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A ship is only as strong as its crew

Employment and employment structure in the German maritime sector from 2015 to 2024

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List of abbreviations

BA ..... Federal Employment Agency
BMVI ..... Federal Ministry of Transport and Digital Infrastructure
BMWi ..... Federal Ministry of Economic Affairs and Technology
BMWK ..... Federal Ministry of Economics and Climate Protection
DMZ ..... German Maritime Centre
EEG ..... Renewable Energy Sources Act
ETR ..... Economic Trend Research
EU ..... European Union
ISL ..... Institute of Shipping Economics and Logistics
KIdb 2010 ..... Classification of occupations 2010
NUTS ..... Nomenclature des Unités Territoriales Statistiques
OECD ..... Organization for Economic Co-operation and Development
PStG ..... Civil Status Act
SGB III ..... Third Book of the Social Code
VACAD ..... Association of Air Cargo Dispatchers of Germany
VDMA ..... Mechanical Engineering Industry Association
WZ08 ..... Official classification of economic activities 2008

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Executive Summary

The maritime sector in Germany is encountering significant challenges in attracting sufficient skilled workers and young talent. In response to these challenges, the German Maritime Centre has developed an employment analysis methodology to monitor employment trends and structures within the sector. This study outlines the methodology utilized for recording employment in the maritime sector and presents the findings of the employment analysis for the period from 2015 to 2024. The insights garnered provide essential information for the formulation of targeted strategic measures aimed at ensuring the long-term competitiveness of the maritime sector.

A comprehensive definition of the maritime sector was established for this study, encompassing pertinent economic structures in Germany and distinctly delineating its various sub-sectors. This framework serves as the basis for a continuous and consistent survey of employment and employment structure within the sector. The maritime sector comprises the following sub-sectors:

- Research and teaching, consulting
- Fisheries and aquaculture
- Port and terminal operations
- Hinterland transport and logistics
- Navy
- Maritime service providers
- Offshore wind
- Shipbuilding
- Shipping
- Administration and associations
- Hydraulic engineering
- Supplier industry

The employment figures are derived from the Federal Employment Agency's employment statistics, which comprehensively documents dependent employment across all sectors in Germany. The analysis includes data on the number of employees, their occupations, and various characteristics such as age, gender, nationality, and qualifications.

The study results indicate the following:

- Employment in the maritime sector increased to approximately 394,000 individuals between 2015 and 2024.
- Despite weaker economic performance in Germany, employment saw modest growth in 2023 and 2024.
- The positive employment trend within the sector is attributed to heterogeneous developments across the subsectors.
- The occupational structure reveals that 40% of individuals are employed as vehicle operators or other occupations in transport and logistics, and 18% are engaged in administration, business organization, and general commercial professions.
- The number of apprentices has decreased by nearly 15% since 2015.
- The proportion of female employees has steadily increased.
- The age structure in the sector is increasingly shifting towards older employees over the age of 55, while the employment trend for those under 35 is considerably weaker.
- Positive employment growth in the sector is largely due to the increase in employees of foreign nationality.
- There is a trend toward higher educational qualifications and higher qualified occupations within the maritime sector.

1. Introduction

A functioning, efficient, and internationally competitive maritime sector is of significant economic importance for Germany. However, it increasingly faces challenges related to skilled labour shortage, which necessitates a thorough employment analysis.

The German economy relies heavily on international trade. As an advanced industrial nation, Germany imports raw materials and intermediate goods from other countries and exports industrial products globally. Additionally, material prosperity in Germany is influenced by the availability of affordable consumer products from abroad. Maritime transport is the primary mode of transportation for trade with non-EU countries. Over 60% of goods are transported by ship via German ports. The maritime sector also plays a crucial role in the energy transition. Therefore, the economic model and social prosperity in Germany depend significantly on the maritime sector, which facilitates cost-efficient international goods transportation.[1]

To meet these requirements, the maritime sector in Germany must address the challenge of securing sufficient and appropriately qualified personnel. Finding skilled workers and attracting young talent are increasingly important for companies in the maritime sector, which is affected by various changes in the German labour market. It is essential to monitor these developments closely to implement appropriate strategic measures promptly.

Demographic changes result in retiring baby boomers and fewer trained young people for the maritime labour market. More school leavers aim for university, making it harder to recruit for dual vocational training. Moreover, digitalization is altering work and qualification needs, with many sectors competing for digitally skilled workers, leading to a shortage of skilled labour in maritime professions. Finding and retaining new employees long-term is increasingly challenging.

A comprehensive analysis of the employment landscape and development within the maritime sector in Germany has yet to be conducted. Existing research typically offers limited insights, focusing on specific sub-sectors or smaller geographical areas. Important factors such as demographic structures and educational backgrounds of employees are frequently overlooked, despite their significance for strategic workforce planning and education policy decisions.

The German Maritime Centre (DMZ, *Deutsches Maritimes Zentrum*) is committed to systematically and continuously analyse the employment situation and structure in the maritime sector to establish a reliable information base for addressing the challenges of the sectors' labour market. The goal is to provide a comprehensive overview of the sector and a detailed examination of its sub-sectors. To achieve this objective, it is necessary to define the maritime sector and establish a database, allowing for recurring analyses with reasonable effort and consistent methodology.

The methodology for calculating employment in the maritime sector was developed as part of a project by the Institute of Shipping Economics and Logistics (ISL) and Economic Trend Research (ETR), in cooperation with the DMZ. It builds on the 2021 study *Maritime Wertschöpfung und Beschäftigung in Deutschland* (Maritime added value and employment in Germany) [2] and has been adapted as well as enhanced with input from maritime sub-sector representatives.

The "maritime sector" lacks a fixed definition and may include various and sometimes very heterogeneous sea-related sub-sectors, depending on the research interest or regional delimitation of studies.[3] Typically, it covers ports, shipping, and shipbuilding. Other also sea-related areas like maritime tourism, hinterland logistics, and the navy are often excluded from such analyses. This study defines the maritime sector to include relevant economic structures in Germany for ongoing analysis based on publicly available data. The included sub-sectors are:

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[1] See BMWK: Branchenfokus Maritime Wirtschaft, URL: https://www.bmwk.de/Redaktion/DE/Textsammlungen/Branchenfokus/ Industrie/branchenfokus-maritime-wirtschaft.html (as at: 24 March 2025).
[2] BMWi (2021).
[3] See Kildow and Park (2014).

- Research and teaching, consulting
- Fisheries and aquaculture
- Port and terminal operations
- Hinterland transport and logistics
- Navy
- Maritime service providers
- Offshore wind
- Shipbuilding
- Shipping
- Administration and associations
- Hydraulic engineering
- Supplier industry

Employment numbers are based on the Federal Employment Agency (BA, *Bundesagentur für Arbeit*) employment statistics, covering all sectors in Germany for ongoing evaluation. The BA industry classification follows the German adaption of the statistical classification of economic activities NACE Rev. 2 (WZ08, *Klassifikation der Wirtschaftszweige 2008*).[4] Maritime sub-sectors often consist of multiple sectoral classes; only three are fully captured in WZ08, allowing to take employment data directly from BA statistics. For the other sub-sectors, the level of employment and the maritime shares of individual economic activities are determined by using secondary data sources and assumptions. Defining the maritime sector using WZ08 enables consistent employment studies with official statistics, making future studies easier and more efficient.

The employment statistics can be used to evaluate information on various personal and employment characteristics such as occupation, age, nationality, and education. This information helps to identify changes in employment structure, interpret employment trends, and understand the effects of structural changes on employment in the maritime sector.

The study results provide a detailed tool to analyse employment trends in Germany's maritime sector and its sub-sectors. They allow analyses from aggregated levels down to individual economic activities of sub-sectors. The following shows results for the entire maritime sector. Such a comprehensive employment analysis of the maritime sector in Germany has not been conducted before.

Chapter 2 introduces the definition of the maritime sector on which the study is based, provides detailed explanations and describes the individual sub-sectors. Chapter 0 presents the BA's employment statistics as the data basis and details the special evaluation of the statistic used for the analysis. Chapter 4 outlines the methodology and other data sources utilized to calculate employment across all sub-sectors and identifies the economic activities comprising the sub-sectors. Chapter 5 discusses the results regarding the number of employees, occupational structure and the employment characteristics in the maritime sector, highlighting differences between sub-sectors and comparing these with the broader economic employment trends. Chapter 6 concludes with a summary.

2. Definition of the maritime sector

To analyse employment in the maritime sector, a precise definition is necessary. This must include all relevant areas of the sector in Germany as well as clearly outline sub-sectors to avoid double counting. The goal is to consistently survey employment figures and structure with minimal effort in data collection.

There is no widely accepted definition of the maritime sector, with various terms like *maritime economy* [5], *ocean-based economy* [6], *blue economy* [7] or *marine sector* [8] being used. The key issue is determining which activities belong to the

[4] See Federal Statistical Office (2008) and Eurostat (2008) for an overview of the statistical classification of economic activities.
[5] See Laaser et al. (2020).
[6] See UNCTAD (2021).
[7] See European Commission (2023).
[8] See Morrissey and O'Donoghue (2013).

maritime sector and defining the boundaries between activities that are associated with, provide services for, or depend on the maritime sector.

Definitions related to the maritime sector vary by country, reflecting their economic structures and sub-sectors. Moreover, the definitions can vary significantly regarding the allocation of activities to specific sub-sectors. These differences complicate comparisons of the sector across nations.[9]

Both national studies and studies aiming for a universally valid definition of the maritime sector or related terms vary in their research interests. Definitions can be divided between those with a narrow economic or industrial focus and those attempting to capture a comprehensive framework of activities and resources linked to the sea. According to a study by the Organization for Economic Co-operation and Development (OECD), there is a distinction between the economic sphere of marine use and the marine ecosystem. Its definition of the maritime economy includes both areas and considers their mutual influence.[10] The European Commission's definition of the *blue economy* encompasses a wide range of economic and social uses of the oceans, seas, and coasts, including recreational activities and health aspects.[11] Kildow and Park (2014) note that a comprehensive definition of maritime activities also incorporates areas currently utilized commercially only to a limited extent or that are still in exploratory phases, such as deep-sea mining or algae cultivation.

For the objective of an ongoing employment analysis of the maritime sector in Germany, expanding the definition of the sector to be as comprehensive as possible represents a significant additional effort, which in many cases is disproportionate to its importance for employment. Additionally, the definition should include sub-sectors that interact in their activities and mutually ensure a functioning maritime economy. For this reason, this study focuses on economic activities that make a relevant economic contribution to the German maritime sector and are related to the topics of the DMZ.[12]

Using existing definitions allows for comparability with other studies. Country-specific research is often shaped by national maritime sector structures, making transnational studies and research on Germany particularly important. Kwiatkowski and Zaucha (2023) discuss the balance between standardized and country-specific definitions. While specific definitions may yield more precise results, they reduce comparability.[13] Since this paper does not focus on cross-national comparisons, it uses a specific definition for Germany.

The definition of the maritime sector is derived from the study *Maritime Wertschöpfung und Beschäftigung in Deutschland* (Maritime added value and employment in Germany) commissioned by the Federal Ministry for Economic Affairs and Energy (BMWi).[14] This definition supports the objective of a standardized and regular analysis of employment within Germany's maritime sector. It was developed considering the specific characteristics of the maritime sector in Germany, with input from industry representatives. The sub-sectors are classified according to WZ08, allowing the use of the BA's employment statistics. Most data used to assess employment within maritime sub-sectors is published at least annually and is easily accessible, enabling regular and continuous analysis. Utilizing an established definition also provides the benefit of historical comparative figures to verify new data. Other studies on Germany often focus on individual sub-sectors or smaller regions, thus were only supplementary to the definition and methodology.[15]

The maritime sector is defined as follows: *The maritime sector includes organizations that directly use waterways or the maritime space commercially or that produce, provide or maintain the fixed, mobile, digital or personnel structures required for their use.* The resulting areas of the maritime sector are listed inTable 1 .

The original definition and methodology were validated and refined during the study with additional industry input. The calculation methods and data for employee numbers and proportions for economic activities not clearly assigned to the

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[9] See Kildow and Park (2014), European Commission (2017), Morrissey (2017), Kildow and McIlgorm (2010).
[10] Cf. OECD (2016).
[11] See European Commission (2012).
[12] See DMZ: Our priorities, URL: https://dmz-maritim.de/en/priorities/ (as at: 24 March 2025).
[13] See Kwiatkowski and Zaucha (2023).
[14] Today Federal Ministry for Economic Affairs and Climate Action (BMWK). Study: BMWi (2021).
[15] Cf. BMVI (2019), Laaser et al. (2020), Brandt et al. (2009).

maritime sector were adjusted for the sub-sectors port operations, maritime services, offshore wind, and supply industry. Hinterland transport and logistics were added as central components of port logistics. Future analyses will aim to further develop and update the data and methodology.

Table 1
Maritime sub-sectors

Sub-sector	Description
Research and teaching, consulting	Research institutions with a direct connection to the marine and coastal area, educational institutions with a maritime focus and companies specializing in consulting on maritime issues.
Fisheries and aquaculture	Fishery comprises the catching and collecting of fish, crustaceans, molluscs and marine animals. Aquaculture describes the rearing of fish, other marine animals and plants in a controlled environment (breeding, feeding, protection). Both can take place in salt or fresh water. The sector also includes industrial fish processing.
Port and terminal operations	Activities that ensure the efficient handling of goods and passengers through the operation of ports equipped with quay facilities, berths, and the necessary equipment and personnel. This sub-sector not only encompasses traditional ports, which typically have multiple harbour basins and quay facilities and may also provide various maritime and logistical services. Additionally, moorages where goods or passengers are transferred are included. This classification aligns with official statistics on waterborne transportation.
Hinterland transport and logistics	Port-related logistics activities such as storage and onward transportation of goods in the hinterland by truck and train.
Marine	The armed forces of the Bundeswehr of the same name.
Maritime service providers	Heterogeneous group of different economic activities that provide services for the implementation of shipping. In this study, this includes the brokerage of freight capacities in shipping (ship brokers) as well as pilotage, the rental of water transport equipment, mooring and unmooring services, lighterage, ship chandlers, tug services, salvage, icebreaking, ship registration and the operation of lighthouses. Not included are sectors that are only partially related to the maritime sector, such as banks, insurance companies or general consulting firms.
Offshore wind	Activities related to the planning, manufacture, construction, operation and maintenance of offshore wind power plants and their energy transmission to land.
Shipbuilding	All activities that contribute directly to the manufacture and repair of ships, boats and similar floating objects. In addition to traditional shipyard operations, this also includes the areas of repair and maintenance. Shipbuilding comprises commercial cargo and passenger ships as well as civilian and military special ships. The construction of private ships is also included. Both sea-going and inland waterway vessels are included.
Shipping	The commercial transportation of goods and passengers by sea and inland waterway vessels. Passenger transportation can be carried out for transportation purposes (e.g. ferries, water cabs) as well as for leisure purposes (e.g. cruise and excursion shipping).
Administration and associations	State administrative tasks and association work related to the maritime sector. In the federal and state transport administration, there are agencies whose tasks are focused on the port and maritime sector. In addition, there are waterways and shipping authorities that are responsible for shipping traffic on German waterways.
Hydraulic engineering	Construction activities and supporting construction planning activities related to seas and bodies of water. This includes the construction of waterways, harbours (including marinas), river structures, locks, riverbank structures, dams, dikes and other flood protection structures. Dredging is also considered hydraulic engineering if its purpose is the dredging of waterways for their construction or maintenance. Dredging with the primary objective of extracting raw materials is counted as a mining activity. Overall, hydraulic engineering is a small-scale and heterogeneous, but also well-defined sector.
Supplier industry	The supplier industry mainly comprises manufacturing sectors that provide products and services for the German and international shipbuilding industry. It also includes engineering activities in the design and construction of components as well as other technical services. It is difficult to draw a precise distinction, as many companies produce parts that are not exclusively intended for shipbuilding, such as screws or cable harnesses as well as materials for interior fittings.

Source: BMWi (2021), revised and supplemented by DMZ

Other economic sectors and activities related to the oceans are not included in the study. Ocean-related tourism, which is sometimes included in other definitions of the maritime sector or economy, is excluded from this definition. Although considering ocean-related tourism can be beneficial for analyses of the economic importance of (healthy) oceans, it is less

relevant for employment connected to their direct economic use. The offshore sector includes only wind energy. The extraction of resources such as gas and oil or other forms of energy generation (e.g. tides, wave power and ocean heat)[16] do not play a significant role for Germany and are therefore omitted.[17] Marine technology encompasses various technology and application fields within different areas of maritime activities.[18] It is a heterogeneous cross-sectoral industry, most of whose participants are likely already included in the sub-sectors covered. Due to its complex delimitation, no separate analysis is conducted. Future developments in the maritime sector will continue to be monitored and incorporated into the definition if necessary.

3. The Federal Employment Agency's employment statistics as a data basis

The BA records dependent employment in all sectors along with labour market-relevant characteristics of employees. This data serves as a basis for evaluating employment and the employment structure regularly. The employment statistics are based on the social security registration procedure, which includes all employees who are subject to compulsory health or pension insurance or compulsory insurance in accordance with Book III of the German Social Code (SGB III). The number of employees subject to social security contributions and marginally employed individuals at reporting date is determined based on the social security notifications submitted by the companies.[19]

The employment analysis uses a specialized evaluation of the employment statistics. Some maritime subsectors need detailed data at the most disaggregated WZ08 sub-class level, which isn't public. This evaluation covers the period from 2015 to 2024, distinguishing between employees subject to social security contributions and marginally employed people by economic activity as of June 30 each year. Employees are also categorized by occupation using the German classification of occupations 2010 (Kldb 2010, *Klassifikation der Berufe 2010*) at the level of occupational groups.[20] Furthermore, various structural characteristics of the employees are recorded (see table 2).

Table 2
Structural characteristics of the employment statistics

Feature	Description
Gender	Male or female*
Age groups	Under 25, 25 to 34, 35 to 44, 45 to 54, 55 to 64, 65 and older
Nationality	German or foreign nationality
Working hours	Full-time or part-time
Apprentices	Employees in vocational training
Professional qualification	Without vocational qualification, recognized vocational qualification, academic vocational qualification, no indication of vocational qualification
Requirement level of the occupation	Complexity of a professional activity according to Kldb 2010: helper, skilled worker, specialist, expert
School-leaving certificate	Without school-leaving certificate, secondary school leaving certificate / equivalent qualification, intermediate school-leaving certificate / equivalent qualification, Abitur (The final examination at the end of secondary school in Germany, granting access to university-level education) / Fachabitur (German qualification granting access to universities of applied sciences)

* According to the German Civil Status Act (PStG), in addition to "female" and "male", official gender registrations without an indication (since 2013) or with the indication "diverse" (since 2018) are also possible. However, due to the small number of cases, these characteristics are not shown separately in the statistics. They are randomly allocated to male and female by the BA.
For more information on the characteristics of the employment statistics, see Federal Employment Agency (2025a).

[16] See European Commission (2012).
[17] There is currently one oil production platform off the North Sea coast of Schleswig-Holstein. However, as it is part of a larger group and is not listed separately, employment figures are not available separately.
[18] See Society for Maritime Technology e.V., URL: https://www.maritime-technik.de/arbeitsfelder (as at: 24 March 2025).
[19] For more information on employment statistics, see: https://statistik.arbeitsagentur.de/DE/Navigation/Statistiken/ Fachstatistiken/Beschaeftigung/Beschäftigung-Nav.html (as at: 24 March 2025).
[20] The Kldb 2010 is a hierarchical system comprising five classification levels. It groups occupations across the top four tiers based on the similarity of activities, knowledge, and skills that define them. See also: https://statistik.arbeitsagentur.de/DE/Navigation/Grundlagen/Klassifikationen/Klassifikation-der-Berufe/KldB2010-Fassung2020/KldB2010-Fassung2020-Nav.html (as at: 24 March 2025).

When interpreting employment statistics, the following points should be considered:

- The employee count shows the number of people, but hours worked can only be roughly estimated based on social security contributions and types of employment, such as full-time or part-time.
- Company-provided information determines economic activity allocation. This may cause errors, especially in closely related sectors on disaggregated levels like *52240 Cargo handling* and *52291 Freight forwarding* within WZ08 classification.
- Structural characteristics and occupations cannot be combined in the special evaluation of the employment statistics. Additional crossings are possible for new data queries, but low employment figures in some areas may lead to censored values due to data protection by the BA. This already occurs in some cases in the current evaluation.

4. Methods and data sources for employment in the maritime sub-sectors

Employment data for sub-sectors fully included in the classification of economic activities can be directly obtained from BA statistics. For others, additional sector information is required to determine the level of employment or the share of employment in various economic activities. For some sub-sectors, information on the number of employees comes from additional data sources, while the employment statistics are used for the sectoral and employment structure. If information from additional data sources is only available for certain years or is not yet available for current periods, missing values are estimate or extrapolated. For all sub-sectors that are not fully mapped in the WZ08, it is assumed that the distribution of characteristics does not differ significantly from the underlying economic activities and can therefore be adopted for the maritime shares. This section explains which economic activities are included for the individual sub-sectors and which methods and additional data are used to calculate the employment. Table 3 summarizes the data sources employed.

Table 3
Sub-sectors by data source of employment figures

Sub-sector	Employment statistics by WZ08		Additional data sources		
	Fully included	(partly) to be derived proportionately	Statistics from association and other sources	Studies	Supplementary research and interviews
Fisheries and aquaculture	X				
Maritime service providers*	(X)		X		
Shipbuilding	X				
Shipping	X				
Port and terminal operations		X	X		
Hinterland transport and logistics		X	X		
Hydraulic engineering		X			
Research and teaching, consulting					X
Navy			X		
Offshore wind			X	X	
Administration and associations					X
Supplier industry			X	X	

* Plus freelancers in the pilotage sector
Source: Own representation based on BMWi (2021)

4.1 Fisheries and aquaculture

The fishery and aquaculture sub-sector is fully covered by WZ08, so that employment can be determined entirely based on the employment statistics. The relevant economic activity classes are *03.11 Marine fishing, 03.12 Freshwater fishing, 03.21 Marine aquaculture, 03.22 Freshwater aquaculture* and the economic activity group *10.2 Processing and preserving of fish, crustaceans and molluscs*.

4.2 Port and terminal operations

Employees in port and terminal operations include those in subclass *52.22.2 Operation of ports, harbours and piers* and the portion of class *52.24 Cargo handling* related to port cargo handling. This share estimate was adjusted from BMWi (2021) methodology for a more accurate and easier annual port-related employment recording.

WZ08 class 52.24 Cargo handling includes businesses involved in freight handling regardless of transport mode. Therefore, it is important to identify the proportion of employees working in port and terminal operations, including inland waterway vessels, ocean-going vessels, and rail terminals within ports.

4.2.1 Methodology of the estimate

The starting point for the estimate is the definition of port regions based on freight handling volumes, similar to BMWi (2021). Annual freight throughput for inland vessels, ocean-going vessels, and rail NUTS -3 level[21] in Germany is evaluated. Regions where freight is primarily handled by ships are defined as port regions. Rail transshipment in these regions is also considered part of the ports, as rail mainly serves as a feeder and onward carrier. The port regions account for 100% of throughput in seaports and nearly 80% in inland ports between 2015 and 2023.

Employment in class *52.24 Cargo handling* within the port regions serves as a basis for determining port-related employment in freight handling. The data for this is derived from a special evaluation of the employment statistics for NUTS-3 regions, which have been predominantly defined as port regions between 2015 and 2023.[22]

4.2.2 Adjustment for air cargo handling

In the next step, employment in air cargo handling must be deducted. The Association of Air Cargo Dispatchers of Germany (VACAD, *Verband der Air Cargo Abfertiger Deutschlands*) publishes figures on cargo handling and employment of its members for the years 2021 to 2023.[23] Total air cargo handling in Germany is recorded in the air transport statistics by the Federal Statistical Office. VACAD members manage approximately 35% of all air cargo operations. Based on the VACAD data, the cargo handled per employee is calculated and extrapolated to the total air cargo handling in order to estimate employment in this sector. For the years 2015 to 2020, for which VACAD data is not available, the estimate is based on the average value of the employee-to- cargo handling ratio from 2021 to 2023. The employment in air cargo handling at airports in port regions determined from the air transport statistics is then subtracted from the total employment in *52.24 Cargo handling* in these regions.

4.2.3 Estimate of employment in inland ports outside port regions

As a final step, the employment in cargo handling in inland ports located outside port regions is calculated. To determine this, the missing port-related cargo share (6% to 10%) outside the port regions per year is assessed. The estimated employment is based on the employee-to-cargo ratio in the port regions.

4.3 Hinterland transport and logistics

Although port-hinterland transport was not included in the BMWi (2021) study, it was mentioned as a related area of the maritime sector. Due to its close link to port operations and significance to those processes, this study also considers hinterland transport.

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[21] Nomenclature des Unités territoriales statistiques (NUTS): Geographical classification of territorial units for statistics. In Germany, NUTS-3 corresponds to districts and independent cities.

[22] For data protection reasons, the employment figures are only available as a total for all regions.

[23] See VACAD, Quarterly figures on handling volumes and employment, URL: http://www.vacad.org/aktuelles.html (as at 24 March 2025).

The estimation of employment within the port-hinterland transport sector is derived from the methodology and findings of the BMVI study (2019) on the economic significance of German seaports and inland ports based on their impact on employment. The study estimated the proportion of hinterland logistics within the total transportation performance for pertinent economic activities in the year 2017.[24]

In evaluating the maritime transport chain, the study also considered shipping, warehousing, and freight forwarding alongside hinterland transport. Shipping is recorded as an independent sub-sector in this study and thus excluded from hinterland transport calculations. Consequently, the analysis encompasses the following economic activities: *49.2 Freight rail transport, 49.41 Freight transport by road, 52.1 Warehousing and storage, 52.29.1 Freight forwarding*, and *52.24 Cargo handling*. Notably, cargo handling refers to activities within the port hinterland of German ports that do not occur directly within the ports themselves, thereby avoiding any overlap with employment shares attributed to port and terminal operations.

To determine the maritime share of the respective economic activities, an estimate was made in the BMVI port study (2019). This is based on the cargo handling statistics, the interdependence matrix of the maritime traffic forecast and the foreign trade statistics. This is used to determine what proportion of economic activity in these sectors is directly related to the ports. The proportion of employment attributable to the hinterland transport and logistics sector is therefore as follows:

Table 4
Share of employment in Hinterland transport and logistics by economic activities

Economic activity		Share
49.2	Freight rail transport	42%
49.41	Freight transport by road	7%
52.1	Warehousing and storage	19%
52.24	Cargo handling	2%
52.29.1	Freight forwarding	10%

Source: BMVI (2019) p. 52

The aggregate of the contributions from various economic activities constitutes the total employment within the hinterland transport and logistics sub-sector. It is presumed that the shares of maritime employment have remained relatively stable over the reviewed period, thus enabling their use for calculating employment figures across all years.

4.4 Maritime service providers

The maritime services sub-sector includes *52.22.3 Navigation, pilotage and berthing activities*, *52.22.9 Service activities incidental to water transportation n.e.c.*, *52.29.2 Organisation of group consignments by sea*, and *77.34 Renting and leasing of water transport equipment*. These maritime economic activities are fully covered by WZ08. However, numerous individuals in the pilotage sector are self-employed and thus not reflected within the employment statistics. Consequently, the number of self-employed pilots is derived from data provided by the Federal Chamber of Pilots (*Bundeslotsenkammer*) and incorporated into the sub-sector analysis. It is assumed that the employment structure for self-employed pilots mirrors that of employed pilots.

4.5 Offshore wind

As a cross-sectoral industry, offshore wind energy is broadly diversified. The definition and identification of the economic activities involved in the BMWi study (2021) are based on the studies on value creation in the offshore wind energy sector in Germany by wind:research.[25] The number of employees for the sub-sector reported in the study was also adopted.

[24] The study only considers German seaports, as the focus was not on the maritime sector, but on the employment effects of German seaports and inland ports. For future evaluations, the economic effects of hinterland traffic with foreign seaports may also be taken into account.
[25] See wind:research (2022, 2019).

However, the wind:research studie from 2019 in 2022 only provides employment figures for 2018 and 2020. Due to the limited data this study is based on a different source for the number of employees.

As part of the research projects "Macroeconomic effects and distribution issues of the energy transition" and "Economic indicators of the energy system" commissioned by the BMWi/BMWK, several studies on the employment effects of renewable energies have been published, including offshore wind sector figures.[26] Compared to the wind:research studies, the 2018 and 2020 data are slightly higher, but show a similar dynamic. Like the wind:research studies, the definition of the offshore wind sector considers the planning, construction and installation as well as the operation and maintenance of wind turbines. As the employment figures are available up to 2022 and are to be collected on an ongoing basis, they serve as a data source for this study.

Employee distribution by economic activity follows BMWi (2021). As a cross-sectoral industry, many economic activities are relevant for the offshore wind sector. The largest share is accounted for by *27.1 Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus*, *72 Scientific research and development*, *28.11 Manufacture of engines and turbines, except aircraft, vehicle and cycle engines* and *33 Repair and installation of machinery and equipment*.[27] Shipping also plays a significant role for the sub-sector, but is excluded from maritime employment calculations for the maritime sector as a whole to prevent double counting.

For years without published employment figures, missing values are estimated using regression analysis. Plausible and significant results were obtained from data on installed offshore wind turbines in Germany.[28] In addition, a dummy variable was included for 2020 and 2021 to account for the structural break caused by the COVID-19 impact. The regression uses logarithmised variables, allowing the estimated parameters to be interpreted as elasticities.

4.6 Shipbuilding

Shipbuilding comprises the economic activity classes *30.11 Shipbuilding (excluding boat and yacht building), 30.12 Boat and yacht building* and *33.15 Repair and maintenance of ships, boats and yachts*. These economic activities belong to the maritime sector and employment is fully recorded in the employment statistics.

4.7 Shipping

The WZ08 classifies the shipping sector under economic activity division *50 Water transport*, including *50.1 Sea and coastal passenger water transport, 50.2 Sea and coastal freight water transport, 50.3 Inland passenger water transport* and *50.4 Inland freight water transport*. Employment data is fully captured in the employment statistics.

4.8 Hydraulic engineering

Hydraulic engineering, classified under WZ08 class *42.91*, includes all major construction activities in this field. However, project management for civil engineering activities (*71.12.1 Engineering activities for projects involving civil, hydraulic and traffic engineering*) is not included. As it is part of hydraulic engineering activities, the share of hydraulic engineering for sub-class *71.12.1*, which covers planning activities in the entire construction industry, must be estimated. Therefore, the share of employees in hydraulic engineering in the total construction industry (Section F of WZ08) is calculated in order to approximate the number of engineers. All necessary employment figures are taken from the employment statistics. The total for the hydraulic engineering sector is calculated by adding the individual components.

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[26] Overview: BMWK (2023), Bruttobeschäftigung durch erneuerbare Energien 2000 bis 2022, URL: https://www.bmwk.de/Redaktion/DE/Downloads/E/ee-beschaeftigte-2000-2022.pdf?__blob=publicationFile&v=6 (as of March 24, 2025). See O'Sullivan et al. (2023), O'Sullivan and Edler (2020), O'Sullivan, Edler and Lehr (2018), Lehr et al. (2008).

[27] Details on request.

[28] Source: Deutsche WindGuard GmbH, Status des Offshore-Windenergieausbaus in Deutschland (various years), URL: https://www.wind-energie.de/presse/pressemitteilungen/ (as of 24 March 2025).

4.9 Supplier industry

The supplier industry is not clearly represented in official statistics because it includes many small parts of various economic activities. Thus, employment data can't be directly determined from employment statistics. The BMWi study (2021) uses employee numbers from the economic survey of the shipbuilding and offshore supply industry.[29] This survey is conducted annually by the German Engineering Federation (VDMA, *Verband Deutscher Maschinen- und Anlagenbau e.V.*) - Marine Equipment among the association's members. Projections are used to estimate total employment in the supplier industry, accounting for underrepresented sectors.

The sector structure of the supplier industry, i.e. the relevant economic activities and their shares, was determined through a multi-stage process.[30] The estimate is based on information from the VDMA surveys regarding turnover shares of different product fields as well as information from industry studies, industry surveys and structural data from the official input-output tables. The result is a comprehensive list of economic activities, primarily from manufacturing. A high proportion of the supplier industry is represented by economic activities in mechanical engineering (e.g. *28.11 Manufacture of engines and turbines, except aircraft, vehicle and cycle engines, 28.12 Manufacture of fluid power equipment*) and in metalworking (e.g. *25 Manufacture of fabricated metal products*).

VDMA's employment figures are continuously collected, making them suitable for ongoing maritime sector analysis. This study assumes that the sector shares for economic activities remained stable throughout the study period and are valid for all years.

If the VDMA's employment figures are not yet available for the current year, they are estimated using regression analysis analogous to the methodology for the offshore wind sector. The most important customers of the supplier industry are the global shipyards. Thus, employment is regressed on the global order book, with a linear trend to approximate the productivity development and a dummy variable for a structural break as a result of the global shipping crisis in 2008.

4.10 Other sub-sectors

The definitions and employment figures for the sub-sectors

- research, teaching and consulting,
- administration and associations,
- navy

are taken from the BMWi (2021) study. Naval data was directly requested from the Bundeswehr. Employment in the other sub-sectors was estimated based on industry research and surveys. The development of employment is calculated based on the available values taken from the BMWi (2021) study for 2018 using development of employment in the underlying economic activities of the sub-sectors, as shown in table 5.

Table 5
Economic activities in research, teaching and consulting, administration and associations and navy

Sub-sector	Economic activities
Research, teaching and consulting	72 Scientific research and development, 85.3 Secondary education, 85.4, Higher education, 70.2 Management consultancy activities
Administration and associations	84.1 Administration of the State and the economic and social policy of the community
Navy	84.22 Defence activities

Source: BMWi (2021)

[29] Cf. VDMA.
[30] See BMWi (2021), p. 20f.

5. Results of the employment analysis for the maritime sector in Germany

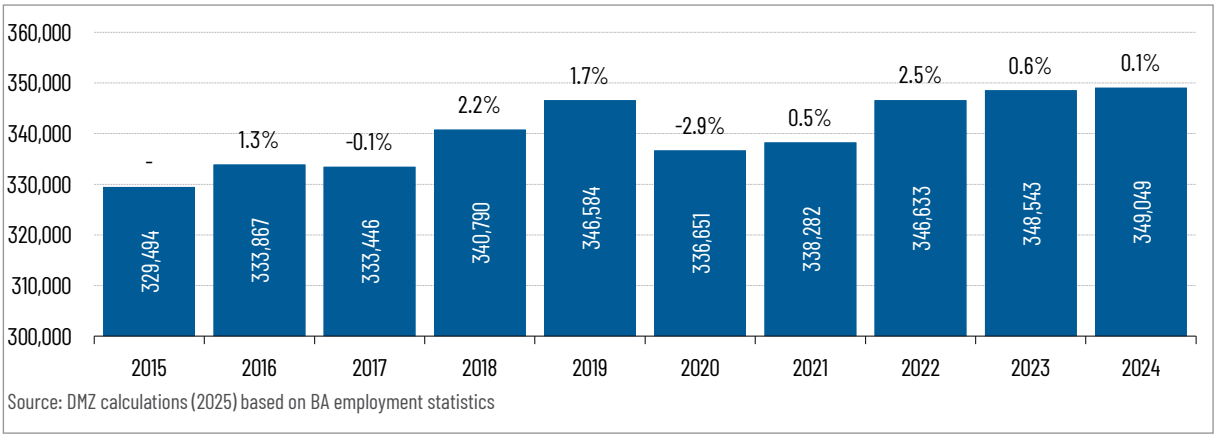
The outlined methodology for calculating employment in the maritime sector allows for various analyses across different levels. Employment trends within sub-sectors can be examined based on the associated economic activities. Employee characteristics and occupations provide insights into the employment structure of sub-sectors. At a broader level, the development of the entire maritime sector's can be analysed to understand the impact of overall economic employment trends and its significance for aggregated employment.

An overarching analysis of employment trends within Germany's maritime sector has not yet been conducted. Previous research has primarily concentrated on specific sub-sectors, regional developments, or snapshots of the current state of employment. Utilizing the new methodology that enables ongoing examination, this study assesses the comprehensive development of the maritime sector from 2015 onwards.

5.1 Employment

The number of employees attributed to the maritime sector rose by almost 10,000 individuals between 2015 and 2024 (Figure 1). There was a particularly strong increase in the years leading up to 2019. The COVID-19 pandemic led to a decline in employment of just under 10,000 people in 2020. In the subsequent recovery phase, employment in 2022 returned to the 2019 level. Although it continued to rise in the following years, the increase was significantly weaker than before 2020, which is likely due to Germany's weak overall economic development.

Figure 1
Employment in the maritime sector

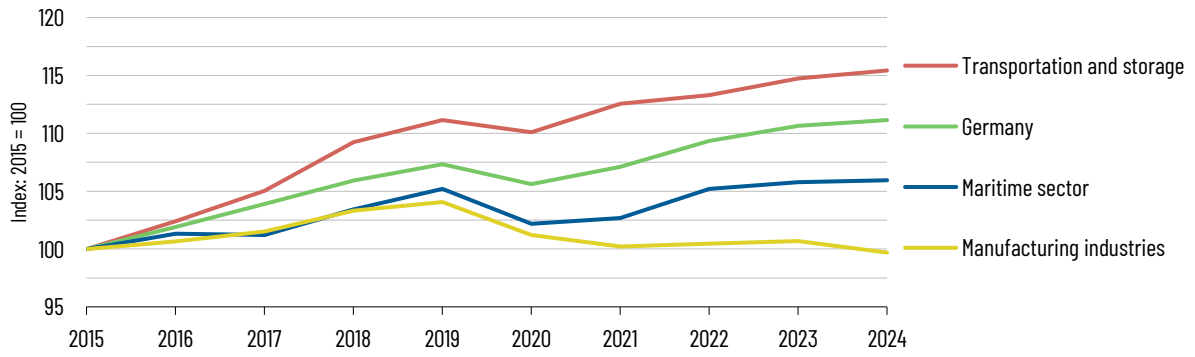


Source: DMZ calculations (2025) based on BA employment statistics

Compared to the overall economic development in Germany, employment in the maritime sector grew at a slower rate of 5.9% during the period under review (Figure 2). Overall, employment rose by 11.1% over the 10-year period. The transportation and storage as well as the manufacturing industries are also listed as relevant comparison sectors. Around 40% of employees in the maritime sector work in companies within the transportation and storage sector, while the figure for the manufacturing industry is just under 30%. With an overall increase of 15.4%, employment in transportation and storage has grown faster than in the German economy as a whole. In manufacturing, however, employment growth since 2019 has been significantly weaker than in the maritime sector. In 2024, it is just below the 2015 level.

Figure 2

Employment trends in Germany and the maritime sector

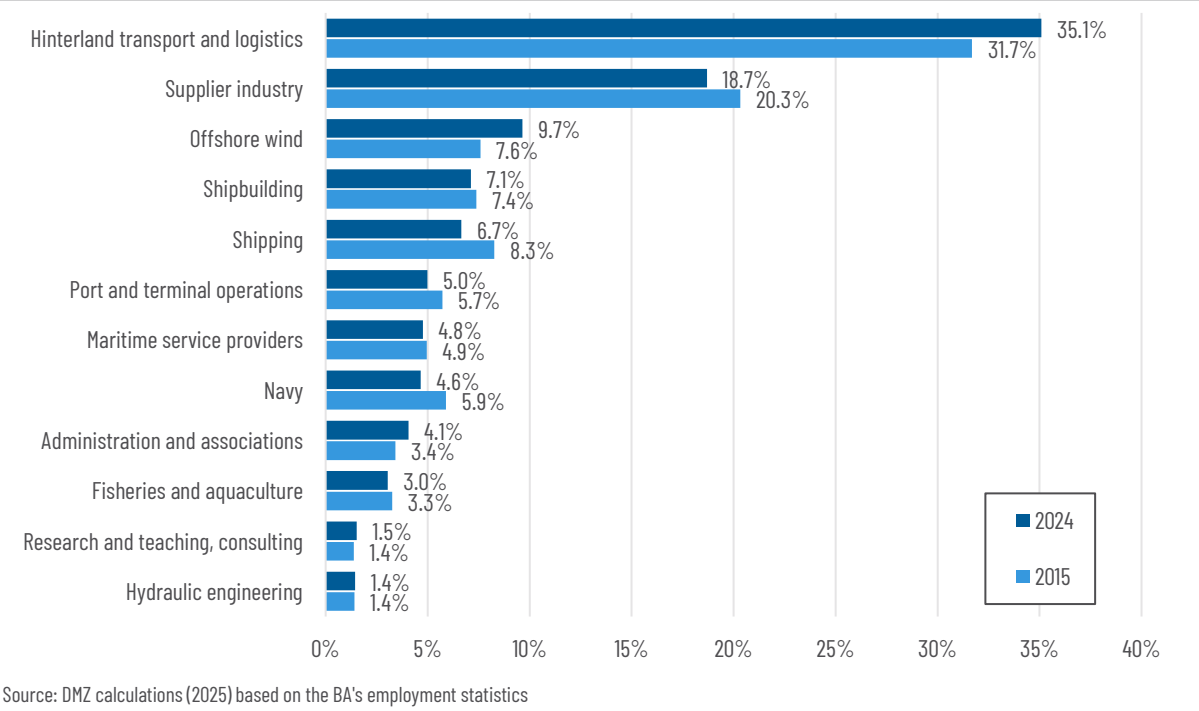


Source: DMZ calculations (2025) based on BA employment statistics

The distribution of employment across the maritime sub-sectors shows that over 50% of employees are concentrated in two areas (Figure 3). In 2024, 35.1% of employees worked in hinterland logistics and 18.7% in the supply industry. Compared to 2015, the share of hinterland logistics increased by 3.4 percentage points, while the share of the supply industry fell by 1.6 percentage points. The two sub-sectors with the highest number of employees thus showed both the largest increase and decrease in share during the period under review. The sub-sector with the third highest number of employees is offshore wind, followed by shipbuilding, shipping, ports, maritime service providers and the navy. Their share of employment is between 5% and 9%. Of these six sub-sectors, only offshore wind has increased its share of employment since 2015. The other sub-sectors show declining shares.

Figure 3

Sub-sector structure of employment in the maritime sector

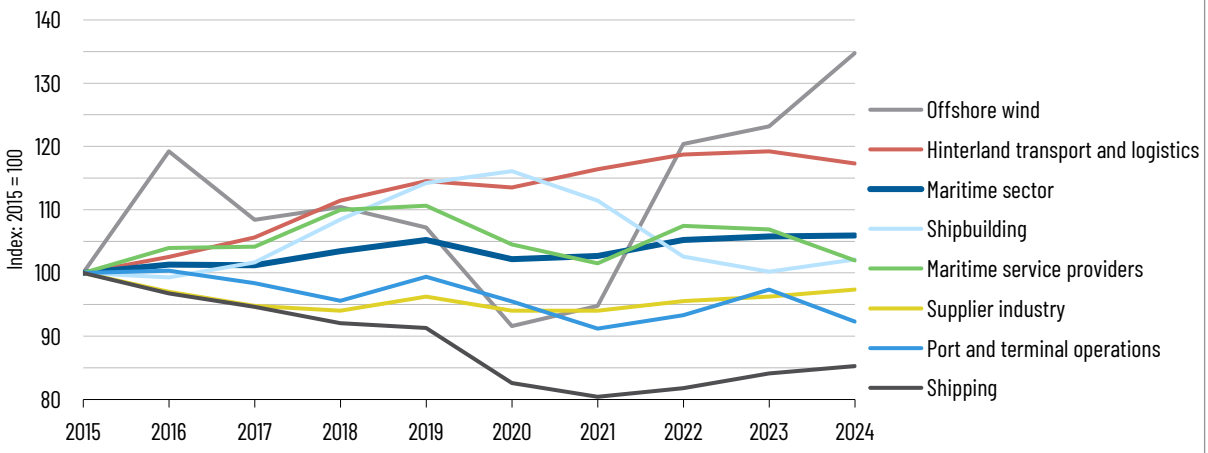


Source: DMZ calculations (2025) based on the BA's employment statistics

Figure 4 shows the employment trends in the larger maritime sub-sectors. The findings indicate that the positive overall employment trend is a result of very heterogeneous employment trends between the sub-sectors. The largest employment gains were seen in offshore wind and hinterland logistics. While the latter showed steady growth, the number of employees in offshore wind was subject to strong fluctuations. The background to the decline in employment between 2016 and 2021 is likely to be the faltering expansion of wind power in 2020 and 2021 as well as the inhibiting framework conditions due to

the Renewable Energy Sources Act (EEG, *Erneuerbare-Energien-Gesetz*) during the period under review. Between 2022 and 2024, there was significant growth in employment, driven by renewed expansion efforts and ambitious targets for wind energy.[31]

Figure 4
Employment trends in the maritime sub-sectors



Source: DMZ calculations (2025) based on the BA's employment statistics

Shipbuilding recorded strong employment growth of 16% from 2015 to 2020. However, this was followed by a decline, with employment returning to around the 2015 level in 2023. The negative trend since 2020 is linked to the shipbuilding crisis in Germany, characterized by the COVID-19 pandemic and weak demand for cruise ships. The industry recorded a slight increase in employment again in 2024. Employment among maritime service providers also rose by 11% in the first half of the observation period up to 2019. The decline in 2020 and 2021 was not fully offset by an increase in employment in 2022. Employment fell again in 2023 and 2024, ending only 2% higher than in 2015.

The number of employees in port and terminal operations, supply industry, and shipping has decreased overall since 2015. In the ports sector, a negative trend was particularly evident during the COVID-19 years 2020 and 2021, with employment falling by 9% compared to 2015. The increase in employment since 2022 did not offset this loss by 2023. Another decrease in employment occurred in 2024. Since 2022, employment in the port industry has been significantly influenced by weak foreign trade due to low economic growth in Germany and geopolitical tensions. In the supply industry, employment fell slightly in the years after 2015 and then remained relatively stable at a level just under 5% below that of 2015. Since 2022, there has been a positive employment trend. In shipping, there has been a clear negative employment trend since 2015, which worsened during the COVID-19 pandemic. Employment has been rising since 2022 but is still 15% below the 2015 level in 2024.

The employment trend in the sub-sectors is relevant when assessing the following analysis of the occupational structure and employee characteristics. The increase in employment in hinterland logistics, the largest sub-sector, is particularly significant. The other two important fields of transportation and logistics, shipping and ports, counteract this trend with declining employment. The industrial sub-sectors shipbuilding and supply industry also saw a decline in employment during the period under review.

In the development from 2023 to 2024, structural changes are evident across the sub-sectors. Employment declines in ports, hinterland logistics, and maritime services. These sub-sectors are closely linked to German foreign trade and evidently respond to the weak economy and geopolitical conflicts. Conversely, shipbuilding, supply industry, and offshore wind

[31] The aim is to achieve at least 40 gigawatts of installed capacity by 2035 and at least 70 gigawatts by 2045. At the end of 2024, 1,639 offshore wind turbines with a total capacity of around 9.2 gigawatts were in operation in Germany. See Federal Government: Beschleunigter Ausbau - Mehr Windenergie auf See, URL: https://www.bundesregierung.de/breg-de/aktuelles/windenergie-auf-see-gesetz-2022968 (as at: 24 March 2025) and Deutsche WindGuard (2025).

sectors face employment growth. The economic situation in these sectors has seemingly improved recently. It is driven by positive cruise industry conditions, government naval orders, a large number of international orders for new ships and a rapid expansion of offshore wind power.

5.2 Occupational structure

Employment in companies in the maritime sector is distributed across different occupations. The occupations are categorized using the occupational main groups (2-digit code) and groups (3-digit code) of the German Classification of Occupations 2010.[32] These breakdown levels balance differentiation of the occupations and sufficient aggregation to ensure data is not censored under data protection law.

Table 6 displays the 20 most frequent occupational main groups in the maritime sector, representing 94% of all employees. They represent the second-highest level of aggregation, providing an overview of the occupational structure in the maritime sector. The results indicate that most of the workforce is concentrated in few main groups, with over half in the three largest and two-thirds are in the top five groups. Conversely, only 14% of employees work in the bottom ten groups.

Table 6
Most frequent occupational main groups in the maritime sector in 2024

Occupational main groups	Quantity	Share	Change since 2015
Maritime sector	**349.049**	**100,0%**	**5,9%**
51 Occupations in traffic and logistics (without vehicle driving)	87.614	25,1%	17,9%
52 Drivers and operators of vehicles and transport equipment	49.652	14,2%	-2,4%
71 Occupations in business management and organisation	47.901	13,7%	0,3%
25 Technical occupations in machine-building and automotive industry	25.208	7,2%	0,7%
24 Occupations in metal-making and -working, and in metal construction	20.709	5,9%	-6,4%
27 Occ. in tech. research, development, construction, production planning, scheduling	14.661	4,2%	5,8%
26 Occupations in mechatronics, energy electronics and electrical engineering	13.126	3,8%	5,6%
61 Occupations in purchasing, sales and trading	7.825	2,2%	20,5%
72 Occupations in financial services, accounting and tax consultancy	7.354	2,1%	4,5%
43 Occupations in computer science, information and communication technology	6.559	1,9%	40,1%
73 Occupations in law and public administration	6.516	1,9%	24,0%
29 Occupations in food-production and -processing	6.386	1,8%	-6,2%
34 Occupations in building services engineering and technical building services	6.120	1,8%	7,6%
22 Occupations in plastic-making, -processing, and wood-working and -processing	5.252	1,5%	-4,0%
84 Occupations in teaching and training	4.384	1,3%	21,2%
54 Occupations in cleaning services	4.247	1,2%	-11,8%
63 Occupations in tourism, hotels and restaurants	4.156	1,2%	10,1%
33 Occupations in interior construction	3.828	1,1%	-5,8%
62 Sales occupations in retail trade	3.811	1,1%	-9,8%
83 Occupations in education and social work, housekeeping, and theology	3.303	0,9%	41,9%

Source: DMZ calculations (2025) based on the BA's employment statistics

In terms of the most frequent occupational main groups, three areas can be identified that are characteristic of the maritime sector in Germany. Nearly 40% of employees are involved in transport and logistics-related occupations, with 14.2% driving vehicles (52) and 25.1% performing other related activities (51). Employees from these groups are present in most maritime sub-sectors, particularly in hinterland logistics, ports, shipping and maritime services. Occupations in the manufacturing sector form a second group, comprising the occupational main groups 25, 24, 27, 26 and 22. Collectively, they account for 22.6% of employees, mainly in shipbuilding and the supply industry. The third group includes occupations

[32] Cf. chapter 3.

related to business organization, and commercial activities. Occupations in *business management and organization (71)* represent the third largest group of employees, accounting for 13.7%. Additionally, there are occupations related to *financial services, accounting and tax consultancy (72)*, *law and public administration (73)*, and *purchasing, sales and trading (61)*, making up 20% of the workforce in the maritime sector. This high proportion can be attributed to the presence of these professions across every sub-sector.

Since 2015, the number of employees in different occupational main groups has varied. The largest group, *51 Transport and Logistics*, grew by 17.9% in 2024. Notable increases also occurred in the smaller groups *84 Occupations in teaching and training* (21.2%) and *83 Occupations in education and social work, housekeeping, and theology* (41.9%). Both are related to training and education and are largely located in the research, teaching and consulting sub-sector. *73 Occupations in law and public administration* grew by 24%, while *43 Occupations in computer science, information and communication technology* saw a 40.1% rise.

Employment decreased in seven of the largest occupational main groups. The reduction in employees in *24 Occupations in metal-making and -working, and in metal construction*, *22 Occupations in plastic-making, -processing, and wood-working and -processing* and *33 Occupations in interior construction* are linked to declines in employment in shipbuilding and the supply industry. There were also fewer employees in the groups *52 Drivers and operators of vehicles and transport equipment*, *29 Occupations in food-production and -processing*, *54 Occupations in cleaning services* and *62 Sales occupations in retail trade*.

Table 7 presents the occupational groups at the subsequent lower aggregation level of the KldB 2010, facilitating an in-depth analysis of occupational trends. This level is particularly advantageous for investigating the structure and transformations within specific sub-sectors.

Table 7

Most frequent occupational groups in the maritime sector in 2024

Occupational groups	Quantity	Share	Change since 2015
Maritime sector	**349.049**	**100,0%**	**5,9%**
513 Occ. in warehousing, logistics, postal, other delivery services, cargo handling	56.813	16,3%	21,4%
521 Driver of vehicles in road traffic	34.137	9,8%	-3,0%
714 Office clerks and secretaries	23.766	6,8%	-5,2%
713 Occupations in business organisation and strategy	19.315	5,5%	3,2%
251 Occupations in machine-building and -operating	17.875	5,1%	-0,1%
516 Management assistants in transport and logistics	17.600	5,0%	9,4%
244 Occupations in metal constructing and welding	9.017	2,6%	-13,1%
242 Occupations in metalworking	8.769	2,5%	4,1%
273 Technical occupations in production planning and scheduling	7.716	2,2%	8,6%
511 Technical occupations in railway, aircraft and ship operation	6.814	2,0%	-10,3%
611 Occupations in purchasing and sales	6.445	1,8%	18,3%
252 Tech. occ. in the automotive, aeronautic, aerospace, ship building industries	6.404	1,8%	-8,5%
524 Ship's officers and masters	6.315	1,8%	-10,6%
263 Occupations in electrical engineering	5.685	1,6%	8,9%
262 Technical occupations in energy technologies	5.601	1,6%	1,3%
732 Occupations in public administration	5.484	1,6%	27,1%
722 Occupations in accounting, controlling and auditing	5.299	1,5%	-1,6%
525 Drivers/operators of construction and transportation vehicles and equipment	4.579	1,3%	-5,9%
522 Drivers of vehicles in railway traffic	4.302	1,2%	39,1%
541 Occupations in cleaning services	4.247	1,2%	-11,8%

Source: DMZ calculations (2025) based on BA employment statistics

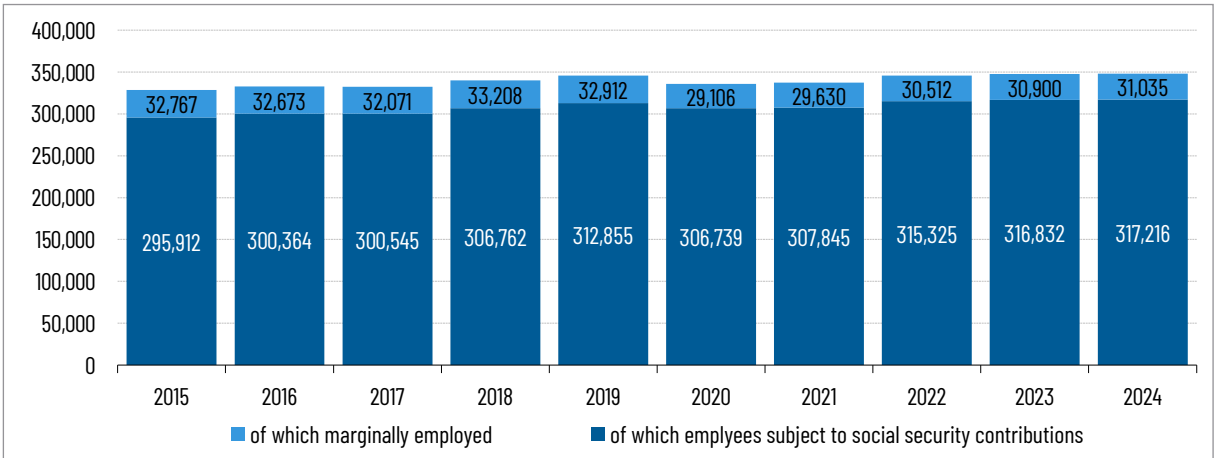
Two-thirds of employees in the largest occupational main group 51 are in *513 occupations in warehousing, logistics, postal, other delivery services, cargo handling*, with one of the strongest increases over the occupational groups of 21.4%. 17,600 employees work as *516 Management assistants in transport and logistics* and around 7,000 in *511 Technical occupations in railway, aircraft and ship operation*. Most of the employees in *52 Drivers and operators of vehicles and transport equipment* work as *521 Driver of vehicles in road traffic*, making up about 10% of all employees in the maritime sector, while only 1.8% work as *524 Ship's officers and masters*. Additionally, 1.3% and 1.2% of employees work as *525 Drivers and operators of construction and transportation vehicles and equipment* and as *522 Drivers of vehicles in railway traffic*. This distribution is largely influenced by the high personnel intensity of hinterland transport by truck. The number of *524 Ship's officers and masters* declined by 10.6%, reflecting the broader decline in employment in shipping. Since 2015, employment of *522 Drivers of vehicles in railway traffic* has grown by 39.1%, the strongest increase of the groups considered, indicating a shift towards rail traffic.

5.3 Employee characteristics

5.3.1 Type of employment

The employment structure of the maritime sector in Germany is characterized by a high proportion of employment subject to social insurance contributions (Figure 5). In 2024, the share was 91%. This distribution is consistent across most sub-sectors. Only in fishing and aquaculture, in research, teaching and consulting as well as in maritime services the shares are somewhat lower at around 80%.

Figure 5
Marginal employment and employment subject to social security contributions in the maritime sector



Source: DMZ calculations (2025) based on BA employment statistics

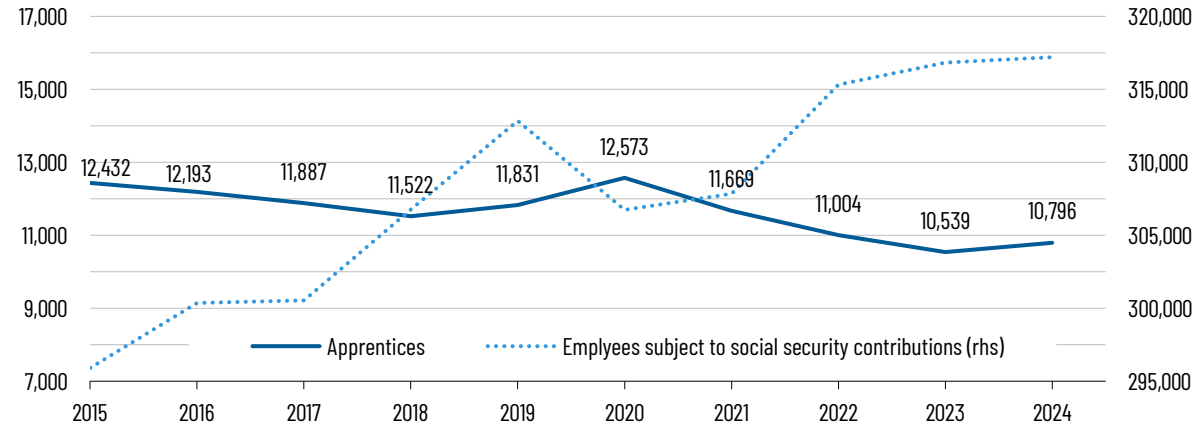
In comparison to the national economy, the share of employment subject to social insurance in the maritime sector is nearly 10 percentage points higher and similar to the manufacturing industry, at 93% in 2024. The share has increased by one percentage point since 2015, mainly due to a disproportionate 11% decline in marginal employment during the COVID-19 pandemic in 2020. Marginal employment has risen again but not completely recovered. The number of employees subject to social insurance fell less in percentage terms in 2020 and exceeded the 2019 level in 2022.

5.3.2 Apprentices

The number of apprentices decreased overall during the period under review, falling to 10,796 people, which is 13% lower in 2024 than in 2015 (Figure 6). This trend contrasts with employment subject to social insurance contributions, which increased in the same period (seeFigure 5). It should be noted that the development of the number of apprentices does not directly align with overall employment but rises and falls with a delay of one to three years. For instance, the peak number of apprentices was observed in 2020, coinciding with a significant drop in employment due to the COVID-19 pandemic. In 2024, the number of apprentices slightly increased for the first time after three years of decline. To contextualize the

development, it should be examined to what extent the number of training positions and the ability to successfully fill these positions are influential.

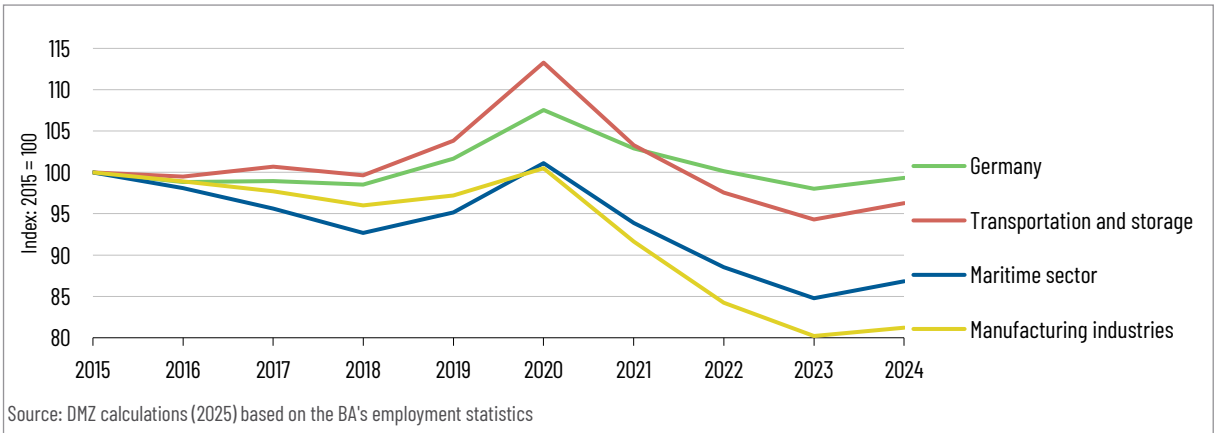
Figure 6
Apprentices in the maritime sector



Source: DMZ calculations (2025) based on the BA's employment statistics

The trend in the number of apprentices in the maritime sector mirrors that in the manufacturing industry, transport and storage and the overall German economy (Figure 7). However, the decline is less pronounced for the economy and the transport and storage sector which saw decreases of one percent and four percent from 2015 to 2024. The manufacturing and maritime sectors developed similarly until 2020. Afterward, the number of apprentices in the manufacturing sector fell more sharply by 19% by 2024 compared to 2015, while maritime apprentices decreased by 13%.

Figure 7
Development of apprentices by economic sector

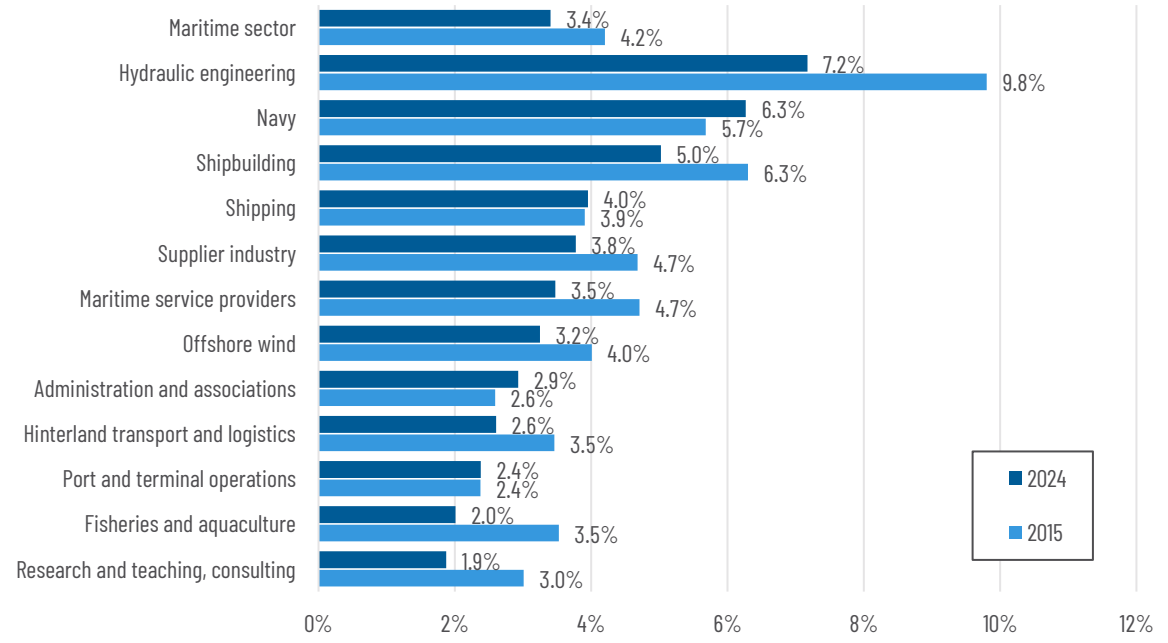


Source: DMZ calculations (2025) based on the BA's employment statistics

Between 2015 and 2024, the proportion of apprentices among employees subject to social security contributions decreased from 4.2% to 3.4% (Figure 8). In the various sub-sectors, proportions of apprentices ranged from 2% to 10%. Most sub-sectors showed a declining trend in shares of apprentices. Only marine, shipping and administration and associations sectors saw slight increases, while the ports sector maintained its level from 2015 to 2024. High proportions of apprentices can be seen in the industrial sub-sectors hydraulic engineering, shipbuilding and the supply industry, as well as in navy and shipping. Hinterland logistics ranked fourth-last in 2024 with a share of 2.6%. Due to its size, hinterland logistics has a strong influence on the overall low proportions of apprentices in the maritime sector.

Figure 8

Share of apprentices among employees subject to social insurance contributions in the maritime sub-sectors



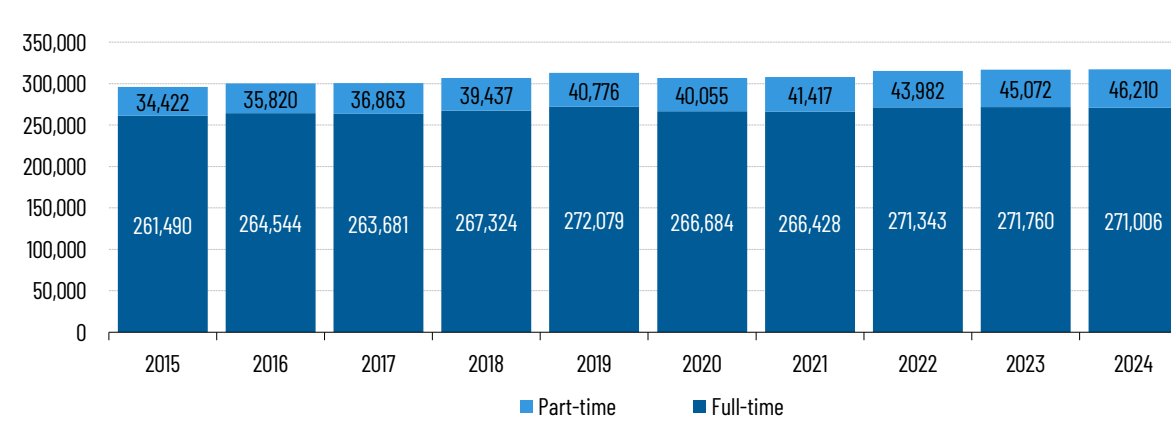
Source: DMZ calculations (2025) based on the BA's employment statistics

5.3.3 Working hours

Part-time employment among social insurance-covered employees grew by 34.2% from 2015 to 2024, totalling 46,210 employees (Figure 9). Meanwhile, full-time employment saw a modest increase of 3.6%. As a result, part-time positions now make up 14.6% of the workforce, rising from 11.6%. This trend is evident across all sub-sectors, notably for ports and shipping, with increases of 8.5 and 5.5 percentage points respectively. The industrial sub-sectors shipbuilding, hydraulic engineering and the supply industry have lower proportions of part-time employees, of 7% to 10%. In contrast, there are particularly high proportions in administration and associations as well as in research, teaching and consulting at 39% and 40%.

Figure 9

Employees subject to social insurance contributions in the maritime sector by working hours



Source: DMZ calculations (2025) based on the BA's employment statistics

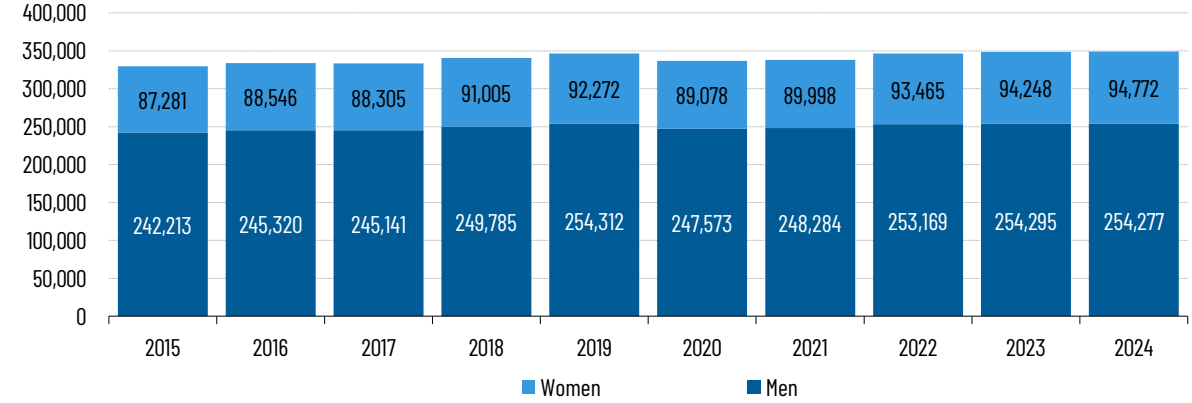
Compared to the German economy, the maritime sector is experiencing a slightly stronger growth in part-time employment. However, at 14.6%, the proportion of part-time employees is still significantly lower than the overall economic average of 31% in 2024 and only slightly higher than in the manufacturing industry with 11%.

BA studies show that around 50% of employed women and 12% of men worked part-time in 2023.[33] The available data for this study does not allow for a more detailed analysis of employees working hours according to other characteristics. However, it can be assumed that similar patterns also exist in the maritime sector. Increasing the working hours of part-time employees could be a way of tapping into additional labour capacity, addressing the issue of skilled labour shortages. At the same time, improved possibilities for part-time working offer an opportunity to activate additional employment potential for the maritime sector, for example by improving the reconciliation between work, family and private life.[34]

5.3.4 Gender

In 2024, approximately 95,000 women and 254,000 men were employed in the maritime sector in Germany (Figure 10). Between 2015 and 2024, female employment increased by 8.6%, while male employment grew by 5%. Consequently, the proportion of women in the maritime sector rose from 26.5% to 27.2%. This is still well below the overall proportion of women in the economy of just under 48%. This difference is attributed to sector-specific differences in female representation. In comparable sectors such as transportation and storage or manufacturing, the proportion of women is at a similar level.

Figure 10
Employees in the maritime sector by gender



Source: DMZ calculations (2025) based on the BA's employment statistics

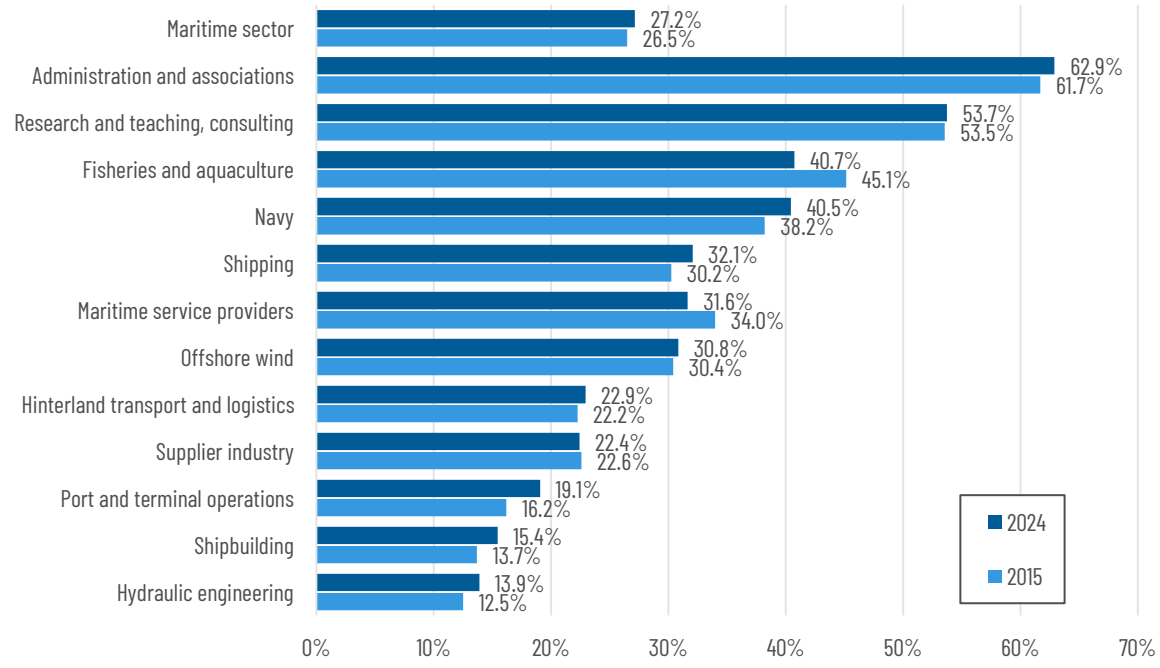
Almost all maritime sub-sectors recorded an increase in the proportion of women, albeit with considerable differences between the individual sectors (Figure 11). The distribution follows the overall economic pattern:

- High proportion of women over 50%: Administration and associations as well as research, teaching and consulting.
- Low proportion of women between 10% and 25%: Logistics sub-sectors such as hinterland logistics, port and terminal operations as well as manufacturing sectors such as the supply industry, shipbuilding and hydraulic engineering.

[33] See Federal Employment Agency (2024a).
[34] See German Economic Institute (2024), Tobsch and Holst (2019), Wanger and Weber (2023).

Figure 11

Share of women in the workforce in the maritime sub-sectors

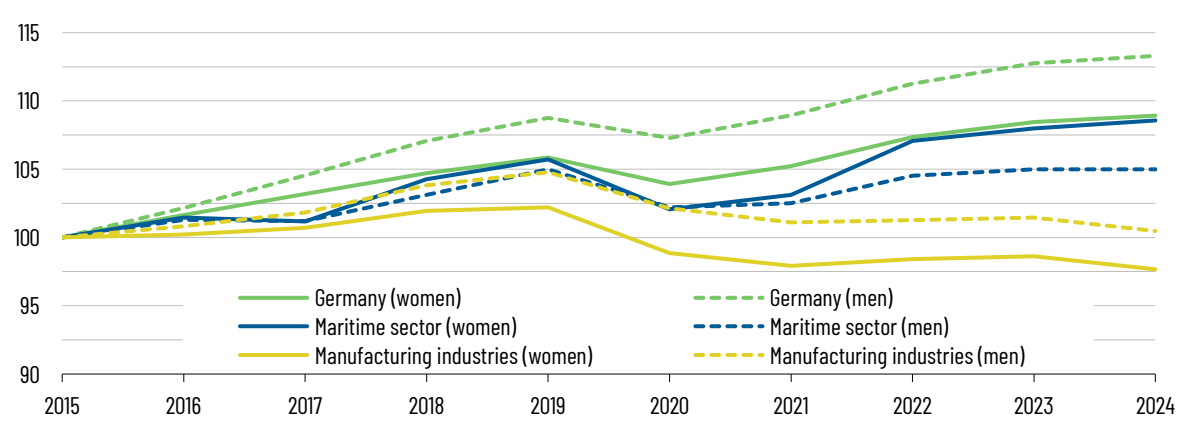


Source: DMZ calculations (2025) based on the BA's employment statistics

Between 2015 and 2020, employment growth for men and women in the maritime sector followed similar paths (Figure 12). Following the overall decline in 2020, female employment increased at a faster rate than male employment in subsequent years. This contrasts with the overall economic trend where female employment grew similarly, while the number of male employees increased more strongly, reducing the proportion of female employees overall. A comparable trend can be seen in the manufacturing industry. According to the BA, this was influenced by the large influx of refugees during this period, with male refugees showing higher employment rates.[35] For the maritime sector, it remains to be clarified whether the trend was driven by strong female employment or weak male employment. Since 2015, maritime sub-sectors that belong to the manufacturing industry and traditionally have a high proportion of men have been particularly affected by a weak or negative employment development.[36]

Figure 12

Employment trends for men and women by economic sector



Source: DMZ calculations (2025) based on BA employment statistics

[35] See Federal Employment Agency (2024a).

[36] See sections 5.1 and 5.2.

5.3.5 Age

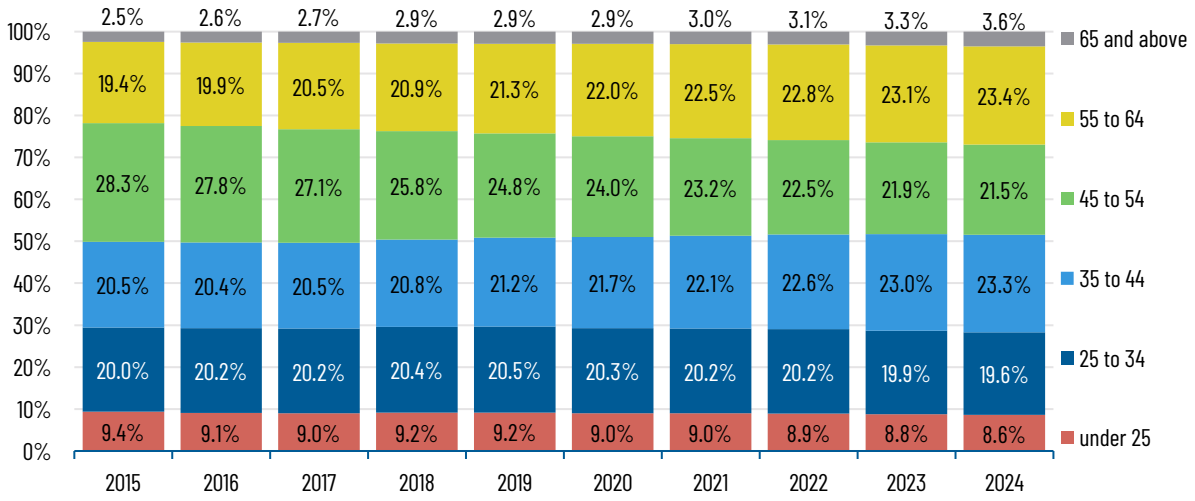
The age structure of employees in the maritime sector has shown a shift towards older workers since 2015 (Figure 13

- The proportion of employees over the age of 54 rose from 22% to 27%.
- The number of over-65s grew by more than 50%, but their share remains low at 3.6%.
- The 55 to 64 age group recorded an increase of 28%.
- The number of 45- to 54-year-olds fell by 20%, reducing their share of the workforce from 28% to 22%.
- Younger employees under the age of 35 have been declining since 2019.

This development reflects the demographic trends within the general population. The baby boomer generation is progressively entering the over 55 age group, whereas the younger age groups are notably smaller.[37] In comparison to overall employment in Germany, the proportion of individuals aged over 54 in the maritime sector is slightly higher across all sectors, while the proportion of those under 35 is somewhat lower.

The maritime sector faces substantial challenges due to demographic changes. Over the next decade, a considerable number of experienced professionals will retire from the workforce. Additionally, the influx of younger workers will be limited because of declining birth rates. Consequently, it is imperative to develop strategies to recruit enough skilled personnel to address the overall reduction in the workforce and preserve the existing knowledge within the maritime sector.

Figure 13
Age structure in the maritime sector



Source: DMZ calculations (2025) based on BA employment statistics

5.3.6 Nationality

Employment of foreign workers has become increasingly important for the German labour market in recent years– including the maritime sector. Between 2015 and 2024, the proportion of foreign employees increased from 10% to 19% (Figure 14). This corresponds to a doubling of the absolute number from 33,000 to 66,000 individuals. The majority of these employees are subject to social security contributions. It is noteworthy that their share of employment subject to social security contributions (94%) is even higher than that of German employees (90%).

[37] See Federal Employment Agency (2024b).

The following sub-sectors had the highest proportion of foreign employees in 2024:

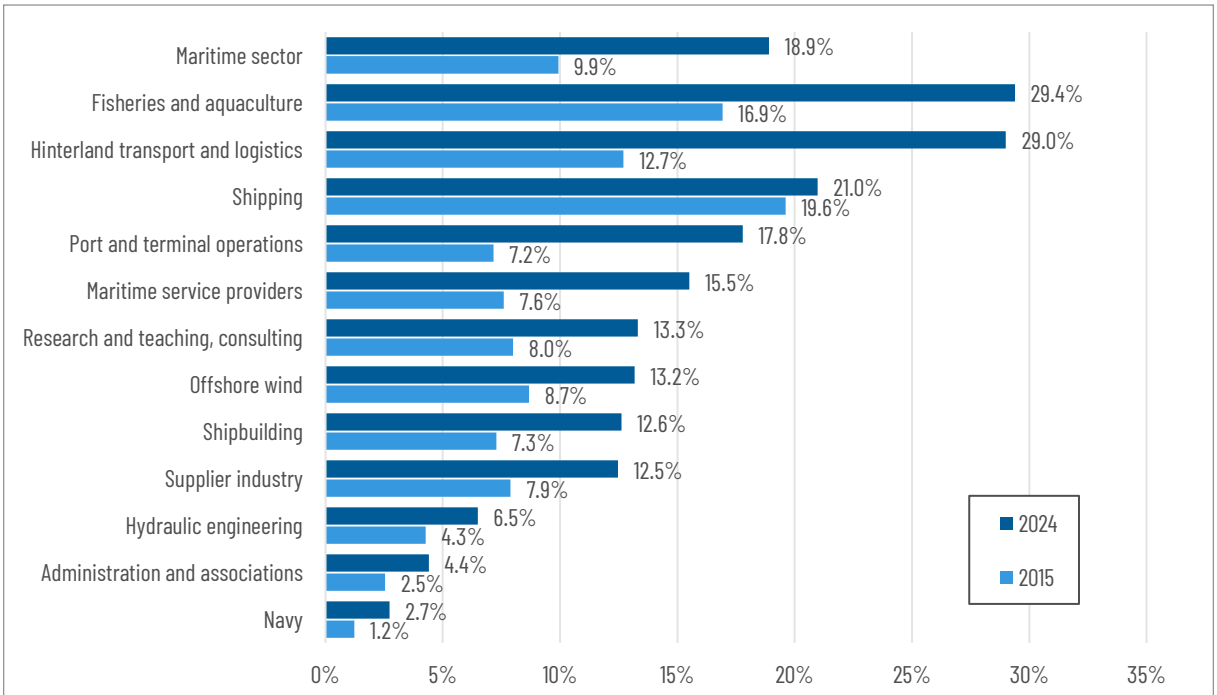
- Fisheries and aquaculture: 29%
- Hinterland logistics: 29%
- Shipping: already at a high level in 2015 (~20%), only slight increase since then

In contrast, low proportions of foreign employees can be found in the following areas:

- Hydraulic engineering: 6.5%
- Administration and associations: 4.4%
- Navy: 2.7%

Figure 14

Proportion of employees of foreign nationality in the maritime sector



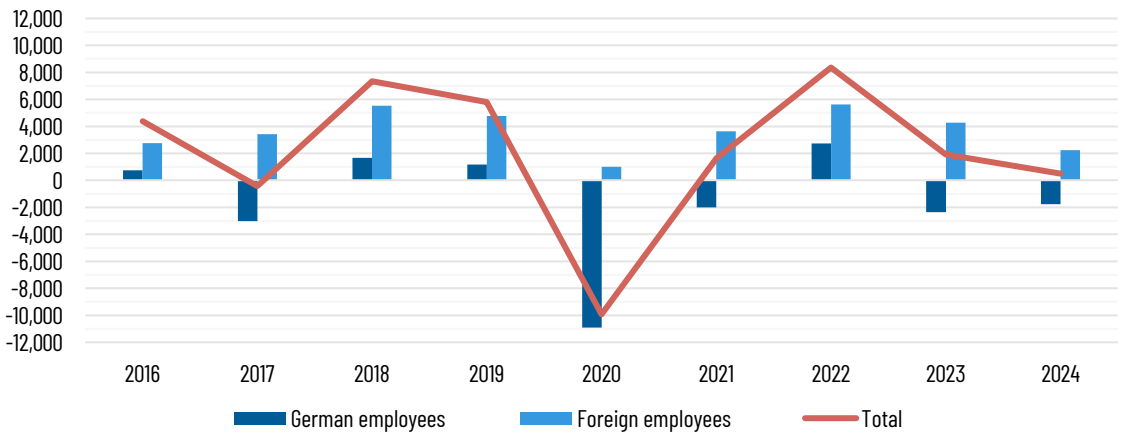
Source: DMZ calculations (2025) based on BA employment statistics

Since 2015, the number of foreign employees has steadily increased, even during the initial phase of COVID-19 in 2020 (Figure 15). Their growth consistently outpaced that of German employees, whose numbers fell in five years between 2016 and 2024. In 2021, 2023, and 2024, the decline in German employees was balanced by the rise in foreign workers, resulting in overall employment growth in the maritime sector.

The progression within the maritime sector mirrors broader economic trends. In Germany, the employment of foreign workers increased by 85% between 2015 and 2024, raising their proportion from 10% to 16% among all employees. Concurrently, the number of German employees decreased, making immigration increasingly pivotal in maintaining labour market stability.

Figure 15

Change in employment by nationality in the maritime sector



Source: DMZ calculations (2025) based on the BA's employment statistics

The underlying evaluation of the employment statistics does not provide information on the origin of foreign workers in the maritime sector. However, the BA's Migration Monitor provides general data for Germany:[38]

- 45% of foreign employees subject to social security contributions are from the European Union (EU).
- 27% are from European non-EU countries.
- 11% are from the most frequent countries of origin of asylum seekers outside Europe.[39]
- 17% are from other third countries.
- Since 2018, third-country nationals have contributed more to employment growth than EU nationals.[40]

The maritime sector is expected to continue depending significantly on international workers in the future to address demographic-related labour shortages. Both highly qualified and low-skilled individuals from abroad contribute to the sector. A common occurrence is "downgrading," where immigrants are initially employed in positions below their actual qualifications. Implementing long-term strategies to improve the recognition of foreign qualifications and providing targeted training opportunities can enhance the utilization of this workforce potential.[41]

5.3.7 School-leaving certificate

Since 2015, there has been a notable increase in the proportion of employees in the maritime sector possessing higher-level qualifications (Figure 16). Specifically, the number of employees with an Abitur or Fachabitur increased by 44% by 2024, raising their overall share from 23% to 31%. Conversely, the proportion of employees with a lower secondary school leaving certificate decreased from 25% to 20%.

This development reflects a trend in Germany: more employees have an Abitur or a vocational diploma, while fewer have a secondary school leaving certificate (*Hauptschule* or *Volksschule*). Overall, this is even more pronounced: in 2024, 36% of German employees had an Abitur or Fachabitur, while only 16% had a secondary school leaving certificate. This is due to the increasing number of school leavers with technical college or university entrance qualifications and the continuous decline in lower secondary school qualifications.[42]

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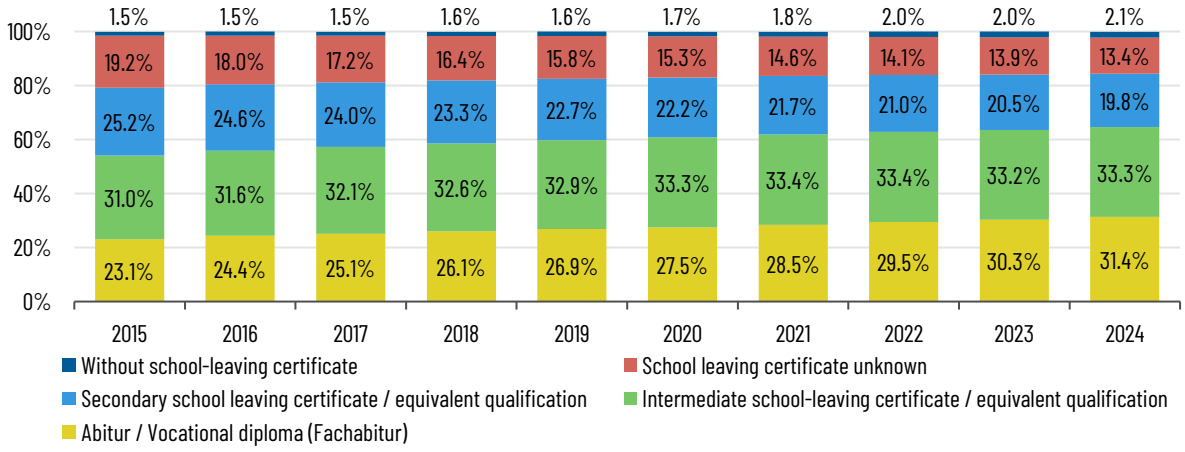
[38] See Federal Employment Agency (2025b): Migrationsmonitor Deutschland Februar 2025.
[39] These are: Afghanistan, Eritrea, Iraq, Iran, Nigeria, Pakistan, Somalia, Syria.
[40] Including the European Economic Area and Switzerland.
[41] See Süddeutsche Zeitung: Wo die deutsche Wirtschaft von Ausländern abhängt, November 17, 2023, URL: https://www.sueddeutsche.de/wirtschaft/migration-wo-die-deutsche-wirtschaft-von-auslaendern-abhaengt-dpa.urn-newsml-dpa-com-20090101-231117-99-979362 (as at: 24 March 2025).
[42] See Federal Statistical Office (2024).

Figure 16

School-leaving qualifications of employees in the maritime sector



Source: DMZ calculations (2025) based on the BA's employment statistics

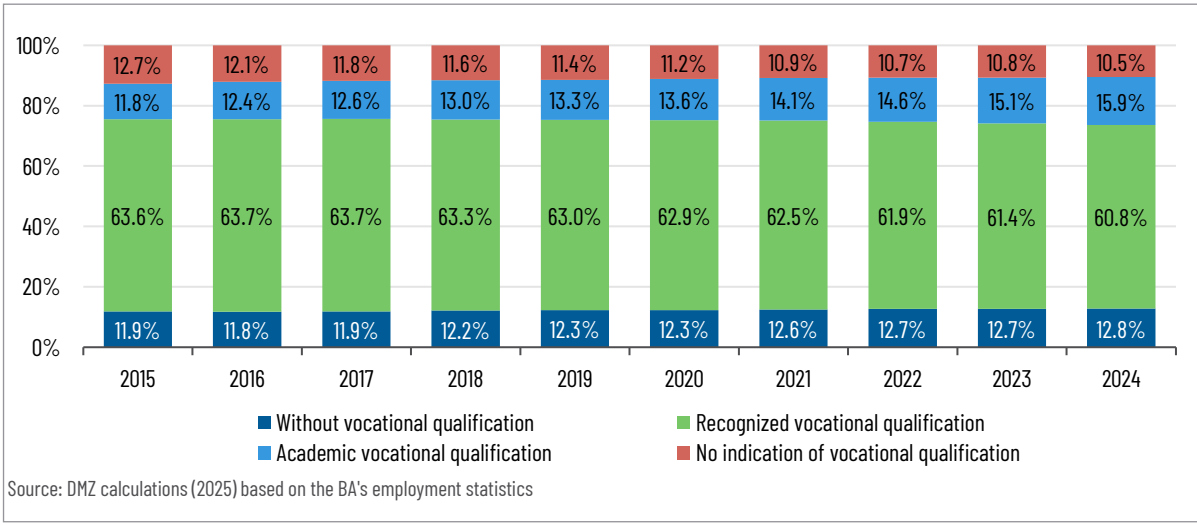
5.3.8 Professional qualification

The majority of employees in the maritime sector have a recognized vocational qualification as their highest qualification. Their number grew by 4% between 2015 and 2019 but fell in 2020 and has since stagnated at a level that is just under 1% higher than in 2015 (Figure 17). Consequently, their share dropped from 64% to 61%. Meanwhile, employees with academic qualifications rose by 43% by 2024, increasing their share from 12% to 16%. The proportion of employees without a formal vocational qualification also rose slightly from 12% to 13%.

This trend towards academization mirrors broader changes in Germany's workforce. The increasing number of graduates with technical college or university entrance qualifications and the growing number of higher-qualified jobs in the economy are contributing to this development.[43]

Figure 17

Professional qualifications of employees in the maritime sector



Source: DMZ calculations (2025) based on the BA's employment statistics

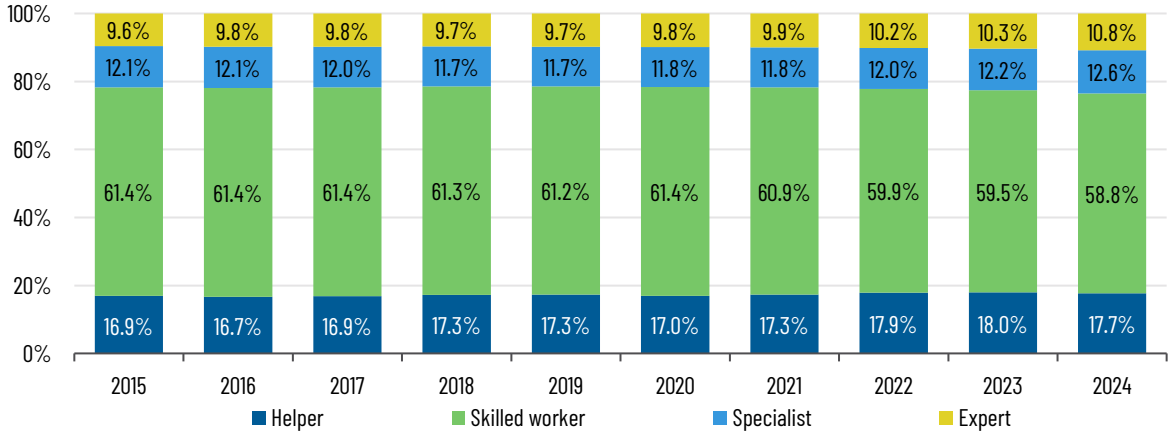
[43] Cf. Federal Statistical Office (2025), Federal Employment Agency (2025c).

5.3.9 Requirement level of the profession

A similar trend to that of vocational qualifications can also be seen in the requirement level of the occupations (Figure 18). Most employees work at the skilled worker level. However, the proportion has slightly declined from 61.4% in 2015 to 58.8% in 2024. This development corresponds to the change in employees with a recognized vocational qualification (Figure 17). The proportion of employees in higher-skilled jobs at the specialist and expert levels has increased. Particularly after 2021, a stronger growth is observable in these groups. The number of specialists rose to 11% above the 2015 level by 2024, while the number of experts increased by 19%. At the same time, the proportion of employees in occupations with a low requirement level has risen slightly since 2015. However, this increase significantly leveled off in 2023, and there was a decline in this group in 2024. This development can also be attributed to the changes in the structure of professional qualifications and indicates a gradual shift towards more highly skilled occupations in the maritime sector.

Figure 18

Requirement level of the work performed by employees in the maritime sector



Source: DMZ calculations (2025) based on the BA's employment statistics

6. Conclusion

Germany's maritime sector relies on the recruitment of qualified specialists to effectively fulfil its economic functions. The DMZ aims to create a comprehensive, scientific data basis on employment trends in the maritime sector in order to provide decision-makers from politics and business with a solid information base on current labour market issues such as demographic change, securing skilled workers and recruiting young talent. This paper presents the definitions for determining the maritime sector, the methodology for calculating employment and the results of the employment analysis for the period between 2015 and 2024.

As part of a project in cooperation with ISL, ETR and DMZ, the definition of the maritime sector and the methodology for calculating employment were established. The definition of the maritime sector includes the sub-sectors research and teaching, consulting, fisheries and aquaculture, port and terminal operations, hinterland transport and logistics, marine, maritime service providers, offshore wind, shipbuilding, shipping, administration and associations, hydraulic engineering and the supplier industry. Employment is determined based on the BA's employment statistics, considering number of employees, occupations and characteristics such as age, gender, nationality and qualifications. The WZ08 classification is used to allocate employees within maritime sub-sectors. As not all economic activities can be directly allocated to the maritime sector, the share of maritime employment is determined for many sub-sectors using additional information and assumptions. This enables a well-founded extrapolation of employment in the maritime sector.

The results of the study indicate that employment in the maritime sector increased by 5.9%, reaching approximately 349,000 individuals between 2015 and 2024. The decline in employment during the COVID-19 pandemic was successfully reversed by 2022. Despite the weaker economic performance in Germany, slight growth in employment continued in 2023

and 2024. This positive trend within the sector can be attributed to diverse developments across the sub-sectors. Hinterland logistics and, since 2021, offshore wind energy have seen particularly strong growth. Conversely, three sub-sectors — supply industry, shipping, and port operations — experienced a decline in employee numbers. The occupational distribution reveals that 40% of employees are engaged in transport and logistics roles, including vehicle operation. The second largest occupational group, comprising 18% of employees, includes positions in administration, management, and general commercial occupations.

The analysis of personal and employment characteristics reveals significant trends within the maritime sector. Despite an overall positive employment trend, the number of apprentices has decreased by nearly 15% since 2015. However, an upward shift was observed in 2024, following three years of decline. A continuous rise in the proportion of female employees has been noted, as employment growth among women has exceeded that among men, contrary to the general economic trend. Additionally, demographic changes are evident; the age structure is increasingly skewed towards older employees over the age of 55, while the employment rate for individuals under 35 has shown a marked decline. A pivotal factor contributing to the positive employment growth within the sector is the substantial increase in employees of foreign nationality. This figure has more than doubled since 2015, whereas the number of German employees has seen only moderate growth. There is also a noticeable trend toward higher educational qualifications and more highly qualified positions within the maritime sector.

This study offers comprehensive insights into developments of employment in the maritime sector and trends in the employment structure. The analysis of employee characteristics provides cross-sectoral key points for strategic personnel planning, helping to secure skilled workers and address demographic challenges. Key factors include:

- What opportunities are there to attract more young people to vocational training in the maritime sector?
- How will sectoral and company expertise be retained when a large number of employees reach retirement age in the upcoming years?
- What incentives can help to activate potential workers from specific groups for the maritime sector?
- What do trends such as digitalization and decarbonization mean for the employment structure of the future?

Overall, the employment situation in the maritime sector is robust. There are different structural developments in the subsectors that require more in-depth analysis. The methodology used allows for more detailed analyses of individual subsectors. In particular, the evaluation of detailed occupational information at sub-sector level is suitable for identifying structural changes in employment and interpreting them in conjunction with employee characteristics. In addition, the methodology enables examining specific characteristics more closely through targeted data evaluations by the BA. For example, more precise information on apprentices or employees of foreign nationality can be obtained by crossing characteristics.

The DMZ aims to continuously develop and expand the methodology and conduct ongoing evaluations. Parts of the methodology for which the underlying information cannot be taken directly from the WZ08 and for which information on the sector structure is based on the initial study from 2021 for the year 2018 must be adapted in particular.[44] Without adaptation, results will become less accurate over time due to structural changes in the sub-sectors. The sub-sectors supplier industry, offshore wind and hinterland logistics are particularly relevant due to their high employment levels. Additionally, new developments in the maritime sector should be observed in order to integrate emerging areas into future analyses if necessary.

[44] See chapter 4 , BMWi (2021).

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