Study on Competitiveness of the European Shipbuilding Industry

Within the Framework Contract of Sectoral Competitiveness Studies – ENTR/06/054

Final report

Client: Directorate-General Enterprise & Industry

Rotterdam, 8 October 2009

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Table of contents

Preface

The shipbuilding sector in Europe is operating within a global market. Not only demand patterns are directly influenced by global patterns in shipping, but also the shipbuilding industry itself undertakes its business at the global market place. As such it is one of the sectors in Europe which is strongly influenced by developments which take place outside Europe.

In this sense it is highly relevant to investigate the Competitiveness of the European Shipbuilding Industry. This analysis feeds directly into the refinement and actualisation of the LeaderSHIP 2015 strategy that was initiated in 2002/2003 by the shipbuilding industry and the European Commission to ensure its long-term prosperity in a dynamic market.

This study focuses on this longer-term competitiveness and the strategic outlook of the European shipbuilding industry. It is therefore not directed in defining answers to the position of the European Shipbuilding industry in light of the current economic crisis. Nevertheless the current crisis may trigger some international responses that in turn may impact the European industry.

During the study we have spoken to various people from different organisations. We would like to express our gratitude to all people who have shared their valuable insight with us on the matter.

It should be noted that the study is carried out by an independent team of consultants from ECORYS. It should be noted that this report represents the views of the consultant, which do not necessarily coincide with those of the Commission.

Rotterdam, September 2009

ECORYS

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Executive Summary

Introduction

Background and objective

The study aims to refocus priority LeaderSHIP2015 actions

In 2002-2003, the European shipbuilding industry initiated the LeaderSHIP2015 strategy. The aim of this strategy was to strengthen the sector's position to ensure its long-term prosperity. This study should build on the framework provided by the LeaderSHIP2015 initiative, so as to deliver **knowledge and insights into the key drivers of an innovative, competitive and sustainable European shipbuilding industry**. As such, the analysis undertaken within the study should contribute to the formulation of suggestions and recommendations for actions that can contribute to the better realization of the objectives of the LeaderSHIP2015 initiative.

Sector description

Sector definition

The European shipbuilding industry study is centred around two sub-sectors:

- Ship construction (shipyards)
- Marine equipment (shipyard supply industry)

Trends and developments

Europe's dominant position was taken over by Japan in the 70s …

A century ago shipbuilding was dominated by Europe, having a world market share of some 80% at the beginning of the 20th century. In the 1950s this position was gradually taken over by Japan, mainly due to a rapid growth of the Japanese economy and a coordinated shipping and shipbuilding program. At the early 1970s Japan and Europe still dominated the world market with a combined share of some 90%.

.. which in turn was surpassed by South Korea at the beginning of this decade…

… and China entering the stage 10 years ago

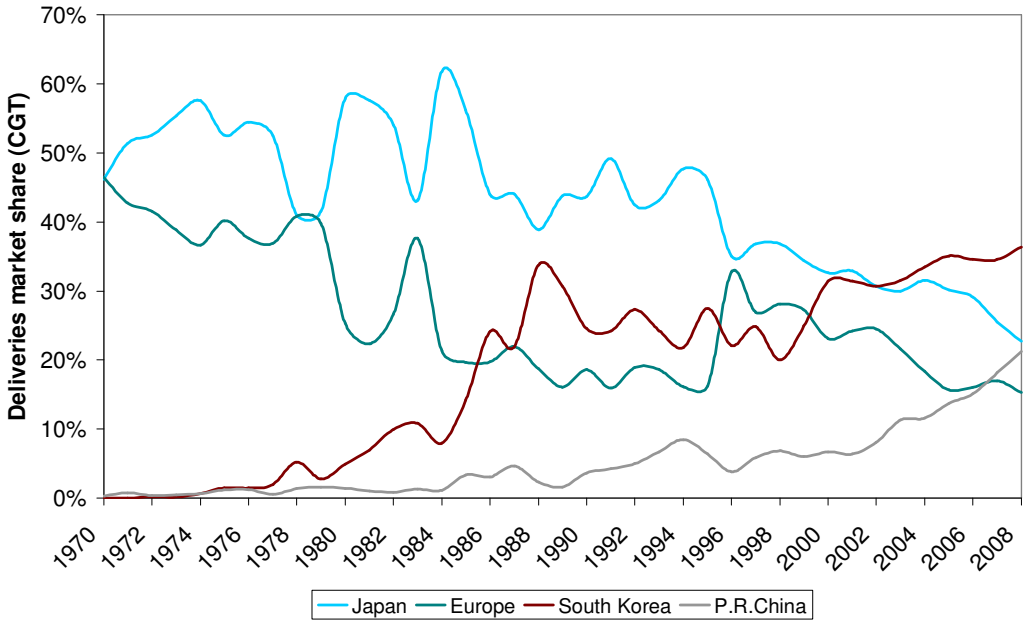
In the early 1970s South Korea entered the stage. The country offered lower wages than Japan or Europe and chose to position shipbuilding as a strategic industry. Just as Japan did before, a carefully planned industrial program was successfully initiated, leading to a world market share of 25% by the mid-1990s and a world first position as of 2005. Although having shipyards since the 1940s, China is only becoming a dominant player since the last 10 years. The country's economic boom together with the strategic choice to develop heavy industry activities has led to a strong increase in global market share.

Increased role for marine equipment manufacturers

The role of marine equipment manufacturers has become more important over time. Originally most of the shipbuilding work was carried out at the shipyards themselves. With technological advance, the role of marine equipment industry – as the supply industry to the shipyards - has increased dramatically. While in the 1970s most of the shipbuilding work was carried out at the shipyards themselves, nowadays the share of

marine equipment is assessed at 50%-70% of the product value, and can be 70-80% in the more specialised segments. Close ties between equipment suppliers and shipyards therefore exist.

Figure S.0 Market shares in CGT completed and delivered by major shipbuilding regions from 1970 to 2008



Source: Clarkson[1] (2009).

Large players dominate the market

The shipbuilding industry is dominated by a few large shipyards. The four largest yards, measured by orderbook in CGT, are all based in Korea and together account for some 25% of the market, while the top-18, all in Korea, Japan and China, covers 50%. The first European yard ranks 38th in terms of orderbook measured in CGT (data of 2008). In terms of value the position of Europe is stronger, especially if also naval activities are accounted for.

Europe still dominates some specialised segments

Europe is active in many segments, and – notwithstanding the overall dominance of Korea, Japan and increasingly China – European companies are still dominant in a few specialised market segments such as cruise vessels (99% market share), offshore vessels (43%) and luxury yachts (65%). Also the military vessels segment is relevant in Europe. In general, these segments are characterized by a high degree of specialisation and high-tech qualities, complex production processes, in combination with limited numbers of vessels of the same type that are to be built. As such Europe's position can be characterised as one of a specialised niche player.

[1] It is noted that Clarkson data may be less reliable on recent data compared to CESA statistics. Especially data on changes such as cancellations are not reflected in data directly but may have a delay. In this report Clarkson data is therefore only used if CESA data is not available at the required time horizon or level of detail.

Within Europe, four countries dominate the field in ship construction: Germany, Italy, the Netherlands and Romania. Turkey has entered the stage on the wave of the world shipbuilding boom of the last 5 years.

The top 4 European yards are Meyer Werft in Germany (building container and special purpose vessels), Daewoo Mangalia in Romania (a subsidiary of Daewoo Korea, building bulkers and container vessels), STX Europe (formerly Aker, now a subsidiary of STX Korea, building cruise vessels as well as offshore ships and other types), and Fincantieri in Italy (known for its cruise vessels and ferries). What becomes clear from these yards is that, even though the yards are located in Europe, ownership has partly changed to foreign (Korean) hands. As such, a clear globalisation tendency can be observed.

India, Vietnam, Philippines and Brazil are new players

New players are entering the stage. The last five years, India, Vietnam, the Philippines and Brazil have acquired substantial orderbooks and have become larger players than most European countries. Partly this rise is due to the shipbuilding boom that has now come to an end; partly it has been realised by Korean or European yards investing in facilities in these countries, as a means to combine their own high level skills with the relatively low cost labour available in these countries.

A specific segment is the repair and conversion industry. While the global fleet has expanded, and technology has become more complex, this segment has also gained in importance. Location is important and most repair centres are located along major shipping routes.

Marine equipment is a heterogeneous subsector…

The marine equipment subsector is highly heterogeneous and consists of many relatively small companies. Estimates range from 5,000 to 9,000 suppliers worldwide. Many of those are also active in other business areas, e.g. car or airplane industry. Total market value was estimated at € 57 billion in 2005. European based companies, i.e. having their production sites in Europe, indicatively account for 36% of this. Some of the key areas in Europe are mechanical engineering including engines (26% of European production value), electrical engineering/electronics (18%) and steel products (15%).

…which does not depend on European demand onlv.

European marine equipment suppliers do not depend on European shipyard customers only. Some 46% was exported. Furthermore several of the larger companies have assigned licenses to Asian manufacturers to produce for them at sites near to Asian shipyard customers.

Shipbuilding is a cyclical business which was already entering its next down cycle ….

Shipbuilding is a highly cyclical industry. Even before the current economic crisis global shipbuilding industry was entering its next down cycle driven by the strong upsurge in demand in the last years and the resulting fast decrease in capacity expansion worldwide. This has been further aggravated by the economic and financial crisis.

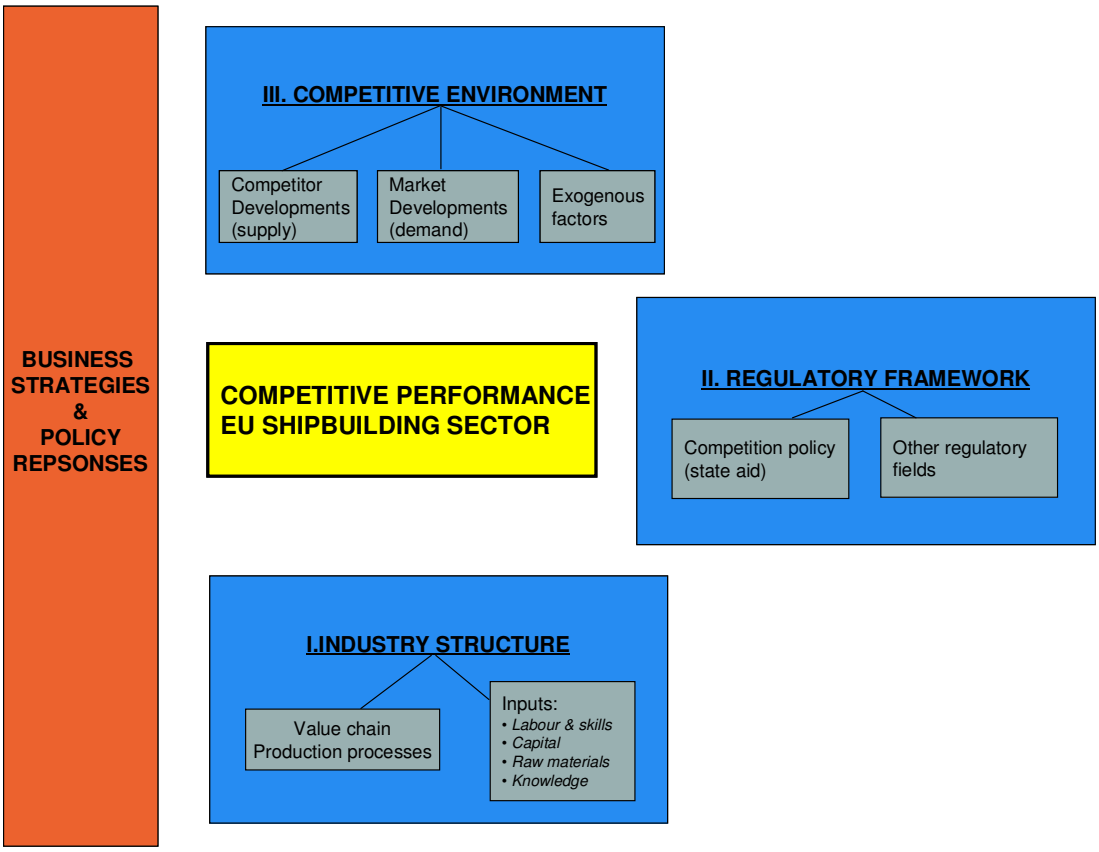
… before the current economic crisis hit the sector

The economic crisis started to become visible with a sharp decline of new orders since Q3 of 2008. In Q4 virtually no new orders were placed worldwide, and neither in Q1 of 2009. In some segments the decline is larger than in others. Especially dry bulk, tanker and container segments are hit hardest. Those are the segments dominated by Asian manufacturers. Nevertheless also European shipbuilders are strongly affected by the worldwide stop in new orders, while also cancellations are widely present.

Competitive position

The competitive position of the EU shipbuilding industry is analysed according to the aspects shown in figure S.2.

Figure S.2 Schematic overview of analytical framework competitiveness EU shipbuilding sector



Industry structure: value chain and production processes

Europe is characterised by many SMEs in shipbuilding

The average size of the shipbuilding companies differs strongly per region. The average size of companies is largest in China, whereas especially Europe is characterized by a relatively large number of SMEs and few larger companies. In Europe the 10% largest companies represent 92% of turnover. In general these small to medium companies show higher profits rates than large (>250 employees) companies.

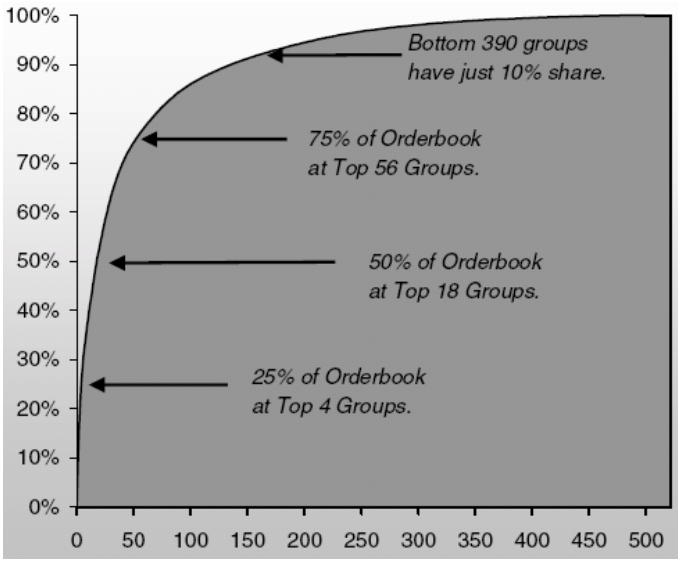
Table S.1 Production structure for the main shipbuilding regions: average size of enterprises

Average figures per enterprise	Japan	China	South Korea	EU27+Norway
production value per enterprise (€, million)	11	34	22	4
employees per enterprise	67	354	100	25
Annual CGT output per enterprise	5900	7250	8900	440

Source: ECORYS based on various sources

Whereas this may be valid for the average position the largest shipyards can be found in Korea. Of the largest 15 yards in the world 8 are found in Korea. 6 in China and one in Japan (see also figure S.3).

Figure S.3 Shipyard Groups Share of Orderbook (CGT)



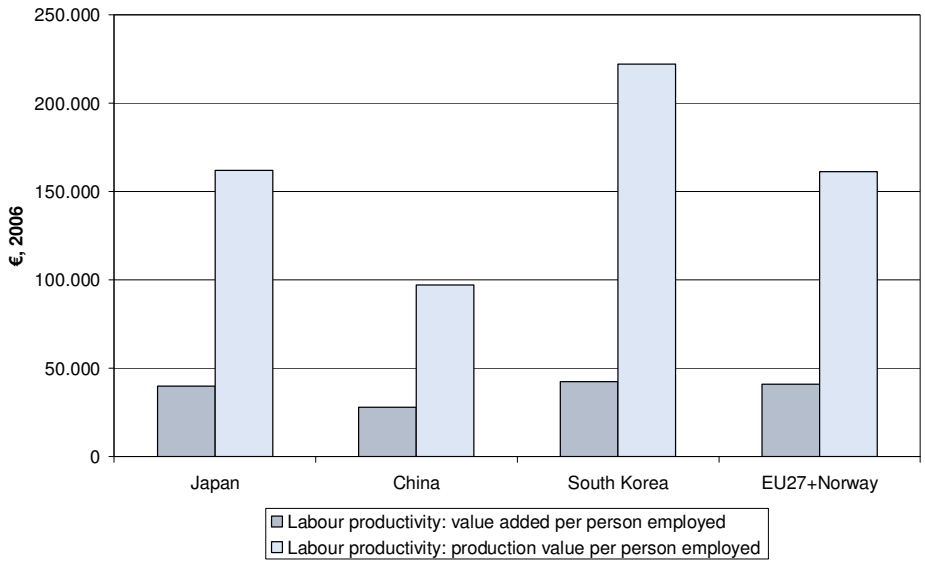
Source: Clarkson Monitor December 2008

A relatively large part of production is outsourced or subcontracted. Value added as a percentage of total production in shipbuilding hovers around 25% in the EU27 + Norway, similar to the level in Japan. In China this figure is relatively high, whereas Korea shows the lowest figure.

Chinese labour productivity is lagging behind

In terms of labour productivity Europe, Japan and Korea show a similar pattern of about €40,000 value-added per person employed in the shipyards. China shows a clearly lower figure of €28,000. This confirms earlier observations that the Chinese shipbuilding sector is mainly active in ship types that relatively labour intensive in comparison to the other shipbuilding regions. It must be noted that the high productivity of Norway largely influences the European average which would be about 35,000 if Norway is excluded.

Figure S.4 Labour productivity



Shipbuilding industry is strongly export oriented in all regions

Whereas shipyards are strongly dominated by Asia, at the buyer side a high concentration in Europe is observed. This confirms the highly international character of shipbuilding. It has also led to significant trade flows across the world. Asian shipbuilding countries show a strong export orientation:.

- South Korea: in 1990, about 15% of its production value was destined for the domestic market and 85% was export. Since 1995, the latter has increased to more than 99%.
- China: In 2007, the exports of newbuildings accounted for 81 percent of total production, while the inflow of new orders was already 89 percent of foreign origin.
- Japan: While in 1971, domestic shipbuilding new orders in Japan surpassed export order for the first time in ten years, in 2004 the share of export new orders was 99% (9.75 million GT).

Also Europe has a high export orientation albeit at a somewhat lower level with approximately two-thirds of its total production being exported.

Also the marine equipment is highly internationally oriented. Approximately 46% of the European marine equipment is being exported which is much higher than for example South Korea (10% export) and Japan (25%).

Industry structure: access to resources

European labour costs are high but countered by its specialisation in high value vessels

Labour costs typically account for some 20% of the overall costs. Europe clearly shows higher labour costs in comparison to its Asian competitors, although low labour cost competition is mainly focused on China and emerging shipbuilding nations. Korea and Japan do not have significantly lower labour costs and have even higher labour costs than some European countries (such as Romania). Due to its specialisation in the high value added segment of the market labour costs are less of an issue in shipbuilding in Europe.

Access to skilled labour is more of an issue

A more prominent theme is the shortage of high educated labour. Although due to market developments the absolute demand for shipbuilding labour is not expected to show strong increases, there is an ongoing demand for highly skilled labour. This is further aggravated

by the ageing population leading to the retirement of current skilled employees in the coming two decades.

Steel prices in Europe are higher than in Asia

In addition to the cost of labour the price of steel is an important factor in determining the cost price of a vessel. In this respect steel prices in Europe are clearly higher than Asia, although the current economic crisis and the resulting drop in steel prices has reduced the price gap.

R&D expenditure is below 1% of production value

R&D is also important for shipbuilding in Europe which focuses on relatively complex, high value ships. Expenditure on R&D in Europe and Korea shows that all countries have a R&D ratio below 1% (of production value), with Korea showing the highest figure. On a company level however this may be different with some European shipbuilders showing clearly higher R&D ratios.

The current financial crisis has put financing under pressure

Access to financing is yet another important factor for a capital intensive industry like shipbuilding. Financing (especially by arranging guarantees) is both important for shipbuilders in arranging pre-delivery financing as for buyers. The current financial crisis has a relatively strong impact on the financing of both shipyards and ship owners.

Regulatory framework

At the international level, multilateral cooperation on competition issues takes place through various channels, including the International Competition Network, the OECD Competition Committee and the World Trade Organisation. However, discussions on designing a multilateral agreement on competition, (e.g. under the WTO) have as of yet not materialized. At a bilateral level, competition issues are included in various bilateral agreements.

Within the EU competition policy is regulated through the framework on State Aid to Shipbuilding

Within the EU, sectoral competition policy for the shipbuilding industry is laid down in the Framework on State Aid to Shipbuilding. This framework establishes the competition regime taking account of the specific characteristics of the shipbuilding sector, including:

- Finance: guarantee schemes and export credits;
- Research, development and innovation.

Export credits are common in most EU countries ….

In most EU Member States, Export Credit Agencies (ECAs) provide trade financing to stimulate exports in the form of credits, credit insurance or guarantees. Guarantees usually apply to the buyer (post-financing), while export credits are extended to the supplier / exporter (pre-financing).

… whereas only a number of countries have developed pre-delivery guarantee schemes

In addition, the EC has laid down specific rules in order to determine whether a guarantee constitutes state aid in the Commission Notice on state aid in the form of guarantees. This has led to the development of national guarantee schemes in various Member States, including Germany, France and the Netherlands. Not all countries have initiated such guarantee schemes however.

Similarly some countries have initiated innovation schemes offering up to 20% support.

Research, Development and Innovation (RDI) policies are justified under the Shipbuilding Framework and a separate RDI framework. Innovation aid to existing shipbuilding, ship repair or ship conversion yards is possible up to a maximum aid intensity of 20 percent. Under the existing framework, various innovation aid schemes at

national level have been approved as being compatible. As with guarantee schemes not all Member States have developed such innovation schemes for shipbuilding as funding also has to come from the national level.

In practice many firms do not protect their knowledge

With knowledge being such a crucial issue in the high value specialised vessels that are being constructed in Europe and its marine equipment industry, in practice many EU firms in the shipbuilding sector often decide not to protect there knowledge for (a combination of) the following reasons:

- general enforcement difficulties (high costs, evidence and reactive nature of IPR);
- enforcement difficulties for EU operators in Asian jurisdictions especially;
- the fact that foreign-owned vessels are placed beyond the reach of domestic patent rights;
- Lack of awareness of the possibilities, especially among SMEs.

Instead, firms indicate that the only way to remain competitive in this sense is to continuously innovate and do it fast, so as to stay ahead of the game.

Creating a level playing field in international trade conditions proves to be difficult

Regarding international trade conditions it proves difficult to create a level playing field. At the multilateral level there are no binding instruments at a sector specific level (apart from WTO, but not specifically on competition policy). Continuing efforts are being delivered to establish an OECD Shipbuilding Framework on prices and subsidies in shipbuilding, but this proves to be difficult. Also at a bilateral level (e.g. through the EU-China Shipbuilding Dialogue) continued attention is being paid to the issue, although it is addressed in a number of bilateral agreements (such as FTAs).

Competitive environment

The competitive environment is influenced by both demand and supply side developments. At a demand level the Europe has established a firm position in more specialised segments such as cruise vessel and offshore and dredging vessels. These are less sensitive to developments in world trade flows, but are also affected by the current crisis. At the supply side an ongoing competitive pressure continues, with new low cost entrants emerging on the market and large incumbent shipbuilding nations trying to move up into more high value ship types.

SWOT

Table S.2 depicts key strengths, weaknesses, opportunities and threats for the European shipbuilding industry.

Table S.2 SWOT of European shipbuilding

Strengths	Weaknesses
• Level of innovation • Innovative SMEs and strong position of marine equipment industry • Strong linkages yards & marine equipment: • Efficiency • Specialisation in niche markets • Spillovers between defence and commercial segments	• Cost levels (wage levels and steel prices) • Access to skilled labour • Access to finance • Potential difficulties in knowledge protection (especially among SMEs) • Fragmented government responses
Opportunities	**Threats**
• New segments, continuous innovation • Greening of shipbuilding industry • Existing transport policies (greening of transport, increased transport quality) • Enhanced requirements regarding shipping standards	• Demand shift from European to Asian buyers • Strengthening of maritime cluster (including finance in Asia) • Increasing development of marine equipment industry • Competitors moving up the ladder • SMEs not surviving the crisis • Flexible and swift competitor's governments to support their industry • Critical mass required to maintain/refresh high skilled workforce. Europe may be too small compared to competitors. Ageing workforce • Price competition in light of economic crisis

Business strategies

Business strategies

Businesses in various countries are responding differently to changes in their competitive environment. Two main strategies can be distinguished:

- Safeguarding the low cost production;
- Specialisation and innovation strategies.

The first strategy is strongly influenced by the type of ships that are produced (mass, standardized production) and whether the production process can be organised in such a way that the cost advantages can be retained. This can be done either by having low labour costs, creating highly efficient (e.g. automated) production processes, or by outsourcing (parts of) the production chain to other, low cost countries.

The second strategy is dominant in Europe which increasingly focuses on high end specialised complex ships that are produced in limited numbers. Also a combination of both strategies can be found in a number of countries, which is triggered by the particularities of the ships that are produced there.

Policy recommendations

The policy recommendations made are founded on the conclusions of the analysis of the European shipbuilding industry and built on the recommendations made in the LeaderSHIP 2015 strategy and its 2007 Progress report. They are summarised in Table S.3. A distinction has been made between short term (ST) and longer term (LT) recommended measures.

Table S.3 Policy recommendations

Key area (from LeaderSHIP)	Recommendations in this field	ST	LT
Establishing a level playing field in world shipbuilding	• Continuing efforts to create a global shipbuilding agreement to create a level playing field.	√	√
	• Take a pro-active approach in addressing pricing practices that raise the suspicion of being unreasonable and unsustainable.	√	
Improving RDI investment in the EU shipbuilding industry	• Exchange of best practices and awareness raising on possibilities regarding RDI aid schemes at MS level (e,g. through tax exemptions)	√	
	• Further simplify procedures and improve access to EU-level RDI programmes		√
	• Actively promote a cluster approach to innovation	√	√
	• Facilitate cross-sectoral exchange of knowledge and experiences between high-tech industries.	√	√
Developing advanced financing and guarantee schemes	• Enhance awareness on best practices and possibilities regarding guarantee schemes at Member State level	√	
	• Look into the possibility to pool funds from various MS to create a regional guarantee fund	√	
	• Initiate further actions to create commitment at MS level to create a central EU (EC or EIB) facility	√	
	• Initiate a further study on the possible set-up and structure of a central EU guarantee fund	√	
	• Investigate the possibility to create guarantee schemes aimed at the purchase of ships	√	
	• Enhance awareness of available schemes, especially towards SMEs	√	√
Promoting Safer and More Environment-Friendly Ships	• Monitoring and implementation of the provisions under the 3d Maritime Safety Package.	√	√
	• Explore options for expansion of mutual recognition of certificates		√
	• Further stimulate standards and quality for Short Sea Shipping	√	√
	• Consider linking financial incentives to fleet renewal (e.g. scrapping schemes) based on compliance with environmental /safety standards and on the age profile of fleet segments	√	
A European Approach to Naval Shipbuilding Needs	*No additional recommendations on top of LeaderSHIP strategy.*		

Key area (from LeaderSHIP)	Recommendations in this field	ST	LT
Protection of Intellectual Property Rights (IPR)	• Awareness raising of IPR protection possibilities, especially among SMEs	√	
	• Actively promote cluster approaches to innovation and knowledge protection in the EU	√	
	• Establish a Community-wide patent and strife for modernisation of atr5*ter* Paris Convention at international level		√
	• Continue addressing IPR in bilateral initiatives (e.g. EU-China shipbuilding dialogue and FTAs)	√	√
Securing the Access to a Skilled Workforce	• Promotion of employment in technical professions and maritime cluster;	√	√
	• Exploration of the possibilities of a specific labour migration policy regarding shipbuilding.		√
Building a Sustainable Industry Structure	• Stimulate the formation of maritime clusters to build and retain critical mass	√	√
	• Enhance the awareness among SMEs of specific support possibilities and promote inclusion of SMEs specific possibilities into national support frameworks and schemes.	√	√

1 Introduction

1.1 Background and objective

In 2002-2003, the shipbuilding industry initiated the LeaderSHIP2015 strategy. This strategy was developed against the background of the difficult market conditions under which the European sector had to operate at that time. Its aim was to strengthen the sector's position to ensure its long-term prosperity. It was considered a sector specific response to the EU's long term strategy for economic, social and environmental renewal as brought forward by the Lisbon Council of March 2000.

Specific objectives were taken at hand within the LeaderSHIP 2015 initiative:

- Establishing a level playing field in world shipbuilding
- Improving research, development and innovation investment
- Developing advanced financing and guarantee schemes
- Promoting safe and more environment-friendly ships
- A European approach to naval shipbuilding needs
- Protection of Intellectual Property Rights (IPR)
- Securing the access to a skilled labour force
- Building a sustainable industry structure

In recent years, as the 2007 progress report of LeaderSHIP 2015 showed, the position of the sector improved and European shipbuilding was enjoying a period of renewed growth. However competing suppliers, especially from Asia, were also growing and adding shipbuilding capacity by building new yards. Moreover, the current economic crisis clearly has a negative impact on European shipbuilding.

The study should support the most appropriate competitiveness strategy for Europe

As part of an overall series of studies into the competitiveness of the European industry the European Commission has initiated a study on the competitiveness of the European Shipbuilding Industry. According to the Terms of Reference this study should build on the framework provided by the LeaderSHIP2015 initiative, so as to deliver **knowledge and insights into the key drivers of an innovative, competitive and sustainable European shipbuilding industry**. As such, the analysis undertaken within the study should contribute to the formulation of suggestions and recommendations for actions that can contribute to the better realization of the objectives of the LeaderSHIP2015 initiative.

1.2 Some notions on data availability

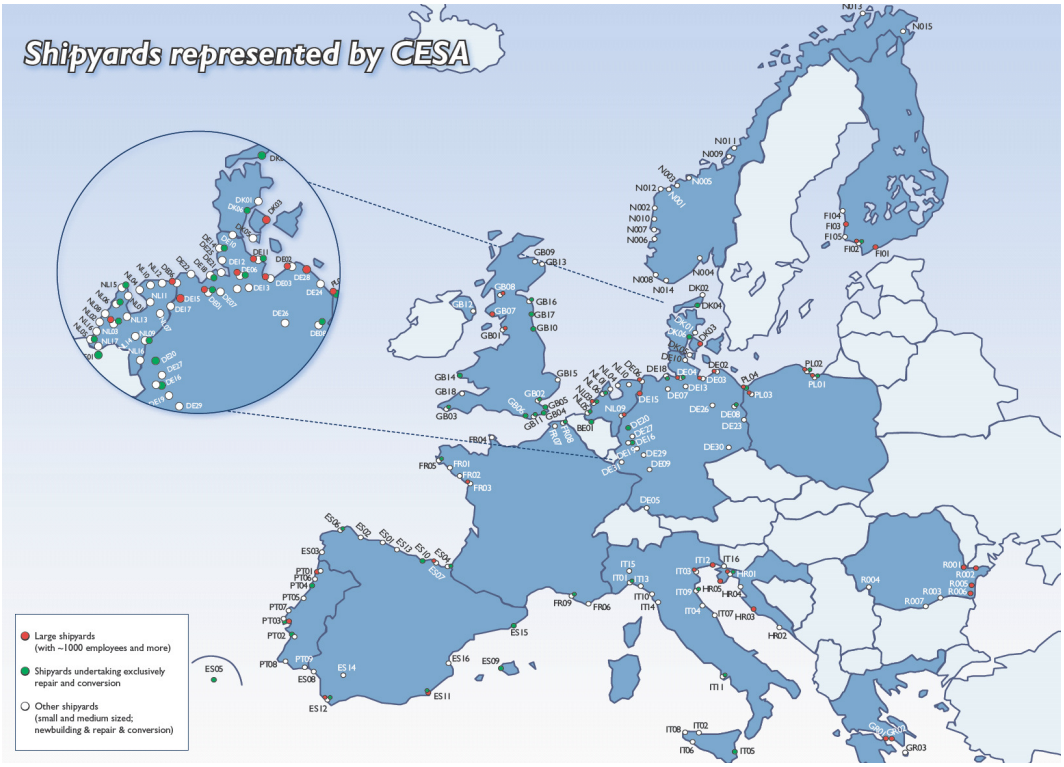
The European shipbuilding industry study is centred around two sub-sectors:

- Ship construction (shipyards, including repair)
- Marine equipment (shipyard supply industry)

Ship construction

CESA represents 367 European shipyards in 14 countries that are indicated in the following map. This map presents both newbuilding yards and repair yards.

Figure 1.1 Map of shipyards represented by CESA



Source: CESA Annual report 2007-2008

CESA represents shipyard companies in 14 countries as indicated on the above map, thus it does not cover the entire EU. On the other hand it should be noted that in most other EU countries, no (newbuilding) shipyards are present. Furthermore companies in Croatia, an accession country, and Norway, part of the EEA, are represented by CESA. Finally in most data and statistics that CESA makes available, information on other European countries, as well as Turkey is often present.

Various data sources applied

For this study, CESA has cooperated and helped the study team in providing data on shipbuilding, new orders, deliveries, etc., both for European shipyards and for competing countries. The latter data they obtained through their cooperation with sister organisations in e.g. China, Korea, and Japan. CESA data are considered reliable and where possible, these have been used in this report. They also refer to Lloyds Register information. For some aspects however, additional data was needed by the consultant. Where the required information was not available through the previously mentioned sources, ECORYS has used Clarkson data as well. This is the case for e.g. long term historical data, or yard group data. Experts indicated that this source may be less reliable and CESA/LR is preferred. Still Clarkson is used in this report several times and the figures should be considered with care.

Marine equipment

It should be noted that in the data sources used for this study, a variety of, sometimes inconsistent, definitions of the marine equipment industry are used. This causes difficulties in comparing data. This is partly caused by the fact that the definition as being used by EMEC is wide and represents a large number of different, highly heterogeneous companies[2]. Furthermore, companies that are suppliers of shipyards, are often delivering to other industries as well (e.g. automotive, aviation, etc.). Finally, there is not one sectoral (NACE) classification which grasps this sector, which means that in many cases no uniform data are collected centrally, hence making this sub-sector much harder to monitor than ship construction.

1.3 Report structure

The report is structured in three parts. The first part contains a description of the shipbuilding sector, illustrating key characteristics and main trends. This part is followed by the second part that analyses the current competitive position of the sector in Europe *vis á vis* its competitors. It both looks at the structure of the industry itself and its access to resources for its production. This is followed by an analysis of the regulatory framework that has a direct influence on the competitiveness and the developments in the competitive environment. The chapter is concluded with a SWOT analysis which summarizes the key strengths and weakness of shipbuilding in Europe. The third and final parts looks into the business strategies that are developed within the sector itself, and gives recommendations for further policy actions in the light of the overall LeaderSHIP 2015 strategy.

[2] According to EMEC it represents over 1300 different companies. In total some 9000 companies are expected to be active in the marine equipment industry worldwide, with estimates for Europe ranging 5-6,000.

PART I: Sector description

2 World shipbuilding: key characteristics and trends

This chapter gives an overview of world shipbuilding, illustrating key characteristics and main trends. Historic and current market shares are depicted and the cyclical demand in shipbuilding is further elaborated. It also includes some of the recent developments as a result of the economic and financial crisis. The chapter concludes with brief profiles of main shipbuilding regions.

2.1 Sector definition

Within the shipbuilding industry study two sub-sectors are distinguished:

- Ship construction
- Marine equipment

Ship construction

Ship construction includes ship repair (and conversion) and is directed at the larger commercial sea-going vessels, as represented by CESA – Community of European Shipyards Associations. This also includes the mega-yacht sub-sector. Within the shipbuilding sector various ship categories are distinguished, including:

- Liquid bulk carriers (crude oil and product tankers);
- Dry bulk carriers;
- Container ships;
- Specialized vessels, including offshore vessels, dredgers, chemical tankers and LPG and LNG carriers;
- Cruise ships and ferries;
- Mega-yachts.

Within these ship categories the focus will lie on those categories that are most relevant to the European shipbuilding industry.

In addition, the submarket of naval shipbuilding is addressed. This sector receives only limited attention since the market of naval ships cannot be seen as a fully open competitive market and is influenced strongly by non-economic factors.

Marine equipment

For marine equipment the definition of EMEC – European Marine Equipment Council - is followed: “the term marine equipment refers to all products and services supplied for the building, conversion, and maintenance of ships (seagoing and inland). This includes technical services in the field of engineering, installation and commissioning, and ship

maintenance (including repair)."[3]

Within the marine equipment sector, several product and services categories can be distinguished, although it should be noted that no standard categorisation of marine equipment supplies exists[4]. Table 2.1 gives an indication of typical groups that are relevant within the marine equipment sector.

Table 2.1 Main groups and categories of marine equipment

Categories	Marine equipment systems
Propulsion/power systems	1. Propulsion, power generating systems 2. Auxiliary Power generating systems 3. Auxiliary Systems
	4. Electrical systems, plants and cables
Navigation/communication/control (electrics & electronics) equipment	5. Instrumentation, control and navigation systems 6. Communications and Entertainment Systems 7. Lightning Systems 8. Steering Systems 9. Special Ship Operation Systems
Cargo related equipment	10. Mooring, Deck Machinery Systems 11. Cargo Systems
"Hotel" and related equipment	12. General Outfitting Components 13. Heat, Ventilation, Air Conditioning Systems
	14. Accommodations Systems
Other miscellaneous	15. Safety and Life Saving Systems, Environmental Protection Systems 16. Other Systems 17. Materials

Source: BAlance Technology Consulting, 2000. [5] and Drewry Shipping Consultants Limited, 2002; redesigned by ECORYS.

2.2 The global market place of shipbuilding

The shipbuilding industry is marked by its global presence, with ships being built in industrialized countries such as Japan, Europe, South Korea and China. The geographical distribution of new ship construction has shown strong changes starting from the original dominance of Europe to an increased role for Asian countries such as South Korea, Japan and China. At the demand side purchases are still dominated by European buyers in many segments.

[3] Source: www.emecweb.eu

[4] As a result, many different categories are found in the data sources. Moreover, it is not always clear what equipment is part of a category, making it even more difficult to compare figures. E.g. some equipment systems can be categorised in multiple categories (such as 'lightning').

[5] See BAlance Industry Consulting (2000). Competitiveness and Benchmarking in the Field of Marine Equipment.

2.2.1 Ship construction and repair – changing regional production patterns

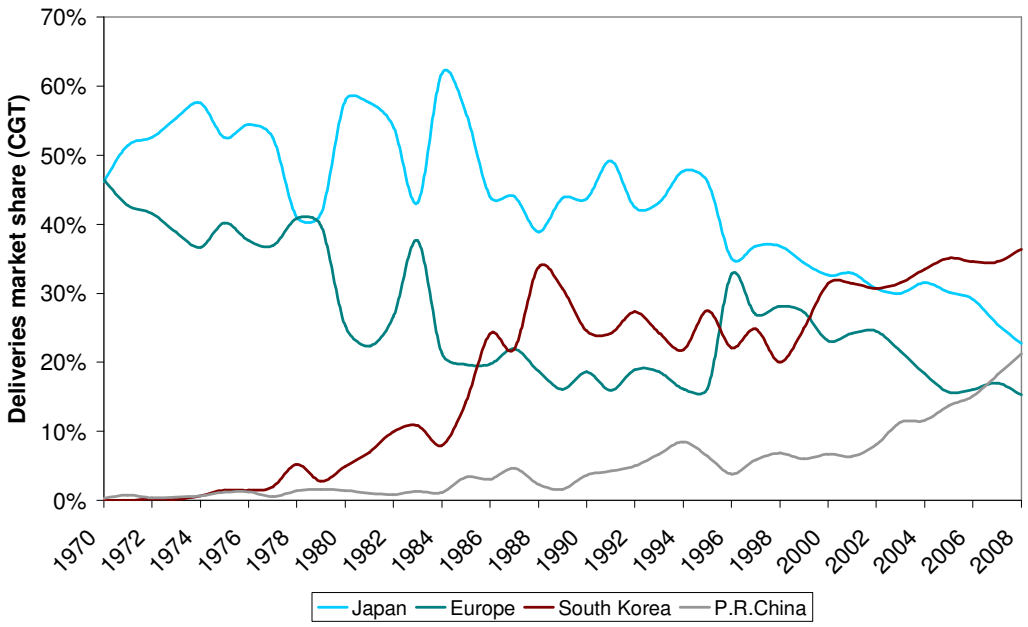
Ship construction

Historic trends

A century ago the market of shipbuilding was dominated by Europe, having a world market share (in CGT[6]) of some 80% at the beginning of the twentieth century. Especially Great Britain had a dominant position at that time. Due to various reasons, including the decrease of the European shipping fleet, lack of investment, poor labour relations and an inability to increase productivity levels, the UK dominance gradually eroded, partially being replaced by continental Europe and Scandinavia.

In the 1950s the position of Europe was being challenged by Japan, to be gradually taken over in the 70s, mainly due to a rapid growth of the Japanese economy and a coordinated shipping and shipbuilding program. Shipbuilding assumed the position of a strategic industry and new shipbuilding techniques were introduced that enhanced the Japanese productivity in shipbuilding. At the early 1970s Japan and Europe together still dominated the world market with a combined share of some 90% (in CGT deliveries).

Figure 2.1 Market shares based on CGT delivered by major shipbuilding regions from 1970 to 2008.



Source: Clarkson (2009)

In the early 70s the position of Japan was in turn challenged by South Korea as labour costs were rising in Japan, while South Korea combined low labour costs with a choice to position shipbuilding as a strategic industry for the country. Just as Japan did before, a carefully planned industrial program was initiated starting with the construction of shipbuilding facilities by Hyundai and Daewoo, later followed by Samsung in the 1990s. In the mid-1990s the share of South Korea had increased to 25% and by 2005 it had overtaken the position of Japan measured in CGT deliveries. Other than Japan and Europe, South Korea focused from the start on the export market.

[6] See annex D for the definition of CGT.

Box 2.1 Measuring supply and demand in shipbuilding

Supply and demand of new vessels is measured by the:

- Orderbook of shipyards, indicating the total orders to be fulfilled, measured in CGT to take account of differences in vessel type and related work effort
- Production levels (deliveries or completions), again in CGT, which are measured through the number of deliveries. This is also often used as a proxy for the total shipyard production capacity (especially in periods of high demand)
- New orders, placed in a certain year, which indicate the new demand for ships.

The total orderbook changes through completions, which reduce the orderbook of a yard, and new orders placed, which increase the orderbook again. If more new orders are placed than delivered, the orderbook will increase. Furthermore, if orderbooks are increasing, there may be a tendency to expand yard capacity, as to be able to deliver within time frames acceptable to the market.

It is noted that the measurement of new orders, deliveries and orderbook, is done in CGT (Compensated Gross Tonnes) on the basis of global conventions with regard to calculation methods and aggregation factors. The method agreed within OECD is applied worldwide, but may cause certain ship types to be presented less prominent than if looked at the underlying GT values.

Shipyard capacity

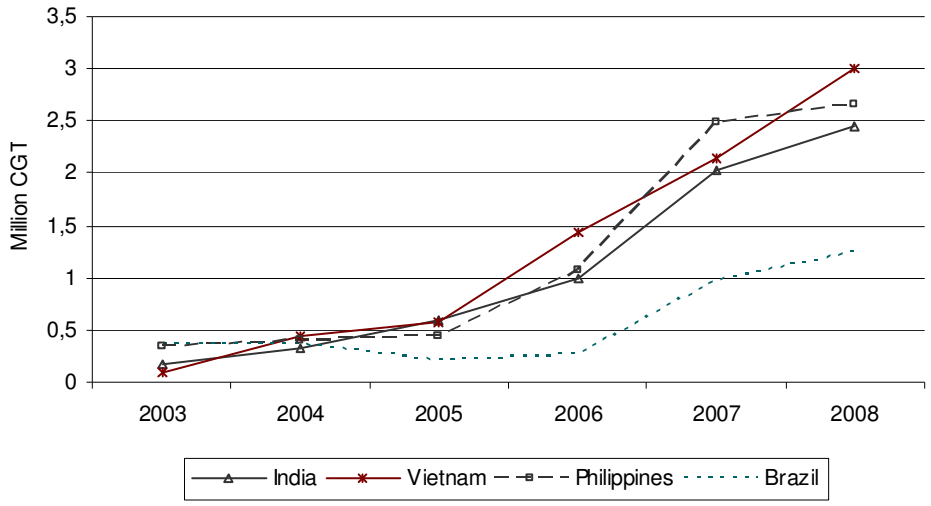
Furthermore it is noted that while production levels are often used as a proxy for the country's shipyard production capacity, this measure should be taken with care. In some segments, limited facilities are needed to be able to build a ship, making the capacity implicitly enormous, while in other segments the requirements are high and therefore capacity is rigid. Different ships with different CGT values can sometimes be built in the same dock. Timing is hard as vessels can have a long lead time. Therefore the term capacity, moreover if analysing overcapacity, should be considered carefully.

The latest challenger on the international market is China. China already had an active shipbuilding industry, but major expansion was realized as part of the country's industrial expansion strategy in conjunction with the strong rising demand as a result of China's economic boom. The share of China has risen rapidly to over 20% of global ship deliveries in 2008 (in CGT). In terms of orderbook, China surpassed Japan in 2006 as the second largest shipbuilding region[7].

With the emergence of China it is not expected that this will result in a consolidation in the regional structure of world shipbuilding. Already new countries are emerging as potential shipbuilding nations, such as Vietnam, India, the Philippines and Brazil. Figure 2.2 depicts the growth in the orderbook of these countries, which shows the strong acceleration in these countries in 2006 and 2007, albeit their share in total shipyard production still remains small.

[7] Part of this growth is driven by speculative orders that anticipated a continued growth in demand.

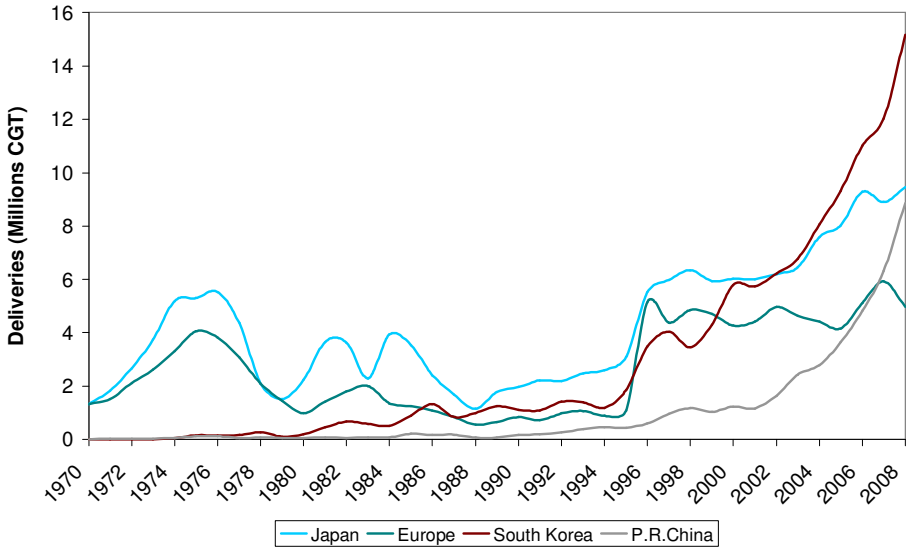
Figure 2.2 Orderbook 2003 – 2008 Main emerging markets



Source: CESA Shipbuilding Market Monitoring

These historic trends indicate a continuous decline of the relative position of the European shipbuilding industry. It does not mean however that Europe's position decreased at the same pace in absolute terms. Until 1995 Europe's position in absolute volumes (in terms of CGT delivered) showed a steady decline, but this was countered by an upheaval in 1995, followed by a relatively stable production since then as a result of increases in world demand (see figure 2.3).

Figure 2.3 CGT completed and delivered by major shipbuilding regions from 1970 to 2008



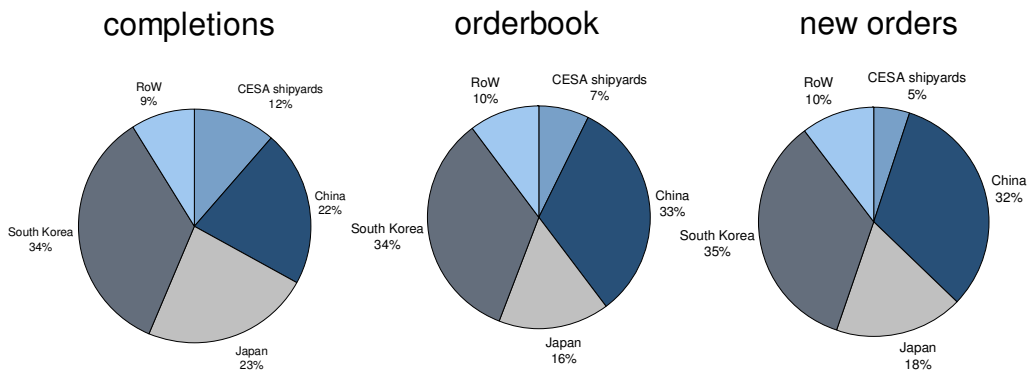
Source: Clarkson (2009), calculations ECORYS

Several peaks are visible in figure 2.3 above, such as the 1970s overcapacity following the post-WOII boom[8], the early 80s economic recovery shocks and the late 1990s worldwide economic boom and yard expansions.

Current market shares

The current distribution of shipbuilding production thus shows a strong dominance of Asian countries. Figure 2.4 presents the market shares in terms of completions (production), orderbook and new orders in CGT in 2008. In terms of completions South Korea, China and Japan represent almost 80% of the world production. In terms of orderbook especially the increased share of China (62 million CGT) becomes noticeable , while the share of Japan (31 million CGT) clearly diminishes. Also the share of CESA shipyards in terms of orderbook is lower than the share in terms of completions, indicating a further erosion of Europe's position in world shipbuilding in CGT volumes. This trend is further confirmed by looking at the new orders which again show a lower share of CESA countries worldwide.

Figure 2.4 Market shares by completions, orderbook and by new orders in 2008 in CGT



Source: CESA Shipbuilding Market Monitor, 2009

The apparent specialisation of Europe on higher value ship types

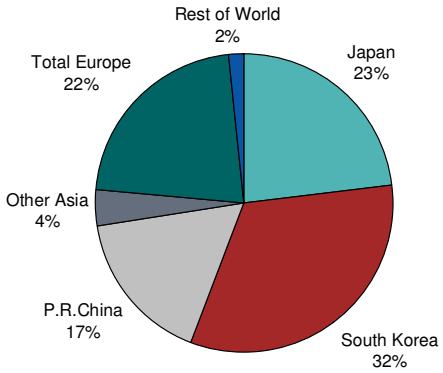
Only looking at volumes being completed by the European shipbuilding industry doesn't sketch the full picture. Although Europe's market share in terms of volumes has declined over the years, Europe has succeeded in retaining a position by building more complex ships with a relatively higher value added, while the production of more standard mass production ships moved to other (lower labour cost) countries, especially in Asia. Whereas in 2007 the market share of production volume completed (in terms of CGT) was 17% for Europe and 82% for Asia in 2007, in terms of its production value (based on actual deliveries) these figures are 22% and 76% respectively[9]. This confirms the statement that Europe builds relatively higher value ships than Asia. In absolute terms, the production-value of Europe (€12.0 bn)[10] was more or less equal to Japan (€12.5 bn), higher than China (€9.0 bn) and lower than South Korea (€17.9 bn).

[8] See box 2.1 on careful considerations with regard to the terms capacity and overcapacity

[9] In term of actual deliveries, the total world ship construction sector is valued at €54.3 billion in 2007.

[10] It should be noted that different estimates exists with respect to the production value of shipbuilding in Europe. CESA in its annual report estimates turnover in the European shipbuilding industry at € 16.3 billion in 2007 (including Turkey). Other sources indicate a much higher value. For example PRC (2008) estimated the total production value in Europe plus Norway, defined as the intermediary purchases and direct value added, at €35 billion. Also the figure from Eurostat for

Figure 2.5 World market shares of production-value (completions) by region in 2007

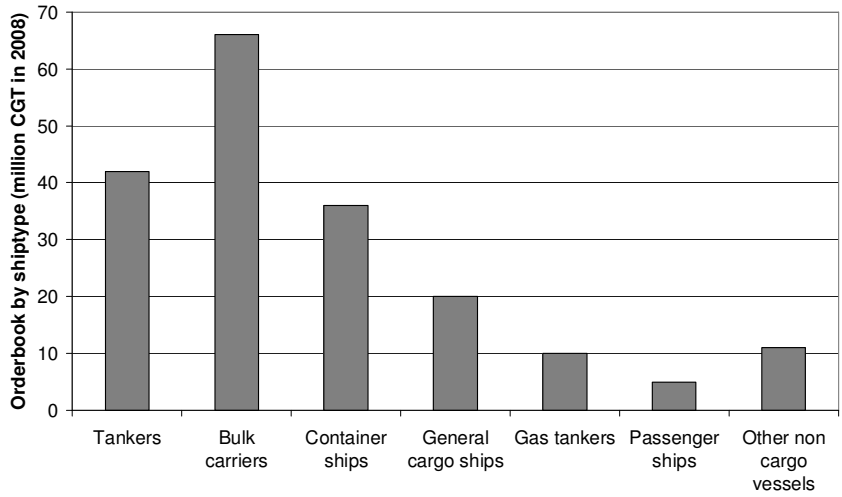


Source: Clarkson World Shipyard Monitor, 2008

This is also reflected in the specialisation by ship type, where the position of Europe is relatively strong in specialised complex ships such as cruise vessels and specialised non cargo ships (including dredgers, off-shore supply vessels). This market is characterised by a limited production (e.g. limited demand in number of ships, prototypes with few sister ships, tailored and knowledge-based production processes, considerable technical expertise and a high number of specialised subcontractors)[11].

The figure below shows the distribution of the world market by type of ship (orderbooks) in 2008. Tankers, bulk carriers and containerships represent the largest demand (in CGT).

Figure 2.6 Orderbook (million CGT) by ship type in 2008



NACE35.11 which represent the shipbuilding sector is much higher (€42.9 billion, EU27 + Norway). The differences are mainly caused by differences in definition. For example the NACE35.11 sector definition which is followed both by PRC and Eurostat includes naval shipbuilding, whereas the data from CESA and Clarkson reflect only the commercial (merchant) shipbuilding.

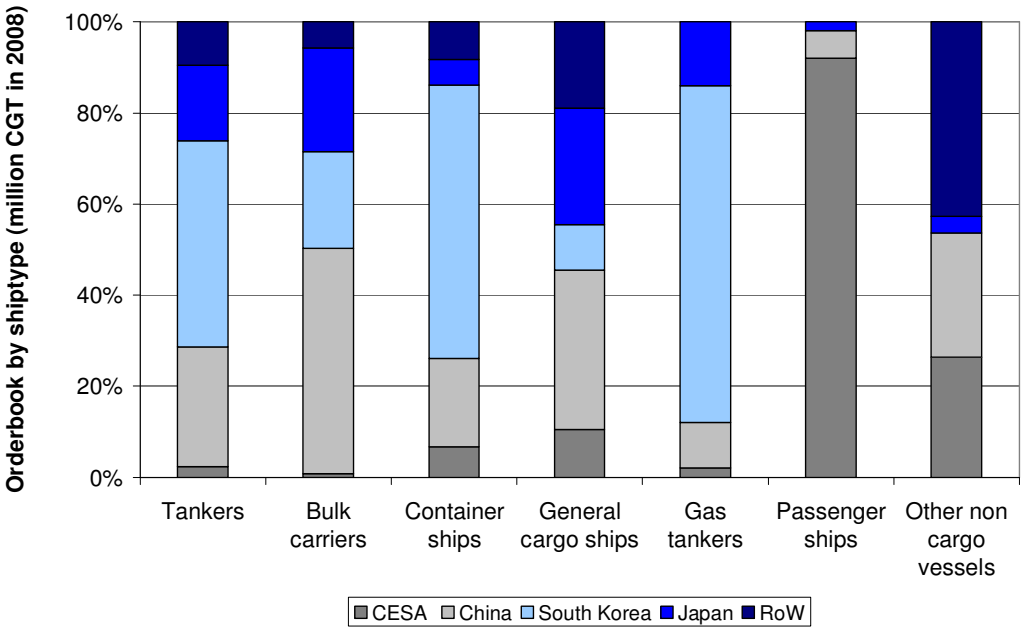
[11] See European Commission (2003) LeaderSHIP 2015 – Defining the future of the European Shipbuilding and Ship Repair Industry

Source: CESA Shipbuilding Market Monitoring, 2009; calculations ECORYS.

Note: Other non-cargo vessels exclude naval vessels. The coverage of luxury yachts may be incomplete.[12]

Figure 2.7 shows the market shares (in orderbook) by ship type for the main shipbuilding countries/regions. In the segment of "passenger ships" CESA countries are dominant. Europe also has a relatively strong position in the segment "other non cargo vessels". In the much larger segment of "containerships" Europe only has a minor share. The newbuilding of tankers, bulk carriers and gas tankers is nearly absent in Europe. The remarkable share of 44% of RoW (Rest of World) for "other non-cargo vessels" is relatively scattered around the world with markets shares of 7.6% for India, 5.7% for Singapore, 5.5% for Indonesia, 5.3% for the USA, 3.5% for Turkey and 3.1% for Brazil.

Figure 2.7 Orderbook (CGT) market shares of main shipbuilding regions by ship type in 2008



Source: CESA Shipbuilding Market Monitoring, 2009; calculations ECORYS. Other non-cargo vessels exclude naval vessels.

The graph confirms that Europe has a strong position the segments of relatively high value passenger (cruise) and other non cargo vessels[13].

[12] Several sources suggest that luxury yachts may not be well covered in statistical sources, as the registration of newbuilt yachts would be incomplete. Therefore the actual share of this segment may be higher than figures in this report indicate. The suggestion could however not be verified.

[13] While passenger ships and other non cargo vessels (which includes offshore, fishing and dredging vessels) represent only 8.4% market share in terms of total world orderbook in CGT, the value of offshore and other vessels represent a market share of 25% of the world orderbook, showing that these clearly represent high value type of ships.

Table 2.2 Typical values of vessel types in 2008

Vessel type	Typical size	Typical newbuild price (in mln US$)
Cruise vessels*	32,000 – 225,000 GRT	250 – 1,400
Gas tankers	24,000 – 160,000 m^3	53 – 245
Tankers	47,000 – 300,000 DWT	47 – 150
Container ships	750 – 8,200 TEU	18 – 129
Dry bulk vessels	30,000 – 180,000 DWT	32 – 88

Source: CESA Market monitoring report and Clarkson Shipyard Orderbook Monitor

* Ship Repair Journal, volume 6, issue 5

On the other hand, European shipyards are also still active in the (generally) lower value segments of container and general cargo ships. The historic trends, but also recent examples (see box 2.2) indicate that Europe's position in this type of ships further erodes over time, a process that is accelerated by the current crisis. The consequences of the decision of Maersk as described in box 2.2 is that with the closure of this activity, large container vessels are not being built in Europe anymore. Therefore European shipbuilders finally give up their position in this segment.

Box 2.2 Maersk stops production of containerships

Maersk Odense Shipyard to Produce Smaller Ships

Danish shipping and oil group A.P. Moller-Maersk said its Lindo Odense shipyard will stop building large containerships and will concentrate on producing smaller ships in the future as part of a new business model. "Large parts of the market for newbuildings have collapsed," Maersk said in a statement. "This has accelerated and increased the necessity for a decision on a new business model." Maersk said that Lindo would concentrate on producing smaller ships, including, potentially, ships for offshore oil and gas production, but that this would not affect the current order book. Maersk also said it would invite external businesses to the Lindo area where they could produce heavy steel products in shared facilities with the Danish group.

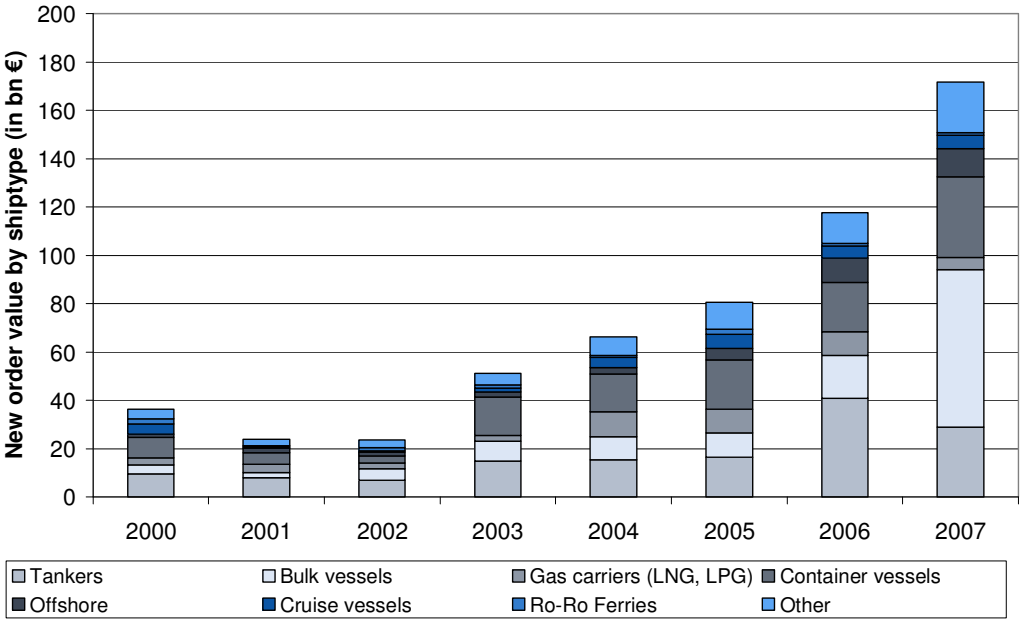
Source: Reuters, January 2009.

Even though Europe's position is relatively strong in high value, niche market ships, one cannot conclude that all 'high value' vessels are being built in Europe, as for example Korea is dominant in highly specialised LNG tankers.

Recent new orders mainly in the bulker and tanker segments

Looking at new orders (investments) by vessel type (figure 2.8) a large share of the new order value of the past years is made up of tankers, bulk vessels and container vessels representing the dominance of this type of ships in the world shipbuilding market. These segments have also shown high growth rates in line with the increased trade volumes worldwide. The market share in terms of value of cruise ships and offshore is more modest, although also the offshore segment has shown high growth rates in the past five years.

Figure 2.8 New order investment value by vessel type (in bn Euro) from 2000 to 2007

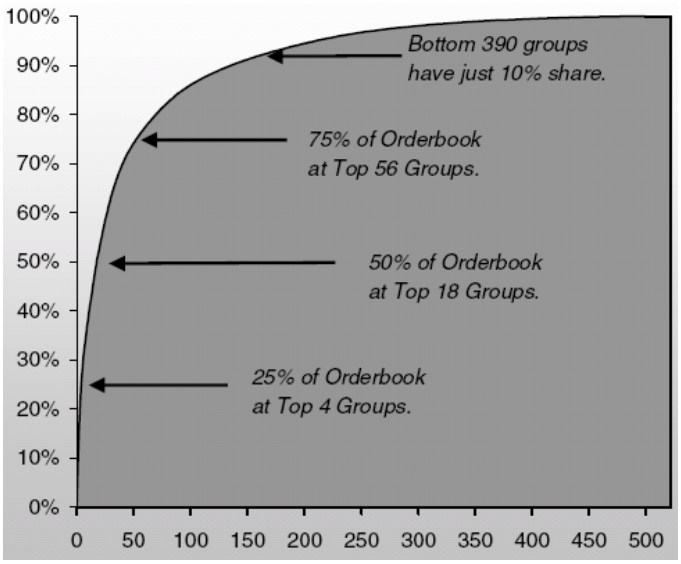


Source: Clarkson World Shipyard Monitor, 2008; calculations ECORYS

Key players and ownership patterns

In a competitive market such as the ship construction industry, next to autonomous growth, mergers and acquisitions are a common phenomenon. This has resulted in a pattern of consolidation and concentration at a number of major conglomerates which dominate the world production in terms of volume (figure 2.9).

Figure 2.9 Shipyard Groups Share of Orderbook (CGT)



Source: Clarkson Monitor December 2008

Out of a total of 522 shipyard groups in the world, 4 shipyard companies represent 25% and 18 players represent 50% of the total orderbook[14]. Table 2.3 presents the top ten shipyard companies in the world, which again confirm the Asian dominance in terms of market volumes. The 15 largest companies are all located in Asia: 8 in Korea, 6 in China and one in Japan[15]. The largest European ship construction company, Meyer Werft in Germany, comes at a mere 38th place[16].

Table 2.3 World's largest ship yard companies by orderbook (in CGT) as of 31st December 2008

Key shipyard companies	No. yards	No. orders	Orderbook in CGT	% world orderbook CGT
Hyundai H.I.	3	500	18,835	10.0%
Daewoo Shipbld. & ME	2	236	11,005	5.8%
Samsung H.I.	1	226	10,427	5.5%
STX Shipbuilding	3	309	7,207	3.8%
Hyundai Mipo	2	289	6,029	3.2%
Imabari S.B.	8	202	4,777	2.5%
Tsuneishi Corp.	3	200	3,904	2.1%
Dalian Shipbld. Ind.	1	119	3,698	2.0%
Jiangnam S/yard	2	133	3,589	1.9%
Sungdong S.B.	1	111	3,231	1.7%
Total	**26**	**2,325**	**72,702**	**38.4%**

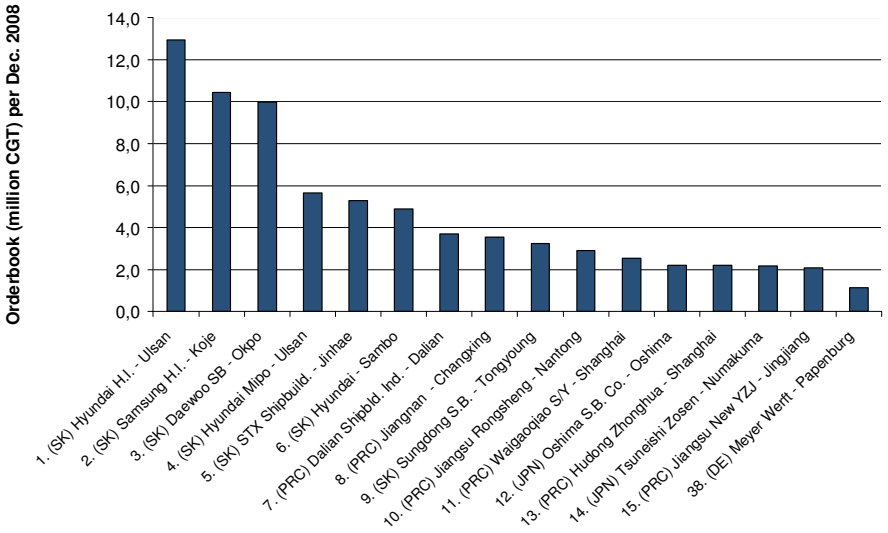
Source: Clarkson Shipyard Monitor January 2009. It is noted that the ranking on the basis of order value may be different. No reliable data are however available on this.

[14] Clarkson World Shipyard Monitor January 2009

[15] It is noted that within the data source used, STX Europe is a treated as a different company (part of the top 56) than STX Shipbuilding of Korea (top 4).

[16] Clarkson World Shipyard Monitor January 2009

Figure 2.10 World's largest shipyards by orderbook (in CGT) in 2008



Source: Clarkson World Shipyard Monitor, 2009; calculations ECORYS. It is noted that the ranking on the basis of order value may be different. No reliable data are however available on this.

Most of these companies have more than one yard under their umbrella. Some of these yards may be located in Europe, while the ownership lies in Asia. This points to an interesting phenomenon, viz. that looking at shipbuilding from a country perspective alone does not capture the full picture anymore, as a growing tendency exists towards globalisation and internationalisation in companies in order to rationalize their production processes and make use of global competitive advantages (e.g. low labour costs, technological advancement). The case of STX illustrates this (box 2.3).

Box 2.3 Internationalisation and globalisation in shipbuilding: the example of STX[17]

Globalisation and consolidation

Several shipyard companies have been expanding outside their own countries in order to add capacity to their firms, to buy in knowledge or to access new (low cost) labour markets. STX from Korea is an example of such a firm.

STX Corporation

STX Corporation is one of the large Korean based shipbuilding companies. Its yard in Jinhae was the 5th largest in 2008 in terms of orderbook. The two shipyards in Korea are mainly focused on tankers and container ships.

Since the 1990s STX has been expanding outside Korea. Several countries it has entered are the following:

- Vietnam: Aker, which was already active in Vietnam before the takeover by STX, considered the country to offer a unique combination of cost efficient production, highly skilled workforce and proximity to the important and growing Asian offshore market. In 2008 the Vietnam Shipbuilding Industry Group (Vinashin) announced that they would step into a joint venture to have invested up to $150M from STX Group (Korea) in a new shipyard in Vietnam. The facility would focus mainly on offshore construction.
- India: STX has established a Joint Venture with Shipping Corporation of India (SCI) to start up

[17] STX Corporation annual report; www,stxeurope.com

shipbuilding activities with SCI as a major customer. SCI is the largest Indian ship owner. This fits well in the Indian ambitions to increase its position in shipyard capacities and to make use of its availability of labour and production sites. The two shipyards proposed by the government will have a capacity to build and repair ships, initially, of up to 175,000 dead weight tonnes (a measure of the cargo carrying capacity). The yards can be expanded further to construct ships of up to 300,000 tonnes, which may be container ships, liquefied natural gas carriers, very large crude carriers and large dry bulk cargo ships. The yards will also be able to repair and refit about 70-80 ships of different types in a year. Mumbai Port and Ennore Port Ltd have been appointed nodal agencies to process the tender on behalf of the shipping ministry for the west and east coast shipyards, respectively. (source: Wall Street Journal, 3 March 2008)

- Europe: purchase of stake in Aker.

The purchase of Aker

In 2008, STX acquired a 39.2% stake in the European company Aker. This company, with its headquarters in Norway, was one of the largest European ship yard companies. The buy-in resulted in a new affiliate company called STX Europe. STX has three business areas: Cruise & Ferries, Merchant Vessels and Offshore & Specialized Vessels. Saint-Nazaire is the largest yard of the group in Europe in terms of CGT and employs 2,660 employees. Saint-Nazaire is specialized in building post-panama size cruise vessels, while the Helsinki yard is specialized in car passenger ferries

One of the fears of STX entering Europe was that knowledge on subsegments until now dominated by European builders – especially the cruise segment – would 'leak' to Asia. Others however think that this is not likely, first of all because the labour cost advantage of Korea is limited compared to Europe and secondly because the existing infrastructure in Europe, with its close ties to suppliers, is working so well that relocating this segment would not benefit the group or only against very high costs.

Conclusion

Foreign expansion, such as STX has been pursuing, is also seen among several other shipyard companies. For example Korean companies are buying or investing in shipyard capacity in China as to get access to lower cost labour supply. European companies like IHC or Damen are doing the same both in China and Vietnam. Prior to the STX takeover, Aker already established positions in Brazil and Vietnam.

Ship repair and conversion

The strong growth of the world fleet from 660 mln dwt in 1990 to 1,040 mln dwt in 2007 has lead to an equal growth of opportunities for ship repair and conversions[18]. Worldwide the annual turnover in ship repair has been estimated at USD 10-12 billion[19].

Traditionally, shipbuilding and ship-repair existed at the same shipyard. However some countries and yards decided to split repair activities from newbuild activities. This is driven by various factors including the higher revenues and lower labour requirements in shipbuilding and the possibility to increase efficiencies in shipbuilding. Notably countries such as Korea, Japan and China have opted to create dedicated yards for ship repair only. Other countries and yards, including some yards in Europe, have chosen to combine repair and newbuild activities, with a view of product portfolio diversification. In general

[18] Cargo carrying vessels of 100 GT and above (source: Lloyds-Fairplay)
[19] CARE, 2008, The shipbuilding industry

however, repair activities are physically separated from newbuilding, e.g. at other yards or even within other companies[20].

Countries like Singapore, Dubai, Bahrain, Sri Lanka (Colombo) etc. have emerged as major ship repair centres, with Singapore being one of the main repair countries in Asia with a share of approx 20% of the global market. These countries benefit from their geographic position along the major east-west routes. This is also why for example for cruise vessels, repair facilities are considered in the Caribbean, the major geographic market for cruise operators.

The position of Europe in the ship repair market is relatively strong. Total turnover in Europe in this industry was €3.5 billion in 2007.[21] Compared to the estimated size of the world repair market this represents a share of some 35%. However, because of the labour intensity of the repair industry, a shift to lower cost countries like China and Vietnam, but also to Eastern Europe can be expected[22].

The OECD (2008)[23] expected a worldwide growth of 110% between 2007 and 2015 with respect to the number of ships needing reparation. This doubling of demand (in terms of turnover) in the repair industry has several reasons:

- the increase of the global fleet as such;
- the increased complexity of modern ships requiring more regular maintenance;
- more inspections leading to more frequent maintenance and unscheduled repairs.

Impact of crisis on conversion is uncertain.

Next to repairs, conversions have become increasingly popular in the past years as ship owners tried to overcome high newbuild prices and long delivery times by adapting existing vessels for different roles. Given these long lead times of up to four years, conversion of vessels was often preferable for owners[24]. For example, it was recently reported by Det Norske Veritas (DNV) that the conversion market was very active, and that it had classed about 40 re-deliveries by the end of 2007[25]. Whether the economic crisis will have a negative impact on the conversion market remains to be seen. On the one hand overall demand for ships has reduced, but on the other hand owners may try to convert vessels currently active in lean segments to become usable in other trades that are less affected by the crisis.

2.2.2 Marine equipment

Only some thirty years ago most of the shipbuilding work was carried out at the shipyards themselves. Since then however an increasing trend can be observed towards outsourcing and subcontracting of activities. Nowadays it is assessed that 50-70% of the value added comes from external subcontractors and suppliers, whereas for more complex ships this

[20] See figure 1.1 on yards represented by CESA.

[21] In 2003, the European repair industry was estimated to have a share of 42% in the global repair industry.

[22] See OECD 2008 The interaction between the ship repair, ship conversion and shipbuilding industry

[23] OECD 2008 The interaction between the ship repair, ship conversion and shipbuilding industry

[24] OECD 2008 The interaction between the ship repair, ship conversion and shipbuilding industry

[25] *"DNV makes safety pledge on single hull conversions"* - Lloyd's List 14/11/07

can be as high as 70-80%[26]. It is expected that this trend will continue in future[27] as the modern shipyard is becoming a final assembly facility (and management/ sales/logistics co-ordinator) with increasing elements of the "outfitting" being contracted out. The yard's focus is being driven by an increasing cost-efficiency combined with a focus on project management. Consequently, the scope for "adding value" is moving more into the domain of the component/equipment supplier.[28]

As a result, the marine equipment sector, which is defined as *'the supply industry to the shipyards'*, is becoming increasingly important. From its position as supplier to the shipbuilding industry the marine equipment industry is obviously directly influenced by developments in the new-building of ships. Supply is not only limited to clients in the region itself. Europe has a relatively strong position in marine equipment worldwide and acts as a net exporter[29].

Other than shipyards the marine equipment sector is highly heterogeneous and consists of many relatively small companies. In total, estimates range from some 5,000 to some 9,000 suppliers of marine equipment listed world wide[30]. Different definitions are used in different sources making it difficult to arrive at "hard" estimations. This should be taken into account when interpreting the data presented.

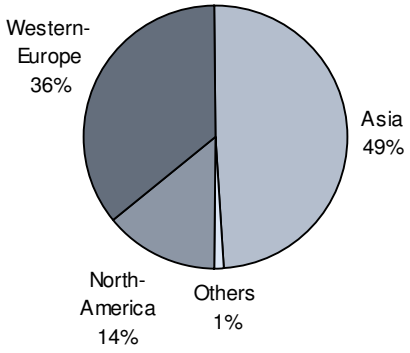
In 2005 the total worldwide marine equipment market (turnover) is estimated at €57 billion[31]. Of this €57 billion, around €36 billion concerns the naval marine equipment and after sales. Around €21 billion is related to the marine equipment in the commercial shipbuilding sector[32]. When also the supplies to the oil and gas sector are taken into account (as is being done in certain definitions of the marine equipment industry), and additional turnover value of €52 billion in 2005 can be added[33], bringing the total to some € 109 billion[34].

Figure 2.11 shows the geographic structure of the marine equipment market in 2005 and includes all equipment used in commercial and naval ships and the after-sales services. The geographic structure reflects the location of production sites and not the ownership situation. E.g. Asian-owned production facilities in Europe are counted as European, and vice versa. Asia and Western-Europe are the regions with the largest market shares. The global market share of the marine equipment sector in Europe is clearly higher than the share of ship construction, reflecting the strong export position of this sector. Within Asia, the shipbuilding nations Japan and Korea had the strongest position[35]. In 2004 the

[26] IKEI, 2009, Comprehensive sectoral analysis of emerging competences and economic activities in the European Union: Building and repairing of ships and boats sector.
[27] ECOTEC, 2006, An exhaustive analysis of employment trends in all sectors related to sea or using sea resources.
[28] Drewry Shipping Consultants Ltd (2002). Insights into a Lucrative Market
[29] According to BALance, 2000, approximately 50% of the marine equipment production value is exported.
[30] Ibidem
[31] Douglas-Westwood (2005). Marine industries global market analysis. The definition used is "*equipment used in commercial and naval ships and the after-sales services.* Other sources (see IKEI, 2009) give estimations of the total market of 74 billion Euro in 2004. They estimate the share of Europe at 35-36% of the world production for marine equipment.
[32] Douglas-Westwood (2005b). Marine industries global market analysis.
[33] Ibidem
[34] Also for marine equipment in Europe different estimates exists regarding the size of the Mmarine equipment sector. PRC (2008), uses a wide definition of marine equipment, "manufacturing and wholesale trade in maritime equipment for all maritime subsectors", and arrive at a production value of € 52 billion for Europe and Norway in 2006.
[35] See BALance, 2000

production output of South-Korea was estimated at €3.9 billion[36] and of Japan at €6.5 billion (¥897 billion).

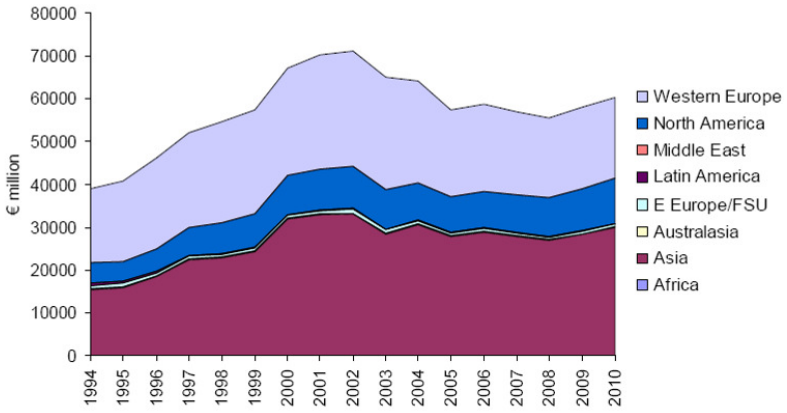
Figure 2.11 Marine Equipment – Regional market shares 2005 (turnover value)



Source: Douglas-Westwood, 2005a

However, the market share of Asia has grown rapidly over the last decade and is expected to grow further at the cost of Europe (see figure 2.12). It is expected that the market share of Europe will be reduced in future (one source expects a drop to 31% in 2010[37]). This is further influenced by the importance of having a location near commercial shipping activities[38] as the after sales services become an increasingly important part of the marine equipment industry.

Figure 2.12 Development of the marine equipment sector value in million € between 1999 and 2010 (2006-2010 forecast)



Source: Douglas-Westwood, 2005

[36] Song, Youngju (UK Trade & Investment) (2007). Sector report marine South Korea UK Trade & Investment.
[37] Douglas-Westwood (2005)
[38] Douglas-Westwood (2005)

2.2.3 Naval shipbuilding

A rather specific sector in shipbuilding is the naval sector. This sector is different from a competitiveness point of view in the sense that it only partially follows regular economic market rules. It is much stronger dominated by "soft" political and strategic factors than regular commercial shipbuilding.

The naval shipbuilding market is segmented in different products and services[39]:

- Submarines
- Surface combatants (incl. ships)
- Auxiliary ships and boats
- Repair and other services

The naval shipbuilding market is a relatively stable market with a yearly output of around 1,950 units from 2002 to 2006. The total value of the output in 2006 is almost € 23 billion[40].

Table 2.4 Output developments of in world naval shipbuilding

	2002	2003	2004	2005	2006	Unit
Industry Revenue						
In USD	23,830	25,594	27,112	28,050	28,996	Mln US dollar
In EUR	25,201	22,626	21,796	22,546	23,093	Mln Euro
Industry Gross Product	13,083	14,077	14,993	15,708	16,412	Mln US dollar
# of Establishments	5,395	5,449	5,515	5,564	5,603	Units
# of Enterprises	5,012	5,079	5,134	5,208	5,256	Units
Employment	295,114	296,903	298,689	299,862	302,759	Units
Total wages	11,243	11,787	12,098	12,397	12,842	Mln US dollar
Ships built	1,930	1,937	1,945	1,949	1,952	Units

Source: IBISworld, 2007

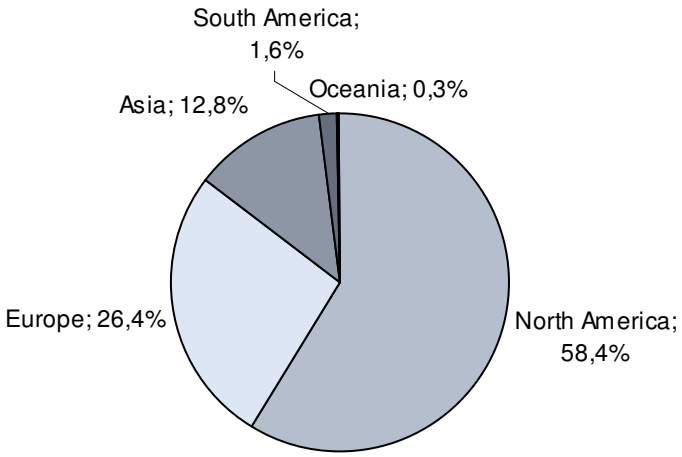
In terms of US dollar value there has been a significant increase in the average cost of a naval ship. Partly this is due to exchange rate developments, but also an explanation can be found in economic-driven factors (material, labour and equipment) and customer-driven factors (complexity, requirements and procurement rate), which each account for about half of the growth[41].

[39] IBISWorld (2007), Global Military Ship and Boat Building – Global Industry report. Cited in The Diplomat p44-45. As data on the naval sector are scarce, any estimate should be considered with care.

[40] Different sources report different figures. For example Jane's Military Ship Market Database estimate the total military ship market at some $50 billion. This may be caused by differences in definition, e.g. with respect to the inclusion of weapon systems.

[41] RAND, Why has the cost of navy ships risen?, 2006

Figure 2.13 Market share in naval shipbuilding by region[42] (in USD; 2006)



Source: IBISworld, 2007

North America and Europe prevail in the naval shipbuilding market with a combined market share of nearly 85% (figure 2.14). There are some reasons for this dominant position. Firstly, the naval shipbuilding industry requires a highly-skilled workforce which can be found in these regions. Next to that, most countries desire domestic shipyards to build their naval ships, for the ships and the newest technologies are object of classified material[43]. The largest navy in the world is the US Navy, at a large distance followed by Japan, Germany, Taiwan, China, Britain, Korea and Russia. It this respect it should be noted that, although yet at its infancy stage, also naval shipbuilding in South Korea is growing rapidly, becoming a major supplier of patrol and supply boats for navies. This is further stimulated by the ambitious naval shipbuilding program that has been initiated by the Republic of Korea Navy.

2.3 Shipbuilding market cycles and worldwide trends

2.3.1 Shipbuilding is a cyclic industry

Shipbuilding is a highly cyclic industry. Although various authors differ on what exactly determines a full cycle, there is a common view that the average cycle lasts some 9-15 years, although deviations from this rule can be observed in history. According to Volk: "shipbuilding is characterised by heavy fluctuations of demand over the short-term and high inertia of supply, leading to short periods of prosperity and long periods of depression"[44].

[42] Data on Russia and China is included in Asia. It is noted that the value of ships built in Europe and North America is relatively high, while probably the share in number of vessels for Asia is larger than in terms of their value. No data is available on this however

[43] RAND Europe, The United Kingdom's naval shipbuilding industrial base, 2005

[44] Volk cited in Stopford 2009.

Demand for new ships is highly volatile. This is clearly illustrated by Stopford (see Box 2.4).

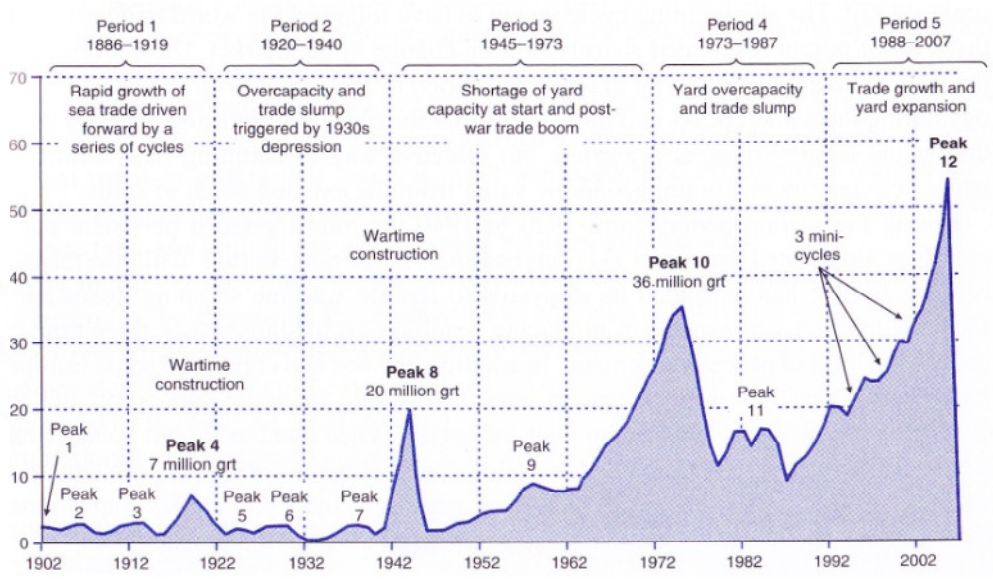
Box 2.4 Volatility of demand for new ships

Stopford uses the following example:
If the merchant fleet is 1,000m. dwt and sea trade grows with 5%, an extra 50 m. dwt of ships are needed. If in addition 20 m.dwt of ships are scrapped, the total shipbuilding demand is 70 m.dwt. But if sea trade does not grow, no extra ships are needed and shipbuilding demand falls to 20 m.dwt. So a 5% change in sea trade produces a 70% change in shipbuilding demand. Five percentage point changes in seaborne trade are common.
Source: Stopford, 2009, Maritime Economics.

At the same time supply is relatively inflexible as modern shipyard capacity is hard to adjust[45]. This is combined with the long gestation period of shipbuilding, with the delivery of ships several years after they have been ordered. As a result, the ordering peaks at the top of the cycle, but at the time of delivery the flood of new ships creates a surplus supply. The cause of these cycles is also strongly related to the occurrence of new market entrants (creating additional supply capacity), which enter the market on a low-cost basis and threaten higher cost-based shipbuilding capacity. Market entry is especially strong at the start of periods of increasing demand.

Over the last century some 12 cycles can be discerned (see figure 2.14)

Figure 2.14 World shipbuilding cycles, 1902-2007



Source: Lloyd's Register of Shipping (In: Stopford 2009)

Two past crises that bear similarities with the current market situation in shipbuilding are explored in box 2.5.

[45] This does differ between different ship types as also relatively low cost production facilities exist in the world.

Box 2.5 Past crises

There have been two relatively similar crises in the world shipbuilding history being characterised by shipyard overcapacity and world seaborne trade slump. The first crisis was in the period 1920-1940 and started with large overcapacity after World War 1. The problem was triggered by the Great Depression in 1930 which undermined demand and resulted in an 83% fall in shipbuilding output between 1930 and 1933, the biggest of any of the 12 shipbuilding cycles mentioned in figure 2.17 between 1901 and 2007.

The second crisis, which started after the 1973 oil crisis and continued until 1987, was harsh for the shipyards. Trade growth was slow, volatile and unpredictable. Shipyard overcapacity was accelerated by the entry of South Korea as a major shipbuilder. The world shipbuilding output peaked in 1975, representing an overcapacity of 50-100%. During the late 1970's the restructuring of the shipbuilding capacity started. Many shipyards were closed and output fell by 60% in 1979 compared to 1975. Severe downward pressure on shipbuilding prices and new ordering drove shipyard output in 1987 to the lowest level since 1962 and a decline of 73% from the 1975 peak. Employment in the world shipbuilding industry halved and many of the marginal shipyards were closed. [46]

Lessons that can be derived from these two crises are their long duration for the shipbuilding sector. While the actual global economic decline period was much shorter – less than a decade and usually less than 5 years – the low demand period for the shipbuilding sector takes on much longer. Explanations for this are that capacity laid off in low demand years will be put in service again when the economy improves. Other factors may be hesitation to invest among buyers, who will first involve old/second hand vessels before taking the risk to apply for newbuilding. It is likely that similar factors will play a role in the current crisis as well.

2.3.2 Were we entering the next down cycle?

Looking at the ship cycles in figure 2.15, the question becomes apparent whether the peak in 2007 (which continued in 2008) preluded a next down cycle. In this respect it is useful to first consider the development in the global production capacity.

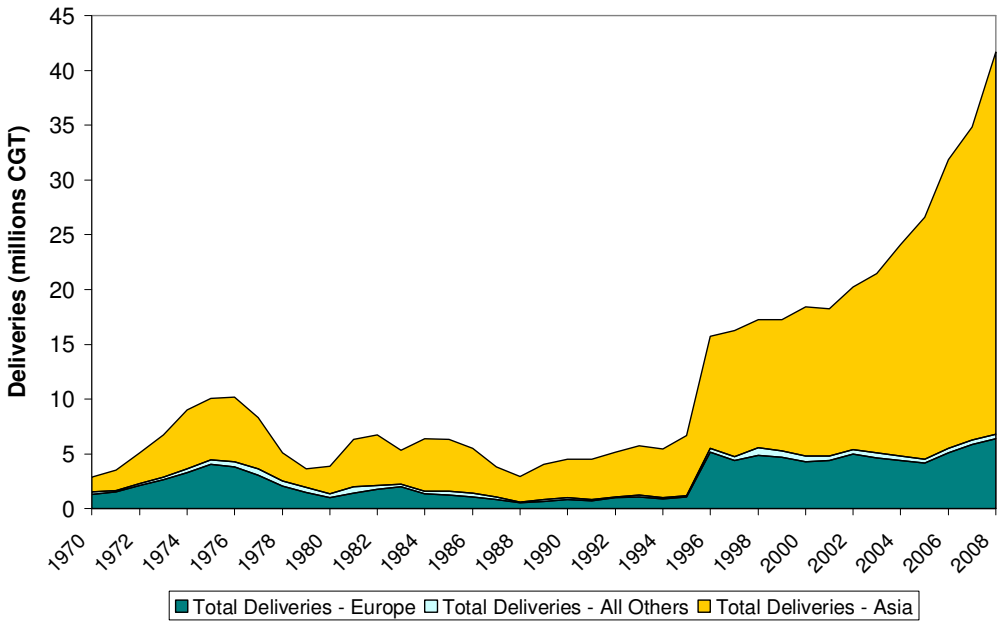
Evolution of shipbuilding capacity

The development of the world capacity can be approximated by looking at the world completions per year[47]. The first major post world war major peak was right after the first oil crisis in 1975 and 1976 with an annual production of 10 million CGT. After that a large increase (134%) is shown from 1995 to 1996 when the world production increased from 6.7 to 15.7 million CGT. Since 1996, shipbuilding production in Europe and the rest of the world has stabilised while the shipbuilding capacity of Asia has grown exponentially. Total world production increased to approximately 42 million CGT in 2008.

[46] Based on Stopford, 2009.

[47] Given the relative inflexibility of supply of shipyards this is a fair proxy of capacity especially in periods that are not characterised by a downcycle in demand. See also box 2.1

Figure 2.15 Total CGT completed by main regions from 1970 to 2008

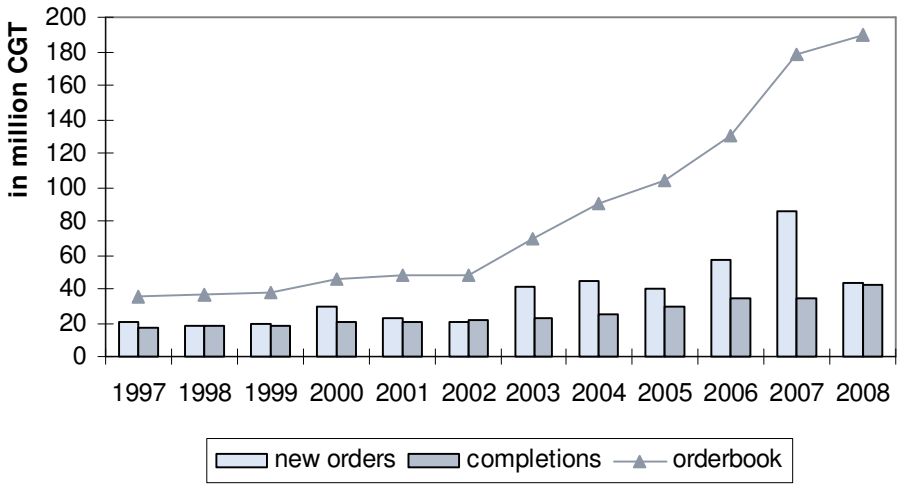


Source: Clarkson (2009); calculations ECORYS

New orders exceed annual supply leading to capacity increases

In absolute terms, from 2003 onwards new orders have exceeded annual completions causing a clear pressure to further shipyard capacity expansion. In order to deliver the orderbook in time shipyard capacity simply has to expand. In view of the decreasing world cargo volumes being shipped, this "over-demand" has decreased in 2008.

Figure 2.16 World trend: new orders, completions and orderbook from 1997 to 2008



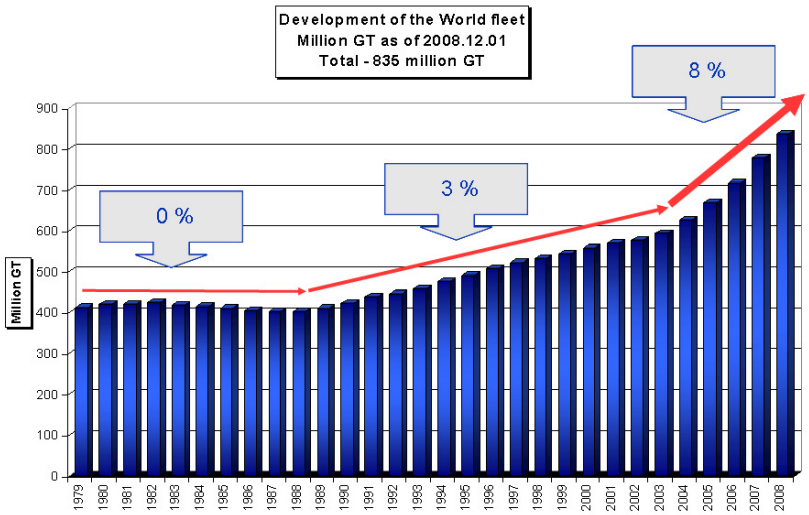
Source: CESA Shipbuilding Market Monitoring, 2009

The next down cycle?

The increased ordering of new ships was driven by the increased demand for shipping. Since 2003 the world fleet increased at an average 8% per annum which represent an

accelerated growth in comparison to earlier years. This in turn is driven by worldwide GDP growth and increasing trade flows.

Figure 2.17 Development of the world fleet 1979-2008

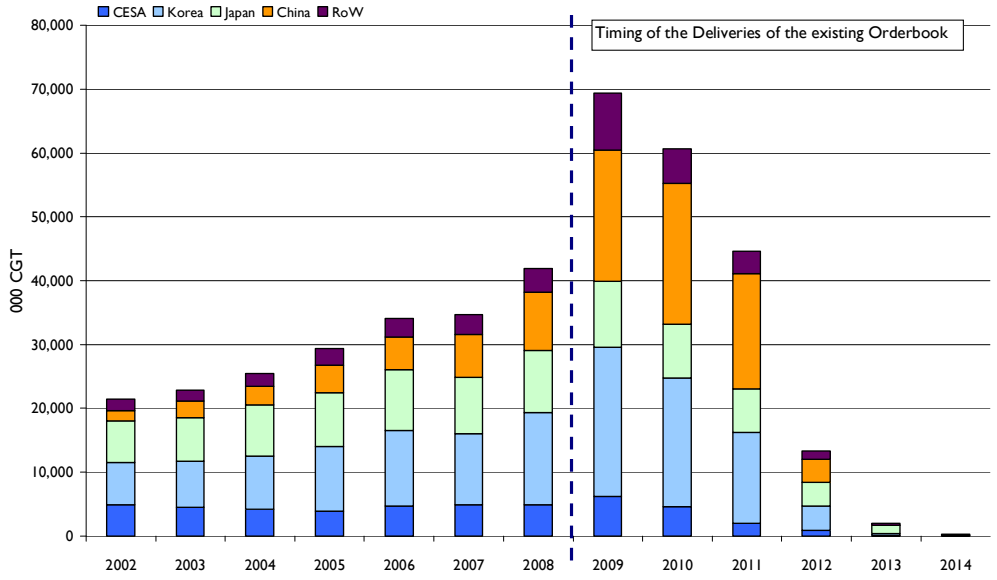


Source: DNV (2009), Challenges and opportunities in today's turbulent market

Even without the current economic and financial crisis it could be expected that shipbuilding would have entered the next the next down cycle. Ship completions of the next three years (current ships on order) represented 50% of the current world fleet. Furthermore, new shipbuilding capacity has increasingly been added over the last years. Using completions as a proxy for production capacity almost doubled between 2002 and 2008, with the outstanding orderbook hinting at further capacity increases (figure 2.18). Even if the world fleet would have continued to grow with 8% per year it could not have been expected that demand would stay at the same high level[48].

[48] As this would result in a renewal of again 50% of the world fleet in approx 4 years time.

Figure 2.18 Completions by main shipbuilding country/region and expectations of deliveries on existing orderbook



Source: CESA Shipbuilding Market Monitoring, 2009

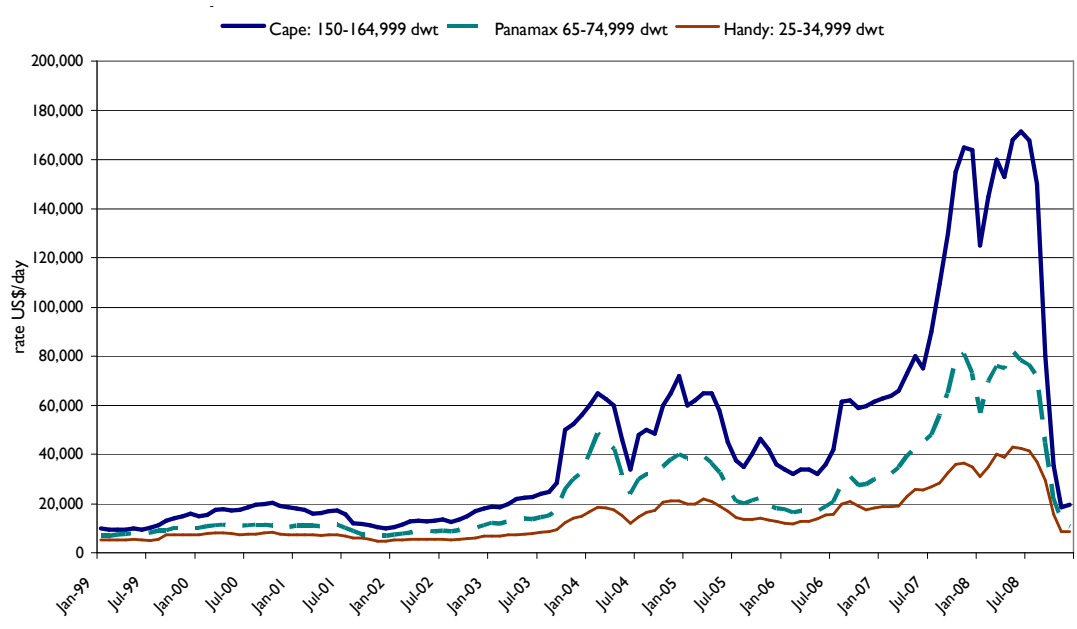
2.3.3 The current economic and financial crisis

The impacts of the current crisis

Strong collapse in demand for shipping

The financial crisis starting in the third quarter of 2008, and still affecting the global economy, has not left the shipbuilding industry untouched. The most direct impacts are clearly noticeable. The economic crisis has led to a sharp decrease in economic growth and corresponding trade volumes. As a result the demand for sea transport has shown a drastic decline. This can be clearly observed in the freight rates. Figure 2.19 shows the evolution of bulk carriers' charter rates.

Figure 2.19 Bulk carrier monthly charter rates



Source: CESA Shipbuilding Market Monitoring, 2009

Increase in number of lay-ups and scrapping

The sharp decrease in demand for shipping in turn has led to an increase in the number of lay-ups and an increase of scrapping. Some 10% of all container ships (especially smaller ships) were reported to be inactive at the end of May 2009[49] with further increases in lay-ups expected. This implies a postponement of the overcapacity problem, as with improving market conditions owners will first re-employ these vessels before placing new orders.

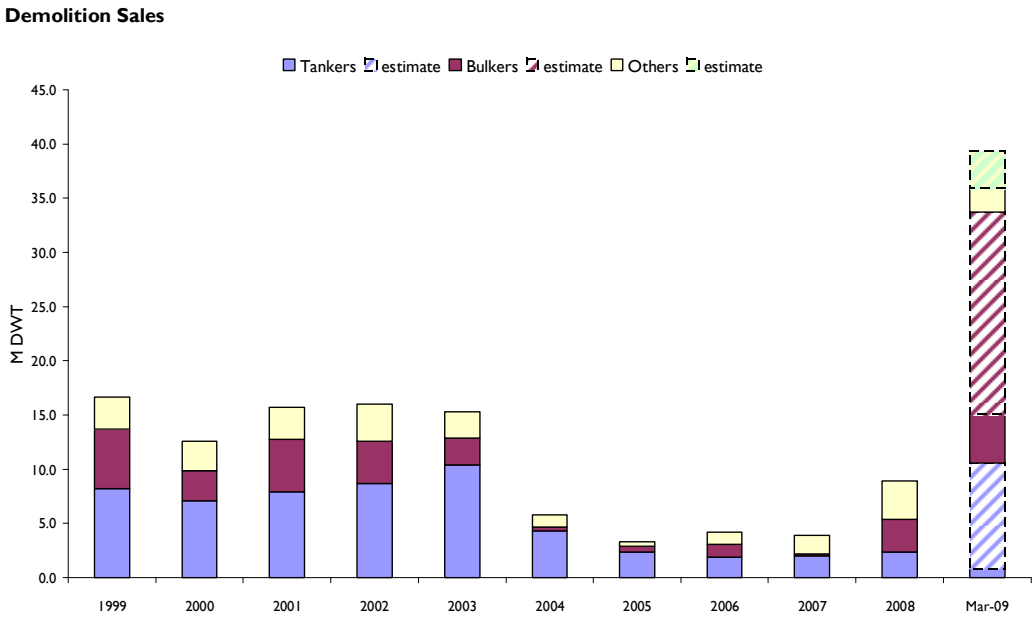
Box 2.6 Maersk laying up vessels

After having imposed eight ships of 6,500 TEU at the end of last year, Maersk Line expects to lay off another 25 medium-sized container vessels. Through negotiations, the carrier is trying to obtain new (chartered) tonnage will become available later than initially agreed.
In an interview with Reuters, the CEO of the Danish company, Eivind Kolding, said that all container companies this year probably will suffer loss. He considers the chance that, due to the current recession, there will be bankruptcies in the sector. 'Maersk will certainly survive", he is convinced.
Furthermore the Danish CEO declared that Maersk Line will not have others taking away market share from them. This will be a challenge especially on the trade between Europe and the Far East, where the company has a market share of 17 percent. Most large container vessels under construction have been ordered for service on this route.
Because of the large amount of capacity available, Kolding expects that the liner shipping segment will take longer to overcome the recession than other sectors. When the volumes will start to grow, our problems will not be over yet. "
Source: Nieuwsblad Transport, 12-3-09

Also scrapping of ships shows a strong increase (see figure 2.20). Low freight rates make it more attractive for ship owners to offer (old) ships for scrapping[50]. The economic crisis has reduced the average age of ships offered for scrapping from 35 years to some 20 years[51].

[49] Source: CESA, Shipbuilding Market Monitoring 2009
[50] This is delayed to some extent by the fact that steel prices have also declined a s a result of the economic crisis thereby reducing the scrapping price that is offered to ship owners.
[51] Source: CESA.

Figure 2.20 Ships offered for scrapping (in m DWT)



Source: Clarkson Research Services, cited in CESA Shipbuilding Market Monitoring, 2009

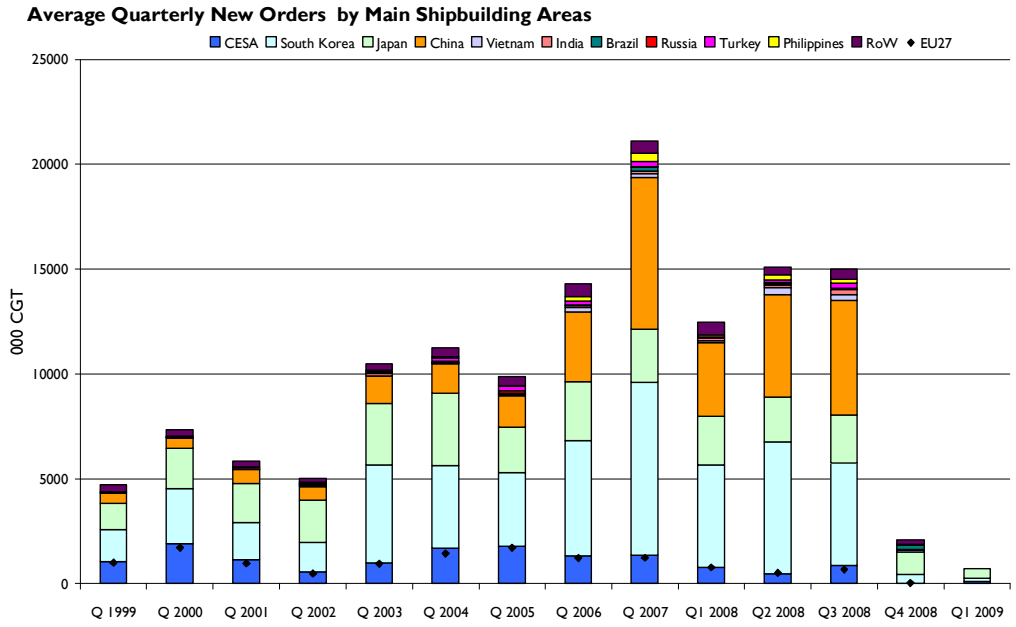
Although lay-ups and scrapping ease the supply of ships in the world fleet the outstanding orderbook still creates a situation of expected oversupply on the market. This has led to an increased number of order cancellations and order postponements. Especially the bulk and container segments are expected to see a high number of cancellations which some expect can be as high as 30% of the orderbook for these segments[52].

Sharp fall in new orders

Obviously with an increasing number of order cancellations and postponements there is hardly a market for new orders. New orders have practically dried up since the 4th quarter of 2008 (figure 2.21).

[52] See DNV, June 2009, Challenges and opportunities in today's turbulent market.

Figure 2.21 Average quarterly new orders compared to 2008 quarters by main shipbuilding countries/regions



Source: CESA Shipbuilding Market Monitoring, 2009

The economic crisis is worsened by the parallel financial crisis

The current crisis is not only an economic crisis but a financial crisis at the same time, in which the financial system is strongly affected and the balance portfolio of banks is negatively affected. This has a direct impact on the willingness of banks to finance new vessels (finance offered to ship owners) or to produce delivery guarantees to shipyards (to offset potential delivery risks of shipyards going bankrupt to new ship owners.

The economic crisis thus has a direct impact on ship yards across the world (see examples in boxes 2.7 and 2.8).

Box 2.7 Impact of the crisis on ThyssenKrupp

Downsizing deals - ThyssenKrupp may fire 1,500 at 3 shipyards

Financial Times Deutschland citing metal workers union representative Mr Wolfgang Maedel reported that ThyssenKrupp AG may fire as many as 1,500 workers at three shipyards because of a decline in orders. The paper said that shipyards in Hamburg, Kiel and Emden are affected because of a drop in demand for container ships and small yachts.

Source: Nieuwsblad Transport, 12 March 2009

Putting newbuilding on hold

Just a day later, it was announced that Thyssen Krupp Marine Systems (TKMS), has immediately cancelled the Construction of four 3,400 TEU countainer vessels. Banks were not prepared to deliver the required financing anymore. The vessels were under xonstruction at HDW and Blohm & Voss Nordseewerke, both in Kiel. Thyssen Krupp didn't want to disclose the name of the client, but according to LIloyds List it concerns Buxpower from Hamburg, an investment vehicle of NSB Niederelbe, a German ship manager. This company has a fleet of 112 vessels, mainly in the container segment, which are leased to large carriers like CMA CGM, MSC and Hanjin.

Construction of the vessels was just started and completion was due in 2010. If not cancelled, TKMS would

have had to complete them on own account. The German shipbuilding association VSM recently announced that German yards have already been forced to accept 29 cancellations, and a similar number is at risk due to financing problems. Since the start of the recession already four German yards have been closed down.
Source: Nieuwsblad Transport, 13 March 2009

Box 2.8 Hyundai affected by decline in new orders

Hyundai's target for orders in 2009
Hyundai Heavy Industries, the world's leading shipbuilder, said Friday that it is aiming at winning US$21.1 billion worth of orders this year, down 33 percent from last year's figure. Last year, the shipbuilder clinched orders valued at a record of $28.2 billion, up 12.77 percent from $25 billion a year earlier, mainly thanks to rising demand for high-priced ships.

But it is unclear whether the shipbuilder will be able to achieve the target. Hyundai Heavy has had no shipbuilding orders since October last year, as demand for new vessels has dropped sharply since the third quarter of 2008, as worldwide financial turmoil eroded sales of commodities and consumer goods .
Hyundai Heavy also said it would post 22.88 trillion won ($15.37 billion) in sales this year, compared with last year's 19.96 trillion won. It also plans to invest 1.43 trillion won for facility upgrade and expansion.
Source (15-3-2009): http://www.vinamaso.net/news-events/shipbuilding-repair/211bn-hyundais-target-for-orders.html

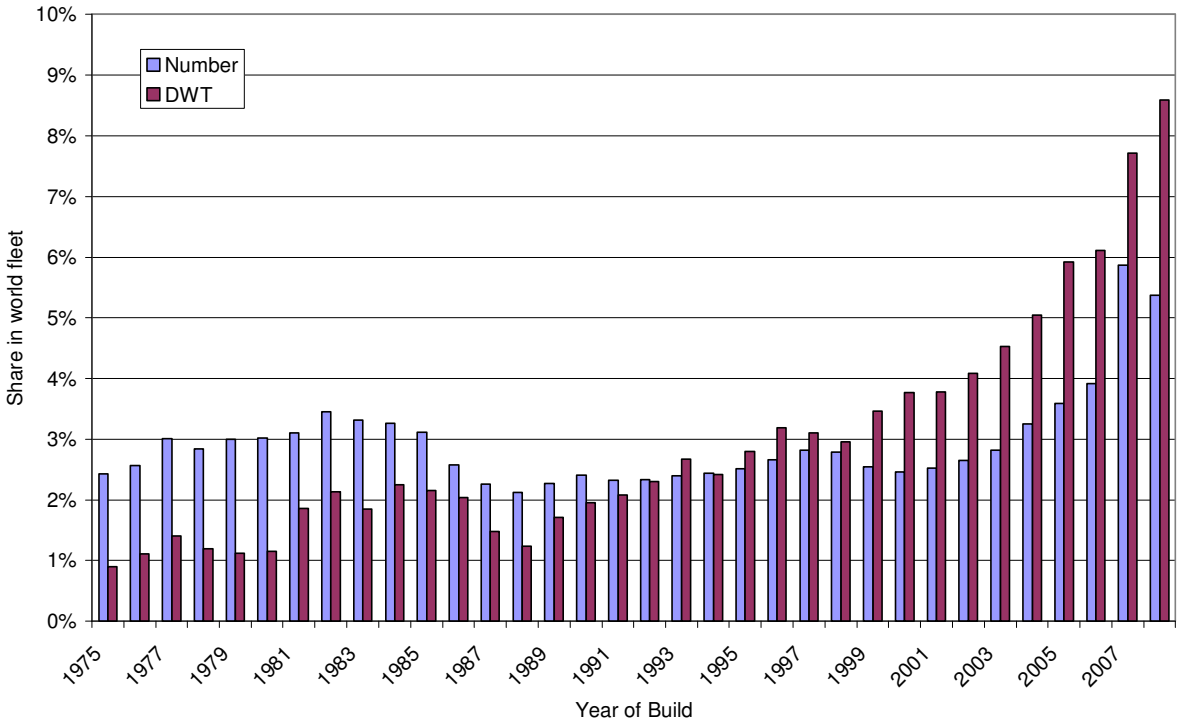
Overcapacity

In the period prior to the economic crisis, a situation of overcapacity was gradually created. As ship owners were investing and ordered large numbers of new vessels triggered by high freight rates, shipbuilding companies were triggered to expand capacity. In Europe this was not so much seen, but in countries like China and also Turkey, various greenfield shipyards were being erected to benefit from the strong demand and high sales prices that could be obtained. As a result, the volume of new orders amounted to about 50% of the total world shipping fleet currently sailing the seas. If one would assume that shipbuilding is needed for replacement of old fleet (e.g. if ships are in operation for 25 years, replacement would be some 4% per year) and to accommodate growth in transport demand (related to world trade growth, say some 5% per year on average, higher in boom times), total annual demand would be some 9%.[53] Of course this applies to mass markets mainly; for specific sectors like dredging, offshore or cruise other assumptions would apply.

Due to the high building rates, current world fleet is relatively young, especially if one corrects for the carrying capacity – vessels have grown in size substantially –, as shown in the next figure. This problem is even more applicable when looking at specific segments like dry bulk, container and tanker vessels.

[53] Derived from CARE, 2008; Stopford, 2009.

Figure 2.22 Age profile of the world shipping fleet (all commercial vessel types)



Source: Lloyds shipping database, data of 1-1-2008.

As newer vessels tend to be typically larger, the average vessel size has increased. Smaller vessels that are deployed on regional markets where smaller consignment sizes are involved tend to be older. This is also the case in intra-European shortsea traffic, where smaller sized vessels are relatively older than larger sized vessel segments. Below table shows this. It is assumed that for intra-EU shipping, European flag vessels are used most frequently, although it is known that also non-EU flag vessels are sailing on intra-European routes. The data below should therefore be considered indicatively.

Table 2.5 Average year of build (YoB) for EU-flag and non-EU flag vessels, by ship size (in GT)

GT size class	Average YoB EU-flag vessels	Average YoB non-EU flag vessels
0-500	1977	1987
500-1,000	1978	1977
1,000-1,600	1983	1980
1,600-5,000	1990	1984
5,000-10,000	1994	1986
10,000-30,000	1995	1988
30,000-60,000	1999	1994
60,000-100,000	2002	1998
> 100,000	2002	1999
Average all size classes	1990	1985

Data from Lloyds Shipping database (2008 world fleet), calculations ECORYS.

EU flag includes EU-27, Gibraltar, Iceland, Norway (including Norwegian International Shipping register)

In most segments and size classes, EU flag vessels are newer than the average. This conclusion also holds when zooming in on specific vessel types. An exception are the smallest sized vessels in the RoRo and ferry segments (below 1,000 GT), which are much older than the world average. In the segments up to 1,600 GT, vessels are more than 25 years old, while the category up to 5,000 GT also contains substantial numbers of relatively old ships. If it is assumed that shortsea shipping is mainly done with vessels of 1,000-10,000 GT, then there is a substantial potential for modernisation of the European flag fleet.

CESA has estimated that global 2009 output will be around 46 mln CGT (Market Monitoring report Q1-2009). If one would look at market growth and replacement needs under 'normal' market conditions, it is expected that on the long run, this capacity level seems sustainable, but the past capacity growth will not return. It is noted that the overcapacity problem in shipping – and therefore also in the orderbooks – is most pronounced in the tanker and container segments, and less in the segments where European yards have leading positions.

Government responses to the current crisis

In response to the current crisis several government have established interventions to support their shipbuilding industries. Table 2.5 present an overview of some of the main responses in a number of countries.

Table 2.6 Main crisis response by country

Country	Description of government intervention
South Korea	• Announcement of a 32 trillion Won (approx. 18 billion Euro) support package to shipyards and ship owners as part of an emergency economic policy, comprising 12 billion Euros in loans and guarantees to shipyards and suppliers (supply of working capital) and 6.7 billion Euros in direct loans and debt guarantees to ship-owners (domestic and foreign). • Creation of a fund of some $3 billion (30% funded by government) to buy over 100 ships from Korean shipping firms. • The Korean Export-Import Bank has put aside 8.5 trillion won for loans to small domestic shipbuilders. The government will encourage state-run banks to provide guarantees for overseas contracts of troubled companies.
China	• State owned COSCO, China Shipping Group and Sinotrans are supported to pick up cancelled shipbuilding orders from state owned shipyards (CSSC and CSIC. • State owned shipyards CSSC and CSIC support to carry out mergers and acquisitions through capital injections and the creation of an industrial fund • Continuation of the stimulus package to expand annual shipbuilding capacity to 50 mln DWT annually. • Specific measures, including competitive loans to ship owners to encourage fleet renewal; increased and preferential credit facilities for foreign ship buyers; (17%) subsidy on ship prices for domestic ocean going ships till 2012; access to working capital for shipbuilders at preferential interest rates + mortgage financing for ships under construction.
India	• Build in India policy – proposal for a $2 billion loan packages to the shipping industry connected to the idea of buying at domestic yards

Country	Description of government intervention
	• 2007 subsidy scheme (30% subsidy) for orders secured till August 2007. Newly proposed 20% subsidy from 2007 onwards.
Brazil	• 2003 Build in Brazil directive; • Subsidized loans for costs of domestically built ships by BNDES (state development bank)
USA	• The USA economic stimulus package also contains a budget for the acquisition of public support vessels such as ferries.
Turkey	Stimulus plan including: • Commercial loans and credit facilities to build ships contracted before downturn; • Extended loan facilities by Eximbanks for exported ships; • Encouragement of public sector to follow a Build in Turkey policy for their own ships; • Potential financial guarantees for companies in trouble.

Source: ECORYS based on CESA

Whereas some of the measures are mainly directed to overcome the issue of access to working capital and financing for ship buyers, other measures especially in China are mainly intended to (artificially) enhance demand. The support in creating access to financing, combined with the current reluctance of ship financing by European based banks may also lead to a shift of ship financing towards Asia. This may stimulate a further buyer concentration in Asia.

Box 2.9 Europe's responses to the crisis in the 1970s

Also in the 1970s, Europe's shipbuilding industry was hit hard by a crisis in world shipbuilding. At that time mainly Europe and Japan were active in shipbuilding world wide. As a result the European Community authorised operating subsidies to the shipbuilding sector that started at the early 1970s, and which resulted in very high support rates. In 1987, with the Sixth directive on shipbuilding, these operating subsidies were limited and gradually a phasing out strategy was adopted. This limited operating subsidies to 28% in the period 1987-88, further reduced to eventually 9% from 1992 onwards. The latter percentage lasted until 2000, when a new framework on state aid to shipbuilding was introduced. The absolute amount of subsidies fell from €1.1 billion in 1990 to € 550 million in 1998, with more than half of the subsidies directed at the cruise shipbuilding industry.

Source : David Glen, Shipbuilding disputes : the WTO panel ruling and the elimination of operating subsidy from shipbuilding

2.4 The structure of shipbuilding by main region

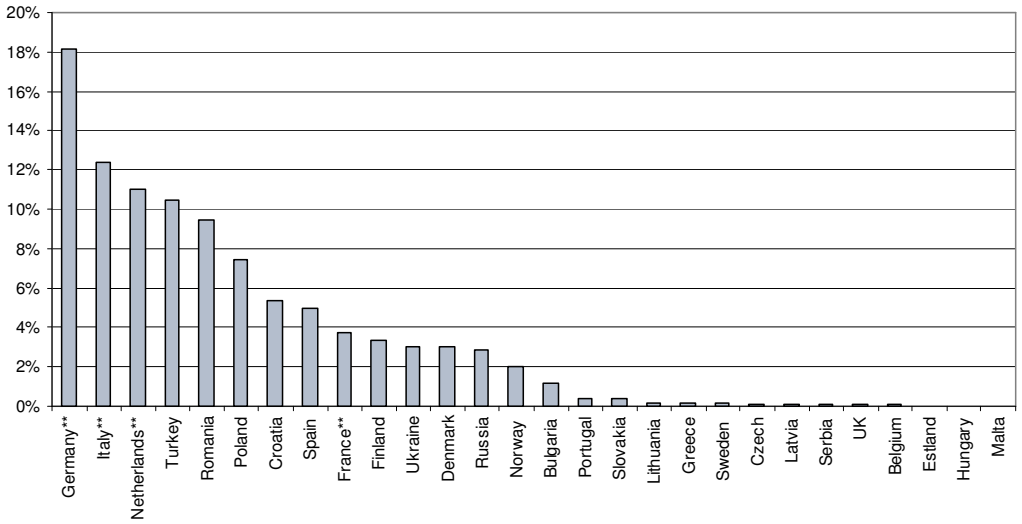
In this section the shipbuilding sector is analysed in more detail, for the various shipbuilding regions. We assess Europe, South Korea, China, Japan as well as a group of emerging players, respectively.

2.4.1 Europe

Ship construction

On the basis of their total orderbook the largest European shipbuilding countries can be identified.

Figure 2.23 Relative position of 30 European countries regarding shipbuilding (orderbook in CGT, 2007)



Source: Lloyd's Register-Fairplay

** CESA/VNSI

Germany and Italy are traditionally the largest shipbuilding nations in Europe followed by countries such as Romania, The Netherlands, Poland, Croatia and Spain. Turkey has grown very fast and is now among the top four in Europe in terms of total order book. This position is also confirmed by the new orders (table 2.7).

Table 2.7 New orders 2004-2008 by country in 1,000 CGT

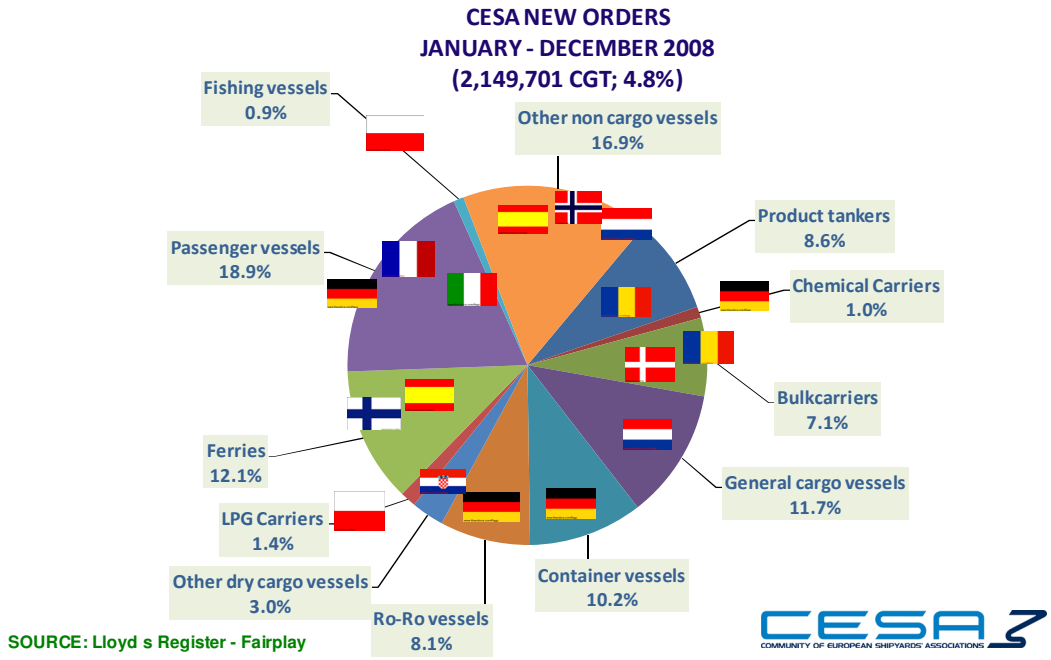
	2004	2005	2006	2007	2008
Germany	1,540	2,406	1,414	1,253	589
Turkey*	628	844	720	924	409
Romania	437	717	210	938	249
Netherlands	536	974	991	1,445	245
Italy	1,285	326	1,067	1,239	49
All other countries	6,389	8,511	7,714	6,787	2,509
Europe total	**7,674**	**8,837**	**8,781**	**7,926**	**2,558**

Sources: CESA Annual Report 2007-2008, CESA Shipbuilding Market Monitoring 2009 and Lloyd's Register-Fairplay

Table 2.7 shows that, while total CGT ordered was hovering around 8 mln CGT until 2007 (and in 2008 declined to one third of this level, mainly as a consequence of the economic crisis starting in Q3), the new orders for individual countries can fluctuate substantially per year.

A further differentiation by ship type (figure 2.25) reveals the specialisation in the different European countries.

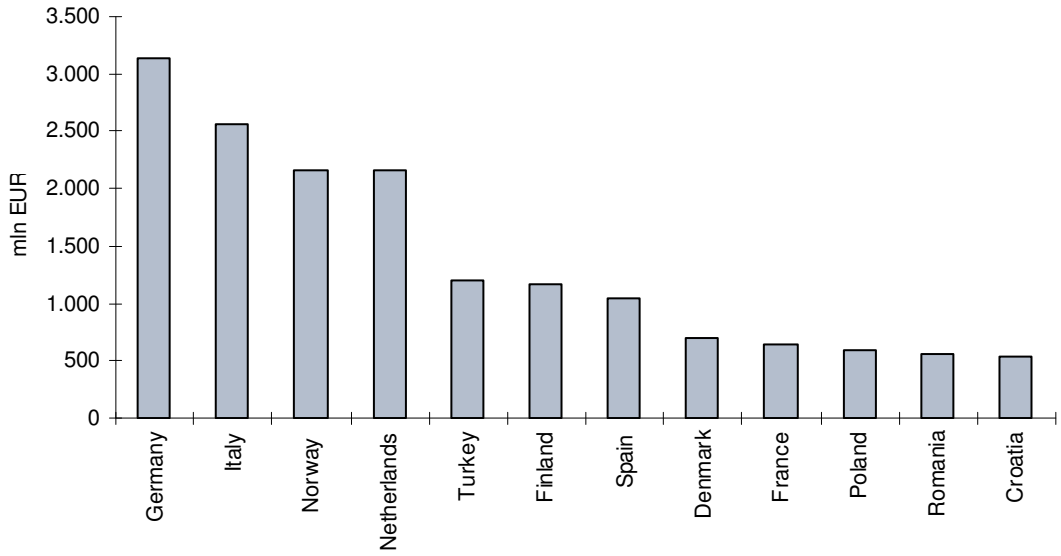
Figure 2.24 CESA new orders in 2008 by main shipbuilding country per ship type



The total turnover in the European shipbuilding industry was 16.3[54] billion euro in 2007. Regarding the distribution of this total, a slightly different picture can be identified than when measures in CGT, again reflecting the differences in ship type specialisation for the various countries. Poland and Croatia for example drop in the ranking due to the relatively lower value of ships produced in these countries. In terms of production value, Germany, Italy, Norway and the Netherlands are the top-4 in Europe, with annual production values above € 2 billion, and Germany even above € 3 billion.

[54] CESA Annual Report 2007/2008, Turkey is added. It should be noted that this figure differs from the figure that is presented in section 2.2 on the total production value of the shipbuilding sector (NACE 35.11), which comes to € 42.9 billion for the EU27 + Norway. The main explanation, apart from a different geographical definition, is that the latter figure also includes all shipbuilding among which naval shipbuilding.

Figure 2.25 Completions by European countries in value (2007, in million Euro)



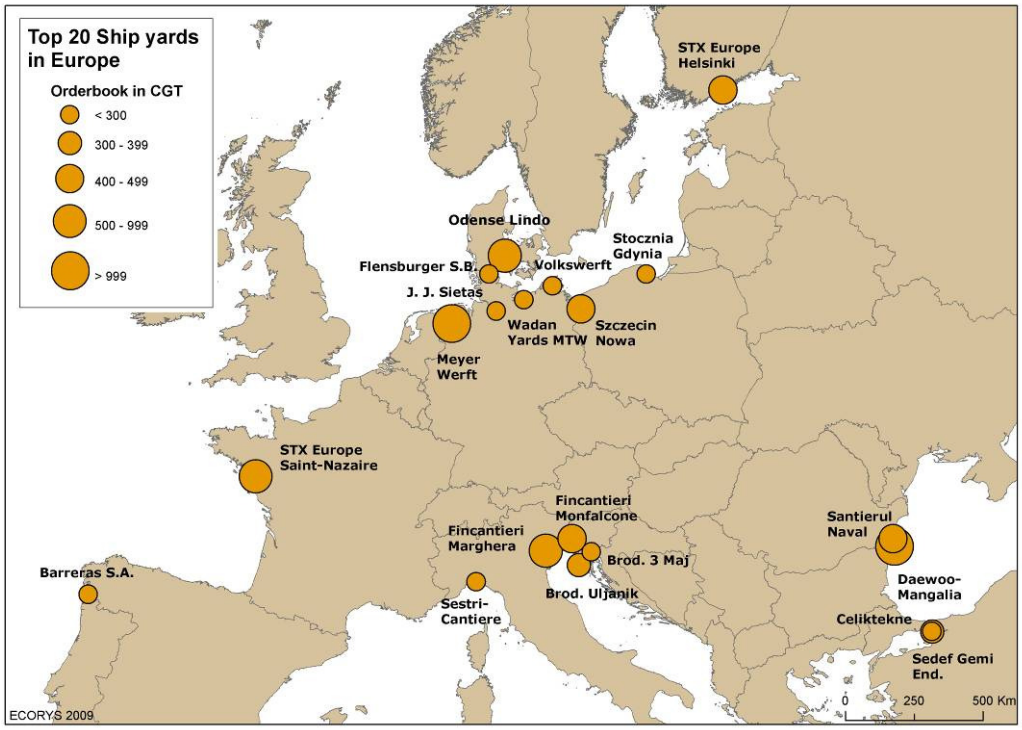
Source: CESA Annual Report 2007-2008 and Clarkson World Shipyard Monitor 2008

Key European players and ownership patterns

Figure 2.26 gives an overview of the location of the largest European shipyards (excluding Turkey). The German yard Meyer Werft is the largest yard in Europe and takes a 38th position in the world ranks with 1.155 million CGT in the total orderbook (2008). Daewoo-Mangalia is second, and part of the larger Korean company Daewoo Shipbuilding and Marine Engineering (DSME). STX Europe (formerly Aker) has two top 10 yards in Europe in terms of orderbook. The STX Europe yard in France has the largest capacity in Europe and takes an 18th position in the world in capacity terms for individual yards[55]. Fincantieri in Italy has two yards in the same area and therefore ranks with the top three companies in Europe.

[55] Clarkson Monitor Report January 2009

Figure 2.26 The top 20 European shipyards as of January 1st, 2009 (orderbook in 1,000 CGT)



Source data: Clarkson; map: ECORYS

The position of the European yards is heavily tested over the last decades by Asian yards. Nowadays, the 37 largest shipyards are in Asia (in terms of orderbook in CGT)[56]. To put the ten largest European yards into perspective, end of 2008 they together had a total orderbook of 5.97 million CGT, which is only 46% of the orderbook of the world leader Hyundai H.I. and only about 3% of the total world orderbook.

Table 2.8 Top 10 European yards by orderbook as of December 31st, 2008 (in 1,000 CGT)

Rank Europe	Rank world	Yard	Country	Capacity in CGT	Orderbook in CGT
1	38	Meyer Werft	Germany	269	1,155
2	41	Daewoo-Mangalia	Romania	128	1,025
3	70	STX Europe Saint-Nazaire	France	409	585
4	74	Fincantieri Marghera	Italy	219	548
5	84	Odense Lindo	Denmark	302	505
6	88	Fincantieri Monfalcone	Italy	238	485
7	89	Szczecin. Nowa	Poland	191	473
8	92	Santierul Naval	Romania	90	468
9	104	STX Europe Helsinki	Finland	198	402
10	114	Brod. Uljanik	Croatia	154	324
Total				**2,198**	**5,970**

Source: Clarkson World Shipyard Monitor January 2009

[56] Clarkson Monitor Report January 2009

Box 2.10 Key players in Europe

Top four European Shipyards

Meyer Werft has a worldwide reputation in special purpose vessels. The company is especially well known for the construction of huge, modern and highly sophisticated cruise vessels. The company builds also car and passenger ferries, RoRo ships and LPG tankers. The yard has over 2,500 employees[57]. With respect to their strategy, Meyer Werft is mainly focusing on special purpose vessels and indicates no plans for mergers or acquisitions. This typically illustrates their difference from Korean yards which try to differentiate.

Daewoo-Mangalia Heavy Industries is a joint venture between Daewoo Shipbuilding & Marine Engineering in Korea and Mangalia Shipyard in Romania. The shipbuilding activity is mainly focused on handysize, up to panamax bulkers and container vessels of 1000 ~ 2500 TEU, as their basis of new building activities[58]. Repair and conversion makes up a major part of their business. Being part of DSME, this joint venture is part of focusing mainly focuses on the European market.

STX Europe ASA, formerly Aker Yards ASA, is part of STX Corporation from Korea. It is the largest shipbuilding group in Europe and the fourth largest in the world. It operates 18 shipyards in Norway, Finland, Germany, Romania, Brazil, France, Ukraine and Vietnam.

Fincantieri is an Italian company with a network of 10 shipyards. Fincantieri's core business is the construction of cruise ships and large ferries as well as naval vessels including surface vessels (frigates, corvettes, patrol vessels etc.) and submarines[59]. Its largest facilities, at Marghera and Monfalcone are both constructing merchant ships. Fincantieri one of the few European companies with a differentiation strategy in all kinds of ship types and along the supply chain. For instance, they have their own marine systems and components company and are active in both newbuildings and reparations.

In addition to the limited number of key players also a large number of small and medium sized companies are active in shipbuilding in Europe (see box 2.11).

Box 2.11 SMEs well represented in shipbuilding

In the EU-27, some 4,800 companies are registered under NACE code 35.11, which is the sector of sea-going shipbuilding. Of the companies with known size, some 83 percent are registered as small (less than 10 employees), micro (less than 50) or medium (less than 250 employees).

From analysing profit and loss accounts of these companies, it appears that in general, average profit per employee is higher for medium sized companies than for large companies, while small and micro companies have lower profit rates. Volatility of these ratios is however higher for smaller companies.

Source data: ECORYS based on AMADEUS database

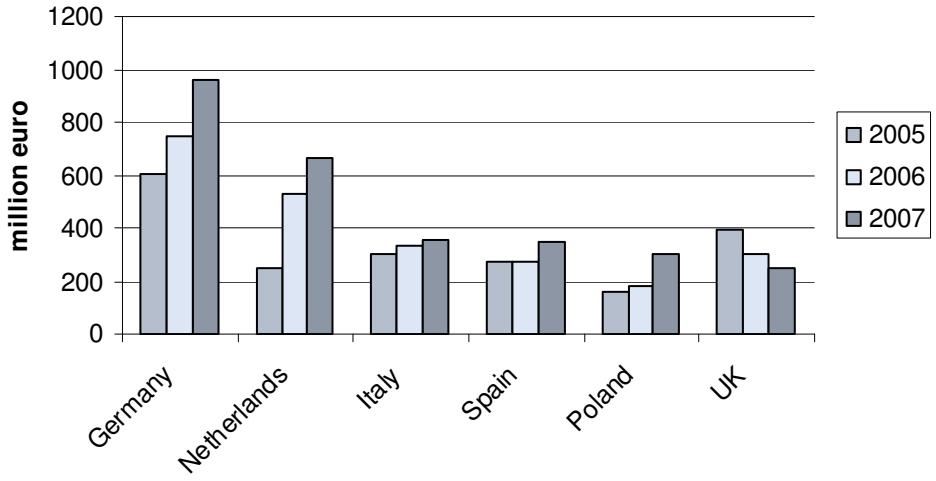
Repair and conversion

The total production value of repair and conversion industry is estimated at €3.5 billion in 2005[60]. This represents approximately 21% of the total production value of the European new building market for ships.

[57] www.meyerwerft.com
[58] www.dmhi.ct.ro
[59] www.fincantieri.it
[60] CESA Annual Report 2007 -2008

Regarding the turnover in repair and conversion, an almost similar picture can be identified as for newbuildings. The top three players in newbuilding, Germany, Italy and the Netherlands are also the largest countries in repair and conversion, to be followed by Spain, Poland and the UK. A relevant trend is that between 2003 and 2007, the repair and conversion industry turnover has grown with 60%, while the newbuilding turnover growth was 12%, thus indicating an increasing importance of repair and maintenance activities.

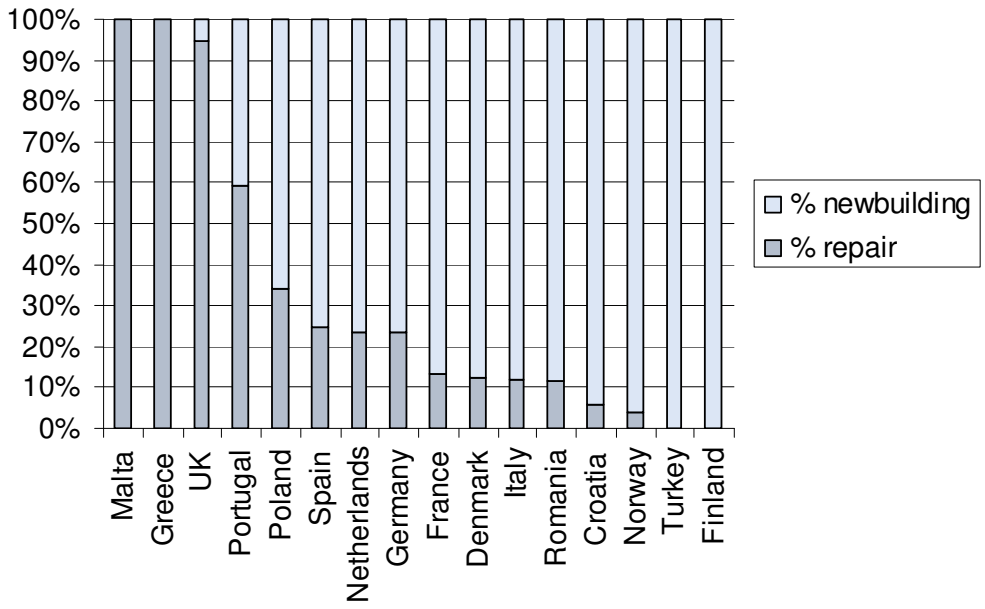
Figure 2.27 Repair industry turnover of European countries between 2005 and 2007



Source: CESA Annual Report 2007-2008

Although large newbuilding countries are also large repairers, there is a distinct pattern in specialization in ship repair versus ship newbuilding in Europe, with some countries mainly specializing on ship repair while others fully concentrate on newbuilding activities. Figure 2.28 indicates the relative importance of repair compared to newbuilding in terms of turnover by country. It clearly shows that while Malta, Greece and the UK, and to a lesser extent Portugal, are dominated by the repair industry, while on the other side countries like Finland, Norway or Croatia are fully focused on newbuilding.

Figure 2.28 Share turnover in repair and newbuilding by European countries in 2007



Sources: CESA Annual Report 2007-2008

* No data available for Turkey and Finland

The top four countries with relatively more turnover from repair than from newbuildings have one characteristic in common. They are all located along major shipping routes. The repair industry is very much geographical oriented as to be efficiently accessible by their customers.

Marine equipment

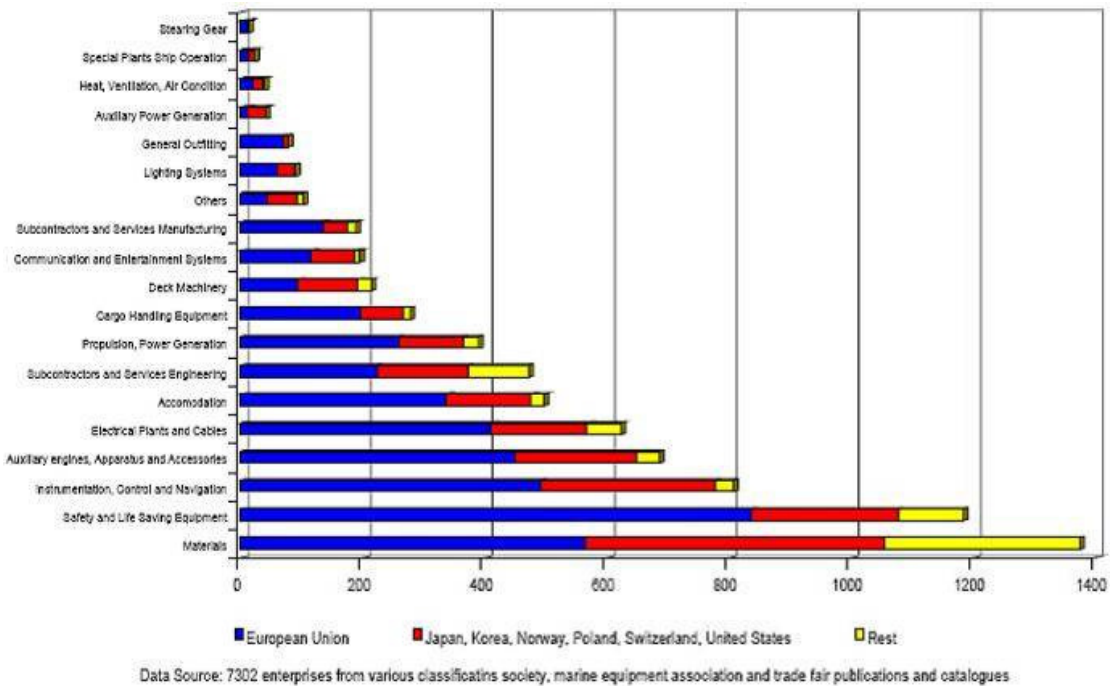
Marine equipment is the key supply industry of shipyards. The shipbuilding industry works with large numbers of subcontractors, often ranging between 1,000 and 2,500 names depending on ship type and company)[61]. According to CESA, roughly 70% of the total shipbuilding production is sourced mainly across the European network of small and medium sized supply companies[62]. Their exact number is not known but estimates range between 5,000 and 7,000 companies in Europe alone.[63] Figure 2.29 gives some further indication of the distribution of the number of companies in different marine equipment subsectors, also in relation to main competing countries. The materials group has the highest number of enterprises.

[61] BALance Technology Consultants, cited in IKEI 2009. This is strongly deviating from the automotive and aerospace industries which tend to work with platform suppliers with less then 200-500 first-tier suppliers.

[62] CESA Annual report 2007-2008

[63] BAlance Technology Consultants (2000); EMEC; CESA

Figure 2.29 EU15 share in the marine equipment industry – number of enterprises

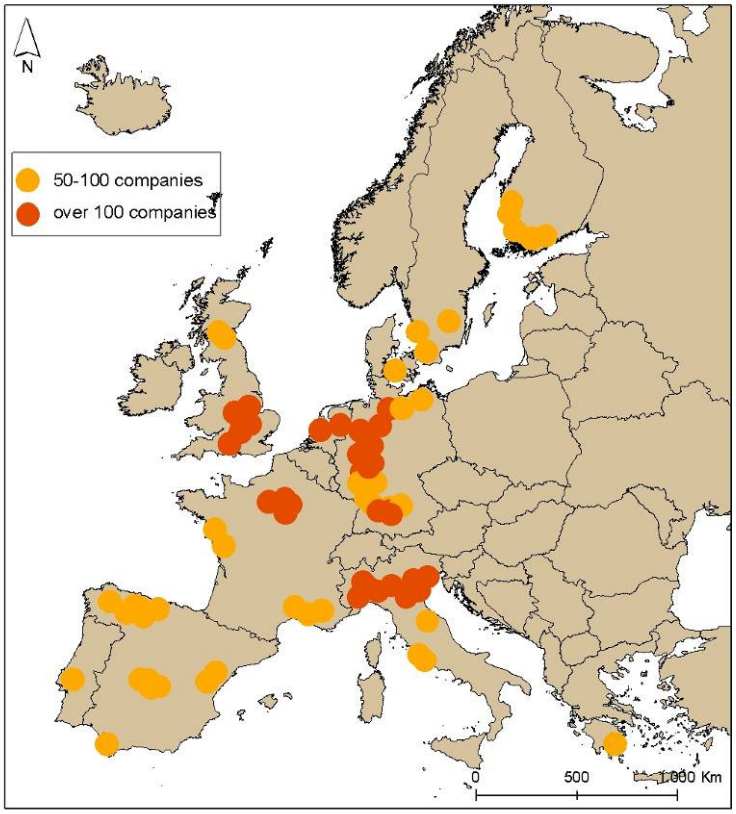


Source: BAlance Technology Consulting, 2000

Within Europe, the largest number of companies can be found around the major shipbuilding locations or in the main industrial centres[64]. For the largest companies (in terms of turnover) a different pattern arises as these can often be found located in industrial centres, rather than shipbuilding areas[65]. figure 2.30 gives an indication of the regional spread of marine equipment supply companies. The map indicates that important geographical clusters can be found in Germany, the Netherlands, Italy, France and the United Kingdom[66] [67].

[64] BAlance Technology Consultants (2000)
[65] BAlance Technology Consulting (2000). Competitiveness and Benchmarking in the filed of marine equipment
[66] It should be noted that in this specific map, BALance did not include Norway.
[67] It is noted that the BALance study dates back to 2000 and only covers the EU-15. After this year, no similar study has been conducted and no other data was found presenting any recent developments and/or data on Eastern European countries.

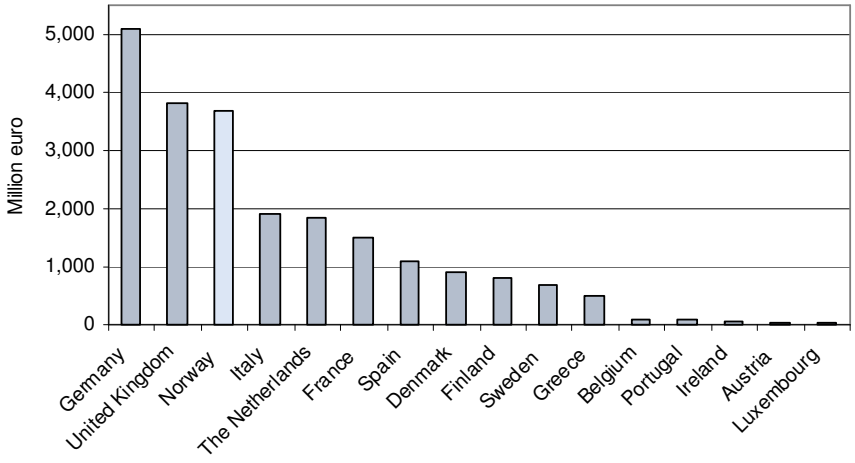
Figure 2.30 Geographical distribution of marine supply companies (2000)



Source: Based on BAlance Technology Consulting, 2000

The same regional pattern is confirmed by the production of marine equipment. In terms of turnover the major players in marine equipment in Europe can be found in Germany, the United Kingdom and Norway. Italy, The Netherlands, France and Spain are countries which are as also relatively large in terms of marine equipment turnover.

Figure 2.31 Total production by country for EU-15 and Norway (mln Euro in 1998)



Source: BALance Technology Consulting, 2000

Until the 1990s, Germany was the leading country in the marine equipment sector with a world market share of 15-22%[68]. However, according to IKEI, the market share of Germany has declined to around 15%.[69] Unfortunately, no recent figures for the EU level are available. Also landlocked countries such as Czech Republic and Austria are reported to have a relatively important marine equipment industry[70].

Total European production value of marine equipment is estimated at € 26 billion in 2004[71]. This represents a world market share of approx. 35-36%. European companies are mainly active in the fields of:

- mechanical engineering including engines (26% of the European marine equipment production),
- electrical engineering/electronics (18%), and
- steel products (15%)[72].

In comparison with Asian competitors, European industry is especially strong in high tech related marine equipment. More specifically, they are renowned for propulsion, cargo handling, communication, automation, environmental and security systems. Also the supply industry for the specialised cruise market can be found in Europe[73].

Box 2.12 Marine equipment supply of engine: dependency on ship type.

Within the main engine sector a rough distinction can be made between low-speed and medium-speed engines. The first type is mainly used in bulk carriers because of their volume, they are mostly built close to the yard building such type of vessels. Medium-speed engines are less large and can be more easily transported across the world.
Source: Wärtsilä

Key players

Because of the very heterogeneous sector, it is difficult to list the top-20 players in the marine equipment industry. Nevertheless, in some equipment categories it is easier to identify the most important companies in terms of turnover. However, it should be noted that the companies in this sector are international operating companies with offices around the world.

Additionally, it is usual in this sector to work under license, especially regarding the manufacturing of large components such as engines. In other words, there are many Asian companies working under license of European companies. In this section it is attempted to give an overview of the most important European companies. Because of the specific nature of the sector, Asian companies will also be taken into account.

[68] Different sources give a different figures. IKEI (2009) reports a market share of 15% while BALance (2000) indicates a market share of 25% in 1998.
[69] See: IKEI (2009). Comprehensive sectoral analysis of emerging competences and economic activities in the European Union: Building and Repairing of Ships and Boats sector.
[70] The postion of Austria is not confirmed in the BALance study.
[71] Source IKEI 2009 based on ECOTEC 2006. BALance (2000) reports a figure of €19 billion in 1998.
[72] BALance (2000) cited in IKEI (2009)
[73] IKEI 2009

In the main engine sector, Wartsilä (Finland) and MAN B&W Diesel (Germany) are considered to be the dominant Euroepan players with licensees all over the world. These licensees are mainly located in Asia, including South-Korea, Japan and China.

Box 2.13 Leading marine engine manufacturers

The 'big-two'

Wärtsilä

Wärtsilä is a Finnish company and an important player in the medium-speed engine segment (37% market share). It has facilities in 70 countries including many countries in Asia. Wärtsilä claims to be the leading provider of ship power solutions to clients within the merchant, offshore, cruise and ferry, navy and special vessels segments.[74] It has joint-ventures with Asian companies and has licensed Asian companies (such as Diesel United, Mitsubishi, NKK, Hitachi Zosen, CSIS, Dalian, Yichang, CSSC, Hudong, Shangchuan, Hyundai, and HSD Engine) to built mainly low speed engines and auxiliary engines.[75]

MAN B&W Diesel

MAN B&W Diesel is a German company and claims to be – together with their licensees – market leader (market share of 50%) in the two and four-stroke engines produced for large oceangoing vessels.[76] Major Asian partners are Hyundai Heavy Industries (production of two-stroke engines), Doosan Engine, STX (also four-stroke engines), CSIC/CSOS, CSSC/CSTS and CSSC-Mitsui Diesel Co.Ltd. (China).

The actual leaders

The norm in the main engine sector is production under license.[77] As a result, the top 7 'actual' engine constructors (list 2002) are located in Asia[78]:

1. Hyundai Heavy Industries (HHI) (South-Korea), division Engine & Machinery is part of the HHI corporation (world leader in shipbuilding). HHI claims to be world leader in building marine diesel engines and has a market share of 35%
2. Doosan (HSD) (South-Korea) (Manufacturing for both MAN B&W and Wärtsilä and both four and two-stroke engines. It also builds engines under license of SEMT-Pielstick (France)
3. Mitsui (Japan) (licensee of MAN B&W diesel, has also set up a joint corporation with CSSC-MES Diesel (China)
4. Mitsubishi (Japan). Mitsubishi has set up –together with Wärtsilä- a joint venture in October 2006 with the China Shipbuilding Industry Corporation to manufacture large low-speed engines in China (under license).[79]
5. Hitachi Zosen(Japan) (licensee of Wärtsilä and MAN B&W).
6. Diesel United (Japan) (licensee of Wärtsilä and SEMT-Pielstick)
7. Kawasaki (Japan) (part of the shipbuilding division)

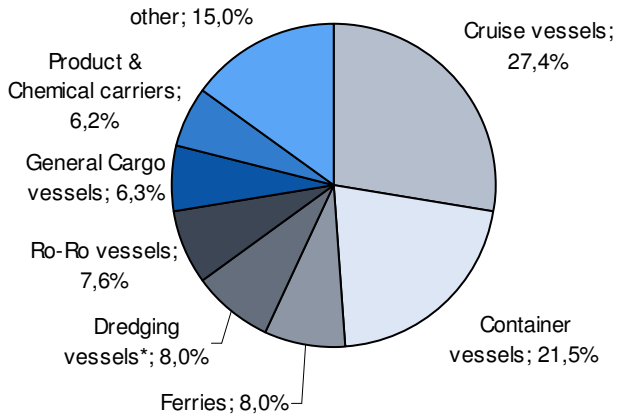
There is no update of this 'actual players' available. Other often mentioned players are STX Corporation and Dai Dong Machinery ld. in South-Korea.

[74] See W"ärtislä site, section "about us"
[75] See Wärtislä Annual report 2008, available at www.wartsila.com
[76] See MAN Diesel (2008). Marine engine IMO Tier I programme 2008 Available at www.manbw.com
[77] Drewry Shipping Consultants Ldt(2002). Insights into a lucrative market.
[78] Since this list comes from the 2002 Drewry Shipping Consultants report, the position of these companies might have changed over time. However, no actual data was found.
[79] http://www.wartsila.com/Wartsila/global/docs/en/about_us/twentyfour7/4_2006/engines_for_chinas_shipbuilders.pdf

Ship type diversification in Europe

Since the fierce competition of Asian companies, European companies were forced to diversify their product portfolio and focus on ships with a relatively higher value added. If the current order portfolio of European shipbuilding is analysed (see figure 2.32) large shares for cruise vessels and container vessels can be noticed. From a global perspective however, the European role in the container ship segment is much less important (see figure 2.7). What the figure does confirm however is Europe's specialisation on higher value, relatively complex ship types.

Figure 2.32 Orderbook CESA countries by ship type as per 31st December 2007 (% CGT)

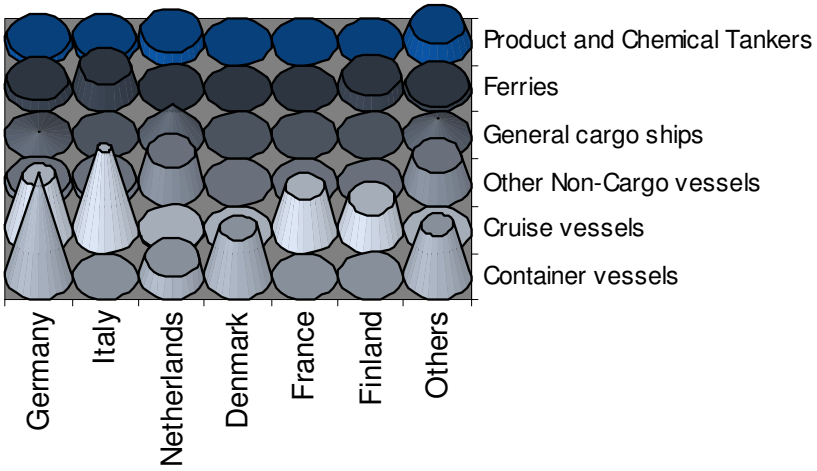


Source: CESA Annual Report 2007-2008; calculations ECORYS

* estimated

Figure 2.33 shows the relative importance of ship types by country based on orderbook in CGT in 2006.

Figure 2.33 Orderbook of main European shipbuilding countries by vessel type December 31st 2006 (based on CGT)



Source: IKEI Comprehensive sectoral analysis of emerging competences and economic activities in the European Union: based on CESA (see Annex for detailed information). Military vessels are not included.

From the above figure the following can be derived:

- The container market is an important market for Europe, even though it is known that Asian countries are many times larger. In this segment, Germany is the largest player followed by Denmark.
- Within the cruise market Italy, Germany, France and Finland are key players.
- The non-cargo vessel market is the third largest market. Within this category specialised dredging and offshore industry vessels can be found. The Netherlands is the largest builder of these types of ships, while Spain is a runner up. The Netherlands focuses in particular on dredgers, while Spain focuses on the offshore industry. Norway is by far the largest offshore builder[80], but is not included in the IKEI report[81].
- The ferry market is dominated by Italy, Finland and Germany.
- With respect to general cargo ships, the Netherlands is leading in Europe, and Spain, although at a much lower level, is the runner up.

The following sections describe a number of specific ship type submarkets which are important for Europe. Subsequently these are:

- Cruise ships
- Container vessels
- Dredging
- Off-shore
- Mega yachts

Cruise ships

With 15.2 billion euro on order in December 2008, the **cruise segment** represents 33% of the total European orderbook in euro[82]. Measured in CGT, after a decline between 2001 and 2003, the orderbook for cruise vessels has increased 180% between 2004 and 2008, which is rapid, but slower than the growth in some other segments. As a consequence, in the same period, the share of cruise vessels in the total world orderbook decreased from 6% down to 4%[83]. This might imply that the overcapacity created in this period will affect the cruise segment less than it will touch other segments.

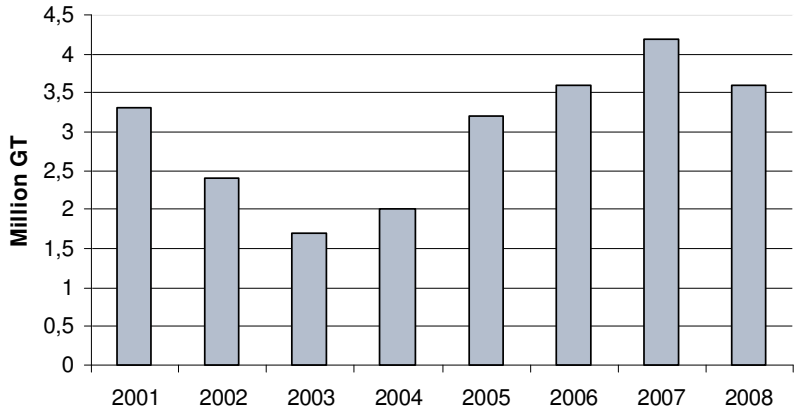
[80] Clarkson World Shipyard Monitor 2008

[81] IKEI report does not include Norway in their analyses

[82] Clarkson World Shipyard Monitor January 2009. Orderbook Europe total was 61.5 billion dollar, which is 46.66 billion euro on January 1st 2009

[83] ISL World Shipbuilding and Shipbuilders issue 9-10/2008

Figure 2.34 World orderbook cruise vessels 2001- December 2008



Source: Clarkson World Shipyard Monitor January 2009

Europe has been world leader in the cruise building industry for nearly 40 years. The cruise yards located in Finland, France, Germany and Italy currently have a collective share of 98% of the capacity and 91% of the world total of new orders in December 2008.

Table 2.9 Orderbook cruise vessels December 2008 by company

Shipbuilder	Country	No.	Size (1,000 GRT)	Value (€ million)	Share of value
Fincantieri	Italy	13	1,248	5,602	36.2%
Meyer Werft	Germany	10	1,015	5,030	32.5%
STX Europe	Finland/France	6	920	3,965	25.7%
T. Mariotti	Italy	3	96	599	3.9%
Total Europe		**32**	**3,279**	**15,196**	**98.3%**
Fact naval de Marin	US	1	32	190	1.2%
Irving Shipbuilding	Canada	1	9	49	0.3%
Chesapeake SB	US	1	-	23	0.1%
Total World		**35**	**3,320**	**15,458**	**100.0%**

Source: Ship repair Journal January 2009; calculations ECORYS

Assumed exchange rate euro-dollar 1,3180

Italy is the largest cruise vessel builder with some 40% of the world's production. Germany ranks second. France and Finland are the other main cruise builders in Europe. The abundance of specialist skills and sophisticated technology in areas such as navigation and outfitting are part of their strength[84].

Box 2.14 Key players in the cruise segment

With 13 new cruise vessels on order, **Fincantieri** is the largest cruise building company in the world. Its largest individual cruise vessel to be delivered in 2009 is the Carnival Dream, with a size of 130,000 GRT.
The second largest cruise vessels builder in Europe is **Meyer Werft** in Germany. As of December 2008, they

[84] Source: Contributions of cruise tourism to the Economics of Europe 2007

are the largest in terms of orders for the long run in 2011 and 2012.

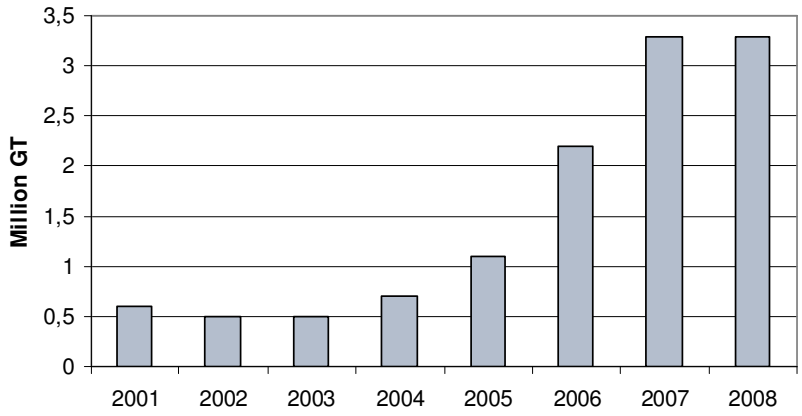
STX Europe completes the top three of the world. STX Europe (formerly Aker) builds the largest cruise ships in the world. The largest ship currently on order is the 225,000 GRT vessel Oasis of the Seas, which is to be delivered in 2009. Consequently, the value per vessel is also the highest for STX Europe.

T. Mariotti is a new player in the world. For 2009 they have 1 cruise vessel on order, with 2 more in later years.

Offshore vessels

With 9.3 billion euro on order on January 1st 2009, the **offshore segment** represents 20% of the total European orderbook measured in euro[85]. The orderbook in GT of newbuilding offshore vessels increased rapidly with 371% between 2004 and 2008. This is higher than the average growth of the world orderbook.[86].

Figure 2.35 World orderbook offshore vessels 2001- December 2008



Source: Clarkson World Shipyard Monitor January 2009

Together with Asia, Europe has a leading position in the offshore vessel building industry. The yards in Norway, Spain and the Netherlands had a collective 39% share of the world orderbook value and 19% of the world total of new orders as per January 1st 2009.

Table 2.10 Orderbook offshore vessels January 1st 2009 by country

Country	No.	Million GT	Value ($bn)	Share of value
Norway	127	0.7	8.0	28.1%
Spain	55	0.3	2.0	7.0%
Netherlands	12	0.1	1.1	3.9%
Rest of Europe	59	0.2	1.2	4.2%
Europe	**253**	**1.3**	**12.3**	**43.2%**
China P.R.	264	0.6	4.6	16.1%
South Korea	15	0.1	1.6	5.6%

[85] Clarkson World Shipyard Monitor January 2009. Orderbook Europe total was 61.5 billion dollar, which is 46.66 billion euro on January 1st 2009

[86] Clarkson World Shipyard Monitor 2008

Country	No.	Million GT	Value ($bn)	Share of value
Brazil	31	0.1	0.9	3.2%
United States	54	0.1	0.7	2.5%
Rest of world	389	1.1	8.4	29.5%
Total World	**1,006**	**3.3**	**28.5**	**100.0%**

Source: Clarkson World Shipyard Monitor January 2009

Box 2.15 Key players in the offshore segment

STX Europe is one of the leading companies in the global market for offshore vessels. Its orderbook was valued 3.22 billion euro (25.9 billion NOK) by Q3 2008. Mostly, its hulls are produced in Romania, while the outfitting yards are in Norway.

Bergen Group is another Norwegian company active in the offshore segment. They had an 805 million euro (6.5 billion NOK) orderbook in Q3 2008.

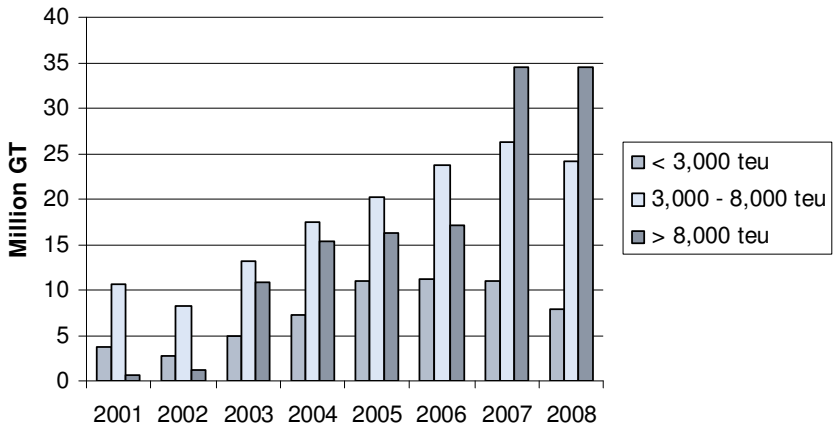
Keppel Offshore & Marine, based in Asia, but with facilities in Europe as well (in 2002 it acquired Verolme from the Netherlands, since then named Keppel Verolme) has offshore vessel activities which are divided into two companies, Singmarine and Nantong. As of the end of 2007, Keppel Singmarine had an orderbook of 19 vessels, for a total value of 730 million euro ($1.0 billion). For Nantong, the orderbook stood at 23 vessels valued at 256 million euro ($351.0 million) at the end of 2007.

Source: company websites.

Container vessels

The **container segment**, with 5.4 billion euro on order on January 1st 2009, represents 11.5% of the total European orderbook in euro[87]. Worldwide new orders for container vessels increased rapidly between 2004 and 2008. In particular the demand for vessels with a capacity above 8,000 TEU grew fast, while for vessels smaller than 8,000 TEU, the market was constant and even declined in 2008. Order book details show that Europe produces mainly smaller container vessels below 3,000 TEU, thus hardly benefiting from the global demand growth.

Figure 2.36 World orderbook container vessels 2001 – December 2008



[87] Clarkson World Shipyard Monitor January 2009. Orderbook Europe total was 61.5 billion dollar, which is 46.66 billion euro on January 1st 2009

Source: Clarkson World Shipyard Monitor January 2009

As already mentioned, the newbuilding of container vessels makes up a substantial share of the total newbuildings in Europe. Compared to world level production however, Europe has small share of only 8%. In Europe, Germany is the biggest container vessel producer with the largest orderbook, followed by Poland. The segment is dominated by ship yards from Korea and China. As described earlier (see box 2.2) it is increasingly difficult for Europe to maintain its position in this segment. This is aggravated by the fact that Europe is mainly active in the relatively smaller container vessels that show less demand growth.

Table 2.11 Orderbook container vessels January 1st 2009 by country

Country	No. > 3,000 teu	No. < 3,000 teu	Million GT	Value (billion)	Share of value
Germany	10	67	1.5	2.8	3.1%
Poland	7	16	0.8	1.0	1.1%
Turkey	-	22	0.3	0.9	1.0%
Rest of Europe	24	15	1.7	2.4	2.6%
Europe	**41**	**120**	**4.1**	**7.1**	**7.7%**
South Korea	438	44	41.2	53.6	58.5%
China P.R.	151	235	12.5	19.0	20.7%
Rest of world	108	63	8.8	12.0	13.1%
Total World	**738**	**462**	**66.6**	**91.7**	**100.0%**

Source: Clarkson World Shipyard Monitor January 2009

Dredging vessels

Until 2008, market demand for **dredging** services exceeded the capacity of global dredging operators. The dredging industry was booming last decade. Between 2000 and 2006, the global industry turnover doubled to 8.3 billion euro[88]. Especially, the Middle East was a booming region with projects like 'Palm Island' and 'The World' in Dubai. Furthermore, China became an important region.

Europe plays an important role in the dredging industry. From the top five players in the world, four are European.

Table 2.12 Top five owner dredging capacity in the world 2006 by type (% of global capacity)

		Backhoe, Grab and Dipper Dredgers		Cutter Suction Dredgers		Trailing Suction Hopper Dredgers	
		World position	% of world	World position	% of world	World position	% of world
Boskalis Westminster	Netherlands	1	10%	1	7%	3	11%
Van Oord	Netherlands	5	4%	1	7%	1	12%
CHEC *Consolidated*	China	3	5%	1	7%	1	12%
DEME NV	Belgium	5	4%	1	7%	5	8%

[88] IADC

		Backhoe, Grab and Dipper Dredgers		Cutter Suction Dredgers		Trailing Suction Hopper Dredgers	
		World position	% of world	World position	% of world	World position	% of world
Jan de Nul	Belgium	?	?	5	5%	4	9%
			23%+		33%		52%

Source: IADC, 2007

This has lead to high demand for new vessels, as well as for major investments in the renovation and upgrading of equipment[89]. The newbuilding of dredging vessels is a relatively small industry. Within this segment, Europe is dominant.

Box 2.16 Key players in the dredger building segment

IHC Merwede from the Netherlands is world market leader in the construction of sophisticated and specialised dredgers. They have a global market share of more than fifty percent, and gaining 774.3 million euro in 2007 from this segment. Their total orderbook was 1.43 billion euro at the end of 2007 of which almost half is related to the dredging unit. Another emerging builder in Europe is **Jan de Nul** from Belgium, which delivered five dredging vessels in 2007.

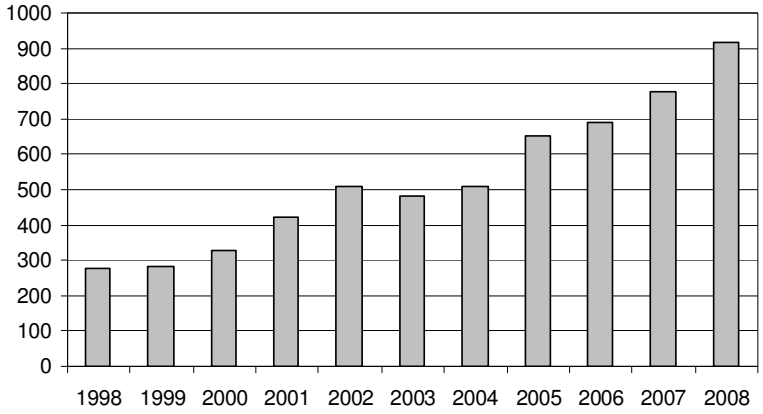
It is estimated that the total European orderbook of dredging vessels has a value of around 1 billion euro. This represents only 1.5% of the total European orderbook value of 61.5 billion euro[90] in 2008.

Mega-yachts

The **mega-yacht** or luxury yacht[91] industry has been a fast growing segment the last decade. From 1998 till 2008 the industry has grown with 228%[92]. In units, it might seem to be that the luxury yacht market is very small, as only 916 were built in 2008, but the total amount of money spent in this industry was not less than $10 billion. This implies that the average cost of a luxury yacht is around $11 million, and this amount has not changed substantially during the last years. These figures make this market very significant in the world of shipbuilding.

[89] IHC Annual report 2007
[90] Clarkson World Shipyard Monitor January 2009
[91] A luxury yacht is defined to be all yachts which have a minimum length of 24 metres (80 feet)
[92] 2008 Global Order Book, Showboats

Figure 2.37 Total world orderbook 2007 in units



Source: Showboats (2008)

Europe is market leader in the luxury yacht industry, with a market share of more than 65% in 2008. Yacht builders in Europe are concentrated in Italy, the Netherlands, Germany, and the United Kingdom.

Table 2.13 Overview of major yacht building countries

Country	Total length (m)	No. of projects	Av length (m)	Market share in new orders in units (%)
Italy	15,080	427	35	46.6%
The Netherlands	3,196	65	49	7.0%
Germany	2,780	31	90	3.3%
United Kingdom	1,762	57	31	6.2%
Rest of Europe				2.6%
Total Europe				**65.4%**
USA	4,054	104	39	11.3%
Taiwan	2,093	71	29	7.7%
Turkey	1,589	38	42	4.1%
Australia	811	21	39	2.3%
China	674	23	29	2.5%
New Zealand	527	13	41	1.4%
Rest of world				5.0%
Total world		**916**		**100%**

Source: Global Orderbook 2008, Showboats International

Italy is the largest luxury yacht builder in the world, with a market share of more than 46%. The United States hold a steady second place with 11%. The other countries which follow in the top-10 ranking all have a market share below 10%. The reason why luxury shipbuilding is so big in Europe is explained by the presence of high-skilled workers and high technology. The design of the yachts and its image are important factors as well, especially for Italian and Dutch design. These things together make the quality of the

ships, which is the most important factor for the buyers for whom price most of the time is not an issue.

The largest yacht builders are presented in the table below.

Table 2.14 Top ten global luxury yacht builders (2008 orderbook by total length on order)

Rank '08	Name	Country	Tot. length (m)	Unit	Av. Length (m)	Rank '07
1	Azimut-Benetti	IT	3,603	98	37	1
2	Ferretti Group	IT	2,845	89	32	2
3	Rodriguez Group	FR	1,506	47	32	4
4	Lürssen	DE	1,400	14	100	8
5	Sunseeker International	UK	1,386	48	29	3
6	FIPA Group	IT	1,304	40	27	6
7	Sanlorenzo	IT	1,059	35	30	9
8	Trinity Yachts	USA	990	19	52	5
9	Camuzzi Nautica	IT	965	23	42	16
10	ThyssenKrupp	DE	884	10	88	10

Source: Global Orderbook 2008, Showboats International

What can be derived from the table above is that the Italian yards are large scaled and make normal sized yachts. This in comparison with Germany, where the really big yachts are built, on average respectively 100m at Lürssen and 88m at Thyssen Krupp. A reason for this may be found in the fact that the German shipbuilders also build other types of ships, like naval ships, which have similar size. Therefore they already have the infrastructure and equipment to build larger ships, which makes it easier and maybe more efficient to focus on this segment of the luxury yacht market. In chapter 4 the relevance of clustering segments and the competitive advantages of doing this will be further explored.

Another notable fact which can be derived is that in the Netherlands, which is ranked 3rd measured by market share in units worldwide, many relatively small companies are active. The largest Dutch company is listed 11th measured in total length built (Heesen).

Box 2.17 Key players in the luxury yacht building segment

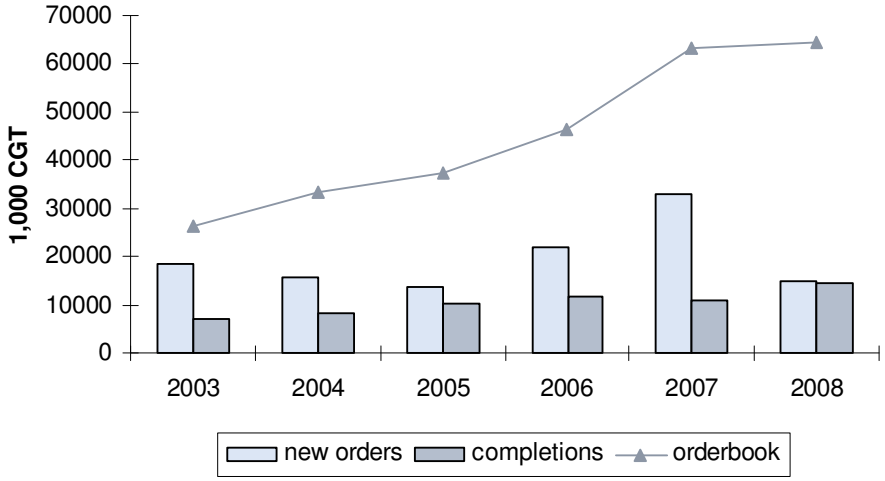
The biggest luxury yacht builder in the world is the **Azimut-Benetti Group**, an Italian company with its headquarters in Genoa. The group became the largest by a takeover of Benetti by Azimut in 1985. After Azimut-Benetti, the **Feretti Group** is the second largest yacht builder in the world. Feretti Group is an Italian company as well, and produces yachts which vary in length from 8 to 80 meters. The French **Rodriguez Group** is the third largest yacht builder in the world. This group has multiple international subsidiaries and positions, i.e. in Italy, UK, Spain and Dubai.

2.4.2 South Korea

For years already, South Korea is world leader in shipbuilding. Their orderbook rose from 9.6 billion CGT in 1998 to 64.4 billion CGT in 2008.Except for dry bulk carriers and

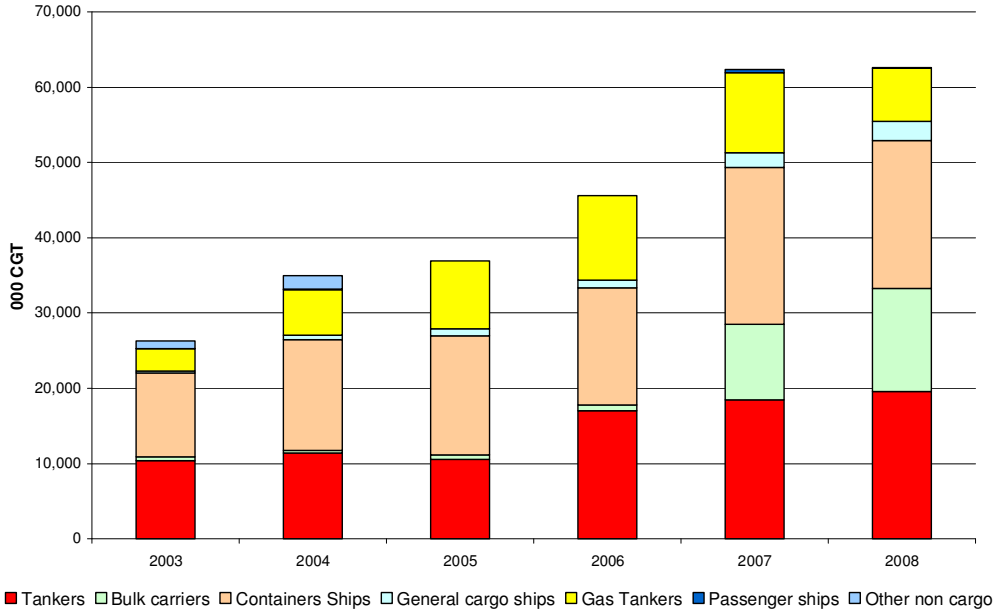
offshore vessels, in 2007 South Korea was orderbook leader in most types of vessels[93]. The Korean orderbook of tankers and LNG and LPG carriers represented a global share of respectively 46, 59 and 77%.

Figure 2.38 South Korean shipyards activity 2003 - 2008



Source: CESA Shipbuilding Market Monitoring (2009)

Figure 2.39 South Korean orderbook by ship type 2003 - 2008



Source: CESA, 2009

Key players in South Korea

Several major conglomerates are based in Korea. They are often both shipyards and marine equipment manufacturers, and many of them are also active in various other industrial segments.

[93] CARE Research

Box 2.18 Korean key players

Hyundai Heavy Industries is world leader in terms of its orderbook. The South-Korean company has 10% of the worldwide orderbook. The company has a large product portfolio, but produces mostly three types: tankers, bulk carriers and full container vessels.
Their main shipyard, where production of both HHI and Hyundai Mipo is taking place, is in Ulsan. With nine docks of H.I. and four docks of Mipo, this is by far the world's largest shipbuilding area with the largest capacity. Next to this, the company has yards in Samho and Gunsan, also in South Korea.
The company is a real conglomerate and is also active in other segments, such as the car industry. It has its own supply chain incorporated. Regarding the production of engines, they have a joint venture with Wärtsilä. Other components are mainly coming from their affiliate Hyundai Heavy Material Service. For repair works, the company has a yard (Vinashin) in Vietnam.
HHI has a special business unit to serve the offshore market. Through this they offer a variety of services including the newbuilding of offshore vessels.

Daewoo Shipbuilding & Marine Engineering (DSME) is world's second largest shipbuilder, with nearly 6% of the total world orderbook. DSME's largest shipyard is situated in Okpo and is, in terms of dwt capacity, the second largest shipyard in the world, after Hyundai's Ulsan facility. This shipyard is mainly focused on LNG and specialised carriers. With its annual output and distribution in LNG carriers accounting for over one-third of those worldwide, the company is ranking first across the world in this segment.
The company also has its own supply chain incorporated. In 2005, they opened a new yard in China called DSME Shandong co. (DSSC). Through a joint venture, DSME is also established in Europe (Deawoo Mangalia Heavy Industries (DMHI)). With a focus on both bulk and container carriers as well as ships repair, DMHI delivers a variety of products and after sales service at this site. DSME envisages opening also a ship repair yard in Asia. DSME also has a special business unit to serve the offshore market including the newbuildings of offshore vessels.

Samsung Heavy Industries (SHI) has the third largest orderbook in the world and also the third largest shipyard in the world (dwt). SHI's largest and only shipyard is situated in Geoje, South Korea. The company produces mostly tankers and container ships, but is also aiming at LNG and offshore vessels. Samsung does not have yards outside South Korea. Furthermore, they have also a separate division focused on offshore activities.

STX Shipbuilding is the fourth yard group in the world. With two yards in South Korea (Jinhae and Dalian) mainly focused on tankers and container ships. STX Shipbuilding is part of the huge conglomerate STX Corporation. See also box 2.3 on internationalisation and globalisation in shipbuilding.

Marine equipment

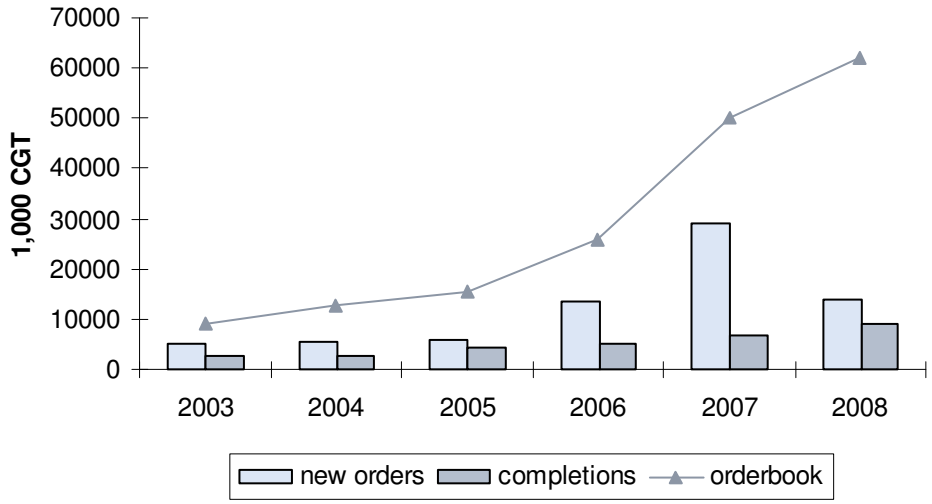
The Korean marine equipment industry has grown in line with Korean ship construction. The machinery and equipment industry began to take off in the early 1980s as Korean shipbuilding took a progressively larger share of the global market. Industry growth has been due more to supplying domestic shipbuilders rather than to exports[94].

[94] IKJournal (2005) Localization: making it big with the shipbuilders. A profile of Korean ship Machinery & Equipment industry. Available at http://www.ikjournal.com/InvestKoreaWar/work/journal/content/content_main.jsp?code=4360216

2.4.3 China

The Chinese shipbuilding orderbook rose from 1.9 billion CGT in 1998 to 62 billion CGT in 2008, almost as large as Korea's. Thus, the Chinese orderbook grew more than two times faster than the world orderbook in total. With strong governmental support in terms of liberal regulations and huge investments, the Chinese shipbuilding industry currently ranks second in terms of its orderbook.

Figure 2.40 China shipyards activity 2003 - 2008

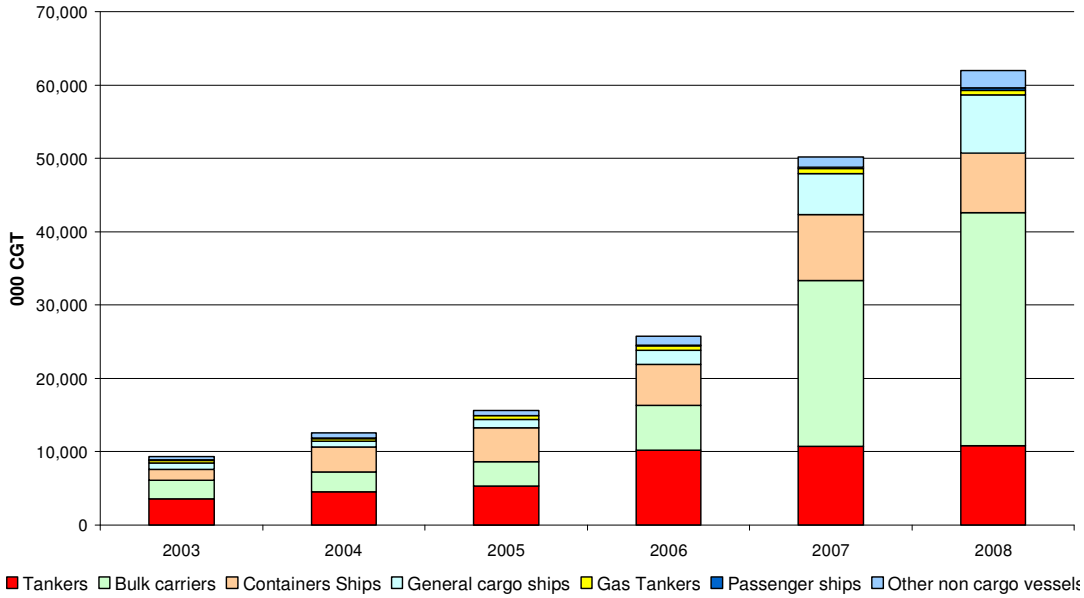


Source: CESA Shipbuilding Market Monitoring (2009)

Due to low labour cost and competitive prices, European orders have been tuning in to China's favour. China especially has become world leader in the bulk carriers segment. Its market is strongly export oriented. Low labour costs and preferential fiscal treatment of exported ships have made China quite competitive in the international market. Currently about 87% of its total orderbook is destined for export markets.

1 China Shipbuilding & Repairing Industry Report, 2007-2008, research and market, 2008.

Figure 2.41 China orderbook by ship type



Source: CESA Shipbuilding Market Monitoring (2009)

Key players in China

The Chinese shipyards are mainly divided into two conglomerates: China Shipbuilding Industry Corporation (CSIC) and China State Shipbuilding Corporation (CSSC). Both are state owned and they dominate the Chinese market. All large shipyards fall under these two corporations.

Table 2.15 Top three shipyards in China as of December 31st, 2008 (in 1,000 CGT)

World rank	Yard	Orderbook
7	Dalian Shipbuilding Industr.	3,698
8	Jiangnan Changxing	3,547
10	Jiangsu Rongsheng	2,904

Source: Clarkson World Shipyard Monitor January 2009

Dalian Shipbuilding Industries is part of CSIC while Jiangnan and Jaingsu are part of CSSC.

Marine equipment

There are no production figures available on the marine equipment industry in China, nor is there an association known that represents the Chinese marine equipment companies. It is known however that the marine equipment market has strong connections with the new-building of ships in China. It can be expected that with the increase of shipbuilding activities in China, the marine equipment manufacturing will have further developed as well. In the 2002 Drewry Shipping Consultants Limited report this was already expected:

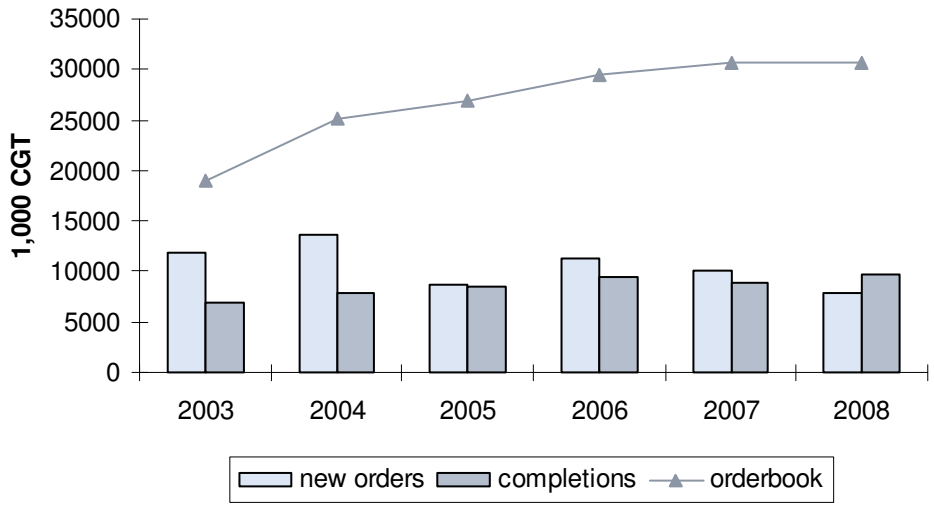
"China has a considerable potential to develop as a manufacturing base for marine equipment makers and this potential will continue to grow as Chinese shipbuilding increases its market share and the sophistication of its vessel output "[95]

It is known that many Chinese shipbuilders are also active in the marine equipment industry. Initially, – mainly because of the state-controlled way of working – few joint-ventures within China were set up. Currently however, there is an increasing number of manufacturers that licensed to Chinese companies to produce e.g. engines of MAN B&W and Yanmar[96], and propulsion equipment of Wärtsilä, and also South-Korean and Japanese equipment manufacturers are seeking for more cooperation. Many marine equipment suppliers are part of a yard, for instance *East China Marine Equipment* being part of CSSC (formerly known as Hudong Heavy Machinery Company Limited).

2.4.4 Japan

The Japanese shipbuilding industry has been dominant in the global shipbuilding industry since the 1970s. Between 1970 and 1990 the orderbook of Japan rose, mainly based on technical inventions. Nevertheless since the 1990s they lost their market share to lower cost countries like South Korea and, increasingly, China.

Figure 2.42 Japan shipyards activity 2003 - 2008

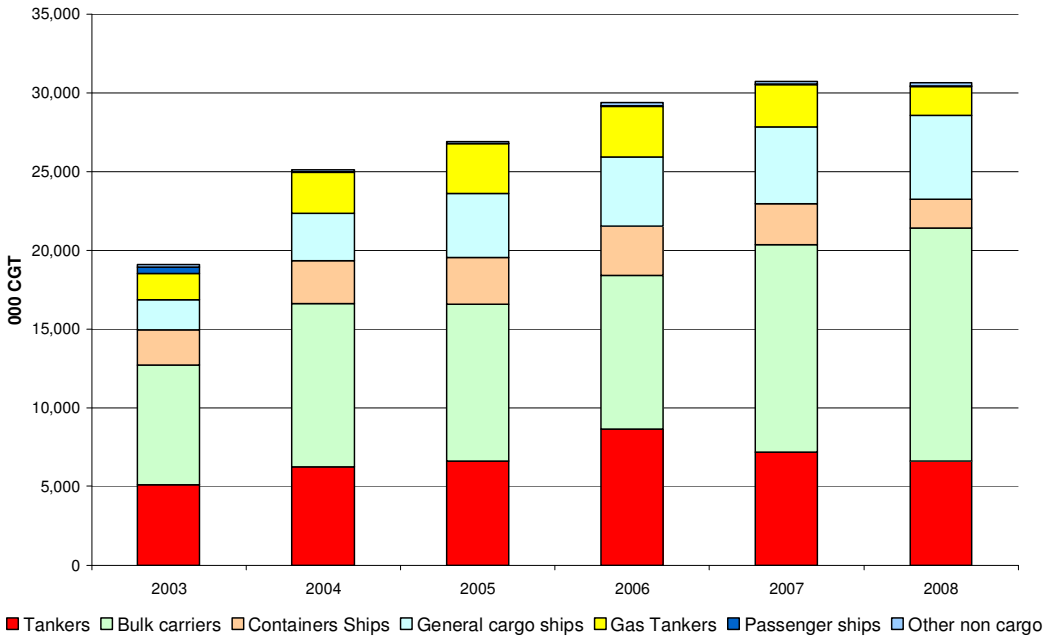


Source: CESA Shipbuilding Market Monitoring (2009)

Still, the Japanese orderbook has been growing over the last years, be it less than the growth of the global orderbook. Japan's market share declined from 26% in 2000 to 17% in 2007[97]. Particularly from 2006 on, the share of Japan declined when the Chinese shipbuilding market started to increase.

[95] Drewry Shipping Consultants Limited (2002). New insights into a lucrative market sector.
[96] Drewry Shipping Consultants Limited (2002). New insights into a lucrative market sector.
[97] CARE Research

Figure 2.43 Japan orderbook by ship type



Source: CESA Shipbuilding Market Monitoring (2009)

Regarding the future perspective for Japan, the bulk carriers segment, in which they were dominant for a long time, has suffered from heavy competition from China, which is now world leader in this segment. Similarly, Japan may expect more and more competition from emerging countries like India and Vietnam[98].

Key players in Japan

The three largest Japanese yards are Oshima, Tsuneishi, and Imabari.

Table 2.16 Top three shipyards in Japan as of December 31st, 2008 (in 1,000 CGT)

Rank world	Yard	Orderbook
12	Oshima S.B. Co	2,218
14	Tsuneishi Zosen	2,191
25	Imabari S.B.	1,476

Source: Clarkson World Shipyard Monitor January 2009

For years, Oshima Shipbuilding has been Japan's largest shipbuilder. Their main business is in handymax and panamax bulk carriers[99]. Tsuneishi is one of the oldest Japanese shipyards. This company has established local subsidiaries on Cebu Island in 1994 and Zhoushan China in 2003, and has set itself apart from domestic companies by pursuing a global strategy[100]. Imabari Shipbuilding is the third largest company in Japan with a main focus on bulk carriers and container vessels. With a total of 8 shipyards in the group, the

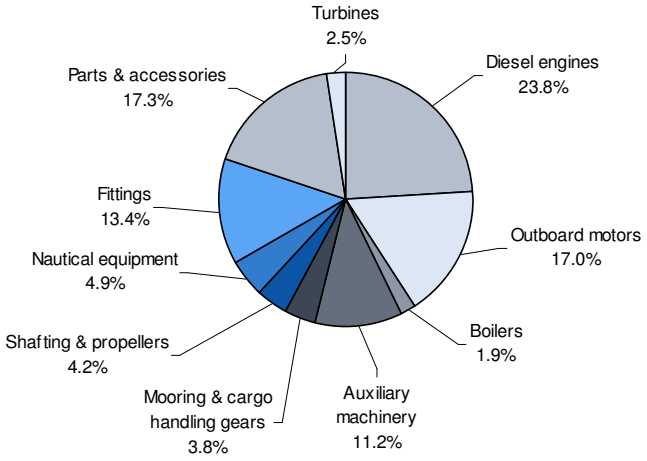
[98] CARE, 2008
[99] www.osy.co.jp
[100] www.tsuneishi.co.jp

Imabari Shipbuilding group ranks 6th in the world on total orderbook[101]. Tsuneishi, with three yards, ranked 7th.

Marine equipment

In 2006, the total production of the Japanese marine equipment industry equalled 1,084 billion Yen (€9.8 billion). In the figure below, the output by equipment type is shown. As shown in the figure, diesel engines, outboard motors and parts & accessories are the most important output equipment types.

Figure 2.44 Output of Japanese ship machinery industry products in 2006, based on output value.



Source: JSMEA, 2007

2.4.5 Emerging shipbuilding nations

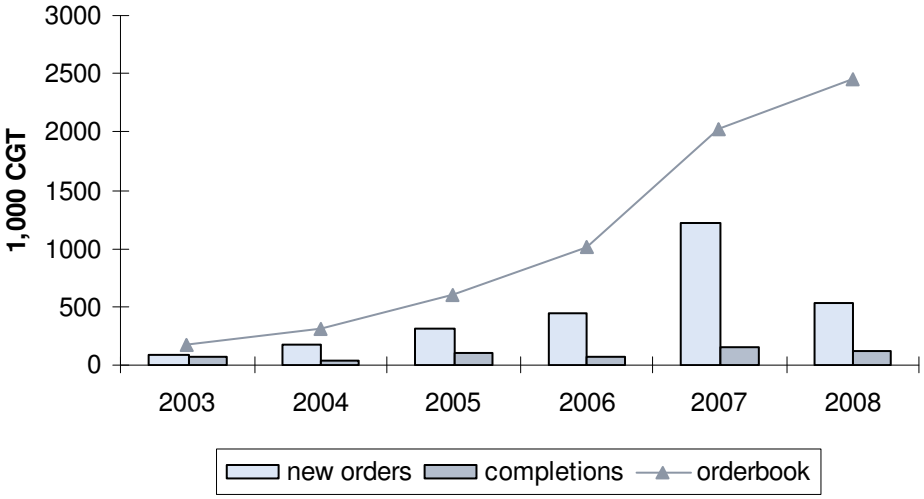
A number of countries can be seen as potential new challengers to the existing shipbuilding nations. In this section a brief description is presented of India, Vietnam, the Philippines, and Brazil.

India

India is an emerging country in many sectors. As of August 2007, India had the fourth largest orderbook of the world representing 1.2% of the total world market[102], thus being larger than any of the European shipbuilding countries. However, end of July 2008, they were passed by the fast growing Vietnam and Philippines, and are now ranked sixth[103].

[101] Clarkson World Shipyard Monitor January 2009
[102] PPFAS India shipbuilding industry
[103] CARE Research

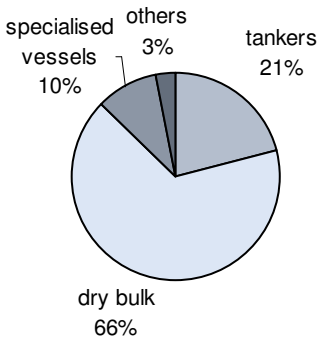
Figure 2.45 India shipyards activity 2003 - 2008



Source: CESA Shipbuilding Market Monitoring (2009)

Since 2005, India grew very fast, particularly in 2007 and 2008. However, its shipbuilding capacity is still limited and therefore the orderbook grew from a relatively low base level. The country's orderbook consits for two third of dry bulk and one fifth of tankers.

Figure 2.46 Orderbook India by vessel type in 2007 (% dwt)



Source: CARE Research, 2008

There are several large players in India. See table 2.16 for these shipyards in terms of their orderbook in CGT. A lot of new investments are said to be made that will enlarge India's capacity[104].

[104] CARE Research

Table 2.17 Top three shipyards in India as of December 31st, 2008 (in 1,000 CGT)

Rank world	Yard	Orderbook
54	ABG Shipyard	852
101	Pipavav Shipyard	407
125	Bharati S.Y.	279

Source: Clarkson World Shipyard Monitor January 2009

Box 2.19 Key players in India

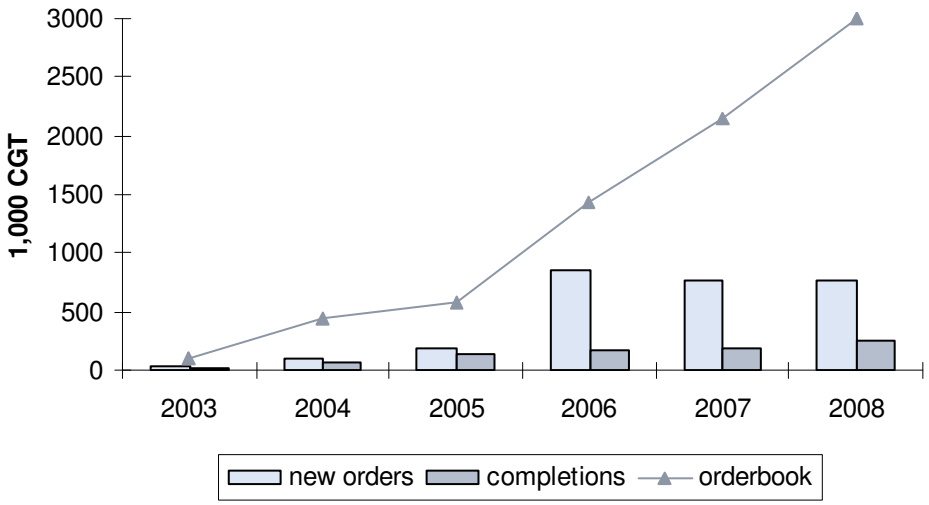
ABG is the largest private shipbuilder in India. Ninety percent of the vessels is for export. They have an expansion and acquisition plan to become an even larger player in India. Since 2005, their orderbook grew over 1000% percent in terms of value.

Pipavav Shipyard is a new player in India and already has a larger orderbook than Bharati, another large shipbuilder in India. In 2005, the two owners SKIL and IL&FS invested much money in the yard. The yard has the distinction of being one of the five largest docks in the world and largest in the country. As of 2007, they are also focussing on the offshore industry after investments by Punj Lloyd's.

Vietnam

Vietnam is also a fast growing shipbuilding country,mainly on the basis of its low cost labour sources. They ranked fourth in the world in terms of orderbook on December 31st 2008, before India and European players like Germany and Turkey[105]. However, the production capacity is still very limited.

Figure 2.47 Vietnam shipyards activity 2003 - 2008

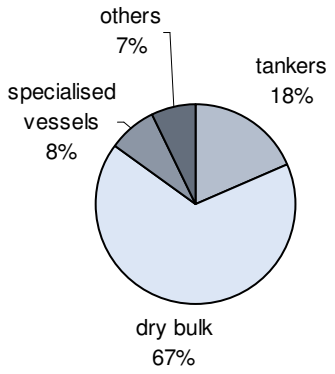


Source: CESA Shipbuilding Market Monitoring (2009)

The Vietnamese orderbook consists mainly of bulk carriers and tankers.

[105] Lloyd's Register Fairplay

Figure 2.48 Orderbook Vietnam by vessel type in 2007 (% dwt)



Source: CARE Research, 2008

Like India, Vietnam is also enlarging its capacity and has some noticeable players.

Table 2.18 Top three shipyards in Vietnam as of December 31st, 2008 (in 1,000 CGT)

Rank world	Yard	Orderbook
95	Ha Long Shipyard	428
109	Dung Quat Shipyard	373
110	Hyundai Vinashin	364

Source: Clarkson World Shipyard Monitor January 2009

Box 2.20 The Vietnamese key players

All top three yards are part of the **Vinashin** company. This is a state owned shipbuilding company with 52 subsidiaries and 20 shipyards. Both Ha Long and Dung Quat are subsidiaries and Hyundai Vinashin is a joint venture with Hyundai Heavy Industries. Ha Long Shipyard has the largest orderbook. Dung Quat is established in 2006. Hyuandai Vinashin has the largest capacity in Vietnam. A large investment programme was introduced to enlarge capacity of ten yards in 2007.

One of the objectives of Vinashin is to construct newbuildings with domestic material and equipment, which would result in price levels some 60-70% of international competition[106].

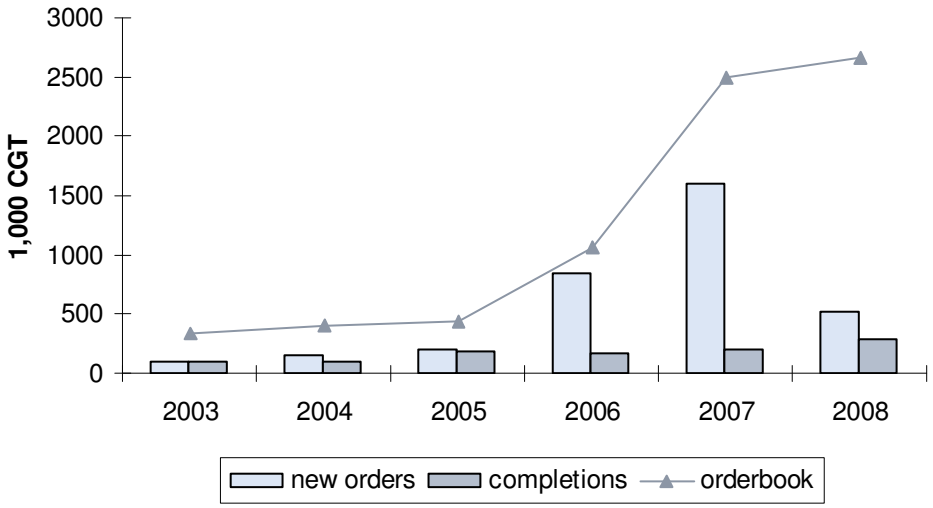
Several European shipyards have also established facilities in Vietnam. Often these are through Joint Ventures with local companies. An example is Damen from the Netherlands. Compared to Vinashin the volume of these activities is still relatively limited.

[106] BRS Shipping and Shipbuilding Markets 2007

Philippines

Thanks to foreign investments of particularly South Korea's Hanjin and Japan's Tsuneishi, the Philippines have realised a remarkable growth in shipyard activity over the last three years.

Figure 2.49 Philippines shipyards activity 2003 - 2008



Source: CESA Shipbuilding Market Monitoring (2009)

As of 2006, new orders came in very rapidly, particularly for Hanjin Heavy Industries & Construction in Subic Bay, which opened its new yard late 2008. In 2006, they started the construction of their new shipyard and this resulted in a large orderbook even before start-up. Perhaps the connection to the experienced mother company gave investors confidence to place orders.

Table 2.19 Top two shipyards in Philippines as of December 31st, 2008 (in 1,000 CGT)

Rank world	Yard	Orderbook
22	HHIC Philippines	1,646
39	Tsuneishi Cebu	1,154

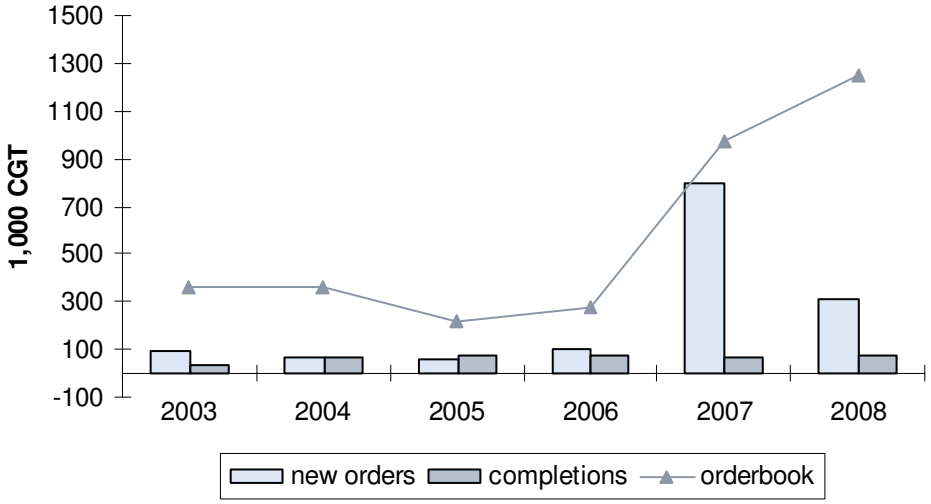
Source: Clarkson World Shipyard Monitor January 2009

Tsuneishi Cebu is active in the Philippines since 1994. It is an affiliate of Japan's Tsuneishi.

Brazil

The Brazilian shipbuilding sector had a very good year in 2007. The country's total orderbook rose from 0.3 to 1.0 million CGT between 2006 and 2007. To put this into perspective, the latter is similar to that of a medium-sized European shipbuilding country like Spain or Croatia.

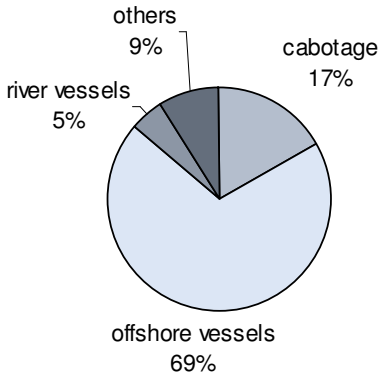
Figure 2.50 Brazil shipyards activity 2003 - 2008



Source: CESA Shipbuilding Market Monitoring (2009)

Brazil appears to be a niche player. Particularly, it produces offshore vessels.

Figure 2.51 Orderbook Brazil by vessel type 2003 – 2006 (% dwt)



Source: SINAVAL Shipbuilding Industry in Brazil, A new horizon

Box 2.21 Key players in Brazil

Atlantico Sul is a new shipyard in Brazil opened in 2008. It mainly focuses on offshore vessels. It is an affiliate of Samsung Heavy Industries, one of the worlds largest shipbuilders.

EISA Shipyard is Brazil's second largest shipbuilder in terms of orderbook. It was established in 1995 and builds offshore, port and military vessels .

The third largest Brazilian shipbuilder is **STX Europe Brazil**, a former Aker Yard. The yard only produces offshore vessels as PSV and AHTS, and is part of STX Europe's business unit Offshore & Specialized vessels.

2.5 Conclusions

Historic trends

Europe's dominant position was taken over by Japan in the 70s …

A century ago shipbuilding was dominated by Europe, having a world market share of some 80% at the beginning of the 20th century. In the 1950s this position was gradually taken over by Japan, mainly due to a rapid growth of the Japanese economy and a coordinated shipping and shipbuilding program. At the early 1970s Japan and Europe still dominated the world market with a combined share of some 90%.

.. which in turn was surpassed by South Korea at the beginning of this decade…

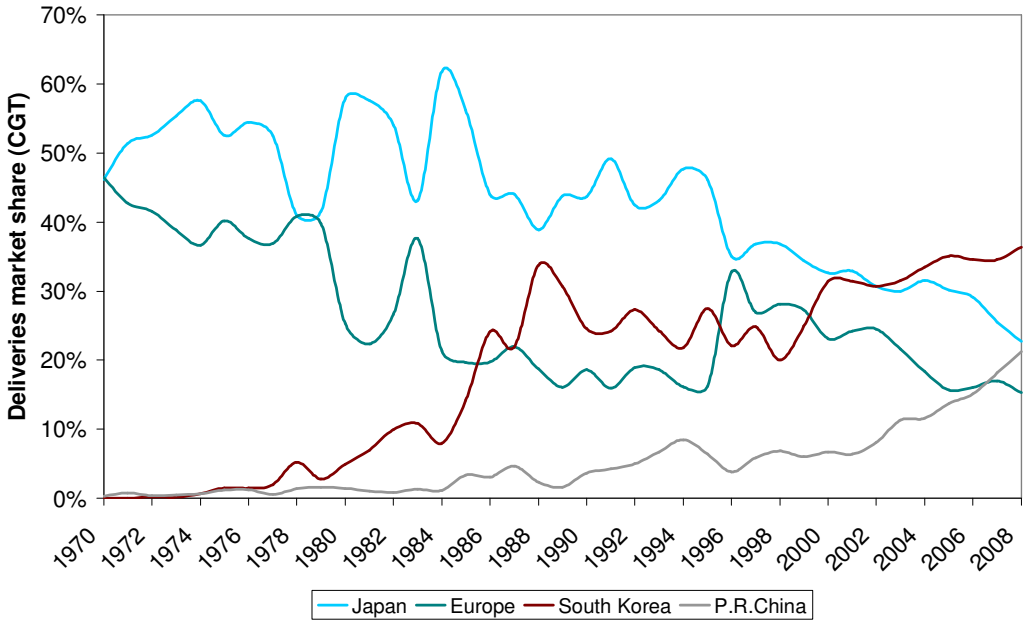
… and China entering the stage 10 years ago

In the early 1970s South Korea entered the stage. The country offered lower wages than Japan or Europe and chose to position shipbuilding as a strategic industry. Just as Japan did before, a carefully planned industrial program was successfully initiated, leading to a world market share of 25% by the mid-1990s and a world first position as of 2005. Although having shipyards since the 1940s, China is only becoming a dominant player since the last 10 years. The country's economic boom together with the strategic choice to develop heavy industry activities has led to a strong increase in global market share.

Increased role for marine equipment manufacturers

The role of marine equipment manufacturers has become more important over time. Originally most of the shipbuilding work was carried out at the shipyards themselves. With technological advance, the role of marine equipment industry – as the supply industry to the shipyards - has increased dramatically. While in the 1970s most of the shipbuilding work was carried out at the shipyards themselves, nowadays the share of marine equipment is assessed at 50%-70% of the product value, and can be 70-80% in the more specialised segments. Close ties between equipment suppliers and shipyards therefore exist.

Figure 2.52 Market shares in CGT completed and delivered by major shipbuilding regions from 1970 to 2008



Source: Clarkson[107] (2009).

Large players dominate the market

The shipbuilding industry is dominated by a few large shipyards. The four largest yards, all based in Korea, together account for some 25% of the market, while the top-18, all in Korea, Japan and China, covers 50%. The first European yard ranks 38th in terms of orderbook (data of 2008).

Europe still dominates some specialised segments

Europe is active in many segments, and – notwithstanding the overall dominance of Korea, Japan and increasingly China - European companies are still dominant in a few specialised market segments such as cruise vessels (99% market share), offshore vessels (43%) and luxury yachts (65%). Also the military vessels segment is relevant in Europe. In general, these segments are characterized by a high degree of specialisation and high-tech qualities, complex production processes, in combination with limited numbers of vessels of the same type that are to be built. As such Europe's position can be characterised as one of a specialised niche player.

Within Europe, four countries dominate the field in ship construction: Germany, Italy, the Netherlands and Romania. Turkey has entered the stage on the wave of the world shipbuilding boom of the last 5 years.

The top 4 European yards are Meyer Werft in Germany (building container and special purpose vessels), Daewoo Mangalia in Romania (a subsidiary of Daewoo Korea, building bulkers and container vessels), STX Europe (formerly Aker, now a subsidiary of STX Korea, building cruise vessels as well as offshore ships and other types), and Fincantieri in Italy (known for its cruise vessels and ferries). What becomes clear from these yards is that, even though the yards are located in Europe, ownership has (partly) changed to foreign (Korean) hands. As such, a clear globalisation tendency can be observed.

India, Vietnam, Philippines and Brazil are new players

New players are entering the stage. The last five years, India, Vietnam, the Philippines and Brazil have acquired substantial orderbooks and have become larger players than most European countries. Partly this rise is due to the shipbuilding boom that has now come to an end; partly it has been realised by Korean or European yards investing in facilities in these countries, as a means to combine their own high level skills with the relatively low cost labour available in these countries.

A specific segment is the repair and conversion industry. While the global fleet has expanded, and technology has become more complex, this segment has also gained in importance. Location is important and most repair centres are located along major shipping routes.

Marine equipment is a heterogeneous subsector…

The marine equipment subsector is highly heterogeneous and consists of many relatively small companies. Estimates range from 5,000 to 9,000 suppliers worldwide. Many of those are also active in other business areas, e.g. car or airplane industry. Total market

[107] It is noted that Clarkson data may be less reliable on recent data compared to CESA statistics. Especially data on changes such as cancellations are not reflected in data directly but may have a delay. In this report Clarkson data is therefore only used if CESA data is not available at the required time horizon or level of detail.

value was estimated at € 57 billion in 2005. European companies account for 36% of this. Some of the key areas in Europe are mechanical engineering including engines (26% of European production value), electrical engineering/electronics (18%) and steel productsm (15%).

…which does not depend on European demand onlv.

European marine equipment suppliers do not depend on European shipyard customers only. Some 46% was exported. Furthermore several of the larger companies have assigned licenses to Asian manufacturers to produce for them at sites near to Asian shipyard customers.

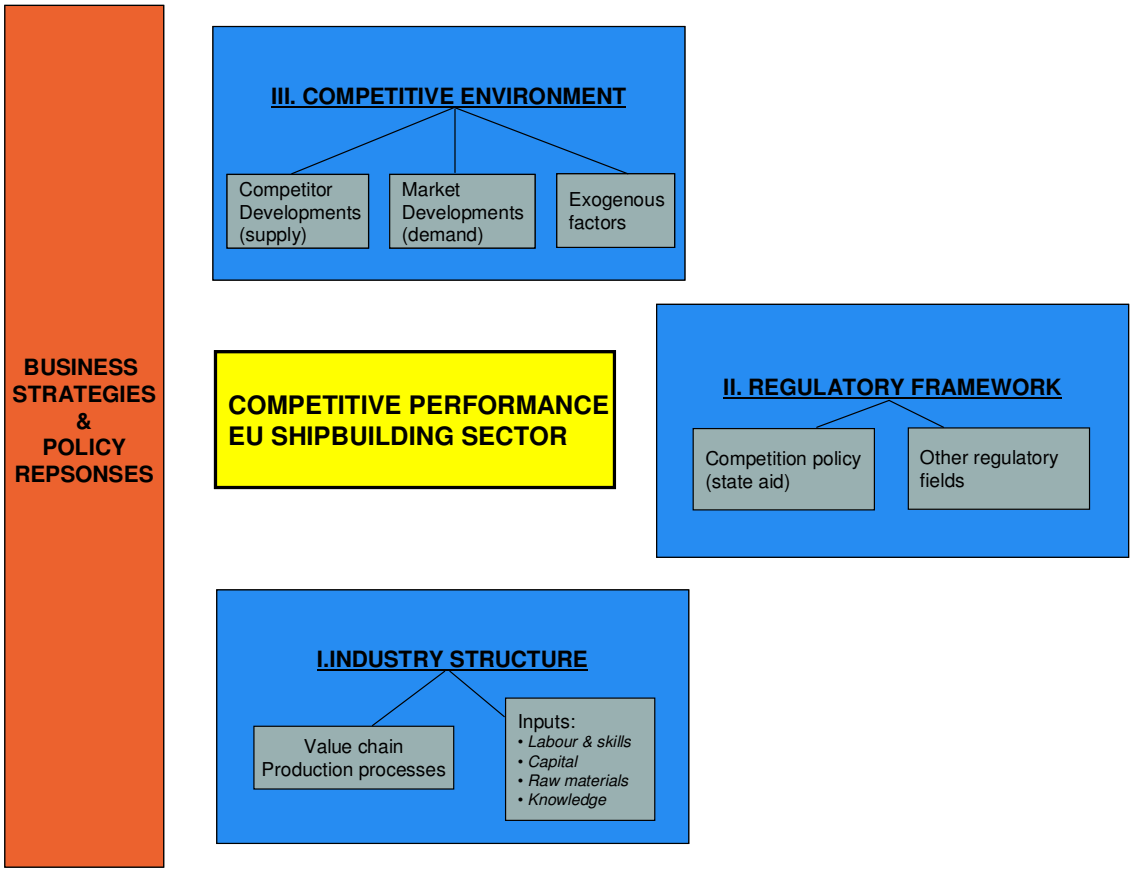
PART II: Analysis of competitive position

3 Approach/framework of competitive analysis

3.1 Framework competitive performance European shipbuilding sector

PART II of this report covers the analysis of the competitive position of the European shipbuilding and marine equipment sector. The overall framework used for the competitiveness analysis is illustrated schematically in figure 3.1.

Figure 3.1 Schematic overview of analytical framework competitiveness EU shipbuilding sector



The competitive position and performance of the European shipbuilding and marine equipment sectors can be viewed as the outcomes of a complex set of supply-side and demand-side conditions. These relate, on the one hand, to the situation of the European value chain for each sector (noting that the marine equipment sector is itself an element of value/supply chain for shipbuilding) and the situation of the value chains of competing suppliers. On the other hand, the performance of the shipbuilding and marine equipment sectors must be set in the context of developments within the final markets for shipbuilding

and marine equipment products and services, including 'exogenous' factors such as the overall macroeconomic environment.

Both the supply-side and the demand-side conditions are, in turn, influenced by regulatory (and other framework) conditions that shape the level and nature of competition within final markets, and by the business models and strategies adopted by firms within the sector in response to these conditions and in response to the overall competitive environment that they face.

In the above schematic overview, these relations have been summarised into three main blocks affecting the competitiveness performance of the EU shipbuilding industry:
I. Industry structure;
II. Regulatory framework;
III. Competitive environment.
These blocks are separately discussed below.

3.2 Industry structure

The analysis of the industry structure is presented in Chapters 4and 5. This analysis will be split into two main parts:

- **Analysis of the value (supply) chain and production processes** (Chapter 4). This part focuses on the 'internal' dimensions of the European shipbuilding industry. It discusses specific characteristics of the production structure in terms of company size, organisation of production processes, labour productivity and profitability. From a value chain perspective also the trade patterns and import/export position of the industry is further analysed.
- **Analysis of access to resources** (Chapter 5). This part focuses on the production inputs that are required in the sector and the access to such resources (e.g. labour & skills, knowledge and technology, intermediate goods and services, raw/basic materials, energy, capital and finance, etc.)

The primary aim of this industry structure analysis is to provide an understanding of how European production is organised, where and how value-added is created within the industry, and to identify those factors that are the most important determinants (drivers) for value-added generation and enhanced competitiveness.

3.3 Regulatory and other framework conditions

Chapter 6 sets out the regulatory environment and 'other' framework conditions affecting the shipbuilding sector. It aims at assessing the public policy environment that influences the competitive performance of the shipbuilding and marine equipment sectors. The relevant regulatory issues can be split into:

- **Competition policy related issues.** The general competition policy regime specifies specific rules for state aid that are e.g. relevant for financing schemes (export credits and guarantees) and innovation aid.
- **Other regulatory issues.** These include specific international trade barriers, standards & classification, IPR regime, etcetera.

Essentially, this assessment is concerned with those factors – both from a supply-side and a demand-side perspective – in the general business environment of the sector that are or may be influenced through public policy initiatives. This may include measures/initiatives at national, regional (e.g. European), or international levels.

3.4 Competitive environment

The competitive environment assessment (Chapter 7) will focus on the assessment of market conditions and the level and nature of competition and competitive pressures in the main market segments. The analysis will be organised around three core themes:

- ***Market (demand-side) developments*** (e.g. identification and assessment of the main demand-side trends and developments);
- ***Competitor (supply-side) developments*** (e.g. identification and assessment of the main supply-side trends and developments related to the main competitors for European products and services);

In addition to these two themes, exogenous conditions affect the competitive environment (e.g. globalisation, technology, environment, demographic change, macroeconomic conditions, etcetera; these are addressed throughout the analysis where relevant.

3.5 Business strategies and policy responses

PART III of this report draws conclusions on the findings done in PART I and PART II. This is partly done by looking closer at the **business strategies** chosen in the European sector. Also, **competitiveness benchmarking** is applied, providing a comparative benchmark of the competitive performance and main competitiveness determinants both at intra-EU level (i.e. relative competitive position and performance of main EU Member States) as well as mainly extra-EU (i.e. relative competitive position and performance of the EU compared to major competitor countries/regions).

Finally, policy responses and recommendations can be derived.

4 Industry structure: value chain & production processes

4.1 Introduction

The industry structure in shipbuilding has been split in two different chapters. In this chapter the value chain and production processes are analysed, focusing on the organisation of the industrial production processes and trade patterns. The next chapter is directed at the access to production factors or resources (production inputs), being access to labour, capital raw materials, knowledge and finance.

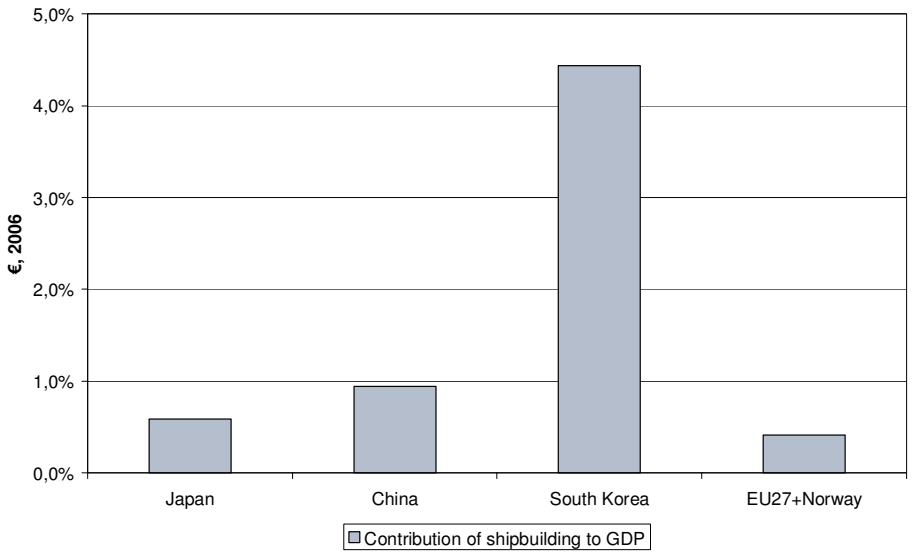
The primary aim of the analysis in these two chapters is to provide an understanding of how European production is organised, where and how value-added is created within the industry, and to identify those factors that are the most important determinants (drivers) for value-added generation and enhanced competitiveness.

4.2 Relative importance of the shipbuilding sector

National shipbuilding sector of highest importance to Korea

The relative contribution of the shipbuilding sector to the GDP is measured by the total shipbuilding production value as percentage of the total GDP. While for China, Japan and Europe, shipbuilding's contribution to the GDP is less than 1%, in Korea this percentage is 4.5%.

Figure 4.1 Shipbuilding sector's relative contribution the GDP



Source: see table 4.1

4.3 Production-related performance indicators

Different production-related performance indicators can be used to provide an indication of the competitiveness of the economic activity of the shipbuilding industry. These include earlier indications of the market share (see chapter 2), but also data on the structure of the industry such as size of companies, trade patterns, and includes indicators that indicate labour productivity and profits levels.

As table 4.1 shows, we have not been able to identify one single source which includes production related data for the calculation of all performance indicators defined. In order to make an as much reliable comparison between the main shipbuilding regions as possible, the following considerations were adopted for selecting the data sources:

- As much data from the same source as possible
- Quality/reliability of the data
- Completeness: we aimed to have at least a full comparison of all four main shipbuilding regions for one year

Table 4.1 Overview of sources for production related performance indicators

Region	Data	Main sources
EU27	employment	Eurostat - Structural Business Statistics NACE DM35.11
	companies	Eurostat - Structural Business Statistics NACE DM35.11
	economic indicators	Eurostat - Structural Business Statistics NACE DM35.11
	profit	Amadeus pan-European financial database
	production in CGT	CESA (CESA countries)
	shipbuilding	NACE DM35.11 = ship construction; marine equipment is fragmented in Eurostat
	scope	Shipbuilding direct + indirect, marine equipment excluded
Japan	employment	OECD – STAN Database for Structural Analysis
	companies	OECD – STAN Database for Structural Analysis
	economic indicators	OECD – STAN Database for Structural Analysis
	profit	n.a.
	production in CGT	CESA
	shipbuilding	STAN: C351 Building and repairing of ships and boats
	scope	Shipbuilding direct + indirect, marine equipment excluded
South Korea	employment	KOSHIPA annual reports 2008 and 2009, Shin & Hassink (2009)
	companies	KOSHIPA annual reports 2008 and 2009, Shin & Hassink (2009)
	economic indicators	OECD – STAN Database for Structural Analysis
	profit	n.a.
	production in CGT	CESA
	shipbuilding	STAN: C351 Building and repairing of ships and boats
	scope	Shipbuilding direct + indirect, marine equipment included
China		
	employment	CANSI - Analytical Report on Economic Performance of China's Shipbuilding Industry in 2008, National Bureau of statistics of China - China statistical

Region	Data	Main sources
		yearbook
	companies	CANSI - Analytical Report on Economic Performance of China's Shipbuilding Industry in 2008, National Bureau of statistics of China - China statistical yearbook
	economic indicators	CANSI - Analytical Report on Economic Performance of China's Shipbuilding Industry in 2008, National Bureau of statistics of China - China statistical yearbook
	profit	CANSI - Analytical Report on Economic Performance of China's Shipbuilding Industry in 2008, National Bureau of statistics of China - China statistical yearbook
	production in CGT	CESA
	shipbuilding	Shipbuilding, ship accessory manufacturing and ship repairing and dismantling
	scope	Shipbuilding direct + indirect, marine equipment included

The following table shows some key shipbuilding production figures for the main shipbuilding regions.

Table 4.2 Key shipbuilding production input/output figures for the main shipbuilding regions, 2007 (NACE 35.11)[108]

	Japan	China	South Korea	EU27+Norway
Number of persons employed	109,000	440,000	162,703	265,800
Number of enterprises	1,632	1,242	1,628	10,824
Value added at factor cost (€, million)	4.344	12.187	6.894	10.827
Production value (€, million)	17.669	42.679	36.120	42.861
CGT (million; completions) 2008	9.7	9.0	14.5	4.8

Source: Europe (Eurostat), Japan (OECD STAN), South Korea (KOSHIPA, Shin & Hassink, OECD STAN), China (CANSI) (see table 4.1); CESA for CGT values.

Employment and production value figures deviate from figures stated in chapter 2, however this can be well explained by the wider definition that is used for NACE sector 35.11 (as this e.g. also includes naval shipbuilding). According to these data in terms of value, European shipbuilding still is one of the major players worldwide.

4.4 Production structure

4.4.1 Average size of enterprises

Based on the above figures the average size of companies can be established.

[108] Including naval shipbuilding

Table 4.3 Production structure for the main shipbuilding regions: average size of enterprise, 2007

Average figures per enterprise	Japan	China	South Korea	EU27+Norway
production value per enterprise (€, million)	11	34	22	4
employees per enterprise	67	354	100	25
CGT completed per enterprise	5,900	7,250	8,900	440

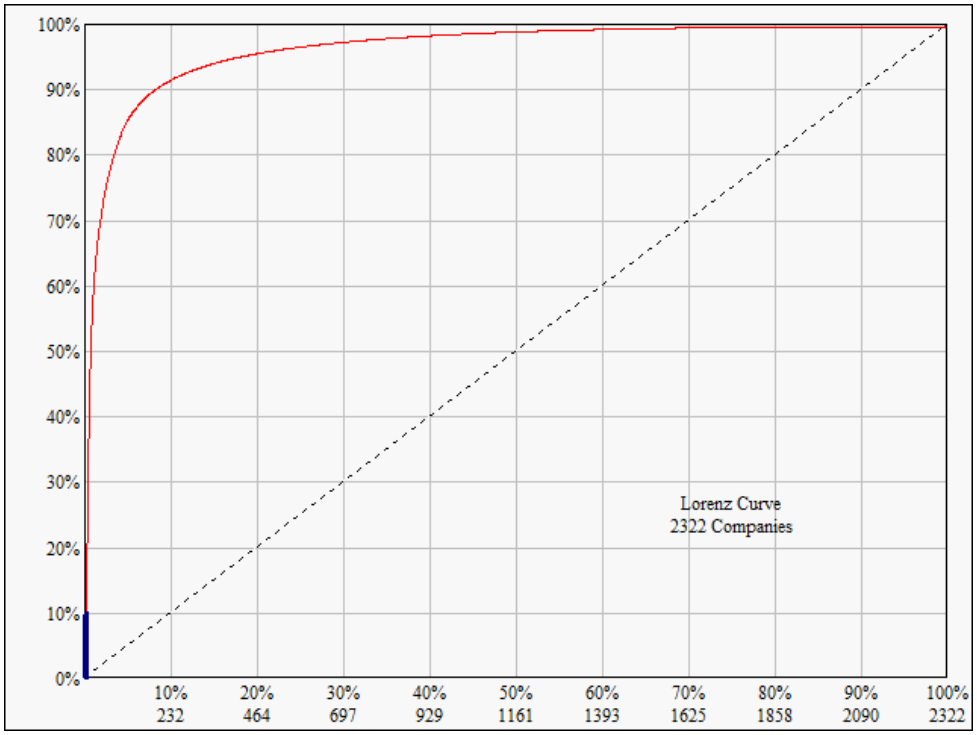
Source: ECORYS based on various sources (see table 4.1)

Europe comprises much more SME's

The figures above give an indication of the structure of the industry. Apparently, Europe comprises much more small and medium size enterprises in shipbuilding than the other regions. While European shipbuilding companies comprise on average about 25 employees, the Chinese counterparts comprise about 350 employees. In terms of CGT output per enterprise, Europe's average output per enterprise (440 CGT per year) is about 15-20 times lower than in China, South Korea and Japan. As stated by the Korean shipbuilding association, KOSHIPA[109], 9 out of 112 shipyards in Korea accounted for more than 90% of Korea's shipbuilding output in 2007. But also Europe shows a clear concentration of output at a limited number of yards.

Based on the Amadeus database (see Annex F) an analysis has been carried out on the distribution of companies per size class (figure 4.2).

Figure 4.2 Concentration of turnover (percentage of companies versus percentage of sector turnover – Lorenz curve), NACE 35.11, in 2006



[109] S.J. Chung, KOSHIPA, London (2008)

The analysis shows that the 10% largest (reporting) companies represent over 92% of turnover. For employment a similar concentration can be observed, whereas the top 10% companies represent 83% of all employment.

Apart from the companies registered under NACE 35.11 a large number of small and medium sized supply companies in the marine equipment industry. Their number is estimated between 5,000 and 7,000 companies in Europe alone[110].

4.4.2 Value added as a percentage of total production value

As indicated earlier, nowadays it is assessed that 50-70% of the value added comes from external subcontractors and suppliers, whereas for more complex ships this can be as high as 70-80%[111].

Box 4.1 Subcontracting in Korea

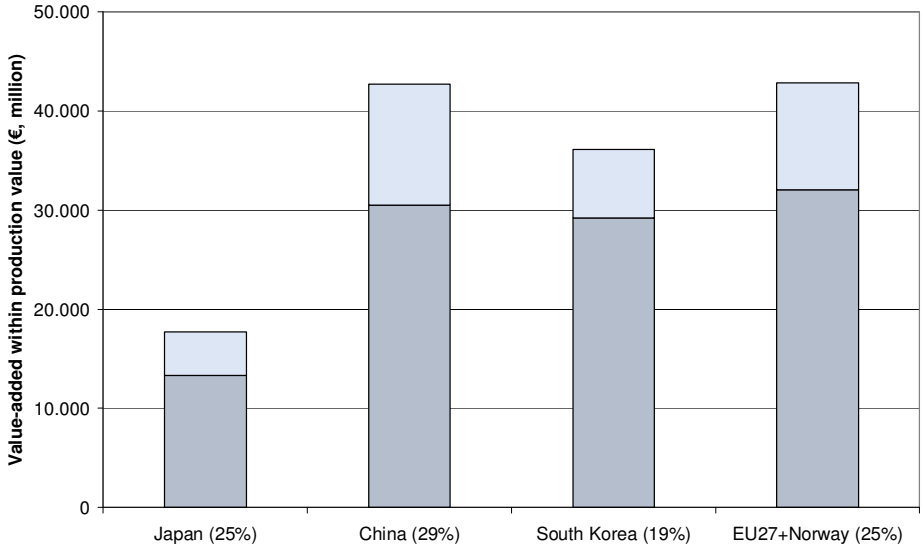
In addition to the extended supply base, shipyards increasingly sub-contract parts of the production process to sub-contractors, which are often located on or very close to the yard. Traditionally, Korea's car industry used this practice, mainly to reduce union activities and labour costs (by externalising fringe benefits of the workers, for example). However, the practice was expanded to the shipbuilding industry as well, because of the same reasons. Initially, it was only common with regard to low-skilled jobs, but it increasingly spread to even more sophisticated tasks, especially since the financial crisis. In 2003, Samsung had 94 of these sub-contractors assisting directly from the shipyard and another 16 located elsewhere (see Figure 4.2). These firms together employed 12,268 workers (Sshi, 2004), producing approximately two-thirds of Samsung's total shipbuilding products.

Although the measure itself is showing something different, an indirect indication for the use of suppliers can be found if the value added in NACE 35.11 is compared to the total production value in this sector (figure 4.2). For the sector as a whole some 25% of the total production value is added by shipbuilding itself. The rest are intermediary purchases and imports.

[110] BAlance Technology Consultants (2000); EMEC; CESA

[111] IKEI, 2009, Comprehensive sectoral analysis of emerging competences and economic activities in the European Union: Building and repairing of ships and boats sector.

Figure 4.3 Value added within total production value



Source: ECORYS based on various sources (see table 4.1)

The total value added as percentage of the total production value is highest in China (29%) and lowest in South Korea (19%). Japan and Europe take an intermediary position. This is a rough indication that subcontracting and intermediary supply from other sectors (e.g. marine equipment supplies) is higher in Korea and Europe than in China[112].

4.4.3 Labour productivity

Labour is an important production factor in shipbuilding. As a result the labour productivity is also highly important as this determines how efficient labour is used. Together with the wage costs this is a major factor in determining the competitiveness and profitability of shipbuilding operations.

Chinese labour productivity is lagging behind

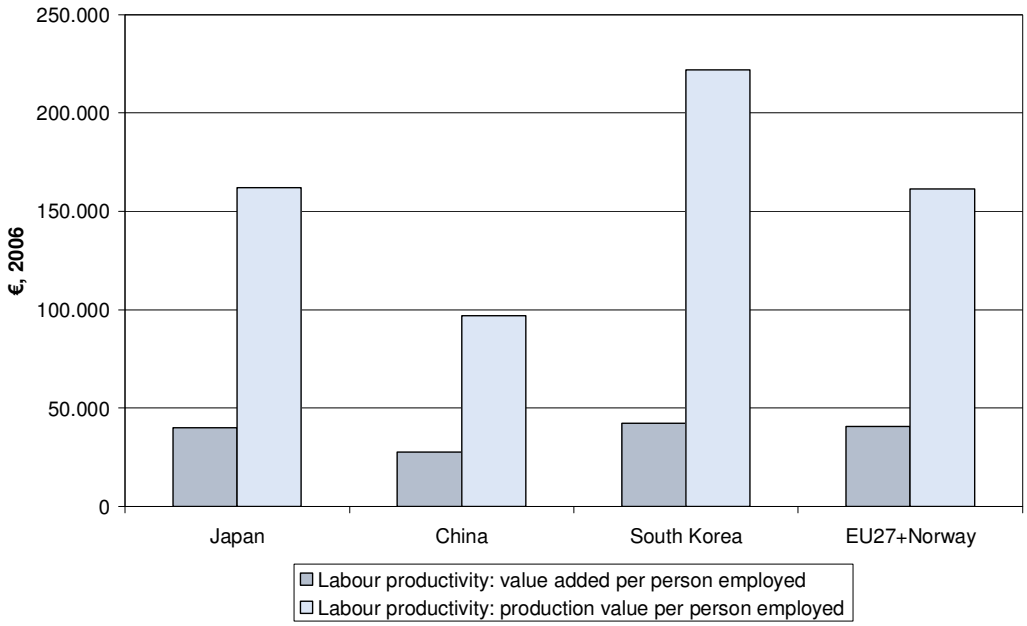
Figure 4.4 shows two types of labour productivity, one in terms of value-added per person employed and the other in production value per person employed[113]. The first type of labour productivity is about €40,000 value-added per person employed for Europe, Japan and South Korea and about €28,000 for China. This confirms earlier observations that the Chinese shipbuilding sector is mainly active in ship types that relatively labour intensive in comparison to the other shipbuilding regions. It must be noted that the productivity of Norway largely influences the European average which would be about € 35,000 if Norway is excluded.

[112] This is indeed a rough indication as it can also be caused for example by differences in prices of steel that is purchased, or different ships that are being built.

[113] These figures should be treated with care, because they are also influenced by the share of subcontracting. The higher the subcontracting the lower the amount of employees in the shipyard itself. This is especially valid for the labour productivity that is expressed in terms of production per employee and less for the value added per employee.

Also the second labour productivity indicator shows that China has a relatively lower production output per employee. With €220,000, the Korean production value per employee is more than twice as high as in China[114].

Figure 4.4 Labour productivity



Source: ECORYS based on various sources (see table 4.1)

Correcting for labour cost favours Asia

Dividing the labour productivity (value-added) measure by average labour cost gives a wage adjusted labour productivity amounting to 119% in European shipbuilding compared to 147% in European manufacturing. OECD data indicate a wage adjusted labour productivity of approximately 170-180% in Japan and South Korea. Apparently wage rates have a large impact on the wage adjusted productivities across shipbuilding regions.

The production efficiency in terms of annual CGT output per person employed shows high output per employee in South Korea and Japan (both close to 90 CGT/employee), followed by Europe and China (both around 20 CGT per employee).

Box 4.2 Some notions with respect to the use of CGT in calculating labour productivity and output per company

Figures in gross tons are available for all ship types, but not the number of man-hours, the use of materials and the amount of yard-hardware used in their production. Resources used to build one gross ton differ widely with the size and type of ship. By multiplying figures in gross tons with CGT coefficients, which reflect the work content of each type and size of ship, it is possible to convert the ever changing product mix into CGT figures, which reflect with some accuracy worldwide shipbuilding activity.

At a first glance, the calculation of CGT factors seems to be a simple task: for each ship type, and ship size,

[114] Again this is also directly influenced by the higher share of value added in the production value (as a proxy for subcontracting) in Korea. If the figures are corrected for this phenomenon, using a standard percentage of 25% share of VA in total production, the figure for Korea would become €165.000, while the figure for China would be €110.000. Korea would then be comparable to Japan and Europe, while China would still show a relatively low production value per employee.

collect information on the workload necessary to build a single gross ton, relate these data to a basic ship type, and the results will be the CGT factor (OECD, 2007). However, when it comes to details, practically no shipyard builds a ship in the same way as its competitors. One of the major differences is the production depth i.e. the amount of parts and blocks produced in the shipyard, relative to the amount which is subcontracted to outside suppliers (the portion of the self-manufacturing in the enterprise).

Furthermore, the use of CGT coefficients for the comparison of production efficiency expressed in CGT output per year and number of employees for different shipyards (a measure often found even in serious publications), is misleading as long as the production depth of the yards being compared is not taken into account. A yard or a group of yards with low production depth would wrongly appear to have a high efficiency compared to a yard with higher production depth, if the comparison only takes into account the CGT delivered in a year divided by the number of direct employees of those yards[115].

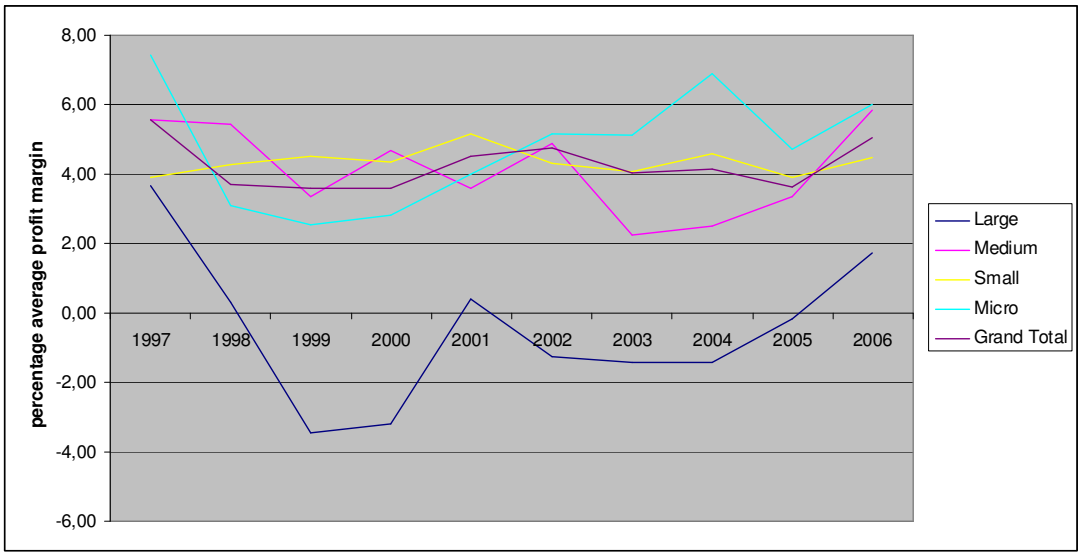
4.4.4 Profit margins

The profitability of shipbuilding has been analysed by using the Amadeus database (see Annex F). Only profit margins for European shipbuilding companies could be analysed. In the analysis a distinction has been made between:

- large (>250 employees),
- medium (<250 and turnover ≤ 50 mio € or balance sheet total ≤ 43 mio €),
- small (< 50 employees and turnover ≤ 10 mio € or balance sheet total ≤ 10 mio €) and
- micro enterprises (< 10 employees and turnover ≤ 2 mio € or balance sheet total ≤ 2 mio €).

Figure 4.5 gives an overview of profit margins in the period 1997-2006.

Figure 4.5 Average profit margin of European shipbuilding companies



The analysis shows that profitability showed a dip at the beginning of the 21st century but that especially 2006 showed a strong improvement in profit margins. Regarding the

[115] OECD, A NEW COMPENSATED GROSS TON (CGT) SYSTEM (2007)

booming order portfolio and production levels a further increase in profit margins is expected for 2007. A remarkable observation is that especially profit margins for the large sized companies have been under pressure, while medium, small and micro sized companies have been performing at a much more stable level even at the beginning of the last decade of the 20th century.

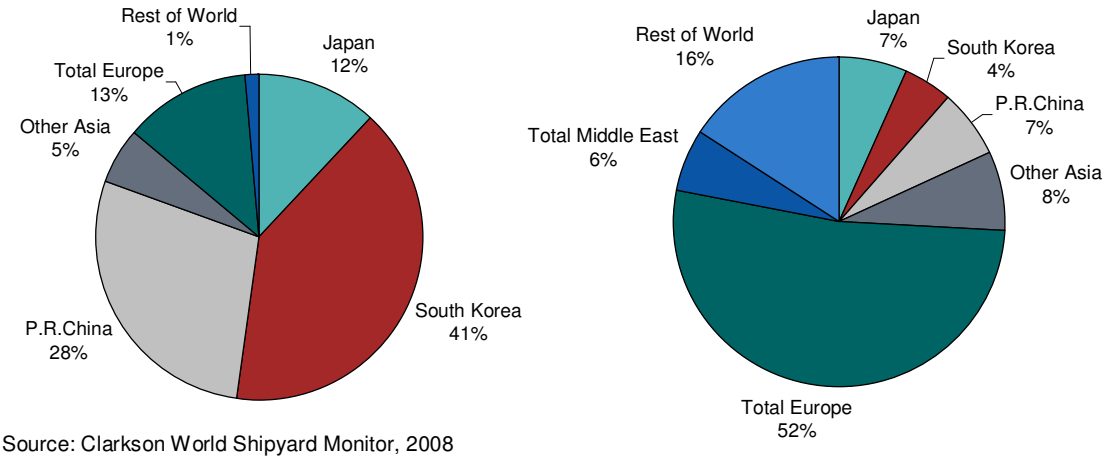
4.5 Trade patterns

4.5.1 Trade flows

Global pattern of demand

In addition to the global structure of the supply of new ships also the buyers act at a global level. Times where ships were sourced from the country of the buyers are long past, although this tendency can still be observed in a number of countries or for specific market segments (e.g. naval shipbuilding). This is illustrated by comparing the supply (in terms of orderbook-value) with the geographical distribution of the origin of the buyers (see figure 4.6). The figure shows that while European shipbuilding companies are contributing 13% of the total orderbook value, European buyers account for over half of the entire demand for newbuildings, whereas Asian clients only represent 26% of global demand. It can be expected that with the rise of Asian shipping companies these demand patterns may also change in favour of Asia[116].

Figure 4.6 World market shares of orderbook-value by builder country/region (left) and buyer (right) in 2008



Source: Clarkson World Shipyard Monitor, 2008

Table 4.4 gives more insight in the origin of the European buyers.

[116] This may even be accelerated by the current crisis which has triggered policy responses in a number of Asian countries (viz. China) that may stimulate demand from domestic shipping companies (see chapter 2).

Table 4.4 Origin of ship buyers in Europe, 2005-2008 (in million US dollar)

	2005	2006	2007	2008
Greece	6.2	20.0	40.6	18.3
Germany	15.3	16.9	33.8	17.6
Denmark	4.5	4.5	4.7	7.5
Norway	6.9	15.9	15.4	5.2
Italy	4.8	6.2	8.4	4.6
Total Europe	**51.6**	**84.5**	**136.6**	**69.5**

Source: Clarkson World Ship Monitor January 2009

Strong export orientation in shipbuilding

The global pattern of demand and supply, combined with specialisation tendencies in a number of countries (see chapter 2) has led to a strong export orientation in shipbuilding.

Given the geographical imbalance in demand and demand it can be expected that especially Asian shipbuilding countries have a strong export orientation:.

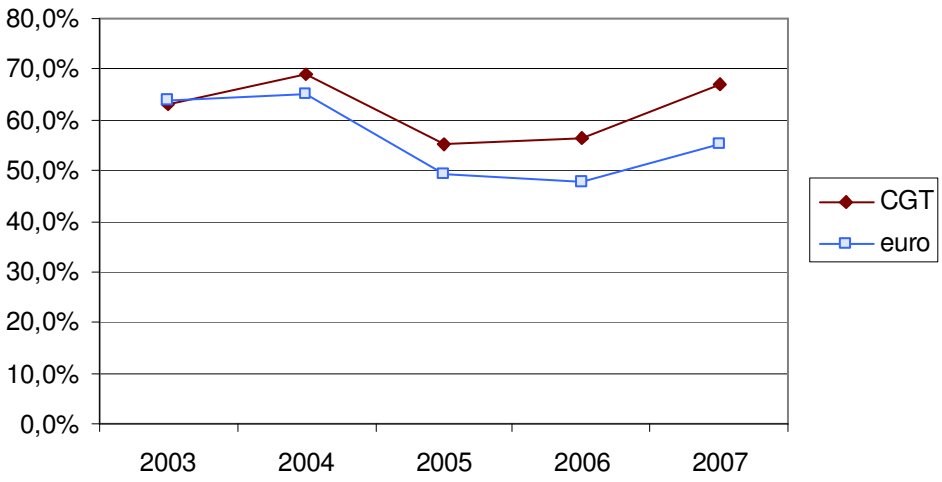
- South Korea: in 1990, about 15% of its production value was destined for the domestic market and 85% was export. Since 1995, the latter has increased to more than 99%.
- China: In 2007, the exports of newbuildings accounted for 81 percent of total production, while the inflow of new orders was already 89 percent of foreign origin.
- Japan: While in 1971, domestic shipbuilding new orders in Japan surpassed export order for the first time in ten years, in 2004 the share of export new orders was 98.6% (9.75 million GT).

Box 4.3 China: Shipbuilding exports

Export delivered by Chinese shipbuilders reached RMB212.2 billion in 2008, up 56.1% year on year, the growth is 6 percentage points lower than in 2007; and export of ships and floating structures was US$19.57 billion, up 59.9%, 9 percentage points higher on year. The tonnage of export ships completed in 2008 was 21.07 million DWT, up 41.4% on year and accounting for 73% of the total tonnage of ships completed; and China-made ships were exported to 150 countries and regions, with export value to 25 countries and regions standing above US$100 million. Singapore, Germany and Hong Kong remained the main export destinations of the China-made ships.

Even though a large part of the buyers is Europe based, also Europe shows a strong export orientation, again reflecting the global character of the shipbuilding market. Between 2003 and 2007, Europe's export rate remained stable at some two third of its total production in CGT (see figure 4.7). It is noted that, in terms of export value, Europe's export share development is diverging from the CGT trend: apparently in 2007 relatively less expensive newbuildings (per CGT) are being exported, while the more expensive, compared to CGT, are delivered to European customers.

Figure 4.7 Europe's export rate of newbuildings between 2003 and 2007



Source: CESA Annual report 2007 - 2008

Table 4.4 gives further insight in the export position of European shipbuilders for a number of major shipbuilding countries.

Table 4.5 Completions 2007 European countries divided by national and foreign account

	National clients		Foreign clients	
	CGT	%	CGT	%
Norway	84,024	100,0%	0	0,0%
Germany	594,908	50,8%	576,406	49,2%
Italy	354,203	43,9%	452,000	56,1%
Netherlands	398,022	37,6%	659,919	62,4%
Poland	1,788	0,5%	394,726	99,5%
CESA total	**1,799,195**	**33,0%**	**3,650,241**	**67,0%**

Sources: CESA Annual Report 2007 – 2008 and National Associations Annual Reports

Marine equipment

Not only trading of ships is a typical global business; also the position of the marine equipment industry is highly internationally oriented. The following text gives more insight in trade patterns of marine equipment in some of the major shipbuilding regions.

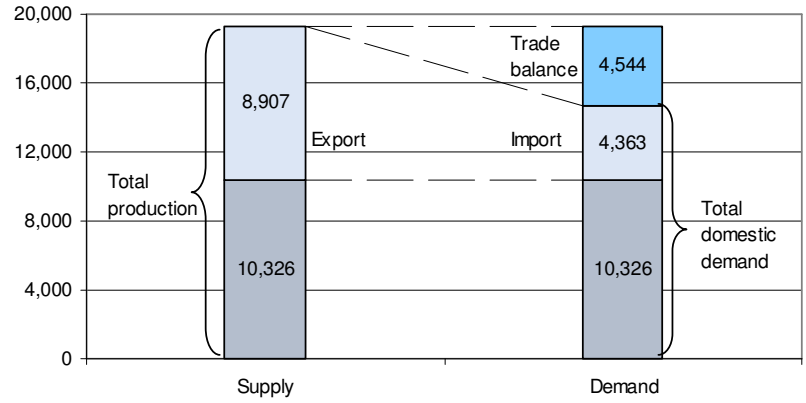
Europe

The production and trade patterns in marine equipment for Europe were analysed in a study of 2000 by BAlance Technology Consulting[117] for the EU15 (see figure 4.8). According to this study total production of the EU15 countries was around €19.2 billion. Around €10.3 billion of this was for the domestic market and € 8.9 billion was exported (46%). The total European demand was around €14.7 billion of which €4.3 billion was imported (import

[117] BAlance Technolgy Consullting, (2000). Competitiveness and Benchmarking in the Field of Marine Equipment.

dependency of 29%). The overall net impact on the trade balance for Europe was estimated to be €4.5 billion representing 25% of the total production value.

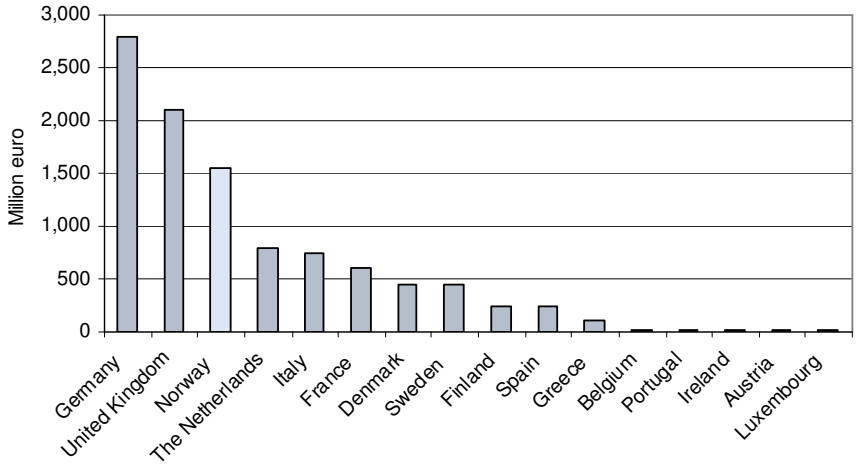
Figure 4.8 European supply and demand in the marine equipment industry (EU-15) in 1998 in million euro



Source: BAlance Technolgy Consulting, 2000

Key European exporting countries in 1998[118] were Germany, the United Kingdom, Norway, the Netherlands, Italy and France (see figure 4.9)

Figure 4.9 Exports from EU-15 countries and Norway in millions of euro



Source: Balance Technology Consulting, 2000

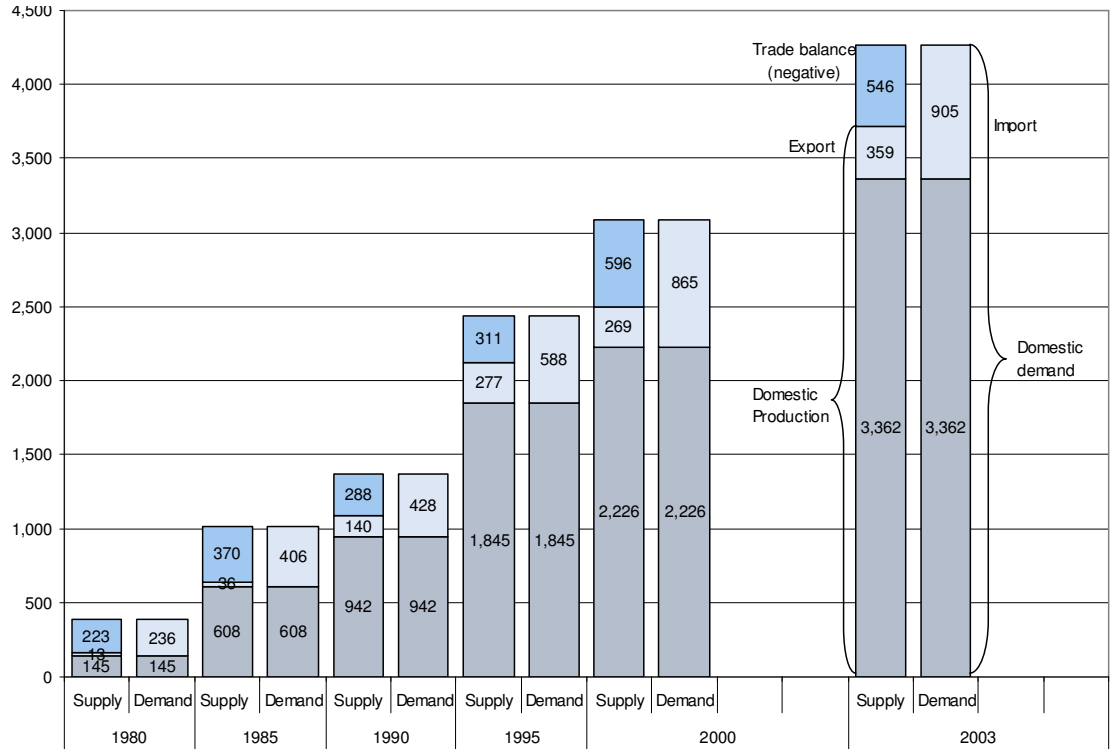
A more recent study indicates a further increase in the international orientation with increasing physical presence of enterprises in Asian shipbuilding countries such as Korea and China[119]. The role of European ship owners/buyers may not be neglected as a relevant factor in de demand for marine equipment from Europe. It is said that while they buy vessels from Asian yards, specifications to use European built equipment are often used to ensure e.g. quality and consistency with their fleet inventory, maintenance support, etc.

[118] Only EU15 and Norway. Source BAlance Technolgy Consullting, (2000)
[119] IKEI 2009.

South Korea

The production of marine equipment in South Korea has shown a strong increase of the past 25 years, in line with the shipbuilding production (see figure 4.10). Although the imports have risen in absolute terms, the import dependency has clearly declined (from 62% in 1980 to 21% in 2003), showing the increasing strength of marine equipment products made in South Korea itself. Most import originates from Japan (42% in 2003), but also Germany, Norway and the USA are important trade partners.[120]

Figure 4.10 South Korean import, export, domestic demand and supply of marine equipment between 1980 and 2003 in million US dollars

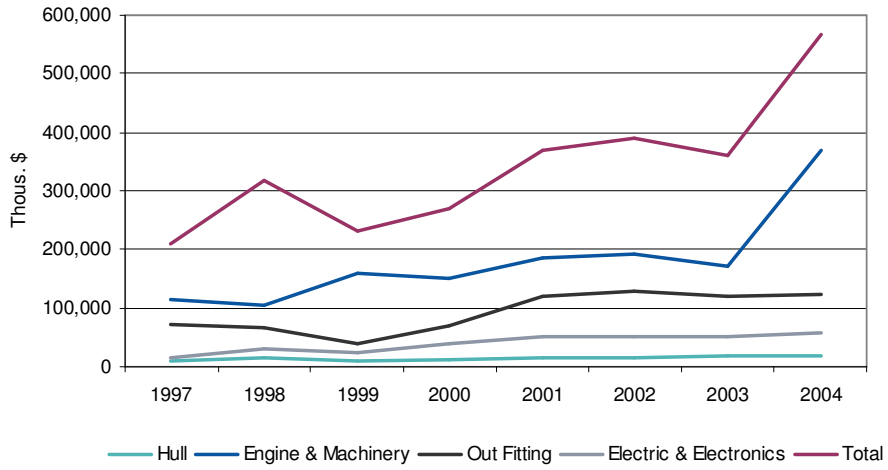


Source: KOMEA, 2003 and 2009

Whereas the share of exports of marine equipment produced in South Korea increased, its export position is still modest (slightly over 10%). Nevertheless, the trade balance for South-Korea was about half a billion dollar negative in 2003 (meaning that more marine equipment is imported than exported). Figure 4.11 gives further insight in the composition of marine equipment exports from South Korea. Especially the export of engine & machinery components has shown a strong upward trend.

[120] IKJournal (2005) Localization: making it big with the shipbuilders. A profile of Korean ship Machinery & Equipment industry. Available at http://www.ikjournal.com/InvestKoreaWar/work/journal/content/content_main.jsp?code=4360216

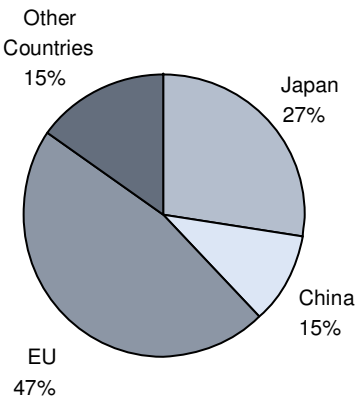
Figure 4.11 Exports of Korean marine equipment manufacturers between 1997 and 2004 by type of equipment (in thousand US $)



Source:KOMEA, 2008

Figure 4.12 shows the main destination countries for export of marine equipment from South Korea. It becomes clear that Europe clearly is the major destination. This concerns mainly engine and machinery products (97%).

Figure 4.12 Export destination of Korean marine equipment exports (in percentage value of total exports 2004)[121]



* other countries include Singapore, USA,Taiwan, Pilippines,Kuwait,Russia, etc

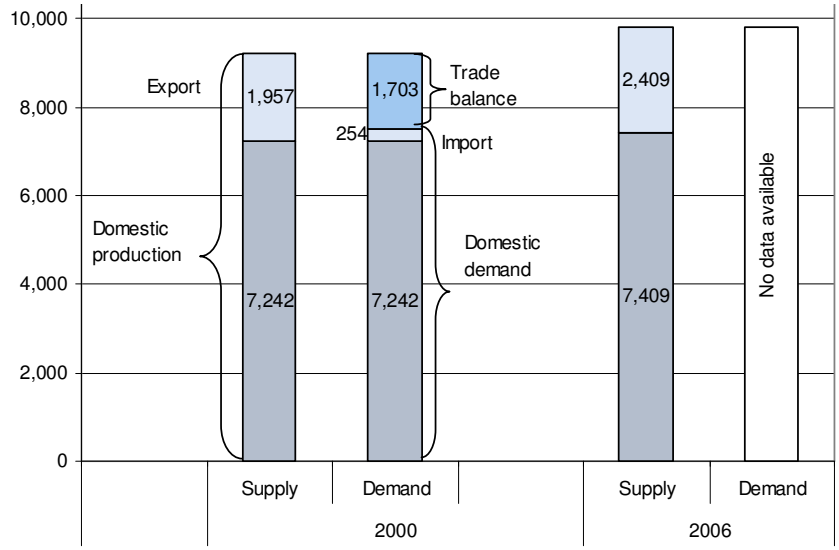
Source: KOMEA (www.komarine.or.kr, visited on 5th February 2009)

[121] Original data in US$. Exchange rate dollar-euro 2004: 0.8039 (www.ecb.eu)

Japan

Japan shows a relative low import dependency of marine equipment (3%), showing that the country mainly depends on domestically produced marine equipment (see figure 4.13).

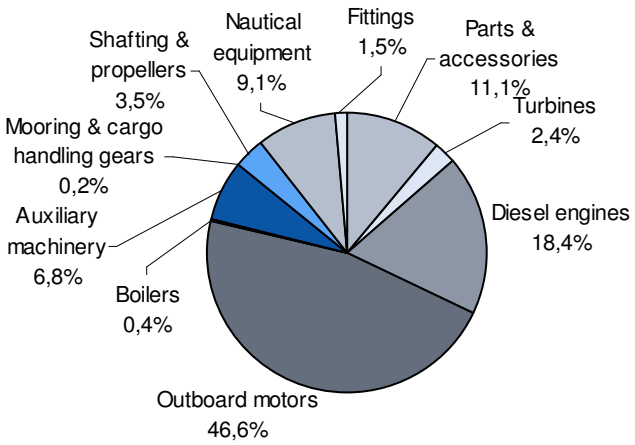
Figure 4.13 Production and export/import figures marine equipment Japan in 2000 and 2006 in million euro



Sourc: Drewry Shipping Consultants Limited 2000 and JSMEA, 2009 (www.jsmea.co.jp, visited on 5-2-2009)

It also becomes clear that Japan is clearly exporting marine equipment with an export share of domestic production of approx 25%. This remained relatively stable over the period 2000-2006. Figure 4.14 presents an overview of the 2006 exports by product type. Outboard motors are the most important export category for Japan. Most of these outboard motors are exported to North-America (outboard motors make up 81% of all export to this region), followed by Europe (outboard motors make up 55% of all exports to Europe). Other important equipment categories exported to Europe concern 'Parts & accessories' (21% of the total export to Europe) and diesel engines (11% of the export to Europe).

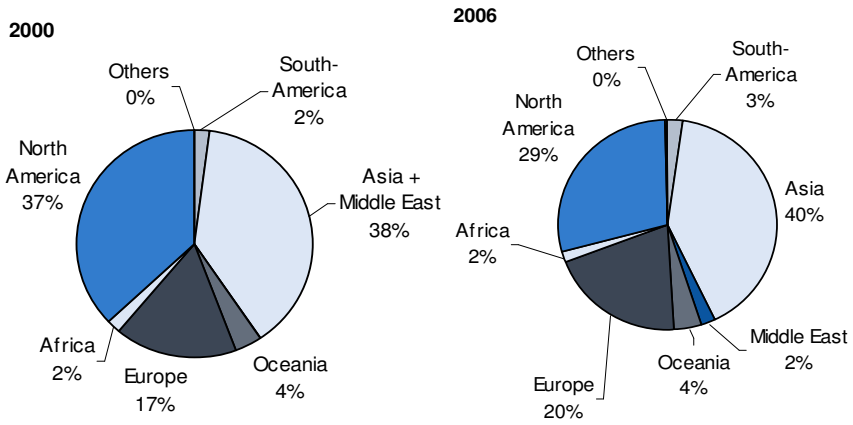
Figure 4.14 Japanese Ship Machinery Exports in 2006 by Product (total exports amount 351,671 million yen)



Source: JSMEA, 2008 (http://www.jsmea.or.jp/e-top/index.html)

Japan's major export partners are countries within Asia (mainly engines) and North-America (see figure 4.15). Between 2000 and 2006 the export share of North-America has declined in favour of the export share of Asia and Europe.

Figure 4.15 Japan's Ship Machinery exports in 2000 and 2006 (by destination) in percentages



Source: JSMEA, 2008 (http://www.jsmea.or.jp/e-top/index.html)

5 Industry structure: access to resources

Chapter 5 analyses the competitiveness of shipbuilding from the viewpoint of access to main resources or production factors that are crucial for shipbuilding. The analysis focuses on the access to the following resources:

- Employment & labour
- Raw materials - steel
- Knowledge
- Capital

5.1 Employment, skills and labour costs

5.1.1 Overall employment levels in shipbuilding[122]

Ship construction

Europe

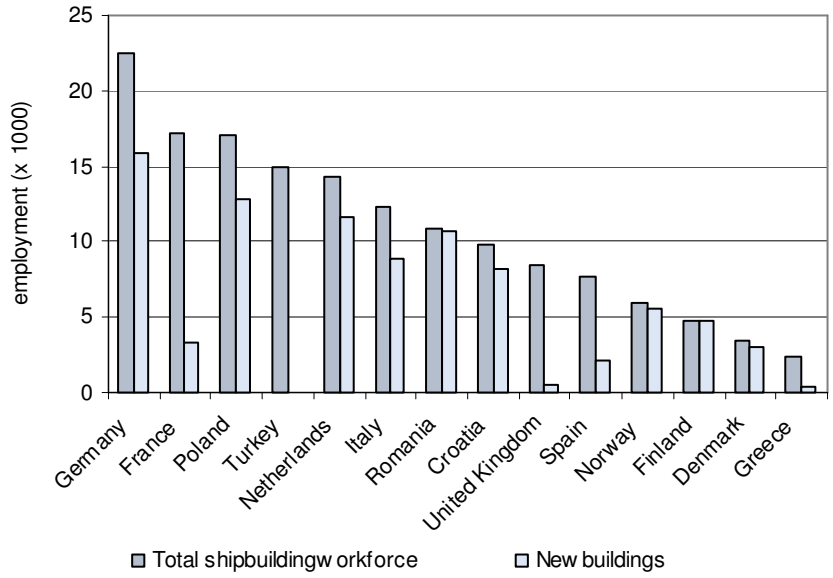
Based on CESA shipyards employment data, European direct employment in the ship construction sector amounted to 117,000 in 2004[123]. If direct employment in the accession, candidate and associated countries (European economic region) is taken into account, the figure for 2004 is estimated at 155,000[124]. The OECD estimated that the European ship construction workforce was around 150,000 in 2007. Adopting a wider definition (reflecting the NACE sector 35.11, which also includes naval shipbuilding), the workforce in the EU27 plus Norway is estimated at some 265,000 persons (see table 4.2). This represents some 0.12% of the total employment in the EU and Norway.

The employment in shipbuilding has shown a continuous decrease, reflecting the loss of market share of Europe and ongoing productivity increases. In 1975, European direct employment in the ship construction still totalled 462,000 thus showing a fall of some 75% in 30 years time.[125]

Figure 5.1 shows the total employment in shipbuilding for the 12 most important shipbuilding countries in 2007. Together these countries represent 91% of the total European (direct) employment in shipbuilding. Germany, with some 22,500 employees is the largest contributor to the European shipbuilding employment representing some 15.0% of the total workforce in Europe[126] [127].

[122] In most cases this excludes marine equipment, unless otherwise mentioned.
[123] ECOTEC, 2006
[124] IAW, 2006
[125] ECOTEC, 2006
[126] SSDC HR Reseach Study 2008: Demographic Change & Skills Requirements in the European Shipbuilding & Ship Repair Industry

Figure 5.1 Employment shipbuilding industry by European countries in 2007 (total workforce and newbuilding)

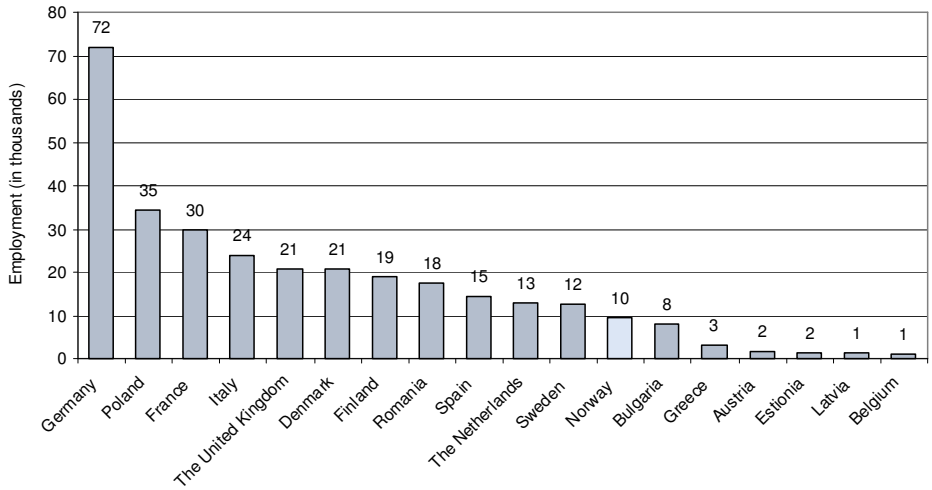


Sources: CESA Annual Report 2007-2008 and OECD Economic Surveys: Turkey; data exclude naval shipbuilding.

Marine equipment

EMEC estimates the direct employment in the European maritime equipment industry at more than 287,000. Indirect employment related to the marine equipment industry is estimated at 436,000.[128] Other studies show a similar order of magnitude. A recent study by PRC (2008) estimated employment in marine equipment in Europe at 305,200 persons. Again Germany is one of the main employers in this industry (see figure 5.2). Total employment in the marine equipment is around 1.4% of the total employment in the European Union and Norway.

Figure 5.2 Employment in the marine equipment industry in 2006 (in thousands)



[127] PRC (2008)
[128] EMEC (2009) at www.emecweb.eu

Source: Policy Research Corporation, 2008

The importance of employment in the shipbuilding industry (NACE 35.11) as a percentage of total employment in transport equipment manufacturing industries in the EU27 is modest (9.5% in 2007). Most important subsectors are the motor vehicle manufacturing industry (71% of total transport equipment manufacturing industry) and aircraft manufacturing (12.2%). It should be noted that these statistics exclude the employment in the marine equipment industry.[129] Therefore, the actual share of the total shipbuilding industry is expected to be higher.

South Korea

Ship construction

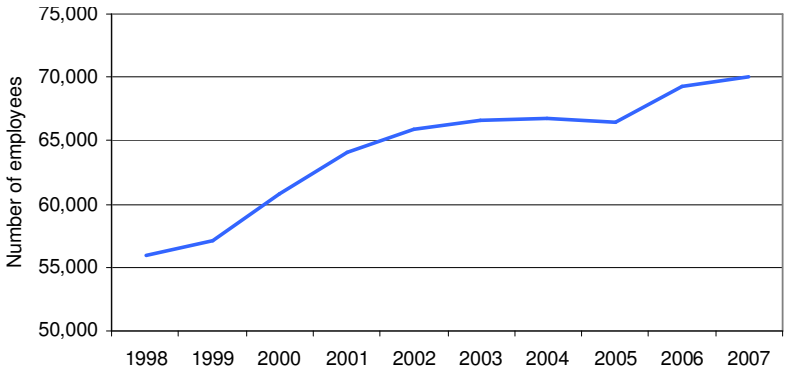
Ship construction employment in South Korea increased from 75,000 people in 1984 to 119,000 at the end of 2007, reflecting the increased market share and volume growth in shipbuilding in this country. The increase between 2006 and 2007 was remarkable strong (some 25% growth), reflecting the required sharp increase in manpower to realize a historic high number of ship completions[130].

Nevertheless, South Korea faces heavy competition from low cost countries. Due to rising labour rates, labour costs in South Korea currently constitute about 30% of the total construction costs, whereas in for example India this is around 15%[131]. To ensure a large orderbook and good margins, the strategic focus of Korean companies is on an increased presence in low cost countries as well as bringing low cost labour supply from other countries to their Korean shipyards[132].

Marine equipment

Also the number of employees in the marine equipment sector has shown a rapid growth. Between 1998 and 2007 employment in this sector has increased with some 25%.

Figure 5.3 Employment development in the South-Korean marine equipment industry, 1998-2007

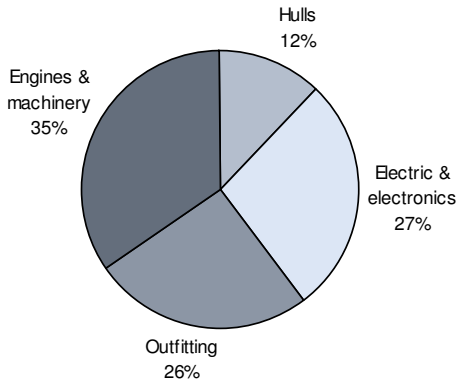


Source: KOMEA, 2008

[129] The Marine Equipment Industry consists of multiple NACE codes in Eurostat. In addition, these NACE codes are within multiple industries: manufacturing industry, wholesale and other services.
[130] KOSHIPA, 2008
[131] CARE, 2008
[132] CARE Research

This workforce can be further detailed by type of equipment that is produced (figure 5.4). Most employees (35%) are working within the engines & machinery subsector[133]. This is followed by the electric & electronics subsector and the subsector outfitting, both of which have shown rapid growth.

Figure 5.4 Workforce share by equipment type, 2007



Source: KOMEA, 2008

China

Ship construction

In 1949, there were about 20 shipyards in China with 20,000 employees in total. Statistics of the Commission of Science Technology and Industry for National Defence (COSTIND) show that in 2005 there were more than 2,000 shipbuilding companies in China, which employed a workforce of around 400,000[134]. Out of this, 315,000 were employed by the 480 largest companies[135]. A more recent publication (CANSI, 2008)[136] assesses the total workforce at 440,000.

Marine equipment

For marine equipment, there are no exact figures available on China. Even estimating is quite difficult, since marine equipment manufactures may also be part of a shipyard.

Japan

Ship construction

There are limited sources available on employment in the Japanese shipbuilding sector. The OECD[137] estimates the total workforce at 109,000. Another source indicates a much lower volume, viz. some 40,264 in 2004[138].

Marine equipment

The employment in the marine equipment industry in Japan was estimated by Drewry for the year 1999[139]. According to this source the Japanese marine equipment industry employed some 33,000 people in 740 companies.

[133] See KOMEA 2008
[134] This figures matches well with the figure of 440,000 that is mentioned in table 4.2.
[135] Ship Management Office, COSTIND, 2005
[136] CANSI, Analytical Report on Economic Performance of China's Shipbuilding Industry in 2008 – National Bureau of Statstics – China Statistical Yearbook.
[137] OECD - STAN Database for Structural Analysis
[138] IAW, 2006
[139] Drewry Shipping Consultants Limited, 2002

5.1.2 Skills requirements and availability of labour

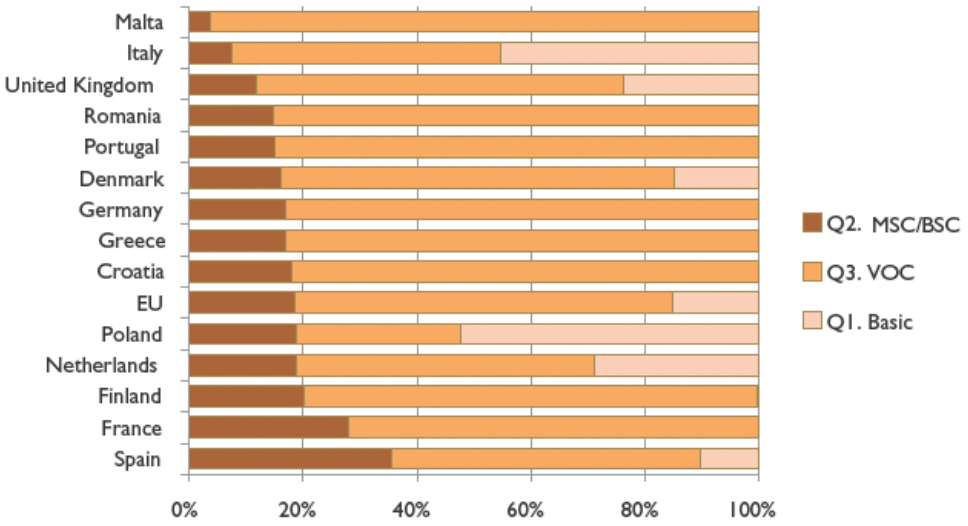
The availability of (skilled) labour is an important factor in determining the competitiveness of the shipbuilding industry. This is especially valid for Europe, which increasingly focuses on specialised vessels in niche markets and depends strongly on its ability to innovate. This section elaborates the availability of (skilled) labour for the most important shipbuilding regions.

Europe

Required work skills and demand for labour

Due to its specialisation the access to skilled labour has become important for both European shipyards and marine equipment suppliers. Figure 5.5 shows the EU-14[140] shipbuilding workforce by education level. For the EU14 as a whole this concerns 19% MSc/BSc level, 66% vocational level and 15% basic level employment. Employees are mainly found in production and work preparation (86% for the EU14), while 12% can be found in design and engineering and 2% in sales and after sales.

Figure 5.5 EU-14 Shipbuilding workforce by education level (2008)



Source: European Shipbuilding Social Dialogue Committee, 2008

The trend is that more and more high educated employees are needed and that employees with only basic education are gradually disappearing (see table 5.1). This is closely linked to the shift to a more specialised and knowledge-intensive shipbuilding industry. This is in line with the expected increase in demand for sales personnel (from 2 to 3%) and design and engineering staff (from 12% to 17%).

Table 5.1 Education level outlook in percentage of total shipbuilding workforce in EU-14 shipbuilding nations

Education Level	2004	2010-2015
MSc/BSc level	19%	25%
Vocational level	66%	74%

[140] EU-14 consists of 14 CESA member countries

Education Level	2004	2010-2015
Basic level	15%	<1%
Total	**100%**	**100%**

Source: 't Hart, P. and D. Schotte, 2008

Already, most recruitment problems concern blue collar workers, engineers and architects. There is no such lack of IT-specialist. according to a recent study from Tholen & Ludwig (2008).[141] Reasons for these difficulties are the low number of qualified universities' graduates as well as qualified school leavers, who might be suitable for the shipbuilding industry. The lower attractiveness of both manufacturing in general and shipbuilding in particular, causes problems of recruiting (see also box 5.1). [142]

Box 5.1 European Shipyard week

The image of the shipbuilding industry is not very positive: sector is often associated with being an old industry with an uncertain future and difficult working conditions. Therefore, in 2006 and 2008 CESA and the European Metalworkers' Federation (EMF) jointly organized the "European Shipyard Week". The prime objective to set up such a week is to reinforce and spread the message of LeaderSHIP 2015 to improve the attractiveness of the shipyards as a workplace for young graduates and highly-skilled people and portray the right image of the sector. By addressing the challenges arising from the impending shortage of qualified people and an ageing workforce the social partners wanted to contribute to ensuring productivity, innovation, competitiveness and employment for the sector in the future.

In October 2009 the third European shipyard week will take place.

Based on: European Commission, 2007. Commission Working Document: LeaderSHIP 2015 Progress Report.

Because of the shortage of MSc/BSc students, shipyards are starting to recruit students from other technical disciplines. According to a report of ESSDC, the recruitment of vocational students remain an important issue; it was concluded that the starting qualifications were too low. In turned out that in several countries, the national education system does not provide sufficient qualified technical people.[143]

Box 5.2 Shipbuilding education

Several European countries provided suggestions for the lack of highly educated shipbuilders at MSc/BSc level and vocational students. An interesting development in German shipbuilding is the development of a dual system of studies combining a vocational education with a Bachelor's degree for applied sciences. In four to five years time the students, employed by the shipyards, follow their course of studies in combination with practical training phases on the shipyards. As a result, they can obtain a double qualification as skilled worker and Bachelor of Science. In other countries, permanent education and continuing learning lines or a wider education field like Maritime Technology are promoted. Some shipbuilding countries also have good experiences with European

[141] Tholen, J, L. Ludwig & F. Smets (2008). Survey on European Shipbuilding – panel study.
[142] Tholen, J, L. Ludwig & F. Smets (2008). Survey on European Shipbuilding – panel study.
[143] CESA (2009). Annual Report

student and/or knowledge exchange programs.

CESA (2009). Annual Report

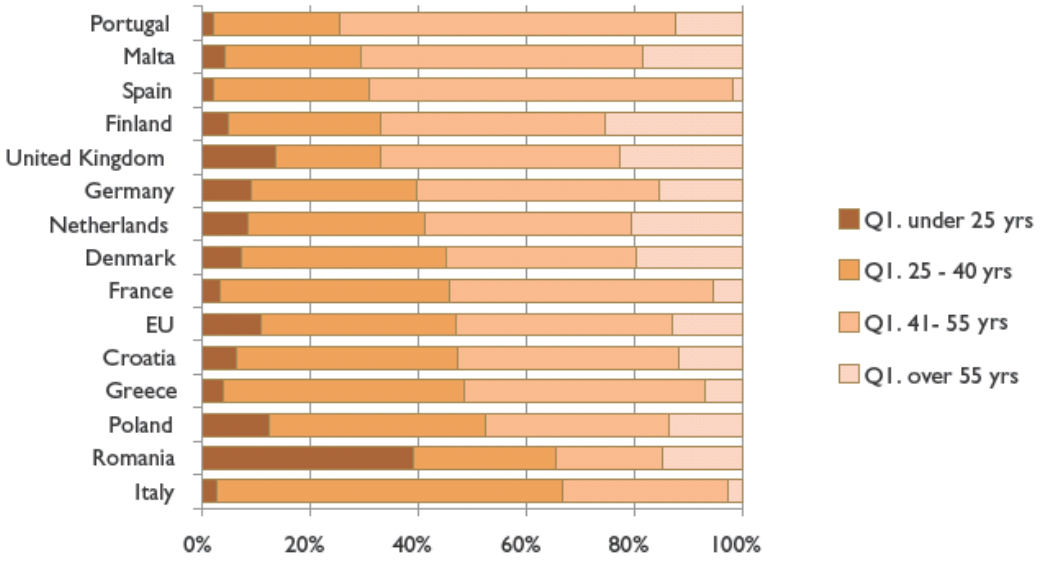
Availability of labour

Apart from an expected need for an increasing share of higher educated staff, overall employment requirements are expected to follow closely the demand in market share, absolute production volumes and labour productivity increases[144].

The ageing population

An important aspect in the availability of labour is the ageing work force in Europe. It is expected that the share of 65+ years old will increase from 15.8% in 2000 to 30.3% in 2050[145]. This trend may be highly relevant in the shipbuilding industry as the EU-14 shipbuilding industry reported a slightly older workforce than the European average: 53% of the EU shipbuilding workforce was aged over 41, compared to 50% of the European total (EU14 figures, 2004; see figure 5.6). As many older employees are expected to retire in the coming years, taking along a wealth of experience, knowledge and competences, the demand for highly qualified engineers but also for highly skilled blue-collar workers is ascending in Europe.[146]

Figure 5.6 EU-14 Shipbuilding technical workforce – age distribution



Source: 't Hart, P. and D. Schotte, 2008

Generally speaking, the North-West European countries have a relatively older workforce compared to the South-East European countries. Finland, the UK, the Netherlands and France are expected to experience the largest problems with the ageing workforce, since they have relatively many employees over 55 years old.

[144] According to a recent study by IKEI a possible slowdown in demand in shipbuilding may occur as a result of the current economic and financial crisis. Q1-2009 data of CESA already indicate confirm this.

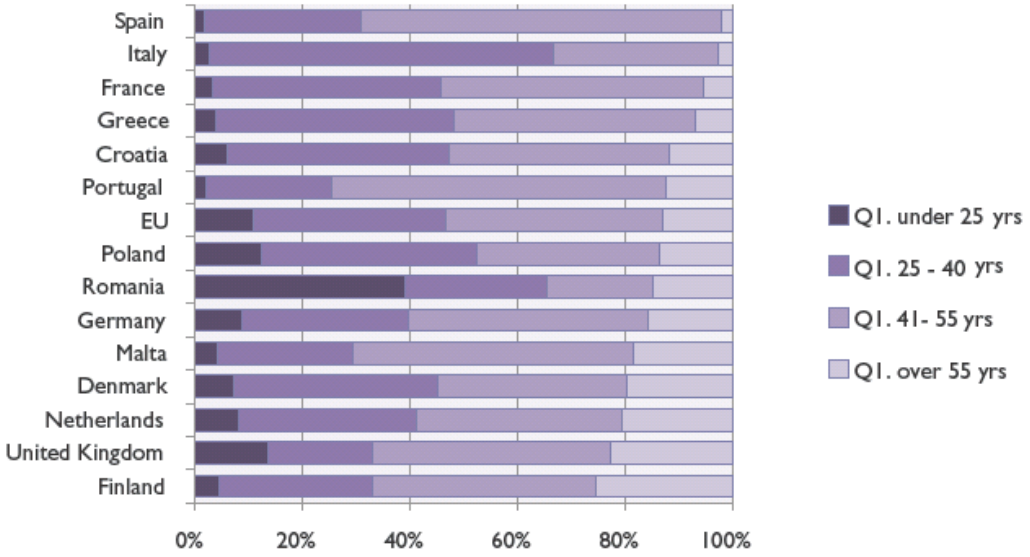
[145] 't Hart, P. and Schotte, 2008

[146] CESA (2009). Annual Report 2007-2008

In a country like Romania, the age-group under 25 years is still relatively large. However, in 2006 and 2007 Romania lost about 2,000 skilled workers per year due to the need for skilled workforce in West-European countries and the United States of America and due to higher wages in these countries.[147]

The ageing population is expected to present worse problems in future. In figure 5.7, an outlook on the shipbuilding workforce in the next ten to fifteen years is shown.[148]

Figure 5.7 EU-14 Shipbuilding technical workforce – age distribution (outlook over 10-15 years from now)



Source: 't Hart, P. and D. Schotte, 2008

Asian countries

When taking a look at the skill slevels in Asia, to a certain extent similar patterns exist although there are clear differences between countries. For example in Korea, the total workforce in shipbuilding can be broken down in management & administration (5%), engineers (10%), technical & skilled workers (27%) and workers at subcontracted companies (57%). In China the majority of the employees is still reported to have a basic education.

However in all three main Asian shipbuilding countries Japan, South-Korea and China a shift towards a higher-skilled workforce can be observed, especially in Japan and South Korea where wage levels are close to European wage levels.

Demographic change and ageing population

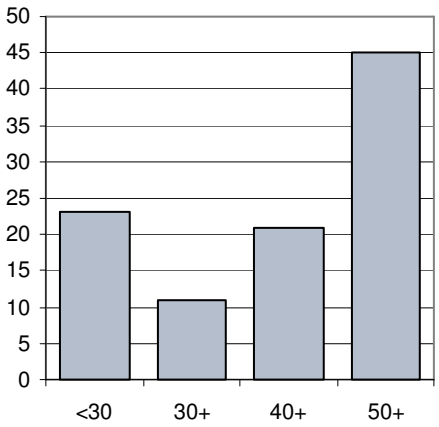
The ageing of population and the workforce in these countries is an issue like in Europe. However, the issue is not equally severe in all countries. Especially in Japan it the population is aging rapidly. Nearly half of the skilled workers in the industry are over 50, while skilled workers in their 30s account for just over 10%. For the shipbuilding sector, the retirements of higher skilled employees is a concern (see figure 5.8). This has triggered

[147] European Shipbuilding Social Dialogue Committee (2008). HR Research Study: Demographic Change & Skills Requirements in the European Shipbuilding & Ship Repair Industry.

[148] It should be noted that this outlook was created before the economic crisis.

serious concerns in Japan. As a result a policy was developed that focuses on the transfer of expertise of shipbuilding skills by effectively training the employees at every phase of their career. Elderly experienced skilled workers are utilised as trainers.[149] For this purpose the Shipbuilding Skills Development Centre was founded in 2004.

Figure 5.8 Age distribution of the Japanese shipbuilding workforce (including sub-contractors) in %



Source: Shipbuilder's Association Japan, 2007[150]

In South-Korea there are no data available on the age distribution of the shipbuilding workforce. However, in these countries an ageing trend is to be found as well. In 2005 24% of the population was aged over 50 in Korea. In 2030 and 2050 this is expected to have risen to 46% and 53% respectively.

In China these numbers are 22% in 2005, 37% in 2030 and 45% in 2050. This will have an impact on the shipbuilding workforce. However the availability of labour appears to be less of an issue for China because of its abundant labour force, especially where it concerns lower skilled labour. In China it is common for shipyards to use many migrant workers (from rural areas): they are cheaper and can be easily laid up in less prosperous times.[151]

5.1.3 Wage costs

Wages have a major impact on the competiveness of a shipyard: labour accounts for a large part of the costs of a ship. The labour share in total production costs strongly depends on the wage levels and the labour intensity of the production process. Figures on this vary from 40-50%[152], while other sources state a percentage between 21-23% in Europe and Japan and 19% in Korea. Indian shipbuilding labour costs are estimated at 8-10% of the total shipbuilding costs.[153]

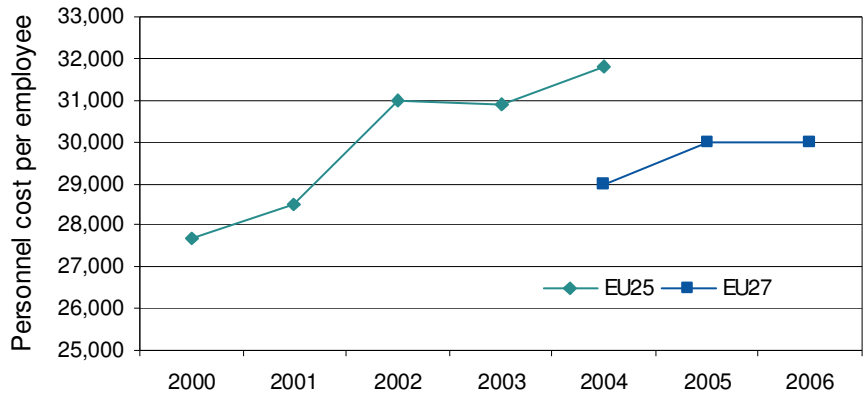
[149] OECD, Working Party on Shipbuilding (2006). Japanese Shipbuilding Policy since 2001
[150] Part of presentation of Mr. Motoyama from Mitsui Engineering & Shipbuilding Co.Ltd.
[151] Ludwig, T. and J. Tholen (2006). Shipbuilding in China and its impacts on European shipbuilding industry.
[152] Stopford, 2009
[153] Angel Broking (2008). Built to Last: Shipbuilding Sector Report.

As a result of labour cost competition, shipyards in high labour cost countries are trying to reduce the man-hours required to build the ship. This can be done by improving facilities, systems and labour productivity. Automation is important, but improved organization, systems and product development may all play a part.[154]

Europe

In general, labour costs in Europe are much higher compared to Asia, although large differences can be observed between individual countries. The average labour cost in the shipbuilding sector is €30,000 per employee in 2006 for the EU27.[155] In **Error! Reference source not found.** the development of the average labour costs between 2000 to 2004 for the EU-25 and EU27 (as from 2004) is shown. It becomes clear that labour costs have been rising over this period, while they are still substantially lower in the new EU members Romania and Bulgaria.

Figure 5.9 Development in labour costs per employee in EU-25 (2000-2004) and EU-27 (2004-2006)

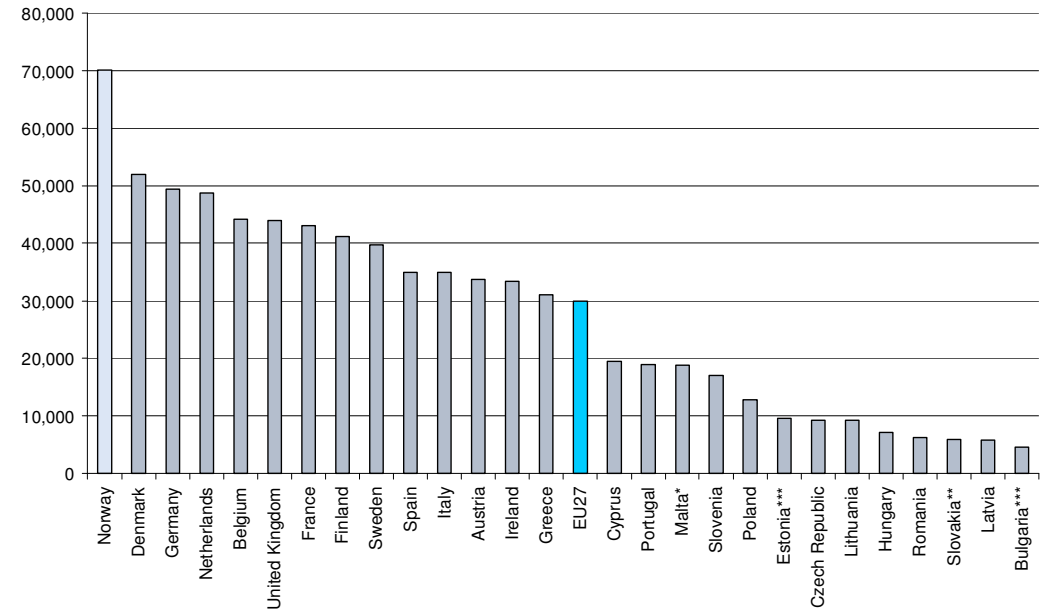


Source: Eurostat, 2009

This also becomes clear if the average labour costs for individual European countries (EU plus Norway) are compared (see figure 5.10).

[154] Stopford (2009)
[155] Eurostat (2007)

Figure 5.10 Labour costs per employee in EU-27 countries and Norway in 2006



* 2002 data ** 2004 data *** 2005 data

Source: Eurostat, 2009

Asia

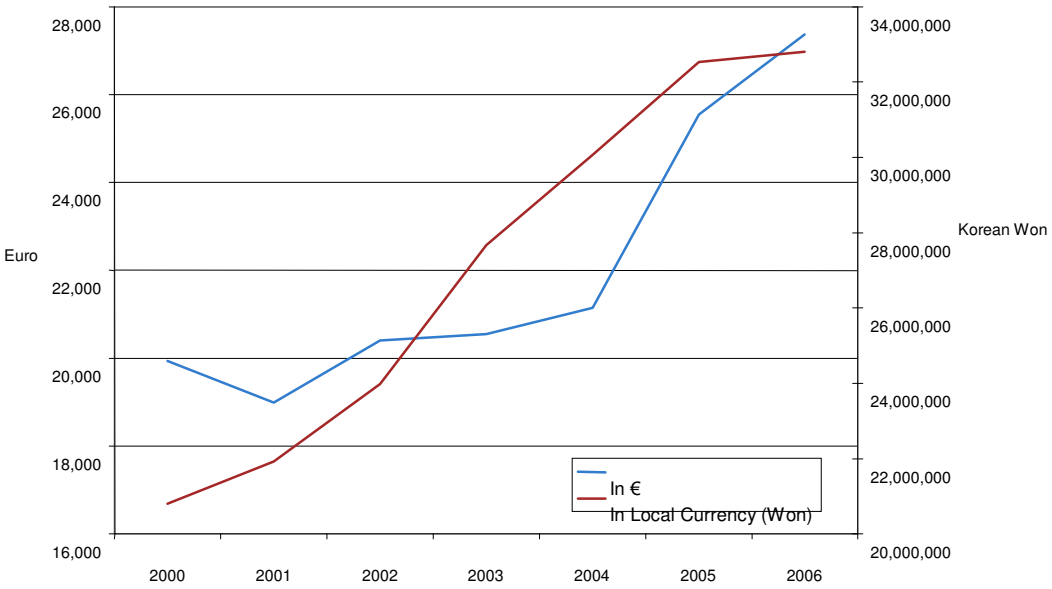
In Asia there are strong differences in wage costs between the main shipbuilding countries. The Chinese labour cost, at US$ 2/day are substantially lower than the labour costs in South Korea (US$ 19/day) or Japan (US$ 25/day)[156].

Although the figures of Europe and Asia do not have the same data source, the figures above give a good approximation of the differences between Europe and Asia. Although the average labour costs in Japan and South-Korea are below the EU27 average, they are higher compared to Poland and Romania. The relatively low labour costs in especially China are a disadvantage for Europe. This has led to a further specialisation of Europe towards more specialised higher value ships. However similar pressures can be observed in Japan and Korea as a result of their wage cost levels.

Also in Japan and Korea increases in wage costs levels can be observed. Figures 5.11 and 5.12 show the labour cost development per employee per year between 2000 and 2006 in South-Korea and Japan. It is noted that differences in wages are corrected for exchange rate changes.

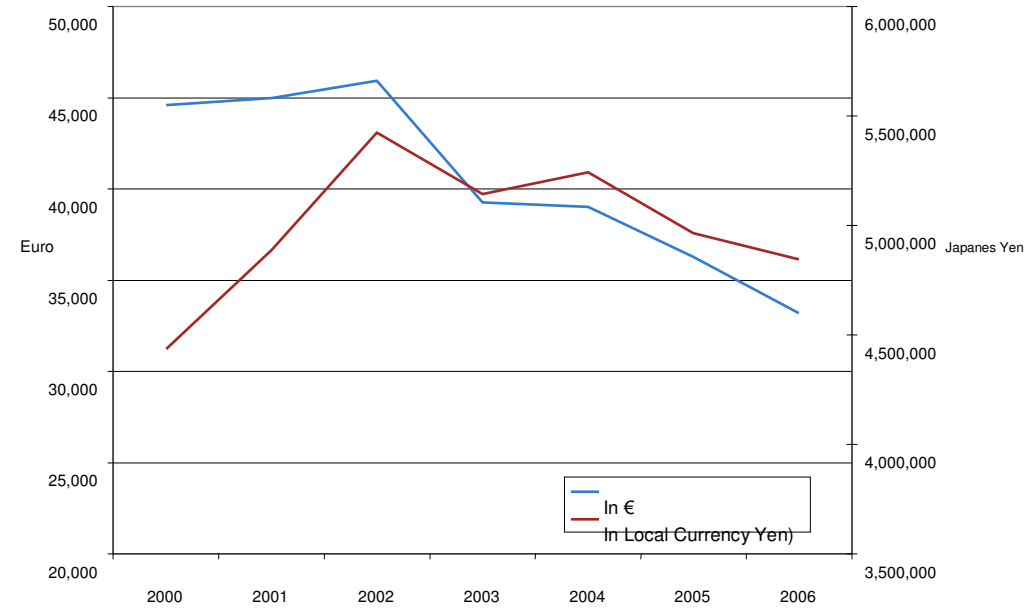
[156] CARE, 2008

Figure 5.11 Labour cost development 2000-2006 in South-Korea in Euro and South-Korean Won (labour cost per employee per year



Source: calculations based on OECD, 2009

Figure 5.12 Labour cost development 2000-2006 in Japan in Euro and Japanese Yen (labour cost per employee per year)



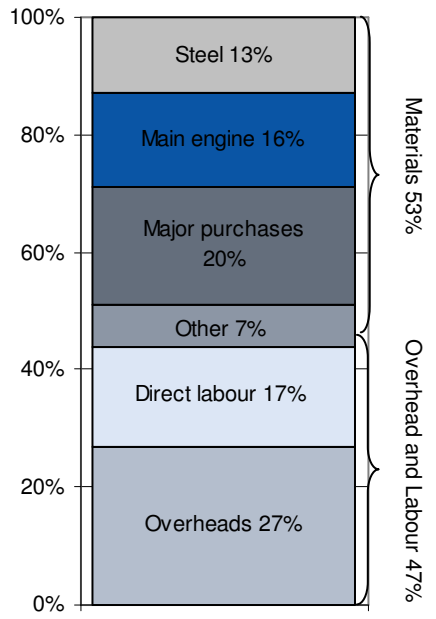
Source: calculations based on OECD, 2009

Also in China an increase in wage costs can be observed. In the sector "manufacturing of transport equipment", wages between 2003 and 2007 increased with 43%.

Share of labour costs in the costs structure

Generally speaking, over half of the cost of the ship is materials. In the figure below, the cost breakdown is shown.

Figure 5.13 Indicative cost breakdown for the building of vessels



Source: Stopford, 2009

As shown in the figure, materials represent around 55% of the total shipbuilding costs; direct labour accounts for 17%, while overheads amount to 27%. However, these figures may vary between ship types and countries. Other sources (Drewry, 2002) show that materials are estimated at 65% of the total ship costs, overheads at 15%, leaving 20% for labour costs.

5.1.4 Conclusions

Europe clearly shows higher labour costs in comparison to its Asian competitors, although low labour cost competition is mainly focused on China and emerging shipbuilding nations. Korea and Japan do not have significantly lower labour costs than Europe and even have higher labour costs than some European countries (incl. Romania). Due to its specialisation in the high value added segment of the market, labour costs are less of an issue in shipbuilding in Europe.

A more prominent theme is the shortage of high educated labour. Although due to market developments the absolute demand for shipbuilding labour is not expected to show strong increases, there is an ongoing demand for highly skilled labour. This is further aggravated by the ageing population leading to the retirement of current skilled employees in the coming two decades.

5.2 Access to raw materials: steel

For the shipbuilding sector, access to cheap raw materials is very important in order to keep down input costs of vessels. The main raw material – one that determines the cost price of a vessel to a large extent – is steel (next to some non-ferrous metals like copper, nickel and aluminium).

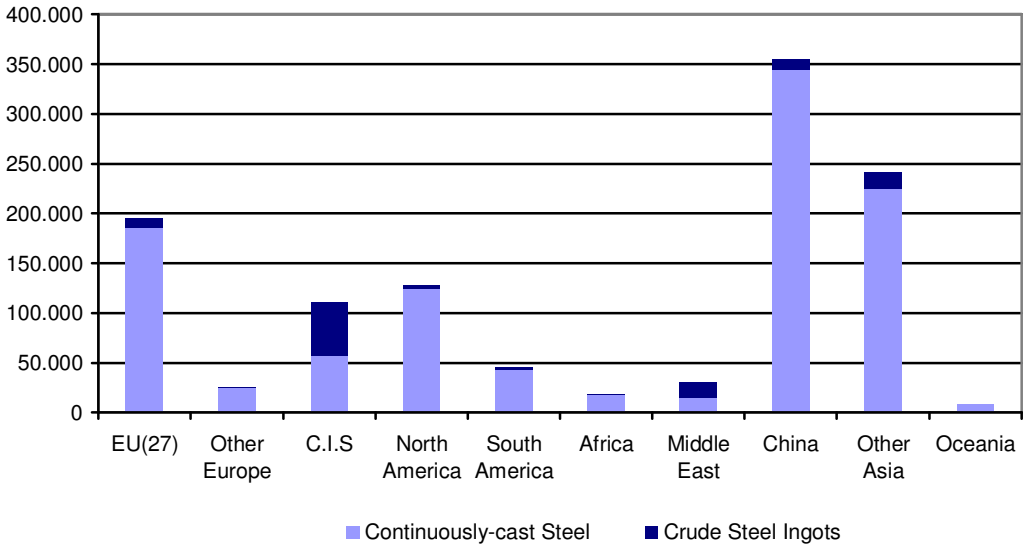
The importance of steel is emphasised also by the importance given to it by the OECD WP6: "*Regarding the item [steel] … the proposed activity could include a regular monitoring of major supply market developments. Shipyards around the globe are currently experiencing significant cost inflation*" (LeaderSHIP 2015). Also during the JECKU 16th Top Executive Meeting (San Diego, October 2007) price and availability of raw materials were considered crucial issues (JECKU, 2007).

With steel prices driving a large part of the costs for building ships, three aspects are worth monitoring: 1) supply of steel; 2) demand for steel; and 3) its price developments, including comparisons of EU steel prices with other parts of the world.

5.2.1 Production, capacity and utilisation in steel production

Figure 5.14 displays the production of crude steel (separated into continuously cast steel and steel ingots). Particularly noticeable are the very high share of China and Other Asia in production of crude steel. Following Asia, the EU is the second largest world steel producing region in the world with a total production of 208 million tonnes in 2007, equal to a market share of approximately 16 percent. With a market share of 56 percent in 2007, Asia is currently by far the world's largest producer of crude steel and finished steel products. China alone takes up 36 percent. As the market supply per head of population in China is only about two-thirds that of the EU or the USA, sustained growth can also be expected to continue in the future. The International Iron and Steel Institute (IISI) reports that in the first four months of 2008, China produced 169.8 million tonnes of crude steel, an increase of 9.1 percent compared to the same period in 2007.

Figure 5.14 Production of crude steel by casting process in world regions, 2005 (thousand metric tonnes)



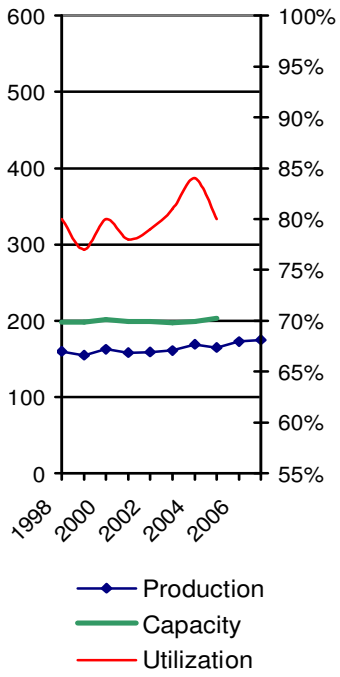
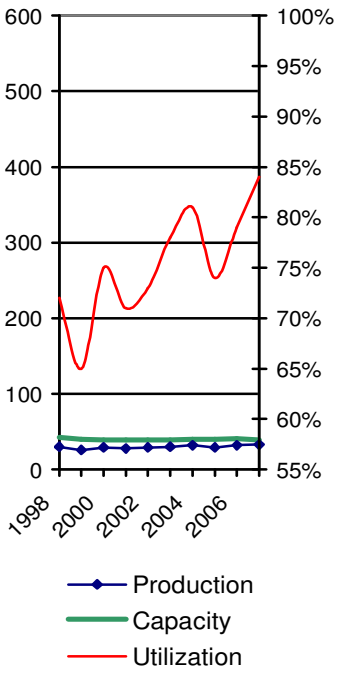
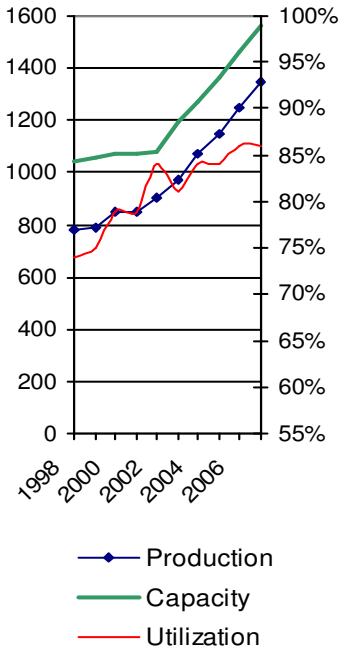
Source: Steel Statistical Yearbook, 2008

In addition, figure 5.14 illustrates the development in the world steel industry's capacity utilization from 2001 to 2007. It also depicts the development in the EU15, the EU12 new Member Sates, and some key competing steel production locations. The area between capacity and production is equal to overcapacity, and the development in the size of the gap reflects the development in capital utilisation.

The global steel industry's capacity, production and utilisation have increased significantly over the past decade, especially since 2002. Global production capacity surpassed 1.5 million tonnes in 2007. Capacity utilisation increased from 73 percent in 1998 to 85 percent in 2006 and 2007. While the overall gap between production and capacity has reduced globally in recent years until 2007, significant regional differences remain. A capacity utilisation rate of about 85 percent is considered close to the maximum possible production rate (= full capital utilization) when taking into account bottlenecks, logistics, normal and exceptional maintenance, strikes, and accidents.

Most of the capacity and production increase over the past decade has taken place in China. In China alone, the capacity has increased by more than 60 million tonnes a year since 2004. In comparison, this increase is larger than the entire annual production of the largest EU steel producing country, Germany. Capacity utilisation in China was 86 percent in 2007. For flat products, China in particular, but also South Korea and Japan, have an overcapacity due to over-investments in the past years; this overcapacity has increased significantly over 2008 and the beginning of 2009. Other countries with relatively high capacity levels and with increasing capacity are India, Brazil, and the C.I.S.

Table 5.2 Development in production, capacity and utilisation in crude steel production (1998 – 2007)

EU15	New Member States	World
		

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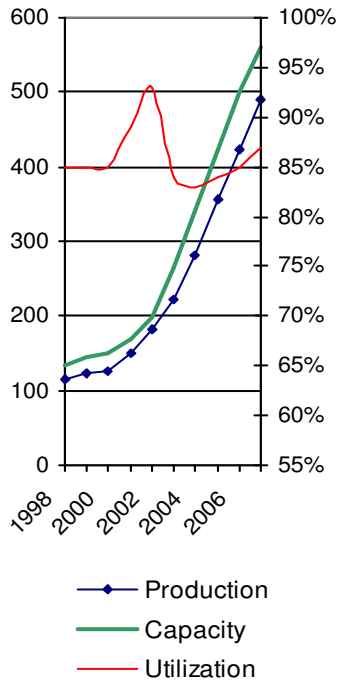
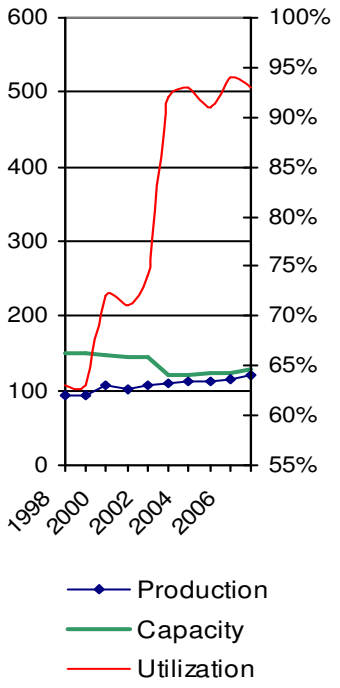
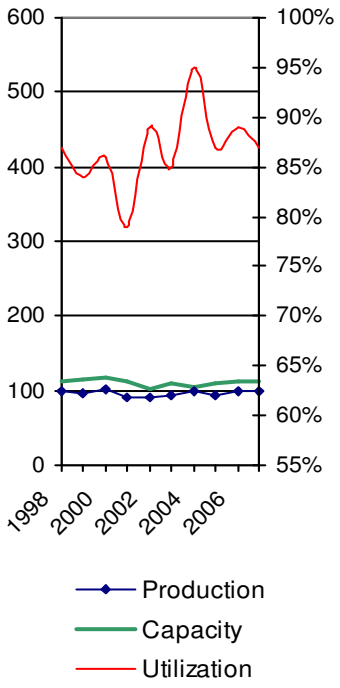
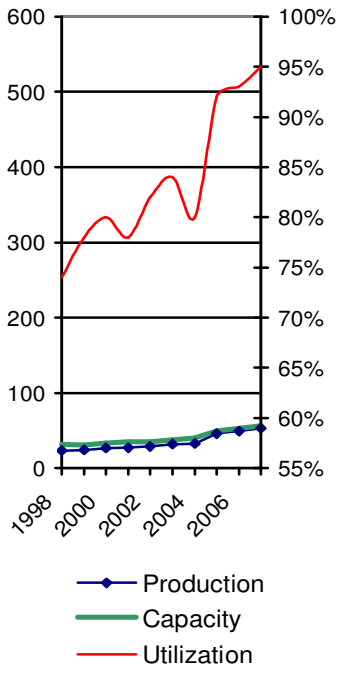
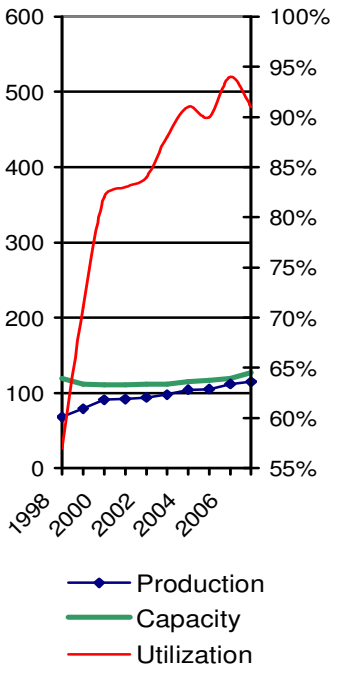
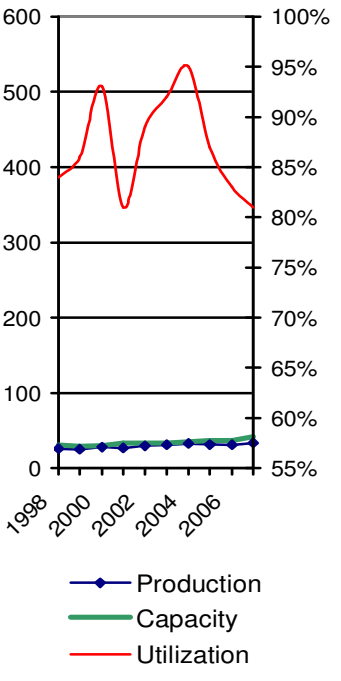
China	Japan	USA
		
India	**Russia and Ukraine**	**Brazil**
		

Source: OECD Steel Committee. Data for EU27 are incomplete for 2006 and 2007.

Notes: Capacity and production are displayed in million tonnes. Utilisation is calculated as the percentage of production to capacity. Thus the left scale applies to production and capacity, whereas the right scale in percentages applies to utilization.

By comparison, the EU27 crude steel production increased by 15,287 million tonnes from 1998 to 2007. The capacity utilisation of crude steel production in the EU27 is 85 percent (2007) and the capacity seems well balanced with production. The capacity utilization by 85 percent in the EU27 is noticeable with a view to the fact that since 1959 overcapacity has been a problem in the European steel industry, and the early 1980s in particular marked a period of low capacity utilisation in a time of decreased demand for steel. However, massive reorganisation and restructuring of the European industry, first in the old EU Member States (in the 1980s) and more recently in the new EU Member States (over the last decade) [157], meant that excess capacity and capacity utilisation has gradually improved until 2007. However, the financial crisis has reversed this process significantly in 2008 and 2009.

5.2.2 Steel consumption

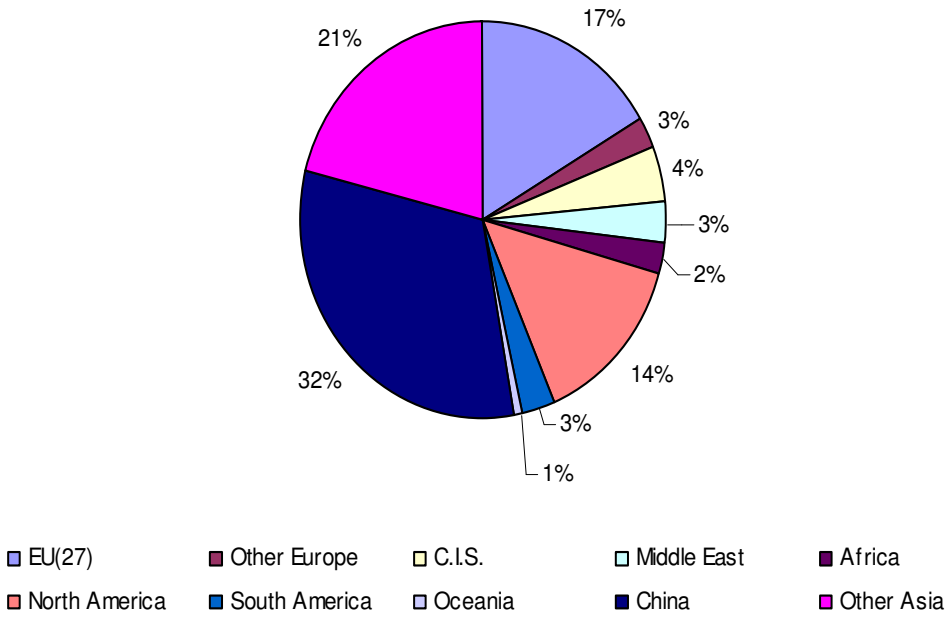
The increases in crude steel production underestimate increases in consumption of finished products as technical improvements within the industry have led to more saleable products being produced per tonne crude steel - a trend which could already be seen in 1997 (cf. Mytton & Lewis, 1997). Consequently, total consumption has in general grown a little more than total production until 2008. Moreover, the geographical patterns of production and consumption, as well as imports and exports, differ.

Figure 5.15 shows current global consumption by region. Asia is the largest steel consuming region in the world with 53 percent, of which China alone accounts for 32 percent. The EU27 is the second largest steel consuming region, followed by North America (USA). Together these three regions account for approx. 84 percent (2006 figures) of world finished steel consumption (as well as crude steel consumption) and are thus the driving forces in world steel demand with China in the anchor position.

Accelerating in 2001, world steel demand has experienced significant annual increases, primarily driven by steel consumption in Asia (China). Chinese steel consumption reached a level of 384.3 million metric tonnes of crude steel and 357.4 million metric tonnes of finished steel in 2006 - a change of approximately 9 percent compared to the previous year. Following years of significant growth, world steel demand growth decelerated in 2007 in line with declining consumption in North America. In 2008, demand for finished steel products dropped further as a result of the global economic downturn.

[157] Currently, restructuring in the new member states only still happens in Bulgaria and Romania.

Figure 5.15 Share of global apparent consumption of finished steel by regions, 2007



Source: Steel Statistical Yearbook, 2008

Note: The IISI data are based on a broad definition of steel consumption, including steel tubes and castings. IISI uses ASU (apparent steel use) = Total Deliveries + Imports from 3rd countries - Exports to 3rd countries - steel industry receipts (to prevent double counting).

5.2.3 Iron ore and steel prices

The European steel industry is facing increased pressure in relation to access to raw materials for steel production and other metal production. Furthermore, prices for all kinds of metals have reached record high levels in 2007 and 2008. Iron ore prices are traditionally set annually when the world's largest iron ore consumers agree on contract costs with suppliers. Three companies, i.e. Vale (formerly CVRD), Rio Tinto, and BHP Billiton, control 75-80% of the iron ore market (approx. 75 percent in 2006 which seems to have increased since then). Even though a small quantity of iron ore is sold on the spot market, the benchmarked agreements tend to dominate the sector. Once one contract is agreed, it tends to become a benchmark for other agreements. With the high prices, new forms of hybrid contracts are being tried out with a larger part of the quantity in spot market prices (Times online, 2008; Economist 2008).

As shown in Figure 5.16, iron ore prices have increased substantially since 2004 due to bottlenecks in the supply chain resulting in difficulties to meet high demand. EconStats reports a similar tendency in spot prices. In January 2007, spot prices were $75 US/ton iron ore and prices have increased monthly to the $196 US/ton reported in February 2008. Iron ore prices and spot prices have dropped again significantly in 2008.

Figure 5.16 Iron ore prices – annual contract prices, 1976 – 2008

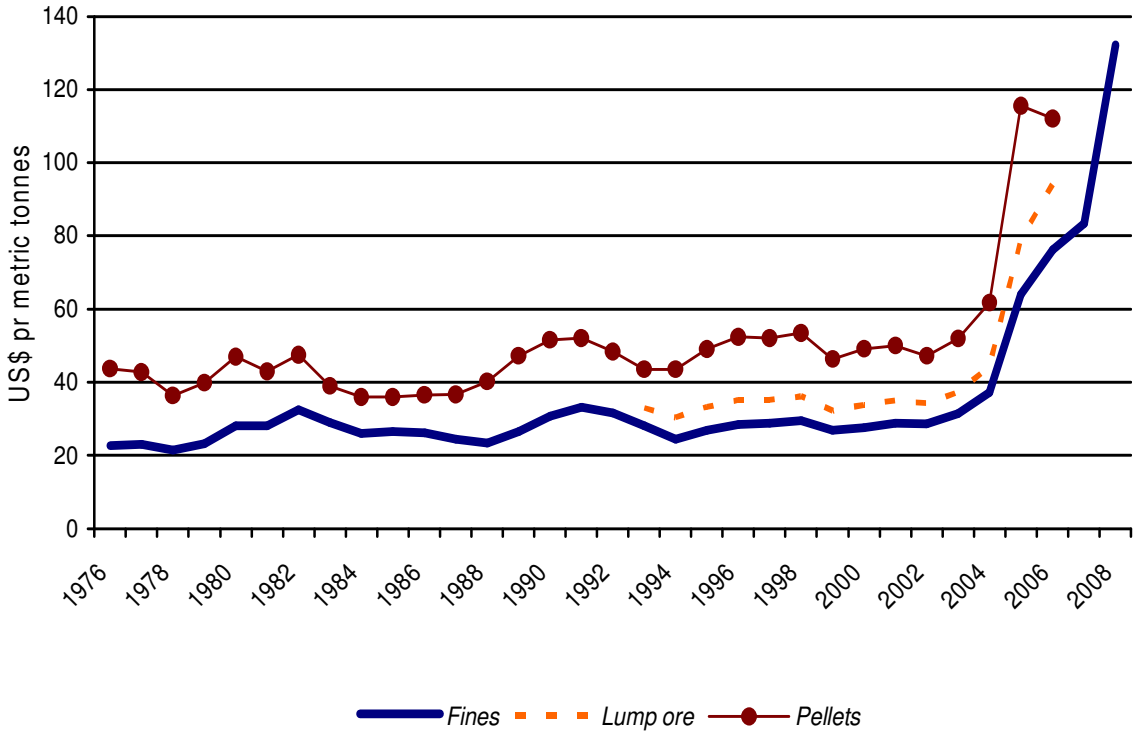
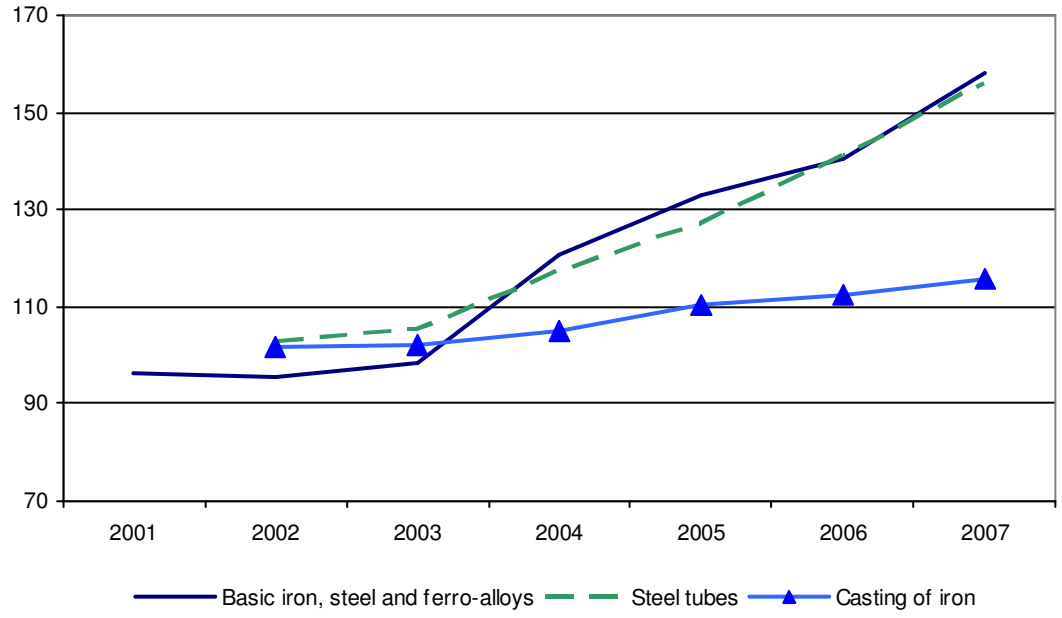


Figure 5.17 Development in steel prices: total output price index, EU27, 2001 – 2007



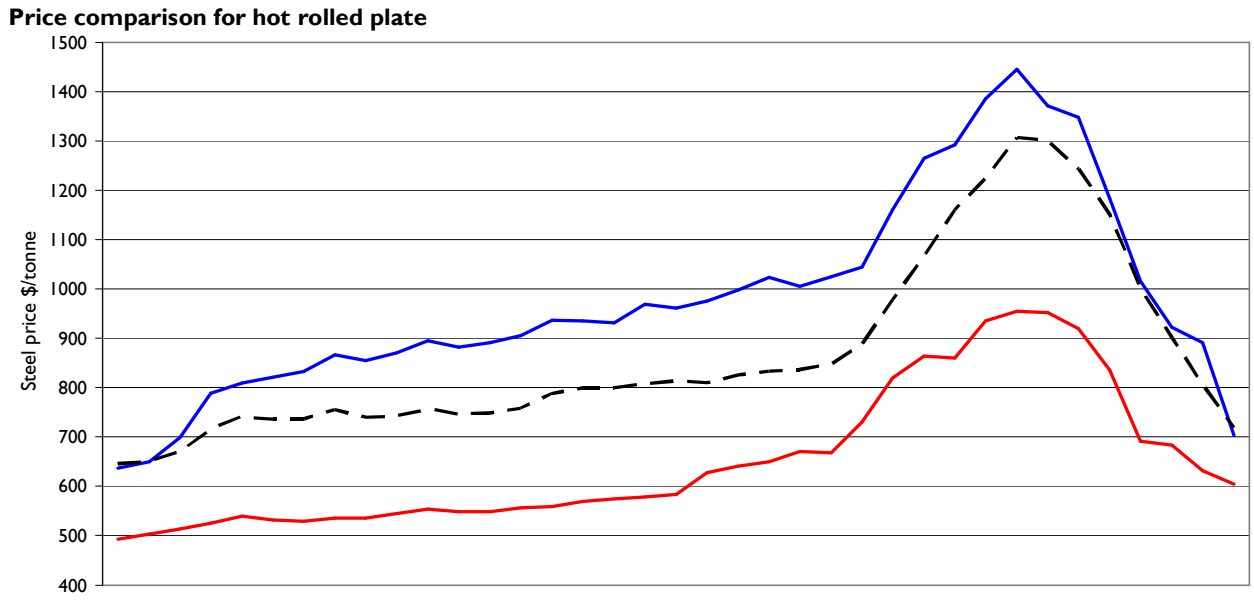
Source: EUROSTAT

Related directly to the price for iron ore is the price for steel. In the early 1980s, falling steel product prices were another severe concern for the European steel industry alongside low

capacity utilization. In the 1990s, prices continued to decrease. From 2003 onwards, as shown in Figure 5.17, steel prices have increased dramatically (for steel and ferro-alloy products as well as steel tubes and iron castings).[158] The recent increases in product prices signify that market conditions for the EU steel industry in this regard have been generally favourable.

The reason why steel prices have increased significantly since 2003 and onwards can be attributed to increasing raw material prices (iron ore) and a tightening supply-demand balance (rising utilisation rates), fuelled by rapid demand growth particularly in China but also elsewhere, with real consumption rising by on average 4.8 percent per annum in the 2003-2007 period, and supply bottlenecks in the whole steel supply chain mainly in transport infrastructure for supply of iron ore and coking coal. However, all other things being equal, increasing prices also indicate favourable conditions for increased earning/products.

Figure 5.18 Steel price comparison for hot rolled plate



	02-06	03-06	04-06	05-06	06-06	07-06	08-06	09-06	10-06	11-06	12-06	01-07	02-07	03-07	04-07	05-07	06-07	07-07	08-07	09-07	10-07	11-07	12-07	01-08	02-08	03-08	04-08	05-08	06-08	07-08	08-08	09-08	10-08	11-08	12-08	01-09	02-09
Asia	493	503	513	526	540	532	529	535	535	545	554	548	548	556	559	570	575	578	583	628	641	650	670	668	730	820	864	860	936	955	952	919	836	691	684	632	605
EU	636	649	699	789	810	822	833	865	854	871	895	881	891	905	936	935	931	969	962	975	998	1023	1005	1024	1044	1161	1265	1292	1385	1445	1371	1348	1183	1016	922	891	703
World	646	651	670	717	741	736	737	755	740	743	757	747	748	758	788	800	800	808	814	810	826	833	837	847	887	978	1065	1160	1225	1307	1300	1243	1150	1000	901	806	719

Source: MEPS International, cited in CESA Market monitoring report June 2009

The figure above shows that until June 2008 prices have gone up, even though more recently they have dropped in the wake of the Global Financial Crisis and lower levels of aggregate demand, also for steel, that followed. The figure, however, also shows that – even though in the EU shipyards benefit from a tight network of highly specialised quality producers – the European shipyards are at a disadvantage compared to their Asian and other global competitors with respect to the price of steel per tonne. The price differential between

[158] Prices index data for steel casting is not available for the entire EU.

Europe and Asia for shipbuilding steel plates was quite significant, indicating that European shipyards had to pay a significant mark-up over the price available to their Asian counterparts. For steel intensive ships, steel can represent up to 25 percent of the total cost of the vessel. With existing price gaps, it was becoming nearly impossible for European yards to offer competitive prices in such market segments.

An important development in this respect is that since mid 2008 steel prices have dropped dramatically as a result of the economic crisis and subsequent changes in steel demand. This is clearly shown in the steel prices for hot rolled plates.

5.3 Knowledge: R&D and innovation[159]

Knowledge, R&D and innovation are of strategic importance for the competitive position of the EU shipbuilding sector. As the EU shipbuilding sector is increasingly specialising into the high knowledge- and technology-intensive niches, knowledge is becoming an ever more important input in its value chain. Some specific characteristics of these niches of the shipbuilding sector contribute to this strategic importance of knowledge:

- *One-of-a-kind or short-series production*;
  Demand in the high-tech niche is generally characterised by a limited number of ships and a tailor-made production process. This implies that innovation – and associated R&D – is an inherent characteristic of the individual end product. It is not always possible to standardise innovative applications completely; it is possible for example to standardise developments in hull design for standard ships, but this is much more difficult for built-up according to specific client preferences.
- *Sales based on concept design*;
  Ships in these niches are sold mostly on the basis of the concept rather than the detailed end product specification. This implies that most innovation activities are part of the production process (after signing the sales contract) and an inherent characteristic of the final product.
- *Complex production chains*;
  When comparing production in the high-tech niche with more mass-oriented production processes, the former is generally characterized by a more extensive network of highly specialised subcontractors. This implies that there is a high degree of R&D and / or innovation expenditure throughout the value chain, and a dense knowledge network is required (yards and suppliers).

Especially innovation is thus often built into the production process and part of the production costs, implying that it can be hard determine expenditures on innovations. With respect to R&D expenditures, some figures are available at OECD level as well as from annual reports from companies; these are presented below.

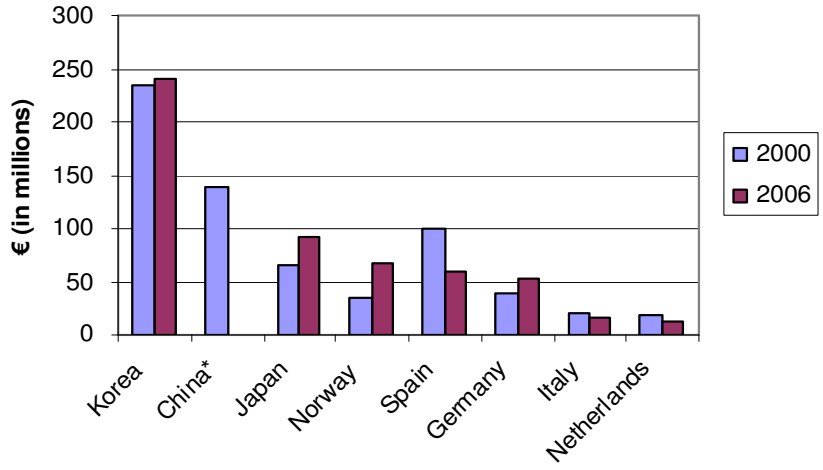
[159] In distinguishing R&D from innovation, the terminology from the RDI Framework is used. In practice when looking at figures at company level, the distinction can become somewhat blurry, as the specific aim of R&D is often to innovate and to market those innovations. Given the characteristics mentioned in this section, this also implies that both R&D and innovation processes are integrated into the production process, more so than is generally the case in many other sectors. For this reason, annual report figures often state "R&D expenditures", but in fact this may be to a large extent focussed on innovation. Also, the figures given above on R&D expenditure as provided by OECD STAT are based on reported BERD in an enterprise basis, yet not all countries follow a strict enterprise basis for R&D expenditure allocation (which is especially relevant for the maritime equipment sector, where allocation to industry classes can be difficult). Therefore the figures on R&D (and innovation) as presented in this section should be interpreted with some caution.

5.3.1 Developments in R&D expenditure

R&D expenditures in shipbuilding at country level

As Figure 5.19 shows, absolute R&D expenditures have become more important between 2000 and 2006; expenditures of most of the largest shipbuilding countries have increased. In absolute terms, South Korea has been the country with the highest R&D expenditures for years. China takes a second place in the absolute ranking. Within the EU, R&D expenditures of Norway and Spain are highest; expenditures of Spain, Italy and the Netherlands slightly decreased in the six year period.

Figure 5.19 R&D expenditures on Shipbuilding by country in 2000 and 2006 (in million euros)



Source: OECD STAT (code 351)

* Figure for China 2006 is unknown

When looking at R&D expenditures in relative terms, the picture is somewhat different. Table 5.3 shows R&D ratios for 2006, relative to production value. According to these figures, all countries have a R&D ratio below 1%, which is well below the 3% aim of the Lisbon Agenda. Korea has the highest R&D ratio, while Italy and the Netherlands have the lowest R&D ratios. In the EU, Germany and Norway rank highest.

Table 5.3 Production value, R&D expenditures and R&D ratio of shipbuilding industry in 2006 (in million euro)

	production value	R&D expenditures	R&D ratio
Korea	29,738	240	0.8%
Japan	17,669	92	0.5%
Norway	10,469	66	0.6%
Italy	7,562	17	0.2%
Germany	7,150	53	0.7%
Netherlands	3,864	12	0.3%

Source: OECD STAT (code 3510 Building and repairing of ships and boats)

* Exchange rates used for production value calculations: Korea = 1198.58 Won/Eur, Japan = 146.02 Yen/Eur, Norway = 8.05 NKR/Eur

Shipbuilding

R&D expenditures in shipbuilding at company level

Table 5.4 depicts some R&D expenditure figures at company level for 2008. Overall, R&D expenditures rose further over the last years. When comparing the level of R&D expenditure of European and Asian shipbuilders, the R&D budgets in Asia are generally higher in absolute terms. Yet, European budgets are observed to grow somewhat faster. The R&D budget of Finantieri was € 50 million[160] in 2007; for IHC Merwede this was € 30 million[161] in 2008. These budgets are both larger than national R&D expenditures of respectively Italy and the Netherlands in 2006. Asian shipbuilders are also raising their R&D budgets. For instance Hyundai HI had R&D expenses of € 107 million in 2008 and will raise it to € 237 million in 2009.

When looking at R&D ratios, relative to revenues, the European shipbuilders have considerable higher ratios than the South Korean companies, where they are all below 1%. This may also explain why the level of effort in IPR is rather low among shipbuilders.

Table 5.4 R&D expenditure ratio's for shipbuilding and related companies in 2008 (in million euro)

	Revenue	R&D expenditure	R&D ratio
European shipbuilders			
Fincantieri *	2,572	50	1.9%
IHC Merwede	1,090	30	2.8%
Asian shipbuilders			
Hyundai HI	15,871	107	0.7%
DSME	6,895	33	0.5%
Samsung HI	6,640	28	0.4%
Equipment manufacturers			
Wartsila	4,612	121	2.6%
MAN B&W	2,542	156	6.1%

Sources: Annual reports

Exchange rate: 1 euro is 1606.09 South Korean Won

* 2007 figure

Marine equipment

Both R&D expenditures and R&D ratios of the equipment manufacturers mentioned in the table above are higher than for the shipbuilders. This reflects the importance of R&D (and innovation) within parts, components and sub-systems in the value chains of shipbuilding. Therefore for them IPR may also be of more importance than for shipyards.

[160] Fincantieri, Annual report 2007

[161] IHC MERWEDE: major growth again in 2008, press release 2 April 2009

5.4 Access to capital – ship financing

The demand for ships is – besides shipping freight rates, price, seaborne trade expectations and market sentiment – also depending on the availability of ship financing. If financial means are difficult to obtain, the demand for ships will be low.

The financing of ships differs from other asset based industries like real estate and aircraft. Ships are not just seen as a means of transport, but also as a speculation[162]. This is caused by unpredictable earnings, low levels of disclosure, unclear defined ownership and less formal corporate structures of shipping companies. In addition, the revenue flows are highly volatile, as are asset values[163]. As a result, ship finance is generally regarded as a specialist business.

Ship Financing Methods

Generally speaking, a buyer can finance a ship with equity or with debt. Either way, he has to find a way to raise funds. There are four methods for raising funds for ship financing, of which the rules and regulations can differ across countries.

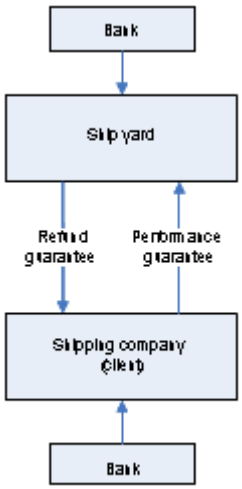
- *Private funds*: this can be own funds or money from private investors
- *Bank loans*: this is the most important source of financing. The three main types concern mortgage-backed loans, corporate loans and shipyard credit.
- *Capital markets*: established shipping companies can use this market to raise finance (public offering, bond issue)
- *Stand alone structures* (special purpose company, limited partnership, finance lease, operating lease, securitization)

The principles of financing newbuildings are generally the same; however, two additional issues should be taken into account:

- The capital cost of a new ship is generally too high relatively to its likely spot market earnings;
- The finance is needed before the ship is built. In other words, there is a period of time when part of the loan is drawn but the hull is not available as collateral.

When financing a ship there are basically two methods:

- *Progress payments by the client*. The client pays every step of the construction. The client asks for guarantees of the shipbuilder for the delivery. At submission of the shipbuilders guarantee the client asks for money at the bank. After the delivery, the shipbuilder has to have performance guarantees. When prefinancing a ship in this method, there are , generally speaking 5 payment moments, linked to the following milestones:
  - Contract signing
  - Steel cutting
  - Keel laying
  - Launching
  - Delivery



[162] Stopford, M. (2009). Chapter 7: Financing Ships and Shipping Companies. In: Maritime economics.
[163] Stopford, M. (2009). Chapter 7: Financing Ships and Shipping Companies. In: Maritime economics.

A buyer can negotiate on the payment percentage for each milestone. However, in times of recession a ship yard would like to have a high percentage during the first moments in order to have sufficient working capital. The buyer on the other hand, can have troubles with the bank obtaining the loan. To avoid a stalemate, refund and performance guarantees are provided by the banks in order to minimise risks.

- *20/80 method*. The client pays 20% up front and 80% at delivery. The shipbuilder asks for guarantees of the client for the payment. Simultaneously, the shipbuilder asks for money at the bank for the construction of the ships.

These issues make it difficult to get newbuilding finance from commercial banks, especially during recessions when shipyards are keen to win orders[164]. Because of this, there is a long tradition of shipbuilders offering financing to their customers, often with the support of their governments (through government controlled credit agencies). The government intervenes and makes shipbuilding credit more attractive by giving a guarantee to the loan, offer subsidized interest or by agreeing on a one- or two-year moratorium on interest[165].

CESA[166] indicated that in some areas – especially Turkey and China – greenfield yards have been established on the basis of speculative newbuilding activities, probably funded by (public or private) investors. In the booming market of the last years, investors would be relatively sure about the market taking up their vessels, and they would benefit from the ability of quick supply, as opposed to existing yards with delivery delays due to their overloaded order books. In declining market periods, these yards the likely the first to be affected.

Box 5.3 Impact of financial crisis on ship financing

The world's shipbuilding industry is now facing a number of challenges following from the economic crisis affecting all major economies, and which will inevitably lead to falling demand. Since capacity has increased rapidly the last decade, this will result in global overcapacity which will place the economic viability of the industry under pressure in some parts of the world.

The current crisis has a strong impact on the possibilities for ship financing, since it is becoming more difficult to obtain bank credit in order to be able to make advanced payments. This can differ amongst countries: in countries where advance payments are high, the cancellations will be less numerous compared to countries where the advance payment is lower or where ships are built on a speculative basis.

Either way, there is the risk of an increased tendency of governments to set up national support programs by providing subsidies or other market distorting measures. This is worrying, since this can create major structural problems even in the most efficient shipbuilding industries.

Source: based on http://www.oecd.org/dataoecd/26/52/40194862.pdf

[164] See Stopford, M. (2009). Chapter 7: Financing Ships and Shipping Companies. In: Maritime economics.
[165] See Stopford, M. (2009). Chapter 7: Financing Ships and Shipping Companies. In: Maritime economics.
[166] CESA Shipbuilding Market Monitoring Meeting 17-03-2009, Brussels

6 Regulatory and other framework conditions

The shipbuilding sector operates in a regulatory framework that is defined by various substantive legal fields. These fields are affected by measures in force at the international, regional (EU) and national level. This chapter discusses the main regulatory issues and framework conditions that affect the shipbuilding sector.

Firstly, the overall **competition policy framework** is discussed (section 6.1), as under the EU competition policy regime, rules on state aid and subsidies are specified. For the shipbuilding sector, this is specifically relevant in the context of the following fields:

- **Financing: guarantee schemes and export credits** (discussed further in section 6.2);
- **Research, development and innovation** policies (section 6.3).

In addition to these themes affected by the competition policy regime, other regulatory fields affecting the shipbuilding sector specifically include:

- **IPR regime** (section 6.4);
- **International trade conditions** (section 6.5);
- **Standards and classifications** (section 6.6).

6.1 Competition policy framework

Competition policies and competition authorities are introduced to make sure markets are open to all companies and companies in the market compete with each other; entry and exit conditions are eased by removing government erected barriers, structural barriers and/or entry deterrent strategies of incumbents. In other words, they try to prevent monopolies, cartels and state aid policies disturbing competition. The objective of competition policy is to encourage companies to supply products and services to consumers that they want at lowest prices possible and to support innovations. The purpose of competition authorities is to examine and monitor the markets and ongoing practises, to find possible cartel arrangements, and fine companies that are breaking the competition policy legislation.

6.1.1 Competition policy framework: international level

At the international level, multilateral cooperation on competition issues takes place through various channels, including the International Competition Network, the OECD Competition Committee and the World Trade Organisation. However, discussions on designing a multilateral agreement on competition, (e.g. under the WTO) have as yet not materialized.

At a bilateral level, competition issues are included in various bilateral agreements. The EU has established *cooperation agreements on competition policy* with the USA, Canada, Japan and South Korea (see box below). These agreements generally include provisions on the exchange of information and coordination of enforcement activities between enforcement authorities. Also agreements on positive and traditional comity are usually included.[167] In addition, competition policy issues are usually included in the *free trade agreements* that are negotiated at bilateral (or bi-regional) level. Various *other forms of cooperation* between competition authorities take place at bilateral level between countries, e.g. based on the 1995 OECD recommendation.[168] China and the EU have agreed on a structural EU-China Competition Policy Dialogue that includes possibilities for technical assistance and capacity building for China (see box below).

Box 6.1 Cooperation on competition policy issues: EU – Korea and EU – China

EU- South Korea Agreement concerning cooperation on anti-competitive activities

This Agreement, signed in May 2009 and entered into force on 1 July 2009, provides for cooperation between the European Commission and the Korean competition agency (Korean Fair Trade Commission, KFTC). The basis of Korean competition law is the Monopoly Regulation and Fair Trade Act that is enforced by the KFTC and deals with, amongst others, cartels, abuse of dominant positions, mergers and acquisitions affecting the Korean market, consumer protection and competition advocacy. In the EU-South Korea Agreement, provisions are given for:

- Reciprocal notification of cases under investigation that may affect significant interest of the other party;
- The possibility of coordination of enforcement activities between the two authorities and rendering assistance;
- Positive and traditional comity;
- Exchange of information, without infringing each party's confidentiality obligations;
- Regular bilateral meetings between the authorities to update each other on enforcement activities and priorities and on economic sectors of common interest, to discuss foreseen policy changes and other matters of mutual interest regarding the application of competition laws.

EU-China competition policy dialogue

In 2008, China's first comprehensive competition law entered into force (the PRC Antimonopoly Law), dealing with merger control, abuse of dominant position and restrictive agreements. The main authorities dealing with competition policy in China are the Fair Trade Bureau, the Anti-Monopoly Bureau and the National Development and Reform Commission.

In 2003, the Chinese government and DG Employment agreed on the EU-China competition policy dialogue, therewith establishing a permanent mechanism for consultation and transparency in the field of competition between the two sides with the aim to enhance the EU's technical and capacity building assistance to China (in the context of the EU-China Trade Project). On the most recent dialogue session in 2007, the new Chinese anti-monopoly law and the Chinese Competition Authorities (to be newly established) were discussed.

[167] *Positive comity* implies that competition authorities on both sides may ask the other side to take enforcement actions, usually while *traditional comity* refers to the principle that authorities on each side must take the other's significant interest into account when taking enforcement action.

[168] C(95)130/FINAL, Recommendation of the Council concerning Co-operation between Member Countries on Anti-competitive Practices affecting International Trade, OECD, 27 July 1995.

6.1.2 Competition policy framework: EU level

EU competition policy regime

At EU level, the main common rules on competition are laid down in artt. 81 – 89 EC Treaty. The two main substantive antitrust articles are:

- Art. 81 dealing with **cartels** and similar behaviour by prohibiting "*all agreements between undertakings, decisions by associations of undertakings and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition within the common market*". This provision is subject to some exceptions.
- Art. 82 prohibiting **abuse of a dominant position** in the common market by one or more undertakings.

The main substantive article on **state aid** is art. 87 EC Treaty (see box below). Art. 87 (1) in principle prohibits state aid distorting competition. Art. 87 (2) and art. 87 (3) respectively give some *de iure* derogations and some discretionary derogations from this incompatibility of state aid with the common market.

Based on these provisions and their derogation possibilities, various rules have been laid down for specific areas, setting precise conditions for such derogations.

Box 6.2 Article 87 of the EC Treaty

Art. 87 of the EC Treaty

1. Save as otherwise provided in this Treaty, any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favoring certain undertakings or the production of certain goods shall, in so far as it affects trade between Member States, be incompatible with the common market.

2. The following shall be compatible with the common market:

(a) aid having a social character, granted to individual consumers, provided that such aid is granted without discrimination related to the origin of the products concerned;

(b) aid to make good the damage caused by natural disasters or exceptional occurrences;

(c) aid granted to the economy of certain areas of the Federal Republic of Germany affected by the division of Germany, in so far as such aid is required in order to compensate for the economic disadvantages caused by that division.

3. The following may be considered to be compatible with the common market:

(a) aid to promote the economic development of areas where the standard of living is abnormally low or where there is serious underemployment;

(b) aid to promote the execution of an important project of common European interest or to remedy a serious disturbance in the economy of a Member State;

(c) aid to facilitate the development of certain economic activities or of certain economic areas, where such aid does not adversely affect trading conditions to an extent contrary to the common interest;

(d) aid to promote culture and heritage conservation where such aid does not affect trading conditions and competition in the Community to an extent that is contrary to the common interest;

(e) such other categories of aid as may be specified by decision of the Council acting by a qualified majority on a proposal from the Commission.

6.1.3 Specific competition rules relevant for the EU shipbuilding sector

For the EU shipbuilding sector, the specific horizontal compatibility rules with the competition regime laid downs in the following thematic fields are relevant:

- Finance: guarantee schemes and export credits;
- Research, development and innovation;

These thematic fields are discussed in the sections below.

Framework on State Aid to Shipbuilding

In addition to these horizontal provisions, the most specific set of compatibility rules specifically addressing the shipbuilding sector is the ***Framework on State Aid to Shipbuilding*** ("Shipbuilding Framework").[169] The Shipbuilding Framework provides sector-specific rules for assessing compatibility with state aid rules in light of the specific nature of the shipbuilding sector. Justified exceptions are specified for:

- Aid to research, development and innovation (section 3.3.1 of the Framework);
- Closure aid (section 3.3.2);
- Employment aid (section 3.3.3);
- Export credits (section 3.3.4);
- Development aid (section 3.3.5);
- Regional aid (section 3.3.6).

6.2 Finance: guarantee schemes and export credits

6.2.1 Compatibility of financing schemes with competition policy

In most EU Members States, Export Credit Agencies (ECAs) provide trade financing to stimulate exports in the form of credits, credit insurance or guarantees. Guarantees usually apply to the buyer (post-financing), while export credits are extended to the supplier / exporter (pre-financing). Such interventions can make shipbuilding credit more attractive by providing e.g. a guarantee to the loan, subsidized interest or a one- or two-year moratorium on interest. [170] ECA covers (if the ECA is a government controlled agency) have to comply with the specific rules on state aid.

Under the EC competition regime, specific provisions on export credits are provided in section 3.3.4 of the *Shipbuilding Framework*, stating that the credit facilities that comply with the 1998 OECD Arrangement on Guidelines Officially Supported Export Credits for Ships and with its Sector Understanding on Export Credits for Ships are deemed compatible with the common market.

OECD Sector Understanding on Export Credits for Ships

The ***OECD Sector Understanding on Export Credits for Ships*** ("SSU") sets common rules for government supported export credits for ships.[171] The agreement, to which Australia, the European Community, Japan, Korea and Norway are participants, deals particularly with:

[169] The Shipbuilding Framework (2003/C 317/06) entered into force on 1 January 2004, and was recently prolonged for the second time until December 2011.

[170] See Stopford, M. (2009). Chapter 7: Financing Ships and Shipping Companies. In: Maritime economics.

[171] Amendment of the Sector Understanding on Export Credits on Ships – October 2007, available at: http://www.oecd.org/dataoecd/28/18/40198054.pdf. Since 2005 the SSU is part of the broader OECD *Arrangement on*

- Interest rates;
- Duration of credits.

For example, the SSU sets a maximum repayment term of 12 years after delivery. The maximum instalments for repayment of the principal sum of an export credit can not exceed 12 months and interest has to be paid no less frequently than every six months. If these requirements are met, a national export credit scheme is considered compatible with the EU competition regime.

Commission Notice on State aid in the form of guarantees

In addition, the EC has laid down specific rules in order to determine whether a guarantee constitutes state aid (in the sense of art. 87 EC Treaty) in the ***Commission Notice on state aid in the form of guarantees***.[172] This new 2008 Notice is an amendment to the Notice of 2000, as was foreseen in the *State Aid Action Plan* (SAAP). The Notice applies to all guarantees that include a transfer of risk (save export credit guarantees) and sets specific criteria to determine whether or not the guarantee contains an "aid element" and if so, what the value of that element is.

For example, in order not to constitute state aid, an *individual guarantee* should respect the conditions that a private lender would grant to a borrower ("Market Economy Investor Principle"), assessed through four general conditions:[173]

- The borrower is not in financial difficulty;
- The guarantee is linked to a defined financial transaction, for a fixed maximum amount and limited in time;
- The guarantee does not cover more than 80 percent of the outstanding loan;
- The market price for the guarantee is paid.

For *guarantee schemes* to be considered non-aid, the first three general conditions mentioned above similarly apply. In addition:

- The terms of the scheme are based on a realistic assessment of the risk;
- The premiums cover the normal risk, the administrative costs of the scheme and a yearly remuneration of an adequate capital;
- The scheme provides terms under which future guarantees can be granted.

The new Notice provides some simplifications for SMEs in order to address their specific difficulties in accessing financial resources. For example, "safe harbour" premiums are specified for SMEs (according to their rating) that are assumed to be in conformity with the market price, automatically qualifying the guarantee as non-aid. This applies both to individual guarantees and guarantee schemes. In addition, guarantee schemes only relating to SMEs may apply a single yearly premium for all borrowers in the scheme when the amount guaranteed is below € 2.5 million per company, allowing for a risk-polling effect

Temporary framework for State aid measures to support access to finance in the current financial and economic crisis

In context of the current economic and financial crisis, the EC has adopted the ***Temporary framework for State aid measures to support access to finance in the current financial***

Guidelines for Officially Supported Export Credits. See also OECD (2009) OECD Council Working Party on Shipbuilding (WP6). Available at http://www.oecd.org/dataoecd/26/52/40194862.pdf.

[172] 2008/C 155/02, *Commission Notice on the application of Atricles 87 and 88 of the EC Treaty to State aid in the form of guarantees.*

[173] See MEMO 08/313 for further details.

and economic crisis.[174] As part of the European Economic Recovery Plan, this temporary framework provides Members States with some possibilities to address exceptional difficulties of companies, especially SMEs, in obtaining finance due to the crisis. More specifically, the Framework allows Member States to grant:

- "A lump sum of aid up to € 500,000 per company for the next two years;
- State guarantees for loans at a reduced premium;
- Subsidised loans, in particular for the production of green products;
- Risk capital aid for SMEs up to € 2.5 million per SME per year (instead of € 1.5 million) in cases where at least 30 percent (instead of 50 percent) of the investment comes from private investors.

Obviously certain specific conditions apply to these provisions (see Temporary framework for more details) and they are limited in time, expiring at the end of 2010.

6.2.2 National guarantee schemes

The regulatory framework applicable to the shipbuilding sector as set out above thus allows for sector specific support in relation to export credits and guarantees, provided that specific compatibility requirements are met. It also allows certain forms of pre-delivery guarantee schemes, which were already indentified in the LeaderSHIP 2015 as being crucial for shipbuilding in securing finance during the construction phase. Since then a number of countries in Europe have introduced pre-delivery guarantee schemes (Box 6.3).

Box 6.3 Examples of pre- (and post) delivery financing scheme in EU Member States

Germany:

In December 2003 the Commission approved a German proposal for a ship financing scheme that is operated in five coastal Länder. The scheme provides public fallback guarantees with respect to bank credits granted for the financing of ships built in German yards. The scheme uses differentiated premiums charged in line with the risk to be covered. Two types of guarantees can be granted: "construction financing guarantees", i.e. guarantees securing the pre-financing of the construction costs and "end-financing guarantees", i.e. guarantees to finance the purchase of the completed ship by the owner.

Netherlands:

In 2005 the Commission authorised a state guarantee scheme in the Netherlands to guarantee loans to Dutch shipyards in order to finance the construction of new ships. Also in the Dutch case risk differentiated premiums are charged, covering the costs of the measure itself. State guarantees amount to a maximum of 80% of the loan. Until this moment no guarantees have been supplied through the scheme.

France:

In 2006 the Commission endorsed a state guarantee scheme offering guarantees to financial institutions providing loans and loan guarantees to French shipyards. Loans, down payment guarantees ("cautions de restitution d'acompte") and performance bonds ("cautions de performance") granted to finance ships with a contract value larger than €40 million are eligible (up to 80%). Premiums are charged.

[174] 2009/C 83/1, *Communication from the Commission – Temporary framework for State aid measures to support access to finance in the current financial and economic crisis,* OJ C83 of 07.04.2009.

Finland:
In 2003 Finnvera granted Kvaerner Masa-Yards pre-delivery guarantees independent from its Norwegian parent company. Total support depends on the value of future orders. In addition, post delivery financing through Finnvera's Buyer Credit Guarantees, that cover risks arising from shipping companies having placed orders for ships, are being backed. These are again based on forthcoming orders and the needs of potential buyers to obtain ECA backed financing.

Italy:
The European Commission blocked an Italian loan guarantee scheme (Shipbuilding Guarantee Fund) in 2005, as it did not cover the costs of the scheme and did not involve any proper risk differentiation, and was thus found to break state aid rules. No alternative scheme has been introduced in Italy since then.

Latvia:
A temporary Latvian scheme (N 139/2009) granting subsidised guarantees for initial investments and working capital loans to shipbuilding companies encountering financing difficulties as a result of the financial crisis has been approved under the Commission's Temporary Framework for state aid measures to support access to finance during the crisis (COM(2009)164.

6.3 Knowledge: Research, Development and Innovation policies

Knowledge is a crucial asset for the European shipbuilding sector. Provided that it is difficult to effectively make use of IPR protection in the shipbuilding industry (to be discussed below), the more offensive strategy of innovating faster than competition is applied extensively by firms in the sector. This section gives an overview of knowledge and innovation policies in place in the EU that influence the technological position of the EU shipbuilding sector.

6.3.1 Compatibility of RDI aid with competition policy

Aid to RDI is usually justified under the discretionary derogations of art. 87 (3) (b) and (c) EC Treaty. The shipbuilding sector is eligible for aid to innovation both under the *Shipbuilding Framework* as well as under the more general ***Framework for State Aid for Research and Development and Innovation*** ("RDI Framework").[175]

Framework for State Aid for Research and Development and Innovation

The RDI Framework lays down rules that will be applied when assessing compatibility of aid with the EU competition regime. Aid to Research, Development and Innovation from the public sector is allowed if it complies with the compatibility rules specified for:

- Aid for R&D projects (section 5.1 of the Framework);
- Aid for technical feasibility studies (section 5.2);
- Aid for industrial property rights costs for SMEs (section 5.3);
- Aid for young innovative enterprises (section 5.4);
- Aid for process and organisational innovation services (section 5.5);

[175] The new RDI Framework (2006/C 323/01) entered into force on 1 January 2007.

- Aid for innovation advisory services and for innovation support services (section 5.6);
- Aid for the loan of highly qualified personnel (section 5.7);
- Aid for innovation clusters (section 5.8).

Under the ***Shipbuilding Framework***, the provision on *Aid to research, development and innovation* justifies aid for innovation in existing shipbuilding, ship repair or ship conversion yards up to a maximum aid intensity of 20 percent gross, given that:
a) "it relates to the industrial application of innovative products and processes, i.e. technologically new or substantially improved products and processes compared to the state of the art existing in this industry in the Community, which carry a risk of technological or industrial failure;
b) the aid is limited to supporting expenditure on investments, design, engineering and testing activities directly and exclusively related to innovative part of the project. (…)."[176]

6.3.2 RDI policies in the EU

At the EU level, the **Lisbon Strategy** is still the main guiding document reflecting the aim to make the EU "the most dynamic and competitive knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment in 2010". One of the two headline targets of the Lisbon Strategy after simplification and relaunching in 2005, is to reach a total (public and private) level of investment in research and development of 3% of GDP by 2010.

Framework Programme for Research and Technological Development

The main EU instrument of funding research is the ***Framework Programme for Research and Technological Development.***[177] The current Framework Programme, FP7, runs from 2007-2013 and has a total budget of € 50 million.[178] The FP7 contains various funding schemes, including for Collaborative projects and Networks of excellence. Under the programme, funded research activities are required to have a "European added value", which generally implies transnationality of research consortia, though under FP7 a new action for "individual teams" is also provided for. Of the five programs of the FP7 (Cooperation, Ideas, People, Capacities, Nuclear research), Cooperation is the largest and it covers focal themes including "Transport" (with a budget of €4,160 million).

A new instrument, with the aim to further the ERA, are the ***Joint Technology Initiatives*** (JTIs), created for cases where existing schemes are inadequate for the scope of the research and the scale of required material and human resources. JTIs are long-term public-private partnerships, financed by he Community national public sources and private (industry) sources. EIB loans can be used where appropriate. JTIs aim to implement part of the *Strategic Research Agendas* of the *European Technology Platforms* in coordination with similar already existing national projects and programmes. In addition, in 2007 the instrument of ***Risk-Sharing Finance Facilities*** was introduced, providing participants in large European research actions with better access to EIB debt financing possibilities. Finally, it is worth mentioning that funding specifically aimed at strengthening the RDI

[176] Shipbuilding Framework (2003/C 317/06)
[177] See http://ec.europa.eu/invest-in-research/funding/funding01_en.htm.
[178] See http://cordis.europa.eu/fp7/.

capacity of **SMEs** has been increased under the FP7, including support for outsourcing of research by SMEs. This aims to improve the participation of SMEs in RTD FPs.

Furthermore there is the:

- Competitiveness and Innovation Framework Programme (CIP), and the
- Key pillar of the European Research Area (ERA)

6.3.3 RDI programmes in the EU shipbuilding sector

InterSHIP

The shipbuilding sector has benefited of RDI support under the EC *Framework Programme for Research and Technological Development* especially regarding longer-term strategic solutions that are carried by a broad research base. One of the main examples was the **InterSHIP** project, an Integrated Project of € 38 million, of which € 19 million was financed under FP6. The project consortium of this programme is depicted below.

Figure 6.1 Project consortium InterSHIP

The objectives of this programme were: "to significantly increase the competitiveness of the European cruise, passenger ferry and RoPax shipbuilders, to develop safer and more environmentally friendly ships considering their entire life cycle, and to achieve a drastic reduction of building and development costs as well as time-to-market of innovative solutions."[179] The project also aimed at further improving vertical integration between yards, suppliers, owners and classification societies.

Water*BORNE*

At present, a large EU level research initiative is the Technology Platform **WATER*BORNE***, launched in 2005, under which various research actions are initiated that are funded under FP7. WATER*BORNE* is an industry-driven consensus-based forum that includes stakeholders along the value chain of waterborne transport. It is mainly industry-

[179] see website InterSHIP, at http://www.intership-ip.com/new/index.phtml.

driven, but also includes the EU Member States, universities and research institutions, and other stakeholders. The objective of the Platform is "to bundle efforts of the European waterborne actors, to remain champions, in maritime transport, in the production of efficient and safe vessels as well as the related systems and equipment, in providing infrastructure and logistics for ports and waterways, in offshore technology and for leisure craft - to continue to create value and high qualification employment opportunities in Europe."[180]

The documents *Vision 2020* and the Strategic Research Agenda (SRA) are the main tools under WATER*BORNE* setting out the strategy to expand and maintain the EU maritime cluster's know-how.

At present, research needs defined under WATER*BORNE* are focussing on the following strategic themes:

- Safe, sustainable and efficient waterborne operations;
- A competitive EU maritime industry (requiring technological and commercial RDI);
- Managing and facilitating growth and changing trade patterns (increased need for waterborne transport and shifts in location gravity requiring developed infrastructure);

6.3.4 National innovation aid schemes

As explained above, the RDI Framework and the Shipbuilding Framework set out rules determining when government aid to innovation is deemed compatible with the state aid rules under the EC competition regime. Under the existing framework, various innovation aid schemes at national level have been approved as being compatible. Some of the main examples are described in the box below.

Box 6.4 National support schemes for innovation aid approved under the Shipbuilding Framework

Germany (N452/04) – Innovation aid to shipbuilding

This is the first notified innovation aid scheme to be approved under the new shipbuilding Framework. The innovation aid scheme of € 27 million over four years is financed by the Federal German Government, under which firms in the shipbuilding, ship repair and ship conversion industry can apply for innovation aid in support of "the industrial application of products and processes the implementation of which carries a risk of technological or industrial failure", in line with the shipbuilding framework. The aid scheme only applies to projects for which the total amount does not exceed € 150 per cgt for a ship or € 5 million for new processes. The EC assessed this scheme to comply with the conditions of the framework, as: the proposed scheme only applies to the shipbuilding industry; the gross aid intensity does not exceed the maximum of 20% of eligible costs; the aid relates to the industrial application of innovative products and processes only, detailed applications have to be submitted and an independent expert will assess the innovative character of the project; detailed provisions for payment and reimbursement are foreseen; the eligible costs meet the criteria; a maximum aid amount for projects is specified and each case will be individually notified to the EC; and a solid ex-post monitoring system is provided for.

France (N 429/04) - Innovation aid to shipbuilding

This innovation aid scheme of € 25 million per year for six years to be financed by the French government is similar in structure to the German aid scheme. The EC ruled that this scheme is compatible with the Shipbuilding framework (as complying with the specific criteria set out above). In line with the earlier decision of the Commission

[180] See website WATER*BORNE*, at http://www.waterborne-tp.org/.

on restructuring aid to Alstom, its subsidiary Marine d'Alstom can only be able to benefit from this scheme from July 2006 onwards (to avoid aid accumulation).

Spain (N 423/2004) – Horizontal aid scheme to shipbuilding

The aid scheme notified by Spain consists of three parts: aid for R&D, aid for innovation and aid regional investment aid (covered under different section of the Shipbuilding Framework). The total scheme accumulates to roughly € 20 million per year for two years. The EC ruled each of the three components of this horizontal scheme to be compatible with the requirements set for those strands under the Shipbuilding framework. For innovation aid, these criteria are set out above. For aid to R&D, the scheme also complies with the maximum aid intensities of 100% gross for fundamental research, 50% for industrial research and 25% for pre-competitive development as well as with the other conditions set out in the Shipbuilding Framework and the RDI Framework. The regional investment aid component is available for firms in regions eligible for such aid and the maximum aid intensity requirements are met. Similarly as in the French case, some exceptions to eligibility for aid in order to avoid accumulation of aid were made for Izar and Navantia.

The Netherlands (N 719/2006) – Innovation aid to shipbuilding

Also in the Netherlands an innovation aid scheme has been introduced. The Ministry of Economic Affairs is responsible for this scheme, which has an annual budget of € 20 million. The scheme is notified for a three year period, ending on 31 December 2009. The scheme is similar to schemes in Germany, France and Italy.

Italy (N 752/2006) - Innovation aid scheme for shipbuilding

A similar scheme was introduced in Italy. The Ministry of Transport is responsible for this scheme, which has an annual budget of € 30 million. The scheme is notified for a three year period ending on 31 December 2009. Italy has undertaken to suspend the payment of aid under the present scheme to any undertaking that has received illegal and incompatible aid under a number of previous aid measures that are listed in the decision, until the undertaking concerned has reimbursed or paid into a blocked account the incompatible aid with the recovery interest.

Finland (N 28/2008) – Innovation aid scheme for the Finnish Shipbuilding industry

The latest innovation aid scheme that was approved was the aid scheme of Finland. The scheme has an annual budget of € 20 million for the period 2008-2011, totalling € 80 million in all.

6.4 Knowledge: IPR regime

Given the strategic importance of knowledge and innovation for the EU shipbuilding industry, it is in turn important to look at the main drivers for innovation, including:

- *IPR protection*; effective protection of intellectual property increases the 'value of knowledge' and secures return on investments on innovation. For highly knowledge-intensive segments, the effective protection of intellectual property rights is an important aspect of maintaining a competitive position.
- *Research climate and knowledge infrastructure*; the research climate is very much related to an innovation-favourable investment climate and depends e.g. on the ease of attracting funding for research both from public as well as private sources.

IPR protection is discussed in this section, RDI policies in the next.

6.4.1 Intellectual Property Rights regime: an overview

Intellectual Property Rights

The WTO defines intellectual property rights (IPRs) as "*the rights given to people over the creations of their minds. They usually give the creator an exclusive right over the use of his/her creations for a certain period of time*."[181] Intellectual property rights and their enforcement are considered a key driver of innovation and competitiveness and a key component underlying the entrepreneurial economy.[182] IPR fosters innovation and investment by ensuring that the creators of new inventions, trade marks and industrial design can reap the benefits – and the return on investments – of their creations without the risk of competitors being able to commercially exploit imitations of their ideas. In doing so, IPR systems aim to strike a balance between protecting intellectual rights (creating long run benefits to society) on the one hand and preventing a monopoly for rights holders (implying some short run costs) being created for too long on the other hand.

For the shipbuilding sector, the most relevant category of IPRs is *industrial property* (the second main category relates to *copyrights*). [183] Industrial property includes patents (and licensing), trademarks, industrial design, inventions and geographical indications. Apart from this set of classic IPR protection instruments, the law of unfair competition and contractual clauses can be used to protect intellectual assets.

In terms of violation of IPRs, *patent infringements and violation of technological secrets* are especially relevant for the shipbuilding sector. For companies that are internationally active, the inability to protect their patents in a destination country, as well as national policies containing indirect obligations to disclose and transfer technology and IP to local companies (e.g. China), can be a high (indirect) cost component for a company or a hindrance to invest in that market in the first place. *Counterfeiting* (fake trademarks and names, designs, patterns, etc) is especially relevant with respect to parts and components. [184]

IPR: international, regional and national level

Given the importance of IPR regimes in an international business context, there has been an increasing trend of harmonisation of IPR legislation at the international level. Minimum standards on IPR protection were first introduced in the **Paris Convention for the Protection of Industrial Property** in 1883[185]. At present, the main two international organisations implementing international treaties and conventions are:

- **World Trade Organisation (WTO).** The entry into force of the WTO Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPs) in 1995 has been a large step in setting international minimum standards of IP protection. Members states are bound by the minimum levels of protection as prescribed by TRIPS. TRIPS covers for

[181] WTO website, at http://www.wto.org/english/tratop_e/trips_e/intel1_e.htm.
[182] Burke, A. & S. Fraser (2005) "The Impact of Intellectual Property Rights on Self-employed Entrepreneurship: An International Analysis." Max Planck Institute Discussion Papers on Entrepreneurship, Growth and Public Policy.
[183] WTO website, at http://www.wto.org/english/tratop_e/trips_e/intel1_e.htm.
[184] European Commission, Directorate General for Trade (2007) "Study on the Future Opportunities and Challenges of EU-China Trade and Investment Relations. Study 12: Exploring China's IP Environment - Strategies and Policies." Study implemented by EMG & Development Solutions.
[185] Paris Convention for the Protection of Industrial Property, signed on 20 March 1883 in Paris, France. The Paris Convention at present has 173 contracting parties.

example copyrights, geographical indications, industrial design, patents, trademarks and it relates to enforcement as well as dispute resolution procedures.

- **World Intellectual Property Association (WIPO).** The WIPO is the UN agency dedicated to developing an international IPR system, with a special focus on developing countries.[186] The WIPO administers 24 treaties, including the Paris Convention and the Patent Cooperation Treaty.

The international standards are transposed into the regional and national legal systems of each region or country bound by it. For substantive legislation this implies that there is an increasing amount of uniformity at the international level. In practice, procedural legislation is more problematic, because, although international standards also relate to procedural harmonisation and minimum standards, enforcement has to take place mainly in local courts in accordance with national procedural regimes.

In addition to these public instruments and standards, the business community is also active in private initiatives, the main example being the Business Action to Stop Counterfeiting and Piracy (BASCAP) of the International Chamber of Commerce (ICC).

IPR protection in the EU

Given the importance of knowledge in the EU economy, the European Commission is making special efforts towards a coherent European IPR system in the context of the EU Single Market. Harmonisation of substantive provisions of individual Member States and creation of a comprehensive Community-wide IPR protection system is ongoing. Community-wide legislation now exists for most (substantive) fields of IPR, including trademarks, designs and copyrights.

The main issues at EU level with respect to IPR include:

- **Ongoing harmonisation (European patent).** Though considerable progress has been made to harmonise IP laws at a Community level (i.e. in the field of substantive copyright law, see Directive 2001/29/EC and Directive 2006/116/EC[187]), further efforts to improve especially enforcement mechanisms are still needed and ongoing. An important example relates to patent law, for which harmonisation is still ongoing, despite existence of the European Patent System under which the first patent applications were already filed in 1978.[188] This implies that at present, patents need to be filed at individual Member State level, implying high costs and limited scope of protection. Various issues are complicating progress regarding a Community-wide patent. For example, the procedural issue of the language(s) in which a Community patent needs to be translated remains a major obstacle to agreement.[189]
- **Common and civil law jurisdictions.** One of the issues complicating harmonisation within the EU is that substantive IP laws and enforcement procedures tend to differ

[186] WIPO website, at http://www.wipo.int/portal/index.html.en. The WIPO already existed before the WTO, and the main international agreements under the WIPO (the Paris Convention for the Protection of Industrial Property and the Berne Convention for the Protection of Literary and Artistic Works) can be seen as the starting point for the common-ground rules as laid down in TRIPS.

[187] Directive 2001/29/EC on the harmonisation of certain aspects of copyright and related rights in the information society (EU Copyright Directive) and Directive 2006/116/EC on the term of protection of copyright and certain related rights.

[188] Such a European patent, under the European Patent Convention, is in fact a bundle of national level patents in designated European states that should be enforced at a national level.

[189] EC, DG Internal market, http://ec.europa.eu/internal_market/top_layer/index_52_en.htm.

substantially between EU Member States, especially between those with a common law tradition (UK, Ireland, Malta, Cyprus) and the civil law jurisdictions. This is e.g. the case in the field of copyright laws, as illustrated by the jurisprudence arising on Directive 2001/29/EC.

- **Enforcement issues.** Also at the EU level, the main priority issue is not substantive IPR legislation, but effective enforcement of it. Within the EU, there is only a limited degree of procedural harmonisation, as civil procedures differ at national level - although there are some EU guidelines, such as Directive 2004/48/EC, which considerably increases effective remedy opportunities in the EU.[190] In this context, factors inhibiting effective enforcement include: lack of knowledge of national civil procedures, high litigation costs, differing remedies and penalties as well as differences in effectiveness of investigation / prosecution entities and lengthy local legal proceedings.

6.4.2 IPR protection in the shipbuilding sector[191]

As is also clear from the survey and interviews conducted, the level of IPR protection applied in the shipbuilding sector is relatively low. Many firms decide not to enforce when confronted with alleged infringements, or in most cases decide not to protect their knowledge in the first place, due to perceived impossibility of enforcing, especially in Asia.

The main difficulties with respect to IPR protection for the EU shipbuilding sector can be summarized as follows:[192]

1. **General enforcement difficulties;**
   a) *Burden of proof on the plaintiff*. In the litigation procedure through which an IPR holder wants to enforce its rights, the burden of proof is on the plaintiff, i.e. the IPR holder has to provide evidence of the IP infringement. In practice this can be quite hard. For example in patent cases, this implies that the validity of the patent needs to be assured first (the requirements for a valid patent generally are "*novelty*" of the patented product, "*inventive step / non-obviousness*" and it needs to be an *industrial application*) and that the patent holder needs to prove that the contestant indeed violated that patent. This often requires detailed technical expertise and comes with high costs.
   b) *High costs of protection and litigation*; Costs of obtaining IPRs and enforcing them can be quite high. Especially for SMEs this can be a large hindrance. As an example, the cost of acquiring a patent roughly ranges between € 2.000 and € 7.000 per country. In the EU a patent can be centrally filed at the European Patent Office

[190] Directive 2004/48/EC on the enforcement of intellectual property rights is an important IPR instrument under the Internal Market and step towards procedural harmonisation. The Directive is mainly aimed at *enforcement* of provisions mainly in the field of counterfeiting and piracy. It determines that if Member State civil procedures are "unnecessarily complicated or costly, or entail unreasonable time-limits or unwarranted delays", then they can be censured before the European Court of Justice. Directive 2004/48/EC requires that Member States apply effective, dissuasive and proportionate remedies and penalties against those engaged in counterfeiting and piracy offences. It also deals with procedural issues regarding evidence, standing, interlocutory measures, damages, judicial publication, etc. It determines that if Member State civil procedures are "unnecessarily complicated or costly, or entail unreasonable time-limits or unwarranted delays", then they can be censured before the European Court of Justice.

[191] Houthoff Bururma and Policy Research Corporation (2007), *Shipbuilding IPR study: an analysis of problems relating to the protection of Intellectual Property Rights of the European shipbuilding industry,* final report for the European commission, DG Enterprise and Industry, 14 December 2007.

[192] Information taken from the interviews performed as well as from a synthesis of literature research.

(to be transformed into patents at national level), but additional fees per number of patents (countries) and translations costs (roughly between € 1.500 and € 2.500 per country) need to be incurred, so that a European patent filing costs around € 4.500 per country.[193] In addition to such costs for acquiring protection, in case of an alleged infringement, enforcement through litigation involves legal costs, including expenses for evidence gathering and technical experts. While in the EU the legal costs will need to be borne (proportionately) by the infringer – provided of course that an infringement can be proven –, in other jurisdictions this is not always the case.

2. Specific enforcement difficulties in Asia (China);

According to two studies performed for the EC on the subject[194], the Far East (focussed on China and South Korea, as these are most relevant for shipbuilding) have a rather complete and up-to-date IPR system in place. Yet, enforcement in practice is generally difficult. In addition to the general enforcement difficulties mentioned above, some specific issues add to IPR enforcement problems in those countries. The study done on IPR in shipbuilding for DG enterprise in 2007 identifies the following issues:

a) *A relatively low commitment to respecting and enforcing IP laws.* Especially China does not seem to have high commitment to IP protection. This can partly be explained by China's overriding government-supported goal of economic development and its catching-up status regarding technology therein. Also, there is a general lack of awareness and tradition of IP protection.[195]

b) *Lack of independent judiciary.* Although by constitution the People's Courts of China exercise their judicial power independently, they also have a constitutional obligation to report to the corresponding level of people's congresses that created them. In giving the final interpretation or invalidation of laws, the Standing Committee of the National People's Congress is superior to the Supreme People's Court (highest judicial instance). [196]

c) *Local protectionism.* Especially at local level, there are many cases reported in which, even if an infringement is established, the infringer does not pay penalties and the infringed goods find their way back into the channels of commerce (which conflicts with article 46 TRIPs), often even through the infringer.[197] The fact that local judges are appointed by local party and financed by the local government (in turn dependent on tax revenues from local companies) may explain some favouring of local companies.

d) *Lack of technical training and experience*. In China, the lack of tradition links to the lack of expertise in IP protection, aggravated by a lack of transparency on merits of a case. In South Korea, the periodical rotation of judges under the current judicial system does not seem to contribute to developing expertise in IP protection.

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[193] Houthoff Bururma and Policy Research Corporation (2007).

[194] Emerging Markets Groups and Development Solutions, *Study on the Future Opportunities and Challenges of EU-China Trade and Investment Relations, Study 12: Exploring China's IP Environment..*

Houthoff Bururma and Policy Research Corporation (2007).

[195] Emerging Markets Groups and Development Solutions, *Study on the Future Opportunities and Challenges of EU-China Trade and Investment Relations, Study 12: Exploring China's IP Environment.*

[196] Article 127 jo. 128. Article 128 Constitution reads: "The Supreme People's Court is responsible to the National People's Congress and its Standing Committee. Local people's courts at various levels are responsible to the organs of satte power which created them."

[197] D. Friedman (2007), *Paper Tiger or Roaring Dragon – China's TRIPs Implementation and Enforcement,*

e) *Unfavourable procedural requirement.* An example of unfavourable procedural requirements to foreign firms seeking protection under Chinese law is the fact that powers of attorney and evidence from foreign countries need to be notarised and legalised before proceedings. Another procedural burden is that there is a very short deadline (three days) for a right holder to apply for seizure of suspected infringing goods to let them be detained by Chinese customs.[198] In South Korea generally no such unbalanced procedural requirements are found.

f) *Lack of enforcement tools.* Especially the excessive workload of the courts in China as well as the serious lack of customs manpower in China and South Korea contribute to limited enforcement in practice. For example, it is estimated that only 4 percent of products leaving Chinese ports are physically checked by customs, and in both China and South Korea criminal prosecution of patent infringements (as required by art. 61 TRIPs[199]) is rare.

g) *Low amount of damages and fines in case of infringement*. Generally in China, low fines are imposed both by courts and by customs, attorney's fees are generally not awarded to a plaintiff in case of infringements, Chinese infringers often have no or hidden financial resources, ordered destruction of the infringing goods often comes for the cost of the IP holder, etcetera. Therefore, potential damage awards for EU firms in Chinese civil litigations on infringements are generally too low to be effective. The same holds for South Korea, though to a more limited extent. It is interesting to note that in China by far the largest amount ever awarded in an IP case relating to a patent infringement was *against* a French company, who was ordered to compensate damages of € 31 million to a Chinese company.[200]

Although these difficulties are considerable, a tendency towards improvement e.g. of compliance of China with WTO (TRIPs) requirements is observed.

3. Limitation of scope of patent protection for vessels: Art 5*ter* Paris Convention.

For reasons of facilitation of international commerce, art. 5ter of the Paris Convention limits the rights of patent holders for vessels that enter a country temporarily under the flag of another nation.

Box 6.5 Article 5ter Paris Convention

Article 5ter Paris Convention

Patents: Patented Devices Forming Part of Vessels, Aircraft, or Land Vehicles

I any country of the Union the following shall not be considered as infringements of the rights of a patentee:

(i) the use on board vessels of other countries of the Union of devices forming the subject of his patent in the body of the vessel, in the machinery, tackle, gear and other accessories, when such vessels temporarily or accidentally enter the waters of the said country, provided that such devices are used there exclusively for the needs of the vessel;

(ii) the use of devices forming the subject of the patent in the construction or operation of aircraft or land vehicles of other countries of the Union, or of accessories of such aircraft or land vehicles, when those aircraft or land vehicles temporarily or accidentally enter the said country. (*red.; underlining added*)

[198] Art. 21 Customs Implementation Regulation 2004.

[199] Art. 61 TRIPs requires that " Members shall provide for criminal procedures and penalties to be applied at least in cases of wilful trademark counterfeiting or copyright piracy on a commercial scale".

[200] Financial Times, "China fines Schneider €31m", 1 October 2007, p.19.

The reason behind this provision is that if a vessel has to conform to patent laws in each national jurisdiction that it enters during its lifetime, this would severely restrict international commerce. Therefore, the article is intended "*to place foreign-owned means of international transport beyond the reach of domestic patentees' exclusive rights because the cost of complying with multiple, inconsistent rights of exclusion provided by the patent regimes of a large number of countries would likely place an excessive drag on international commerce*."[201]

In practice this means that e.g. a Chinese ship containing a counterfeit part entering a Dutch harbour can not be considered as infringing a Dutch patent on that part, even though substantively this might be the case. Obviously, the patent holder could enforce his patent in China had he registered it there, or enforce it if it were a counterfeit part in a Dutch ship.

Box 6.6 Stena Rederi AB vs. Irish Ferries Ltd.

Stena Rederi AB vs. Irish Ferries Ltd. (2003)[202]

An example of the application of the infringement exemption in Europe is the case of Stena versus Irish Ferries in 2003 before the UK Court of Appeal.

A vessel of Irish Ferries bought in Australia and registered in the Republic of Ireland was operated by Irish Ferries, crossing between Dublin and Holyhead three to four times a day. Stena alleged that the vessel was built infringing a patent of Stena without having obtained a license or permission for it. Stena had registered the patent in question in eight EU countries including the UK, but not Ireland where the vessel was registered. Stena therefore brought the case to court in the UK.

The Court of Appeal found that the patent of Stena was indeed valid in the UK, but also decided that the vessel was only in UK waters on a temporarily basis so that it could not be governed by the UK Patent Act under which Stena's patent was valid. Based on US case law on Section 272 (implementing the art. 5ter Paris Convention obligations), the Paris Convention and UK Patent Act, the Court of Appeal ruled that "temporarily" meant 'transient' or 'for a limited time', which did not depend on frequency (in this case three to four times daily). Thus, had Stena registered its patent in Ireland (where the vessel was registered), it could have proceeded against the alleged infringement there. Under UK law this was not possible, as the vessel was temporarily in UK waters only, thus falling under the limitation of rights of domestic patent owners for reasons of facilitating international trade and movement of people.

6.4.3 Knowledge leakage in the shipbuilding sector

It is clear from the above that IP protection and especially enforcement can be difficult and little rewarding for shipbuilding entrepreneurs, especially in the Far East.

Given this context, it is interesting to note that according to the IP study done for the EC, the main **destinations** of knowledge leakages as indicated by yards and maritime equipment

[201] United States Court of Appeals for the Federal Circuit, case 03-1256, *National Steer Car Ltd. v. Canadian Pacific Railway,* January 2004.

[202] UK Court of Appeal, R.P.C. 2003; 120:668-680, *Stena Rederi AB v. Irish Ferries Ltd.*

suppliers are both within Europe as well as to the Far East (both around 40 percent).[203] Though this number indicates a frequency of occurrence rather than corresponding to the extent of damage, it does indicate that there is scope for improvement of protection of IPR within the EU.

The main perceived **source** of knowledge leakage for equipment suppliers is the *yards*, while for yards this is *equipment suppliers*. This observation logically corresponds to the high level of integration and technological interoperability requirements between yards and suppliers. The second largest leakage source for yards is *clients* (given that the yard has to deliver e.g. design blueprints to facilitate repairs and maintenance, indirectly enabling reversed engineering by competitors). This source is difficult to tackle for yards, as there is a relatively large degree of commercial dependence on a small circle of clients. In addition, *classification societies* are indicated as a substantial source of leakage, as yards and equipment suppliers have to provide thorough insights into the working of their products in order to facilitate inspection and approval of compliance with technical standards.

6.5 International trade conditions / access to markets

With the shipbuilding industry being truly global in nature – at the core of international production networks – access of the EU shipbuilding industry to international markets and trade conditions that apply in these markets are important to look into in more detail. This section looks at international trade barriers – affecting market access – and the impact of the international regulatory framework including WTO rules and practices. It also looks at regional differences in support and the effects on the global level playing field.

As already outlined in previous parts of this report related to labour costs and overcapacity, some sector-specific characteristics matter for the sector:

- The sector is cost driven – mainly by cost prices for steel and labour costs;
- The sector often experiences overcapacity as part of its structure;
- The sector requires a long-term risk approach, including pre-financing, and production based on expectations into the future.

These characteristics imply that there is a long-term approach to risk, with low margins due to overcapacity, highly dependent on inputs whose prices the sector itself cannot directly control. In practice this leads to the fact that in all countries where vessels are produced the sector is subsidised, even though the type of subsidy, depth and breadth differs. Removing all subsidies to create a 1st best solution may not be optimal in reality, as already explored by Corden (1963).

Existing international rules on subsidies have so far not been able to create a true level-playing field, as explained below.

[203] Houthoff Bururma and Policy Research Corporation (2007).

6.5.1 International trade barriers

Even though it is often argued that the shipbuilding industry is truly global and vessels can be bought anywhere without major restrictions, global trade rules are not equal, not complete and it is hard to apply them. There are two issues to take into account:

1. International trade barriers consist of tariffs, barriers to services trade and non-tariff measures (NTMs), some of which relate strongly to the shipbuilding sectors, some less;
2. The shipbuilding industry has a specific nature that defines market conditions and market functioning slightly differently than the standard neo-classical market approach;

Tariffs and subsidies

Looking at barriers to trade in the shipbuilding sector, we find that it is not tariffs but rather subsidies, cabotage restrictions, FDI restrictions and other types of support that constitute the international barriers to trade and investment. Subsidies and other types of support are closely related to the repeated efforts by the OECD to reach a global agreement on shipbuilding (more in the next section).

Restrictions to FDI

Moreover, in an age where globalisation is pressing forward rapidly, and where international production networks – driven by large multinational firms – dominate output developments, foreign direct investments and investment barriers faced are of equal importance to international trade and the competitive position of the shipbuilding sector. Multinationals make use of comparative advantages at regional and local level through fragmenting production. The aforementioned case of STX illustrates this point (Box 2.3 in chapter 2).

6.5.2 The multilateral regulatory framework: WTO

Looking at the shipbuilding sector today, many forms of trade distortions exist. Through various means these distortions can be addressed. Broadly, the efforts can be split into multilateral and bilateral ones.

At the multilateral level, the WTO sets rules for international trade, consisting among others of rules on tariffs, standards, intellectual property rights, services and some non-tariff measures. It goes beyond the scope of this report to analyse these rules in detail. Therefore, we only focus on those WTO rules that are most relevant for the shipbuilding industry, namely those related to subsidies. The ***WTO Agreement on Subsidies and Countervailing Measures*** ("SCM Agreement") defines the applicable rules for the use of subsidies, and it regulates the actions countries can take to counter the effects of subsidies.

The SCM agreement only applies to so called "specific" subsidies, which are defined as subsidies available only to an enterprise, industry, group of enterprises, or group of industries in the country (or state, etc.) that gives the subsidy. This implies that subsidies designed for the shipbuilding industry or a specific company in this industry fall under the agreement, while e.g. general R&D subsidies that are available to several industries are not covered by the agreement.

The SCM Agreement distinguishes two types of subsidies: prohibited subsidies and actionable subsidies. Prohibited subsidies are subsidies explicitly aimed at distorting trade, by requiring certain export targets, or the use of domestic goods over imported goods. Actionable subsidies are subsidies that have adverse effects on other WTO member states. The other member states have to demonstrate these adverse effects, e.g. if the subsidies causes the displacement or limits the import by the subsidising country, or if the subsidy causes a significant price undercutting.

In spite of all the WTO rules on subsidies and various other relevant agreements and regulations described above (export credits, RDI, etc.), it has proven to be difficult to establish a world level playing field. Especially in times of an economic down turn, national stimulating programs are a popular means. The line between market distorting state aid and non-distorting government support seems to be difficult to draw.

This is illustrated in the WTO dispute, initiated by the EU against South Korea in 2002, which was concluded in 2005 (see box below). This case has underscored the limitation of global trade rules, effectively rendering the concepts of imports and exports useless in a subsidised industry. The Panel of the dispute settlement body ruled that Korea had provided export subsidies that were explicitly prohibited, but that restructuring subsidies to its shipbuilding yards had not been given.

Box 6.7 WTO case EU – South Korea

WTO case EU – South Korea (DS 273)

In 2000, the European Union accused South-Korea of unfair competition practices. The EU alleged that South-Korea misused international financial aid to subsidize ailing shipyards and allow them to sell ships in the world market at unfairly low prices (dumping) caused by overcapacity[204]. Causes concerned past expansions of yards and that shipyards that were heavily indebted and had been declared bankrupt were not closed down, but freed of debt by the State without capacity restrictions in return. As a result, prices fell sharply.
As a defence, the EU set up temporary state aid program for their members (Temporary Defensive Mechanism, TDM). Under this program, member states were allowed to offer aid payments to their shipyards involved in constructing tankers carrying gas, chemicals and containers.

Since several negotiations between the EU and South-Korea broke down, the EU initiated a **WTO dispute settlement proceeding (DS 273)** against Korea. Several shipbuilding nations asked to participate in the panel as third parties. The Panel's report, which was adopted on 11 April 2005, concluded that Korea had indeed provided export subsidies which are explicitly prohibited by the SCM Agreement through specific advanced payments refund guarantees and pre-shipment loans. The claim however that Korea had granted, through a number of state-owned or state-controlled banks, restructuring subsidies to its shipbuilding yards was not supported by the Panel, even if it recognised that the EU cast doubt on the Korean measures. The Panel ruled that the evidence did not conclusively demonstrate that restructuring measures were commercially unreasonable and therefore Korea was effectively given the benefit of the doubt. The Panel gave Korea 90 days to withdraw the export subsidies.

The EU adopted a "Temporary Defence Mechanism" (TDM) in the form of a Regulation adopted by **the Council in June 2002** authorising direct aid of up to 6% to EU shipyards until 31 March 2004, which has been prolonged

[204] See box 2.1 for the considerations with regard to the term overcapacity

by **Council Resolution 502/2004** until 31 March 2005. Three ship types, for which the EU shipyards were found to have suffered strong adverse effects caused by unfair Korean competition, were eligible for these aids. These were container ships, chemical and products tankers and LNG (Liquefied Natural Gas) carriers. There were also limitations on the temporary scope of application: the TDM would cease to apply if Korea implemented the Agreed Minutes of 2000 or the WTO dispute settlements proceedings were resolved, and at any rate the Regulation was due to expire on 31 March 2005.

In return, Korea considered the TDM and the EU member states implementing provisions to be inconsistent with the EU's and its member states' obligations under the WTO. After consultations failed to produce mutually satisfactory results, Korea decided to start **WTO dispute settlement proceedings (DS 301)** in February 2004 against the EU. The Panel report, issued in April 2005 concluded that with the TDM the EU did not respect its obligation to use exclusively the WTO dispute settlement system to solve its dispute over Korean subsidization of shipyards. By that time the TDM had already ceased to exist.

In the Doha Round of negotiations under the WTO, there are also negotiations on the SCM Agreement. The aim is to clarify and improve disciplines while preserving the basic, concepts, principles of the agreement. With the lack of progress in the Doha negotiations in general, progress on the SCM negotiations is also limited.

The current SCM Agreement requires WTO Member States to notify all specific subsidies every three years, with updating notifications due in the intervening years. Based on these notifications, the WTO's World Trade Report 2006 notes that a total of 11 developed countries, including 7 EU countries, notified subsidies to shipbuilding. The same report shows a decline in the level of state aid in the EU-15 in the 1999-2003 period.

OECD Shipbuilding Agreement

Through the OECD negotiations on an international shipbuilding agreement – addressing the issues of subsidies and low prices – international trade barriers could be reduced, with a focus on shipbuilding. However, in October 2005 these negotiations were 'paused' to the regret of the EU without an agreement. Since then WP6 has been working on furthering the talks with limited success. The main EU competitors do not seem motivated to discuss a substantive agreement in shipbuilding through the OECD.

6.5.3 The bilateral regulatory framework

In addition to efforts at the multilateral level and partially due to the fact the OECD talks on a Shipbuilding Agreement have stalled, the EU has also engaged in bilateral Free Trade Agreements in which shipbuilding components are included. More recently the EU-Korea FTA, the bilateral shipbuilding dialogue with China, and the EU-India and EU-ASEAN FTAs have been or are being negotiated.

EU – Korean Free Trade Agreement

With the EU and Korea being two large competitors in the global market for shipbuilding, and keeping in mind the disagreements in this sector that have led to mutual WTO challenges, the EU-Korea FTA could provide an important alternative route towards a more global level playing field. Since a viable and sustainable European, and indeed world, shipbuilding industry cannot be based on overcapacity, protectionism or subsidies, the EU

and Korea have discussed inside the FTA framework. The EU-Korea FTA negotiations were launched on 6 May 2007. During several rounds of negotiations, the EU and Korea discussed provisions on important issues such as antitrust, merger and subsidies' aspects of the competition policy, transparency of domestic regulation and bilateral dispute settlement mechanisms. On July 10, 2009, the reactions of the EU member states to the draft treaty were positive, with two reservations from Italy and Portugal, not related to shipbuilding.

Bilateral Shipbuilding Dialogue with China

In addition to talks in the OECD, bilateral discussions with China are being pursued, partially via a bilateral shipbuilding dialogue, partially via a potential Partnership & Cooperation Agreement (PCA) that could be concluded between the two countries. The first meeting between Commission officials and their Chinese counterparts was held on 20 December 2006. Broad agreement has been reached on the scope and substance of the Dialogue and a Memorandum of Understanding has been signed in May 2007 to establish a Dialogue in the Shipbuilding Sector between the European Commission DG Trade and DG Enterprise and the Commission of Science, Technology and Industry for National Defence of China. However, due to the restructuring of the Chinese State Agencies, a new ministry called Ministry of Information and Industry of China will take over shipbuilding. This has caused temporary pending of the dialogue. The global financial crisis in 2008 and 2009 has led to further delays and more reluctance towards concrete steps for harmonization of rules & regulations and the creation of a global level playing field.

EU-India Free Trade Agreement

The EU-India FTA negotiations, which were also launched in May 2007, have been rather slow. For the past months, the EU and Indian elections have stalled progress in the EU-India FTA. However, results reached so far are fully WTO compatible, with the EU pushing for an ambitious and comprehensive agreement, covering not only trade in goods and services, but also investment and paying special attention to non-tariff barriers, and to rules and regulations such as Intellectual Property Rights, competition, government procurement, and transparency. These issues are important for the shipbuilding sector also, the more since the Indian government does have an interventionist and actively supporting policy with respect to shipbuilding as the box below illustrates. The final negotiating texts have not yet been agreed so further information on liberalization and integration of EU and Indian shipbuilding activities will have to be awaited for now.

Box 6.8 Shipbuilding policy of the Government of India

Shipbuilding policy of the Government of India – some policy initiatives

The Government of India (GOI) has taken some major initiatives in developing & promoting the shipbuilding industry within the country as part of its strategic policy initiatives.

- The GOI had announced a 30% subsidy assistance for public sector yards in 1997. With the intent to encourage private sector investments, the Ministry of Shipping, in 2002, initiated a move to grant subsidies to private sector yards for a period of 5 years. This subsidy assistance is in line with the direct or indirect assistance given to the shipbuilding industry by governments of other countries. This 30% subsidy was provided to private sector shipyards on vessels prices for orders taken before 14 August, 2007. It was restricted to ocean going merchant vessels over 80 meters in length - manufactured for domestic market & ships of all types - manufactured for export, on fulfillment of certain conditions.
- The subsidy scheme has ended on 14 August, 2007. However, the Ministry of Shipping has proposed a

subsidy of 20% for a period of 10 years beginning 15 August, 2007. This comes on the back of the report submitted by consulting firm KPMG India Pvt. Ltd., that recommended an extension of the 30% shipbuilding subsidy scheme for a 10 year period till 2017 and also suggested that the business be treated as an infrastructure activity, making it eligible for incentives such as tax holidays.

- The GOI has announced a major project known as the "Sagar Mala" / National Maritime Development Programme (NMDP) to develop India's maritime sector, involving a massive investment of Rs. 1,000 billion. The project is primarily aimed at capacity expansion, modernization & creating two major world-class international shipyards – one each on the East & West coast of India. This project is expected to result in additional demand for 2,400 new ships.
- The GOI has introduced tonnage tax for shipping companies which has shown a positive impact on their net profits, thereby free up additional funds for expansion.
- GOI also allows 100% FDI for the shipbuilding sector.
- The Gujarat Maritime Board (GMB) plans to develop a Marine Shipbuilding Park along its 1,600 km long coastline & aims to become the hub of Indian shipbuilding industry.
- The GOI has already awarded 162 blocks in the previous 6 rounds with expected investments to the tune of US$ 8 billion. The Government now plans to offer 57 blocks in the upcoming NELP VII, including 28 blocks for offshore – 19 in deep water and 9 in shallow waters.

EU-ASEAN Free Trade Agreement

The EU- ASEAN FTA could potentially be very important for the EU shipbuilding sector since some large current shipbuilding nations as well as some potential ones are members of ASEAN. Inside the negotiations, a lot of focus has gone to regional integration of ASEAN, harmonisation of competition policy, reductions of EU-ASEAN and intra-ASEAN non-tariff measures, rules of origin (important for shipbuilding with respect to Korea and China), and government procurement. However, at the moment, the negotiations have stalled due to the fact that intra-ASEAN interests were not aligned leading to ASEAN positions with lowest common denominators in various negotiating chapters. Potentially, agreements with individual countries could be signed, but this is something that remains to be seen. In the latter case, opportunities for shipbuilding deals increase, because differentiation of depth in the agreements with South East Asian nations becomes possible.

6.6 Standards & classification

Ships and other marine structures that are registered under the flag of a certain nation are required to meet certain standards that are designed to ensure acceptable levels of safety, environmental impact, etcetera. Flag states authorise **classification societies** for inspection and statutory certification of ships. Classification certificates are generally also required for engines, pumps and other parts that are vital for the functioning of the ship. With this mandate, classification societies thus develop and apply technical standards to the design and construction of ships and marine facilities and they carry out survey work on ships.[205]

[205] See website EMSA, at http://www.emsa.europa.eu/end185d007d001d001.html.

6.6.1 Technical regulations and classification societies

Most standards for shipbuilding are laid down in international regulations adopted by the IMO. The main international treaties dealing with standards for ship design, construction, equipment operating and manning are the *International Convention for the Safety of Life at Sea* (**SOLAS**), the *International Convention for the Prevention of Pollution from Ships* (**MARPOL**) and the *International Convention on standards of Training, Certification and Watchkeeping for Seafarers* (**STCW**).

The IMO has various specialized committees and sub-committees that update existing and develop new technical regulations.[206]

Until recently, ***Directive 94/57*** mainly dealt with classification societies in the EU legal framework (now replaced, see below), requiring a review of the list of recognised classification societies every 2 years, to be assessed by EMSA on behalf of the EC. [207] Worldwide there are roughly 50 organisations providing marine classification services. The EU at present recognizes the following 13 classification societies: [208]

Table 6.1 EU recognised classification societies

American Bureau of Shipping	Korean Register of Shipping	Hellenic Register of Shipping
Bureau Veritas	Lloyd's Register of Shipping	Registro Internacional Naval, SA
China Classification Society	Nippon Kaiji Kyokai	Polish Register of Shipping
Det Morske Veritas	Registro Italiano Navale	
Germanischer Lloyd	Russian Maritime Register of Shipping	

In addition to the *de facto* public tasks of testing and certifying ships and their vital parts, some classification societies also perform research functions as well as sometimes commercial consultancy-type of services. This latter category of activities may bring some tensions, which is indicated as an explanatory factor behind the finding that yards and equipment suppliers see classification societies as a considerable source of knowledge leakage.[209] Another issue with respect to classification is that the various classification bodies are not always perceived to apply standards in an equal manner.

6.6.2 Third Maritime Safety Package

In 2005, the ***3rd Maritime Safety Package*** was agreed upon. The main general objective of this Package is "to restore competitiveness to the sector while benefiting only those operators who respect safety standards, in particular by increasing pressure on owners of

[206] See IMO website for an overview of (sub)committees, at http://www.imo.org/Newsroom/mainframe.asp?topic_id=101.
[207] Directive 94/57/EC *on common rules and standards for ship inspection and survey organisations and for relevant activities of maritime administrations.* This Directive has been amended after the Erika disaster.
[208] 2007/C 1325/04, see also OJ C135/04 of 19 June 2007.
[209] Houthoff Bururma and Policy Research Corporation (2007).

sub-standard shipping".[210] Under the Package, measures have been adopted in the following themes:

- Quality of European flags;
- Classification societies;
- Port state control;
- Traffic monitoring;
- Accident investigation;
- Liability of carriers;
- Insurance.

Under the theme *Classification societies*, Directive 94/57 is replaced by **Directive 2009/15/EC** and **Regulation (EC) No 391/2009**.[211] The new Directive and Regulation aim to make inspection procedures of classification societies more rigorous and also empower the EC to carry out audits and impose penalties. It hopes to provide more legal certainty and make the current directive more readable. The following measures are included:[212]

- Recognized classification societies are to set up an independent joint body to certify quality-management systems;
- There is a reformed system of penalties – recognised classification societies that do not do their work properly can be fined or have their recognition withdrawn;
- Transparency and technical cooperation between approved classification societies is to be approved – mutual recognition of classification certificates for equipment, materials and components is provided for, when appropriate and always in accordance with the most stringent safety standards.

The main expected effects of these measures are firstly to increase the quality of work done by the classification societies. This is the rationale behind increasing the recognition criteria and the reformed system of penalties. The joint specialized body can in addition contribute to increased integration and uniformity of classification activities at the European level. Furthermore, the requirement of mutual recognition of certificates, whenever issued by recognized classification societies on the basis of equivalent technical standards, can decrease costs for maritime equipment suppliers.

Under the theme *Port state control*[213], control mechanisms in port states become more stringent. The goal is to inspect 100% of ships that call at European ports and to increase pressure specifically at high-risk ships. The following measures are included:

- Inspection of all ships calling at EU ports, the frequency of inspections depending on the risk profile of the ship (determined by ship type, age and flag, company's past performance and number of times the ship has been detained);
- Improvement of the regime for banning substandard ships - "it will be extended to include all ships' types, the ban will be stricter through a minimum ban period and sanctioned by a definitive ban in the event of repeated offences";

[210] See http://ec.europa.eu/transport/maritime/safety/third_maritime_safety_package_en.htm.

[211] Directive 2009/15/EC of the European Parliament and of the Council of 23 April 2009 on common rules and standards for ship inspection and survey organisations and for relevant activities of maritime administrations summary.

Regulation (EC) No 391/2009 of the European Parliament and of the Council of 23 April 2009 on common rules and standards for ship inspection and survey organisations and for relevant activities of maritime administrations summary.

[212] See http://ec.europa.eu/transport/maritime/safety/third_maritime_safety_package_en.htm for specificities.

[213] Implemented by Directive 2009/16/EC of the European Parliament and or the Council of 23 April 2009 on Port State Control.

- Publishing of a blacklist of companies operating substandard ships to be added to the one published by the *Paris Memorandum of Understanding on Port State Control* and the blacklist of banned ships published by the Commission.
- Improvement of requirements for qualification and training of inspectors of Port State Control Administrations.

The main expected effects of these measures are an increased focus on inspection of high-risk ships, while alleviating the pressure (less frequent inspections) on high quality ships. Also, inspection coverage levels are increased (up from 25 percent Member State target to 100 percent EU-wide target) and the EC's ability to deter sub-standards ships from its waters (now applying to any categories of ships) is strengthened. Thereby, the EU is sending a signal that repeat offenders are not tolerated (e.g. after a 4th occurrence, offending operators may be permanently banned) and indirectly stimulating demand for high-quality vessels.

7 Competitive environment assessment

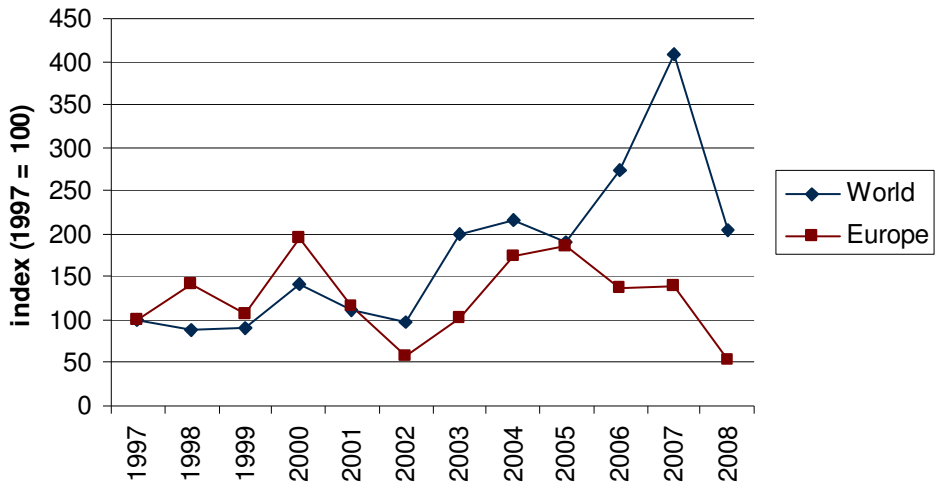
This chapter assesses the competitiveness environment by looking at the level and nature of competition and competitive pressures for different subsectors / market segments. This is done from a demand-side perspective (market conditions and developments) as well as from a supply-side perspective (competitor developments).

7.1 Market developments (demand-side)

In the last decade the mindset of buyers has changed slightly due to the demand of shippers. Buyers order new vessels faster and request faster delivery. This has resulted in some speculative orders in the near past. It has also resulted in a strong pressure to increase capacity resulting in the construction of new yards and docks.

Due to the economic downturn however, the total demand (new orders in CGT) decreased by 50% in 2008; especially from Q4 of 2008 when demand almost dried up. Demand for European vessels decreased by 61% in 2008. This aggravated a longer term trend where demand for European vessels dropped by 46% in the period 1997-2008 (see figure7.1). It should be noted that this was accompanied by a move of European shipbuilders to higher value segments resulting in a much slower drop in terms of value.

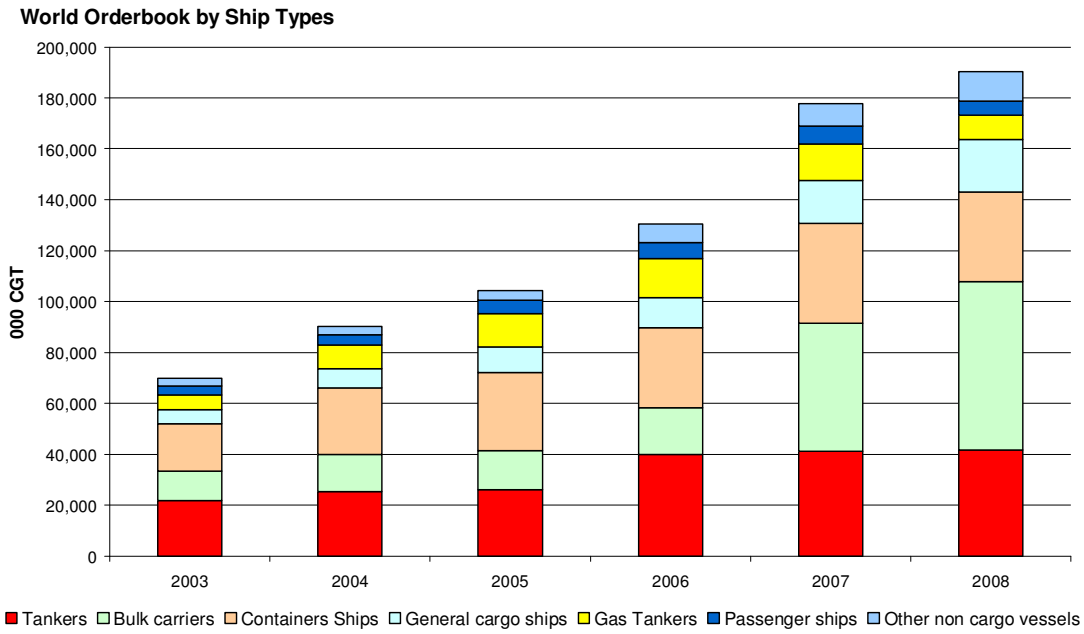
Figure 7.1 Indices of new orders in the World and Europe (1997 = 100)



Source: ECORYS, based on CESA data

As shown in figure 7.1, total demand for vessels in CGT decreased in the worldwide. Figure 7.2 further illustrates this development by looking at the changing demand patterns within the different shipbuilding segments.

Figure 7.2 World orderbook by Ship types in CGT



While the demand for bulk carriers was growing enormously in 2008, the economic crisis has led this segment to face serious cancellations in 2009. HSBC estimates that as much as 65% of the 104.5m dwt of dry bulk carriers on order in the world for delivery in 2010 might be cancelled or delayed[214]. Although this may be an unrealistically high figure, it indicates that the segment is very turbulent.

Also the container segment faced decreasing demand in 2008. A tendency that was continued with a global drop in container demand of 20% in the first four months of 2009[215]. The tanker and passenger ships segments remained relatively stable. However, in 2009 these segment faced a reduction in demand, also. The offshore and general cargo segments have been relatively stable, although also these segment could not escape the overall crisis in the beginning of 2009.

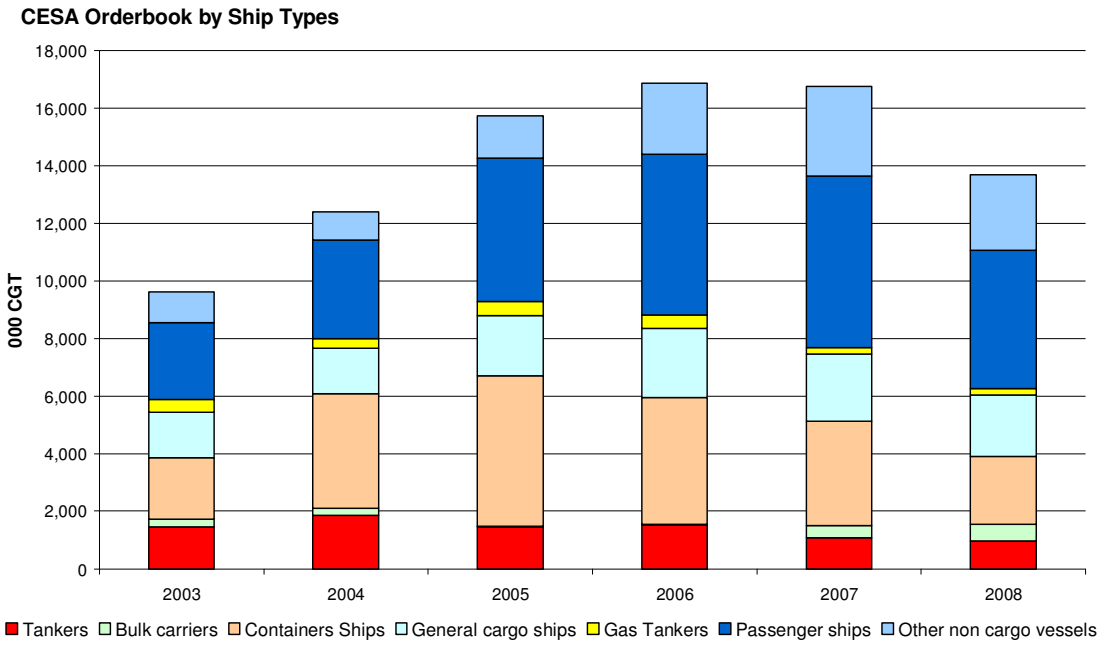
The changing demand patterns are further analysed for the main shipbuilding regions Europe, South Korea, China and Japan.

[214] http://www.vinamaso.net/news-events/shipbuilding-repair/65-of-bulker-orders-face-cancellation-or-delays.html
[215] http://www.vinamaso.net/news-events/general/global-orderbook-falls-to-lowest.html

Europe

As mentioned earlier, total demand for European vessels in CGT decreased over time. Figure 7.3 gives a further insight in the segments that are under pressure in the CESA countries.

Figure 7.3 CESA orderbook by ship types in CGT



Source: CESA Shipbuilding Market Monitor 2009

Regarding the other non cargo vessels, we see still a significant market share because many short sea vessels are relatively old and need replacement. Nevertheless, also in this segment, demand dropped in 2008. However, the offshore segment is a beacon of light accounting for 23 of the 65 worldwide contracts of the first four months in 2009[216].

Regarding passenger ships, there was also a decrease in demand in 2008 but Europe is still the world leader. The general cargo ships are mainly RoRo ships produced in Europe. The demand for these products is quite stable. A major drop visible over several years can be seen in the container ships. In general, the small container ships that Europe produces are relatively expensive.

The demand for the mainly small European tankers is also facing a decrease.

South Korea

The demand for container ships, accounting for a large percentage of the South Korean order portfolio, dropped in 2008. In addition, the gas tanker segment also dropped in 2008 in the South Korean orderbook. The demand for tankers, which account for a large percentage of the orderbook, remained stable over the last years. Two segments were rising in 2008, the bulk carriers and the offshore segment. Bulk carriers face many difficulties in 2009 due to speculation behaviour, while the offshore segment is still rising. A response from South

[216] http://www.vinamaso.net/news-events/general/global-orderbook-falls-to-lowest.html

Korean shipbuilders is to shift their focus to the offshore segment. For instance, Hanjin Heavy Industries & Construction is eyeing the offshore sector[217]. In particular, South Korea is focusing on platforms within the offshore segment and not on ships.

China

China was the only of the four major shipbuilding regions that showed an increase in orderbook in 2008. However, for bulk carriers, that account for 50% of its orderbook, also in China many cancellations have resulted from the economic downturn. By contrast, an increase can be seen in the dredging and offshore segment in 2008. The general cargo and tanker segment remained stable in 2008. Furthermore, the container segment showed a decrease in 2008. This downward trend has continued in 2009 with the global drop in container demand of 20% in the first four months of 2009[218].

Japan

Whereas Japanese shipbuilders were mainly producing the mainstay type of vessels, not many changes in demand took place in the orderbook. Japan received the most orders in the first quarter of 2009 in absolute terms[219]. This was strongly driven by relatively stable local Japanese demand. The demand for Japanese bulk carriers remained more stable than Chinese bulk carriers, for example, due to the focus on more traditional vessels. The container and tanker segments have been decreasing slightly over the last years, while the general cargo ships are slightly increasing. In 2009, there are some examples of companies eyeing the offshore segment. For example Imabari is starting building LNG carriers in 2009[220].

7.2 Competitor developments (supply-side)

Competitor developments in sectors

As indicated in the previous section, there are a number of market trends that directly influence changing strategies of shipbuilders. Since the bulk carriers and container markets dropped in the first four months of 2009, some Asian shipbuilders are shifting their focus to the offshore segment. The early months of 2009 showed a further development in this direction. As mentioned above, Hanjin Heavy Industries & Construction is eyeing the offshore sector[221]. Furthermore Dalian Shipbuilding has developed designs for offshore vessels. Lastly, Imabari is starting building LNG carriers in 2009[222].

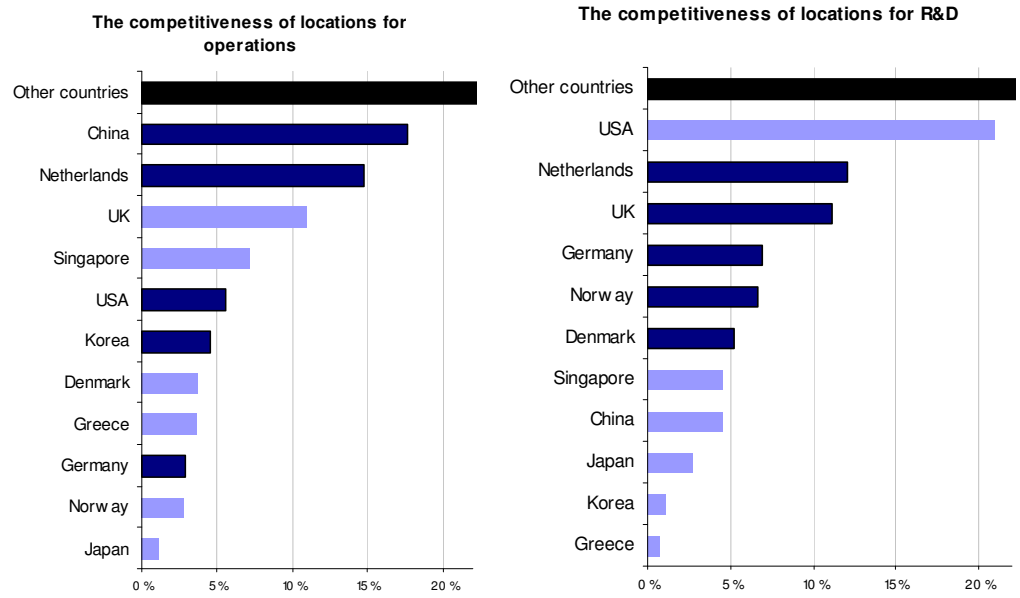
Whereas the offshore segment is apparently attractive to shipbuilders at the moment, other supply side developments can also be observed. For example, Yangzhou Dayang Shipbuilding of China appears to be advancing the development of Aframax tankers[223]. As the builder has no backlogged orders for tankers, it is believed that the yard will foray into a new market once it completes the design for Aframax.

[217] http://www.vinamaso.net/news-events/shipbuilding-repair/imabari-plans-to-deliver-100-ships.html
[218] http://www.vinamaso.net/news-events/general/global-orderbook-falls-to-lowest.html
[219] http://www.vinamaso.net/news-events/shipbuilding-repair/japan-ranks-1st-in-order-receipts.html
[220] http://www.vinamaso.net/news-events/shipbuilding-repair/imabari-plans-to-deliver-100-ships.html
[221] http://www.vinamaso.net/news-events/shipbuilding-repair/imabari-plans-to-deliver-100-ships.html
[222] http://www.vinamaso.net/news-events/shipbuilding-repair/imabari-plans-to-deliver-100-ships.html
[223] http://www.vinamaso.net/news-events/shipbuilding-repair/yangzhou-dayang-makes-inroads-into-aframax.html

Competitor developments by country

Over the last years, many acquisitions, joint ventures and set-ups for shipbuilders were caused by globalisation tendencies. Many shipbuilders focused on low cost countries. However a shift towards European countries can also be observed. Figure 7.4 shows estimates of the competitiveness of different locations for the maritime cluster.

Figure 7.4 Competitiveness of locations



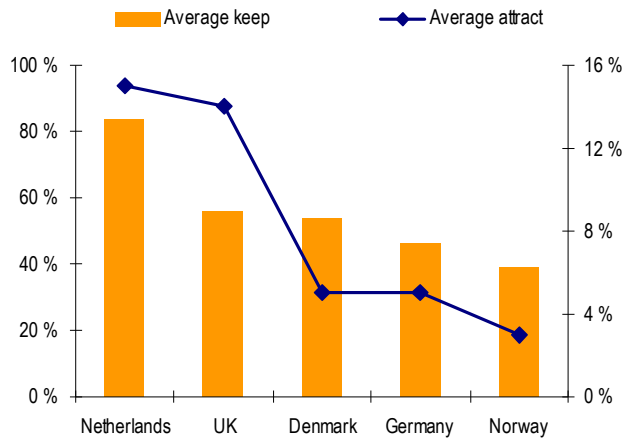
Source: MENON Business Economics: Attracting the Winners, The competitiveness of maritime clusters (2003). Percentages based on a sample of maritime company respondents who indicated their preferred location for their headquarters.

Based on the comparison shown in Figure 7.4, China is one of the most attractive countries to start operations in the maritime cluster. This is largely triggered by the abundant supply of labour, the low cost labour base and increasing market opportunities. Examples of shipbuilding companies which have taken opportunity of this are the joint ventures started in China by Hyundai HI (three joint ventures) and IHC Merwede of the Netherlands. Also other joint ventures were established in recent years, particularly by renowned Japanese and Korean yards, to facilitate the transfer of technology, engineering skills and production know-how to China. These joint ventures have a maximum of 49% ownership by foreign companies (shipbuilding is considered as a strategic sector by China).

Also the position of the Netherlands is remarkable. According to the evaluation, the Netherlands is considered the second most competitive country regarding operations. The country also ranks second on competitiveness for R&D behind the USA. Also the position of the UK remains strong. This has resulted in a prime position of the Netherlands and the UK as favoured European locations for both domestic and foreign firms in the maritime cluster. Nineteen percent of all non-Dutch firms indicated that they would choose the Netherlands as their headquarter location[224].

[224] Attracting the Winners, The competitiveness of maritime clusters, MENON, 2003.

Figure 7.5 The correlation between countries competitiveness for incumbents and foreigners



Source: MENON Business Economics: Attracting the Winners, The competitiveness of maritime clusters, 2003

Apart from China, acquisitions, joint ventures and start-ups took place in the shipbuilding sector also in other low cost countries. Another popular low cost location is Vietnam. In 86% of all ship construction projects in this country, there is full foreign ownership[225]. This is a major difference compared with China. Over the past years, South Korea invested most money in shipbuilding facilities, followed by Singapore, China and Japan. South Korea not only expanded within Asia, but invested in companies all over the worlds. The following table gives an overview of the five largest South Korean companies and their overseas investments.

Table 7.1 Overseas investments by Korean companies

Companies	Overseas Investment
Hyundai Heavy Industries (HHI)	Hyundai Vinashin Shipyard (HVS), Vietnam
	Hyundai Qindao Shipyard, China
Samsung Heavy Industries (SHI)	EAS Shipyard, Brazilian
Daewoo Shipbuilding & Marine Engineering	Daewoo Mangalia Heavy Industries Co.,
(DSME)	Ltd. (DMHI) 1997, Romania
STX Group	STX Europe, Norway (Aker Yards)
	The Dalian complex, China (2009)
Hanjin Heavy Industries & Construction (Hanjin)	Philippine Subic Bay Metropolitan Authority

Source: Dong-Ho Shin and Robert Hassink (2009), Cluster life cycles: the case of the shipbuilding industry cluster in South Korea, paper submitted to Regional Studies.

New competition

The development of shipbuilding by upcoming emergent markets has resulted in heavier competition in the past years. Whereas China is the second shipbuilding country in the

[225] OECD, The shipbuilding industry in Vietnam, May 2008

world and a country like Vietnam has shown rapid growth, there are new emerging market like the Philippines, India and Brazil that are growing as rapidly, also. This will have implications for the top countries. The orderbook of the top 10 global shipbuilders declined from 43.1% in January 2004 to 33.5% in July 2008. However, the orderbook of these 10 players still is on average almost 6-7 larger than the other players in the industry[226].

[226] CARE Research, Report on the shipbuilding industry, December 2008

8 Conclusions on the competitive strength of the European shipbuilding industry

The analyses in the previous chapter have indicates a number of strength and weakness of the European shipbuilding industry, together with pointing towards possible opportunities and threats. These are further summarized in Table 8.1, which can serve as an guidance in identifying issues relevant for a future policy strategy towards shipbuilding in Europe.

Table 8.1 SWOT of European shipbuilding

Strengths	Weaknesses
• Level of innovation • Innovative SMEs and strong position of marine equipment industry • Strong linkages yards & marine equipment: • Efficiency • Specialisation in niche markets • Spillovers between defence and commercial segments	• Cost levels (wage levels and steel prices) • Access to skilled labour • Access to finance • Potential difficulties in knowledge protection (especially among SMEs) • Fragmented government responses
Opportunities	**Threats**
• New segments, continuous innovation • Greening of shipbuilding industry • Existing transport policies (greening of transport, increased transport quality) • Enhanced requirements regarding shipping standards	• Demand shift from European to Asian buyers • Strengthening of maritime cluster (including finance in Asia) • Increasing development of marine equipment industry • Competitors moving up the ladder • SMEs not surviving the crisis • Flexible and swift competitor's governments to support their industry • Critical mass required to maintain/refresh high skilled workforce. Europe may be too small compared to competitors. Ageing workforce • Price competition in light of economic crisis

The SWOT presents shipbuilding as one sector comprising both shipyards and marine equipment. Conclusions cannot be separated as both sectors are highly integrated in Europe. Their interaction will be discussed below.

Europe has developed into a strong niche player in specialised high-end markets (yachts, cruise vessel, specialised offshore markets etc.), while mainstay market segments (bulk, tanker, etc.) have tended to be taken over by Asian competitors. This has had its impact on both shipyards and marine equipment suppliers and the strengths mentioned in the SWOT show this.

This specialisation – which can be seen as both a result of, and a reaction to, a number of comparative disadvantages – has made European shipbuilding less vulnerable to factors such as their relatively high costs of steel and labour. At the same time, it can be expected that Europe will continue loose market share in segments where Asian competitors are strong (e.g. container ships). The strong position of SMEs (also in marine equipment) which are generally seen as an innovative factor can be seen as a key strength.

The limited size of European shipyards – as compared to their Asian competitors – could be seen as a disadvantage (less benefiting from economies of scale), but on the other hand it can be argued that as European yards are less focusing on mass markets, these scale economies are less relevant. On the contrary, for specialised products smaller size may be an advantage ad the company is more flexible in adapting to innovations. It may also help to enhance cooperative development between shipyards and marine equipment companies.

Nevertheless a number of threats are facing Europe, particularly triggered by developments that may prevent Europe from retaining its relatively unique position.

- First they are linked to access to production factors/resources, especially the access to skilled labour. The ageing workforce and the limited attractiveness of manufacturing professions may pose a serious threat to European shipbuilding especially in retaining its specialist position. Although the ageing problem is also applicable to Japan and Korea, the problem is more pronounce in European countries. Shipyards and marine equipment companies will be similarly affected by this trend.
- Furthermore Europe has the highest wage levels, which directly affects the cost levels of the industry, especially if highly specialised labour-intensive ship segments are involved. Again this applies to both shipyards and marine equipment companies.
- Third, the access to financing schemes is rather difficult, especially in the current crisis situation. Indeed several countries have already taken measures to alleviate this, but on the other hand competing countries are doing the same in more aggressive manners. The large Asian companies may have more financial reserves and a ‘longer breath’ to survive, while especially SME companies may not be able to cover too long loss making periods. Especially yards are vulnerable to this as they are the integrators and have to arrange financing of the overall end product.
- This is further triggered by the relative unawareness of SMEs in support programmes for innovation and other support programmes.

All in all the size of the European shipbuilding industry has decreased over time thus threatening its critical mass in keeping support infrastructures alive. This also threatens the shipbuilding cluster in general.

On the other side, competitors are gaining ground on the basis of their large capacity, and slowly shifting up the ladder towards more complex vessel segments. The current crisis is a trigger for them to put even more effort in this climb. The current overcapacity on the

market allows this upmarket development at Asian shipbuilders. Likely Asian suppliers will follow this trend to be able to continue serving their customers.

The financial/economic crisis itself is a threat to the industry. First of all, several European shipbuilding companies (both shipyards and marine equipment companies) may simply not be able to survive the current crisis. The same would be the case in Asia if not governments there would take aggressive measures to keep companies alive that would otherwise get bankrupt.

A historical trend has been that several Asian governments – first Japan, later Korea, now China and also India – have assigned the shipbuilding sector a strategic industry, thus receiving policy support in various ways, as described in chapters 4-6. Their support initially targeted the shipyards but through the integration of companies also marine equipment suppliers have benefited from this. Furthermore in the wake of the current crisis most of these countries have swiftly responded by taking financial measures to support companies, or demand measures i.e. purchase support. European governments tend to take less swift or less sizeable actions, which risks the shipbuilding industry to loose edge.

A further threat is that the whole maritime cluster (shipping operations, ship management) is moving gradually towards Asia, thus also leading to a further shift in demand patterns.

On the other hand also clear opportunities exist in retaining the European market position. Europe is strong in innovation, renowned for its high quality deliveries and efficient cooperation between marine equipment manufacturers and shipyards. This basis can be used to realise opportunities in the field of new markets that are explored on the basis of Europe's current lead position in complex segments. One can think of 'green and safe vessels' as a new market for the future, as well as themes like deep sea applications, ocean energy, etc. From a policy perspective this can be supported by enhancing requirements regarding ship standards.

PART III: Business strategies and policy responses

9 Business strategies

9.1 Introduction

In light of the developments in the competitive position of Europe *vis á vis* its competitors, businesses are formulating their own responses. These form the basis for effective government policies, when the synergy between government policies and business strategies can be optimized.

The market dynamics as well as inherent strengths and capabilities of the shipbuilding industry in Europe from the basis for their business strategies. Therefore, this section of the report puts these strategies in a longer term historic perspective. Furthermore, key business strategies in Europe and in competing shipbuilding regions and countries are analysed.

9.2 The evolution of business strategies in the shipbuilding industry

After World War II, Europe and Japan started to rebuild their fleet. Although wages in Europe were 20 to 30 percent higher than in Japan, highly advanced ship component industries enabled European shipbuilders to build ships at lower prices than Japan at that time[227].

Nevertheless, two important aspects in the 1950s were input for low cost leadership in Japan in the late 1950s. Firstly, the government program of Keikaku Zosen in the late 1950s enforced the Japanese shipbuilding industry to produce steadily with low operational costs. Thereby, the Korean War in 1950-1953 caused undercapacity for the European shipbuilders, which forced oil companies and commercial shippers to order in Japan. The lower prices in Japan forced European builders to move towards a global segmentation in sophisticated vessels with advanced technology.

The energy crises of 1973 and 1979 forced companies in their move towards lower operating cost structures. Robots, the 'parallel shipbuilding' technique and disintermediation of brokers resulted in lower costs. A shifting trend towards more homogenous vessels resulted in a growth of emerging markets. South Korea was the most important emerging market which could benefit from the major shifts in the shipbuilding industry. An important factor was the acceptance of dollars rather than Japanese yens.

As Europe had relatively less of a competitive advantage based on its technology, due to licensing to Asia, it was forced to focus more and more on highly sophisticated vessels.

[227] Sung Cho Dong and Michael Porter (1986), Changing global industry leadership: the case of shipbuilding

Nevertheless, the market share dropped in the 1980s. Japan differentiated towards more innovative vessels, while South Korea chose the opposite strategy. With Daewoo as most famous example, South Korea also developed a stronger segmentation strategy in the 1980s towards more sophisticated vessels. Koreas gained its position as world leader in this period.

From the 1990s onwards, the global market changed rapidly because of the strategy of Korea. Korea had a strong presence in the traditional vessels of bulk carriers, container vessels and tankers. But in addition to a low cost position, they also focused on more sophisticated vessels. With the heat of even lower cost countries like China, South Korea found ways to lower its own labour costs by setting up new yards in low cost countries. Thus, Korean companies simultaneously followed a differentiation (specialisation) strategy and low cost strategy, referred to as 'ambidexterity'.

The most important development of recent years is the entrance of China to the world market. The strategy of the two large conglomerates China Shipbuilding Industry Corporation (CSIC) and China State Shipbuilding Corporation (CSSC) is in line with the strategy that the large South Korean shipbuilders applied in the past. China is currently the low cost leader.

The next table summarizes key business strategies from World War II onwards for the different countries.

Table 9.1 Global strategies and position of shipbuilding groups in shipbuilding countries

	Europe	Japan	South Korea	China
1945 – 1955	*Low cost leader*			
1955 – 1975	Specialisation	*Low cost leader*		
1975 – 1985	Specialisation	Differentiation	*Low cost leader*	
1985 - 1995	Specialisation	Differentiation	*Low cost leader* & segmentation	
1995 - 2005	Specialisation	Low cost	*Low cost leader* & ambidexterity	
present	Specialisation	Low cost	ambidexterity	*Low cost leader*

Source: ECORYS based on Sung Cho Dong and Michael Porter (1986), Changing global industry leadership: the case of shipbuilding

- *Specialisation (or segmentation)* (niche market) strategy is used in specialized markets in which firms gain more advantage through innovation rather than efficiency.
- *Differentiation* strategy aims for a broad market in which costumers are willing to pay a premium for the brand or technology.
- *Low cost* strategy aims for standardized mass products with large economies of scale.
- *Ambidexterity* strategy combines both differentiation and low cost strategy to have efficient products for current customers and innovate to serve future customers.

9.3 Current business strategies

Europe

Not only the overall direction but also the value added of the core segments that are produced are important for the business strategy. For years, Europe has had a position in the high end market segment. As a response to worldwide developments, Europe specialised in even more sophisticated vessels (particularly passenger vessels and other specialised niche segments such as offshore and dredging)[228]. As the Chairman of Fincantieri stated '*The most effective defence strategy is to distance itself from competitors from a technology standpoint by engaging in increasingly intense and effective research and development activities*[229].'

When business strategies in European shipyard companies are observed a number of commonalities can be noticed:

- Operate in a maximum of two sub-segments (specialisation/segmentation);
- Innovate to other sub-segments within the high end market;
- Partial outsourcing of production processes to low(er) cost countries for more standard type of vessels.

Table 9.2 Segments served by the largest European shipyards

	Passenger vessels		Non cargo vessels		Container	Naval
	Cruise	Ferries	Offshore	Special purpose		
Fincantieri	X	X				X
Meyer Werft	X	X				
STX Europe	X	X	X	X		
IHC Merwede			X	X		
Maersk Odense					X	
Damen Group		X		X		

In general it can be said that European shipyards follow a specialisation strategy where innovation and new product development is more important than low cost strategies. However some companies also clearly try to adapt their cost structure to stay competitive in the production of less specialised, more standard type of vessels. Two European examples that are (partially) pursuing this strategy are Damen Shipyards and IHC Merwede. Damen Shipyards started the low cost strategy already in 1994 with the opening of a shipyard in China. Recently, IHC Merwede opened a production location in China in late 2008. This was their answer to heavier competition in the niche markets as well as a response to the Chinese regulations on ownership and import tariffs.

For marine equipment suppliers location is important

European marine equipment suppliers have a slightly different strategy. Firstly, geographical presence is more important for marine equipment suppliers and therefore a stronger incentive exists to create a stronger global presence for companies in major shipbuilding regions. In this respect, marine equipment suppliers like Wartsila and MAN

[228] Of the large shipbuilders Maersk was still active in containership construction although it recently announced that they would stop production of large containerships and focus on smaller specialised vessels.

[229] Fincantieri, Annual report 2007.

Diesel work with licensees over the world to establish a global network. In addition major facilities can be found in low cost countries as well to retain a competitive edge from a cost perspective. Secondly, marine equipment suppliers try to adopt a strategy of continuous innovation and R&D to keep ahead of competition.

Japan

Japan still retained its competitive position in the medium to low end market segment. Imabari announced that it would mainly focus on the construction of bulk carriers, which have been dominating the backlogged orders for all yards in the group[230].
In these segments, Japan is known for its low cost strategies focused on an efficient production process. There are still investments planned to further improve the efficiency. For instance, Tsuneshi plans to invest about 24.8 billion yen (€ 162 mln) in facilities both in and outside Japan. In Japan, an assembly facility at the Tadotsu factory and a painting facility at the Tsuneishi factory will be built to improve production efficiency and capacity[231].

It must be noted that the large Japanese shipbuilders are mainly part of a larger group with other business units than shipbuilding, with some synergies to maximize the operating efficiency.

However, since competition of emerging markets intensifies, Japan has also chosen other ways to pursue its low cost strategy. For instance, Tsuneishi opened facilities in the Philippines in 1997. However last years, Japan was having less of a focus on opening facilities in emerging markets than South Korea did.

As a result of the economic crisis Japan is also reconsidering its strategy. Japanese shipbuilders are now also shifting to other segments such as the offshore segment. For example Imabari is starting building LNG carriers in 2009[232].

South Korea

As we mentioned before, South Korea pursues an ambidextrous strategy. Ambidexterity means on the one hand seeking for more efficient (low cost) operations, while on the other hand seeking more diversification through innovation.

South Korea pursues a rather different strategy than European shipbuilders. Firstly, the scope of the South Korean shipbuilders is much larger since the large players are all conglomerates operating in different businesses. For instance, Samsung Heavy Industries, the world's second-largest shipyard, plans to enter the wind turbine market in 2010. The move is further evidence of a burgeoning trend by South Korea's major shipyards to diversify revenue streams amid a dearth in newbuilding orders[233]. Thus, losses in the shipbuilding units can be compensated by other business units. Furthermore the conglomerate avails of much more equity than the smaller sized European firms.

[230] http://www.tsuneishi.co.jp/english/pressroom/release20090409.shtml
[231] http://www.tsuneishi.co.jp/english/pressroom/release20090409.shtml
[232] http://www.vinamaso.net/news-events/shipbuilding-repair/imabari-plans-to-deliver-100-ships.html
[233] http://www.vinamaso.net/news-events/general/samsung-enters-wind-turbine-market.html

Given their structure and size, South Korean firms can diversify more easily than European firms; they have equity to acquire businesses in new shipbuilding market segments (for instance the acquisition of Aker Yards by STX) and technology to innovate with the changing demands of their customers. Already from the 1980s, South Korea is moving more and more from the low end to higher market segments. All top four Korean shipbuilding companies now incorporate an offshore business. They all endeavour to be specialist of both offshore and general shipbuilding. For instance, STX Shipbuilding recently changed its name to STX Offshore and Shipbuilding. This focus will clearly result in heavier competition for the European (mainly Norway) shipbuilders that are specialized in this segment.

Box 9.1 Asian shipbuilders moving into the specialised offshore market

Within the **offshore segment**, new orders are expected to be placed in the offshore plant sector in the second half of 2009 such as Shell's massive LNG-FPSO, Gorgon Project's LNG plant, Petrobras' drillship and ExxonMobil's LNG carrier, etc[234]. This has resulted in a response from Asian shipbuilders who are also shifting their focus to the offshore segment. For instance, Hanjin Heavy Industries & Construction cites the slowdown in demand for commercial ships due to the global economic crisis as the reason behind the Seoul-headquartered company's drive to diversify. "Contrary to commercial shipbuilding, there is demand from the offshore segment," said Hanjin[235]. Also, Imabari is now focusing on LNG carriers[236]. Furthermore Dalian Shipbuilding has developed designs for 156,800 cu m capacity vessels. Across the sea, China State Shipbuilding Corp has developed designs for a similar sized 156,000 cu m capacity ship.

South Korean shipbuilders are also faced with increasing labour costs. This has already resulted in a shift to low cost countries in the region. For instance, Hyundai HI has three joint ventures in China, while DMSE has its second shipyard in China. By contrast, Samsung Shipbuilding does not have facilities outside South Korea.

The strategies of the world's two largest shipbuilders Hyundai and DSME have many things in common (see table 9.3). Apart from a focus on innovation and increased production efficiencies both companies see network building and creating synergies as strategic objectives.

Table 9.3 Strategic focus of Hyundai and DSME

	Hyundai HI	DSME
Innovation	Operational innovation Technology Development	New business Innovative leadership Process innovation
Efficiency	Structural optimization Production optimization	Optimization Standardization

[234] http://www.vinamaso.net/news-events/shipbuilding-repair/japan-ranks-1st-in-order-receipts.html
[235] http://www.vinamaso.net/news-events/offshore-energy/hanjin-makes-inroads-into-offshore-plants.html
[236] http://www.vinamaso.net/news-events/shipbuilding-repair/imabari-plans-to-deliver-100-ships.html

China

The strategies of the Chinese firms bear some similarities to the South Korean companies regarding their differentiation strategy. For example, R&D institutes and universities are incorporated as in the South Korean conglomerates. Even China is showing some first careful tendencies to move up the ladder, although it is still a long way from the higher segments of Europe and South Korea.

However, their low cost strategy is quite different, since the Chinese shipbuilders China Shipbuilding Industry Corporation (CSIC) and China State Shipbuilding Corporation (CSSC) are having labour cost advantages in their home country. The Chinese government endeavours to conglomerate the supply chain for shipbuilders through integration in the two groups. As a result clear economies of scale can be realised.

10 Policy responses and recommendations

10.1 Leadership 2015 – current policy responses

10.1.1 LeaderSHIP 2015

The LeaderSHIP 2015 framework identifies eight key areas. Table 10.1 gives an overview of the suggested recommendations in these eight fields, as reported in LeaderSHIP.

Table 10.1 LeaderSHIP 2015 Strategy – key areas and recommendations

Key area	Recommendations
Establishing a level playing field in world shipbuilding	• Continuation of the present EU trade policy approach with determination. • Full enforcement of applicable WTO rules to shipbuilding. • Development of enforceable OECD disciplines through a new shipbuilding agreement by 2005 and an unambiguous interpretation of existing rules.
Improving RDI investment in the EU shipbuilding industry	• The European dimension of shipbuilding RDI should be strengthened through integrating and concentrating efforts, with the aim to create Technology Platforms. Work being undertaken within the Maritime Industries Forum should form the base for this approach. • Shipbuilding should, in substance, enjoy the same conditions as other industries that engage in similar RDI activities. • Aid intensities need to reflect the actual technological risks taken in all phases of design, development and production. • New definitions, notably regarding innovation aid, need to be developed where necessary. • RDI investment support needs to aim at enhancing European technological leadership and should reward risk taking.
Developing advanced financing and guarantee schemes	• Explore the possibility of establishing an EU-wide guarantee fund for pre- and post-delivery financing. The alternative of harmonising standards in EU member states, in line with common market and OECD rules, could also be considered, albeit difficult to fully achieve. Any such tools have to be easily applicable. • Export credit insurance companies, covered by appropriate re-insurance, should offer hedging instruments of currency risks.
Promoting Safer and More Environment-Friendly Ships	• Existing and future EU legislation has to be strictly implemented and "exported" to the international level. • A more transparent, uniform, efficient and independent system of technical surveys of vessels has to be promoted. • A quality assessment scheme for shipyards at world-wide level should be developed, covering newbuilding and repair.

Key area	Recommendations
	• Maintaining and strengthening ship repair capabilities in Europe is important to ensure a high level of transport safety and environmental protection. • An expert committee is to be established to provide technical support to the European Commission and to EMSA. • The great potential of Short Sea Shipping needs to be exploited through appropriate political and economic framework conditions.
A European Approach to Naval Shipbuilding Needs	• Joint requirements should be established to shape a number of major projects, enabling co-operation between yards and leading to inter-operability of systems, vessels and fleets. • Member states should address the issue of harmonisation of export rules. • Common rules to create a European market for defence equipment have to be developed, based on the Council's request to create an intergovernmental agency in the field of defence capabilities development, research, acquisition and armaments.
Protection of Intellectual Property Rights (IPR)	• The existing instruments for IPR protection (copyrights, registered designs, trademarks, patents, non-disclosure and specific collaboration agreements) need to be exploited to the full. • Knowledge data bases for shipbuilding, containing information about the state of the art, existing patents, the specific competitive situation for certain products and solutions, and key knowledge holders, should be built and run by dedicated IPR entities. • International patent rules applicable to shipbuilding need to be examined and possibly strengthened.
Securing the Access to a Skilled Workforce	• Programmes for shipbuilding-specific management training need to be developed and established. • New skill requirements need to be analysed and addressed, ideally through a sectoral social dialogue. • Exchange of staff and know how needs to be organised on all levels, from shop floor to academia. • A publicity campaign, showing the vitality and sustainability of the shipbuilding industry, has to be implemented. • Regional centres of excellence could provide crucial input for the realisation of the above recommendations.
Building a Sustainable Industry Structure	• Non-action is not an option, neither is protectionism: The EU of the 25 must further develop its policy approach to the sector, in line with its principles on industrial policies. • A consolidation process among European producers should be facilitated, providing incentives to remove less efficient production capacity and thereby freeing resources for new investments. • The current closure aid rules in the EU should be scrutinized with the view to facilitate a more pro-active approach, based on the idea of "aid to consolidation".

Source: LeaderSHIP2015

10.1.2 LeaderSHIP 2015 progress report

In April 2007, a progress report on LeaderSHIP 2015 was issued, summarising progress (and remaining challenges) for the eight key areas identified in LeaderSHIP.

Establishing a level playing field in world shipbuilding

The shipbuilding industry is truly global, but there is no real level playing field in the international trade and competition arena. Not much result has been achieved in this field. The difficulties with the application of international trade rules (on subsidies) were illustrated in the WTO case between the EU and Korea. Progress in the attempts to negotiate an international shipbuilding agreement under the OECD (addressing subsidies and dumping prices) has been halted in 2005. However, progress has been made in starting bilateral discussions, including the Shipbuilding Dialogue with China and, expectedly, an EU-Korea FTA negotiation process.

Improving RDI investment in the EU shipbuilding industry

In the field of RDI stimulation, the updated provisions on innovation aid to shipyards (for industrial application of innovative products and processes) have been an important improvement for the sector. Germany, France, Spain, the Netherlands and Italy have subsequently developed national funded schemes supporting innovation. The launch of the Technology Platform WATERBORNE and the increase of the budget for surface transport under FP7 have also been considerable steps in strengthening RDI in the EU shipbuilding sector. Industrial clusters play an increasingly important role in maritime industries.

Developing advanced financing and guarantee schemes

In this field, the focus of the Commission in working on this issue has been on pre-delivery financing schemes (refund guarantees). Extensive contacts have been initiated with the EIB, though the EIB has indicated to face statutory constraints, lack of resources and sector-specific knowledge required to take a leading role. In 2006, a workshop was held with Member States, industry, the EIB and relevant commission departments. In the meanwhile the Commission has explored the possibility of an EU guarantee fund for shipyards, though such a Community budget allocation would require considerable legislative measures. A clear political will also at Member State level is needed to make further progress in this field.

Promoting Safer and More Environment-Friendly Ships

Given the high quality of European ships, the EU welcomes higher global standards. However, care must be taken that such standards do not lead to unintended technology transfer and leakage of IP, e.g. through mandatory ship construction files. This must be carefully considered, e.g. in the discussion in the IMO on new Goal-Based ship criteria and in the IACS on new unified rules on hull construction. Both industry and the Commission are actively providing technical expertise to EMSA and are striving in various initiatives to reduce transport pollution and increase safety, e.g. by promoting Short Sea Shipping, applying the clean ship concept widely and introducing new intermodal maritime-based transport logistics chains in Europe.

A European Approach to Naval Shipbuilding Needs

A trend of consolidation and co-operation between naval shipyards at national level is observed, which is welcomed by the Commission provided that it helps building a European Defence Technological and Industrial Base. Much work remains to be done in agreeing upon common operational requirements and harmonised procurement cycles in order to reach more interoperability of vessels and fleets. The competitive advantage of the naval sector in Europe is still at risk because of market fragmentation and resulting lack of synergies. Creation of the European Defence Agency is helping to achieve the goals.

Protection of Intellectual Property Rights (IPR)

Efforts have been made in raising awareness on the value of knowledge in the shipbuilding sector (hinging on technological leadership) and the importance of protecting it. The Commission launched a study on IPR issues in shipbuilding in 2006. A Working Group of the Maritime Industries Forum looking into Rules, Regulations and Right is addressing IPR protection. The Shipbuilding Dialogue with China and other bilateral initiatives intend to include this issue as well.

Securing the Access to a Skilled Workforce

CESA and EMF have launched a formal Social Dialogue Committee for the shipbuilding and ship-repair sectors in 2003. In this Framework CESA and EMF have been granted the status of European social partner and are consulted on social policy proposals. Practical initiatives like the European Shipyard Week serve to improve the attractiveness of shipyards as a workplace for young high-skilled professionals.

Building a Sustainable Industry Structure

Defining the structure of the shipbuilding industry falls outside the scope of the Commission. Some developments towards mergers, acquisitions and joint ventures have been observed, making European shipbuilding groups better equipped to compete successfully. There is however scope for improvement in this direction, when compared to the industries of Japan and Korea.

10.2 Recommendation for new policy responses

10.2.1 Context of policy recommendations

LeaderSHIP 2015 objectives remain relevant but the shipbuilding sector is not the same as when it was launched.

The main objectives of the LeaderSHIP 2015 strategy for the shipbuilding sector still stand; the long term vision of the sector to achieve "competitiveness through excellence" is as relevant today as it was when the strategy was drafted. This framework is therefore the starting point when making new policy recommendations. The shipbuilding sector however does not look the same and is not facing exactly the same challenges as when LeaderSHIP 2015 was launched.

The context has changed…

Since launching LeaderSHIP 2015, the shipbuilding sector has gone through an upward cycle, followed by a deep downward cycle. This current downward cycle has been brought forward and aggravated by the current economic and financial crisis.

…the regulatory environment has changed…

launched to amend the regulatory framework affecting the shipbuilding sector. The market and the business strategies of the main players in the market have also evolved. When making policy recommendations, this new environment needs to be taken into account.

…, which must be taken into account when making policy recommendations

Making policy recommendations

In making policy recommendations, the following points need to be taken into account:

- ***Short term versus long term measures***;
  While the LeaderSHIP strategy itself is a strategy to strengthen the sector on a long term basis, the economic crisis that hit the shipbuilding sector as of end 2008 is asking for short term measures as well. Part of the key areas of LeaderSHIP allow for measures to counter the negative impacts of the crisis. In the sections below, the time horizon is indicated for each measure. It is noted that for many measures, short term action from stakeholders and governments is needed in order to reach impacts on the longer term.
- ***Choosing the appropriate policy mix***;
  Designing an effective set of policy measures requires the formation of an appropriate policy mix. A main distinction in policy measures is that between regulation-based measures ("the stick") and incentive instruments ("the carrot"). An example of the former are the command & control type measures[237], e.g. a cap on foreign equity investments, while an example of the latter are the innovation aid schemes in place. When choosing the optimal set of policy measures, the regulatory environment in which the object – in this case the shipbuilding sector – is acting needs to allow for specificities and learn from (in)effectiveness of measures in place. The policy measures given here are presented along the lines of the LeaderSHIP2015 key areas and should be considered in light of policy mix already in place in that area. Within each area, it is indicated whether new measures are proposed or whether the existing set of policy measures within LeaderSHIP is considered to suffice. The additional recommendations below contain both regulatory-based as well as supportive measures. The recommendations are made taking into consideration the (expected) impacts on the sector of the measures implemented after the launch of LeaderSHIP 2015.

10.2.2 Policy recommendations by key area

Establishing a level playing field in world shipbuilding

Given the global nature of the shipbuilding sector, the divergence of legislation (and enforcement) and the lack of a comprehensive global regime (e.g. in the field of trade and competition policy) is hindering the sector to operate in a level playing field. The pausing of the work on an international shipbuilding agreement under the OECD is regrettable in this perspective. Continuing efforts are advised to further this dialogue and other initiatives at the international level. This should be pursued both at multilateral level (WTO, OECD) as well as on bilateral level, for example through trying to re-activate the Shipbuilding Dialogue with China, as well as by continuing efforts in the negotiation process of an EU-Korea FTA. Although impacts may be expected on the long term only, efforts should be made in the short term.

[237] The OECD defines Command & Control (CAC) policy as: "policy that relies on regulation (permission, prohibition, standard setting and enforcement as opposed to financial incentives, that is, economic instruments of cost internalisation."

Especially in light of the current economic crisis there is a risk that potential competitors attempt to enter niche markets that are dominated by European shipbuilders at price levels that are below cost levels. In those cases it is recommended to take seek a pro-active approach on the short term in avoiding unfair competition practices, by monitoring for potential unfair competition practices, and addressing the responsible authorities of the countries involved.

Recommendations	ST	LT[238]
• Continuing efforts to create a global shipbuilding agreement to create a level playing field.	√	√
• Take a pro-active approach in addressing pricing practices that raise the suspicion of being unreasonable and unsustainable.	√	

Improving RDI investment in the EU shipbuilding industry

The competitive position of the EU shipbuilding sector hinges largely on technological leadership. Continuous innovation combined with strong market/client-orientation are the key to retaining a competitive position in the high-technology niche markets. The Shipbuilding Framework in force since 2004 has been a large step towards specifying interpretation of EU competition rules (state aid) tailored to the shipbuilding sector. The compatibility rules on innovation aid schemes are an important improvement, now also enabling 20 percent aid for industrial applications of innovative products and processes. Similarly, the new RDI Framework in force since 2007 contains important updates of provisions (e.g. for aid to innovation clusters).

The main challenge in the field of RDI now lies in implementing and funding innovation and R&D programs, both at Member State and Community level. At Community level, especially the smaller EU companies indicate that accessing funding and programs at EU-level (e.g. under FP7) can be administratively difficult and time-consuming. Further simplification of procedures and improving accessibility[239], especially for SMEs, is advised. Disseminating information, e.g. through the sectors associations also at national level, on procedural improvements and possibilities under the FPs can help as well, for example on the increased funding opportunities under FP7 specifically aimed at strengthening the RDI capacity of SMEs. At national level, there are differences in whether and how national governments design innovation aid schemes, leading to some differences between Member States. Further exchange of best practices and raising awareness on the possibilities for effective RDI incentive schemes is advised. The instrument of tax exemptions at national level can be further explored.

Further stimulating of a cluster approach to innovation and an open innovation landscape is advisable for the competitive position of the sector in the future. Working in innovation clusters can help create synergies, increase cost-efficiency of innovation and enable more focussed cluster-based knowledge protection. Facilitation of cross-sectoral exchange of

[238] ST = Short term measure, typically in a time frame of 0-2 years; LT = Long Term measure, typically a time frame of 3 years or more. Some measures can be relevant for both ST and LT.

[239] To a certain extent this should also overcome perceptional issues as major efforts have already been undertaken to promote SME participation in FP7.

knowledge and experiences between high-technology industries can help (e.g. in cluster approaches and supply chain processes).

Recommendations	ST	LT
• Exchange of best practices and awareness raising on possibilities regarding RDI aid schemes at Member State level (e,g. through tax exemptions)	√	
• Further simplify procedures and improve access to EU-level RDI programmes		√
• Actively promote a cluster approach to innovation	√	√
• Facilitate cross-sectoral exchange of knowledge and experiences between high-tech industries.	√	√

Developing advanced financing and guarantee schemes

The Commission has been active creating the appropriate environment for Member States to develop their own schemes. A specific Notice was issued for this purpose in 2008 and schemes have been established in several countries. The new Notice provides for an easier access to SMEs. This may be of specific importance in the light of the current crisis. Under the existing legislation it is possible to establish guarantee schemes and adopt them (e.g. to allow easy access to SMEs). However, still not all Member States have decided to adopt such a scheme. This may be a lack of awareness or a lack of willingness to reserve funds for this purpose at a Member State level (i.e. if budgets are limited and priorities lie elsewhere). It is recommended to undertake additional actions to share best practices between Member States. An additional recommendation might be to look into the possibility to establish a multi-country guarantee scheme to overcome possible funding hurdles and pool financing sources from different Member States, although it may also have negative impacts on EU wide schemes.

The creation of a European facility (either through a direct budget allocation at Community level, or at EIB) would require a clear political commitment from the Member States according to the LeaderSHIP progress report. Further actions are advised in this respect. In addition the Commission has launched a request for a study on the establishment of a European pre-delivery guarantee scheme. Results of this study are expected in 2010.

In addition to studying such a pre-delivery guarantee scheme it appears to be recommendable to investigate the possibilities of establishing guarantee schemes that support ship-owners in purchasing new vessels, as support to shipyards forms only one side of the coin.

An additional possibility is created through the temporary framework for state aid measures. This scheme also offers additional possibilities to support SMEs in financial difficulties. Also the EIB recently announced its plan to back financing to SMEs by banks by making up to €30 billion available (general scheme also accessible for shipbuilding).

Recommendations	ST	LT
• Enhance awareness on best practices and possibilities regarding guarantee schemes at Member State level	√	
• Look into the possibility to pool funds from various MS to create a regional guarantee fund	√	
• Initiate further actions to create commitment at MS level to create a central EU (EC or EIB) facility	√	
• Initiate a further study on the possible set-up and structure of a central EU guarantee fund.	√	
• Investigate the possibility to create guarantee schemes aimed at the purchase of ships	√	
• Enhance awareness of available schemes, especially towards SMEs	√	√

Promoting Safer and More Environment-Friendly Ships

Given the high-technology nature of the EU-shipbuilding sector and the high EU-wide priority for safety and environmental quality, high global standards and effective control on them is important.

The recently adopted measures under the Third Maritime Safety Package are expected to contribute considerably to improving quality standards and sharpening their control and enforcement in the EU. The updated provisions on classification societies are expected to help stimulate higher quality of the work of those societies and provide higher levels of cooperation and consistency in application at an EU-wide level. The new provision on mutual recognition of classification certificates for equipment can contribute to reducing costs of certification and help to improve consistency between different societies. The focus should now be on implementing and monitoring these provisions effectively, as well as seeking further measures to stimulate mutual recognition and (technological) cooperation between the classification societies.

The fact that classification societies are seen as a considerable source of knowledge leakage for yards and equipment suppliers is worrisome, especially in the context of some classification societies also providing commercially oriented services. The increased empowerment at the EU-wide level (of the EC) might help to increase the level of quality of recognised organisations in this context.

The updated provisions on port state control on all ships that enter EU waters will increase the effectiveness of control on standards, focusing more on inspection of high-risk ships and being more stringent on banning substandard ships. This can, already on the short term, further stimulate operators to shift to high-quality ships.

Further stimulating (the quality of) Short Sea Shipping can in addition be considered. In addition, the possibilities to link financial incentive schemes to fleet renewal, founded on compliance criteria with environmental (and safety) standards should be considered. A scrapping scheme, if set-up environmentally sustainably and meeting labour condition rules, can also be considered. Examples from the car industry and IWT can be taken into account for its design. In this context, further allocation of funds to research on green and clean ships can be beneficial. Other policies like charging for greening transport or emission trading can also be measures that indirectly benefit this shipbuilding industry.

Recommendations	ST	LT
• Monitoring and implementation of the provisions under the 3d Maritime Safety Package.	√	√
• Explore options for expansion of provisions on mutual recognition of certificates		√
• Further stimulate standards and quality for Short Sea Shipping	√	√
• Consider linking financial incentive schemes to fleet renewal (e.g. scrapping schemes) based on compliance with environmental and safety standards and on the age profile of fleet segments.	√	

A European Approach to Naval Shipbuilding Needs

The initiatives indicated in the LeaderSHIP 2015 initiative which were restated in the progress report of 2007 are still valid. No additional recommendations are formulated in the respect.

Protection of Intellectual Property Rights (IPR)

The level of IPR protection applied in the shipbuilding sector is relatively low. Many EU firms in the shipbuilding sector often decide not to protect their knowledge for (a combination of) the following reasons:

- general enforcement difficulties (high costs, evidence and reactive nature of IPR);
- enforcement difficulties for EU operators in Asian jurisdictions especially;
- the fact that foreign-owned vessels are placed beyond the reach of domestic patent rights;
- lack of awareness of the possibilities, especially among SMEs.

Instead, firms indicate that the only way to remain competitive in this sense is to continuously innovate and do it fast, so as to stay ahead of the game.

Though these reasons considerably hinder effective applicability of IP protection, there seems to be considerable scope for improvement of the level of protection, also within the EU. Given the high level of integration of the sector between the yards and the equipment suppliers in the EU, this could be done increasingly in innovation clusters, e.g. through patent pooling and licensing structures. Establishing a Community-wide patent can facilitate or accelerate this process, also because this would at least solve the scope limitation for vessels brought about by art 5*ter* Paris Convention within Europe (in turn giving the EU a stronger position in striving for amendment to this article at the international level). Also, continuing efforts to increase awareness of IP protection possibilities, especially among innovative SMEs, can stimulate this process. Continued efforts should also be made to address the specific enforcement difficulties in Asia, for example through the EU-China Shipbuilding Dialogue. Furthermore methods can be explored to for instance mark products in a unique way, as suggested by EMEC.

Recommendations	ST	LT
• Awareness raising of IPR protection possibilities, especially among SMEs	√	
• Actively promote cluster approaches to innovation and knowledge protection in the EU	√	
• Establish a Community-wide patent and strife for modernisation of art. 5*ter* Paris Convention at international level		√
• Continue addressing IPR in bilateral initiatives (e.g. EU-China shipbuilding dialogue and FTAs)	√	√

Securing the Access to a Skilled Workforce

Different efforts have been undertaken by Member States, the EC, social dialogue partners and other stakeholders to promote professions in the maritime cluster (e.g. the European Shipyard Week or the recently launched "Future is Ship Shape" campaign in Scotland). This remains a highly topical issue with respect to shipbuilding also in light of the ageing population and the impacts it may have on the longer term. It may even become more difficult if the critical mass of the shipbuilding industry is being threatened and specific education facilities cease to exist. A continuation of active promotion activities to stimulate professions in the maritime cluster, and technical professions is recommended. In addition the possibilities for a more active labour migration policy may be investigated.
For the short term (crisis) period, the need may be less profound, but the increased availability of labour may be a stimulus to promote the sector while there is interest.

Recommendations	ST	LT
• Promotion of employment in technical professions and maritime cluster	√	√
• Exploration of the possibilities of a specific labour migration policy targeted at shipbuilding.		√

Building a Sustainable Industry Structure

As indicated in the LeaderSHIP 2015 progress report actions in this field fall largely outside the scope of the Commission. Choices of investment in certain developments, consolidation or outplacing activities are to be considered by individual companies as they have done in the past. Cooperation between yards and equipment suppliers is considered a key factor in maintaining innovative according to many interviewees.

Nevertheless, taking action to avoid fragmentation and loss of critical mass is important. In this light it is recommended to further build and stimulate the creation of maritime clusters within the European industry.

In addition, it is important to support SMEs as they form an increasing important share of the companies in shipbuilding. Specifically in view of the current crisis these SMEs may not always have the financial means to survive which might lead to the disappearance of otherwise healthy companies. This may be even more relevant for the marine equipment sector than for shipyards, as in the equipment industry the share of SMEs is assumed to be high, In most of the initiatives undertaken by the Commission, specific conditions exist for SMEs (e.g. in the innovation aid schemes, guarantee schemes, FP7 access, temporary framework for state aid support, IPR costs, etc.). However not all possibilities have been adopted by Member States. Yet another issue is that many SMEs are not aware of the possibilities that are offered.

Recommendations	ST	LT
• Stimulate the formation of maritime clusters to build and retain critical mass	√	√
• Enhanced awareness among SMEs of specific support possibilities and promote inclusion of SMEs specific possibilities into national support frameworks and schemes.	√	√

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Annex A List of interviews

Date	Interview/meeting
22-01-09	Seminar on IPR in shipbuilding
	Bilateral talks to various individual companies
28-01-09	Meeting MARIN Wageningen (shipbuilding research)
02-02-09	CESA: discussion on study contents and data exchange
02-02-09	EMEC: discussion on study contents and data exchange
09-02-09	Scheepsbouw Nederland: interview on sector conditions and strategy in the Netherlands
02-03-09	CESA: update of data collection and clarification of market monitoring data
17-03-09	CESA: attended market monitoring meeting with CESA and national experts
26-5-09	Fortis
13-05-09	Van Oord
18-05-09	Fortis
10-06-09	IHC Merwede
	Interviews Round
27-05-09	Romania
03-06-09	Germany
10-06-09	Norway
16-06-09	The Netherlands
19-06-09	Italy
08-06-09/ 12-06-09 17-06-09	United Kingdom

Country interview participants

Romania

- Mrs. Cleonia Copaci, General Director, Severnav
- Mr. Victor Alexiu, Corporate Affairs, Severnav
- Mr. Gelu Stan, Executive Managing Director, ANCONAV
- Mr. Radu Rusen, Managing Director, Constanta Shipyard
- Mr. Florin Spataru, Finance Director, Damen Shipyards Galati

Germany

- Mr Werner Lundt, General Managing Director, VSM
- Mr Hauke Viktor Schlegel, Managing Director, VDMA
- Mr Gerhard Carlsson, Market Analysis & Communications, VSM

Italy

- Mr. Livio Marchesini, Director, ASSONAVE

- Mr. Guido Assereto, Executive International Relations, Fincantieri
- Atillio Dall'Osso, Vice-President, Navalimpianti

Norway

- Mr. Egil Holland, Director Maritime Sector, Norsk Industri
- Mr. Lars Gørvell-Dahll, Sr Vice President Corporate Business Development, Kongsberg
- Mr. Tor S. Andersen, Executive Vice President, Rapp Marine Group

Netherlands

- Mr. Pascal Van Kuijen, Manager Information Services, Scheepsbouw Nederland
- Mr. Hans Voorneveld, COO, Damen Shipyards Group
- Mr. Eibert van de Beek, Director, Ned-deck Marine
- Mr. Kees Kok, Managing Director, Minks kunststoftechniek
- Mr. Don van Oldenbarneveld, Director, Rubber Design
- Mr. Goof Hamers (CEO), IHC Merwede

United Kingdom

- Dr Jonathan Williams, CEO, Marine Southeast
- Mr. John Murray, CEO, Society of Maritime Industries
- Mr. Simon Coote, Director & General Manager, Richards Dry Docks & Engineering Ltd.

Other persons interviewed

- Mr. Reinhard Lüken, CESA
- Mr. Paris Sansoglou, CESA
- Ms. Paola Lancellotti, EMEC
- Mr. Douwe Cunningham, EMEC
- Mr. Marnix Krikke, vice president Scheepsbouw Nederland
- Mr. Gert-Jan Huisink, general manager Holland Marine Equipment
- Mr. Pascal van Kuijen, Manager Information Services Scheepsbouw Nederland
- Mr. Bob Vogelzang, Senior Manager Transportation, Fortis Bank Nederland
- Prof. Robert Hassink, Christian-Albrechts University, Kiel, Germany

Annex B Detailed data

Table 0.1 Market share shiptype by country in 1,000 CGT in 2006

	Germany	Italy	Netherlands	Poland	Denmark	France	Finland	Spain	Romania	Total
Full Container vessels	2203,2	0,0	408,8	769,4	1053,2	0,0	18,5	76,6	258,7	**4788,2**
Passenger vessels	1184,0	1756,6	28,9	0,0	0,0	945,9	675,2	0,0	0,0	**4590,6**
Other Non-Cargo vessels	101,5	132,1	668,9	82,8	11,9	13,5	0,0	312,7	184,1	**1507,4**
General cargo ships	97,3	0,0	646,2	30,8	0,0	0,0	0,0	177,1	164,4	**1115,7**
Ferries	198,7	500,8	10,3	11,4	0,0	4,1	280,2	68,3	21,6	**1095,4**
Product & Chemical Tankers	105,7	87,2	231,2	24,3	0,0	0,0	0,0	138,4	203,0	**789,8**
Ro-Ro vessels	198,7	0,0	0,0	147,7	0,0	0,0	0,0	62,7	0,0	**409,2**
Car Carriers	0,0	0,0	0,0	402,6	0,0	0,0	0,0	0,0	0,0	**402,6**
LPG Carriers	126,9	14,9	0,0	69,8	0,0	0,0	0,0	0,0	14,4	**226,0**
LNG Carriers	0,0	0,0	14,5	16,2	0,0	72,6	0,0	68,3	0,0	**171,6**
Combined carriers	0,0	0,0	33,0	71,4	0,0	0,0	0,0	0,0	0,0	**104,5**
Bulk Carriers	12,7	0,0	82,6	0,0	0,0	0,0	0,0	0,0	0,0	**95,3**
Fishing vessels	0,0	0,0	14,5	0,0	17,3	1,0	0,0	19,4	0,0	**52,2**
Crude Oil Tankers	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	51,2	**51,2**
Reefers	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**
Total orderbook	**4228,7**	**2491,6**	**2138,7**	**1626,4**	**1082,4**	**1037,2**	**973,9**	**923,4**	**897,2**	**15399,6**

Source: IKEI, Comprehensive sectoral analysis of emerging competences and economic activities in the European Union: based on CESA

Table 0.2 Market shares by orderbook in Europe (CGT)

	Orderbook per 31/12/2007			
	Number	GT (1.000)	CGT (1.000)	% (CGT)
Belgium	2	6.0	9.1	0.0%
Bulgaria	29	341.0	260.0	1.2%
Denmark	23	1,462.0	672.0	3.0%
Germany**	239	4,248.8	4,065.7	18.2%
Estland	0	0.0	0.0	0.0%
Finland	10	826.0	739.0	3.3%
France**	28	776.0	830.7	3.7%
Greece	3	19.9	27.8	0.1%
Hungary	0	0.0	0.0	0.0%
Italy**	95	2,415.8	2,774.9	12.4%
Croatia	69	1,997.0	1,201.0	5.4%
Latvia	4	6.0	14.0	0.1%
Lithuania	8	17.0	37.0	0.2%
Malta	0	0.0	0.0	0.0%
Netherlands**	543	1,556.8	2,465.1	11.0%
Norway	64	264.0	454.0	2.0%
Ukraine	70	952.0	685.0	3.1%
Poland	122	2,031.0	1,673.0	7.5%
Portugal	15	63.0	93.0	0.4%
Romania	146	3,043.0	2,121.0	9.5%
Russia	88	690.0	648.0	2.9%
Serbia	3	9.0	14.0	0.1%
Slovakia	22	52.0	86,0	0.4%
Spain	165	865.0	1,114.0	5.0%
Czech	5	12.0	19.0	0.1%
Turkey	337	2,348.0	2,341.0	10.5%
UK	7	2.1	9.7	0.0%
Sweden	2	19.8	27.5	0.1%
Total	**2,099**	**24,023.2**	**22,381.5**	**100%**

Source: CESA

Annex C NACE DM35 classification

NACE DM35: Manufacture of other transport equipment
NACE DM35.1: Building and repairing of ships and boats

Code: 35.11 **Description:** Building and repairing of ships
This item includes: This class includes: – building of commercial vessels: passenger vessels, ferry-boats, cargo ships, tankers, etc. – building of warships – building of fishing boats
This item also includes: This class also includes: – construction of drilling platforms, floating or submersible – construction of floating structures: • floating docks, pontoons, coffer-dams, floating landing stages, buoys, floating tanks, barges, lighters, etc. – maintenance, repair or alteration of ships
This item excludes: This class excludes: – manufacture of ships' propellers, see 28.75 – manufacture of marine engines, see 29.11 – manufacture of navigational instruments, see 33.20 – manufacture of amphibious motor vehicles, see 34.10 – manufacture of inflatable boats or rafts, see 35.12

Source: Eurostat

Code: 35.12 **Description:** Building and repairing of pleasure and sporting boats
This item includes: This class includes: – building of inflatables – building of sailboats with or without auxiliary motor – building of motor boats – building of other pleasure and sporting boats: • canoes, kayaks, skiffs – maintenance, repair or alteration of pleasure boats
This item excludes: This class excludes: – manufacture of marine engines, see 29.11

– manufacture of sailboards, see 36.40
Reference to ISIC Rev. 3.1: 3512

Source: Eurostat

Annex D Ship size terminology

Within shipbuilding it is common to distinguish the market position of yards in Europe and other countries related to ship size volumes. The most common ship size measures, that are used frequently in this report, are the following:

- DWT: deadweight, a measurement of the carrying capacity of a ship
- GT: Gross Tonnage, a measurement of the physical size of a ship
- CGT: Compensated Gross Tonnage, similar to GT, but taking account of the relative complexity and work content used when building a ship.
- TEU: Twenty foot Equivalent Unit, a standard container.

In box D.1 more detailed definitions of these terms are given.

Box D.1 Key terminology (tonnage and capacity)

Deadweight (dwt):

This measurement refers to the weight of cargo and consumables that a ship is designed to carry in metric tonnes. It is less reliable as a comparative measure of size of ship than gross tons because it is strongly influenced by the density of the cargo. Very large cruise ships, for example, are designed to carry low deadweight and appear small on a deadweight scale despite their size. It is the most appropriate parameter for specification of size of bulk cargo carriers, however, such as tankers or dry bulk carriers.

Gross tons (GT):

Formerly known as 'gross registered tons', this is the fundamental measurement of the physical size of a ship. It refers to the volume enclosed by the ship's hull and superstructures in hundreds of cubic feet. All registered ships will be assessed for their gross tonnage and this is the parameter normally referred to when the size of a merchant ship is quoted in tons. (The use of the word ton in this case refers to the old English word 'tun', meaning a barrel. The designation of 'tunnage' with reference to a ship was originally a measure of the capacity of a ship in terms of the number of barrels it can carry, hence its relation to volume rather than weight. The correct unit in this case is tons and not metric tonnes).

Compensated gross tons (CGT):

This measure refers to the comparative work content inherent in building the ship. It is based on the gross tonnage, which is modified by a compensation factor relating to the complexity of the building process. The CGT system was developed in the 1960s by the OECD in co-operation with the Association of West European Shipbuilders (AWES) and the Shipbuilders Association of Japan. The system was needed because gross tonnage alone is not adequate as an indicator of work content or capacity in shipbuilding. Relative work content varies by size and type of ship. One gross ton of a passenger ship, for example, with its sophisticated accommodation and public spaces, contains a significantly greater level of work content than one gross ton of a bulk carrier which is effectively little more than a large steel box with an engine on the back. One CGT of either ship on the other hand should contain roughly equivalent work content. The system has now been highly developed and is fundamental to the analysis of shipbuilding activity.

TEU:

Standing for 'twenty-foot equivalent unit', is the key measurement of the cargo carrying capacity of a container ship. One TEU is the standard shipping container that can be seen on the backs of trucks and train carriages, being a steel box with dimensions eight feet six inches square and twenty feet in length. Whilst there may be some variation within that space, for example possibly incorporating a tank for carrying liquids or a refrigerated space, the dimensions of the unit will not vary. Having said this, some routes and ships permit the use of a double-sized box at eight feet six inches square and forty feet in length. This may be referred to as one FEU or 'forty foot equivalent unit', or two TEU.

Source: The European Community, Background report: Overview of the international commercial shipbuilding industry, 2003

Annex E Survey

1. Introduction

As part of the study a survey was developed. This survey was sent to marine equipment association and individual companies, and shipbuilding associations. Distribution has taken place in coordination with EMEC and CESA. Results of the survey are presented below.

2. Marine equipment industry

In this annex an overview is given on the methodology of the survey and its results. The survey has been sent to the National Member Associations of EMEC and their related companies.

2.1 National Member Associations

Methodology

There are 14 National Associations Member of EMEC in 13 different countries (in Germany there are 2 Associations involved). In cooperation with EMEC, a survey has been created and send to all these Associations, of which five of them has responded.

Results

Below the results of the survey are presented. Since the low number of respondents, the response of each association is shown.

General information

Question 0 Please indicate your country

ID	Country/association
1	German Shipbuilding and Ocean Industries Association, Germany
2	Denmark
3	Finland
4	Netherlands
5	VDMA, Germany

The ID in the first column matches the ID number in the answers below.

1. Marine equipment in your country

Question 1a. How many persons are directly employed by the marine equipment suppliers in your country on a fulltime basis?

ID	Country/association
1	About 80.000
2	5000 (member companies only). Statistic evaluations (input output models) indicate that total direct employment in companies related to maritime equipment – everything included - may employ up to 15 – 20.000 persons.
3	16.000 persons
4	23.100 persons
5	76.000 persons

Question 1b. What is the estimated total turnover for the last fiscal year? Can you estimate which share of this turnover was generated in the maritime sector?

	Country ID				
Turnover	1	2	3	4	5
Of the marine equipment sector	About €13bn	N/A	54%	€ 5.7 billion	100%
Of which within the marine sector	100%	N/A	100%	100%	

Question 1c. Can you indicate the distribution of maritime turnover (estimated if not available)

Distribution of maritime turnover by direction	Country ID				
	1	2	3	4	5
National	27%	N/A	13%	50 %	27 %
Export within the European Union	25%	N/A	20%	25 %	24 %
Export outside the European Union	48%	N/A	67%	25 %	49 %
Total	100%	100%	100%	100%	100%

Question d. Can you indicate the distribution of maritime turnover by type of customers (estimated, direct customers)

Distribution of maritime turnover by customer	Country ID				
	1	2	3	4	5
Shipyards	62%	N/A	16%	35%	N/A
Merchant ship owners, sea going	13%	N/A	30%	15 %	N/A
Merchant ship owners, inland		N/A	1%	10%	N/A
Offshore services	N/A	N/A	14%	5%	N/A
Dredging contractors	N/A	N/A	1%	15%	N/A
Navy	N/A	N/A	4%	2%	N/A
Other maritime sectors	13%	N/A	4%	8 %	N/A
Other equipment suppliers	12%	N/A	30%	10 %	N/A
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Question 1e. If some of your member companies are active in other sectors than the marine industry only (e.g. building engines also for the car industry), can you indicate the impact of this on:

Other sectors	Country ID				
	1	2	3	4	5
Company strategies differences compared to companies solely active in the marine sector	Not necessarily	Nothing specific	No	More engaged with sustainability (decreasing energy consumption etc.), more focused on innovation	Focus on the market with best perspectives and prices
Advantages of being active in other segments	• Technology transfer • Less dependent on the maritime business	Yes	for the cyclical branch it god to have at least two legs / the segments or branch where to make business to be not too depending one	Flexibility in adjucation of personnel	• Higher market volume, • lower dependency on specific customers
Disadvantages of being active in other segments	Distribution of resources to too many activities instead of concentration on core competence	No	Company has to big enough to survive many segments	Being hit in various sectors alike	Efforts for sales and marketing, variant diversity, storage costs, etc

2. Industry structure

Question 2a. As regards type of activities, what is the relative importance of various forms of products manufactured among your member companies? Please indicate in percentages

Importance of activities	Country ID				
	1	2	3	4	5
Engines & propulsion	66%	20 %	40%	10 %	66%
Electrical engineering/electronics	16%	-	5%	10 %	16%
Steel products	n.a.	40 %		20 %	
Steering equipment	n.a.	-		10 %	
Service	15%	40 %			
Other <please specify>	3%	20 %	55%	50 % (engineering)	19% (engineering)
Total	100%	100%	100%	100%	100%

Question 2 b. Can you identify any trends over the last 10 years with regard to the ownership of companies located in your country?

Importance of activities	Country ID				
	1	2	3	4	5
Stable ownership structures		X		X	X
Consolidation within your country	X	X			
National companies have purchased foreign companies	X	X		X	X
National companies have been merged with (larger) foreign companies	x	X	X		X
Split, parts or companies outsourced to other parties in the supply chain		x			
Other, namely… <please specify>					

3. Nature of global competition

Question 3a What are in your view the most decisive competitive factors for your member companies?

Competitive factor – general	Country ID				
	1	2	3	4	5
Price	X	X		X	X
Relationships with customers	X	X		X	X
Image	X	X			
Quality	X	X	X	X	X
Advanced Technologies	X	X	X		X
Other, namely…<please specify>					

Competitive factor – engines &propulsion	Country ID				
	1	2	3	4	5
Price		X			
Relationships with customers		X		X	X
Image		X			
Quality		X	X		X
Advanced Technologies		x	X	X	
Other, namely…<please specify>					X

Competitive factor – electronic equipment	Country ID				
	1	2	3	4	5
Price		X			
Relationships with customers		X		X	
Image		X			
Quality		X	X		
Advanced Technologies		x	X	X	
Other, namely…<please specify>					X

Competitive factor – steel components	Country ID				
	1	2	3	4	5
Price		X		X	
Relationships with customers		X		X	
Image		X			
Quality		X			
Advanced Technologies		x			
Other, namely…<please specify>					X

Question 3b Please indicate the relative importance of each of the following aspects on the global competition in the marine equipment industry:

Aspect	Country ID				
	very unim-portant	unimportant	neutral	important	Very impor-tant
Level playing field			4	1, 5	2, 3
R&D and innovation investments				4	1, 2, 3, 5
Financing and guarantees			1	2, 3, 4, 5	
Environmental requirements			4	1, 3, 5	2
Protection of IPR				2, 4, 5	1, 3
Access to skilled labour			4	2, 5	1, 3
Sustainability of the industry structure			1, 2, 4, 5		3

4. Productivity developments

Question 4a Please indicate the average trend in productivity developments (production efficiency) for your member companies over the last 10 years:

Productivity development trend 1998 –2008	Country ID				
	declined	kept stable	kept stable	improved slightly	improved substantially
General productivity development				3	1, 2, 5
Productivity development among certain subsectors (fill in if available)					1
• Engines/propulsion				4	1, 2, 5
• Electronic equipment				4, 5	1, 2
• Steel products	4				2
Other specific, namely… <Please describe>					

5. Policy, regulatory and framework conditions

Question 5 Does your country have a national strategy for the shipbuilding sector?

Competitive factor – steel components	Country ID				
	1	2	3	4	5
National strategy for shipbuilding sector?	Yes	No	No	No	Yes

If yes, what are the main components,
Does your government apply any specific support programs,? If so, please indicate
How is your country/government dealing with the current crisis?

ID	Main component	Specific program?	Dealing with crisis
1	Improvement of the national framework (labour cost, R&D&I investment)	R&D – "Schifffahrt und Meerestechnik für das 21. Jahrhundert" Innovation – "Innovativer Schiff-bau sichert wettbewerbsfähige Arbeitsplätze" (only for shipyards)	No special programmes for shipbuilding, but the companies of our sector have access to general public programmes for corporate finance
5	Please refer to "LeaderShip" documents		See results of National Maritime Conference

6. Investments and R&D

Question 6a. What is the share of R&D expenditures in your members' yards or marine equipment overall turnover?

R&D share	Country ID				
	1	2	3	4	5
Percentage R&D expenditures in total turnover	(RDIab 10%) 3-4%	N/A			
• General production process innovations		N/A		2%	3.7%
• Product innovations		N/A		2%	
How does this vary among certain subsectors:		N/A			
• Engines and propulsion		N/A	2.6%	10%	
• Electronics		N/A		5%	
• Steel products		N/A		1%	
• Other specific, namely…<Please describe>		N/A			

Question 6b. How have the R&D expenditures developed over the last decade?

ID	declined	kept stable	kept stable	improved slightly	improved substantially
1				X	
2				X	
3				X	
4				X	
5				X	

Question 6c. How do your member companies cooperate with their clients e.g yards and/or shipowners?

ID	Cooperation with clients
1	Equipment suppliers and yards are cooperating on several levels e.g. on R&D&I, on the integration of suppliers in the production process of the yards,
4	Integrated processes for newbuilding, stronger focus on after sales with ship owners
5	Intensely

Question 6d. How do your member companies cooperate with research institutes / universities for R&D?

ID	-- not at all	- limited	0 moderate	+ intensive	++ very intensive
1				X	
2			X		
3				X	
4			X		
5				X	

Question 6e. Can you indicate the role of research institutes and universities for your member organisations?

R&D share	Country ID				
	1	2	3	4	5
Construction contract related cooperation	N/A	X		X	
R&D related cooperation	N/A	X	X	X	X
What fields of cooperation?:					
• Design	N/A	X	X	X	X
• Quality control	N/A	X			
• Testing	N/A	X	X	X	
• Concept developing	N/A	X	X	X	X
• Other, namely…<please specify>					

Question 6f. How does your government support R&D?

ID	Government support in R&D
1	The German government provides specific support programmes for maritime companies: R&D – "Schifffahrt und Meerestechnik für das 21. Jahrhundert" Innovation – "Innovativer Schiffbau sichert wettbewerbsfähige Arbeitsplätze" (only for shipyards)
2	Basic research.
3	We have equal possibilities to get funding max. 50 % of the project cost from Finnish funding Agency as other industries
4	Innovation subsidies in various forms, usually funded on a max 50/50% basis by companies/government
5	Several programs, i.e. S+M program of the Federal Ministry of Economics (BMWi)

7. Labour force and skills

Question 7a. How do you consider the labour force availability and skills requirements of your member companies?

Aspect	Country ID

Workforce availability	Country ID			
	-- Very difficult	0 neutral	++ easy	Varies between categories
Availability of labour force				
How does this vary by skills level and type?				
• Technical – University level	1,2,3,4,5			
• Technical – Bachelor level	1,2,3,4,5			
• Technical – Workmanship level	2,3,5	1,		4
• Managerial		1,2,3	4,5	
• Financial		1,2,3	4,5	
• Sales	5	1,2,3	4	
• Other, namely…<please specify>				

Question 7b If very difficult is selected at question 7a: b. Why do you think it is difficult to find staff of this category?

ID	
1	Insufficient education capacity at German universities (of applied sciences) in particular Bachelor and Master courses in Naval Architecture.
3	In our branch we have the ageing problem, there are no enough young people to study our branch
4	Inflow in education was too low in previous years, negative image of sector
5	High demand, low supply, challenging studies / education

8. Energy and environment

Question 8a. What do you expect to be the relevance of environmental policy development and consumer demand on your country's position in the marine equipment sector?

ID	Very negative	Slightly negative	Neutral	Slightly positive	Very positive
1				X	
2		X			
3				X	
4				X	
5					X

Question 8b: if very or slightly negative is selected: please indicate which segments are affected most, and why?

ID	
2	Manufacturing costs: Negative Product image: Positive

Net result: Production moves out of the EU

9. Competition and trade

Question 9a. Please indicate the origin of your member companies' customers (percentages of turnover: home country, other EU countries and third countries)

Clients	Country ID				
	1	2	3	4	5
National	27%	N/A (important)	13%	50 %	27 %
Export within the European Union	25%	N/A	20%	25 %	24 %
Export outside the European Union	48%	N/A (majority)	67%	25 %	49 %
Total	100%	100%	100%	100%	100%

Question 9b. Where are the main competitors of your member companies based?

Country of competitor	Country ID			
	General	Engines/ propulsion	Electronics	Steel products
Within your own country (competing with each other)	1,3,5	3,5	3,4,5	3,4
In other EU countries	1,2,3,4,5	3,4,5	3,4,5	3
Korea	1,3	2,3,5	3	
Japan	1,3,4,5	3,4,5	2,3,4,5	3
China	1,5			4,5
USA	4	4	5	
Elsewhere <please specify>				

Question 9c. What are in your view the strengths of your competitors?

ID	
1	Korea and China: Lower labour cost, lower material prices
2	Generally lower costs and less bureaucracy
3	Unquality product without R&D, lower labour cost and state aids
4	Lower prices, more local / regional representations, more government support
5	Differs according to region

Question 9d. And what are their weaknesses?

ID	
1	Korea and China: Lower quality, lower reliability,
2	
3	Low quality, no advanced technologies
4	Lower quality, lower level of innovation (both as for Asian competition)
5	Customer relationship

Question 9e. What is your opinion with regard to the current state of Intellectual Property Rights protection in your country/Europe/other countries?

ID	
1	The level of protection in Germany and Europe is generally sufficient, but a similar level of protection and legal requirements are needed in non-European countries especially in Asia
2	Too low level of IPR protection possible. Patent system too costly and complicated.
3	IPR ok in Europe but not in Asia.
4	4. IPR is a matter of academics, in case you need to fight a competitor abroad (and file a case abroad) it is the question whether or not you will ever be able to win the case – IPR is then mostly a matter of whether or not laws exist or are being upheld
5	Weak

10. General outlook

Question 10a. Which future trends in the next 10 years do you see for the marine equipment industry in general (i. e. environmental/safety/security requirements, product diversification for offshore purposes/ marine based energy sources)?

ID	
1	More environment-friendly ships with low emissions, higher energy efficiency and lower operating costs; higher reliability of products and systems, more life-cycle maintenance, more system suppliers
2	Focus on environment, on maritime safety, on offshore energy (oil, gas, wind and wave).
3	
4	Growing importance of environmental/safety/security requirements Growing need for strong aftersales services Product diversification for new sectors such as offshore energy (both fossil and renewable)
5	All mentioned in the question's brackets

Question 10b. What do you consider to be the most relevant opportunities/challenges for your member companies in the next 10 years?

ID	
1	Fiercer competition due to the creation of new equipment suppliers in the main shipbuilding countries, concentration of shipbuilding companies in Far East, higher cost levels in Germany, keeping and improve the technological leadership.
2	Price competition from low cost countries in the Far East.
3	Advanged technologies
4	Growing importance of Asian maritime economies Downturn in newbuilding demand Can enough European yards and ship owners stay in business?
5	Competition in price and quality

Question 10c. What are the main impacts of the financial/economic crisis for your member companies?

Impacts of crisis	Country ID				
	1	2	3	4	5
Less orders	X	X	X	X	X
Financing problems			X	X	X
Cancellations	X	X	X	X	X
Price reductions		x	X		X

Not affected … Other, namely… <please specify>					
Total					

Question 10d. To what extent do these impacts differ between segments?

ID	
1	The impacts are valid for all segments.
3	No hopefully cancellation on cruise and ferries, but no new orders either

2.2 Marine Equipment companies

Methodology

For the companies a web based questionnaire has been developed in Check market. This online survey has been live for 32 days. EMEC has sent out a link to the online survey to their members, which distributed it to their member companies. The exact number of invitees is therefore not known, but is estimated at several hundreds.

A total of 49 respondents have started the online questionnaire, of which 30 have partly answered the survey, 17 have answered all questions and 2 respondents were not part of the target group.

Results

Below the results of the survey are presented. Please note that since not all questions have been obligatory, the number of answers can vary by question.

General information

Question 1. Are you representing a Small or Medium sized company ?

	No	Yes	Total
Are you representing a SME?	19	30	49

Question 2. Does your company have multiple branches in different countries?

	No	Yes, multiple branches across the EU	Yes, multiple branches across the world (including EU)	Total
Does your company have multiple branches in different countries?	28	7	14	49

*Question 3/4 *3. Please indicate the European country in which most of your companies activities are to be found/Please indicate your country*

The following table shows in which countries the companies are based or the country in which most activities are to be found (in case of multiple branches across Europe or the World)

Please indicate your country	Number of respondents
Austria	5
Denmark	1
Croatia	1
Finland	11
France	11
Germany	2
Italy	3
Netherlands, the	1
Norway	1
Poland	1
Sweden	3
UK	1
Total	**41**

Question 5 Is your company involved in marine equipment related activities only or also in other sectors?

Activities	Number of respondents
No, also other sectors	27
Not active in marine equipment at all	2
Yes, only marine equipment	9
Total	**41**

In case question 5 is answered *"no, also other sectors"*, please answer question 6.

Question 6 In what non-marine equipment sectors is your company active?

Nnon-marine equipment sectors	Number of respondents
all construction branches without flying air and space navigation, but also in airports, missile ramps all kind of buildings (public and private), railways (infrastructure and rolling stock), all kinds of energy industry (oil&gas upstream/downstream, nuc	1
Arctic Technology	1
assembly of the hull by welding (stick electrodes - flux cored wire - submerged arc) after cutting of the plates by plasma process	1
Automation and security system for Industry, Energy and Transport	1
Construction industry	1
Electric and fibre optic cables for industrial use	1
Electrical machinery for industies (transportation, Oil & Gas, chemical, stee works etc)	1
Energy (diesel and gaz turbine), Industry, OffShore, Reffinery, Environnnemental	1
Energy sector, infrastructures sector, all Industies sector, Buildings, residential	1
Feight transport management	1

General garbon steels Construction	1
Industrial, Agricultural, Mining, C&I, Rail PowerGen Oil and gas	1
Industry	1
Industry and agriculture	1
Insulations	1
Metal construction modular wet units windtowers building walls	1
Metals, Life Science, Food & beverage, Oil & Gas, Water /Wasterwater,Homehealth & Beauty , Automotive, Tire, Paper & Printing , Renewable Energy , Semiconductors, Entertainment	1
Metals, renewables, oil and gas, infrastructure	1
Mining equipment industry, industry hydraulic drives and controls, petrochemical	1
Oil & Gas industry Tools for aeronautics Chemical industry	1
Pressure vessels, windmills, subsea products, heavy workshop products.	1
water treatment for land installations	2
we are an oraginisation active in e.g. legal and environmental inssues	1
Total	**24**

Question 7 In what kind of marine equipment activities is your company active?

Marine equipment activity	Number of respondents
1 field of activity	22
2 fields of activity	6
3 fields of activity	1
4 or more fields of activity	2
Total	

In the table below it is shown in what kind of marine equipment activities the respondents are working (rows). In the columns it is shown in how many of the activity fields they are working. For example, within the engines and propulsions, there are 2 respondents working in other marine equipment activities as well. The table is based on a total of 34 respondents

Marine equipment activity	1 field	2 fields	3 fields	4 or more fields	Total
Engines & propulsion	6	3	1	1	11
Navigation/communication/control (electrics & electronics)	4	2	1	2	8
Cargo related equipment	1		2	1	4
“Hotel” and related equipment	1	1		1	2
Steel products	2	2		2	6
Waste treatment systems		1	1	2	4
Other:					
Workboat building	2				2
Insulation materials	1				1
steering gears, watertight door, fuel pumps	1				1
cable support	2				2
engine room equipment			1		1

Fresh water desalination	1				1
Offshore products		1			1
Fire protection & sealing systems	1				1
Wet units hydraulic equipment				1	1
Total					46

Question 8 How many persons are directly employed by your company in your country on a fulltime basis?

Number of employees	Number of respondents
< 10	4
10-50	12
51-100	4
101-250	6
251-1000	1
>1000	0
Total	**27**

Question 9 What is the estimated total turnover for the last fiscal year? (in Euro)

Estimated total turnover in euro	Number of respondents
Unrealistic low estimates	5
<1,000,000	1
1,000,000-2,500,000	4
2,500,001-5,000,000	4
5,000,001-10,000,000	5
10,000,001-40,000,000	6
>40,000,000	2
Total	**27**

Question 10 Can you indicate/estimate the origin of your companies'customers (percentage of turnover; home country, other EU countries and third countries)

In the table below the turnover by customers origin is shown. So, 6 respondents indicated that the turnover from the national customers is less than 20%.

	Number of respondents by customers origin		
Percentage of turnover	National	Export within EU	Export outside EU
0-20	6	3	10
21-40	5	12	4
41-60	7	6	4
60-80	6	1	0
80-100	5	0	0
Total	**26**	**22**	**18**

Question 11 Can you indicate the distribution of this turnover (q10) by type of customers?

The table below is based on the answers of 24 respondents. For example: 7 respondents have indicated that 60 to 80 % of their turnover comes from shipyards.

Percentage of turnover	Number of respondents by type of customer							
	Shipyards	Merchant ship owners, sea going	Merchant ship owners, inland going	Offshore services	Dredging contractors	Navy	Other marine sectors	Other equipment suppliers
0-20	5	3	3	4	1	11		5
21-40	2			3		3	3	4
41-60	4	1		1		1	1	3
60-80	7							
80-100	3					1	2	2
Total	**21**	**4**	**3**	**8**		**16**	**6**	**14**

Question 12 Some marine equipment companies are also active in other sectors than the marine industry only (e.g. building engines also for the car industry). Do you think this has an impact on:

The company strategy: the strategy will differ compared to companies solely active in the marine sector

	Yes	No	No opinion	Total
Being active in other industries besides marine equipment will impact the company strategy	15	6	6	**27**
Can you identify advantages of being active in other sectors?	20	7		**27**
Can you identify disadvantages of being active in other sectors?	10	17		**27**

Question 13 Why do you think this strategy is different?

Ten respondents have answered this question. Their answers are listed below:

- 1)higher quality requirements (class approvals for marine industry) 2) product more dedicated in marine industry vs more massive in shore industry 3) end user is personalized in marine industry
- becouse the ship building industry need less marketing and more quality. Is more important to known what's the real necessity of ships than sell the brand
- Better prices & results in other sectors
- bst's products are used everywhere in the industry
- differemnt development of different marktes will necessitates a more complex strategy fro companies active en different sectord
- The company can focus more on other sector than maritime in case of lower need in shipbuilding industry.
- The global strategy has to be transverse on technical options as well as on financial investments. The cycle time is different in various businesses.

- The product portfolio is very diversified. We are working with several onshore and subsea projects.
- The range of products is meant to serve many applications.
- We supply products to marine equipment suppliers, some other competitors deliver turn-key systems.

Question 15 Can you identify advantages of being active in other sectors?
Eighteen respondents have answered this question. Their answers are listed below:

- cyclic activity for marine less new passenger ships very low prices for remaining competitive more safe development can be expected for oil & gas industry, when based on old experience, which is the case for Secomat know how is easier to be exported fo
- Developments may be common and one business may support another when necessary.
- diversification of products with financial security
- existing market and customers if need in shipbuilding industry goes down
- flexibility, 'cross-fertilization' of ideas, at present non-synchronous cyclical downturn
- For the automation supplier it is important, in order to make different experiences.
- global experience on diversified application fields a very high level production (MBTF millions of hours) products ready on the shelf products flexible and adaptable no customization for marine
- Implementation between the sectors is a benefit for development
- independent from single markets/branches/countries' economy
- More steady workload in case that the offshore markets are decreasing.
- not all eggs in same basket
- Not dependent on a unique sector subject to ups and downs and better use of the resources of the company -Each sector can benefit from technical improvements originating from any other sector - Lower production costs due to economy of scale
- Possibility to use same products for control and reporting.
- share the risks variation of activity are different by sectors
- Standing on two legs is always better than on the one only !
- The optimization of cost industry
- We are a ship and offshore design company, so all work is not related to ships equipment
- we have a more stable and solid ground

Question 17. Please give some additional explanation on your identified disadvantages of being active in other sectors?
Nine respondents have answered this question. Their answers are listed below:

- 1) Production lines collision (the same machines involved in production for both sectors), 2) More sales personnel required 3) More rules to be adopted in design

- added costs, in the future non-synchronous cyclical upturn
- different manpower bigger workshop
- Fewer efforts are made to improve and customize products in a defined sector
- In case that we are able to get full workload from offshore markets, then the other sectors will suffer.
- less focused on one single market
- Sometimes hard to serve different business cultures
- spreading business to many different sectors cause problems with core business.
- The risk of use the standard chip product for ship market

Industry structure

The next questions and results concerned the industry structure.

Question 18 As regards type of activities, what is the relative importance of various forms of marine equipment products manufactured by your company? Please indicate in percentages.

The follow table is based on 25 respondents

Percentage of products manufactured	Number of respondents by type of activities						
	Engines & Propulsion	Navigation/communication/control (electrics & electronics)	Cargo related equipment	"Hotel" and related equipment	Steel products	Waste treatment systems	Other (see question 7)
0-20	0	2	1	1		1	1
21-40	1	2	1		3	1	
41-60	1						1
60-80	2						
80-100	4	2		1	2		10
Total	**8**	**6**	**2**	**2**	**4**	**2**	**12**

For example: 3 respondents indicated that 21 to 40 % of the products manufactured concerns steel products.

Question 19 Can you identify any trends over the last 10 years with regard to the ownership of marine equipment companies located in your country?

Identified trend	Number of respondents
Stable ownership structures	10
Consolidation within your country	6
National companies have purchased foreign companies	4
National companies have been merged with (larger) foreign companies	9
Split, parts or companies outsourced to other parties in the supply chain	7

Total	24

Question 20. Please give some explanations to your response

The table below is based on 15 respondents

Identified trend	Explanation
Stable ownership structures	• Alfa Laval, Consilium etc has been stable independant companies • best quality • most com´manies are owned by te same familiea or are the same limited companies as 10 years ago • most of the turnkey suppliers • public passenger line operators, no changes in ownership • the biggest marine equipment suppliers are stable
Consolidation within your country	• 2 LBO in 2005 and 2008 • DCNS with other companies • former state companies have been privatized and gathered in capital group by one owner
National companies have purchased foreign companies	• more than half of our members have initiates prodution abroard often by establishing or buying a foreig company • times have been good and they expand • US company been pruchased • Chantiers de l'Atlantique within Aker Yards & then STX Shipbuilding
National companies have been merged with (larger) foreign companies	• Joint Venture between Fincantieri and ABB • Koreans purchased Finnish shipyard • Masa yards merged to Aker • privatization with majority of shares bought by foreign companies • some turnkey suppliers, evac
Split, parts or companies outsourced to other parties in the supply chain	• deep modifications in the shares of the companies • electrical work isn't done anymore by shipyards themselves but by independent installation companies • Foreign companies has bought know-how and market • Subcontracting has increased.

Question 21 Have any changes taken place with regard to the ownership of your company over the last 10 years?

The table below is based on 24 respondents

Identified trend	Number of respondents
No, stable ownership	18
Yes, consolidation within your country	1
Yes, our company has been merged with (larger) foreign companies	2
Yes, our company has purchased foreign companies	2

Yes, split, parts or companies outsourced to other parties in the supply chain	1
Total	**24**

Nature of global competition

Question 22 Can you indicate the origin of your companies' customers (percentages of turnover: home country, other EU countries and third countries).

	Number of respondents by customers origin		
Percentage of turnover	**National**	**Export within EU**	**Export outside EU**
0-20	3	5	8
21-40	4	7	5
41-60	7	5	2
60-80	3		
80-100	4		
Total	**21**	**17**	**15**

Question 23 Where are the main competitors of your company based (by subsector)?

Country	**Number of respondents**						
	Engines & propulsion	**Navigation/communication/control**	**Cargo related equipment**	**"Hotel" and related equipment**	**Steel products**	**Waste treatment systems**	**Other (see question 7)**
Within your own country	4	1		2	1	2	8
In other EU countries	3	3		2	3		10
Korea					1		3
Japan	1						1
China							3
USA							1
Elsewhere	1			1	1	1	3
Total	**9**	**4**		**5**	**6**	**3**	**29**

Question 24 If you've indicated that your main competitors are based elsewhere, can you please specify for each sector in which other countries these competitors are located?

1. big multinational construction industry companies (Skanska etc) in northern countries
2. electric cables: France
3. Germany Russia
4. Norway Russia
5. Oil & Gas within oil production countries
6. Sweden, Norway, Estonia, Germany

Question 25 What are in your view the strengths of your competitors?
Strengths mentioned included (based on 13 respondents):

- Better financial surroundings (in case of the large companies)
- Larger companies having a diversified product line
- Low labour costs and the our competitors/ companies operating in new eu-coutries do not have not the ballast coming of society casts. (e.g. waste handling , labour safety, social securities which are obligatory to companies operating at "old" Eu
- low prices, ability to deliver low quality without repecussions
- Normal competition from western countries. Price competition from east and asia.
- Low costs

Question 26 And what are their weaknesses?
Weaknesses mentioned (based on 13 respondents):

- Big companies have limited flexibility
- Lack on know-how
- low innovation rate
- Quality
- Delivery accuracy.
- Rigidity
- Less efficient products

Competition & Trade

Question 27 What are in your view the most decisive competitive factors for your company (multiple answers possible)?

Table based on 18 respondents

Country	Number of respondents						
	Engines & propulsion	Navigation/communication/control	Cargo related equipment	"Hotel" and related equipment	Steel products	Waste treatment systems	Other (see question 7)
Price	4	2		2		1	9
CRM	3	1			1	1	6
Image	1				1		2
Quality	2				2	1	8
Advanced technologies	2					1	2
IPR				1			
Other factors							
Total	**12**	**3**		**3**	**4**	**4**	**27**

Question 28. Please indicate the relative importance of each of the following aspects on the global competition in the marine equipment industry.

Aspect on global competition	Number of respondents				
	Very unimportant	Unimportant	Neutral	Important	Very important
R&D and innovation investments	3	2		10	5
Financing and guarantees	2		6	9	3
Environmental requirements	2	1	9	6	2
Protection of IPR	1	2	13	3	1
Access to skilled labour	2	2	5	9	2
Sustainability of the industry structure	1	3	5	10	1
Level playing field	2	1	8	7	2

** one respondent marked in question 29 that it was unclear what IPR means.

Question 29. Are there in your opinion any other relevant aspects on global competition in the marine equipment sector? If so, please explain.
Only 1 respondent answered this question (and the 1 mentioned at question 28)

"prices of class societies for their service differ in all directions: from class to class, from port to port, from client to client"

Question 30 What kind of measures would you like to see implemented that could make the industry more competitive?
Ten respondents answered this questions. Below these answers are listed:

- access to materials (such as steel) and labour, including white collar, under conditions not limited by protectionist measures.
- Common rules and regulations. A approval from one class to be recognized by other classification societies.
- Courage to use innovations
- Environmental rules equal everywhere
- Government subsidies
- Mutual recognition of class certs
- R&D in off-shore and LNG+LPG tankers and high cost ships (dragers+big lift+drilling platforms)
- Resources for R&D and innovation in general
- To find agreement with countries imposing local content to propose better prices when bigger part of production is not local. local imposition are not efficient to improve effectively know how within these countries prices increase for there is a discrepantion
- When evaluating price and companies there should taken care the costs which the societies do shift to companies.

Productivity developments

Question 31 Please indicate the average trend in productivity developments (production efficiency) in your company over the last 10 years.

Table based on 6 respondents

Sector	Declined	Declined slightly	Kept stable	Improved slightly	Improved substantially	Total number of respondents
Engines & propulsion	1	1	1	2	1	**6**
Navigation/communication/control				2	2	**4**
Cargo related equipment						
"Hotel" and related equipment				1	1	**2**
Steel products				2	1	**3**
Waste treatment systems				1	1	**2**
Other (see question 7)			1	5	4	**10**

Question 32. If you have indicated different trends between subsectors, please give some explanation.
No answers provide

Policy, regulatory and framework conditions

Question 33 Is there a national strategy for the shipyards and marine equipment sector available in your country?

Strategy	Yes	No	Total
Is there a national strategy?	9	11	20
Total			

Question 34. What are the main components of this strategy?
Three respondents have answered this question. Their answers included:

- Focus on know how
- Marine cluster work
- Not well known and not fully consistent between navy and civil shipyards, also when collaboration between both sectors increases this may lead to less main subcontractors, which is very difficult for middle size companies

Question 35 Does your government apply any specific support programs?

Support program	Yes	No	Total
Does your government apply any specific support programs?	8	12	20
Total			

Question 36 Can you please indicate what kind of support programs are applied?
Four respondents have answered this question:

- "Pôles de compétitivité"
- funding for newbuildings

- help for working with foreign countries help for R&D
- R&D, innovation

Question 37 On the 11th of March 2009, the European Parliament adopted the new Class Regulation, as part of the Third Maritime Safety Package. The recently adopted measure brings important innovation in the legal framework regulating activities of classification societies. The legislation will mean that the classification societies have to harmonise rules and procedures and mutually recognise each others certificates.
Have you heard of the new legislation introducing harmonization and mutual recognition of certificates?

Question 38 Do you consider the legislation useful?

New legislation	Yes	No	Total
Have you heard of the new legislation?	11	9	20
Do you consider this legislation useful/	11		11

Question 39 Why do you consider this legislation not useful?
Does not apply

Question 40 Is your company affected by the current economic crisis?

Economic crisis	Yes	No	Total
Is your company affected?	15	5	20

Question 41 What are the main impacts of the financial/economic crisis for your company?

Impact	Number of respondents
Less orders	13
Financing problems	3
Cancellations	4
Price reductions	7
Other, please specify	
Not enough work for all technicians	1
Total	**24**

Question 42. To what extent do these impacts differ between sectors?
Not available

Question 43 What (legislative) measures would you like to see implemented to help your company through this time of crisis?
7 respondents have answered this questions. Below their answers are listed:

- better control of subsidies

- helps for middle size independant companies, between 250 & 500 people most helps are not accessible when more than 250 people especially requested for sustaining training
- infrastructure program, R&D program
- securing financing. stating new investments to infrastructures. But not so that all countries do stimulate at the same time so that the whole market does over heat and capacity is over booked when the economical situation will be stabile.
- State orders, some sort of refunding (interest, taxes)
- to extend coast guard+military ships in croatian yards+enter in EU

Question 44 How has your country/government responded with the current economic crisis?

Measures taken	Number of respondents
Measures on general level only	9
Measures in specific sectors, excluding the marine equipment sector and the shipbuilding sector	4
Measures in specific sectors, including the marine equipment sector and the shipbuilding sector	5
No measures taken at all	2
Total	**20**

Question 45 Can you please give some explanations on the measures taken by your government?

Three respondents have answered this question:

- financial help for banks + national airline
- speeding up some public procurement
- Stimulating infrastructure procurement

Investments & R&D

Question 46. What is the share of R&D expenditures in your company's overall turnover?

% of turnover	% R&D expenditures in total turnover	Of which: general production process innovations (%)	Of which: product innovations (%)
0-5	9	8	7
6-15	6	2	2
>15	1	1	2
	16	11	11

Question 47How does this vary among the subsectors?

Country	Number of respondents						
	Engines & propulsion	Navigation/communication/control	Cargo related equipment	"Hotel" and related equipment	Steel products	Waste treatment systems	Other (see question 7)

0-20 21-40 41-60 60-80 80-100	 1 	1 1 	 	1 1 	2 1 	1 	1 1 2
Total	**1**	**2**		**2**	**3**	**1**	**4**

Question 48. How have R&D expenditures developed over the last decade?

R&D development	Strongly declined	Declined slightly	Kept stable	Improved slightly	Improved substantially	Total number of respondents
Development R&D expenditures	2	2	3	11	2	**20**

Question 49 How does your company cooperate with clients e.g yards and/or shipowners?
Question 51 How does your company cooperates with research institutes / universities for R&D?

Cooperation	Not at all	Limited	Moderate	Intensive	Very intensive	Total respondents
Cooperation clients	1		8	9	2	20
Cooperation Universities	3	3	10	4		20

Question 50 How does your company cooperate with the client?
Nine respondents have answered this question. Their answers are listed below:

- detailing projects for yards seling products to yards
- Development project, tests and visist
- maintain good relation
- present improved products, training of yard staff, developing special solutions
- regular contacts to be aware of their needs
- Shipbuilding by proposing improvement measures for studies, and also new methods reducing costs for studies. main limitation is relative to concurrent engineering, for we are only in very few cases able to propose improvement within our customers
- Supporting the r&d for our new products
- Make test and sample in shipyards
- we belong to the group of strategic suppliers, meetings with the directory of the yard
- With normal everyday contacts

Is there a role for research institutes and universities and your company regarding:
Question 52 Construction contract related cooperation?
Question 53. R&D related coordination?

Question 54. Is there any other role for research institutes and universities and your company? (154)

	Yes	No	Total
Construction contract related cooperation	10	7	**17**
R&D related coordination	11	6	**17**
Any other role for research institutes and universities and your company	3	8	**11**

Question 55: if any other role, please explain:
Two respondents have answered this questions. Their response is listed below:

- education and marketing research
- Process development

Question 56. In case a respondent has indicated at question 53 that there is R&D related cooperation between the company and universities/research institutus. In what fields does this take place?

Field of R&D cooperation	Respondents
Design	4
Quality control	3
Testing	6
Concept developing	8
Other, please specify	0
Total	**11**

Question 59 How does your government support R&D?
Eight respondents have answered this question. Their answers are listed below.

- a lot of projects and helps, but nobody has been able to find a real place for R&D in our activity. Most improvement comes from CAD systems, which are directly discussed between main contractors and sofware suppliers, with few consideration of subcontract
- In some extend
- nearly zero, hard to get support, too big administration step
- Non
- Small scale direct support and in larger scale R&D loans etc.
- there is not support
- via TEKES
- with "Pôles de compétitivité"

Question 60 Have you ever participated in an EU funded R&D project?

	Yes	No	Total
Ever participated in EU funded R&D project?	9	11	**20**

Question 61 What's the most important reason for not participating in such a R&D project?
Ten respondents have answered this question. Their response is listed below:

- difficult to access
- do not really know
- lack of time for the initial phases
- No enough time to be involved in such project. However, this participation is our new strategy plan
- no subject found for we are subcontractors, we have improvement actions within global processes of our customers for we are engineering, we have no equipment to provide our production is studies & 3D model, and is not considered as production by our customer
- No topics related to our scope
- not available for company's branch
- There have not yet been suitable projects. As soon as there is, we will participate.
- to find new innovative sectors to our products and to reach lower costs by improving the production and the products.
- we are not member of EU

Question 62. Can you rate your experiences of this R&D project?

Experience	Very negative	Negative	Neutral	Positive	Very positive	Total respondents
Please rate your experience with EU funded R&D project	1		5	3	0	**9**

Question 63 Please give some additional explanation
Two respondents have given some additional explanation. Both had marked their experience as neutral.

- Presence of competitive companies in the same EC projects
- The target is good but otherwise the system is a little challenging considering the resources for the actual R&D and reporting

Labour force and skills

Question 64 How do you consider the labour force availability and skills requirements in your country regarding:

Level	Very difficult	Neutral	Easy	Total
General availability of labour	4	9	6	**19**
Technical – University level	3	10	6	**19**
Technical – Bachelor level	2	10	7	**19**
Technical – Workmanship level	6	9	4	**19**
Mangerial	3	10	6	**19**
Financial	4	9	6	**19**

Sales	5	6	8	**19**

Question 65 If marked difficult, please give a short explanation.
Five respondents have given an additional explanation, which is listed below.

- Bad level of know how for saleing engineering Request better level from general managers on subcontractors and contractors sides Request capacity for measuring technical and financial risks, especially for manhours to be spent nearly never adequation betw
- General labour shortages in Denmark for demographic reasons
- hard sometimes to get young people to workshops
- Many people have been put off from the technical workmanship because of the decline in the industry sector in the last two decades.
- The states strategy is to focus to university degrees which leads to situation that there is not skillfull and talent newcomers to ordinary work like welding, timber man work etc. The education of such persons are shifted to companies.

Energy & Environment

Question 66. What do you expect to be the relevance of environmental policy development and consumer demand on your country's position in the marine equipment sector?

Relevance	Very negative	Slightly negative	Neutral	Slightly positive	Very positive	Total respondents
Relevance environmental policy and consumer demand on position in the sector	1	1	5	7	5	**19**

Question 67 Please indicate which sectors are affected most and why.
Three respondents have given an additional explanation, which is listed below.

- all sectors caused by EU demands on Croatian shipyards for privatization and financial crisis
- not yet thought a lot on this subject, but obviously positive, as all new rules imposing refits, constructions or conformity within a transitional phase Only to take care not to propose measures impossible to be reached by owners of ships
- There are no strategy in EU.

Question 68. Can you indicate if you agree or disagree with the following proposition: ""The innovation of new products is essential to combat the threat of a climate crisis in the future""

Proposition	Totally disagree	Disagree	Neutral	Agree	Totally agree	Total respondents
Innovation is essential to avoid climate crisis	1		1	6	11	**19**

Question 69 Have you had any problems with IPR infringement?

	Yes	No	Total
Problems with IPR infringement	5	14	**19**

Question 70 What is your opinion with regard to the current state of Intellectual Property Rights protection in your country/Europe/other countries?
Seven respondents have answered this question. Their answers are listed below.

- china is terrible should be something done there
- Important all over
- IPR protection is mostly concentrated on patents and trademarks. theres i little protection for desing mprovement or incremental innovations, that may be decisive in the market. In the maritme sector discovery of infringmet is difficult.
- no opinion
- not effective
- there are not problems
- very bureaucrate

Question 71 Have you ever had any difficulties accessing certain markets?

	Yes	No	Total
Problems accessing markets	10	9	**19**

Question 72 If yes, please explain.
Eight of the ten respondents have answered this question. Their answers are listed below.

- Asian cultural and legal barriers market penetration more difficult than sales to European customers
- China
- Dominant position occupied by others
- Lack of references
- oil & gas contracts for foreign countries require a lot of investment for few results
- on Russian market with steel (koren) prices
- protection of market against externals in some countries, e.g. Korea, China
- Russia, France

General outlook

Question 73. Which future trends in the next 10 years do you see for the marine equipment industry in general (i. e. environmental/safety/security requirements, product diversification for offshore purposes/ marine based energy sources)?

Nine respondents have answered this question. Their answers are listed below.

- 1 .Environmental aspects, 2. High competition from far east 3. Implementation of New technologies, engine navigation etc. 4. Protectionism is rising 5. Exchange Currency of Euro to other currencies might be too strong causing problems
- becomes harder and harder as less yards are left in Europe. Far East countries force their yards to use domestic products.
- Environmental issues for the engines will follow the same track as the automotive and truck already has passed
- I think it will regain , but not to same level as before the crisis
- in this time of financial crisis we are not able to see trends
- lower capacity - decreasing of companies
- No specific opinion
- reducing a lot pollution with improvement of motors as has been done for cars shall be imposed no doubt that it is possible
- System supplying will be more and more the need to be a supplier, only good supplying will not be possible for an European manufacturing company. Cheap items and components are coming more and more from Asia. Technological level must be high even if the p

Question 74. What do you consider to be the most relevant opportunities/challenges for your company/sector in the next 10 years?

- Financing 2. skillfull labour force 3. stabile investment plans of EU countries so that there will be stabile demand on market. Avoiding over heating or vise verse
- Ensuring that requirements for ships follow the technological development of new possiblities rather than establishing low standard requirements
- EU governments control in shipbuilding industry and protect EU market
- industrialization of construction
- Keep the position as a supplier / preferred supplier
- maintain a market share
- new products
- To be able to develop Oil & Gas services for production countries, sustaining French major companies, engineering and contractors. To investigate and develop other sectors close to energy For shipbuilding, to improve services to Oil & Gas industry
- to be innovative
- to develop new solution that will support the engine development (same track as automotive)

Question 75 Any other comments?

3. National shipyards associations

Methodology

The survey for CESA national associations has been sent to all CESA member associations through CESA. Only a few respondents have completed the survey, but it should be noted that in five countries, interviews with the associations have taken place. Because of this limited response, the results presented below are summarised shortly.

Results

0. Respondent

The respondents are located in Finland, Germany, Bulgaria and Spain. (Note that interviews were held in Germany, Italy, Norway, the Netherlands and Romania).

1. Industry structure

Question 1a. As regards the yard production, what is the value of outsourcing among your member companies?

Fill in %	Organization of the yard´s production process
	Purchased materials
	Equipment
	Services
100%	<Total should add up to 100%>

Equipment is being outsourced the most according to all four respondents. Purchased materials and services differ between the respondents

Question 1b. How much of these supplier inputs origin from:

Fill in %	Share of supplier inputs from
	Suppliers located in your own country
	Imports from other European countries (EU as well as EEA and accession countries (e.g. Norway, Croatia, Turkey)
	Imports from other countries
100%	<Total should add up to 100%>

Two respondents indicated that most inputs origin from suppliers in their own country, followed by other EU countries. The two other respondents marked imports from other European countries as most important origin, followed by supplier inputs located in his own country.

Question 1c. To what extent has the appliance of outsourcing changed in the last 10 years?

The answers to this question varies between the respondents: some see no differences, other see more outsourcing compared to 10 years ago.

<Select>	Outsourcing of shipyards
	More than 10 years ago
	Similar to 10 years ago
	Less than 10 years ago
Reasons	Please explain why this has changed: <Only if more/less answer is given>

Question 1e. Please estimate the impact of this outsourcing on:

The estimated impact of outsourcing is seen differently by the respondents. Two of them see a lot of improvements in cost levels and production efficiency. One of them even sees improvements in the quality control and innovations, while other estimated this as stable. One of the respondents is less positive and has estimated that all aspects have slightly worsened or are stable. Interesting is that the most positive respondents has marked IPR protection as 'slightly worsened' while the other respondents have estimated this as stable.

Impact of outsourcing on: <select answer>	++ (strongly improved)	+ (slightly improved)	0 (stable)	- (slightly worsened)	-- (strongly worsened)
Cost levels	2	1		1	
Production efficiency of your company	1	1	2		
Quality control		1	2	1	
Innovations		1	1		
IPR protection			2	1	
Other, namely…cost restructuring		1			

Question 1f. Can you identify any trends over the last 10 years with regard to the ownership of companies located in your country?

	<select>
Stable ownership structures	2
Consolidation within your country	3
National companies have purchased foreign companies	
National companies have been purchased by foreign companies	2
Spin-offs, parts or companies outsourced to other parties in the supply chain	1
Other, namely…<please specify>	1 (privatization of public yards)

Please give some explanations to the observed ownership patterns?

Consolidation by creation of bigger groups of companies

2. Nature of global competition

Question 2a. What are in your view the most decisive competitive factors for your member companies? If this differs per segment, please indicate this

<select multiple>	General	Container	Bulk/tanker	Passenger	Naval	Other <OFFSHORE>
Price	3	1	1	2	1	1
Relationships with customers	2		1	2	2	
Reputation	3		1	1	2	1
Quality	3		1	1	2	1
Innovative products	2			2	2	
Other, namely…Financing	1					

Question 2b. In what way does naval shipbuilding relate to commercial shipbuilding capacity to be competitive?

Technological transfer, innovation on production process, skilled workforce There is no connection…

Question 2c. Please indicate the relative importance of each of the following aspects on the global competition in the shipbuilding industry:

Aspect	Importance for global competition: <select answer>				
	-- very unimportant	- unimportant	0 neutral	+ important	++ Very important
Level playing field				2	2
R&D and innovation investments				1	3
Financing and guarantees				1	3
Environmental requirements			1	2	1
Protection of IPR				2	1
Access to skilled labour				2	2
Structure of the industry				3	1
Other, namely …	Please describe:				

3. Competitiveness developments

Question 3 Please indicate the average trend in competitiveness for your member companies over the last 10 years:

Competitiveness development trend 1998 –2008 <select>	-- declined	- kept stable	0 kept stable	+ improved slightly	++ improved substantially
General competitiveness development				1	1
Competitiveness development among certain subsectors (fill in if available)	1				
• Container		1	2		
• Bulk & tanker	1		2		
• Passenger & cruise	1	1			2
• Yachting		1	1		1
• Military		1			1
• Other specific, namely Offshore Military					2

Please explain the above indicated differences between subsectors (if applicable).

Leadership in technology and tailor mad productions improved the German competitiveness for sophisticated vessels

4. Policy, regulatory and framework conditions

Question 4 Does your country have a national strategy for the shipbuilding sector?

<select answer>	Yes	No
National strategy for the shipbuilding sector available	2	2

If yes:

- *What are its main components?*

Innovation in products and processes Access to skilled labour Financing and guarantees Improvement of the national framework (labour costs, taxation, ship financing, R&D&I investments)

- *Does your government apply any specific support programs,? If so, please indicate*

R&D, Innovation programmes

- *What are the measures taken by your government in the context of the current crisis?*

Pre delivery financial measures No special programmes for shipbuilding, but the companies of our sector have access to general public programmes for corporate finance.

5. Investments and R&D

R&D is defined as the process to realise innovations in the production process or in products. This may cover fundamental research, prototype development, pilot studies and the like.

Question 5a. What is the share of R&D expenditures in your members' overall turnover?
According to the respondents this varies between 0.1% and 8%

Question 5b. How have the R&D expenditures developed over the last decade?
The development of the % R&D expenditures in total turnover varies by respondents: 2 have indicated that it has slightly declined, the other 2 are more positive and have indicated that it has improved slightly or even substantially.

Question 5c. How do estimate your member companies' cooperation with their suppliers on R&D developments?
Two of the respondents estimate this as intensely, the other two respondents indicated this as moderate.

Question 5d. How do your member companies cooperate with research institutes / universities for R&D?
Three out of four respondents have indicated that intensive cooperation takes place, one respondents indicated that only limited cooperation takes place.

Question 5e. Can you indicate the role of research institutes and universities for your member organisations?
The role of the institutes vary by respondent: some indicated that there is both construction related and R&D related cooperation. The focus of the R&D related cooperation is on design and concept developing
One respondent indicated that there is a special role for numerical modelling and analyses in the field of the ship hydrodynamics and aerodynamics.

Question 5f. What does your government do in terms of supporting R&D in the shipbuilding industry?

There are specific support programmes for maritime companies as well as innovation aid. Others indicated that in their country there are equal terms for all industries

6. Labour force and skills

Question 6a. What is the level of labour force availability in the view of skills requirements of your member companies?

All respondents have difficulties to attract high level technical employees. There are less problems with finding managerial, financial and sales staff

<select answer>	-- low	00 normal	high++
Availability of labour force			
• Technical – Post graduate level	4		
• Technical – Bachelor (graduate) level	3	1	
• Technical – Workmanship level	3	1	
• Managerial	1	3	
• Financial		4	
• Sales	1	3	
Other, namely…<please specify>			

Question 6b <If --low is selected in a.>
Why do you think it is difficult to find staff of this category?

Low attractive sector with poor image
Uncomfortable work for relatively low salary
Low educational opportunities
Insufficient education capacity at universities (of applied sciences) in particular Bachelor and Master courses in Naval architecture
Marine industry should attract young people more by imago campaigns and telling what the industry really does – cyclical industry should make stable employment. Industry has an ageing problem.
Shipbuilding is a specific activity and has need of specific qualifications and skills. Most of the highly skilled staff leave the country because of better salaries elsewhere.

7. Energy and environment

Question 7a. What do you expect to be the relevance of environmental policy development and consumer demand on your country's position in the shipbuilding sector?

<select answer>	-- very negative	0 neutral	++ positive	Depends on segment	Depends on policy
Impact of environmental policies on market position		1	2		2
If this depends on segments, please indicate the relevant segments					
• Container		1			
• Bulk & tanker		1			
• Passenger & cruise		1	1		
• Yachting		1	1		
• Naval		1	2		
• Other specific, namely… <Please describe>					

b. Please indicate which segments are affected most, and why?

Repairs, because of air and water pollution

8. Trade and competition

Question 8a. Please indicate the origin of your member companies' customers (percentages of turnover coming from clients located in your home country and in other countries)
All respondents indicated that most customers are from other countries (varying from 58 to 95%).

Question 8b. Where are the main competitors of your member companies based?

Main competitor group <select multiple>	General	Container	Bulk & tanker	Passenger & cruise	Yachting	Naval	Other <OFFSHORE RORO ICEBREAKERS
Within your own country (competing with each other)	2	2	1	1			
In other EU countries/EEA	4	2	1	4	1	2	2
Korea	2	2	2	1			2
Japan	1	1	1				1
China	3	2	2	1			2
Elsewhere Turkey Vietnam Philipines	1 1 1 1	1 1 1	1 1	1	 1		

Question 8c. What are in your view the strengths of your competitors?

Local ship owners and local suppliers (EU/EEZ)
Price (China)
Lower labour costs, lower steel prices, public ownership of yards and financial state support
Tax lease systems
Competitors at national level: highly skilled staff, acquired positions on the small vessels market, good production facilities
Competitors at regional level: Highly skilled staff employed, acquired market positions, made due investments in modern equipment.
Competitors at international level (Asia): large market share acquired, long-term traditions in shipbuilding, high level of automation, implementation of new technologies, concept development, extensive facilities, support by the government, low-price staff.
Competitors at international level (Europe): high-tech production, state-of-the-art ship equipment, specialization in ships requiring new technologies and equipment.

Question 8d. And what are their weaknesses?

Price & delivery position (EU/EEZ)
Quality & reliability (China)
Lack of equipment industry
Competitors at international level (Europe): high labour costs, which leads to expensive production.

Question 8e. What is your opinion with regard to the current state of Intellectual Property Rights Protection in your own country and in Europe??

Very little conscious of this problem
The level of protection in Europe is generally sufficient, but a similar level of protection and legal requirements are

needed in non-European countries, especially Asia. Ok Since Bulgaria became an EU member at the beginning of 2007, Bulgarian laws are to be harmonized with European laws. In shipbuilding industry technologies are one of the key factors for its leading position. In this relation IPR protection has to value and preserve the knowledge and competency necessary for the fabrication of top production. Thus, intellectual property is of more importance in order to make competitors observe the rules, therefore, this should be taken care of more in future.

9. General outlook

Question 9a. Which future trends in the next 10 years do you see for the shipbuilding industry in general (i. e. zero emission ship, product diversification for offshore purposes/ marine based energy sources)?

Less emissions, highly sophisticated offshore units, top luxury cruises and other specialised ships. More environment-friendly ships with low emissions, higher energy efficiency and lower operating costs. Diversification of business portfolio through development toward offshore, value-added ships, FPSO's, drill ships, storage units, supply vessels, transportation vessels, energy projects, reduction of CO2 emissions, increase of safety requirements and measures, shipyard mergers, erection of a stable shipping industry structure.

Question 9b. What do you consider to be the most relevant opportunities/challenges for your member companies in the next 10 years?

Quality and reliability Competitors from Asia, more sustainable energy effective, low emission ships Fiercer competition due to the increasing overcapacities and more market distortions due to state interventions Challenges – economic and financial crisis, fluctuation of Baltic Exchange Dry Index, World Fleet Glut Opportunities – design and construction of specialized vessels, attraction of highly skilled staff.

Question 9c. What are the main impacts of the financial/economic crisis for your member companies?

<multiple options>	<select>
Less orders	4
Financing problems • investments in the yard facilities • for ships construction process	2 2 3
Cancellations	2
Price reductions	2
Not affected …	
Other, namely…<please specify>	Financial problems in subcontractors

Question 9d. To what extent do these impacts differ between segments?

Less orders, specially in conventional ship types No cancellations on passenger vessels so far

Question 9e. If you have any other comments to make and were not covered in the above questionnaire, please mention them below.

Annex F Amadeus database analysis

Introduction

While physical output figures on the shipbuilding sector are relatively easy to come by, it is much more difficult to obtain productivity and (financial) performance figures. One possible source is the Amadeus database. This database is operated by a private company and includes (mainly financial) data provided by over 30 regional information providers, such as Chambers of Commerce and the likes. Data to outsiders is only available on a subscription/purchase basis.

The Amadeus database contains a number of relevant fields, which when completely filled, provide a clear picture on the development of the sector as a whole. The data are being collected at company level, whereby companies can be arranged according to the NACE sector code.

Shipbuilding analysis.

For the analysis of the Amadeus database the consultant used a set of key data, covering 27 EU countries and based on sector code NACE Code 35.11. This code is not detailed enough to make a full separation between the various maritime (sub)sectors, but as such could provide the best source for further analysis of the sector as a whole. Data comprised the period 1997 up to 2006 (the latest version of the database available originates from September 2008). The database contains a number of potentially very interesting fields, which are mainly monetary figures (these are always in nominal values). These include operating revenue and value of sales (so in principle, the annual income plus the annual order book), and also material costs and labour costs. As also the number of employees is included, the financial figures in theory will allow for a detailed productivity analysis.

For the purpose of more detailed analysis, the dataset was subsequently broken down into company location (country) and size. The companies were subdivided in four size classes according to number of staff employed in combination with the annual turnover.

Analysis limitations

The analysis showed that in September 2008 in total 4771 companies were active in the NACE category 35.11. Not all of those were reporting to the database. In 2006, 3624 were reporting, while in 2001 only 2199 companies were included. Unfortunately this also indicates the limitations of the Amadeus database to derive aggregate figures. For example in 2006 only 43% of the reporting companies could be qualified according to the predetermined size classes. The immediate conclusion that could be drawn is that the current contents of the database are less suitable for a sector analysis based on aggregate figures.

As some indicators do not require full completeness of the data, it is however possible to derive trends and average figures from the Amadeus files. These indicators are based on the

total observations in each related category, whereby it becomes less relevant whether a field was filled out by an individual company or not.