task of this scope, to be as open as possible to outside contributions. In this respect, I am very pleased with the work achieved thanks to the active contribution of the Dunkirk port authority and the Littoral-Côte d'Opale university. My grateful acknowledgement also goes to the administrations, enterprises and professional associations, and most particularly to the French Navy Staff, the DAMGM, the ENIM, the Tourism directorate and the DTMPL, for their generous help and assistance.

Jean-François Minster,  
chief executive officer of Ifremer





# Introduction

The 2003 edition of the *French marine-related economic data* pursues the work initiated in 1997. It has kept the same structure as the previous ones to present marine-related activities. It analyses the industrial and the non-commercial public sectors separately. The same subdivisions have been maintained for the industrial sector: the primary sector (fisheries, aquaculture) and its related food processing industry; then the industries of aggregate extraction, power production, and manufacturing (shipbuilding, civil engineering and public works, cable-laying); and services (offshore, tourism, harbour-related and financial). The public sector includes the French Navy, support and education administrations, environmental protection and scientific research.

The industrial activities are characterised by key figures for value added and employment. The public sector is characterised by its overall expenditure, payroll and labour force. In each case, qualitative information is provided about the recent economic situation and the short-term outlook, both from the market point of view and that of possible regulatory developments.

Although the structure has remained the same, the contents have changed appreciably from previous publications, in view of the results obtained and the approach we implemented.

First of all, in terms of results, it emerges that the marine economy recorded high growth from 1999 to 2001. With a rate of nearly 11% over two years time, growth was even faster than that of the French economy over the same period (under 9%). Since several of its industrial sectors are big exporters, France's maritime economy was able to make the most of a dynamic world economic situation. Yet over the same period, employment rose by less than 4%, so this growth, with few jobs created, is obviously the reflection of significant productivity gains.

Next, our approach has developed from two quite different standpoints. Firstly, we gave much thought to the scope or the "perimeter" of the marine economy through an analysis of port production. The case study on Dunkirk harbour is an example of this. Although the chapter on "Shipping" endeavours to take into account the direct harbour production, which gathers all public and private activities, and all administrations and companies which are related to ships or to cargo, it does not address so-called indirect production. The latter includes the industrial firms set up near the harbour area, or whose activity is stimulated by it through the port traffic they can draw on. It also includes various services by suppliers or subcontractors.

The considerable assessment work accomplished by the Littoral-Côte

d'Opale university, thanks to the active cooperation of the Dunkirk port authority, has provided crucial information. With over 20,000 jobs and 2 billion euros, the entire direct and indirect production of Dunkirk's harbour shows the vital role of a port for industrial activity. Over half of this port production falls outside of our marine economy perimeter. If it were generalised to all French seaports, the exercise would reveal a "second circle" of maritime activities. Its scope would surely be significant with respect to the evaluations presented in the summary of this document.

Secondly, the assessment of rules and management costs for protected coastal spaces has become much more accurate. The relevant chapter focuses on how the Poimar system has developed since the sinking of the *Erika* and it updates the estimation of clean-up costs for macrowaste shouldered by coastal towns. Thanks to the contribution from Jeffrey Dehez (Cemagref), it assesses the protected area management costs in the case study of the Gironde coast.

Thus, this report consolidates the time series of key indicators, proposing a more precise assessment, particularly as concerns environmental costs, and leads us to think about the marine economy's scope and what it actually covers.

Régis Kalaydjian

# A broader analysis of port employment and production:

## the exemple of Dunkirk harbour

A study carried out by the Littoral-Côte-d'Opale university, commissioned and funded by Ifremer and Dunkirk's autonomous port authority, assessed the full range of industrial activities and services linked to port activity. It provides an update to a previous report supervised by C. Gachelin on the same harbour. The results of this new survey consolidate the knowledge acquired in previous studies and enable an appraisal of a seaport's capacity to drive economic activity.

### General issues of port activity

A maritime harbour ensures transit and logistics functions. It concentrates activities which can be put into three categories.

#### The role of a harbour

This includes specifically port-related activities related to cargo and vessels. These activities are described and cost-assessed in this report (see below: "Shipping" chapter).

#### Indirect production

This category is made up of industrial activities which are stimulated by the port's role, whether they are set up in the harbour area or near it for reasons of cost, or whether their goods pass through the port in question. In the first case, we are talking about industrial-port activity, mainly made up of industrial firms which use or send raw materials or semfinished products coming through the harbour. In the second case, the users, either sending or receiving goods via the sea, can be located farther from the harbour. Indirect production also comprises suppliers and subcontractors working in the sphere of harbour activities, or industrial firms in the area, including various services to companies.

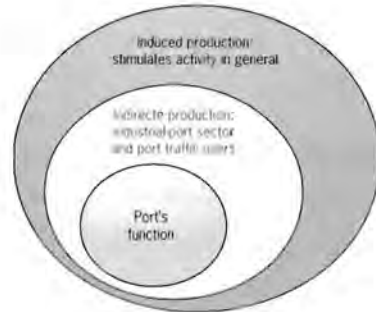
#### Induced activities

Thanks to the port, but without direct links to it or to the professions involved there, economic activity is naturally stimulated by the household income

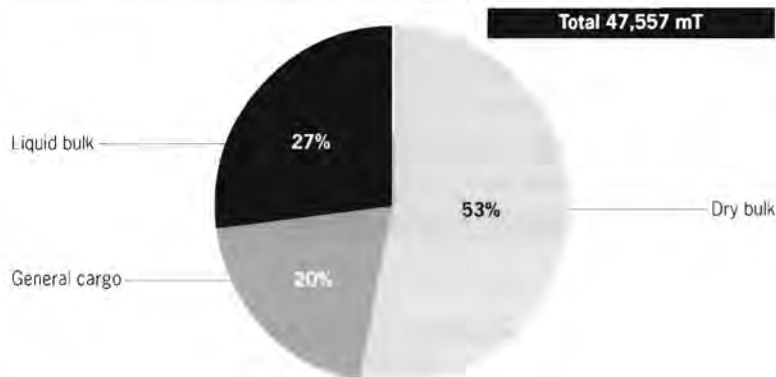
which is induced ipso facto by the two categories of activities mentioned above. The study did not analyse this category, since it is not specific to the harbour.

The cost assessment of the port's function is often done by the port authorities or by the central administrations which supervise them, both in France and abroad. However, data on indirect production are often patchy and can only provide limited estimates. The interest of the study by the Littoral university, summarised below, is that it systematically evaluates both of these categories for the port of Dunkirk.

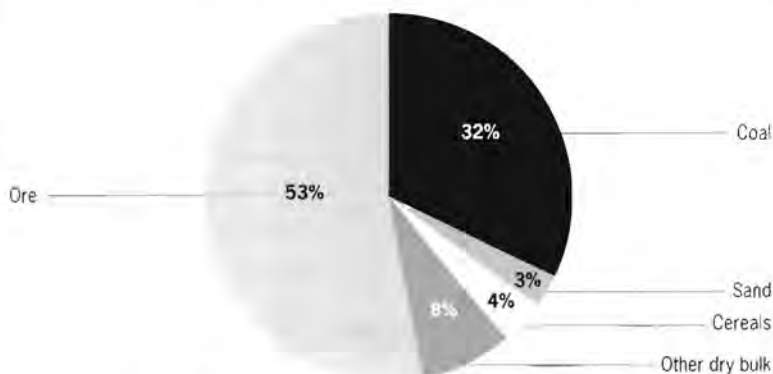
### A port's economic impact



### Main traffic in Dunkirk port in 2002



### Breakdown of dry bulk traffic in 2002



Source: Dunkirk port authority.

## The example of Dunkirk harbour

Ranking third amongst French merchant harbours for both tonnage and value, the port of Dunkirk greatly focuses on dry bulk traffic (making over 50% of its overall traffic), particularly ores and coal. Liquid bulk makes up over a third of its overall traffic. This special orientation reflects the strong presence of Dunkirk's industrial activity in the port area (especially in the steel and petrochemical sectors).

## The analysis made on Dunkirk harbour

The significant presence of industrial firms near the harbour area which are specialised in semi-processed goods, along with that of the high-power electronuclear power plant, directed the study's approach.

a) The objective was to assess all economic activity linked to the port. To do so, a perimeter around the port was defined, within which the value added and employment in existing activities were counted. The principle was to take account of the total production of all industrial firms located within the perimeter: it was considered that its location

was chosen for the proximity of a port function.

There were three distinct zones comprised in this perimeter:

- **ZP** was the port zone (harbour district). Most of the port-related industrial firms are set up there;

- **ZC**: zone of greater Dunkirk (CUD-Dunkirk urban council) outside of ZP. Numerous companies set up there have a link with port and port-related industrial activities;

- **ZHC**: this is the zone outside of greater Dunkirk (CUD), which includes 17 firms linked to port and port-related activities. Once out of the ZP area, the number of firms in question drops very quickly.

## Types of companies in the perimeter: primary (I), manufacturing (II) and service (III) sectors

I	Fisheries, aquaculture
II-1	Industries using shipping via Dunkirk
II-2	Industries which must be set up in a harbour: ship repair, fishing vessel maintenance
II-3	Industries using or supplying products or by-products to II-1 and II-2
II-4	Industries working entirely or partly for subcontracting and maintenance of the four other types
II-5	Gravelines electronuclear power plant
III C1-1	Organisations directly linked to port's function
III C1-2	Enterprises whose main activity is related to vessels (shipowner, consignees, supplying and provisioning, broker, ship surveyors, sales, repair)
III C1-3	Enterprises whose main activity is related to freight and cargo (forwarding agents, stevedoring, storage, terminals, weighing, inspection)
III C2	Service providing firms using the port (for ex., trade)
III C3	Transport firms working in haulage upstream and downstream (road, rail, waterways)
III C4	Service providing firms subcontracted by the industries covered in this study
III C5	Service providers (design offices, consultancy) which enable the above types of enterprises to operate well

## Port value added and employment

Units: number of staff, million euros

	Manpower 2001	Manpower 2002	VA 2001	VA 2002
Sector I	170	172	11.4	11.3
Sector II	16,340	16,531	1,791.6	1,701.1
including II-1	8,465	8,502	1,015.8	897.6
Sector III	4,651	4,543	226.7	233.2
including III C1	2,375	2,265	145.2	150.6
III C2	240	241	9.9	9.9
III C3	399	399	16.1	16.1
III C4 + III C5	1,637	1,638	55.5	56.7
<b>Total</b>	<b>21,161</b>	<b>21,246</b>	<b>2,029.7</b>	<b>1,945.6</b>



b) The method consisted in a postal survey followed by a questionnaire sent to all the firms which had been identified within the perimeter. Missing information was completed by using a data server on companies (income statements).

## Results

500 enterprises were identified and 403 of them selected for the survey. There were 104 responses to the questionnaire, complemented by information on 109 firms filled out using the server and 45 others by estimations, making a total of 258 companies. The data enabled the value added and the employment in activities related to the port's presence to be assessed. In addition, the results focused on the payroll and the professional tax produced by each category of firm.

Three important observations can be drawn from these results.

- As concerns employment, and even more so, value added, the assessment shows the clear predominance of heavy industry (energy and processing of raw materials) in the harbour area of Dunkirk. With hindsight, this justifies the choice of the evaluation method, which focuses on the firms on site rather than on more distant activities which use shipping via the port.

- In the case studied, the port's function, strictly speaking, is made up of three types of activity from the III C1 category. It represents approximately 11% of the labour force and from 7 to 8% of the value added. Except for the port function and maritime activities taken into account in this report (fisheries, aquaculture, shipbuilding and repair and their suppliers, French electricity board employees), a minimum estimation lets us assess the port's indirect production as being 50% of the jobs and 54% of the value added (74% if we add electro-nuclear production), with respect to the totals given here. That means that over half of Dunkirk's port production is based on activities situated outside of the perimeter of the maritime economy as defined in this report. This also shows to what extent taking indirect production into account would change the overall apprehension of the maritime economy, once this analysis has been generalised to all French seaports.

- The method used to evaluate port-related activities is a subject of considerable debate. What approach should be used in the case of a harbour specialised in container traffic or in that of a port which has few industrial activities set up nearby? Through its traffic, the latter can foster certain types of production just as much as the first. A pertinent method would be to retain, out of the entire value added produced by the companies using the port (wherever they are located), the share which effectively passes through the port. This is the so-called "flow" method, used in particular by the port of Nantes. It is different from the "mass" method applied to our case study: the latter takes into account all the firms located within a perimeter, whereas the perimeter concept is inadequate for the flow method.

Rather than competing with each other, these two methods are actually complementary. For ports with diversified traffic, they should be used jointly. The difficulty for the flow method appears to lie in acquiring the data.

The study carried out on Dunkirk harbour is useful for the updating of data on seaports in France and Europe. It provides a wealth of information on several levels for the analysis of the maritime economy. This sort of study should be repeated in order to obtain good, regularly updated coverage of the French coast.

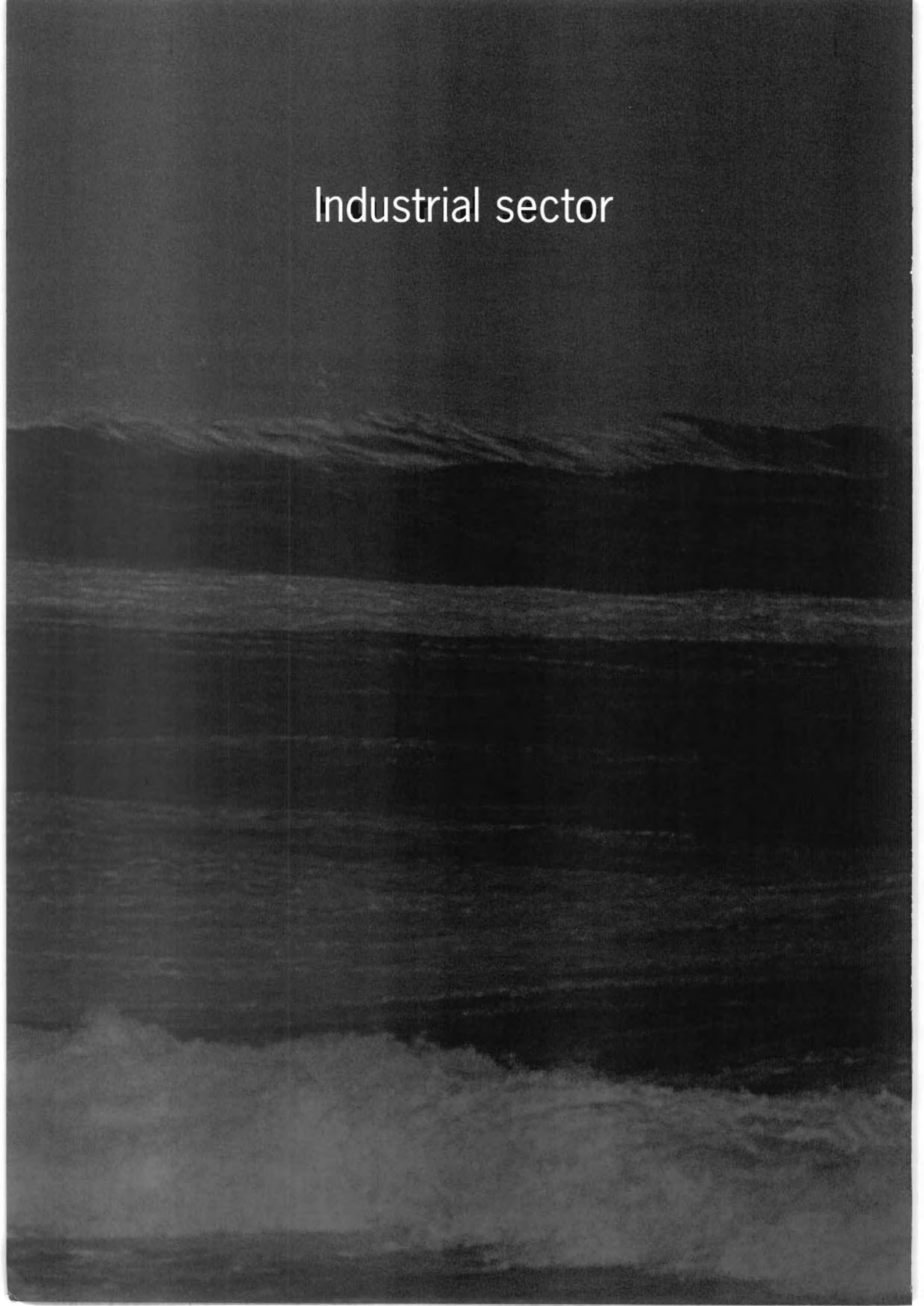
### Labour force in 2001: 21,161



### Added value in 2001: 2,030 millions euros



# Industrial sector



# Seafood products

The seafood product sector comprises a wide range of industries and middlemen:

- marine fisheries, mariculture (fish farming and shellfish farming), seaweed production;
- fish auctions and fish wholesalers;
- the seafood processing industry.

This chapter also deals with foreign trade in seafood and with public action in favour of these industries.

## Marine fisheries

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

### Trends in activity

French marine fisheries display a wide range of types of vessels and species caught. Two thirds of French catches are made in European countries waters (Celtic Sea, Western Scotland, English Channel, North Sea and the Bay of Biscay), though the fleet also operates in many other regions of the world. In the framework of the fisheries agreements signed by the European Union, 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 waters of the French overseas departments and territories (DOM-TOM): French Guyana (prawns), Reunion Island (tuna and swordfish), and the waters of France's southern and Antarctic territories (Patagonian toothfish and spiny lobster). This diversity is further reflected in the fisheries techniques and gear used: dragnets, pots, trawls, nets and lines.

Assessed at 1 billion euros in 2001 by the Fisheries ministry (and at 30% above that by Ifremer) French marine fisheries production was spread over the entire French coast, with the Brittany region dominating (33%), well ahead of the Pays de la Loire (11%) and the Nord-Pas-de-Calais (10%) regions. The production's value has grown since 1997, although the real drop in volumes landed in 2001 is a factor of concern.

Since the turn of the 1990s, marine fisheries' production structure has hardly changed. Fresh fisheries predominate with nearly 70% of amounts landed and 85% of total turnover, due to a relatively higher average price at landing.

Fresh fish account for almost half of landings in terms of tonnage and over 60% of turnover. In the fresh fish category, the species with the highest tonnage caught in 2001 were the sardine, anchovy and whiting. The most important species in terms of turnover are sole and monkfish (so called noble species, averaging high prices) along with *Nephrops* prawn and scallops. For frozen fisheries, tropical tuna is the species caught most.

French production in overseas departments and territories is assessed at 25,000 tonnes (source: Ofimer) and available information gives a breakdown of yield and value by department:

### Key figures for marine fisheries

Units: tonne, million euros, number of staff

Sources: Ofimer, ministry of Agriculture and Fisheries, Ifremer.

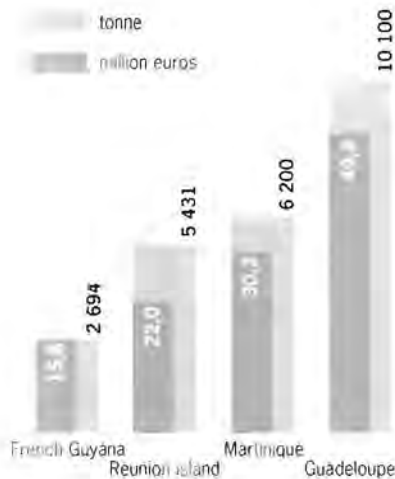
	1997	1998	1999	2000	2001
Yield	587,083	561,076	599,644	620,630	606,456
Turnover	950	959	971	1,034	1,069
Value added <sup>(1)</sup>	551	556	563	662	727
Manpower <sup>(2)</sup>	15,501	15,476	15,510	15,530	15,520
Fleet <sup>(3)</sup>	6,255	6,119	5,906	5,815	5,686

<sup>(1)</sup> value added rate estimated at 58% until 1999, 64% in 2000 and 68% in 2001 (Ifremer estimation)

<sup>(2)</sup> full time equivalents. Series have not been updated. Ifremer's estimations for 1999-2001.

<sup>(3)</sup> number of fishing vessels.

## Fisheries and aquaculture overseas production in 2001



Source: Orliner.

## French marine fisheries structure in 2001

Units: tonne, million euros, euro/kg

	Yield	Turnover	Average price
Fresh fish	295,960	664	2.2
Crustaceans	21,570	97	4.5
Shellfish	51,088	87	1.7
Cephalopods	21,050	58	2.7
Seaweed <sup>(1)</sup>	13,314	3	0.2
<b>Sub-total fresh fish</b>	<b>402,983</b>	<b>909</b>	<b>2.3</b>
Tropical tuna <sup>(2)</sup>	118,330	106	0.9
Other frozen fish <sup>(3)</sup>	85,144	54	0.6
<b>Sub-total frozen fish</b>	<b>203,474</b>	<b>160</b>	<b>0.8</b>
<b>Total fisheries</b>	<b>606,456</b>	<b>1,069</b>	<b>1.8</b>

<sup>(1)</sup> amounts expressed in dry weight

<sup>(2)</sup> including amounts landed in countries near fishing zones and counted as exports in foreign trade statistics

<sup>(3)</sup> landings of deep-sea fisheries in the form of frozen fillets are measured in the equivalent whole (gutted) landed weight.

Source: Orliner.

On the European Union scale, France ranks third and provides 14% of total production in value, estimated at nearly 8 billion euros. The two leaders, Spain (2 billion euros) and Italy (1.5 billion euros), total 45% of European Union production in terms of value.

### Fleet

The French fisheries fleet, totalling 5,686 vessels as of 31 December 2001, is mostly composed of vessels less than 12 meters LOA. In terms of installed engine power, the coastal and high sea fleets are equivalent.

The diagnosis that a great majority of commercial stock resources are being overfished led to regulatory and incentive measures within the framework of

the European Union's Common fisheries policy (CFP). They aim in particular to reduce fishing fleets' catch capacity through vessel decommissioning plans based on the specific or general objectives set out in the MAGP "multi-annual guidance programmes" and, more recently, in the framework of the restoration plan for some specific species (North Sea cod, hake). Other measures aim to reduce catches of juvenile fish (for instance, setting minimum mesh sizes for fishing gear and boundaries for protection areas).

Achieving MAGP objectives has lowered the French fishing fleet capacity since the early 1990s (19% in installed power and 14% in gross tonnage). This has been largely supported by public aid plans to decommission vessels.

### Employment

The drop in the French fisheries labour force is closely linked to fishing capacity cutbacks. Employment data (in full time equivalents) are difficult to determine on a national level. Ifremer's surveys made it possible to estimate a total of 10,500 seamen in full time equivalents working on the Channel, North Sea and Atlantic seafronts.

### Outlook

The preamble of the European Commission's green paper highlights the large number of stocks whose volume today has fallen under reasonable biological limits. It also emphasizes the need to reform the CFP by integrating economic

## Breakdown of fresh fisheries turnover and landings by main species in 2001



Source: Orliner.

and social dimensions on the one hand and environmental aspects on the other, in order to analyse the situations and implement measures. Member States have been obliged since 2001 to collect biological and economic data on the sector. This corresponds to the objective and is making it possible to improve our knowledge about fishing fleets' activity and their economic situation.

## Mariculture

The mariculture sector which produces food for human consumption is composed of two sub-sets:

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

Oysters are also farmed in French Polynesia for their pearls.

Shellfish farming, the oldest of marine rearing techniques, is still mostly done using spats collected in the wild, although purchases of oyster spats from hatcheries are now a current practice. This compensates for variability in wild spat provision from one year to another and provides a tool to control the first phase of the rearing cycle. With regard to the other subset of mariculture, which developed significantly in the nineties, hatcheries produce all of juvenile fish or shrimp, which are then raised to commercial size in grow-out units.

## Trends in mariculture

### Worldwide

Aquaculture supplied 37.9 million tonnes of fish, molluscs and crustaceans in 2001. This is a sharp rise in the percentage of total fisheries and mariculture (excluding seaweed) over ten years, which reached 32%, compared to only 16% in 1992 (FAO data). The share of marine farms in aquaculture has been assessed at 40% of volume and 49% of the value in 2001.

In volume, the growth in world yields from mariculture over the past decade was greatly due to the development of shellfish farming. In value, the boom in mariculture was due, in descending order, to increased farming of crustaceans (mainly tropical shrimp), shellfish and marine finfish. For fish farming, the milestone of the past fifteen years has been the development of a salmon-farming industry in Norway and in the United Kingdom, followed by Chile. Its scope goes well beyond that of finfish

## European marine fisheries production in 2001

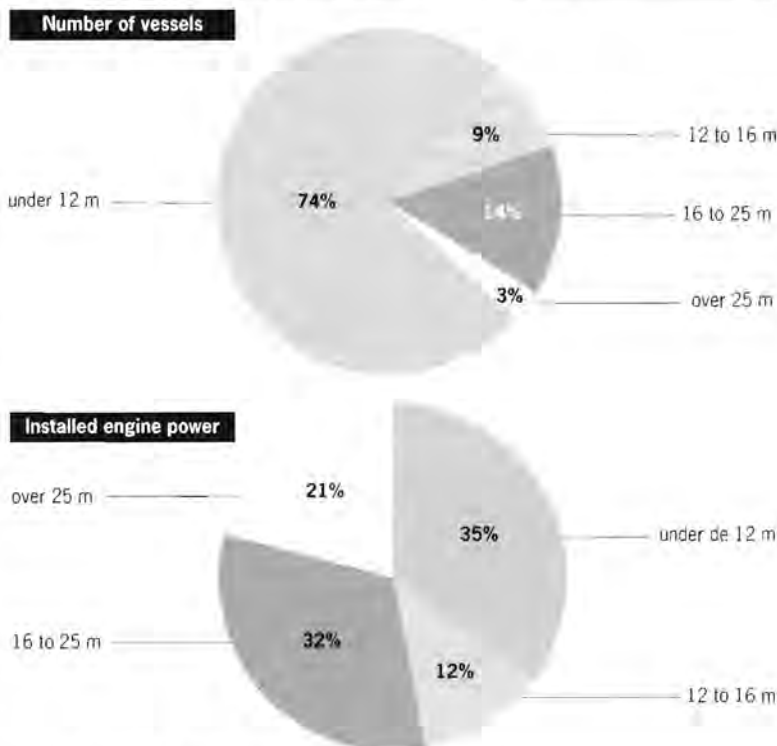
Units: million euros, tonne, euro/kg, number of staff

	Turnover	Landing	Average price	Manpower	Number of vessels
<b>European Union total</b>	<b>7,569</b>	<b>6,039</b>	<b>1.3</b>	<b>215,636</b>	<b>84,558</b>
including					
Spain	1,952	1,079	1.8	64,600	16,646
Italy	1,475	339	4.4	40,701	16,618
France <sup>(1)</sup>	1,037	604	1.7	17,900	5,749
United Kingdom	927	738	1.3	14,645	7,169
Denmark	479	1,490	0.3	4,516	1,515
Netherlands	427	510	0.8	2,346	416
Portugal	333	168	2.0	23,580	10,532
Greece	250	89	2.8	34,900	20,004
Ireland	250	321	0.8	6,000	1,331
Germany	189	217	0.9	2,576	2,238
Sweden	127	298	0.4	2,576	1,851
Belgium	97	27	3.6	700	128
Finland	28	159	0.2	596	361
<b>Other European countries</b>					
Norway	1,003	2,468	0.4	12,965	2,251
Iceland	847	1,987	0.4	5,223	2,012

(1) provisional data

Sources: Concerted European action FAIR PL 97-3541 - Economic Assessment of EU fisheries - Annual Economic Report 2002.

## The French fisheries fleet as of 31 December 2001



Sources: Ministry of Agriculture and Fisheries.



farming at sea until now. However, it should be pointed out that competition from freshwater production is on the rise. This is particularly true for freshwater fishfarming, whose higher growth potential means that it still supplies the majority of farmed fish on the world market. In 2001, the share of freshwater fish production reached 85% in volume and 66% in value (versus 84% and 59% in 1992).

World yields from mariculture are estimated at approximately 30.3 billion euros in value in 2001 (FAO data). In comparison, European marine farms achieved production of 1.67 million tonnes for turnover estimated at nearly 3.9 billion euros, respectively accounting for 11 and 13% of the world supply. Contrary to the situation prevailing globally, the boom in finfish farming in Europe during the nineties was mainly in marine farms, whose 2001 output provided about 60% (in volume) of the European farmed fish supply.

#### In Europe

Norway has become the aquaculture leader thanks to its salmon industry, with a turnover of nearly a billion euros in 2001 (source: FEAP). European countries with a significant shellfish farming tradition, like France, Italy and Spain, or which have made major investments in the marine finfish farming sector (salmon farming in the United Kingdom, seabass and bream in Greece) are also key stakeholders in European mariculture (turnover per country was between 300 and 450 million euros).

#### In France

It is the considerable oyster farming sector (over 90% of European oyster production) which puts the country amongst the top ranking European producers. Mussel farming, the second source of income for metropolitan mariculture, has an intermediate position on the European scale, where Spain occupies top rank. Lastly, French marine finfish farming, oriented towards rearing of seabass, bream and turbot, is an activity providing nearly 12% (including hatchery activity) of metropolitan marine farm turnover.

### French fisheries fleet trends between 1990 and 2000

LOA category	Number of vessels	Tonnage	Power (kW)
Under 12 m	- 34%	- 4%	- 20%
12-16 m	- 37%	- 30%	- 30%
16-25 m	- 20%	- 8%	- 13%
Over 25 m	- 29%	- 19%	- 20%
<b>Total</b>	<b>- 33%</b>	<b>- 14%</b>	<b>- 19%</b>

Source: Ministry of Agriculture and Fisheries.

This continued to rise slightly in 2000 and 2001, in spite of a downturn in the amounts of shellfish and marine finfish marketed. Mariculture in the DOM, whose sustained growth was based on pearl oyster farming in French Polynesia until 2000, showed a sharp decline in 2001, due to a drop in volume and, above all, in price.

Shellfish farming activity is spread over the entire French coastline. The main producing regions, Brittany, Poitou-Charente and Lower Normandy, make up three quarters of national oyster and mussel yields in volume. Oyster farmers mainly target the national market, since oyster consumption is much less developed in other European Union countries. Because this product is consumed raw, it is highly sensitive to environmental quality. This proves that it is a natural product, but conversely, creates an economic detriment when sales of shellfish from contaminated areas are forbidden. Monitoring coastal water quality and problems of coastal management are at the core of the shellfish farming management system set up by the public authorities and Ifremer (see below; chapter on "Protecting the coastal and marine environment"/"Coastal water and resource monitoring networks").

Fish farms are mainly located along the Mediterranean coast (seabass and bream) and that of the Atlantic (turbot), though one third of French bass and bream production is farmed along the coast of the North Sea. Production from

hatcheries, which accounted for nearly 29% of marine finfish turnover in 2001, is highly export-oriented. This activity experienced a period of growth in 2001; particularly due to the increase in turbot fry production capacity to meet the demand of Spanish grow-out firms. On the other hand, adult fish production, 2000 and 2001 showed a decline in activity, notably related to the fact that Atlantic salmon production ceased in these two years. Until now in France, diversification of offshore farms has remained limited. At the commercial farming stage, only meagre, already farmed on a small scale in France, offers perspectives for growth.

### Employment and companies

Enterprises and jobs in mariculture mainly come from shellfish farming.

There are about 3,750 shellfish farms, according to the first shellfish inventory taken in 2002 by the SCEES (ministry in charge of Fisheries and Aquaculture) focusing on the various stages of production and on trade of shellfish in 2001 (not including trade-only firms). In terms of manpower, the survey reported 21,660 permanent, part time or seasonal jobs in 2001, making a total of 10,410 full time equivalents. These firms, most of which (78%) have a sole proprietor, widely use a family-based labour force. The head of operations, co-managers and other working family members account for 56% of all jobs.

### Key figures for mariculture

Unit: million euros  
Sources: Climer, Ifremer, SFAM.

	1997	1998	1999	2000	2001
Metropolitan France turnover	361	380	378	381	389
DOM-TOM turnover	139	132	164	186	139
Total turnover	500	543	558	566	528
Value added*	350	380	390	397	370

\* average value added rate of 70% (Ifremer estimation).

By "shellfish farming region", most of the enterprises are set up in Poitou-Charente. 34% of shellfish farming firms have their head office in that region, followed by those of the Mediterranean (18%) and Southern Brittany (13%). With regard to employment, the regional ranking is especially different for the Mediterranean. Due to a majority of small farms (nearly two thirds of which have less than two full time equivalents) it ranks only third for shellfish farming regions, behind Southern Brittany. Firms headquartered in the Northern France - Normandy region, which are larger, account for 12% of jobs nationwide (for 8% of the number of enterprises).

By type of farm, those which rear only oysters are the most prevalent, with 2,150 farms (58%). Although there are not many enterprises specialised in mussel farming (284), 1,358 firms have been inventoried all the same (making 36% as practicing mussel farming, either alone or along with other types of shellfish farming. A majority of shellfish farms (73%) are also involved in shellfish trade and thus have been approved by health authorities to sell their finished products for human consumption. Analysis of distribution channels used by producers-traders shows a large percentage of direct sales in oyster marketing (28% of volume, compared to 6% for mussels). This considerable use of direct sales in oyster farming means that many firms need to increase their income and extend the selling period over the whole year to move away from consumption which is still highly concentrated on the holiday period at the end of the year.

For the marine finfish farming sector, the figures given for number of staff and jobs come from the last survey conducted by the ministry of Fisheries and Aquaculture (1999 data). This survey inventories 61 firms involved in grow-out or hatcheries of seabass, bream, turbot and marine salmonids, with a total labour force of 500 full time equivalents (91% of which are salaried jobs).

## Production volumes in French mariculture

Unit: tonne

	1997	1998	1999	2000	2001
Oysters	139,700	138,500	139,000	135,500	128,500
Mussels	61,000	61,500	62,500	68,000	59,500
Other shellfish	4,600	4,600	3,550	3,557	3,557
Shrimp (metropolitan France)	24	24	24	28	20
Marine and amphihaline finfish*	5,766	6,468	6,738	5,754	5,678
Farmed pearls	6	6	9	12	10.8
Tropical shrimps	1,160	1,154	1,845	1,763	1,854

\* including overseas DOM-TOM output.  
Sources: Ofimer, Ifremer, SFAM.

## Turnover in French mariculture

Unit: million euros

	1997	1998	1999	2000	2001
Oysters	221	237	229	230	238
Mussels	76	75	76	83	85
Other shellfish	11	11	12	12	12
Shrimp (metropolitan France)	0	0	0	0	0
Marine and amphihaline finfish*	39	44	43	39	35
Farmed pearls	130	123	149	173	125
Tropical shrimps	9	9	15	13	14
Marine finfish hatcheries	10	10	13	13	14
Shellfish hatcheries	3	2	4	4	6

\* including overseas DOM-TOM output.  
Sources: Ofimer, Ifremer, SFAM.

## Outlook

In metropolitan France, the context of regulations and policies for use of the coastal zone limits mariculture's expansion. Marine finfish farming, the most recent activity to get a foothold on a coastal area coveted by many users, has not been able to develop like that of Greek or even Italian and Spanish fish

farming, in spite of its highly advanced scientific research. In the overseas departments and territories, along with shrimp farming, which is well established in New Caledonia, new aquaculture activities based on fast-growing marine finfish, are emerging, like that of red drum in Martinique, Reunion and Mayotte.

## Breakdown of enterprises and jobs by "shellfish farming regions"

	North-Normandy	Northern Brittany	Southern Brittany	Pays de la Loire	Poitou-Charentes	Aquitaine	Mediterranean
Number of companies	305	260	487	377	1,257	376	689
Percentage of enterprises	8%	7%	13%	10%	34%	10%	18%
Number of jobs (full-time equivalents)	1,291	964	1,426	936	3,518	894	1,379
Percentage of jobs	12%	9%	14%	9%	34%	9%	13%

\* these "shellfish farming regions" do not correspond to administrative regions.  
Source: Agreste-Shellfish farming survey 2002.

Problems related to the coastal area also affect shellfish farming. They could lead the profession to ask for new authorisations to extend seaward (deep water farms) or to some restructuring on state-owned land on the seafront. The environmental constraints (degraded coastal water quality, climatic factors, toxic plankton blooms) will also influence the cost-effectiveness of shellfish farming enterprises in the long term, especially if health standards regulating the sale and consumption of live shellfish become more stringent.

### Landed product trade: fish auctions

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

### Situation and trends in activity

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

In 2002, there were 44 fish auctions in France. The top five process nearly 43% of landings. Fish auction turnover rose between 2002 and 2000, due to price rises in current euro value, in spite of

lower quantities sold. Withdrawals rose between 2000 and 2002 by +30%. The turnover of auctions is made up of charges, fishing harbour facility fees and fees for use, paid by both sellers and buyers. They average 8.5% of the landed value, but the services provided by different auctions vary. *Ad valorem* taxation creates an incentive for fishermen to sell outside of the auction (source: Montane *et al.*, 2000). Some auction places are moving to a computerized sale system.

Fish auctions are also places where catch statistics are recorded. In some fisheries, like that of scallops in the Saint-Brieuc bay, sales can only be made through fish auctions.

### Fish trade

The fish trading firms considered here are a distinctive feature of the French seafood market. They are, along with processing firms and wholesale purchasers, the main middlemen between fishermen and seafood distributors. They carry out technical (batching, pro-

cessing, packaging, etc.) and commercial tasks, and are a link in the French fisheries chain. However, this type of intermediary either does not exist in other European countries or exists in other forms, similar to wholesaling or processing. Their status is set out in the 1997 framework law on marine fisheries and maniculture.

### Situation and trends in activity

For the year 2001, Ofimer estimated the turnover and added value at respectively 1,900 and 260 million euros for firms which were only fish traders or which added processing to their activity. This assessment reflects the improvement in company surveys with respect to previous years: 373 enterprises in 2001 compared to only 308 in 1999, and does not necessarily mean that the number of active companies has increased.

Past trends have highlighted considerable restructuring since the late 1980s. The number of firms fell from 680 in 1989 to 322 in 1997, then to 308 in

### Fish trading companies, by turnover category in 2001

Unit: million euros

Turnover category	Fraction of total number of companies	Fraction of total turnover
Less than 1.5	24%	2%
1.5 to 7.5	58%	19%
7.5 to 15	11%	26%
Over 15	7%	53%

Source: Ofimer.

### Key figures for fish auctions

Units: tonne, million euros, euro, number of staff

Sources: Ofimer and Ifremer fish auction surveys.

	1997	1998	1999	2000	2001	2002
Amounts sold	283,837	296,264	282,442	285,512	289,193	281,462
Withdrawals	10,021	7,561	10,274	9,153	8,650	11,920
Value	627	662	647	675	704	711
Average price (€/kg)	2.21	2.23	2.29	2.37	2.43	2.53
Fish auction* turnover	53.3	56.2	55.0	57.4	59.8	60.4
Fish auction value added**	45.3	47.8	46.8	48.8	50.9	51.4
Number of auctions	42	44	44	44	44	44
Employment in full-time equivalent***	798	832	794	802	836	845

\* estimated on the basis of an 8.5% tax

\*\* value added rate of 85% (Ifremer estimation)

\*\*\* Ifremer estimation, not including dockers.

## Breakdown of fish trading companies by region

	Number of companies	Fraction of turnover
Nord-Pas-de-Calais	45	31%
Normandy	51	9%
Brittany	138	23%
Aquitaine/Poitou-Charentes/Pays de la Loire	94	15%
Mediterranean (PACA and LR)	39	8%
Others	6	15%
<b>Total</b>	<b>373</b>	<b>100%</b>

Source: Ofimer.

## Main products imported and exported in 2002

Units: tonne, million euros

Imports	Amounts	Value	Exports	Amounts	Value
Shrimp	79.5	528.8	Tuna	135.8	194.2
Salmon	115.9	407.3	Shrimp	9.2	88.9
Tuna	143.3	386.9	Unspecified filets	15.7	71.6
Unspecified filets	80.4	277.3	Salmon	13.4	61.9
Cod	49.5	205.6	Cuttlefish	15.3	45.2
Scallops, queen scallops	16.8	147.1	Anchovies	13.8	37.7
Alaskan pollack	49.8	111.8	Ee, glass eels	895	35.0
Mussels	48.3	78.3	Sole	3.1	34.1
Spiny lobster	3.6	77.3	Toothfish	3.8	33.4

Source: Ofimer, according to Customs service data.

1999 (source: Ofimer). This concentration went hand in hand with an increase in the average size of firms, as a result of the implementation of health standards for wholesale fish trade workshops.

In 2001, these 373 firms generated an estimated 5,000 jobs. The companies are mainly located on the Atlantic-Channel-North Sea coasts, but a large part of the sector's turnover is made in the Nord-Pas-de-Calais region.

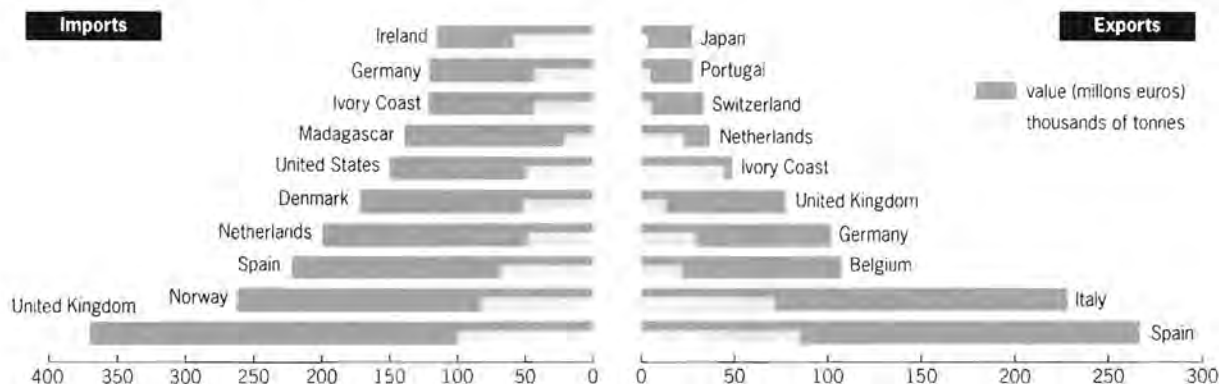
## Foreign trade for seafood products

In 2002, the French trade balance deficit for seafood products amounted to about 2.25 billion euros. Half the value of imports is concentrated in four products: prawns or shrimp, salmon, tuna and non-pelagic fish filets. 42% in value of French seafood imports come from European Union countries. The United Kingdom, Norway, Spain and The Netherlands are the top four suppliers.

The leading French export sales for seafood products are of tuna. Much of this is tropical tuna caught and frozen by French-owned vessels, landed in foreign ports near the fishing areas to be processed in local canning plants (Ivory Coast, Madagascar and Seychelles). French Guyana shrimp also contributes in value to export flows. Southern European countries (Spain and Italy) are the leading customers for French seafood, particularly fresh fish with high market value.

## France's main partners in foreign trade in 2002

Units: thousand of tonnes, million euros



Source: Ofimer, according to Customs service data.



## 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, para-pharmaceuticals and the food industry.

### Situation and trends in activity

Conditions for seaweed exploitation are regulated by decree; moreover, their harvesting is subject to interprofessional regulations. A large part of the national supply is provided by the mechanised harvesting of laminaria beds. This is mainly done in the Finistère county, while the fucus, chondrus and other species are collected on foot in scattered sites along the coast. These various yields reached 80,000 tonnes in 2002, for a turnover of approximately 3 million euros. The production covers about two thirds of processors' requirements. Seaweed farming has remained a very marginal activity in France, with less than 100 tonnes produced, whereas on a global scale, algoculture and harvesting respectively produce 11.5 and 2 million tonnes.

Seaweed processing (including marl) generates turnover of 250 million euros for a value added estimated at about

185 million euros. This processing mainly concerns macro-algae (97% of firms' turnover) and 65% of the enterprises are located in Brittany. The main market outlets are cosmetics, colloids and to a lesser degree, agriculture.

The "seaweed" sector employs nearly 2,200 people. The profiles of firms working in the various market segments vary considerably. In fact, colloids are produced by establishments belonging to international chemical groups, while processing of edible seaweed is done by small-sized enterprises.

## Seafood processing industry

The seafood processing industry includes companies whose all, or part of, activity consists in manufacturing products for human consumption from fish, crustaceans, molluscs and cephalopods. This perimeter does not include those enterprises which only fillet the fish (fish traders) or those specialised in seaweed processing.

### Trends in activity: sector indicators on the upswing

The seafood processing industry is a small component of the French food processing industry. In 2001, with 2.9 billion euros, the turnover from seafood processing accounted for 2.3% of the food processing industry turnover (123 billion

euros). These data come from the yearly company survey (Agreste) carried out on firms in the food processing industry with more than 20 employees or which make more than 5 billion euros in turnover, highlighting the dynamic nature of the seafood product sector. Between 1995 and 2001, turnover for the seafood industry on the whole rose by 46%, which is a clearly higher increase than that for food processing industries overall (22%). This trend is supported by the slightly rising French consumption of aquatic products and increased demand for prepared products.

### Indicators for the seafood processing industry

The key figures and all results provided here to describe the seafood processing industry in greater detail come from a new branch survey carried out by Ifremer. This approach gives a broader inventory, encompassing firms which are not specialised in seafood processing alone, and a breakdown of the activity by main product types: cured (i.e. smoked, salted, dried), canned, frozen, deli-seafood products and fresh prepared products.

The estimations of sales turnover and employment in the branch for 2001 are based on a population of 277 enterprises, for which these indicators are available (source: surveys and accounting data). The total turnover from seafood processing has thus been evalu-

### Key figures for seaweed harvesting

Units: number of staff, tonne, million euros  
Sources: Ifremer, CEVA

		1999	2000	2001	2002
Employment	Sea-going	57	57	48	48
	Fishing on foot	60	60	60	40
Yield	all species	70,997	68,224	66,283	80,366
Turnover	all species	2.9	2.4	2.5	2.9
Value added*	all species	1.7	1.4	1.4	1.7

\* value added rate of 58% (Ifremer estimation)

### Key figures for seaweed processing (year 2001)

Units: million euros, number of staff  
Source: CEVA seaweed technology research centre.

	Macro-algae					Micro-algae		
	Colloids	Food	Cosmetics	Farming (including marl)	Miscellaneous	Total macro-algae	Miscellaneous	Total
Turnover	56.4	2.2	147.9	30.7	7.1	244.3	6.4	250.6
Value added	33.8	1.6	117.2	21.8	5.0	179.3	5.0	184.4
Number of companies	4	6	11	8	6	35	9	44
Employment	415	25	571	1,047	54	2,112	60	2,172



ated at 2.77 billion euros, while the number of jobs the activity generates is about 13,300. The dominant segments are represented by canned (29% of turnover) and frozen (28%) seafood production. However, we must indicate that in the canning sector a significant proportion of the production has been relocated abroad (to be closer to landing points or for lower manufacturing costs). Market shares for smoke-cured products, with smoked salmon production dominating, and for deli-seafood products (surimi, terrines, rillettes, pre-cooked dishes, etc.) respectively account for 20% and 16%. Finally, the more recent segment of fresh products makes up 6% of the branch's turnover.

Companies' outlets are mainly domestic. The export level was 16% in 2001. The value added rate in the branch for the same year reached 18%, i.e. 500 million euros. Taken by type of processing, the highest value added activities are those of cured fish and deli-seafood products (23%), whereas the "canned seafood" activity displayed the lowest rate (14%).

### Specialisation of firms

Seafood processing companies prove highly specialised with respect to their raw material: the turnover from processed seafood makes up nearly two thirds of the overall turnover of these firms. Specialisation is greatest for the firms which produce canned seafood (78%), smoked, dried or salted fish (79%), i.e., in the case of chains, like tropical tuna or farmed salmon, where vertical integration has been most highly developed. Even for companies in the frozen food and "industrial" deli-seafood sectors, where there are more "general" food processing firms, the rate of specialisation with regard to seafood remains quite high (60% and 57%). This shows up certain specificities in terms of supplying or manufacturing processes, as in the case of the surimi industry.

Along with this, these firms show a rather low degree of versatility in terms of activities. Out of the total 277 companies studied, 219 (i.e. nearly eight out of ten) had a single activity. This large degree of specialisation in manufacturing techniques should be balanced with the fact that the majority of companies have a single establishment. Health regulations make it difficult to juxtapose several activities within one production plant.

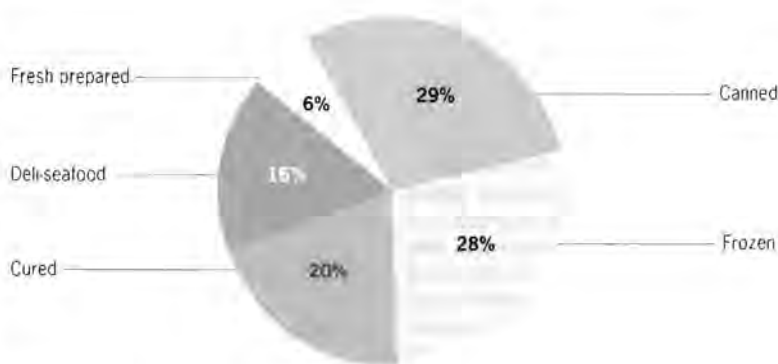
### The industry's concentration

In 2001, out of the 277 enterprises for which data was available, 227 made less than €10 m in turnover from seafood products. Following the pattern which predominates in the food processing industry, many SMEs coexist with a few large companies of national or even international renown. The top five firms in the branch concentrate 36% of the turnover for seafood processing. The concentration indicator reached 49% for the top ten enterprises, 63% for the top 20 and 84% for the top 50 firms.

Taken by activity, concentration is higher for canning, cured and frozen seafood firms (when we add the turnover of the top five companies, we get from 55 to 78% of the total) than for the deli-seafood product manufacturers (36%). For the canning industry, this situation has been accompanied, in addition to relocation of their production activities, by considerable foreign investment in the leading firms. On the cured fish market segment, buyouts and mergers observed during the 1990s continued into the early 2000s, with enterprises taken over by foreign capital and links established between French firms.

Comparatively speaking, the catered dish industry is still not very concentrated, except for the surimi sector. Its structure is effectively more varied: with a significant number of non-specialised firms (general catered dish producers or diversified seafood processors). This low level of concentration is also due to the recent nature of the activity, whose growth rates may attract new players on this market.

Breakdown of turnover by processed product type in 2001



Source: Ifremer survey

### Key figures for seafood processing in 2001\*

Units: million euros, number of staff

Sources: Ifremer survey, Olimer (accounting data).

\* including firms with less than 20 salaried employees.

On the basis of new survey.

Assessment figures cannot be compared to those given in our previous publications.

Turnover	2,780
Value added **	500
Employment	13,300
Level of exports **	16%
Number of companies	277

\*\* value added rate and export level computed using existing accounting data, corresponding to 202 enterprises (73% of manpower and total turnover).

## Geographical breakdown

The companies are mainly located along the coast. Over 60% of the firms are located in the regions of Brittany, Nord-Pas-de-Calais, Pays de la Loire and Aquitaine, with nearly three quarters of the turnover. The counties containing the most plants are the Finistère (42), Morbihan (24), Loire-Atlantique (16) and Pas-de-Calais (27).

Firstly, the location of the firms can be explained historically by the complementarity between fisheries landing points and canning plants and smoking sheds. This is notably the case for canning factories set up in southern Brittany, Vendée and smoking plants in the Nord-Pas-de-Calais region. Today, with an industry which is mainly supplied by imports, the links between the landing places and processing sites are not as strong. However, the factors which contribute to maintaining a coastal location are the nearness to seafood importation centres, access to certain infrastructures (refrigerated facilities), the presence of a skilled labour force and the "maritime" image which is good for marketing.

## Public action in favour of seafood product industries

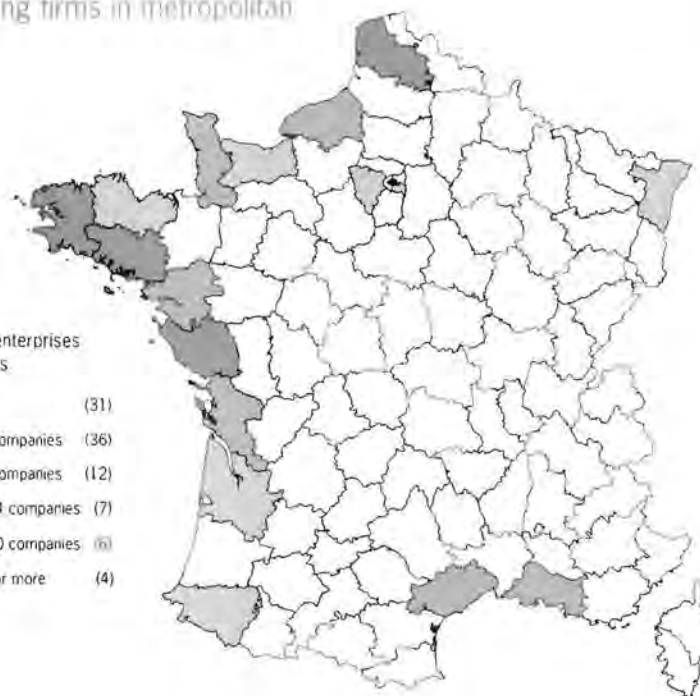
Public funding to support the seafood industry is essentially national and European. On the European level, these come from the financial instrument for fisheries guidance (FIFG), the European agriculture guidance and guarantee fund (EAGGF) and the Pesca community initiative. Various public subsidies are mainly devoted to organising markets in the framework of the Common market organisation (CMO), as included in the common fisheries policy, as well as to restructuring the seafood industry.

The table showing public support for the industry indicates that aid to exploit resources and enhance product value reaches a hundred million euros yearly. Other three quarters of public funding is channelled through the social welfare system: this fundamental aspect is dealt with later in this report (see chapter "Public intervention").

## Geographical breakdown of processing firms in metropolitan France

Number of enterprises per countries

□ none	(31)
□ 1 to 4 companies	(36)
□ 5 to 9 companies	(12)
■ 10 to 14 companies	(7)
■ 15 to 20 companies	(6)
■ twenty or more	(4)



## Ofimer

The national interprofessional office for seafood and aquaculture, called Ofimer, is an industrial and commercial public body created in 1998. It has the status of an agricultural office as defined by the law n° 82-847 of 6 October 1982 and employs some fifty staff. Ofimer's missions include regulating the markets, improving the economic effectiveness of the industry and product quality, better market knowledge, organising or supporting communications and promotional operations for aquatic products. Along with monitoring of harvesting and first sale, Ofimer is responsible for monitoring processing, transportation and logistics, distribution and technical innovation. Its remit includes land-based aquaculture and fresh water fisheries.

With authorisation from the European Commission and French authorities, Ofimer deploys European countries aids concerning the regulation of seafood markets, particularly EAGGF credits. It also acts in the framework of the programme Specific measures concerning agricultural products to assist the French overseas departments (Poseidom). To provide guidance for the seafood industry, the organisation takes part in actions developed by the State-region plan contract or which are eligible under the FIFG. This means that it can join local authorities in co-financing investments designed to improve the conditions of landing catches and their initial sale, provide financial support for project to modernise fish handling workshops and support producer organisations in their projects to improve product quality.

## Public support for the seafood industry

Unit: million euros

	2001	2002	From national budget 2002	From the E.C. budget 2002
<b>Exploiting resources</b>	<b>77.0</b>	<b>77.6</b>	<b>48.9</b>	<b>28.7</b>
<i>Investment and modernisation</i>	34.6	34.3	19.4	14.9
<i>Guiding production and supporting markets</i>	8.5	11.3	7.0	4.4
<i>Limiting production</i>	7.7	4.5	2.5	2.0
<i>Compensation for geographical disadvantages</i>	6.1	7.1	0.0	7.1
<i>Transitional and restructuring aid</i>	0.6	2.7	2.3	0.4
<i>Disasters and bad weather*</i>	19.4	17.7	17.7	0.0
<b>Enhancing seafood value</b>	<b>17.5</b>	<b>22.0</b>	<b>15.2</b>	<b>6.8</b>
<i>Initial marketing</i>	7.6	12.7	9.2	3.5
<i>Seafood processing industry</i>	7.3	4.8	1.5	3.3
<i>Development of seafood consumption</i>	2.6	4.5	4.5	0.0
<b>Research and education</b>	<b>55.2</b>	<b>58.2</b>	<b>58.2</b>	<b>0.0</b>
<b>Social welfare and solidarity system</b>	<b>581.5</b>	<b>570.9</b>	<b>570.9</b>	<b>0.0</b>
<b>Corporate services</b>	<b>13.6</b>	<b>14.3</b>	<b>13.1</b>	<b>1.2</b>
<b>Total</b>	<b>744.9</b>	<b>743.1</b>	<b>706.3</b>	<b>36.8</b>

\* including Ulmer indemnities paid for damage from oil spill and storm in 1999.

Source: ministry of Agriculture and Fisheries - Les concours publics aux pêches et aux cultures marines -, October 2003.

# Marine

## aggregate extraction

Marine aggregates mined in France include silica sands and gravels, as well as calcareous sand and marl. The first category is used for construction, engineering and public works and the second mainly in agronomy (soil improvement). 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).

### The activity's situation

Extraction of marine materials falls under the framework of French mining laws and requires issuance of a title, a national permit and authorisation for work to begin, along with an impact study. Extracting marl and calcareous sand is subject to quotas and authorisation from the prefect. These regulatory provisions were harmonised by the law 97-1051 of November 1997, which places calcareous materials under the mining system.

The main production centres for siliceous materials are located between the Seine-Maritime and Gironde counties, in shallow areas of less than 30 metres. The main production site is at the mouth of the Loire River. Calcareous materials are produced in Brittany (three marl deposits).

Marine aggregate production in France makes up a little less than 3% of national production of building materials, itself estimated at 350 million tonnes (15% in the United Kingdom). This mainly consists of:

- 5.4 million tonnes of siliceous aggregates in metropolitan France. 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;

- some 4 million tonnes of calcareous material are produced. This is made up of marl and calcareous sand. The first is used as a processed soil improver, or as a component in animal feed or of fertiliser; the second as raw soil improver or animal feed ingredient.

If we define the bounds of this activity as extraction, unloading, drying and calibration up to the loading for delivery for processing, the overall turnover was about € 25 m in 2001 and 2002 (Ifremer's

estimation after consulting the professionals). The value added is around € 10 m (Ifremer's estimation based on Sessi data).

### Employment and companies

For siliceous materials, direct employment is estimated to be approximately 200 seamen and 100 on-shore staff

### Production of siliceous marine aggregates in metropolitan France

Unit: thousand tonnes

	1997	1998	1999	2000	2001	2002
<b>Extraction*</b>						
Channel	750	700	660	690	1,230	1,240
Brittany	80	60	70	60	35	10
Atlantic seaboard	3,290	3,350	3,610	3,700	4,100	4,150
<b>Total</b>	<b>4,120</b>	<b>4,110</b>	<b>4,340</b>	<b>4,450</b>	<b>5,365</b>	<b>5,400</b>
<b>Imports**</b>	850	850	na	na	1,000 to 1,200	800 to 1,000

\* mostly siliceous materials. Not including marl extraction

\*\* approximately 80% from the United Kingdom and 20% from Belgium

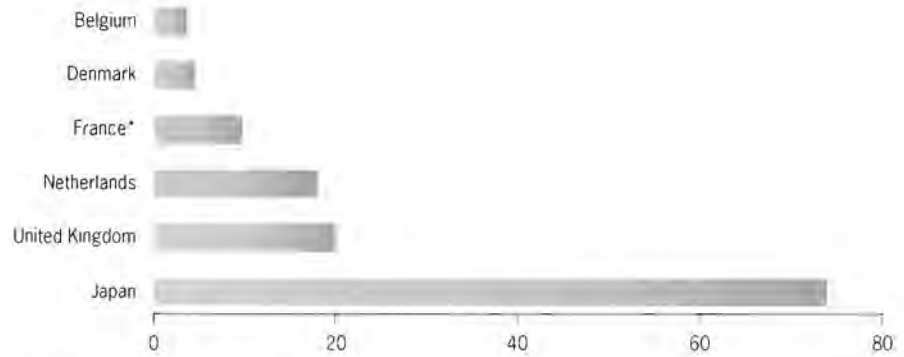
na: not available

Source: National aggregate producers union.

## Marine aggregate extraction in a few countries

Unit: million tonnes

Sources: UNPG and Ifremer estimations.



\* siliceous and calcareous materials.

(administrative, sales and technical duties) according to Ifremer. There are dozen firms using 16 sand dredging vessels of varying sizes (from 80 to 1,926 grt). Some of these companies process these materials and sell them for ready-to-use concrete or civil engineering operations. Marine materials are also extracted by industrial firms mining land-based deposits, in an effort to diversify their supplies. Extractions can then be subcontracted out to specialised international companies. They are also used for construction and civil engineering work.

The shipowners who mine calcareous materials work in four companies which employ a hundred seaman and use ten vessels.

## Outlook

Marine aggregate extraction is an advantage in view of the increasing difficulties in accessing deposits, especially for alluvial aggregates. Currently, more and more applications are being made for extract permits in the Channel region.

Ifremer assesses the siliceous aggregate resources in French territorial waters to be 52 billion tonnes. However, usable reserves are currently limited to 600 million m<sup>3</sup> (960 million tonnes).





# Electricity generation

This chapter contains the available information about electrical power plants in coastal locations. The choice of an electrical production site will depend on the possibilities of 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. The sea can also provide tidal power.

## Activity

Available data is insufficient to estimate turnover for each of the French electricity board's (EDF) power plants. As regards employment, the total labour force for power plants on the coast reached 6,800 in 2002, including over 5,600 people who work on nuclear power sites.

Ten high power electrical plants are located on the coast or in estuaries in metropolitan France. Their total installed power capacity is over 26,000 MWe, i.e. just under a quarter of the total capacity available in France (115 GWe in 2000).

At Dunkirk, approximately € 450 bn is being invested to replace the current thermal power plant. The new plant, called DK6, is slated for delivery in February 2005. It will have two 400 MW generating units and will be the most powerful combined cycle plant in France.

By the end of 2003, wind generators set up on the coast (metropolitan France and overseas administrative departments and territories) provided total power of nearly 120 MWe, i.e., about half of all French wind power production (246 MWe). In spite of significant growth from 2000 onwards, French wind farm facilities continue to lag behind those of our European neighbours: in June 2003 they supplied 220 MWe, compared to 586 MWe in the United Kingdom, 800 MWe in Italy, 2,919 MWe in Denmark, 5,060 MWe in Spain and 12,836 MWe in Germany.

## Wind farm facilities set up on the French coastline\* in late 2003 (total 117 MWe)

Regions and departements (counties)	Net power (MWe)	Year commissioned
Bouches-du-Rhône	0.9	2002
Brittany	12	2000-2002
Corsica	12	2000-2002
Guadeloupe	15	1996-2003
Languedoc-Roussillon	36	1991-2003
Nord-Pas-de-Calais	11.7	1991-2003
New Caledonia	5.2	1999-2001
Pays de la Loire	19.5	2003
Saint-Pierre et Miquelon	0.6	2000
Somme	4	2003
Tahiti	0.1	1999

\* this list only includes those sites located less than 15 km from the coastline.  
Source: Ademe.

## Electrical power plants set up on the coast

Site	Generating units	Net power (MWe)	Energy source	Year commissioned
Dunkirk (harbour)	3 & 4	2 x 117	BFG*	1969
Le Havre (harbour)	1	250	coal	1968
	2	585	coal	1969
	3	585	fuel oil	1973
	4	580	coal	1983
Cordemais (Loire estuary)	1	490	coal	1970
	2 & 3	2 x 685	fuel oil	1976
	4	580	coal	1983
	5	580	coal	1984
Martigues	1	250	fuel oil	1971
	2	250	fuel oil	1972
	3	250	fuel oil	1973
	4	250	fuel oil	1974
Gravelines (outer harbour of Dunkirk)	1, 2 & 3	3 x 910	nuclear	1980
	4	910	nuclear	1981
	5	910	nuclear	1984
	6	910	nuclear	1985
Penly (Eastern Channel)	1	1,330	nuclear	1990
	2	1,330	nuclear	1992
Paluel (Eastern Channel)	1 & 2	2 x 1,330	nuclear	1984
	3	1,330	nuclear	1985
	4	1,330	nuclear	1986
Flamanville (Western Channel)	1	1,330	nuclear	1985
	2	1,330	nuclear	1986
Le Blayais (Gironde estuary)	1	910	nuclear	1981
	2	910	nuclear	1982
	3 & 4	2 x 910	nuclear	1983
Rance estuary		240	tidal power	

\* blast furnace gas.

Source: EDF.

# Shipbuilding and repair

*This sector covers merchant and naval shipbuilding and repair for civilian and military uses, naval equipment and fittings and subcontracting as well as boatbuilding. These activities are very different in terms of organisation, concentration, size and type of market. There is some overlapping: some naval vessels are used for EEZ surveillance and policing of fisheries; civilian shipyards sometimes build military vessels or large yachts. Ship repair provides shipyards with an opportunity for diversification.*

## Merchant shipbuilding

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

### Trends in activity

The favourable economic situation for French shipyards from 1996 to 2000 was partly due to a phase of steady growth on their international markets. However, worldwide in 2001 and 2002, the sector's activity deteriorated, with contraction in the volume of orders for most types of vessels, accompanied by a significant drop in prices. Furthermore, shipbuilding capacity continued to rise elsewhere in the world, and particularly in China.

The type of vessels whose market slumped the most were container-ships

(new orders went from 13 million dwt in 2000 to 7.1 in 2001 and 7.4 in 2002 for vessels over 1 000 teu) and cruise liners (orders recorded went from 1,427,200 grt in 2000, 58,600 in 2001 and 228,000 in 2002).

The reversal in the economic situation worldwide, the high international tension persisting after the terrorist attacks on 11 September 2001, chronic overcapacity and the fall in freight traffic until the second semester of 2002 are the main reasons for this. However, world orders continued to progress in 2001 (75.8 million cgt) and stabilised in 2002 at a slightly lower level (74.9 million).

### Asia

Asia's predominance in the shipbuilding sector has grown constantly stronger. South Korea has consolidated its leadership position worldwide with orders reaching 31 million gct in 2002. It has

maintained its presence in its preferred fields and strengthened its market positions on high value added markets like those of methane carriers, cable-layers or ro-ro passenger vessels.

Ranking second worldwide, Japan also performed well in 2002, closing the year with an order book of 25 million gct. It took advantage of its dense domestic market, the patriotism of local shipowners and, until recently, a weak yen with respect to the dollar. Japan had a very good year in bulk carriers and methane carriers, since it took 9 of the 16 orders placed in 2002.

China is continuing its rise: in 2002, it took Europe's place as third ranking world builder, with 9.1 million cgt ordered, compared to 7.4 million in late 2001. It is pursuing its growth strategy, which is chiefly sustained by particularly low manpower costs.

## Key figures for civilian shipbuilding\*\*

Units: million euros,  
number of staff

Source: Sessi (annual company surveys).

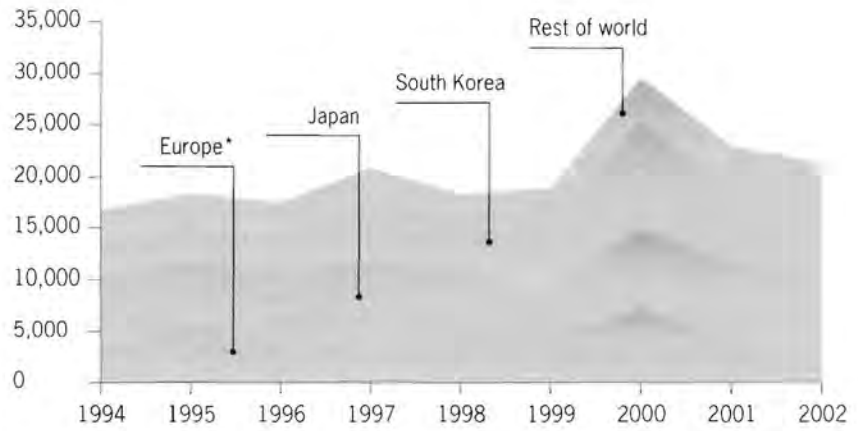
	1997	1998	1999	2000	2001
Turnover	906	1,026	1,576	2,127	1,485
Value added	232	345	466	440	298
Employment	6,092	5,297	6,032	5,984	6,260
Number of companies*	28	29	34	33	32

\* doing all or part of their business in this field.

\*\* companies totalling over 20 employees.

### New orders in the main regions

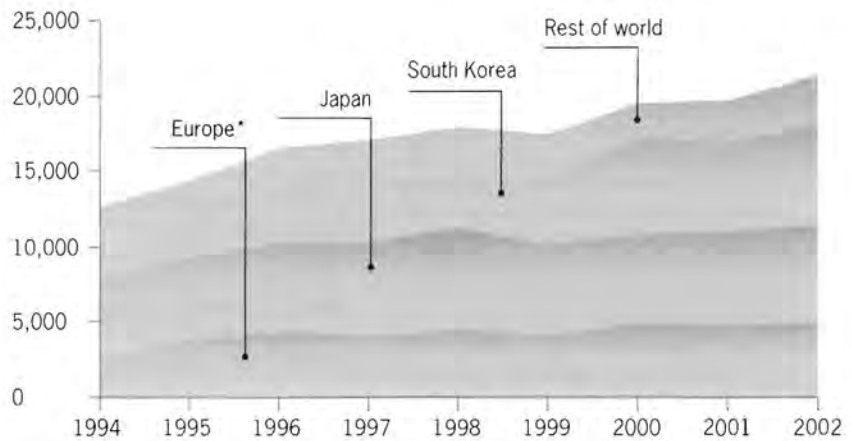
Unit: cgt  
Source: AWES.



\* AWES member countries.

### Market shares in production volume from the main regions (yearly deliveries)

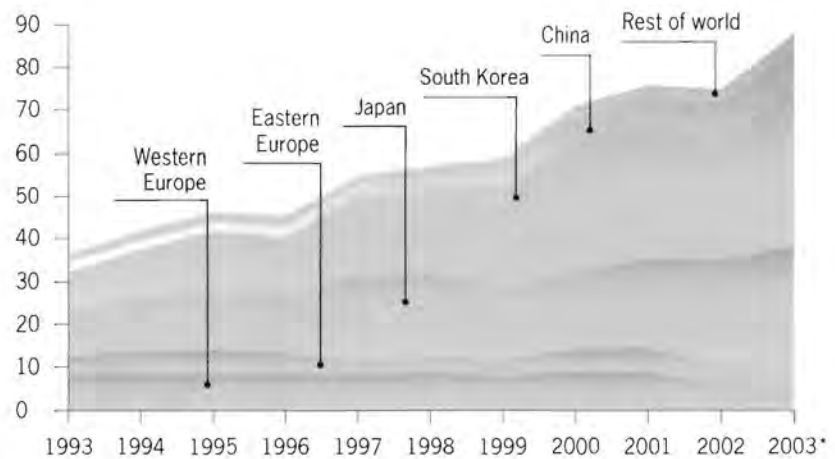
Unit: cgt  
Source: AWES.



\* AWES member countries.

### World orders since 1993

Unit: million cgt  
Source: Lloyd's Register of Shipping



\* end of second quarter 2003.

## Europe

Although not all countries have been affected to the same extent, European shipbuilding is undergoing an unfavourable international economic situation. Its market share went from 12.3% in 2000 to 8.3% at the end of 2002, and orders from 8,5 million cgt to 6.2 million.

It has been directly hit by the drop in demand for specialised vessels which were one of its strong points, the fall in merchant vessel prices (which is difficult for European shipyards to cope with, especially since financial aid was cut off in December 2000), the recent depreciation of the dollar with respect to the euro and increasing Asian competition on high value-added vessels: Europe got only one order out of the 16 placed for methane carriers in 2002.

Generally speaking, many shipyards are having difficulties; besides lay-offs, a number of yards in several European countries have either filed for bankruptcy or gone bankrupt. In this difficult context, the dispute between the European Union and Korea has grown deeper. Following the failure of negotiations with the Korean government, the EU initiated proceedings with the WTO in 2002 and re-established a temporary safeguard mechanism authorising financial aid to shipbuilding to the amount of 6% (of the contract value before aid) for container-ships, oil tankers and chemical tankers for any contract signed as of 24 October 2002 and up to 31 March 2004. These subsidies were extended to include methane carriers in June 2003.

## France

French shipbuilding's situation in 2001 and 2002 was crippled by sluggish demand for large vessels. With the exception of one order being officialized, no new orders for cruise liners were recorded for French shipyards for two years. In the methane carrier sector, two orders were placed by Gaz de France (in 2002 and 2003). So, after a considerable growth phase, the French shipyards' order books have undergone the effects of an unfavourable economic situation, going from 920,000 cgt in late 2000 to 670,000 at the end of 2001, then to 464,000 at the close of 2002.

However this assessment should be measured against the yardstick of diversity and dynamism of medium-sized shipyards which are positioned on specialised niche markets. They recorded good results in 2002, thanks to numerous orders for fishing vessels, service vessels, passenger boats or small military vessels. The market niche for small French shipyards has shown sustained, and highly diversified, activity overall. It should also be noted that these small shipyards have made forays into the small pleasure boat market. Well filled order books for French shipbuilding until at least 2004 will make it possible to keep deliveries coming at a high pace.

## Outlook

### Market trends

In view of orders worldwide for the first two quarters of 2003, an upturn appears to be taking shape for the entire merchant shipbuilding sector. More stringent

regulations (see below) are leading some shipowners to renew their fleets more rapidly, thus creating a revival in demand for oil tankers and bulk carriers.

On the container-ship market, we see the premises of recovery. Orders at the end of the first semester 2003 were six times higher than those for the same period in 2002. The rebound seen for oil tankers and bulk carriers in late 2002 gives reason for optimism, since the replacement of the fleet is being stimulated by stronger regulations concerning these vessels, notably through the increasingly fast introduction of requirements for double-hulls.

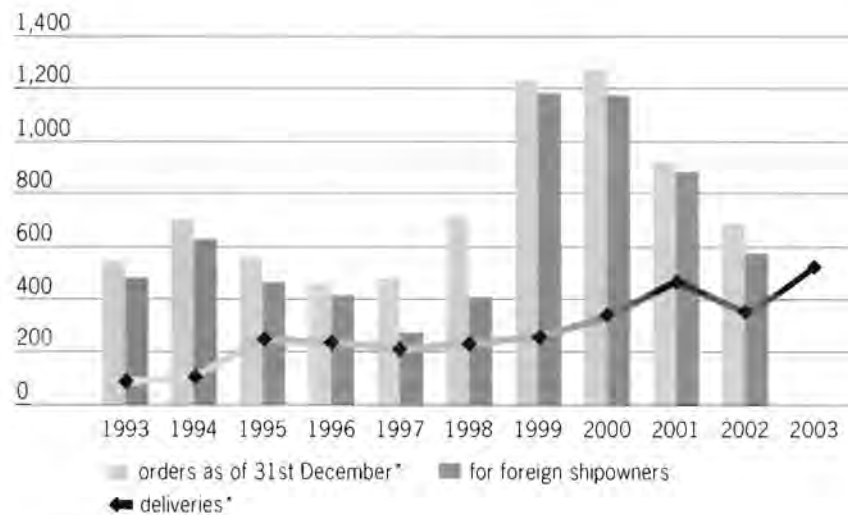
Liquid natural gas transport doubled in the decade of the 1990s. The Lloyd's List estimates that its growth by 2015 will reach 118%. Orders for methane carriers taken over the past two years will contribute to growing the world float to 65 vessels in the next five years. Growth in transport demand will reveal a need for 98 additional vessels before the end of 2015.

The cruise market, very hard hit by the consequences of the Sept. 11 terrorist attacks in 2001 and the economic recession, still showed a growth of 8% in 2002, which has continued in 2003. This could be a favourable context for resumption of cruise liner orders.

In the short term, however, shipbuilding is confronted with the risk of increasing overcapacity. According to the OECD, it exceeded 15% in late 2002. It could reach 30% in two years' time, unless specific action is taken to counter this trend.

## French civilian shipbuilding

Unit: thousand cgt  
Source: CSCN



\* deliveries for the top six French private-sector shipyards.



### Safety at sea and shipbuilding

The debate about safety at sea has steadily increased in scale over the past several years and is reopened with each new accident. This was particularly true in the case of the *Prestige*. After the *Erika* sank in December 1999, the European Union strengthened its arsenal of laws on safety at sea.

The faster incorporation of requirements for double hulls was ratified by the regulation EC/1726/2003 of the European Parliament and Council on 22 July 2003, which amends EC/417/2002 of 18 February 2002. It imposes a schedule for the phasing out of single-hulled oil tankers, aiming for their total prohibition by the year 2010.

### Naval shipbuilding

Naval shipbuilding includes:

- building and repair of warships by civilian shipyards;
- design and construction of military vessels, as well as their overhauls, ensured by the DCN naval shipyards.

The naval shipbuilding activity in France mainly comes under the competence of the DCN. Merchant shipyards provide a small share in this speciality, of less than 10% of DCN production. The latter works in design, construction and maintenance of naval equipment. Its main customer is the French Navy, but it also exports.

### Trends in activity

With a turnover of 1,176 billion euros, 2001 was an adverse financial year in the DCN's recent history. But, after several difficult years related to cutbacks in defence budgets, a strong recovery has been established in the wake of the military programming law for 2003-2008, up by 5.5 billion euros from the previous budget, including new series of frigates and SSN attack submarines, a fourth SSBN ballistic missile nuclear submarine and a second aircraft carrier. The effects of this upturn have been felt since 2002, with DCN turnover showing an increase

of over 44% to reach 1.7 billion euros.

On 30 April 2003, DCN personnel amounted to 13,700 staff, about 3,500 of whom are based in Brest (nuclear submarine and surface ship maintenance, logistics, warships and heavy tonnage ships), 2620 in Cherbourg (submarine construction), 950 in Lorient (surface vessels), 1050 at Indret (naval propulsion), 800 at Ruelle (equipment and fittings), 2,880 in Toulon (ship maintenance, combat management system), 290 at Saint-Tropez (torpedoes) and 250 at Papeete (maintenance). Personnel cutbacks have been announced. They will

### Single hull oil tanker phase out schedule

	Vessel's delivery date	Phase out date
Category 1	1980 or before	2003
	1981	2004
	1982 or after	2005
Categories 1 & 2	1975 or before	2003
	1976	2004
	1977	2005
	1978 & 1979	2006
	1980 & 1981	2007
	1982	2008
	1983	2009
	1984 or after	2010

### Key figures for naval shipbuilding

Units: million euros, number of staff  
Sources: Sessi for merchant shipyards, DCN for naval shipyards.

	1997	1998	1999	2000	2001	2002
<b>Merchant shipyards</b>						
Turnover <sup>(1)</sup>	64	82	60	59	106	
Value added <sup>(1)</sup>	33	38	21	30	56	
Employment	795	758	626	714	695	
Number of companies <sup>(2)</sup>	8	7	6	7	9	
Level of exports (%) <sup>(3)</sup>	60	69.4	67.4	45.7	84.3	
<b>Naval shipyards (DCN)</b>						
Production <sup>(4)</sup>	2,036	1,626	na	na	1,187	1,509
Procurement of material, equipment and services	1,194	909	na	na	488	557
Inventory changes	85	15	na	na	-6.8	-8.2
Value added <sup>(5)</sup>	757	702	na	na	699	952
DCN workforce	20,333	17,515	16,332	na	14,787	14,002

(1) Data has been corrected since previous editions

(2) fractions of companies: doing all or part of their business in this field

(3) average percentage of turnover for companies with 20 or more employees

(4) DCN accounting methods were modified from 1999-2000 on

(5) Ifremer estimation for 1999: about FRF 4,500 m (taking the same accounting basis as for previous years).

na: not available.

bring the total labour force to 12,300 by 2005.

Over the past ten years, the DCN has undergone sweeping changes designed to give it means to meet the challenges of international competition. The creation of Armaris in 2002 was a vital step in this process: this company is jointly held, in equal shares, by the DCN and Thalès, grouping their sales and main contracting activities for export or cooperation-based projects.

The DCN's true transformation took place on 1st June 2003. On that date, its status changed from that of a national public service organisation to that of a private law company with public capital, in application of the law n°2001-1276 of 28 December 2001. This development frees it from administrative constraints, particularly in the fields of procurement, human resources and industrial partnerships.

Several civilian shipyards have a foothold in military shipbuilding, thus complementing DCN's offering. The main ones are Alstom Marine, CMN, Ocea, Socarenam, CNB and Raidco Marine.

### Outlook

DCN has many assets for the future: mastery of every type of modern warship, orders amounting to approximately 6 billion euros and firm forecasts for activity in view of the military programming law.

However, some reasons for concern are arising with the sudden arrival of American firms in Europe. The March 2002 buyout of HDW (world leader in the conventional submarine sector) by an American pension fund indicates their interest for the European market. Against this backdrop of increased competition, DCN is taking part in industrial alliances, par-

ticularly with several Italian and Spanish shipbuilders. Merchant shipyards will also play an important part, especially in the forthcoming programmes: building of the "Mistral" and "Tonnerre" BPC (force projection and command) vessels jointly achieved by the DCN and the Chantiers de l'Atlantique civilian shipyards, illustrate this type of cooperation.

## Equipment makers and subcontractors

This series of businesses, supplying shipbuilding and ship repair yards, shipowners and offshore oil-related industries, hold the following activities:

- manufacturing technical equipment: propulsion machinery, electrical and electronic equipment, shipboard handling, navigation and bridge equipment, pumps, ventilation and air;
- supplying shipbuilding yards with "modules" of assembled and tested equipment, either as prefab or installed, and complete systems or functions like installation of ventilation and air conditioning or fitting out of public areas and cabin areas in passenger ships;
- subcontracting of studies and production.

### Trends in activity

Closely linked to the shipbuilding industry, the merchant and naval equipment branch plays a predominant role. Depending on the type of ship in question, the average contribution of equipment suppliers to the total value has been assessed by the European Marine Equipment Council (EMEC) as about 70%, with high fluctuations. For instance, the electronics in a military frigate today account for up to 60% of its cost.

The European equipment sector (mainly represented by Germany, the United Kingdom and Norway) has succeeded in keeping its world market share, particularly facing Japan, the United States and South Korea.

For propulsion systems, several innovative new concepts have come to the fore in the past few years (pods, propellers, for example), whereas other older systems like hydrojets, have been improved to become more high-performance and multi-purpose.

The European Commission published a survey in March 2000 which gives a view of the sector at world level: the ship equipment industry's turnover worldwide was estimated at 61 billion euros in 1999 and that of the EU plus Norway at about 22 billion euros (i.e., 36% of the total). This employs some 240,000 people, working in over 9,000 companies all over the world.

## Merchant ship repair

The activity includes:

- repair and scrapping of civilian vessels (warship repair is included in naval shipbuilding, see above)
- ship conversions.

Shipbuilding and repair are obviously two closely related and complementary activities. Although the activity is mainly ensured by specialised firms, it can also provide an additional outlet for shipyards.

### Trends in activity

The highly competitive activity of ship repair is more of a service industry than a manufacturing one. Manpower costs are decisive in keeping workshops competitive. Internationally speaking, Asian

## Key figures for all equipment supply and subcontracting

Units: million euros, number of staff

Source: FIMF and SESSI  
(annual company survey)

	2001
Turnover	2,700
Value added	800
Employment	25,000
Level of exports *	40%

\* not including the re-exported share on ships built in France for abroad.

yards predominate, especially Singapore (6,760 called for repairs in 2001, making a rise of 47% from 2000), Japan and South Korea, both supported by their highly buoyant national markets. Vietnam and China have recently made a remarkable breakthrough on this market thanks to their very low labour costs.

In Europe, ship repair is marked by competition from Eastern European countries: southern European shipyards (Italy, Spain, Malta and France) are in competition with the Ukraine and Romania; to the north, the Germans and British must cope with the attractive pricing of their Russian and Baltic counterparts.

In France this activity is small scale. Following the downswing at the middle of the last decade, France was able to take advantage of global growth and the favourable situation for international shipping, recording results on the rise from 1997 to 1999. After a significant drop in turnover in 2000 and 2001, the activity appears to be on the upturn.

### Outlook

According to a recent study by Ocean Shipping Consultants Limited, the average growth rate for demand in the sec-

tor should reach 2.1% for the period from 2001-2005, 2.5% from 2006 to 2010 and 2% from 2011 to 2015. The continuous rise in investments from Asia should, according to the same study, lead to overcapacity worldwide, and consequently, to a phase of falling prices. Since European companies are currently less competitive in terms of production costs, they may be led to focus on specialised market niches.

## Boatbuilding

The term boatbuilding comprises the manufacturing of sailboats and powerboats, rigid or inflatable, and windsurf boards, as well as their fitting out, maintenance and repair.

### Trends in activity

Boatbuilding worldwide shows a marked predominance of motorboats. According to the FIN, world production of these boats now accounts for 7.3 billion euros, compared to 1.3 billion for sailboats.

The French boatbuilding industry is still the leader in Europe and ranks second worldwide behind the United States. Its strong points remain the building of sail-

boats and inflatable boats, ranking first worldwide on these markets.

Some 750,000 boats make up the French pleasure fleet, with an average age of 14 years and 83% powerboats. With nearly a third of the fleet made up of vessels built more than twenty years ago, the French pleasure fleet is ageing. Therefore, its perspectives for the replacement market are considerable.

According to FIN nautical industry federation data, the activity has shown a rise of 2.8% during the 2002-2003 financial year, compared to 21% recorded annually between 1997 and 2002. This slowdown in activity has not prevented the French industry from confirming its internationalisation: export levels, which exceeded 50% in 1998, continued to rise to reach over 62% in 2002.

### Outlook

The French boatbuilding industry expects an upturn for 2004, in the wake of that observed in the United States. According to the FIN, the renewal of the sailing boat fleet, the trend towards a regularly bigger sailboats and the opening of new markets in the former Eastern block countries should fuel this growth.

### Key figures for ship repair\*

Units: million euros, number of staff  
Source: Sessi  
(annual company survey).

	1997	1998	1999	2000	2001
Turnover	200	221	243	197	186
Value added	80	76	92	82	67
Employment	2,464	2,466	2,511	2,150	1,822
Number of companies**	44	44	55	51	45

\* This branch of activities under the NAF nomenclature includes: repair and conversion of civilian vessels, and scrapping.  
\*\* doing all or part of their business in this field.

### Key figures for boatbuilding\*

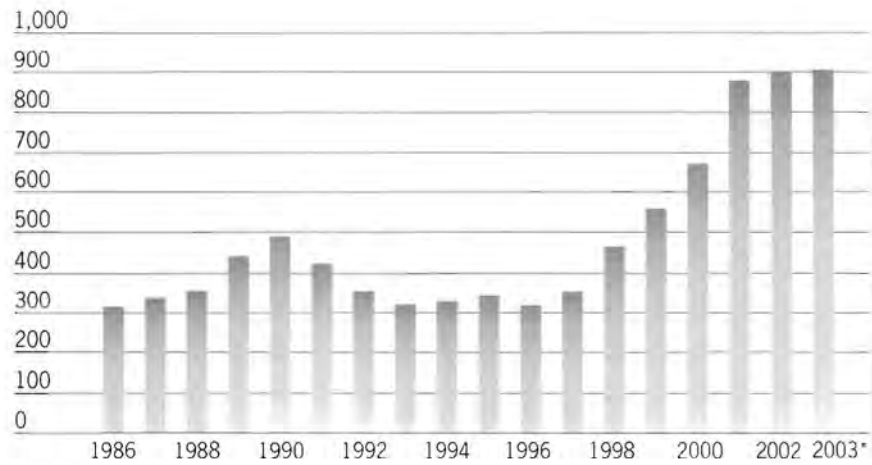
Units: million euros, number of staff  
Source: Sessi  
(annual company survey).

	1997	1998	1999	2000	2001
Turnover	380	530	640	793	978
Value added	130	178	210	237	314
Employment	3,607	4,259	5,072	6,174	7,151
Number of companies**	42	45	52	52	65

\* data for the field, related to companies of 20 or more employees.  
\*\* doing all or part of their business in this field.

Annual turnover  
of the pleasure boat industry  
(not including maintenance  
and repair)

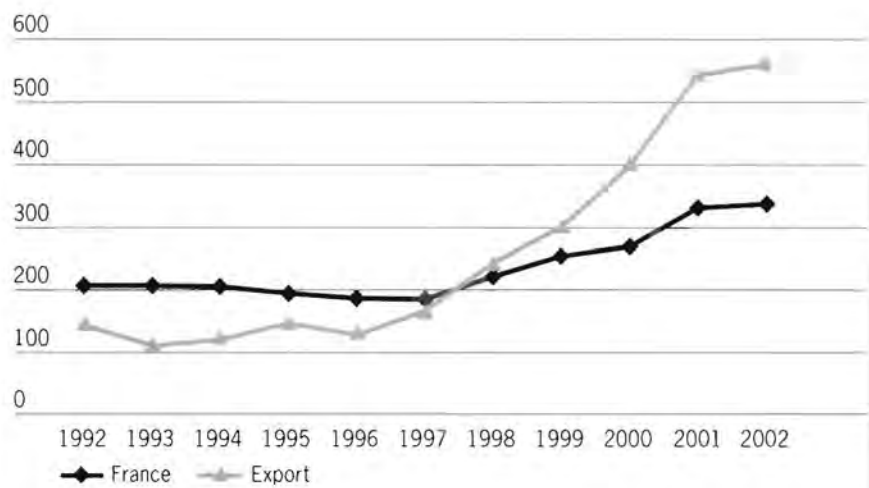
Unit: million euros  
Source: FIN (field survey)



\* estimation.

The French industry's sales  
in France and abroad

Unit: million euros  
Source: FIN (1992-2002 field surveys).



# Maritime civil engineering

The maritime and inland water engineering activity covers construction and engineering carried out at sea or on inland waters. This involves building riprap protection (natural or artificial) and constructing or regulating waterways (navigable or not).

In the available data, the "maritime" subset of this activity is not distinguished from the "inland water" subset. Ifremer estimates that the former makes up about 50% of total annual turnover for marine and river engineering.

Maritime civil engineering meets different objectives:

- for harbours: constructing harbour facilities, breakwaters, quays, piers, jetties, locks, dry docks, bridges, slipways, channel linings;
- for coastal protection: rip-rap, retaining walls, ramparts;
- for the French Army and Navy: coastal defence works;

at sea: offshore platforms, lighthouses and beacons.

This work entails special techniques and materials. It can also require highly-skilled staff. Along with new constructions in maritime sites (approximately 50% of the activity in 2001), maritime civil engineering also involves their maintenance and renovation (50% of the activity).

It should be noted that maritime CE makes up only a small proportion of public works overall: in metropolitan France in 2001, engineering firms on maritime and river sites produced 1.5% of the annual turnover in civil engineering.

## Civil engineering trends in metropolitan France

This turnover has shown constant growth since 1995, although it has been stagnating since 1998. Over the same period manpower levels declined slightly.

While 67.7% of employees in the CE sector overall in 2001 were workers, maritime CE employed more highly skilled workers on average: workers made up 60% of its total manpower in 2001.

### Key figures for marine engineering in Metropolitan France<sup>(1)(2)</sup>

Units: million euros, number of staff

Source: National federation of public works (FNTP).

	1997	1998	1999 <sup>(4)</sup>	2000	2001
Turnover	636	856	875	883	935
including outside of metropolitan France	538	781	749	748	779
Value added <sup>(3)</sup>	286	385	394	398	421
Employment	1,110	1,056	1,097	1,040	1,061

(1) on the basis of a 50% proportion of maritime engineering in overall marine and inland engineering (Ifremer estimation)

(2) The figures are based on statistics which differentiate between work carried out in metropolitan France and overseas.

The latter includes works in the French overseas dominions and territories and abroad.

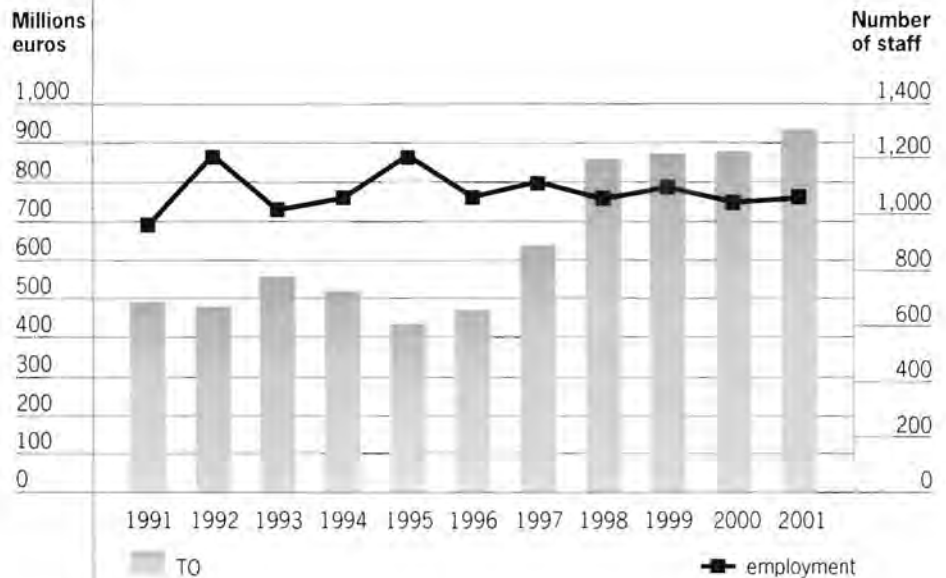
(3) value added rate estimated to be 45%

(4) data revised since the previous edition.



### Turnover volume and employment in maritime CE

Units: million euros, number of staff  
 Source: *l'Inremer* estimations based on *FNTP* data.



In metropolitan France, the main customers of French marine and inland CE companies are the public sector (local authorities, counties, State) for 66.1% of production, private sector firms (25.4%) and private individuals (8.5%). The largest turnover volume was achieved in the PACA and Corsica region in 2001.

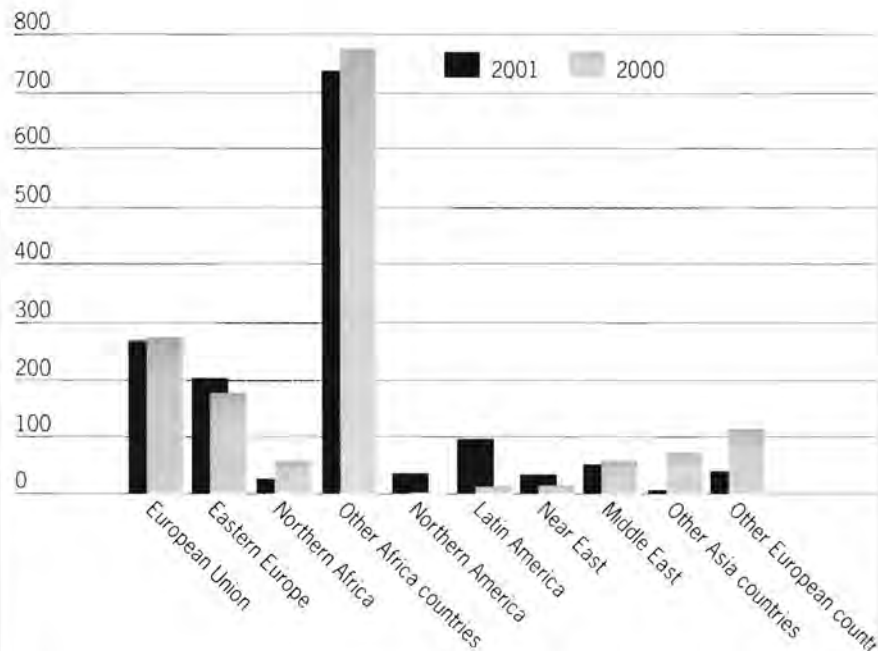
83.3% of the total turnover. The activity in maritime and inland water CE contributed to the export turnover figures of all French CE, reaching 12.6% in 1999, 10.9% in 2000 and 10.1% in 2001.

activity in 1998 was closely linked to the major worksites underway at the time in Scotland and England. This situation did not last: the European Union market share went from 48.3% in 1998 to 17.7% in 2001. For the same period, Africa continued to progress (+ 10.4% in 2001). Its share rose from 33.8% in 1998 to more than half of the markets (53.6%) in 2001.

From 2000 to 2001, turnover for export sales of marine and inland water CE companies recorded a rise of 4% to 1,557 million euros. The strong growth for the European Union in the share of export

### Trends in export activity

French CE enterprises achieve a significant part of their activity in exports. In 2001, the turnover of this activity outside of France (including the DOM-TOM dominions and territories) accounted for



### Foreign customer trends for maritime CE firms from 2000 to 2001

Unit: million euros  
 Source: *FNTP*.

# Submarine cables

*Underwater telecommunication cables submerged at great depths are used to transmit telephone and data communications. The activity accounted for here includes seabed and route surveys, engineering, manufacturing and maintenance of cables and their installation. Commercial services also concern the setting up of projects and promotion. Figures are not available for all these segments.*

## How the activity is organised

There are two types of cables:

- very long haul cables which can cover thousands of kilometres with powerful transmission capacities. They use submerged "repeaters", equipped with optical amplifiers to compensate for loss along the cable;
- so-called "unrepeated" systems, with no submerged active electronic components. These are much cheaper than those mentioned above, can cover up to 400 km and be linked to repeated long-haul networks.

Industrially speaking, the submarine cable stream includes:

- the feasibility study: a seafloor survey performed by a specialised ship (essential for the cable's useful life), underwater route surveys;
- engineering: protection method, network architecture design (capacities, connections);
- manufacturing the cables;
- laying and maintenance, which require

the use of cable-laying vessels. This can entail jetting (protecting the cables by burying them) which is performed by remotely operated vehicles. Jetting is done at ever-increasing depths, currently 1,000 m, sometimes reaching 1,500 m.

Compared to their communications competitor, the satellite, cables currently ensure most long-distance telecommunications, including all those linking Europe and North America.

## Market trends

Until the late 1990s, with the development of telecommunications and the Internet, the submarine fibre-optic cable market grew significantly. For manufacturing alone, the world market rose to 9.3 billion dollars in total orders over 1993-1997. From 150,000 to 200,000 km of cable were produced every year. Each of these specific markets (long haul repeated and medium haul unrepeated systems) is characterised by the small number of enterprises involved.

The submarine cable industry has had several peaks in its activity which correspond to the arrival of new technologies: regenerated fibre optic systems in 1987-1988, optically amplified systems in 1991-1992, the first WDM (Sea-Me-We 3 with four 2.5 Gbit/s wavelengths) in 1994-1995, followed by the DWDM technology enabling transmissions reaching 120 wavelengths at 10 Gbit/s in 1998-2000.

Overcapacity in telecommunications equipment has hit all segments of the activity hard and has led to a sharp downturn in investment projects. Whereas the world market amounted to 6.2 billion US dollars in 1998, it dropped to less than 2.4 billion in 2001 and to 250 million US dollars in 2002. This situation has brought on major difficulties for most of the sector's enterprises, which are proceeding with layoffs and deep-ranging restructuring. Current orders are mainly being placed for maintenance of the existing facilities. In about three years' time, a market could develop for the replacement/renewal of equipment or even demand for new capacity.

## Key figures (manufacturing, laying and maintenance of underwater cables)

Units: million euros, number of staff  
Sources: data from companies and Ipremer estimations.

	1997	1999	2000	2001	2002
Value added	49	232	270	223	44
Employment	1,170	1,597	2,168	1,916	1,507

# Offshore oil and gas-related industry

The French offshore oil and gas industry includes engineering, supplying petroleum and gas equipment and facilities, providing services in the fields of exploration and production at sea (especially offshore oil platforms, drill-ships and drilling systems, building LNG carriers and some gas processing techniques, as well as gas terminals). The contractors are usually oil companies and gas production firms.

## Trends in activity

The French oil and gas equipment and service sector is structurally oriented towards exportation, for lack of national oil production. This means that sector is especially open to international competition. It ranks second to the American oil and gas-related industry for exports. On average, 93% of its turnover was achieved abroad. For the offshore sector, we estimate that 100% of production is exported (source: IFP).

Companies in the sector play an active role in providing services and equipment for exploration and production, refining and petrochemicals, as well as for transporting gas. They work both upstream and downstream in the petroleum field and feel a cyclic effect which is strongly linked to the latter, then to that of crude oil and gas price cycles. Investments in oil exploration and production have a

major influence on the oil-related industry in general and the French one in particular, at least for the upstream segment which constitutes a major part of offshore activities.

Within a context of good results for European and North American economies, the 1999-2000 rise in crude oil prices to levels temporarily exceeding \$35/barrel was immediately followed by a rally in investments (+ 12% in 2000, at \$ 100 bn), which continued in 2001 (+ 13%) to reach a record high of \$112 bn in 2001. The decline in the economic climate from mid 2001, combined with the consequences of the terrorist attacks on September 11, 2001, brought on a slight decrease in investments (about -4%) which went to \$ 107.5 bn in 2002. So, after a period of steady growth, trends in oil investments tend to vary, but their fluctuations are at a level which remains high.

Under the impetus of favourable factors in the 90s, the French oil-related industry showed a sustained growth rate from 1994 to 1998 and the sector consolidated its position worldwide during that period. The drop in 1999, mainly due to offshore activities and mitigated by mergers and acquisitions, was followed by a strong upswing in 2000 (+ 12.5%) and 2001 (21.5%). The year 2002 was marked by a contraction of growth (+ 1.6%), which was mainly linked to external development operations: within the same scope, turnover decreased by 1%, in accordance with worldwide trends. A rise of 2.3% in the latter has been forecast for 2003, which would set a record value of \$ 15.8 bn.

After the fall in 1999 and low growth in 2000, the offshore industry activity's activity surged in 2001 (+ 38% to € 5.2 bn) and 2002 (+ 12% to € 5.8 bn). This trend is partly due to the

## Key figures for the offshore sector

Units: billion euros, number of staff  
Source: French petroleum institute (IFP).

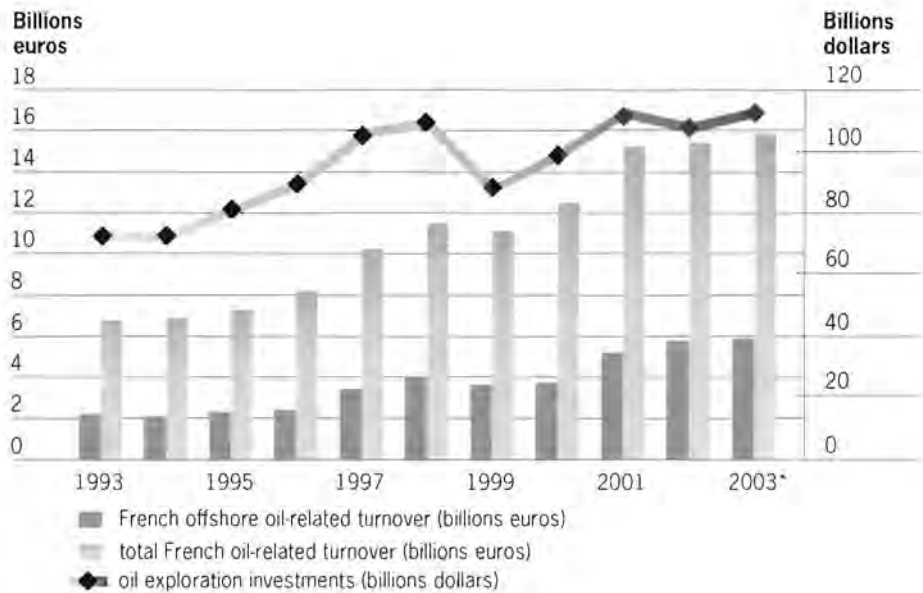
	1997	1998	1999	2000	2001	2002	2003 <sup>(1)</sup>
Turnover	3.4	4.0	3.6	3.7	5.2	5.8	5.9
Value added <sup>(2)</sup>	1.36	1.54	1.23	1.20	1.69	1.78	1.80
Employment (thousands)	17	19	17.5	17	24	25.2	25.6

(1) forecast

(2) value added rate as estimated by the IFP for the entire oil-related industry. Ifremer's estimate from 2000 on, based on previous IFP data, has been improved since the preceding publication.

## Turnover (total sales) of French oil industry

Units: billion euros, billion dollars  
Source: IFP.



\* forecast.

acquisitions of companies or foreign divisions made during this period; within the same scope, growth would have only been 4% in 2002. The offshore sector, representing 38% of the French oil-related industry in 2002, should experience growth of about 2% in 2003.

The gas-related industry is another strategic segment where the French are active. Amongst the currently competitive countries on the LNG carrier market are Japan, South Korea, Spain, France and Finland. France has mastered the membrane system for LNG cargo which competes with a Norwegian spherical tank system. These two techniques each cover about 50% of the world LNG carrier fleet. Membrane technology is being used on 80% of ships built in South Korea today.

In the nineties, LNG carrier prices dropped very sharply, mainly due to increasingly intense international competition. Since 2000, we have seen a recovery in these prices, but they remain far from the levels reached ten years earlier.

## Companies and employment

There are significant differences in the way French oil-related service and equipment companies perform. Service providers reacted strongly to market

fluctuations and were hard hit by the fall in 1999 (-17%) and then showed a strong recovery in 2000 and 2001. In 2002 they recorded a 3% decrease in turnover to € 7.2 bn, while a 3% increase has been predicted for 2003. Equipment manufacturers and engineering firms, less prone to swings, saw their sales fall by 3% between 2001 and 2002 to around € 3.9 bn. Forecasts indicate a growth rate of 1.3% for 2003.

Internationalisation of capital is a basic trend in the French oil sector. "International" firms, i.e., listed on the stock market and in which the French hold only minority interests, are increasingly influential in the sector.

After a drop in 1999 and relative stagnation in 2000, the French oil industry labour force rose by 12% in 2001 and by 5% in 2002, reaching 61,000 people, approximately 25,000 of whom work in the offshore sector.

## Outlook

The expected progression for 2003 in the world oil sector is strongly linked to high oil prices (above \$ 30/barrel in October) and growing demand. Furthermore, the IFP has estimated that investments in exploration and production (not including Russia and China) should increase by 5%

in 2003 to reach 113 billion dollars, following a drop of 4% in 2002.

However, this overall increase remains quite limited with respect to the high levels of oil prices over the past two years. This restraint shows the hesitation on the part of companies who, according to the IFP, are afraid that prices will collapse and are holding to cautious investment policies. The many uncertainties linked to the Iraqi crisis without doubt have a bearing on this situation and could be determinant for the short-term developments in the sector.

The LNG-carrier segment has a large potential for growth, seeing that natural gas consumption has constantly increasing (an average of + 3.4% per year in the nineties, + 2.8% in 2002), accounting today for nearly a quarter (24%) of world energy consumption, almost equal to coal. World production also recorded an increase of 1.4% in 2002, at 2,493 billion cubic metres.

In this growth context, French expertise in membrane system technology is a sound asset which has been reinforced by the perfecting of the new CS1 system combining the advantages of the two membrane systems already implemented. It will initially be developed on a 75,000 m<sup>3</sup> LNG carrier ordered from French shipyards by the French gas board GDF.

# Coastal tourism

Coastal tourism covers a wide range of goods and services for very different types of consumers, brought together by the common goal of tourist activity.

In France, the overall turnover for tourism is evaluated through spending by French (resident) and foreign (non-resident) tourists during their stay in France.

Tourist consumption includes expenditures for accommodation, catering, recreation, miscellaneous purchases, foodstuffs purchases, other services, transportation and package offers (within spending for tourist stays in France).

Coastal tourism is far and away the largest sector of the marine and coastal economy in terms of turnover, added value and employment. It is one of the major sectors of the French tourist economy. Second ranking tourist destination in France in terms of the number of stays (one fourth) and top ranking for the number of nights (over one third) due to an average stay which is longer than that in the other areas of city, mountains and countryside. It accounts for slightly more than one quarter of annual tourist consumption.

## Tourist consumption trends

After the rather unfavourable year of 2001, the environment for French

tourism remained difficult in 2002:

- France's gross domestic product only rose by 1.2%. Household consumption was slightly more dynamic, showing growth of 1.8%.
- As concerns international tourism, the events on 11 September 2001 in the United States, followed by other terrorist attacks elsewhere in the world, weighed heavily on the economic situation in a generally non-buoyant economic context. Following the period from 1990-2000, marked by an average growth rate of 4.3% for international tourism, a drop of 0.5% was recorded for 2001 and a relatively weak rise (3.1%) in 2002.

Generally speaking, French tourism grew a bit faster in 2002 than in 2001: + 4.3% for the total number of stays and + 3.3%

for the number of nights. This compares respectively to growth of 2.0% and - 0.2% in 2001. For both years, a downward trend for the average length of trip was observed. Trips abroad make up only a small part of travel by the French overall (a little more than 10% of stays and 15% of nights). This was on the rise in 2002, especially for short stays (three nights at most). Therefore, for a fairly strong increase in the number of stays abroad (+ 6.1% from the year before), the number of nights only rose by 2.3%.

As in 2001, the relatively dynamic nature of tourism continued to be backed up by careful behaviour: the non-paying accommodation sector was preferred to the paying sector. The volume of trips abroad did not rise faster than that of trips made on French territory.

## Key figures for coastal tourism

Units: million euros,  
number of staff

Sources: Tourism directorate/tourism  
accounts, Unedic.

	1997	1998	1999	2000	2001	2002
Tourist spending	17,867	18,220	18,120	19,139	19,287	20,032
Value added*	7,504	7,652	7,610	8,038	8,101	8,413
Employment**	167,194	182,826	190,402	196,334	190,688	na

\* Ifremer estimation based on tourism accounts. Value added rate estimated at 42 %

\*\* jobs in characteristic tourist activities. Ifremer estimation based on tourism accounts and Unedic data  
na: not available



## The seaside's importance for tourism in France

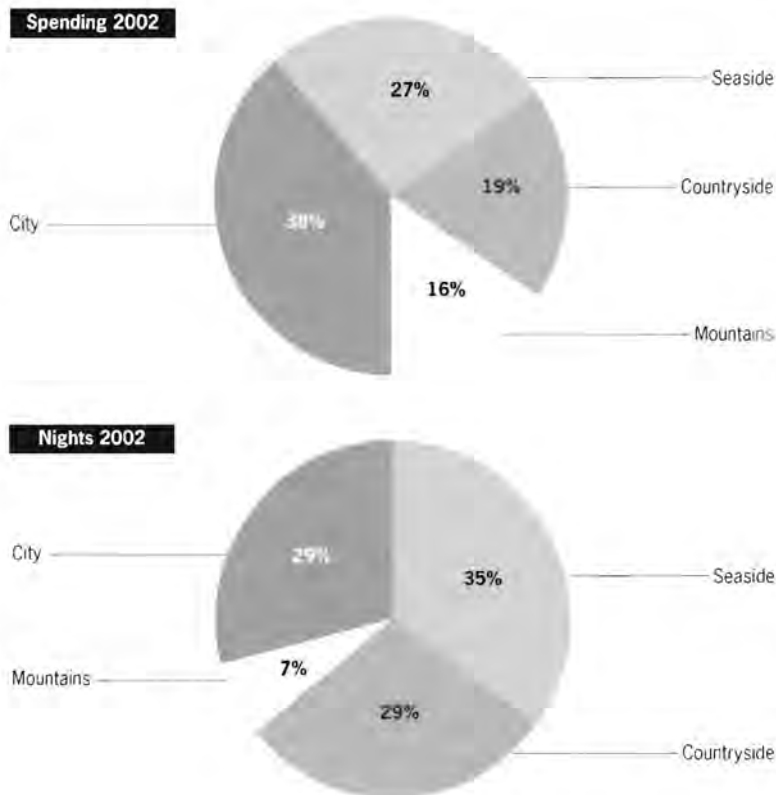
Coastal tourism remains a seasonal activity lasting from two to four months a year, depending on whether the coasts in question are in northern or southern France. From 2001 to 2002, the number of nights and of stays by domestic and inbound tourists on the French seaside rose by 2.8%.

The coast is the top ranking tourist destination, attracting 35.3% of total nights, but it only accounts for slightly over one quarter (26.6%) of non-business tourist consumption. With 39% of tourist spending by a foreign clientele, the seaside makes a vital contribution to the economy in coastal areas.

In terms of the tourist area chosen, the behaviour of domestic tourists must be distinguished from that of inbound tourists in France. The seaside totals 31% of French tourists' spending, compared to 27% for cities. The distribution structure is much different for inbound visitors, since 51% of their tourist consumption takes place in towns, as opposed to 22% at the seaside.

For tourism by domestic residents, along with mountain and lakeside holidays, French people stay longest at the seaside. 62% of stays exceed three nights, compared to 45% when all tourist areas are taken together. The seaside is the area where the average length of stay is longest (eight nights).

### Stays and overnights for non-business trips by French tourists by tourist area



Source: Tourism directorate/tourism accounts.

### Stays and overnights for non-business trips by French tourists by tourist area

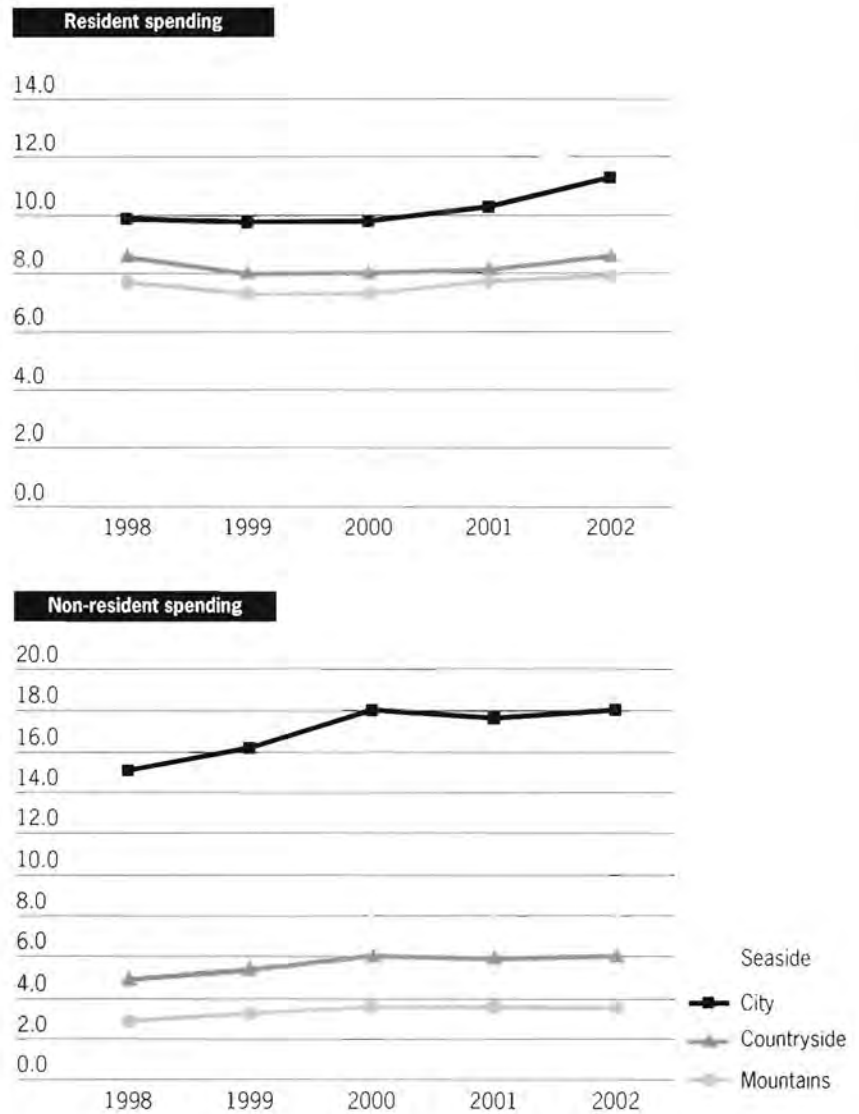
Unit: %

	Breakdown of stays*					Breakdown of nights*				
	1998	1999	2000	2001	2002	1998	1999	2000	2001	2002
Seaside	26.4	27.6	28.0	27.6	27.3	38.6	38.9	40.0	39.6	39.2
Mountains	15.4	15.1	15.1	14.4	14.5	19.0	19.5	19.2	18.9	19.2
Countryside	36.8	36.0	34.9	36.1	36.1	34.0	32.8	31.5	32.1	32.0
City	33.6	33.4	33.9	33.5	34.0	26.5	27.1	27.2	27.3	27.9
Lakeside	4.1	4.0	4.2	4.0	4.0	5.9	5.1	5.7	5.4	5.7
Other	2.3	2.3	2.9	2.8	2.7	2.2	2.3	2.9	2.7	2.7

\* Totals exceed 100%: since several types of area may be visited during the same stay.  
Sources: Tourism directorate, TNS Sofres, SDT monitoring of domestic tourist travel

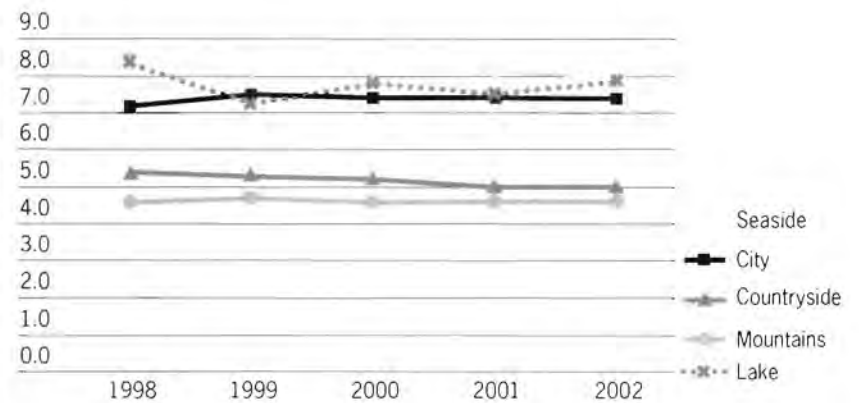
Breakdown of domestic and inbound visitors' consumption on non-business stays by tourist area

Unit: billion euros  
Source: Tourism directorate/tourism accounts.



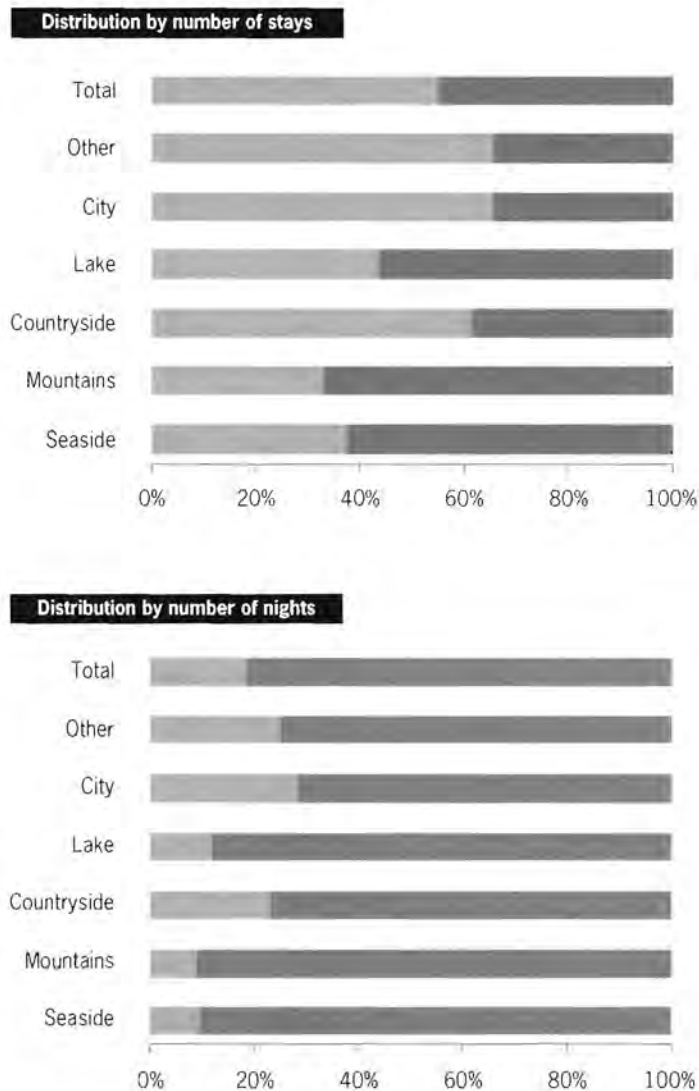
Average length of non-business stays by French tourists by tourist area

Unit: number of nights  
Sources: Tourism directorate, TNS Sofres, SDT



## Length of stays by tourist area in 2002

Sources: Tourism directorate,  
TNS Sofres, SDT.



In terms of spatial distribution, the seaside ranks third for overnight stays from short visits (27.8 million nights) after the countryside and cities, which are respectively number one and two domestic destinations in France for non-business stays. The seaside is the leading area for overnights on long stays (259.5 million nights).

Non-residents' choice between tourist areas is entirely different. Domestic tourists spend 40% of their seaside overnight stays for non-business reasons, compared to 23.5% of inbound tourists. Foreigners show a preference for urban areas which take 32.4% of their overnight visits; they also spend more than French tourists (€ 355 per person and per stay on annual average in 1998).

## Overnight stays by inbound visitors on non-business stays by geographic area in 2002

Unit: %

City	32.3
Seaside	23.5
Countryside	18.0
Mountains	11.1
Several	15.1
<b>Total</b>	<b>100</b>

Sources: Tourism directorate, TNS Sofres, 1997  
survey at French borders.

## Employment

The seaside accounts for 26.7% of total tourist consumption on non-business stays for both domestic and inbound tourists. 77% of jobs in tourism are in accommodation and catering. The rest are mainly found in cafés, travel agencies, tourist information offices, facilitation and thalassotherapy. Other jobs are linked to tourist activity, but are not taken into account here as part of "characteristic tourist activities". They are indirect and induced employment in shops, transportation, health care and waste treatment activities in particular.

## Seaside tourist capacity as seen through accommodation

Paying accommodation is the most usual choice for stays on the coast, but holiday homes fulfil a vital role. Thus, 46.4% of domestic tourist nights spent at the seaside are in paying accommodation, as opposed to 78.9% for inbound tourists. The types of paying accommodation most used at the seaside are camping and caravanning for 46% (51.2% of sites are located on the coast). Residents prefer rentals for 34.7% of paying accommodation.

Non paying accommodation is preferred in rural and urban tourism. Moreover, France is one of the countries with the largest number of second or holiday homes in the world. They are mainly located at the seaside and in the countryside.

In 2002, 55% of rooms were supplied in cities and 18% on the coast. Two-star and three-star hotel rooms respectively account for 53% and 23% of the seaside supply. Over half (51%) of short stay camping sites are located at the seaside.

## Tourism in the French overseas departments and territories

DOM-TOM hotel capacity is more than 20,000 rooms, approximately 60% of

## Overnight stays by domestic and inbound visitors on non-business seaside stays broken down by type of accommodation

Unit: thousand nights

<b>French</b>	<b>2001</b>	<b>2002</b>
Hotel	12,471	12,865
Rental	41,530	43,433
Camping + caravanning	44,081	43,887
Other paying offers	28,692	29,010
Paying	126,774	129,195
Non paying	135,983	142,576
<b>Total</b>	<b>262,757</b>	<b>271,771</b>

<b>Foreigners</b>	<b>2001</b>	<b>2002</b>
Hotel + board	22,466	22,295
Rental	21,609	21,496
Camping + caravanning	45,841	45,583
Other paying offers	8,838	8,783
Paying	98,754	98,157
Non paying	26,406	26,230
<b>Total</b>	<b>125,160</b>	<b>124,387</b>

Sources: Tourism directorate, TNS Sofres, SOT

## Breakdown of rated hotel rooms by tourist area

	<b>1997</b>	<b>1998</b>	<b>1999*</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>
City	350,102	355,143	305,760	311,308	329,491	332,687
Seaside	130,477	135,497	109,209	109,519	109,384	110,084
Countryside	76,715	73,424	98,765	99,664	94,269	93,653
Mountains	43,589	42,880	69,844	68,683	67,348	67,195
<b>Total</b>	<b>600,883</b>	<b>586,944</b>	<b>583,578</b>	<b>589,174</b>	<b>600,492</b>	<b>603,619</b>

\* new zoning since 1999.

Sources: Tourism directorate, Insee, regional partners.

## Breakdown of campsites by tourist area

	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001*</b>	<b>2002</b>
Seaside	411,614	403,084	401,128	394,746	369,326	364,466
Countryside	237,558	235,518	234,231	234,164	250,145	248,324
City	119,805	118,989	116,814	115,644	43,291	43,191
Mountains	31,741	30,873	30,701	30,412	102,144	101,457
<b>Total</b>	<b>800,718</b>	<b>788,464</b>	<b>782,874</b>	<b>774,966</b>	<b>764,906</b>	<b>757,438</b>

\* new zoning since 2001, following the example of rated hotel trade.

Sources: Tourism directorate, Insee, regional partners.

which are located in the Caribbean. French overseas locations welcomed a total of 2 million tourists in 2000. Currently, tourism is a vital activity for the DOM overseas departments but is still rather undeveloped in the TOM overseas territories (except in New Caledonia and Polynesia). Cruise tourism has developed above all in the Caribbean. The latter one of the cruising areas with the most visitors worldwide, although it is now facing the breakthrough of Central and Latin America, with their new high-performance harbour facilities suited to North American clients.

### Number of visitors and jobs in tourism in the DOM-TOM in 2000

	Number of tourists	Tourist-related employment
Guadeloupe	602,815	20,000
Martinique	526,290	10,093
French Guyana*	63,300	1,900
Reunion island	430,000	6,797
New Caledonia	109,587	3,364
French Polynesia	252,000	7,325
Mayotte	23,000	300
Saint-Pierre-et-Miquelon	12,056	150

\* year 1998 for number of tourists.

Sources: secretary of state for Tourism, ledom

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

Units: million euros, number of staff  
Sources: FIN, AFIT, FFPP, DTMPL

Yachts*	740,375
including sailboats	168,310
including power boats	572,065
Number of marinas	261
Turnover for marinas	160
Number of spaces	223,000
in harbours	163,000
on moorings	60,000
Total occupation rate (including DOM-TOM)	94%
Boat building/repair firms	161
Turnover for boat building/repair	872
Number of staff in boat building/repair	9,441
Total employment in water sport industry	40,000

\* as of 31 August 2001, plus 27,360 vessels with other means of propulsion, or propulsion not indicated.

### Assessment of the pleasure boating field in France

Pleasure boating has steadily developed over the past few decades, entailing constant increases in boat registries, reaching about 809,000 in 2003 (nearly a quarter of which are sail boats). The fleet's growth creates strong demand for berths and moorings, which marinas are no longer capable of meeting.

According to a recent study conducted on behalf of the AFIT, FIN, FFPP and DTMPL, the shortage of spaces in 2000 was assessed by port authorities at 54,000. This amounts to one third of total capacity (223,000 spaces, 163,000 in harbours and 60,000 in various anchorages). Even though an estimated potential 50,000 spaces which could meet this demand have been noted, the risk that this context of a moorings shortage may have a negative influence on boat purchases in the long term should be borne in mind. After a contraction in new registrations in 2001 and 2002, the trend has picked up in 2003 on the basis of strong growth, in the wake of the recovery seen in the United States.



# Shipping

Shipping includes fleet and sea port activities. The activities taken into account here are goods transport and passenger traffic. Inland shipping is not included. The sea ports sector comprises the general harbour organisation along with other auxiliary services.

## How French port activity is organised

By port activity, we mean the operation and general organisation of harbours through port authorities representing the State or local authorities, as well as other auxiliary service activities provided by private enterprises under State control.

### Ports

The decentralisation laws, in particular that of 22 July 1983, distinguish between three types of ports: autonomous ports (PA), ports of national interest (PIN) and decentralised ports. The decrees to apply this law designated seven autonomous ports: Marseilles, Le Havre, Dunkirk, Nantes, Rouen, Bordeaux and Guadeloupe.

The PAs (merchant harbours) are State run public authorities which are legal entities with financial autonomy. They are supervised by the ministry in charge of sea ports, subject to economic and financial control by the State and governed by the law of 29 June 1965. They handle over 80% of goods traffic by sea. The 23 PINs (merchant and fishing harbours) fall under State authority. Operation of their facilities is generally contracted out to chambers of commerce and industry. They ensure about 20% of freight tonnage, 50% of non-containerised general cargo and over 80% of passenger traffic. Since 1 January 1984, the 532 decentralised ports include all French yachting harbours (228) run by towns, a large number of fishing harbours and some merchant harbours (304) which are run by the general councils of French counties. The key figures given here concern PA and PIN authorities.

## Public operators and participants

There are various types of public participants: State authorities in the case of autonomous ports; State shipping services in other ports of national interest. Since the decentralisation law in 1983, county councils also have jurisdiction over fishing and merchant harbours, and towns have jurisdiction over marinas.

State services ensure harbour police services, security and safety, maintain and operate the basic port facilities, and carry out necessary upgrading and extension work. The harbour master's office is under the public authority. It is in charge of coordinating movements and berthing of vessels inside the harbour; the navigational assistance service, whose mission is to ensure safety of

## Key figures for port organisations\* (autonomous ports and ports of national interest)

Units: million euros, number of staff

Source: DTMPL.

	1997	1998	1999	2000	2001	2002
Turnover of autonomous ports (PA)	496	522	517	528	496	512
Turnover of ports of national interest (PIN)	272	277	273	266	202	206
PA and PIN value added	574	596	523	529	518	524
Employment in PA	na	na	5,504	5,482	5,426	5,428

\* revised data from 1999 on (new set based on 20 PIN)  
na: not available.

shipping at sea and when approaching the coast, and to help rescue people and property; the harbour police and Customs services.

The port authority, which is the public authority itself in the case of autonomous ports or, in the case of ports of national interest, the contract holder running the public service - usually a chamber of commerce and industry - federates the port community actions and promotes the harbour commercially. The port authority is also responsible for financing the public facilities, landside storage areas and warehouses, as well as operating them, or renting them to stevedoring services and harbour operators.

### Other harbour stakeholders

#### Ship-related auxiliary professions

Pilots guide ships into harbours or up rivers and estuaries. Pilotage is a public service organised by the State in accordance with regulations from the law of 28 March 1928, setting out the system of pilotage in marine waters and supplemented or modified by decrees on 14 December 1929 and 19 May 1969. The principle of these regulations is that pilotage is compulsory for all vessels. Only those ships whose overall length is under a certain limit, or those assigned to harbour improvement, maintenance or supervision, or rescue and beacon ships, are exempted.

The pilot stations are created by order of the ministry in charge of sea ports. Today in France (including metropolitan France, the overseas departments, and the local authority of Saint-Pierre-et-Miquelon) there are thirty pilot stations. Local regulations set the limits of the zone where pilotage is compulsory, the number of pilots, the property held by

the station and the pilotage dues. Legally speaking, pilots perform commercial services which are paid for by the user.

Towage services use powerful tugboats to facilitate ship manoeuvres and mooring in harbour and contribute to their safety. Towing is an optional commercial service under private contract, carried out in the public domain by companies which are usually governed by private law. It has a certain public service character, in that it plays a direct part in the safety of port operations. There are towage companies in almost every French port. The Bourbon group dominates this sector with approximately 90% of the market.

Linesmen, or boatsmen, take care of mooring a vessel, moving it from one

quay to another and untying it. There is a boatage company in almost every French port, usually set up in the form of a workers' cooperative production society called a SCOP. Just like towage, boatage is an optional commercial service under private contract, carried out in the public domain by companies which are usually governed by private law, with an aspect of public service. Contrary to pilotage dues, boatage dues are freely set, following the ruling of 1986.

Other professionals dealing with vessels include the chartered shipbroker, the ship's consignee, the shipping agent, and the sworn shipbroker.

Direct employment linked to harbours, involves a labour force of slightly over 39,000 people. There is an extremely

### Direct harbour employment (metropolitan France and over seas)

	2001			2002		
	PA	PIN	Total State harbours	PA	PIN	Total State harbours
State services	1,419	2,100	3,519	1,353	2,076	3,429
including customs	529	387	916	529	381	910
Port organisations	5,608	1,725	7,333	5,591	1,796	7,387
Harbour professions*	23,246	5,793	29,039	23,217	5,445	28,662
including:						
active stevedores	3,417	997	4,414	3,401	985	4,386
pilotage	566	182	748	552	182	734
boatage	713	213	926	717	249	966
towage	367	367	734	381	379	760
<b>Total</b>	<b>30,273</b>	<b>9,618</b>	<b>39,891</b>	<b>30,161</b>	<b>9,317</b>	<b>39,478</b>

\* pilotage, towage, boatage, handling (not including stevedores), shipping companies, shipping agencies, brokerage, transit

Source: DTMPL, based on information supplied by autonomous ports, shipping services and Customs services. For services to vessels, different source from that of key figures.

### Key figures for services to vessels

Units: million euros, number of staff  
Source: DTMPL

	Turnover			Manpower		
	1999	2001	2002	1999	2001	2002
Boatage	54	60	60	720	710	770
Pilotage	91	95	95	730	710	710
Towage	114	92	95	1,050	1,000	960

wide range of port facilities and services. These include not only the port authority functions but also the auxiliary professions related to vessels and to cargo.

#### **Dredging in harbours under State jurisdiction**

For harbour operations, dredging plays an essential role: it is often a significant part of major harbour construction and development operations and determines the size or draught of ships which can come there.

There are two types of dredging operations: maintenance and new construction.

- The maritime port laws stipulate that dredging for maintenance in fairways to the main merchant harbours (metropolitan PAs and PINs) is financed by the State. Routine maintenance dredging work is performed by harbour staff. Some ports occasionally subcontract to other ports or, as Dragages-Ports itself, to private enterprises. The dredges belong to the GIE economic interest group called Dragages-Ports, set up in 1979 between the State and metropolitan maritime PAs. Since its creation, Dragages-Port has implemented a new-build programme costing more than 120 million euros, and replaced a large number of old, and often obsolete, equipment: the fleet went from 150 machines of all types in 1979 to thirty more modern, efficient tools in 2000.

- As for creating new channels and fairways, this is an occasional activity, done by private firms (often foreign) mainly contracted by the port authorities.

#### **Cargo-related auxiliary professions**

Auxiliary professions working with cargo include the forwarding agent, the Customs broker, the goods broker and the cargo consignee.

Port handling contractors carry out loading and unloading operations for goods either bound for or arriving from sea transport, as well as any related operations. They use tools (cranes and gantry cranes) which either belong to them or are rented to them by the port authority, with or without the staff to operate them. There can also be options combining private and public operators.

The profession is regulated by the law of 9 June 1992 and decrees of 12 October 1992. Stevedores are in handling companies are mainly paid on a monthly salary basis. The previous system of contract work has become an exception.

#### **Outlook**

One of the main challenges today for this activity is market access to port services. The draft directive of the European Parliament and Council (2001/047(COD)) of 13 February 2001 was ~~approved~~ <sup>examined</sup> at its second reading by Parliament on 11 March 2003. It aims to ensure fair competition conditions for all service suppliers and establish clear rules for an open and transparent access to these services.

Port services in question are all forms of cargo handling, passenger services and technical services like towage, boatage and pilotage.

#### **Volumes dredged annually in State ports**

Unit: million cubic metres

	Sand	Silt	Total
Estuary harbours	6,50	18,60	25,10
Coastal harbours	1,20	5,00	6,20
<b>Total</b>	<b>7,70</b>	<b>23,60</b>	<b>31,30</b>

Source: GIE Dragages-Ports.

#### **Dredging activity indicators in France**

Units: thousand euros, number of staff

	1997	1998	1999	2000	2001	2002
Operating cost of public fleet <sup>(1)</sup>	54,202	54,629	57,442	58,279	56,578	52,993
Work done by companies <sup>(2)</sup>	2,394	3,803	3,942	6,173	4,210	7,465
Seamen employed by ports (dredging, hydrography, safety) <sup>(3)</sup>	676	650	662	627	587	596

(1) rental of machines belonging to Dragage-Ports + seamen's salaries (port staff) + stores and miscellaneous expenses for machines covered by ports. A very large part of these costs concern maintenance work

(2) private companies, mainly for new work, a minority for maintenance work

(3) including 440 dredging staff in 2000.

Source: GIE Dragage-Ports.

#### **Key figures for port handling operations\***

Units: million euros, number of staff

Source: METL/DAC/SES (EAE).

	1997	1998	1999	2000	2001**
Net turnover excl. taxes	724	831	780	852	824
Value added excl. taxes	316	348	337	351	352
Manpower***	5,141	5,193	5,279	5,209	4,791
Number of companies	134	127	124	125	117

\* data revised since previous edition

\*\* provisional

\*\*\* salaried and non-salaried staff.

## The French merchant fleet in the international context

### French merchant fleet

In the main, the merchant navy flying the French flag is now longer among the world leaders. The same is true of most major countries, since 50% on average of their owned fleets are held under non national flags.

From 798 vessels in 1962, the French fleet went to 514 on 1975. Since 1995, it has remained stable with between 205 and 210 ships, a hundred of which are on the Kerguelen registry. France, which still held the 10th place worldwide in tonnage during the 1970s, ranks 28th today. As of the 1st July 2003, the merchant fleet flying the French flag had 205 vessels with 4.71 million tonnes (gt) and 6.46 million dwt, i.e., respectively increasing by 19.9% and 6.3% since 1993. It remains among the world leaders in a few specialised niches: ocean and seismic research, laying and maintenance of undersea telecommunication cables, underwater engineering, drilling and provision of supplies to offshore platforms.

The maritime investment policy undertaken in 1996 with the tax deduction scheme called "quirats" was replaced by the EIG (economic interest group) tax scheme (law n°98-546 of 2 July 1998) which has the same objective, i.e. to promote investments whether for cargo vessels or passenger ships.

Since 1999, the French merchant fleet has become younger. Although the average ship age on 1 January 2001 is 11.6 years, compared to 6.4 on 1 January 1980, it is over six years lower than the European Union average and nearly

three years lower than the worldwide average (14.1 years). On the 1st January 2003, the average age was 8.9 years for the French fleet and 7.9 years for the oil tankers.

### Vessels\* belonging to French shipowners as of 1st January 2002

Unit: dwt

Types of vessel	French flag		Other flag <sup>(3)</sup>	
	Number	dwt <sup>(1)</sup>	Number	dwt <sup>(1)</sup>
100 grt or more <sup>2</sup>				
Liners	6	12,730	0	0
Ferries	35	113,362	11	22,319
Passenger launches	20	4,098	1	622
Chemical carriers	6	50,385	2	43,849
Other tankers	4	25,618	0	0
Bulk carriers	8	773,544	5	550,598
Other multi-purpose dry bulk carriers	4	134,080	3	14,835
Full container ships	15	731,546	17	409,403
Specialised carriers	6	9,281	0	0
Ro-Ro vessels	18	44,620	4	100,715
Cargo ships	30	42,734	0	0
Other types of vessel (research)	2	6,044	0	0
Oil tankers	49	4,915,858	10	85,776
Liquified gas tankers	7	233,130	1	3,590
<b>Total</b>	<b>210</b>	<b>7,097,030</b>	<b>54</b>	<b>1,231,707</b>

(1) dwt: deadweight

(2) grt: gross registered tonnage

(3) fully owned ships only. In all, the fleet owned by French shipowners under a third country flag tallies over one hundred vessels. A fleet of about 150 vessels flying third-country flags is directly or indirectly controlled by French shipowners.

Source: METL/DTMPL-French shipowners.

### Key figures for shipping and coastal transport

Units: million euros, number of staff

Source: DAEI/SES.

	1997	1998	1999	2000	2001
Production <sup>(1)</sup>	4,160	3,864	3,942	4,920	5,053
Value added <sup>(2)</sup>	548	614	624	668	681
Employment <sup>(3)</sup>	11,422	11,494	11,574	12,272	12,632
Number of companies	207	368	388	458	443

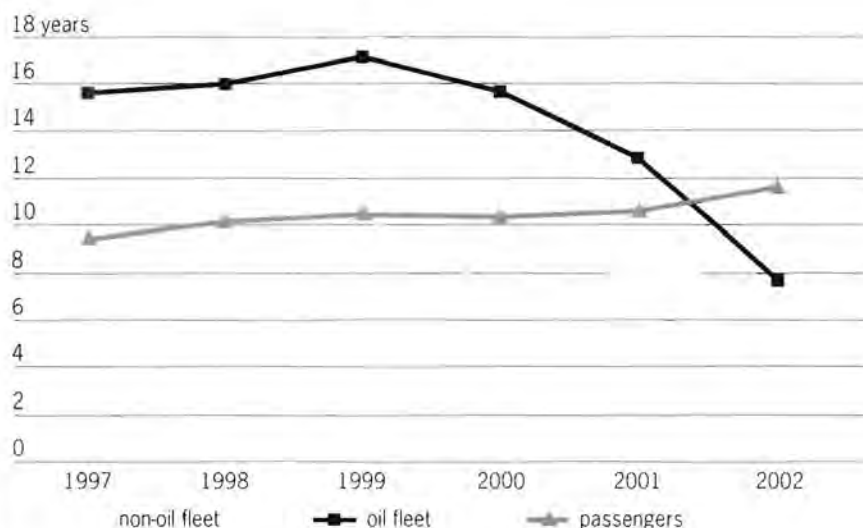
(1) turnover + stocks + capitalised production costs

(2) gross value added to factor prices (including subsidies)

(3) salaried and non-salaried staff.

### Trends in merchant fleet age under French flag

Source: METL/DTMPL.

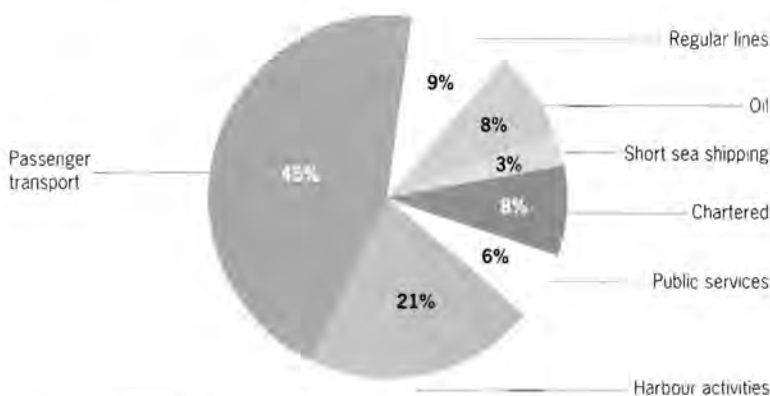


### Trends in employment

The number of seagoing crew aboard vessels is decreasing on an international scale. From 1965 to 1970, a ship's crew ranged from 35 to 40 seamen; in 1980, this was from 28 to 35 men, today, crew size is around 22 to 24 men for large vessels and from 12 to 14 for small ones. This decrease means that additional staff is needed during calls in port.

Out of total staff, passenger transport and harbour activities provide nearly two-thirds of jobs. Trends for French seagoing personnel have followed the same downward curve as for the fleet: the manpower levels went from 43,550 seagoing staff in the early 1960s to 9,315 on 31 December 2001.

### Manpower\* broken down by type of activity in 2002



\* from a total of 9797 people  
Source: French Shipowners according to CNEM.

### The world merchant fleet

The world merchant fleet has continued to grow: at the start of 2003, it included 39,415 vessels over 300 grt, with a carrying capacity of 816.4 million dwt and 8 million teu.

The world container ship fleet has grown steadily for more than a decade now. Concurrently, the size of container ships is also continuing to increase. The first 2,000 teu vessels which had appeared in the early 1970s were replaced by Panamax vessels reaching 4,800 teu. Today there are some units of 8,000 teu and numerous projects to build vessels of over 10,000 teu (for instance with the Malaccamax concept).

### Merchant navy personnel<sup>(1) (2) seagoing<sup>(3)</sup>. Situation as of 31 December</sup>

	1980	1985	1990	1995	2000	2001	2002
Officers <sup>(4)</sup>	5,531	4,067	2,795	2,848	2,720	2,756	2,925
Ratings	9,555	6,649	3,565	3,492	3,215	3,087	3,353
<b>Total</b>	<b>15,086</b>	<b>10,716</b>	<b>6,360</b>	<b>6,340</b>	<b>5,935</b>	<b>5,843</b>	<b>6,278</b>

(1) The scope is different from that of EAE. Cannot be compared directly.

(2) including towage, pilotage and pleasure boating.

(3) not including non-seagoing active seamen (whose numbers are equivalent).

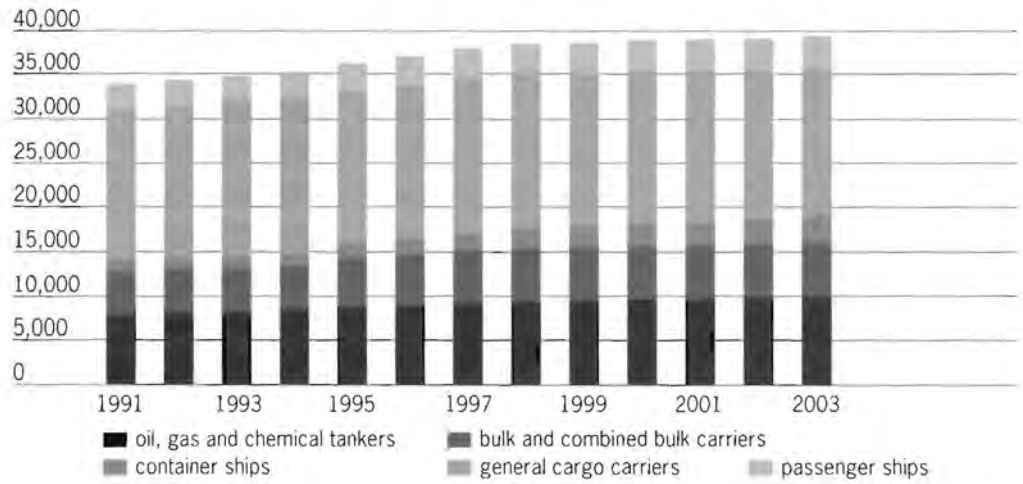
(4) Staff not in the hierarchy have been put in the "officers" category.

Source: METL/DAMGM.



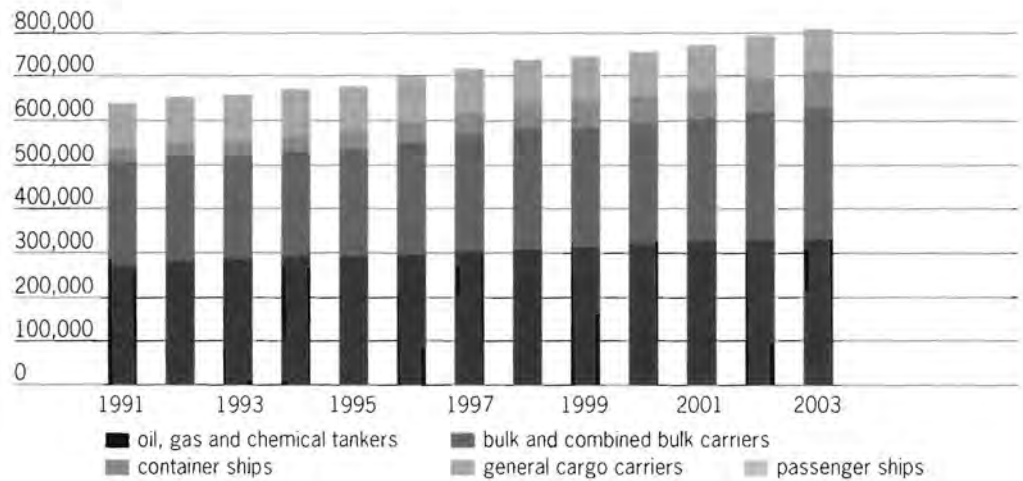
### Trends in world fleet by type of vessels\*

Unit: number of vessels  
\* vessels > 300 grt, as of 1st January.  
Source: ISL Brème.



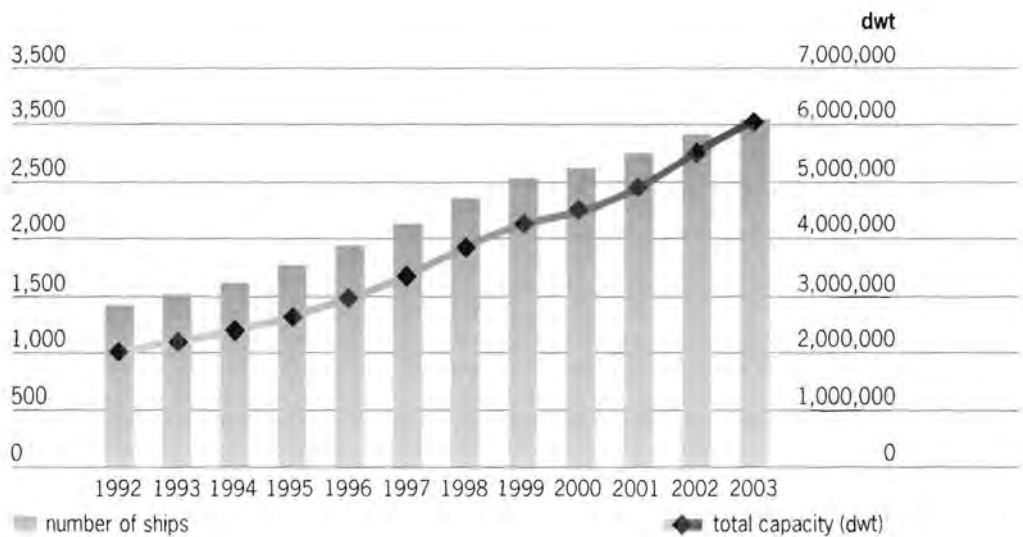
### Trends in world fleet carrying capacity by type of vessels\*

Unit: thousand dwt  
\*\* vessels > 300 grt, as of 1st January.  
Source: ISL Bremen.



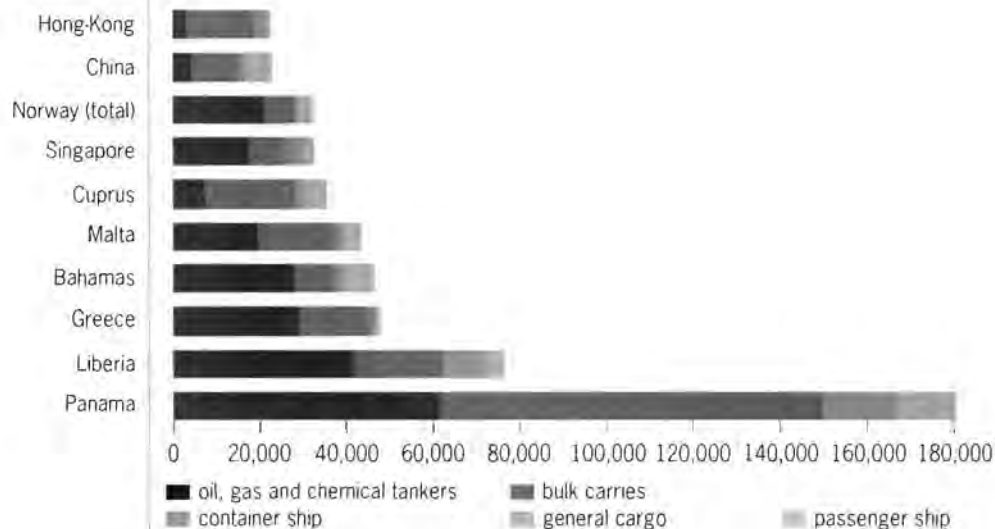
### Trends in world fleet of container ships\*

\* only cellular fleet.  
Source: BRS 2003.



### Breakdown of the world fleet by type of vessels and by flags as of 1st January 2002

Vessels > 300 grt  
Unit: thousands of dwt  
Source: ISL Brême.



Since WWII, the world fleet's distribution has changed considerably, to the detriment of fleets flying the flags of developed countries. Along with the growth in Asian countries' fleets is the massive recourse by shipowners to flags of convenience, for economic reasons. Today these flags account for nearly half of the world merchant fleet in tonnage. The largest, and oldest of these, i.e. Panama and Liberia, represent nearly a third of world tonnage.

The shipping companies which belong to European Union nationals control one third of the world fleet, and approximately 40% of European union trade is carried on vessels controlled by interests from within the European union. Out of the top twenty shipowners worldwide, ten are Asian.

#### Outlook

The outlook for French fleet trends partly depends on what will follow the Richemont report. The latter notably recommends that an International French Registry (RIF) be created, where both ocean-going vessels and those in international short-sea shipping could be registered. Like other international registers from European countries, the objective would be to increase the number of ships and promote employment.

On the global scale, one of the most remarkable changes is the spectacular increase in container ship size (currently there are nearly 80 orders for vessels

over 7 500 teu, compared to just 10 in mid-2002). This phenomenon will contribute to limiting the number of ports which are able to handle these future ships, and consequently to the expansion of feeding networks (distributing containers towards secondary harbours or on the contrary, transporting them towards main ports).

In France, the will of certain autonomous ports to take up this challenge has found concrete expression through investment programmes like that of Fos2XL for Marseilles and Port2000 for Le Havre. Amongst other objectives, they share the aim to increase their container terminal capacity.

Lastly, the increasingly strict regulations concerning single hulls should lead to a progressive renewal of the oil tanker fleet (see chapter on "shipbuilding").

#### Sea traffic

Based on sea port and merchant fleet activity, sea traffic includes liquid bulks (oil products, gas, chemicals, liquid foodstuffs), dry bulks (coal, ore, fertiliser, cereals, animal feeds), general cargo (RoRo traffic, lumber and wood products, foodstuffs, metallurgical products), transported on regular lines, a growing percentage (approximately two thirds) of which is containerised, as well as passenger traffic which includes ferries, cruise liners and launches.

#### Trends in activity

The maritime mode clearly predominates in France's international exchanges, in terms of tonnage. This is no longer true in terms of value, due to the weight of road traffic for intra-European trade. Outside of the European Union, about three-quarters of imports and exports in tonnage are made by sea, accounting for approximately one third in value.

In 2002, tonnage handled in French ports rose by 1.2% to 338.2 million tonnes (compared to 334.3 million in 2001 and 339.3 million in 2000). The leading French port, Marseilles-Fos, recorded 92.6 million tonnes of traffic, a slight decline of 0.1% with respect to 2001, followed by Le Havre with 68 million (- 2%), Dunkirk (47.5 Mt, + 6.8%), Calais PIN harbour (32.5 Mt, + 5.99%), Nantes-Saint-Nazaire (31.7 Mt, + 4.5%), Rouen (19.6 Mt, - 5.5%) and Bordeaux (8.6 Mt, - 3.9%). Autonomous ports accounted for about three-quarters of turnover, value added and investments for all ports and received almost all the operational assistance available.

French port traffic is characterised by the structural prevalence of liquid bulks (especially oil, making French port traffic quite sensitive to the oil market climate) which represent nearly half of traffic (48%).

#### Liquid bulk cargoes

French traffic in liquid bulks was 163.8 million tonnes in 2002, down 2.7% from

2001. Among the autonomous harbours, only Marseilles and Nantes-Saint-Nazaire progressed on this segment, respectively with 64.1 million (+ 1%) and 20.8 million tonnes (+ 3.6%). Le Havre recorded 42 million tonnes (- 9.8%), Dunkirk 13.1 million tonnes (- 2%), Rouen 8.5 million tonnes (- 6.7%) and Bordeaux 4.6 million tonnes (- 4.7%). Worldwide, this traffic reached 2.13 billion tonnes in 2001 (+ 0.6% compared to 2000), making 36.2% of total cargo traffic. 77.5% of this was crude oil and the rest made up of refined petroleum products and gas.

**Dry bulk cargoes**

In 2002, French dry bulk traffic displayed a rise of 4.2% to 79.4 million tonnes, following a drop of nearly 10% in 2001. The leading French port for this type of traffic was Dunkirk with approximately 25 million tonnes (+ 8.8%), followed by Marseilles Fos (13.5 million tonnes, - 9%), Nantes-Saint-Nazaire (8.36 million tonnes, + 8.3%), Rouen (8.12 million tonnes, - 3.2%), Le Havre (5.6 million tonnes, + 29%) and Bordeaux (3.22 million tonnes, + 7.7%).

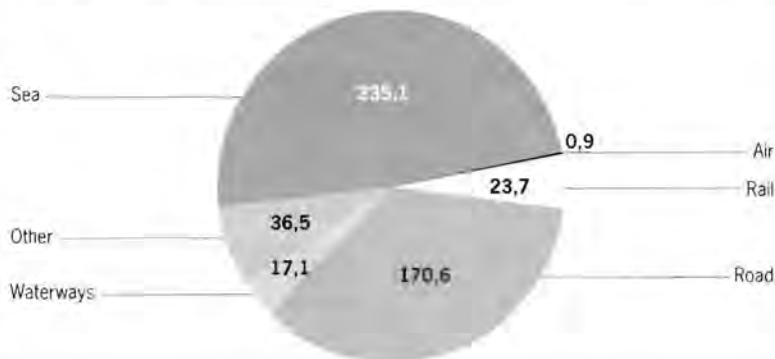
In 2001, world traffic in the five principal dry bulk cargoes (iron ore, coal, grains, bauxite/aluminium and phosphate) amounted to 1.3 billion tonnes, an increase of 1.2% from 2000.

**General cargo**

French general cargo traffic has grown over the past several years. It reached 95.6 million tonnes in 2002 (compared to 88.8 million in 2000 and 834 in 1998). This increase is buoyed by the considerable rise in containerised traffic, which broke a new record in 2002 at 29.4 million tonnes (+ 11% from 2001),

**Modal breakdown in value of French foreign\* trade in 2001**

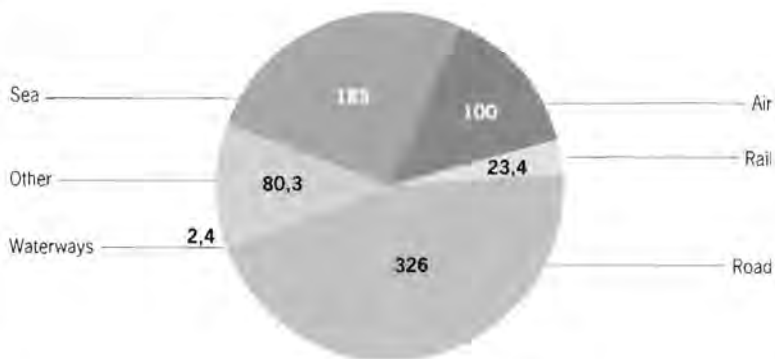
Unit: million tonnes



\* amount of imports and exports in volume.  
Source: French shipowners according to METL

**Modal breakdown in value of French foreign\* trade in 2001**

Unit: million euros

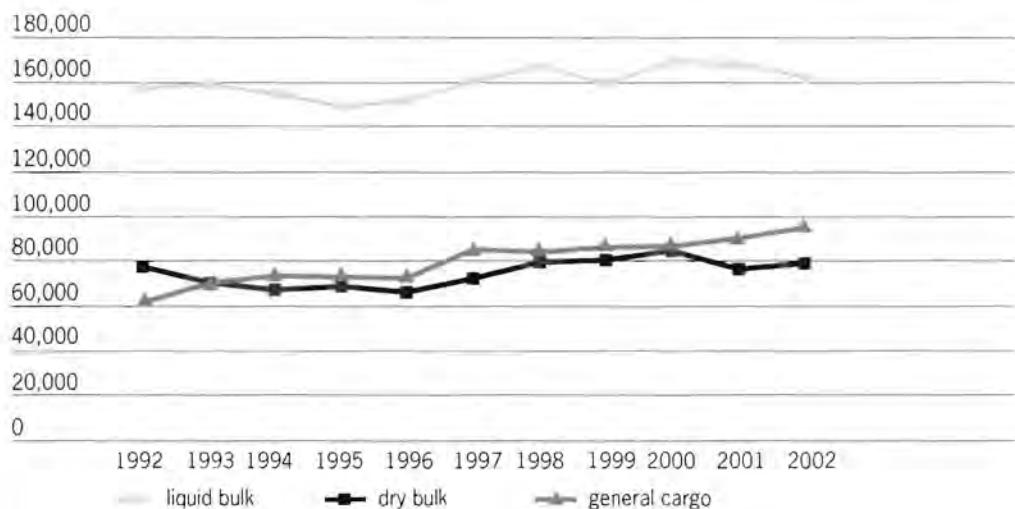


\* amount of imports and exports in value.  
Source: French shipowners according to METL

**Trends in goods traffic for the six main French ports\***

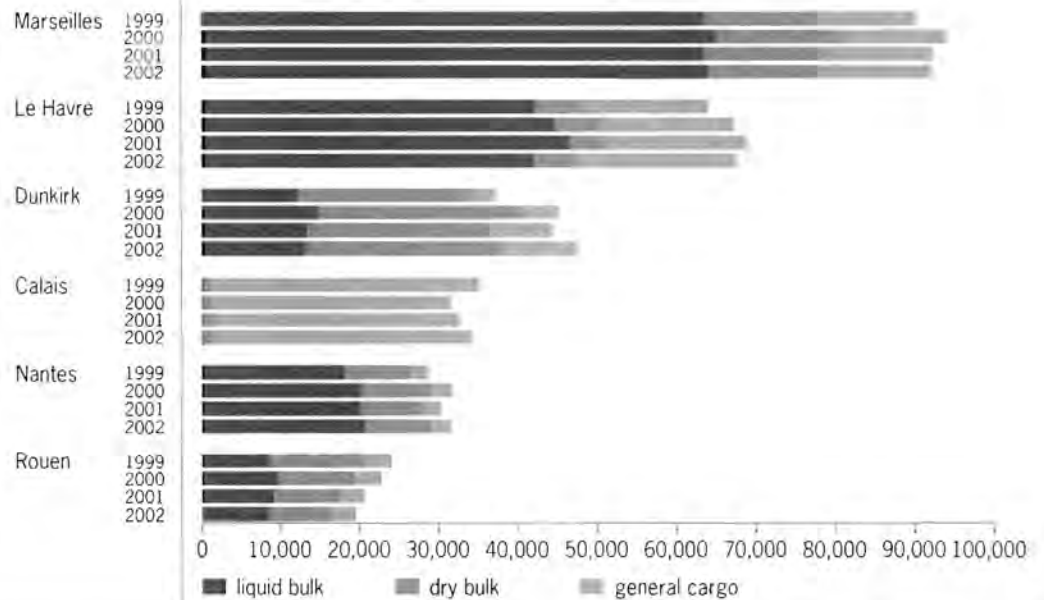
Unit: thousand tonnes

\* the 6 metropolitan autonomous ports and the top 13 PINs.  
Source: DTMPL



### Trends in goods traffic for the main metropolitan ports

Unit: thousand tonnes  
Source: DTMPL.



as well as by RoRo tonnages which benefited from the recovery in traffic in 2001 and 2002, after the sharp drop in the year 2000. In ports of national interest, it was above all RoRo which led in general cargo traffic.

#### Passenger traffic

In 2002, French sea ports received 28.8 million passengers, making a rise of 6.3% with respect to 2001. This upturn followed a slight rise of 0.3% in 2001 and two years of decline in 1999 (-3.6%) and 2000 (-7.4%). On the other hand, the « passenger » activity of French overseas harbours dropped again by 12.6% in 2002 (after -9.4% in 2001), notably due to a sharp fall in the number of travellers in Guadeloupe.

#### • Car ferries

Cross-Channel traffic is the leading world market for sea crossings with, for the share involving French ports, 21.1 mil-

lion passengers carried in 2002. This represents a rise of 5% succeeding several years of consecutive decreases (-6.1% in 1999, -10.6% in 2000 and -3.1% in 2001). All the French ports on this seafront have displayed rising figures. With nearly 15 million passengers (+4.32%), Calais handles more than a third of this traffic. It should be noted that Eurostar traffic dropped by 5% in 2002 to 6.6 million passengers.

In the Mediterranean, passenger traffic has continued to increase (+7.9% in 1999, +5.6% in 2000 and +11.5% in 2001) and reached nearly 7.5 million passengers in 2002 (+10%). Corsica accounts for most of this activity. There were over 2.1 million passengers for

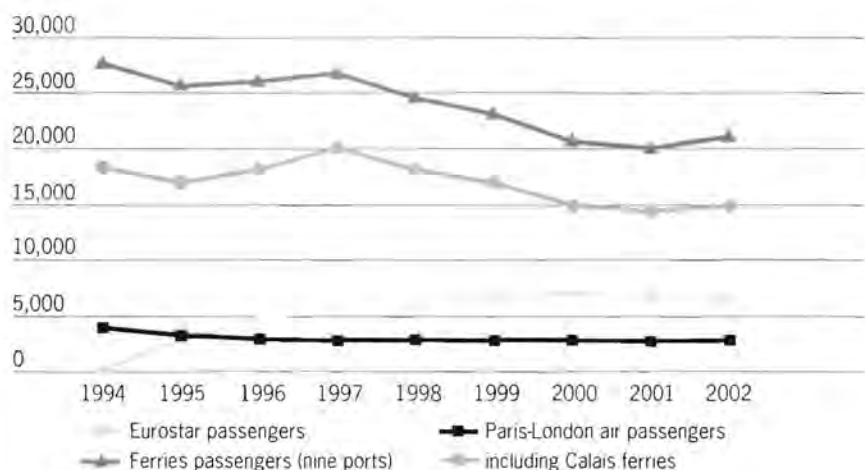
Bastia, going over the two million mark for the first time, while the ports of Marseille and Nice on the continent also broke their passenger records (respectively 1.74 million and 1.2 million passengers).

#### • Sea cruises

In spite of the slowdown in activity which can be attributed to the threat of terrorist attacks and the international economic situation, the world sea cruise market recorded overall growth of 8% in 2002. Approximately 8 million Americans, 2 million Europeans and 500,000 Asians travelled on cruise ships. In France, the results for the year 2002 are contrasting, because they too have been affected by the New York attacks.

### Breakdown by traffic modes of cross-Channel passengers coming through France

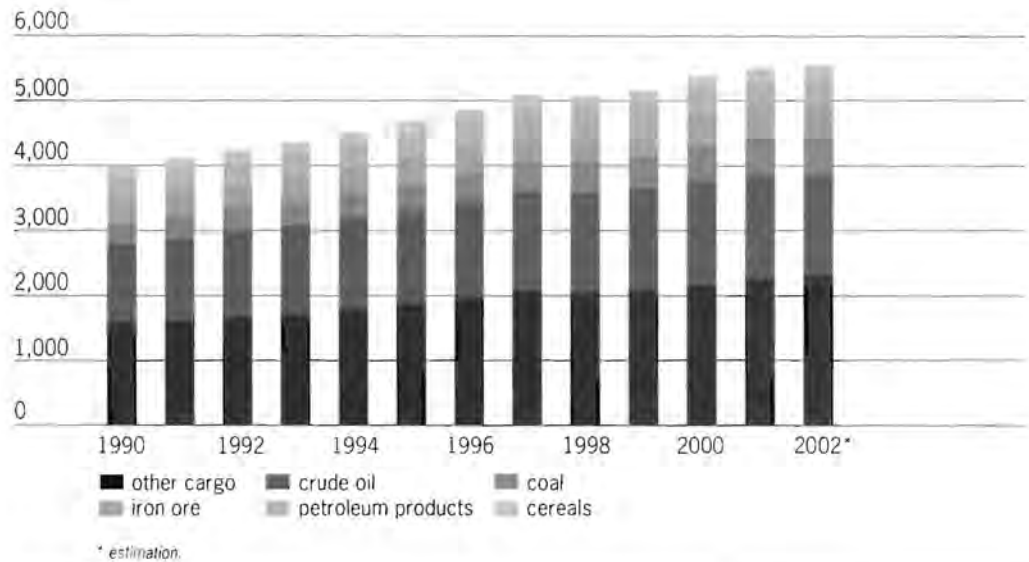
Unit: number of passengers  
Sources: French shipowners according to DTMPL, Eurotunnel, SNCF



## Trends in sea traffic for principal goods

Unit: million tonnes

Source: French shipowners according to ISL.



Results for Mediterranean ports are positive (+ 14% in Marseilles, + 19% in Nice), whereas those of the western seaboard have shown a downturn, overall.

The profession is counting on strong development in the coming years, in view of far-reaching economic and sociological trends: cruises still make up only a limited share of the leisure market, especially in Europe. Forecasts are optimistic on the whole, such as those of the Armateurs de France (French shipowners) which cites 11 million passengers in 2005 and 14 million in 2010.

### • Micro-short sea shipping

Coastal and island traffic (French coasts and overseas archipelagos) is carried by all sizes of vessel, transporting passengers, goods and vehicles. In 2000, taking travellers to nearby destinations (islands, estuaries, sea outings) repre-

sented 10.1 million passengers. The sector is highly diversified and scattered along the coasts of the Atlantic, the English Channel and the Mediterranean, as well as in the West Indies. Annual turnover is estimated to be more than 60 million euros.

## International traffic

Global sea traffic has grown continuously every year since 1985, with the exception of 1998, with an average yearly growth of 5% in volume since 1980. Initial assessments indicate almost no rise for 2002.

With fifteen of the twenty leading ports worldwide in 2001, Asia has a dominant position in international goods traffic. In Europe, development of seaborne traffic is much stronger on the northern

seafloor, with Rotterdam, Antwerp, Bremen-Bremerhaven and Hamburg. Rotterdam is the world's leading merchant harbour on an equal footing with Singapore, and its total traffic is equal to that of all French ports together.

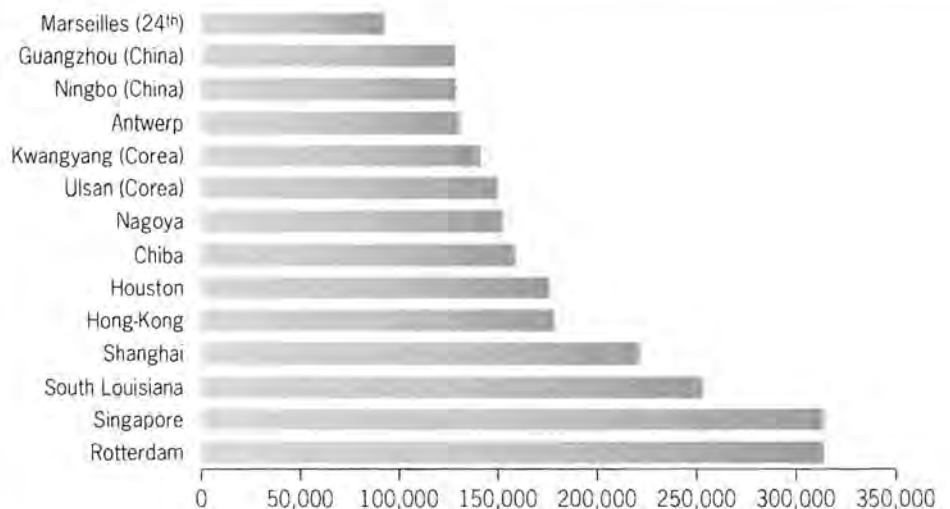
Development of ports is strongly influenced by that of containerised general cargo whose traffic is more and more concentrated through hubs.

They need good connections with transport networks on land, as well as a system of feeding. This type of traffic can require digging new fairways, lengthening wharfs and quays and increasing rail-road-river service to the hinterland. Development of short sea shipping lines has been fostered by RoRo techniques (transporting vehicles and containers).

## Total traffic of top world ports in 2001

Unit: thousand tonnes

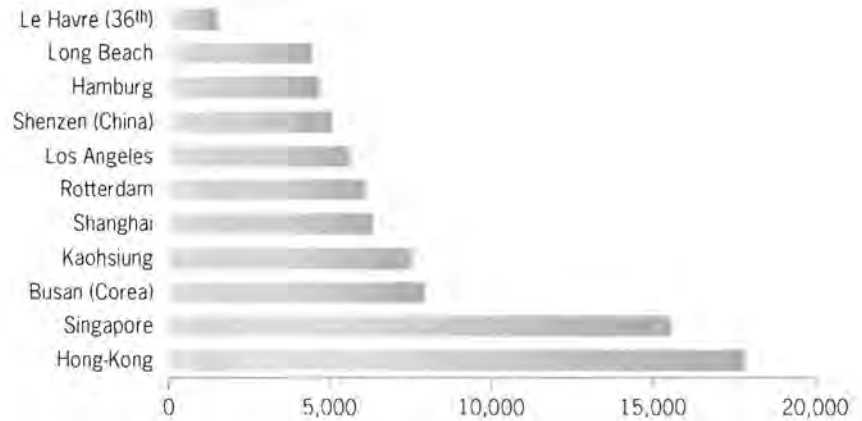
Source: ISL (2002).





### Total container traffic of top world ports in 2001

Unit: thousand TEU  
Source: ISL (2002)



Sea traffic is vital for the European Union: in volume, over 90% of its foreign trade and nearly 45% its domestic trade transit by sea; in all over a billion tonnes of freight are loaded and unloaded each year in EU ports.

#### Outlook

Short sea shipping is a generic term covering coastal shipping, feeder, sea-river traffic, cross channel and micro-short sea shipping. Its development aims to create new foundations to grow international sea traffic - and European traffic in particular. The exponential growth of road traffic in Europe (which should increase by 50% by 2010 unless specific action is taken, to reach 12 billion t/km) is a subject of concern for the European Commission. The "White paper" on European transport policy for 2010 (dated 12 September 2001), sets the objective of curbing road traffic growth by 2010 in order to shift the balance towards different transport modes, at their 1998 level.

Replacing the Pilot action for combined transport (PACT) which came to a close at the end of 2001, the « Marco Polo » programme approved on 22 July 2003 and covering the period from 2003-2010 is broader in scope and ambition, with an initial budget of 75 million euros for the first stage (2003-2006). It has three main orientations:

- modal shift actions, mainly aiming to shift part of the road transport to short sea, rail and inland waterway transport;
- catalyst actions through innovative projects aiming to modify non-road freight transport within the EC;
- common learning actions aiming to stimulate cooperative behaviour and know-how between operators in the freight logistics market in order to improve the sector's environmental performance.

# Maritime financial services

Maritime financial services include maritime insurance and banking.

Maritime insurance economic data are followed and updated by the industry itself,

though figures include a larger set of insurance activities than maritime alone.

Absent more general data, banking services allowed for herein are only related to the fishing industry.

## Maritime insurance

This sector comprises insurance underwriting for ships ("hull insurance") and for goods transported by ship ("cargo insurance"). International standardisation of insurance statistics has led to the merging of marine and transport figures, the latter including transport by sea, by inland waters and by land.

### International situation

The very keen international competition which had characterised marine insurance from the mid 1990s led to a drop in rates and premiums up to the year 2000. The slight rise in rates which has been felt since 2001, following a period of sharp cutbacks in capacity may be the

sign that this bearish cycle is ending. However, it has not yet had any positive effects on the situation for insurers. This is not only because the trend is still limited (average hull and cargo premiums in 2002 remained lower than the average levels in 1998) but also for external reasons:

- the events of 11 September 2001, natural disasters and a series of serious accidents at sea in 2002 led to an appreciable increase in reinsurance premiums, which in turn entailed rises in new contract insurance premiums, particularly in France;

- the stock market drop in 2001, which continued into 2002, deprived maritime (and non-maritime) underwriters of the financial products which had given them the vital leverage needed to reach an operating equilibrium in the 1990s.

This context greatly contributed to degrading the economic situation in 2001 and 2002, affecting all the segments in the sector, including P&I Clubs. It has modified relations between companies by increasing the pressure on the reinsurance market, by leading to a revision of new insurance policies and by making refinancing necessary for numerous companies.

### French companies: situation and outlook

French companies are very active on the international insurance market overall and on the marine and transport insurance markets in particular: they hold interests in more than 5,000 vessels flying 50 different flags. Although they have

## Key figures for marine and transport insurance in France\*

Units: million euros (all currencies converted), number of staff

Source: FFSA/DMAT, Insee (accounts for branch of activity).

\*figures have been revised since previous edition.

	1994	1995	1996	1997	1998	1999	2000	2001
Hull premium <sup>(1)</sup> income	584	566	499	493	407	473	505	537
Cargo premium income	486	519	511	505	488	543	496	567
Total income <sup>(2)</sup>	1,070	1,085	1,010	998	895	1,016	1,001	1,104
Value added <sup>(3)</sup>	65,8	68,5	62,4	69,4	69,4	62,4	66,6	55,2
Employment <sup>(3) (4)</sup>	1,382	1,289	1,135	1,054	1,043	1,092	1,090	1,227

(1) total gross premium income

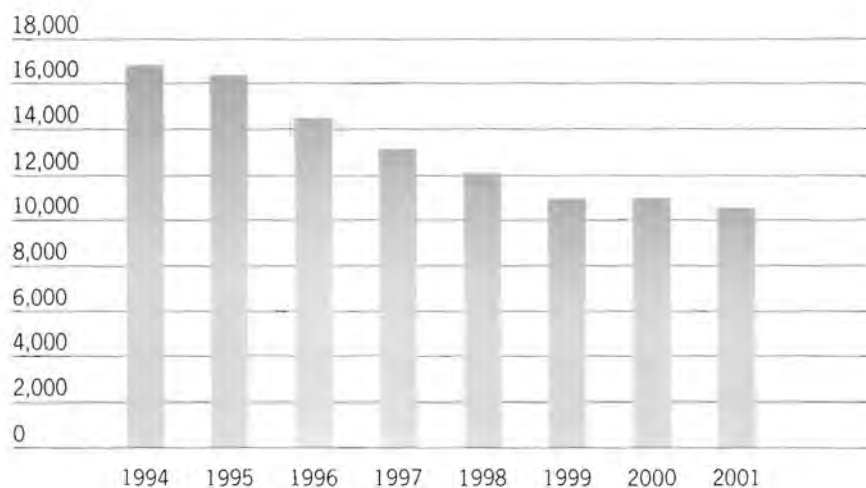
(2) ordinary risks and war risks, direct writing and assumed reinsurance, including river and pleasure boats, not including land transport liability

(3) revised Insee estimations

(4) full time equivalents.

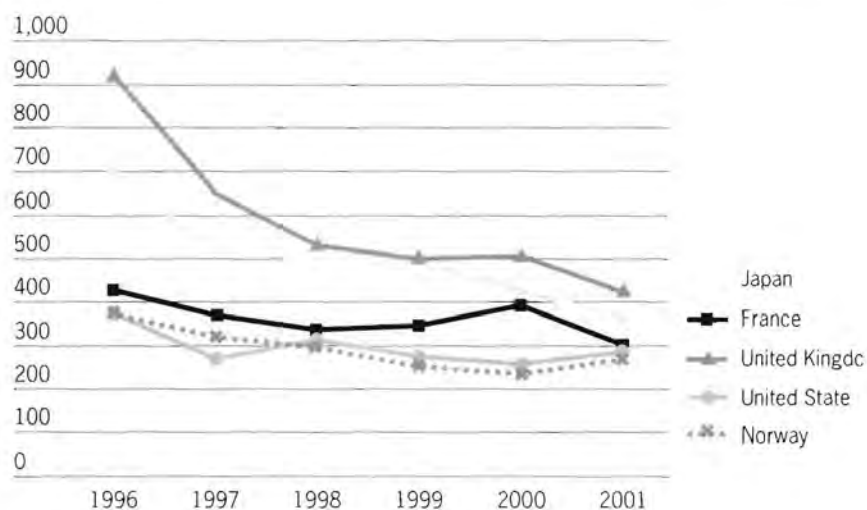
### World turnover for marine and transport insurance

Unit: million dollars  
 Source: Central Union of Maritime Underwriters, Oslo, Norway.



### The five largest world markets: hull\*

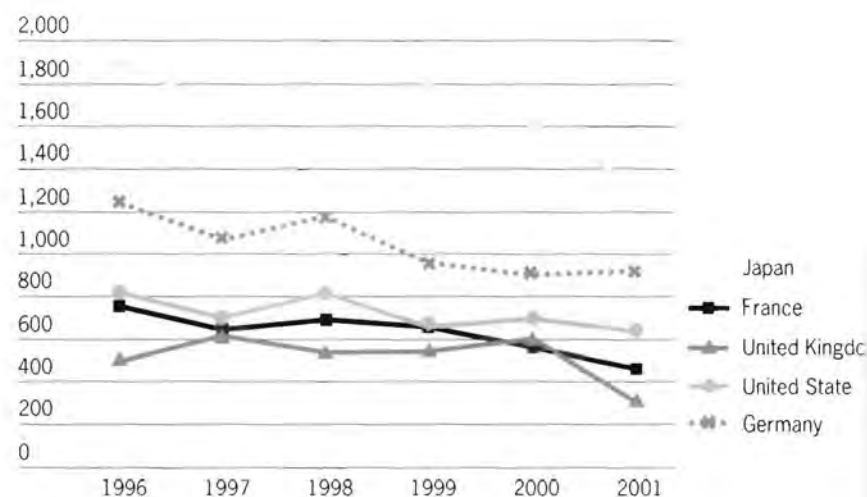
Unit: million dollars  
 Source: IUMI.  
 \* not including offshore energy and hull liability.



Definitions of market areas not harmonised between countries.

### The five largest world markets: cargo

Unit: million dollars  
 Source: IUMI.



Definitions of market areas not harmonised between countries.

been affected just like foreign firms by this particularly deteriorated economic context, they still seem to have held up well. This is particularly due to the geographic diversification of their commitments and, as mentioned earlier, because they raised their premiums.

If we accept the hypothesis that the bearish cycle is coming to an end and that capacities are now better adapted to demand, the structural effects of the economic context (capitalisation of companies, revising new policies) could have beneficial effects on the international insurance market in the short term, provided that claims and loss experience return to more ordinary levels and that the upturn for financial markets, begun in 2003, continues. French firms should be in a good position to rapidly take advantage of this.

## Banking sector

Banking services for marine activities other than fisheries (harbour activities, merchant navy, etc.) are fragmented and competitive markets. Several French banks are active on them. Due to data availability, the only banking activity accounted for here is linked to the marine fisheries sector.

In the realm of banking assistance for the marine fisheries sector, the *Crédit maritime mutuel* holds the mutual maritime loan company (SCCMM) and ten regional, mutual, marine loan banks along the coast of metropolitan France, in the West Indies and the Indian Ocean. These banks are affiliated with the *Caisse centrale du Crédit coopératif* lending institution.

In the field of banking and finance, the SCCMM represents all of its banks at national and EC levels. It leads, organ-

ises and coordinates the *Crédit maritime's* actions. The *Crédit maritime* is on the board of the *Confédération de la coopération de la mutualité* and of the *Crédit maritime*, which is the confederation representing the interests of the cooperative movement in the fields of fisheries and mariculture. The institution has 150 agencies and over 900 staff.

The *Crédit maritime* is the number one financial intermediary in the field of marine fisheries. The bank enjoys exclusive management of a number of subsidised loans for this sector. Thus for fisheries, banking terms seem to be another instrument of State sector-based policy. The *Crédit coopératif*, the central body of the *Crédit maritime* bank, is also a financial stakeholder in the sector. The *Crédit maritime* provides at least 90% of banking services in the fisheries sector. It is also present in the merchant harbour and marina sectors.

### Key figures for the *Crédit maritime* mutuel loan bank

Units: million euros, number of staff  
Source: *Crédit maritime mutuel*.

	1997	1998 <sup>(1)</sup>	1999 <sup>(2)</sup>	2000 <sup>(3)</sup>	2001	2002
Net bank proceeds	78.0	78.5	81.3	88.0	92.0	92.0
Value added*	53.2	55.2	54.6	58.7	62.6	62.6
Manpower**	888	897	891	908	900	900

(1) all regional banks, SCCMM, Guarantee funds, Union of regional banks

(2) = (1) + *Crédit maritime Informatique*

(3) = (2) + *CM Vie* (life insurance company)

\* Interim estimation based on trading accounts

\*\* full time equivalents

# Public sector





# The Navy

The French Navy is taking part in the major changes in armed forces deployment enacted since the end of the Cold war, i.e., the move to professionalisation and refocusing of priorities on missions of deterrence, prevention, projection-action and protection.

The Navy action covers three main fields:

- taking part in nuclear deterrence, which guarantees that France's vital interests will be defended facing any global or regional power;
- participation in the strategy for action which aims to provide force and power projection capability in crisis zones coming in from the free area of the open sea;
- participation in maritime protection, covering all the missions responding to emerging threats which can come from the sea (terrorism, smuggling, piracy), to ensure that sovereign rights are defended at sea (fisheries police, for instance) and to control the risks related to maritime activities (pollution prevention and response).

## Budgetary means and staffing

Not including pensions, the Navy's budget accounts for 18% of Defence spending.

In the draft budget for 2004, 66% of Navy funding was allocated to investments, making a total of 3,838 million euros. The Navy's investment expenditures represent 25.5% of those for Defence. They have risen by 12.2% with respect to the initial budget for 2003. Part of this is related to charges created by the change in the DCN naval shipyards' status (see above: "Shipbuilding").

Capital expenditure slated in the Navy budget corresponds to:

- studies and development for 11.3%;
- scheduled maintenance and equipment manufacturing for 77.3%;
- infrastructures for 4.5%;
- and 6.9% to help restructure the DCN naval dockyards (industrial adaptation fund).

Payroll and social contributions for military personnel make up 26% of all "Navy" funding and 76.5% of running costs alone. Between 2003 and 2004, these budgets have fallen by 0.8%, and running operations budgets have remained stable.

In terms of R & D of interest to the French Navy, are oceanography-related studies listed in the "Studies and development" item in the table entitled "Capital expenditures allocated to the Navy", as well as upstream studies steered by the DGA. They deal with:

- modelling physical ocean phenomena, underwater acoustics, perfecting of digital models and numerical processing, signal processing;
- developing naval system components;
- developing equipment, and perfecting demonstrators and prototypes.

## Key figures for the French Navy

Units: million euros, number of staff  
Source: Naval staff.

	1998	1999	2000	2001	2002	2003	2004*
Navy budget**	4,976	5,173	5,031	5,099	4,978	5,430	5,834
Civilian and military personnel	65,172	62,641	59,064	55,293	54,433	54,362	54,656

\* draft budget

\*\* pensions are not counted in the French Navy budget.

## Outlook

The 2003-2008 "military programming bill" (LPM) aims to strengthen or renew naval capacity in its various fields of action mentioned above: deterrence, action strategy and maritime protection.

During this period will be delivered: a ballistic missile nuclear submarine (SSBN), the *Vigilant*, two *Horizon* type anti-aircraft frigates built in cooperation with Italy, two force projection and command vessels (BPC), which will increase capability in conducting amphibious assault or air-borne operations from the sea, and *Rafale* type aircraft armed with cruise missiles. Protection capabilities will be increased thanks to the replacement of the "response, assistance and rescue tugs" (RIAS) based in Brest and Cherbourg the replacement of the heavy *Super-Frelon* helicopters by NH90s.

The Navy is also going to launch, during the period covered by this military programming finance law, programmes which aim to provide it with a second aircraft carrier, meaning that France will have a fleet air arm at all times, new frigates to replace an ageing fleet (17 multi-role European frigates (FREMM) are slated to be built in cooperation with Italy) and *Barracuda* type nuclear-powered ballistic missile submarines. The latter two types of vessels will carry cruise missiles. Most these new facilities will be commissioned for active duty in the next decade.

Most of this new capability is being produced in cooperation within a European framework.

The 2004 finance bill, for the second consecutive year, is in line with the 2003-2008 LPM military programming law, designed to aid the recovery of the French defence system, with a clear effort in terms of equipment availability. For the second year running, the share of defence spending in the national budget will be increased.

Between 2003 and 2004, investment funding shot up by 9.2% for Defence overall and by 12.2% for the Navy. This was most obvious with the delivery of the latest of the new generation SSBNs, the *Vigilant*, and through the order place for four *Fremm* frigates.

## Share of commitment appropriations for the Navy

Units: billion euros, %

	1998	1999	2000	2001	2002	2003	2004*
<b>National budget</b>	<b>241.7</b>	<b>254.2</b>	<b>253.8</b>	<b>260.9</b>	<b>266.4</b>	<b>273.8</b>	<b>283.6</b>
Defence budget, including pensions	36.3	37.1	37.0	37.3	37.7	39.9	41.6
Defence budget as % of national budget	15.4	14.6	14.6	14.3	14.1	14.6	14.7
Defence budget, not including pensions	28.2	29.0	28.6	28.2	28.9	31.1	32.4
French Navy budget as % of Defence budget, not including pensions	17.7	18.4	17.6	17.7	17.2	17.5	18.0

\* draft budget.

Source: Naval staff.

## Capital expenditures allocated to the Navy

Unit: million euros

	1998	1999	2000	2001	2002	2003	2004 <sup>(1)</sup>
Studies and development <sup>(2)</sup>	288	438	482	530	463	519	434
Scheduled construction and maintenance	2,515	2,539	2,317	2,409	2,397	2,687	2,966
Infrastructures	109	116	133	108	107	148	174
Restructuring of the DCN	69	112	132	117	90	67	264
<b>Total</b>	<b>2,981</b>	<b>3,205</b>	<b>3,064</b>	<b>3,164</b>	<b>3,057</b>	<b>3,421</b>	<b>3,838</b>

(1) draft budget

(2) except for upstream studies by the DGA concerning the maritime area (chapter 5281): i.e., approximately 60 m euros/year.

Sources: ministry of the Economy, Finance and Industry, Naval staff.

## Appropriations for Navy operating expenses

Units: million euros, number of staff

	1998	1999	2000	2001	2002	2003	2004 <sup>(1)</sup>
Military personnel <sup>(2)</sup>	1,536	1,565	1,551	1,521	1,519	1,573	1,561
Operations	457	401	413	412	400	434	433
Operating subsidy and others	2	2	2	2	2	2	2
Total running costs of Navy	1,995	1,968	1,966	1,935	1,935	2,009	1,996
<b>Total running costs of Defence <sup>(3)</sup></b>	<b>23,975</b>	<b>24,014</b>	<b>24,373</b>	<b>24,591</b>	<b>25,392</b>	<b>26,320</b>	<b>26,667</b>

(1) draft budget

(2) payroll and social contributions

(3) retirement pensions included (approximately 8,300 million euros)

Source: Naval staff.

## Payroll of Navy military and civilian personnel

	1998	1999	2000	2001	2002	2003	2004*
Civilian personnel	8,156	9,017	9,573	9,906	10,157	10,296	10,525
Military personnel	57,016	53,624	49,491	45,387	44,276	44,267	44,131
including conscripts and volunteers	11,498	8,298	5,018	1,667	1,613	1,601	1,596
<b>Total</b>	<b>65,172</b>	<b>62,641</b>	<b>59,064</b>	<b>55,293</b>	<b>54,433</b>	<b>54,563</b>	<b>54,656</b>

\* draft budget.

Source: Naval staff.

## Naval and naval aviation facilities

Main equipment	2003	2008 (end of LPM)	Armed forces model 2015
Aircraft carrier	1	1	2
Carrier-based aircraft	62	61	60
Maritime patrol aircraft	28	28	22
Combat helicopters	55	52	51
SSBN	4	4	4
SSN	6	6	6
Anti-air frigates	3	3	4
Anti-submarine frigates	8	8	8
Multi-purpose frigates*	14	14	14
Mine warfare ships	14	14	16
Landing platform docks	4	4	4

\* These include the multi-role land attack version frigates (Fremm AVT), La Fayette type frigates and the A69 aviso patrol boats.

Source: Naval staff.

# Public intervention

*Note: administration intervenes in a variety of maritime activity fields, whether at national or local level. This chapter deals with several aspects of this intervention: notably the financial, social and educational domains, as well as surveillance, safety and rescue.*

## Key figures

The Equipment and Transport Ministry's remit in the maritime field accounts for the major part of public intervention related to maritime affairs. The maritime share of the Ministry's budget amounted to 1.053 billion euros in 2001, with small fluctuations from 2000 to 2003. The state subsidies for the ENIM (social security scheme for naval personnel) made up 67% of this budget.

On the basis of the Ministry's data, state services staff cost for maritime affairs was estimated at 130 million euros in 2001, for a total staff of 4,600 approximately.

## Maritime authority administration

### Local services

Local services for the administration in charge of the sea include:

- maritime authority services, subdivided into regional and county divisions, along with maritime teaching staff;
- maritime services with the county divisions of the Equipment and Transport Ministry, with competence to create and operate seaports and for signals at sea (subdivisions of Beacon and lighthouses service).

2,339 staff work in the 32 coastal services (metropolitan France and overseas) and in seaports.

## ENIM

The ENIM provident fund for naval personnel is a division of the Equipment and Transport Ministry. It has two functions:

- as a central state service, it draws up legislation and regulations for the seafarer's social benefit scheme;
- as an administrative public body, it manages social benefits, with the exception of family allowances, for seafarers and their families and collects social security contributions from shipowning companies and seafarers they employ.

The ENIM employs 515 staff.

## Signals, surveillance, safety at sea

### Signals

The 1,300 staff of the "beacon and lighthouse" services ensure:

- general guidelines for navigational aid systems, both for marine and inland waters;
- relations with users in local sailing committees;
- relations with foreign countries and international organisations for maritime signal issues;
- defining, deploying and maintaining all maritime navigational aid systems in metropolitan France and overseas departments and territories;
- managing storage centres for equipment used to fight accidental oil pollution at sea.

## Safety, surveillance, search and rescue

Safety at sea covers:

- public inspections to control that the regulations are complied with,
- organisations of navigation, especially maintenance and upgrading of lighthouses and beacons.

There are five regional rescue coordination centres (RCC) in metropolitan France (Gris-Nez, Jobourg, Corsen, Etel, Lagarde) and one in the West Indies-Guyana (Fort-de-France). The RC centre of Reunion island completes the array. The RCCs have the following remit: search and rescue at sea, surveillance of shipping, monitoring fisheries, monitoring water pollution and disseminating information. They are part of the international network of maritime rescue coordination centres set up by the Hamburg Convention in 1979.

The French sea rescue society (SNSM), a private body directed to the public benefit, performs a large part of rescue operations on a volunteer basis under RCC control. The SNSM relies on 3,500 experienced rescue staff and seamen, 1,100 seasonal rescue workers trained in its 26 centres by 300 instructors and on 1,000 volunteers in charge of supervision. As a non-profit organisation, the SNSM is financed roughly 50% by private donations and the rest by subsidies from State and local authorities.

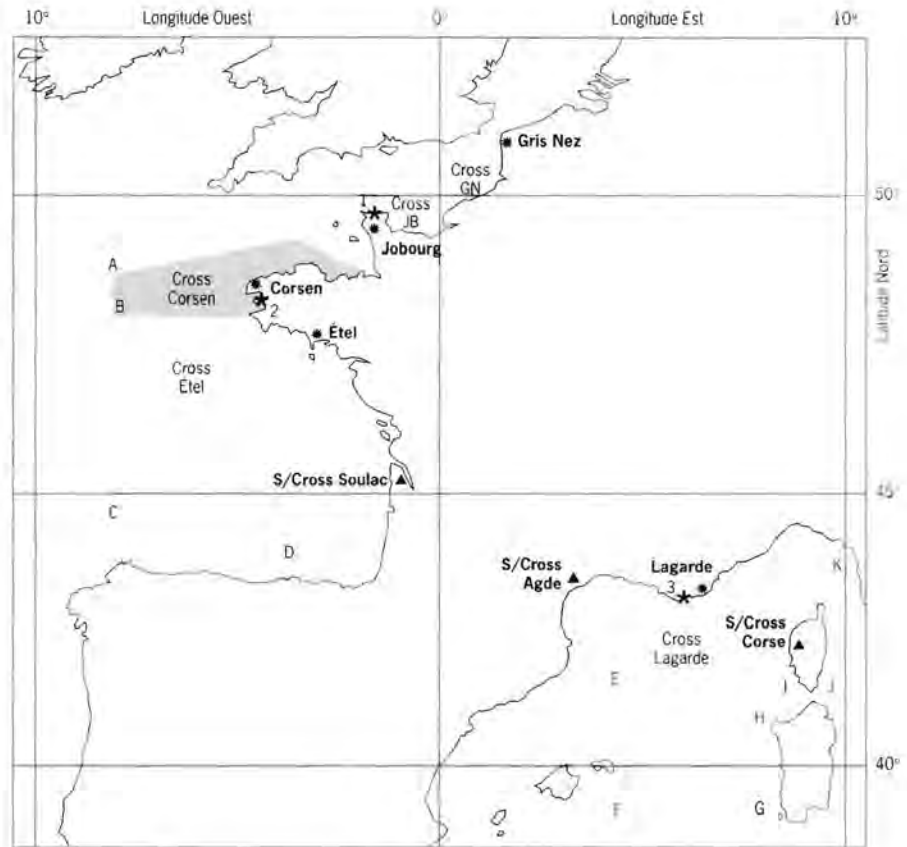
## RCC (Cross) implantations

Source: Equipment and Transport Ministry, RCCs

## Training and education

If we limit the scope to training and education services which draw on the Equipment and Transport Ministry's budget, there are several levels of training. High schools for maritime and aquaculture training (LEMA) provide initial and further training for qualified seamen, aquaculture professionals and some fisheries officers.

The four merchant navy schools (ENMM) of Le Havre, Saint-Malo, Nantes and Marseilles train officers who will mainly serve aboard merchant vessels. Other schools are either private or run by associations.



- ★ 1. County maritime authority Manche-mer du Nord (Cherbourg)
- ★ 2. County maritime authority Atlantique (Brest)
- ★ 3. County maritime authority Méditerranée (Toulon)
- chef-lieu Cross (main regional RCC)
- ▲ sous-Cross (subordinate regional RCC)



# Coastal and marine environmental protection

*Coastal environments are subject to numerous disturbances which can be naturally caused or related to human activities. To address the consequences of these disturbances, coastal and marine environmental protection policies have been set up nationwide, as well as in the framework of the international institutions where France takes part. They focus on preventing, reducing and eliminating pollution; repairing damage; collecting, processing and disseminating environmental data. This chapter deals with: coastal water quality monitoring and protection; accidental pollution response and waste management; and protecting our ecological and scenic assets.*

## Protecting coastal water quality

Many human activities are directly or indirectly affected by coastal water pollution phenomena through contamination of aquatic ecosystems. This vulnerability led to the implementation of various nationwide measures to protect water quality. Among the core measures are monitoring networks, action taken by water authorities and programmes for wastewater management.

### Coastal water and resource monitoring networks

#### Monitoring and prevention

Information from the monitoring networks is vital for detection and follow-up of health and environmental hazards. Data from the networks provide the basis for programmes informing coastal users about environmental quality in order to prevent health hazards.

#### Monitoring over the long term

Monitoring will supply part of the scientific basis required to draw up or modify environmental standards, making it possible to assess the effectiveness of coastal management and health and environmental hazard prevention policies.

#### Monitoring covers

- general water quality parameters (salinity, temperature, dissolved oxygen, pH);
- enrichment and eutrophication parameters (nutrients, chlorophyll, organic matter, turbidity);
- chemical contaminants and their effects on living resources (metals, pesticides, polycyclic- aromatic hydrocarbons, or PAH);
- health-related microbiology;
- toxic plankton and phycotoxins.

#### 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 matters. The inspections help determine the quality of recreational areas which have not been permanently closed and identify those presenting a health hazard, usually related to poor bacteriological quality. When necessary, bathing is forbidden in these areas and municipalities must indicate this to users.

Monitoring is done during the seaside holiday season, defined locally with respect to climatic conditions and periods when visitors are numerous, in 648 coastal towns in metropolitan France and overseas. In metropolitan France, the minimal recommended period runs from

15 June to 15 September. The number of inspection points at sea rose from 591 in 1975 to 1,869 in 2002. On average, more than 13 samples are taken on each site during the bathing season (making a total of 24,890 seawater samples in 2002). The ministry in charge of the Environment and the ministry of Health have assessed the annual cost of the network at over 4.5 million euros, not including labour costs.

In spite of the drainage and sewage treatment efforts carried out with the help of water authorities by the municipalities in question (see below), recreational sea water quality has deteriorated somewhat over the past two years. In 2002, 87.5% inspection points were found to be compliant with the European Directive 76/160/EEC of 8 December 1975, compared to 88.7% in 2000. The investigation into the causes of water pollution conducted by the ministry of the Environment shows that the main causes involve drainage and treatment and that stormy periods create special problems for coastal communes (municipalities), especially in southern France.

#### Monitoring networks operated by Ifremer

Nationally speaking, in France, Ifremer is one of the main stakeholders in continuous coastal environment monitoring, managing several networks for observa-

tion and monitoring of coastal water quality. In 1998, the total cost of all Ifremer's coastal environment monitoring activities (coordinating national networks and working with regional networks, environmental data management tools) was estimated to be over 10.7 million euros in 2002 value.

- **The national seawater monitoring network (RNO)** was set up in 1974 by the ministry of the Environment. This network is coordinated by Ifremer on behalf of the ministry. It is the source of the monitoring data which France has a commitment to disseminate to the following international organisations: the International council for exploration of the sea (ICES) and Oskar conventions for the northeast Atlantic and the Barcelona convention for the Mediterranean. Water quality parameters (salinity, temperature, nutrients, chlorophyll) were moni-

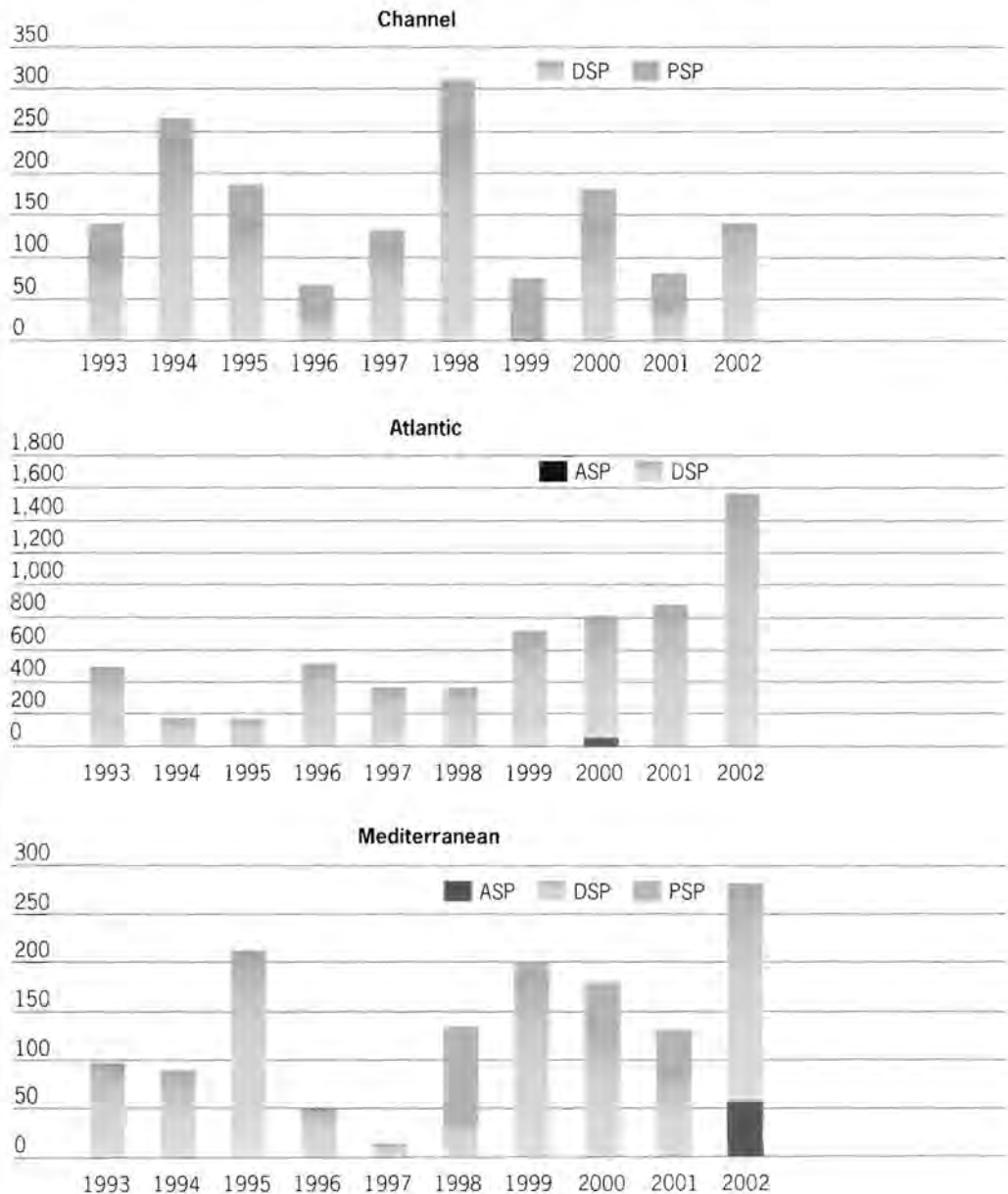
tored on water masses in twelve sites, including two in Martinique and Guadeloupe. Contaminant (heavy metals, PCB, PAH, pesticides) monitoring is done on marine organisms (approximately 90 sampling points, sampled twice a year in metropolitan France and in the West Indies) and on sediment (the entire coast-line is covered every ten years).

This watch has led to measures to protect public health. For instance, measurements of cadmium contamination in the Gironde estuary and its zone of influence led to a ban on shellfish farming activities and dredging of wild oysters for relaying and growing out in the estuary. RNO data were also used to classify shellfish farming areas in terms of chemical contaminant levels for which standards have been set (mercury, lead and cadmium).

- **The phytoplankton and phycotoxins monitoring network (Rephy)** was created in 1984, after toxic phytoplankton blooms occurred along French coasts. Rephy has both ecological and alert aspects, since its objectives are to: a) inventory all phytoplankton species in coastal waters, as well as exceptional occurrences (coloured water, blooms of species harmful to marine fauna); and b) protect consumers, by detecting the species which produce toxins and monitoring these toxins in shellfish. About 200 sampling points make up the Rephy network, roughly one third of which are sampled very regularly all year round. The measured parameters comprise, along with phytoplankton species and toxins, hydrological variables (temperature, salinity, turbidity, and in some cases, dissolved oxygen) and eutrophication variables (chlorophyll *a* and pheopigments).

Trends by seafront sectors, number of days that production areas were closed due to phycotoxins, 1993-2002

Source: Ifremer.



If toxicity test results exceed the threshold values, sale and harvesting of shellfish can be prohibited. A look at bans on sale due to phycotoxins over the past ten years in France shows that some areas are regularly closed for long periods, which can exceed three months, due to diarrhetic poisons (DSP). The latter affect areas in the English Channel in summer and autumn, in the Atlantic in springtime and in the Mediterranean all year round. Paralytic poisons affect areas in northern Brittany in summertime and Languedoc areas in the winter. The first closures due to amnesiac shellfish poisons were ordered in 2000 in western Brittany, then in 2002 in the Mediterranean.

- **REMI, the microbiological monitoring network for shellfish farming zones** was set up by Ifremer in 1989, in order to obtain results for microbiological quality in shellfish farming areas and keep a regulatory health watch there in accordance with the European directives 79/923/EEC of 30 October 1979 and 91/492/EEC of 15 July 1991. The areas have been officially classified upon administrative recommendations which are based on Ifremer's expert assessment and report.

The network checks that microbiological contamination levels remain compliant with the classification designated by the Administration and detects unusual occurrences of contamination. There are four quality classes: A, B, C and D. Shellfish can only be harvested for direct human consumption in class A zones. Marketing of shellfish from class D zones is prohibited. Shellfish from B and C zones must undergo preliminary cleansing or be relayed in an A class zone set aside for this use. As of 1 January 2003, there were 488 classified production areas on the French coastline. 141 of them were in class A, 197 in B, 56 in C and 94 are still under temporary classification.

REMI monitors class A, B and C zones (388 sampling points). Samples are taken on a monthly, bimonthly or quarterly basis, as appropriate for the estimated quality (A, B or C) or risk of sporadic deterioration in the area's bacteriological quality.

The REMI alert system is triggered when monitoring results exceed the standards

set for quality classes, or when there is a risk of contamination (pollutant discharge, storm) or in the case of epidemics either reportedly or assumed to be due to shellfish. When standards are exceeded, the Administration decides on measures to protect consumer health (temporary downgrading, purification or banning of sale) in the sector in question.

REMI's nationwide coordination has been part of the "Shellfish Microbiology" National reference laboratory (NRL) since its designation within Ifremer in early 2003. The NRL's remit is to provide a guaranteed monitoring system on a national level for viral and bacteriological contamination of live shellfish with regard to the conditions under which they are produced and marketed.

- **The farmed mollusc yield network (Remora)** makes it possible to assess performance of different oyster rearing areas, considering the farm's biological yield (survival and growth) and quality of oysters produced. The network has two purposes: helping shellfish farming ecosystem management and providing historical series to be used for scientific studies. It is based on the annual monitoring of a given batch of oysters in the main French oyster-farming areas (44 national stations and a varying number of regional stations). Oyster survival, growth and quality are assessed quarterly in Ifremer's regional laboratories. Since the network began operations in 1993, a ten-year summary of its results was drawn up in 2003. As well as the description of trends recorded at each station, the summary highlights abnormal mortality phenomena (1995), poor growth (1998) or poor quality (Polydora infestation on the rise). Analysis of these results shows that beyond the annual fluctuations, there are great differences from one shellfish farming sector to another. A report is published every year. The data are stored and can be accessed upon request to the network coordinator. A summary of the data can be consulted at:  
<http://ifremer.fr/remora>.

- **The mollusc pathology network (Repamo)**, was created in 1986, particularly in response to the European directive 91/67 concerning regulations and health inspections for the mollusc trade between EC countries. It conducts:

a) monitoring of diseases which must be declared: bonamiosis and marteliosis in native oysters; b) general monitoring of farmed and wild bivalve mollusc populations; c) studies of the causes of abnormal mortality; and d) inspections of mollusc exchanges with European or other countries. The network relies on all Ifremer's coastal laboratories and is coordinated by the "Genetics and Pathology" lab, itself a mollusc disease reference laboratory for the European Union and the International Office for epizootic diseases.

#### Other monitoring networks

Local measurement networks have been set up on the scales of estuaries or département (county) coastlines. They either supply data needed for a local problem, as is the case for the nutrient watch in the Nord-Pas-de-Calais region, or that of the Marel "automatic measurement for the Seine bay and estuary's coastal environment" network, or provide the coordination required for monitoring activities on a regional scale, as in the Mediterranean coastal network.

Other stakeholders are involved in monitoring work on a local scale. In the field of sanitary microbiology, supplementing the REMI and recreational waters network data, the DDASS are in charge of monitoring the health safety of areas where recreational fishermen gather shellfish along the French coasts. The CQEL coastal water quality units provided by the public works and amenities ministry to the ministry of the environment perform ad hoc monitoring, for instance in harbour waters, or within the framework of the RNO. Monitoring is based on a local approach, but unit strategies are coordinated on a national level. Moreover, the ministry of the Environment, as the contracting authority of the Repom national seaport monitoring network, has entrusted the units with its implementation. It covers 186 metropolitan harbours and three overseas ports.

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

## Action by water authorities and wastewater management

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

The water authorities were set up by the water management law of 16 December 1964 and the order of 14 September 1966. They are public administrative institutions placed under the supervision of the Ministry of the Environment. There are six French water authorities in France, making one per major catchment area in metropolitan France: Adour-Garonne, Loire-Brittany, Seine-Normandy, Artois-Picardy, Rhine-Meuse and Rhone-Mediterranean-Corsica. In each watershed, the organisation is the same, made up of a catchment board defining the policy and a water authority.

The six water authorities are financially independent institutions. They collect the amounts charged to public or private individuals for water abstraction (drinking water, industrial uses, irrigation) and for industrial (wastewater spills in natural habitats or public sewage treatment networks) and domestic pollution (paid by towns).

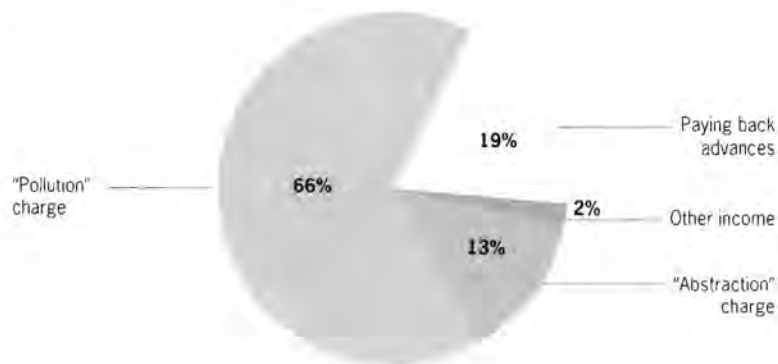
The proceeds from these charges are redistributed as aid to finance operations of pollution response, environmental protection or improving access to water resources. The authorities distribute the funds on the basis of a five year intervention programme.

### Wastewater management costs

Since 1990, spending nationwide for wastewater management has grown steadily, by an average of 5% annually. It reached 10.49 billion euros in 2001 (source: IFEN), i.e., 43% of total expenditure for environmental protection in France for the same year (source: draft 2002 budget, Environment). This is financed by firms, households, public administrations and companies specialised in collecting and treating wastewater.

The municipal or inter-municipal services which manage wastewater, regardless of whether they are managed directly by the local authority, or partially or totally delegated, accounted for nearly 80% (8.3 billion euros) of nationwide spending in this sector in 2001. They 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.

Breakdown of water authority income in 2002: 2109 million euros

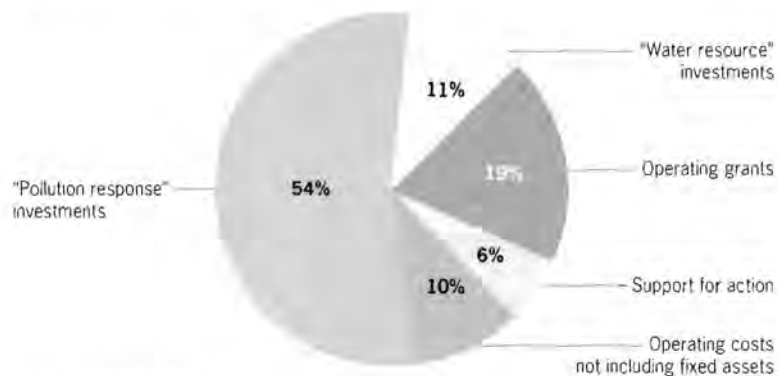


including, per user category:

	Local authorities	Industry	Farming
Abstraction charges	72%	22%	6%
Pollution charges	88.3%	11.1%	0.6%

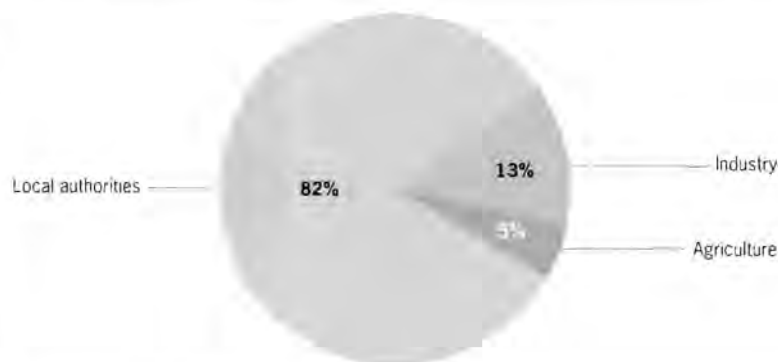
Source: 2004 draft budget.

Breakdown of water authority expenditure in 2002: 2,131 million euros



Source: 2004 draft budget.

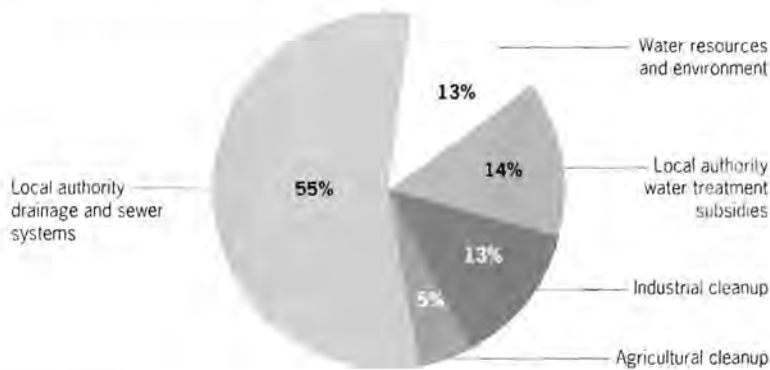
Aids and subsidies per user category



Source: 2003 draft budget.



## Aids and subsidies by type of intervention



Sources: P.F. 2003

## European framework for water management

Since 1975, the European Union has adopted some thirty directives or EC regulations (bathing water, shellfish areas, sensitive areas, Natura 2000, etc.) based on a dual approach of combating the discharge of hazardous substances into the aquatic environment and defining quality standards for specific areas. To improve the policy's effectiveness and ensure better coherence between the various directives, a framework directive was adopted in September 2000. It will entail the repeal of several directives, according to a set schedule; directive 79/923 modified by directive 91/692 relating to shellfish water quality requirements will thus be repealed in 2013. Only those directives dealing with drinking water, bathing water, urban wastewater and agricultural nitrates will be maintained.

See: <http://www.ifremer.fr/envlit/surveillance/directive.htm>

## Green tide pollution response

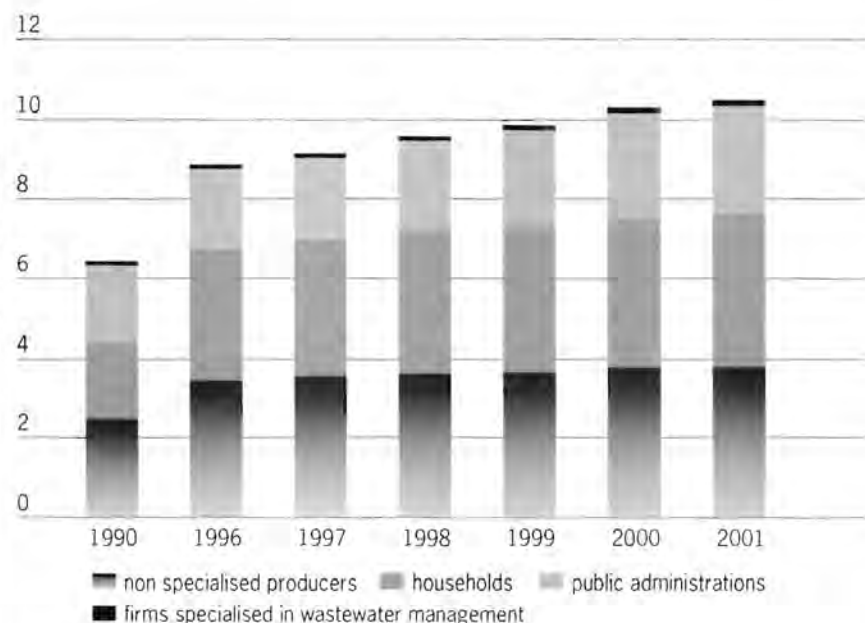
So called "green tides" are coastal blooms of macrophytic green algae (notably ulva and enteromorpha) which grow in the water mass. Although reported for many years, the phenomenon has now become significant at some points along European coasts (North Sea, Baltic Sea, Venice lagoon). In France, it affects the Languedoc lagoons, the Arcachon basin and above all some fifty beaches in Brittany.

Algal development is favoured by the combined action of three factors: excessive nitrogen inputs (usually as nitrates), gentle beach slope (high temperatures and sunlight in spring and summer) and limited renewal of sea water (trapping). Ulva biomass produced on Breton shores has been assessed at a minimum of 15 to 20,000 tonnes (instant stock observations at time of supposed annual maximum). Amongst the regularly affected sites, a dozen are highly impacted. They are mainly located on the Finistère and Côtes d'Armor coasts.

The problem is currently increasing, with greater impact on "minor site" beaches, longer presence of algal masses on the shore and expansion of blooms towards areas of deeper water (reaching roughly - 20 m). Ulva account for 85% of the total tonnage of seaweed collected on

## Breakdown of spending for wastewater management in France

Unit: billion euros  
Source: IFEN





beaches in Brittany over the past four years, and 78% of the total cost of seaweed collection.

Along with the complex ecological consequences on the foreshore and in the benthic ecosystem, green tides have economic and social consequences which can be far-reaching. Firstly, these involve regional tourism, due to the nuisances generated by the volatile compounds smelling like sulphur that they release into the air, and by the physical hindrance they create for recreational activities on the coast. Secondly, they affect shellfishing activities, by making harvesting difficult and through ecological disturbances created by high densities of macroalgae.

Possibilities of recycling them by methanisation or composting this biomass have not yet proved to be cost-effective. Until the nutrient flows reaching the coast are limited, the only way to parry the problem remains collection. Its cost varies from site to site and from one year to the next. In Brittany, the total cost reached a high in 2000 of over 600,000 euros. In 2002, it was more than 400,000 euros. Spending commitments from riparian communes (municipalities) are financed by county councils at 80% for Côtes-d'Armor and 60-72% in the Finistère, depending on the commune's size.

## Accidental pollution response and waste management

### Administrative action in terms of accidental marine pollution response

The organisation of response to accidental pollution at sea still in effect today is based on the 12 October 1978 Polmar instruction. Its objectives were mainly to set up an operational pollution prevention and response system and to improve it through research studies and through coordination between the administrations.

The main organisations which play a role in the Polmar system are the following:

• **In terms of central administration:**

- the DTMPL directorate for sea transport, ports and the coast is in charge of purchasing the equipment required for pollution prevention and response. In 2003, the funds specifically budgeted for the Polmar plan amounted to 1.3 million euros, with operating credits exceeding 600,000 euros. Special funds were granted in addition to the annual allocation in order to replenish the inventory of equipment used during the *Erika* spill. On average, the DTMPL spends 125,000 euros per year on studies and research.

- The Cetmef techniques and maritime studies centre provides technical support to the DTMPL and is in charge of group buying of equipment. It also manages the mobilisation of stockpiled resources when they are needed. The French Navy's pollution response practical studies commission is in charge of assessing the needs for combating pollution at sea, and purchasing and managing the Polmar-mer stockpiled equipment and products.

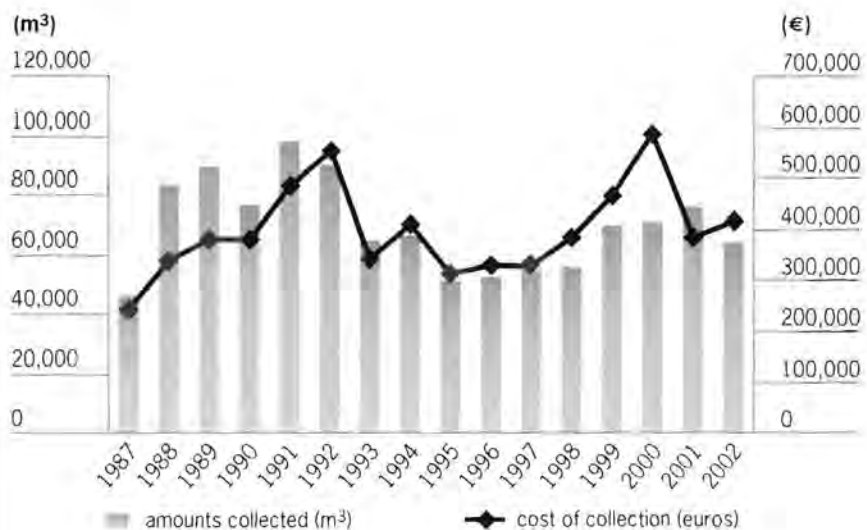
- The Cedre is in charge of on-going documentation, research and experimentation on pollution response techniques, equipment and material, as well as providing operational advice in emergency situations.

• **On département (county) and local levels:**

county Polmar plan executives ensure the communication between the various stakeholders involved. The DDAM county directorates for maritime affairs act as a local relay for the ministry of Public works and amenities and the ministry of Agriculture and Fisheries. They also play an important part in Polmar sea and land links. Furthermore, France has 13 stockpile centres, 8 of them in metropolitan France. The DDE county directorate for public works and amenities plays an important role in operations using pollution prevention and response equipment.

## Trends in collection of green algae on Breton coasts

Source: CEVA.



Apart from emergency management plans, the public administrations contribute financially to operations to clean up and restore the coastal environment. In the case of the *Erika* accident, the French state and local authorities bore part of these costs.

According to the IFEN, the environmental damage caused by this pollution can be estimated at 915 million euros, which by French law is not included in the overall amount entitled to compensation, nor covered by the international compensation system.

### Macro-waste

Macro-waste deposited on beaches by coastal waters or on the seabed can be from natural sources (plants carried by stream networks) or caused by humans. The waste due to human activity can be particularly harmful because it sometimes has a very long life (plastics). Its origins vary; rubbish from urban households or dumps, mainly carried by streams; rubbish left by coastal dwellers and users; waste from harbours, fisheries and shellfishing, merchant vessels or boating, carried back to the shore by currents.

This pollution is causing growing concern in coastal communities which are responsible for cleaning their shores, and particularly their beaches. The better part of cleanup costs are shouldered by these towns. The general (county) councils may also finance part of them. Curative action mainly consists in cleaning the areas; either by collecting the waste at sea or collecting it by machine or by hand on the beach. Other action taken by the towns involves placing adequate rubbish bins and toilets in coastal settings; eliminating collected waste along with municipal waste, which requires stringent management to comply with existing regulations, and informing coastal users. The cost of the measures varies considerably with the nature, the scope and the frequency of the operations in question.

### How the Polmar system has developed since the sinking of the *Erika*

Since the accident involving the *Erika*, the regulations of the Polmar plan have been improved by the public authorities through a series of directives to better coordinate the "sea" and "land" components. The main laws in effect are the 2 April 2001 directive "related to the intervention of public authorities in the case of major accidents at sea", the 4 March 2001 framework directive "related to the coming into force of directives dealing with accidental pollution response in the marine environment and establishing shipwreck rescue plans", the directive «relating to combating accidental pollution in the marine environment (national Polmar documentation)» and the directive «related to the contingency funds to fight accidental marine pollution», dated 4 March 2002. The latter two directives are undergoing a revision procedure to take account of lessons learnt from the *Prestige*.

These new directives aim to improve the coherence between existing organisations and resources to better fight pollution. For this, closer collaboration between the various French (maritime, county and defence zone) préfecture authorities is asked for, in terms of developing contingency plans and the triggering and management of the Polmar system. Greater coordination is also required in order to implement actions at various levels:

- At the national level: inter-ministry coordination is ensured by the minister for the Sea, supported by the secretariat general for the Sea in the event that only the "Polmar-sea" plan is applied, and by the minister in charge of emergency safety services in other cases (alert given in a préfecture at the county or defence zone level);
- At the département (county) level, the préfet activates rescue plans which are led by an emergency committee which is rapidly set up;
- At the defence zone level, the maritime and defence zone préfets each set up a staff to take part in a think tank for emergency management and conducting rescue operations on land and on sea.

As well as watch and action plans to prevent and combat pollution, particular interest is given to expert assessments of the scope of damage following pollution events. The minister of the Environment, in coordination with the minister of Health and the Institute of health surveillance, has set up a unit of experts who evaluate the risks for health, food and the environment. At a local level, the county and defence zone préfecture authorities form a second unit of experts to support the one described above. This is made up of scientists and specialised research institutions.

Thus developing and improving the Polmar system is based on: 1) organising pollution response (with the préfets of the defence zone taking part in the contingency plans at sea and on land, possibly involving international cooperation); 2) the linking of the system's land and sea components; 3) close coordination between ministries and at the defence zone level; 4) expert assessments; 5) storing and treating polluted materials and recovered pollutants; 6) informing the public (about health, food and environmental hazards, as well as about the steps to take to apply for compensation).

A new directive now makes it possible to have recourse to contingency funds to enable any and all measures for pollution prevention and response to be implemented even when the Polmar plan has not been activated.

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### Public administration spending to combat pollution following the *Erika's* sinking

Unit: million euros

<b>State</b>	<b>124.61</b>
Local authorities, of which:	21.74
municipalities and inter-municipal structures	13.19
départements (counties)	6.60
Pays-de-la-Loire region	1.95

Source: IFEN, 2001.

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## Annual costs of macro-waste collection per coastal town (2002)

Unit: euro

Département (county)	Mean	Minimum*	Maximum*
Charente-Maritime	57,016	10,671	152,449
Finistère	22,712	3,049	60,980
Gironde	66,967	5,107	381,123
Landes	36,488	15,245	128,819
Loire-Atlantique	43,778	11,129	91,469
Morbihan	18,571	3,659	53,357
Pyrénées-Atlantiques	203,265	182,939	228,674
Vendée	30,490	1,524	68,602

\* lowest and highest district cost per county.

Source: Cedre, survey taken in Bay of Biscay coastal towns in 2002.

A study conducted recently by the Cedre on communes on the Bay of Biscay coast measured the cost of macro-waste collection by these coastal municipalities in 2002 and its development since the first framework survey done in 1996. The assessment was carried out through a survey, since the information is either not available or does not exist for all of the districts. Although costs can easily be determined in cases where municipalities call on professional cleanup enterprises, it is more difficult when operations are effected using the commune's resources in equipment and manpower.

The amounts spent for waste collection vary greatly from district to district and from county to county. The Pyrénées-Atlantiques county clearly stands out from the others with the considerable amounts spent by towns there for the cleaning of coastal areas.

The unit cost of cleanup, measured in euros per linear kilometre of coastline, rose slightly between 1996 and 2002. According to the Cedre survey, the estimated increase of cleaning costs for this period was nearly 1,000 euros in current value, which, with inflation, represents nearly 500 euros in 2002 value and an increase of 8%.

## Protecting ecological and scenic assets of the coast

Public action taken in this field especially involves fighting erosion of the coastline, combating proliferating species and protecting natural assets.

## Action against coastal erosion

The phenomenon of coastal erosion causes growing concern. According to the results of the Corine coastal erosion programme which is part of the European "Corine" programme, 45% of the French shores are stable, 24% are receding and 11 are undergoing accretion. In Europe, these ratios are respectively 55%, 20% and 11%. In France, 48% of beaches are receding. In the framework of the State-Region plan contracts, the total funding to protect inhabited coastal areas amounts to 40 million euros for the period 2000/2006. € 5 m of this expenditure has been undertaken (source: ministry of Public works and amenities, 2001).

## Combating proliferating 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 have to be implemented. Both public and private spending for this purpose contributes to protecting the coastal environment.

This type of problem arises for certain species of macroalgae. Besides ulva, whose development is closely linked to changes in sea water quality (see below), other known cases involve some brown algae (like *Sargassum muticum*), and a tropical green algae called *Caulerpa taxifolia*.

The case of the gastropod mollusc called the crepidula, or slipper limpet, is also well known. The crepidula was introduced to French coastal areas during the Second World War, and again with the arrival of Pacific oysters in the 1970s. Today it occupies a significant place in coastal ecosystems, especially in shallow, sheltered sectors like bays and estuaries. The gulf between Normandy and Brittany is without a doubt the most colonised sector, especially the Saint-Brieuc and Mont-Saint-Michel bays.

Slipper limpets modify both the seabed's texture, through silting, and its biological make-up, to the advantage of the vagile and sessile epifauna there. Along with this effect is the risk of spatial and trophic competition with other filter-feeders, both in shellfishing zones and in natural bivalve beds. Moreover, some of the shellfish farming sectors and capture shellfisheries zones traditionally dredged and trawled have become unusable due to the greater volume of crepidula harvested and increased sorting times. Moving or even reducing some of these activities has been observed on local levels.

Until recent years, the response to crepidula was limited to occasional cleanup operations by dredging oyster beds, then dumping the limpets into abandoned areas of water or in dumps on land. Various treatments have also been tested, with varying degrees of success. For instance, grinding and discharging them at sea has proved ineffective, seeing that the process is inefficient and difficult to control and that the discharges may have other effects.

A programme to restore the sea bottom was implemented in northern Brittany by the Areval association for gathering and utilisation of crepidula, formed by the regional maritime fisheries committee of Brittany and the northern Brittany regional shellfish farming section. "Côtes d'Armor Développement" (of the Côtes-d'Armor county council) provides the technical coordination of the regional programme on Areval's behalf. In addition, it monitors the technical aspect of their utilisation (collecting and storing data on it) and takes part in Ifremer's monitoring of its environmental effects. The seabed restoration programme's objective is to remove the slipper limpets and use them on an industrial scale to make a powder. It will be used in animal feed or as calcareous soil enrichment for farm land. Other leads for reuse are being investigated.

Initially, it was hoped to remove from 25,000 to 30,000 tonnes of crepidula per year. About 20,000 tonnes were collected in 2002 (source: CAD), using a 58 metre vessel with a specially designed hydraulic vacuum extraction system. Operations have been conducted in the bays of Saint-Brieuc and Cancale. Since 1998 (with the project's operational phase beginning in 2002), nearly 50,000 tonnes of crepidula have been collected in these areas. On the basis of 300 to 800 tonnes produced daily (depending on the areas worked) and 130-140 tonnes per hour, the unit production cost was estimated on average to be nearly € 12 exclusive of taxes per tonne collected (source: CAD). Professional fishermen and shellfish farmers co-finance 10% of the total collection cost. The other partners are the European Commission (50%), Brittany's regional council and the counties of Côtes-d'Armor and Ille-et-Vilaine.

### Protecting natural assets

The creation of a Fund for natural habitat management in 1999 from the Environment ministry's budget illustrates how new resources are being deployed in natural environment protection projects, especially within the framework of European directives application. With a committed budget of € 37 m in 2002, the fund helps finance French participation in the European Natura 2000 network of land and marine sites under the remit of the "Bird" (1979) and "Habitat" (1992) directives.

In 2002, the ministry was granted a budget of more than 95 million euros to create a coherent network of protected natural areas, placed under State responsibility and managed in part by public institutions. The beneficiaries in this capacity are national parks (particularly missions to set up the "Iroise sea" and "Calanques" marine parks), nature reserves, the Coastal and Lakeshore Conservatory in order to broaden its programme to purchase natural spaces, and the National Museum of Natural History for its policy to promote knowledge and take stock of biodiversity.

Amongst the actions taken to protect coastal ecosystems, financed in part by public funding, the schemes for inventories, regulatory protection, contracts and land protection are examined below.

### National biodiversity inventories

Biodiversity knowledge programmes make it possible to define action to be taken for its protection. They also apply

to the coast and marine environments: inventories of "natural areas of ecological and wildlife interest" (14,755 of these so-called ZNIEFF have been designated nationwide, covering 24.5% of French territory) and "EC important bird areas" (285 ZICO designated, covering 8.1% of national territory).

### Nature reserves and national parks

The nature reserve system, established by law in 1930, then amended in 1957 and by the nature protection law in July 1976, is by far the most prevalent on the coast, in terms of surface area and number of sites concerned. Coastal nature reserves cover a total surface area of nearly 250,000 hectares. Some of them, like the Bouches de Bonifacio reserve (79,460 ha, which is the French part of the international Bouches de Bonifacio marine park), Scandola (1,669 ha) in Corsica or the Cerbere-Banyuls (650 ha) reserve in the Pyrénées-Orientales deal especially with marine areas.

In addition, although the existing network of seven national parks created in the wake of the law of 1960 only comprise

one marine park (Port Cros), it is now being extended to marine areas: a project is under study in the Calanques region for the Mediterranean sea; and in Brittany (Iroise sea) for the Atlantic.

### Contracts for protection (Natura 2000, PNR, Ifremer)

The Natura 2000 network as of 15 December 2003, comprised 1209 sites (4,196,526 hectares of which 500,726 ha are marine sites) which were proposed for the application of the European "Habitats" directive and 148 special protection areas (1,172,627 ha) designated for the application of the "Birds" directive. The Natura 2000 network aims to preserve the most threatened habitats and species in Europe through a concerted, contract-based approach on these sites.

Nine regional natural parks include shore areas within their boundaries (Nord-Pas de Calais, Brotonne, Cotentin and Bessin marshes, Armorique, Landes de Gascogne, Camargue, Corsica, Martinique and French Guyana).

## Coastal and marine nature reserves in metropolitan France and DOM

Unit: hectare

### Marine or "mixed" (land + sea or state-owned maritime area) reserves

Channel and North Sea	9,834.00
Atlantic	12,777.00
Mediterranean	81,779.00
DOM	16,899.00
<b>Total</b>	<b>121,289.00</b>

### Seaside "land" (including dunes or dykes) or touching the sea

Channel and North Sea	143.00
Atlantic	1,346.50
Mediterranean	15,068.00
DOM	110,023.00
<b>Total</b>	<b>126,580.50</b>

### All "coastal" nature reserves

Channel and North Sea	9,977.00
Atlantic	14,123.50
Mediterranean	96,847.00
DOM	126,922.00
<b>Total</b>	<b>247,869.50</b>

Source: ministry of Ecology and Sustainable Development



### Ifrecor

France is the only country to have coral reefs in the three oceans of the world. These environments are, ecologically, culturally, economically and socially speaking, exceptional assets for the seven overseas authorities of Guadeloupe, Martinique, Mayotte, Reunion island, New Caledonia, French Polynesia and Wallis et Futuna. To protect them, the government launched the "French initiative for coral reefs" called Ifrecor, in 1998. The initiative took form with the creation of the Ifrecor committee, made up of national and local level stakeholders. Significant financial means have been mobilised since 2000 (nearly 216,000 euros in 2002) to support the action taken by each of the seven authorities.

### Public land purchases in order to protect nature

The "Conservatoire de l'espace littoral et des rivages lacustres" (Coastal and Lakeshore Conservatory) is a core operator in coastal protection. As a public administration, its remit is to implement a land-buying policy to protect wildlife and coastal landscapes.

The Conservatoire buys up land which is threatened, especially by urban sprawl, and restores it in order to make it widely accessible to the public. The land acquired in this way becomes inalienable and cannot be sold on afterwards. The Conservatoire's scope for intervention concerns 2,380 towns, 1,046 of which have a seafront.

The average cost of land was 0.84 euros per square meter in 2001. Funding for the establishment's expenditure mainly comes from its State budget allocations and special ministerial programmes, contributions from European funds and outside partners (towns, counties, donors and sponsors). Local authorities manage Conservatoire lands, employing wardens to watch and maintain the sites.

From its creation in 1975 up to the 1st January 2003, the Conservatoire has bought up property of over 67,516 ha in coastal areas on 500 sites, making 861 km of coastline (metropolitan France, overseas, lakes and coastal lagoons). To this should be added 12 km of land with easements.

Management of sites purchased by the Conservatoire is first entrusted to those local authorities who accept it. Other stakeholders join, or sometimes replace, local authorities to ensure this management (joint consortia, public institutions, approved foundations and associations and farmers). Although activities developed on these sites sometimes create revenues (rental, farm tenancies, leases and agreements, proceeds from entertainment and demonstrations), profits like these remain an exception.

Two other public operators also control land used to protect nature on the coast:

- the national forestry office manages State-owned land, similar to that of the Conservatoire;
- the départements (counties) which buy up land using the county levy for fragile natural areas. This optional tax, levied since 1985, aims to take advantage of urban development to finance the acquisition and management of areas to be protected.

## Conservatoire acquisitions

Units: hectare, million euros

	2002	1976-2002
<b>Surface area purchased (hectare)</b>	<b>1,865</b>	<b>67,516</b>
Land with easements (hectare)*	-	1,317
Investment (million euros)**	10.7	290.5
Number of sites acquired	14	500
Number of deed signed	196	5,746

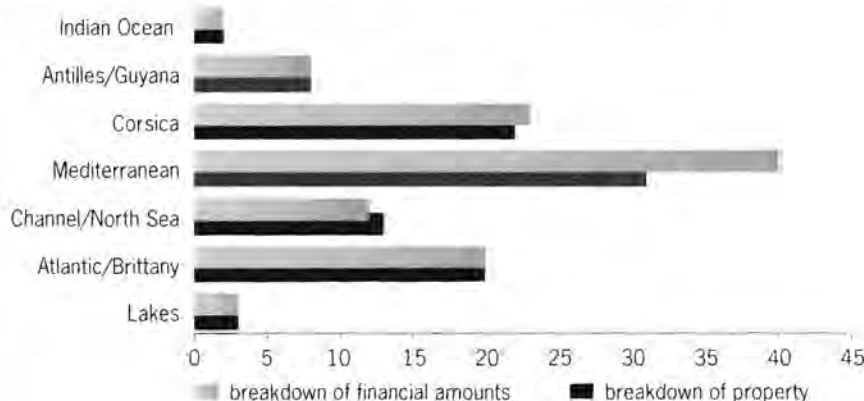
\* protection easements granted to the Conservatory along with a management agreement.

\*\* current euro value.

Source: Conservatoire du littoral.

Geographical breakdown of the Conservatoire's assets (in % of surface area purchased) and investments (in % of financial amounts) for the period 1976-2002

Source: Conservatoire du littoral.





## Management of protected areas, and its cost: the example of the Gironde coast

Coastal protection requires active management in most cases. It is a question of supporting both ecological dynamics (fighting erosion, maintaining biodiversity) and human activities (channelling human presence, regulating conflicts of use). There is an extremely varied range of experiences and numerous stakeholders representing public authorities, associations and more rarely the private sector (farmers). The practices and objectives depend on the natural characteristics of the sites and the local economic context. This management mobilises resources whose scale is still difficult to assess, for several reasons: for instance, superimposed financial circuits, the lack of a data collection system, recourse to volunteers.

A study (Dehez, 2003, see bibliography below) was carried out along the Gironde coast to assess the management costs of a nature area network which comprises state-owned property, plots of land belonging to the town or district and beaches open to the public. It focuses on the seafront and notably does not include the Gironde estuary or the Arcachon basin. The linear area studied makes 126 km of coastline, 70% of the Gironde county's seafront and 86% of the non-built up total linear area. The monetary values given are expressed in 1999 euros.

### Gironde coast: the study area



Source: Dehez (2003)

### Management costs of state-owned property on the Gironde coast

	1998	1999
Surface area (hectares)	20,441	20,441
Linear area (kilometres)	87	87
Total cost (1999 thousand euros)	3,874	4,254
- including operations	3,749	3,650
- including investments	125	608
Cost per hectare (euros)	189,5	208,1
Cost per kilometre (euros)	44,531	48,896

Source: Dehez (2003)

## Management cost assessment

For all the sites, the annual management costs reached about 3.8 million euros in 1998 and 1999. These costs are mainly operating expenses, although the proportions vary from one year to another. Unit costs are about 200 euros/hectare, i.e. 45,000 euros/km or more.

Out of this whole, we can isolate some special places such as dunes (hardly visited, generally speaking). With annual spending of 275 thousand euros, their relative weight is fairly low (between 6 and 7% of the total cost). This will give a cost per hectare of approximately 115 euros, or about 3,000 euros/km. However marked differences remain, because, depending on the sections in question, annual costs often vary on a scale of 1 to 20. Ordinary maintenance work (covering bared areas, planting) is far and away the biggest expenditure item, whereas watch and information operations represent just under 10% of the total cost.

The relatively low management costs for dunes should not make us forget the important role played by dunes, particularly in terms of accompanying coastal erosion. They can provide an effective arrangement with a low maintenance cost, compared to some manmade structures which can cost up to 7,500 euros per metre to install.

Recreational activities offered on the coast comprise a range of services including a network of areas to receive the public, bicycle paths or even landscape maintenance. In 1998 and 1999, the costs related to the first two categories respectively amount to 2 and 2.5 million euros. This represents nearly half of total management costs and illustrates the strong constraints placed on means available to managers.

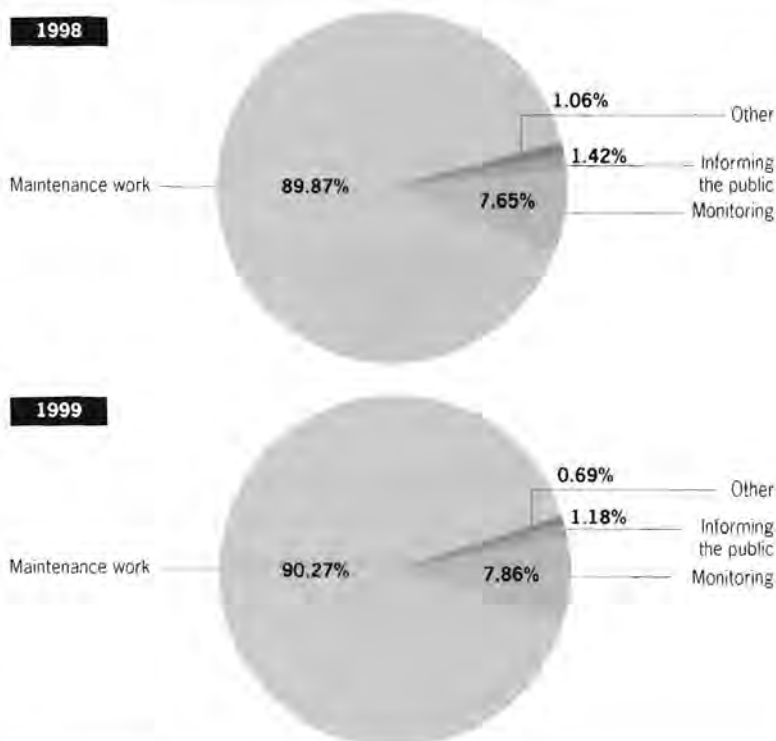
Operating costs predominate today, because investment efforts were made in previous years. Thus, between 1975 and 1999, over 10 million euros were spent to create reception areas. In the past ten years, about 1.75 million euros have been spent to renovate or create some 40 kilometres of bicycle paths (i.e. 23% of the current network). The ageing of these infrastructures is naturally a factor in rising costs.

## Management costs for dunes

	1998	1999
Surface area (hectares)	2,333	2,333
Linear area (kilometres)	87	87
Total cost (1999 thousand euros)	266.3	276.2
Cost per hectare (euros)	114.2	118.4
Cost per kilometre (euros)	3,061	3,174

Source: Delhez (2003).

## Breakdown of dune management expenditure, by type of operation



Source: Delhez (2003).

## Cost of recreational use (reception areas and bicycle paths)

Costs	1998	1999
Total cost (1999 thousand euros)	2,026.3	2,541.2
- including operations	1,870.1	1,946.0
- including investments	156.3	595.2
<b>Amenities</b>		
Number of reception areas		15
Developed wooded areas (ha)		159.43
Developed coastline (km)		14.00
Number of parking spaces		16,715
Bicycle paths (km)		171

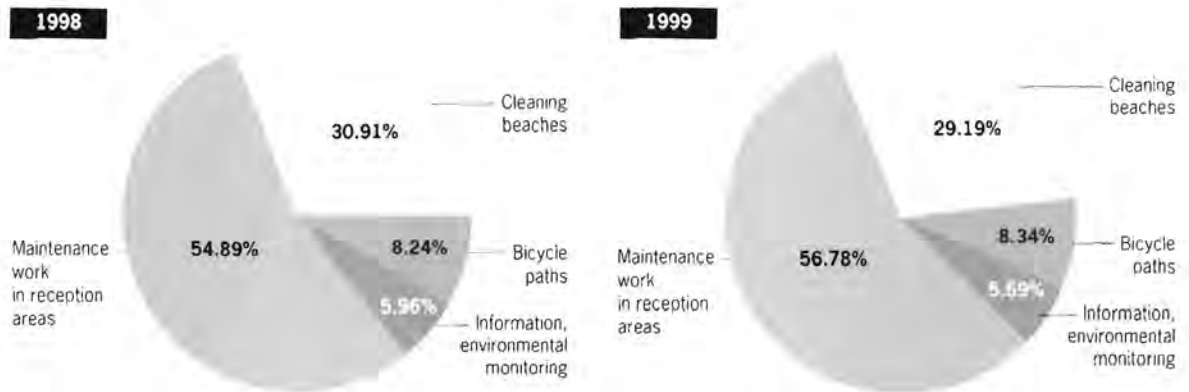
Source: Delhez (2003).

In operational terms, three operations stand out clearly: reception area maintenance (this notably includes maintenance of access and safety facilities and amenities, rubbish collection, restoring the environment), supervising bathing areas and regular cleaning of beaches in summer. The latter two alone represent nearly half of operating costs (we are basing this on estimations).

Funding comes from public sources, since the communes are the main backers. In return, they benefit from the positive effects brought on by tourism. In fact, they have instruments for redistribution, such as the tourism tax. The national forestry office (ONF) mainly acts in operational terms, based on resources obtained from certain commercial uses of the forest (lumber sales

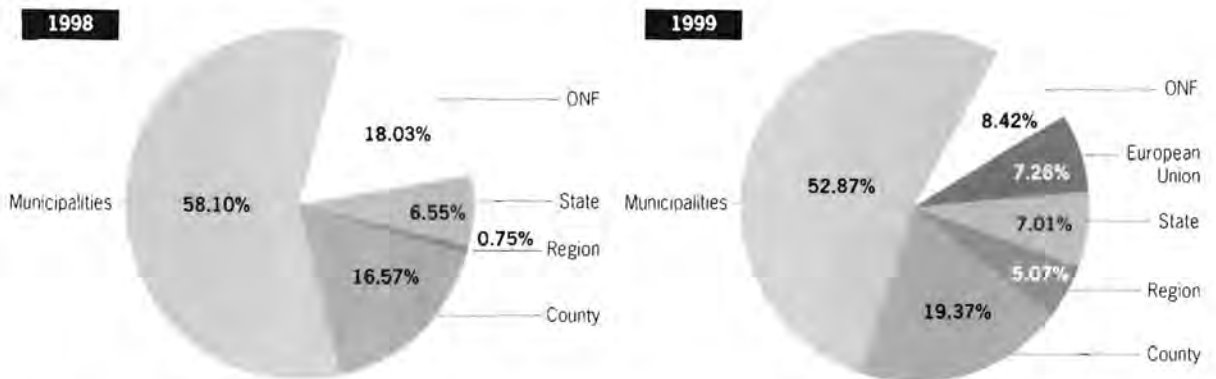
and hunting permits), or the granting of concessions for tourist activities. The highest levels of the public authorities (Europe, State and region) take action on a much more occasional basis, providing subsidies or grants for investments.

### Breakdown of operating expenses related to recreational activities



Source: Dehez (2003).

### Financing of recreational use, not including beach cleaning



Source: Dehez (2003).

# Marine research

*This chapter focuses on the activities of French public bodies in the field of marine research and operational oceanography. French research, assessed at nearly 10% of marine research activities worldwide, will reap the advantages of a new satellite launched recently. In operational terms, new work is focusing on repetitive in situ measurements.*

## Research bodies

Ifremer, university and CNRS-INSU oceanography laboratories, the SHOM French navy hydrographic and oceanographic service, the IRD and the IPEV (see below) are the core scientific organisations in public marine and ocean research. In this field, Ifremer concentrates about half the human resources devoted to R&D nationwide. Earth-observation satellites provide an additional spatial component for oceanographic research. They are financed by the CNES, generally in the framework of bilateral or multilateral cooperation.

Ifremer is a State-funded industrial and commercial establishment (EPIC) whose remit embraces promoting basic and applied research and developing technologies designed to understand, assess and upgrade in order to efficiently exploit ocean resources. The institution's research is based on four strategic main lines: the coastal environment, exploiting living resources, ocean and climate, and exploring the deep sea.

Ifremer is responsible for creating and managing major facilities of public interest: the fleet, underwater vehicles, shipborne equipment, computing and testing facilities, and experimental mariculture facilities. It commissions coastal and deep sea vessels. On a national scale, the blue water research fleet comprises four Ifremer vessels, one IPEV ship and one IRD vessel. The coastal fleet has

six inshore vessels under CNRS/INSU control, one from the IRD, three from Ifremer and one from the IPEV. Furthermore, the SHOM can call on research vessels capable of taking part in national surveys.

Ifremer uses the deep sea fleet for the following research:

- **physical oceanography** (to study ocean circulation and the mechanisms behind its variability);
- **chemical oceanography** (to study the carbon, nitrogen and phosphorus cycles);
- **marine geosciences** to discover and explore the sea floors;
- studying **deep benthic ecosystems** in the hydrothermal domain and on continental margins;
- **ocean engineering**, notably through support in designing underwater intervention systems, deep sea offshore investigations (hydrodynamic behaviour of structures at sea, studying new types of structures) or in providing the scientific and technical basis to assess promising areas for deep sea oil production;
- **fisheries** (fished stock assessments, relations between these stocks and their environment);
- **coastal environment**, complementing inshore vessel operations (investigating contaminants and their fate, matter and nutrient flows and assessments, impact from human activities).

Ifremer operates several coastal marine environment monitoring networks (chem-

ical contamination, faecal contamination, toxic phytoplankton, farmed and captured shellfish) and collects data on marine fisheries. To back up this monitoring and anticipate societal problems and issues, Ifremer leads research programmes on this environment, its resources and their recovery.

Ifremer's annual budget provides funding for research and research-support activities (research administration, fleet operation) in metropolitan France and the DOM-TOM. Its Genavir subsidiary commissions the ocean RV fleet.

The oceanographic component of CNRS research requires large-scale resources for data collection (satellites, ocean research vessels, atmospheric research aircraft), data processing and interpretation. CNRS oceanographic research mainly devolves to its "Department of sciences of the universe" and to the INSU national institute for sciences of the universe. They focus on the ocean, climate and the global environment, and study of the marine biosphere, solid earth dynamics and the coastal environment. Many of these investigations are carried out jointly with Ifremer. Over forty of the CNRS's own labs and university laboratories associated with CNRS are involved in this research.

The national network of thirteen "marine stations", reorganised in 1994, is made up of oceanographic laboratories set up along the French coast. The principal research themes they address are

marine species biology, marine ecosystems, ocean circulation and flows, marine environmental chemistry and marine geology. Six of these stations are OSU science of the universe observatories.

The main universities involved in ocean research are Bordeaux I, Brest, Lille I, Marseille II, Paris VI, conjointly supervising the six OSU with the INSU, and Caen, La Rochelle, Littoral et Côte d'Opale, Perpignan.

Oceanographic research's spatial dimension is provided by the Earth observation satellites launched by the CNES national space research centre and the ESA European space agency. They are the Franco-American satellite Topex-Poseidon, shared by NASA and the CNES which has taken highly accurate altimetric measurements since August 1992; the European ERS1 (active from 1991 to 1996) and ERS2 (since 1995) satellites launched by ESA, with a significant French contribution. Since March 2002, the large multi-sensor satellite Envisat, from the ESA programme, has measured ocean topography and water colour; Jason 1, Topex-Poseidon's successor, was launched in December 2001.

Global observation satellites supply information on certain surface parameters (sea height, temperature, wind, waves, primary production) and indirectly, on sea floor structures (ridges, volcanoes). Thanks to their comprehensive, consistent and repetitive nature, these increasingly accurate measurements are used more and more in combination with *in situ* measurements.

The SHOM, with 885 staff in 1997, including 254 sea-going personnel, mainly conducts research on oceanography for military purposes (marine environment and its physical phenomena, bathymetry, sedimentology). The military oceanography centre CMO is also specialised in naval oceanography, supplying French Navy forces with ocean and meteorological data and the means to use them. The CMO holds the SHOM-Météo research and design laboratory called BRESM.

The SHOM's main establishment (Epsom) is in charge of centralising, processing, formatting and disseminating

data on operational hydro-oceanography. It carries out R&D projects in collaboration with several organisations (Météo-France, CNRS, Ifremer, universities). It uses data from the Topex-Poseidon, Jason 1 and ERS2 global observation satellites. The other fields of Epsom's studies address physical oceanography, sedimentology, geophysics and marine chemistry.

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

- 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, impact of human activities.

The Paul-Emile Victor institute (IPEV), formerly the "French institute for polar research and technology", created in 1992, is a GIP public interest group. As a resource agency for French polar and subpolar research, it selects and promotes scientific programmes in polar and subpolar regions, as well as financing and implementing these programmes in sub-Antarctic islands, in the Arctic and the Antarctic. Research principally addresses: internal and external geophysics, physics of the upper and

lower layers of the atmosphere, glaciology, marine and continental biology, oceanography and medicine.

The other principal research bodies involved in ocean studies are:

- Météo France (French Meteorological office): researching ocean-atmosphere interactions and climate fluctuations in cooperation with university and CNRS laboratories and with several other bodies which are active in the ocean-atmosphere-biosphere environment (CNES, IRD, Ifremer);
- INRA: marine hydrobiology and ecosystems, migrating fish species ecology, research related to marine and freshwater finfish farming (especially pathology) and to upgrading of products either fished or farmed in fresh or brackish waters;
- Cirad, whose main marine research themes are fisheries and coastal biodiversity;
- BRGM: amongst other subjects, working on geological mapping of the continental shelf, study of phenomena at the ocean-continent interfaces, such as inputs from catchment areas.

Apart from oceanographic research, mariculture research is mainly done at Ifremer (highest budgeting and use of human resources), INRA and IRD. The Afssa French agency for food sanitary safety, relaying Cneva, which became part of Afssa at its creation, also works in aquaculture pathology.

### Civilian marine research budgets, for main research bodies in 2001

Units: million euros, number of staff

	Total spending	including staff costs	Manpower
Ifremer <sup>(1)</sup>	149.3 <sup>(2)</sup>	78.4	1,705 <sup>(3)</sup>
CNRS-INSU-universities	85.4	56.4	786
IPEV	7.9	0.14	10
IRD	30.1	21.4	170
INRA	12.8	9.5	203
<b>Total</b>	<b>285.5</b>	<b>165.8</b>	<b>2,874</b>

<sup>(1)</sup> all Ifremer activities taken into account

<sup>(2)</sup> operating expenditure and commitment appropriations

<sup>(3)</sup> including 1,385 Ifremer employees and 320 Genavir salaried staff

Sources: the various organisations



## Operational meteorology and oceanology data

Operational oceanography aims to supply a description in almost real time of the 3D hydrological structure of the ocean and marine currents. To do so, it uses data from *in situ* observation and from sensors on board satellites and processes their assimilation in numerical models which can forecast ocean trends. The outputs of these models are "secondary" data, often applied at a local level. The final products are distributed to private industrial users and to public bodies. The activity is growing in several fields: measurements and forecasts, especially concerning speed and direction of sea winds, wave height and direction, surface currents, tides, sea ice and sea surface water temperature. All the public bodies mentioned at the beginning of this chapter are involved, at various levels, in implementing operational oceanography. Météo-France and Ifremer's work is reported below.

Météo-France is a public establishment (called EPA) under the ministry of planning and amenities, with the remit to monitor the atmosphere, the ocean surface and the snow mantle, to predict changes and to disseminate the corresponding information. Météo-France investigates the ocean layer affected by ocean-atmosphere interactions. Operational oceanography is one of its strategic priorities for 2000-2010.

Météo-France expenditures for marine meteorology and operational oceanography in 2002 accounted for 5% of total spending, i.e., a budget of about 15.5 m Euros. The international nature of these activities requires its major participation in international networks for cooperation and exchange of data, particularly in the framework of the joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM). Météo-France fulfils France's operational commitments in terms of safety at sea, marine pollution, tropical cyclone forecasts and management of data from drifting buoys. This is Météo-France's contribution to the GMDSS global maritime distress and safety system, covering the western Mediterranean, part of the Atlantic and part of the Indian Ocean,

where its centre on Reunion Island is in charge of cyclone warnings and marine forecasts for the Amsterdam-Crozet-Kerguelen zone. In the Mediterranean and the Atlantic, Météo-France helps fight pollution within the framework of the SIUPM marine pollution emergency response system.

In the framework of the Eumetsat European Organisation for the Exploitation of Meteorological Satellites, Météo-France has been designated to steer, run and coordinate the SAF-Ocean satellite applications centre devoted to the ocean and sea ice, in cooperation with the Norwegian and Dutch meteorological institutes. More recently, the Eumetnet weather service network put Météo-France in charge of surface observations (ships, drifting and moored floats) in the North Atlantic (Eucos-Marine).

For safety in the open seas and coastal protection, Météo-France deploys marine forecasting teams at the national forecast centre and in regional departments in metropolitan France and overseas. They constantly monitor the ocean, issuing warnings whenever necessary (for instance, "special weather forecasts" for the safety of shipping, high swell and surge warnings for coastal areas) and provide meteorological-oceanographic predictions: marine weather forecasts, modelling and predicting sea states, sea surges, drifting objects or pollution slicks. Météo-France also plays a role in the Polmar plans (see above: "Coastal environmental protection"), in charge of predicting drifts along with the Cedre.

Thus, for oceanography and marine meteorology, Météo-France is involved in:

- *in situ* data acquisition (vessels and buoys), in both international and national frameworks. The latter is through the action of Coriolis (see below), in cooperation with Ifremer and five other organisations;
- satellite data acquisition and processing;
- routine production of sea surface temperature analyses, using *in situ* data and satellite images;
- operational implementation of models to forecast dangerous ocean phenomena (waves, low levels, surges) or technological hazards (drifting oil slicks, wrecks, etc.);

- global and regional ocean modelling within the "Mercator-Ocean" public interest grouping's activities, as well as in European programmes such as the MFS (Mediterranean Forecasting System);
- data archiving, modelling and satellite imaging.

Ifremer's operational activity falls into three main fields: managing coastal water quality networks (see above: "Coastal and marine environment protection"), ocean circulation, cruises to study physical oceanography and fisheries.

Ocean circulation is being studied in a deep sea operational oceanography programme for the climate, with half a dozen French research bodies taking part. It has three components:

- modelling the global ocean (Mercator), aiming to forecast the ocean (currents, temperature and salinity). A 15-day forecast assimilating altimetric and *in situ* data has been published weekly since early 2001. As the model is improved, forecasting has become increasingly accurate;
- satellite altimetry, with the launching of Jason: sea level measurements accurate to a centimetre are taken routinely. This Franco-American programme is led by the CNES;
- routine *in situ* ocean measurements (Coriolis): this multi-organisation project coordinated by Ifremer collects, validates and makes available real time ocean temperature and salinity profiles. The main user is the Mercator model, which assimilates the data supplied each week by Coriolis. The project will have launched 320 profiling floaters by the end of 2004 in the framework of the global Argó ocean observation programme, which plans to have 3,000 instruments at sea by 2006. In addition, Coriolis recovers routine measurements from French oceanographic vessels in real time.

This offshore ocean forecasting programme is the forerunner to future operational activity. This will interest economic sectors of activities which are sensitive to marine climate conditions: tourism, farming, fisheries, energy, transport and insurance.

Operational surveys focus more specifically on:

- supplying fisheries data: in order to assess fish stocks in European waters in

the Atlantic, North Sea and Mediterranean. The surveys may also take place in non-European waters, through cooperation;

- pursuing Coriolis;
- taking inventory of economic zones: through collection of geological, fisheries and bathymetric data;
- commercial operations: underwater cable route surveys;
- the environment: monitoring the development of certain invasive species like *Caulerpa* and toxic plankton algae;
- observation of the consequences of some ways that the sea is exploited, such as nodule mining, burying waste and extracting marine aggregates;
- working on wrecks, testing fisheries gear and other equipment.

Vessel activity receives funding from the European commission. The *Thalassa*,

the new operational ocean research vessel delivered to Ifremer in June 1996, was co-funded by the IEO Spanish oceanography institute.

The SHOM is also involved in operational oceanography, and is an active partner in Coriolis and Mercator. It is responsible nationwide for collecting, validating and disseminating nautical information to civilian navigators, military and professional seafarers and boaters. It distributes more specific data on the marine environment to the naval forces and staff.

Operational oceanography's realm also covers data supplied by satellites such as meteorological data from the Metop programme and those from oceanographic satellites like Jason and Envisat.

# Summary

## The marine economy in 2001

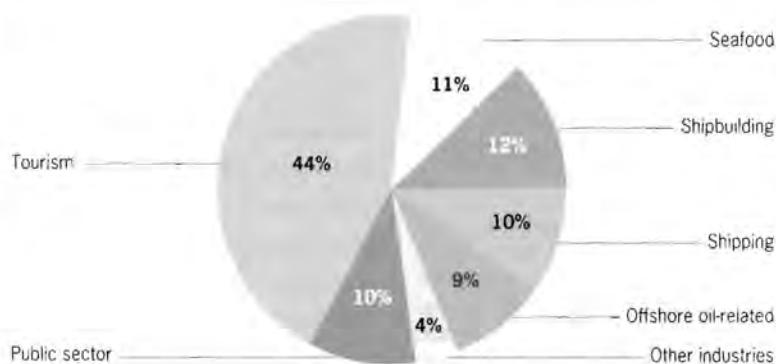
**18.5 billion euros in value added and 442,000 jobs, account for the marine economy's impact in 2001.**

In this report we have only assessed the production sectors which are specifically related to the sea and omitted all their induced activities. The introductory chapter illustrates the importance of industrial activities linked indirectly to merchant harbours. So a "maritime GDP" could be evaluated on the basis of an extended perimeter and go well beyond what has been strictly recorded and taken into account here.

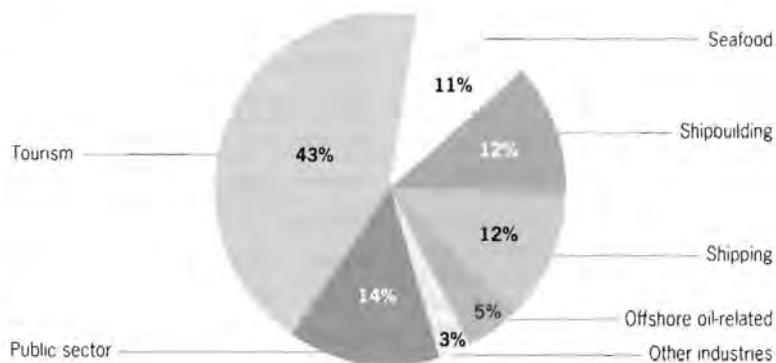
In 2001, the marine-related economy remained marked by the predominance of coastal tourism, as highlighted in our previous reports. However, although this lead has continued to be substantial, it has levelled off slightly to the advantage of other industrial activities.

In terms of the industrial sector's production, the offshore oil-related industry particularly increased its share in the marine economy, since it is practically equivalent to the three groups of activities which, though lagging behind tourism, provide overall balance: seafood products, ship building and repair, and shipping. Each of these four groups represents about 10% of the industrial value added. But what holds true for value added is not the case for employment. Indeed, showing the effect of high productivity rates, employment in the offshore sector, with a labour force of 24,000, is lower than in the other three large groups (on the order of 50,000 jobs in each) and than in the pub-

Maritime value added in 2001: 18.5 billion euros



Maritime employment in 2001: 442,000 jobs



lic sector. The latter remained significant in 2001 (14% of total jobs) although down from the results in the previous publication of this report (17% in 1999). This is the effect of the drop in French

Navy personnel and the industrial sector's simultaneous dynamic trend.

## Growth of the marine economy

Value added increased by 10.8% from 1999 to 2001, between the two most recent publications of this document. This is high growth, even with a change in the scope of maritime activities taken into account (especially for naval equipment). However this change does not significantly modify the view of the sector overall. By comparison, the French GDP grew by 8.9% for the same period. Thus the marine economy's growth was higher than that of the national economy. Employment showed growth of 5%. This figure is fairly low, in spite of the fact that manpower in some sectors (naval equipment, electrical power production) were better taken into account. It is an indication that economic growth has been accompanied by significant productivity gains.

This growth is in great part due to the fact that marine activity is highly export-oriented overall. As we have highlighted in our previous publications, several fields of business (offshore, merchant fleet, ship building and boat building, maritime engineering, etc.) are turned to a large extent toward foreign markets, which benefited on the whole from significant international expansion at the end of the past decade.

A brief look at typical industrial sectors in the marine economy highlights the differences between activities.

In terms of value added, several sectors have taken full advantage of the development of both their French and export markets. These include coastal tourism and the merchant fleet, whereas shipbuilding has undergone a drop in new orders for cruise liners. Those sectors specialised in advanced techniques (offshore, boat building, as well as submarine cables), where French firms are well positioned, have scored significant successes. Another important factor in the good results for marine activities is the price effect. This is especially true for the food processing sector: maritime fisheries production volume in 2001 was comparable to that of 1999, but the average price of landed products increased by 12%, explaining the better yield in value.

These contrasts are even more striking as concerns employment. In some expanding sectors, jobs have risen at the same rate as production (offshore, boat

## Marine activities in 2001

Units: million euros, number of staff

	Turnover	Value added	Manpower
<b>Industrial sector</b>		<b>16 702</b>	<b>379 333</b>
<b>Coastal tourism</b>	<b>19 287</b>	<b>8 101</b>	<b>190 688</b>
<b>Seafood products</b>		<b>2 094</b>	<b>47 846</b>
Maritime fisheries	1 069	727	15 520
Mariculture	528	370	10 910
Seaweed harvesting and processing	253	186	2 280
Fish auctions	60	51	836
Fish trade	1 900	260	5 000
Seafood processing	2 780	500	13 300
<b>Shipbuilding</b>		<b>2 178</b>	<b>54 235</b>
Merchant vessels	1 485	298	6 260
Naval vessels	1 187	699	14 002
Naval equipment	2 700	800	25 000
Ship repair	186	67	1 822
Boat building	978	314	7 151
<b>Shipping</b>		<b>1 856</b>	<b>51 147</b>
Merchant fleet	5 053	681	12 632
Marine insurance	1 104	55	1 227
Port authorities <sup>(1)</sup>	698	518	8 249
Stevedoring	5 141	352	4 791
Other harbour professions <sup>(2)</sup>		250	24 248
<b>Extracting marine aggregates <sup>(3)</sup></b>	<b>25</b>	<b>10</b>	<b>300</b>
<b>Electric power generation</b>	<b>na</b>	<b>na</b>	<b>6 800</b>
<b>Maritime civil engineering</b>	<b>935</b>	<b>421</b>	<b>1 061</b>
<b>Oceanographic instrumentation <sup>(4)</sup></b>		<b>30</b>	<b>nd</b>
<b>Undersea cables</b>		<b>223</b>	<b>1 916</b>
<b>Marine publications <sup>(4)</sup></b>		<b>35</b>	<b>440</b>
<b>Offshore oil-related industry</b>	<b>5 200</b>	<b>1 691</b>	<b>24 000</b>
<b>Banking</b>	<b>92</b>	<b>63</b>	<b>900</b>
<b>Non-commercial public sector</b>		<b>1 817</b>	<b>62 767</b>
<b>French navy</b>		<b>1 521</b>	<b>55 293</b>
<b>State services <sup>(5)</sup></b>		<b>130</b>	<b>4 600</b>
<b>Civilian marine research</b>		<b>166</b>	<b>2 874</b>
<b>General total</b>		<b>18 519</b>	<b>442 100</b>

(1) PA in PIN harbours, port authorities and CEMMMS

(2) value added for pilotage, towing and boating

(3) perimeter limited to aggregate extraction

(4) bremer estimations

(5) bremer estimations based on METI data

na: not available.

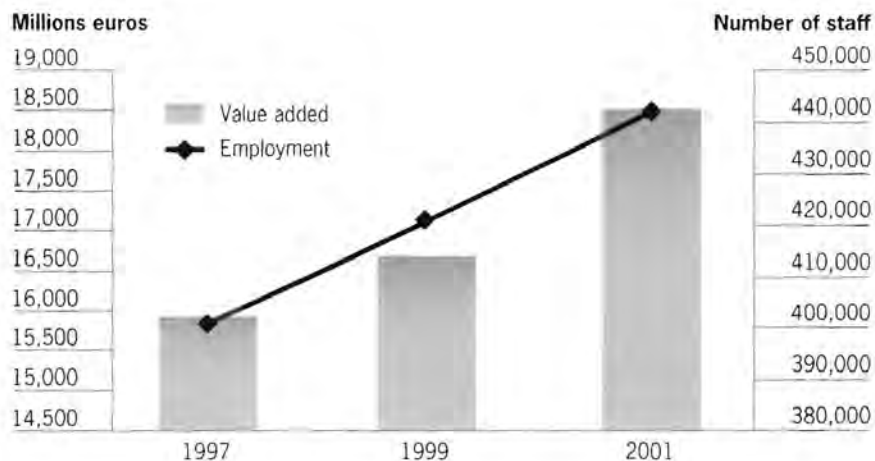
building, merchant fleet). In other sectors, the need for productivity gains has prevailed (as is the case for shipbuilding). In maritime fisheries, where the quantities landed hardly vary, employment has not risen.

Although employment is stagnating in some fields of the marine economy, no significant drop in manpower has been seen, contrary to the adjustments by sectors observed over the previous decade. This is a sign that the phase of

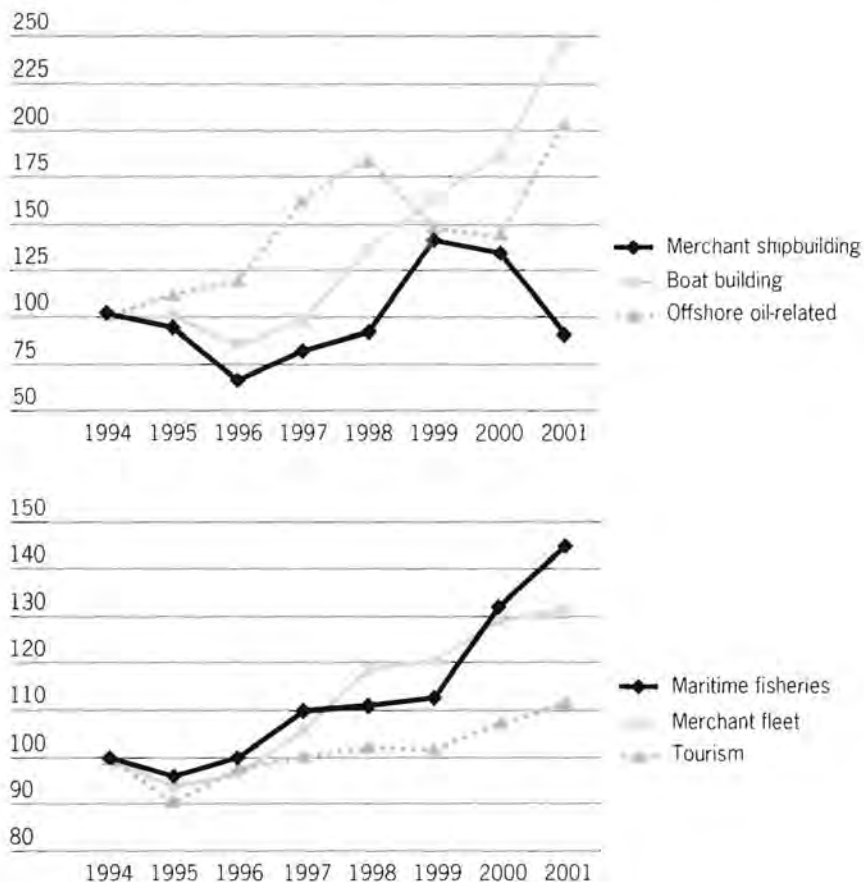
economic expansion has had effects which, while certainly contrasting, have been relatively well distributed.

### Maritime value added and employment from 1997 to 2001

Units: million euros, number of staff

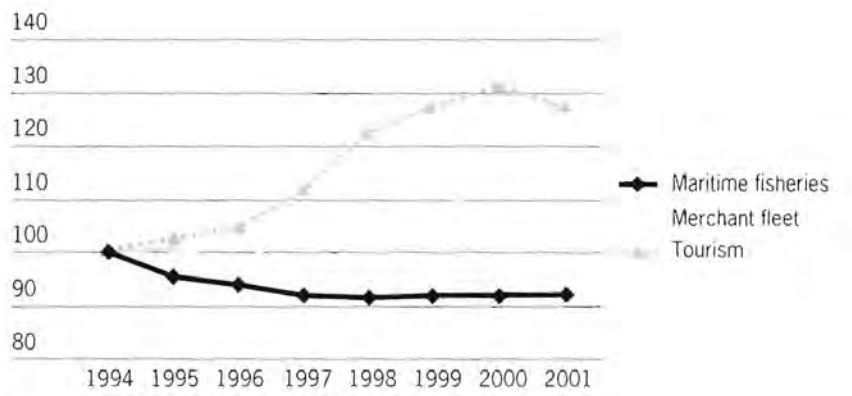
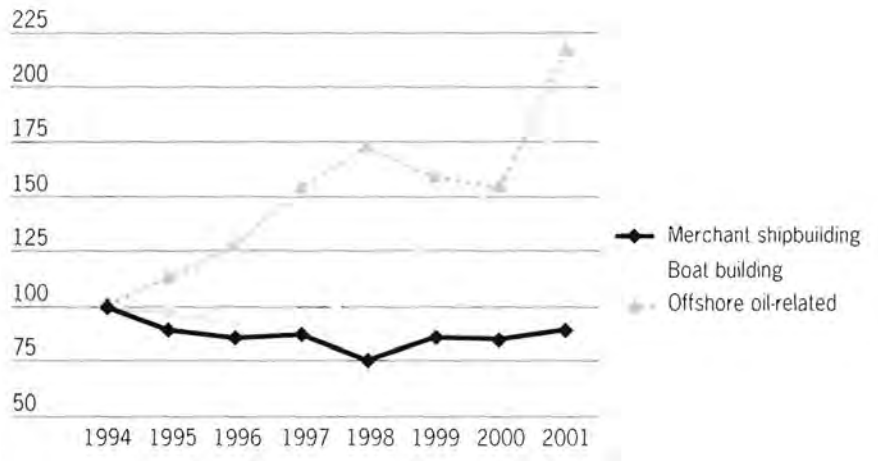


### Annual growth index for a few sectors





Trends  
in employment (index)



# Bibliography

- AFIT, DTMPL, FFPP, FIN.** *Etude stratégique sur l'adaptation des capacités d'accueil et la gestion des places dans les ports de plaisance maritimes en France métropolitaine.* Rapport du bureau d'études Act-Ouest, AFIT, Paris, septembre 2003.
- Armateurs de France.** *Cahier statistique maritime, années diverses.*
- Armateurs de France.** *Rapport annuel, années diverses.*
- Assemblée nationale.** Rapport au nom de la commission des Finances, de l'Économie générale et du Plan sur le projet de loi de finances pour 2003, n° 230, annexe 40 : « Défense », 9 octobre 2002.
- Assemblée nationale.** Rapport au nom de la commission des Finances, de l'Économie générale et du Plan sur le projet de loi de finances pour 2004, n° 1110, annexe 40 : « Défense », 9 octobre 2003.
- Assemblée nationale.** *Avis présenté au nom de la commission de la Défense nationale et des forces armées sur le projet de loi de finances pour 2004, n° 1114, tome V, « Défense Marine », 9 octobre 2003.*
- Assemblée nationale.** Rapport au nom de la Commission des Finances, de l'Économie générale et du Plan sur le projet de loi de finances pour 2004, n° 1110, annexe 13 : « Écologie et Développement durable », 9 octobre 2003.
- Association of European Shipbuilders and Shiprepairers (AWES).** *Rapport annuel, années diverses.*
- Balance Technology Consulting.** *Competitiveness and Benchmarking in the Field of Marine Equipment,* mars 2000.
- Barry-Rogliano-Salles.** *Transport maritime et construction navale.* BRS, Paris, années diverses.
- Canmac Economics, School for Resource and Environmental Studies, Enterprise Management Consultants, secrétariat du Comité consultatif Atlantique pour la gestion de l'information sur les zones côtières.** *La valeur du secteur océanique pour l'économie de l'Île-du-Prince-Édouard.* Préparé pour le gouvernement de l'Île-du-Prince-Édouard et le gouvernement du Canada, 2002, 115 p.
- Commission européenne.** *Directive 2000/60/CE du Parlement européen et du Conseil, du 23 octobre 2000, établissant un cadre pour une politique communautaire dans le domaine de l'eau.* JOUE L 327, 22 décembre 2000.
- Commission européenne.** *Livre vert sur l'avenir de la politique commune de la pêche.* COM (2001) 135 final. CCE, Bruxelles, 20 mars 2001.
- Commission européenne.** *Livre blanc : « La Politique européenne des transports à l'horizon 2010 : l'heure des choix ».* Communautés européennes, Bruxelles, 2001.
- Commission européenne.** *Rapports de la Commission au Conseil sur la situation de la construction navale dans le monde.* Bruxelles : COM(2001) 219 final du 02.05.2001, COM(2002) 622 final du 13 novembre 2002, COM(2003) 232 final du 6 mai 2003.
- Commission européenne.** Règlement (CE) 1726/2003 du Parlement européen et du Conseil du 22 juillet 2003 modifiant le règlement (CE) 417/2002 relatif à l'introduction accélérée des prescriptions en matière de double coque ou de normes de conception équivalentes pour les pétroliers à simple coque.
- Commission européenne.** Règlement (CE) 1382/2003 du Parlement européen et du Conseil du 22 juillet 2003 concernant l'octroi d'un concours financier communautaire visant à améliorer les performances environnementales du système de transport de marchandises (« programme Marco Polo »). JOUE L 196, 2 août 2003.
- Commission des Nations unies pour le commerce et le développement.** *Review of maritime transport 2000.* Cnuced, New York, Genève, 2002, 145 p.
- Conservatoire de l'espace littoral et des rivages lacustres.** *Rapports annuels, années diverses.*
- Conservatoire de l'espace littoral et des rivages lacustres.** *Politique et coûts de gestion des sites du Conservatoire du littoral. Les Cahiers du Conservatoire, n° 9,* Paris, 1995.
- Corrail, faculté des sciences économiques et de gestion.** *Réactualisation des études de 1991, 1993 et 1995. Port autonome de Nantes-Saint-Nazaire, Nantes, juin 1997,* 63 p.
- Dehez J.** *Analyse économique des coûts de gestion des zones côtières protégées. Le cas des forêts domaniales de Gironde. Thèse de doctorat de sciences économiques, université de Bordeaux 4,* 2003.
- Department of Fisheries and Oceans, Ocean Policy Division ed.** *Canada's Ocean Industries: Contribution to the Economy 1988-1998,* prepared by Roger A. Stacey Consultants Ltd, Ottawa: DFO, March 2001, 83 p.
- Fédération des industries nautiques.** *Les chiffres-clefs du nautisme, année 2002.* FIN, Paris, 2003.

- Fédération française des sociétés d'assurance, Direction des assurances transports.** *Chiffre d'affaires et résultats du marché français des assurances transports.* FFSA, Paris, éditions 2002, 2003.
- FNTP.** *Recueil de statistiques.* Années diverses.
- Gachelin C. (éd.), Dubreuil C., Lepenne N., van Meyel T.** *La valeur ajoutée brute des activités liées au port de Dunkerque en 1993.* Dunkerque : Port autonome de Dunkerque, 1995, 79 p.
- Gaubert P. (éd.), Lesur V., Haspesslagh P., Hadot B.** *Étude sur la valeur ajoutée brute des activités liées au port de Dunkerque.* Université du Littoral-Côte d'Opale, port autonome de Dunkerque, Ifremer, décembre 2003.
- IFEN.** *Erika : éléments d'évaluation des dommages.* Les Données de l'environnement, n° 68, juillet-août 2001.
- IFEN.** *Rapport à la Commission des comptes et de l'économie de l'environnement. Données économiques de l'environnement.* IFEN, B. Poupat (éd.), Orléans, 2003.
- Ifremer.** *Données économiques maritimes françaises.* Ifremer (éd.), Brest, années diverses.
- Insee.** *Les transports en 2002.* 40<sup>e</sup> rapport de la Commission des comptes des transports de la Nation. Insee, Paris, 2003, 250 p.
- Institut français de la mer.** *Le Cluster maritime français. Poids économique et social de la France maritime.* Paris : IFM, janvier 2004, 22 p.
- Institut français du pétrole (IFP).** *L'industrie parapétrolière française, résultats d'enquêtes annuelles.* IFP, Paris, années diverses.
- Institut océanographique, Centre de la mer et des eaux.** *Guide des formations : mer, eau, environnement.* Institut océanographique, Paris, 2001.
- Institut supérieur d'économie maritime.** *La mesure de la valeur ajoutée liée aux activités portuaires.* Synthèse n° 3, Isemar, Nantes, décembre 1987.
- Institut supérieur d'économie maritime.** *Les outils statistiques : réflexions méthodologiques sur les études portuaires.* Synthèse n° 14, Isemar, Nantes, février 1999.
- Lebahy Y., Cariou P. et al.** *Étude d'impact socio-économique des ports du nord-ouest atlantique.* Lorient, Nantes, université de Bretagne Sud, université de Nantes, novembre 2003.
- Ministère de l'Agriculture, de l'Alimentation, de la Pêche et des Affaires rurales.** *Les concours publics aux pêches maritimes et aux cultures marines en 2002.* Projet de loi de finances pour 2004. Maapar, Paris, octobre 2003.
- MATE.** *Projet de loi de finances : Agences de l'eau,* Imprimerie nationale, Paris, années diverses.
- MATE.** *Projet de loi de finances : Environnement.* Imprimerie nationale, Paris, années diverses.
- METL/DAEI/SES.** *Mémento de statistiques des transports.* DAEI, Paris, années diverses.
- Montane J., Eliez A., Hamon J.-Y., Tetu A., Collet M. (2000).** *La situation des ports de pêche.* Rapport au ministère de l'Agriculture et de la Pêche et au ministère de l'Équipement, des Transports et du Logement, affaire n° 1999-0130-01, Paris.
- Ocean Shipping Consultants Limited.** *The World Shiprepair Market to 2015.* Janvier 2002.
- Paskoff R.** *Les littoraux. Impacts des aménagements sur leur évolution.* Armand Colin, Paris, 1998.
- Pugh D., Skinner L.** *A New Analysis of Marine-Related Activities in the UK Economy with Supporting Science and Technology.* Inter-Agency Committee on Marine Science and Technology, Information Document n° 10., Southampton: August 2002, 48 p.
- Technopole maritime du Québec éd.** *Estimation de la valeur économique des industries associées au domaine maritime au Québec.* Préparé par J.-C. Michaud, Y. Dion, N. Diop, J. Laflamme (université du Québec à Rimouski), Québec : TMQ, avril 2002, 92 p.

# Acronyms and abbreviations

AFIT	Association française de l'ingénierie touristique	ENIM	Social security regime for French seafarers
AFIT	French agency for tourist engineering	ENMM	French merchant navy school
Afssa	French agency for food sanitary safety	ENS	École normale supérieure (establishment training teachers and researchers)
Agema	Agency managing training centres for fisheries and aquaculture	EPA	State-funded administrative establishment
AWES	Association of European Shipbuilders and Shiprepairers (Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Poland, Portugal, Spain, United Kingdom)	EPIC	State-funded industrial and commercial establishment
Bresm	SHOM-Météo France research and study office	EPLE	State-funded local teaching establishment
BRGM	Geological and mining survey office	Epshom	main French navy hydrographic and oceanographic department
Cedre	Centre of documentation, research and experimentation on accidental water pollution	ESA	European Space Agency
CEVA	Seaweed processing technology research centre	FAO	Food and Agriculture Organization of the United Nations
Cirad	Centre for international co-operation in agricultural research for development	FEAP	Federation of European Aquaculture Producers
CMO	Navy oceanographic centre	FEEE	Foundation for environmental education in Europe
JCOMM	Joint WMP/IOC Technical Commission for Oceanography	FFPP	Federation of French marinas
CNEM	National commission for maritime employment	FIN	Federation of nautical industries
CNES	National Space research Centre	Fnotsi	French federation of tourist offices and information centres
Cneva	National veterinary and animal research centre	FNTF	French federation of public works
CNRS	National Centre for scientific research	Genavir	Ifremer's subsidiary for the management of research vessels
Cofrena	French marine equipment manufacturers association	grt	gross registered tonnage (see gt)
Corine	European programme: coordination of information on the environment	gt	gross tonnage is the sum of the hull volume and that of superstructures. Net tonnage is obtained by deducting the propelling and machinery space, spaces used for navigation and accommodation of the officers and crew
Cosma	Coastal rescue centre in the West Indies	hub	Port platform for consolidating and bulk breaking cargo (generally containerised)
Cosru	Coastal rescue centre of Reunion island	IACMST	Inter-Agency Committee on Marine Science and Technology (Royaume-Uni)
CQEL	Coastal water quality unit	ledom	French overseas department issue institute
CSCN	Shipbuilders trade association	IEO	Instituto Español de Oceanografía
Datar	Delegation for national and regional planning and development	IFEN	French institute for the environment
DCN	Naval shipbuilding directorate	IFP	French petroleum institute
Ddass	County-level division of the ministry of health and social affairs	Ifremer	French research institute for exploitation of the sea
DEMF	French marine economic data	INRA	National agronomic research institute
DOM	French overseas département (= county)	Insee	National institute for statistics and economic studies
EDF	French electricity board	INSU	National institute for sciences of the universe
EMA	Vocational training school for seafaring and aquaculture	IPEV	Institut Paul-Emile Victor (ex-French polar research and technology institute)

IRD	French research institute for cooperative development	Repom	National surveillance network for maritime harbours
ISL	Institut für Seeverkehrswirtschaft und Logistik (Bremen, Allemagne)	RNDE	National water data network
IUMI	International Union of Marine Insurance	RNO	National marine environmental quality monitoring network
LPM	Military programming act	RSP	Posidonia monitoring network
Mapaar	Ministry of Agriculture, Fisheries, Food and Rural affairs	Sandre	National administration service for water data and references
Marel	Automated measurement for the coastal environment	SCCMM	Mutual maritime loan company
MFS	Mediterranean Forecasting System	SCOP	Workers' cooperative production society
MWe	Net power, expressed in megawatts, generated by an electric power plant	Sdage	Water management and planning master plan
NAF	French activities nomenclature	SDT	Monitoring of tourist movement
OECD	Organisation for economic cooperation and development	SFAM	French marine aquaculture society
Qfimer	Inter-professional office for seafood and aquaculture products	Shom	French navy hydrographic and oceanographic service
ONF	National forestry office	SIUPM	Emergency response system for marine pollution
ONT	National tourism observatory	SNSM	Coastal zone rescue society
OSU	Observatory for sciences of the universe	Somlit	Coastal environment observation service
PA	Autonomous port	STCW	Standards of Training, Certification and Watchkeeping (convention internationale sur le niveau de formation des marins)
Panamax	Type of vessel defined by carrying capacity which limited to the Panama canal's size	TAAF	French southern and antarctic lands
PIN	Port of national interest	TOM	French overseas territory
quiral	Former tax deduction scheme for investment in shipownership	TTC	inclusive of tax
post-panamax	Vessel larger than a panamax (see Panamax)	EJ	European union
R&D	Research and development	VA	Value added
Remora	Network for aquaculture mollusc resources	ZICO	zone of community importance for birds
REMI	Microbiological inspection network	Znieff	Nature reserves of ecological interest for fauna and flora
Repamo	Mollusc pathology network		
Rephy	Phytoplankton and phycotoxin monitoring network		



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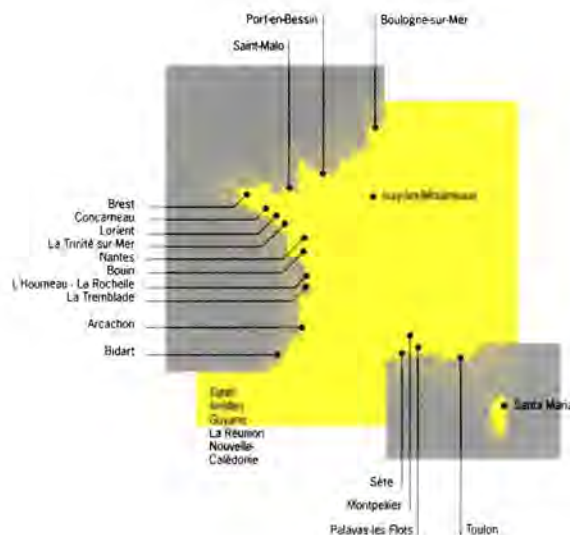
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## French marine-related economic data, 2003

The document, fifth edition of a collection which has started in 1997, presents a survey of marine-related activities in France. The commercial sector includes exploitation and extraction of marine resources, manufacturing industry, private services. In this new edition, a special effort is devoted to the analysis of maritime ports related industries. The non-commercial sector includes public services, among which the Navy, state services, education, safety, marine and coastal environment protection, marine sciences. Each activity of the commercial sector is described by key figures (turnover, value added, employment). The non-commercial sector includes data on running costs, in particular personnel costs. In addition to indicators, qualitative information is provided on the recent developments and future prospects of industries.

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