

French marine-related economic data

edited by Régis Kalaydjian
Ifremer, Marine Economics Service

2001

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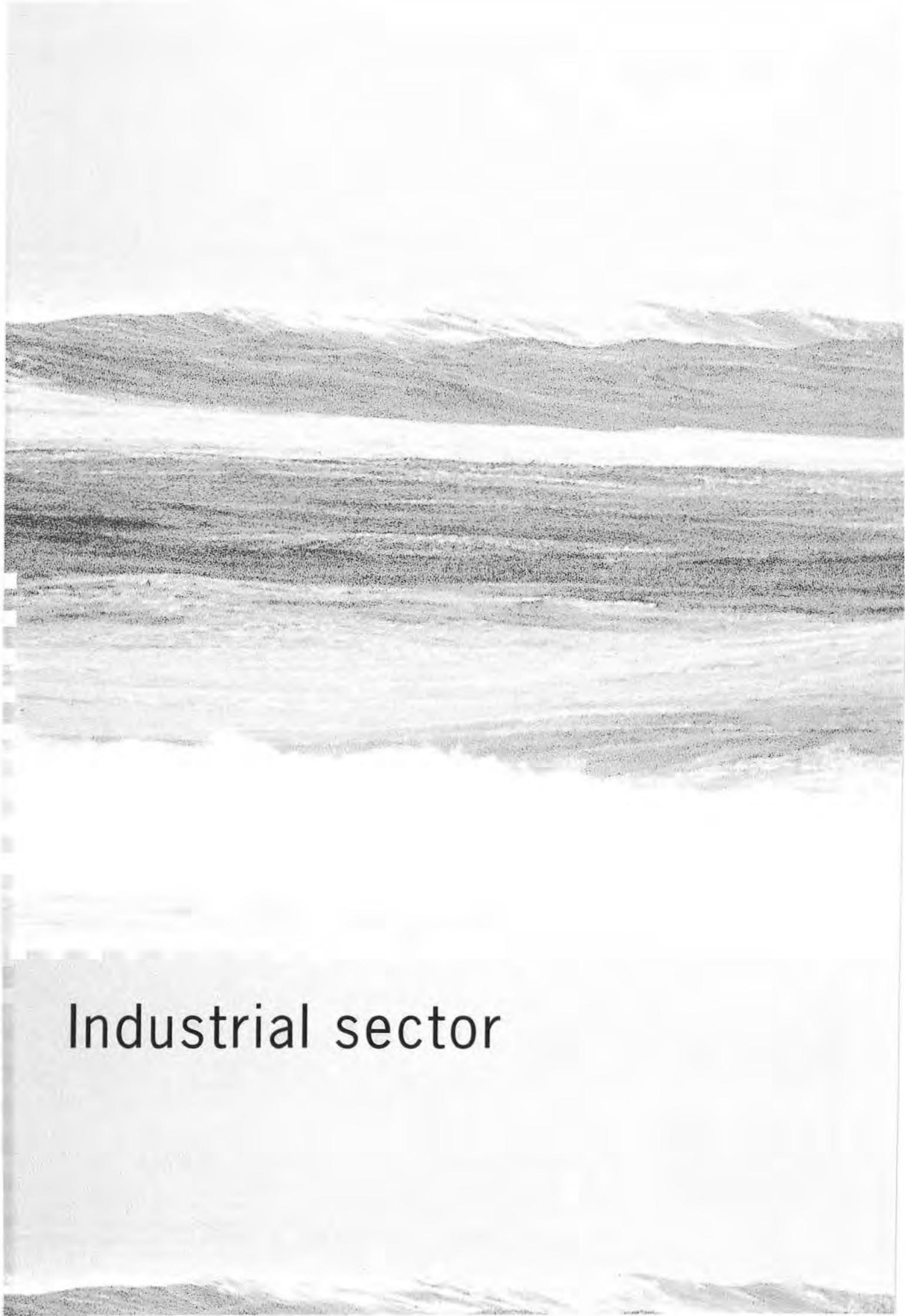
Marine economic data 2001

edited by Régis Kalaydjian
Marine Economics Service

Authors:

F. Daurès, S. Girard, O. Guyader, R. Kalaydjian, S. Kerautret, J. Le Roux, J. Pérez, O. Thébaud.

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Industrial sector

European maritime economy

The European Commission ordered the following study on maritime economy:

© Policy Research Corporation N.V. & ISL. - "Economic Impact of Maritime Industries in Europe".

Although the study was published in 2001, it covers only the year 1997. Nevertheless, its results prove extremely interesting for comparison.

The countries taken into account were those of the European Union, plus Norway. The scope of the maritime economic perimeter defined in that study is not the same as that selected for this book:

- Maritime shipping (freight and passengers),
- ship building, including repair and conversion, military vessels, scrapping;
- offshore supply; seismic research, platform construction and conversion, drilling, offshore-related transport, engineering, consultancy;
- inland shipping;
- maritime works: submarine cables and pipelines, dredging and other operations;
- maritime harbours and related services,
- fisheries, aquaculture;
- recreation: vessel construction and repair, recreational boating services (trade, training, marinas, etc.);

- maritime services: research, education, classification societies, inspections, safety, marine insurance, brokerage, administrations;
- maritime equipment manufacturing and trade.

It should be noted that coastal tourist services, as we have taken them, in the broad sense of the term, do not appear there. Nor do other marine-related activities, such as seafood processing. In contrast, the scope of the study includes inland shipping, which is excluded from our definition: this activity is closely linked to maritime shipping in Northern Europe.

The study records turnover, direct and indirect value added of the maritime economy thus defined. It also assesses employment.

The overall estimates are: European maritime economy generated a gross value added of 70,105 million euros in 1997, i.e., 1% of the overall total GDP in the EU and Norway, and 1,545,000 jobs.

According to estimates, the maritime economy makes up only a small part of Europe's GDP. The six largest "maritime economies" in Europe are, in order of importance: the United Kingdom, Germany, Italy, Norway, The Netherlands, France. If inland shipping was excluded, France would rank fifth.

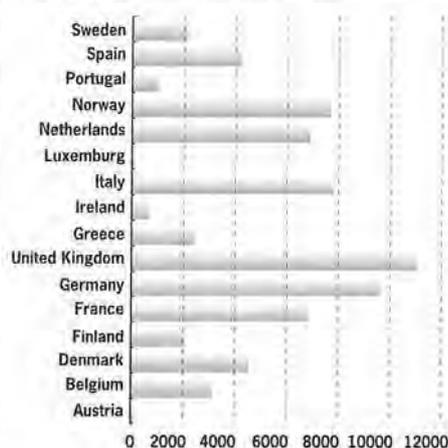
European countries show considerable diversity in the importance of maritime industries in their overall economies. The share is very large in Norway (5.6%), Denmark, The Netherlands and Greece. It is lower in France.

The industrial make-up of the maritime economy varies greatly from one country to another, although structures in Northern Europe do have points in common. In Norway, shipping, offshore

and maritime equipment and facilities are tremendously important; in the United Kingdom, shipping and offshore industry predominate; in Germany, equipment and facilities, shipbuilding and navigation count most; in The Netherlands, harbours provide the most significant activity by far.

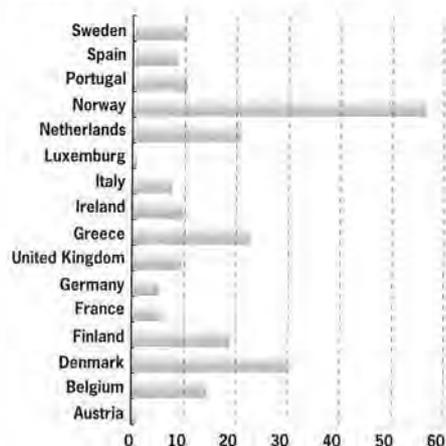
Direct value added of the European maritime economy in 1997 - Unit: Million euros

Source: © Policy Research Corporation NV & ISL



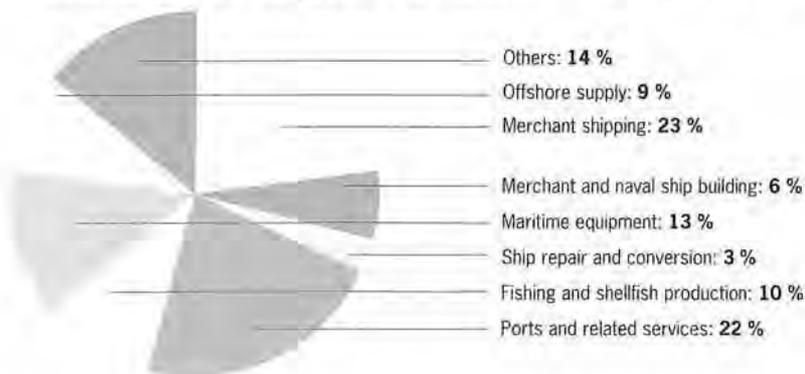
Share of maritime economy in national GDP - Unit: %

Source: © Policy Research Corporation NV & ISL



Distribution of the European value added

Source: © Policy Research Corporation NV & ISL



Introduction

"Marine Economic Data 2001" pursues the objective of the first three issues in the series, to provide an assessment of the French marine economy through an analysis of the fields of activity composing it.

However, this objective immediately raises a fundamental issue. Just what are the components of the marine economy? Ideally, these would include all companies or parts of enterprises whose activity is linked to the sea. Constant discussion could be devoted to the pertinence of the analytical field, where the criterion of "marine-related" could be interpreted by an economist in several different ways. Other authors have chosen different definitions than our, and the introductory chapter which follows gives an example of this through a European Commission publication.

Of course, the definition of the perimeter often boils down to practical considerations based on the data available. Yet, the specificity of this *lfremer* publication, compared to all similar studies disseminated over Europe, is that our study is periodical. To the best of our knowledge, the analyses available abroad are isolated studies. The long-term action we lead should eventually enable us to overcome some difficulties in collecting data, and the new publication rate (now biennial) should contribute to this, providing studies alternating with sector-based analyses.

One of the significant remaining problems - which will require additional studies - is that of company diversification. Many firms have only a fraction of their activity in the maritime or marine realm. In many cases (e.g. oceanographic instrumentation, marine engineering, some equipment manufacturing industries), this sort of fraction is not specifically monitored and does not appear in the statistics, especially if it is limited or if the company does not consider the "marine-related" criterion to be a pertinent one for its strategy. For cases of this type - and there are many of them, even in some harbour-based activities - a method should be developed to assess value added.

No major change from past options is introduced in the 2001 edition. It upholds the scope of the maritime economy adopted in previous editions and strives to improve the quality of the assessment.

The scope is clear from the document's table of contents. It divides the activity into an industrial sector (made up of private companies working on competitive markets) and a public sector (French Navy, administrations, marine research). The industrial sector is itself conventionally divided into primary, manufacturing and service sectors.

The quality of the assessment has been enhanced, especially for the sea products sector, where on the one hand, European fisheries statistics tend to be more regular and easier to use, and on the other hand, we have been able to use data from the processing industry, more accurate in covering this activity. That is why the processing industry has taken on greater significance in terms of turnover, compared to previous assessments. We have also tried to improve part of the statistics on harbours and shipping, moving towards a harmonisation of sources.

As for results from analysis of the recent economic situation, the following pages contain some outstanding facts on the maritime economy. Under the impact of the period of growth in the late 1990s, sharp acceleration was recorded in several branches of activity: French shipyards received major orders for large cruise vessels; shipbuilding also enjoyed unprecedented market growth; the offshore oil-related industry continued its impressive expansion, albeit with a economic turnaround in 1999. The undersea cable laying sector also enjoyed an exceptionally favourable situation, a reversal is expected for 2002. Conversely, naval shipbuilding continues to adjust downwards, given the falling pace of State orders for this type of facilities.

Overall, in the past three years, the maritime economy will have maintained its structure (the large groups of activities composing it have kept their relative sizes) and will have experienced growth, in terms of value added rather than employment.

Foreword

Ifremer presents the fourth edition of "French marine economic data". It will now be published every two years. This regular interval will not prevent us from investigating recent trends in each sector of activity. Furthermore, from year to year, the authors will be able to alternate writing the document with making a sector-based study, either by themselves or in partnership with interested bodies. Each sector-based study will aim to enrich the content of the following edition. This pace of work should provide regular progress in terms of correct coverage and accurate analysis, since these two points are indeed the fundamental difficulties in this exercise.

Much discussion is given to how the marine economy should be covered. If dealing with ports, should their logistics base also be dealt with? Should various industrial establishments enjoying nearby harbour facilities be included? If we account for purely "marine" activities, should the activities they stimulate indirectly, involving suppliers, customers or users, also be examined? The scope of the marine economy will always be subject to debatable conventions. This proves that the activities in question are, very fortunately, not isolated from the rest of the national economy but interlinked within an entire range of industries and services. In this respect, the word "marine" as used in the title means "related to the sea or the coast" and is neither systematically aimed at offshore activities alone nor specifically related to shipping. Many branches of activity taken into account are located on land, sometimes far from the sea, since coastal areas are closely linked with the rest of the territory.

However, analytical accuracy will always depend on access to data, which is not something simple. The "marine" aspect is rarely used as a discriminating criterion in public and private statistics, excepting special cases like the merchant navy or fisheries. This difficulty, which we are striving to gradually overcome, is common in all the countries which have undertaken studies similar to this one. It influences our definition of the marine economy.

In spite of these issues, we have endeavoured to highlight the specificities of the French marine economy. It covers many major exporting activities (which took advantage of the period of growth up to 2000), manufacturing industries and developed financial and offshore services, where cutting edge techniques exist side by side with traditional activities of the more slowly evolving primary, industrial or service sectors. In spite of the marine economy's modest contribution to France's GDP, its vast diversity and high sensitivity to the international economic situation are striking. Moreover, the marine economy is dependent on a fragile environment sensitive to pollution, to dwindling resources and weather hazards: the risks related to the development of the marine economy (fisheries, offshore services, shipping, natural site management) are numerous and varied. The sinking of the *Erika* and its consequences have provided a vivid reminder of this. Although measuring risks is complicated, one of the objectives of this document is to supply the most accurate and systematic measurement possible of the costs of information and data collection on the coastal and marine environment, as well as the cost of protecting and maintaining coastal areas. To this end, it must be based on economic studies carried out at Ifremer and in other research units.

The 2001 issue is plainly presented, with increasing readability and more graphs and illustrations. Ifremer has produced and edited this document and thus bears full responsibility for any errors which may appear. But Ifremer does not take credit for this production alone: we have received considerable assistance from administrations, public bodies, companies and professional associations. They have my warm thanks and I would like to particularly acknowledge the "direction du Transport maritime, des Ports et du Littoral", the "direction des Affaires maritimes et des Gens de mer", the Enim, the French navy staff, and the "direction du Tourisme" for their vital contributions to important chapters of the book. I strongly hope that this co-operation will continue and grow deeper, both in the interest of the marine economy and in that of the ever-growing public showing interest in our publication.

Jean-François Minster,
Chief executive officer of Ifremer

Public sector

The Navy	53
Public intervention	56
Maritime public spending	
Maritime authority administration	
Signals, surveillance, safety at sea, SAR	
Training and education	
Coastal and marine environmental protection	64
Protecting coastal water quality	
Accidental pollution response and waste management	
Protecting environmental and scenic heritage of the coast	
Marine research	75
Research bodies	
Operational meteorology and oceanology data	
Summary	78
The maritime economy in 1999	
A changing maritime economy	
Bibliographic references	81
Acronyms and abbreviations	83

Contents

Foreword	5
Introduction	6
European maritime economy	7
Industrial sector	
Seafood products	9
Marine fisheries	
Mariculture	
Fish auctions	
Wholesale fish trade	
Foreign trade seafood products	
Exploiting and processing seaweed	
Seafood processing industry	
Public action in favour of seafood product industries	
Marine aggregate extraction	19
Shipbuilding and repair	21
Merchant shipbuilding	
Naval shipbuilding	
Merchant and naval equipment industry	
Ship repair	
Boat building	
Offshore oil and gas-related industry	28
Electricity generation	30
Maritime civil engineering	31
Submarine cables	33
Coastal tourism	34
Employment	
Trends in activity	
Tourist capacity as seen through accommodation	
Tourism in the French overseas departments and territories	
Spotlight on water sports	
Summer coastal tourism: a survey on the regional breakdown of consumption	
The impact of the <i>Erika</i> spill on hotel activity	
Shipping	39
Merchant fleet	
Maritime harbour	
Maritime financial services	50
Maritime insurance	
Banking sector	

Seafood products

The seafood products sector comprises:

- upstream, marine fisheries, aquaculture (fish farming and shellfish farming), seaweed production;
- fish auctions and fishmongers: i.e. services related to marine fisheries;
- further downstream, the seafood processing industry.

Marine fisheries

Definition

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

Assessed at 6.4 billion French francs in 1999 (nearly 975 million euros), French marine fisheries production is distributed over the entire French coast, with the Brittany region dominating (45%), well ahead of the Pays de la Loire

(15%) and the Nord-Pas de Calais (14%) regions. The activity remained stable until 1997, through compensations between fluctuations in amounts landed and in average prices at first sale.

Since the turn of the 1990s, the structure of marine fisheries production has hardly changed. Fresh fisheries lead with nearly 70% of amounts landed and nearly 90% 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 fisheries category, the species most caught in 1999, in tonnage, were sardine, anchovy, whiting and saithe. The most important species for turnover are sole and monkfish (so

Key figures

	1995	1996	1997	1998	1999	1999 (€m)
Production (tonnes)	603,408	584,540	587,083	561,076	599,644	
Turnover (FRF m)	5,422	5,685	6,235	6,288	6,367	971
Value added (FRF m)*	3,145	3,297	3,616	3,647	3,693	563
Manpower**	16,099	15,850	15,501	15,476	15,500	
Fleet***	6,593	6,475	6,255	6,119	5,906	

* Value added/turnover rate estimated to be 58%.

** Full time equivalent, estimation for 1999.

*** Number of fishing vessels.

Sources: Inter-professional national board for sea and fishfarming products (Olimer), ministry of Agriculture and Fisheries, Ifremer.

French marine fisheries production in 1999

	Quantity (tonnes)	Turnover (FRF m)	Turnover (€ m)	Average price (FRF/kg)	Average price (€/kg)
Fresh fish	296,603	4,202	640.5	14.2	2.2
Crustacean	22,654	610	93.0	26.9	4.1
Shellfish	47,946	429	65.3	8.9	1.4
Cephalopods	22,658	343	52.3	15.1	2.3
Seaweed*	15,039	20	3.0	1.3	0.2
Sub-total fresh fisheries	404,900	5,604	854.3	13.8	2.1
Tropical tuna**	131,239	552	84.2	4.2	0.6
Other frozen fish***	63,505	211	32.2	3.3	0.5
Sub-total frozen fish	194,744	763	116.3	3.9	0.6
Total fisheries	599,644	6,367	970.6	10.6	1.6

* Amounts expressed in dry weight.

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

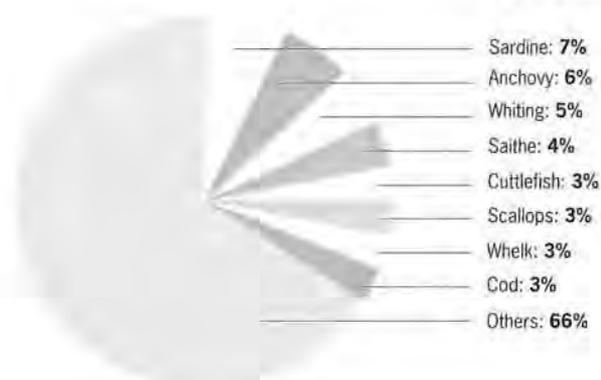
*** Landings of deep-sea fishery catches in the form of frozen filets are measured in the equivalent whole (gutted) landed weight.

Source: Olimer.

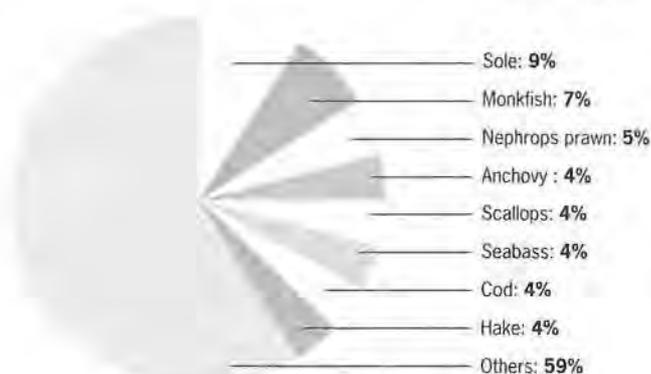
Breakdown of turnover and landings of fresh fisheries by main species in 1999

Source: Ofimer.

Landed volume - 1999



Turnover - 1999



Fisheries and aquaculture overseas territories production in 1999

	Quantity (tonnes)	Value (FRF m)	Valeur (€ m)
Guadeloupe	9,114	na	na
Martinique	6,000	na	na
Reunion	7,997	163	24.8
French Guyana	4,820	178	27.1

na: not available.

Source: Ofimer.

called noble species, averaging high prices) along with nephrops prawn and scallops. In frozen fisheries, tropical tuna is the species caught most.

French production in overseas departments and territories is assessed at 28,000 tonnes.

On the European Union scale, France ranks third and provides 13% of total production in value, estimated at nearly 50 billion French francs (FRF 50bn), Spain (FRF 14bn) and Italy (FRF 10bn) alone total half of European production. Considering the number of people employed in the activity, France shows good performance levels in terms of TO per head (EUR 60,000) compared to the European average (EUR 30,000). It achieves a level similar to Denmark's but far behind the Netherlands (EUR 180,000) and Belgium (EUR 145,000).

Fleet

The French fishing fleet, totalling 5,815 vessels as of 31 December 2000, is mostly made up of boats under 12 meters. However, in terms of vessel engine power, a pertinent indicator of catch capacity on the European scale, the coastal and blue water fleets are equivalent.

The diagnosis of overfishing for a great majority of commercial stock resources led to regulatory and incentive measures being set up within the framework of the European Union's Common Fisheries Policy (CFP). They aim in particular to reduce fishing fleets' catch capacity by setting up "multiannual guidance programmes" (MAGPs); each member State has objectives to reach, generally expressed in total fleet vessel power (kilowatts) and tonnage (grt).

European production of marine fisheries in 1999

	Turnover (€ m)	Landings (tonnes)	Average price (€/kg)	Manpower	Number of vessels
Total European Union	7,598	6,267	2.2	227,500	92,519
including					
Spain	2,059	1,106	1.9	61,100	17,521
Italy	1,550	417	3.7	51,800	19,075
France	971	600	1.6	15,500	5,906
United Kingdom	903	829	1.1	14,700	7,500
Denmark	484	1,575	0.3	4,500	1,468
Netherlands	413	440	0.9	2,300	415
Portugal	319	188	1.7	26,700	10,933
Greece	288	116	2.5	36,700	19,749
Ireland	210	307	0.7	5,500	1,709
Germany	182	226	0.8	2,800	2,261
Sweden	110	329	0.3	2,500	1,977
Belgium	86	26	3.3	700	125
Finland	23	108	0.2	2,700	3,880
Other European countries					
Norway	1,194	2,618	0.5	21,300	13,199
Iceland	771	1,691	0.5	6,200	1,928

Source: Concerted European action Fair PL 97-3541 - Economic Assessment of EU fisheries - Annual Economic Report 2000.

Other measures aim to reduce catches of juvenile fish (for instance, setting minimum mesh sizes for fishing gear and boundaries for protection areas).

Achieving the MAGP objectives has led to lower French fishing fleet capacity since the early 1990s (19% in kW and 14% in grt). This has been largely supported by public aid plans to remove vessels from the fleet.

Employment

The drop in the French fisheries labour force is closely linked to fishing capacity cutbacks. However, this has slowed down since 1996, with the activity's rebound.

Outlook

Consumption

Long term trends indicate regular growth in frozen product consumption to the detriment of fresh products. But in the past few years, this trend has been reversed, with the fresh product share rising.

Production

The CFP, adopted in 1983, will be renegotiated in 2002 and should lead member States to continue reducing their fishing capacity. It will mainly be based on the Community structural policy reform, whose objectives are now under discussion within the member States.

Mariculture

Definition

The mariculture sector, producing food for human consumption, is composed of two sub-sectors:

- shellfish farming (mainly oyster and mussel farming);
- "new" mariculture to produce fish (sea bass, bream, salmonids, turbot) and shrimp or prawns (principally tropical shrimp in New Caledonia).

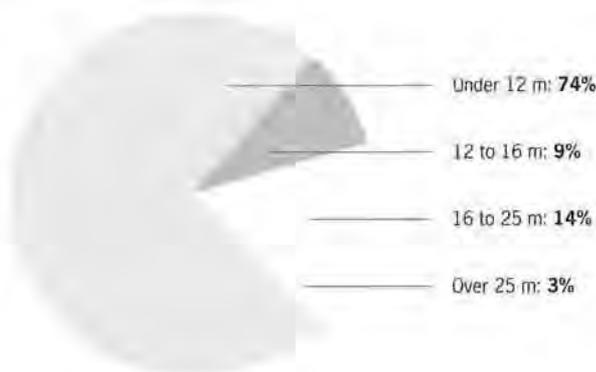
Moreover, there is an oyster-farming activity in French Polynesia to produce pearls.

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 in the rearing cycle. As for the other sector of mariculture, which developed significantly in the nineties, hatcheries ensure all production of juvenile fish or shrimp, which are then raised to commercial size in grow-out units.

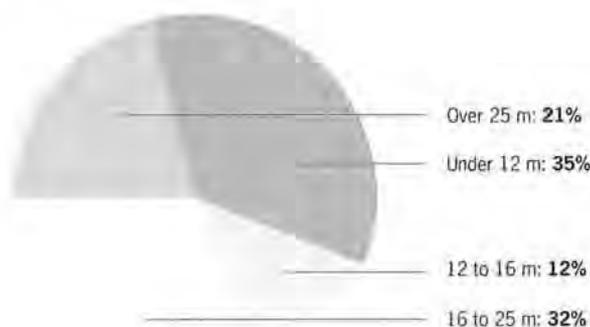
The French fishing fleet as of 31 December 2000

Source: Ministry of Agriculture and Fisheries.

Fishing fleet - Number of vessels as of 31/12/2000



Fishing fleet - Power as of 31/12/2000



French fishing fleet trends

LOA category	Number of vessels		Tonnage (grt)		Power (kW)	
	2000	Trends 1990-2000	2000	Trends 1990-2000	2000	Trends 1990-2000
Under 12 m	4,302	-34%	28,553	+4%	324,166	-20%
12 to 16 m	538	-37%	14,584	-30%	110,626	-30%
16 to 25 m	817	-20%	53,861	-8%	292,644	-13%
Over 25 m	158	-29%	75,409	-19%	192,217	-20%
Total	5,815	-33%	172,407	-14%	919,653	-19%

Source: Ministry of Agriculture and Fisheries.

Trends in activity

Globally speaking, mariculture produced 23 million tonnes in 1999, i.e., 23% of total input of products from the sea, compared to 10% in 1990 (FAO data). In volume, this growth is mainly due to developing shellfish farming and seaweed cultivation. In value, the boom in mariculture was due to increased farming of shellfish, crustaceans (mainly tropical shrimp) and marine finfish, in that order. In shellfish farming, growth in oyster and scallop production was outstanding over the past decade. In fish farming, the decade's milestone has been the development of a salmon-farming industry in Norway, in the United Kingdom and then in Chile, of hitherto unrivalled scope for finfish farming at sea. However, freshwater fish production is giving greater competition; it has a higher growth potential and still supplies the majority of farmed fish on the world market. In 1999, the share of freshwater fish production reached 87% in volume and 66% in value (versus 83% and 61% in 1990).

Global mariculture production value was assessed at FRF 203bn in 1999 (EUR 30.90bn) of which FRF 163bn (EUR 28.84bn) did not include seaweed farming (FAO data). In comparison, European marine farms achieved production of 2 Mt and turnover estimated at FRF 26bn (nearly EUR 3.9bn), respectively accounting for 9% and 13% of the world supply. Contrary to the situation prevailing globally, the boom in finfish farming in Europe during the nineties mainly relied on marine farms, whose 1999 production provided roughly 60% (in volume) of the European farmed fish supply.

France is the leader of EU producer countries, due to the size of its oyster farming sector (approximately 90% of European oyster production). Mussel farming, the second income source for metropolitan French mariculture, was less significant economically on the European scale, where Spain occupies top rank. Lastly, French marine finfish farming, oriented towards rearing sea bass, bream and turbot, is an activity providing nearly 15% (including hatchery activity) of metropolitan marine farm turnover. Between 1995 and 2000, mariculture development rested above all on overseas production, where average annual growth was 14%, while turnover in metropolitan marine farms grew less, at an average rate of 2% per year in current French francs.

Shellfish farming activity is disseminated over the entire French coastline. The main producing regions, Lower Normandy, Brittany and Poitou-Charente have equal weight, and they total between 85% and 90% of national production. Oyster farmers mainly target the national market, oyster consumption being much less developed in other European Union countries. This production, as consumed raw, is highly sensitive to environmental quality. It is proof that the product is natural, but conversely, entails 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 system set up by the public authorities and lifermer to manage shellfish farming. As far as markets are concerned, the need for price control to secure farms' profitability has led the industry to improve marketing in the first sale phase. Over

the past decade, 6 producer organisations (POs) have been created in the purpose of securing a minimum benchmark price, assisting in marketing and labeling and setting up partnership with large-scale distributors.

Fish farms are mainly located along the Atlantic coast (salmonids and turbot) and the Mediterranean coast (sea bass and bream), though one third of French bass and bream production is reared on the coast of the North Sea. Production from hatcheries accounts for nearly 24% of marine finfish turnover and highly export-oriented. In the short term, growth perspectives for marine finfish farming in metropolitan France firstly rely on hatchery activity, especially with plans to increase turbot fry production capacity to meet the demand of Spanish grow-out firms. To produce adult fish, research efforts in diversification are continuing, with a preliminary selection of best candidate species on the basis of biological, environmental and economic criteria. Today, the choice seems to be turning towards cod and pollack for the northwest coast, whereas blue-fin tuna and meagre are the species attracting the most interest in Mediterranean coastal areas. Amongst the species mentioned above, only meagre is being commercially farmed on a small scale and is therefore a developing sector. The other fish are still in the experimental phase, or even in the research project stage (but may have already moved into commercial farming in other European countries).

Key figures Unit: million of French francs

	1995	1996	1997	1998	1999	1999 (€ m)	2000	2000 (€ m)
Turnover metropolitan France	2,267	2,427	2,366	2,495	2,481	378	2,497	381
Turnover Dom-Tom	595	896	911	1,067	1,177	179	1,219	186
Total turnover	2,862	3,323	3,278	3,562	3,658	558	3,716	567
Value added*	2,003	2,326	2,294	2,494	2,561	390	2,601	397

* Value added/turnover rate estimated to be 70%.

Sources: *Ofimer, Ifremer, Agriculture and Fisheries Ministry, SFAM.*

Production volumes in French mariculture Unit: tonne

	1995	1996	1997	1998	1999	2000
Oysters	152,100	151,600	139,700	138,500	139,000	135,500
Mussels	62,000	64,400	61,000	61,500	62,500	68,000
Other shellfish	4,000	4,000	4,600	4,600	3,550	3,557
Prawns in metropolitan France	30	28	24	24	24	28
Marine and amphihaline finfish*	6,220	5,966	5,766	6,468	6,738	6,504
Farmed pearls	3	6	6	6	8	12
Tropical shrimp	902	1,046	1,160	1,154	1,845	1,763

* Including overseas farms.

Sources: *Ofimer, Ifremer, Agriculture and Fisheries Ministry, SFAM.*

Turnover in French mariculture

Units: million of French francs and million of euros

	1995	1996	1997	1998	1999	1999 (M€)	2000	2000 (M€)
Oysters	1,409	1,522	1,452	1,554	1,505	229	1,508	230
Mussels	445	483	498	492	500	76	544	83
Others shellfish	54	65	72	72	77	12	77	12
Prawns in metropolitan France	3	3	2	2	2	0,4	3	0,4
Marine and amphihaln fish*	286	269	259	291	285	43	255	39
Farmed pearls	550	840	850	1,006	1,081	165	1,136	173
Tropical shrimp	45	56	61	61	96	15	83	13
Marine finfish hatcheries	40	60	64	67	85	13	83	13
Shellfish hatcheries	30	25	19	16	27	4	28	4

* Data for bass, bream and turbot taken from the Agriculture and Fisheries Ministry's statistical survey for 1997.

Sources: Olmer, Ilremer, Agriculture and Fisheries Ministry, SFAM.

Employment and companies

Both enterprises and jobs in mariculture mainly come from shellfish farming.

There are about 3,300 active shellfish farms according to the survey taken for the 1999 year by the Agriculture and Fisheries Ministry. They work on 5,000 to 6,000 concessions. These small, often family, firms employed some 8,800 "full time equivalent" workers (in AWU) for permanent or seasonal jobs. 51% of the manpower in shellfish farming is salaried employees.

The census of companies and jobs in the marine finfish farming industry, through the same survey, mentions 61 enterprises in 1999, with a grow-out and/or hatchery activity for sea bass, bream, turbot or marine salmonids. The total labour force in marine finfish farming is over 500 full-time equivalent jobs, most of which are salaried (91%). Firms largely differ by their size.

Outlook

In France, the management of coastal zones and the protection of natural environment are limiting the expansion of mariculture. Owing to this major constraint, the industry's development will depend on optimising rearing practices, research on diversifying techniques and species and genetic improvement. Depending on the type of operating system, different approaches will be adopted. Within marine finfish farming, controlling the feed given to farmed fish in order to limit waste and genetic selection can potentially raise performance in an industry still in its early days, compared to freshwater fish farming. The stakes shellfish farming is facing will make it turn towards other choices, aiming to reduce environmental hazards and overcome problems of space scarcity (by developing deep water farms, and by greater use of

hatchery products). Triploidisation is a means to increase productivity and eliminate the seasonal aspect of oyster sales.

Moreover, the "sustainable development" objectives for the entire sector must take account of consumer behaviour. Consumers have become highly aware through recent food crises and expect to be informed about product quality and traceability. The new European regulations to be applied as of 1 January 2002 on labelling of products for sale (requiring the indication "farmed" or "wild") should help respond to this demand. In return, the new context is going to increase the need for communication from the profession and a stronger commitment in approaches to improve the image and quality of aquaculture products (good practice code, obtaining labels and official quality indicators).

Fish auctions

Definition

Fish auctions are the market place to which fishermen (suppliers), wholesale traders and fishmongers (buyers) participate. They are also the place where producer organisations exercise a control in order for auction prices to stay above "withdrawal" prices.

Trends in activity

The fish auction operating conditions are governed by local regulations and their management is ensured by chambers of commerce and industry (80% of cases), by cooperatives, by local marine fisheries committees or by semi-public companies.

In 2000, there were 44 fish auctions in France. The top five process nearly 43% of landings,

compared to 45% in 1998. Fish auction turnover rose between 1998 and 2000, due to the rise in prices, in spite of lower quantities sold. The turnover of auctions is composed 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 services provided vary from one auction to the next. Ad valorem taxation is an incentive for fishermen to sell outside of the auction (Montane *et al.*, 2000). An increasing number of auction places are passing to a computerized sale system.

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

Fishmongers

Definition

Fishmongers are, along with processing firms and wholesale purchasers, the main middlemen between fishermen and seafood distributors. They carry out technical (batching, processing, packaging, etc.) and commercial tasks, and are a link in the French fisheries chain, whereas this type of intermediary either does not exist in other European countries or exists in other forms, similar to wholesalers or processors. Their status is set out in the 1997 law on marine fisheries and mariculture.

Situation and trends in activity

Since precise economic data is not available for 1999, we estimated a TO of FRF 9bn, a VA of FRF 1bn and 4,000 jobs, on the assumption that 1999 figures are close to those of 1998.

Key figures (fish auctions)

	1994	1995	1996	1997	1998	1999	2000
Sales (tonnes)	279,287	275,965	275,641	283,837	296,264	282,442	285,512
Withdrawals (tonnes)	14,069	12,591	10,042	10,021	7,561	10,274	9,153
Value (FRF m)	3,736	3,691	3,854	4,110	4,340	4,246	4,430
Value (€ m)						647	675
Average price (FRF/kg)	13.38	13.38	13.98	14.48	14.65	15.03	15.52
Average price (€/kg)						2.29	2.37
Fish auction* turnover (FRF m)	318	314	328	349	369	361	377
Fish auction TO (€ m)						55	57
Fish auction** value added (FRF m)	270	267	278	297	314	307	320
Fish auction TO (€ m)						47	49
Number of auctions	42	41	43	42	44	44	44
Employment in full-time equivalent***	785	776	775	798	832	794	802

* Estimated on the basis of 8.5% in fees.

** Value added/turnover rate of 85% (Ifremer estimation).

*** Ifremer estimation, not including dockers.

Source: Ofimer and Ifremer fish auction surveys.

The wholesale fish trade sector has undergone considerable restructuring since the late 1980s and the number of firms fell from 680 in 1989 to 322 in 1997, then to 308 in 1999 (source: Ofimer). Along with this concentration, the average size of firms has grown. Making wholesale fish trade workshops compliant with health standards began in 1992 and was completed in 1996, but measures to support upgrading of workshops are still continuing. This has provided the remaining companies with the opportunity to modernize equipment and improve organisation.

Employment and companies

In 1998, some 4,000 people were employed by fish wholesale trading companies. These are small-sized enterprises, 57% of them employing less than ten staff and 32% have an annual turnover of less than FRF 10m. They are mainly located in coastal ports and Brittany holds 128 of the 308 enterprises.

Foreign trade for seafood products

In 2000, the French trade balance deficit for seafood products amounted to roughly FRF 13.2bn. Four products concentrate half the value of imports: prawns or shrimp, salmon, tuna and unspecified fish filets, 42% in value of French seafood imports come from European Union countries. The United Kingdom, Norway, Spain and Denmark are the top four suppliers.

The first French export item for seafood products is that of tuna sales. Much of this is tropical tuna caught and frozen by French shipowners, landed in foreign ports near the fishing areas to be processed in local canning plants (Ivory Coast, Madagascar, 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.

Fishmongers by turnover category

Turnover category (FRF m)	Number of companies	
	in 1997	in 1999
Less than 5	48	41
[5-10[60	59
[10-20[126	123
[25-50[55	55
50 an over	33	30

Companies by number of staff

Number of staff categories	Number of companies	
	en 1997	en 1999
Less than 10	185	176
[10-50[127	124
50 an over	10	8

Breakdown of fishmonger companies by region

Region	1997	1999
Brittany	132	128
North	49	46
Channel	48	44
Vendée-Charentes	45	43
Mediterranean	25	24
South-West	21	21
Others	2	2
Total	322	308

Source: Ofimer.

Exploiting and processing seaweed

Definition

Seaweeds are marine plants gathered on the shore or harvested at sea. The production is mainly used for extracting gelling agents (colloids), as well as 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 inter-professional regulations. A large part of national supply is provided by mechanised harvest of laminaria beds. This is mainly done in the Finistère county, while the collecting, on foot, of fucus, chondrus and other species is done in scattered sites along the coast. These various productions fluctuated around 75,000 tonnes, for an annual TO of about FRF 20m at

the end of the 1990s. Seaweed farming has remained very marginal in France, with less than 100 t, while on a global scale algoculture and harvesting respectively produce 1.1 and 7.7 Mt (FAO, 1996). French imports come to 10,000 t of dry matter. The industry's value added was assessed to be approximately FRF 10m in the late 1990s and some sixty people were employed in harvesting (source: Ifremer).

Seaweed is processed by companies which are for the most part located in Brittany. Their turnover is estimated to be roughly FRF 700m, 50% of which concerns making products for use in farming and cosmetics. The value added is assessed at roughly FRF 450m (Ifremer estimations based on data from the seaweed technology research centre). With 6,500 tonnes, French colloid production accounts for 8% in volume of the world market, estimated at \$583m in 1997. Consumption of edible seaweed remains low, at 600 tonnes.

Employment and companies

The seaweed sector employs over 1,000 people. The companies operating in different market segments have highly diverse profiles. In fact, colloids are produced by three establishments belonging to international chemical groups, while processing of edible seaweed is done by small size enterprises.

Outlook

On the colloid market, harvesting *laminaria hyperborea* and *digitata* in unexploited areas holds some interesting openings. Uncertainty persists on how edible seaweed consumption will develop. The emergence and growing of micro-algae holds perspectives of producing high value added molecules.

Seafood processing industry

Definition

The seafood processing industry includes companies whose activity consists in manufacturing products for human consumption from fish, crustaceans, molluscs and cephalopods. It can be broken down into five groups of activity: canning, curing (smoked, dried, salted products), deep freezing (precooked dishes and plain foods), "catered" dishes (salads, terrines, precooked dishes, surimi) and fresh, "prepared" products (pre-wrapped fish and raw preparations sold by fishmongers).

The perimeter thus defined does not include:
- food products made exclusively from seaweed;
- the initial processing (filleting, heading) done by fishmongers.

Principal products imported and exported in 2000

Imports	Value (FRF)	(€ m)	Exports	Valeur (FRF)	(€ m)
Shrimp	3,524	537.2	Tuna	1,886	287.5
Salmon	3,190	486.3	Shrimp	712	108.5
Tuna	2,067	315.1	Unspecified filets	540	82.3
Unspecified filets	1,778	271.1	Anchovy	317	48.3
Cod	1,428	217.7	Salmon	314	47.9
Scallops, queen scallops	838	127.8	Cuttlefish	258	39.3
Spiny lobster	596	90.9	Cod	243	37.0
Alaska pollack	595	90.7	Meal, powder	242	36.9
Lobster	438	66.8	Eel, glass eel	219	33.4
Mussels	402	61.3	Sole	195	29.7

Source: Olimer, according to Customs data.

France's main partners in foreign trade in 2000

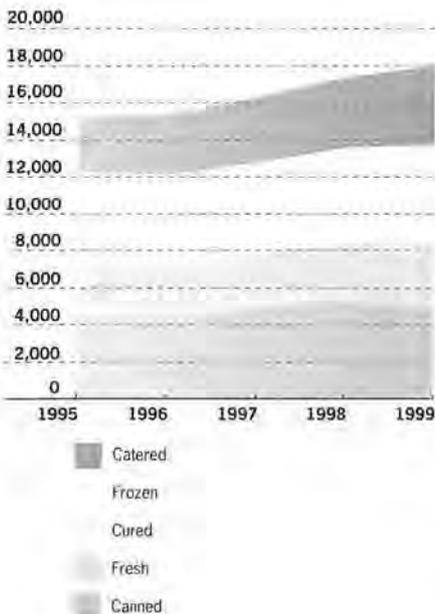
Unit: '000 tonnes

Imports				Exports			
Country	Volume	Value (FRF m)	(€ m)	Country	Volume	Value (FRF m)	(€ m)
United Kingdom	98.9	2,523.4	384.7	Spain	92.9	1,827.4	278.6
Norway	104.6	2,142.7	326.7	Italy	79.8	1,379.6	210.3
Spain	78.6	1,462.5	223.0	United Kingdom	43.8	1,032.4	157.4
Denmark	69.2	1,148.1	175.0	Germany	33.7	727.6	110.9
Netherlands	49.3	1,133.8	172.8	BLEU	26.3	760.8	116.0
United States	29.6	753.8	114.9	Netherlands	25.3	326.5	49.8
Ivory Coast	45.4	663.4	101.1	Ivory Coast	47.1	219.5	33.5
Islande	38.2	650.4	99.2	Switzerland	5.9	190.6	29.1
BLEU	16.6	639.4	97.5	Portugal	5.3	188.1	28.7
Germany	39.0	602.3	91.8	Greece	30.2	187.9	28.6

Source: Olimer, according to Customs data.

Breakdown of turnover by product type - Unit: FRF m

Source: Agriculture and Fisheries Ministry, Ifremer



Trends in activity show high growth compared to the food processing industry

The seafood processing industry is a small component of the food processing industry. In 1999, with FRF 18bn, turnover from sea product processing accounted for less than 2.5% of food processing industry turnover (FRF 709bn). But in five years time, it increased by 18%, indicating a rise in French consumption of seafood products (see key figures).

In 1999, the largest market segment in terms of turnover was frozen products (FRF 5.4bn), followed by canned (FRF 4.7bn), catered (FRF 4.4bn) and cured products (FRF 2.7bn) and the fresh prepared product segment (FRF 800m). Since 1995, the market segments showing greatest growth are those of fresh prepared products (+45.9%) and catered products (+44.9%). These are recent markets, which have developed over the past fifteen years or so. The older market segments like frozen and canned foods have increased their turnover more moderately, by 6.3 and 7.3%, respectively. Curing, although belonging to old mar-

kets, has had a significant growth rate of about 30% since 1995.

Companies' market outlets are mainly domestic. The export level stabilised at around 10% for the period.

Since 1995, the value added/turnover ratio has risen: before 1997, it was 14%; today it fluctuates around 18%. This trend can be explained by the development of catered and cured product markets, which are high value added segments.

Enterprises

Reducing the concentration

In 1999, out of the 282 enterprises for which data was available, 211 made less than FRF 50m in turnover from seafood products. Since 1996, 75% of companies on average have had turnovers under FRF 50m.

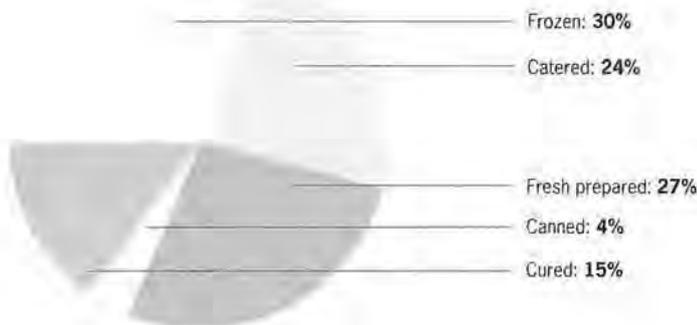
Although the number of firms has grown constantly since 1995, there is a concurrent drop in the size of larger companies, in terms of turnover share.

Nevertheless, the general trend results from situations which are different for each group of activities.

- In canning, the slight decline in concentration has come from the growth of small enterprises, linked to more "up-market" specialisation and developing canned terrines and salads. The largest companies still clearly dominate the market: the top ten hold 90% of shares.
- In curing, after a downswing in the top ten firms' importance (1996-1998), buyouts and mergers contributed to concentrating the activity: in 1999, the top ten companies accounted for 75% of turnover.
- For frozen food products, the concentration is less significant: the top ten companies achieved 60% of turnover in 1999. Special distribution circuits (home delivery) enabled medium sized firms to develop. Since 1995, the trend has been towards less concentration.
- For catered products, there is a large number of enterprises. In 1999, the top ten companies made less than 50% of turnover.
- The market for fresh prepared products is very new. The activity is highly concentrated.

Breakdown of turnover by product type in 1999

Source: Agriculture and Fisheries Ministry, Ifremer



Key figures *

	1995	1996	1997	1998	1999 (FRF m)	(€ m)
Turnover (FRF m)	15,219	15,317	16,249	17,385	17,993	2,743
Turnover from exports (FRF m)	1,339	1,303	1,694	2,397	2,056	313
Level of exports (%)	9	9	10	14	11	
Value added (FRF m)	2,132	2,207	3,020	3,008	3,297	503
Total jobs	11,383	11,490	11,443	11,860	13,129	
Total number of companies	256	273	288	277	282	

* Figures presented are all the firms or fractions of firms which do sea product processing. Firms with less than 20 salaried employees are taken into account. 365 companies in the activity were counted for 1999. Ifremer's assessment of the industry was done on the basis of accounting data available for 282 of them.

Sources: Agriculture and Fisheries Ministry, Ifremer

A majority of specialised firms

Out of the total 356 companies counted in 1999, 262, i.e., approximately three out of four, had a single activity. This large degree of specialisation 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 activity's diversification appears to be through expanding ranges to include catered products. Indeed, 79 out of the 97 companies present in several market segments manufacture catered products.

Geographical breakdown

The processing plants are mainly located along the coast. Over 60% of the production plants are located in the regions of Brittany, Nord-Pas-de-Calais, Pays de la Loire and Aquitaine. The counties containing the most plants are the Finistère (44 enterprises), the Morbihan (32) and the Pas-de-Calais (27).

The location of the firms can first be explained historically by the complementarity with fisheries landing points. This is notably the case for canning plants set up in southern Brittany, Vendee and in the Nord-Pas-de-Calais region. Today, the links between the landing site and the processing site are more extensible. However, the factors which contribute to maintaining a coastal location are: access to certain infrastructures (refrigerated facilities), the skill of the labour force in fish handling and the "maritime" image which is good for marketing.

Outlook

Overall, the trend for the activity in France will be influenced by general factors such as a slower economic growth in 2002 and the consequences of the transition to a 35-hour working week.

There are specificities in various segments of the activity.

- In terms of market outlook: although few significant changes can be expected for canned and frozen products, the contrary is true of fresh prepared products which is in a rapid development phase. Its market share should continue to increase. However, we still do not have much information on the possible developments of the new markets (pre-packed fresh and catered dishes) in a low-growth period like the one we are in. Since the activity exports little, domestic consumption will be a decisive factor.

- In terms of industrial structure: for some segments, there are favourable factors for concentration. The curing activity is undergoing a transformation; salmon producers are continuing their downstream integration. The high concentration of farmed salmon production limits the sources of supply for processors. In 2000, some processing firms merged with the aim of balancing upstream producers' market power. In the catered product segment, companies which have interests in, and connections with, raw material producers are increasing in number.

Public action in favour of seafood product industries

Public aid to the seafood industry is essentially national and European. At European level, these come from the Financial Instrument for Fisheries Guidance (FIG), the European Agriculture Guidance and Guarantee Fund (EAGGF) and the community initiative concerning the restructuring of the fisheries sector (Pesca). Various public aids are mainly intended for:

- organising markets in the framework of the Common market organisation (CMO) for the Common fisheries policy;
- organising the seafood chain.

Ofimer

Created by decree n° 98-1261 dated 29 December 1998, put into application by the law dated 3 November 1998, following the frame-

work law on marine fisheries and mariculture, the National Inter-professional Board in charge of seafood and aquaculture products (Ofimer) replaced the Fund for market intervention and organisation (Fiom).

Ofimer is a public body under the jurisdiction of both the Ministry of Agriculture and Fisheries and the Ministry of Finance and Budget. Ofimer has taken over most of the missions previously carried out by the Fiom, but now broadened to include freshwater aquaculture and fisheries. Ofimer's mission includes regulating markets, improving the economic effectiveness of the seafood chain and the quality of products, improving market knowledge, and 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.

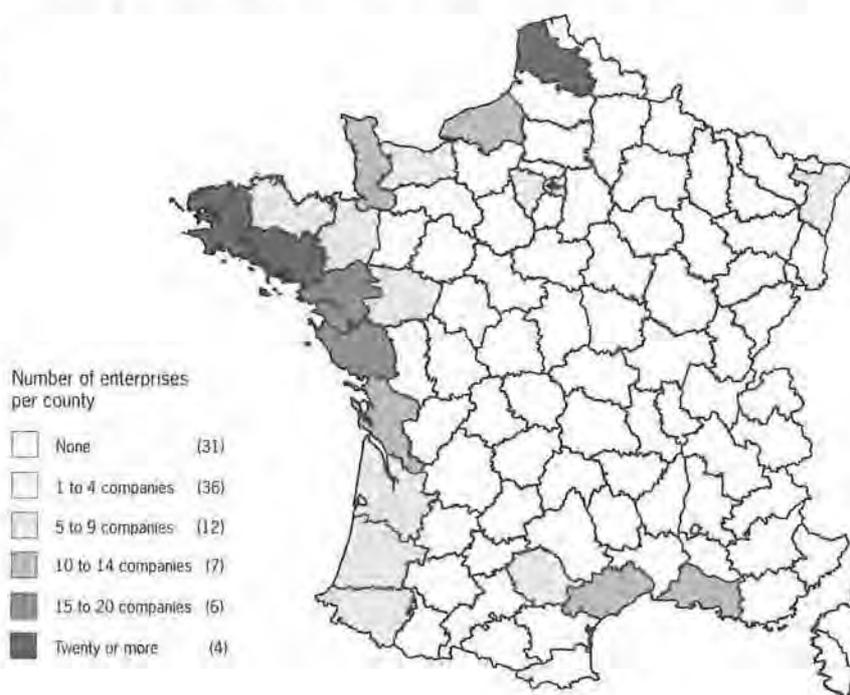
Breakdown of turnover

	Unit: %				
TO of n top companies	1995	1996	1997	1998	1999
Top 5	29	29	29	32	28
Top 10	44	41	39	42	39
Top 20	60	56	53	57	54
Top 50	82	79	77	79	78

Source: Agriculture and Fisheries Ministry, Ifremer.

Geographical breakdown of seafood product processing firms

Source: Insee, Agriculture and Fisheries Ministry, list of approved companies for seafood handling.



At Region level, Ofimer provides financial support, eg for action taken to organise the market, especially to improve the conditions of first sale in fishing harbours. In 2000, it distributed aid payments for fishermen and shellfish farmers hit by storms and the oil spill.

Ofimer is authorised by the French authorities to pay out EC aid for fisheries and aquaculture. Relaying the EAGGF, Ofimer finances compensatory measures provided for by the CMO (as well as for implementing EU aid schemes in favour of overseas counties). It ensures that financial compensation files are processed and the corresponding aid paid out. Ofimer's action notably concerns withdrawals (from the first sale), adapting seafood supply quality and quantity, and information (labelling).

Ofimer's income is composed of allocations from the State, the proceeds of special taxes levied, and various revenues such as professionals' contributions to special operations and European Union aid for promotional campaigns, as well as investment income. The state subsidy amounted to EUR 14.60m in 2001 (FRF 95.8m).

The special taxes benefiting Ofimer are paid by shipowners and buyers on first sale auctions (of catches landed on French territory or in a foreign port by a fishing vessel registered in France) and by importers of seafood from countries other than EEC or EFTA. Their proceeds, roughly EUR 3.4m in 2001, are used to finance operations to promote fishery products.

Marine aggregate extraction

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

Activity situation

Extraction of marine aggregates falls under the mining system and requires issuance of a mining 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 aggregates under the mining system. That is why, upon request from the ministry for Industry, operators in calcareous materials (marl and shelly sands) have to file an application for a mining title and a national permit.

The main production sites for siliceous aggregates 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 aggregates are produced in Brittany (three marl deposits).

Marine aggregates production makes up approximately 1.5% of the national production of building materials. It is mainly composed of siliceous aggregates (about 4 million tonnes) and the rest comes from calcareous materials. To can be added the approximately 300,000 tonnes produced on one site operated in Guadeloupe, tiny production from Saint-Martin



and that of Saint-Pierre-et-Miquelon to the amount of 20,000 t. By comparison, the United Kingdom produces 21 million tonnes of siliceous aggregates (15% of its total material production) and Japan 80 million tonnes.

Extraction and importing marine aggregates in metropolitan France

Unit: '000 tonnes

	1997	1998	1999	2000
Extraction*				
Channel	750	700	660	690
Brittany	80	60	70	60
Atlantic seafront	3,290	3,350	3,610	3,700
Total	4,120	4,110	4,340	4,450
Imports	850	850**	na	na

* Mainly siliceous aggregates; marl extraction not taken into account.

** 80% of which come from the United Kingdom and 20% from Belgium.

na: not available.

Source: UNPG (National aggregate producers union).

Calcareous material produced (about 700,000 t) is equally composed of marl and calcareous sand. The first is used as a processed soil improver, or as an ingredient in animal feed or fertiliser. The latter are used as raw soil improvers or as ingredients in animal feed.

The perimeter of the activity in metropolitan France can be assessed as follows:

- for siliceous materials: considering operations up to loading for delivery to construction materials firms;
- for calcareous materials: taking account of operations up to delivery of the end product; extraction of raw material cannot be dissociated from the end uses mentioned above.

Based on this perimeter, we can estimate overall turnover to be about FRF 500m. Under this assumption, VA would be about FRF 200m (VA/turnover ratio based on Insee data).

Employment and companies

Dredging ship companies for marine aggregates are one of the sector's trades. Direct employment is estimated to be approximately 200 seamen and 100 on-shore staff (administrative, sales and technical duties) according to Ifremer. There are a dozen firms using 16 sand dredging vessels of varying sizes (from 80 to 1,926 grt). Some of these companies also process the materials and sell them for ready-to-use concrete or civil engineering operations.

Marine aggregates are also extracted by industrial firms mining land-based deposits, in an effort to diversify their supplies. Extractions can then be subcontracted to specialised international companies. They are used for construction and civil engineering work.

Outlook

Marine aggregate extraction is an asset with respect to growing difficulties in accessing deposits, especially for alluvial aggregates. More and more extract permits applications are being made for 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 m³ (960 million tonnes).

Shipbuilding and repair

The sector covers merchant shipbuilding, naval shipbuilding, naval equipment and fittings, civilian ship repair, and boat building.

These activities come under different schemes:

there are huge differences between companies in terms of how they are organised, their concentration, size and strategy.

The volume and nature of their markets is also quite different: maritime shipping is shipbuilding's market outlet; pleasure boating is that of boat building.

There is some interdependence: some naval vessels used for public service missions (EEZ surveillance, policing of fisheries) are also built by merchant shipyards; ship repair and shipbuilding rely on the maritime shipping market; repair provides shipyards with an opportunity for diversification.

Merchant shipbuilding

Definition

Merchant shipbuilding comprises the design, actual construction and equipment and fitting out of ro-pax vessels for passenger and cargo traffic, fishing vessels, service vessels, hovercraft, offshore platforms and other floating structures.

Trends in activity

Shipbuilding's recent economic situation is linked to the global growth phase, but also to the recession which has hit Japan and South Korea and its impact on exchange rates: the Korean Won, in particular, depreciated sharply. After stagnating slightly in 1998-1999, orders soared in 2000: production capacities were remarkably high and prices for most types of ship increased on average, after a slack period in 1999. The dominant position of Japan and South Korea in international competition has become even stronger.

Key figures

	1995	1996	1997	1998	1999	1999 (€ m)
Turnover (FRF m)	6,843	4,869	5,942	6,733	10,337	1,576
Value added (FRF m)	1,784	1,331	1,525	2,260	3,055	466
Employment	6,278	6,003	6,092	5,297	6,032	
Number of companies*	35	29	28	29	34	
Level of exports (%)**	70.6	60.0	81.9	43.7	53.9	

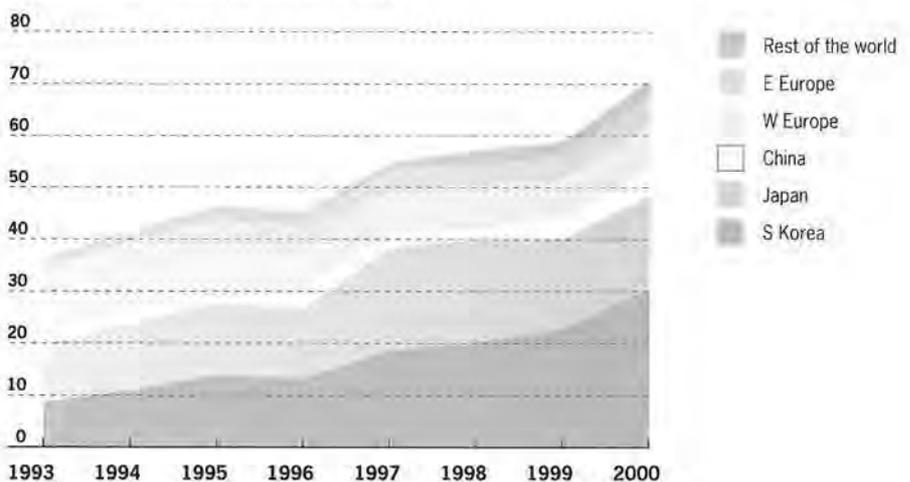
* Companies doing all or part of their business in this field.

** Average percentage of turnover for companies with 20 or more employees.

Source: Ministry for Industry.

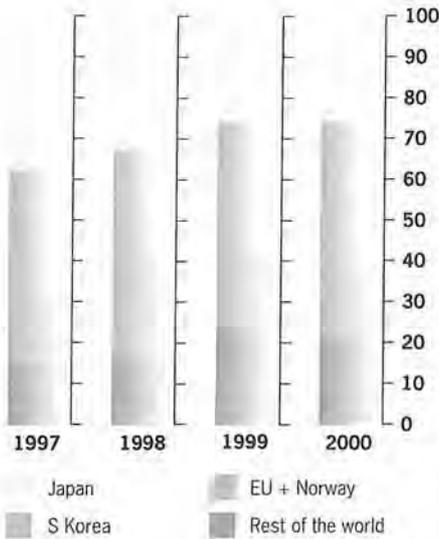
World order book since 1993

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



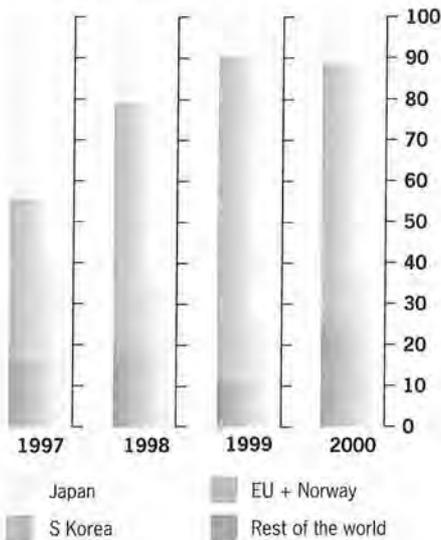
New orders

Unit: % of volume in cgt
Source: Lloyd's Register of Shipping.



New orders for container-ships

Unit: % of volume in cgt
Source: Lloyd's Register of Shipping



Asia

Asian predominance in the shipbuilding sector has become clear. The shipyards of three main countries (Japan, South Korea, China) overwhelmingly dominate standard vessel markets (oil tankers, break-bulk carriers, container-ships). However, this is more obvious in volume than in value, due to the price differences between standard vessels and specialised ships.

In 2000, South Korea achieved top rank in shipbuilding worldwide, with over 35% of world orders. The Korean yards, in debt and not very cost-effective, were able to spread their debts, sell at low prices, invest and expand their capacity. They turned massively towards the export market (currently over 15 billion dollars per year) since no large domestic orders were available. 1998 was a difficult year for the Koreans because of the Asian crisis which hit the banking sector hard, and the resulting absence of financing plans for shipyards. But their market share grew as of the second semester of 1998, after the recession bottomed out, thanks to the weakness of their currency. On the oil tanker and container-ship markets, Korean yards' world supremacy is unquestioned (market share of

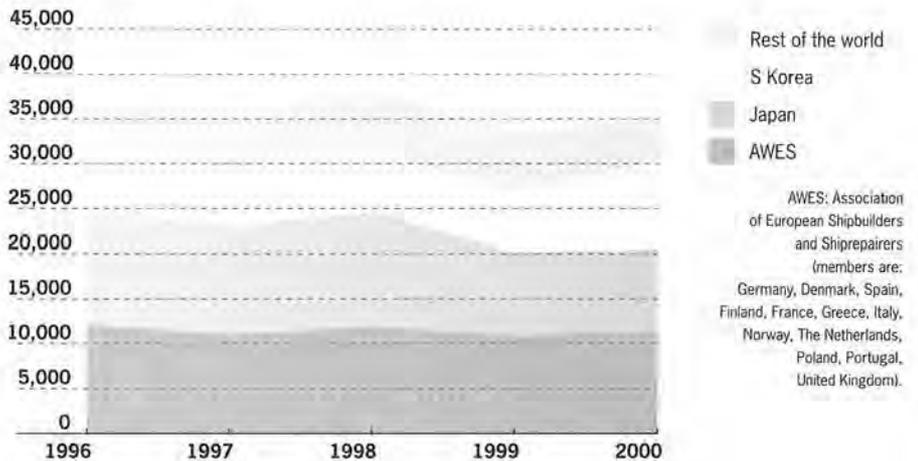
over 60%). However, they are trying to capture all segments, are very active in LPG tanker production and have just taken orders for ferries from European shipowners.

In Japan, the yen was stronger against the dollar. Market shares were lost in 1999 and 2000, particularly to Korea. Facing the latter's competition, Japan is trying to rationalise its production tool. It is maintaining good positions on the bulk carrier market, but losing ground on those for oil tankers and container-ships. China regularly increased its market shares for standard vessels between 1998 and 2000. Active on the break-bulk carrier market, the Chinese shipyards are working to strengthen their position on the oil tanker and container-ship markets.

Market shares in value for production from the main regions

(estimated value in deliveries for the year)

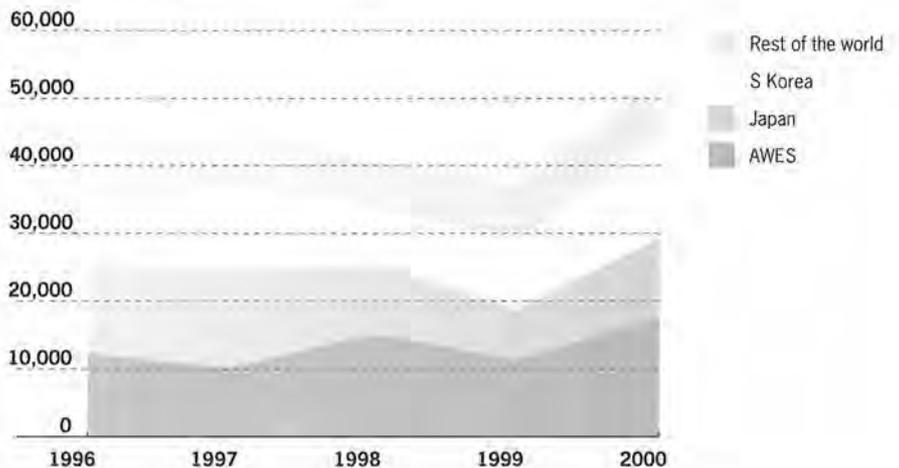
Unit: m\$ - Source: AWES



AWES: Association of European Shipbuilders and Shiprepairers (members are: Germany, Denmark, Spain, Finland, France, Greece, Italy, Norway, The Netherlands, Poland, Portugal, United Kingdom).

Value of new orders in main regions

Unit: m\$ - Source: AWES



Europe

Clearly dominated by their Asian competitors on standard vessel markets, European shipyards are marginalized on orders for oil tankers, low value bulk carriers and large, post-Panamax type container-ships. They have fallen back on specialised vessel niches (chemical tankers, ro-ro, ro-pax, cruise liners) where their positions are strong. European market shares are still resisting Asian competition in terms of value. On the cruise liner market, the competition is almost all European. The number of European competitors in this niche is growing as they withdraw from cargo ship markets. However, nothing should be taken for granted in the field of specialised ships: LPG carriers, a European speciality in the past, were mainly built in Japan during the nineties, when the Korean competition appeared. In 1999, the majority of orders were taken by Korea, the rest by Japan, and none by Europe.

Looking at trends, world growth, a stronger dollar and saturation of Asian shipyards, thus forced to sub-contract abroad, have provided favourable factors for European activity. But specialised vessel markets didn't grow as fast as those for standard ships from 1998 to 2000. Through the container-ship orders handled and good positions on some specialised ships (LPG carriers, for instance) Poland ousted Germany from first place in Europe in 2000. The latter, EU leader for shipbuilding, has an increasing order backlog for specialised vessels, but a drop in orders on the container-ship market, which is strongly eroding its market share. Italy, ranking third in Europe, is well positioned on some specialised vessel niches, especially cruise liners.

Structurally speaking, the European Commission noted the European shipbuilding sector's fragmentation in 1997, with 103 companies. In 1996, the five largest European builders accounted for 36% of compensated gross tonnage produced, compared to 44% in Japan and 99% in Korea.

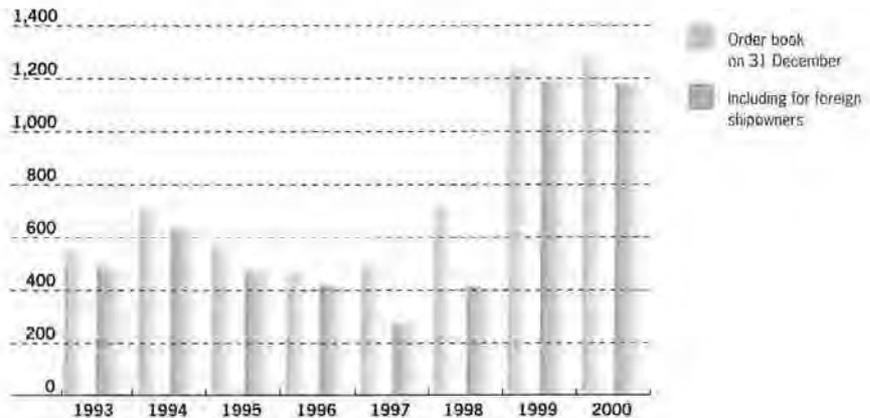
France

The activity is more concentrated than in Europe on average. The top four shipyards employed over 43% of the labour force in 1998, ensuring 58% of sales and 61% of exports (source: Industry Ministry). If we consider the main shipyards, which are CSCN members, the concentration is even greater.

The sector is highly specialised in cruise liners. It so happens that the economic situation over the past two years was favourable for international liner order and the order books are full, up to 2003.

Order book for the top six private French shipyards

Unit: '000 cgt - Source: CSCN



France also has competitive know-how for design and construction of LPG carriers. No recent orders have been taken for this type of ship under current circumstances, but the potential is there. 183 LPG carriers have been built since 1961, 35 of these by French yards, 58 by Japan and 46 by South Korea (source: CSCN). To date, the backlog of firm or practically firm orders, is mainly held by Korean yards (over half), the Japanese, and to a lesser extent, Spanish shipyards.

Generally speaking, these are often export markets, especially for big orders, seeing the small size of the national fleet.

Annual orders for French shipyards now exceed 900,000 cgt. They even reached 1,230,000 cgt at the close of 1999, an unprecedented level in the past twenty years. The key-figures (see above) indicate considerable growth in turnover and in value added between 1997 and 1999, a labour force held at around 6,000 jobs, not to say much lower in 1998. They show how significant productivity gains were over the period. From 1999 to 2000, French production was to follow the same rising curve: up about 50% in volume according to AWES.

Outlook

After the year 2001, with growth rates still high, forecasts for 2002 are less optimistic. In the short term, several parameters will impact the situation of the European Union in general and France in particular:

- The sustained pace of liner orders experienced since 1999-2000 seems to be slowing down. There seem to be two opposing trends. On the one hand, there is high growth potential on the

long term cruise market, mainly due to the increasing demographic figures for target consumer categories; on the other hand, the current economic slowdown in the United States and Europe, which should hinder market development in the short term. In a context of economic slowdowns, overcapacity may rear its head here and there.

- Is the Korean breakthrough on the large passenger ship market (thanks to recent orders) the prelude to their acquiring competitive know-how for cruise liner production which would pose a threat to the Europeans on the last international market niche they dominate? Moreover, the latter may also risk a "crowding out" effect: will Korean performances for standard vessels lead new competing shipyards, particularly Japanese, to bolster their presence on specialised vessel markets, especially liners, thus increasing the risks of overcapacity on that market?

- The issue is all the more sensitive in that world shipyard capacity increases (for all types of vessels) are already scheduled, for the most part, between now and 2005: +25% for Korean shipyards (to 6 million cgt in 2005), +7% for the Japanese (to 7.4 million), +11% for AWES (to 5.3 million).

- How will the EC react to what it considers to be dumping on the part of the Koreans, with respect to the WTO, and modify the subsidies system, normally due to disappear, for European shipyards? The legislation in force entrusts the EC with the task of proposing measures aiming to solve the problem of anti-competitive practices seen in this activity (see art. 12 of Council regulation 1540/98 dated 29 June 1998 concerning aid granted to shipbuilding).

Naval shipbuilding

Definition

Naval shipbuilding includes:

- shipbuilding and repair of warships by civilian shipyards,
 - design and construction of warship and surveillance vessels, as well as their overhauls.
- This is the responsibility of the DCN naval shipbuilding division in the Ministry of Defence.

The naval shipbuilding activity in France mainly comes under the DCN. In this speciality, the merchant shipyards have a small share: about 5% for DCN's production. The latter works in designing, constructing and maintaining naval equipment. Its main customer is the French Navy, but it also exports. It manages the naval shipyards and production sites of Cherbourg, Brest, Lorient, Toulon, Saint-Tropez, Papeete, Indret and Ruelle.

Trends in activity

The international context is characterised by cutbacks in military spending in many countries, especially in those of the European Union. Most companies restructure and establish alliances, as the competition gets harsher on shrinking markets.

France is no exception to the rule: the decrease in military budgets has been appreciable since 1990, due to efforts made by the Defence Ministry to cut its own costs: the turnover generated by orders from the State was approximately FRF 20bn in 1990, and less than FRF 9bn in 2000. The drop in the DCN's workload schedule is in keeping: 23.9 million productive hours in 1996; assessed at 12.7 million for 2001 and 14 million planned for 2002. Concurrently, civilian shipyards are increasingly turning towards exported naval vessel production and the number of companies involved in the field is dwindling yearly.

The record bottoming-out of State orders seems to have been reached in 2001. A rally in orders has been observed since 2000, without necessarily indicating major recovery. Overall, the DCN has experienced an upheaval in its operating conditions over the past decade, which has led it to take part of the subcontracting within its centres: the travel-to-work areas have been affected by these adjustments.

DCN's reorganisation began in 1991, with the creation of DCN International, aiming to develop exports and enable industrial and commercial alliances. It also involved the establishment's status, defined until recently as an operational directorate of the Defence Ministry. The decree 97-35 dated 14 January refocused the DCN's missions on industrial activities, by creating two separate services: the state naval programme service (SPN) with about 2,000 people, ensuring the undertaking of contracts on behalf of the French Navy; the industrial service (on eight sites) making up the "new" DCN, is the contracting authority managing industrial projects and maintenance of French Navy equipment.

By decree 2000-326, dated 12 April 2000, the DCN was given a new status which maintains the organization as an administration with a business account, but which reinforces the separation between the establishment (supplier) and the Defence Ministry (customer). The latter, however, continues to exercise its supervisory jurisdiction.

Key figures

Unit: FRF million and number of staff

	1995	1996	1997	1998	1999	1999 (€ m)
Merchant shipyards						
Turnover	700	552	421	539	392	60
Value added	357	251	217	248	138	21
Employment	1,363	1,090	795	758	626	
Number of companies ⁽¹⁾	16	11	8	7	6	
Level of exports (%) ⁽²⁾	21.2	44.0	60.0	69.4	67.4	
Naval shipyards (DCN)						
Production ⁽³⁾	14,937	15,225	13,353	10,667	na	
Procurement of material, equipment and services	9,229	9,482	7,832	5,965	na	
Stock variation	229	348	557	100	na	
Value added ⁽⁴⁾	5,516	5,395	4,964	4,602	na	
DCN workforce	21,839	20,860	19,214	17,515	16,332	
Subcontracted workforce	5,634	5,737	4,600	3,360	na	

(1) Fractions of companies: doing all or part of their business in this field.

(2) Average percentage of turnover for companies with 20 or more employees.

(3) DCN accounting methods were modified as of 1999-2000.

(4) Ifremer estimation for 1999: in the order of FRF 4,500m (on same accounting basis as for previous years)
na: not available.

Sources: Industry Ministry for merchant shipyards, DCN for naval shipyards.

Trends in outsourced subcontracting rates for the DCN*

Unit: %

Site	1998	1999	2000**
Cherbourg	30	20	15
Brest	27	40	30
Lorient	26	19	18
Toulon	47	44	40
Indret	22	25	22
Ruelle	6	12	10

* Subcontracting of speciality and capacity.

** Estimation.

Source: DCN.

DCN production by site

Site	Main activity
Cherbourg	Building submarines and dismantling nuclear submarines
Brest	Maintenance of fleet ballistic missile submarines (SSBN)
Lorient	Building medium tonnage surface ships
Toulon	Ship maintenance
Indret	Propulsion power systems for all ships
Ruelle	Special systems and equipment (handling, platform control, simulators)
Papeete	Maintenance of French Navy ships based in the Pacific
Engineering	Engineering division in Paris: naval architecture Engineering division in southern France: Combat systems Engineering division at Saint-Tropez: torpedo system

Source: DCN.

DCN workforce

	1995	1997*	1999	2000
Cherbourg	4,039	3,627	3,137	2,824
Brest	5,823	4,950	4,278	3,906
Lorient	3,005	2,487	2,159	1,861
Toulon	4,345	3,728	2,932	2,669
Indret	1,534	1,374	1,212	1,141
Ruelle	1,373	1,186	925	853
Papeete	366	284	261	257
Engineering division	1,354	1,286	1,094	1,170
Headquarters	-	292	334	414
Total	21,839	19,214	16,332	15,095

* Separation of state activities in 1997: concerns about 2,000 staff; creation of headquarters.

Source: National assembly, 2001; document n°3320.

The most recent step taken in this restructuring process was the government's decision in July 2001 to transform the DCN into a State-owned company, in order to give it the means to ensure its development and forge vital alliances. A draft law in line with this is to be filed by the end of 2001. It provides for actual creation of the company early in 2003.

Outlook

Large-scale restructuring on the European scale have already begun in the defence industry. International alliances are being set up between naval shipyards. Of course, the main French operator will try to play a part.

Nationally, the 1997-2002 military programming law is drawing to its term. It provides for a cut-back of 20 billion French francs (3bn euros) in the budget allocated to the DCN's industrial service. For 1999-2002, the adjustment effort will have entailed staff cuts of 22%. The DCN's financial forecast for 1998-2002 indicated that over one third of turnover would come from exports and diversification.

Merchant and naval equipment industry

Definition

The naval equipment field comprises the following activities:

- manufacturing technical equipment for boats: propulsion machinery, electrical and electronic equipment, shipboard handling, navigation and bridge equipment, pumps, ventilation and air conditions, for main facilities,
- supplying shipbuilding yards with assembled and tested equipment as "modules", either pre-fab or in their technical setting, and complete systems or functions like installation of ventilation and air conditioning or fitting out public areas and cabin areas in passenger ships.

Trends in activity

The level of activity depends on the merchant and naval shipbuilding market. In 1994, according to an assessment based on the ten main Cofrena committee member companies, the breakdown of turnover between civilian and military markets was 57-43%.

The closing of several French shipyards was compensated for by good penetration of foreign markets, particularly in Asia. External markets, which account for over 40% of the sector's turnover, are mainly located in Italy, Spain and Finland, and concern cruise liners. Export levels increase with company size. Global competitors are mainly Japan (world leader), Germany (European leader), South Korea and Norway.

Results of the survey conducted in 1999 by the French committee for naval equipment (Cofrena) on this French industry provided production and employment estimates for the "equipment and system manufacturing" activity. Based on the hypothesis that most French production will go to Europe, we estimated the VA at about FRF 1,800m for 1999 (EUR 275m) and about 8,750 jobs.

Ship repair

Definition

The activity includes:

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

This work is mainly done by shipyards specialised in ship repair and conversion, but can provide a supplementary outlet for other shipyards.

Trends in activity

Ship repair is more of a service industry than a manufacturing one. Manpower costs are decisive for competitiveness. Internationally speaking, the activity is dominated by Japan, Southeast Asia (Singapore) and the Far East (Korea), but the Europeans have a significant market share. Amongst these, northern European countries are highly active (the United Kingdom leading, then the Netherlands, Germany, Scandinavia), as well as some Mediterranean countries (Italy, Spain, Portugal) and eastern countries (Poland, Rumania).

In France this activity is small scale. Following the downswing at the middle of the last decade, at the end of the current period, ship repair seems to be taking advantage of global growth and the favourable situation for international shipping (70% of customers are foreign shipowners). The activity's turnover is rising in spite of serious difficulties encountered by some companies in this field. 1999 and 2000 were good years, mitigating the impact of competition from eastern European and Mediterranean countries.

Outlook

Generally speaking, the profession predicts increased activity in the years to come. This is notably due to the fleet entry of many ships for some segments and the rising average age, especially for oil-tankers.

However, production capacity has grown sharply over the past few years in Europe, and even more so in the Far East. We can assume that this will make international competition harsher, probably in anticipation of increased demand. That should lead to a drop in prices and changes in market shares to the advantage of countries with cheaper labour forces. Nonetheless, Europe should get out of this tough situation unharmed.

Key figures* Units: million FRF and million euros

	1995	1996	1997	1998	1999	1999 (€ m)
Turnover	1,334	1,504	1,314	1,450	1,596	243
Value added	548	644	526	500	602	92
Employment	2,913	2,913	2,464	2,466	2,511	
Number of companies**	52	47	44	44	55	

* Related to ship repair as understood in the French activities classification: repair-conversion of all merchant vessels and scrapping.

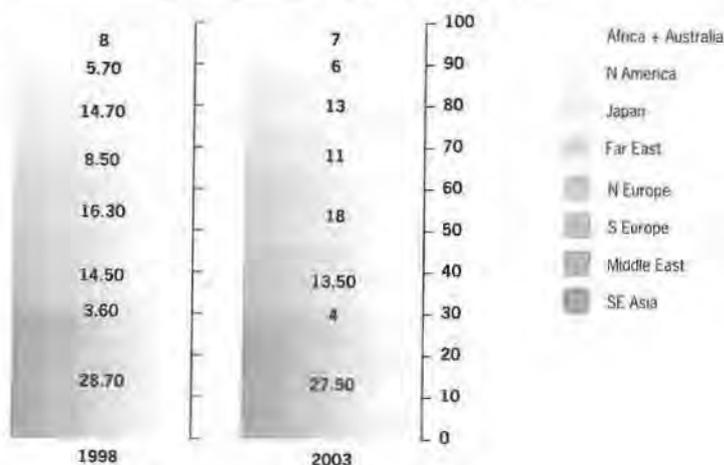
** Doing all or part of their business in this field.

Source: Industry Ministry

Forecast global market breakdown between regions (market shares, in percentage)

Unit: % of volumes in cgt

Source: Lloyd's List, May 1998, according to Drewry Shipping Consultants Ltd



Boat building

Definition

The term boat building comprises the manufacturing of sailboats, rigid or inflatable powerboats and windsurf boards, as well as their outfitting, maintenance and repair.

Trends in activity

French boat building ranks second to that of the United States in the field worldwide. It accounts for over a third of European turnover in this speciality. Its strong point is production of sailing boats and inflatable dinghies, holding leadership in these two specialities for the past fifteen years, with respective turnovers of 414 and 59 million euros in 2000. In both cases, French boat building covers 35% of the world market.

Apart from its own dynamics, like many recreational products, the French boat building industry's results seem to correlate with the general economic situation and are highly sensitive to consumers' potential buying power. The industry sailed through a highly favourable period in the second half of the 1980s, then through the long growth period in the 1990s. Between the two phases, the economic slowdown from 1991-1995 was simultaneous with a drop in recreational boat production.

Since 1997, sales have been dynamic in France, but mainly exports have boosted the activity's growth rate. In sales shares, they took well over half the production and enjoyed growth of nearly 25% in 1999 and over 32% in 2000, much higher than that of domestic sales. In 2000, nearly 72% of sailing boat production and over 77% of inflatable boat production were exported.

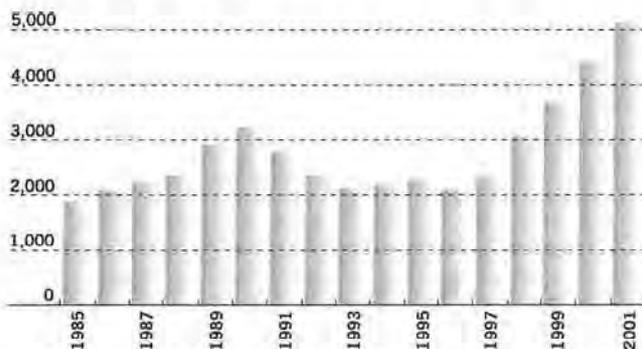
In addition to sailboats (more than 56% of total TO in 2000) and inflatable boats, French industry also produces powerboats. Its international niche on this market is less significant. It holds 5% of the global market for in-board motorboats and 2% for out-boards. The leaders for these products are the United States, Italy, Germany, Canada and Japan, unequally present in the various categories of motorboats. Maintenance and repair account for 9% of the French industry's turnover.

The United Kingdom, Germany, Italy and Spain are the main customers for French boat building in Europe and together account for three-quarters of sales. Outside of the European Union, the United States are by far the main outlet (with over 37% of non-EU sales in 2000).

Outlook

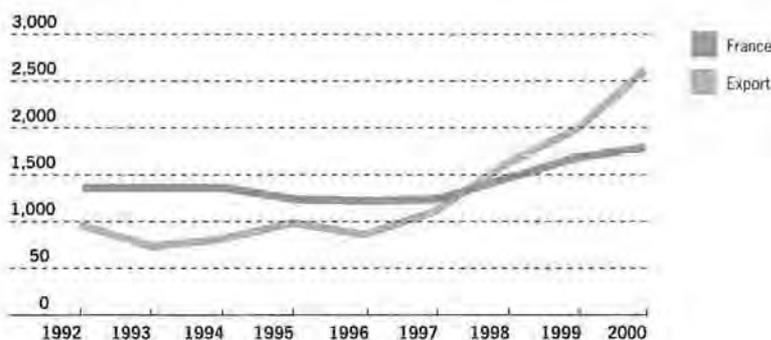
The unprecedented growth that French boat building experienced over a decade was favoured by a propitious economic situation in developed countries, particularly the United States, a predictable impact of replacement buying for an ageing fleet (40% of the French recreational boat fleet is over 20 years old) and a new clientele with often high spending power. It is tempting to compare these parameters by analogy with those influencing cruise liner construction. The size of the export markets, especially in the United States, make this activity highly sensitive to the international situation. The economic slowdown phase we are entering may change the international market context, especially for recreational consumption such as sailing and water sports. Predicting the impact on French boat building is still risky.

Annual production turnover (not including maintenance and repair) - Unit: FRF m - Source: Fin



French production sales in France and abroad

Unit: FRF m - Source: Fin



Key figures

Units: FRF m, million euros, % of sales, manpower

	1994	1995	1996	1997	1998	1999	1999 (€ m)
Turnover	2,553	2,563	2,197	2,494	3,474	4,198	640
Exports/turnover (%)	50	56	47	53	58	56	
Value added	776	782	767	853	1,167	1,377	210
Employment	3,944	3,840	3,627	3,607	4,259	5,072	
Number of fractions of companies	46	42	38	42	45	52	

Source: Industry Ministry.

Offshore oil and gas-related industry

The French offshore oil and gas-related industry includes engineering, supply of oil and gas equipment and facilities and provision of services in the fields of exploration and production at sea (especially offshore oil platforms, drill ships and drilling systems, building of LNG carriers and some gas processing techniques, as well as gas terminals).

The contractors are usually oil companies and firms in gas production.

Trends in activity

Since there is no national oil production in the French EEZ, the offshore oil and gas-related industry is structurally export-oriented. This means that the sector is particularly exposed to international competition. It ranks second to the American oil and gas-related industry for exports. In recent years, 90% of 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 upstream to downstream in the petroleum field and experience a cyclic effect which is strongly linked to that of crude oil and gas price cycles. Therefore, investments in oil exploration and production have a major influence on the oil-related industry in general and the French oil-related industry in particular, at least for the upstream segment of the sector, this segment constituting a major part of the offshore oil and gas-related industry.

Following the record high in oil investments during the Gulf War (\$ 79bn), the 1992-1994 slowdown led to a downturn in the international economic situation. With the healthy growth experienced by the United States from 1992, and an equally favourable situation in Europe, oil exploration and production investments rose in a cycle which peaked in 1998 at \$110bn. By the close of that year, while the Asian crisis worsened, oil prices, falling since 1997, reached the record low of \$10/barrel. The turnaround was significant for the petroleum industry, where exploration/production investments dropped by 20%, to \$90bn. In a context of good European and North American economic

performances, the rebound of crude oil prices in 1999-2000 to levels briefly exceeding \$35/barrel, was immediately followed by rallying investments (\$100bn in 2000).

So, after a period of regular growth, oil investment trends have fluctuated since 1997-1998, albeit at a level which remains very high indeed.

With the impetus of favourable factors over the past decade, the French oil industry's growth rate doubled yearly from 1994 to 1997, and the sector consolidated its position worldwide. The slight slowdown in 1998 was followed by a drop in total sales in 1999 (-4%). This decrease, largely attributable to the offshore sector, was mitigated by merger/acquisitions. It was followed by a return to strong rises in 2000 and 2001 (12% per year), although this is less significant if merger/acquisition effects are not taken into account. For offshore production, recovery was slower than for onshore production in 2000, with 4% growth. For 2001, a turnover growth of 19% is forecast, which would re-establish the pre-1998 pace. French onshore and offshore sectors are expected to reach unprecedented turnover levels in 2001.

The gas 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 gas transport "membrane" technique, competing with a Norwegian system. During the 90s, delivery of LNG carriers became much more competitive and their delivered prices dropped sharply. Orders for LNG carriers fell off during the Asian crisis (a single order in 1998), then rallied in 1999 (ten orders). Although none of these orders were placed with French shipyards (see above: ship building), they maintained their competitive know-how all the same.

Key figures

	1995	1996	1997	1998	1999	1999 (€ bn)	2000	2000 (€ bn)	2001* (€ bn)
Turnover (bn FRF)	15.0	16.0	22.0	26	23.5	3.6	25	3.8	4.4
Value added (bn FRF)**	5.9	6.8	8.9	10.1	8.1	1.2	9.3	1.4	1.6
Jobs ('000)	12.5	14	17	19	17.5		17		

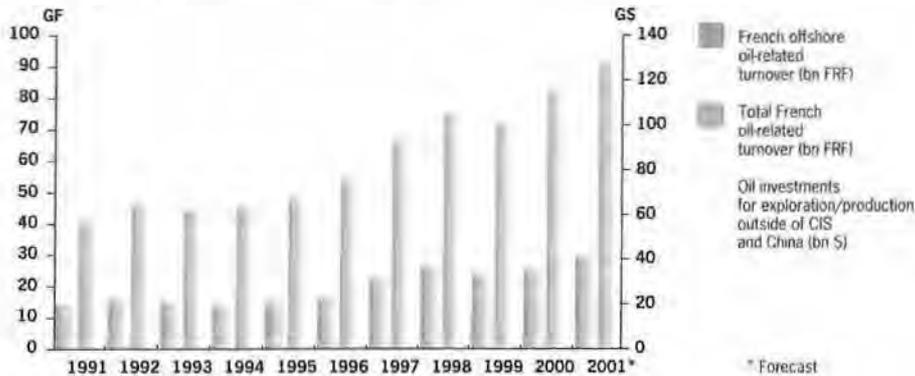
* Forecast.

** Value added/turnover rate as estimated by the IFP for the entire oil-related industry. Ifremer estimate for 2000 and 2001, based on previous data from IFP.

Source: French Petroleum Institute (IFP).

Turnover of the French oil and gas-related industry

Units: bn FRF and \$ - Source: IFP



Companies and employment

There are significant differences in the way French oil companies behave. The service providers, who are highly reactive to market variations, benefited more from the favourable economic situation than did equipment suppliers in 1996-1998. Likewise, they were harder hit by the downturn in 1999 (-17%) and enjoyed a strong recovery in 2000 (14%). The situation of equipment manufacturers and engineering firms, less prone to swings in their activity, was affected by merger/acquisitions and increased acreage.

It should be noted that internationalisation of capital is a fundamental trend in the French oil sector. "International" firms, i.e., listed on the stock market, with only minority interests held by the French, are increasingly influential in the sector.

The IFP puts the figure of overall R&D efforts by French oil industry firms at FRF 600 to 700m in 2000 (92 to 107 EURm).

Employment in the oil-related industry, after a slight downturn in 1999 and relative stagnation in 2000, picked up again in 2000, to reach record levels.

Outlook

In 2001, oil prices were down (under \$20/barrel in November) and gas prices were even lower (down by 2/3 from January to August) and the economic slowdown has been confirmed in the OECD Area. As is often the case, the issue will be to see if OPEC can keep discipline over

supply in the context of an economic slowdown of unknown duration. The price level will have direct repercussions on oil investments and the upstream sector of oil-related industries.

For the LNG-carrier segment, there is a large growth potential, seeing the lack of vessels and expanding world gas consumption, especially LNG. However, the current downturn in gas prices may alter the short term outlook.

Electricity generation

This chapter gathers available information on electric power plants in coastal locations.

The choice of an electric production site depends on the possibilities of cooling or diluting the effluents discharged by the plant. From this point of view, the sea is a natural, stable cold reservoir, which makes coastal access highly attractive for building nuclear or thermal power stations.

The sea can also provide tidal power.

The information available is not adequate to estimate either turnover for the French electricity board's (EDF) power plants, nor the labour force on their 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. one quarter of EDF's available capacity: four conventional thermal power stations, five nuclear power plants and one tidal power plant. Three conventional thermal generating units, totalling 1,550 MWe, are either on long-term shutdowns or being kept as back-up.

The total land requirement for plants in the coastal area depends on the reactor system, the number of generating units, the cooling system and the topography. For nuclear energy plants, EDF assesses the land requirement for four generating units of 1,450 MWe to be 100 hectares. For conventional thermal plants, conditions vary only slightly: 150 ha for ten 600 MWe generating units and 100 ha for six units of 600 MWe. Cooling tower systems require an additional 30% or so of land area.

Electrical power plants set up on the coast

Site	Generating units	Net power (MW)	Energy source	Year commissioned
Dunkirk (harbour)	3 et 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 et 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 et 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 et 2	2 x 1,330	nuclear	1984
	3	1,330	nuclear	1985
	4	1,330	nuclear	1986
	Flamanville (western Channel)	1	1,330	nuclear
	2	1,330	nuclear	1986
	Le Blayais (Gironde estuary)	1	910	nuclear
	2	910	nuclear	1982
	3 et 4	2 x 910	nuclear	1983
Rance estuary		240	tidal power	1966

* Blast furnace gas

Source: EDF.

Marine 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 it makes up about 50% of total annual turnover for maritime and inland water engineering work.

Key figures are based on statistics which make a distinction between engineering done in metropolitan France and elsewhere. The latter includes work in the French overseas dominions and territories and abroad.

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 construction on maritime sites (50% of the activity in 1999), maritime civil engineering also involves maintenance and renovation (50% of the activity).

Note that maritime CE makes up only a small proportion of public works overall: in metropolitan France in 1999, engineering firms on maritime and river sites made 1.2% of annual turnover in civil engineering.

Civil engineering trends in metropolitan France

According to the FNTF, a turnover of FRF 1 million in French CE companies required an average of 1.5 direct jobs. Since 1995, this turnover has shown constant growth, although stagnating at the end of the decade; over the same period manpower levels remained about the same, according to our estimations.

While the entire CE sector occupied 67.2% of workers in 1998, maritime CE employed more highly skilled manpower on average: workers made up only 26% of total manpower in 1998.

In metropolitan France, the main customers of French maritime and inland waters CE companies are the public sector (local authorities, counties, State) for 69% of production, private sector firms (19.6%) and private individuals (11.2%). In 1999, the region with the highest turnover volume was Normandy.

Trends in export activity

French civil engineering enterprises are significant exporters. From 1998 to 1999, the turnover of this activity outside of metropolitan France (including the overseas dominions and territories) accounted for 86% of the total turnover. In 1998, France ranked 3rd worldwide for exports, with a market share of 13% (behind the USA and Japan). The activity of maritime and river CE contributed to the export turnover figures of all French CE, to the amount of 10.4% in 1997, 14% in 1998 and 13% in 1999.

Key figures* Units: FRF million, euros million, number of staff

	1995	1996	1997	1998	1999	1999 (€ m)
Turnover (FRF m)	2,827	3,074	4,170	5,617	5,739	875
Including outside of metropolitan France	2,178	2,493	3,529	5,120	4,915	749
Value added (FRF m)**	1,272	1,383	1,876	2,528	2,870	438
Employment	1,206	1,062	1,110	1,056	1,097	

* On the basis of a 50% proportion of maritime engineering in overall maritime and river engineering (Ifremer estimation).

** Value added/turnover rate estimated to be 45%.

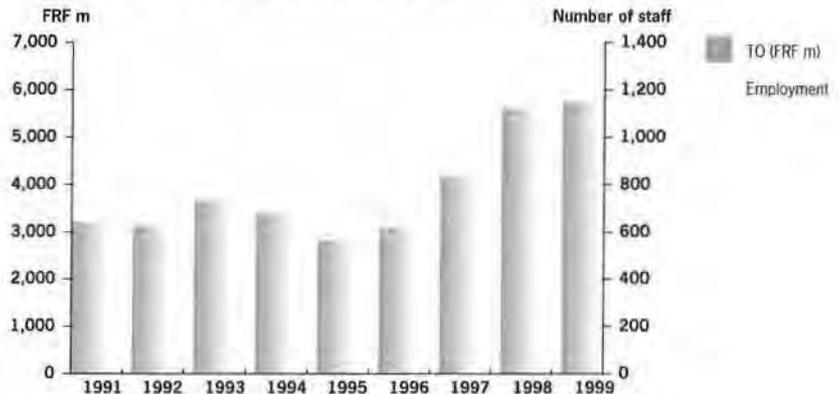
Source: National federation of civil engineering (FNTF).

On the export market in 1998, there was a sharp increase in civil engineering projects on maritime or inland water sites. Most of the work was carried out in the European Union (48%), where the activity more than doubled in one year's time, thanks to the boom on the UK market (which practically tripled in 1998). Construction sites underway in Scotland, at Ardersier and in England at Teeside, mostly explain the growth of this activity in the EU. However, from 1998 to 1999, export sales of maritime and river CE companies registered a decrease of 4% linked to the drop in exports in the EU (-32.5%).

The activity rose by 41.8% in Africa (especially in Angola) compared to 1997. In 1999, Africa represented half of the export trade. However, in the Middle East, maritime and inland water engineering projects were down 24% between 1997 and 1998.

Maritime CE turnover volume and estimated* employment

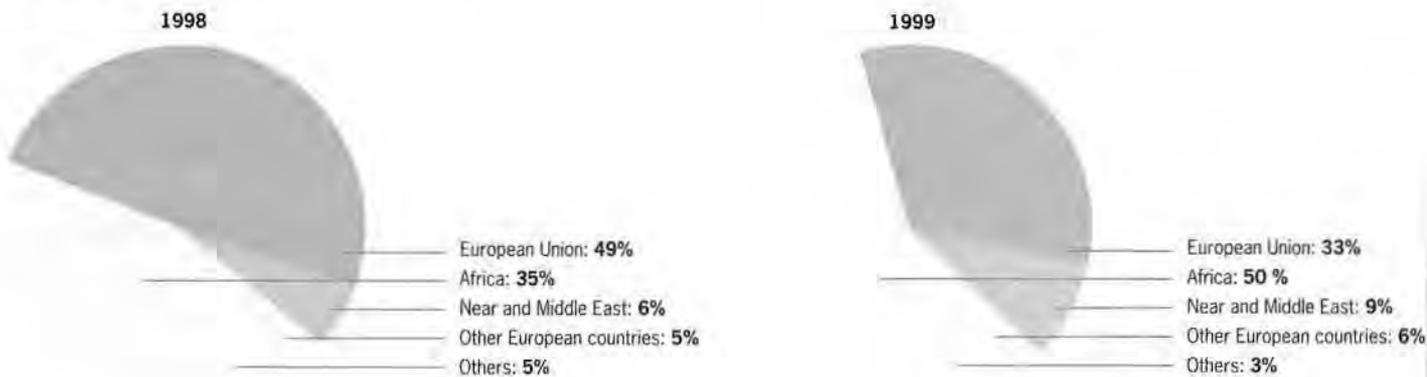
Units: FRF million and number of staff - Source: FNTP



* Ifremer estimations.

Foreign customers for French maritime CE companies

Unit: FRF million - Source: FNTP.



Submarine cables

Underwater telecommunication cables submerged at great depths 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 are also linked to setting up projects and promotion. Figures are not available for all these segments.

How the activity is organised

The first cables used were coaxial. Use of fibre-optics and optically amplified repeaters techniques have made for major advances in cable transmissions.

They have given rise to two types of products:

- 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 over 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:

- feasibility studies: seafloor survey performed by a specialised ship (the cable's lifespan will depend on this), underwater route surveys;
- engineering: protection method, network architecture design (capacities, connections);
- manufacturing the cables;
- laying and maintenance, requiring that cable-laying vessels be used. This can require 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.

Cable use is growing with respect to satellite competition and currently provides most long-distance telecommunications, and all of those linking Europe and North America.

Recent situation and outlook

Until the late 1990s, with the development of telecommunications and the Internet, the submarine fibre-optic cable market underwent significant growth. For manufacturing alone, the world market rose to 9.3 billion dollars in orders accumulated from 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. On the French side, Alcatel Submarine Networks is the leading submarine cable manufacturer worldwide (in volume). It is particularly active in unrepeated systems. In terms of cable-laying, France Télécom grouped its marine activities in early 2000 in the subsidiary called France Télécom Marine.

Of note amongst recent long-haul network orders for submarine cable manufacturers, are:

- a three-ring system between the United States and the United Kingdom;
- a fibre-optic cable link running 7,300 km between the Caribbean and Central and South America. The contract reached over a billion French francs;
- "Sea Me We 3": a fibre-optics cable totalling 39,000 km in length, linking Western Europe to the Far East and Australia via the Mediterranean and the Indian ocean with forty landing points.

Echoes from the industry indicate that current overcapacity in telecommunications equipment will hit all segments of the activity hard. In the short term, it will lead to a sharp downturn in investment projects.

Key figures (manufacturing and laying cables)

	1997	1999	1999 (€ m)	2000	2000 (€ m)
Value added (FRF m)	320	1,520	232	1,770	270
Manpower	1,170	1,597		2,168	

Source: ASN, France Télécom Marine and firmers estimations established after consulting professionals.

Coastal tourism

Coastal tourism covers a wide range of goods and services, with the shared consumer goal of tourist activity in common.

No assessment of tourism turnover is available.

We have evaluated the activity through spending by French (resident) and foreign (non-resident) tourists related to their stay in France.

Spending is thus used here as an estimate of production. Tourist consumption includes expenditures for:

accommodation, catering, recreation, various purchases, food, other services, transportation, packages (all-in 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, value added and employment. It is one of the major sectors of the French tourist economy. However, although it is the top ranking tourist destination, attracting 35.6% of total nights, the coast only accounts for slightly over one quarter (26.8%) in tourist consumption.

Employment

The seaside accounts for about 28% of tourist consumption for non-business stays of domestic and inbound visitors; that ratio is taken to estimate to assess coastal tourist employment. 84% 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. These are indirect and induced employment in shops, transportation, health care, and waste treatment activities in particular.

Trends in activity

In 2000, the activity was expected to encounter difficulties, owing to the *Erika* oil spill, storms and mediocre summer weather. All the same, overall volume progressed by 3.5%, thanks to stable domestic tourism and a sharp rise in the number of inbound visitors. However, the north-western regions (Brittany, Pays de Loire and Lower Normandy) received somewhat fewer visitors, while their numbers rose in the south-east (PACA, Rhône-Alpes) and in ordinarily less busy regions (Picardy, Bourgogne and Franche-Comté).

Tourism remains a seasonal activity, over two to four months a year, depending on tourism zones. From 1999 to 2000, the number of nights spent in the French coastal area rose by 3.1% (to the detriment of other areas), while the number of stays dropped slightly (by 0.3%).

The coast's position as the French's favourite holiday destination is confirmed. This is most of all a summer choice.

Along with mountain and lakeside holidays, French tourists stay longest at the seaside. 62% of stays exceed three nights, as opposed to 45% when all geographical areas are taken together. The coastal area holds the record for average length of stay, with eight nights. Combining all stays, both for business and pleasure, short visits make up 18% of total stays; long visits account for 82%.

In spatial distribution, the seaside ranks third, with 17% of overnight stays from short visits, generating a volume of 23.6 million nights, after the countryside (36.1%) and the city (33.3%) which are respectively number one and two domestic destinations in France. On the other hand, the seaside takes first place for long stays with 33.6% of overnight stays, generating 217.5 million nights.

French 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 taking 32.4% of their overnight visits; they spend more than French tourists (FRF 2,330 per person and per stay on annual average in 1998).

In 2000, the coast accounts for 26.8% of domestic tourist consumption on non-business stays, compared to 38.5% for city stays. 39% of tourist spending taking place at the seaside is done by foreign customers.

The coast totals 31% of French visitor 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.

Key figures

	1995	1996	1997	1998	1999	2000
Tourist spending (FRF m)	105,700	114,300	117,200	119,515	118,862	(18,120 € m) 124,445 (18,972 € m)
Value added (FRF m)*	44,394	48,006	49,224	50,196	49,922	(7,611 € m) 52,267 (7,968 € m)
Employment **	153,048	156,468	167,194	182,826	190,402	196,334

* Value added rate assessed by Ifremer at 42%

** according to provisional estimates by the Tourism administration.

Sources: tourism directorate/tourism accounts (assessments based on 1999/2000 tourism accounts, currently under review), Unedic.

Stays and overnight stays for non-business trips by French tourists, broken down geographically

Unit: %

	Breakdown of stays*			Breakdown of nights*		
	1998	1999	2000	1998	1999	2000
Seaside	26.4	27.6	28.0	38.6	38.9	40.0
Mountains	15.4	15.1	15.1	19.0	19.5	19.2
Countryside	36.8	36.0	34.9	34.0	32.8	31.5
City	33.6	33.4	33.9	26.5	27.1	27.2
Lakeside	4.1	4.0	4.2	5.9	5.1	5.7
Other	2.3	2.3	2.9	2.2	2.3	2.9

* Totals exceed 100%, since several types of area may be visited during the same stay.

Sources: Tourism directorate, Sofres.

Average length of non-business stays by French tourists broken down geographically

Unit: number of nights

	1998	1999	2000
Seaside	8.6	8.2	8.2
Mountains	7.2	7.5	7.4
Countryside	5.4	5.3	5.2
City	4.6	4.7	4.6
Lakeside	8.4	7.3	7.8
Other	5.7	5.8	5.9

Source: tourism directorate, Sofres.

Overnight stays by inbound visitors on non-business stays in 2000 broken down geographically

Unit: %

City	32.4
Seaside	23.5
Countryside	18.0
Mountains	11.1
Several	15.1
Total	100.0

Source: tourism directorate, Sofres.

Breakdown of domestic and inbound visitor consumption in non-business stays broken down geographically

Unit: FRF bn

French	1998	1999	2000
Seaside and lakeside	76.6	72.9	75.3
City	65.1	64.2	64.5
Countryside	56.5	52.3	52.1
Mountains	50.4	47.6	48.8

Foreigners	1998	1999	2000
Seaside	42.9	45.9	49.1
City	99.6	106.2	114.1
Countryside	33.0	35.3	37.8
Mountains	20.0	21.4	22.9

Source: tourism directorate/tourism accounts

The French hotel industry's structure has undergone the same changes seen elsewhere in the world, that is to say, moving towards concentrations of chains and internationalisation. Camping-caravanning is not experiencing the same concentration as the hotel trade.

Tourist capacity as seen through accommodation

45% of French tourist seaside nights rely on paying accommodation, as opposed to 79% for foreign tourists. The types of paying accommodation most used at the seaside are camping-caravanning (51.2% of sites are located on the coast) and rentals.

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

In 2000, 53% of room supply was provided by cities and 19% by the coast. Two-star and three-star hotel rooms respectively account for 53.3% and 22.8% of the seaside supply. Over half (51%) of short stay camping sites are located at the seaside.

Breakdown of rated hotel rooms by tourist area

	1995	1996	1997	1998	1999	2000
City	355,089	352,783	350,102	355,143	305,760	311,308
Seaside	133,702	133,899	130,477	135,497	109,209	109,519
Countryside	78,344	77,681	76,715	73,424	98,765	99,664
Mountains	44,402	43,990	43,589	42,880	69,844	68,683
Total	611,537	608,353	600,883	586,944	583,578	589,174

Sources: tourism directorate, Insee, regional partners.
Note: zoning has changed since 1999.

Breakdown of short-stay campsites by tourist area

	1995	1996	1997	1998	1999	2000
Seaside	420,097	418,603	411,614	403,084	401,128	394,746
Countryside	242,466	238,421	237,558	235,518	234,231	234,164
City	123,847	121,257	119,805	118,989	116,814	115,644
Mountains	32,514	32,195	31,741	30,873	30,701	30,412
Total	818,924	810,476	800,718	788,464	782,874	774,966

Source: tourism directorate, Insee, regional partners.
Note: zoning has changed since 1999.

Tourist spending in the Dom-Tom (French overseas counties and territories)

	Spending (FRF m)	Employment
Guadeloupe (2000)	2,400	20,000
Martinique (2000)	1,700	14,500
Guyane (1996)	310	1,000-2,000
Reunion (2000)	2,100	5,400
New-Caledonia (1998)	1,539	na
French Polynesia (1998)	2,177	na
Mayotte (2000)	60	na
Saint-Pierre et Miquelon (1997)	23	150

na: not available.

Sources: Iedom, Ieorm, Insee

Tourism in the French overseas departments and territories

The latest statistics show that Dom-Tom hotel capacity is nearly 22,000 rooms. The Caribbean makes up 60% of hotel capacity. French overseas locations totalled 1.9 million tourists in 1998. Currently, tourism is a vital activity for the overseas departments, while still hardly developed in the overseas territories (except in New Caledonia and Polynesia). Cruise tourism is developed above all in the Caribbean (cruise area with the most visitors worldwide) and especially in Guadeloupe, where cruise passengers made up nearly two thirds (63.3%) of passenger traffic.

Spotlight on water sports

Sources: CSA, secretary of state for Tourism, Afit-Fin

According to a poll taken by the CSA consultancy, 60% of French people have already practiced a water sport or form of recreation. Water sports generate many induced economic effects: boat building, rental, sale and maintenance, catering on passenger ships, restaurant services, courses (sailing, diving, water skiing), stops (shops and local services), marinas, nautical festivals.

According to a study by Afit, a good marina draws 10 to 100 times more visitors than direct harbour users, who come to "have a look", walk around, stay over and consume.

Pleasure boats

As of 31 August 2000, the registered fleet of pleasure boats officially numbered 788,638 (including 44,891 in the Dom-Tom), broken down as follows:

- 75% under 6 metres in length;
- 21% sailing boats and 74% power boats.

Average age of the French fleet, for vessels over 6 metres, is 16 years.

Boat registrations increase by roughly 20,000 vessels a year.

Marinas

Exclusive of the Dom-Tom, 466 harbours designed to handle pleasure boats have been counted. They were often built between 1965 and 1980, fitted with piers and pontoons, and provide 163,795 moorings, in addition to the individual and collective anchorages found along the coast. The overall occupancy of French marinas is 94% (this includes a rate of 114% in the Dom-Tom).

The French federation of yachting harbours estimates the total turnover for marinas to be roughly FRF 1bn. According to the administration, turnover for the marina sector is FRF 15bn. Nautical tourism generates consumption of FRF 30bn (i.e., about 10% of French coastal tourism consumption). Pleasure boating employs 40,000 staff, in 3,000 enterprises.

Activities and products

In majority, day outings are the norm, with 4 million boaters practising regularly one of three main types of water activities: day fishing, sea outings, recreational sailing.

Cruises only concern 30 to 40% of the fleet over 2 tonnes. Two types of competition are practised: local and regional races (concerning about 10,000 boats) and open sea racing (involving a limited number of participants).

Boat hire has grown significantly as a tourist activity (+10% per year), whether as cruise rentals, chartered boats or day boats. According to a study by the Marketing Office consultancy, 206,000 people rent a boat each year, generating FRF 1,275m in turnover, FRF 275m of which is overseas.

For boat rentals, there are 120 specialised companies accounting for 1,500 boats (making a turnover of FRF 300m). In addition, there is a fleet of professionals (for whom hire is not the main business), and direct rental by private individuals. The total fleet available for hire is probably about 4,000 boats. Nearly 30% of those boats are based in the West Indies.

The average expenditure for boat hire, per week and per person, amounts to FRF 1,500, not including any required crew, fuel or mooring fees. Two geographical centres dominate the market:

- the Mediterranean (40% of contracts);
- southern Brittany (35% of contracts).

In 1998, according to a study by Afit-Fin, 40% of boat hire clients prefer to rent a yacht with skipper. Boating can be enjoyed by all ages and for long periods. Week-long rentals is the key formula in the market.

In France, some 853,000 people are members of a water sports federation, active in 8,140 clubs for all sports, and 9 million people practice water activities. The main water activities are:

- small craft sailing: 75,000 members (in 1,400 clubs) and 110,000 members in sailing schools;
- deep sea diving: 154,000 membership card-holders;
- swimming: 150,000 members;
- windsurfing: 15,000 card-holders, for 400,000 enthusiasts (FRF 600m in TO);
- game fishing: 1 million fishermen;
- miscellaneous: surfing (100,000 surfers, 150 world competitions), water skiing, canoeing, kayak, speedboat racing (motorboats and inflatable dinghies), jet ski, fly-surf, rowing, speed-sailing.

Summer coastal tourism: a survey on the regional breakdown of consumption

A survey was made in 1999 and 2000 for Ifremer by the Sofres on summer seaside tourism consumption, in order to obtain a breakdown by region. It was worth regionalising the data, since local studies remain isolated and hard to harmonise on a national scope.

Two consecutive studies by the Sofres focused on expenditure for all French stays of at least one night away from home, and were conducted on the metropolitan French seaboard in July-August-September of the years 1999 and 2000. Only non-business, tourist visits were considered. The seaside is a highly seasonal destination. The months of July and August are quite representative of coastal tourism. In those two

months, about half of the annual visitors are received. The Sofres grouped regions when necessary to obtain significant figures.

The study, based on a sample of tourists surveyed, out of the French population, aged 15 or over. Therefore, the study was built to exclude the under-15s and any foreign residents. A brief summary of the study follows.

In the summer of 2000, tourist spending reached nearly FRF 35.18bn compared to FRF 35.24bn in the summer of 1999.

Regional breakdown of nights and expenditures

In 2000, the number of nights varied from 1 to 2.5 from one region to another, and the total spending from 1 to 2.6. The Pays-de-Loire/Poitou-Charente set came first for coastal destinations with 22.2% of overnight stays, fol-

lowed by Languedoc-Roussillon and Brittany. The Channel coast, not including Brittany, with 9% of nights, is mainly a near-by destination for short-stays.

Average expenditure per night

44% of tourist consumption takes place on the Mediterranean coast, of which 26% in the regions of Provence-Alpes-Côte d'Azur and Corsica. The Atlantic coast totals 31% of tourist consumption and Brittany 17%.

In 2000, the greatest expenditure per night was 309 F for Provence-Alpes-Côte d'Azur and Corsica. This high specificity is mainly attributable to accommodation and the round trip. It is the top region on the French coast in terms of tourist generated spending, thanks to large visitor numbers and average spending which is higher than elsewhere. The lowest expenditure is found in Aquitaine (FRF 253) and Brittany

(FRF 255). For all regions, the consumption items vary within a narrow range. The relative budget distribution is stable from one region to another, with a few exceptions.

Not including all-in packages, accommodation is the most expensive item (26% of spending) in the consumption structure.

If spending done in the *Erika* zone is compared during the summers of 1999 and 2000, whether for total expenditure or per night, a small variation is observed. In fact, that holds true for all the coastal regions. It is difficult to determine whether the stability reflects the true situation or rather the panel polling method used.

To shed light on this point, here is the report on a very different type of study, concerning the impacts of the *Erika* oil spill on hotel occupancy in the area affected.

Regional distribution of nights, total expenditure and average expenditure per night in 2000

	Total nights (million nights)	Total expenditure ('000 FRF)	Average expenditure per night (FRF)
Picardie, Lower Normandie, Upper Normandie, Nord-Pas-de-Calais	16.6	2,775.6	167.1
Pays-de-la-Loire, Poitou-Charentes	41.0	7,216.5	176.1
Brittany	33.6	5,972.6	177.8
Aquitaine	19.9	3,701.5	185.7
Languedoc-Roussillon	33.6	6,286.4	187.1
Provence-Alps-Côte d'Azur, Corsica	39.9	9,182.0	230.3
<i>Erika</i> *	63.7	11,335.2	178.0
Total French coast	184.4	35,134.6	190.6

* The five counties hit by the *Erika* oil spill. This line tallies with the group of regions: it should not be added to the other lines.

Source: Sofres.

Average expenditure per night according to expense items for all stays in 2000 - Units: FRF and %

	All-in package	Accommodation	Meals	Personal leisure activité	Consumers goods	Food shopping	Round journey	Trips	Total not including packages
Picardie, Lower Normandie, Upper Normandie, Nord-Pas-de-Calais	256	61	54	31	76	37	22	11	292
Pays-de-la-Loire, Poitou-Charentes	221	73	40	34	55	37	20	9	268
Brittany	335	66	40	28	57	32	24	9	256
Aquitaine	209	63	40	26	56	32	25	11	253
Languedoc-Roussillon	163	68	44	30	53	33	24	9	261
Provence-Alps-Côte d'Azur, Corsica	275	78	45	37	60	32	43	14	309
<i>Erika</i>	258	70	39	32	55	36	21	9	262
Total for France	240	70	43	31	57	34	27	11	273
Total for France: expenditure distribution, not including all-in packages (%)		26	16	11	21	12	10	4	100

Source: Sofres.

The impact of the Erika spill on hotel activity

Source: Insee, Tourism Directorate, regional partners (2001). Visitor number survey in the rated hotel trade and open air hotel trade. Variations from 1999 to 2000.

A survey was made to measure the impact of the Erika oil spill on the rated hotel trade and open-air hostelry, located in the coastal zone, particularly in five counties of western France: Finistère, Morbihan, Loire-Atlantique, Vendée and Charente-Maritime. The following results are taken from that study.

Rated hotels

The five counties contained nearly 10,300,000 hotel rooms in 2000 (slight variation with respect to 1999). Rooms are most numerous in the Loire-Atlantique county as well as being situated less often in the coastal area. On average, hotel rooms in the five counties are mainly (65%) located in the coastal zone. This distribution is identical to that of 1999.

Impact on the occupancy rate

Following the oil spill in December 1999, the occupancy rate of hotel rooms in the coastal area did not drop much from 1999 to 2000. The decrease went from 0.6% (in Vendée) to 2.5% (in Loire-Atlantique). In the Finistère, the rate even rose slightly (+0.1%). However, there is a difference between the hotel trade inland from the coast and that on the seaside, the latter being much more affected.

Impact on stays

In the coastal area, the total number of hotel nights dropped by 4.9% overall between 1999 and 2000 (going from 8.8 million to 8.4 million nights). The phenomenon was above all observed for foreign customers (-13.7% of nights), while French customers changed their behaviour less, in proportion (-3.2% of nights).

Variation in number of nights from 1999 to 2000

Unit: %

	French tourists inland zones	Foreign tourists inland zones	French tourists coastal zones	Foreign tourists coastal zones
Charente-Maritime	7.3	-0.1	-3	-8.8
Finistère	11.6	-50.3	0	-11.8
Loire-Atlantique	-5.1	-3.7	-11.5	-17
Morbihan	-1.5	-29.6	-5	-17
Vendée	2.4	3.3	-4.1	-16.9
Total 5 counties	-1.2	-13.2	-4.2	-13.8

The drop in foreign visitor numbers was sharpest above all in the counties of Morbihan, Loire-Atlantique and Vendée.

Camping sites

In 2000, campsites in the five counties recorded nearly 18 million overnight stays, including 16.5 million in the coastal zone (i.e., 91% of nights).

The nights are unequally distributed over the 5 counties. There were more in Charente-Maritime (32%) and in Vendée (30.6%). The Loire-Atlantique is the county with the lowest number of overnight stays (8% of total nights). French customers are much more numerous (79% of nights) than foreign visitors (21%).

From 1999 to 2000, the total number of nights for the 5 counties dropped by 18.7%. On coastal areas the decrease in the number of nights was significant in all counties except that of Charente-Maritime, with only -13.7%. It was the greatest in Loire Atlantique (-29.1%), followed by the Morbihan (-23.9%).

Overall, from 1999 to 2000, the drop in visitor numbers was much higher for foreigners (-28.5%) than for the French (-16%).

Trends in number of nights at camping sites per type of customers, from 1999 to 2000

Unit: %

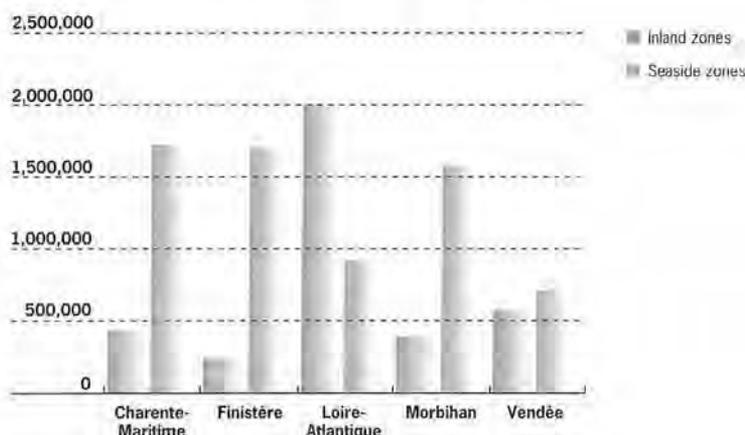
	French tourists	Foreign tourists
Charente-Maritime	-13.3	-12.7
Finistère	-10.9	-36.3
Loire-Atlantique	-26.9	-27.8
Morbihan	-21.2	-37.3
Vendée	-14	-28.1

Trends in occupancy rate for hotels in the coastal area, by county, from 1999 to 2000

Unit: differential for occupancy rate from 1999 to 2000

	Seaside zones	Inland zones
Charente-Maritime	-1.6	4.9
Finistère	-1	1.3
Loire-Atlantique	-5.7	-3.6
Morbihan	-6	-3.5
Vendée	-3.8	1.6

Number of hotel rooms per county in 2000



Shipping

Shipping includes fleet and sea port activities. For the merchant Navy, the activities considered are goods transport and passenger traffic. Inland shipping is not included. The sector of maritime harbours includes operations and general organisation of harbours as well as other auxiliary services activities.

Merchant Navy

The French shipping

As of 1st January 2001, the French fleet ranked 24th worldwide in deadweight (for vessels exceeding 1,000 grt), compared to ranking tenth in the 70s and fifth in the 60s. In some specialised niches, it remains amongst the top ranking fleets: ocean and seismic research, laying and maintenance of undersea telecommuni-

cation cables, underwater engineering, drilling, provision of supplies to offshore platforms.

After ten years of stable figures, ranging from about 205 to 210 ships, a hundred of which were registered in the Kerguelen, the French fleet increased to 206 vessels flying the French flag as of 1st January 2001. The maritime investment policy undertaken in 1996 with the tax deduction scheme (called *quirats*), has been replaced by the EIG tax arrangement: since the law of 2 July 1998 came into force, 41 vessels

Key figures

Units: FRF million and number of staff

	1995	1996	1997	1998	1999	
Production ⁽¹⁾	25,915.9	25,856.8	27,285.4	25,347.0	25,648.6	(3,910.1 € m)
Value added ⁽²⁾	3,184.2	3,273.9	3,595.8	4,028.6	4,088.7	(623.3 € m)
Jobs ⁽³⁾	10,837	10,447	11,422	11,494	11,574	
Companies	175	193	207	368	388	

(1) Turnover + stocks + capitalised production costs Sub-contracting included.

(2) Gross value added, including subsidies.

(3) Salaried and non-salaried staff.

Source: Transport Ministry.

Vessels* belonging to French shipowners as of 1 January 2000

Types of vessel	French flag		Others flags ⁽³⁾	
	Number	dwt ⁽¹⁾	Number	dwt ⁽¹⁾
Liners	5	8,319	0	0
Ferries	42	88,462	9	14,438
Passenger launches	1	155	0	0
Cargo-ships	54	183,805	13	128,965
Container ships	13	501,379	17	421,751
Reefers	0	0	8	49,340
Dry bulk carriers	11	1,153,523	7	526,412
Oil and wine tankers	4	26,186	2	10,650
Chimiquiers	5	27,030	0	0
Coasters < 500 grt ⁽²⁾	6	2,547	0	0
Others cargo-ships	5	15,395	0	0
Oil tankers	55	4,170,935	14	129,403
Gas tankers	9	296,711	4	25,479
Total	210	6,474,447	74	1,306,438

*Vessels of over 100grt.

(1) dwt: deadweight tonnage (see glossary)

(2) grt: gross registered tonnage (see glossary).

(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 150 vessels flying third-country flags is directly or indirectly controlled by French shipowners.

Source: Transport Ministry.

(26 in 1999 and 16 in 2000) have entered the French fleet, making FRF 8,530 million in total investments.

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). The average age of the French deep sea oil fleet went from 15.9 years in 2000 to 13.3 years on 1 January 2001. Amongst the sixteen entering ships recorded in 2000, seven were oil tankers (five new builds over 300,000 tonnes deadweight and two temporarily registering as French).

Crews are becoming smaller all over the world. From 1965 to 1970, a ship's crew ranged from 35 to 40 men; 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 make up nearly two-thirds of jobs.

International goods transport

Approximately 70,000 vessels are used worldwide, half of which are oil tankers. Ships are getting larger: in late 1999, there were 38,500 ships over 100 dwt with a carrying capacity of 799 million grt.

Today out of twenty international shipowners, ten are Asian, eight European (only one of which is French) and two are American. These twenty shipping companies make up 45% of world transport capacity. In tonnage, the top world ranks are held by the fleet of Panama (18.5% of world tonnage) and that of Liberia (11.4% of world tonnage).

There are four kinds of traffic:

- bulk liquids (oil products, gas, chemical products, liquid foodstuffs);
- dry bulk (coal, ore, fertilizer, grains, animal feed);
- various cargoes (ro-ro traffic, timber, foodstuffs, metallurgical products); increasingly containerised;
- passengers (people carried by ferries, liners or launches).

Definitions

Flags of convenience or open registry: flags freely granted by some States, such as Liberia and Panama, with advantages for shipowners (lower tax and social contribution costs), but which do not create a substantial link between the flagship and the flag state.

Second registry: flagships from certain states can registry on a specific registry depending on the administrative independence of the registry's location.

There are six registries in France:

- The metropolitan registry, also applicable to French overseas departments, prohibits seafarers who are not from the European economic space being taken on-board; social regulations under this registry are governed by a special code of law, the maritime labour laws, which supplement certain collective labour agreements. Vessel safety regulations applied are the same for all French registries.
- The French southern and Antarctic lands (Taaf) registry, also called the Kerguelen registry: this registry is subject to different laws than those applicable to the metropolitan registry. It makes French shipping more competitive in terms of wages and contribution costs. Shipowners can hire foreign personnel provided that 35% of the crew, including officers, are French (see article 26 of law n°96-151 dated 26 February 1996 concerning transport; decree n° 97-243 dated 14 March 1997 taken for its application).
- The registries of New Caledonia, and Wallis and Futuna have different registration rules than those for the metropolitan and Taaf registries. Social relations are governed by the overseas labour laws.
- Those of French Polynesia and Mayotte have an additional degree of particularity, since social regulations are defined locally.

Merchant navy personnel sea going*

Situation as of 31 December

	1980	1985	1990	1995	1998	1999
Officers**	5,531	4,067	2,795	2,848	2,754	2,806
Ratings	9,555	6,649	3,565	3,492	3,388	3,169
Total	15,086	10,716	6,360	6,340	6,142	5,975

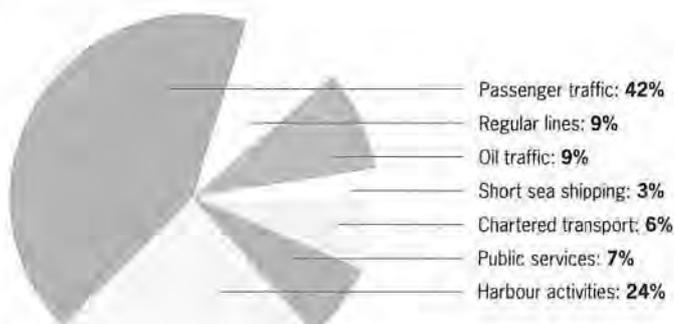
* Including towing, pilotage and pleasure boating. Embarked crew only

** Staff not in the hierarchy have been put in the "officers" category.

Source: Transport Ministry.

Manpower* broken down by type of activity as of 31 December 1999

Source: Transport Ministry



* From a total of 9,522 people.

Over three-quarters of world trade use maritime and inland waters transport. Maritime traffic alone, involved the carriage of 5.23 billion tonnes of cargo in 2000. Since 1980, most maritime exchanges have grown (+5% in volume annually, according to the CCAF). Continuing growth of world maritime traffic is forecast, seeing the internationalisation of exchanges and progressive opening of new countries to the market economy (China, Africa).

The French fleet and cargo traffic

In the main, the merchant navy flying the French flag is no longer among the world leaders. The same is true of most major countries, whose owned fleets are on average, held for approximately 50% under non national flags. The fleet owned by French ship companies is also small, although France is the fourth largest exporter and importer worldwide in terms of freight value. In 2000, 56% of total French imports and 38% of total French exports, in volume, were transported by sea.

The maritime mode clearly predominates in France's international exchanges, in terms of tonnage. This is not true in terms of value, due to increasing road traffic for intra-European trade. Outside of the European Union, in tonnage, about three-quarters of imports and exports are made by sea, making approximately one third in value.

Cross trade's share is outstripping that of traffic to or from France for the three main components: liquid bulk, solid (or dry) bulk, various internationally shipped general cargoes. Cargoes of oil and gas (especially cargoes imported and for cross trade), as well as general cargo traffic (especially export cargoes) compose the main part of French shipowners' maritime traffic.

The distinction is made, for maritime cargo traffic, between:

- regularly scheduled lines (mainly for general cargo),
- chartered traffic (mainly for liquid and solid bulk cargoes).

Container ships

Shipping containers by sea has become an essential element of international trade and is undergoing significant expansion. The number of containers handled was multiplied by 2.3 between 1990 and 1999. Container traffic increased at an annual rate of 8 to 9% from 1992-1999, and reached 11% of maritime shipping in volume in 1997. This freight provides shippers with strategic services in terms of regularity, frequency and transit times, for prices which have become very low.

To enhance competitiveness, cost-effectiveness of vessels and container management, shipowners are creating technical "alliances" to share ship capacity and the choice of calls, or sometimes merging. They must now offer end-to-end services, including other transport modes.

The trend is toward bigger container-ships. At the start of the nineties, container-ships measuring 6,000 TEUs and more, called post-Panamax vessels, came into use. Such large vessels make it necessary to manage calls in port differently.

- large spaces available to store and move containers;
- computerized stock management, loading plans and in-out movements of containers;
- handling equipment adapted to ships' size and potential loading and discharging rates;
- increasingly smaller and more skilled labour force;
- development of feeder, i.e., conveying containers by linking main ports called hubs to secondary ports via container ships (feeder vessels) which are generally smaller than ships plying intercontinental waters.

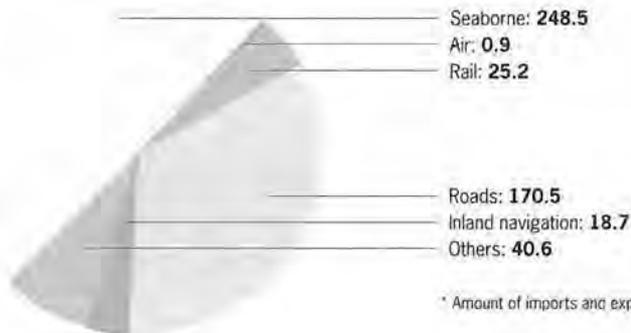
In Singapore, the most modern container transfer terminals in the world are entirely run by an expert system. The three main European ports for container transit are Rotterdam, handling over 6 million containers, followed by Hamburg and Antwerp, each processing half this number. In France, mainly Marseilles and Le Havre are concerned.

The world container-ship fleet has increased two-fold over the past seven years, in terms of TEU capacity; as of 31 December 2000, there were 2,755 container-ships with a capacity of 4.9 million TEUs. In 2000, 139 container-ships (426,000 TEUs) were delivered. While the vessel size distribution has balanced out, the order book has filled up: as of 31 December 2000, orders had been placed for 306 cellular container-ships, for an additional capacity of one million TEU.

In 2000, France had thirty container-ships (1.1% of world capacity), over half of which were flying other flags.

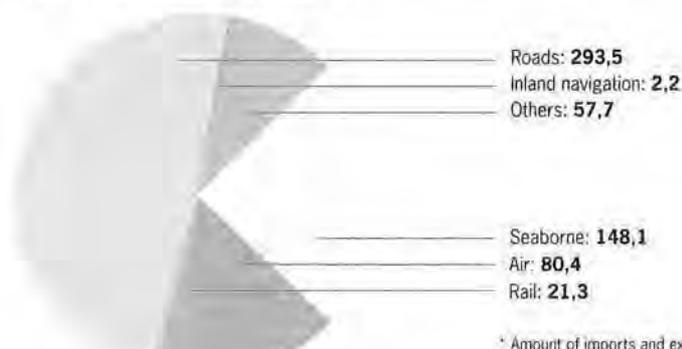
Breakdown in volume of France's foreign trade* by transport mode in 2000

Unit: million tonnes - Source: Transport Ministry



Modal breakdown in value of French foreign trade* in 2000

Unit: FRF bn - Source: Transport Ministry



French shipowners activity, regardless of flag and not including national short-sea shipping

Unit: '000 tonnes

	1996	1997	1998	1999
Imports	17,384	20,133	18,371	21,926
Exports	6,664	7,273	6,316	8,212
Cross trade *	63,191	68,763	67,937	70,842
Total	87,239	96,169	92,624	100,980

* Selling transport services to non-residents.

Source: Central Committee of French Shipowners.

Liner service: general cargo

Ocean-going or international short-sea shipping lines are specialised in carrying general cargo, approximately two thirds of which is containerised. Liner companies carry cargo on the basis of publicly available, predetermined schedules, routes, ports and tariffs.

In France, the overall stability of general cargo traffic in 2000 (88.8 Mt) is the joint outcome of a sharp rise in containerised traffic (25.6Mt, +7.3%) and a decline in non-containerised traffic, especially cross-Channel freight (41.1Mt, -5.7%), decreasing at Calais by 10.5% (especially due to the competition from Eurotunnel). This is a volume of 30.6m tonnes for the port of Calais alone (71% of general cargo of non-autonomous harbours). This trend conceals a sustained progression in the volumes handled by autonomous ports (+10.3%), i.e., 43 million tonnes and nearly half the general cargo processed by French ports. Within this category, containerised traffic handled by autonomous ports (especially Le Havre and Marseilles) make up almost all containerised volume handled by French ports. This activity is growing.

Chartered transport: liquid and dry bulk cargoes

• Liquid bulk

Liquid bulk traffic (crude oil, refined petroleum products, chemical products, gas, foodstuffs) are highly unstable in nature. Transport or chartering costs are subject to cyclical investments in ships and shipbuilding, as well as seasonal aspects of demand and stocking-inventory run-down.

For a secure energy supply, the French law of 31 December 1992 requires that national crude oil carriage by sea be capable of being effected in part by ships registered in France (art 6, law n°92-1443 dated 31/12/92). When Europe liberalised the short-sea shipping of oil on 1 January 1997, few problems arose, seeing the small proportion of this traffic in companies' activities and the fact that the event was well prepared in advance.

As concerns liquid bulk cargoes, French shipping owns 15 vessels flying the French flag and operates on a permanent basis about the same number of vessels under other flags. Each year French companies transport nearly 40 Mt of bulk liquids, two thirds of which are carried between foreign countries. The French port with the largest liquid bulk cargo traffic is Marseilles (65.1 Mt in 2000).

Growth of volumes handled in French harbours in 2000 was greatly due to healthy liquid bulk traffic. Their volume increased by 6.2% with the rise in petroleum product traffic (95% of this volume goes through autonomous ports).

• Dry bulk cargoes

Dry bulk traffic mainly involves ores, coal and grain. It is dependent on variations in industrial activity, seasonal fluctuations and European and international agricultural policies.

In France, dry bulk tonnages handled totalled 87.6 million tonnes and were up +4.1% between 1999 and 2000. French shipowners are less involved on the medium weight market, but are very active on the short-sea small tonnage links in Europe and the Mediterranean and on large tonnage (150,000 tonnes and over) transoceanic traffic. On the large vessel market, one world class French group operates seven French ships of nearly 170,000 tonnes. Over all, France has some sixty vessels which ply on demand the major international traffic linked to production areas.

The French fleet and passenger traffic

In 2000, the number of passengers in major French sea ports (27.7 million) dropped by 6.4% from 1999, mainly due to the competition from Eurotunnel and the disappearance of duty-free sales. The only exception: Dunkirk, where cross-Channel traffic is picking up.

Car ferries

The generic name of ferries comprises all types of ships transporting passengers, vehicles and

goods, on short, regular lines. There is a special type of roll on-roll off vessel which is well adapted to their round trip services. Today they tend to offer services similar to those of sea cruises.

Twenty-eight large capacity car-ferries flying the French flag (for three-quarters of them) run on the Channel and Mediterranean lines (towards Corsica or North Africa). The short sea sector provides a quarter of turnover for French shipping and employs 40% of French sea-going staff. In the Mediterranean, fast ships reaching speeds of 40 knots (75 km/h) have modified the market, especially for Corsica, less than three hours away via HSC (high speed craft).

Cross-Channel traffic is the leading world market for sea crossings, with 20.6 million passengers carried in 2000 down by 4 million from 1998 involving French ports. French shipping ensures a large share of this traffic: 24% of passengers, 31% of their vehicles and 37% of lorries. When the Channel Tunnel opened in 1994, competition became keener between various European operators. In 2000, the Eurostar carried 7.1 million passengers (a rise of 8% from 1999), and the Eurotunnel shuttles carried 2.8 million cars, 80,000 coaches and 1.8 million lorries, and enabled the carriage of 2.9 Mt of freight (that makes 60% of the tourist market share and 48% of the freight market for the first semester of 2001).

Sea cruises

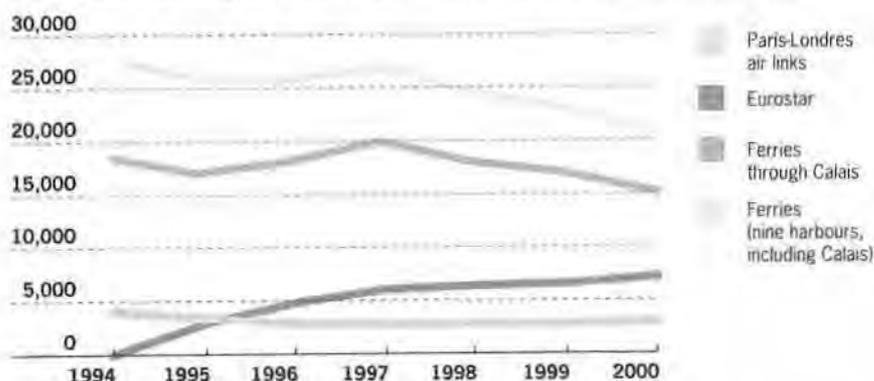
The cruise market has shown constant growth over the past few years (see above: Ship building): 8% on average worldwide; 18% in the United States from 1999 to 2000, according to the Cruise Lines International Association (Cia). The total number of cruise passengers went from 4.4 million in 1990 to 8 million in 1999. There are five cruise ships in the French fleet.

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, and it is estimated that this will increase. The Central Committee of French Shipowners (CCAF) forecasts 11 million passengers in 2005 and 14 million in 2010. Worldwide, the cruise market is assessed at over 50 billion dollars, i.e., 9.5 million cruise passengers yearly. The greater capacity new vessels delivered have enabled prices to stabilise. The question raised by this market is related to the potential impact of the current economic slowdown on cruise demand.

As for the French market, comparable growth has been recorded over the past decade. According to the CCAF, it increased by 90% between 1992 and 1999. After long favouring the Caribbean, cruises are developing greatly in

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

Unit: number of passengers - Source: Transport Ministry, Eurotunnel, SNCF (French National Railway utility)



Europe, especially in the Mediterranean, French shipowners are offering large luxury liners (over 2,000 passengers), medium-sized vessels (from 300 to 1,200 passengers) and sail-powered liners (from 30 to 60 cabins).

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) represented 10.0 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 FRF 400m (61 EURm).

In 2000, overseas passenger traffic remained stable overall, which conceals some highly contrasting trends: the rise in traffic for Guadeloupe (+ 9.9%) compensates for the drop in traffic for Martinique (- 10.8%).

Maritime harbours

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

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.

Turnover and value added data given here have been supplied by the port authorities of autonomous ports and ports of national interest.

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.

In 2000, autonomous ports generated about three-quarters of turnover, value added and investments for all ports and received almost all the operational assistance available.

French harbour traffic is characterised by the structural prevalence of liquid bulk cargoes (especially oil) which make up half of the throughput (49%) and by the predominance of PAs among the harbour structures, ensuring 79% of total traffic. Traffic in PINs fell by 4.5% in 2000, due in particular to drops recorded for Calais, Cherbourg, Brest and Bayonne.

Various port-related professions and services

This section accounts for direct employment linked to harbours, involving a labour force of slightly over 39,000 people. There is an extremely wide range of port professions and services. These include not only the port authority functions but also the auxiliary professions linked to vessels and to goods.

Public operators

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

The public authority, i. e., State services, ensure harbour police services, security, maintain and operate the basic port facilities, 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 shipping at sea and when approaching the coast, and to help rescue people and property; the harbour police, Customs services.

Key figures of port authorities

Unit: FRF m.

	1995	1996	1997	1998	1999	1999 (€ m)	2000	2000 (€ m)
Turnover of autonomous ports	3,080	3,212	3,255	3,426	3,389	516.6	3,463	527.9
Turnover of ports of national interest	1,624	1,659	1,781	1,819	1,791	273.0	1,743	265.7
PA and PIN value added	3,566	3,631	3,763	3,910	3,862	588.8	3,884	592.1

Source: Transport Ministry

Direct harbour employment in 2000 (metropolitan France and overseas)

	PA	PIN	Total State harbours
Port authority personnel ⁽¹⁾	6,510	3,407	9,917
Customs	528	382	910
Stevedores paid monthly and active contract workers	3,384	970	4,354
Other harbour professions ⁽²⁾	19,195	4,778	23,973
including: Pilotage ^{(3) (4)}	532	177	709
Boatage ⁽³⁾	333	376	709
Towing ⁽⁴⁾	791	221	1,012
Total	29,617	9,537	39,154

(1) Jobs related to State services (not including Customs), to autonomous ports and to contracts granted to chambers of commerce and industry.

(2) Pilotage, towing, boatage, handling (not including stevedores), shipping companies, shipping agencies, brokerage, transit.

(3) Estimations for 2000.

(4) Including 348 pilots in 2000.

Source: Transport Ministry, based on information supplied by autonomous ports, shipping services and Custom's 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.

Dredging in harbours under State jurisdiction

In harbour maintenance and development tasks, dredging plays a special role. Firstly, it is often a major part of harbour development operations. Secondly, the nautical specifications of vessels which may use the port depend on it. Therefore, the activity is vital for harbour operations. Dredging for maintenance purposes is most widely done in estuarine harbours.

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

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. Work is generally done by direct contract, using equipment commissioned by harbour authorities. The dredgers belong to the firm Dragages-Ports, set up in 1979 between the State and metropolitan maritime PAs. Since its creation, Dragages-Ports has implemented a new-build programme costing some FRF 800m, 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.

The crew aboard dredgers is mainly composed of seamen. These regular maintenance dredging operations are performed by port authority staff. Some ports occasionally subcontract to other ports or, as Dragages-Ports may do itself, to private enterprises.

As for creating new channels and fairways, this is an occasional activity, done by private firms (often foreign), whose port authorities are the main contractors.

Upgrading of equipment is continuing from 2000, when Dragages-Ports set up a dredging development scheme stating an investment plan of 1.2 billion French francs for the next ten years. The first step of this programme deals with building two large suction dredges, with hopper capacities of 8,000 and 8,500 m³. These two pieces of equipment (the largest dredges ever built for French ports) are being built in the Izar shipyards in Gijon, Spain, and will be delivered in 2002.

At the programme's outcome, the number of equipment in the public dredging fleet will be reduced to a dozen. Each element of the new fleet will be much more productive than the current dredges. A corollary to this trend is that each harbour will no longer have its own equipment available: the equipment fleet will have to be operated in common. Dragages-Ports is setting up the new terms for operation with the various ports.

Another major concern is the environmental impact of dredging. A major effort has been undertaken over the past few years to improve understanding of the phenomena involved, monitor the situation in the field more accurately and pertinently, take part in required changes of national and international regulations on these issues, and disseminate knowledge to the services concerned.

Volumes dredged annually in State ports

Unit: million m³

	Sand	Silt	Total
Estuary harbours	6.50	18.60	25.10
Coastal harbours	1.20	5.00	6.20
Total	7.70	23.60	31.30

Source: Dragages-Ports.

Dredging activity indicators in France

Units: '000 FRF and number of staff

	1997	1998	1999 ('000 €)	2000 ('000 €)
Operating cost of public equipment fleet*	355,544	361,385	376,800	382,285
Subcontracting to companies**	15,706	25,854	24,472	34,398
Seaman harbour staff (dredging, hydrography, safety)***	676	653	655	638

* Rental of machines belonging to Dragages-Ports + seamen's salaries (port personnel) + stores and misc. expenses for equipment covered by ports. A very large part of these costs involve maintenance work.

** Private companies, mainly for new work, a minority of maintenance work.

*** Including 440 dredging staff in 2000.

Source: Dragages-Ports.

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 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 latter has kept some provisions of the law of 28 March 1928. 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's station is a mainly regulatory structure which marks the existence and the organisation of the public pilotage service in a demarcated zone. It is managed by the pilots' union, the property required to perform the service belong to the pilots' group.

The pilot stations are created by order of the ministry in charge of sea ports. Today in France (including metropolitan France, the overseas counties, and Saint-Pierre-et-Miquelon) there are thirty pilot stations. They are organised on the basis of local regulations established on order of the regional prefect after consulting the commercial assembly, now composed of members with voting powers (representing users, port authorities, shipowners and pilots) and representatives of the administrations in an advisory capacity. Local regulations set the limits of the zone where pilotage is compulsory, the number of pilots, what property the station holds and the pilotage dues. A decision by the local State authority sets the minimum size of ships for which pilotage is compulsory and the conditions under which master pilot licences are issued.

Legally speaking, pilots perform commercial services which are paid for by the users. Dues are submitted to the commercial pilotage assembly, before being approved by local State authorities to be decided on by prefectorial order, thus making them part of local regulations.

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. There are towage companies in almost every French port. They receive official approval to exercise their activity, issued by the local port authority. 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.

Just like towing, boatage is an optional commercial service under private contract, is subject to approval by the port authority both for personnel and equipment. Contrary to pilotage dues, boatage dues are freely set, since the ruling of 1986.

The chartered shipbroker (or cargo broker) is a middleman who brings together a shipper and a shipping company in order to draw up a charter party.

The ship's consignee is the shipping company's salaried agent, in charge of receiving and delivering goods on behalf of the shipowner and organising the vessel's call in port.

The shipping agent represents a shipowner. He helps the ship's master by setting up freight quotations and issuing bills of lading on behalf of his company.

The interpreting broker and ship conductor is an administrative officer holding a monopoly position to take certain vessels to Customs. This responsibility is evolving to become freely accessible.

The overall VA for pilotage-towage-boatage was approximately FRF 1,090m for 1999 (Ifremer hypothesis based on Transport Ministry's data), making EUR 165m.

Auxiliary professions related to cargo

The forwarding agent is a specialised middleman, ensuring the link between two modes of transportation in compliance with the instructions he has been given.

The freight forwarder is a professional middleman who undertakes to have goods transported under his own responsibility and in his own name, on behalf of a customer, having free choice of the mode of transport and the carrier company used.

The Customs broker carries out customs formalities concerning the cargo on behalf of his customer.

The goods broker purchases and sells the products traded.

The cargo consignee is an agent charged with taking delivery of the goods on behalf of the destined recipient.

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 solutions.

The profession is regulated by the law of 9 June 1992 and decrees of 12 October 1992. Stevedores are mainly paid by monthly salaries in handling companies. The previous system of contract work is now an exception.

Key figures for some services to vessels: 1999 estimations

	Pilotage	Towing	Boatage
TO (FRF million)	600	750	355
TO (€ million)	92	114	54
Manpower	730	1,050	720

Source: Transport Ministry.

Key figures for port handling operations

	1995	1996	1997	1998	1999
Production (FRF m)	4,342	4,537	4,750	5,453	5,119
Value added (FRF m)	1,921	1,933	1,962	2,162	2,101
Employment*	5,724	5,766	5,130	5,193	5,279
Companies	128	125	134	127	124

* Salaried and non-salaried staff.

Source: Transport Ministry.

French port traffic and the international context

In 2000, Rotterdam ousted Singapore as world leader with total traffic of 323 Mt, of which 135 m were oil imports. Rotterdam alone handled as much traffic as all French ports taken together.

On a global scale, port development is highly influenced by that of containerised cargo traffic. The flows are more and more concentrated through hubs, which requires good connections to land networks and a feeder system. This type of traffic requires digging new fairways into harbours, lengthening wharfs and quays and ensuring better rail-road-river service to the hinterland. Development of short sea shipping lines has been fostered by ro-ro techniques (transporting vehicles and containers).

In 2000, Hong-Kong and Singapore, with 16 million TEUs each, and Kaoshiung (Taiwan) far behind, were the three leading container ports in the world. The top two French ports are Le Havre, 34th, and Marseilles 65th.

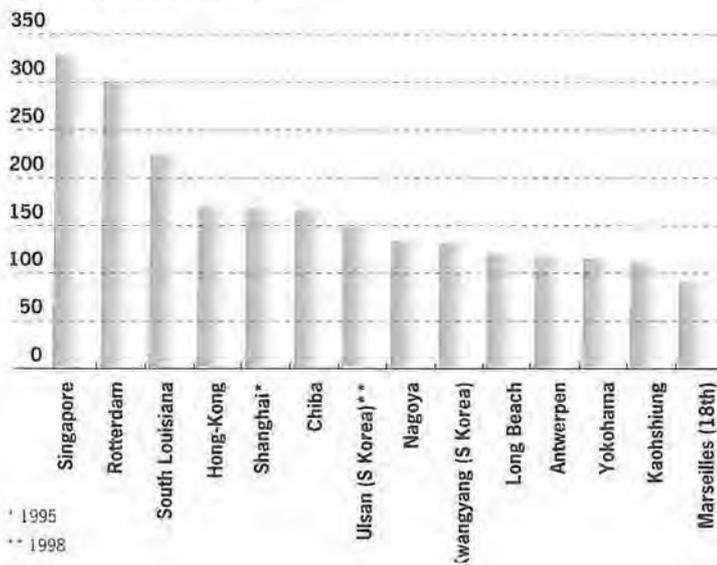
In Europe, development of seaborne traffic is much stronger on the northern seafront, with Rotterdam, Antwerp, Breme-Bremerhaven and Hamburg.

As concerns French port traffic, there is a prevalence of liquid bulk traffic: approximately 50% of total traffic, as opposed to 25% for dry bulk and 25% for general cargo. More than 90% of this is handled by PAs. This specificity means that French ports' activity overall is sensitive to the oil market's climate. Growth of 4% was seen in 2000 after a break in 1999 due to a drop in oil product traffic. Dry bulk and general cargo progressed regularly until 2000.

In 2000, total traffic reached 346.4 million tonnes (Mt), an increase of 4.0% from the year 1999. Traffic through autonomous ports (271 Mt) rose by 6.5%, while that of other ports (75Mt) dropped by 1.4%.

Total traffic of top world ports in 1999

Unité: '000 tonnes - Source: ISL (2000)



Economic situation for the main French ports

The main French ports are the six French metropolitan autonomous ports and the port of Calais. A hierarchy exists between ports with capacity to handle a share of world trade (like Marseilles and Le Havre) and those which cannot justify discharging the ultra large container ships.

Since 1993, the majority of France's main ports increased their tonnage. The port of Calais alone suffered the consequences of Eurotunnel's growth, especially since 1997. The year 2000 featured several records hit for some French ports and a strengthened position for others (with the exception of a drop for Rouen related to a decrease in 2000-2001 grain traffic).

Marseilles/Fos

In 2000, total traffic for the port exceeded 94 million tonnes. The autonomous port of Marseilles (PAM) reversed the downward trend, by recovering traffic lost in 1999 and recapturing market shares, particularly in the general cargo market (+ 4.7%). This field is mainly composed of containers (rise of 9.2%)

Contrary to 1999, oil products transported as liquid bulk increased (+ 2.4%). Hydrocarbon traffic makes up two thirds, as in 1999, of the port's annual traffic. There is a progression of other traffic, particularly general cargo, and that of heavy bulk cargoes and bulk foodstuffs.

With the prediction of a future drop in oil product traffic (currently making 40% of French crude oil supply, as well as refined petroleum products), the PAM plans to reinforce and develop the hydrocarbon/bulk chemical cargo stream by creating the first chemical hub in the Mediterranean. Moreover, by 2006, the PAM has slated large scale renovation of its oil sites, which are indeed ageing: the installations at Fos were built in the 1970s and those of Lavéra in the 1950s.

Le Havre

By attaining 67.5 Mt last year, overall traffic reached its peak for the past 20 years. The ports asserted its European position, especially with the "Port 2000" project. This project aims to handle major new generation container traffic and the largest of container ships used for it under optimal conditions. It fits in with the forecast for world containerised traffic.

After a drop in 1999 due to the decline in oil products, traffic in 2000 was up 5.6% from 1999. Satisfactory results were obtained for almost all traffic, especially that of general cargo. In the latter category, container traffic rose significantly, maintaining Le Havre as French leader in the sector. Containerised trade with Africa grew notably (+ 26.4%). In 2000, growth for refined products was marked by greater progress for inputs than for outputs.

Since January 2001, new traffic has developed with vehicles shipped from Spanish factories to Northern Europe and French-produced vehicles sent to Spain. An increase of 150,000 cars per year can be expected.

Dunkirk

Up by 18.3% since 1999, the total traffic surpassing 45 Mt in 2000 is the best ever recorded in Dunkirk. In 2000, it was one of the top North-Western range ports in Europe. A feeder service linking Dunkirk to Rotterdam, Felixstowe and Le Havre, enables it to discharge or load containers from every port in the world, once or twice a week. Container traffic growth reached 22.5% from 1999 to 2000. This improvement is due to hydrocarbons (up 20.6%), dry bulk (a 39.9% increase for coal, which boosted growth, sent from overseas and reshipped to England) and to general cargo.

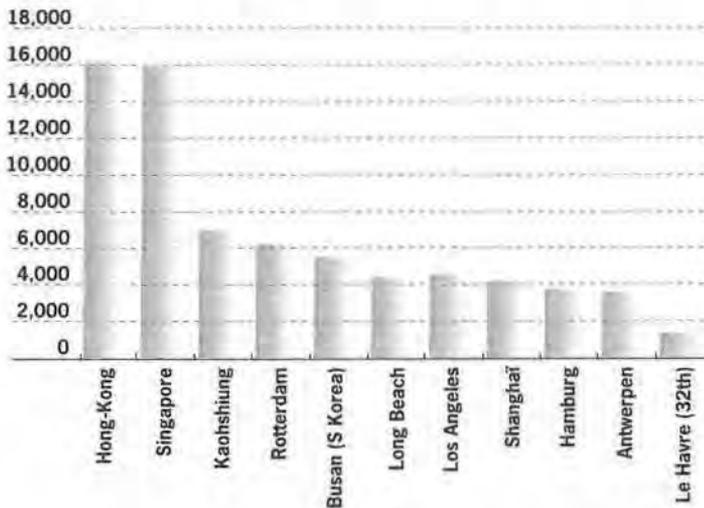
Calais

Calais is a PIN. It ranks fourth in France with its total traffic (31.9 Mt in 2000). However, the port has declined by 9.7% from 1999, due to the competition from Eurotunnel (which is progressively doubling its offer, aiming to lead on all markets as of 2000) and that of Dunkirk.

In 1999, 96% of its activity was cross-Channel ro-ro traffic of general cargo. In 2000, Calais was second worldwide in passenger traffic by sea, after Dover (18.3 million passengers). Calais totalled 15.1 million passengers in 1999 (including 91% on Ferries) showing a drop of 11.9% from 1999, owing to competition from Eurotunnel. Nevertheless, Calais accounts for 54% of total passenger traffic through French ports.

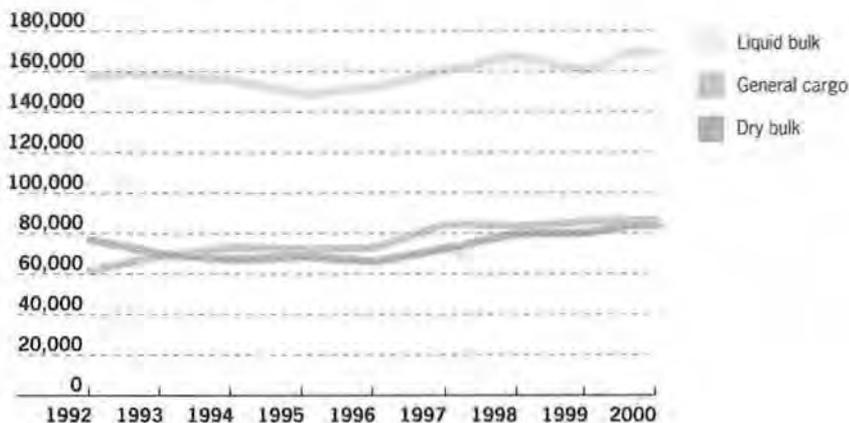
Total container traffic of top world ports in 1999

Unit: '000 TEUs - Source: ISL (2000)



Trends in goods traffic for the six main French ports

Unit: '000 tonnes - Source: Transport Ministry



Nantes-Saint-Nazaire

Achieving 31.9 Mt, the port has broken its own record in absolute value, while reducing the share of energy-based traffic. Its objective for 2015 is 40 Mt.

In spite of the drop caused by the Donges refinery (-3.7%), the overall rise of 10.6% in 2000 mostly comes from increased imports of liquefied natural gas (+21.9%) and the rise in crude oil (+12.8%) and coal (14.9%) traffic. The port has also seen its traffic soar for grains (+16.7%), containers (+3.4%) and ro-ro (+1.6%). The port is a leader for foodstuff traffic. The high demand from construction firms created growth of 13.5% for timber traffic.

It is interesting to note that the port of Nantes-St-Nazaire is exceptional in France in that the same authority manages five sites over an area of more than 40 km (Nantes - including the site of Cheviré -, Cordemais, Donges, Montoir et Saint-Nazaire).

Rouen

In 2000, the port recorded a downturn of 5.3% to 22.8 Mt. This drop is due to the fall in grain exports (traffic down by 25.2% from 1999 to 2000), due to bad weather last summer.

The rest of the traffic, other than grains, went up by 6.2% compared to 1999. This traffic growth is due in part to actions taken over several years to diversify traffic. Refined oil products rose by 10.5%, making 6.8 Mt. Another strategic sector for port activity, that of general cargo passed (for the first time in several years) the 3.5 Mt mark. It is the leading French port for printing paper imports.

Bordeaux

A small upswing (3.9%) brought port traffic to a level (nearly 9.3 Mt) which it had not reached since 1995. This return of growth is due to three factors:

- the rise by 8.9% of hydrocarbon imports, generated by the oil terminal coming into service at Ambès and by increased local demand;
- the boom in maritime pine exports, after the major storm in December 1999;
- containerised traffic, up 0.7%.

Grain exports dropped by 300,000 tonnes in 2000.

Traffic through metropolitan and overseas French ports

Units: '000 tonnes and '000 passengers

		1998	1999	2000
Liquid bulk	Autonomous ports	156,946	149,313	159,360
	Other ports	10,429	10,714	10,509
	Total	167,375	160,027	169,869
Dry bulk	Autonomous ports	65,762	65,977	68,441
	Other ports	17,254	18,207	19,235
	Total	83,016	84,184	87,676
Marchandises diverses	Autonomous ports	37,892	38,994	43,023
	Other ports	48,258	49,789	45,798
	Total	86,150	88,783	88,821
Grand total	Autonomous ports	260,600	254,284	270,824
	Other ports	75,941	78,710	75,542
	Total	336,541	332,994	346,366
Passengers	Metropolitan ports	30,397	29,618	*27,719
	Overseas ports	2,469	2,225	2,263

* Cross Channel passengers only.

Source: Transport Ministry.

Traffic of main ports in 2000, France mainland

Unit: '000 tonnes

	Liquid bulk	Dry bulk	General cargo	Total
Marseilles	65,119	15,498	13,479	94,096
Le Havre	44,595	5,762	17,135	67,492
Dunkirk	14,810	25,712	4,761	45,283
Calais	184	1,056	30,635	31,875
Nantes	20,183	8,754	2,923	31,860
Rouen	9,572	9,730	3,503	22,805

Source: Transport Ministry.

Guadeloupe

Traffic (3.1 Mt) dropped by 2.7% in 2000, especially owing to a fall in local sand carriage. Over a third of traffic involves goods in containers. This cargo has increased by 14.1% between 1999 and 2000.

2001 will be a decisive year for the future bulk energy terminal, to be built at Port-Louis by 2004. The project will be decided on this year.

Outlook

As in many other realms of the European economy, port and shipping policies are increasingly influenced by guidelines and decisions adopted on a European scale. In this respect, some recent initiatives are noteworthy.

In 1992, the European Commission disseminated a white paper on "the development of the common transport policy", which recommended opening up the transport market. For the more specifically maritime aspects, it proposed a common policy for ports and marine infrastructures, outlined in its green paper of December 1997.

This initial white paper from the Commission had solid repercussions on maritime transport-related regulations. To mention two important examples, the Commission first opened maritime cabotage services to European competition by the council regulation (EEC) 3577/92 dated 07.12.92 on free circulation of maritime transport services within Member states. In practice, there are transitory restrictions for short sea shipping in the Greek islands. Secondly, the Commission is now looking at "port services" like pilotage, towing and mooring, cargo handling and passenger services (embarking and disembarking). To sum up, the Commission's intention is to ensure non-discriminatory access to service providers to the port services market, as well as transparency in the signing of these contracts. To this end, it made public a directive proposal from the European parliament and Council (see Bibliography) concerning "market access to port services".

In 2001, a second white paper from the Commission drew up a list of insufficiencies in transport policy, or rather in the application of provisions in the treaty of Rome. The saturation of many infrastructures, the imbalance in financial efforts from Member states favouring road haulage, bottlenecks in urban areas and continuing growth of demand render a programme for action to be taken by 2010, aiming to promote and rationalise use of different modes of transport, particularly short sea shipping. Emphasis is also given to environmental constraints, strengthening intermodal systems and safety, as well as harmonising fuel taxes and pricing principles for infrastructure use.

The directive draft is currently undergoing the amendment process. The second white paper has raised considerable discussion amongst the professionals involved. The way these texts are modified will indicate more precisely what the coming period of EC transport policy will bring. It should involve sea transport, especially through the greater flexibility for harbour service markets and through the consequences of strengthening intermodal aspects for transport infrastructures near harbours.

Maritime financial services

This sector comprises insurance underwriting for ships (called "hull insurance" by underwriters) and for goods transported by boat (called "cargo insurance"). The banking sector provides extremely diversified support to marine activities. The banking activity accounted for here is mainly linked to the marine fisheries sector.

Maritime insurance

Despite this definition, the following statistics do not differentiate marine transport. 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.

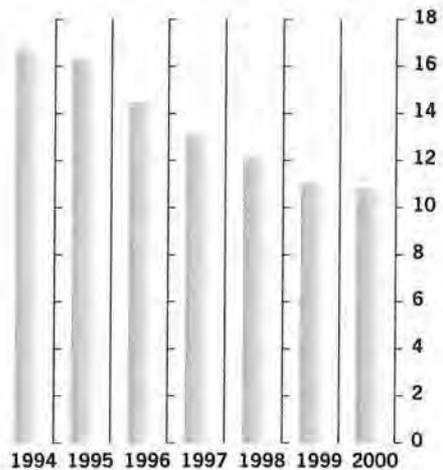
International situation

International competition is keen in marine insurance. All the big insurance companies are present. The market is cyclical and has registered very high shrinkage since the mid-1990s. According to the International Union of Marine Insurance-IUMI, the global turnover for "marine and transport insurance", i.e., the total gross

Global turnover for marine and transport insurance

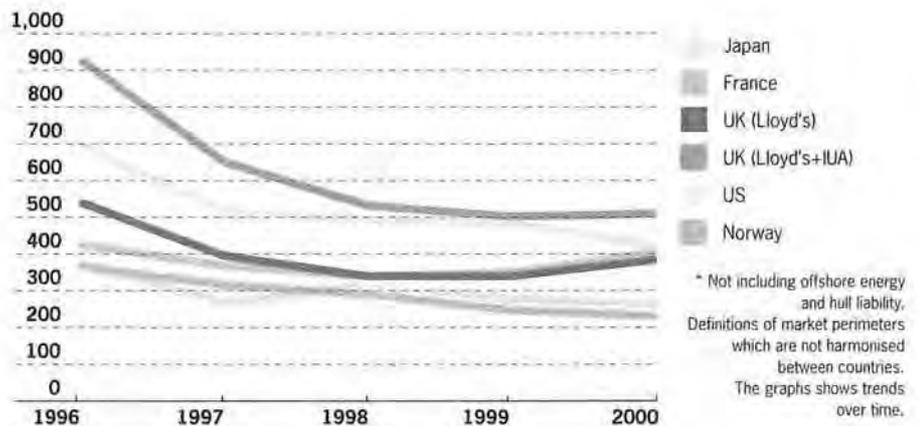
Unit: bn \$

Source: Central Union of Maritime Underwriters, Oslo



The five major global markets: hull insurance turnover*

Unit: m \$ - Source: IUMI



Key figures

Units: FRF million (all currencies converted) and number of jobs

	1994	1995	1996	1997	1998 ⁽²⁾	1999	1999 (€ m)
Hull insurance ⁽¹⁾	3,834	3,713	3,270	3,237	2,667	3,101	473
Cargo insurance	3,185	3,407	3,355	3,312	3,022	3,189	486
Total marine insurance ⁽²⁾	7,019	7,120	6,625	6,549	5,689	6,290	959
Value added ⁽⁴⁾	380	420	380	400	407	388	59
Jobs ⁽⁴⁾	1,270	1,260	1,110	1,010	950	1,030	

(1) Insurance = Total gross premium income.

(2) Figures reviewed by the FFSA.

(3) Ordinary risks and war risks, direct writing and assumed reinsurance, not including land transport liability.

(4) Ifremer estimations based on Insee data for the insurance field.

Source: French Federation of insurance companies (FFSA), transport insurance division.

premium income (including inland water hull insurance, insuring of cargoes sent by land, inland waters or air, as well as land transport civil liability) has indeed dropped since 1994, its peak year.

The sharp drop in premiums, to levels which were considered exceptionally low at the end of the decade, has put the activity in a critical situation. The recent Asian crisis and resulting drop in marine freight activity have also been adverse factors. Yet, market shrinkage has been observed in North America simultaneously with sound economic growth.

In this unfavourable economic situation, some large players disappeared from the market in 1998, 1999 and 2000. Business seemed to reach its lowest level 1999, then a reversal was perceptible from September 2000 on. According to the profession, this turn-around was confirmed in 2001. Some observers feel that this was the end of the bearish cycle.

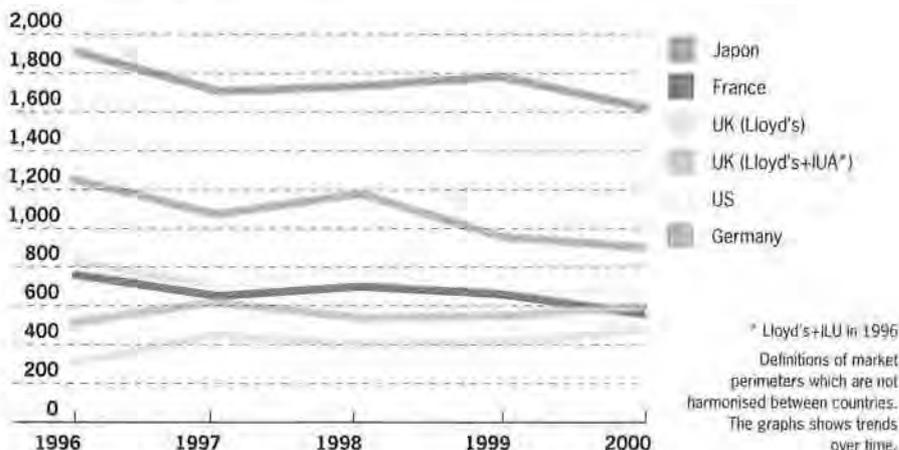
However, in the short term, the activity may have to face new disturbances. The marine insurance market may be affected by the slow-down of OECD countries, if sea transport itself feels the repercussions. Along with this still hypothetical risk are the consequences of the September 2001 terrorist attacks in the United States: there is consensus on inevitable market tightening due to the foreseeable rise in insurance premiums, which is in turn influenced by rising reinsurance costs.

French companies' activity

French companies are very active on the international insurance market overall. They are well positioned on the global marine and transport insurance market. More specialised in hull insurance, they have interests in more than 5,000 vessels (flying under fifty different flags). They have resisted the slump particularly well, and managed to improve their positions on the global hull insurance market. They also play an active role on the marine cargo insurance market.

The five major global markets: cargo insurance turnover

Unit: m \$ - Source: IUMI



In 1999, the French marine and transport insurance market included 56 underwriters (27 in 2000) representing 68 companies. The top twelve underwriters held 90% of the market (89% in 2000).

Banking sector

Activity

Banking services for marine activities other than fisheries (harbour activities, merchant navy, etc.) are fragmented, competitive markets. Several French banks are active on them.

In the field of bank assistance for the marine fisheries sector, one company plays a predominant role: the Crédit maritime mutuel gathers the mutual maritime loan company (SCCMM) and eleven regional mutual banks along the coast of metropolitan France as well as 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 the banks of the company at national and EU levels. It leads, organises and coordinates Crédit maritime's actions. The Crédit maritime is on the board of the Confédération de la coopération de la mutualité et du crédit maritimes, the confederation representing the interests of the co-operative movement in the fields of fisheries and mariculture. The institution has 150 branch offices and over 900 staff.

The Crédit maritime is the number one financial intermediary in the field of marine fisheries. It has been established for a long time. The bank enjoys exclusive management of a number of subsidized loans for this sector. Thus for fisheries, banking terms seem to be an instrument of State sector-based policy. The Crédit coopératif, the central body of the Crédit maritime, is also a financial player in the sector. The Crédit maritime covers at least 90% of banking services in the fisheries sector. It is also present in merchant harbour and marina sectors.

Key figures for the Crédit maritime mutuel

Units: FRF million and number of staff

	1995	1996	1997	1998 ⁽¹⁾	1999 ⁽²⁾	1999 (€ m)	2000 ⁽³⁾	2000 (€ m)
Net bank proceeds	495	522	511	515	533	81.3	566	86.3
Value added*	337	354	349	362	358	54.6	385	58.7
Manpower**	890	880	888	897	891		908	

(1) All regional banks, SCCMM, Guarantee funds, Union de caisses régionales.

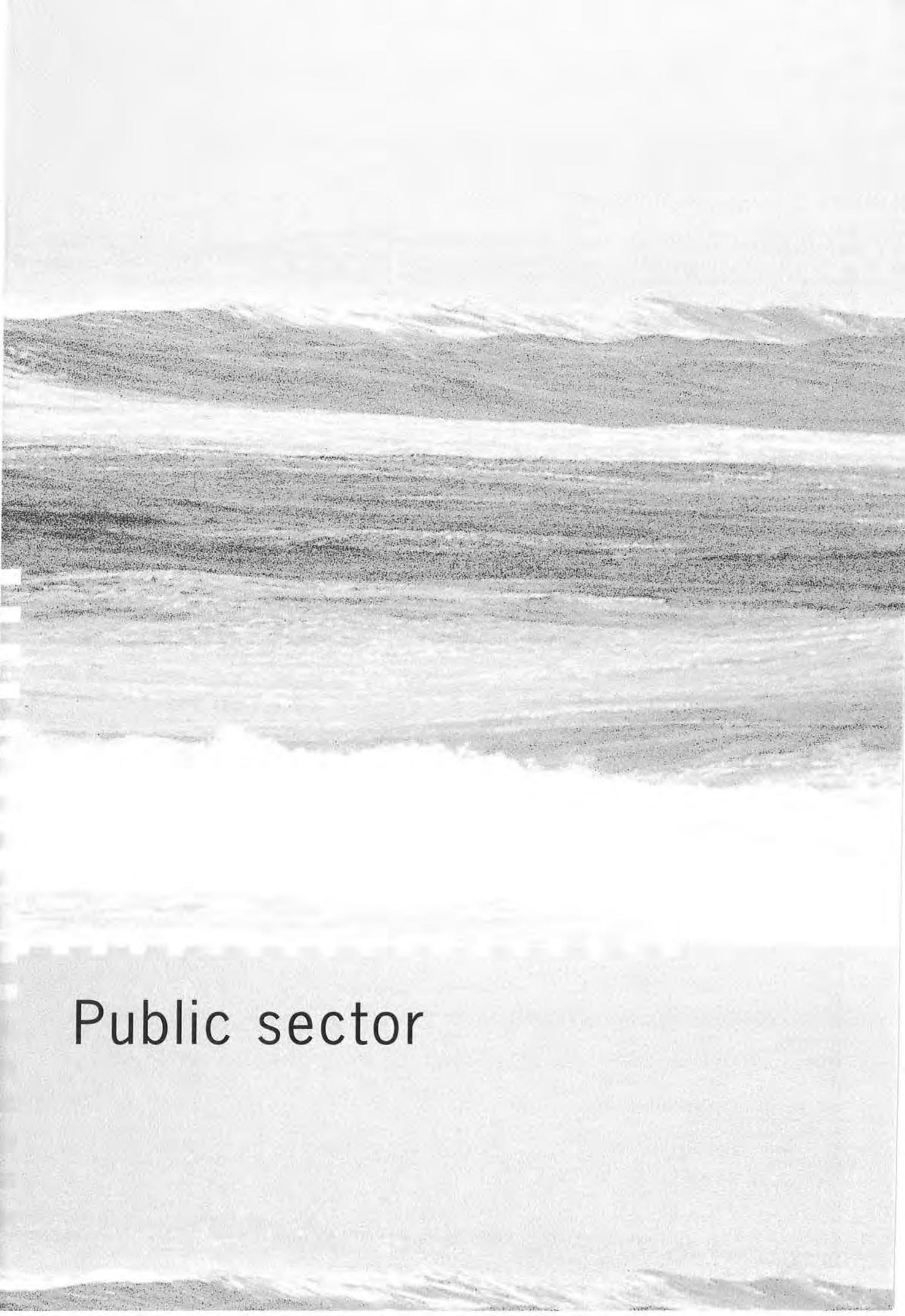
(2) = (1) + Crédit maritime Informatique.

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

* Ifremer estimation based on operating accounts.

** Full time equivalents.

Source: Crédit maritime mutuel.



Public sector

The navy

The Defence budget, with a total of FRF 244.7 billion (37.3 milliard Euro) in 2001 including retirement pensions (185 billion - 28.2 milliard Euro - without pensions) is the third largest item within the State budget (fourth, if debt servicing is taken into account) after those of the Education Ministry and the Employment and Solidarity Ministry. It amounts to a little less than 1.8% of the GDP.

The "military programming law" for the 1997-2002 period featured a significant downsizing and a shift to an all-professional armed forces. For the Navy, between 1997 and 2001 this downsizing translated into a 20% decrease in resources, in units and in manpower, broken down for the latter as follows:
- 26.6% for military personnel,
+ 35% for civilian personnel.

Not including pensions, the Navy budget amounts to 17% of Defence spending.

In current French francs, the budget allocated to the Navy has dropped by 10.6% between 1995 and 2001. The Defence budget, not including pensions, has decreased by 1.1%. Over the same period, the State budget has grown by 18.7% and the GDP by 24%.

In the initial 2001 budget, 62% of Navy fundings were allocated to investment, for a total of FRF 20,755 million. The Navy's investment expenditures represent 25% of those for Defence.

These expenditures break down as follows:

- 67%, for development and manufacturing of equipment surface ships, submarines, aircraft, ammunition,
- 24% for maintenance,
- 3.5% for infrastructure,
- 3.7% to help restructure the DCN naval dockyards.

In terms of equipment, the 1997-2002 period will have been devoted primarily to developing future equipment. Logically, the next military programming act currently in preparation (for the 2003-2008 period) should assign a larger share of the budget to manufacturing this equipment. Thus, since 1998, the annual total earmarked for "studies and development" in the Navy budget has grown significantly since 1999. This shows the Navy's major effort devoted to developing future equipment which will be commissioned from 2005 on (anti-aircraft frigates, new LPDs, NH 90 helicopters, F2 standard Rafale aircraft)

Payroll costs and social contributions make up for 80% of running costs.

Key figures

	1996	1997	1998	1999	2000	2001	2002*
Navy budget (FRF m and € m)**	35,173	35,532	32,640	33,933 (5,173 M€)	33,003 (5,031 € m)	5,099 € m	5,006 € m
Civilian and military** personnel	69,878	67,584	65,172	62,641	59,064	55,293	54,456

* Draft budget.

** Pensions are not included in the Navy budget.

Source: Naval staff.

Breakdown of the Navy budget

Units: bn Francs, bn euros, %

	1996	1997	1998	1999	2000	2001	2002*
National budget	1,541.3	1,582	1,585.3	1,667.4 (254.2 bn €)	1,664.8 (253.8 bn €)	260.9 bn €	266.1 bn €
Defence budget, including pensions	241.4	243.4	238.2	243.5 (37.1 bn €)	242.8 (37.0 bn €)	37.3 bn €	37.6 bn €
Defence budget as % of the national budget	15.7	15.4	15.4	14.6	14.6	14.3	14.1
Defence budget, not including pensions	189.6	190.9	184.7	190 (29.0 bn €)	187.9 (28.6 bn €)	28.2 bn €	29.3 bn €
Navy budget	35.2	35.5	32.6	33.9 (5.2 bn €)	33 (5.0 bn €)	5.1 bn €	5.0 bn €
Navy budget as % of Defence budget not including pensions	18.6	18.6	17.7	18.4	17.6	17.7	17.1

* Draft budget

Source: Naval staff.

Capital expenditures allocated to the Navy

Unit: FRF million, Euros million

	1996	1997	1998 ⁽²⁾	1999	1999 (€ m)	2000	2000 (€ m)	2001 (€ m)	2002 (€ m) ⁽¹⁾
Research and development	2,722	3,003	1,887 ⁽³⁾	2,871	438	3,163	482	530	3,890
Construction and maintenance ⁽⁴⁾	17,966	18,573	16,500	16,654	2,539	15,201	2,317	2,409	15,108
Infrastructure	749	737	714	758	116	873	133	108	731
Restructuring of the DCN	-	-	454	736	112	869	132	117	591
Total	21,437	22,313	19,549	21,019	3,204	20,106	3,065	3,164	20,320

(1) Draft budget.

(2) Change in budget bounds due to administrative reorganisation.

(3) Since 1998, change in accounting of upstream studies carried out by the Defence administration.

(4) Since 1994, maintenance has been gradually transferred from the "Operations" chapter to the "capital expenditures" chapter.

Sources: Economy, Finance and Industry Ministry, Naval staff.

Navy's operating expenses

units: FRF million, Euros million

	1996	1997	1998	1999	1999 (€ m)	2000	2000 (€ m)	2001 (€ m)	2002 (€ m) ⁽¹⁾
Military personnel ⁽²⁾	9,924	9,903	10,077	10,265	1,565	10,175	1,551	1,521	1,507
Operations ⁽³⁾	2,424	3,297	2,996	2,629	401	2,709	413	412	402
Operating subsidy and others	13	13	13	13	2	13	2	2	2
Total running costs of Navy	12,361	13,213	13,086	12,907	1,968	12,897	1,966	1,935	1,911
Total running costs of Defence ⁽⁴⁾	152,501	154,639	157,264	157,523	24,014	159,878	24,373	24,591	25,211

(1) Draft budget.

(2) Payroll and social contributions.

(3) Since 1994, maintenance has gradually been transferred from "Operations" to "capital expenditures".

(4) Retirement pensions included (approximately FRF 55 000m).

Source: Naval staff.

Payroll of Navy military and civilian personnel

	1983	1995*	1997	1998	1999	2000	2001	2002 ⁽¹⁾
Civilian personnel	7,944	6,612	7,526	8,156	9,017	9,573	9,906	10,148
Military personnel (including conscripts)	68,287	63,820	60,326	57,016	53,624	49,491	45,387	44,276
conscripts and volunteers	17,904	18,257	14,698	11,498	8,298	5,018	1,667	1,613
Total	76,231	70,432	67,852	65,172	62,641	59,064	55,293	54,424

(1) Draft budget.

* Decision to downsize the Armed forces. For the Navy, a 20% reduction over 5 years

Source: Naval staff.

Outlook

Today, the Navy has reached the size set by the 2015 armed forces model, as defined by the 1997-2002 military programming law, which in turn was the translation of the 1994 "Defence White Paper". In the years, 2003-2008, covered by the next military planning law, whose draft was filed in summer 2001, the Navy must launch two major programmes to renew its surface ships and submarines.

To replace its ocean-going fleet, the Navy has chosen a programme of 17 multi-purpose, or

multi-mission, frigates, whose streamlining should entail significant cuts in purchasing and maintenance costs and greater flexibility in use. Eight of these 17 ships will be devoted primarily to submarine warfare, while, in light of recent crises (Kosovo, Afghanistan), the nine others will be "land-attack" versions. The first ship of this new class should be commissioned in 2008.

The Navy will also launch a programme to replace its six nuclear-attack submarines. The first of these vessels should be commissioned in 2012.

However, the funding currently envisioned in the draft 2003-2008 military programming law does not enable the Navy to order a second aircraft carrier. Nevertheless, a number of studies will be devoted to this project, which would provide our country with aircraft carrier operational capability at all times.

Lastly, in the aeronautical field, besides the acquisition of Rafale combat aircraft, the Navy will start replacing its helicopters (Lynx WG 13, Super Frelon) by the new NH 90, built in cooperation with Germany, The Netherlands and Italy.

Naval and aeronautic material

Main units	01.01.1997 (start of current LPM)	31.12.2001	End 2002 (end of LPM)	Armed forces model « 2015 »
Aircraft carrier	2	1	1	2*
Carrier-based aircraft	74	61** (including 7 Rafales and 2 Hawk Eyes)	62 (including 10 Rafales and 2 Hawk Eyes)	60 Rafales and 3 Hawk Eyes
Maritime patrol aircraft	25	25	22	22
Combat helicopters	64	56	56	50
Ballistic missile nuclear submarines (SSBN)	5	4	4	4
Attack submarines (SSN)	12 (including 6 nuclear powered)	6 SSN	6 SSN	6 SSN
Anti-aircraft frigates	4	3	3	4
Anti-submarine frigates	11	8	8	8
Multi-purpose frigates	19	16	15	14
Mine warfare ships	16	14	14	16
Landing platform docks (LPD)	4	4	4	4

LPM: military programming law.

* The second, economic conditions permitting.

** The "Crusaders" and "Alizé" were decommissioned on 31/12/1999.

Sources: National Assembly, report on behalf of the Finance Committee on the 1997 draft budget (n°3030, appendix 40), Naval staff.

Public intervention

State administration intervenes in a variety of maritime activity fields, whether at national or local level.

The chapter deals with several aspects of this intervention, notably the financial, social and educational domains, as well as surveillance, safety and rescue.

Maritime public spending

Information is given here on public spending in the maritime realm. This mainly involves the "marine" budget, which is an aggregate composed of the Equipment Ministry's share of the budget related to its remit in the maritime field. This comprises: solidarity and training for seafarers, the merchant fleet and safety at sea. Over the period in question, the "marine" budget rose steadily from 6 to 7 billion French francs. The state subsidy for the Enim (social security scheme for naval personnel) makes up over 70% of this.

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, Transport and Housing Ministry, with competence to create and operate sea-ports and for signals at sea (subdivisions of Beacon and lighthouses service).

Maritime authority staff need multiple skills to carry out administrative remits for seafarer management. These include working in the labour system, social security, disciplinary and criminal protection and vocational training for seamen. They ensure technical assignments for vessel safety, maritime navigation (Cross), economic and social aspects (regulating maritime fisheries and mariculture, managing public areas used for mariculture, inspecting health and technical aspects for seafood, fisheries statistics and quotas). They carry out policing and judicial duties in courts dealing with maritime and trade disputes.

As of 1 January 2001 there were 1939 maritime authority staff in decentralised services, not including Enim (see below). In addition, there are roughly 200 port officers and assistant port officers employed by the Equipment Ministry in PAs, and about 200 performing harbour policing in PINs and county level harbours.

Staff at the "Beacon and Lighthouse" service analyse user needs, study, develop and implement appropriate navigational (types of aid) and physical (buoys, beacons) solutions. Their wide ranging skills (electronics, civil engineering) enable quick intervention when navigational aid must be restored. They keep sailors informed about work underway, defects, repairs.

1157 staff work in the 32 coastal services (metropolitan France and overseas). This includes 230 State inspectors, 345 workers in vehicles and workshops, 291 seamen (crewing some fifty vessels). Their contributions benefit other offices working in the maritime sector.

Enim

The Enim provident fund for naval personnel is a division of the Equipment, Transport and Housing 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 the seafarers they employ.

Funds allocated to the "marine" budget (for budgets running until 2001 and draft budget for 2001)

Unit: Current FRF million

	1997	1998	1999	1999 (€ m)	2000	2000 (€ m)	2001 (€ m) ⁽¹⁾
General administration	425.1	478.9	106.4	16.2	104.7	16.0	83.6
including administration staff costs	356.6	388.3	382.2	58.3	385.4	58.8	68.9
including funds dedicated to "maritime police and safety", not including staff funding		9.0	9.2	1.4	8.6	1.3	1.2
Seafarers	156.5	215.4	189.5	28.9	185.1	28.2	18.9
including maritime training	111.5	114.1	117.2	17.9	124.1	18.9	15.3
State subsidy to the Enim	4,599.2	4,299.5	4,342.2	662.0	4,616.0	703.7	733.3
Maritime police and safety	122.5	134.5	130.7	19.9	145.6	22.2	20.3
Seaports and coast ⁽²⁾	598.4	897.6	945.6	144.2	1,053.3	160.6	105.5
Merchant fleet	314.3	250.8	423.3	64.5	341.5	52.1	62.6
Scientific and technical research	0.5	0.5	-	-	-	-	-
Total	6,216.6	6,277.2	6,137.8	935.7	6,446.2	982.7	1,024.1

(1) Draft budget.

(2) Spending related to maintenance, operation and investment for seaport facilities under state (PA & PIN) jurisdiction and coastal ports (metropolitan France and overseas).

Source: Equipment, Transport and Housing Ministry.

The Enim's central services are in Paris, with three health insurance centres in Saint-Malo, Lorient and Bordeaux, a pension centre in Paimpol and a centre in Saint-Malo which collects social security debts from those covered by the system. There are 560 staff in all.

The drop in the working population of seafarers (-16% from 1992 and 2000) and the increase in the number of pensioners explain the somewhat large State balancing subsidy. The working/non-working population ratio went from 1: 2.3 in 1993 to 1: 2.9 in 2000. This contraction in revenues also shows the impact of measures taken by public authorities to reduce social contributions to make the French fleet more competitive.

Enim Budget

Unit: MF

	1996	1997	1998	1999	1999 (€ m)	2000	2000 (€ m)
Enim budget	9,285	9,283	8,874	8,966	1,367	9,544	1,455
State aid	4,528	4,599	4,299	4,342	662	4,616	704

Source: Enim.

Trends in number of Enim beneficiaries

	1995	1997	1998	1999	2000
Number of working population	45,541	42,715	42,764	42,917	43,503
Number of pensioners	121,524	123,374	124,354	125,090	125,651
Number of beneficiaries	269,083	253,200	249,161	244,877	240,837

Source: Enim.

Signals, surveillance, safety at sea, SAR

Signals: "beacon and lighthouse" service

A 1792 law entrusted lighthouse, landmark and buoy surveillance to the Naval Ministry and work on them to the Home Ministry. Since 1997, the staff working entirely or partly on beacon and lighthouse assignments are attached to the Equipment, Transport and Housing Ministry. There are about 1,300 staff (central administration, coastal divisions, technical network and training).

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.

The maritime signals comprise all navigational aid devices. These are mainly radio-electric or visual: lighthouses, beacons, buoys, landmarks, towers and other small sea marks. As of 1st January 1997, the beacon and lighthouse service was managing 1,170 lights and 4,500 unlit markers.

Techniques have changed, bringing about corresponding changes in maritime signalling work. This includes lighthouse automation, solar panels for buoys and beacons, developing remote-controlled systems. Global positioning systems (GPS today, Galileo in future), with

their local supplements (DGPS) and regional systems (Loran C) have replaced the previous ones (radio-beacons, Decca, Rana, Toran). Thirty-eight centres on the metropolitan coast and overseas maintain the signalling facilities. The beacon and lighthouses fleet has fifty vessels of all sizes working from the various centres. Replacing heavy beacons by lightweight ones will make it possible to replace the very old, large beacon-tenders by lighter vessels.

Created in 1998 by decree, taking over the remit of former public bodies, the Cetmef (Centre for maritime and river technical studies) has nation-wide scope and covers both maritime and inland waterway studies. Cetmef develops and disseminates techniques, conducts surveys and research, and performs engineering services and assessments in the following fields:

- maritime and inland water construction and structures,
- marine and river hydraulic phenomena,
- safety aids and devices for maritime and inland water navigation,
- transmissions, telematics and satellite techniques for all divisions of the ministry in charge of public works and infrastructures.

Safety, surveillance, SAR: RCCs and SNSM

Safety at sea covers:

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

Several administrations are responsible for checking that a vessel fulfils navigational requirements, i.e., Customs, the gendarmerie maritime and the French navy. The Maritime authority administration plays a predominant role: ensuring the technical safety inspections for ships and shipping, and enforcing legislation on hygiene and working conditions.

There are five regional rescue coordination centres (RCC) in metropolitan France (Gris-Nez, Jobourg, Corsen, Etel, La Garde) and one in the West Indies-Guyana (Fort-de-France). The RC centre for Reunion island (Cosru) completes the array. The RCCs have the following remit: search and rescue (SAR) 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 Hamburg Convention in 1979.

To coordinate their action, the RCCs can call out operational units such as Maritime authority launches, launches, ships, helicopters and planes from the French Navy, Customs, gendarmerie and civil protection, and SNSM life boats and launches (see below). In cases of distress, they may also have recourse to contacting nearby merchant, fishing or sailing vessels to take part in SAR operations. The RCC's coastal radiocommunications chains is made and maintained by the Cetmef.

Appropriations for maritime police and signals (budgets until 2000, draft budget for 2001 and planned budget for 2002)

Unit: FRF m

	1997	1998	1999	1999 (€ m)	2000	2000 (€ m)	2001 (€ m)
Running costs	54.1	54.6*	54.3	8.3	53.9*	8.2	6.9
General administration part allocated from 1998 on		9.0	9.2	1.4	8.6	1.3	1.2
Capital expenditure	68.4	79.9*	76.5	11.7	91.7	14.0	13.4
Total	122.5	143.5	139.9	21.3	154.1	23.5	21.5

* Exécution supérieure à la dotation en LFI compte tenu des rentrées fonds de concours.

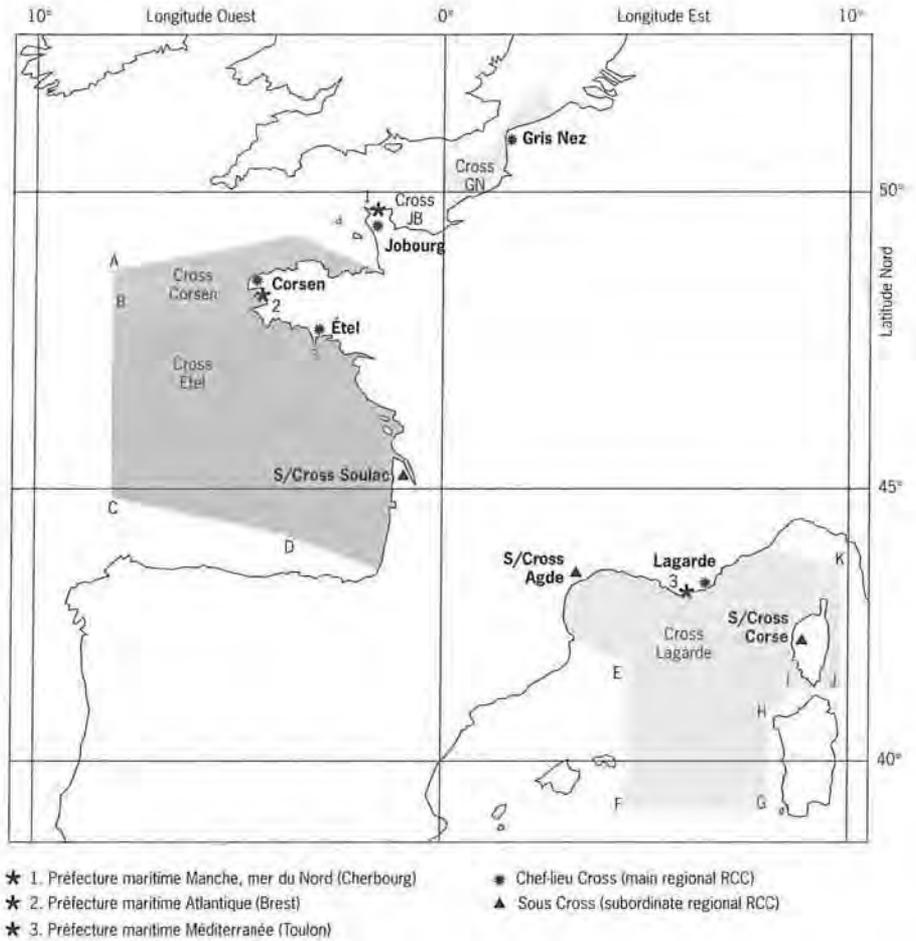
Source: Equipment, Transport and Housing Ministry.

In 2000, metropolitan and overseas RCCs received 8,393 alerts, up by 5% from 1999, mainly due to the Pas-de-Calais (Dover strait) area and Indian Ocean waters under Cosru responsibility. 59% of interventions involved water sports and boating.

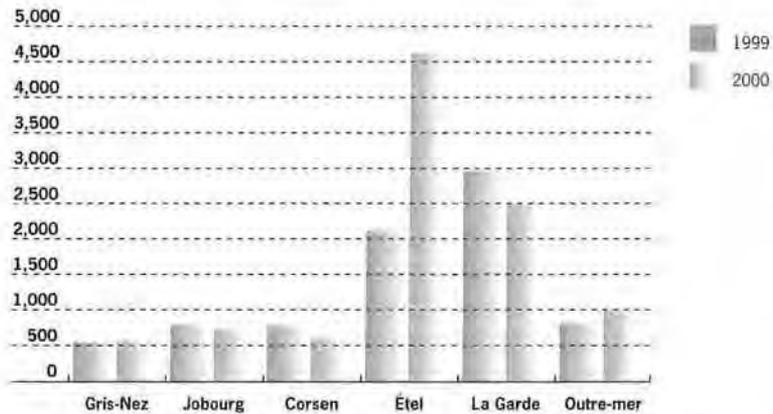
The French sea rescue society (SNSM), a private body directed to the public benefit performs a large part of rescue operations on a volunteer basis under RCC control. The SNSM relies on 3,500 experienced rescue staff and seamen, 1,100 seasonal rescue workers trained in its 26 centres by 300 instructors and on 1,000 volunteers in charge of supervision. Today the society has 146 ocean-going boats (all-weather lifeboats and launches) and 465 inflatable craft for inshore use. There are forty salaried staff for administrative duties.

As a non-profit organisation, the SNSM is financed roughly 50% by private donations and the rest by subsidies from State and local authorities.

“Cross” (i.e. RCC) implantations - Source: CAAM, RCC data 2000



Breakdown of number of operations by metropolitan RCCs and total overseas (operations in zones under French responsibility and other zones) - Source: Equipment, Transport and Housing Ministry, RCC data 1999, 2000



SNSM budget

Unit: FRF m

	1996	1997	1998	1999	1999 (€ m)	2000	2000 (€ m)	2001 (M€)
Operating budget	28.4	30.3	31.4	37.5	5.7	39.8	6.1	6.0
Capital expenditures budget	25.1	25.9	26.2	24.1	3.7	21.7	3.3	5.9
Total	53.5	56.2	57.6	61.6	9.4	61.5	9.4	11.9

Source: SNSM.

Distribution of operations in 1999-2000 by type of craft involved (zones of French responsibility)

Source: Equipment, Transport and Housing Ministry, RCC data 2000.



Training and education

Maritime training

The following section covers the training and education streams which draw on the "marine" budget.

There are several levels of training available for seaman, from the vocational aptitude certificate for fisheries to officer's degrees from French merchant navy schools. High schools for maritime and aquaculture training (Lema) provide initial and further training for qualified seamen, aquaculture professionals and some fisheries officers. State-run local educational establishments (EPLE) receive funding from regions.

The four French 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.

After a drop in maritime high school enrolment in the early 1990s, numbers have risen again since 1994. The same phenomenon has been noted for the ENMM.

Funds allocated to seafarer training (budgets until 2000 and draft budget 2001)

Unit: FRF m

	1996	1997	1998	1999	1999 (M€)	2000	2000 (€ m)	2001 (€ m) ⁽¹⁾
ENMM subsidy	7.9	9.1	11.1	12.5	1.9	11.4	1.7	2.4
Agema budget	72.5	74.2	76.7	79.0	12.0	87.1	13.3	8.7
Maritime and aquaculture training schools/ Teaching equipment and facilities (investment)	3.7	4.2	3.3	2.4	0.4	2.9	0.4	0.5
Private schools	4.3	4.3	3.7	5.2	0.8	5.2	0.8	0.7
Seafarers sub-total	88.3	91.8	94.9	99.1	15.1	106.5	16.2	12.3
Grants and further vocational training		19.7	19.3	18.1	2.8	17.6	2.7	3.0
Total Maritime training		111.5	114.1	117.2	17.9	124.1	18.9	15.3

(1) Draft budget

Source: Equipment, Transport and Housing Ministry.

ENMM budget and staff

Units: FRF million and number of staff

	1997		1998		1999		
	Annual budget	Staff	Annual budget	Staff	Annual budget	Annual budget (€ m)	Staff
Le Havre	5.7	70	5.9	68	6.0	0.9	70
Saint-Malo	3.9	54	3.1	53	3.4	0.5	58
Nantes	4.2	70	4.6	71	6.5	1.0	71
Marseille	5.2	62	6.0	68	6.2	0.9	65
Total	19.0	256	19.6	260	22.1	3.4	264

Sources: Bureau of education and maritime training.

Agema budget and staff

	1995	1996	1997	1998	1999	1999 (€ m)	2000	2000 (€ m)
Agema budget (FRF m)	98	100	101	106	112	17.1	121	18.4
Payroll, including social security contributions (FRF m)	86	87	89	96	101	15.4	110	16.8
Staff (personnel present as of 31.12)	464	493	498	560	548		544	
including teaching staff*	288	302	308	361	na		na	

* Teachers, instructors, supply teachers, part-time lecturers, guidance counsellors, supervisors and technical assistance staff.
na: not available.

Source: Agema for 1995-1998; Equipment Ministry for 1999-2000.

Lema maritime and aquaculture high school initial training

Unit: enrolment as of 30 September

	1993/1994	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	1999/2000
Fisheries	726	653	717	756	875	959	809
Shellfisheries	256	266	295	333	335	378	402
Merchant seaman	75	57	66	82	106	129	125
Fisheries and merchant navy	204	251	290	343	397	399	401
Total	1,261	1,227	1,368	1,514	1,713	1,865	1,737

Source: Agema until 1999; Equipment Ministry for 1999/00.

Breakdown of enrolment by school

School year	1996/1997	1997/1998	1998/1999	1999/2000	2000/2001
Lema initial training	1,514	1,713	1,865	1,746	1,766
Lema further training	1,917	1,924	2,105	2,023	1,988
ENMM	780	830	911	1,020	1,051
Total	4,211	4,467	4,881	4,789	4,805

Source: Bureau of education and maritime training.

Training and education in all sectors

The following table focuses on courses of study in training and education which existed in 1998, regardless of the budgets they draw on.

Education and training for maritime activities and marine sciences in 1998

	Secondary education (types of diplomas and courses) of study leading to diploma	Higher education (+2 years after A-levels) number of courses of study	Higher education: number of courses of study (from A-levels + 3 years)					Schools: Engineering schools, agricultural schools Ensa
			A-levels +3 or 4 years	Master's & magistère degree (4)	DESS	DEA (options), DAA	Master + specialised degree (A-levels +6)	
Marine biology (1)		3 DU		10	2	8		2
Aquaculture (2)	CAPM, Bepa, BEPM, BPAM, BTA, technical high schools, other BPs	4 BTSA, 2 Deust, 1 DTSM, 3 DU	1 DIT, 2 DTS, 1 Desta, 1 MST		1	2	1 DU/European master's (A-levels +5), ISPA	3 Ensa, 2 Esa, Istom, other
Aquariology	Bepa, BTA		1 DIT					
Animal house and farming management	CFPPA, Bepa, BT, BTA							
Veterinary care	CFPPA, BTA	1 DAV					1 DU	5 ENV, misc. ENMM
Fishing	CAP, BEP, vocational high schools							
Fish biology and halieutics				2	1	1(+1 DAA)		Ensa Rennes
Agri-food industry		2 DUT		4		1	2 master's, 1 DRT	Istom, 2 Ensa, 1 Esa, other
Seafood marketing	CAP, BEP, BTA	BTS technical sales 3 Deust, 1 DU, others						
Physical and chemical oceanography		1 DTSM	2 Bachelor of science degrees	7		7		21
Climatology						5		
Meteorology		2 DTS						1
Marine geosciences (3)			2 Bachelor of science degrees	10, including 2 magistères	2	16		9
Coastal zone management		1 Deust		1	3	2		
Remote sensing			1 DU		4	5	2 master's	3
Telecommunications				3 + 1 DHET	3	15	2 master's, 1 DRT	15 engineering schools + universities
Mechanics, hydraulics		Several DUTs		3	2	5	1 master's, 1 DHET	7
Civil and ocean engineering		1 DUT, 1 DTSM	1	1	2	1	11	
Hydrography			4 Dest					3
Naval architecture							1 master's, 1 specialised diploma	4 schools of architecture 3 engineering schools
Shipbuilding and boat building	CAP, BEP, vocational high schools, others	2 BTS						
Navy								French Navy, 13 schools or academies 1 instruction centre

	Secondary education (types of diplomas and courses) of study leading to diploma	Higher education (+2 years after A-levels) number of courses of study	Higher education: number of courses of study (from A-levels + 3 years)				Schools: Engineering schools, agricultural schools Ensa	
Navigation	CAP, vocational high schools	vacational certificates					ENMM	
Transport and logistics		3 Cnam diploma, 8 vocational diplomas, 11 DUT, 1 DU	3 DU, Cnam, misc.	4 MST, 1 engineering-master	5 (+2 DU A-levels +5)	3	1 master's degree	3
Coastal surveillance								Customs, French Navy, Gendarmerie nationale
Maritime law					4	4		
Maritime insurance		1 BTS, 1 Deust	2 DU	2 MST, misc.	3			
Water sports, sports management	Certificates (live-saving, swimming, surfing), BEES, Atsan, BAPAAT, misc.	3 DU, 3 Deust	1 DU, 1 DEU	12 (including 1 master's, 2 engin.-master)	6		1 specialised master's degree	
Diving, medical studies on diving	BEES					3	6 DU	Military diving schools 1 professional diving institute
Deepsea archaeology			1 DU	1 MST	3			Ecole du Louvre (A-levels +3 to 7 years), ENP
Scientific facilitation and interpretation	Various certificates, BAPAAT	7 BTSA, 1 DUT, 2 State diplomas			1			
Tourism	Various certificates	1 BTS, 1 Deust	2 DU	1 MST, 1 engin.-master	9 (+1 DU A-levels +5)			
Thalassotherapy, hydrothermalism	Vocational high schools, BEP	3 DU			1 (+1 DU A-levels +5)			

Source: Institut océanographique.

(1) Biology of organisms, populations and ecosystems, marine organism physiology, oceanology, chemistry and physical chemistry, compounds of biological interest, cosmetology, cosmetic techniques and technology, biochemical and food engineering, microbial genetics.

(2) Fishfarm production and shellfish-farming (technical and technical-economic aspects), operational management, biological engineering

(3) Only some special training courses are indicated here.

Atsan: assistant water sports and events technician

CFPPA: agricultural vocational training and promotion centre

CAPM: maritime professional training certificate (3 years)

BEP: vocational studies certificate (2 years)

Bepa: agricultural vocational studies certificate (2 years)

BEPM: maritime vocational studies certificate (2 years)

BP: vocational certificate

BPAM: agricultural and maritime vocational certificate

BT: technician's diploma (2 years)

BTA: agricultural technician's diploma (2 years)

BTSA: agricultural technicians higher qualification diploma (A-levels +2 years)

BEES: State sports instructor diploma

Bapaaat: vocational aptitude certificate for technical facilitator assistant

DU: university degree (A-levels +2 to 6 years)

DAV: veterinary assistant diploma

Deust: Preliminary degree course in science and technology (A-levels +2 years)

DEU: European university degree

DTSM: marine technician higher qualification diploma (A-levels +2, Intechimmer)

DIT: technological engineering diploma (A-levels +3 years)

Destia: preliminary degree course in aquaculture techniques (A-levels +4 years)

MST: master's degree in sciences and techniques (2 years, A-levels +4 years)

Dhet: diploma of higher technological studies (A-levels +3 to 5 years)

DESS: business-oriented postgraduate diploma (A-levels +5 years)

DEA: research-oriented postgraduate diploma (A-levels +5 years)

DAA: postgraduate diploma in agronomy (A-levels +6 years)

DRT: postgraduate diploma course for engineers, research work in innovative technology (A-levels +6 years)

Ensa: school specialising in agronomy

ENV: school specialising in veterinary science

Esa: school specialising in agriculture

Intechmer: national institute of marine sciences and techniques (Cherbourg)

Ispa: animal production higher education institute

Istom: French overseas higher technical institute

ENP: National heritage school

Coastal and marine environmental protection

Coastal environments are subject to numerous disturbances of natural origin or related to human activities. To address the consequences of these disturbances, protection policies have been set up nationwide, as well as in the framework of international institutions in which France takes part. They focus on preventing, reducing and eliminating pollution and other environmental degradation; repairing damage; gathering, processing and disseminating environmental information. Examining these actions and the resources devoted to them is a way to assess the importance given to coastal ecosystem protection in France.

Protecting coastal water quality

Many human activities are directly or indirectly sensitive to phenomena of coastal water pollution, through the contamination of aquatic ecosystems. This vulnerability has led to the setting up of various measures to protect water quality nationwide.

France is also party to major international commitments for the restoration of water quality, whether inter-governmental agreements (Oslo 1972, Marpol, 1973, Paris 1974, Barcelona 1976, London 1982) or European commitments: European Commission directives on the quality of recreational waters (1975), shellfish farming waters (1979), processing of residual urban waste waters (1991) and nitrates from farming (1991).

Monitoring networks, water authorities and wastewater management programmes are key activities in this area, in France.

Coastal water and resource monitoring networks

In order to take preventive action, monitoring network information is vital for the detection and follow-up of health and environmental hazards. Data from networks provide the basis for programmes informing coastal users about environmental quality, preventing health hazards and also, developing eco-label policies. In the longer term, monitoring supplies part of the scientific grounding required to draw up or modify environmental standards. It also provides feedback to assess how effective and pertinent policies have been in managing man-induced inputs to and extraction from the coastal environment and in preventing health and environmental hazards. Monitoring covers:

- general water quality variables (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 water inspections are carried out by the DDASS county-level directorates for health and social matters, under the authority of the minister of Public health. The inspections help determine the quality of recreational areas which have not been permanently closed and identify those presenting a health hazard, especially when related to poor bacteriological quality. If need be, bathing is forbidden in these areas, and towns must indicate this to users.

Monitoring is done during the seaside holiday season, defined locally depending on climatic conditions and periods when visitors are numerous. In metropolitan France, the minimal recommended period runs from 15 June to 15 September. The number of inspection points at sea went from 591 in 1975 to 1,856 in 1998. These points are located at over 648 coastal towns in metropolitan France and overseas, chosen with respect to the number of bathers using the site. An average of 11 samples is taken on each site during the seaside season (i.e., a total of 20,833 seawater samples for 1998). The ministry in charge of the Environment and the ministry of Health have assessed the annual cost of the network at over FRF 30m, not including staff.

Bathing water quality has improved overall in France over the past fifteen years, thanks to efforts made for wastewater collection and treatment developed by the towns in question with the help of the water authority (see below). For the 1998 season, out of 1,856 points inspected, 1,155 were evaluated as being of good quality and 598 of average quality. The other inspection points were declared non-compliant with the European directive. The environment ministry study on the causes of water pollution shows that the main reasons involve wastewater collection and treatment and stormy periods which create special problems for coastal towns, especially in southern France.

Within the framework to revise the 1975 European directive undertaken in late 1998 by the European commission, changes in this network are now being discussed. In particular, areas used for water sports could undergo health monitoring in the same way as the recreational waters used for bathing.

Monitoring networks operated by Ifremer

On the French national level, Ifremer stands out as a major actor in continuous coastal environment monitoring, since it manages several networks for observation and monitoring of coastal water quality.

• **The national seawater monitoring network (RNO)** was set up in 1974 by the ministry of the Environment. Ifremer coordinates the network on behalf of the ministry. It provides the information on trends in coastal ecosystem quality used by France to meet international commitments in this area. By assessing the levels and trends of contaminant concentrations in the marine environment, along with general water quality variables, the RNO has become the source for monitoring data which France disseminates to international organisations: the International Council for exploration of the sea (ICES) and Ospar conventions for the northeast Atlantic, the Barcelona convention for the Mediterranean. Water quality parameters (salinity, temperature, nutrients) are monitored in water masses in 11 sites. Monitoring of contaminants (heavy metals, PCB, PAH, pesticides) is carried out on marine organisms (80 sampling points, sampled four times yearly) and in the sediment (the entire coast is covered every eight to ten years).

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

• **The Réphy network monitoring phytoplankton and phycotoxins** was created in 1984, after toxic phytoplankton blooms occurred on French coasts. Réphy has both ecological and alert aspects, since its objectives are to:

- inventory all phytoplankton species in coastal waters, as well as exceptional occurrences (coloured water, blooms of species harmful to marine fauna);
- protect consumers by detecting phytoplankton species which produce toxins and monitoring these toxins in shellfish. About 200 sampling points make up the Réphy 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).

If toxicity test results exceed existing threshold values, sale and harvesting of shellfish can be prohibited. In 1998, 19 of the monitored sectors had bans averaging forty days. Looking more closely at bans on sales due to phycotoxins over the past ten years in France, we see that some areas are regularly closed longer than two months at a time due to diarrheic poisons (northern Seine, western Finistère, Morbihan, Salses Leucate lagoons in the Roussillon, Diana and Urbino lagoons in Corsica). Closed periods vary depending on the area and the type of toxins. For diarrheic poisons, closures occur in summer-autumn in the Channel, spring-summer in the Atlantic, all year round in the Mediterranean. Paralytic poison episodes occur in summer in northern Brittany and in winter in the Thau lagoon in Languedoc.

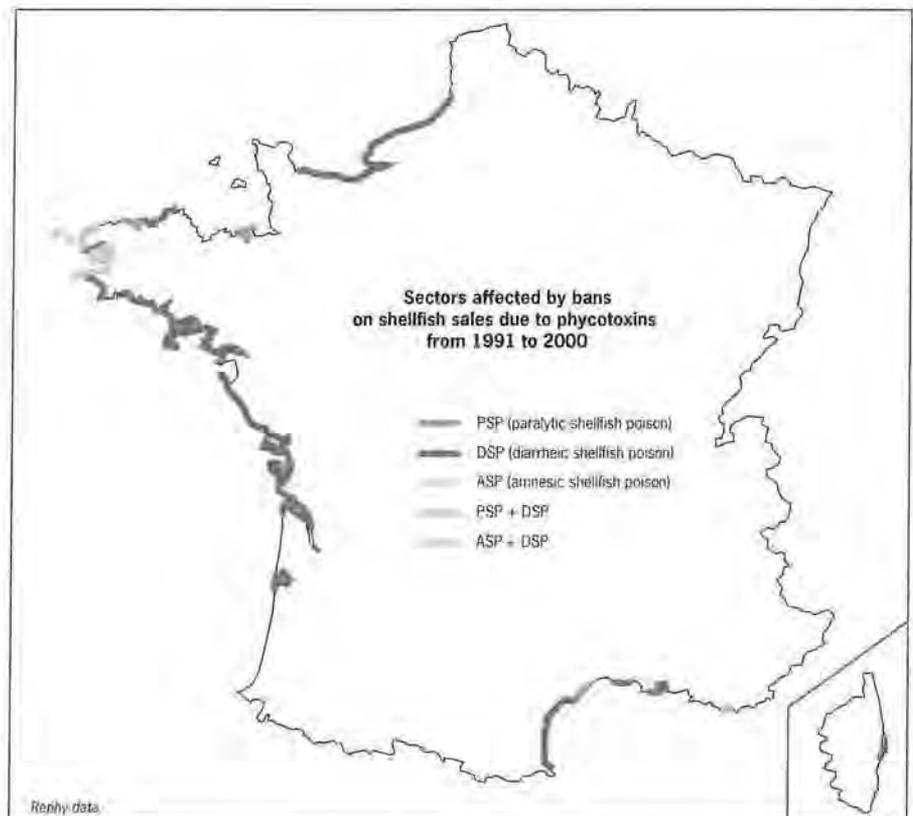
• **The Rémi network** ensures microbiological monitoring of shellfish farming areas. It was created in 1989, revised in 1997, and was set up by Ifremer as a basis for defining the sanitary classification of these areas, and to keep a regulatory health watch on those areas. Setting up a periodical monitoring system for shellfish production areas, and classifying these areas according to quality criteria, especially microbiological quality, was imposed by European directives 79/923/EEC of 30 October 1979 and 91/492/EEC on 15 July 1991.

The Rémi routine monitoring network checks that microbiological contamination levels remain

compliant with the classification of production areas designated by the Administration and detects unusual occurrences of contamination. There are four quality classes: A, B, C and D. Shellfish from Class D waters cannot be harvested or marketed, those from Class B or C waters must be cleansed by heat-treatment or by relaying in Class A waters set aside for this use before marketing. Shellfish in Class A areas can be harvested for direct human consumption.

The Rémi alert system is triggered when monitoring results exceed or will probably exceed the standards set for quality classes, 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.

As of 31 December 2000, there were 334 classified production areas, 128 of which were Class A, 172 in B, 60 in C, and 123 still under temporary classification. The Rémi network monitors only Class A, B and C zones, on 385 sampling sites in all. 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 Remora farmed mollusc yield network** makes it possible to assess the performance of different oyster basins, especially in farms' biological yield (survival and growth) and quality of oysters produced. It was launched in 1993, with operations based on annual monitoring of a given batch of oysters in the main French oyster-farming areas in 39 national stations and various regional stations. Oyster survival, growth and quality are assessed quarterly in Ifremer's coastal laboratories. The data are in the process of being included in a database. An annual report is produced. Analysis of results shows that beyond year-to-year variations which are closely linked to hydro-climatic conditions, the differences between shellfish farming zones depend on environmental quality. Moreover, phenomena such as abnormal mortality (in 1995), lack of growth (1998) or quality phenomena (mounting infestation by *Polydora* worms) have been highlighted and quantified. Like Repamo (see below), although the Remora network's purpose is shellfish-oriented, it also provides indications on the quality of the seawater in the farms.

- **The mollusc pathology network (Repamo)**, was created in 1992, in response to the European directive 91/67 for regulation and

health control for the mollusc trade between EC countries. Today, the network has three inspection units working in collaboration, each responsible for a coastal front in metropolitan France. It performs analyses to determine the classification of 10 monitored French coastal areas into zones which are either free of or infected by pathogenic mollusc parasites (*Marteilia* and *Bonamia*); routine monitoring of reared and wild bivalve mollusc populations; the study of the causes of abnormal mortality; and inspecting mollusc exchanges between European countries or with other countries. In 1998, 20,000 animals were analysed overall, nearly half of them in the framework of mortality studies.

In 1998, the total cost of all coastal environment monitoring activities by Ifremer (coordinating national networks and cooperation with regional networks, environmental data management tools) was estimated to be over FRF 66m, inclusive of tax.

Other monitoring networks

Local measurement networks have been set up at the level of estuaries or counties' coastlines. They supply data needed for local problems, as is the case for the nutrient watch in the Nord-

Pas de Calais region, or that of the *Ulva* network on the Breton coast, or provide the coordination required for monitoring activities on a regional scale, as in the Mediterranean coastal network.

Marel automatic measurements for the Seine estuary and bay's coastal environment, developed by Ifremer, is a novel approach to water quality monitoring, using stand-alone instrument stations. The network continuously measures water quality variables and parameters of oceanology and meteorology. It produces highly frequent measurements which are quickly made available to the user. Co-financed by the Seine-Normandie water authority and part of the 1994-1999 interregional planning contract for the Parisian catchment area, the network is now operational. Currently, it has four automatic monitoring stations (one in the estuary and three in the Seine bay) and a regional management station located on the premises of Ifremer's Port-en-Bessin station.

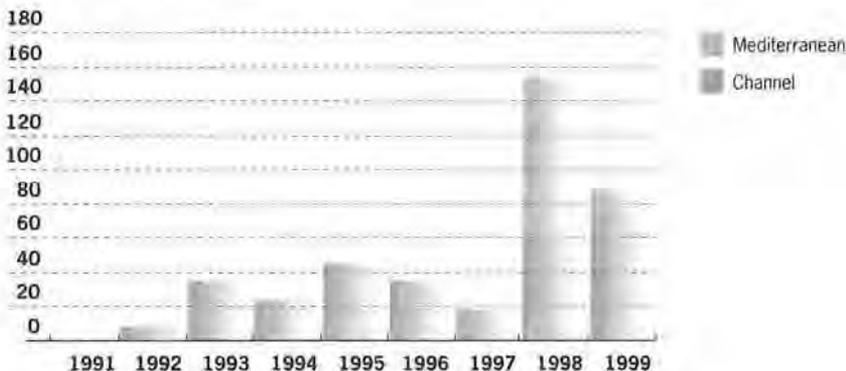
Other actors are involved in monitoring work on a local scale. In the field of sanitary microbiology, supplementing the Rémi and recreational waters network data, the DDASS are in charge of monitoring the health safety of areas used by recreational fishermen to harvest shellfish along the French coasts. An assessment of the use of these recreational shellfishing zones during the spring tides in 1997, in the Loire-Brittany catchment area, showed that the watch network covered 40% of natural shellfish beds visited by over one hundred rock pool fishermen.

The CQEL coastal water quality units made available by the public works ministry to the ministry of the environment, perform ad hoc monitoring, for instance in harbour waters, or in the RNO framework. The units run both routine and alert networks, with the main remit of policing the waters, primarily for discharges at sea (runoff from storms, releases from urban areas, industry and agriculture). 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. This network is designed to assess and monitor trends in water and sediment quality in port basins, and thereby evaluate the impact of harbour facilities on the marine environment. It covers 186 metropolitan harbours and 3 overseas ports.

Furthermore, 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 in six French coastal sites of the institute.

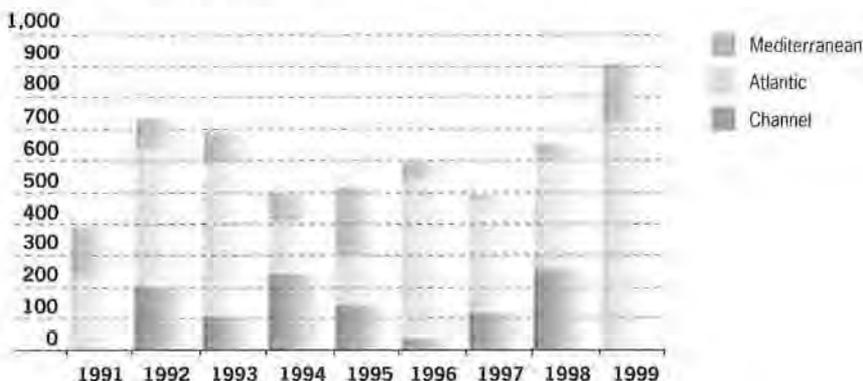
Trends of number of days closed due to PSP

Unit: Number of days closes



Trends of number of days closed due to DSP

Unit: Number of days closed



Annual costs, inclusive of tax, for Ifremer-managed networks (averages estimated for 1998-2000)

	RNO*	Rephy	Remi	Remora	Repamo	Total
Staff (FRF m)	5.7	5.5	6.8	1.5	1.5	21.1
Total (FRF m)	8.0	7.4	8.5	1.8	2.1	27.8
Total (€ M)	1.2	1.1	1.3	0.3	0.3	4.2

* Costs related to the part operated by Ifremer. An additional FRF 1m, approximately, for the part operated by coastal water quality units (CQEL).

Source: Ifremer.

Trends and outlook for coastal water monitoring networks

In order to manage the data from networks, Ifremer developed the Quadrige database and Aurige software tools to edit statistics and maps. This is compatible with the format used by the national administration for water data and references (Sandre), developed on the initiative of the RNDE national water data network which Ifremer joined in 1997.

Network data are also made available in part on Ifremer's coastal environment website as are a number of files and publications: <http://www.ifremer.fr/envlit/index.htm>.

The RNDE was set up to optimise the collection, management and utilisation of nationwide water data. To this end, it has created a number of tools including one-stop shopping which makes it possible to obtain information on all the existing databases concerning water in France, both in terms of content and on how to access them. The ministry of the Environment provided the preliminary studies and funding required for its opening, at a cost of FRF 600 thousand.

Information dissemination strategies: the "European Blue Flag" example

Information campaigns are run on recreational water quality. They include press conferences, compulsory posting by municipalities of results during the holiday season at the town hall and on bathing sites, electronic dissemination of the information via the French minitel system and on an internet server. However, new ways of using environmental quality data are emerging.

Over the past ten years, Europe has awarded the "blue flag" label to coastal towns and marinas which meet certain criteria for environmental quality. This eco-label is increasingly popular. It is based on water quality criteria as well as those of waste management, town planning, governance of natural areas and raising of pub-

lic environmental awareness. In France, the European blue flag is implemented by the French Office of the FEEE foundation for environmental education in Europe, a private body. The operation is supported by the European commission, the ministry for spatial planning and the Environment, the ministry of Health, the ministry of Tourism, the Ademe agency for environment and energy management, the water authorities and the ministry of Public works, transport and housing.

For the year 2001, the ministry of the Environment and its public institutions (water authorities, Ademe) contributed to the operation with funding of FRF 900 thousand. The flag was awarded to 107 coastal towns out of 207 applicants and 82 marinas out of 113 applicants. The operation is gaining in scope, which shows that towns and marinas find that obtaining the label is highly attractive.

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, the action of water authorities is vital in this field, and is briefly reviewed here.

The water policy is organised on the scale of the six major catchment areas: Adour-Garonne, Loire-Brittany, Seine-Normandy, Artois-Picardy, Rhin-Meuse, Rhône-Mediterranean-Corsica. In each watershed, the organisation is the same, made up of a catchment board defining the policy and a water authority. The catchment boards' role was confirmed by the law n°92-3 dated 3 January 1992 on water, which entrusted them with developing Sdage water planning and management master plans, an essential tool for water management in France. Moreover, the board ratifies water authority programmes for intervention, which must be compliant with the Sdage.

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

The proceeds from these charges are used to finance operations for pollution response, environmental protection or improved access to water resources. The authorities allocate the funds on the basis of a five year intervention programme. The seventh intervention programme for 1997-2001 provides for overall investment aid of FRF 45bn. In addition, the authorities contribute FRF 12bn for operational subsidies. In 2000, the authorities also contributed some FRF 500m (EUR 76m) to creating a national water solidarity fund, designed to finance national solidarity and policies of national interest concerning water.

National expenditure for wastewater management is constantly growing, from one year to the next. The sum was estimated at FRF 66.6bn for 1999 (EUR 10.15bn) which makes up 43% of total spending on environmental protection in France (source: Environment Ministry). Since 1990, it has risen by 5% on average. Three-quarters of this spending is covered by local authorities.

The funding for national wastewater management costs comes from firms, households, public administrations and companies which are specialised in collecting and treating wastewater. Since 1990, contributions from public administrations and specialised companies have hardly varied, whereas those from non-specialised firms and households have risen sharply.

Towns, which are responsible in France for sewage and water treatment, financed three fourths of wastewater management spending in 1999, with a budget up 11% as compared to 1997. Municipalities work on collective drainage networks and perform inspections on private individuals' drainage units. 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.

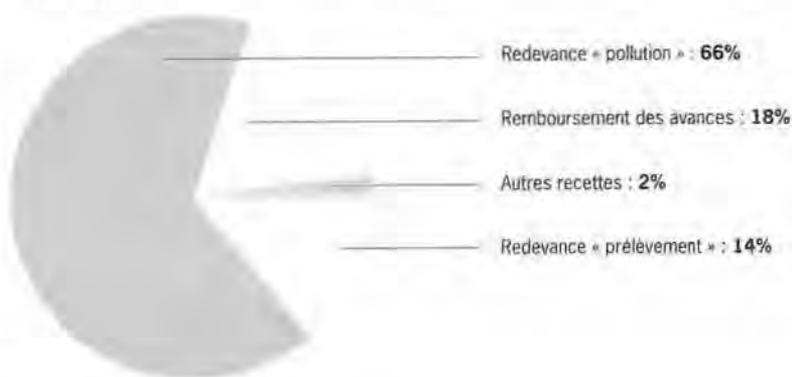
Green tides

So called "green tides" are coastal blooms of macrophytic green algae (notably ulva and enteromorpha) which multiply in the water mass. Although it was reported for many years, the phenomenon has now become significant in various areas 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.

The predominant role played by nitrogen in these blooms and the major responsibility of intensive farming practices were shown by Ifremer as of 1988. Algal development is favoured by the combined action of three factors: excessive nitrogen inputs (usually as nitrates), limited beach slope (high temperatures and sunlight in spring and summer) and limited renewal of sea water (trapping). Ulva biomass produced on the Breton shores has been assessed as at least 14 to 20,000 tonnes (instant stock observations at time of supposed annual maximum). Out of the sites regularly affected in Brittany, a dozen are highly impacted. They are mainly located on the coasts of the Finistère and Côtes d'Armor counties. The current trend in green tides is still rising, like that of nitrate inputs. This is shown by greater impact on "minor site" beaches, longer presence of algal masses on the coast and expansion of blooms towards areas of deeper water (reaching roughly - 20m).

The trend toward collecting ulva and other seaweed correlates perfectly to this. Average weight in tonnes of ulva recovered over the past four years is about 85% of total seaweed collected, while the cost of collecting green algae accounted for nearly 78% of total cost for seaweed collection.

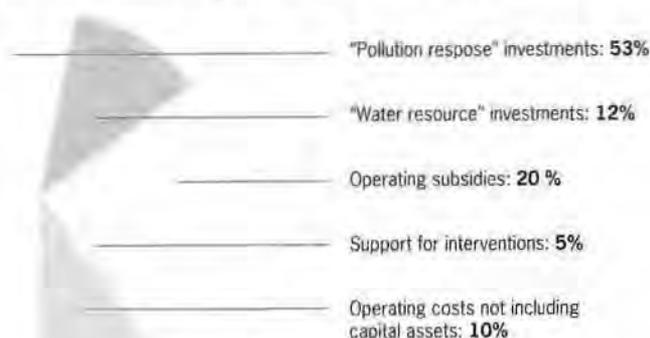
Breakdown of water authority income in 2000: FRF 13,363m (EUR 2,007m)



including, per user category

	Local authorities	Industry	Farming
Abstraction charges	74%	21%	5%
Pollution charges	89%	11%	0%

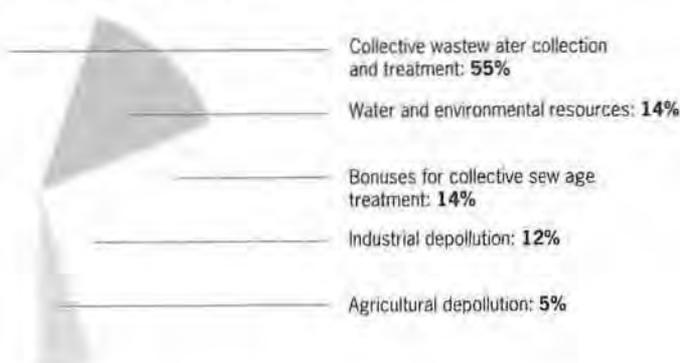
Breakdown of water authority expenditure in 2000



Aids & subsidies per user category - Source: Environment Ministry, Water authorities.

	Local authorities	Industry	Farming
	83%	12%	5%

Aids and subsidies by type of intervention - Source: Environment Ministry, Water authorities.



Water authority aids in the framework of the 7th intervention programme 1997-2001

Unit: FRF bn

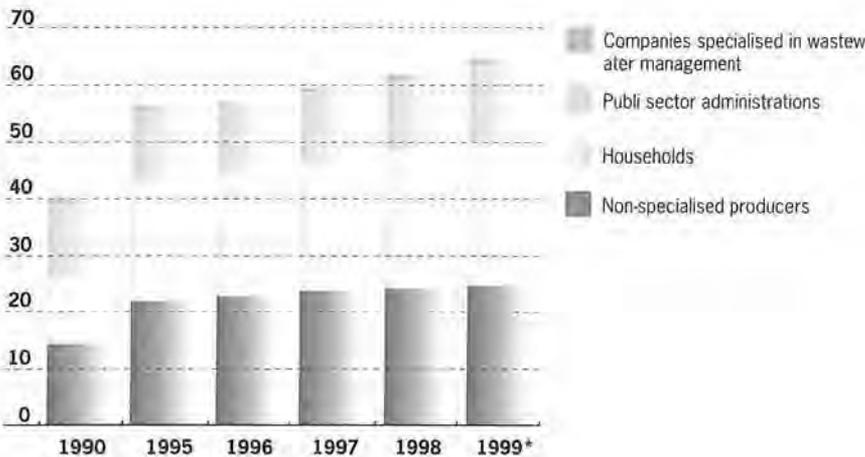
Six main objectives

	Amount of aid
Town wastewater treatment, including:	34.8
Sewage treatment plants	13.1
Drainage networks	13.7
Bonuse for sewage treatment	8.0
Industrial pollution response	6.2
Eliminating toxic waste	1.0
Subsidies for good operability of sewage treatment plants for towns and industries	2.2
Agricultural pollution response	2.0
Improving quality of water used for the potable water supply	5.7
Resource management of surface and ground waters	2.6
Restoring and maintaining aquatic environments	1.5
Miscellaneous	1.0
Total	57.0

Source: Environment Ministry.

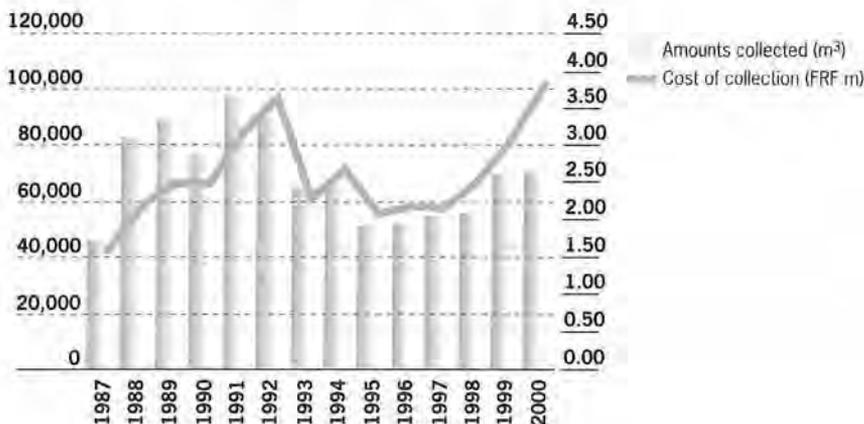
Breakdown of spending for wastewater management in France

Unit: FRF bn - Source: Ifen



Trends in collection of green algae on Breton coasts

Source: Ceva



Along with their 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 sulphur-smelling compounds 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 the algae 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. The collected seaweed is spread on farmland or put onto dumps (as of 2002, European regulations will prohibit the latter solution). After peaking in 1991-1992, the annual collection cost evened out to around FRF 2m for all the Breton counties in question. However, since 1998, a sharp rise in the collection cost has been noted, reaching over FRF 3.8m for the above-mentioned counties. However this varies considerably from site to site and from year to year.

Spending commitments from riparian towns, financed by county councils, remain at 80% for Côtes-d'Armor and from 60-72% in the Finistère, depending on the town size.

Accidental pollution response and waste management

Accidental marine pollution

The organisation of response to accident pollution at sea in France was established by the 12 October 1978 Polmar instructions, updated on 17 December 1997 and 2 April 2001. This plan embraces prevention of accidental pollution and spills (whether originating on land or at sea), preparation of the response for rapid intervention in the case of an accident, and the response itself, aiming to reduce the consequences of pollution. When the Polmar contingency plan is activated, the intervention fund managed by the ministry of the Environment can be accessed to cover staff and equipment expenses.

The national plan distinguishes between combating pollution at sea and on land.

- **The Polmar/Sea plan**, for spill response at sea, is under the authority of the maritime prefects in metropolitan France and that of prefects or high commissioners overseas, the latter being assisted by maritime zone commanders.

The plan is coordinated by the French Navy, pollution response being one of its missions in the framework of the French state's seaborne action.

The Navy is in charge of preparing marine pollution response:

- by supplying maritime prefects with anti-pollution products and equipment;
- by organising training of personnel who carry out response operations at sea;
- by having studies made by the centre for documentation, research and experimentation on accidental water pollution (Cedre, see below) in order to improve specific techniques to combat pollution;
- by supporting response operations conducted by maritime prefects, with provision of resources or products.

The Navy is responsible for chartering high-sea tugs to salvage vessels in difficulty before they run aground and cause pollution. Anti-pollution equipment for sea response is stockpiled in the different storage and intervention centres (see Polmar/Land below). The French Navy seaborne and airborne facilities used for pollution response operations or exercises, as well as the personnel deploying them, are financed by the Navy budget.

• **The Polmar/Land contingency plan** falls under the authority of the prefects of the counties concerned. It is activated by the prefect, under the authority of the minister of the Interior, for pollution of exceptional scope. Small to medium-sized pollution events are to be taken charge of by local authorities within the remit of their general police powers, set out in the code of law concerning local authorities.

Thirteen Polmar land storage and intervention centres managed by the Equipment Ministry are located along the entire French coastline (8 in metropolitan France and 5 overseas). They store and maintain the equipment needed to combat spills at sea, 38 km of floating booms, 110 pumps, 93 skimmers, 350 storage tanks in all. These figures are changing because of new purchases to replace inventory after the Erika spill.

On average, over the past ten years, these centres have accounted for annual investments of about FRF 5m for studies, purchases, construction and ship equipment, along with FRF 2m for operational credits. Initial investments ranged from FRF 10 to 30m annually for the first years of the plan's operation (1976-1985). Following the Erika spill, an exceptional sum of FRF 40m was allocated in 2000 to replace and upgrade equipment.

Authorities can also draw from other anti-pollution equipment stocks in autonomous harbours (Dunkirk, Le Havre, Rouen, Nantes-Saint-Nazaire, Bordeaux, Marseilles), in some fire fighting and rescue stations and in private equipment stores, particularly that of the private oil cooperative "Fast Oil Spill Team" or Fost based in Marseilles.

Overall, counting all stock available in the framework of the Polmar land and sea plans and from other partners (harbours, fire fighters, private cooperatives): some 55 km of booms, 172 skimmers, 241 pumps, 574 storage tanks and tubs, 426 beach cleaners and approximately 1,500 m³ of dispersants are made available to the authorities in the case of accidental pollution in the marine environment.

The 1997 instructions confirm that cooperation shall be sought between the polluted party (State and local authorities) and the polluter (shipowner, charterer and their insurance) and more generally speaking, between the public sector and industry and between neighbouring countries within the framework of regional agreements. The staff of the response directorate will especially include representatives from all ministerial departments involved and competent technical organisations, notably the Cedre.

Cedre is a non-profit organisation whose main remit is to:

- supply information about pollutants and the hazards they represent;
- provide advice on applicable methods and techniques and on equipment and products which can be used in the field of accidental water pollution.

It can provide private firms and foreign organisations with expert assessments. Its board of directors includes the national entities concerned by its remit: ministries, public bodies and trade organisations, elected representatives from the coastal area. They contribute subsidies, personnel, equipment resources and contracts, which complement the operating subsidy provided for in the ministry of the Environment's budget. In 2000, the Cedre employed 43.9 full time equivalent staff (6.7 of which were made available by members of the association) for a budget of FRF 21.3m (plus FRF 2.5m of contributions in kind by association members).

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 lifespan (plastics).

The origins vary: rubbish from urban households or dumps, mainly carried by streams (over half of macro-waste); rubbish left by coastal dwellers or visitors and waste from harbours, fisheries and shellfishing, merchant vessels or boating, carried back to the shore by currents.

The graphs for the golfe du Lion and the mouth of the Adour river clearly show that macro-waste concentrations depend on environmental characteristics. The Adour situation shows the importance of estuarine inputs rather than inputs from water currents coming from the other side of the border. Macro-waste in the golfe du Lion mainly concentrates offshore. This source of pollution is carried by the Rhône river and fed by westerly circulating currents as well as wind-induced transport.

This pollution is causing growing concern in coastal communities which are responsible for cleaning their shores, and beaches in particular. 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 actions taken by the towns involves the placing of adequate rubbish bins and toilets along the coast; eliminating waste collected along with municipal waste, the latter requiring stringent management to comply with existing regulations, and action to inform coastal users. The cost of the measures varies considerably with the nature, the scope and the frequency of the operations in question.

Financing of the Polmar-land plan since 1997

Unit: '000 euros

	Operations	Investment*
1997	270	750
1998	270	960
1999	460	990
2000	457	1,220**
2001	610	1,220

(*) Commitment appropriations.

(**) Following the sinking of the Erika, the appropriation was increased by an additional EUR 6.1m (FRF 40m).

Source: Equipment Ministry.

Protecting environmental and scenic heritage of the coast

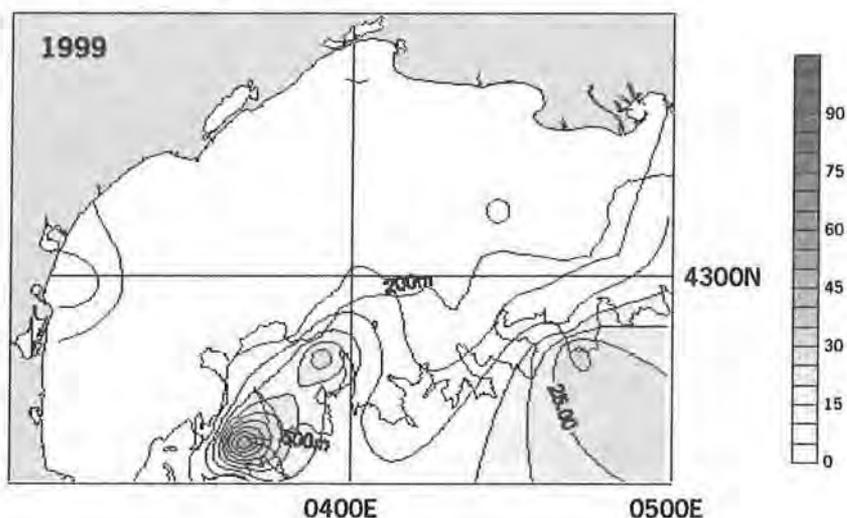
Action against coastal erosion

The phenomenon of coastal erosion is causing growing concern. According to the results of the Corine coastal erosion programme, 45% of the French shores are stable, 24% are receding and 11 are undergoing accretion. In Europe these three ratios are respectively 55%, 20% and 11%. In France 48% of beaches are receding. Annual spending for shoreline protection against erosion by the sea is mainly financed by local authorities.

In the late 1980s, the "sea defence" appropriation from the ministry of public works was close to FRF 9m per year. Following strong storms in 1990, an exceptional allocation of FRF 28m was granted. Since then, the State's share dropped to nothing in 1994 but progressively rose again to FRF 3.1m in 1996 and FRF 6m in 1999.

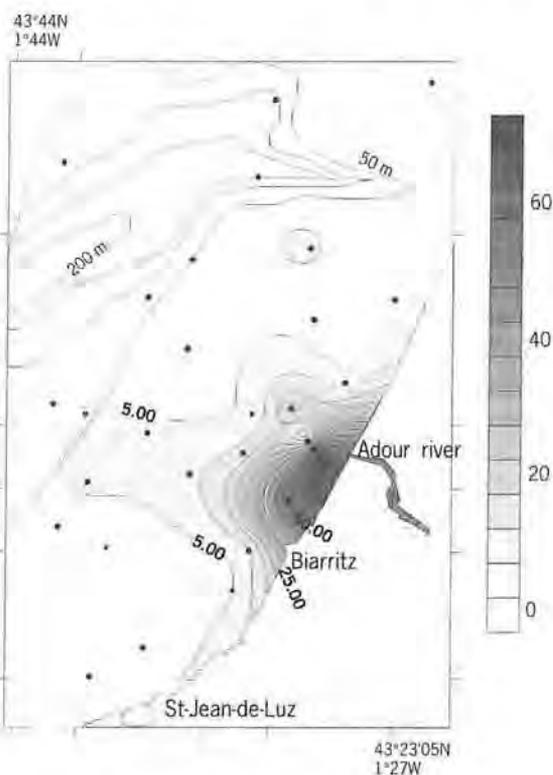
Concentration of macro-waste: golfe du Lion

Source: Ifremer/F. Galgani/ Medits surveys 1999



Concentration of macro-waste: mouth of the Adour

Source: Ifremer/F. Galgani/Adour survey, August 1998



Isoconcentration curves of waste in the golfe du Lion and on the Basque shelf, respectively showing the accumulation of waste in adjacent canyons on the continental shelf and in the estuary of the Adour river. Densities are given in number of debris per hectare.

Examples of annual cleaning costs

	Opération	Cost (FRF thousand)
Biarritz	Specialised team doing daily collections on beaches	1,600
	Floating waste collected at sea in summer	80
La Baule	Collecting waste on the beach and from beach restaurants in summer and during school holidays	1,000
Saint-Jean-de-Luz	Collecting floating waste and regular beach cleaning all year round (daily in summer)	1,000
Les Sables d'Olorne	Beach cleaning, daily in summer, at regular intervals the rest of the year	1,000
Hendaye	Daily beach cleaning using machines, complemented by hand cleaning in summer	1,450
Noirmoutiers-en-l'Île	Daily manual cleaning of beaches in summer, done by seasonal workers.	450
Sète	Daily beach cleaning by the SMNLR in summer	500
Marseilles		3,500
Cap d'Ail	Manual beach cleaning and sea collection all year round	200
Lucciana		1,700
Porto-Vecchio		800

Source: Cedre. Study carried out in the framework of the multi-annual agreement n°9500075 between Cedre and the water authorities.

Combating proliferating species

Some species have been accidentally introduced in coastal ecosystems. When their development brings on significant changes in the characteristics of these ecosystems and creates nuisances for coastal users, ways are sought to stop their spread. Spending to this end helps both public and private efforts to protect 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 seaweed (like *Sargassum muticum*), and a tropical green seaweed called *Caulerpa taxifolia*.

Brown algae, from Japan have proliferated through the vector of Pacific oyster spats. They hinder shellfish farming (beds require cleaning), rock pool fishing, boating and bathing.

Caulerpa taxifolia is a tropical seaweed which was accidentally introduced through spillage from a tropical aquarium in the northwestern Mediterranean in 1984. It develops in seasonal cycles, subject to water temperature. Therefore, it mainly develops from late spring to late autumn, when temperatures exceed 18°C, and goes through a latency phase during the winter.

Ifremer has monitored this seaweed's spread since 1992, with cooperation from Monaco's environmental service, the Posidonies scientific interest group and the coastal marine environment laboratory of the University of Nice, conducting one or two surveys per year. Since that date, *caulerpa* has progressed on all types of substrate, forming very dense cover in some places. In 2000, the surface areas affected by

varying degrees of density, went from 1% to 100%, reaching 13,000 hectares. Now, not only the Principality of Monaco, where the phenomenon was first reported, but also France, Spain, Italy, Croatia and Tunisia are impacted. Moreover, variations in its expansion, apparently linked to temperature and hydrodynamic conditions, have been observed.

Growth of the area colonised by the alga is creating some worries. Indeed, its development leads to the seafloor rapidly becoming uniform. Beyond the direct ecological modifications involved, this also entails direct economic consequences. It reduces the attraction of the areas in question for recreational activities like deep sea diving, since the seaweed's invasion renders the underwater landscape very monotonous. *Caulerpa's* spread also creates physical hindrances for coastal fisheries (especially by clogging fishing nets which become visible to fish).

The case of the gastropod mollusc called the "crepidula" is also well known. Originally from the North American seaboard, it arrived on European coasts at the turn of the last century and is present today from Sweden to the Mediterranean. The *crepidula* was introduced to French coastal areas during WWII, 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 (bays, estuaries). The Norman-Breton gulf is unquestionably the most colonised sector, especially in the bays of Saint-Brieuc (current stock assessed at 250,000 tonnes) and Cancale (an estimated current stock of 100,000 tonnes).

Although shellfishing activities were a major vector in spreading *crepidula* over the French coasts in the 1960s and 1970s, due to exchanges of shellfish between basins, coastal

fisheries using towed gear have helped disseminate the species locally since then. Investigations underway have shown that *crepidula* are continuing to proliferate in most of the sectors studied.

The *crepidula* modifies the texture of the seabed, and when it develops in high concentrations it depletes the diversity of benthic communities. 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 shellfish farming sectors and capture fisheries zones traditionally dredged and trawled have become unusable due to the greater volume of *crepidula* harvested and the time required to separate them. Some of these local activities have either moved away or been reduced.

Until recent years, the only response to *crepidula* was occasional clean-up operations by dredging of oyster beds (particularly in Marennes-Oléron and Cancale), re-dumping into abandoned areas of water or put into tips on land (the latter solution will probably be forbidden soon, within the framework of European regulation). 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 have potential effects.

An industrial project for use is currently being considered. It consists of massive harvesting in highly colonised sectors (particularly in Saint-Brieuc and Cancale bays), then processing for use in the agri-foodstuff industry. The operation envisaged is based on an input of approximately 50,000 tonnes per year.

Protecting natural heritage

The recent creation of a Fund for natural habitat management from the budget of the ministry for Spatial planning and the Environment illustrates how new resources are being implemented in natural environment protection projects, especially in application of European directives. With allocations of FRF 16m in 1999, the fund helps finance French participation in the European Natura 2000 network of land and marine sites addressed by the "bird" (1979) and "habitat" (1992) directives, re-launched in 1997.

In 1999, the ministry was granted a budget of nearly FRF 399m to create a coherent network of protected natural areas, placed under State responsibility and managed in part by public institutions. As such, the beneficiaries are national parks (especially missions in charge of setting up marine parks in Corsica and the Iroise sea), nature reserves, the coastal and lakeshore conservancy, to broaden its programme to acquire natural spaces, and the national museum of natural history for its policy promoting knowledge and inventories of biodiversity. Amongst the actions taken to protect coastal ecosystems, financed in part by public funding, the French schemes for regulatory protection and inventory and schemes for land protection are examined below.

Natural parks and nature reserves, national biodiversity inventories

The nature reserve system established by the nature protection law in July 1976 is by far most present 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 (see table below). Some of them comprise marine areas, like the Bouche de Bonifacio (79,460 ha), Scandola (1,669 ha) in Corsica or the Cerbère-Banyuls (650 ha) reserve in the Pyrénées-Orientales. Furthermore, the existing network of seven national parks is

being expanded to include marine areas, with projects in Corsica (gulf of Porto, straits of Bonifacio in cooperation with Italy), the Mediterranean sea, and in Atlantic Brittany (Iroise sea). Lastly, seven regional natural parks include shore areas within their boundaries littoral (Nord-Pas de Calais, Brotonne, Cotentin and Bessin marshes, Armorique, Poitevin marshes, Camargue and Corsica).

In addition to these schemes, there are biodiversity programmes which also apply to the coast: inventories of "nature reserves of ecological interest for fauna and flora" called Znieff (14,755 have been designated nationwide, covering 24.5% of French territory) and "zones of community importance for birds", called Zico (285 Zico designated, making 8.1% of national territory).

Public land purchases in order to protect nature

The "Conservatoire du littoral", a conservancy body for natural areas on the coast, lakeshores and river banks, is a key operator in this field. As a public administration, its remit is the implementation of a land buying policy to protect flora, fauna 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 FRF 3.15/m² in 2000, compared to FRF 3.19/m² in 1999. Funding for the establishment's expenditure mainly comes from its State budget allocations (commitment appropriations) and special ministerial programmes, contributions from European funds and outside partners (towns, counties,

Coastal nature reserves

Seafront	Surface area (ha)
Channel-North Sea	9,991
Atlantic	15,016
Mediterranean	97,510
DOM	126,831
Total	249,348

Source: Environment Ministry.

Conservatoire acquisitions

	2000	1976-2000
Surface area purchased (ha)	2,086	62,374
Land with easements (ha)*	-	1,317.6
Investment (FRF m)**	63.7	1,654.9
Investment (€ m)	9.7	252.3
Number of sites acquired	30	465

* Protection easements are granted to the Conservatoire, along with a management agreement.

** Current French francs.

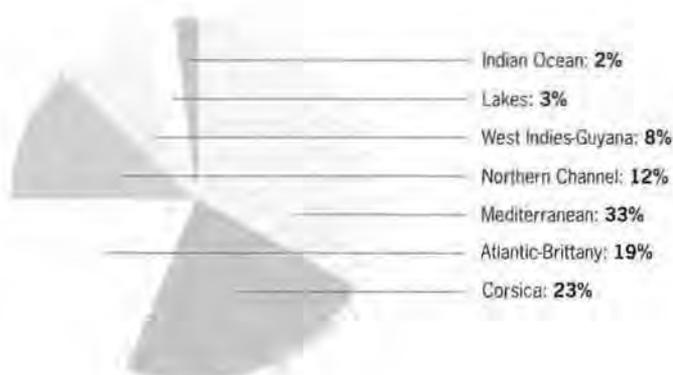
Source: Conservatoire du littoral.

donors, sponsors). As of 1 January 2000, the establishment had 46 items on its budget. Local authorities manage Conservatoire lands, employing wardens to watch and maintain the sites.

From its creation in 1975 up to 2000, the Conservatoire has bought up holdings of over 62,000 ha in coastal areas, representing 830 km of coastline (metropolitan France, overseas, lakes, coastal lagoons), as well as 12 km of land with easements (see table showing acquisitions). This system can adequately guarantee long-lasting protection at lower cost).

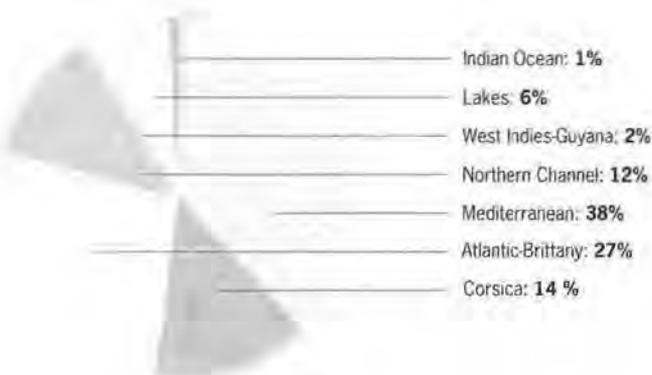
Geographical breakdown of the Conservatoire's holdings for the period 1976-1999

Source: Conservatoire du littoral



Geographical breakdown of investments for the period 1976-1999

Source: Conservatoire du littoral



Management of sites purchased by the Conservatoire is first entrusted to those local authorities who accept it. Other actors join, or sometimes replace, local authorities to ensure this management (joint associations, public institutions, approved foundations and societies, 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 land which belongs to the State, similarly to that of the Conservatoire;
- counties which buy up land on the basis of the county levy for fragile natural areas. This optional tax levied, set up in 1985, aims to take advantage of urban development to finance the acquisition and management of areas to be protected.

Marine research

This chapter focuses on the activities of French public bodies in the field of marine research and operational oceanography.

The French marine research, assessed at nearly 10% of marine research activities worldwide in terms of budget and personnel, 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 IFRTP are the core scientific organisations in public marine and ocean research. In this field, Ifremer concentrates about half the human resources devoted to French R&D nationwide. Earth-observation satellites also give oceanographic research a spatial component. 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 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 IFRTP 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 IFRTP. Furthermore, 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 carbon cycle, nitrogen and phosphorus),
- 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 operations (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 vessels operations (investigating contaminants and their fate, flow and assessment of matter and nutrients, impact from human activities).

Ifremer operates several coastal marine environment monitoring networks (chemical contamination, faecal contamination, toxic phytoplankton, farmed and captured shellfish) and collects data on marine fisheries. To back up this monitoring and foresee societal problems and issues, Ifremer leads research programmes on this environment, its resources and their upgrading.

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 operates the ocean RV fleet.

- The oceanographic component of CNRS research requires large-scale resources for data collection (satellites, ocean research vessels, atmospheric research aircraft), processing and interpretation. CNRS oceanographic research mainly devolves to the Department of sciences of the universe and the Insu national institute for sciences of the universe. They focus on the ocean, climate and the global environment, studying 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 Insu manages a national coastal fleet with an annual budget estimated at FRF 19m (not including salaries and back-up funding for surveys at sea).

The national network of thirteen "marine stations" along the French coast, operating as oceanographic laboratories, was reorganised in 1994. The principal research themes addressed there are marine species biology, marine ecosystems, ocean circulation and flows, marine environmental chemistry and marine geology.

- The main universities involved in ocean research are Bordeaux I, Brest, Lille I, Marseille II, Paris VI, Caen, La Rochelle, Dunkirk, 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, and the European ERS1 and ERS2 satellites launched by ESA, with a significant French contribution. In future, participation is slated for several satellite projects, particularly Envisat, an ESA programme, which will notably measure ocean topography and water colour, and Jason 1, Topex-Poseidon's successor, scheduled to be 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 association with *in situ* measurements.

- The Shom, with 885 staff in 1997, including 254 sea-going personnel, mainly conduct research on oceanography for military purpose (marine environment and its physical phenomena, bathymetry, sedimentology. The CMO (military oceanography center) 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 unit 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, ERS1 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 IFRTP French institute for polar research and technology, was created in 1992. 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.

Estimates of civilian marine research budgets in 1999, for main research bodies

	Total spending		including staff costs		Manpower
	FRF m	€ m	FRF m	€ m	
Ifremer ⁽¹⁾	1,039 ⁽³⁾	158.4	488	74.4	1,631 ⁽²⁾
CNRS-Insu-universities ⁽⁴⁾	560	85.4	370	56.4	786
IFRTP	37.7	5.7	1.8	0.3	10
IRD	265	40.4	208	31.7	215 ⁽⁴⁾
Inra ⁽⁴⁾	9	1.4	7	1.1	24
Total	1,911	291.3	1,075	163.9	2,666

(1) The full range of Ifremer's activities is taken into account.

(2) Operating expenditure and commitment appropriations.

(3) 1331 staff as of 31.12.1999 + Genavir's staff of roughly 300.

(4) Ifremer's estimate based on discussion with the bodies.

Sources: the various bodies and Ifremer estimates.

• 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, migrating fish species ecology, research related to marine and freshwater finfish farming, and to upgrading of products from fisheries and fish farming in fresh or brackish waters;

- Cirad: whose main marine research themes are fisheries and coastal biodiversity;

- BRGM: amongst others, geological cartography of the continental shelf, studying phenomena at the ocean-continent interfaces, such as inputs from catchment areas.

Mariculture research is mainly done at Ifremer (largest financing and human resource efforts), 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.

Operational meteorology and oceanology data

Operational oceanography aims to supply an almost real time description 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 output 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, sea surface water temperature. All the public bodies mentioned at the beginning of this chapter are involved, on various levels, in implementing operational oceanography.

Météo-France is a public establishment, 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.

Météo-France expenditures for marine meteorology and operational oceanography in 1996 accounted for 8% of total spending, i.e., a budget of about FRF 140m. The international nature of these activities requires its major participation in international networks for cooperation and exchange of data. In the framework of Eumetsat, Météo-France has been designated to steer, run and coordinate a Satellite applications centre devoted to the ocean and sea ice, in cooperation with the Norwegian and Dutch meteorological institutes.

For marine meteorology, Météo-France, within the SCEM central meteorology operations division, implements a nationwide marine forecasting service working primarily for the safety of shipping and sailors. This is Météo-France's contribution to the GMDSS global maritime distress and safety system, covering part of the Atlantic, the western Mediterranean and two zones in the Indian ocean near Reunion island for cyclone warnings.

For oceanography, Météo-France is involved in:

- *in situ* data acquisition,
- 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),
- data archiving, modelling and satellite imaging.

Ifremer's operational activity falls into three main fields: managing coastal water quality monitoring networks (see previous chapter: "Protecting the coastal and marine environment"), ocean circulation, cruises linked to 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, having 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.
- 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. Thus, 300 profiling floaters will be launched by 2004 in the framework of the global Argo ocean observation programme using 3,000 instruments.

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

Operational surveys

They deal more particularly with:

- supplying fisheries data: in order to assess fish stocks in European waters in the Atlantic, North Sea and Mediterranean. The surveys may also be done in non-European waters, through cooperation.
- setting up 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 plancton algae;
- observing the impacts of specific aspects of sea resource exploitation, e. g. 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*, Ifremer's new operational ocean research vessel delivered in June 1996, was co-funded by the IEO Spanish oceanography institute.

The Shom is also involved in operational oceanography, being responsible nationwide for nautical information (collecting, validating and disseminating it) to civilian navigators, military and professional seafarers and boaters. As a French Defence administrative service, it distributes more specific marine environment data to the naval forces and staff.

Also falling under operational oceanography are data supplied by satellites such as meteorological data from the future Metop programme and those from satellites like Jason and Envisat.

Summary

The marine economy in 1999

The series of key-figures presented in this document provide an assessment of the French marine economy's size in 1999. Within the scope we have defined, its value added is nearly 110 billion French francs (16.7 billion euros) and it employs 420,000 people.

The major components of this economy have not undergone sweeping structural changes: the industrial and service sector produces value added exceeding FRF 95 billion (nearly EUR 15 billion) and provides over 350,000 jobs. The non-commercial sector employs almost 70,000.

Within the commercial sector, several large groups of activities can be defined:

- as in previous years, coastal tourism has maintained its prevalent position;
- three sets of activities have equivalent value added, for relatively close employment levels. These are seafood products, shipbuilding and shipping (merchant fleet, harbours, insurance and other transport-related services);
- the offshore oil-related industry's value added is growing in importance in the marine economy, with a much lower level of employment.

The large manpower figures in the non-commercial public sector are due to the French Navy. Since there is no data available for capital amortization, we have assessed its value added using personnel expenditures.

The French marine economy's value added may seem low: representing just slightly over 1% of GDP, compared to that of the Netherlands, for example. Indeed, the French economy is not specialised in specifically marine industries. However, the scope of activities we have defined eliminates a mass of induced activities which are included in the French GDP and are present on the coast and elsewhere. The low figures are in great part due to the restrictive nature of our definition of the marine economy. Amongst other things, we have not included industrial port activities.

A changing marine economy

The data collected for this and previous editions of "French marine economic data" enable the reader to follow trends in the main commercial marine activities where our retrospective observations are sufficient.

In the preceding edition we could see growth in several branches of marine activities from 1995 to 1997, to such an extent that the entire sector showed faster expansion than the French economy overall. Taking a longer period into account (1995-1999) shows highly diverse trends from one branch of activity to another. This is not surprising, for a group including, amongst other things, foodstuffs (seafood products), professional equipment (shipbuilding), services to companies (offshore, merchant

Breakdown of marine value added in 1999



Breakdown of marine employment in 1999



Marine activities in 1999

	Turnover (FRF m)	Value added (FRF m)	Value added (€ m)	Jobs
Industrial sector		na		
Coastal tourism	118,862	49,922	7,611	190,402
Seafood products				
Maritim fisheries	6,317	3,693	563	1,500
Mariculture	3,658	2,561	390	9,300
Seaweed processing	700	450	69	1,000
Fish auctions	361	307	47	794
Wholesale fish trade	9,000	1,000	152	4,000
Seafood processing	17,993	3,297	503	13,129
Total seafood		11,308	1,724	43,723
Shipbuilding				
Merchant vessels	10,337	3,055	466	6,032
Naval vessels (1)		4,500	686	19,300
Naval equipment		1,800	275	8,750
Ship repair	1,596	602	92	2511
Shipbuilding	4,198	1,377	210	5,072
Total shipbuilding		11,334	1,729	41,665
Shipping				
Merchant fleet (4)	25,649	4,089	623	11,574
Marine insurance	6,290	388	59	1,030
Port authorities	5,180	3,862	589	10,827
Stevedoring	5,119	2,101	320	5,279
Other harbour professions (3)		1,090	165	24,611
Total shipping		11,530	1,756	53321
Extracting marine aggregates	500	200	30	300
Marine engineering	5,739	2,870	438	1,097
Oceanographic instrumentation (5)	330	140	21	nd
Undersea cables		1,520	232	1,597
Marine publications (5)	590	165	25	440
Offshore oil-related industry	23,500	8,100	1,235	17,500
Banking	533	358	55	891
Total industrial sector		97,447	14,856	350,936
Non-commercial public sector				
French Navy		10,265	1,565	62,641
Satte services		700	107	4,600
Civilian marine research		1,075	164	2,666
Total public sector		12,040	1,836	69,907
General total		109,487	16,692	420,843

(1) On the hypothesis of approximately 3,000 jobs subcontracted by the DCN,

(2) PA and PIN. Jobs as of year 2000.

(3) Value added for pilotage, towing and boating only. Jobs as of year 2000, dredging included.

(4) Data revised since previous editions, especially for employment.

(5) Hypothesis based on previous results.

Na: not available.

navy) and services to private individuals (tourism, boat building). The large variety of company logics is reflected in the economic trends.

However, this observation period also reveals a drop in growth rates, although not simultaneously, over the period of 1997-1999. Although the sector-based reasoning behind it, makes it hard to interpret these growth rates, it is no less likely that outside factors, especially the Asian crisis in 1998 and its aftermath, may have played a role in recent trends. The fact that numerous marine economy sectors export and are highly dependent on foreign markets should also be borne in mind. This is why, seeing the

economic situation of the OECD countries in 1999-2000, the slight upturn in growth rates taking shape after 1999 should be fully substantiated once a full set of figures is available for 2000.

When reasoning on a sectorial basis, we see soaring growth in shipbuilding, obviously due to orders for liners at a time when cruise consumption and leisure activities in general are experiencing a sharp rise. Boat building's remarkable progress can be explained by similar causes. There has also been a marked drop in offshore oil-related industries, mainly due to the collapse of crude oil prices. The seafood product sector has maintained positive growth.

In terms of employment, analysing and displaying the highly diverse changes between sectors is more complicated. The present and future economic situation influences not only adjustments (boat building, shipbuilding) but also productivity efforts (shipbuilding and oil related industry) and specific factors like maritime fisheries vessels leaving the fleet.

Annual growth rates in a few sectors of marine activity

Unit: %

	1995	1996	1997	1998	1999	2000
Maritime fisheries	-4.4	4.8	9.7	0.9	1.3	
Seafood processing		3.5	36.8	-0.4	9.6	
Marine engineering	-16.8	8.7	35.6	34.7	2.2	
Merchant shipbuilding	-5.8	-28.8	22	13.3	53.5	
Boat building	0.4	-14.2	13.5	39.3	20.8	
Offshore oil-related industries	11.1	6.7	37.5	18.2	-9.6	6.3
Shipping		2.8	9.8	12	1.4	
Tourism	-9.5	8.1	2.5	2	-0.5	4.7
Port authorities		1.8	3.6	3.9	-1.2	0.6

Annual growth rate for employment

Unit: %

	1995	1996	1997	1998	1999	2000
Maritime fisheries	-4.4	-1.5	-2.2	-0.2	0.2	
Seafood processing		0.9	-0.4	3.6	10.7	
Marine engineering	14.5	-11.9	4.5	-4.9	3.8	
Merchant shipbuilding	10.6	-4.4	1.5	-13	13.9	
Boat building	-2.6	-5.5	-0.6	18.1	19.1	
Offshore oil-related industries	13.6	12	21.4	11.8	-7.9	-2.9
Shipping	0.8	-3.6	9.3	0.6	0.7	
Tourism	2.4	2.2	6.9	9.4	4.1	3.1

Bibliographics references

- Assemblée nationale. *Rapport au nom de la commission des Finances sur le projet de loi de finances pour 1997*, n° 3030, annexe 40, Défense, 1996.
- Assemblée nationale. *Rapport au nom de la commission des Finances, de l'Économie générale et du Plan sur le PLF 2002*, n° 3262, annexe 26, Équipement, Transport et Logement - Mer, oct. 2001.
- 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 2001*, n° 2627, tome V, Défense/Marine, 11 oct. 2000.
- Assemblée nationale. *Rapport au nom de la commission des Finances sur le projet de loi de finances pour 2002*, n° 3320, annexe 40, Défense, 14 nov. 2001.
- Assemblée nationale. *Rapport au nom de la commission des Finances, de l'Économie générale et du Plan sur le PLF 2002*, n° 3320, annexe 5, Pêche, nov. 2001.
- Association française de l'industrie touristique. *Les ports de plaisance en France*. Paris, AFIT, 70 pages.
- Barry-Rogliano-Salles. *Le marché du transport pétrolier en 2000*. Paris, BRS, 2001.
- Barry-Rogliano-Salles. *Transport maritime et construction navale*. Paris, BRS. Années diverses.
- Comité central des armateurs de France. *Cahier statistique maritime 2000*. Paris, CCAF, 2001, 52 pages.
- Comité central des armateurs de France. *Marine marchande. Rapport annuel 2000*. Paris, CCAF, 2001, 51 pages.
- Comité national d'évaluation de la recherche. *Évaluation de la recherche en océanographie*. Paris, La Documentation française, 1998.
- Commission européenne. *Communication de la Commission au Conseil, au Parlement européen, au Comité économique et social et au Comité des régions. Vers une nouvelle politique de la construction navale*. COM(97) 470, Bruxelles, 01.10.1997.
- Commission européenne. *Règlement (CE) 1540/98 du Conseil du 29 juin 1998 concernant les aides à la construction navale*. Bruxelles, JOCE n°L 202, 18.07.1998, p. 1-10.
- Commission européenne. *Rapports de la Commission au Conseil sur la situation de la construction navale dans le monde*. Bruxelles, COM (2000) 263 final du 3.5.2000, COM (2000) 730 final du 15.11.2000, COM (2001) 219 final du 2.5.2001.
- Commission européenne. *Communication de la Commission au Parlement européen et au Conseil : Améliorer la qualité des services dans les ports maritimes : un élément déterminant du système de transport en Europe. Proposition de directive du Parlement européen et du Conseil concernant l'accès au marché des services portuaires*. COM (2001) 35 final, 2001/0047 (COD), Bruxelles, 13.2.2001.
- Commission européenne. *La politique européenne des transports à l'horizon 2010 : l'heure des choix*. COM (2001) 370 final, Bruxelles, 12.9.2001.
- Commission des Nations unies pour le commerce et le développement. *Review of maritime transport 2000*. New York, Genève, Crucead, 2000, 149 p.
- Conservatoire du littoral. *Rapports annuels*. Années diverses.
- Cour des comptes. *La politique portuaire française*. Paris, Cour des comptes, octobre 1999.
- Dujardin B. « De l'opportunité de créer un observatoire européen de l'emploi maritime et portuaire ». *Colloque 15-16 mai 2000*, Lorient, 10 p.
- DTMPL. *Résultats de l'exploitation des ports maritimes*. Paris, DTMPL, 1998, 265 p.
- FIN. *Les chiffres-clés du nautisme, année 2000*. Paris, FIN, 2001.
- FFSA, direction des assurances transports. *Chiffre d'affaires et résultats du marché français des assurances transports*. Paris, FFSA, éditions 2000, 2001.
- FNTP. *Recueil de statistiques*. Années diverses.
- FMI. *World Economic Outlook*. Washington DC, États-Unis, oct. 2001.
- Hamon J.-Y., Dubois J.-C. *L'avenir de la flotte de commerce française : une démarche collective*. Rapport présenté par Paris, Conseil général des ports et chaussées, Inspection générale des services des Affaires maritimes, 1999, 58 pages + annexes.
- Ifen. *Rapport à la Commission des comptes et de l'économie de l'environnement. Données économiques de l'environnement*. Poupat (éd.), Orléans, Ifen, 2001.
- IFP. *L'industrie parapétrolière française, résultats d'enquêtes annuelles*. Paris, IFP, années diverses.
- Ifremer. *Données économiques maritimes françaises*. Paris, Ifremer, 1997, 1998, 1999.
- Insee. *Les transports en 2000. 38^e rapport de la Commission des comptes de transports de la Nation*. Paris, Insee, 2001, 210 p.
- Institut océanographique, Centre de la mer et des eaux. *Guide des formations : mer, eau, environnement*. Paris, Institut océanographique, 1998, 239 p.
- Mate. *PLF : Agences de l'eau*. Paris, Imprimerie nationale, années diverses.
- Mate. *Projet de loi de finances pour 2001 : Environnement*. Paris, Imprimerie nationale, 2000.

- METL/DAEI/SES. *Mémento de statistiques des transports*. Paris, DAEI, 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.
- Office parlementaire d'évaluation des politiques publiques, 1998. *La politique maritime et littorale de la France : enjeux et perspectives*. Assemblée nationale (n° 771), Sénat (n° 345), Paris.
- Observatoire national du tourisme. *L'hôtellerie classée et les campings classés en France : l'offre et la fréquentation en 1999*.
- ONT. *Le trafic de voyageurs transmanche*. Paris, ONT, 2001, 50 pages.
- Policy Research Corporation N.V. & ISL[®]. *Economic Impact of Maritime Industries in Europe*. Bruxelles, Commission européenne, 2001.
- Secrétariat d'État au Tourisme. *Mémento du tourisme 2001*. Paris, 128 pages.
- Secrétariat d'État au Tourisme. *Le tourisme dans les Dom-Tom*. Paris, 139 pages.
- Sénat. *Situation des ports maritimes français au regard des ports du Bénélux*. Rapport d'information n° 295. Paris, Sénat, février 1998, 33 pages.
- Sénat, commission des Affaires économiques, groupe d'étude de la Mer. *Pour une stratégie de l'économie de la mer : les trente-six propositions*. Paris, Sénat, 26 juin 2001.
- Sessi. *Enquêtes annuelles d'entreprises 1999*. Paris, ministère des Finances et de l'Industrie, 2001.
- Sofres. *Enquête sur le suivi de la demande touristique. Les dépenses au cours des séjours sur le littoral français, juillet-septembre 1999*. Paris, Ifremer, 1999, 54 p.
- Sofres. *Enquête sur le suivi de la demande touristique. Les dépenses au cours des séjours sur le littoral français, juillet-septembre 2000*. Paris, Ifremer, 2000, 54 p.
- Williams D.O. *An Oversimplified Overview of Undersea Cable Systems*.- Genève, CERN, 2000, 20 p.

Glossary

\$ bn	billion dollars	CSG	Social security contribution
Acomo	Aid for consolidation and modernisation	Datar	Delegation for national and regional planning and development
Ademe	Agency for environment and energy management	DCN	Naval shipbuilding directorate
Afit	French agency for tourist engineering	Ddass	County-level division of the ministry of health and social affairs
Afssa	French agency for food sanitary safety	DEMF	French marine economic data
Agema	Agency managing training centres for fisheries and aquaculture	Dom	French overseas département (= county)
Ania	French agri-industry trade association	dwt	deadweight tonnage: unit used to measure the carrying capacity of the vessel expressed in tonnes
ASCOTP	Association for civil engineering knowledge	Eaggf	European agriculture guidance and guarantee fund
AWES	Association of European Shipbuilders and Ship repairers (Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Poland, Portugal, Spain, United Kingdom)	EC	European commission
BFG	Blast furnace gas	EDF	French electricity board
Bresm	Shom-Météo France research and study office	EEC	European economic community
BRGM	Geological and mining survey office	EEZ	Exclusive economic zone
CCAF	Central committee of French shipowners	Ema	Vocational training school for seafaring and aquaculture
Cedre	Centre of documentation, research and experimentation on accidental water pollution	Enim	Social security regime for French seafarers
Cersat	Processing, archiving and dissemination centre for ERS1 and ERS2 satellite data	ENMM	French merchant navy school
Ceva	Seaweed processing technology research centre	ENS	École normale supérieure (establishment training teachers and researchers)
CFC	French confederation for appertized-pasteurized canned food	Epa	State-funded administrative establishment
CFP	Common fisheries policy	Epic	State-funded industrial and commercial establishment
Cgt	compensated gross tonnage: product of the gross tonnage multiplied by a compensation coefficient which takes into account shipbuilding labour measured in hours for a given value of gross tonnage, varying according to the vessel's size and type (see gt)	Eple	State-funded local teaching establishment
Cirad	Centre for international co-operation in agricultural research for development	Epsom	main French navy hydrographic and oceanographic department
CLIA	Cruise lines international association	Erdp	European regional development fund
CMM	Marine meteorology centre	Esa	European Space Agency
CMO	Navy oceanographic centre	EU	European union
Cnes	National Space Research Centre	EUR m	Million euros
Cneva	National veterinary and animal research centre	FAO	Food and Agriculture Organization of the United Nations
CNRS	National Centre for scientific research	Feederling	Short-sea shipping using container-ships
Cofrena	French marine equipment manufacturers association	FEEE	Foundation for environmental education in Europe
Corine	European programme: Coordination of Information on the Environment	Ficur	Federation of deep freeze industries and trades
Cosma	Coastal rescue centre in the West Indies	FIFG	Financial instrument for fisheries guidance
Cosru	Coastal rescue centre of Reunion island	FIN	Federation of nautical industries
County	Administration subdivision of the French territory (95 counties in France-metropole)	Fnotsi	French federation of tourist offices and information centres
CQEL	Coastal water quality unit	FNTP	French federation of public works
CRM	Seafarers provident fund (Enim)	FPSO	Floating production storage and offloading vessel
CSCN	Shipbuilders trade association	FRDP	Framework research and development programme (European commission)
		FRF bn	Billion French francs
		FRF m	Million French francs
		Genavir	Ifremer's subsidiary for the management of research vessels
		GMDSS	Global maritime distress and safety system
		Grt	Gross registered tonnage (see gt)

Gt	gross tonnage: 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	Remi	Microbiological inspection network
HCR	Hotels, cafés and restaurants (catering)	Remora	Network for aquaculture mollusc resources
HSC	High speed craft	Repamo	Mollusc pathology network
Hub	Port platform for consolidating and bulk breaking cargo (generally containerised)	Rephy	Phytoplankton and phycotoxin monitoring network
IACMST	Inter-Agency Committee on Marine Science and Technology (United Kingdom)	Repom	National surveillance network for maritime harbours
Ices	International Council for the Exploration of the Sea	RGA	General agriculture census
ledom	French overseas department issue institute	RNDE	National water data network
IEO	Instituto Español de Oceanografía	RNO	National marine environmental quality monitoring network
IEOM	French overseas issue institute	ro-ro	roll on-roll off carriage of lorries or special trailers
Ifen	French institute for the environment	RSP	Posidonia monitoring network
IFP	French petroleum institute	Sandre	National administration service for water data and references
ifremer	French research institute for exploitation of the sea	SCCMM	Mutual maritime loan company
IFRTP	French polar research and technology institute	SCEM	Central meteorology operations division
IMO	International maritime organization	SCN	Division with nation-wide jurisdiction
Inra	National agronomic research institute	Scop	Workers' cooperative production society
Insee	National institute for statistics and economic studies	Sdage	Water management and planning master plan
Insu	National institute for sciences of the universe	SDT	Monitoring of tourist movement
IRD	French research institute for cooperative development	Secodip	Marketing, distribution, advertising surveys
ISL	Institut für Seeverkehrswirtschaft und Logistik (Bremen, Germany)	SFAM	French Union of Marine Aquaculture Industry
IUMI	International Union of Marine Insurance	Shom	French navy hydrographic and oceanographic service
JO	Official journal of the French government	SMVM	Coastal zone management scheme
JOCE	official journal of the European communities	SNSM	National sea rescue society
LPG	Liquid petroleum gas	Somlit	Coastal environment observation service
LPM	Military programming act	SPN	Naval programmes service
Magp	Multi-annual guidance programmes	SSBN	Ballistic missile nuclear submarines
Marel	Automated measurement for the coastal environment	SSN	Attack submarines
Mt	million tonnes	Taaf	French southern and Antarctic lands
ODP	Ocean Drilling Program	TEU	Twenty foot equivalent units
OECD	Organisation for economic cooperation and development	TO	Turnover
Ofimer	Inter-professional office for seafood and aquaculture products	Toga	Tropical Ocean Global Atmosphere
ONF	National forestry office	Tom	French overseas territory
ONT	National tourism observatory	Tonnage	The tonnage of vessels is the estimation of their volume, expressed in tonnes. The old unit of tonnage corresponded to 2.83m ³ . As of July 1994, vessel tonnage which has been recalculated is now given in standard maritime units (SMUs) inclusive of tax
Opec	Organisation of petroleum exporting companies	TTC	inclusive of tax
Osu	Observatory for sciences of the universe	Unctad	United Nations conference on trade and development
P&B	French lighthouse and beacon service	USD m	million US dollars
PA	Autonomous port	VA	value added
PAH	Polycyclic aromatic hydrocarbons	Woce	World Ocean Circulation Experiment
Panamax	Type of vessel defined by carrying capacity which limited to the Panama canal's size	WTO	World trade organization
PIN	Port of national interest	WTO	World tourism organization
post-panamax	Vessel larger than a panamax (see panamax)	Zico	Zone of community importance for birds
Quirat	former tax deduction scheme for investment in shipownership	Znieff	Nature reserves of ecological interest for fauna and flora
RCC	Regional rescue coordination centre		
R&D	Research and development		
Region	Administrative subdivision of the French territory (22 regions in France-metropole)		

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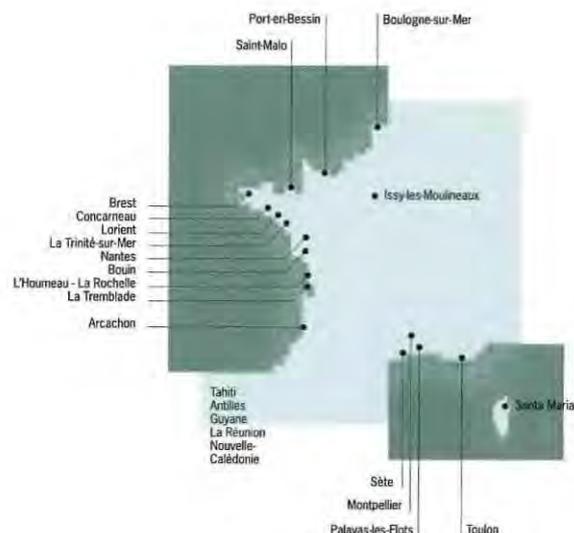
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French marine-related economic data, 2001

This document presents a survey of the marine-related activities in France, i.e. those of the commercial sector (exploitation of mineral and living resources, manufacturing industries, services) and those of the public sector (Navy, State services, education, safety, marine research). A chapter is devoted to the protection of the coastal and marine environment, and the chapter on tourism gives quantitative data on the impacts of the pollution caused by the *Erika* oil-tanker. Each activity of the commercial sector is described by key-figures (turnover, value added, employment). The description of the non-commercial public sector includes data on costs, including personnel costs. In addition to these figures, qualitative information is given on the recent development, present situation and outlook for each activity.



Données économiques maritimes françaises 2001

Ce document présente un panorama des activités liées à la mer en France, c'est-à-dire du secteur industriel (exploitation des ressources minérales et vivantes, industrie manufacturière, services) et celles du secteur public non marchand (Marine nationale, services de l'État, enseignement, sécurité, recherche marine). Un chapitre est consacré à la protection de l'environnement littoral et marin, et le chapitre sur le tourisme donne des indications quantitatives sur les impacts de la pollution causée par le navire pétrolier *Erika*. Chaque activité du secteur industriel est décrite par des chiffres-clés (chiffre d'affaires, valeur ajoutée, emploi). Pour le secteur public non marchand, sont fournies des données sur les coûts, notamment les coûts de personnel. Ces indicateurs sont accompagnés d'informations qualitatives sur l'évolution récente, la situation actuelle et les perspectives de chaque activité.

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