

# Employment trends in all sectors related to the sea or using sea resources

Denmark



European Commission  
DG Fisheries and Maritime Affairs

# **An exhaustive analysis of employment trends in all sectors related to sea or using sea resources**

Country report – Denmark

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## 1.0 Summary<sup>1</sup>

The core Danish maritime activities include shipping and maritime transport, maritime services (including seaports), shipbuilding, maritime equipment and offshore oil and gas extraction. These Danish maritime sectors are often referred to as Blue Denmark.

The overall importance of the Danish maritime activities is derived from a combination of its direct effects and its indirect effects (i.e. supply chain linkages through purchases from and sales to the Blue Denmark). Because of its absolute size, diversity, relative technology intensity, and various external linkages to other industries, the maritime activities are very important for the Danish economy. It is one of the leading export sectors and internationally competitive area as well as a noteworthy direct contributor to GDP and employment, in absolute as well as in relative terms. Specifically, the production value of the Blue Denmark was 193 billion DKK in 2002 and made up 6.3% of the total Danish value added in 2002.

The Blue Denmark created 75,700 jobs directly both in 1997 and 2002, with employment peaking in 1999 with nearly 80,000 jobs. During this time period indirect employment slightly declined, by around 1,400 jobs. The Blue Denmark sectors employ about 6% of the total Danish workforce in the private sector.

**Table 1.1 Total employment in the Blue Denmark sectors 1997 - 2002**

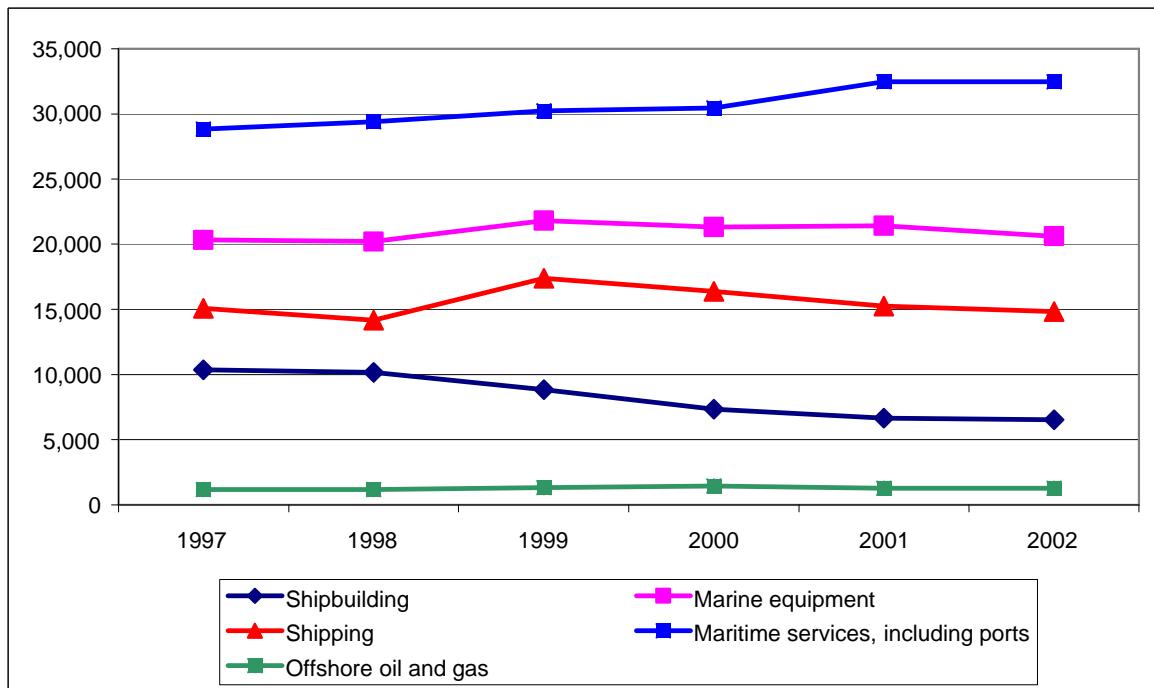
Sector		1997	1998	1999	2000	2001	2002
Danish Maritime cluster	Direct	75,756	75,129	79,598	76,932	77,080	75,712
	Indirect	32,604	33,386	35,277	32,291	30,386	31,202
	Total	109,556	110,061	113,537	108,335	107,466	106,914
% of the Danish economy	Direct	2.9	2.8	2.8	2.8	2.8	2.7
	Indirect	1.3	1.3	1.3	1.2	1.1	1.1
	Total	4.2	4.1	4.1	4.0	3.9	3.8

Source: National Statistics Office and Danish Maritime Authority, 2006

Overall employment in the core Blue Denmark cluster has remained stable over the six-year period, 1997-2002 (see figure 1.1 overleaf). However, as the following graph shows, employment has slightly increased in maritime services and ports sector, as well as in activities related to oil and gas extraction. Jobs in the shipbuilding sector have declined by 37%, whilst employment in the shipping and marine equipment sector are largely speaking at the same level in 2002 than in 1997 even though some fluctuations in employment have taken place during this period.

<sup>1</sup> This report excludes employment related to fishing.

**Figure 1.1 Employment trends - Blue Denmark, 1997-2002**



In addition to employment in the Blue Denmark maritime cluster there are also other sea related sector with a significant employment impact, including wind energy, coastal tourism, boating industry and to a lesser extent also maritime works sector. In 2002 the domestic employment in wind energy was some 21,000 (direct and indirect). Employment in coastal tourism was estimated at some 61,628 in 2004, whilst recreational boating provided over 5,200 jobs mainly in the trade and service sector.

Total direct employment in the Blue Denmark cluster together with other related sea related sectors, as defined in this study, stood at around 149,000 in 2002<sup>II</sup>.

**Table 1.2 Direct employment in sea related sectors in Denmark, 1997-2002**

Sector	1997	1998	1999	2000	2001	2002	2004/2005
Shipbuilding	10,352	10,170	8,843	7,331	6,653	6,524	-
Marine equipment	20,326	20,202	21,811	21,336	21,427	20,626	-
Shipping	15,068	14,172	17,371	16,364	15,251	14,815	-
Maritime services, including ports	28,842	29,405	30,236	30,464	32,462	32,460	-
Offshore oil and gas	1,168	1,180	1,337	1,437	1,287	1,287	-

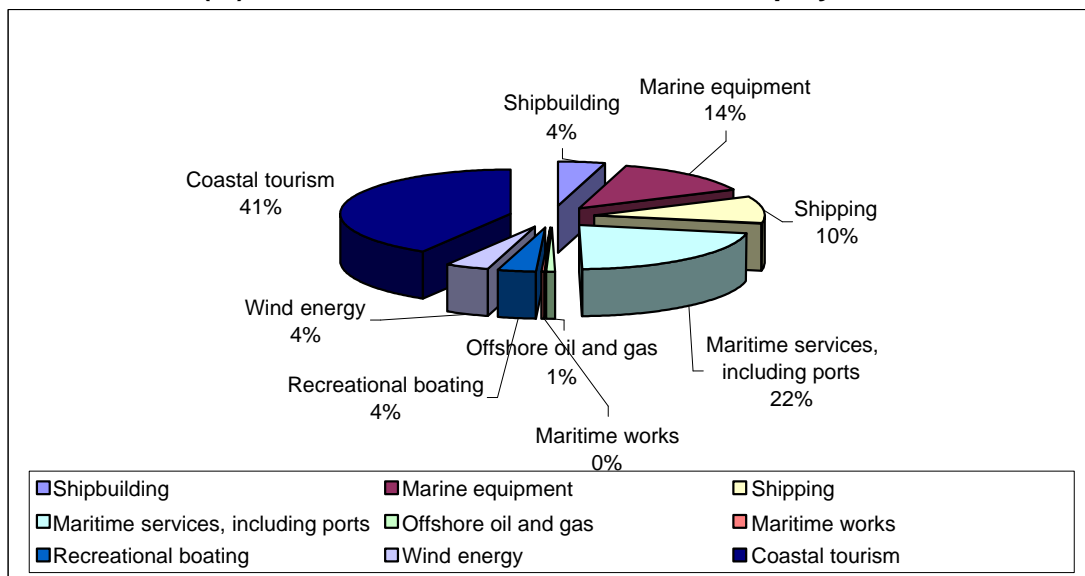
<sup>II</sup> Maritime works, recreational boating and coastal tourism figures are from 2004/2005.

Sector	1997	1998	1999	2000	2001	2002	2004/2005
Maritime works	-	-	-	-	-	-	150
Recreational boating	-	-	-	-	-	-	5,290
Wind energy <sup>III</sup>	2,800	-	-	-	-	6,600	-
Coastal tourism	-	-	-	-	-	-	61,628

Source: ECOTEC Research & Consulting, 2006

Coastal tourism is the largest sea related sector in Denmark in terms of employment by making up 41% of total employment. However, further studies are recommended to establish a more precise projection of the coastal tourism employment than is currently available. Maritime services, which also includes seaport related employment is the second largest sector with the sector constituting over a fifth of total employment in this cluster, followed by marine equipment (14%) and shipping (10%).

**Figure 1.2 Share (%) of different sub-sector in terms of employment**



<sup>III</sup> The first figure refers to estimates from 1994.

## 2.0 Shipbuilding

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The shipbuilding sector consists of several different activities, such as merchant, naval and recreational shipbuilding as well as maintenance, repair and conversion. Denmark has a long and proud tradition in shipbuilding and has had thousands of employees and shipyards in all regions of the country throughout most of the 20th century. However, over the recent decades there has been a critical decline in orders for new ships and today employment in the shipbuilding sector is very marginal. This decline in the Danish shipbuilding has largely been influenced by the increasing competition from Asia, mainly South Korea, Japan and China, which have pushed prices down to a level that Danish shipbuilders can no longer compete with. State subsidies kept the sector alive until the late 1990s but when the state stopped these, most of the shipyards in Denmark had to close down<sup>IV</sup>; and the Danish yards were losing out to the State subsidised yards elsewhere in Europe. The extent of the shipbuilding decline is highlighted by the fact that the total production of ships has more than halved and employment in the sector has declined by two-thirds since the 1980s.

As noted above, numerous shipyards were forced to reduce their activities or close down during the nineties and today only one major shipyard with new-building activities exists in Denmark. Although some of the smaller shipyards also carry out some new-build activities, it is mainly mega yachts and naval ships as opposed to merchant vessels. Generally activities in the shipbuilding sector focus on conversion, repair and design. Some companies are also diversifying into land-based operations in the oil and gas industry.

The largest Danish shipyard, Odense Steel Shipyard, is probably the company most exposed to international competition. It is widely viewed that the reason for its success is its high degree of mechanisation, combining traditional craftsmanship in shipbuilding and welding with robots and control by a sophisticated computer programme (the TASS programme). However, like many other Danish shipyards, Odense Steel Shipyard has had some difficulties over the past 3-4 years and has reduced its workforce from 2,900 employees down to about 1,800.

Small and medium-sized Danish shipyards appear to be less exposed to international competition and focus on small niche markets (mainly within conversion and repair and

<sup>IV</sup> Changing conditions of international competition might only constitute part of the explanation why Danish shipbuilders have recently been so unsuccessful. As Lorenz (1991) has so convincingly argued in the context of British shipbuilding, to understand competitive decline in this industry we must include in the explanation other organisational and institutional aspects of shipbuilding (such as managerial perception of uncertainty or the organisation of labour unions and industrial relations).



with some new-building activities on a small scale). Fredericia Shipyard (a major Danish repair yard) and Karstensen's Shipyard are the most prominent examples. These companies tend to do fairly well in competition with British, German, Norwegian, Finnish and Swedish shipyards. They are, however, also increasingly stressed by competition from low-wage countries such as Poland and the Baltic countries, where production costs are much lower<sup>V</sup>. Then again, since most types of ships are standardised commodities (although of varied designs) of a fairly homogenous quality (partly ensured by the classification societies, which are in charge of the technical approval of ship design and construction), the rise of competition from these countries also presents some opportunities for Danish shipyards. Buying and converting hulls from low-wage countries allows Danish shipyards to combine external economies of scale with high-skill capabilities in ship design.

## 2.1 Employment trends

Shipbuilding is a separate industry in Danish official statistics (351000) and can thus, like the maritime transport industry, be analysed reasonably precisely. Similarly, shipbuilding is a separate entity in the Danish input/output tables, which enables inter-industry linkages to be determined and analysed.

Shipbuilding is the industry in the maritime sector that has experienced the greatest fall in employment since the 1990s. In 2002 the industry employed 6,524 people which is nearly half of the 1990 level of employment. Nearly 4,000 jobs were also lost between 1997 and 2002 which displays a decline of 37% in direct employment.

**Table 2.1 Employment in the shipbuilding sector, 1997 - 2002**

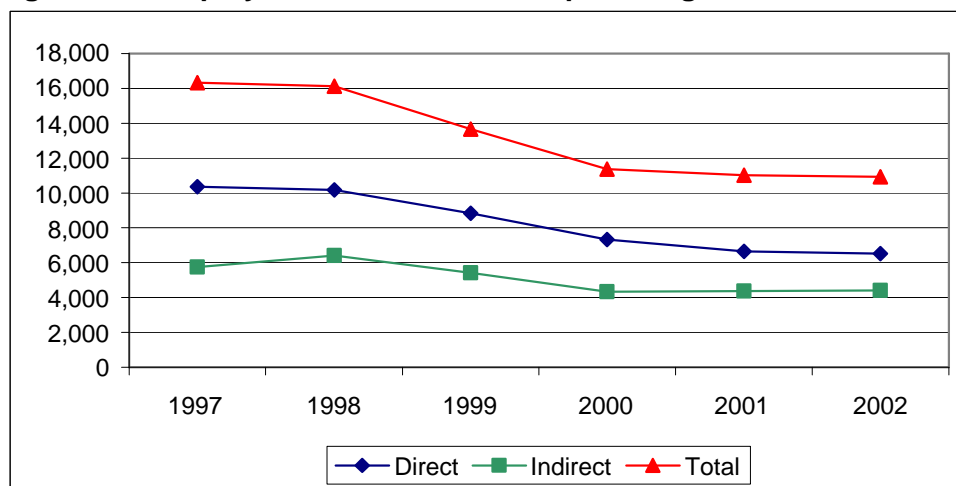
	1997	1998	1999	2000	2001	2002
Direct	10,352	10,170	8,843	7,331	6,653	6,524
Indirect	5,753	6,417	5,412	4,343	4,363	4,408
Total	16,333	16,123	13,672	11,365	11,016	10,932

Source: National Statistics Office, 2006 and the Danish Maritime Authority, 2006

<sup>V</sup> In Poland, shipbuilding has become the major exporting industry in recent years, with expertise in passenger ships, pleasure cruisers, cargo vessels, ferries, floating constructions, and fishing ships. Often Danish ship owners, marine consultants, and naval architects contract with Polish yards, because these can produce high-quality ships at competitive prices.

The shipbuilding industry's employment multiplier has traditionally been relatively high and has remained so despite the general decline in the industry itself. In 2002 the shipbuilding industry contributed to the employment of 4,408 people in other industries<sup>VI</sup>.

**Figure 2.1 Employment trends in the shipbuilding sector, 1997-2002**



As mentioned above, the main reason for the major decline in Danish shipbuilding has been an increasing competition from the Far East and the end of state subsidies to the industry. Although thousands of shipbuilders have lost their jobs, new and modern industries are growing in the areas where shipbuilding once ruled. Most of the old Danish shipyards have been taken over by the wind farm sector and this has created new jobs for those previously working in the shipbuilding sector. Indeed, between 600 and 700 employees were producing wind farm towers and wings instead of ships in 2002<sup>VII</sup>.

## 2.2 Employment projections

Employment statistics have demonstrated a clear downward trend for the past 15 years. Even the most successful and largest Danish shipyard, Odense Steel Shipyard, has seen a clear reduction in employment over the past years. Many organisations have assessed that the future of the Danish shipbuilding industry looks bleak unless agreements are concluded at the international level concerning the prices for the building of new ships<sup>VIII</sup>.

<sup>VI</sup> Specifically, the manufacture of other general purpose machinery, manufacture of construction materials of metal etc, wholesale and commissioned trade exclusive of motor vehicles and manufacture of marine engines, compressors etc industries.

<sup>VII</sup> EIRO (2000) Industrial relations in shipbuilding in Denmark

<sup>VIII</sup> EIRO (2000) Industrial relations in shipbuilding in Denmark

## 3.0 Marine Equipment

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The marine equipment industry consists of companies that produce equipment for ships, drills, port and other maritime activity. Some important subcontractors of marine equipment to the Danish maritime cluster include Hempel A/S, MAN B&W Diesel A/S, Grundfos A/S, Damcos<sup>IX</sup>, Lyngsø Marine A/S, Inexa, and Thrane & Thrane.

Marine equipment makers are very sensitive to the developments in maritime and related industries. With the crisis in domestic shipbuilding, the marine equipment industry has experienced a major downturn in the home market. However, as the global market potential has increased, this has offered some good opportunities for Danish producers, which are already highly international in their business orientation.

In 2002 the sector contributed more than 27 billion DKK (direct and indirect) to the Danish economy and represents 12.5 percent of the total economic impact of the Blue Denmark cluster.

### 3.1 Employment trends

Like maritime services, marine equipment cuts across multiple and typically highly specialised industries and can therefore not easily be defined using official Danish statistics. As a consequence, SNA93 code 291000 Manufacturing of marine engines, compressors etc has been used as a crude variable for the marine equipment industry. Although this proxy may capture the economic impact and employment of some specialist suppliers, it is still the case that many suppliers will not be covered by this definition. Suppliers of radio and communication equipment, for example, are not included in this proxy. Even if this industry delivers an important share of the equipment purchased by maritime companies, it also delivers equipment to many other industries as well as to consumers. It is therefore not possible to assess the share of economic transactions this industry has with maritime companies is from the available data.

The marine equipment industry can be better understood by analysing input industries to shipbuilding, maritime transport and maritime services. Examples of types of marine equipment other than engines, compressors and so forth are control, measuring and navigation equipment, maritime communication equipment, boilers, fittings, cables and screws, containers, a number of textile products, plastic products, inks and paints, chemicals and so on. Makers of control, measuring and navigation equipment and of maritime communication equipment often serve as specialist suppliers, while suppliers of

<sup>IX</sup> Former Danfoss A/S.

items such as, for example, boilers and textile products are likely to be second-tier subcontractors.

With 20,626 people employed in the industry in 2002, the marine equipment sector represents the second largest employer in the cluster.

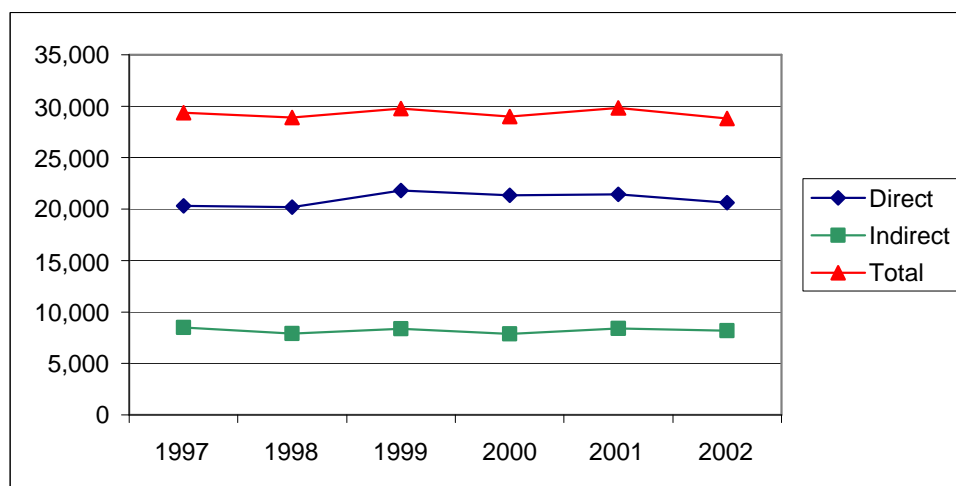
**Table 3.1 Employment in the maritime equipment sector, 1997 - 2002**

	1997	1998	1999	2000	2001	2002
Direct	20,326	20,202	21,811	21,336	21,427	20,626
Indirect	8,504	7,909	8,372	7,862	8,397	8,174
Total	29,355	28,892	29,773	29,010	29,824	28,800

Source: National Statistics Office, 2006 and the Danish Maritime Authority, 2006

On the basis of these statistics, employment in the marine equipment industry has fallen slightly since 1990 but has remained fairly stable at around 20,000-22,000 people since 1997. Indeed, between 1997 and 2002 the sector generated some 300 new jobs. Part of the decline in employment during the early 1990s is likely to have been caused by job losses in the shipbuilding industry in Denmark, but the fact that job losses has not been greater in this industry suggests that the industry has been successful in diversifying into other markets.

**Figure 3.1 Employment trends in the marine equipment industry, 1997-2002**



In addition to the 21,000 directly employed by the sector, it also contributes to the employment of some 8,000 persons in other sectors, significantly the wholesale and commissioned trade exclusive of motor vehicles, manufacture of marine engines, compressors etc and manufacture of hand tools and metal packaging industries.

### 3.2 Employment projections

In the last three years maritime transport has grown by some 20 percent and this has created a significant demand for reparations/maintenance, new building of ships and marine equipment. This trend is likely to continue in the next 15 years and thus creates good opportunities for increased employment in the Danish shipbuilding and marine equipment sectors.

## 4.0 Shipping

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Maritime transport is one of the largest export industries in Denmark and ranks among the ten largest in the world. It is estimated that the Danish shipowners and their overseas affiliates together operate a fleet of 50 million dwt. In terms of value, the industry represents around 10% of total Danish exports, amounting to 92 billion DKK in 2001 and 140 billion DKK in 2005 (approximately €12 billion)<sup>X</sup>. The sector's direct contribution to the nation's GDP has more than trebled since 1990, from 29 billion DKK to 90 billion DKK.

The maritime transport sector industry encompasses about 200 firms, but is dominated by a few large and internationally competitive shipping companies. On the freight transport side these include the A. P. Moller Maersk Group (Maersk), which is the biggest Danish company and one of the largest shipping conglomerates in the world; J. Lauritzen Holding (JL), Dampskibsselskabet Norden A/S (Norden) and A/S Dampskibsselskabet Torm (Torm). On the passenger transport side they include Scandlines and DFDS.

Danish ship owners operate a fleet of container, tanker and bulk vessels. Their operations encompass a wide range of maritime activities: specialised product carrier services, cable-laying, salvage and offshore supply services, traditional bulk, tanker trade, general cargo, heavy lift, reefer activities and roll-on/roll-off (RO/RO) and passenger operations (DFDS, Scandlines, and Mols-Linien A/S). The largest Danish ship owner, Maersk, is also engaged in related activities such as shipbuilding, offshore drilling and production, warehousing, storage, container port operations, rail transport, inland distribution, logistics, and trading of ships.

In addition to operating their own ships, the Danish know how has also made commercial management a large scale industry for Danish ship owners. It is estimated, that Danish ship owners operate 30 million deadweight tonnage (dwt) under the flag of other countries. In comparison, only 10 million dwt sail under the Danish flag<sup>XI</sup>.

<sup>X</sup> Danish Maritime Authority 2005 and 2006 – based on estimations from the Danish Shipowners Association.

<sup>XI</sup> The Danish Maritime Authority (2005)

The Danish maritime transport industry has generally maintained its competitive edge by investing in technologically advanced vessels, employing highly skilled personnel and utilising the highly specialised and proficient maritime know-how that has developed in concord with longstanding Danish maritime traditions<sup>XII</sup>. The future competitiveness of the Danish shipping industry depends on improved access to global markets as well as on transparent and effective competition measures.

## 4.1 Employment trends

Maritime transport is defined by the SNA93 code 610000 in the official Danish Statistics and therefore it provides a fairly precise estimate of employment in the industry. Analysis of this industry is also aided by the fact that it is a separate industry in the Danish input/output table (SNA93 610000), and thus it is possible to give a fairly precise account of its structural development as well as its economic significance. Data on the number of seafarers has also been obtained from the Danish Shipowners Association but the consultations with the Danish shipping industry officials confirmed that the statistics from the Danish Statistics Office are to be used as official Danish figures as they also include employment in the shipping companies on shore.

According to the statistics from the national statistics office, in 2002 the shipping sector generated nearly 15,000 jobs in Denmark directly and further 4,000 indirectly. The level of direct employment is slightly lower than in 1997 but indirect employment has nearly doubled during this six year period. In relative terms, the maritime transport industry accounted for nearly 20% of all direct employment within the Danish maritime cluster (Blue Denmark) in 2002.

**Table 4.1 Employment in the maritime transport sector, 1997 - 2002**

	1997	1998	1999	2000	2001	2002
Direct	15,068	14,172	17,371	16,364	15,251	14,815
Indirect	4,219	3,968	4,864	4,582	4,270	4,148
Total	19,287	18,140	22,235	20,946	19,521	18,963

*Source: National Statistics Office, 2006 and the Danish Maritime Authority, 2006*

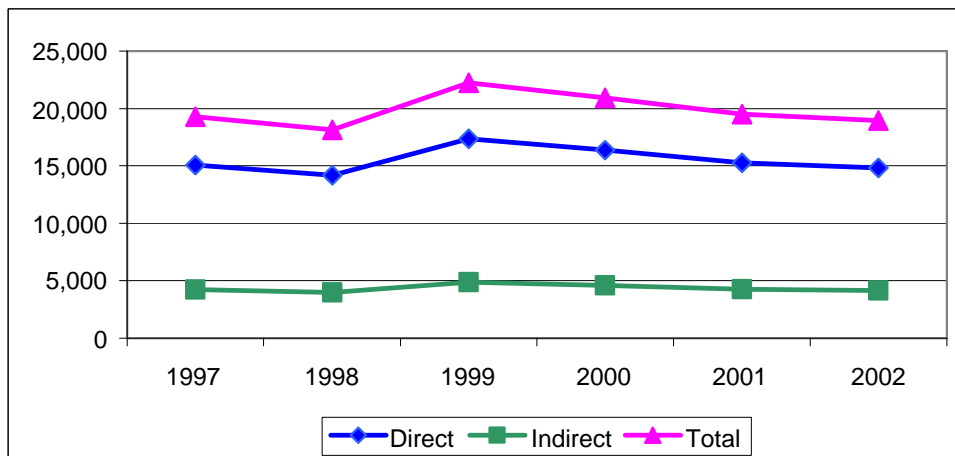
Maritime transport also contributes to the employment in other industries through inter-industry linkages. Estimates by the Danish Maritime Authority suggest that in addition to the 14,815 people employed directly in 2002, the water transport industry also contributes indirectly to the creation of 4,081 jobs in a number of other sectors (most significantly shipbuilding (and repair), maritime equipment and maritime services sectors). Indirect

<sup>XII</sup> The Danish Maritime Authority (2005)

employment in the sector nearly doubled between 1990 and 2000, but started to fall fairly significantly in 2001 (from 6,078 employees in 2000 to 4,081 in 2002).

Overall, employment in the Danish shipping sector has remained relatively stable between 1997 and 2002. Throughout most of the 90s employment in the shipping sector increased, however, in 1999/2000 the level of employment started to fall slightly (as the figure 4.1 below shows).

**Figure 4.1 Employment trends in the shipping sector, 1997-2002**



Source: National Statistics Office, 2006 and the Danish Maritime Authority, 2006

According to the data from the Shipowners' Association on the number of seafarers, the number of seafarers in Denmark has remained relatively stable, indeed increasing by around one thousand between 1995 and 2005.

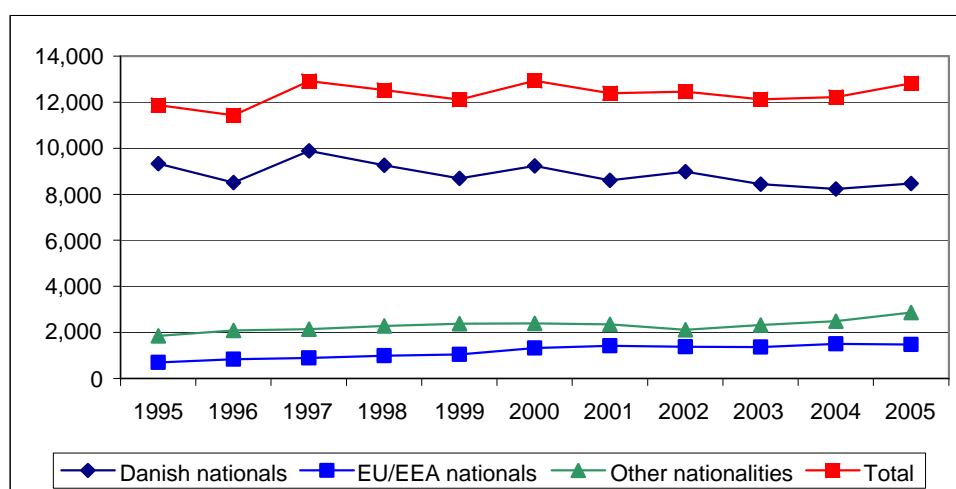
**Table 4.2 Number of seafarers, 1990-2005**

Year	Danish			Other EU / EEA			Other foreigners			TOTAL		
	Officers	Ratings	Total	Officers	Ratings	Total	Officers	Ratings	Total	Officers	Ratings	Total
1990	4,839	4,091	<b>8,929</b>	60	316	<b>377</b>	182	842	<b>1,025</b>	5,081	5,250	<b>10,331</b>
1995	5,292	4,042	<b>9,334</b>	152	539	<b>691</b>	268	1,583	<b>1,850</b>	5,712	6,164	<b>11,875</b>
1996	5,150	3,357	<b>8,507</b>	188	648	<b>837</b>	408	1,672	<b>2,080</b>	5,746	5,677	<b>11,423</b>
1997	5,422	4,466	<b>9,888</b>	168	721	<b>889</b>	403	1,739	<b>2,142</b>	5,994	6,926	<b>12,920</b>
1998	5,296	3,962	<b>9,258</b>	210	776	<b>986</b>	434	1,846	<b>2,280</b>	5,941	6,583	<b>12,524</b>
1999	5,210	3,480	<b>8,690</b>	214	830	<b>1,044</b>	450	1,924	<b>2,374</b>	5,874	6,234	<b>12,108</b>
2000	5,388	3,839	<b>9,226</b>	209	1,110	<b>1,319</b>	456	1,932	<b>2,388</b>	6,052	6,881	<b>12,933</b>
2001	5,206	3,405	<b>8,611</b>	225	1,196	<b>1,421</b>	343	2,012	<b>2,356</b>	5,775	6,613	<b>12,387</b>
2002	5,314	3,667	<b>8,981</b>	223	1,148	<b>1,371</b>	287	1,820	<b>2,107</b>	5,824	6,635	<b>12,459</b>
2003	5,148	3,287	<b>8,435</b>	242	1,121	<b>1,363</b>	368	1,952	<b>2,321</b>	5,758	6,361	<b>12,119</b>
2004	4,946	3,287	<b>8,234</b>	242	1,254	<b>1,496</b>	426	2,065	<b>2,491</b>	5,614	6,607	<b>12,221</b>
2005	5,183	3,290	<b>8,473</b>	264	1,217	<b>1,480</b>	527	2,338	<b>2,864</b>	5,973	6,844	<b>12,817</b>

Source: Danish Shipowners' Association, 2006

Between 1995 and 2005 the number of Danish seafarers declined by nearly 900, whilst the number of other than Danish EU/EEA nationals has more than doubled from 691 in 1995 to nearly 1,480 in 2005. The number of seafarers from outside EU/EEA has also increased, although not with the same rate as the number of EU nationals.

Figure 4.2 Trends in the number of seafarers by nationality, 1995-2005





A significant proportion of seafarers in the Danish fleet are Danish, 65 percent in 2004. Out of the remaining 35 percent, around 15 percent are from Scandinavia or other EU countries, whilst 20 percent are from other countries<sup>XIII</sup>.

## 4.2 Employment projections

The future level of employment is largely dependent on future economic conditions and the future competitiveness of the Danish maritime transport sector. Denmark has made use of the EU-guidelines on State Aid (tonnage taxation and tax exemptions on seafarers' salary to reduce manning costs). However, 200 ships have recently been ordered by Danish ship owners, which suggests that there is an optimism about the sector. If a significant proportion of these new ships fly the Danish flag it will have a positive impact on employment in the sector. The implementation of the tonnage tax regime in Denmark has largely speaking seen as success, with seafaring employment remaining stable over the past decade, the turnover of the industry has grown strongly and related employment ashore is increasing.

## 4.3 Skills and training

The maritime transport industry requires highly skilled maritime officers with practical experience at sea, as well as commercially trained staff for the land-based activities. Without the maritime competencies of the staff, the possibilities for growth are significantly reduced. It is therefore important to ensure continuous recruitment, education, training, and a flow of highly competent staff in the shipping industry to secure a critical mass for these competences.

General costs are typically the same for most shipping companies that operate globally, regardless of which country they are based in, with the exception of the cost of seafarers. Indeed, in Denmark, and in other high income countries, the cost of employing seafarers is significantly higher than in low income countries, which makes Denmark less competitive in the market place. With this in mind, innovation has become increasingly important for the development and the continued growth of the Danish maritime transport sector.

Based on these facts, two main challenges prevail:

- One is to ensure that maritime officers have the competencies that are needed to maintain and develop the shipping sector as a whole – and also to contribute to growth and future innovation.

<sup>XIII</sup> Danish Shipowners' Association, 2005

- The other is to ensure that there is added value for ship owners when employing maritime officers from Denmark, and the EU, as compared with (cheaper) officers from outside the EU<sup>XIV</sup>.

A strategy document "Sofartspolitisk Vækststrategi – Kompetencer og vækst" highlights a number of ways in which these challenges can be overcome:

- Exploring new markets, products and technologies and organisational structures
- Exploiting technological opportunities (on and offloading systems, marketing tools, education and research cooperation)
- Creating organisational structures that are more efficient in operation
- Creating a climate for learning that is based on experience. New knowledge and signals from the market regarding changing conditions and opportunities.
- However, Denmark and many other European countries currently face problems in recruiting a sufficient number of young people for maritime training programmes. This is largely because in comparison with other sectors, maritime education does not provide a profession with a particularly high social status or living conditions. One of the main priorities in Denmark is therefore to inform young people about the career opportunities in the maritime transport industry in order to reduce labour shortages in the future.

In recent years the supply of quality education in the sector has also become a concern, primarily regarding the capacity of schools<sup>XV</sup>. Apart from people with a maritime education it should also be noted that there is also a significant demand in Denmark for people to work in the maritime sector with other education and experience, including shipping education, lawyers, economists, engineers and craftsmen.

## 5.0 Seaports

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The Danish seaport sector employment is included in the maritime service sector employment (see Section 6.0). It is however worth mentioning here that there are altogether 120 seaports in Denmark and the 17 largest seaports employ some 950 people directly<sup>XVI</sup>.

A recent report shows that Esbjerg Port, which directly employs 64 people, contributes to the employment of at least 7,000 people in the region<sup>XVII</sup>. The Port of Aarhus currently employs 120 people, while approximately 150 private companies at the port employ a

<sup>XIV</sup> The Danish Maritime Authority (2005)

<sup>XV</sup> The Danish Maritime Authority (2003) Sofartspolitisk Vækststrategi – Kompetencer og vækst

<sup>XVI</sup> Transport- og energiministeriet samt Sofartsstyrelsen og Konkurrencestyrelsen: Vækst i Danske Havne. 2005

<sup>XVII</sup> Maritim Industri

further 4,000 people. In the future seaports will become increasingly important partly because of the expected growth of inter-modal transports<sup>XVIII</sup>.

## 6.0 Maritime Services, including seaports

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Important players in this industry include DMI (a formerly independent research institute but since 2002 a division in Force International), Carl Bro A/S, Cowi A/S, K. E. Hansen, TetraPlan, and Rambøll to mention just a few.

Traditionally, maritime service companies have been somewhat secluded from one another, both in a physical sense and in terms of coordination and integration. However, as international competition increases (in the EU further prompted by deregulation) and some ports develop from traditional waterfront businesses (primarily loading and unloading of transported goods) into logistics centres competing for international traffic, an increasing number of companies in the maritime service sector are located either at or close to the ports (with consultants and classification societies being obvious exceptions). Inter-firm coordination and integration has also become an important strategic characteristic of the sector. The general and increasing outsourcing of transport and logistics taking place in current years has contributed to this development<sup>XIX</sup>.

With this development port administrations have become specialised enterprises related to international maritime transportation and trade, and the scope for maritime services has increased and handling equipment of various kinds has become more refined. The port as a logistics (or distribution) centre thus plays an important role in the further development and international competitiveness of maritime transport in Denmark. It also provides the physical link between maritime and inland transport.

In the Danish context, attractive ports have been described as those, admittedly few, with the right geographical location that can be characterised as effectively organised systems<sup>XX</sup>. In Denmark there are (besides yachting ports) currently about 80 traffic ports<sup>XXI</sup>, however, according to Cowi A/S, only the biggest Danish ports are expected to survive under the conditions of increasing international (and especially European) competition in the future<sup>XXII</sup>.

<sup>XVIII</sup> Maritim Industri

<sup>XIX</sup> The Danish Maritime Authority (2002) Den blå landevej

<sup>XX</sup> Ladefoged 1996 Benchmarking af havne. Muligheder for effektivisering af havnene as cited in Sornn-Friese (2003) Navigating Blue Denmark

<sup>XXI</sup> Denmark also have 60 fishing ports (of which the fishing port of Esbjerg is also base to the whole of the Danish offshore oil and gas extraction industry in the North Sea)

<sup>XXII</sup> Jensen (2002) The leading harbours of the future [www.covi.dk](http://www.covi.dk)

## 6.1 Employment trends

Most of the companies offering maritime services are not contained separately in the official Danish Statistics or in the Danish input/output table and can therefore not be easily defined. Nevertheless, on the basis of calculations by the Danish Maritime Authority it has been estimated that there were 32,460 persons employed in the maritime services sector in 2002<sup>XXIII</sup>. Notably, the maritime services sector is one of the sectors within "the Blue Denmark" that has increased the level of employment since 1990. Between 1997 and 2002 the number of people employed in the sector directly increased by 3,618 persons. This makes the maritime services sector the largest employer in "the Blue Denmark", accounting for 43 percent of total employment in the Blue Denmark.

**Table 6.1 Employment in the maritime services sector, including ports (1997-2002)**

	1997	1998	1999	2000	2001	2002
Direct	28,842	29,405	30,236	30,464	32,462	32,460
Indirect	13,869	13,444	13,957	11,534	10,554	12,305
Total	42,888	43,145	44,291	42,213	43,016	44,765

In addition to the people directly employed by the maritime services industry, the industry also indirectly contributes to the employment of 12,305 people in other industries. Again this is not matched by any other industry within the cluster. An analysis of the Danish output and input tables has established that the maritime sector has significant linkages with the post and telecommunication and maritime transport sectors.

## 6.2 Employment projections

Past employment trends have indicated that employment in the maritime services sector is likely to increase, and in fact has been rising since the early nineties. In relation to employment in ports, an analysis by Cowi A/S implied that employment in the port industry can be expected to decline in the coming years, in the face of intensifying international competition<sup>XXIV</sup>.

<sup>XXIII</sup> SNA93 codes 631130 (Cargo handling, ports etc; travel agencies) (or 630000) and 634000 (Activities of other transport agencies) were used as a proxy for the maritime services industry. The first of these proxies has also been used in earlier studies of the Danish maritime cluster (Danish Maritime Authority 1999). However, due to the broad definition of this proxy measure it will overestimate the economic importance of maritime services. The first industry includes loading and unloading as well as stevedoring of both passenger and freight transport, while the second industry includes the conveyance, forwarding and handling of freight transport, not distinguishing between modes of transportation. On the other hand, some of the proxies representing the other core maritime industries in fact underestimate the importance of those industries.

<sup>XXIV</sup> Jensen (2002) The leading harbours of the future [www.covi.dk](http://www.covi.dk)

## 7.0 Maritime works

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The Rohde Nielsen Group from Copenhagen operates globally with a team of 150 employees.

## 8.0 Offshore oil and gas extraction

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Oil and gas production in Denmark started in 1972 and is now well established with activities offshore and onshore. Because such natural fuels (oil and natural gas) are difficult to locate, exploration and drilling are key activities and technological innovation is a key aspect of this industry.

The major Danish offshore oil and gas fields are located in the North Sea, with about 16 fields currently producing. Onshore activity relates to the maintenance of underground gas storage. The short distance to the offshore oil rigs in the North Sea has led to a clustering of companies, primarily suppliers of technical and consultancy services to the oil companies, in the Esbjerg region.

The total value of the Danish oil and gas production was calculated at about DKK 39 billion in 2004 (€5.2 billion), which represents a 27% increase compared to the level in 2003. The high production value in 2004 is attributable to the relatively high oil price level in 2004.

Although overall production in Denmark is modest in international comparison, the considerable growth in the production of oil and gas (especially in the first half of the 1990s) has enabled Denmark to be self-sufficient in energy since 1997. In 2004, the total production of oil, gas and renewable energy was 53% higher than total energy consumption. This is an increase compared to the year before, when production exceeded consumption by only 41 per cent<sup>xxv</sup>. As a result, Denmark has a surplus on the balance of trade for oil and gas, which was estimated at just over DKK 19 billion in 2004.

Until recently, the Danish Underground Consortium (DUC), which is owned by Maersk, Shell and Texaco, was the only oil producer in the Danish North Sea sector. The Government's involvement in the industry is limited to licensing and contract terms.

<sup>xxv</sup> Ministry of Science, Technology and Innovation (2006)

## 8.1 Employment trends

From a broad conception, the offshore oil and gas extraction industry cuts across a number of individual industries in the official Danish statistics (namely SNA93 110000 Extraction of crude oil and natural gas etc., SNA93 402000 Gas supply, and SNA93 451200 Test drilling and geological investigations). In the following analysis, though, SNA93 110000 is used as substitute for the industry. Oil refining is typically also considered a separate industry and is not discussed here, although many oil companies both extract and refine oil.

According to estimates by the Danish Maritime Authority 1,287 people were directly employed in offshore extraction of oil and gas in 2002. The industry contributed to the employment of a further 2,234 through supply chain linkages. In comparison, employment in the sector in 1997 was 1,198 (direct) and 2,408 (indirect). This indicates that the number of people directly employed in the sector has increased slightly, while the number of jobs created in other sectors has declined.

**Table 8.1 Employment in the sector of offshore oil and gas extraction, 1997-2002**

	1997	1998	1999	2000	2001	2002
Direct	1,168	1,180	1,337	1,437	1,287	1,287
Indirect	2,408	2,145	2,140	2,184	2,374	2,234
Total	3,436	3,201	3,258	3,308	3,661	3,521

*Source: National Statistics Office and Danish Maritime Authority*

It should be noted though that the above estimates are only accounting for employment in offshore extraction of oil and gas and hence is expected to be an underestimate of the true employment levels. The Danish Energy Authority has estimated the numbers employed in the oil and gas sector to be somewhere in the region of 10,500. This includes those discovering oil and gas, those managing the activities, and those that are employed at the oil rigs. Of the 10,500 employed in the sector approximately 3,500 is working in a facility that is physically located in the sea (the Danish part of the North Sea).

In respect of inter-industry linkages the offshore oil and gas extraction industry purchases a number of commodities and services from maritime and related sectors, including maritime transportation services, bridges, accommodation equipment, alarm systems, buoyancy units and float elements, pumps, engineering, supervision, containers, control systems, cranes, engines, fabricators and platforms, filters, towers, hydraulic cylinders, maintenance and repair, pipe handling equipment, propeller systems, propulsion packages, purifiers and rigs and ships.

## 8.2 Employment projections

Notwithstanding the recent growth in production, it has become more difficult lately to obtain new-building orders from the offshore oil and gas extraction industry, and this has generally impacted negatively on the major suppliers. For example, Bladt Industries recently announced that they are going to lay off 190 employees (about half of their employees) when they have finished the construction of rigs for the Halfdan Field. Also, other supplier companies (e.g., Semco or ABB Alstom) have experienced increasing difficulties as suppliers to the offshore oil and gas extraction industry and have, accordingly, diversified into other activities, serving other industries.

## 9.0 Offshore wind energy

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Offshore wind farms and other offshore electricity power plants such as wave power plants are newcomers in the maritime sphere and are important tools in the efforts to cut, inter alia, greenhouse emissions. With the growing prices on oil and CO<sub>2</sub>-quotas, offshore wind farms can be regarded as an increasingly competitive source of renewable energy and is therefore expected to increase in number and size in the future. New technology may in the future lead to competitive wind farms farther out at sea and would thereby become a more important part of the maritime picture<sup>XXVI</sup>. As a consequence of the technological development and growing markets, the price of windmills has dropped more than 80% since 1980. Wind power is therefore now able to compete with other new capacities.

The competence cluster for the windmill industry can be divided into 3 main categories:

- "Windmill and wing manufacturers" are comprised by Denmark's three windmill manufacturers (NEG Micon A/S, Vestas Wind Systems and Bonus Energy A/S) and the wing manufacturer LM Glasfiber A/S
- "Bigger Danish component suppliers" comprise medium-sized producers of steel components, electronic equipment, or software to the windmill manufacturers. Among them are AVN Hydraulik A/S, MITA, KK-electronics A/S and Niebuhr Gear Manufactory
- A number of smaller sub-contactors of various kinds. Ringkøbing County hosts a concentration of enterprises within metal industry and manufacturing technology related to the windmill industry<sup>XXVII</sup>.

Denmark is the world's leading producer of windmills and 3 of the world's 10 leading producers are Danish. Measured in kilowatt Denmark is responsible for close to 50% of the world's production of windmills measured in kilowatt. Traditionally, the windmill industry

<sup>XXVI</sup> The Danish Maritime Authority (2005)

<sup>XXVII</sup> Ministry of Science, Technology and Innovation (2006)

has operated on a market with a high degree of political price-fixing. National and international political demands for using alternative energy as well as subsidies to the establishment of windmills have had a strong effect on the demand for mills.

In 2002 the turnover of the industry was 21 billion DKK, which can be compared to the turnover of 1990 which was 925 million DKK. In other words, turnover was 23 times higher in 2002 compared to 12 years earlier. No studies have been conducted to look at economic impact of offshore wind energy or wind turbines located within 50km from the sea – however, it can be estimated that a large proportion of wind turbines are located within 50km from the sea, thus coming under the definition of this study. Because of the limited demand in the domestic market, an increasing share of wind mill production has been exported. In 2002, 90 percent of all production of wind mills and wings were exported, which can be compared to 50 percent in 1990. This means that the export of wind mills and wings now is at the same level as the export of meat (pork)<sup>xxviii</sup>.

Most components used to generate wind energy are produced in Denmark. The only core components that are produced abroad are gears and generators. Thus, the production of wind mills and wings has a positive effect on the Danish balance of payments.

## 9.1 Employment trends

The Danish wind industry consists of companies that produce wind mill towers and wings, operate, repair and maintain wind mills. In 2002, it was estimated that the Danish wind industry employed around 21,000 – direct and indirect. This means that the collected employment within this sector has trebled since 1994-95. Out of the total employment, 6,600 people were employed directly by the four big wind farm factories. This is more than twice as many as the sector employed in 1998 (around 2,800)<sup>20</sup>. The strong growth in employment is largely attributed to Denmark's strong market position, that Danish wind mill producers have established in recent years.

**Table 9.1 Employment in the offshore wind energy sector, 1994 - 2002**

Employment	1994e	2002
Direct	2,800	6,600
Indirect	4,200	14,000
Total	7,000	21,000

e= estimate

<sup>xxviii</sup> Danish Wind Turbine Owners' Association (2003) Produktion og beskæftigelse ved vindenergi



Danish wind farm producers have also established "local production" abroad. Production and/or development of wind farms and/or wings have been set up in Germany, Spain, Italy, Holland, Scotland, USA, India, Australia and China. In 1997 estimates by the Danish Wind Industry Association suggested that there were 4,500 workplaces related to Danish wind farms abroad. If these estimates are re-calculated in relation to the export shares of each of the years, this would mean that there are around 19,000 "Danish" workplaces in the wind farm sector abroad. This brings the total number of people employed up to some 40,000 (however, this employment includes both the jobs generated by the industry in Denmark and abroad).

Most production companies for Danish wind energy technology are joint-ventures with a significant Danish share, typically around 50 percent.

Offshore wind mill parks currently account for about 21 percent of total wind energy production and by 2030 it is expected that it will account for some 72 percent<sup>xxix</sup>. It should be noted though that the wind mill parks that are not located offshore are generally located very close to the coast and can thus be regarded as sea related activities.

## 9.2 Employment projections

As of 1 January 2005 Denmark had a wind capacity offshore of 424 MW wind turbines and the Danish Energy Authority intends to establish 400 MW new offshore wind-turbine capacity. Just recently the Danish Government published the Energy Strategy 2025 - stating among other things - that the offshore wind power is expected to become competitive with growing prices on oil and CO<sub>2</sub>-quatas. As a consequence the Danish Government will initiate an overall screening of the Danish territorial waters for potential sites for offshore wind mills (an update on the "The Offshore Wind Turbine Action Plan for Danish Waters" from 1997). This is likely to have a positive effect on future employment. It should be noted though that employment will not grow proportionately with the capacity of wind turbines and the production of wind mills as a result of the adoption of more technology and increased production abroad. Nevertheless, it is expected that some 24,000 (direct and indirect) will be employed in the sector by 2007, which represents an increase of some 14 percent compared to 2002/20.

<sup>xxix</sup> Danish Wind Turbine Owners' Association (2006)

## 10.0 Recreational boating

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Recreational boating in Denmark has been buoyant in recent years as a result of a relatively favourable economic conditions in Denmark. Relative to its size, Denmark is a large and well respected producer of wind and motor assisted boats. In 2004, nearly 2,000 boats were exported at a value of 588 million DKK. A slightly higher number of boats were imported but these were typically lower value boats and as a result Denmark had a trade surplus of some 320 million DKK in the boating sector.

### 10.1 Employment trends

According to DANBOAT, the Danish Boating Industry Association, there is currently no available employment data for this industry. According to the study carried out by the British Marine Federation on employment in the recreational boating industry in Europe, in Denmark the industry provided 5,290 in 2004. Of the total figure 890 were involved in boatbuilding activities, 20 in marine engine manufacturing, 1,840 in marine equipment manufacturing and nearly half of all employees, some 2,540 were employed in activities related to trade and services in the industry.

## 11.0 Coastal tourism

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During 2004 the turnover of the Danish tourism sector was 67 million DKK or 4.7 percent of total GDP. Over the last 10 years there has been a general fall in the number of nights spent by tourists in Denmark. In 1994, 42.7 million nights were spent in Denmark, whilst only 42.2 million nights were spent in 2004. This represents a fall of around 1 percent. Notably, the number of nights spent by Danes has increased by 23 percent, whilst the number of nights spent by foreign visitors has fallen by 16 percent. The fall in nights spent by foreign visitors has largely been caused by a decline in visits by Germans, who in 1994 represented 73 percent of total nights spent in Denmark (62 percent in 2004). Indeed, the number nights spent by Germans fell from 19,354 to 13,781 between 1994 and 2004. The reasons for this fall are many and include a poor German economy, fewer families with small children (the primary target group for coastal tourism), increasing competition from other destinations and shorter summer breaks<sup>xxx</sup>.

Despite the significant fall in nights spent by German tourist, the total number of nights spent in Denmark has only fallen slightly in the last ten years. This is largely due to the fact that more nights have been spent by Danish tourist. Moreover, there has been a slight

<sup>xxx</sup>Ministry of Economic and Business Affairs (2006) Report on Danish Tourism

increase in the number of nights spent by tourists from Norway, Sweden and the Netherlands.

## 11.1 Employment trends

The tourism sector is not a sector in a traditional sense, and thus it is not possible to obtain a precise measure of employment in the sector from the official statistics. As a result, a model has been developed in Denmark to estimate the effect on employment from tourism expenditure. The model shows that one and a half jobs are created for every million DKK that is spent in the tourism sector. This means that in 2004 it is estimated that there were some 100,000 people employed (FTE), which represents 3.7% of total employment in Denmark.

The importance of tourism is however different in different parts of Denmark. In Bornholm it accounts for just over 9%, whilst in the local authority of Viborg it only accounts for 1.8 percent of total employment.

In respect of the total nights spent by tourist in Denmark, it is estimated that some 87% are coastal related. City tourism account for 8% of total nights spent and business tourism for 5%. However, if you look at the expenditure of tourists, coastal tourism only accounts for 62%. Thus, suggesting that the expenditure per person is significantly lower for coastal tourists compared to particularly business tourists, who account for 24% of total expenditure.

Given that 62% of total expenditure is related to coastal tourism, it has been estimated that 61,628 people (FTE) are employed in the coastal tourism sector. This however is a rough estimation of employment in tourism activities within 50km from the sea (as defined in this study) and consequently further studies on coastal tourism employment are recommended to outline a more precise picture.

The number of nights spent in Denmark related to coastal tourism increased between 2000 and 2003 but then fell dramatically in 2004 to a level 1% lower than in 2000. As a consequence it can be assumed that employment in coastal tourism has remained more or less the same in recent years.

## 11.2 Employment projections

The aim of the Danish government is that the growth of Danish tourism should be comparable to that of the rest of Northern Europe by 2010, particularly in terms of city tourism and business tourism, but also coastal tourism. Thus, given that coastal tourism is

a relatively labour intensive sector, it can be expected that employment will grow in the future.

However, according to the European Tourism Satellite Accounting by the WTTC, Denmark is the only EU country, alongside the UK, where travel and tourism related employment is expected to decline between 2006-2016. It has been forecasted that direct travel and tourism industry jobs are to decline by 7,000, representing a decline of 8.4%.

### 11.3 Skills and training

People working in the tourism sector generally have a lower level of skills and qualifications compared to the national average and to other service sectors (see table 11.1). This is partly an effect of the seasonal nature of the sector, which makes it difficult to attract and hold onto higher skilled employees.

**Table 11.1 Skill levels**

	Tourism sector	All service sectors	All sectors
Vocational training qualification	42%	57%	62%
No post-compulsory school qualifications	38%	30%	30%

Source: Ministry of Economic and Business Affairs, 2004

Indeed, a significantly lower proportion of people employed in the tourism sector have a vocational training qualification, 42% compared to the national average of 62% and the average for the service sector of 57%. The tourism sector also have a notable higher proportion of employees with no qualifications, 38% compared to the national and service sector average of 30%.

Increased levels of knowledge and competencies have been identified as an important condition for future growth in the sector. Moreover, it has been highlighted that there needs to be greater cooperation between the tourism sector and the educational sector, in order to identify and exploit new markets and activities.

Moreover, it has been highlighted that it may be necessary to create full time jobs for the whole year in the tourism sector if it is to become a future growth sector.

## 12.0 Skills and recruitment in the Danish maritime sector

The maritime transport sector is not the only maritime sector facing recruitment problems; recruitment problems are shared by all other maritime sectors too. As a whole, the maritime sector is reliant on a broad range of skills to manage innovation, which is a

necessary prerequisite for competitiveness and for the ability to manage growth in the maritime sector. The character of innovation is different within the maritime industries, stretching from incremental innovation in day-by-day operations to break-through innovation stemming from new technologies. Furthermore, innovation must be seen in a broad perspective, encompassing inter alia technology, marketing, operation, design and human resources.

Future recruitment of skilled labour and innovation is therefore of paramount interest for all parts of the maritime sector. In response to this, the Danish Minister for Economic and Business Affairs, has published a report outlining a plan of action that intends to sustain and develop Denmark's position as the leading shipping nation in Europe. In respect of skills and training the plan of action highlights the need for continuous assessment to maintain a sustainable and targeted supply of education. It also highlights the need for more efforts to be put into recruitment and information campaigns in order to increase the awareness of maritime sector job opportunities among young people

Perhaps an overlooked fact in the past is that there are good opportunities for employees to shift between employment at sea and in land based organisations. For example, there is a great need for employees with technical expertise, not only in shipbuilding and consultancy companies, but also in the technical organisation of shipping companies. In a similar way, there is a need for employees with technical background in the maritime equipment sector. As a consequence, educational programmes that may on the face of it seem to be aimed at a certain sector of the maritime cluster actually provide employment opportunities in a wide variety of sectors in the cluster. This is something that has been highlighted in the new plan of action, which intends to focus its activities to create intra-sector career paths in order to enhance coherence.