Federal Ministry
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Maritime Agenda 2025

The future of Germany as a maritime industry hub

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Content

I. Foreword

This year, Germany is holding its 10th National Maritime Conference. The NMC has become a most successful platform for Germany, its coastal states, and industry to shape Germany's maritime sector.

The tide is certainly rough for the maritime industry. With its high degree of internationalisation, the sector is one of the most exposed to megatrends including globalisation and digitisation. And it needs to find a way of dealing with these challenges.

This is why it is important that we take this anniversary as an opportunity not only to look back at times past, but also to plan for the future – not least by establishing a new instrument of maritime coordination: The "Maritime Agenda 2025" marks the first time that the Federal Government has developed a long-term strategy for this particular sector.

Under the strategy, we are providing fresh impetus to each of the nine fields of action we have identified within our industrial policy for the maritime industry. These include technologies for future markets, a roadmap for research and innovation, the energy transition within the maritime industry, and Industrie 4.0 within the maritime value chain. Maritime policy is a branch of industrial policy. This is also why it falls within the remit of the Federal Ministry for Economic Affairs and Energy.

Our Maritime Agenda is focusing on the time until 2025. This is long enough for companies to be able to reach important milestones in development and production. Long enough for business models to be tried and tested. And short enough for us to be able to respond to new developments in the market. The Agenda is designed to be dynamic.

The "Maritime Agenda 2025" is the fruit of a long process that took place in close cooperation with the sector. And it is by working together that we want to achieve the goals and targets set out in the document. There can be no doubt that the NMC is the perfect place for us to set the course for the future. This is true for this special year in the NMC's history as much as for any other year.

Uwe Beckmeyer,
Parliamentary State Secretary at the Federal Ministry
for Economic Affairs and Energy
Federal Government Co-ordinator for the
Maritime Industry

II. Introduction

"Navigare necesse est" or "to sail is essential" – the Hanseatic League motto remains unchanged to this day. As an outwardlooking industrialised country with no resource base of its own, Germany relies on the importation and exportation of goods, raw materials and semi-processed and processed goods. The large majority of these goods are transported by sea. The marine environment, however, is much more than a mode of transport. Our oceans cover 70 percent of the surface of our planet. They are a deposit and production site for renewable and fossil energy as well as for mineral resources. They are also a source of food. Our oceans are sensitive ecosystems, recreational areas and play a significant role in security policy. They are an important driver of climate patterns and provide habitats for an abundant and still largely unexplored biological diversity. With this in mind, technological innovations can also help in making the necessary lasting improvements to the effective protection of the marine environment and in reaching climate goals. The protection of marine environments has a value in itself which must be preserved.

The German Federal Government recognises the manifold importance of the ocean and infers from this the need for a maritime agenda. In 2011 the Government presented a strategy for an integrated maritime policy in the "Maritime Development Plan".[1] This was based on the concept of a holistic, sustainable development of all maritimerelated policy areas. With the Federal Government's present Maritime Agenda 2025 another central building block for this area of industry has been laid. The Agenda includes a comprehensive stock-take and a coherent programme aimed at strengthening the competitiveness of the maritime industry whilst giving equal consideration to the goals of economic growth, high employment potential and stringent environmental and nature conservation requirements. Moreover, security policy aspects are addressed as part of a holistic maritime policy in the 2016 White Paper on Security Policy of Germany and the Situation and Future of the Bundeswehr.[2]

In November 2016, the Federal Government adopted the Climate Action Plan 2050 in order to reach greenhouse gas neutrality by the year 2050. In implementing the emission reduction targets, which are first fixed in the plan for the year 2030, in each sector there are challenges for all areas of industry – including the maritime industry.

At the same time there are opportunities associated with this for the development and use of innovative technologies such as greenhouse gasneutral forms of propulsion, which, in turn, provide the appropriate efficiency potential for shipping.

An efficient maritime industry forms the basis for Germany's role as a leading export country; it is decisive in delivering products and services of German companies ontime all over the world.

Simultaneously the maritime industry faces tough international competition quite unlike that of any other industry. German shipyards compete internationally with state-funded companies that distort fair competition for shipbuilding contracts. German shipping companies are also experiencing growing competitive pressure, which is exacerbated by severe excess capacity in the transport sector and low charter rates and freight rates. Also facing stiff international competition are the German ports.

Despite these difficult circumstances, German companies could secure the top spot on the international market in the shipbuilding, shipbuilding supply, offshore technology, marine engineering and port industries. This is due not least to their high level of innovation, leading role in the development of sustainable technologies and their well-trained work force. Since the German maritime industry is mainly operated by the private sector it was able to react quicker than its competitors to changes on the market. Efficient ports and logistics as well as renowned research and training facilities are further cornerstones in the success of the maritime industry in Germany. As industry becomes increasingly digitalised the sector will have to make its production, logistics and governance processes quicker, more efficient and more sustainable if it is to withstand the growing pressure of international competition in future.

1 https://www.bmvi.de/SharedDocs/DE/Anlage/VerkehrUndMobilitaet/Wasser/meerespolitik-entwicklungsplan-meer.pdf

2 https://www.bmvg.de/portal/a/bmvg/start/weissbuch/downloads

Due to its importance for the entire German economy, its high level of innovation and its strategic role, the Federal Government has a strong interest in securing and strengthening the competitiveness of the maritime industry. The Federal Government supports the maritime industry in the development of long-term strategies with targeted support programmes and instruments. The Government provides the sector with an effective platform to present and conduct dialogue at the regular National Maritime Conferences.

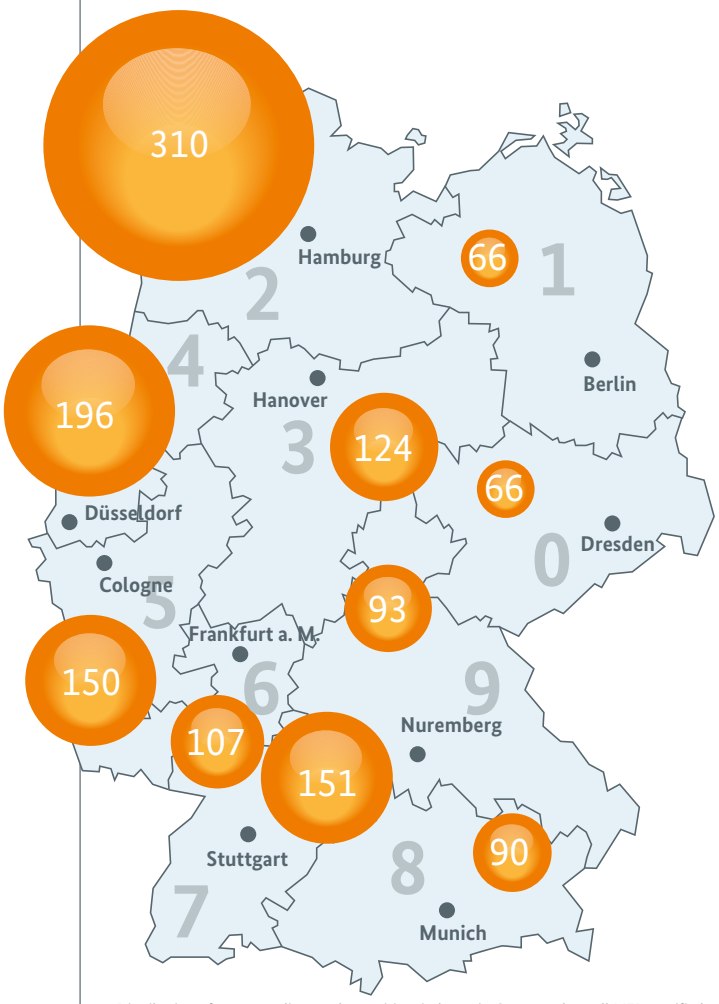
The present Maritime Agenda 2025 defines the key goals, areas of action and proposals for coordinated measures that contribute to the sustainable use of the seas and a high level of protection and that also further strengthen Germany's competitiveness in the medium and long term as a technology, production and logistics hub. The aim of the Agenda is to formulate parameters that apply to the whole maritime sector for addressing key challenges such as the automation and digitalisation of products and services, production and logistic processes, increasing competition on global markets, demand for skilled labour and demographic change, maritime security and increasing environmental and climate standards.

The Maritime Agenda 2025 has considered the findings of comprehensive consultations with the maritime sector, which were initiated in the runup to the Ninth National Maritime Conference 2015. The National Maritime Conference will continue as the dialogue platform used to regularly review the accuracy of the Maritime Agenda and, where necessary, to ensure that adjustments and updates are made in face of new and changed challenges.

III. Germany as a competitive site for maritime activity

The maritime industry is one of the most important sectors of the German economy. Estimates place the annual turnover at up to EUR 50 billion and the number of jobs which are directly or indirectly dependent on the maritime industry at up to 400,000.

The sector is not just limited to the key sites on the North Sea and Baltic Sea coasts. Maritime production takes place all over Germany: supply companies are based in all regions of Germany, in particular in Baden-Wuerttemberg, Bavaria and North Rhine-Westphalia.



Distribution of 1353 suppliers to the maritime industry in Germany that sell MED certified products / products certified by classification societies (companies each shown by name; grouped according to postcode).
Source: BALance Technology Consulting GmbH

The sea and inland ports are connected to the hinterlands by a modern and efficient transport infrastructure. They are keys hubs of European and international trade and are attractive locations for the manufacturing industry and for service providers.

1. The maritime industry and its value chains

1.1 Shipbuilding

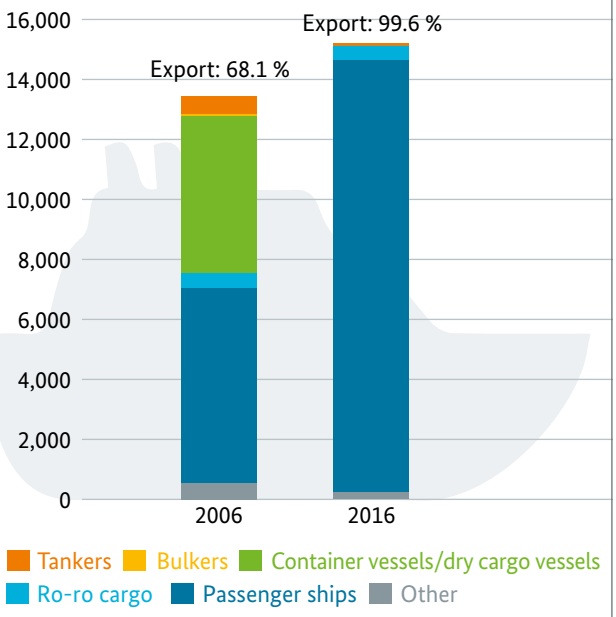
The German maritime industry develops and manufactures complex ships and installations for a wide range of applications at sea: civil seagoing vessels (merchant ships, passenger ships, yachts and civil public-authority vessels), naval vessels and boats as well as manufacturing facilities and conveyor systems for offshore use and also vehicles for use on inland waterways. There is also a wide range of repair and retrofitting services. The maritime industry comprises material, component and system suppliers, shipyards as system integrators as well as several skilled craft businesses and service providers. According to estimates there are around 500 companies with around 90,000 jobs in the field of shipyards and mechanical and plant engineering. The German maritime industry largely comprises medium-sized companies and exports its high-tech products worldwide. The maritime industry is the technology leader in many areas and contributes substantially – directly and indirectly – to value added in Germany. According to expert estimates the industry has an annual turnover of EUR 18 billion. Suppliers account for 70 to 80 percent of the value added in shipbuilding.

Since over-capacities currently exist in the global shipbuilding market, the market potential for German companies lies primarily in developing and manufacturing high-tech products that require large amounts of equipment. These are produced in consideration of high safety and environment standards and are often produced as single solutions and in small batches. The growing pressure of competition, particularly from Asia, means that it is essential for the sector to focus on research and development in order to remain internationally competitive with innovative processes and products in the emerging global markets.

Market potential can be found in climate and environmentally-friendly products and technologies for the shipbuilding industry ("green shipping"), which contribute towards lowering harmful inputs into the marine environment, using energy and other resources more efficiently and reducing both operating costs and emissions, thereby also fulfilling the increasing climate change mitigation requirements.

Industry 4.0 and digitalisation bring both opportunities for the sector in terms of future manufacturing possibilities and new maritime business areas ("smart ships") and great challenges, i.a. in areas such as data management, data security, jobs and training. Federal and Länder authorities also face growing challenges in fulfilling safety requirements.

Change in German shipyards' product portfolio. Order volume in million €



Source: The German Shipbuilding and Ocean Industries Association

1.2 Marine technology

Marine technology involves innovative companies and scientific disciplines that focus on exploring and using the sea as a source of energy, raw materials and food as well as on marine protection. Sustainable use of the seas will continue to make an important contribution to an environmentally sound and secure supply of energy and raw materials and will therefore play a strategic role for Germany as an industry location.

Turnover for maritime technology markets is forecast in the medium and long-term at more than USD 365 billion per year (as of 2014). Germany has a large share of this with an approximate turnover of EUR 22 billion (around 7 percent), with a much higher share in high-end products. This figure does not yet include the highly rated medium to long-term market forecasts for deep sea mining, gas hydrates, renewable energies (in addition to offshore wind energy) and blue biotechnologies.

Thanks to the expertise of German companies and research facilities in the development of innovative maritime technologies and components, opportunities are arising to set high international standards to ensure high environmental protection standards and maritime safety and to increase the competitiveness of the maritime industry using ancillary services. Marine technology in Germany covers a wide spectrum and is used in a wide range of areas:

Offshore oil and gas

Offshore oil and gas production is one of the most important areas of application for the marine technology supply industry. The process chain comprises the exploration, production, transport and processing of oil and gas resources.

The technical effort required for offshore production of crude oil and natural gas is much higher than production on land. This is because in order to develop the deposits under the sea, it is necessary to have drilling and production platforms. Innovative and environmentally-friendly technologies used in the planning, erection, production, operation, service and dismantling of offshore platforms are becoming increasingly important in securing the supply of energy and raw materials. The global development of crude oil and natural gas fields in depths between 1,500 and 3,000 metres and in extreme environments will be the determining factor in the development of the offshore market in the near future. In view of the Paris Agreement target for global greenhouse gas neutrality in the second half of the century, the offshore industry must avoid possible lock-in effects resulting from new investments in fossil energy infrastructure.

Launch and Recovery System (LARS) of a Remote Operated Vehicle (ROV)

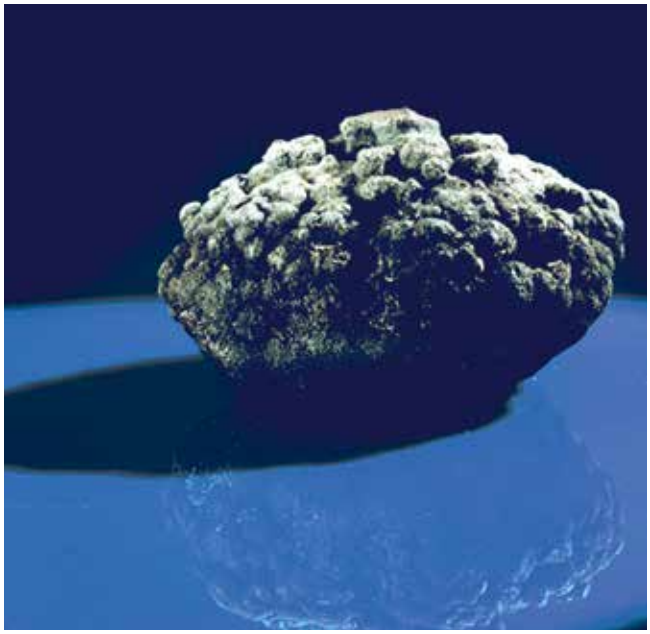
Maritime safety and security

Maritime security is of particular importance for industrial value chains in two ways: Firstly, there is a need to avert dangers to global logistic supply chains, maritime infrastructure such as ports and offshore wind turbines, and to ensure security at sea and protect borders. Secondly, high demands placed on transport safety and accident prevention require that all responsible persons work closely together. The organisation and execution of many maritime activities are subject to complex safety and security provisions, which require technical surveillance and monitoring systems in order to ensure a high level of safety and security and to minimise risks. This means that the maritime safety and security partnership between state authorities and the concerned companies must constantly evolve. The challenges will continue to grow as a result of pressure to reduce costs, increasing traffic volumes, in part with increasingly large container ships, and also in terms of the expansion, operation and maintenance of offshore wind parks and the continually high growth rates in cruise tourism and in recreational boating. Increased requirements for responsible emergency preparedness must be satisfied using state-of-the-art equipment and highly qualified per-

sonnel. New technologies in the field of enavigation and the monitoring of port traffic and port logistics can make a significant contribution to increasing traffic safety. This creates significant opportunities: internationally, German companies are market leaders in many areas of maritime safety and security technologies.

Marine mineral resources

Marine mineral resources could generally contribute towards securing the needs of German industry in the long term. In 2014 mineral resources worth approximately EUR 40 billion were imported to Germany. Germany has held an exploration licence for manganese nodules in the Pacific Ocean since 2006 and another licence for the exploration of polymetallic sulphides in the Indian Ocean since 2015. Deep sea mining only comes into consideration, however, if first – as a conclusion of the exploration phase – it can be proved that the technologies needed for the possible mining work are in proper working order and that these are environmentally sound and sustainable. A so-called pilot mining test (PMT) is used to verify this. Germany is working closely with the International Seabed Authority and is advocating the establishment of the highest environmental standards.[3]



Manganese nodule

Installation to convert ocean currents into electrical energy

Marine energy

Marine energies can be generated using waves, the tidal range, the tide, sea currents as well as salinity and temperature gradients. Technologies are being tested worldwide to convert marine energy into electric energy. With corresponding technical progress these sources of renewable energy could in future contribute to our energy supply whilst having a low environmental impact and to reaching our climate change mitigation goals.

Marine autonomous technology systems

Autonomously operated marine technology systems cover a broad range of technologies, processes, services, products and system solutions for the automated monitoring and maintenance of underwater installations. In future, remote-controlled systems or systems that are as autonomous as possible with complex sensor technology will be increasingly needed in order to install, inspect, monitor and service systems and installations in depths of up to 6,000 metres or in extreme environments such as icecovered waters.

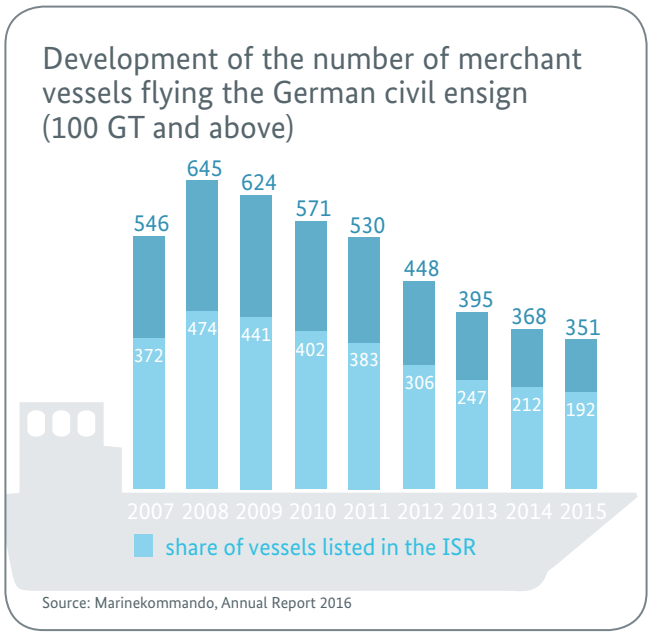
3 cf. G7 decisions2015/Elmau on Deep Sea Mining, https://www.bundesregierung.de/Content/DE/_Anlagen/G7_G20/2015-06-08-g7-abschluss-deu.pdf?__blob=publicationFile&v=5

Wilhelmshaven container terminal

2. Shipping

In Germany more than 360 shipping companies operate around 2,700 seagoing vessels.[4] According to owner nationality, with its merchant fleet Germany is the largest shipping nation after Greece, Japan and China (ranked 4th). In container shipping Germany holds around 29 percent of all container-carrying capacities worldwide and is still positioned as international leader according to owner nationality.[5]

In the past few years the situation in the shipping industry has been strongly characterised by container ship overcapacity. Given the pressure on freight rates, consolidation or cooperation amongst shipping companies is becoming increasingly important. The German merchant fleet shrank by around 200 ships in the last twelve months.



Source: Marinekommando, Annual Report 2016

Currently there are 339 ships operated under the German flag. One year ago there were still 350 ships.

The German merchant fleet is one of the most modern and youngest fleets in the world. Whilst the average age of the global merchant fleet is 14 years, the German merchant fleet is approximately one third younger. It covers a broad spectrum of industrial activities, the main one being the transport of containers, followed by cargo vessels, bulk carriers and mineral oil tankers. The merchant fleet also includes high-performance passenger and cruise ships as well as dedicated vessels such as heavy load carriers, roll-on/roll-off ships, gas tankers and chemical tankers. German shipping companies are also active and very successful in rendering services for offshore wind farms.

In the short and medium term market analysts do not expect shipping markets to recover significantly. In the long term, increased global trade, particularly via the sea, and a significant decline in fleet growth in future should lead to reduced disparity between supply and demand for shipping capacity and a gradual market recovery.

3. Ports

The German seaport industry comprises well over 200 port companies in more than 21 locations along the German coast. German seaport operators serve more than 120,000 ships per year and handle around two-thirds of German external seaport trade including around 300 million tonnes of raw materials, agricultural goods, vehicles and commodities in containers and lorries/trailers. Annually approximately 30 million passengers are transported via German seaports. The German ports sector is also a service provider for the on and offshore wind power sector. 13,000 people

4 German Shipping Register, as of 31 October 2016
5 Source: German Shipowners' Association

alone are employed by German seaport operators in the 16 most important locations. In addition there are commercial employees and service provider staff, whether these are hazardous goods experts, engineers or IT technicians. Ports are high-tech locations.

Freight handling at German seaports saw a slight decline in the last two years. In the year 2014 the Federal Ministry of Transport and Digital Infrastructure (BMVI) published the results of the 2030 forecast of transport interconnectivity including the maritime transport forecast. This forecast an average annual growth of 2.8 percent until the year 2030 for the 19 German seaports that were examined. This is equivalent to an increase of 74 percent in the volume of cargo handled for the period between 2010 and 2030. An increase of around 53 percent in seaport hinterland transport is also expected in this period. This presents opportunities for German inland ports for another positive development and stronger integration in logistics chains. Even today German inland ports are trimodal (i.e. they include rail, road and inland waterway transport modes), transhipment, industrial and commercial sites and are a driving force behind employment and value added in their regions.

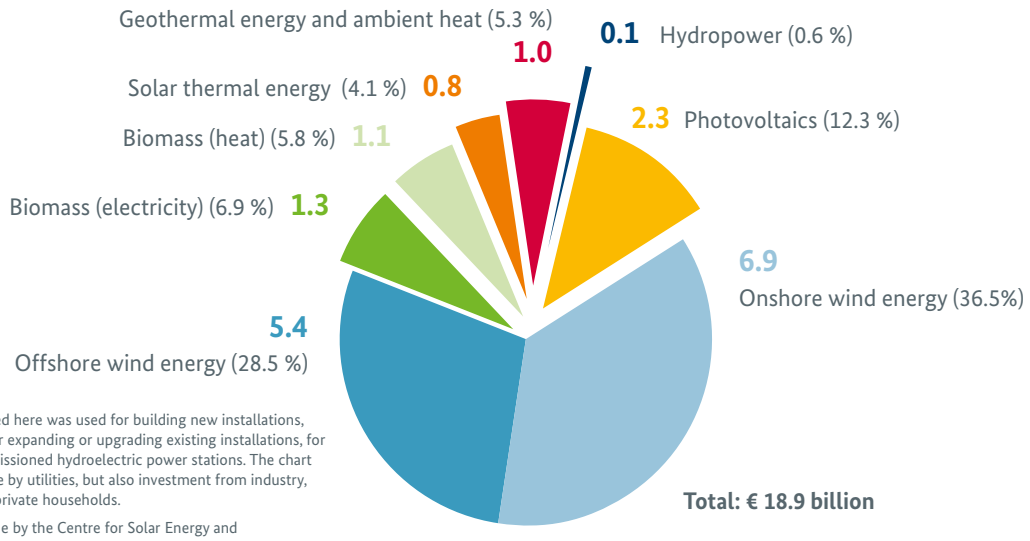
4. Offshore wind energy

Another part of the maritime industry is offshore wind energy. This has an important part to play in Germany's energy transition and is also an important factor for the economy. Given its performance potential and its dependability, offshore wind energy will account for a steadily increasing share of a secure, environmentally-friendly energy supply in Europe. Decreasing electricity generation costs offer huge potential for growth and export opportunities for these new technologies. In 2014 the sum of investments into the construction of offshore wind farms was around EUR 5.4 billion. In the same year gross employment in the offshore wind energy sector amounted to 18,700 people. In 2015 the export ratio was around 50 percent, this is equivalent to approximately EUR 2 billion.[6] In future the sector may manage to reach export ratios of up to 75 percent.

If electricity generation costs continue to significantly decrease it is expected that the global market volume will grow steadily. Particularly during the operational phase of offshore wind parks significant regional economic impulses are expected.

At the end of 2016, wind turbines in German waters feed over 4,000 megawatts (MW) of electricity into the grid; by 2020 total output will far exceed 7,000 MW. The official expansion target is 15,000 MW by the year 2030.

Investment (in billion €) that went into the building of renewable energy installations in 2014



Most of the investment represented here was used for building new installations, with a smaller share being used for expanding or upgrading existing installations, for example for re-activating decommissioned hydroelectric power stations. The chart includes not only investment made by utilities, but also investment from industry, the commercial sector, trade and private households.

Source: In-house calculations made by the Centre for Solar Energy and Hydrogen Research (ZSW)

6 Renewable Energy Sources in Figures, BMWi 2015

IV. Federal Government areas of action and maritime industry policy objectives

Multitouch interaction

The maritime industry is directly affected quite unlike any other sector by developments on international markets and the trade and subsidy policies of other countries. Whilst EU state aid law provides clear and reliable provisions for state subsidies, in other economic areas there is a recognisable trend towards stronger state subsidies, particularly subsidies that favour the own maritime industry, for instance shipyards. This leads to international market distortions, which are detrimental to all market operators in the end.

One of the key goals of the Federal Government is to strengthen the competitiveness of all sub-sectors in the maritime industry. In order for the Maritime Agenda to be a success in the long term it is important that it is embedded into the existing national and international frameworks and into a European concept for strengthening maritime interests. For the purpose of an integrated maritime policy, it should be ensured that the economic exploitation of the sea is carried out in a sustainable manner. The nine areas of action presented below describe key areas in which the maritime sector in Germany can consolidate its international competitiveness in the aforementioned sense.

Area of action 1: Consolidate and expand technological leadership

German companies in the maritime sector are world market leaders in important market segments. This success is largely based on its strength in research and innovation. On average maritime companies invest around 10 percent of their turnover in research, development and innovation. The maritime industry is therefore one of the most research-intensive sectors in Germany. Maritime technologies also set standards for other sectors, e.g. in precision engineering, joining technology, robotics and sensor technology. In the Federal Government's high-tech strategy, maritime technologies are addressed as key technologies for future intelligent mobility concepts. The development of innovative, marketable products and processes and the ability to develop and adapt entire value chains (systems expertise) continue to be important competitive factors.

Germany has a wide-ranging and effective maritime research scene. Close ties between the scientific community and industry during research and development is an important strength of the German system of innovation and an important requirement for investors of foreign capital. This was also confirmed by the study commissioned by the BMWi on the maritime research landscape in Germany.[7] The companies surveyed as part of the study saw a need for

7 cf. Final report on the study „Angebots- und Bedarfsanalyse der Institutionen, Strukturen und Netzwerke in der maritimen Wirtschaft im Bereich Forschung, Entwicklung und Innovationen" from 09/2016 – http://www.bmwi.de/DE/Mediathek/publikationen,did=786434.html

optimisation when it came to cross-innovation and information on cross-sector technology and market developments.

There is expected to be another surge in innovation in maritime technologies in the next few years (e.g. in ship bridges, propulsion technology, sensor technology and data management, marine engineering, underwater technology and wind turbines, and in research, emergency response and surveying vessels). In the field of deep sea mining German companies are able to realise extremely great innovative potential. This could have a useful spillover effect for many other fields. At the same time, global competition for technological leadership will increase, not least due to the collapse of the low-tech mass markets. It is therefore important to provide reliable and innovation-friendly parameters in order to further consolidate the innovative strength of the sector.

Government objectives in this area are:

- to identify new fields of technology and emerging markets together with industry and to accompany these with targeted research and innovation funding;
- to consolidate cross-innovation and information on cross-sectoral technology and market developments;
- to place more emphasis on climate and environmentally-friendly technologies during public procurement (pioneering role);
- to ensure better coordination of measures in order to set up end-to-end chains from scientific research, to industrial R&D all the way through to market launch;
- to strengthen research cooperation at European level and in doing so include small and medium-sized companies (SMEs) in particular.

Area of action 2: Strengthen international competitiveness

Maritime markets are global markets: More than 90 percent of the annual turnover made by German shipyards is generated in international business. The export ratio for the German shipbuilding supply industry is approximately 75 percent making Germany world export leader in this field. The German merchant fleet is ranked fourth amongst the global merchant fleets; based on owner nationality, the German container ship fleet is even ranked first by international comparison. The German seaports and inland ports are amongst the best terminals in the world. However, these are in competition with terminal operators from, for instance, China, Singapore and the Middle East.

By international comparison the German maritime sector is dominated by medium-sized companies. Germany does not have any leading international oil or gas companies and German companies do not currently operate as system integrators in the fields of offshore oil and gas or deep sea mining. It is therefore essential that the German maritime industry enhances its international networking, is present at leading international trade fairs, but also that further harmonisation of international standardisation processes takes place in order to open up new export markets.

Creating a level playing field internationally is the prerequisite for enabling sub-sectors of the maritime industry to consolidate and expand their position on the market. The rules set out by the United Nations International Maritime Organisation (IMO) offer a good basis for the requirements of safe and environmentally sound shipbuilding, ship operation and marine equipment. This is also true for the International Labour Organisation's (ILO) provisions on working conditions and social standards on board seagoing vessels. Special national or regional rules should be avoided in order to prevent weakening Germany's position as a competitive shipping location in the long term.

Due to specific market and product features, however, there are still no existing trade rules for shipbuilding which completely prevent market distortions. For this reason Germany plays an active role in several international organisations and committees to help shape a unitary regulatory framework at international and European level. The Federal Government pursues these goals in the context of WTO multilateral trade agreements and bilateral trade agreements as well as at European Union level. It also advocates effective implementation of WTO trade defence instruments, greater transparency and accountability and peer reviews in OECD member states. As part of the International Working Group on Export Credits (IWG), which brings together OECD and non-OECD countries, the Government is working on including emerging export nations in international rules for the financing of ships using export credit guarantees.

Remaining a competitive centre for the shipping industry with an efficient merchant fleet is of great importance for the overall economy of an export country like Germany. The Federal Government is committed to enhancing the general terms for shipping activities in Germany.

Government objectives in this area are:

- to continue to strive for a level playing field worldwide by playing an active role in international and European committees and to avoid purely regional solutions;
- to continue a flexible use of financial instruments according to the situation within the existing room for manoeuvre;
- to support German companies in accessing foreign markets, e.g. in the form of programmes for developing new markets and the BMWi's foreign trade fair programme;
- to commit to making Germany a strong site for maritime business and efficient shipping.

Area of action 3: Consolidate competitiveness of German ports, expand infrastructure and secure Germany's leading position as a logistics hub

Adequate transport infrastructure and efficient and competitive ports are an important factor influencing the attractiveness of Germany as a competitive maritime sector location and the entire export-orientated German economy. Management of the freight transport forecasted requires an efficient transport network, optimised access to sea and inland ports as well as efficient connections to the hinterland. Maritime logistics have a particular part to play here.

The new Federal Transport Infrastructure Plan 2030 (BVWP 2030), totalling close to EUR 270 billion, forms the basis for government development and expansion of transport infrastructure. Most of this investment is intended for investment in renewals and replacement infrastructure. Moreover, the BVWP 2030 is focusing investments in construction and expansion in all modes of transport on unblocking bottlenecks on major transport arteries and therefore optimising traffic flow in the entire transport network. The fact that this is high on the priority list will particularly benefit inland traffic to and from seaports.

In order to increase the shift of road traffic onto the railways and waterways and to reduce climate-damaging emissions and pollutants, efficient terminals are indispensable. In order to support companies in shifting their activities to other modes of transport and to offer them optimal infrastructure the Federal Government is funding the construction and expansion of combined transport terminals that are operated by non-state-owned companies as well as rail siding tracks for private companies. Companies that apply the Guidelines on Funding for Combined Transport Terminals Operated by Private Undertakings can receive

Altenwerder container railway terminal

financing for up to 80 percent of the eligible expenditure. This funding particularly benefits inland traffic to and from seaports. Companies belonging to Deutsche Bahn AG receive construction grants in accordance with the Federal Railway Infrastructure Development Act. Applying the Guidelines on Funding for the Construction, Upgrading and Reactivation of Private Sidings, which cover up to 50 percent of construction costs, allows for other forms of freight transport to also be moved onto the railways. Currently new funding guidelines for both programmes are being decided on. These will come into force soon.

Storage and slot capacities at seaports are under strain due to long turnaround times of containers and a lack of information on the destinations of goods. Better interlinking of IT systems of all those involved in the logistics chain is one of the requirements to speed up freight handling and onward transport.

The National Port Concept for Sea and Inland Ports, adopted by the Federal Cabinet in January 2016, aims to support all those involved in tackling the challenges ahead and to offer a common framework for action, especially in terms of the targeted expansion of port-related infrastructure and improving port competitiveness.

Ports are increasingly a focus of national and international policy, which is resulting in a growing need for coordina-

tion among all actors. In the interests of overall economic development and of the ports, both the Federal and Länder governments must agree on new arrangements about how they will cooperate on ports policy.

Government objectives in this area are:

to develop a framework to ensure that in future ports are still able to overcome economic and logistic challenges, these include:

- further optimising port intercommunication with other links of the logistics chain so that these may enhance their role further as national and international trading hubs;
- maintaining, expanding (as appropriate) and modernising infrastructure to handle expected freight transport volumes within the scope of existing federal jurisdiction;
- introducing better coordination of ports policy between the Federal and Länder governments;
- supporting the shift of freight traffic onto the railways and waterways in order to reduce strain on road infrastructure and to contribute to the achievement of climate and environmental protection goals.

Area of action 4: Shape maritime transport sustainability – strengthen climate and environmental protection and nature conservation

Based on its transport capacity, maritime transport is not only indispensable but also an energy efficient mode of transport. At the same time, climate and environmental protection and nature conservation requirements (including air pollution control, water pollution control and resource efficiency) are placing increasingly higher demands on this mode of transport. For business and industry, investments in climate change mitigation and in environmental and nature conservation are an opportunity to remain internationally competitive with innovative businesses, products and processes.

When developing climate and environmental standards the Federal Government attaches great importance to a coherent framework containing globally applicable rules to ensure effective protection whilst avoiding market distortions. Thus, as part of its work with the IMO, Germany is committed to continually enhancing existing standards and rules, particularly the MARPOL Agreement (International Convention for the Prevention of Marine Pollution from Ships) which provides a core set of rules. Provisions on dumping waste and other residues, reducing air pollutant emissions, noise reduction, reduction and discharge of ship sewage and other pollutants from the shipping industry must be reviewed on an ongoing basis and amended if necessary in order to ensure their efficacy in the long term and to continuously improve these. The same also applies to the introduction of alternative fuels with the aim of reducing air pollutant levels and greenhouse gas emissions.

Obligations to reduce greenhouse gas emissions from shipping are currently only listed in the MARPOL agreement in relation to shipbuilding in the form of the Energy Efficiency Design Index (EEDI). But in future the shipping industry will also have to contribute to reducing greenhouse gas emissions in order to reach the goals set at UN climate conference in Paris. The IMO's system for recording CO_2 emissions data from shipping, adopted in October 2016, is a first step. In the meantime, the IMO has adopted a roadmap for the development of a medium and long term strategy.

Germany also promotes environmental protection in the shipping industry at a bilateral and multilateral level, for instance through the requirements in its shipping agreements with third countries or its membership in the Helsinki Commission (Helcom) and the OSPAR Commission for the protection of the North Sea and the North-East Atlantic. In addition to this, as part of the implementation of the United Nations Convention on the Law of the Sea, Germany is committed to the development of a binding instrument under international law for the protection and

LNG Hybrid Barge HUMMEL

sustainable use of biological diversity on the high seas. The aim of this is to establish internationally recognised marine protected areas.

For the first time in 2013 the Federal Government presented a comprehensive overview of the technologies and alternative fuels for the various modes of transport in the form of the Mobility and Fuels Strategy (MKS). The objective of the MKS as a "learning strategy" is to point out ways in which we can implement the energy transition in the transport sector in the long term. Several studies have been commissioned in order to enhance and develop MKS content. This process should identify room for improvement for the Federal Government and the industry involved in order to create fuel alternatives that are ready to be put on the market as soon as possible.

In parallel to this the MKS is being implemented with funding programmes and pilot projects, for instance on LNG and methane propulsion of ships and ferries and on possibilities of using LNG in the power supply of container ships in seaports ("LNG PowerPac as an integrated energy supply on ships"). Another important step in order to guarantee security of investments is to gain the support of the Länder and port cities in establishing a harmonised approval management process that is as efficient as possible. The Federal Government can assume a coordinating role in this process.

These measures are being put into effect in liaison with the further implementation of Directive 2014/94/EU on the deployment of alternative fuels infrastructure. The Federal Government has adopted a national policy framework on this subject.

Government objectives in this area are:

- to commit to the development and consequent harmonised implementation of international climate, environmental and nature conservation standards in order to protect the marine environment and reach international climate protection goals; to coordinate viable concepts at international level; to set incentives to create a utility supply infrastructure for the use of alternative ship fuels at national level and for retrofitting/equipping ships with the engine technology that is necessary for this; to support the Länder and port cities in establishing harmonised approval standards;
- considering climate and environmental protection, to set incentives for a modal shift of freight traffic from the roads to the seas, in particular to short sea shipping.

Area of action 5: Contribute to the energy transition using maritime technologies

In order for the energy transition to succeed in Germany, it is essential that regenerative energy technologies are used in and on the seas. Offshore wind energy expansion is already at an advanced stage. It is already an important factor for the economy and for growth, particularly in the North German Länder but is also important in mechanical engineering locations in Central and South Germany. The maritime industry plays a key role in the development and establishment of the offshore technology, which is still relatively new. Only in working together with the established maritime industry can the existing potential in offshore wind energy be enhanced with a view to achieving a secure energy supply that proves cost efficient in the medium term.

In order to guarantee an eco-friendly expansion and safe, environmentally sound operation of wind turbines at sea and their connection to the electricity grid, it is necessary to build complex structures, foundations and platforms in shipyards and also to ensure the availability of suitable port infrastructure and innovative dedicated vessels as well as efficient logistics chains. Production and port locations must be adapted to cope with the stringent requirements regarding the size and weight of wind turbines. New fields of application for maritime autonomous and semi-autonomous technology systems can be found in the operation, monitoring, servicing and dismantling of offshore wind turbines.

It is also highly important that the expansion of wind farms and the expansion of grid infrastructure take place in close connection with one another. Technology development and the use of prototypes and testing facilities can significantly help in keeping costs down. This requires even closer cooperation between the maritime industry, wind energy sector and network operators.

The legal provisions for the expansion of offshore wind energy post 2021 were reconfigured with the amendment to the Renewable Energy Sources Act (EEG 2017)[8] and the Offshore Wind Act.[9] A paradigm shift occurred after a tender procedure was introduced for determining remuneration; now the market decides on the remuneration rates. Concurrently, land use planning and spatial planning, wind farm approval, EEG support and grid connection procedures are improving and becoming more costefficiently intertwined with each other. Due to existing bottlenecks in the grid on land, a specific course for annual expansion was laid down in the EEG 2017. In 2020 the aim is to reach an installed offshore capacity of 6.5 gigawatt; in the year 2030, 15 gigawatts. This will mean that by 2030 offshore wind energy will cover around ten percent of German electricity consumption. The purpose of setting a course of expansion is to ensure that the expansion of the power grid and the building of offshore wind farms keep pace with each other.

Over the coming years innovative energy and transport technologies must also play a role in promoting the energy

Building foundations for a wind farm

8 Article 1 of the Act of 13 October 2016 (BGBl. I p. 2258)
9 Article 2 of the aforementioned Act of 13 October 2016

transition in the transport sector in combination using intelligent sector coupling. In future, the use of alternative fuels and propulsion systems for the purpose of reaching climate and energy policy goals will also become a focus of the maritime sector. They must make an appropriate contribution to the decarbonisation of energy and transport systems and to the reduction of greenhouse gases in order to achieve the objectives set at the UN climate conference in Paris. Measures taken to improve air quality are also helping to better protect sensitive marine ecosystems (see also area of action 4).

Government objectives in this area are:

- to strengthen networking efforts between the offshore wind industry and the maritime industry for a targeted exchange of information on future demand for maritime technologies that are to be used in the operation and servicing of offshore wind parks and on the potential for reducing costs in the area of technology and logistics;
- to advance dialogue between the offshore wind sector and the ports sector on possibilities of expanding the range of services in the offshore wind energy sector;
- to ensure the attainment of the defined expansion objectives and to examine measures for increasing cost-cutting potential;
- to facilitate the construction of environmentally sound and nature-friendly offshore pilot wind farms including their foundation structures;
- to promote the energy transition in the transport sector by funding innovative energy and transport technologies and using intelligent sector coupling;
- to supervise the development and use of innovations in connecting to the grid and in grid integration and to investigate funding of prototypes;
- to use cross-programme research initiatives to increase the strategic multiplier effect of research funding in energy, industrial and technology policy.

Area of action 6: Maritime 4.0 – use the opportunities of digitalisation

Just like other sectors, the maritime industry is currently undergoing a transformation as a result of increasing digitalisation in the areas of development, production and services. Industry 4.0 will result in great opportunities for the maritime sector: it is anticipated that new processes in development, production, operation and port logistics will result in a substantial increase in efficiency. IT-based development, for instance, will lead to an increased innovation dynamic and faster implementation of ideas in products that are ready for market. Flexible and smartly interlinked manufacturing systems enable small batch and custom-made production at competitive prices. In future 3D printing will also be used, at the very least, in parallel to traditional manufacturing processes in the maritime industry. One key topic is the targeted analysis, assessment and management of data flows (big data/data mining), which will especially transform processes used in merchant shipping and in the ports sector: the collection and collation of data – where applicable even in real time – (e.g. data on weather, navigation, shipping operations, loading, railway and lorry operations) are an important requirement for optimising shipping operations and for ensuring that operations run smoothly at ports and in the logistics chain. Interlinking production and logistics using IT systems, or the so-called digital life cycle management, opens up new business segments. The use of digital technologies, which are continuing to grow at a rapid pace, is becoming a decisive competitive factor for the whole maritime sector.

The foundations for the implementation of these processes are universal broadband and mobile network coverage with high data transfer rates and corresponding (shipping, ports) industry investment. Since the shipping sector is international, data formats and interfaces need to be aligned firstly at EU level, if not worldwide.

The Government's broadband special support programme envisages coverage of industrial areas – including ports – with a high-performance broadband connection (at least 1 Gb/symmetrical). Calls for applications for funding will follow soon.

One of the key challenges in implementing Industry 4.0 lies in pooling the know-how from various areas such as machinery and equipment, logistics, electronics and information and communications technologies. This can only be achieved in the form of strategic partnerships. For this purpose the BMVI has created the 5G Initiative for Germany which includes the Dialogue Forum 5G. 5G is the new mobile network that will be available from 2020. The 5G Initiative aims to present the current state of 5G developments to vertical industries and to promote cooperation between industry partners. The Dialogue Forum 5G with

Use of augmented reality in shipbuilding

the logistics sector also provides the shipping industry with the opportunity to present its particular 5G requirements. The aim must be to make use of the existing potential in this area through stronger cooperation within the industry and to secure Germany's leading role in the field of intelligent traffic management and information management systems.

Given its international activity, it is of utmost importance that the maritime industry pursues a common international approach for technical regulation. Digitalisation in marine technology brings with it new safety and security requirements such as the approval and certification of ship components, systems and digital networks on board. This too requires the amendment of international provisions. It is important to make German views known early on in international agreement and standardisation processes – and to voice these views in particular to the IMO, the ISO (International Organization for Standardization) and the IEC (International Electrotechnical Commission). At the same time, the correct parameters must be set for data security, data protection and the management of rights of disposal.

The key to success, however, will remain the workforce. Education and needs-geared training are and remain the key lever and must be adapted to meet the requirements of rapid digitalisation.

In developing the platform Industry 4.0, the BMWi and the BMBF (Federal Ministry of Education and Research) have established a centralised network for national and international activities relating to digital transformation in Germany. This platform involves precompetitive industry input and the inclusion of the social partners. The platform aims to bring together stakeholders from industry, the scientific community and society in order to contribute thematic proposals, mobilise businesses, in particular medium-sized ones, to provide information and to promote the development of international networks. The areas of action identified by the platform are addressed in five different working groups: standards and standardisation, research and innovation, security of networked systems, legal frameworks and legal work, initial and further training. The "SME 4.0 Digital Production and Working Processes" funding initiative complements the other platform components.

The BMWi's "Digital Strategy 2025"[10] described important measures and instruments needed for the successful management of the digital transformation in Germany. The "Action Programme on Digitalisation" specifies these measures, for instance the establishment of SME 4.0 competence centres. These can also be beneficial for the maritime industry.

10 http://www.bmwi.de/DE/Themen/digitale-welt,did=754836.html

Government objectives in this area are:

- to further enhance relevant research and development for Industry 4.0 by laying down priorities accordingly in the maritime funding programmes and through targeted funding of collaborative projects, particularly of cross-sectoral flagship projects;
- to promote and facilitate dialogue between actors along the entire value chain – from the supplier company to the shipyard all the way through to the shipping company and ports sector;
- to direct and push forward with the introduction of international industry standards through collaborative initiatives between German industry players;
- to optimise the initial and further training of qualified professionals in line with increasing digitalisation requirements whilst involving social partners.

Area of action 7: Strengthen Germany's maritime expertise

Training of qualified professionals is the key to securing the viability and competitiveness of the German maritime industry. Germany has excellent professional training infrastructure thanks to its dual system of vocational education and training and its high-performing universities.

Germany as a hub for maritime activity is characterised by close cooperation between educational establishments, research institutes and business. All sub-sectors of the maritime industry profit equally from this since the expertise of their workforce is an important factor contributing to their success. The workforce profits from a diverse labour market in a high-tech industry, often associated with long-term employment prospects and high retention rates for trainees. Excellent university courses, a continually growing number of recognised training occupations and the unique combination of theoretical basics and practical application used in the dual system of vocational education and training ensures diversity and quality.

One important future task for companies and educational establishments is to continually train and develop highly-qualified professionals. It will be particularly essential to react to the rising need for engineers from all fields. In order to achieve this, obstacles in the transition from the bachelor's degree to the master's degree must be removed and practical relevance improved. The presence of technological innovations and applications in the training curriculum must be increased. It is also essential to implement "life-long learning" concepts as a key element of professional development.

The Alliance for Training and Employment in Maritime Shipping is the ideal platform from which to shape national shipping policy together with maritime industry stakeholders. In the past years, positive impetus has been provided in many ways, for instance through government funding for training and employment opportunities. Competitive conditions are continually changing. Safeguarding maritime expertise in Germany remains a priority task of the Maritime Alliance. With the support of the maritime sector, the aim is to offer young people secure prospects in maritime professions.

Government objectives in this area are:

- to cover the demand for workers in the maritime sector with maritime and naval engineering and marine technology training programmes for skilled workers and engineers;
- to promote the exchange of dialogue between educational establishments and the maritime industry on the continuous development of the curriculum;
- to continue and develop the Alliance for Training and Employment in Maritime Shipping.

Area of action 8: Develop industrial capabilities in naval and coastguard shipbuilding

Naval and coastguard shipbuilding, which involves close cooperation with hundreds of supplier companies throughout the territory of the Federal Republic of Germany, represents around one quarter of the total turnover of the German shipbuilding industry. Given the increasing importance of safe and secure shipping routes for the global economy, the changing situation in security policy and the growing threats to maritime security, shipbuilding will become increasingly important in future. The global developments in security policy and the change in necessary military capabilities are currently leading both in some of the Western industrialised nations and also world-wide to a renewed rise in defence budgets and to different procurement needs. This also applies to the German navy. This means that export success on foreign markets and national reference projects are of key importance for the basic capacity utilisation of the German naval shipbuilding industry and for maintaining an efficient national defence industry. Particular attention has to be given in this respect to "subsurface units", the key technology defined in the Strategy Paper of the Federal Government on Strengthening the Defence Industry in Germany of 8 July 2015.

Rheinland-Pfalz F 225 frigate in the shipyard

Government objectives in this area are:

- to ensure the German navy and the national police force are equipped adequately to meet the growing number of demands placed on them;
- to campaign at EU level for further harmonisation of the different export control policies of individual member states on the basis of the EU Common Position of 2008;
- to continue dialogue on implementing and developing the Strategy of the Federal Government on Strengthening the Defence Industry of 8 July 2015.

Area of action 9: Play an active role in shaping the EU's Blue Growth Strategy

The objective of the long term Blue Growth strategy of the EU is to achieve environmentally compatible and socially equitable growth in all areas of the maritime sector. The strategy should take into account the protection needs of the seas, oceans, marine species and marine habitats. It is the economic component of the EU comprehensive vision for an integrated maritime policy. Blue Growth should help to achieve the objectives of the "Europe 2020 Strategy" for environmentally compatible, smart and sustainable growth both around and on our seas.

The Blue Growth strategy is in keeping with the other areas of the Integrated Maritime Policy such as maritime environmental protection, access to marine data, maritime spatial planning and integrated maritime surveillance. The strategy also includes regional measures (so-called sea basin strategies). These are platforms for coordinating measures on how to boost innovation and sustainability, the enhancement of skills and qualifications, cluster development and access to finance for maritime projects. In 2014 the European Commission adopted the Baltic Sea Strategy, which is an agenda for sustainable growth in the Baltic Sea area. As part of the Baltic Sea agenda, possibilities for increased cooperation between stakeholders were identified.

Other objectives include a targeted and consistent approach in the industry sectors of mariculture, coastal tourism, marine biotechnologies, marine energies and deep sea mining. The strategy forms the basis for the implementation of HORIZON 2020, the EU Framework Programme for Research and Innovation, in the maritime sector. It aims to pool research and innovation i.a. on the topics of clean energy, green transport, climate action and resource efficiency. The strategy also acts as a benchmark for the European Investment Bank (EIB) in financing maritime projects.

Government objectives in this area are:

- to play an active role in shaping the EU Blue Growth Strategy and to better coordinate Federal Government measures for implementing the strategy (by creating a key point of single contact and/or an interministerial coordination body within the scope of existing mandates);
- to promote cooperation with European partners as part of the EU strategy;
- to take into account the key concept of the German integrated maritime policy – the protection and sustainable use of the seas and oceans – during policy-making processes for growth that is climate, nature and environmentally compatible.

V. Means to implement the Maritime Agenda 2025

The objectives of the Maritime Agenda 2025 can only be reached if the sector develops dynamically and all bodies involved work together. The following means of implementation differentiate between cross-sectional measures, which are relevant for the whole maritime industry, and sector-specific measures. In order to ensure a reliable environment for future investment in the long term, sound government finances are key. Thus, all measures included in the Maritime Agenda 2025 must concord with the German Federal Budget and Financial Plan and are subject to this proviso.

1. Maritime coordination, intercommunication and dialogue forums

Well-functioning value chains and optimal collaboration between the various links of the logistics chain are essential in order to maintain Germany's competitiveness as a maritime hub. This includes efficient coordination of the various actors from politics and administration (Federal, Länder, local authorities), industry, the scientific community and trade unions. It also involves improving maritime networks. Maritime networks promote visibility at European and international level; they are extremely important for the maritime sector in Germany, which, by international comparison, is dominated by medium-sized businesses.

It is the task of the Federal Government to create the framework for intensive dialogue between the various actors, to actively accompany the networking process and to initiate collaborative projects. At the same time the Federal Government ensures that the "Blue Growth" goals are integrated at an early stage into political decision making at EU level and at national level using these coordination, cooperation and dialogue structures.

Maritime Coordinator, National Maritime Conference, dialogue forums

The task of the Federal Government's maritime coordinator is to coordinate all measures for strengthening Germany's competitiveness in the fields of shipbuilding, marine technology, offshore wind energy, shipping and ports. A key instrument in maritime cooperation is the National Maritime Conference (NMK). Experts from the worlds of politics, business, trade associations, science, trade unions and non-governmental organisations take part in the event that has taken place regularly since the year 2000 under the patronage of the federal chancellor. The national maritime safety and security authorities at federal and Länder level are also involved in coordination as necessary. The sector forums introduced in the run-up to the 9th NMK in 2015 updated the event concept and ensured that the dialogue between the different participants became more transparent and that there were no fixed expectations regarding the outcomes.

In addition to this, the Federal Government is establishing other platforms for the continued exchange between actors in the maritime industry. These include the Alliance for Training and Employment in Maritime Shipping and the maritime coordinator's LeaderSHIP initiative where interaction on shipbuilding is facilitated between representatives from the maritime industry, associations, trade unions and the Länder. Furthermore, within the scope of the National Port Concept for Sea and Inland Ports, the Federal and Länder Governments, the ports sector and associations agreed on a common strategic guideline and established the dialogue structures necessary for its implementation with the Steering Group and the Working Group on Ports. The Port Development Dialogue is a committee made up of Federal Government and Länder Government representatives in which issues relating to ports policy are discussed.

Networks

A key governance instrument is the National Master Plan for Maritime Technologies (NMMT), which was adopted by the Federal Cabinet in 2011. The NMMT creates a common platform for all maritime actors (industry, science and coastal Länder) which aims to better exploit the potential found in maritime technologies. It is the task of the NMMT coordinating office, established by the BMWi, to amplify the Master Plan to a strategy encompassing all areas of the maritime industry. It also aims to increase perception of the diverse technological and application areas found in the maritime industry.

The Working Group on Interlinking the Maritime Industry with the Offshore Wind Energy Sector, funded by the BMWi since 2010, is a dialogue platform for Federal Government, Länder and industry representatives which aims

to boost value-adding potential by working together. Cooperation priorities in the planning, development, building and erection of offshore wind farms and the related issues of accelerating grid expansion and reducing the costs involved in this will focus increasingly on the use of maritime technologies in operating, servicing and monitoring the turbines at sea. Optimising interrelated processes can mean that the whole maritime value chain is strengthened. This is only possible if all actors work together on this task. The project "Together for the Maritime and Offshore Wind Industries", which is funded by the BMWi and runs until the end of 2018, provides a framework within which the Working Group can make a significant contribution to the energy transition and at the same time can highlight new opportunities for growth in the maritime industry.

The Federal Government plans:

- to use the National Maritime Conferences to underline the importance of global developments for Germany as a competitive maritime hub;
- to organise the first NMK in the 19th legislative term in an inland location in order to highlight the significance of the maritime sector for the whole German economy;
- to continue with and to advance the Maritime Alliance in order to shape national shipping policy alongside all stakeholders;
- to push ahead with the implementation of the National Port Concept for Sea and Inland Ports through the Steering Group and Working Group on Ports;
- to continue developing the Working Group on Interlinking the Maritime Industry with the Offshore Wind Energy Sector, particularly in terms of their key areas of activity during the commencing industrialisation phase which comprise the operation and servicing of offshore wind farms;
- to organise technical conferences, including at international level, on strategically important areas of activity and to foster international industry cooperation;
- to support the maritime sector through a "German Maritime Centre";
- to actively accompany the European Commission in the implementation of its Blue Growth strategy.

2. Developing the National Master Plan for Maritime Technologies

The Federal Government will work alongside industry to transform the National Master Plan for Maritime Technologies, which has focused until now solely on marine technology, into a concept that is relevant for the whole maritime industry. The aim of the NMMT is to identify important areas of action for the German maritime industry and to tackle the associated economic, technological and environmental/climate policy challenges. The Master Plan is designed to open up new markets of the future for the German maritime industry.

In future, government funding for research and development in the maritime sector should focus more strongly on these future tasks. This requires close cooperation between the advisory board set up for the maritime research programme and the NMMT coordinating office.

Current and reliable statistics on employment, production and value-added potential for the whole maritime industry are an important basis for further evolving the NMMT.

The Federal Government plans:

- to expand the NMMT, which had previously only focused on marine technology, so that it applies to the whole maritime industry; this includes shipbuilding, all maritime technology providers, the offshore wind industry as well as marine technology; currently a call for tender for a study on determining the value-added potential of the maritime industry is being reviewed by the BMWi;
- to identify new maritime technologies for existing and newly emerging maritime markets, to specifically support market-based developments promoting sustainable solutions for an economic use of the seas, for the energy and transport transition and for a secure supply of raw materials and food; all of these measures must ensure a high level of climate, nature and environmental protection;
- to closely interlink maritime research and development activities with the NMMT in order to achieve the maximum impact with the available funds.

3. Promoting research, development and innovation on the sustainable use of the seas

The Federal Government is using technology funding to create incentives for companies to step up investments into research and development. The Government's High-Tech Strategy aims to shorten the innovation process from the concept through to finished product by supporting basic research, applied research and market-based research in parallel with each other for the translation of this into products, processes and services.

Funding of maritime technologies requires close coordination between the research programme on marine sciences at the Federal Ministry of Education and Research's (BMBF) and the programmes on research funding and innovative shipbuilding, which are both initiatives of the BMWi. The objective must be to ensure that funding is consistent throughout the entire value chain. The Energy Research Programme of the Federal Government focuses on innovative and cost-cutting research approaches for funding offshore wind energy. These approaches incorporate the whole lifecycle of a wind farm as well as grid infrastructure. Programmes spanning multiple sectors and which are open to all types of technology are also of relevance to the maritime sector.

Funding basic research

Coastal, marine and polar region ecosystems must be sustainably protected and safeguarded for the future by being used in a responsible and environmentally sound way. Marine research can provide a valuable basis for decisions on adaptation measures and environmentally friendly use and management practices. To this end marine research is incorporated in the international scientific platform "Future Earth", which is closely engaged in processes such as the United Nations' Sustainable Development Goals and climate and biodiversity agreements.[11] In addition to this, German scientists make an important contribution to the World Climate Research Programme (WCRP). At European level, the Federal Government has been actively involved in the Joint Programming Initiative (JPI) "Healthy and Productive Seas and Oceans".

In 2016, the Federal Government published its coastal, marine and polar research programme for sustainability (MARE:N). The programme is designed to generate the

11 "United Nations Framework Convention on Climate Change" and "The Convention on Biological Diversity"

knowledge required for making decisions on the sustainable management of natural resources and to lay the foundations for future-orientated and innovative "precautionary research". Further examples of the research project funding include projects on topics such as gas hydrate reservoirs, deep sea mining and ammunition recovery. In these projects the Federal Government focuses its financial support on aspects such as improving the understanding of systems, environmental compatibility and the development of suitable technologies. In the field of deep sea mining the Federal Government is backing a research project at European Level on "EcoMining" as part of its work in JPI Oceans.

In order to carry out international and competitive marine research it is necessary to have efficient research vessels. To this end the Federal Government is investing in renewing the German departmental research fleet whilst giving due consideration to strict environmental requirements stipulated in the Blue Angel label requirements for ships. At the end of 2014 the new research ship SONNE was commissioned. Preparations are currently underway for replacing POLARSTERN. Research ships METEOR and POSEIDON are also set to be replaced by a combined research vessel.

Federal Government maritime funding programmes

The "Next-Generation Maritime Technologies" funding programme is geared towards research and development projects in the pre-competitive phase. It is divided into four research priorities: marine technology, production of maritime systems, shipping and marine engineering. Research ranges from industrial basic research through to the development of pilot plants and technology demonstrator models. Eligible for support are companies in the industrial sector (shipyards, suppliers, engineering companies and service providers), universities and technical colleges and non-university research institutes. Shipping companies may also receive support. Halfway through the year 2017 the programme will be evaluated in order to prepare the new programme framework for 2018 onwards. One of the tasks of the programme is to examine future technological trends and their compatibility with requirements on funding. Themes such as Industry 4.0 and Big Data are taken into account in establishing the focuses of the programme.

The support programme "Innovative Shipbuilding Secures Competitive Jobs" funds innovation activities in shipbuilding, ship-repair and refits for self-propelled merchant ships and for floating or moving offshore structures. One funding requirement is that the product or process innovations are being used for industrial application in the EU for the first time. Shipyards based and with manufacturing facilities in Germany that execute the shipbuilding order or parts of this in Germany are also eligible. Development costs, manufacturing costs and costs for supplies from third parties are eligible for support as long as they relate to the innovative parts of the shipbuilding order. The innovation support programme was evaluated at the end of 2016. On the basis of this evaluation measures for a more effective programme structure are to be examined and agreed upon. During this process consideration will be given to whether innovative suppliers may also be incorporated into the funding chain in order to enhance competitiveness along the value chain.

Research vessel in the Central Arctic

Maritime Safety Programme/Realtime Services

Protecting maritime infrastructure (coasts, ports, shipping routes, offshore installations etc.) and increasing resource efficiency and transport capacity are of strategic importance for the whole economy. Technologies play an important role in this task in the context of intercommunication, realtime applications and big data. The "Maritime Safety/ Realtime services" support programme aids companies together with partners from science and research in, for instance, the development of assistance systems for (semi) autonomous shipping, navigation tools for efficient routing and the monitoring of port traffic and port logistics. This enables IT companies and data service providers to also open up new business opportunities using the satellite data provided.

Civil security technologies funding programme

An innovation programme for the support of diversification strategies is still being developed. The programme aims to fund innovations of companies in the defence industry in the field of civil security technologies. Great synergy potential lies in the collaboration between military and civil companies. Funding guidelines on the programme will be published by the BMWi.

Funding of innovative port technologies (IHATEC)

Considering the dynamic growth of the shipping industry, the challenges of an increasing digitalisation of maritime logistics chains and increasing international competition, it is necessary to increase the attractiveness and efficiency of the ports sector as an entire logistics system of different stakeholders. For this reason the Federal Government is supporting German ports in the exploration and development of innovative port technologies and also in transhipment with the Initiative for Innovative Port Technologies (IHATEC) launched in 2016. The programme has a budget totalling approx. EUR 64 million and is set to run until 2020. The main purpose of the programme is to optimise freight handling, passenger services in ports and the flows of traffic, to improve digital infrastructure, to encourage a stronger use of IT in ports and in logistics chains as well as the funding and development of innovative port technologies that help to improve environmental and climate protection.

Funding alternative propulsion methods and fuels in the maritime sector

As part of its National Innovation Programme Hydrogen and Fuel Cell Technology – Phase 2 (NIP 2, running from 2016–2026) the Federal Government is funding the use of hydrogen inland shipping and maritime transport with the flagship project "e4ships". The use of technology to provide electricity on board and/or for propulsion of vessels greatly reduces ship emissions, particularly in ports. Efficient progression in this area requires international standards, guidelines and an approval procedure. A process for regulating the approval of fuel cells in ships and for all international ports has been initiated within the IMO. New funding guidelines set by the BMVI as part of its NIP 2 programme (with a focus on "sustainable mobility") are currently being internally coordinated within the ministry. The aim of the guidelines is to support measures in the areas of research, development and innovation of a decentralised energy supply (cogeneration/trigeneration systems on board ships) and propulsion technologies for inland vessels.

In order to further progress on the introduction of LNG in German shipping, the Federal Government is pursuing the approach of demandside funding through targeted incentives for using LNG as a ship fuel in German ports and in European waters. The BMVI is funding pilot and demonstration projects looking at converting a container feeder onto a LNG propulsion method and using PowerPacs for onboard power in ports.

Other cross-sectoral programmes

In order to drive the energy transition forward the Federal Government is supporting the research, development and trial of new energy technologies with its 6th Energy Research Programme. In order to tap into the synergistic potential of innovative propulsion technologies the BMWi is planning a research initiative that spans multiple programmes. This should address system synergies in the fields of energy and mobility. Another positive way to interlink the two sectors with power-to-fuel technologies (PtF) is through i.a. high-performance gas engines and the use of regeneratively produced gas. The German maritime industry already has high systems expertise in this area.

Infrastructure plans for building or expanding port infrastructure facilities are also eligible for funding, particularly under the policy for the improvement of regional structure. Under the Joint Federal Government/Länder Scheme for the Improvement of Regional Economic Structures (GRW), the Federal Government bears half of all costs for projects approved by the Länder. In terms of European state aid legislation, the Government hopes that in future appropriate scope will be maintained for investments in port infrastructure so that German ports may be developed further.

European programmes and EU project funding

At European Union level technology is mainly funded via the EU Framework Programme for Research and Innovation (HORIZON 2020), which has a total budget of EUR 75 billion. Horizon 2020 is built on three pillars: Research institutes apply for project funding via the first pillar, “Excellent Science”. The second pillar provides innovative SMEs with equity and venture capital. The Agency for SME Development provides funds in the maritime sector under the headings Blue Careers, Blue Labs and Blue Technology. Industry can apply for project funds under the third pillar, “societal challenges”. Maritime issues are funded under the themes “transport” and “climate action, environment” (i.a. environmentally sound conditions for deep sea mining).

The Federal Government will continue to look after the interests of the German maritime sector in the individual programme committees in order to ensure the programme follows a course that is within these interests and to continue the consultations being conducted with industry. The technology platform WATERBORNE offers an opportunity for the maritime sector to bring in its own research focuses.

Other EU funding instruments in the fields of research, technology and innovation are the European Regional Development Fund (ERDF), the European Structural Fund and the European Investment Bank loans under the Trans-European Transport Network (TEN-T) programme and the EU’s Connecting Europe Facility programme on infrastructure.

The European Commission is improving the strategic coordination of national funding programmes that finance networks through the ERA-NET scheme. Under HORIZON 2020 the financing of networks is set to be replaced by the establishment of an ERA-NET Cofund. In future, funding will take place in the form of a joint call for transnational research and innovation projects with top-up funding from the European Commission. The Federal Government will continue its participation in the ERA-NET scheme. An ERA-NET Cofund proposal in the field of Blue Growth has been submitted and approved by the European Commission. The proposal was led by Germany alongside 14 other Member States.

On behalf of the BMWi, the National Contact Point on Shipping and Marine Technology provides free advice for research institutes and businesses on possibilities for EU research funding in the field of shipping and marine technology. The range of services includes information on the possibilities of taking part in current collaborative projects, on suitable funding instruments and on the application and funding procedures. The NCP is run by the project management company Jülich and is part of the network of NCPs for Smart, Green and Integrated Transport, which is coordinated by TÜV Rhineland.

The Federal Government plans:

- to bring together the BMWi's three maritime funding programmes on research, development and innovation under one budget item, "maritime technologies - research, development and innovation", making them more visible in order to ensure a more flexible and needs-orientated use of available funds and with a view to increasing these funds;
- to better interlink maritime funding measures as regards content with the aim of setting up funding chains and widening the pool of system expertise;
- to use the evaluations from the maritime R&D programme and the innovation support programme in shipping as a basis for examining further measures for using funds more efficiently;
- to examine the possibility of political support of a pilot mining test as a way of concluding the exploration phase in the Clarion-Clipperton Zone;
- to draw up a roadmap, based on the BMWi-commissioned study on research offers and structures in the maritime field, on the future course of application-orientated research funding for maritime companies in Germany, which includes all relevant stakeholders in line with their responsibilities; to initiate a process for strengthening cross-innovation and to specifically provide support for collaborative projects with cross-innovation elements;
- to continue building on the research and innovation expertise of SMEs by precisely tailoring existing funding programmes;
- to play a leading role in shaping European cooperation projects by actively using the new EU co-funding instrument to secure and increase access to EU funds for German companies.

4. National Port Concept for Sea and Inland Ports

The National Port Concept for Sea and Inland Ports, which was adopted by the Federal Cabinet in January 2016, is part of the Federal Government's long-term strategy in transport policy which aims to improve the competitiveness of the whole logistics sector. Germany will only be able to hold on to and build on its strong international competitive position if it organises its transport and logistics as efficiently, profitably and environmentally friendly as possible.

Adequate transport infrastructure and efficient and competitive ports are an important location factor for the maritime sector and the entire export orientated German economy. Nearly all sectors of the economy are reliant upon well-functioning ports and well-developed infrastructure. Without these services provided by ports, Germany's role as one of the leading trading nations in the world would be impossible.

Management of the anticipated freight transport in future requires an efficient transport network, optimally configured access to sea and inland ports as well as efficient connections to the hinterland. In addition to this, Germany must cope with increased competition between ports internationally and at European level and appropriate regulations must be developed at EU level for ensuring fair competition. The technological developments in the IT field in

The Federal Government plans:

- to implement the measures contained within the National Port Concept 2015 together with the Länder and to review these on an annual basis;
- to follow the development of European regulations in the ports sector together with the Länder with both a critical eye and in a constructive manner; to effectively represent the interests of the German ports;
- to continue to aid the ports in the development and introduction of innovative port technologies and
- to support the development of infrastructures for alternative fuels and for the discharge of ship sewage in ports.

particular can be seen as an opportunity for strengthening port competitiveness. Efficient environmental and climate protection and the growing need for infrastructure for alternative fuels and shoreside power require strategic planning and, where necessary, the support of the Federal and Länder Governments. The implementation of the National Port Concept is therefore a key priority. It forms the strategic guideline for the ports policy of the next ten years.

The goals of the Federal Government's policy are to ensure that German ports are able to master economic and logistical challenges in future, to strengthen the competitiveness of sea and inland ports as national and international trading hubs and as key goods distribution centres and to support the shift of freight traffic onto the railways and waterways whilst also achieving the agreed climate and environmental protection goals. This requires a qualified and highly-motivated workforce as well as appropriate safety and security measures in ports.

The National Port Concept contains 155 measures and aims to help all stakeholders in tackling future challenges and offer a common framework for action.

5. Securing Germany's economic prospects as a shipping location, efficient maritime transport

As one of the leading trading nations worldwide, Germany is also one of the largest maritime transport hubs worldwide. Germany is the world leader in container shipping with a global market share of around 30 percent. The tonnage of the German fleet has doubled in the last ten years. This track record makes Germany one of the top shipping locations.

It is essential to maintain what has already been achieved, to expand on this and at the same time to guide maritime transport into the digital age. The digital transformation amounts to an efficiency revolution in the maritime transport sector and can make a substantial contribution to Germany keeping its leading position in terms of its business environment. Already Germany is setting standards in digitalisation and is the forerunner for Mobility 4.0 – e.g. with electronic ship safety certificates and fully-automated logistics solutions. The Federal Government also supports shipping companies with a modern flag state administration.

The Federal Government's shipping policy provides a competitive framework so that the maritime industry in Germany can perform well. Maritime transport under the German flag stands for quality, modernity and competitive-

ness: The German flag has a place on the White List and receives high ratings in the ICS Performance Table. It is on a consistent path of modernisation. Germany is, for instance, one of the first countries that has issued electronic Minimum Safe Manning Documents for ships under the German flag since July 2016. Alongside the Länder, the Federal Government has adopted measures to make the German flag competitive at European level. Wage tax deduction in favour of employers has been raised from 40 to 100 percent. The new guidelines on the reimbursement of the employer's social security contributions have been published and the Manning Scales Ordinance amended. The range of measures adopted is characterised by the concept of maintaining high-quality training and employment standards in Germany as a maritime hub.

The Federal Government also offers shipping companies an attractive tonnage tax policy, which is extremely important for shipping company hubs in the North German Länder in particular. Moreover, ship income pools are now permanently exempt from insurance tax.

6. Maritime Safety

Changing environmental conditions and the further increase in maritime traffic, including the increasing use of large container ships, have given rise to additional safety requirements in maritime transport and in the protection of the crew, ship, cargo and the marine environment. Important areas of action include the development of traffic guidance systems (particularly on rivers and in ports) and methods for ensuring the minimum required power to maintain manoeuvrability in a seaway.

Other dangers to maritime safety and security include piracy and terrorism as well as the vulnerability and abuse of information systems both on board and on land. Another challenge is the clear identification of the cargo in containers. Though dangerous goods containers are usually declared, there are a range of potentially dangerous substances which do not have to be reported to shipping companies.

The Federal Government plans:

- to carry on providing internationally competitive conditions in future in order to ensure that Germany as a maritime hub and the German shipping industry can perform well;
- to review and, if necessary, to adapt the set of measures for strengthening maritime transport under the German flag in due course;
- to continue improving the quality of service of the flag state administration in comparison with the administration of other flag registers through modernisation measures, to further expand available options for electronic applications and to develop the corresponding technical solutions;
- to continue promoting global acceptance of electronic ship safety certificates and liability certificates;
- to effectively develop traffic management under the maritime safety and security partnership between the maritime industry, public bodies and security service providers.

The Federal Government plans:

- to strengthen the maritime safety and security partnership between the maritime industry and the national maritime safety and security authorities at federal and Länder level;
- to support more strongly the development of international regulations on the basis of current research findings and to create organisational structures to be fully capable of acting in the international context of interlinking maritime transport IT systems;
- to promote e-Navigation and to maintain the high quality of marine pilotage services;
- to improve and develop traffic management and the availability of cargo details through a digitally interconnected information system;
- to improve emergency preparedness on board ships using invehicle measures (improved fire detection, development of mobile and stationary fire extinguishing facilities, suitable towing equipment, targeted training for crew) and the availability of places of refuge for ships in distress including the necessary unloading and salvage facilities.

Ship's bridge

7. Promotion of foreign trade and investment

Tapping into foreign markets is essential for the long-term success of the export-orientated maritime industry. However, particularly small and medium-sized companies may struggle with starting operations on international markets. The Federal Government supports German companies in facing the challenge of entering and securing business in foreign markets. Under the new umbrella initiative "Mittelstand Global" the range of support measures offered by the BMWi has been reconfigured and bundled together more effectively at an organisational and thematic level.

Programme to develop foreign markets

The programme initiated by the BMWi in 2012 called "Measures for entering foreign markets for small and medium-sized manufacturing companies and service providers" (MEP) supports these in positioning themselves on international markets. The "maritime industry" sector has received increased support since 2016. The support offered under the MEP is divided into modules which can also be combined with each other. The following modules are open to companies in the maritime industry: "market information", "market exploration", "initiation of business contacts", "buyer and fact-finding tours", "manager training" and "trade fair participation".

The BMWi also supports participation of companies in trade fairs and exhibitions worldwide under its foreign trade fair programme.

The German Chambers of Commerce Abroad and state-owned Germany Trade and Invest (GTAI) provide information on the developments on world markets and with their extensive range of services they offer small and medium-sized companies in particular a reliable and competent basis for making decisions on entering new markets. For instance, between 2012 and 2016 the GTAI published around 80 reports on selected maritime industry topics and on different countries.

Political Support

Besides the described measures to help with entering foreign markets it is also important to have inter-ministerial political support. This includes regular visits to important leading trade fairs by high-level government representatives and maintaining close bilateral ties to important partner countries through regular intergovernmental consultations. Success in exporting abroad and national reference projects are of key importance for all sub-sectors in the maritime industry. In German naval shipbuilding they ensure basic capacity utilisation and the maintenance of an efficient national defence industry. Interministerial political support for exports in the maritime sector takes place under consideration of interests in security and arms policies. Funding of key technologies is granted on a case-by-case basis in line with the "Policy Principles of the Federal Government for the Export of War Weapons and Other Military Equipment" from the year 2000.

Risk hedging and financing

Ship financing that is tailored to individual requirements both for the construction period funding and for long-term follow-up funding is one of the significant cornerstones in international competition and plays a decisive role in awarding contracts. The increasing trend of German shipyards towards dedicated vessel construction is contributing to market stabilisation, though it is associated with increasing costs of construction, longer construction periods and higher technical risks. Aside from the consequences of the financial and shipping crises, which are still noticeable today, this trend has a negative effect on the willingness of banks to provide financing, which are already facing stricter EU rules on capital requirements for banks and investment firms.

The Federal Government supports German companies in the implementation and financing of international projects with i.a. export credit insurance (Hermes cover) and investment guarantees. The shipping sector is traditionally one of the sectors that benefits greatly from the Government's export credit insurance. In 2015 alone German exports were insured with export credit insurance amounting to EUR 25.8 billion. The largest single export credit guarantee amounted to EUR 16 billion and EUR 5.1 billion of this was attributed to the shipping sector. The Hermes guarantees are an important part of the German policy of export promotion.

Supporting the shipbuilding industry in construction period financing and shipyard financing is the responsibility of the Länder.

Under the German Shipping CIRR Programme, introduced in 2008, German shipyards are assisted on the international market by government supported fixed interest rates for ship buyers ordering at a German shipyard. This internationally common funding programme, which is a firmly established practice in the OECD, aims to create a level playing field amongst OECD countries. The German Shipping CIRR Programme helps German shipyards in generating business.

Measures for strengthening the competitiveness of German companies

In October 2016 the Federal Government adopted the key points of a strategy paper "new impetus in international competition for strategic large-scale projects – improving Germany's prospects." The measures contained within the key points strengthen the competitiveness of German companies in applying for strategic large-scale projects abroad. Key areas of action include improving coordination within the Federal Government and gearing existing funding instruments to the needs of German companies.

In its strategy paper the Federal Government takes into account the fact that competitors from Asia receive the systematic political support of their home countries when applying for industrial large-scale projects, which is also reflected in their extensive financing instruments. The measures mentioned in the key points are to help counteract this practice.

Specifically, the strategy paper defines the following measures:

- better coordination of projects in the strategic interest of Federal Government. For this purpose a representative will be appointed and a coordinating body in the BMWi will be established.
- better use of existing foreign trade instruments. This could, on a case by case basis, include financing of feasibility studies, assumption of 100 percent guarantees or greater consideration of foreign value-added shares in export credit coverage.
- improving financial instruments for strategically relevant projects on a case by case basis, particularly through use of KfW funds at the minimum interest rate as set by the OECD in so-called "matching situations" where operators outside of the OECD offer access to finance at very favourable conditions;
- stepping up international initiatives in particular through support of bank regulation under Basel III and Basel IV.

The Federal Government plans:

- to continue developing and efficiently using the instruments available to companies in the maritime sector for the promotion of foreign trade and investment;
- to continue with the programme for developing new markets and to offer stronger political support for important reference projects i.a. on key technologies;
- to conclude bilateral agreements between departments and governments if the prospects for German companies with large procurement projects abroad can be improved and if this corresponds to the foreign and security policy interests of the Federal Government;
- to maintain the flexible and tailored Hermes export credit guarantees for the maritime sector and to sustain the Shipping CIRR Programme at competitive conditions.

8. Training and employment

As maritime production processes become more complex and new IT is introduced into shipping, port logistics, offshore and marine technology, the demands placed on qualified maritime personnel will continue to increase. Simultaneously, wage costs remain a significant criterion for competitiveness in this internationally active sector. Securing qualified professionals remains an important task for the future in order to safeguard Germany's position as a competitive maritime hub. Functioning social partnerships can greatly contribute to achieving this goal.

Securing skilled labour for the maritime sector

The existing range of courses offered on maritime topics and the dual system of vocational education and training form a solid basis for educating the young staff in the maritime sector. Work-study programmes ("sandwich courses" or "degrees with an industrial placement") in particular help train highly competent and versatile engineers and skilled professionals for the shipbuilding industry. In the fields of shipbuilding and marine engineering there are currently more than 20 professions to choose from under the dual system of vocational education and training. The courses offer interesting employment prospects and good opportunities for career advancement.

Key to success in this area is close cooperation between the Länder who are responsible for the training establishments as well as cooperation with regard to the necessary development of training content. Future markets such as offshore wind energy and the design, construction and equipment of cruise ships and yachts are to be accompanied in future by a larger range of educational qualifications.

Shipping companies have access to a strong maritime labour market in Germany. In Germany, labour and living conditions for seafarers are extensively and modernly regulated. An effective system of flag state and port state controls secures employee rights and occupational safety standards. This proves beneficial for both shipping companies and seafarers. The number of accidents at work on vessels under the German flag has been continually declining over the past years.

Maritime technical colleges offer high-quality nautical and marine technology courses. In terms of skilled worker qualifications, young people can undergo high-quality training under the dual system. Competent and diverse maritime educational establishments with a commitment to further professional training complete this range of educational options. Germany is committed to maintaining and preserving its maritime expertise.

For more than ten years the Alliance for Training and Employment in Maritime Shipping has enjoyed a trustful cooperation.

Government funding for training and employment opportunities in the maritime industry has increased significantly.

A particular emphasis is placed on developing nautical professions further in the context of technological development and digitalisation. The aim is to define the digital skills required and that need developing in the training and further education of nautical specialised personnel and to then introduce these skills into the curriculum. This should take place in cooperation with educational establishments and in accordance with industry needs.

The Federal Government plans:

- to continue the close dialogue between the Länder, industry representatives and trade unions on the necessary adaptation of educational structures, for example to new challenges such as digitalisation, within the scope of existing platforms (e.g. Maritime Alliance and the Working Group on Interlinking the Maritime Industry with the Offshore Wind Energy Sector) and
- to increase the career and training information available on topics in the maritime sector.

9. Climate and environmental protection in the maritime industry

The maritime industry must strike the balance between the conflicting demands of economic necessities and environmental protection requirements. Both interests must be reconciled for shipping to be as efficient and sustainable as possible. An increasingly important overriding requirement is the reduction of greenhouse gas emissions in order to meet the climate protection goals. Meeting the objective of environmental and climate protection and nature conservation in the shipping industry will involve challenges but also new economic prospects. In order to meet the demands of an international and global sector in this context it is necessary to have an international legal framework that takes into consideration the interests of all involved.

Even though the shipping industry is regarded as an efficient mode of transport relative to the quantity of goods that is transports, there is still room and potential to improve on this. Over the past years clear progress has already been made: ship design and propulsion have been made more environmentally compatible, routing and operations have been optimised. At the same time, at international level new requirements were placed on the industry by the IMO, for instance the establishment of control areas for ship emissions such as sulphur and nitrogen oxide and for discharges from ships, or the recent decision by the IMO Environmental Committee to lower the maximum sulphur levels of ship fuels from 3.5 percent (which applies currently) to 0.5 percent from the year 2020. These measures will significantly reduce the environmentally harmful and unhealthy sulphur oxide emissions caused by shipping activities.

The development of alternative propulsion technology and the establishment of new marine fuels can support the objective of complying with stricter air pollution control requirements. Concurrently they open up a new area of business for the innovative German shipbuilding and supply industry. The Federal Government is leading by example by equipping its ships with LNG technology. A draft policy developed at the BMVI for further funding for the use of LNG in shipping activities is currently being coordinated between the various ministries.

As part of the development of the Mobility and Fuels Strategy further suitable programmes on market activation are being developed and implemented as necessary in order to promote a quicker introduction of alternative fuels.

The ratification of the Paris agreement has increased the pressure on the shipping industry to play its part in international climate protection. The IMO Environment Committee has therefore greatly intensified the debate on an "appropriate contribution" by the shipping industry to reducing its greenhouse gas emissions. In addition to adopting a data collection system for monitoring efficiency, the development of a comprehensive strategy was also agreed upon during the 70th meeting of the Environment Committee in October 2016. Work on this began immediately. The Federal Government has set in motion the debate on an "appropriate contribution" by the shipping industry and will continue to actively pursue this issue within the scope of the IMO.

The Federal Government plans:

- to continue playing an active role in shaping appropriate provisions on climate and environmental protection and to support the designation of further marine protected areas (ECAs). Efforts should be undertaken to ensure that regulations are made at an international level as far as possible.
- to support the introduction of new fuels and propulsion systems, which contribute to lowering air pollutant and greenhouse gas emissions;
- to explore the feasibility of equipping or retrofitting existing vessels under the authority of the federal government departments with new propulsion methods and to plan new vessels accordingly;
- to support the implementation of the IMO's global data collection system for recording fuel consumption of ships and to promote the adaptation of the European MRV system accordingly;
- to push in the IMO the specification of a long-term target for the shipping sector to reduce CO_2 levels that is consistent with the climate protection goals agreed on in Paris.

10. Public procurement

The spectrum of contracts awarded by Federal Government contracting authorities for projects in the maritime sector ranges from the procurement of dedicated vessels, e.g. for customs authorities, the Federal Police, fisheries inspection or the federal waterway and shipping administration and the construction of technology-intensive research vessels such as POLARSTERN II, to repair work for ships and component procurement through to maritime services. Even naval shipbuilding is part of the public procurement spectrum.

As a "buyer on the market", public authorities can assume an important role as a driver of innovation and should serve as an example when it comes to enforcing high social and environmental standards. Particularly in durable goods such as ships, which can have a life cycle of more than 30 years, operating costs (i.a. energy consumption) and through-life costs (i.a. maintenance requirements) are important factors influencing the efficiency and quality of the procured good.

Public procurement rules in the maritime sector

New vessels regularly exceed the threshold for Europewide tendering. Furthermore, ship orders tend to be technically complex involving extensive technical planning in drafting the tender specification and in setting the award criteria prior to publication in addition to intensive project management support during shipbuilding itself. Due to the requirements specification, the procured units are usually prototypes or made in very small batches, which generally involve considerably higher technical and, therefore, also financial risk for the shipyard than conventional mass production.

The Act on the Modernisation of Public Procurement Law of 17.02.2016 (Federal Law Gazette, part I, p.203) has led to the consolidation of quality and innovation aspects and social and environmental aspects. In the Act against Restraints of Competition, the whole course of the tendering procedure is outlined for the first time from the tender specification through to the awarding process itself. Clarity is provided on which strategic requirements may be imposed in which stage of the tendering procedure. By stipulating certain features – e.g. requirements regarding the materials used, the life cycle of the product or the provision of documentation and customer support services – public authorities can ensure that only tender bids that take into consideration certain qualitative, innovative, social or environmental provisions will have a chance of being awarded the contract.

In the competitive public-sector procurement of ships and boats, due attention needs to be paid to the fact that in the European Single Market the same competitive conditions must apply for all companies. Above all this entails ensuring equal parameters in awarding contracts. This is highly important for private-sector small and medium-sized companies and for the defence industry in Germany, particularly in comparison with European competitors.

Procurement for the German navy

Public contracts are very important for the maritime industry since government and naval vessels in this export-orientated sector act as important reference projects for the international market.

The Federal Government's strategy for strengthening the defence industry in Germany, which was incorporated in the White Paper on Security Policy adopted in July 2016, not only involves strengthening the European framework for the defence industry and a closer cooperation with European partners but also the retention of key national defence technologies. Sensor technology and subsurface units were identified as key national technologies that are relevant for the naval sector. When weighing up foreign, European and defence policy interests in making procurement decisions, it is intended that particular consideration is given to the retention of key defence technologies and that there is interministerial support for the decision.

The objective of the "Armaments Agenda" by Federal Government of Defence (BMVg) is to make armaments more transparent, effective and modern. This includes structured dialogue with industry which covers the abovementioned issues.

The Federal Government plans:

- to strengthen qualitative, innovative, social, climate and environmental aspects in the procurement of government vessels and to make the procurement process more efficient;
- to provide more detailed information on the general course of procurement procedures for interested companies via the contracting entities and to promote dialogue between actors on technical requirements for the warranties of specification features and on current innovative processes in shipbuilding;
- to take greater account of innovations during public procurement in the maritime sector and to take up these innovations in projects funded as part of R&D programmes;
- to allow for stronger international cooperation in naval procurement through joint procurement programmes with European partners in line with the challenges of a changing security scene in Europe and the defence planning processes of the EU and NATO as well as
- a regular review of the list, particularly of the key defence technologies that are relevant for the maritime sector and
- better transparency in procurement processes; i.a. by defining needs and requirements in close dialogue with industry in the form of a maritime military strategy.

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