



Maritime sector developments in the global markets

SmartComp Research Report No 3, October 2013



CENTRAL BALTIC
INTERREG IV A
PROGRAMME
2007-2013



EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
INVESTING IN YOUR FUTURE

The Smart Comp project is partly financed by the Central Baltic INTERREG IV A
Programme 2007-2013.

CONTENTS

| | | |
|----------|--|------------|
| 1 | Summary..... | 3 |
| 2 | Introduction | 5 |
| 2.1 | About SmartComp and this report..... | 7 |
| 2.2 | Research group and structure of the research | 7 |
| 3 | Key clusters in the global maritime sector | 10 |
| 3.1 | Brazil..... | 10 |
| 3.2 | China | 15 |
| 3.3 | Denmark..... | 22 |
| 3.4 | France..... | 26 |
| 3.5 | Germany..... | 32 |
| 3.6 | Italy..... | 37 |
| 3.7 | Japan | 41 |
| 3.8 | The Netherlands..... | 46 |
| 3.9 | Norway..... | 52 |
| 3.10 | Russia | 58 |
| 3.11 | Singapore | 63 |
| 3.12 | South Korea..... | 69 |
| 4 | Other interesting countries and regions | 74 |
| 4.1 | Africa | 74 |
| 4.2 | Australia | 76 |
| 4.3 | India | 78 |
| 4.4 | Indonesia..... | 80 |
| 4.5 | Malaysia | 82 |
| 4.6 | The Middle East | 83 |
| 4.7 | North America..... | 86 |
| 4.8 | The Philippines..... | 90 |
| 4.9 | Vietnam..... | 93 |
| 5 | Conclusions | 96 |
| 5.1 | Summary of the key maritime clusters outside the CBR | 96 |
| 5.2 | Business opportunities for the CBR actors in global markets..... | 99 |
| 5.3 | Possibilities for learning and benchmarking..... | 101 |
| 6 | References | 104 |

1 SUMMARY

The aim of this report is to discuss and analyse the global developments in the maritime sector and hence provide new perspectives for visioning the future of the maritime clusters in the Central Baltic region (CBR). Based on a vast desk study and expert interviews, the report presents the recent developments and future prospects in the most important maritime clusters around the world. The countries and regions studied in this report are illustrated in the following figure¹.

Figure 1. The countries and regions analysed in the third SmartComp Research Report



¹ Source of the original map: www.free-world-maps.com.

The report concludes that there is growing global demand for cleantech solutions, design and engineering services, ship repair and conversion services, offshore expertise, and Arctic expertise. In highly developed maritime clusters the market potential lies mostly in niche technologies and services, whereas clusters at lower stages of development provide markets for various infrastructural suppliers as well as project management and personnel training experts.

However, in the growing markets there are also more and more competing actors. Although knowhow in the aforementioned technologies forms the current competitive advantage of the CBR maritime clusters, there are also other actors providing state-of-the-art expertise in the same fields. For instance the offshore sector seems to be very attractive as almost all of the studied regions plan to focus on the related activities and expertise. Thus, although the offshore markets are extensive, there is eventually room only for the best of the best. It seems that the future competitiveness of the CBR actors lies in highly specific niches, but even when holding the world-leading technologies and expertise, no company should ever rest on one's laurels – R&D as well as marketing efforts need to be continuous.

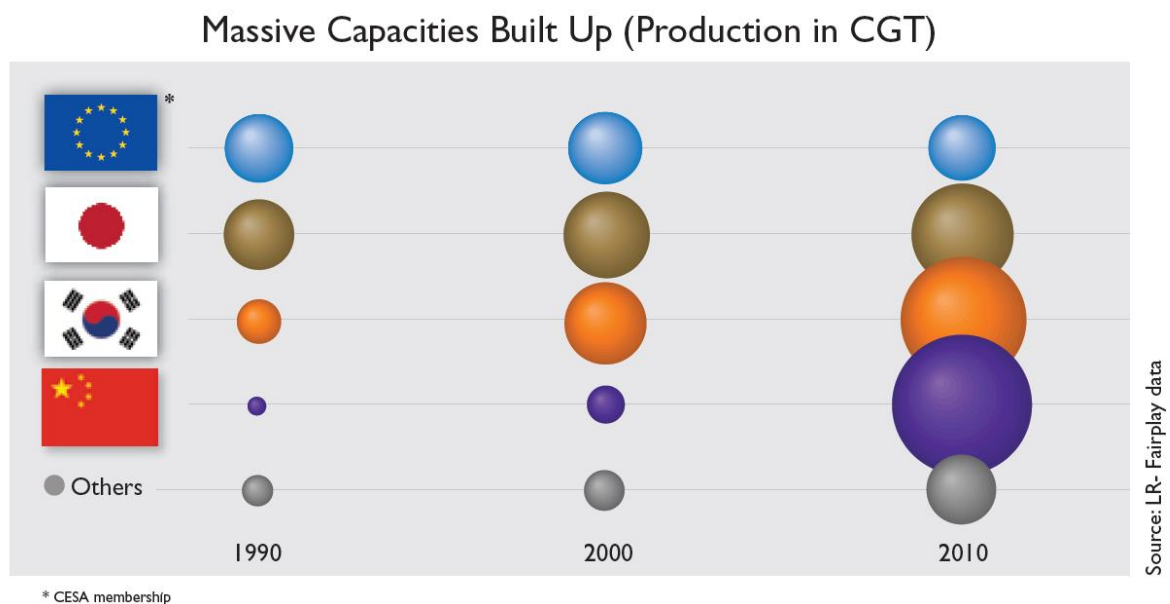
It is also clearly worth noting that competing clusters have been smarter in some dimensions of developing the maritime sector. The CBR clusters should thus closely follow not only the market developments but also technological, infrastructural and business-related advancements in the studied regions, Denmark, Norway and Singapore presenting very interesting examples. Governments play a key role in the development of these successful clusters, most importantly through clearly defined visions of the clusters' future, which are then implemented in cooperation with strongly committed stakeholder efforts and supported by the relevant infrastructural developments. Simultaneously the local associations are not only supporting the interests of their members within the national cluster but are involved also in international discourse and active marketing of the domestic expertise. New research centers are being established with mixtures of public and private funding, coming even from foreign companies. The public and private actors also cooperate in developing the local maritime education and in improving the image of this traditional industry towards a modern and more attractive field of work. Local companies are thus actively linked with the state authorities, local research institutions, and also international business networks.

The report shows that even the most successful clusters have significant challenges, but with active triple helix cooperation, brave industry networking, and strong investments in implementing ambitious visions, the clusters will continue successful development. The CBR maritime clusters seem to lack a clear vision and strategy for developing the sector, and the public actors should rapidly decide on the direction to which the development efforts should aim at. Without a clear vision and strong commitment, the triple helix cooperation cannot solve the significant problems these clusters are facing. At the same time, the CBR maritime clusters should actively build presence in the global markets – that is the only way to discover emerging business opportunities and take the others' smart solutions and best practices back home.

2 INTRODUCTION

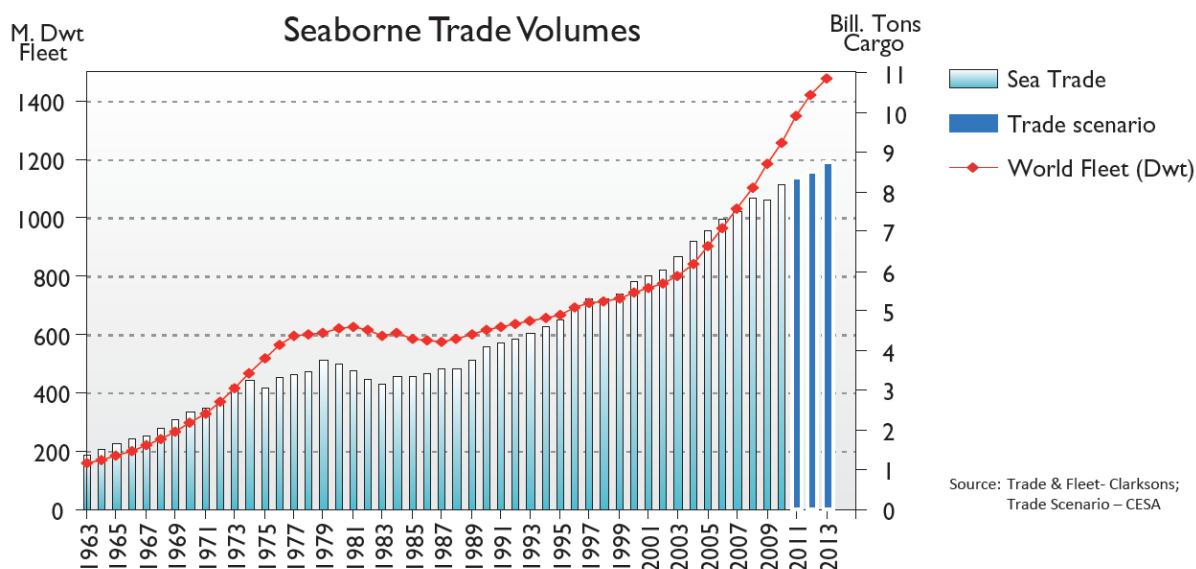
The global maritime sector is facing great changes. The shipbuilding industry worldwide is suffering from a significant excess capacity, particularly due to the large improvements in the productivity of the shipyards and the over-investments in the industry. The production capacity, particularly in several Asian countries, was expanded forcefully before the economic crisis – for instance, in only a few years, China rose to the largest shipbuilding nation in the world. Europe, on the other hand, has lost its market share for the booming maritime industries in the Far Eastern countries, particularly China and South Korea, which are producing series of standardized vessels at low costs. However, as the competitive advantage of the European clusters lies in high quality and specialization, they have been able to maintain their market share particularly in some special types of vessels, such as cruise ships. The imbalance between supply and demand in shipbuilding has also affected shipping markets because so much new tonnage is entering the market. Although the demand for shipping services has been growing after the economic downturn, the fleet oversupply is still overrunning the cargo growth and the future demand for cargo ships remains uncertain. (CESA 2011) The following figures illustrate these developments.

Figure 2. The development of global shipbuilding capacity



Source: CESA 2011, 4.

Figure 3. Comparison of the world fleet and sea trade developments



Source: CESA 2011, 6.

Besides the changes in the shipbuilding industry worldwide, there are other trends shaping the development of the global maritime sector. The shifting of energy production to new areas, particularly the Arctic region, and opening of new shipping routes, such as the Northeast Passage, create a growing demand for specialized maritime and offshore solutions, as well as new icebreaking and shipping services. Environmental-friendly solutions, such as cleantech, are of increasing importance as well, as there is both a growing need and awareness to prevent environmental pollution and to mitigate the climate change.

The Central Baltic region maritime clusters are also affected by the changes taking place in the maritime sector worldwide. The constantly increasing competition creates challenges for the region's actors to which they can only respond by maintaining their position in the forefront of the global innovation development. However, that is not an easy task, particularly when the local environment is also facing significant changes, such as the rising cost levels and the tightening environmental regulations, to mention some examples. Looking more closely into the global developments in the maritime field is crucial not only because knowing the competitors is important but also because the other successful maritime clusters offer a chance for benchmarking and learning, and even applying their best practices in some form to the CBR. Furthermore, as the CBR maritime clusters should be constantly seeking for new markets abroad, revealing potential business opportunities for the region's maritime companies requires an analysis of the structure and competitiveness of the other maritime clusters around the world.

2.1 ABOUT SMARTCOMP AND THIS REPORT

SmartComp – Smart Competitiveness for the Central Baltic region is a Central Baltic INTERREG IV A Programme 2007–2013 financed project which aims to support smart, environmentally sustainable development, growth, competition and cooperation between maritime clusters, cities and universities in the Central Baltic region, i.e. in Estonia, Finland, Latvia and Sweden. The partners involved in the project include Union of the Baltic Cities, Commission on Environment Secretariat (Lead Partner, Finland), University of Turku/Centre for Maritime Studies (Finland), University of Turku/Turku School of Economics (Finland), Centrum Balticum Foundation (Finland), Åbo Akademi University (Finland), Tallinn University of Technology (Estonia), University of Tallinn (Estonia), Riga International School of Economics and Business Administration (Latvia), and Latvian Maritime Academy (Latvia). Through triple helix cooperation, this consortium seeks new opportunities for the maritime clusters in the CBR. The project is divided into four Work Packages: (WP1) Management, (WP2) Research and analysis, (WP3) Training and consultation, and (WP4) Policy development and branding. This publication is the third research report² of WP2, describing and analysing the other globally strong maritime clusters in relation to the CBR.

Regarding earlier research on the maritime sector developments at a global level, some studies have been conducted for instance concerning the maritime industry, e.g. *CESA Annual Report 2010-2011*, *Global shipbuilding Market Report* (2013), *Marine Construction (Global) - Industry Report* (2013) and *Global Marine Trends 2030* by Lloyd's Register's Strategic Research Group, QinetiQ and the University of Strathclyde (2013), and concerning the maritime logistics, e.g. *Global Shipping Industry 2013 - Forecast, Trends & Opportunities* by Taiyou Research and *Navigating in stormy waters - Global Shipping Benchmarking Analysis 2012* by PwC. However, earlier global-level studies analysing the key maritime clusters – let alone from the perspective of the Central Baltic region – could not be found. Thus, the aim of this report is to discuss and analyse the global developments in the maritime sector and hence provide new perspectives for visioning the future of for the CBR maritime clusters and also information for the CBR maritime companies concerning the business opportunities emerging in the global markets.

2.2 RESEARCH GROUP AND STRUCTURE OF THE RESEARCH

This research report was produced in June–October 2013 by the project research group comprising Kari Liuhto, Eini Laaksonen, Hanna Mäkinen, Minghui Gao and Akseli Jouttenus from the Pan-European Institute at Turku School of Economics at the University of Turku (Finland) and Annemari Andréén and Jenni Junnelius from PBI Research Institute at Åbo Akademi University (Finland). Brief descriptions of each member of the multidisciplinary research group are presented next.

WP2 leader **Kari Liuhto** is Professor in International Business (specialisation Russia), Director of the Pan-European Institute at the University of Turku, Finland, and Director of Finland's Baltic Sea region

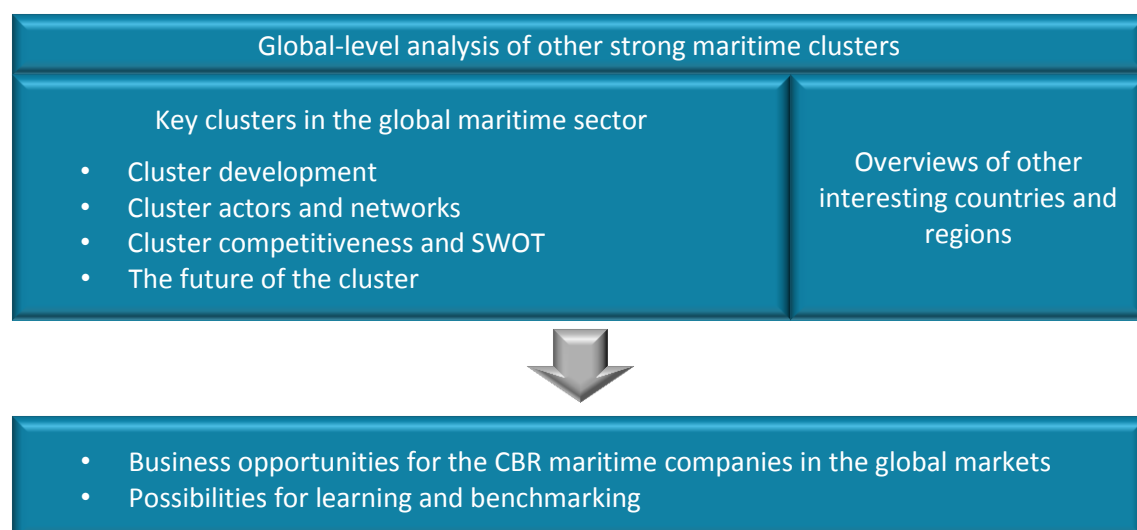
² Regarding the research conducted for this report, the researchers are highly grateful for the financial support provided also by Liikesivistysrahasto (the Foundation for Economic Education) and Werner Hacklinin säätiö (the Werner Hacklin Foundation).

think tank called Centrum Balticum. His research interests include EU-Russia economic relations, energy relations in particular, foreign investments into Russia and the investments of Russian firms abroad, and Russia's economic policy measures of strategic significance. M.Sc. (econ) **Eini Laaksonen** is Project Researcher at the Pan-European Institute. She has specialised in International Business with an emphasis on the economic development of the Baltic Sea and Barents Sea regions. She has been involved in several research projects and has published articles concerning business prospects and risks in the Barents and Baltic Sea regions, most recently focusing on the maritime cluster developments. **Hanna Mäkinen** holds M.A. in General History, Political Science and Contemporary History from the University of Turku. She currently works as Project Researcher at the Pan-European Institute. She has been involved in several research projects and her main research interests include economic and political development of the Baltic Sea region, recently focusing particularly on the maritime cluster developments, and contemporary history of the Baltic States. **Minghui Gao** holds M.A. in Baltic Sea Region Studies from the University of Turku. She currently works as Research Assistant at the Pan-European Institute and is also a doctoral student at the Faculty of Behavioral Sciences at the University of Helsinki. **Akseli Jouttenus** is Research Assistant at the Pan-European Institute. He is also studying accounting and finance at Turku School of Economics.

M.Sc. (econ) **Annemari Andrén** works as a Researcher at Åbo Akademi University, Laboratory of Industrial Management and as a Manager at PBI Research Institute. She has conducted extensive research for the marine industry for over 15 years. Her areas of expertise are business relations (customer, supplier and employee relationships) and business model development. She has been involved in several research programs and strategic assignments regarding value creation, business logic and business model development in project-based firms. She has carried out close to 1 000 personal interviews across the world and produced solutions to complex problems relating to customer management and value-adding. M.Sc (econ) **Jenni Junnelius** is working as Junior Analyst at PBI Research Institute at Åbo Akademi University. She also holds a Master's degree in sociology from Helsinki University. At PBI she has focused on projects related to the maritime industry.

The structure of the research follows the construct presented in the SmartComp Work Plan for WP2 and is presented in the following Figure.

Figure 4. Structure of the research



As originally planned and presented in the WP2 Work Plan, the work for Task 3 began in June 2013 with the collection of research material. Material was collected from various media sources and earlier studies on other maritime clusters, as well as by conducting expert interviews. Altogether ten expert interviews³ were made particularly for Task 3, and interviews made for previous tasks were also taken advantage of. The clusters to be analysed were selected based on their importance on a global scale, as well as their significance from the point of view of the Central Baltic region. The clusters selected for the analysis were divided into two groups: 1) Key clusters in the global maritime sector, comprising Brazil, China, Denmark, France, Germany, Italy, Japan, the Netherlands, Norway, Russia, Singapore, and South Korea, and 2) Other interesting countries and regions, comprising Africa, Australia, India, Indonesia, Malaysia, the Middle East, North America, the Philippines, and Vietnam. Countries in this first group were discussed concerning their development and current state, main challenges and opportunities, and future prospects. While the researchers also wanted to give the readers a grasp of developments in other countries and regions which might not be considered as key players in the global scale but still worth looking into, the latter part of the report presents brief overviews of these other interesting maritime regions. Consequently, instead of conducting a comprehensive mapping of all maritime clusters in the world, the report aims to highlight and discuss only the most important clusters and trends from the perspective of the CBR. The report is concluded with a discussion on the competition the region is facing from these overseas clusters, on the business opportunities these clusters are offering for the CBR maritime companies, and on the possible benchmarking and learning opportunities based on the ways in which the sector is developed elsewhere.

The report contributes to the project outcomes with an analysis on the development, structure and competitiveness of globally strong maritime clusters outside the Central Baltic region, and supports the creation of the concluding report in the final phase of the project. At the same time, the report provides fresh ideas and viewpoints to be discussed in Work Packages 3 and 4. For more information about the forthcoming SmartComp publications and events, please visit www.cb-smartcomp.eu.

³ The experts interviewed were **Gerhard Calsson** (Verband Schiffbau und Meerestechnik), **Nikolai Dobronrav**in (St. Petersburg State University), **Erik Dyrkoren** (Maritim21), **Jan Fritz Hansen** (Danish Shipowner's Association), **Christoph Lauer** (Verband Deutscher Reeder), **Jo Stein Moen** (MARINTEK), **Kai Paananen** (SET Group), **Lene Rasmussen** (the Danish Maritime Cluster project), **Francis Vallat** (Cluster Maritime Français), and **Pietro Zanini** (Wärtsilä Italia). Moreover, interviews were requested from various other experts around the world but within the project's timeframe, only these highly informative discussions were eventually conducted.

3 KEY CLUSTERS IN THE GLOBAL MARITIME SECTOR

3.1 BRAZIL – HUGE MARITIME NEEDS DUE TO RAPID OFFSHORE DEVELOPMENT

By Eini Laaksonen

The development of the cluster

The shipbuilding industry has a long history in Brazil and some of the shipyards still operating were established in the 19th and 20th century. Although the industry's history in Brazil is characterized by strong government intervention and occasional economic and political chaos, in the 1970s Brazil was for a moment the world's second largest shipbuilder after Japan. (NID 2011) In the next decade problems arrived again, but in the 1990s, a number of modernization and trade liberalization reforms were implemented and the inflation was finally brought under some control. Successful fiscal and economic policies led to economic growth in many sectors and to the increase of incoming foreign investments. (MOR 2013; Cruz 2012) In 2000, the marine and offshore engineering employed directly less than 2000 people, whereas in 2010 the number had exceeded 78 000 (NID 2011).

The main drivers of growth in the Brazilian maritime industry have been the increased activities in the offshore production of oil, relative economic stability, and the massive investments particularly by the national energy company Petrobras⁴ in building a self-reliant maritime sector to the country. This company aims at doubling its production capacity by 2020 up to 5,4 million barrels a day, requiring 38 new deep sea drilling rigs, 280 support vessels, and some 70 tankers, with investments totaling USD 228 billion. (NID 2011) To achieve these ambitious goals, 9 new shipyards are under construction in different regions of Brazil and the orderbook of local shipyards contains 367 orders for shipbuilding and offshore construction, accounting for 8% of the worldwide activity (IN 2013).

Moreover, the Brazilian government aims at developing also the merchant fleet and port infrastructure to match the country's economic growth (NID 2011). The Brazilian exports have tripled during the last 10 years (BBE 2008) and at the current state Brazil's 34 major ports are unable to handle the potential quadrupling of traffic to some billion tonnes a year by 2030 (Boadle 2013). In 2013, the Brazilian government signed into law new regulations for expanding private sector participation in the port operations in order to improve the situation with the ports clogged by rising cargo volumes. Private investments are highly welcome to the logistical sector as currently the exports of agricultural harvest and hydrocarbons are continuously jammed due to the shortage of trucks, queues at ports, poor port management, and poor general infrastructure. (Ribeiro 2013; MecroPress 2013) Consequently, the reforming Brazilian maritime sector is facing various challenges and foreign actors are welcome to the development process.

⁴ Petrobras, the largest company in Brazil, is a publicly traded corporation with the Government of Brazil holding the majority of stakes. The company operates in the following sectors: exploration and production, refining, oil and natural gas trade and transportation, petrochemicals, and derivatives, electric energy, biofuel and other renewable energy source distribution. The company is present in 25 countries and the 2013–2017 Business Plan calls for investments of USD 236,7 billion. (Petrobras 2013)

Cluster actors and networks

Due to the significant investments in the maritime industry, Petrobras and the affiliated companies play a key role in the industry's future development in Brazil. The booming of the industry can be seen in the vendors list of Petrobras, which already in 2010 comprised 900 vendors (NID 2011). The Brazilian exploration and drilling company OGX is also contributing to the industry's development with its rig and vessel orders. In addition, the Brazilian navy has actively ordered vessels, such as submarines and patrol vessels, from the local shipyards, generating opportunities for technology transfer between European and Brazilian companies. (NID 2011) Due to their experience in offshore operations, particularly Norwegian ship designers, owners and operators are well present in the Brazilian market with over 100 Norwegian SMEs established in the country (NID 2011).

In Brazil the shipbuilding and marine industries have developed into distinct regional centers, some due to geographical locations near important waterways and large cities, and some as a result of active economic policies. For instance, in the cluster formed around Rio de Janeiro, there are altogether 22 shipyards specialized in building tankers, FPSOs, rigs, support vessels, container ships and navy vessels. The Pernambuco cluster, in turn, currently contains only one shipyard but the local state is intensively developing it, with a particular aim at increasing international cooperation in terms of maritime education. (NID 2011) In addition to large shipyards, a number of smaller specialized yards are focusing on niche areas such as yachts and inland water way vessels, particularly in the Southern states of Santa Catarina and Rio Grande do Sul (NID 2011).

Due to the states' development objectives, the Brazilian maritime sector is highly interested in increasing international cooperation. For instance, a Finnish minister delegation with business representatives has already several times visited the country to discuss cooperation and partnering possibilities (TEM 2013; UM 2012). Because of the local content regulation affecting the operations of foreign companies in Brazil, several companies have established subsidiary offices to Brazil or even joint ventures with local businesses. The commercialization of imported products is not directly prohibited as such trade barriers would be against WTO regulations, but mechanisms like subsidized financing, tax breaks, and quotas for preferential purchases are used to indirectly lead to a certain level of local content, depending on the industry and mode of operations (Sperling 2013). The rationale is to enhance the operations of local businesses and support local employment by forcing foreign companies to set up operations in the country instead of solely importing goods. However, the regulation is not ultimately very effective in generating local economic growth while Brazil currently suffers from the so-called megaproject disease by having inadequate local capacity and skills in relation to the ambitious plans (Byrne 2013). Foreign investments and technical solutions are urgently needed, but the content regulation combined with the challenging taxation, bureaucracy and immigration laws hinder the activities of particularly small foreign companies in Brazil (NID 2011). However, as a host of FDI flows totaling USD 65 billion in 2012, Brazil still ranks the fifth largest investment destination worldwide after the United States, China, Hong Kong and Belgium (WIR 2013), mainly due to the foreign capital entering oil exploration, growth of local consumer markets, and the preparations for the 2014 World Cup and the 2016 Olympics (Portal Brazil 2013). At the same time, competition in the Brazilian market is already fierce – particularly Asian corporations affect the maritime industry's development in Brazil through ownerships in shipyard joint ventures

and as so-called technology partners they bring in their own solutions and service providers. Breaking in these chains is rather difficult for companies coming from elsewhere (Kuuluvainen 2013).

Nevertheless, there are successful examples of business entrances into the Brazilian maritime industry also from the CBR. Within the past couple of years, for instance Finnish companies such as Almaco, Deltamarin, GS-hydro, Vaisala and Vacon have opened their sales offices in Brazil. As an inspiring example, Almaco, a Finnish company specialized in building and modernizing accommodation and food handling areas onboard passenger ships and offshore vessels, established a presence in Brazil in 2010, and in 2013 received a notable breakthrough order from Estaleiro Enseada do Paraguaçu (EEP) Shipyard in Brazil. Almaco is to build complete living quarters on six drillships to be used in the Brazilian pre-salt ultra-deep layers drilling program. (Almaco 2013) The active marketing and networking of Finnish export support organisations as well as companies, even SMEs, is starting to pay off in Brazil.

Cluster competitiveness

Regarding the future of the Brazilian maritime industry, significant developments will certainly take place, sooner or later. The global demand for oil drives the production offshore, resulting in a great and relatively rapid need of investments from rigs to various supply vessels. However, the industry is facing growing pains. First of all, the sources of financing for all the massive investments still remain somewhat unclear – for the time being, investors such as Sinergy Group, Eike Batista group, South Korean marine industries, and Brazilian development bank BNDES are involved, but in the midst of the global economic downturn it would be surprising if all the ongoing projects would be completed in the given schedules. At the same time, due to the volatility of the Brazilian financial markets, the capital costs in Brazil are rather high. Furthermore, the basic infrastructure in the coastal roads and ports remains insufficient to meet the logistical needs of the intensive growth plans. (NID 2011)

At the same time, the general business environment in Brazil reportedly suffers from heavy bureaucracy and slow political decision-making (NID 2011; Kuuluvainen 2013). For instance, in terms of greenfield investments, the rigorous process of obtaining the required environmental licenses may take years, hindering the building of new shipyards, for instance. Moreover, complicating the operations of particularly foreign companies, the Brazilian tax system is complex – a company operating in Brazil is subject to some 50 different taxes, and the rules differ between the states (NID 2011). At the same time, the local content regulation requires considerable efforts from foreign companies in entering the country.

Despite the population of some 200 million people, the lack of skilled workforce is also a problematic issue (Kuuluvainen 2013). The Brazilian shipbuilding industry employs today directly 62 000 workers, and the number is expected to reach 100 000 within the next five years (IN 2013). With the aim of supporting local employment, the granting of visas for foreign workers does not meet the needs of businesses (NID 2011). Regarding the maritime cluster, there is an evident lack of maritime and offshore industry professionals, skilled welders and work supervisors, and the salary costs of the skilled ones are in high increase together with the general inflation (the current inflation rate in Brazil around 6%). While the costs of acquiring such special expertise are becoming overpriced, it is reasonable to outsource for instance naval engineering services to Europe. (NID 2011; Kuuluvainen

2013) At the same time, absorbing imported technologies in the Brazilian maritime industry is challenging due to the unskilled workers (NID 2011).

To guarantee the availability of workforce, Brazilian maritime and offshore companies are actively cooperating with the local universities – Petrobras alone has partnerships with 120 Brazilian universities. At the same time, to fix the labor gap, the Brazilian universities are keen on developing educational programmes and other forms of cooperation with their foreign counterparts. (NID 2011) While the offshore activities attract foreign operators in Brazil and the demanding megaprojects proceed, the maritime sector in Brazil is expected to cumulate its own expertise and technological knowhow, thus increasing the country's competitiveness in the maritime sector.

Figure 5. SWOT-analysis of the Brazilian maritime sector

| STRENGTHS | WEAKNESSES |
|---|---|
| <ul style="list-style-type: none"> • Industry has a long tradition and plenty of experienced shipyards • Foreign interest in investing in the development, technology transfer • Political interest in establishing international cooperation relationships, both with foreign businesses and universities | <ul style="list-style-type: none"> • New shipyards need to be built and the old ones renovated • Lack of skilled workforce combined with the high costs of the skilled ones • The industry cannot absorb the foreign technologies fast due to the unskilled workforce • Local content regulation, complex tax system and practical requirements in knowing Portuguese hinder foreign operations • Weak logistical infrastructure • Strict immigration laws • Slow political decision-making and high bureaucracy |
| OPPORTUNITIES | THREATS |
| <ul style="list-style-type: none"> • Global demand for increasing offshore oil production • Huge investments planned for the industry • Political support for R&D and international cooperation | <ul style="list-style-type: none"> • Capital and service costs – how to finance the needed investments? • Strong role of foreign (particularly Asian) players in the sector's development • Potential for inflation growth and its effects on the economy |

The future of the cluster

Nevertheless, when it comes to the global competition, the cost levels will prevent Brazil from competing with the Asian tigers and thus Brazil is not expected to take any leading role in global shipbuilding, at least in the near future. While Singaporeans and Koreans are highly involved in the industry's development, they are not likely to contribute to building a competitor for their home clusters. However, the specialization in offshore operations and obtaining the related capacities and knowledge will shape Brazil's role in the global playground. If the offshore production in the future booms in West Africa, Brazil could sell some capacity or provide services to the African countries, or even to the Gulf of Mexico (NID 2011).

While the Brazilian maritime sector is not going to compete with prices, this new hub of offshore production activity has to invest heavily in the logistical infrastructure and R&D. The new ports law aims at expanding the private sector participation in Brazil's port operations and thus increasing competition between port operators, resulting in more efficient and lower-priced cargo handling charges. Although dock workers strongly protested the earlier drafts of the law in fear of decreased job security, the final version was largely supported and the law was signed in June 2013. (Ribeiro 2013) Considerable investments are, however, needed also in developing the surrounding rail and waterway infrastructure. Regarding R&D, while research activities have been concentrated into the Southern parts of the country, new research centers and laboratories are now being established in the Brazilian Northeast, thus covering almost the whole coastline with petroleum R&D infrastructure. Increasing R&D activities are also a result of Special Participation (PE) contractual clause, requiring the operators of large production fields to invest 1% of the net profits in R&D. At the same time, some of the globally largest service providers have started installing research centers for the pre-salt⁵ in Brazil. (Paschoalin 2010) Consequently, triple helix cooperation, in terms of R&D particularly, seems to be increasing.

For foreign companies, there are basically four entering options: (1) providing services and goods from abroad, (2) setting-up operations in Brazil, (3) associating with a local company, or (4) engaging in R&D programs with local companies and universities (NID 2011). Although the maritime sector is booming in Brazil, entering the business in a foreign country always involves risks, combined with prospects for high returns. However, the Brazilian market is consolidating fast, and there is no room for all – consequently, firms with potential interest should take rapid actions if they wish to participate in developing the Brazilian maritime clusters.

At the same time, the Brazilian government should take concrete actions for instance in developing the tax system and immigration policies in order to make the country friendlier and appealing to foreign investors. If the boom continues and investments flow in, it will also fuel the public spending and that way contribute to the conditions of the road and port infrastructure, further supporting the country's development (NID 2011). Current attempts to attract foreign businesses to the Brazilian market have been rather successful through reciprocal trade delegation visits and international conferences (e.g. Navalshore 2013 in Rio in August 2013), for instance. For the time being, however, it is rather troublesome for foreign SMEs to enter the Brazilian maritime industry, even though foreign technologies are needed in the development process. Deep pockets and patience are required from the entering companies (NID 2011), and often it is only large companies who can afford that. Moreover, while the local shipyards currently focus on building vessels rather small in size, the future of the industry lies in offshore oil production which is going to require rigs and FPSOs. Currently these can be built only on a few large yards. (NID 2011) Thus, particularly for large engineering companies and offshore operators, the developing Brazilian market provides a profitable future.

⁵ Pre-salt reservoir is a layer of oil-bearing rock of carbonate composition, positioned under a thick layer of salt. In Brazil the major exploration and production efforts are being applied on the Santos Basin Pre-Salt Cluster (SBPSC), including six blocks operated by Petrobras and several partners. The area is located 300 to 350 km away from the coast in depths of 5 000 metres below the sea level under a thick salt layer. (Estrella 2011)

3.2 CHINA – THE WORLD'S LARGEST SHIPBUILDER AFTER SKYROCKETING GROWTH

By Minghui Gao

The development of the cluster

In the last two decades, with China's emerging as a global giant on exporting, a vital foundation has been provided to its maritime development (CMSI 2013). The rapid development and expanding of maritime industry in China has significantly contributed to the country's GDP growth (CRI English, 2010). According to the latest government report, the maritime industry has employed more than 34 million workers, and reported a total production value of 5 trillion yuan (about EUR 602 billion) in 2012, which contributed almost 10% of the country's GDP and is thus seen as "a new engine for growth" (China Daily 2012; 罗沙 2013; Xinhuanet 2013). Furthermore, this report has predicted that the total production value of China's maritime industry would exceed 20 trillion yuan (over EUR 2 billion) by 2030, accounting for over 15% of the country's GDP (罗沙 2013).

As an open and highly competitive market, the global shipbuilding used to be dominated by European, Japanese and South Korean shipbuilders from the mid-19th century to the early stage of the new millennium (Mickeviciene 2011). By 2010, China had gained nearly 44% of the global ship market surpassing other major competitors, and has been ranked as the largest shipbuilding country in terms of order book volumes since then (Mickeviciene 2011; Yang & Zhu 2011; China Daily 2012; China Economic Net 2013). In 2012, the completion volume of China's shipbuilding industry was 60,2 DWT and new order quantity was 20,4 million DWT (China Economic Net 2013; Liu 2013; MIIT 2013).

Shipbuilding industry in China has transformed from defense-focused into a commercial enterprise since 1982, and it has been expanding considerably with China's accelerated economic growth (Collins & Grubb 2008; OECD-WP6 2008). Nowadays, the primary focus of this rapidly growing industry is on commercial vessels, and most of the production is 6,000-and-under TEU container ships, bulk cargo carriers, crude oil tankers, and high value and sophisticated vessels (Collins & Grubb 2008; OECE-WP6 2008). Though the primary aim of increasing shipbuilding capacity in China has been to maintain self-sufficiency in sea transport and satisfy domestic use, ships and boats are also exported to 169 countries and regions, mainly to Asia and Europe (OECE-WP6 2008; China Daily 2012; Mickeviciene 2011; 何广顺 2012). As the world's biggest ship manufacturer, 80% of the gross output of Chinese shipyards is devoted to export customers (Collins & Grubb 2008; China Daily 2012).

Based on statistics in 2005, the number of shipbuilding companies in China exceeded 2 000, employing approximately 400 000 workers (OECE-WP6 2008). Currently there are four types of firms in China's shipbuilding industry: large state-owned enterprises (SOEs), joint ventures, small private-owned enterprises, and military shipyards (Collins & Grubb 2008; Yang & Zhu 2011). The first three types are discussed more often in terms of exporting: more than 78% of the export sales comes from SOEs, over 16% comes from joint ventures, and over 5% is contributed by the small private-owned enterprises (OECE-WP6 2008).

The SOEs, as the key players, refer to the two massive state-owned conglomerates: the China State Shipbuilding Corporation (CSSC) that handles shipbuilding activities in the east and the south of

China, and the China Shipbuilding Industry Corporation (CSIC) that deals with those in the north and the west of the country (Collins & Grubb 2008; Yang & Zhu 2011). CSSC and CSIC are directly under the supervision of the central government (Yang & Zhu 2011). They both have a high degree of investment and capital-management autonomy from the state, and they are allowed to involve in direct competition for both domestic government contracts and international orders (Collins & Grubb 2008). With their mega-size production and technology capacity, these two conglomerates dominate China's shipbuilding market (Collins & Grubb 2008; ECORYS Research & Consulting 2009; Yang & Zhu 2011).

With China's ever-increasing trade and its flourishing shipbuilding business, China's total demand for maritime shipping is the largest among all countries (Khalid 2006; 张良 2011). As the biggest iron ore importer, the second biggest crude oil importer, and the biggest exporter of manganese, copper and chrome ore in the world, over 90% of China's foreign trade cargo delivery (including nearly 95% of imported crude oil and 99% of imported iron ore) are carried by sea (Xu 2008; 刘兴增 & 杨光 2008a; 张良 2011; 陆娅楠 2011; 环球网-财经 2012; 殷毅 2013; 中国网-财经 2013). Therefore, China's shipping industry has become a vital industry, which is highly related to the rapid development of the economy, foreign trade, and national security (张良 2011; 陆娅楠 2011; 环球网-财经 2012; 殷毅 2013; 中国网-财经 2013).

Since 1980s, China has been reforming its transportation system; after a decade of development, the reform was briefly completed in the early 1990s (刘兴增 & 杨光 2008b). In 1993, China's largest international ocean shipping enterprise – China Ocean Shipping Company Group (COSCO) was founded; and China's largest coastal shipping enterprise – China Shipping Company Group (CSC) was founded in 1997 (刘兴增 & 杨光 2008a; Le 2010). These two originally state-owned enterprises have become “the backbone” of China's logistics/shipping market (Le 2010).

By the end of 2012, China owned 2 486 oceangoing vessels (on average 27 932 DWT per vessel) and 10 947 coastal trading vessels (on average 5 959 DWT per vessel), and the dimension of China's shipping fleet ranks 3rd in the world (陆娅楠 2011; 中国网-财经, 2013). The volume of trade from sea shipping service exceeded EUR 37,5 billion in 2011 (环球网-财经 2012). Moreover, this increasing demand of shipping will keep stimulating the development of China's shipping industry – according to Qinetiq, Lloyd's Register and University of Strathclyde's united report of “Global Marine Trends 2030”, by growing from 15% in 2010 to 24% in 2030, China will have the largest growth in fleet ownership among all countries and regions by then (Qinetiq, Lloyd's Register and University of Strathclyde 2013).

As the country increasingly gains ascendance in global trade, China has been experiencing a boom also in harbor construction (Khalid 2006). Maritime infrastructure in China continues to be developed at an extremely fast pace (Khalid 2006). Currently there are over 150 seaports in China, providing an overall port throughput of over 100 million TEU annually that tops the world list. In the meantime, China's port handling efficiency also set world records (Ministry of Communications of the PRC 2006; Xu 2008; 贾大山 2008). Among the world's top 20 sea ports in terms of total throughput capacity and container handling capacity, China has 12 and 8 ports in the lists respectively. Moreover, in the past decade, Chinese ports have continuously been the world leaders

in terms of the total throughput capacity and container handling capacity (陆娅楠 2011; 中国网-财经 2013). China has become a significant sea-nation after the 60 years of development (张良 2011).

When speaking of ports in China, the Port of Hong Kong is an inseparable and important component. The Port of Hong Kong is one of the few major international ports whose port facilities are financed, owned and operated by the private sector (Hong Kong Port Development Council 2013; Ship Technology 2013d). The container terminals, nine in total, are operated by five companies: Modern Terminals, Hong Kong International Terminals, COSCO, Dubai Port International Terminals, and Asia Container Terminals. Meanwhile, the Hong Kong Special Administrative Region Government and the Hong Kong Port Development Council are undertaking strategic planning of the ports and providing the necessary supporting infrastructure (Hong Kong Port Development Council 2013; Ship Technology 2013d).

Cluster actors and networks

China's shipbuilding industry is controlled by the two conglomerates CSSC and CSIC, which split their "territory of power" by the Yangtze River: CSSC controls shipbuilding activities in the east and the south of China, and CSIC handles those in the north and the west of the country (Collins & Grubb, 2008; Yang & Zhu 2011). Therefore, the shipbuilding clusters in China are distributed accordingly, along with the location of China's longest river, the Yangtze; the largest river in South China, the Pearl River; as well as the second longest river of the country, the Yellow River (OECE-WP6 2008). According to the current study, there's little cooperation between the clusters or the two companies.

Though most of the shipyards are state-owned and the openness of Chinese shipbuilders to foreign shipbuilding companies is limited, the situation is changing gradually. There is currently a number of joint ventures and small private shipbuilding enterprises that are actively connected with foreign partners. In the recent years, foreign investment has been engaged in support activities of shipbuilding industry, such as marine equipment industry (OECE-WP6 2008). Most of the foreign capital comes from Europe, South Korea, the U.S., and Japan (e.g. Wärtsilä, MAN B&W, ABB, Caterpillar, Daeyang, Samsung Group, Daewoo) (OECE-WP6 2008; Mickeviciene 2011). Foreign investment in most joint ventures has been limited to a 49% share, especially when it concerns shipyards, diesel engine and crankshaft manufacturing enterprises. They are also required to "transfer their expertise to local partners through the establishment of technology centers" (Collins & Grubb 2008).

Besides such joint ventures, the cooperation between China and foreign shipbuilding companies has also been increasing. For instance, the increasingly topical polar scientific research has brought the Helsinki-based Aker Arctic Technology Inc. (hereafter Aker Arctic) and China together. In 2012, Aker Arctic signed a contract with China, who chose Aker Arctic to design a new icebreaker that is equipped with advanced scientific equipment for the purpose of China's research on polar oceans (Aker Arctic Press Release 2012).

Concerning shipping industry and ports, the "National Plan for Coastal Port Layout" of China (published in 2006) divides all seaports into five groups: Bohai Sea Area, Yangtze River Delta, Southeast Coastal Area, Pearl River Delta, and Southwest Coastal Area, which are considered

shipping and port clusters (Ministry of Communications of the PRC 2006; Xu 2008; 杨光 2008; Lian 2013). The cooperation takes place within each cluster where the nearby ports form a chain (rather than network) serving the surrounding area. These clusters are rather independent and localized systems. This situation is even more common when it comes to smaller ports, those that are not as well-known as mega-cities/ports.

However, the main players COSCO and CSC have been actively developing their international networks by expansion overseas. In the meantime, the international network of China's ports has been strengthened by the entry of foreign companies. More importantly, the EU-China Maritime Transport Agreement entering into force has further accelerated the international cooperation in the global shipping industry. This agreement enables unrestricted access to maritime transport services, cargoes and cross trades, as well as the use of ports and auxiliary services between European Community, Austria, Belgium Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, the UK and China (EU-China Maritime Transport Agreement 2002).

Cluster competitiveness

In general, China's emerging economy, strong support by the state, and the country's huge human potential have been the largest engines in accelerating the development of China's shipbuilding industry (Mickeviciene 2011). China's principle advantage on the world shipbuilding market has always been the price of its vessels, which is mainly brought by its low production costs; particularly its abundant supply of relatively skilled, low cost labor, as well as other costs (OECE-WP6, 2008: 15 & 23). The ability of building competitively priced basic vessels, especially bulk tankers, has made China's shipbuilders attractive to worldwide orders (OECE-WP6 2008). Comparing with Japan, South Korea and Europe, the rapid growth of China's shipbuilding industry is also due to its attractiveness to foreign direct investment and strong foundation of its existing shipbuilding sector (OECE-WP6 2008).

The main factors considered as limits to the growth of China's shipbuilding industry are low complexity and comparatively poor management (Collins & Grubb 2008; OECE-WP6 2008). Though the shipbuilding industry of China has been taking advantages of its abundant supply of skilled and low cost labor, its productivity is still low by international standards (OECE-WP6 2008). The strong advantage in labor costs – the labour costs in China are considerably lower than in Japan and South Korea – helps the industry in offsetting the productivity disadvantages. However, when comparing with Japan and South Korea, China's average production output and average output value are also significantly lower than of the two former market leaders (OECE-WP6 2008). In other words, the shipbuilding industry of China is rather labor-intensive and less efficient (Collins & Grubb 2008). Moreover, even though China stands on top of the list in terms of the order book volume, its products mainly include rather low-complexity vessels and the industry heavily depends on the bulk carrier market (Collins & Grubb 2008; OECE-WP6 2008). High value-added production capacity accounts for less than 10% of the world's market (Mickeviciene 2011).

The development in China's shipping industry, in turn, has supported the development of mega-sized shipping companies such as COSCO and CSC, as well as that of modernized seaports like the Port of Shanghai and many other ports along China's coastal line (中国海事服务网 2013). The

maritime fleets of China have their advantages in terms of vessel technology and size, which enables them to provide services that request large capacity (中国网-财经 2011; 中国海事服务网 2013). The total throughput capacity and container handling capacity, as well as handling efficiency of China's seaports, rank high in the world (中国网-财经 2011).

Though China's shipping companies are ranking high in the world in terms of their fleet sizes, comparing with its need for shipping, the size is still rather small – in 2012, the shipping capacity of China was about 68% of that of Japan and Germany, but China's need for shipping was already much higher than that of the two counterparts (中国网-财经 2011; 中国海事服务网 2013). Moreover, China's influence on the developments in the important shipping channels is still very weak – its influence at the Strait of Malacca, Sunda Strait, Lombok Strait, Suez Canal, Strait of Hormuz, Panama Canal is very limited at the moment (中国网-财经 2011; 中国海事服务网 2013).

Concerning the construction of shipping network, though the Chinese government and conglomerates pay much attention to it, the development is very slow and a comprehensive network has not yet been constructed (中国网-财经 2011; 中国海事服务网 2013). Though China has set the goal of making Shanghai, Tianjin, Dalian and Xiamen international shipping centers, the major achievement is still merely concerns the port throughput capacity and there is very much work to do in terms of urban environment, fundamental shipping services, shipping information and financial service of the ports and their surroundings (中国海事服务网 2013). In addition, the public awareness of the above-mentioned ports is still low in the world – for instance, over 68% recognize Shanghai as an economic center, but only 36% see it as a shipping center (中国网-财经 2011).

Shipping companies in China are generally weak in stabilizing and adjusting their business to the market fluctuations and their profits vary significantly between the market booming period and down period, which has revealed their weaknesses on risk management (中国海事服务网 2013). The overall knowhow and high-level human resources of China's shipping industry is still far from what it actually needs, especially when comparing this aspect with international shipping centers. However, the supply of rather low-end human resources is surplus (中国行业研究网 2012; 中国海事服务网 2013). The over-intensive development of China's shipping industry in the past years makes the industry now suffer from overcapacity, as the supply has seriously exceeded the market demand, especially when the potential needs for shipping tend to decrease (中国行业研究网 2012). In this case, the shipping prices have been decreasing fast, which makes profiting more difficult (中国行业研究网 2012). In addition, though China has been involved in many international organizations, its influence on maritime regulations is rather modest (中国行业研究网 2012; 中国海事服务网 2013).

Though the world shipbuilding industry, along with China's, is putting much effort on increasing the complexity and diversity of technologically advanced vessels, the demand for basic vessels, such as bulk vessels, still remains high (OECE-WP6 2008). Meanwhile, China has noticed its weaknesses and now aims to improve the productivity of its shipbuilding industry by improving the training of the workforce, renovating and modernizing equipment in SOEs, as well as attracting foreign technology and capital (OECE-WP6 2008).

Besides productivity, China has also been promoting technological innovation and R&D capability of its shipbuilding industry (Yang & Zhu 2011). China will invest more in high-tech and high value-added technologies, for example in environmental-friendly and energy-saving shipbuilding like those utilizing wind and sea water, maritime equipment projects, and critical internal equipment within ships (Yang & Zhu, 2011: ii). In addition, offshore drilling rig industry has been developing as a future alternative to China's traditional shipbuilding (Yang & Zhu 2011). The ongoing changes, which are all with military implications, are increasing emphasis on hull-block construction, investing in major new "greenfield" shipyards, and increasing Chinese firms' ability to produce marine diesels and gas turbines (Collins & Grubb 2008). In the meantime, the shipping industry also works effectively on strengthening design and R&D competitiveness in volume ship types, for instance, tankers, bulk carriers and container vessels (OECE-WP6 2008). For the long-term development of the industry, China has been increasing its focus on human capital such as skilled workforce and high-level technological human resources, which refers to the investment on Chinese universities and maritime academies that produce marine engineers and naval architects (Collins & Grubb 2008).

As China's economy and trade have been significantly developing, its need for maritime transport is also increasing rapidly, which provides the opportunity for China's shipping industry (中国海事服务网 2013).

In the recent years, the global economy has been experiencing a downturn, negatively influencing the overall maritime sector. As the prices of production materials (especially steel) and labor cost have been surging rapidly in the past years, the pricing advantage of China's shipbuilding is being threatened (OECE-WP6 2008; Mickeviciene 2011; 张力军 2012). This also makes the operating costs of shipping industry increase all the time (中国报告网 2011).

Since the former market leaders Japan and South Korea are forced to focus more on high-end ships with more complexity by leveraging their advantages on technology and productivity, the heavy dependency on basic and low-complexity vessels of China's shipbuilding industry makes its competitiveness difficult to remain for the long-term, since if demand for low-end vessels were to decline due to the slowing of the world economy, China's overall order book could be significantly (and negatively) influenced as most of it is contributed by bulk carriers (OECE-WP6 2008; 张力军 2012). Moreover, basic and low-complexity vessels provide much lower profitability than the high-end ships, especially considering the fact of the ever increasing labor costs (OECE-WP6 2008; 张力军 2012).

In the shipping industry, the demand is generally much smaller than the market supply, and combines with the strong competition from international tycoons such as the Danish Maersk, the global market has become an intensive competing place (中国报告网 2011).

Figure 6. SWOT-analysis of the Chinese maritime sector

| STRENGTHS | WEAKNESSES |
|--|--|
| <ul style="list-style-type: none"> • China's economic growth • State support • Low cost labour • Basic vessel production • Shipping fleet size • Vessel technology related to e.g. large vessels • Port capacity & handling efficiency | <ul style="list-style-type: none"> • Low complexity of shipbuilding and technological expertise • Poor management • Low productivity • Lack of skilled & high-level human resources • Lack of cluster networks • Shipping overcapacity |
| OPPORTUNITIES | THREATS |
| <ul style="list-style-type: none"> • Constructing complex vessels designed elsewhere, e.g. Arctic • Technology transfer from foreign companies • Environmental friendly & energy saving shipbuilding • Increasing R&D investments • Future market demand for shipping | <ul style="list-style-type: none"> • Global economic crisis • Increasing production costs while competitiveness rests on low labour costs • Constructing low complexity vessels does not support obtaining sustainable competitive advantages • Intensive competition in the global market |

The future of the cluster

The flourishing trade between China and the rest of the world has been accelerating the development of China's maritime industries. Even though the global financial crisis has slowed down the increase of the economy and the amount of trade, in general, it is still believed that the trend of maritime businesses is increasing.

The development of China's maritime clusters receives powerful support from the Chinese government, especially the state-owned enterprises. Maritime enterprises in China generally have adequate funding to carry out their operations, and profit from rather low labor costs comparing with many other countries. On the other hand, the disadvantages of China's maritime industries are also revealed. The complexity of China's shipbuilding outcome is rather low, which shows the lack of technological know-how and technical facilities, as well as a rational product structure and even industrial structure. In addition, the cooperation between different maritime clusters is still missing. In order to achieve sustainable development in the future, China's maritime clusters might need to take the following consideration into account:

The industrial structure and layout should be optimized in order to have more rational planning in terms of shipbuilding and shipping capacity, to establish stronger connection between clusters and cooperation between industries, and to form a more open market for competition. Meanwhile, a more advanced strategy for human resources should be applied in order to attract more skilled personnel who have the updated know-how on technology and management. This would require cooperation between the clusters and with universities, other research institutes, and foreign partners.

Concerning shipbuilding clusters, they need to find a new direction for further development – for instance in building high-end cruise vessels and icebreakers. In this case, maritime companies in the

Baltic Sea region would have more opportunities to provide such technologies to design vessels for China's maritime clusters, or provide supporting facilities for them. The previously mentioned Finnish Aker Arctic has set a very good example on this matter.

Concerning clusters for shipping and ports, as international tycoons like the Danish Maersk are extremely powerful in the international markets, other companies in the Baltic Sea Region might want to cooperate with the Chinese shipping lines in order to benefit from services which have advantages on both price and the shipping routes. Furthermore, the entry into force of EU-China Maritime Transport Agreement will definitely create more opportunities and reduce more barriers in the field of shipping. More open shipping lines and ports would benefit both the parties concerned.

To conclude, the cooperation between maritime clusters of China and the Baltic Sea region will require efforts from both sides, from the company level and the governmental level. The Chinese government has expressed its willingness to utilize foreign advanced knowledge, and has encouraged such activities by adopting policies accordingly, which might do a big favor in accelerating such cooperation.

3.3 DENMARK – VISION TO BECOME THE MARITIME CENTRE OF EUROPE THROUGH TRIPLE-HELIX COOPERATION By Annemari Andrésen

The development of the cluster

Denmark is a seafarer nation with a long tradition in shipping and strong shipowners. The five biggest shipping companies; Maersk Group, DFDS, Lauritzen, Torm and Norden account for 95 % of Danish shipping (Hansen interview 2013). Interestingly, the same companies have managed to remain strong for decades and 6/10 of the top companies in the 1960s are still strong today (Gammelgard et al. 2013).

In line with several other countries, Danish shipowners flagged out their vessels to lower cost countries starting from the 1970s. This development led to 40% of the total fleet being flagged out in 1987, which opened the eyes of the politicians to acknowledge that something needed to be done to reverse this trend. In the coming years the Danish International Ship Register (DIS) was created, and the Danish Maritime Authority was established. However, the major improvement was brought by introducing the tonnage tax in 2002 (Gammelgard et al. 2013). This has helped shipowners to invest in newbuildings and thus reduce the average age of the fleet. The Danish tonnage has developed steadily during the 21st century. Compared with 2008, the Danish fleet has increased by almost 50%, leaving Denmark prepared for the next upturn in shipping. However, due to poor market conditions the earnings have not risen although the tonnage has increased (Hansen 2013). Especially the fleet of special vessels has doubled, as 52 new ships were ordered in 2011 (Danish Shipping Statistics 2013).

The shipbuilding industry in Denmark has followed the Swedish example and has almost been phased out. The remaining shipyards have been converted into repair yards, such as Fayard shipyard in Odense and Hirtshals Yard, which was started after Wärtsilä closed its office there.

Cluster actors and networks

The maritime industry forms an important part of Denmark's economy. The cluster holds 24% of exports from Denmark and 10% of production. Altogether the cluster employs around 115 000 persons (Gammelgard et al. 2013)

There are approximately 100 shipping companies in Denmark (The Blue Denmark, 2013) and Danish shipping employs directly around 18 500 people (Danish Maritime Authority 2012). The Danish merchant fleet is the 18th largest in the world and comparatively young, with an average age of vessels of 8 years. The size of the Danish merchant fleet was in May 2013 611 ships with a gross tonnage of 11,5 million (Danish Shipping Statistics May 2013). Of the current fleet 64% is liner trade, 30% tanker trade and 6% tramp. Only 25% of the vessels call at Europe (Hansen 2013).

The Danish share of the world merchant fleet is merely 1,1 % in total, yet Danish shipping companies operate more than 6% of the total tonnage and transport about 10% of world trade (in value). This can largely be attributed to AP Møller-Maersk A/S, which is the biggest shipping company worldwide in terms of operated tonnage, and the fourth biggest in terms of owned tonnage. Maersk Group offers a wide variety of services for the logistics and offshore segments. Maersk group is known for its Triple-E, the largest container vessel in the world, setting new standards in the industry based on size, energy efficiency and environmental performance. 20 vessels of this type have been ordered and they are said to emit 50% less CO₂ per container than the current average (Asia-Europe route). (Maersk 2013)

In line with earlier announced shipping alliances among container shipping lines, A.P. Møller Maersk A/S has recently teamed up with two other large global players, namely Mediterranean Shipping Company and CMA CGM to pool 255 vessels in the P3 alliance, which is to be started in the second quarter of 2014 subject to meeting antitrust rules. The alliance can be seen as a sign of the dire straits the shipping market is currently in, as the three companies have very different brands that are not easily coupled (Hansen 2013).

As for ports, Denmark has a number of small ports but only a few larger ones. The biggest port is CMP, which was established as Malmö and Copenhagen ports merged in 2001. Copenhagen Malmö Port is the leading Nordic cruise destination, which has helped in creating jobs. The Port of Aarhus handles 50% of all container traffic in Denmark and is also the largest bulk port in Denmark (Gammelgard et al. 2013). Aalborg port on the other hand is aiming at doubling the feeder traffic and calls itself the "intelligent port of Denmark" (Bruun 2013). The port of Esbjerg is also important as it is a major hub for Danish offshore activities (Rasmussen 2013).

There are also some strong marine industry suppliers in Denmark. Burmeister & Wain was a former Danish shipyard and a leading Danish engine producer, until it was acquired by MAN in the 1980s. However, it still maintains some activities in Denmark under the MAN brand. Other strong competence areas are found e.g. in lubrication oil and boilers, through Aalborg industries which is today part of Alfa Laval (Hansen 2013).

Denmark has recognized the value of and opportunity brought by its maritime cluster and has therefore focused largely on its development. The name "Blue Denmark" was given to the maritime cluster and a strategy for developing the cluster, "an agenda for growth", was introduced in 2006.

The strategy was updated in 2012 based on the recommendations by a so called “Growth team for Blue Denmark”, consisting besides government officials of company as well as university representatives. The visions presented include the following: making Denmark the maritime centre of Europe, green solutions are the future for the Blue Denmark, and growth in the maritime cluster should be supported by strong Danish competences. The plan includes 38 initiatives in different areas, such as research, economical frameworks, education, retrofits etc. The initiatives are quite concrete and are stated as actions that the government intends to take, demonstrating high-level commitment. (Denmark at work, 2012) Among other things, a need to prioritize research has been identified. There are various universities involved in the maritime segment. Danish Technical University is looking into e.g. energy efficiency, whereas Copenhagen business school is focusing on the business side and e.g. supply management and the University of Southern Denmark is investigating security issues. The problem is that the research is quite widespread. In 2013 a research policy committee consisting of a broad representation from the three sectors will be established to tackle this issue and identify common problems and areas of interest. (Gammelgard et al. 2013). Much has also been done in order to attract young people to the industry, not least through the World Careers-campaign by the Shipowners’ association (The Blue Denmark, 2013).

The network organization *Maritime development center of Denmark* is coordinating an EU-funded project called the *Danish Maritime Cluster*, reaching from November 2011 to December 2014 (The Danish Maritime Cluster 2013). There are 11 partners in the project which aims at strengthening the competence level in the maritime business sector and thereby securing growth and jobs. The project includes the development of several graduate programs and opportunities for pursuing higher education. It also aims at developing creative projects in collaboration between business, educational institutions, research institutes and authorities. Up to now, 45 new courses or subjects for both students and industry employees have been developed, aiming at renewing the education to better correspond with today’s requirements for more multi-disciplinary competences. (Rasmussen 2013)

Cluster competitiveness

The Danish maritime cluster project has among other things produced a SWOT analysis and benchmarking analysis of the Danish maritime cluster (including shipping, transport related services, maritime business services, offshore, shipbuilding and equipment industry). The findings from the benchmarking suggest that the history and geography of a country play a significant role in how the clusters have developed and it is stressed that development of a cluster must be based on its strengths: in Denmark’s case on the international experience and strong commercial competence, which are needed considering the global nature of the business. Perhaps as a sign of the latter, Denmark has invested in a large fleet in a time when shipping is not profitable business for anyone in order to profit from this when the next wave arrives and freight and charter rates go up. The strong focus on government level can also be seen as a strength, as well as the developments made in the area of renewing the educational system. Denmark has low bureaucracy and takes pride in being a doer. Despite the small size of the country, Denmark is a strong player in global shipping. According to an interviewee, Denmark would like to become the Singapore of Europe, in terms of lowering the threshold to do business in Denmark through becoming more service-minded (Hansen 2013).

The main weaknesses stem from cost competitiveness compared with low-cost countries, and previous lack of cooperation within the cluster, which seems to be improving. As an example can be mentioned the procurement cooperation company Seamall, which was founded three years ago by 5 shipowners in charge of 100 ships. Now the amount has increased to 14 shipowners in charge of 350 ships, and the goal is to reach 1000 ships. The company has frame agreements with several suppliers, ranging from lube oil to painting, and provides commercial benefits to its members through economies of scale. It should be noted that the members also represent shipowners of other nationalities besides Danish. (Altenburg 2013)

The main opportunities of the cluster lie in further developing the competences, business conditions and innovations in particularly the green shipping area, in order to acquire more market share. Growth is to be based on quality shipping, which means high standards of health, safety and social conditions as well as protecting the environment. Denmark regards itself as a pioneer in the Arctic field, which puts them in a good position to acquire work in the offshore sector. Regarding offshore wind power, Denmark is a frontrunner with much expertise. As there are several offshore wind farm projects in Europe, Denmark should have opportunities in those. Companies such as A2SEA have been quite successful in the segment, having already installed more than a thousand turbines and 400 foundations (A2 Sea 2013). The revenues from these projects are also better than those from traditional shipping for the time being. However, the offshore and offshore wind projects require competences that differ somewhat from traditional shipping and need to be taken into account when developing the educational field (Wengel-Nielsen 2013).

The cost competition and protectionism of mainly Asian countries poses a major threat. The failure of other countries to comply with environmental regulations whilst Denmark and its neighbors make large investments in order to follow the rules can also be regarded as a threat, as it may lead to low competitiveness for the latter, especially if the regulations are later on further tightened. Therefore, being an early adopter should be somehow compensated and effort should be put on supervising compliance with the new regulations, to ensure that everyone follows them. (Hansen 2013).

Figure 7. SWOT-analysis of the Danish maritime sector

| STRENGTHS | WEAKNESSES |
|---|--|
| <ul style="list-style-type: none"> • Strong shipping nation with leading international companies • Strong commercial competence • Cross-sectoral cooperation • Stable framework conditions and flat management structures | <ul style="list-style-type: none"> • High cost level compared with Asian competition • Limited R&D activities and lack of coordination |
| OPPORTUNITIES | THREATS |
| <ul style="list-style-type: none"> • Increased strategic R&D activity • Increasing access to growth markets, such as offshore and offshore wind • Green maritime technology | <ul style="list-style-type: none"> • Competition from low cost countries • Lack of human resources & competence (naval architects, offshore competence) • Protectionism • Failure of other countries to follow environmental regulations |

The future of the cluster

The future of the Danish maritime cluster looks bright in the sense that the country is preparing for an upturn in shipping and has invested in meeting that in terms of fleet development, renewal of education, and improving cooperation between different parties. Should the upturn not take place, the situation is of course another. However, the world trade is increasing overall and the largest growth is depicted between the developing countries where a large part of the Danish fleet is operating, thus benefiting Danish shipping companies. Besides traditional shipping, the opportunities from offshore and offshore wind projects are important for Denmark, although several of these projects have been characterized by delays. Whether Denmark becomes the Singapore of Europe remains to be seen, but it is important to have a vision towards which all the activities are directed (Hansen 2013).

3.4 FRANCE – A SOLID MARITIME NATION WITH FUTURE OFFSHORE POTENTIAL IN RENEWABLE ENERGIES By Jenni Junnelius

The development of the cluster

France has a substantial history in the maritime field with some major shipping and shipbuilding companies operating since the 1900's. In the field of shipbuilding there is a long experience, traditionally passenger and naval ships have been built and nowadays the focus is more on specialized ships and technical solutions. Traditional sectors, such as fisheries, need to be renewed or they will diminish, to be replaced by emerging sectors such as marine renewable energies, aquaculture, biotechnologies and new technologies for shipbuilding and shipping (Vallat 2013).

Foreign ownership of the yards has increased, e.g. STX has acquired two of the yards in France (STX France 2013). The shipping industry has for a long time been important in France. The third biggest container shipping company in the world CMA-CMG was founded in 1999 as a merger of CMA founded in 1978 and the originally state owned CGM, and is still in the family of the founder of CMA. The cluster employed around 1,5% of the French labor force while the production was between 2 and 2,5% of the gross domestic product before the economic recession (Wijnolst 2006). The cluster experienced a clear drop in turnover in 2009 but showed signs of recovering again in 2010 and 2011. (Cluster Maritime Français 2013)

In 2008 the maritime awareness was substantially increased and politicians started to recognize the French maritime cluster and the need to address it, not least because France has the second largest sea territory in the world after the USA. In 2009, President Nicolas Sarkozy addressed the need to rebuild a maritime policy that focuses on the new challenges, and as a result, the maritime strategy was developed in 2010. In 2011 the government confirmed its commitment on the key maritime issues and the strategy was agreed to be monitored annually. (Sarkozy 2009; Cluster Maritime Français 2013)

Cluster actors and networks

The French maritime cluster consists of a variety of industries and operations. The seven identified industries included in the cluster are shipping, ports, shipbuilding, offshore activities, yachting

industry, seafood production and marine renewable energy. Out of these industries shipping is the biggest in turnover, nearly EUR 15 billion (2011), followed by the offshore service and supply industry above EUR 10 billion and then with a turnover of almost EUR 8 billion are the industries shipbuilding and marine equipment services and the industry of fishing and seafood products. (Cluster Maritime Français 2013)

The French fleet is new and diversified in global comparison, operating in sectors ranging from goods and passenger transport to oceanographic research and offshore, covering the whole range of sea transportation. It consists of around 100 shipping companies with around 900 vessels, of which over half are operated under the French flag. Much attention is paid to safety and environmental issues and ship condition and maintenance is continuously worked on. The turnover of the maritime and coastal transport is almost EUR 15 billion and there are over 20 000 direct jobs in shipping companies, excluding part time and seasonal jobs. The strength of the French fleet is that it is modern and reactive being able to adapt to changing market conditions (Cluster Maritime Français 2013). France deposited with the International Labour Office the instrument of ratification of the Maritime Labour Convention, 2006 in 2013, as the 35th ILO Member State and the 13th EU member State, which sets out decent working and living conditions for seafarers while creating conditions of fair competition for shipowners (International Labour Organization 2013).

In the shipping sector the tankers and container ships are by far the biggest, followed by ferries and gas carriers. Among the shipping companies there are some that are among the biggest in the world. French shipping companies in liquid bulk transport have more than 60 tankers carrying raw and refined bulk cargoes, Socatra (transportation service for crude and petroleum products with a fleet of 14 modern double-hull tankers), Maersk Tankers France and Gazocean being the most significant companies in this sector. Among containerships, the most significant company is CMA-CGM, the third biggest in the world with a turnover of USD 14,9 billion in 2011 and a fleet size of 394 ships. Another important company is Marfret, a family owned sea carrier and shipowner that employs 150 people with a turnover of 170 million. Among the ferry operators, Brittany Ferries, Corsica Ferries and SNCM are the largest. (Cluster Maritime Français 2013)

The CMA-CGM is involved as one partner in the recently initiated P3 network alliance together with Maersk Line and Mediterranean Shipping Co, with a planned pool of 255 ships on 29 loops covering the world's three biggest trade lanes. However, the alliance has been facing difficulties in its establishment as the network is not yet clear about its intentions and of the sharing of services, even though operations are planned to start in the second quarter of 2014. Another uncertainty factor is the approval from competition authorities that the pool still needs before starting the operations. The pool was established as result of overcapacity in the containership market and the hope of the pool is to increase profits for the involved companies and bring a change to the market with still more than 15 competitors on the routes. Nevertheless, there is uncertainty regarding the general market outlook and future trade growth. (JOC 2013)

The French shipbuilding and repair industry is the 6th biggest in the world, employing around 40 000 people. The focus in the industry is largely on human resources and innovation, creating a capacity to build advanced and sophisticated vessels requiring a high level of adaptability and competence. Such vessels include liners and other passenger ships, destroyers and power projection ships, support vessels, submarines and a know-how applied in offshore activities. The high value added

differentiates the French shipbuilding from Asian shipyards. With the support of French equipment suppliers, the shipyards can produce a wide variety of vessels up to 400m in length. The shipyards often build the hulls to then incorporate the systems built elsewhere, a system including a wide variety of actors such as joint contractors, equipment suppliers and service providers. DCN, STX France and CMN are the biggest shipbuilders in France. (The maritime voice 2013) An example of international cooperation within the international ship building companies is the construction of the Oasis 3 cruise ship, which was decided to be built by STX France instead of STX Finland, where the previous ships were built. However, the equipment suppliers involved in the previous building projects will be partly included this time as well. Not only is it up to the single companies in Finland but it is supported by Finpro, which aims at securing the position of Finnish maritime companies, for instance by opening a project office at the STX Saint-Nazaire shipyard premises in France in summer 2013. The experts at the office will help Finnish companies to fulfill the criteria of French legislation and the obligations set by the shipyard for its subcontractors. (Finpro 2013a)

The French offshore oil and gas service and supply sector is the second largest in the world with 18% of the world market for offshore support services. The turnover has increased from EUR 3,5 billion in the end of the 1990s to EUR 10,5 billion in 2011 and the sector employs around 30 000 people. The offshore sector is globally significant and accounts for up to 9% of added value in the French maritime economy. The competence lies particularly in deep water and ultra-deep water technology. The industry includes services and supply companies operating dedicated fleets, doing extensive studies or construction work needed to find and extract offshore oil and gas deposits. An important actor in the offshore segment is Bourbon, a leader in offshore oil and gas marine services. (Cluster Maritime Français 2013)

During the past decade the French ports have been reformed, introducing the status of Grand Ports Maritimes to seven of them. The substantial development efforts of the ports have also included privatizing the cargo handling for increased efficiency, as the goal for the ports is to double the market share of container traffic, taking it to 12% of the European market (Sarkozy 2009). Commercial sea ports handle more than 85% of the French trade by volume. There are 12 ports operated by the State (7 Major Sea Ports) and 2 autonomous ports in the Overseas Collectivities. Additionally there are around forty ports under regional administrations (some since 1983, others since 2007), mainly under the authority of chambers of commerce. The port policy includes three main points; the first being a reform of the autonomous seaports through legislation since 2008, including a transfer of cargo handling to private companies for the ports to be more competitive. The second policy is a transfer of port railways to the port authorities to provide an opportunity to expand into high volume freight transport. The third policy is government support in terms of an investment program for 2009–2013. (Cluster Maritime Français 2013) However the reform process has turned out to be complicated, expensive and prolonged when around 900 jobs have been shifted to the private sector (World Cargo News 2013).

The service sector is also of great importance. For example, there is an association for the insurance companies called CESAM (Comité d'Études et de Services des Assureurs Maritimes et Transports), an economic interest group which provides services to member companies while bringing together French and foreign companies in the marine insurance business. France is also prominent in ship financing. Calyon, BNP Paribas and Société Générale have been able to reach the level of the biggest

international banks specialized in shipping and they all have developed tools to accompany the world fleet's renewal and growth. In the sector of maritime chartering and ship brokerage, France has the over 150-year-old company Barry Rogliano Salles (BRS), which ranks in the top five of the world's shipbrokers, and probably on a third place when all activities are included. With BRS, France has one of the leading brokers in the new building sector. France is also prominent in the ship classification sector, providing the maritime sector with a large range of services such as classification, certification, information services and system, assisting and advisory services. The marine division of Bureau Veritas ranks at the 2nd place in the world in terms of the number of ships and at the 5th place in terms of tonnage. The group has a world-wide workforce of 25 000 professionals in over 600 offices and labs in 140 different countries (Wijnolst 2006).

Regarding networking platforms and associations related to the cluster, the French Maritime Cluster was established in 2006 by the French Institute of the Sea to promote the French maritime economic sector. Three main objectives of the organization are to promote communication, to lobby, and to search for synergies between different industries. The French Maritime Cluster is a useful source of ideas and action for shaping government maritime policies. It lobbies for the French maritime industries' greater priority and is the communication channel between them and the French administration and government. There is also cooperation with the French Navy to promote the French maritime capabilities internationally and the French Navy supports the organization in its role as an ambassador for French maritime expertise. (Cluster Maritime Français 2013; Wijnolst 2006)

The French Maritime Cluster organizes several events and networking forums regularly for the members and the industry, e.g. Maritime Economy Forums arranged together with the French Institute of the Sea. For instance, there are the so called synergy groups, 34 theme-based work groups that have been set up since 2006 bringing together more than 3700 maritime executives and managers. These decision-makers from member organizations meet regularly to work on cross-cutting subjects such as: "Marine Renewable Energy", "Creation of a marine investment fund", "Ship Breaking", "Franco-Russian Cooperation", "Overseas Territories", "Crisis and Prospects". The recommendations outlined by the groups are promoted by the French Maritime Cluster. Also different networking events for members to discuss current topics, present new products, and share ideas, are arranged several times a year. (Wijnolst 2006; Cluster Maritime Français 2013)

The French Marine Industry group (Gican), the association for the marine industry, has members in the naval defence, maritime security, safety and environment and commercial shipbuilding sectors. The combined turnover of the group is EUR 40 billion and the companies employ some 40 000 people. Gican arranges the International trade show for naval defense and maritime safety and security, which is a leading trade show in the sector. The exhibition brings together major sectors such as maritime security and safety at sea, naval defense and maritime environment. (Gican 2013) A significant actor in the sector is the world leading company in naval shipbuilding dating back to the 18th century, The DCNS Group. The company has a variety of operations including developing solutions in civil nuclear engineering and marine renewable energy. The company signed a partnership with Russia in 2011, being the first foreign partner to provide Russia with a warship built abroad and sharing technology for further naval construction projects in Russia. (DCNS Group 2013; IHS Jane's 360 2013)

Cluster competitiveness

The French maritime cluster is developed and diverse, focusing on traditional sectors as well as newer sectors, developing operations within industries with future potential. Even within traditional sectors such as shipping, facing challenges globally, France has focused on renewing the fleet with an average age of 8 years, and maintaining a diverse fleet up to date to be competitive and adaptive in the world of changes. Equipment suppliers are present in the international market as well, such as in the shipbuilding sectors of China, Japan, and South Korea (Vallat 2013).

The offshore sector is already established in France with a significant history but new opportunities are searched for and development in the sector is continuous. For instance, France is increasingly focusing on the energy sector within the maritime cluster. The world's first tidal power station was constructed in France in 1966, and it is the largest tidal power station in the world in terms of capacity. Therefore there is experience and knowledge in the field that can be developed in terms of wind, wave and even marine biomass as renewable energy resources. There are broad possibilities for France to develop the sectors by building e.g. offshore and especially floating wind farms, utilizing wave energy and the energy from currents and thermal energy of the sea in the tropical and equatorial waters in Overseas France, areas in which technological development is needed and for which extensive R&D budgets are reserved. (Sarkozy 2009; Vallat 2013; Wyre Tidal Energy 2013)

The French have various service industries that support the maritime cluster and its businesses. The French belong to the world leaders in the maritime insurance sector; the maritime insurance companies are maintaining themselves at the 2nd or 3rd world ranking, excluding markets that are not open to foreign competition (e.g. USA and Japan). Their operations are of high quality in terms of market organization, reliability, securities, tools, methods and the existence of technical agencies and various associations. France is also among the world leaders in maritime research and technological services (Wijnolst 2006).

France recognizes the importance of education to maintain a competitive workforce and human resources for future development in the cluster. There are several educational institutions, universities, engineering schools, research centers and laboratories, directly or indirectly providing education for the maritime related industries. France has developed comprehensive career routes for all occupations in the maritime sector and offers a wide range of training options. The French Institute of the Sea (IFM) keeps an up-to-date list of all maritime training facilities in France, including the addresses and particulars of all centres. (Cluster Maritime Français 2013; Vallat 2013) The human resource focus is especially found in the shipbuilding industry where competent and qualified resources are needed to develop the industry into more and more specialized ship building.

The port network in France has recently undergone a substantial reform from public state owned ports into privatized more efficient units. It was a complicated and long process but considered crucial in order to enable growth in volumes handled by the ports and increased turnover, as these are expected consequences of the development. The port operators are also expected to become more efficient in handling cargo and the French ports therefore to become more attractive in the European overall trade.

France is proud of its world leading actors in different maritime sectors. Several reports bring up single successful actors present on the global market and when it comes to cooperation and networking, the Cluster Maritime Français is brought up as an organ and forum for communication between different actors and across industries and sectors. However, very little evidence is found regarding actual collaboration in the industry apart from the activities and events organized by the French Maritime Cluster. The French Maritime Cluster has encouraged e.g. relations between marine renewable energies and fishery, between the French Navy and the merchant navy, and has gathered port and shipping sectors to think about ports in 2030 and is about to create a consortium for biotechnologies (Vallat 2013). It is admitted that also the initiative of establishing the French Maritime Cluster was quite late compared to other European countries, and therefore there are high hopes for the work of the organization bringing together actors from different sectors and it is stated that it plays a fundamental role in creating collaboration and synergies between the merchant national maritime actors (Wijnolst 2006). Professionals from different maritime sectors need to know each other's business to build and benefit from synergies (Vallat 2013).

The cluster has until recently been quite diversified with a number of industries and companies but without synchronized activities and networks working towards common national goals. The strategy development has, as mentioned, started but the work is extensive and it requires time to develop the French maritime industries into a well working cluster benefitting from increased cooperation and synergies between companies and industries. There are already concrete initiatives introduced by the French Maritime Cluster with the goal of bringing together the different actors and develop cooperation in larger extents.

Figure 8. SWOT-analysis of the French maritime sector

| STRENGTHS | WEAKNESSES |
|---|---|
| <ul style="list-style-type: none"> • New and diversified fleet • Offshore sector • Service sector such as insurance, ship financing and brokers • Focus on human resources development | <ul style="list-style-type: none"> • Limited actual networking activities across sectors • Late national maritime strategy development in European comparison (introduced 2011) |
| OPPORTUNITIES | THREATS |
| <ul style="list-style-type: none"> • Marine energy (wind, wave, tide & marine biomass) • Port operations development and turnover growth • Increased cooperation within the maritime cluster | <ul style="list-style-type: none"> • Global competition • The strong role of foreign corporations, such as STX |

The future of the cluster

The energy sector in France is considered as of great importance for the future, providing various opportunities for the maritime sector, including renewable energies and the related business opportunities. Significant research and development efforts are directed to the marine renewable sector highly focusing on emerging technologies (Sarkozy 2009). The marine energy sector is clearly

in the focus and a tender for a pilot marine energy project was announced in September 2013 by the French government. France has the second largest tide potential in Europe and also wave energy provides potentials. France wants to speed up the process of establishing the renewable marine energy and develop technologies in the sector, as there is potential of increasing the capacity substantially; the aim is to install 100 MW and 200 MW of wave and tidal energy by 2020. (Reuters 2013) Deep sea mining is also a future development area in which France already has world class actors (Vallat 2013).

The future of the shipping industry is uncertain specifically regarding the P3 network in which the major containership company CMA-CGM is involved in. However, also the tankers are important in the shipping sector and the offshore industry is continuously growing, providing business and growth opportunities for actors in that sector. Also equipment suppliers and technology development companies can benefit from the growing offshore and marine renewable sectors in France and abroad.

However, know-how, diversified products, quality, innovation, financing and increased cooperation are needed in all sectors in order to be a competitive cluster in the global maritime market. Political support is also needed continuously to promote the cluster, mainly in terms of simplified maritime labor laws, stabilized and clarified business laws, tax laws and legal systems to facilitate the maritime business. (Vallat 2013)

Connections to the Central Baltic region in terms of business opportunities are rather unclear, except for some individual examples such as the STX yard ownership both in Finland and France, providing some opportunities for equipment suppliers across the nations. On the other hand, it is a competitive situation from a national perspective and the loss of cruise ship orders from Finland to France has a substantial impact on the yard operations and employment in Finland.

3.5 GERMANY – TOWARDS A GREENER FUTURE THROUGH WINDS OF CHANGE

By Annemari Andrésen

The development of the cluster

Germany is the largest shipbuilding nation in Europe and has at present around 130 shipyards; 60 if the small ones are not counted (CESA 2013). However, German shipbuilding has faced significant changes, as since 1975 German shipbuilding capacity has been reduced by 75% in the large shipyards and 40% in the smaller ones (GlobalSecurity.org 2013). Also the structure of German shipbuilding has changed from producing container vessels (2/3 of production in 2004) towards more specialized vessels, such as cruise ships, passenger vessels and yachts. Quite a few shipyards have been subject to insolvency and consolidation following the crisis in shipbuilding in 2008 and 2009, and further consolidation and bankruptcies have been predicted. An example of the consolidation is ThyssenKrupp Marine Systems GmbH, which acquired several shipyards, e.g. Howaldtswerke-Deutsche Werft and Blohm+Voss. However, in 2009 they decided to quit the container market and sell off production sites such as Nordseewerke to SIAG. The amount of foreign ownership has also increased among the German shipyards as companies from e.g. Russia, Britain and the Persian Gulf have purchased shipyards. (Calsson 2013)

The shipping industry in Germany is substantial, especially the container vessel segment. The development of the German merchant navy fleet from 1970 to today demonstrates a steady growth. At the same time, however, the number of vessels under German flag has decreased from 100% to 15%. (Verband Deutscher Reeder 2012). Before 2008, the industry boomed partly thanks to the so called KG structure, i.e. a financial structure that enables the shipping companies to sell and charter back their vessels to a special purpose company, which sells the equity further to private investors, who get tax benefits. This enabled a continuous renewal of the fleet. (Marine Money Offshore 2013) However, also the German shipping companies have faced difficulties after 2008 due to the financial crisis, overcapacity of vessels and declining freight rates. Financing has become harder to come by and German shipping financiers such as Commerzbank have withdrawn from shipping altogether. Private investors, banks and ship owners are encouraged to come up with solutions and financing concepts, as the means of the state to finance new-buildings are limited and mainly consist of export credit guarantees and innovation support. The rising costs and decreasing incomes cause further pressure towards merging especially small and middle-sized shipping companies.

Cluster actors and networks

The amount of employees in shipbuilding has risen again after the slump in 2008–2011, and in September 2012, 16 852 people were directly employed by shipbuilding (MarineLink.com 2013a). In 2012, nine shipyards at twelve sites supplied 21 ships with a tonnage of 437 700. In total, the order book for German shipyards was according to Mitteldeutsche Zeitung worth EUR 8,5 billion in May 2013, showing an increase from the previous year and consisting up to 80% of passenger vessels and yachts (Mitteldeutsche Zeitung 2013). However, diversification has been a success factor, as the German shipyards still build a variety of ship types and also do substantial repair work. The naval sector is an important customer segment for the German shipyards which construct for instance submarines for export. Around one fourth of the shipbuilding turnover comes from the naval sector (Calsson 2013). Other segments growing in importance are offshore and wind power.

Papenburg-based Meyer Werft appears to be the success story among the German shipyards. Meyer Werft was founded in 1795 and is in its sixth generation of family ownership, as Bernard Meyer is the managing partner of the company. Meyer Werft builds cruise vessels, passenger ferries, as well as also gas tankers. River cruise vessels are being constructed at Neptun Werft, a subsidiary of Meyer. Meyer contributes to up to 72% of the total shipbuilding in Germany and has demonstrated a steady order intake during the past years, which have been difficult years for shipbuilding. The latest order was announced in October 2013 for Star Cruises (Meyer Werft 2013). Meyer Werft, as well as its subcontractor network, has benefitted from using Porsche consultants in order to improve its processes. Also Flensburg shipyard has worked with Porsche. Other examples of successful family-owned shipyards or shipyard groups are Abeking & Rasmussen and Lürssen, who has expanded strongly and is a leader in mega-yachts. (Calsson 2013).

There are around 380 shipowners in Germany, of which the majority is small with less than 10 ships (VDR 2013). The biggest companies in terms of owned tonnage are Claus-Peter Offen Reederei with 85 ships with a gross tonnage of 5,5 million, followed by ER Schifffahrt GmbH & Cie KG with 100 vessels but smaller in terms of tonnage, and Peter Doehle Schifffahrts-KG with 119 vessels. In terms of operated tonnage, Oldendorff Carriers GmbH & co comes in the sixth place worldwide with 494

operated vessels, followed by Hapag-Lloyd AG, who operates 148 vessels. (Danmarks rederiförening: Danish Shipping Statistics May 2013).

When it comes to newbuilding activity, a strong decrease can be seen after 2007–2008, which is explained by the overheated market. In 2007, 643 new orders were placed and 308 vessels were delivered, whereas the number of new orders in 2009 was a mere 31. (VDR 2013)

The turnover of the German ports shows a positive development for the past three years, although the amount of transported cargo is still behind the top levels reached in 2008. Hamburg is the largest of the German ports and the third largest European port, with a cargo throughput of 131 million tons and handling of 3,8 million containers in 2012 (Port of Hamburg 2013). Also for the ports, the offshore wind sector is believed to bring opportunities as production or assembly should be located near to the port of shipment.

In addition to shipbuilding and shipping, Germany has a strong network of suppliers consisting of around 400 businesses, 70 000 employees and a turnover of EUR 11,5 billion (Verband für Schiffsbau und Meerestechnik 2012). Many of these companies are also active exporters, due to the fact that many German shipowners construct their vessels in Asia, and require certain domestic components to be used. Germany is strong in e.g. the fields of electronics and automation, as well as marine diesel engine technology through MAN, MTU and MaK. After Caterpillar acquired MaK in 1997, the Kiel facility has become a center for research and development for large diesel MaK engines, as well as large diesel and gas engines manufactured under the Cat trademark. (Caterpillar 2013).

Marine technology is seen as an area where German companies possess a vast knowhow and where growth is expected. The government has in 2011 decided on a National Masterplan for Maritime Technologies (NMMT), in order to strengthen the position of German companies on the world market and pool efforts of companies and research organizations in the area. As a part of the NMMT, a common platform has been developed for all marine actors. The NMMT was drawn up by the Federal Ministry of Economics and Technology in cooperation with other Federal Ministries, Germany's coastal states and associations. The plan focuses on maritime technology in the fields of offshore oil and gas, offshore wind energy, underwater engineering, maritime traffic control and security technology, and marine mineral raw materials. The fields of action include strengthening R&D and improving coordination between research programs, promoting exports through political support, establishing networks, expanding educational programs and developing demonstration and beacon projects, such as smart systems in maritime engineering. (Federal Ministry of Economics and Technology 2011)

The Federal Ministry of Economics and Technology (BMWi) has launched a funding program called the Next-Generation Maritime Technologies, in order to finance industry-led collaborative projects between the industry and universities or research institutes for e.g. improving energy efficiency of vessels and flexibility of serial production of ships. ("Next-Generation Maritime Technologies" Research Programme 2013)

The Maritime Alliance for Employment and Training is an alliance between shipping companies, the Federal Government and the Northern Federal states, where mutual issues are discussed and solutions sought in conferences arranged every other year. The goal of the alliance is to secure

maritime jobs and education in Germany despite the growing flagging-out of vessels. The alliance was formed in 2003. (Bündnis für Ausbildung und Beschäftigung in der Seeschifffahrt - Maritimes Bündnis 2013) As one result from this alliance, the Shipowners' association has in 2013 set up a foundation, Stiftung Schifffahrtsstandort Deutschland, which collects money from shipowners flying foreign flags and pays shipowners under the German or other European flag for training new personnel. (Lauer 2013)

Germany is a large country and there are clear differences between the regions. Northern Germany has created its own cluster consisting of the states of Hamburg, Lower Saxony and Schleswig-Holstein, with the aim of strengthening the competitiveness of the maritime economy through regional projects and expanding existing collaborations beyond state borders. (Maritime Cluster Northern Germany 2013)

Cluster competitiveness

One of the strengths of the German maritime cluster is that all parts (shipping, shipbuilding, financing, equipment supply) are strongly represented and collaborate with each other, which helps the industry develop. Even if vessels for German shipowners are not built in Germany (in fact the share of domestic orders is close to zero) many of the components used are German. In the difficult times for shipping, the shipowners are more or less forced to collaborate on issues such as financing, as it is challenging for small, family-owned shipowners to acquire financing. As a result, money has been collected through issuing bonds and new financiers such as American hedge funds and Chinese banks have been discovered. However, with the latter may come a requirement to increase the use of Chinese manufacturers in newbuildings. The shipowners are also looking to increase their competitiveness by developing additional services to shipping, such as door-to-door solutions or focusing on niches, such as service vessels for offshore wind farms. (Lauer 2013)

The stricter environmental regulations are seen as opportunities for the cluster in terms of developing environmental-friendly solutions. The marine suppliers have also benefitted from the offshore business focus and have been able to grow their business in the oil- & gas segments. The situation is worse for those focusing on supplying standard vessels, as the construction of these is declining.

Figure 9. SWOT-analysis of the German maritime sector

| STRENGTHS | WEAKNESSES |
|---|--|
| <ul style="list-style-type: none"> • Strong shipbuilding and shipping nation • Family-owned companies who are in the business long-term • Creative financing models • Political stability • Strong collaboration between shipyards and marine equipment suppliers • Diversification of shipbuilding | <ul style="list-style-type: none"> • High cost level compared with Asian competition • Maritime industry is not a prioritized area politically • Lack of capital and financing currently |
| OPPORTUNITIES | THREATS |
| <ul style="list-style-type: none"> • Offshore wind parks in the North Sea • Developing services for the whole logistics chain • Increase in world trade • Retrofits due to stricter regulations • Innovative solutions in chosen niche | <ul style="list-style-type: none"> • Losing fleet due to poor market conditions, forcing shipowners to get rid of their vessels • Lack of orders for European shipyards, e.g. postponing of offshore wind projects and cancellation of contracts • SECA leading to shift from sea to road transport • Increasing protectionism |

The future of the cluster

Along with its decision to give up nuclear power, Germany has dedicated significant resources into the renewable energy sector, such as wind power. The new environmental policy of Germany, Energiewende, states that by 2050, 80% of energy used should come from the renewables sector. The plans of installing 25 000 MW of wind power in the North and Baltic Sea until 2030 support this development. (Deutscher Bundestag 2013) The offshore wind power projects are anticipated to provide work for shipyards, suppliers and harbors alike. The North-West area has become a wind power center, attracting industrial investments by companies such as WeserWind and Areva Wind. Some of the shipyards in the area have shifted their production from traditional shipbuilding to offshore wind, as it has been noted that the significant offshore wind project investments provide an opportunity to combine the marine and clean-tech knowledge areas and makes up for the loss of demand in the shipbuilding segment (Kauppalehti 2013). As a result of this development, new jobs and education programs have been created. On the other hand, the industry is still heavily subsidized in terms of feeder tariffs and the project costs for offshore wind are very high, raising questions how realistic it is that the planned projects will be realized. Already several delays have been witnessed. There is also a problem of connecting the farms to the grid due to a lack of coordination between different parties, which has postponed projects in the field (Calsson 2013; Lauer 2013).

Regarding shipping, the future has potential in terms of increasing cargo transport, but as the current situation is very challenging, consolidation into larger companies is expected and the fleet will probably diminish further due to increasing scrapping of less efficient vessels. As a result, Germany may lose its current position of the third largest merchant fleet to China (Lauer 2013).

3.6 ITALY – COUNTING ON ITS TRADITIONAL MARITIME SECTORS OF SHIPPING AND SHIPBUILDING

By Jenni Junnelius

The development of the cluster

Traditionally shipbuilding has been an important industry in Italy, due to the importance of sea borne transportation dating back several centuries due to its long coastline and the position of the country in the Mediterranean.

Some growth in the Italian cluster has been identified since the beginning of year 2000, although the current economic situation has had its clear impact and Italy overall is under great pressure, not making the situation in the maritime cluster any easier. Reports published by the Italian maritime cluster organization Federazione del Mare in the 2000's indicate that the cluster is important for the Italian GDP and in terms of employment in the country. In 2000, the maritime cluster contributed EUR 26,3 billion (2,3%) to GDP and in 2004 the GDP contribution of the cluster had increased to EUR 36,5 billion (2,7%) of GDP. Total employment was estimated at nearly 320 000 of which 122 000 were directly employed and exports from the cluster amounted to EUR 14,1 billion, accounting for 4,7% of national exports. (Hansen & Clasen 2010)

The political focus on the cluster has been modest in the past and with the country's current economic situation, the future of the cluster remains uncertain. The Italian maritime cluster is not politically a main focus area, especially since Italy is currently in a deep economic crisis there is not any focus on developing strategies for the maritime industry in particular. (Zanini 2013)

Cluster actors and networks

The Italian maritime industry consists mainly of four sectors: yards and shipbuilding, shipping, ports and services. The cluster on a global level can be considered as small or medium sized (Zanini 2013). The Italian maritime cluster had a turnover of nearly EUR 40 billion (2011). There are 213 000 persons directly employed by the industry, the production value per employee is EUR 185 000 (2011). The development has been significant; from 1996 to 2011 the increase of employees was 60%. The biggest industry is shipping with a turnover of above EUR 10 billion, port logistics and services is the second biggest with a turnover of EUR 6,5 billion, followed by nautical and cruise tourism EUR 5,8 billion in turnover. After these follow institutional activities (Navy, Coast Guard, Port Authorities, EUR 4,6 billion) and the industries of shipbuilding (EUR 4,4 billion), fishing (EUR 4,4 billion) and yachting (EUR 3,4 billion). (Federazione del Mare 2013)

The extent of the import and export by sea is 250 million tons yearly. Italy is world leader in ro-ro with a fleet of 180 ships and 1,2 tons (Federazione del Mare 2012). Ro.Ro. Tranship is a company providing door-to-door concepts and additional transportation services to the core business of shipping (Ro.Ro. Tranship 2013). There are different kinds of shipping companies including cargo, chemical, cruise ship and ferry companies. The shipping companies, however, face challenges with the current economic situation and difficulties in finding financing. There are no pools or cooperation between the shipping companies to be mentioned. (Zanini 2013) However, the Grimaldi Group with its history and size is one of the main shipping actors on the Italian market. It was

established 1947 and is now a multinational logistics group specialized in maritime transport of cars, rolling cargo, containers and passengers with branches in 25 countries and still run by the family. The Group comprises eight main shipping companies (including Finnlines) and has a fleet of about 100 vessels, providing maritime transport services between North Europe, the Mediterranean, the Baltic Sea, West Africa, North and South America and some passenger traffic within the Mediterranean and Baltic Sea. The company has also created its own international port network, e.g. in the Baltic region, Finnlines' subsidiary Finnsteve operates terminals in the Finnish ports of Helsinki, Turku and Kotka. (Grimaldi Group 2013)

Cruise ship building and motor-yacht building is world class with strong actors in global comparison, such as Fincantieri and Azimut-Benetti (Federezione del Mare 2012). Shipbuilding, however, faces difficult times as new orders are limited, hitting hard especially the mid-sized boat building sector. On the other hand the Italian marine industry federation feels confident with the strength of the "made in Italy" brand on the world shipbuilding market. (International Boat Industry 2013) Fincantieri is the biggest yard and known on the international market, whereas most other shipbuilders are medium-sized and small companies with some known brands in the specific sector of luxury yachts.

Fincantieri is involved in international networks and business in different ways. Finnish engine and propulsion manufacturer Wärtsilä is present on the Italian market with its own factory in Trieste and in recent ships built by Fincantieri, Wärtsilä engines have been used (Cruise Business Review 2013). Trieste as an industrial city is important also for the maritime sector with various maritime related businesses present in the area. Moreover, Fincantieri offshore is a global organisation with a network of 21 shipyards, 3 design centres, a research centre in the naval field and two production sites dedicated to the manufacturing of systems and mechanical components (Fincantieri Offshore 2013).

Within the shipping sector, there are some individual large and important international actors. Within the cruise sector, Italian Costa Concordia is a worldwide known company, present in the cruise sector since the mid 1900's. Today the fleet consists of 14 cruise ships, mostly built or refurbished in Italy by Fincantieri but also some of them built in Finland. The cruise vessels are operating all over the world, e.g. in Africa, the Caribbean, the Far East and Norway in the north but the entire fleet is registered in Italy. (Costa Cruises 2013) A recent setback for the company was the accident of Costa Concordia which shipwrecked on the Italian coast in 2012.

Grimaldi on the other hand operates a number of different shipping companies with a total fleet of around 100 ships serving different shipping sectors from container to passenger traffic. Also port logistics and services belong to the operations of the group. (Grimaldi Group 2013) There are also some well-known Italian luxury yacht brands with a well-established image and high quality in this sector; however as a sector it is not very significant for the overall maritime sector revenues in Italy. There is a number of smaller and mid-sized yards on the Italian market contributing to the sector but not operating in the same league as a company like Fincantieri.

In the energy sector the internationally known actor Eni S.p.A. (Ente nazionale idrocarburi 2013), is operating in the sectors of oil and gas exploration and production, international gas transportation and marketing, power generation, refining and marketing, chemicals and oilfield services. Saipem is

the offshore focused company within the group, focused on EPCI (Engineering, Procurement, Construction, and Installation) projects. The company has a strong, technologically advanced and highly-versatile fleet and world class engineering and project management expertise and delivering drilling platforms and vessels, capable of operating in ultra-deep waters. (Eni 2013; Saipem 2013)

The Italian ports are strategically important for continental Europe handling around 500 tons of goods yearly and 59% of Italian import and 47% of the Italian export goes through ports. The most significant ports are Ancona, Bari, Cagliari, Genova, Gioia Tauro, La Spezia, Livorno, Napoli, Palermo, Ravenna, Taranto, Trieste and Venezia. (Federezione del Mare 2012) The ports are, however, state-owned and independent units with no common strategy developed on a national level. Therefore there is limited or no cooperation and no use of synergies between the ports – they are not working together to strengthen the Italian ports as a network. The port operators are privately owned companies but also in that sector there is a lack of cooperation and networking between the actors, they are all operating to maximize their own profits. However, there have been some improvements in the activities of the port operators and the big ports are important employers in the country. Some key players, such as the Grimaldi Group, are establishing port terminals and operations of their own in order to ensure more efficient port handling than what the state owned port authorities can provide. (Grimaldi Group 2013; Zanini 2013)

Maritime research activities are often carried out and initiated by different associations related to issues such as the environment and energy, for instance in terms of pollution reduction in ports. CETENA S.p.A., The Italian Ship Research Centre, is a company of the Italian main shipbuilding actor, Fincantieri Group. It is dedicated to research and consultancy in the naval and maritime field supporting customers in various studies, mostly technical, engineering, and shipbuilding-related, carried out in appropriate testing facilities and laboratories. CETENA carries out applied research and consultancy and therefore combines the academy and the world of shipbuilding and maritime operations. It also has consolidated activities with the Ministries of Transport, Industry and Research and with the Italian Navy. (Fincantieri 2013; Cetena 2013)

Another example is an already well-established cooperation between Fincantieri and the Genoa University (Polytechnic). The most recent cooperation announced in September 2013 is an initiative of up to EUR 500 000 funded by Fincantieri to develop and capitalize the best ideas and research originating from the university in order to transform them into product innovations with a financial return. (MarineLink.com 2013b) In addition to the industry-related education activities in Universities, there is also the Italian Shipping Academy. The Academy was established in Genoa in 2005 and is a specialized training center in the maritime field, particularly focused on the education and training of Merchant Navy Cadets (Italian Shipping Academy 2013).

Federazione del mare is the roof organization for the cluster and the associations of the different maritime industries. It was founded in 1994 in order to bring together the maritime organizations in merchant shipping, shipbuilding, maritime agency and brokerage, maritime law, port-operators insurance and port administration, leisure-boating and fishing. The organization has published some reports in the 2000's on the Italian maritime cluster and more specifically regarding the economic and social impact of the cluster, including topics such as human resources and environmental protection. (Federazione del mare 2013; Wijnolst 2006) The Italian Shipowners' Association (Confitarma) represents the main part of the Italian merchant fleet including different shipping

companies and ship owner groups in the cargo and passenger transportation sectors. The association states that its main objectives are to promote the growth of the fleet, represent the shipping industry in political and authority matters, and with public and private actors and providing support and information to its members. (Confitarma 2013) Assonave is the association of Italian shipbuilders and ship repairers and it represents nearly all of the country's shipbuilding industry including shipyards, ship repair yards, diesel engines producers, marine research centers and about 100 marine equipment suppliers. (Assonave 2013) The Netherlands-based Mare Forum, in turn, arranges maritime related conferences all around the world, and in May 2013, one was arranged in Italy to gather together actors in different industries. This is a forum for leading Italian and international shipowners, CEOs from shipping, trading and brokerage companies, key investors and other relevant actors to discuss and share views, visions and valuable information. (Mare Forum 2013)

Cluster competitiveness

It is mainly the traditional sectors such as shipping and shipbuilding that are strong in the Italian maritime cluster. However their strength and success largely depends on some strong, single actors that are large in size and internationally well-known. Fincantieri and Grimaldi are such actors with operations and networks all around the world. In general, Italy lacks a national maritime strategy, indicating the limited interest in the cluster from the political point of view. Italy's location makes the ports important for sea borne trade into Italy and Europe; however, the state owned ports are considered inefficient and not well developed or networked, even though some improvements have been noticed in the private port operators' activities. Therefore, the port network is considered an area in which increased cooperation and a stronger national network could be established. However, the lack of a national policy or strategy makes it difficult for them to increase cooperation and benefit from synergies, not only among the ports but in the cluster generally, and between industries and companies the networking seems to be limited. The large companies have the supply and distribution networks of their own and have built up some cooperation with the academia for example, according to their own needs.

The Mediterranean area is considered as an opportunity for the national clusters within it (Mediterranean – the upcoming future recommencement of the re-composition process following the global crisis 2013) However, the national clusters seem to be very limited in their networking and cooperation activities. The Italian cluster consists of single actors in different industries without common forums or promotion for cooperation from a political level. Therefore further cooperation within the Mediterranean depends on the needs and possibilities of individual companies.

Figure 10. SWOT-analysis of the Italian maritime sector

| STRENGTHS | WEAKNESSES |
|---|--|
| <ul style="list-style-type: none"> • Shipping and ship building • Single strong companies (e.g. Fincantieri and Grimaldi) • Luxury yacht brands | <ul style="list-style-type: none"> • No national maritime cluster strategy • Limited political interest in the cluster • Limited networking • Undeveloped port network |
| OPPORTUNITIES | THREATS |
| <ul style="list-style-type: none"> • Networking and cooperation between actors to benefit from synergies (e.g. between ports) • Awakening political interest • Increased cooperation between the Mediterranean maritime clusters | <ul style="list-style-type: none"> • Overall economic situation • Modest developments in new sectors and industries • Dependence on a few strong global players |

The future of the cluster

The general political environment is currently a challenge for the country. The political engagement in the maritime industry has so far been very limited and there are no signs of change as the economic future is completely unknown. The lack of a national maritime strategy also indicates that the cluster is not very well consolidated. There are clear opportunities for increased cooperation and networking both on a political and industry level, but for the time being, Italy does not seem to focus on supporting a development in this direction. Neither have the priority sectors been identified nor has a clear development direction been established. The existing industries are predicted to continue their operations in a stable manner and there are no signs of any emerging ones that would provide particular future opportunities for the country.

3.7 JAPAN – A FORMER WORLD LEADER IN SHIPBUILDING SEARCHING FOR NEW COMPETITIVENESS By Akseli Jouttenus

The development of the cluster

Maritime industry in Japan has had a significant influence on the country's history and economic development. Japanese maritime cluster is internationally significant even though it is losing its market share to China and South-Korea. Being an island nation with few natural resources, Japan is very dependent on seaborne trade and has established secure sources of raw materials. Habara states in his report Maritime policy in Japan (2011) that 96% of the supplies entering and leaving the country are carried by maritime transport. According to the same report, the value of the Japanese international shipping industry was around five trillion yen in 2011. The country's access to reliable and cost-effective shipping has helped it in becoming a major industrial power (BIMCO 2010).

Japan was a world leader in shipbuilding industry for almost fifty years and the industry has had a positive influence on maritime transport and the development of the world economy (Habara 2011). However, in the last few years, China and South-Korea have passed Japanese shipbuilding in terms of orderbook and output (International Maritime Information Website 2010). Data from the report of

Organisation for Economic Co-operation and Development shows that there are over 1000 shipyards in Japan, of which some are individual enterprises while others operate multiple shipyards. The report points out the three biggest Japanese shipbuilding companies in the terms of current orderbook: Imabari Shipbuilding, Tsuneishi Holdings and the Oshima Shipbuilding Company. These three companies with Universal Shipbuilding, Mitsubishi Heavy Industries and Namura Zosensho belong to the top 30 worldwide shipyard groups. Japanese shipbuilders' share of the country's GDP has varied over time and has been relatively small in the recent years. The employment in the shipbuilding sector is also a fairly small part of the country's total employment. According to data from the Japanese Government, only 0,13% or 84 000 people are working in the shipbuilding industry. Considering these numbers it may seem that the role of shipbuilding industry in Japan is small but it is actually much larger because of the joint activities with other industries related to shipbuilding, e.g. steel and marine equipment. Shipbuilding industry is an important part of the maritime cluster which influences Japanese economy. (Council Working Party on Shipbuilding 2013)

A few decades ago, Japanese ports like Kobe, Tokyo and Yokohama were among the world's top 20 ports in terms of volume of freight containers handled. Today Japanese ports are losing to their neighbors in competition. In 2009 Tokyo, the top Japanese port in terms of handling volume of containers, was only 26th in the world's ranking while the top five ports were all Asian. According to Habara (2011), international shipping industry and even Japanese shippers have avoided Japanese ports because of their cost. For instance, transshipment costs in South-Korean port in Busan are 40% cheaper than costs in some Japanese ports. (Habara 2011)

Cluster actors and networks

Japanese maritime business structure has a close relationship with other industries in Japan. The maritime cluster in the country is composed of three major groups – shipping companies together with ship owners, shipbuilding companies and shippers/manufacturers. The fact that these three industries have been set up independently and upheld effectively is a unique feature of Japanese maritime industry. The close cooperation of these groups and the financial support provided by the Zaibatsu, meaning Japanese financial combines, has led to successful results for the Japanese maritime cluster. (Habara 2011) Inatomi (2010) agrees with Habara in his presentation Maritime and Related Industries in Japan, listing financiers as an important part of the maritime cluster in Japan. There are several different organisations to enhance the cooperation among the country's maritime industry, e.g. the Shipbuilders' Association of Japan (SAJ), Japan Ship Technology Research Association (JSTRA), and Japan Ship Machinery & Equipment Association (JSMEA).

The Japanese maritime cluster is also internationally networked. There are globally known private ship owners like Ehime Senshu and Shikoku Senshu, which contribute to the world's maritime industry by supplying ships to international operators and charters. (Habara 2011) Also three major shipping companies, K Line, Nippon Yusen Kaisha and MOL mostly register their units in open registers and employ a lot of non-Japanese seafarers (BIMCO 2010). Many bigger Japanese shipbuilding companies have started showing more interest abroad by increasing their foreign investments in order to increase their competitiveness. Some companies have founded yards in other Asian countries and one has invested in a shipbuilding company in Brazil. These international links can produce new sources of innovation and skills and also market opportunities. Even though Japanese shipbuilders are increasing their foreign investments, foreign institutions have relatively

modest ownership in Japanese shipbuilding companies. However, many vessels built in Japan are sold abroad. According to the government report, in 2012 about 60% of the vessels in the Japanese orderbook were for export while the same number a year before was over two-thirds. (Council Working Party on Shipbuilding 2013)

Japan is trying to increase its maritime industry's international cooperation. For instance, Japan and Norway organised a seminar in June 2013 to help companies in finding global business partners and share latest innovations on products and services. The aim is to create green growth in the maritime sector. Possibilities for collaboration between countries were presented in the areas of LNG, innovations for oil and gas exploitations, offshore wind, the Arctic and fuel efficient designs and operations (NOR SHIPPING 2013) Another example of Japanese maritime cluster cooperating internationally is the planning of joint gas development with China in the East China Sea, which started already in 2008 but later led to a dispute over a maritime boundary between the countries (Chen 2013).

Cluster competitiveness

There are many different factors contributing to the competitiveness of the Japanese maritime cluster. As mentioned before, its structure is one of its strengths. Close cooperation with the banking system, great number of players in the related industries, and reliable relationships between them makes the cooperation inside the cluster effective. (Habara 2011; Inatomi 2010) Adopting policies of advanced automation and quality control and at the same time focusing only on some certain ship types have in the past preserved the competitiveness of the shipyards in Japan. Ship production in Japan has high productivity because of series production, and the Japanese methods of production engineering have become known around the world. Japanese shipbuilders are also known for their advanced ship design technology and marketing skills. (Habara 2011; BIMCO 2010) There are some advantages of Japanese shipbuilding compared to that of other major shipbuilding nations. It has been able to maintain a domestic production rate close to 100% and it has had a great volume of experienced and skilled workforce for the manufacturing processes that cannot be fully automated. However, there will be a major generational change of skilled workers during the next ten years. (Habara 2011) Japan is looking to the future by investing in research and development projects for green technology in maritime industry, and the country's shipbuilding industry has already made its mark in the energy saving technologies (MLIT 2011).

The ageing workforce is causing problems for Japanese maritime sector. The generational change and difficulties to find young people into the maritime sector in Japan has led the maritime transport industry to depend on foreign seafarers. The problem is global and estimates show that there is going to be a shortfall of about 27 000 seamen in 2015. (BIMCO 2010; Habara 2011) The number of ships registered in Japan has also decreased with the number of Japanese seamen registered. Meanwhile, the capital to asset ratio of Japanese shipping companies is worse than with their competitors overseas. In order to enhance the international competitiveness of the country's shipping industry, Japan introduced the tonnage tax system into Japanese-flag ships in 2008. Ports and port services is another part of the Japanese maritime cluster where the competitiveness has declined. Especially other Asian countries, which have made a lot of investments in ports, have passed the Japanese ports in competition. (Habara 2011) The strengthening yen and the fact that

Japan is a high cost economy are making it harder for this maritime nation to compete in global markets. (BIMCO 2010; Council Working Party on Shipbuilding 2013)

Even with the fierce competition, there are opportunities for the Japanese maritime cluster to enhance its competitiveness in its strong areas or break into a new territory in the global markets. According to Habara (2011), the global volume of ocean-borne cargo movement has increased about 50% over the past decade. He also points out that the growth of the cargo volume is expected to continue. The increase in maritime transport and the plans of Japanese shipping companies to more than double the number of their Japanese registered vessels because of the tonnage tax are very good opportunities for maritime industry in Japan. The increase in Japanese registered ships will boost the country's shipbuilding industry because its international shipping industry acquires 90% of its vessels from domestic builders. Japanese government also wants its ports to utilize the growing maritime transport and is investing to Keihin port and Hanshin port to transform them into major hubs. A great opportunity for the Japanese maritime cluster is the growing demand for green technology. Japan's MLIT (Ministry of Land, Infrastructure, Transport and Tourism) has set a goal to reduce GHG emissions for a 30% from international shipping. It also expects the demand for high efficient vessels to grow heavily. MLIT plays a big role in reaching the set goals by supporting Japanese maritime cluster's R&D of new technologies. (Habara 2011)

Japanese maritime industry also faces some outward challenges and threats. Piracy is a continuing threat to the global shipping, especially at the coast of Somalia, where a total of 237 attacks took place in 2011 (Ministry of Foreign Affairs of Japan 2012). In 2008, there were approximately 20 000 vessels transiting the Gulf of Aden from which 2 103 were members of the Japanese Shipbuilding Association (Maekawa 2009). Japan has taken numerous actions in order to protect the maritime security including deploying naval patrol vessels and aircrafts to address the issue. (Ministry of Foreign Affairs of Japan 2012) Japan is also strengthening the security around its own coast according to country's Prime Minister Yoshihiko Noda, who also stated that: "It is unmistakable that the security environment surrounding Japan is becoming more serious than ever. " These comments were given in 2012 while the dispute in the East China Sea continues. (Lowe 2012) Other threats facing Japanese maritime sector are natural disasters like earthquakes and tsunamis. These disasters shut down ports and stop shipping industry, while the estimates of the insurance lost can be as much as USD 10 billion (Leach 2011). Already mentioned major outward threat for Japanese maritime sector, especially for shipbuilding in Japan, is the increasing competitiveness of the other shipbuilding nations (Habara 2011).

Figure 11. SWOT-analysis of the Japanese maritime sector

| STRENGTHS | WEAKNESSES |
|--|---|
| <ul style="list-style-type: none"> • Reliable relationships within maritime sector • Maritime cluster's close cooperation with the country's banking system • High productivity of shipbuilding • Shipbuilding's domestic production rate of almost 100% | <ul style="list-style-type: none"> • Ageing workforce • Decreasing competitiveness of shipping industry • Low competitiveness of ports and port services due to a lack of investments in the past • Strengthening yen |
| OPPORTUNITIES | THREATS |
| <ul style="list-style-type: none"> • Shipping companies allowed to pay tonnage tax plan to more than double the number of their Japanese-registered vessels • Plans to great major port hubs by increased investments • Investments in green technology | <ul style="list-style-type: none"> • Security environment in the country's territorial waters • Natural disasters • Increasing competitiveness of rival shipbuilding nations |

The future of the cluster

Japanese shipbuilding industry is trying to overcome its competitiveness issues. One way of coping with this is through shifting construction focus from one ship type to another. For example MHI's Kobe shipyard ceased to manufacture merchant vessels and is now constructing offshore units and research vessels, while also focusing on a cruise ship construction. Others are focusing more on the shipbuilding services like providing design, technology support or training of engineers. One example of this is IHI Marine United, which made a technical assistance contract with a Brazilian shipbuilding company. According to the Council Working Party on Shipbuilding's report (2013) both of the strategies require increasing efforts on R&D for the development of new competencies. The report shows that in Japanese listed companies the investments to R&D have more than doubled from 2006 to 2011 (to USD 157 million). It seems that the focus of the Japanese shipbuilders' R&D is to increase energy saving and environmental technologies. Examples of these efforts include reducing CO₂ emissions and improving fuel efficiency. Some of these R&D efforts are done in cooperation with other companies in order to improve the development. For example ClassNK is working with Imabari and Sanoyas Shipbuilding Corporation to test technologies that meet new EEDI regulations in actual operating environments. (Council Working Party on Shipbuilding 2013)

MLIT's report of the green growth and maritime industries also emphasizes the R&D efforts to increase the industry's competitiveness through green innovations. While focusing on green growth of shipbuilding and especially the development of LNG-fueled ships, the report states that there are other industries that can utilize the new green technology. For example wind power generation at sea and the development of undersea resources can benefit from the new technological innovations. According to the report, regulations are good for the industry because they force the maritime cluster to invest in new technologies also in the future. An already mentioned example of this is the maritime sector regulations on GHG emissions and the followed investments in energy saving technologies. (MLIT 2011)

It is essential to improve the efficiency in Japanese ports. The future competitiveness of the Japanese ports depends largely on the success of implementing the MLIT's strategic plan for the Japanese ports. Habara states (2011, p. 76): "The strategic port plan of Japan requires integration and privatization of port terminal corporations to streamline port operations". Part of the plan was to concentrate the international activities in a few named ports in order to create major hubs.

In April 2013, Japan approved a new Basic Plan on Ocean Policy (Headquarters for Ocean Policy 2013). The aim of this plan is to protect the Japanese interests at sea. The first ocean policy was announced in 2008, but due to different factors, e.g. weak institutional coordination, it did not lead to concrete action. Now Japanese policymakers face a fiercely growing global competition which motivated them to make more proactive plan to enhance country's position among global maritime powers. Japan is trying to increase its capabilities to exploit its seabed resources. Increased ability to exploit its own seabed energy and mineral resources would be a negotiation tool for overseas resource supplies in the future, and it would also decrease the country's resource dependence. Implementation of the new ocean policy also means increased efforts in securing the maritime transit routes and territorial waters. Japan's neighboring countries could interpret these actions as provocation and it could lead to further disputes. As for the new strategy with ports, also for the new plan on ocean policy to succeed it is imperative to be more engaged with the private sector and to cut through the ineffective bureaucracy. If the application of the new policy is successful, it can create new growth and competitiveness for the Japanese maritime cluster. (Oxford Analytica Daily Brief Service 2013)

There has been cooperation between Central Baltic region maritime companies and Japanese maritime sector in different fields of maritime industry, e.g. the development of RoRo ships, fuel cell products, and diesel engines. Further potential exists in the joint development of green technology. For instance, the Japanese government and maritime companies have increased their investments in energy saving and environmental technologies and some companies from the CBR have already taken advantage of this opportunity. For example NAPA, a software house for ship design and operations, has collaborated with Japanese ClassNK, the world's largest ship classification society, in creating solution to increase eco-efficiency and reduce fuel consumption (NAPA 2012). Another CBR company, Elomatic, has cooperated with Japanese MTI, NYK Line and Italian marine designer Garroni Progetti in developing an environmentally friendly low emission container ship of 8000 TEU. The futuristic ship with 70% less CO₂ emissions serves as platform for new technologies and their use in the future vessels. (Elomatic 2012; NYK Line 2013) Such examples and experiences could also encourage other companies from the CBR to find cooperation possibilities in the land of the rising sun.

3.8 THE NETHERLANDS – FROM A STRONG SHIPPING NATION TO FOCUSING ON PORTS AND INLAND SHIPPING

By Jenni Junnelius

The development of the cluster

The Dutch maritime cluster has an extensive history in maritime-related operations, and the country is by tradition a trading nation with around 70% of its GNP being generated by exports (Holland Trade 2013). The Netherlands's location at the center of Europe has made it an important hub for

transportations to and further across Europe. The country once had one of the largest merchant fleets in the world that ensured profitable trade with its colonies and other countries. However, the fleet was nearly extinct after the Second World War. The oil crisis had a significant impact also on the Dutch maritime industry development, not necessarily in terms of diminishing shipbuilding but the rise in oil prices triggered and encouraged the search for oil and gas offshore. This resulted in the development of the offshore sector including world leading equipment suppliers for the oil and gas companies located mostly in Rotterdam. (Gammelgaard et al. 2013)

While the cluster has experienced positive growth in general, the individual sectors have shown some variations, e.g. due to global economic development. The recession has hit hard the shipbuilding sector, forcing it to find new paths due to the declining demand in shipbuilding (Hansen & Clasen 2010). A report (Peeters et al. 1994) on the maritime cluster published in 1994 has had a strong impact on Dutch maritime policy building. The report illustrated the structure of the added value produced by the cluster, showing that only 30% derived from traditional shipping, whereas 70% was created onshore through direct and indirect activities. Consequently the attention then turned to the related maritime sectors and together with the Ministry of Economic Affairs the Transport Ministry established the Dutch Maritime Network. (Hansen & Clasen 2010, Wijnolst 2006)

The shipping industry in the Netherlands, as in many other countries, has faced challenges during past decades, which have been handled through a number of policies to strengthen the competitiveness of Dutch shipping. For example, in 1996 the tonnage taxation was introduced, the costs and rules regarding e.g. the nationality of the crew were made easier, and some national rules regarding safety and environment were simplified. Generally the focus in the Netherlands has been on encouraging Dutch ownership rather than vessels under Dutch flag (Statskontoret 2010). The Netherlands was among the first to specialize in container shipping after the oil crisis in the 70's as they had not largely focused on tanker shipping before that. The offshore industry started to develop after the crisis, and the Dutch were highly involved in developing this sector and a market for various equipment suppliers was established. The shipbuilding industry started building large tankers and specialized vessels, but also simple short sea ships. Technological development followed in the cluster and specialized shipbuilding evolved as many new ship types were needed for the deep sea shipping, e.g. chemical-gas and container carriers. Also inland shipping started to develop as the canals provide transportation possibilities to surrounding countries. In addition, pleasure yachts became a new profitable niche sector. (Gammelgaard et al. 2013)

Cluster actors and networks

The status of the Netherlands as the maritime center in Europe results from the multifaceted maritime industry, a very diverse fleet of sea-going vessels, Europe's largest inland navigation fleet, and the highest port capacity in Europe. The Netherlands is additionally a global leader in the provision of offshore services and developing complex maritime systems. Groundbreaking maritime products and services create a successful maritime sector (Government of the Netherlands 2013).

The maritime cluster comprises 11 subsectors and 11 000–12 000 companies which employ around 185 000 employees and generate an annual turnover of above EUR 26 billion. The identified sectors are shipping, shipbuilding, ports, inland shipping, dredging, offshore, equipment suppliers, the royal navy, maritime services, yachting industry and fishing. Out of the eleven sectors in the industry, the

port sector is the largest sector, producing 29% of the value added, 19% of the employment is generated in the port industry, followed by the shipping and shipbuilding sector, whereas the fishing sector is the smallest (Nijdam & de Langen 2003, Hansen & Clasen 2010).

Traditionally ship building has been an important part of the Dutch cluster and the Netherlands is the third largest ship builder in Europe, number one if the number of ships is counted. It still has a strong position as a shipbuilder nation, even though it recognizes the global challenges in the shipbuilding sector. In addition to seagoing cargo vessels, the Netherlands is also producing specialized vessels and inland ships in increasing amounts (110 in 2010) and also a variety of other non-cargo carrying vessels such as dredgers, patrol ships and river cruise vessels. The equipment suppliers range from specialized niche companies to larger ship building groups, but mostly they are SME companies. Together the around 750 companies generate a turnover of EUR 3–5 billion and around 65% of the turnover comes from exports. The environment is highly international with global companies operating in the Dutch cluster. (Maritime by Holland 2013)

The Dutch fleet was 0,6% of the world fleet (2009), out of which slightly over half of the vessels were registered under Dutch flag. The fleet mostly consist of smaller vessels around 10 000 GT and has an average age of 10 years (Statskontoret 2010). Wagenborg, established over 100 years ago, is an important actor in the shipping sector, providing a wide range of shipping solutions for the global shipping market, varying from a diversified fleet to ship management (Wagenborg 2013). The shipbuilding sector has a turnover of EUR 7,3 billion (2009) and employs around 35 000 people. The 750 maritime suppliers employ around 21 000 people (2009), focusing on e.g. technologies around electronics, cooling equipment and transport equipment. Dutch boatyards delivered 19 mega-yachts and the order intake was 8 new ships and 77 super-yachts, ranking the Netherlands third in yacht building by gross tonnage (2009) (Holland Trade 2013).

The Dutch maritime cluster has developed into the main logistics cluster in Europe with a highly developed infrastructure, including developed land (2500 km of motorway) as well as sea (6000 km rivers and canals) transportation prerequisites. The port of Rotterdam, the biggest port in Europe (total port area 10 500 hectares in 2006) and considered as the gate to Europe, is a central point of the logistics cluster due to its geographical location and importance in world trade. It has been developed largely during the past years and the wider cluster is employing indirectly some 90 000 people. Also the port of Amsterdam is considered important with its favorable location, closeness to further transportation routes, and ability to handle all kinds of cargo, especially efficient in handling bulk and containers (Gammelgaard et al. 2003).

The high focus on logistics activities is illustrated by the Dutch Institute for Advanced Logistics (Dinalog), which was founded in 2009 to focus on logistics-related research and development activities (Dinalog 2013). The importance of smart and well working ports is recognized on a governmental level, stating that the cargo handling need to be well structured to be efficient and that research is needed in this field, focusing also on safety and sustainability issues (Government of the Netherlands 2013). An important company in the infrastructure sector is the Van Oord Company specialized in dredging, marine engineering and offshore projects (oil, gas and wind), hence involved in a variety of infrastructural projects, with an experience from over 100 years (Van Oord 2013).

The Dutch maritime cluster is highly international in its approach and recognizes the importance of global awareness and cooperation in the maritime market. The companies are to a large extent international and value the presence on a global market. Over 60% of turnover is from exports (2009) with a total turnover of almost EUR 14 billion, and for instance shipbuilders and suppliers are establishing operations worldwide (Holland Trade). Not only are the Dutch companies interested in the international market but the Dutch market is also of great interest to international players, as the highly developed and collaborative cluster provide an attractive business environment and there is a wide range of foreign companies present on the Dutch market, such as in shipping one of the world leading companies, the French CMA-CGM. (Maritime by Holland 2013)

The Netherlands is involved in high technology innovations. Development projects are results of joint ventures and networking activities enabling significant technological development, while requiring cooperation across sectors and involvement of both public and private actors. As an example, in 2013, a 3D-print factory was opened for printing parts for multinationals. Eight companies, organized in the Additive Industries collective, have invested a total of EUR 1,8 million to start up the first facility of this kind in the Netherlands (Holland Trade 2013).

In the Netherlands more than 10 000 maritime cluster companies are active in various forms of operations and cooperation across sectors. Extensive R&D activities support the development of the cluster and its various sectors (Maritime by Holland 2013). The Maritime Research Institute Netherlands (MARIN) is combining academic research and market needs by providing the industry with innovative design solutions and by carrying out advanced research for the benefit of the maritime sector as a whole (MARIN 2013). The Maritime Knowledge Centre (MKC) was founded in 2002 to increase cooperation within the public maritime knowledge infrastructure in the fields of fundamental and applied research. MKC is a cooperation project between Delft Technical University, TNO, MARIN and the Royal Netherlands Naval College. MKC wants to make a valuable contribution to the strengthening of the Dutch maritime cluster through knowledge development. Moreover, the aim is to increase the attractiveness and quality of maritime education through the development, adaptation and integration of new knowledge and technologies that are transferred to the industry, contributing to innovation and modernization for the benefit of the long-term competitiveness of the maritime cluster. The main goal is stimulation of the cooperation between knowledge infrastructure and industry in the fields of fundamental and applied research. (Maritime Knowledge Center 2013)

Another initiative of cooperation within the maritime cluster and effort to develop it is the already mentioned Dutch Maritime Network (NML), which was established in 1997 as a joint initiative of the Ministry of Transport, Public Works and Water Management and the Royal Association of Netherlands shipowners (KVNR), partly as a result of the new shipping policy introduced in 1996. Its objective is to raise awareness of the maritime cluster, promote the industry's image, and promote the shipping industry as an important part of the cluster. The NML has also been a driving force in the establishment of the European coordinating body for maritime clusters (Dutch Maritime Network 2013). Maritime by Holland, on the other hand, is a joint initiative with 11 000 member companies in the maritime cluster in the Netherlands. These companies generate social and economic value for clients worldwide through the combination of expertise, imagination and collaboration. (Maritime by Holland 2013)

Cluster competitiveness

The Netherlands is considered to be a key maritime cluster due to its geographical location, which enables possibilities for the sector to be developed as a lot of transportations through Europe pass the Dutch ports. Therefore the port system and infrastructure is of world class and a top priority in the Netherlands. The Dutch port infrastructure has been ranked number one in the world, largely as a result of the substantial and continuous investments in developing it. The port of Rotterdam describes the way of investing and developing as cooperation between all affected actors, such as the industry, ministries and NGO's. This is focused development work towards the outlined strategy for the port of Rotterdam, Port Vision 2030. (The Journal of Commerce, Port Vision 2030) Not only is it development of the actual port and its operations, but the development covers the whole port area and businesses related to it, with the aim of creating a competitive and main industrial complex in Europe. The Port of Rotterdam is ranked the fourth biggest in the world, and the biggest in Europe. Values such as efficiency, sustainability, cooperation and flexibility are key guidelines in the development work of the port (Port Vision 2030).

Consequently, the inland shipping is of great importance in a country with such a location. The shipbuilding and technological development in the country is also largely focusing on this sector to develop and make more efficient vessels for specifically the demands of the inland shipping. Inland shipping is clearly an area with further development possibilities. The vessels are designed to better adapt to the conditions of inland shipping which differs from the deep sea shipping, in terms of more shallow waters, for instance. As another example, traditional propulsion systems have been used so far but a new dolphin-tail O-foil propeller has been introduced, increasing efficiency and reducing emissions (The Netherlands Trade 2013).

Also the offshore sector is developing fast and constitutes an important sector within the cluster. There is a number of equipment and service suppliers with a strong focus on developing the operations and technology required. The need for human capital is recognized as a challenge for the sector in the future. (Offshore Holland) The offshore business covers everything from the oil and energy companies to yards and vessel building companies and single components suppliers related also to the energy sectors of wind and tide. It is regarded as an important and strong sector also in global comparison, with extensive history in the field and a wide range of companies present not only on the domestic market but with a strong presence on the international market. The Dutch offshore companies are suppliers in major offshore and deep sea projects in countries such as Brazil, West Africa and Australia (Nordic Industries Development OY 2013).

The need for human resources in the future is recognized both within the traditional shipping sector and the specialized high technology sectors. The Netherlands Maritime University was established in 2007 to educate specialists for the industry needs, providing study programs up to a master's level. It was established and is run by the STC-Group, with its home base in the port of Rotterdam, offering education, consultancy and applied research to the logistics sector, shipping, maritime and port-bound industries. The education is approved by the Ministry of Education, Culture and Science and is the only one of its kind in the Netherlands. The STC group has a global presence with offices and operations in a number of countries, e.g. offering the education programs also in Vietnam. (STC Group 2013) The increasing focus on sustainability and innovation also require highly educated and competent specialists, therefore the human resource need is focused on the education sector

connected to the maritime industries is developed in various ways and in a number of educational institutions.

Overall the Dutch maritime cluster is highly collaborative. The importance of cooperation to reach visions, common goals and development within the cluster for joint benefits is clearly recognized. Maritime by Holland encourages and recognizes that yacht and shipbuilders collaborate with marine engineers, dredgers share views with equipment suppliers and R&D companies cooperate with specialized consultancies. There is a number of projects including actors from the private as well as the public sector and joint efforts bringing together companies across industries to develop and innovate products as well as services in order for the Netherlands to strengthen its position as a competitive and successful cluster on the global market. (Maritime by Holland 2013)

Figure 12. SWOT-analysis of the Dutch maritime sector

| STRENGTHS | WEAKNESSES |
|---|---|
| <ul style="list-style-type: none"> • Geographical location, logistic center in Europe (e.g. Rotterdam) • Offshore expertise • Port infrastructure • Global presence, international companies • Cooperation and networking • Political interest to develop and support the cluster | <ul style="list-style-type: none"> • Largely dependent on international material flows through the country |
| OPPORTUNITIES | THREATS |
| <ul style="list-style-type: none"> • The growing offshore sector • Inland shipping • Russian markets • Technological innovations related to the cluster industries | <ul style="list-style-type: none"> • Lack of human resources (educated seafarers and specialists) |

The future of the cluster

In 2020 the Netherlands is predicted to be the European market leader in controlling flows of goods passing through one or more European countries. Dutch value added (GDP) in supply chain control and related logistics activities will triple from EUR 3 billion in 2007 to over EUR 10 billion in 2020 (Dinalog 2013). The importance of the port operations will be increasingly high, since substantial infrastructural investments are made related to the ports enabling greater and more efficient material flows, the increase in the port turnovers are likely to be achieved.

According to the Maritime by Holland-report, the important future areas that should be in focus are human capital, globalisation, innovation, sustainability and cooperation. These areas illustrate the focus within the Dutch cluster and the areas that are prioritized even more in the future. In other words, the international presence is crucial and is promoted across all industries in order to build a strong cluster on the global maritime market, where operations need to be worldwide and cooperation to other countries is also desirable. Not only is it a question of Dutch companies exporting to a greater extent and establishing operations abroad, but the Dutch environment should

also become even more attractive for foreign investors to enter (Maritime by Holland). Growth sectors in the maritime cluster are in addition to shipping naturally also offshore, dredging and maritime services. (Janssens 2005)

For the Nordic countries, for instance the offshore sector is of great interest, providing possibilities of cooperation for a number of SME's to cooperate with the Dutch companies constantly looking for technological development and markets to expand to. For example the Russian market is a common market of interest for the Finnish and Dutch maritime clusters and provides possibilities of cooperation if companies in the two clusters find corresponding partners to network with and establish joint efforts, being stronger units for entering the Russian market. (Nordic Industries Development 2013)

3.9 NORWAY – WORLD-LEADING EXPERTISE IN OFFSHORE AND SUBSEA OPERATIONS IN THE HIGH NORTH

By Jenni Junnelius & Eini Laaksonen

The development of the cluster

Geographically Norway is a natural environment for the development of maritime operations due to its long coastline and large offshore oil and gas reserves. In 1970s and 1980s Norway was one of the largest shipbuilding nations in the world, but due to the crises faced by the sector, the country's relative position has slightly diminished and changed in nature. For instance, a large downscaling of yards took place between 1975–1990 as a result of the oil crisis and its impact on the traditionally strong shipbuilding industries in the world. However, during the past decade, the number of yards has remained rather stable in Norway. (Jakobsen & Espelien 2011) Today, the Norwegian maritime industry remains strong, constituting the second largest field of exports (15% of total exports) after the oil and gas sector. (Det kongelige nærings- och handelsdepartementet 2013; Henriksson & Huhtinen 2013) The maritime industry's share of Norway's GDP has almost doubled during the past ten years – from 3,5% in 2000 to almost 6% today (Jakobsen 2010; Henriksson & Huhtinen 2013). When it comes to shipping, Norwegians control one of the world's largest merchant fleets. Even though the size of the fleet has slowly reduced after the growth-resulting maritime policy in 1996, the fleet still accounts for approximately 5% of the global capacity. (NSA 2004; Henriksson & Huhtinen 2013)

The Norwegian maritime cluster has survived well through the financial crisis, largely due to the diverse range of vessels constructed in the country, which has helped the businesses to adjust to the market fluctuations. At the same time, the efficient networks within the cluster have been a key source to success. In addition, while the global overcapacity in shipbuilding keeps the prices low, Norwegian shipping companies aim at strengthening their future positions by ordering new ships. (Henriksson & Huhtinen 2013) The sector's future prospects are positive – not only because of the good conditions of the cluster, but also due to the emerging opportunities regarding Arctic shipping routes and offshore subsea energy production. Particularly the Norwegian offshore industry is under extensive development, illustrated for instance by the fact that it is the second largest in the world after the U.S. (Reve 2009; Henriksson & Huhtinen 2013), the Norwegian offshore fleet comprising some 500 ships, around 60% of which sail under the Norwegian flag (NSA 2012). Substantial investments are directed into the related technology development, research, and education in order

to ensure adequate resources to meet the needs of this globally growing sector (Driftsrapport 2012, NSA 2013b).

Cluster actors and networks

The Norwegian maritime cluster is on a global scale strong and viable in terms of the width of maritime related operations and businesses in the country (Reve 2009). Maritime-related actors are scattered all over the country, employing around 100 000 people in total (Det kongelige nærings- och handelsdepartementet 2013; Henriksson & Huhtinen 2013). In fact, the Norwegian maritime cluster consists of a number of specialized regional sub-clusters located in different parts of the country (Jakobsen 2010). Out of the four main sectors within the industry – shipping companies, yards, equipment suppliers and service suppliers – the biggest single sub-sector has traditionally been shipping, contributing with a turnover above EUR 23 billion (2009). The equipment and service supplier sectors both have a turnover just above EUR 10 billion (2009), whereas the turnover of the yards has been around EUR 5,5 billion (2009). The 450 port and logistics provider companies in Norway have a combined turnover of EUR 1,5 billion (2009) (Jakobsen & Espelien 2011).

From 1995 to 2002, the Norwegian fleet has grown at a greater pace than the world fleet but since then the drop in growth has been dramatic, although the fleet is still the fifth largest in the world (Jakobsen 2010). The deep sea shipping (including general cargo and bulk, container, cruise, chemicals and car ferries) is decreasing and the offshore sector (including service, underwater entrepreneurs and seismic companies) is growing. (Jakobsen & Espelien 2011) Norwegian shipping companies are often privately owned, and usually there are at least two companies competing in the same category and geographical region. This pushes continuous development as the companies share a common labor market, rely on the same set of advanced suppliers, and draw on the same pool of maritime knowledge. The development of new technologies and innovations is a top priority, and potential for mutual cooperation in this area has also been acknowledged. As an example, Norwegian shipping companies have decided to meet the global climate challenge by agreeing on a zero emission vision for Norwegian shipping (Reve 2009). However, the ship owners' total power in the maritime sector is decreasing as the political dialogue aims at a focused and structured cluster where traditional shipping no longer plays the most central role (Dyrkoren 2013). Nevertheless, Norwegian shipping sector still remains significant and is expected to grow, supported with the largest ship order in the world in 2012 (more than new 130 ships valuing almost EUR 13 billion in total) (NSA 2013b).

When it comes to shipbuilding, the key areas of Norwegian expertise are offshore vessels, small special vessels, and recreational vessels (Henriksson & Huhtinen 2013). Altogether there are 75 yards in Norway, focusing mainly on construction, repair and maintenance work on a wide variety of specialized ships such as offshore vessels, advanced fishing vessels, passenger/car ferries and specialized coastal vessels (Working on the Norwegian shipyard industry 2013). Around 25 yards focus on newbuilds, with the largest concentrating on offshore and special vessels such as LNG ships and specialized tankers, and smaller yards focusing on fishing boats and other small vessels (Henriksson & Huhtinen 2013). The currently largest shipyard groups are STX OSV (Aker Yards), Bergen Group and HavYard Group, which have all been established during the past 10 years (Henriksson & Huhtinen 2013; Working on the Norwegian shipyard industry 2013). Ship design is also an important area of business, even though it nowadays is mostly carried out in foreign-owned

international companies such as Wärtsilä Ship Design, Rolls-Royce Marine and STX Norway Offshore Design (Jakobsen & Espelien 2011). The industry also includes a wide variety of equipment suppliers, many of which focus on special technologies and provide products and services for demanding conditions not only in offshore but also in fishing sector, for instance. The sector of equipment suppliers has grown significantly during the recent years with the total turnover doubled since 2005 to almost EUR 10 billion (Jakobsen & Espelien 2011).

While the Norwegian maritime cluster develops and produces innovative technologies and specialized products, foreign companies have also found it beneficial to set up operations into the country. For instance Rolls-Royce is a significant operator in the Norwegian market, employing around 3000 workers in the country (Rolls-Royce 2013). As another example, Fiskerstrand BLRT AS, a Norwegian subsidiary of SC Western Shipyard (part of the Estonian-based BLRT Grupp), specializes in designing and building small to medium sized car and passenger ferries. The company's future aim is to focus on renewable energy, particularly on supplying vessels and products related to offshore wind farms. (Fiskerstrand BLRT 2013; Western Shipyard 2013) At the same time, Norwegian companies are very active in international markets and cooperation activities. For instance, due to the rising labour costs, it is becoming more and more common in shipbuilding that parts of a vessel are constructed abroad (in the Baltics for example) and the final assembly takes place in Norway (Henriksson & Huhtinen 2013). Norwegian companies are also exemplary in successful international business networking and marketing of their own expertise, and have gained strong presence in the key future markets like Brazil, Western Africa and Australia, related to the offshore sector particularly (Henriksson & Huhtinen 2013). A lot of this success stems from beneficial and proactive state actions. As an example, Norway signed a free trade agreement with South Korea already in 2006, and Norwegian companies actively took advantage of the provided opportunities. The EU signed such an agreement only in 2011, and for instance Finnish companies still have not taken full advantage of the included benefits. (Finpro 2013b)

While the Norwegian maritime sector already includes a large number of global actors operating in areas like specialized shipbuilding, offshore, fishing and seafood, all these actors create a relatively well networked hub of expertise (Reve 2009). In fact, a global knowledge hub is what Norway is consciously building around the maritime activities with triple helix level support. The state, local universities and the industry are closely cooperating and supporting each other through this approach which is continuously being developed. (Dyrkoren 2013) Various associations also play a strong role in the Norwegian maritime sector. An influential example is Maritimt Forum, the head organisation for all the labour and employee organisations covering the whole value chain of shipping. (Maritimt Forum 2013) Creating a cooperative environment between different actors relevant in the sector's development is considered crucial in a country with high production costs in order to maintain global competitiveness (Jakobsen & Espelien 2011).

Cluster competitiveness

The Norwegian maritime cluster benefits from unique expertise in maritime sector, largely due to the long tradition in developing the related technologies and knowhow. Norwegian shipping companies are the main customers for the shipbuilding sector, accounting for 75% of the orders (Jakobsen & Espelien 2011). However, as the salary costs in Norway keep rising along with the levels in the oil and gas industry, the cost levels of Norwegian shipbuilding have become a troublesome

issue and a key challenge to the sector's competitiveness in the country (Laakso 2013). One recent example of a Norwegian vessel order not built in Norway is the latest addition to the Norwegian Cruise Line fleet, which was created by British SMC Design together with Swedish Tillberg Design and built by Meyer Werft in Germany (Cruise Business Online 2013). It has been acknowledged years ago that the Norwegian maritime industry is not competitive in terms of building large vessels, and the focus has been shifted to more specialized vessels. However, another interesting case was Statoil ordering a Dagny-rig from South Korea, which aroused a lot of media discussion as it was the fifth consecutive large-scale investment that Norwegian shipyards, despite excellent expertise, lost abroad. (Henriksson & Huhtinen 2013) When orders are lost and activities do not continue right after another, it is even more difficult to improve local knowhow and competitiveness. As a result, some of the least profitable shipyards have been closed during the past years (Henriksson & Huhtinen 2013).

To support the sector's competitiveness through continuous production of cutting-edge knowhow and skilled workforce, Norwegian universities are closely involved in the maritime sector's development. For instance, specific professorships have been introduced and sponsored by the industry to promote research related to the maritime sector. For example in Trondheim, considered the technological capital of Norway, there is the Marintek research and development organization with advanced test facilities. Their testing laboratory, opened in 1981, is the largest in the world and the advanced technology attracts customers from all around the world (e.g. Wärtsilä) to do various maritime product-related tests. At the same time, the cluster's advancement is supported by wide business and cooperation networks around the world. For instance Singapore has big financial resources and substantial initiatives, but is missing human resources and is hence interested in the education and knowledge provided in Norway. (Dyrkoren 2013)

Simultaneously, the Norwegian maritime cluster is well networked internally and relatively broad in its operations. The interaction between seafarers, shipowners, shipbuilders, equipment manufacturers and service providers has strongly supported the sector's development and created synergies between fishing, technology, finance, and oil and gas industries (NSA 2013a). Moreover, for instance in Ålesund, most of the maritime companies are very small but together form a dynamic knowledge center where orders and work is given to a neighbouring firm if one's own capacity is full (Henriksson & Huhtinen 2013). We-spirit has also supported the industry at a larger scale as Norwegian oil companies tend to favor domestic shipping companies even in their overseas operations (Vauraste 2013). However, the increasing cost levels have started to cause breaks in the national we-spirit.

The political spirit for developing the maritime sector is, however, very strong. An important step towards a more coordinated maritime cluster was the work done for the extensive national maritime strategy report, published in 2010. The report stated five focus areas: (1) environmental technology, (2) deep water, (3) Arctic, (4) renewables and (5) seafood, guiding the development work to a focused direction in universities, research institutes and in the industry. The work resulted in a common communication platform across the industries. Maritime21 was introduced by the government as a program to coordinate particularly research programs as there are plenty of them but they are not necessarily well coordinated or supporting each other. (Dyrkoren 2013)

The future directions for developing the expertise of Norwegian maritime actors clearly stem from the emerging needs and market potential. While Norway's sea area is six times larger than the land mass and while the majority of this area is defined as High North (NSA 2013a), the melting of the polar ice cap is both a significant concern and opportunity for the country. The concerns refer to the changes in the natural environment, whereas the opportunities refer to the increasingly accessible oil and gas resources and to the opening of new transportation routes. Norwegian maritime industry has world-leading technology and expertise in performing maritime operations in such demanding conditions (NSA 2013a), and the emerging opportunities are not only looked into but already under active development. Oil companies, including the state-owned Statoil, plan to drill 12 wells in the Norwegian Barents Sea this year, hitting a record equal to the wells drilled altogether in the past two years (Bevanger 2013). At the same time, the Northeast Passage creates new transport opportunities for Norwegian shipping and oil companies. In 2012, approximately 1,25 million tonnes of cargo were shipped through the route, which, however, still remains a tiny figure against the 740 million tonnes in the Suez Canal. Consequently, this northern sea route is not expected to become a rival to the Suez Canal, but with fast growth potential it might provide a lot shorter seasonal complement in near future (Koranyi 2013) and strengthen the position of the Norwegian shipping companies (Henriksson & Huhtinen 2013).

However, in addition to the environmental concerns, the current settlement patterns and business structure in Norway's northern counties are a challenging issue regarding future developments in the north. Businesses there are small, scattered and localized, with low innovation capacities in comparison to the national average. (NSA 2013a) Investments in the northern areas are thus required in order to provide complete services as well as to make most of the potential stemming from the increased production and transportation activities. The northern road, railroad and terminal networks as well as docking capacities need to be built and developed (NSA 2013a). However, the Arctic towns are waiting for the realization of these opportunities and are already preparing for the future activity in the region. For instance in Kirkenes, which is a Norwegian town in the High North and just a 15-minute drive from the Russian border, two major shipping terminals are on a drawing board together with a planned LNG terminal. Greger Mannsverk's Kimek shipyard, which today serves the Russian fishing fleet in Kirkenes, aims at benefiting significantly by taking on business from global oil companies. (Bevanger 2013)

One of Norway's future challenges concerns attracting skilled people to the maritime sector to meet the cluster's future needs. University support, professorships and master's degree programs specifically related to the maritime industry have for that reason been introduced. The sector is now being branded as a modern industry and attractive for young people. However, it is still a challenge to get people to move to remote places where some of the maritime related companies are located and where activities are expected to expand. Knowledge creation and education are thus among the top priorities, in which both the state and the industry need to invest. (Dyrkoren 2013) The number of employees in the sector is expected to increase during the years to come and therefore it needs to be ensured that there is a future generation with skills and knowledge to work in the sector (Driftsrapport 2012).

Figure 13. SWOT-analysis of the Norwegian maritime sector

| | |
|--|--|
| <p>STRENGTHS</p> <ul style="list-style-type: none"> • High level of expertise and technologies, particularly related to offshore subsea operations, Arctic conditions and LNG • Geographical location next to an emerging sea route and unexplored natural resources • Wide variety of operations helps adjusting to market fluctuations • Well networked and dynamic cluster • Well spread marketing networks all over the world • Strong political support for the sector's development (infrastructure, public financing, national development strategy) | <p>WEAKNESSES</p> <ul style="list-style-type: none"> • High cost-levels • Multiple, disintegrated development organizations and projects • Relatively poor infrastructure in the Northern Norway |
| <p>OPPORTUNITIES</p> <ul style="list-style-type: none"> • Further integrated and focused triple helix cooperation • Creation of a truly global knowledge hub • Growing global markets in offshore and Arctic maritime business | <p>THREATS</p> <ul style="list-style-type: none"> • Drop in oil and gas prices • Increased price competition, particularly from Asia • Government support depending on individual politicians' initiatives • Lack of educated workforce willing to move to remote areas where lots of maritime related activities are located in the future |

The future of the cluster

The future outlook of the Norwegian maritime cluster is very positive, but the state and public financing will continue to be crucial for all the ongoing development efforts. The shipping industry looks positively to the future and expects a growth of approximately 10% within the sector until 2015. The offshore sector is expected to witness the biggest growth but also short sea and deep sea are expecting growth. The Norwegian maritime industry is becoming increasingly more internationalized and the shipping industry has realized that it is important to take a wider perspective and see how the global markets are developing. There are high expectations concerning particularly the energy sector as the global demand of energy continues to increase, providing growing markets for Norwegian expertise in the offshore sector and shipping of oil and gas, particularly LNG. The Norwegian oil reserves are of high importance to the country and therefore the global oil demand and price development is crucial for the Norwegian economy in general (NSA 2013b).

The vision of the maritime industry's future in Norway is ambitious, as it is not only aiming at strong presence at global markets but also a position as a knowledge hub – as the most attractive location for global, knowledge based and environmentally robust maritime business. The knowledge hub approach means a more integrated and focused system of activities driving the development, shifting shipping to research and innovation as the most central activity in the maritime cluster, with

a number of activities surrounding and supporting it. (Maritime21 2013) To support this goal, Norway is also actively involved in developing new international regulations for maritime safety, environment, and labour, for instance with the International Maritime Organization (IMO), the (International Labour Organisation) ILO and the EU (NSA 2013), further strengthening its international role in the sector's future development.

From the perspective of the Central Baltic region, Norway can be seen as a tough competitor but also as a country of great business opportunities. Namely, although the CBR maritime clusters are suffering from expensive workforce, the situation is even worse in Norway (Laakso 2013), thus providing markets and a competitive advantage for companies operating in the CBR countries. While having high relevant expertise, for instance Finnish companies should seize the opportunity and rapidly participate in the maritime-related as well as infrastructural projects underway in Norway. This way the CBR companies could also get in to the business networks of Norwegian companies, and compete for international orders in cooperation with Norwegians as well as benefit from their existing contact networks, for instance in the offshore sector. Regarding the somewhat hardly accessible Russian markets, Norwegians benefit from existing cooperation connections through the joint Arctic offshore projects, and are to cooperate even more intensively in the future as the agreement of sharing the Arctic 'grey zone' was finally achieved and the oil and gas production in the Barents Sea is to begin – Russia benefiting from Norwegian technologies and expertise, and Norway getting an access to Russia's gigantic energy reserves (Laaksonen 2012; Bevanger2013). Involvement in Norwegian business groups and project offerings might thus result in new business opportunities even in Russia. Simultaneously, as Norway is in great need of workforce with good maritime expertise, the CBR clusters could consider more active cooperation with Norway also in terms of education, as well as in R&D and international lobbying, for instance. We should not let the Scandes stop us from seeing the massive opportunities in the neighbourhood.

3.10 RUSSIA – THE AWAKENING GIANT By Eini Laaksonen & Hanna Mäkinen

The development of the cluster

After the collapse of the Soviet Union, the Russian shipbuilding industry has gone through deterioration. The shipbuilding sector has suffered from a lack of private investments, which has prevented the commercial shipbuilding from developing, whereas the military shipbuilding still holds the dominant position which it had during the Soviet times. Moreover, Russia has mostly invested in the development of its port capacity particularly in the Baltic Sea and the Far East. However, the Russian maritime cluster has recently received increased attention and funding, particularly due to the growing interest in the Arctic hydrocarbon fields and sea routes as well as the continuous importance of energy exports for the Russian economy, and can be considered to be experiencing a rebirth. The Government of Russia has even classified the shipbuilding industry as one of the strategic sectors of the economy and adopted a specific development programme which aims at quintupling the Russian shipbuilding output by 2030 with the total state funding of RUB 1,3 trillion. In this development programme the Russian shipbuilding sector is divided into three clusters: the robust Northwest Russia requiring modernisation, the Southern Russia concentrating on shipbuilding in SEZs (special economic zones), and the Far East with a new modern shipyard complex. (The Bank

of Finland Institute for Economies in Transition 2012b; Vorotnikov 2012) Particularly the Far Eastern complex seems to be the future priority for the state because of the active oil and gas production operations requiring also new maritime capacity in the area (President of Russia 2013).

The Russian economy is highly dependent on the energy export revenues as oil and gas revenues constitute half of the budget and over 70% of the exports of goods in Russia (The Ministry of Foreign Affairs of Finland 2013). The development of the Russian maritime sector is largely guided by the needs of the country's energy industry and if the Russian economy remains energy-driven, the situation is not likely to change in the foreseeable future (Dobronravin 2012). On the contrary, the energy production is shifting north to increasingly demanding Arctic conditions, which requires considerable investments and completely new technological solutions also from the supporting maritime sector. While the Russian Arctic is estimated to hold the half of the world's untapped hydrocarbon resources, the development of these Northern regions is gaining increasing attention and investments from the state as well as businesses. Despite the strategic nature of the energy sector, Russia is inviting also foreign oil companies to the new mega projects to get the projects started with their technological expertise and capital. (Ernst&Young 2013)

Of particular interest is the Northeast Passage, the Arctic sea route along the Eurasian northern coast, which provides a shorter and thus cheaper alternative to the southern Suez Canal route to the growing Asian markets. However, due to the almost non-existing infrastructure, lack of adequate ice-going vessels and emerging disputes over the waterway rights, the Northeast Passage is not expected to emerge as a large-scale international transport route in the near future. Although the period during which the route is navigable is lengthening (currently open between July and November) and this year already has seen a record number of ships passing it, heavy investments are still required in the Arctic port infrastructure, satellite coverage and rescue system, let alone the construction of new ice-capable LNG tankers as well as the icebreakers necessary to escort their voyage. Although the need for such new vessels can already be recognized, the concrete orders are expected to surge only after the final investment decisions of the Arctic energy projects have been closed. (Evers 2013; Mitchell & Milne 2013; Vukmanovic & Koranyi 2013)

Moreover, the enforcement of safety and environmental protection in the Arctic remains an open and rather heated issue. As an example, in September 2013, a group of Greenpeace activists were arrested in Russia's Arctic waters for piracy after they had tried to board into Gazprom's oil platform. While the activists wanted to draw attention to the dangers of Arctic oil exploration, Gazprom said the protest threatened workers under water at the time. (Meyer 2013) The incident has attracted a lot of international media attention, while Arctic States are anyways keeping an eye on each other's developments (Munson 2013). Nevertheless, as a concrete peaceful attempt to support the environmentally friendly operations in the Arctic is the Polar Code under development in IMO. This set of standards for ships operating in polar waters is to cover the full range of design, construction, equipment, operational, training, search and rescue and environmental protection matters relevant to ships operating in the inhospitable waters surrounding the Arctic and Antarctic poles. Moreover, followed by the proposition of Norway and Russia, the Maritime Safety Committee adopted in 2012 a new mandatory ship reporting system "In the Barents Area (Barents SRS)". (IMO 2013) Consequently, little by little, a new maritime sector playground is emerging into the Russian Arctic.

Cluster actors and networks

The Russian shipbuilding activities are spread between the north-western, southern and far-eastern parts of Russia. Currently the industry is led by the cluster in the Russian Northwest which benefits from a long tradition in shipbuilding. Today the region accounts for 72% of Russia's total shipbuilding production volume and over 80% of the related R&D. Almost 40% of all the 170 Russian shipbuilding enterprises are located in the Russian Northwest. (Doing Business in St. Petersburg 2011) At the same time, while having sea ports also by the Black Sea and the Pacific Ocean, the Baltic Sea is the main sea route for the country's foreign trade. Crude oil and petroleum products constitute the majority of the maritime transports, and one third of Russia's total oil exports are transported through the Russian Baltic Sea ports. Russia is constantly increasing the export capacity of its Baltic Sea ports and Ust-Luga in particular in order to become less dependent on third-country transshipments (The Bank of Finland Institute for Economies in Transition 2012a).

The general structure of the Russian maritime industry is relatively centralized due to the high state involvement in the sector's development. Currently the state-owned United Shipbuilding Corporation (USC) accounts for about 80% of the shipbuilding orders in the country (Vorotnikov 2012). This St. Petersburg-based corporation was established in 2007 to unite the government's shipbuilding, repair, and maintenance subsidiaries in the Western and Northern parts of Russia and in the Far East, and to strengthen the state's control over the industry (The Moscow Times 2013a; Staalesen 2013b). Currently it includes 22 shipyards and 9 research institutions. However, the USC has recently received a lot of criticism due to its poor performance – the majority of enterprises in this corporation are continuously unprofitable. This has resulted from outdated facilities, slow renovation, and more expensive and time-consuming shipbuilding compared to foreign yards. Even President Putin has expressed his dissatisfaction with the delayed contracts, and the head of the corporation was changed in May 2013. (Pynnöniemi 2013) The company's new strategy requires investments totalling over USD 30 billion by 2030 and abandoning of regional subholdings in favour of three new military and two new civil production divisions. This radical restructuring can result in the shutdown of St. Petersburg's Baltic Shipyard and Admiralty shipyard and moving their operations to the new facilities. (The Moscow Times 2013b) The ineffectiveness of the Russian maritime sector has resulted in a considerable lack of adequate equipment in the Russian offshore oil and gas industry and thus vessels are mainly being built abroad. To fix the unfavourable situation, the Russian government considers the establishment of a new shipbuilding consortium which would be led by Rosneft. The new group would include partnership also from OSC as well as Gazprom Bank, and would be responsible for modernizing the aged naval yards of Zvezda in the Russian Far East and Roslyakovo in Murmansk. Particularly Zvezda is to become a new super-yard developing and producing offshore petroleum equipment. (Staalesen 2013a)

The Russian government aims to close the technological gap between the Russian shipbuilding industry and the European and Asian shipbuilding industries. In order to facilitate technology transfer and simultaneously improve the quality of Russian vessels it has established joint production for ships and maritime equipment with foreign companies. The Russian maritime industry has cooperation relationships with shipyards in Finland, France, Norway, Singapore and South Korea, among others. (Dobronravin 2012; Motorship 2013) The Russian shipyards cooperate increasingly with foreign shipyards by dividing different phases of ship production within the yards. A

concrete example of this kind of cooperation is the Finland-based Arctech Helsinki Shipyard, currently operating in the shared ownership of the USC and STX Finland. The ice breakers built in the Arctech Helsinki Shipyard have been designed in Finland, the hulls constructed in the Russian shipyards of Yantar or Vyborg, and afterwards the vessels have been returned to Helsinki for finalization.

On the other hand, the smaller companies involved in the Russian maritime sector are rather difficult for foreign companies to reach as they are quite scattered, and without an organizing association or such, these actors do not have joint development initiatives either. Currently the Russian maritime cluster lacks both the organisations specialised in coordinating the activities of the cluster, and associations and interest groups promoting the interests of the maritime industry. (Laaksonen & Mäkinen 2013) Moreover, foreign companies often consider the Russian business environment too challenging in relation to the expected profits (Laaksonen 2012). In addition, the supply chains under the Russian state corporations are not developed to the level of efficiency that would meet international standards. The ambition to develop the sector seems strong – the big issue is not finance but how to use it most fruitfully. For the time being it seems that the Russian decision-makers have controversial opinions concerning the best development directions, but all do agree on favoring the domestic shipbuilding industry (Pynnöniemi 2013).

Cluster competitiveness

Regarding the future of the Russian the maritime sector, the maritime industry can be considered to hold significant growth potential but the industry's modernization will certainly take time. Russia has fallen behind other shipbuilding nations in terms of technologies and knowhow. The current Russian expertise is mostly restricted to military shipbuilding, for instance submarines and naval vessels, and the industry is not export-oriented or even present at the international market. The commercial shipbuilding capacity is focused on building hulls, and advanced technologies and equipment are usually imported. As shipbuilding industry can be considered a strategic sector in Russia, the state plays a leading role in its development as the main customer for vessels, the owner of the key shipyards, and the funding provider. However, the strong roles of both the Russian state and naval industry in the country's maritime industry have hindered commercial shipbuilding from developing. Since the shipbuilding industry has been operating in an environment in which it has not been faced with competition and large shipyards have been mostly managing on the state's orders, the industry has not been forced to develop its cost efficiency, technologies and knowhow. (The Bank of Finland Institute for Economies in Transition 2012b; Paananen 2013) A clear indication of the domestic shipyards' low competitiveness is the fact that Russian private companies also prefer foreign shipbuilders – currently only 6% of the orders from private Russian shipowners are placed to domestic shipyards (Vorotnikov 2012).

The existing Russian fleet is in need of rapid and broad modernisation and Russia aims to diversify the legacy of the military shipbuilding and increasingly engage in the building of civil vessels. However, the concern about the state of the Russian shipbuilding industry is nothing new. Russian government has established several policies since 1990s to support the maritime industry's development which have not yet proven very effective. For instance, the creation of the USC in 2007 was a part of the Strategy of shipbuilding development until 2020 and for the further perspective, but the holding company is still in process of consolidating and developing the cooperation within

the subsidiaries. The state-private interaction has not brought significant results either in terms of increased competitiveness. Indeed, the government policies seem to have focused more on collecting the relevant actors inside the same holding instead of supporting the formation of natural business networks and clustering. (Laaksonen & Mäkinen 2013)

The Russian maritime cluster benefits from low labour and steel material costs as well as advanced metal processing, although simultaneously suffering from a lack of qualified work force, particularly in engineering, design and project management. The innovative capacity of the Russian maritime industry also remains at somewhat low level. However, due to the available funding and ambition to gain expertise, it is constantly developing and Russian companies and research organisations are increasingly engaging in R&D activities, also with international organisations. Personnel exchange and training are also done with international partners to achieve transfer of knowledge to Russia. Indeed, the slowly increasing international cooperation provides a good starting point for engaging the cluster into global competition. (Laaksonen & Mäkinen 2013; Paananen 2013)

Figure 14. SWOT-analysis of the Russian maritime sector

| STRENGTHS | WEAKNESSES |
|--|--|
| <ul style="list-style-type: none"> • Low labour and steel material costs • Advanced metal processing • Expertise in naval shipbuilding and ship hulls • Political incentive and funding to develop the maritime industry | <ul style="list-style-type: none"> • Lack of knowhow, advanced technologies and equipment related to commercial shipbuilding • Lack of qualified work force • Low innovation capacity • Outdated Russian fleet • Dominant roles of military shipbuilding and the state hinder the development of commercial shipbuilding • The Russian maritime industry is not export-oriented or present in the international market • Lack of clustering and natural business networks • Challenging business environment |
| OPPORTUNITIES | THREATS |
| <ul style="list-style-type: none"> • Significant investments allocated for renewing the fleet • Increasing international cooperation • Growing interest in the Arctic and the Northeast Passage creates a need for related maritime solutions | <ul style="list-style-type: none"> • Russian shipbuilding industry has fallen behind other shipbuilding nations in terms of competitiveness • The government's development plans fail to materialize effectively • The economy's dependence on energy revenues guides the development of the maritime sector |

The future of the cluster

It remains to be seen whether the Russian government can turn the course of its maritime industry with the latest development strategies and planned investments, and also find the most fruitful balance between state control (which has not appeared successful through the USC) and natural market development. Considerable developments are needed in order for the Russian maritime industry to become able to truly participate in international competition. However, engagement in

international activities can be seen as the key way in developing Russia's own maritime expertise. Fortunate for the Russian clusters, foreign companies are highly interested in entering the country's maritime business due to the huge market potential, particularly regarding the Arctic vessels and shipping.

From the perspective of the Central Baltic region, Russia provides plenty of business opportunities. Regarding Finland and Russia, the clusters are very different from each other in terms of structures, technological advancements and international networks, but as the Finnish and Russian shipbuilding companies often operate at the different stages of the shipbuilding process, e.g. Finnish companies focusing on design and Russian companies on building hulls, they complement each other, which has been already seen in the case of Arctech Helsinki shipyard, for instance. The developing shipbuilding sector in Russia provides high market potential also for Finnish and Swedish ship designers and software and device providers. For the Estonian and Latvian companies, Russia provides a growing market in ship repair and conversion services, for instance. Whereas many Finnish companies are hesitant to enter the Russian business environment, the Estonian and Latvian companies often benefit from for instance language skills and Russian ownership linkages, having high potential also for joint internationalization activities.

The CBR countries also operate as transport corridors between the EU and Russia. Particularly the development of the Port of Ust-Luga is likely to influence the Russian transit traffic volumes, and between 2011 and 2012, the cargo volumes of Ust-Luga have already more than doubled from 23 to 47 million tons (Port of Tallinn 2012). One of the competitive disadvantages of the Finnish ports compared to their Russian and Baltic counterparts are channel fees that the Finnish state is collecting from merchant ships entering the Finnish waters. At the same time, however, the ports have plenty of possibilities in starting various kinds of joint development projects – the fast approaching sulphur directive providing the most concrete example.

3.11 SINGAPORE – THE GLOBAL HUB OF MARITIME SECTOR ACTIVITIES By Eini Laaksonen

The development of the cluster

Singapore has seen an impressive transformation from a small regional shipping port into an international superstore of maritime and offshore services. Singapore became a vivid trade centre already in 1820s due to its central location combined with the absence of transport fees. Singapore attained self-rule in 1959 and to fight the high unemployment, the government mounted a systematic effort to grow the maritime industry. The muddy swampland along the Geylkand River was transformed into Singapore's first maritime industrial estate, and roads, water and electrical systems were laid down to provide the necessary infrastructure. In 1960s, as a result of active government encouragement as well as technology transfers from Japan and Europe particularly, the ship repair and conversion business as well as shipbuilding started to flourish. However, while being strongly affected by the cyclical shipping and oil trades, the Singaporean maritime cluster has faced its ups and downs along with the international economic crises. (ASMI 2013a)

Nevertheless, the government establishing the necessary infrastructure and incentives for private (also foreign) enterprises while holding a stake in key enterprises has resulted in a relatively steady

growth in the maritime sector. The first foreign company to respond to the investment invitation was Japan's second largest shipbuilding group IHI, which right from the start also extensively used the services of local subcontractors. With interest in the strong growth potential, more foreign investments followed. To meet the labour demand, the government and shipyards selected promising Singaporean students and sent them to study naval architecture and engineering abroad, particularly to Britain, Germany and Japan. After returning to Singapore, these people formed the core of managers in the booming Singaporean maritime cluster. (ASMI 2013a)

After 40 years of impressive development, Singapore can today be seen as a veritable hub of maritime industry and logistics, not only at regional level networking Australia, India, Indonesia, Malaysia, the Philippines and Vietnam, but increasingly as a global center of maritime activities and developments. (SMD 2013) Singapore is one of the premier ship repair and ship conversion centers in the world and a leader in the building of rigs and offshore structures and in the conversion of FPSO (Floating Production and Storage and Offloading) units. In terms of newbuilds, Singapore is also a niche player in building customized and specialized vessels such as offshore supply and support vessels. (SMIAR 2012; ASMI 2013b)

Moreover, in 2013, the Port of Singapore was once again awarded the Best Seaport in Asia due to its cost competitiveness, container shipping friendly fee regime and infrastructure, the facilitation of support services, and the timely investments guaranteeing that the level of services will also meet the future demand (AsiaOne 2013). While constructing a new container terminal, Singapore is also expanding and consolidating the existing five terminals to eliminate the need for inter-terminal haulage as well as to provide more advanced processes (SMD 2013b). In 2012, container throughput crossed the 30 million TEU milestone for the first time and vessel arrival tonnage also reached a record high of 2,25 billion gross tons. In addition, Singapore remained the world's top bunkering port with the registered bunkering sales volumes of almost 43 million tonnes. (AsiaOne 2013) Furthermore, while cruise business market is only at an emerging phase in Asia Pacific and expected to balloon in the next few of years, Singapore is already the homeport of Costa Cruises and Star Cruises, and Royal Caribbean International as well as Princess Cruises will start cruises from Singapore by 2014 (SMD 2013c). Singapore may thus turn into a future cruise passenger hub as well.

Cluster actors and networks

The Singaporean shipbuilding industry is led by two large shipyard groups, SembCorp Marine Ltd and Keppel Offshore & Marine. Both operate within the entire value chain from ship repair to rig building and offshore production, and with decades of experience and proven track records, they are actively involved also in overseas projects. In addition to these two key players, over 40 medium-sized shipyards are located in this dense city state. The yards are supported by over 5 000 companies offering a spectrum of services including ship owning, designing, engineering, marine equipment supplies, navigation, managing, broking, finance, insurance, arbitration testing and certification. (EDB 2013b; SMD 2013; Yeo 2013) Many foreign operators and manufacturers have also set up local agencies in Singapore for their own manufacturing, sales and services facilities. The sector employs some 170 000 workers and contributes altogether 7% to Singapore's GDP (SMD 2013), thus playing a crucial part in the country's economic growth (ASMI 2013a; 2013b).

Shipbuilding has remained relatively stable and ship repair operations have grown moderately, but particularly the offshore sector has grown rapidly during the past ten years – from EUR 0,5 billion in 2003 to EUR 5,3 billion in 2012. In fact, the rigbuilding order book hit the new record with secured deals worth EUR 13 billion, completion dates stretching to 2019.⁶ This growth has resulted largely from the aggressive operations expansion of Keppel and Sembcorp Marine into the offshore sector (Credit Suisse 2011, 3; SMIAR 2012). Although Korean yards in total dominate the global drillship market, these two Singaporean companies are global leaders in producing jack-up rigs with a combined 60% market share (Credit Suisse 2011).

The two giants, however, have somewhat different approaches to their markets. With a global presence in over 30 countries, Keppel Corporation has its own yards around the world and has consistently built an international network of resources and talents to grow its key businesses near the markets (Keppel 2013). Sembcorp Marine, in turn, has most of its facilities in Singapore and has extended its global reach mainly through local partnerships and minority investment stakes (Credit Suisse 2011). Nevertheless, currently both the companies are flourishing in offshore business. One thing in common – and probably a reason for the major yards' success – is their strategy of long-term partnerships and fleet arrangements with their customers. Long-standing customers ensure a steady income flow from ship repair. Many of such alliances have been formed in niche market segments like in the upgrading of tankers, LPG and LNG carriers, passenger lines and cruise ships. In 2012, alliance contracts and regular customers accounted for 80% of the respective shipyards' repair workload. (SMIAR 2012)

The Singaporean maritime cluster seems to be working actively both in terms of supporting the cooperation of local maritime actors as well as attracting foreign businesses and investments to join the hub. The Association of Singapore Marine Industries (ASMI) and Singapore Maritime Foundation (SMF) can be mentioned as examples of such support organisations. For instance ASMI, in partnership with Marshall Cavendish Business Information Pte Ltd, publishes the annual Singapore Ship Repairing, Shipbuilding & Offshore Industries Directory providing a comprehensive contact base among the relevant actors in the sector⁷. In addition, Singapore has introduced incentives for shipowners and operators to set up their operations in the country. For instance, in 1991 the Approved International Shipping Enterprise (AIS) scheme was presented to attract more foreign maritime auxiliary service providers in Singapore, further supporting the creation of a comprehensive international hub. The AIS has been afterwards steadily expanded by the Maritime and Port Authority of Singapore, and in 2011 it with all its awards and benefits was consolidated under the all-encompassing Maritime Sector Incentive (MSI) scheme. The current vibrancy of Singapore's maritime sector is believed to be, at least partly, a result of these state actions. (McKinnon 2011; SMD 2013; Tan 2013)

In addition to such promotions, the sole hub effect can be identified in the cluster's development as international companies one after another have entered the country. Particularly Japanese maritime companies are well present, accompanied with Europeans and Australians, for instance. (SMD 2013)

⁶ Currency converted from Singaporean Dollars as per 30.9.2013.

⁷ The ASMI directory is available at <http://www.asmi.com/index.cfm?GPID=102#Directory>.

From the Central Baltic region particularly, for instance Finnish companies are rather actively operating in Singapore. In fact, of the ASEAN countries, Singapore is Finland's largest trading partner and over 70 Finnish companies are present in Singapore to serve the whole Asia Pacific. Over half of the Finnish exports to Singapore comprise machinery and equipment, and the most significant Finnish operators in Singapore include Neste Oil, Kone and Wärtsilä. The formation of such relationships has been supported through international agreements concerning issues such as visa freedom and taxation and through minister-level trade promotion visits. (Embassy of Finland 2011) For instance, during the visit of Finnish Minister of Education Krista Kiuru in Singapore in August 2013, the Singaporeans due to their domestic workforce concerns and willingness to invest in their educational system expressed strong interest towards Finnish education and the related enterprises (Ministry of Education and Culture 2013).

Cluster competitiveness

As the Singaporean maritime sector is engaged in increasingly challenging projects, more knowledge-intensive skills and higher engineering content are required from the workforce. (ASMI 2013b) As a result, manpower and mechanisation constitute the key challenges for the industry, followed by the related problems of training, foreign worker employment and work safety. Namely, as the industry prospered in the 1980s, an increasing number of foreign workers had to be imported to Singapore particularly from Malaysia, India, Bangladesh and Thailand to meet the needs of the growing maritime sector. Quantity came before quality, and still today, despite the attempts to increase the attractiveness of the field in the eyes of Singaporeans, the number of foreign manpower with inadequate high-tech skills is a growing problem. (ASMI 2013a) Today foreign workers comprise about 75% of the employees in the Singaporean yards, and although their low salary costs provide one of the key competitive strengths to the industry, that is offset by the lower productivity. In fact, average employee costs in Singaporean yards are some 40% of their South Korean counterparts, but the revenue generated by employee is only 32% of that of Korean yards⁸. Thus, in addition to the lack of labour, productivity presents a challenge for significant development. It is believed that reducing the share of foreign workforce would result in increasing labour costs but at the same time in increasing the productivity even more. If the costs do increase, production definitely has to grow as well – the lower-cost Chinese yards have just recently gained considerable market shares in the jack-up rig market. For instance, of the 19 jack-up orders placed globally in the first quarter of 2013, ten were signed with Chinese yards, eight with Singaporean yards (five for Keppel and three for Sembcorp Marine) and one with the United Arab Emirates. (Credit Suisse 2013)

To address the workforce challenge, Singapore has initiated triple helix cooperation within the industry actors, government agencies, relevant associations, and research and education institutions. The range of initiatives includes apprenticeship schemes, on-the-job training, classroom-based training, and scholarships for further studies, as well as overseas attachment schemes. At the same time, to reduce the need for workforce and raise the shipyards' productivity levels, more

⁸ In fact, between 2006 and 2010, revenue per employee seems to have declined in Singapore vis-à-vis the Korean yards, but it is likely to be a result of the Korean shipbuilding shifting from conventional ship repair to rigbuilding and of efficiency improvements in their yards (Credit Suisse 2011).

automatized methods have been introduced where possible. For instance Marine Centre of Innovation at Singapore Polytechnic and Maritime Research Centre at Nanyang Technological University work closely with Keppel, SembCorp, and other local yards. Furthermore, shipyards have set out to increase safety awareness among workers and have implemented comprehensive safety management systems. (ASMI 2013b; EDB 2013a; EDB 2013b) The bizSAFE accreditation programme, which aims at driving shipyards and maritime companies to incorporate workplace safety issues as an integral part of their business, was launched in 2009, and since then Level 3 certification has been a minimum requirement for suppliers entering the projects at the shipyards (SMIAR 2012). At the same time, Singapore is working on the image and attractiveness of the maritime sector – *The Peak*, a TV drama serial showcasing the vibrancy and multidimensional nature of the industry premiered in 2007 and has since then been one of the most watched TV programmes in Singapore. The series was sponsored by Keppel Group, the Maritime and Port Authority of Singapore, Singapore Maritime Foundation, and Association of Singapore Marine Industries. (EDB 2013b)

Another constraint to the development of new maritime sector activities is the simple lack of land. This concerns particularly the booming offshore and marine industry as shipyards require large waterfront space. (Credit Suisse 2011) Moreover, Singapore emphasizes the need for a city to be not only business friendly but also a comfortable living environment. This is definitely challenging as Singapore as a city state is the second most densely populated country in the world. However, Singapore is very advanced in terms of logistical innovations and the city has made public transport the centerpiece of the land transport system in order to control congestion and protect the environment. (Eizema et al. 2012) Nevertheless, increasing activity as well as cargo and people flows require continuous improvements and innovations.

Increasing international competition, particularly in the offshore sector which currently constitutes 60% of the maritime industry's turnover in Singapore, is setting new challenges not only in terms of labour costs but also due to increasing requirements. The global demand for oil and gas will only grow, and as the exploration and production is shifting to more challenging environments, oil companies require new, safer and more efficient rig units. At the same time, the existing global offshore fleet is ageing and in need of renovations and replacements. Singaporean rigbuilders with their proven track records are in a good position to meet the demand for new rigs, but stiff competition is rising particularly from the Chinese and Korean shipyards. (SMIAR 2012)

Figure 15. SWOT-analysis of the Singaporean maritime sector

| | |
|--|--|
| <p>STRENGTHS</p> <ul style="list-style-type: none"> • Strategic geographic location – a true hub providing comprehensive and integrated maritime services • International melting pot of new technologies and knowledge • Inflowing investments support further development • Stable economy with strongly future-oriented governance | <p>WEAKNESSES</p> <ul style="list-style-type: none"> • Skills and productivity of the workforce • Lack of land with the required waterfront space – even more efficient land use needed |
| <p>OPPORTUNITIES</p> <ul style="list-style-type: none"> • Improving global economic conditions – demand for shipping and shipbuilding grows slowly • Increasing demand in the offshore sector for new vessels and rigs as well as to repair the ageing fleets • Oil and gas exploration increasing also in the neighbourhood | <p>THREATS</p> <ul style="list-style-type: none"> • Volatile global market conditions • More and more actors moving into the offshore rig building market – price competition |

The future of the cluster

Although the Singaporean maritime sector is currently performing very well, global competition in the sector is fierce and this is felt also in Singapore. Sustaining the competitiveness requires developing innovative and cost effective solutions, increasing product offerings, and expanding global presence in the future key markets. As an example, in terms of shipbuilding, Singapore has started to move towards niche market segments and the local industry players are exploring new markets such as construction of drill ships and vessels for the offshore wind and energy sectors. The shipbuilding sector actually improved its performance in 2012 and launched a total of 110 vessels, comprising mainly relatively small-sized specialized vessels. Regarding the manpower issue, Singapore has to find ways to produce more with less. At the same time, new capabilities and competencies have to be built so that the cluster is ready to take in more complex offshore projects. (SMIP 2013) All this requires increased triple helix cooperation in supporting the generation of knowhow and innovations as well as the local buzz emerging from this hub of international maritime expertise.

Concerning triple helix cooperation, the Maritime and Port Authority of Singapore (MPA) recently announced three groups of initiatives to supplement the existing MSI Scheme and to strengthen Singapore's maritime industry. The groups comprise (1) maritime R&D, (2) productivity enhancement, and (3) manpower development. Regarding the first group, the Maritime Innovation and Technology (MINT) Fund set in 2003 with EUR 60 million to fund universities, research institutes and companies in R&D and test-bedding of maritime technologies, will be extended for five years with additional EUR 30 million. As an example of the second group, a new EUR 15 million Productivity Programme will be introduced to provide co-funding for business process re-

engineering and automation, for instance. As regards manpower, over a million EUR is to be used during the next five years for a Global Internship Award, which will be granted to selected local students enabling them to undergo a fully-sponsored internship in international maritime companies or even abroad.⁹ Simultaneously, new maritime-related programmes will be introduced at the local universities. (Tan 2013) Consequently, the main challenges hindering the cluster's competitiveness have been acknowledged and the local government is actively working on them together with the industry and research institutions.

When it comes to the import of foreign expertise, a great number of foreign companies have found their way to Singapore, and the number seems to be increasing. For instance, the power-systems company Rolls-Royce has announced that it will move its global Marine business headquarters to Singapore. The Swedish Berg Propulsion as well as MacGregor-Plimsoll, in turn, recently launched new plants in Singapore to strengthen their Asian presence. (EDB 2013b) In general, Singapore is interested in European design and solutions, and in the future the country will provide increasing business opportunities for international companies specialized in LNG, port construction, and green shipping, for instance. As Singapore has no energy resources of its own, it is dependent on imported fossil fuels and increasingly keen on diversifying its energy sources as well as contributing to the general energy efficiency in all possible ways. Rising fuel costs as well as environmental issues have led to growing consciousness on energy efficiency in maritime operations as well. As a result, an LNG terminal is currently under construction, and the industry is looking also into bio-fuel solutions. Moreover, a fifty hectare CleanTech Park was set up jointly by EDB and Jurong Town Council to house R&D activities and collaboration between the industry and academia and serve as a living lab for systems level clean technology solutions. (Eizema et al. 2012) Particularly the demand for green maritime products and services is likely to provide considerable market opportunities for foreign businesses, and with this in mind, companies currently developing solutions for the environmental regulations in the Baltic Sea region might soon find themselves in a very advantageous position in Singapore.

3.12 SOUTH KOREA – A WORLD-CLASS SHIPBUILDING MAGNATE COMPETES FOR THE THRONE THROUGH NEW CHANNELS By Minghui Gao

The development of the cluster

South Korea's large water area and over 12 000 km long coastline provides the nation natural advantages of developing maritime industries. Aiming to become a major marine power in the world, South Korea ranks high in the world in terms of shipbuilding industries, shipping and ports. (Blue Revolution 2013)

Shipbuilding has been at the heart of South Korea's economic development over the past few decades (World Maritime News 2013). During the late 1970s–90s, South Korea made remarkable successes on shipbuilding (Collins & Grubb 2008). Through its low cost shipbuilding, South Korea

⁹ Currency converted from Singapore Dollars as per 30.9.2013.

surpassed Japan (Mickeviciene 2011) and ranked first in the world in 1993 in terms of its new shipbuilding orders with a share of nearly 38% of the world market (KOSHIPA 2011; 2013a). Though the trade friction between South Korea and the EU has caused many inconveniences to South Korea's shipbuilding industry in the early 2000s, and the increasing labor costs and material prices have weakened the nation's competitiveness on shipbuilding since the first decade of the new millennium, South Korea is still an important player in the world shipbuilding market (Mickeviciene 2011). In 2011, South Korea built 13 million gross tons of ships which created a total value of more than EUR 430 billion, and hence, shipbuilding industry has become the nation's number one export industry which represents more than 15% of its total exports (World Maritime News 2013). According to the Korea Shipbuilders' Association (KOSHIPA), there are nine major shipbuilders in South Korea, which are Hyundai Heavy Industries, Daewoo Shipbuilding & Marine Engineering, Samsung heavy Industries, Hyndai Samho Heavy Industries, Hanjin Heavy Industries & Construction, STX Offshore & Shipbuilding, Hyndai Mipo Dockyard, SLS Shipbuilding, and Dae Sun Shipbuilding & Engineering. (Shipbuilding Korea 2011; Kim 2009; Chen et al. 2010)

While shipbuilding industry makes great contribution to South Korea's exports, shipping and port industry are also vital to the nation's economy as almost all of its imported and exported goods are transported via the sea (Shipbuilding Report: Marine and Shipbuilding, 2013). In South Korea's shipping industry, private enterprises have been playing significant roles on strengthening competitiveness and coping with the changes in the global market. According to United Nations Conference on Trade and Development (UNCTAD), South Korea's Hanjin Shipping (Hanjin) and Hyundai Merchant Marine (HMM) enter the list of top 20 leading container shipping operators in the world (Review of Maritime Transport 2012; 牛序谋 2013). STX Pan Ocean and Koreanlines Corporation (KLC) used to be the third and fourth largest shipping companies in South Korea after Hanjin and HMM; however, due to the current economic situation, which does not seem to be optimistic, these two have been confronting difficulties on sales in recent years and already entered the auction market for merger and acquisition (牛序谋 2013).

As an important sector of the national economy, the ports of South Korea have been developing on the path to become "a load center in Northeast Asia" (Jung 1996; 肖钟熙 2013; 杨钰池 2013) and later "Northeast Asia's logistic hub" (Ducruet, Lee & Roussin 2009; 肖钟熙, 2013; 苏海河 2013). The biggest ports in South Korea are the Port of Busan, the Port of Kwangyang and the Port of Incheon, which are all free trade zones (肖钟熙 2013). Among the three, the Port of Busan, with its throughput over 16 million TEU, is the biggest port in South Korea and ranks in the world's top 20 container terminals in terms of throughput (Review of Maritime Transport 2012).

Cluster actors and networks

In the South Korean "chaebol" economic structure, shipbuilders – except naval facilities – are all private capital-accumulating corporations (Collins & Grubb 2008) and therefore these corporations build up their business network on their own. In South Korea, while many smaller shipbuilding companies have joined in Korea Shipbuilding Industry Cooperative (Kim 2009), almost all of the major and medium-to-large shipbuilders have joined in KOSHIPA. KOSHIPA is a non-profit organization which was established in later 1970s when South Korea started to develop its shipbuilding industry. This organization aims to "enhance cooperation among its member companies

and to promote their common interests”. (KOSHIPA 2013b) In turn, in the area of shipping and ports, South Korea has developed the “two-hub port strategy” which aims to increase the competitiveness of South Korean ports. The strategy is based on the Ports of Busan and Gwangyang, and emphasizes the functions and positions of the two ports. However, this strategy is currently confronting intense competition from Chinese ports. (Ducruet, Lee & Roussin 2009; 肖钟熙 2013)

Shipyards overseas have been adding strengths to domestic shipbuilding companies in South Korea. South Korean shipbuilders operate in different regions in the world; among all of the subsidiaries abroad, STX’s shipyard in Dalian, China, Hanjin’s Subic Shipyard in the Philippines, Daewoo’s Mangalia Shipyard in Romania and Hyundai’s Vinashin Shipyard in Vietnam are operating the best. The STX group also enters Azerbaijan shipbuilding industry. (Shipbuilding Korea 2008; Kim 2009) Samsung Heavy Industries (SHI) has acquired stake from shipbuilders in Brazil and other countries in Latin America, and provide them with technology support, shipyard construction and ship design. Furthermore, STX Group has taken over more than 88% of the stake of Norway’s Aker yards in 2008, and operates shipyards in Norway, Finland, France and Canada. Recently, as the STX’s shipyards in Europe have been confronting financial troubles, the group decided to sell some of the yards. (Kim 2009; France24 2013) In September 2013, STX Rauma Shipyard in Finland has been announced to be closed, and hundreds of employees will lose their jobs (Finland Times 2013).

In the field of marine supply, South Korea has extended network with foreign suppliers. For instance, Wärtsilä Corporation provides services on ship power in South Korea (Wärtsilä Press Releases 2008), and Baltimore’s Maritime Applied Physics which is based in the U.S provides engineering and manufacturing for Hyundai Heavy Industries (Tradeology, the ITA Blog 2012). In addition, South Korea has also been actively involved in international organizations and activities, for instance, OECD WP6 Meetings, IMO activities, Asian Shipbuilding Expert’s Forum as well as shipbuilding cooperation with China and Japan (KOSHIPA 2013a).

Cluster competitiveness

In general, the South Korea’s shipyards, ports and shipping industry are well developed for instance in terms of infrastructure and the size of the fleet (杨钰池 2009; Chen et al. 2010). Moreover, the development of the industries is strongly supported by the government, which provides advantages for the development of ports especially in terms of free trade zone policy, as well as incentives and driving force for the shipbuilders and shipping operators (Jung 1996; Ducruet, Lee & Roussin 2009; Chen et al. 2010; 杨钰池 2013; 肖钟熙 2013; 苏海河 2013). At the same time, the strong network of domestic shipbuilders, shipping operators and suppliers assures the efficient process of manufacturing and operating (Chen 2009).

The high technology of South Korea’s maritime industries has also brought the nation competitive advantages. It on the one hand provides the technological leverage for shipbuilders to build high-complexity and therefore highly profitable vessels, and on the other hand increases production efficiency (Mickeviciene 2011; Review 2012 2013; Collins & Grubb 2008). Furthermore, the high-quality labor force also guarantees the production efficiency. However, the operating costs of South Korean maritime industries have been increasing rapidly, due to higher fuel costs (Hand 2013; 中国海事服务网 2011), and higher labor costs (South Korean Shipyards: Opportunity or threats 2013;

Chen et al. 2009). At the same time, due to the over-speeded increase of the supply of shipping operators in the global range, as well as the sharp decrease of shipping price (Hand 2013; 中国海事服务网 2011), South Korea is confronting a hard time when seeking profits. As South Korea operates much in the global market, the currency used in the trade may have a large impact on its maritime industry. Due to the using of South Korean currency “won” and the major appreciation of this currency, the profit margins of the nation’s maritime industries have been weakened (South Korean Shipyards: Opportunity or threats 2013).

South Korea has been actively cooperating with international players in the maritime industries, which may provide more opportunities for the nation to maintain its competitive advantages and to improve its industrial structure. Since 2005, South Korea has been working on and promoting the development of eco-friendly ship construction-related technologies, which creates a niche market for South Korea’s ship products, and helps in maintaining competitive advantages in comparison with late-started shipbuilding countries, such as China, in the future (Review 2012 2013; Hand 2013). However, South Korea’s focus on global maritime market has distracted concentration away from the domestic market, which may decrease the domestic demand (Chen 2010). Furthermore, South Korea is struggling to win the competition with its rivals, especially China and Japan, in the field of shipbuilding, shipping and ports (Ducruet, Lee & Roussin 2009). In addition, The South Korean government has made different development plans for each port based on their own features and advantages (Review 2012 2013). The strong support from the government may accelerate the development of the port sector of South Korea.

Figure 16. SWOT-analysis of the South Korean maritime sector

| STRENGTHS | WEAKNESSES |
|---|--|
| <ul style="list-style-type: none"> Well-developed shipyards, ports and shipping industry Governmental support Strong national and international networks High technology in shipbuilding High quality of labor force | <ul style="list-style-type: none"> High fuel and labour costs Decreasing shipping prices The appreciated won currency affects profits |
| OPPORTUNITIES | THREATS |
| <ul style="list-style-type: none"> Increasing international cooperation Eco-friendly shipbuilding Port development with specific direction | <ul style="list-style-type: none"> Low domestic demand in the maritime industry Oversupply of the shipping operators in the global range Intense competition in the global market |

The future of the cluster

South Korea has the advantages in the maritime industries brought by governmental support, knowhow of high technology, high production efficiency, as well as extensive international cooperation (Kim 2009). Moreover, the credible shipyard training centers and maritime education in the universities guarantee the continuous support of skilled and professional human resources. In the meantime, the nation is also confronting intense competition in the global market. Therefore,

the maritime industries of South Korea might need to find their niche market and further international cooperation in order to maintain their own competitive advantages and be profitable.

Considering the fact that South Korea is already quite advanced in terms of maritime technologies, it might be suitable for the nation to keep its path on developing high complexity and eco-friendly shipbuilding. Furthermore, the Arctic region is believed to become a new market area for South Korea maritime industries. In August 2013, South Korea has made and published their plan on Arctic policies. With the full supports from the government, South Korea sees their primary mission as developing and taking advantage of the shipping through the Arctic region. The Arctic shipping routes, on the one hand, can bring South Korea large market potential and shortened distance between Asia and Europe, but on the other hand, reveal a problem that South Korea is presently lacking icebreakers. (中华航运 2013) In this case, further international cooperation becomes necessary for South Korea on seeking technological support. In terms of this matter, South Korea and Norway have started their cooperation in Arctic shipping, which is as considered an opening of new shipping route between Europe and Asia (Barents Observer 2012). From this perspective, South Korea's focus on the Arctic shipping may also provide maritime companies in the Central Baltic Sea region with technological expertise more business opportunities, especially in the field of icebreaker designing and manufacturing. With the strong support from the South Korean government, it is believed that the business environment for foreign companies will be welcoming.

4 OTHER INTERESTING COUNTRIES AND REGIONS

4.1 AFRICA – THE EMERGING MARITIME SECTOR IN THE MIDST OF GREAT CHALLENGES

By Eini Laaksonen

The economic developments in Africa are today largely driven by the extraction of the gigantic energy sources. The continent has been proven to contain approximately 132 billion barrels of oil, representing 8% of global oil reserves. In addition, Africa holds 7% of the global natural gas reserves and close to 4% of the global coal reserves. One of the largest oil producers is Nigeria, whose oil production is expected to double by 2016 to 4 million barrels a day, making the country the fifth largest oil producer after Russia, Saudi-Arabia, USA and Iran. Although Africa belongs to the world's richest countries in terms of energy sources, its own energy consumption is clearly lower than in any other continent. No wonder foreign corporations, particularly Chinese and Indian, are actively searching new energy fields in different parts of Africa. (Johansson 2012)

The African maritime sector is also under rather active development to support particularly the increasing energy transports – 90% of continental trade goes by sea, and there is no alternative given the inadequate conditions of the overland infrastructure as well as the nature of external trade. As a result, coastal trade is only going to grow (MDA 2010) and Africa should improve its attractiveness in the eyes of shipping firms (Baker 2011). However, the sector has to deal with several severe problems, most urgently the security related matters such as piracy, corruption, terrorism, illegal fishing, bunkering and waste dumping, and smuggling of weapons, drugs and people. The coastal protection capacity, let alone deep water patrol capacity, are insufficient to control the 31 000 km coastline. (MDA 2010; Baker 2011) As a result, a whole new industry of private security providers has emerged aside the maritime sector. The security industry is estimated to be worth over USD 13 billion and growing by 8% annually. Outsourcing something that was earlier considered as a state responsibility has caused concerns about the confrontation between the public and private sectors and about the erosion of government credibility. For instance, instead of state authorities, it is the global community that currently provides the anti-piracy naval resources. However, if governed according to the principles of democratic control, the industry could emerge as a creator of not only maritime security but also of new intra-state power relationships. (MDA 2010) Namely, piracy can be seen as a symptom of a deeper problem – Africa suffering from weak maritime governance and the lack of harmonized vision for developing it (Harding et al. 2007; Baker 2011).

Issues to be tackled in the African maritime sector include also securing the inland waterways, solving the current and future inter-state resource conflicts, integrating road, rail, air and sea transport networks, and improving the security, effectiveness and consequently the costs of port operations (MDA 2010). Currently ports in Africa are the least efficient in the world – dwell times are quadruple in relation to Asian ports and many of them do not have adequate facilities and equipment to handle containerized traffic and the increasingly common megacarriers. At the same time, high bureaucracy of the predominantly publicly-owned ports as well as high insurance costs resulting from piracy and poor aids in dredging and navigation lead to low traffic in the African ports, again increasing the costs of port operations per visitor. (Harding et al. 2007; Baker 2011) In

addition, the shipyard capacity does not meet even the current needs of the industry. Except from the highly developed industry giant South Africa, there is very limited capacity in sub-Saharan Africa for major ship repairs. In terms of shipbuilding, the situation is even worse while even the capacity that used to exist has deteriorated, Durban retaining a minor facility focused on tugs and bunker vessels. However, potential for growth does exist, but taking advantage of it requires considerable investments in the infrastructure, expansion of facilities, and personnel training, for instance. (MDA 2010; Baker 2011)

Due to the great interest in the African natural resources, extra-African actors are willing to participate in developing the sector. As an example, China Merchants Holdings (International) Co Ltd is investing USD 10 billion in building a new, probably the biggest port in Africa to Bagamoyo, northwest of Dar es Salaam in Tanzania. The port is a trade gateway for east Africa's landlocked countries such as the Democratic Republic of the Congo, Zambia, Rwanda, Malawi, Burundi and Uganda. The aim of the port project is to create notable increase in trade, particularly regarding the shipping of raw materials to China and supplying Chinese manufactured goods to the African markets. In addition to the new port, the project includes upgrading the surrounding road and rail infrastructure and an establishment of a special economic zone. (StrategyPage 2013; Ng'wanakilala 2013) At the same time, China is financing a USD 1,2 billion natural gas pipeline (532 km) and is about to start mining coal and iron ore in Tanzania (Ng'wanakilala 2013).

Nevertheless, there are also examples of African attempts and investments in developing the maritime sector, such as the Memorandum of Understanding signed by Nigeria and South Africa according to which Durban-based Southern African Shipyards (SAS) will finance the development of modern shipyards in Nigeria and operate them with Nigerian labour and local content as much as feasible. The agreement also includes the establishment of maritime engineering technology transfer program from South Africa to Nigeria. (Oritse 2010) Simultaneously the Nigerian Government has revealed plans to revive the Nigerian maritime sector by building a new shipyard with private sector participation (Ventures Africa 2013). In addition to generating employment and economic growth to the country, the project is expected to provide increased training possibilities for the cadets of the Maritime Academy of Nigeria (MAN) which already utilizes the country's great labor pool in educating seafarers and maritime industry professionals even for foreign vessels (Eroke 2013; Ventures Africa 2013). Moreover, developing the maritime sector could provide a catalyst to diversify the oil-driven economy (Daily Independent 2013).

Despite such initiatives, the clear need for a continental maritime strategy has been recognized in order to improve the sector's security and competitiveness in Africa. It has also been acknowledged that intra-African as well as external maritime partnerships are crucial in addressing the aforementioned key challenges. (MDA 2010) The process is only at the beginning – some of the African states are developing national maritime strategies to safeguard and develop their assets, and for instance the African Union has developed good initiatives and ideas on improving the security. However, too often these plans have not materialized. Moreover, many of these efforts suffer from the lack of coordination among different stakeholders and address only security issues instead of the whole set of core problems related to governance and economic development.

Collaboration with external companies and international organisations should and is increasingly welcome. When it comes to businesses, particularly Chinese giants are actively participating in

developing the African maritime sector, but for smaller European actors the business opportunities are not yet that evident, and political support seems to be needed – for instance European shipping companies have formally called the European Commission to provide a joint naval fleet to protect them from pirate attacks on their ways along the African coastline (Kristiansen 2013; Andersen 2013). Nevertheless, individual maritime actors even from the CBR have found business opportunities in Africa, the construction of an Antarctic research vessel at the Finnish STX shipyard for the South African Department of Environmental Affairs providing an example (Ndlovu 2009). International organisations also seem to be increasingly active in Africa, and for instance IMO has funded the establishment of Maritime Rescue Coordination Centres (MRCCs) around the African coast. (MDA 2010; Baker 2011) This way foreign actors follow and little by little participate in the development of the African maritime sector. At the same time, African actors seek to take example of successful methods and policy initiatives applied elsewhere, thereby avoiding the need to ‘reinvent the wheel’ (MDA 2010).

4.2 AUSTRALIA – OFFSHORE OIL AND GAS INDUSTRY CONTRIBUTING TO THE ISLAND NATION'S MARITIME SECTOR By Akseli Jouttenus

Even though Australia is a dry continent, sea is very important to its national identity and culture. Country's large cities are located at the coastline and over 80% of the population lives within 50 km of the sea. (Tsamenyi & Kenchington 2012) Maritime industry has a significant effect to the economy of Australia in all its states and territories. Sector's GDP of USD 8 billion and direct employment of around 22 000 people indicates its importance to the country. Industry's exports in 2009–2010 were worth USD 422 million with additional USD 1,8 billion worth of international maritime tourism and recreational activities. (Department of Industry 2011) Australian maritime industry comprises national clusters of different sizes. A large cluster is the Australian maritime complex, which is located in Western Australia. In the cluster three industries are converging: maritime, defence, offshore oil and gas (Arnott 2003). Another large cluster is the Cairns maritime cluster which is located on the Eastern coast of Australia. Largest maritime tourism fleet in the Southern Hemisphere is located in the cluster and it also has a significant navy presence. Other industries in the cluster include maritime training, shipbuilding and repair, and commercial fishing. (Scott-Rimington 2003)

For a maritime nation like Australia, ports are an important part of the international trade. The bulk commodity exports and metropolitan container imports are expected to double every decade in the country. However, some of the Australia's ports have major infrastructural challenges. (Infrastructure Australia 2010) For the competitiveness of the country's foreign trade, it is very important to ensure adequate capacity of the ports. In addition to infrastructural capacity, skilled workers for shipping and port sectors are important contributors to the international competitiveness. An ageing workforce is a major challenge in the Australian maritime industry and particularly in the port sector. Attracting young and skilled seafarers is especially important when country's shipping volumes are expected to increase. The sector is looking different ways to recruit and retain skilled workers, for instance by developing social infrastructure around remote ports and increasing workers' non-salary benefits like health-checks. (The Australian 2010)

Nearly all of Australia's export trade is moved by ship and shipping also plays big a role in carrying out Australia's domestic freight task. The country's coastal shipping industry has been in downturn and there are an increasing number of foreign vessels operating around the Australian coast. (Commonwealth of Australia 2008) Shipbuilding industry is also an important part of the country's maritime cluster. Defence-related industries are the biggest part of Australian shipbuilding with the share of two thirds of the sector's revenue. Rest of the turnover is generated by commercial shipbuilding, repair and maintenance of the vessels. Significant investments to innovations and R&D have enabled the development of advanced design and construction techniques in the Australian shipbuilding sector. (Mazzarol 2004) For instance, Australia is a world leader in the design of large, high-speed, multi-hull aluminium vessels (Department of Industry 2011).

Oil and gas industries are not only major contributors to the whole Australian economy but also to the country's maritime sector. A number of companies in different areas of maritime industry provide services to the oil and gas industry. (Department of Economic Development, Tourism and the Arts 2013) Most of the oil and gas produced in the country comes from the offshore sedimentary basins (Geoscience Australia 2012). In 2009, the country was the 4th largest exporter of LNG in the world (Department of Resources, Energy and Tourism 2010). The investments in the sector currently increase Australian GDP by up to 2,2% per year (APPEA 2013b). The country's oil, condensate and LPG production has declined over last decade while the production of gas, including LNG, is almost twice as much as it was in the beginning of the century (APPEA 2013a). Maintaining global competitiveness is the major challenge of the industry. The country's high-cost local environment and rising global LNG competitors, like East Africa and North America, make it harder for Australia to compete internationally. (APPEA 2013b) However, there are also possibilities for the oil and gas industry of the country. Floating LNG (FLNG) has potential to enable Australia to develop gas fields that are uneconomic to develop in conventional methods. The country is expected to be the first one in the world where FLNG is used. Using FLNG requires special vessels, so this creates new opportunities for maritime industry. Also the growing importance of natural gas increases the importance of Australia in the global gas market. (Department of Resources, Energy and Tourism 2010)

The Antarctic continent is of great importance for Australia as 42% of the continent is covered by the Australian territory. Australian research on Antarctic creates a cooperation possibility for countries in Central Baltic region. Icebreakers and special research vessels are essential for the country committed remaining a leading Antarctic nation. In January 2013, Australian government informed about the plans of replacing their old Antarctic research and supply vessel Aurora Australis. As there are already a number of operating Antarctic research vessels built in Finland, Finland and other CBR countries could continue to offer their Arctic expertise and submit their proposals for design and building of these kinds of vessels also in the future. (EPE 2009; Department of the Environment 2013) In 2012, STX Finland delivered South African National Antarctic Programme a vessel similar to Aurora Australis, SA Agulhas II, and due to this previous experience on building such vessels, STX Finland is a very potential shipyard for the big Australian project. There is a theoretical possibility that the replacement vessel will be built in one of Australia's own shipyards, but it is not likely because of the concentration of country's shipyards on naval shipbuilding and high-speed aluminum craft. (McGuire 2013)

4.3 INDIA – POTENTIAL TO BECOME ONE OF THE LEADING MARITIME NATIONS IN THE WORLD

By Akseli Jouttenus

India has a potential to become one of the leading maritime nations in the world. It has a coastline of about 7 500 km and maritime transport carries approximately 95% of the country's external merchandize trade by volume and 70% by value. India's maritime sector has had major influence in ensuring the country's competitive position in global trade. (PFI & EY 2012) The country's large domestic market, which covers 60% of its GDP, acts as a buffer against the global market fluctuations (Agarwal 2013). The increase of Western countries shifting their manufacturing functions in low-cost economies is expected to boost the growth of Indian maritime industry in the future (Invest India 2012).

There are 12 major ports in India, handling approximately 60% of country's seaborne traffic, and 176 notified non-major ports. All of the major ports and 35 of the non-major ports are International Ship and port Facility Security Code (ISPS) compliant. (Agarwal 2013) The ports sector is growing in India. Strong domestic demand is expected to generate growth in port-related logistics and service activities. Foreigners are also investing to the country's port sector. Between April 2000 and July 2011, the sector attracted 1,1% (USD 1 635 million) of total FDI inflows into the country. (Invest India 2012) Challenges that threaten the growth of the sector include regulatory issues like slowness of the development projects, capacity limitations of the infrastructure, and poor support systems (PFI & EY 2012). The government has started projects to enhance the quality of the sector, e.g. road and rail connections of major ports are being improved in order to ensure the smooth flow of cargo. (Invest India 2012)

India's shipping sector has been growing steadily over the years in the areas of physical and financial assets, human resources, knowledge base, operating processes and support infrastructure. (FICCI & EY 2010) Many Indian shipping companies, including private and government owned, have been significantly expanding their shipping fleet in spite of recent economic downturn (Innovation Norway 2010) Sector is regulated domestically by the Ministry of Shipping of India and internationally by conventions and protocols of IMO. Country's shipping tonnage has grown drastically from 0,19 million gross registered tonnage (GRT) in 1947 to 9,6 million GRT in 2010. In 2010, the coastal shipping vessels accounted about 65% of the total vessels operating in India, while their share of total GRT was about 10%. However, there are many regulatory and fiscal hurdles limiting the growth of the country's coastal shipping. From a long-term perspective, infrastructure development in developing economy like India is increasing the demand for shipping services. While also container cargo volumes are expected to grow enormously, Indian actors are not likely to play a big part on the category because of the foreign ships' major share on this market. The challenges of the sector include the country's ageing shipping fleet, the average age of the Indian fleet being approximately 18 years compared to world average of about 12 years. (FICCI & EY 2010) Indian shipping companies have made major investments and plans to renew their fleets (Innovation Norway 2010). There is a possibility for cooperation for the equipment suppliers from the CBR in newbuilding of this ageing fleet. Another challenge is the declining share of Indian ships in the country's overseas sea-borne trade, resulting from the decreasing cargo support and the greater number of the Indian ships deploying on global waters. Some other difficulties facing the sector are unfavorable tax regime,

slow passage of cargo from ports and the increasing maritime manpower shortage. Important improvement for the country's shipping sector is to increase the deployment of the capacity to Indian ports. Also in order to utilize all of its future growth opportunities, India's shipping industry needs to adopt a more global outlook. (FICCI & EY 2010)

Regarding the shipbuilding industry, there are around 30 shipyards in India, of which 8 are public and the rest private (Export-Import Bank of India 2010; Agarwal 2013). Even though the private shipyards are larger in number, they are very limited in capacity and the size of vessel they can build (Vøgg 2012). The biggest shipyard of the country, government owned Cochin Shipyard Ltd, has the capacity to build 110 000 DWT vessels at the most, which is not a lot compared to the current global tendency to build large size vessels (Ministry of Shipping 2012). In 2010, the country's shipbuilding reached a turnover of USD 1,6 billion and is estimated to double in the next five years (Vøgg 2012). The share of Indian shipbuilding industry of the world shipbuilding has also grown significantly from 0,1% in 2001 to 1% by 2008 (Ministry of Shipping 2012). The strengths of the Indian shipbuilding include strong and low-cost labor force, large coastline for ships and government allowing 30% cash subsidies to newbuilding yards in the country. There are also challenges in the industry like heavily booked shipyards, lack of skilled labor force, and lack of sufficient government support for instance in financing. Demand for offshore oil exploration and production offers new opportunities for India. Investing in offshore oil would also result in an increase in demand for offshore platforms and their repair facilities. (Vøgg 2012)

India's share in the global ship repair market is only about 1% (USD 100 million of the total USD 1 billion). There is only one shipyard dedicated for the ship repair activity. However, the country's strategic location on the international trade route creates a good business opportunity for the sector. Ship owners might prefer the possibility of repairing and maintaining vessels without deviating from their trade route. India's ageing shipping fleet also guarantees domestic demand for the repair industry. (Export-Import Bank of India 2010)

Maritime sector of India is continuing to grow, which leads to cooperation possibilities for the CBR countries. India is one of the leading manpower suppliers to the global shipping industry. Many private and public institutes of maritime education have been established in the country. (Innovation Norway 2010) There are possibilities for cooperation with India as the country continues to train this large group of maritime professionals and also seeks to improve the education. The lack of sufficient technology has been a core issue in the development of India's maritime sector (Innovation Norway 2010). This is an area where lies many opportunities for the CBR. For example, Indian shipbuilding, ship repair, and also maritime training and education sector could benefit from the technological assistance of the CBR countries. Green technology is especially interesting area of technological expertise for India's maritime sector. Cooperation possibilities in green technology include LNG, green shipbuilding and ship design technologies, for instance. The CBR countries can find many prospective business opportunities, while India is striving to improve its efficiency and modernize its whole maritime industry.

4.4 INDONESIA – CONTINUALLY GROWING AND DEVELOPING MARITIME SECTOR

By Akseli Jouttenus

Indonesia, the world's largest archipelago with more than 17 000 islands, is South East Asia's largest economy, with a nominal GDP of USD 500 billion. The country is also the world's fourth populous country with around 240 million people. (Country report Indonesia 2001; Indonesia Defence & Security Report Q2 2010) Indonesia has about 5,8 million square kilometres of marine territory and 92 000 kilometres of beach and coast (Yusuf & Trondsen 2013). Because of the special structure of the country, Indonesia is dependent on maritime transport for international as well as for domestic trade. Improving shipping and port services throughout the country has been a priority of the Government of Indonesia. In the past, the Indonesian maritime sector had more public sector involvement and restrictive licensing and regulatory regime than it now has. The system in the country has become much more liberalized and decentralized. (Country report Indonesia 2001)

Fisheries retain an important role in the Indonesian maritime sector as well as in the country's economy. Indonesia has huge marine resources and the livelihoods of the majority of the Indonesian people are related to the fishery sector. Indonesia has become the fourth major fisheries producer in the world, but the country's fishery exports are still comparatively low ranking only 12th in the world, far below other Southeast Asian countries. The problem is the inability of the Indonesian fishery industry to produce value-added products. The sector is dependent on exports of non-processed fish, which still contributes only a little to the value of exports and to the employment. In addition to weak competitiveness of the country's fishery products, the sector also suffers from a lack of proper policies and decision making processes in regional fisheries. The country's Ministry of Maritime Affairs and Fisheries has a goal to make Indonesia the world's leading producer of fishery products and to create a marine and fisheries sector that has entered the stage of industrialization. In order to achieve this goal, the sector needs increased product innovation, investments in R&D, focusing on the value chains, greater market orientation, and improved training of human resources. (Yusuf & Trondsen 2013)

According to the Indonesian National Shipowners Association (INSA), it is likely that the country's shipping industry will grow around 20% during 2013 due to a country's good economic performance. In 2013, there will be 560 new ships in the Indonesian shipping industry, which will increase the number of Indonesian flagged ships to 12 600. With this fleet, the Indonesian shippers are expected to be able to deliver around 1,2 billion tons of cargo, for both the domestic and international markets. One factor contributing to the Indonesian shipping is the government's implementation of the cabotage principle, which means that all vessels operating in Indonesian waters must be domestically owned. The increasing number of national flagged vessels for domestic maritime transportation and the amount of cargo delivered by the national fleet indicate the benefit generated. However, there are exceptions to the principle, because of the inability of local companies to provide the technologically advanced facilities and personnel needed for sophisticated activities like oil and gas drilling and production. (Osman 2012)

The country's shipping industry suffered heavily from the downturn during 2009 crisis. One reason was the overcapacity resulting from the downturn. (OSK 2012) Although INSA predicted growth for

the sector, the health of the global economy is still very fragile, and in the most shipping markets the situation is still unpredictable (Jati 2012). However, Indonesia's growing economy has attracted foreign shippers to cooperate with local shipowners. International joint ventures are expected to emerge between those shipping companies in 2013. (Osman 2012)

One of the key issues regarding the growth of the Indonesian maritime sector is investments in port infrastructure, including road and rail links (BMI 2012). Indonesia's geographical characteristics are very difficult and as a consequence, the nation has approximately 1 700 seaports. The total throughput of the country's port sector was estimated at 968 million tonnes in 2009, which splits almost evenly between the domestic and international cargo movement. Weak operational performance of Indonesia's port sector and low level of investments in port infrastructure are major challenges for the sector. (OECD 2012) Recently, the Indonesian government has shown more commitment to building port infrastructure and standardizing port charges. State-owned companies Pelindo and Terminal Peti Kemas are cooperating in order to standardize port charges starting from 2014. (OSK 2012) One major improvement in the country's port capacity is the expansion of the country's largest port, Kalibaru in North Jakarta, which is expected to commence first phase operations in 2014 with a capacity of 1,5 million 20-foot equivalent units. (Osman 2012) According to OECD report, Indonesia's port sector should encourage more private sector participation and improve the environment for competition (OECD 2012). Another needed improvement is to make country's ports suitable for cruise ship activity. The challenges to overcome include inadequate conditions, facilities, security and cleanliness at ports. (Jakarta Post 2011)

Indonesia's around 200 shipyards are mostly centered in Batam in Riau Islands; Tanggamus in Lampung; and Lamongan in East Java. Country's shipbuilding industry's annual capacity has reached 800 000 DWT for ship production and 10 million DWT for ship repairs. The Indonesian government has set a goal to develop larger vessels, up to 70 000 DWT, particularly tankers, by 2015, which would help grow the country's shipbuilding industry. Even though government has given incentives as government-paid import duties for component purchases and tax allowances, it is unlikely that the industry will hit the set targets in the near future. For instance, the country's shipbuilding sector suffers from relatively high production costs in relation to its competitors in the other Asian countries such as Vietnam and China. (Wee 2013)

Piracy is also one of the challenges of the Indonesian maritime sector. At the global level the number of pirate attacks has been decreasing, but the conditions concerning piracy in Indonesia have not improved. However, piracy incidents in Indonesia are generally not as dangerous as those occurring in regions elsewhere. There are very rarely serious cases where firearms are used and major injuries occur. (Putri, Buensuceso & Winata 2013)

Nevertheless, the Indonesian maritime sector has seen growth through the past years. Additionally there are other sectors like automotive, electronics, food and beverage and fertilizer seeing increased capacity, which contributes to the country's maritime transport. There is also potential to develop the ship component industry in the country. (IME 2013) At the same time, the CBR countries could take advantage of the fact that Indonesian maritime sector is seeking improvement in many different areas like maritime policy, fisheries, port development and management, and capacity of the shipyards. For instance, the Finnish Konecranes recently won record order of over EUR 100 million for container handling equipment from Indonesian terminal operator (Konecranes 2013).

Regarding increasing the activity of foreign businesses in the Indonesian maritime sector, international events, such as the international Indonesia Maritime Expo (IME) conference organized in 2013, are ideal occasions for building new partnerships and presenting business opportunities in the country where the maritime sector has rapidly grown in the last six years (IME 2013).

4.5 MALAYSIA – A TRADITIONAL SHIPPING PROVIDER ON THE STRAIT OF MALACCA SEEKS NEW ENGINE FOR MARITIME DEVELOPMENT By Minghui Gao

Locates in Southeast Asia between the Pacific Ocean and the Indian Ocean (张艳 2009), the country of Malaysia is divided by the South China Sea into two parts: East Malaysia and Peninsular Malaysia (also called West Malaysia) (Malaysia – The World Factbook 2013). Between the west shore of Peninsular Malaysia and Sumatra lays the Strait of Malacca, which is the busiest and strategically the most important sea channel in the world (王晓, 2011; 国际船舶网 2012). Therefore, the geographical location of Malaysia determines the high dependency of its national trade and economy on maritime industries (张艳 2009; 王晓惠 2011).

Malaysian shipbuilding has a long history – the shipbuilding industry has existed since the 1900s (Noor 2012). Though the industry has not been widely known in the world, it still plays a key role in making contribution to the nation's economy (World Maritime News 2012). Currently, there are more than 80 shipbuilders and ship repairing companies operating in Malaysia (国际船舶网 2012), and the largest shipbuilder is Malaysia Marine and Heavy Engineering (MMHE) (MIDA 2013). Most of the yards are located along the coastal lines of both East Malaysia and Peninsular Malaysia (国际船舶网 2012), where the yards are divided into two shipbuilding clusters. East Malaysia Cluster specializes in steel vessels for offshore supply, tug, barge and river ferry; while Peninsular Malaysia Cluster emphasizes on building steel and aluminum vessels for government, as well as oil and gas. Comparing the two clusters, the East is relatively more innovative and competitive in terms of design, shipbuilding process and material sourcing, whereas the Peninsular Cluster is rather lack of those features due to its dependence on doing governmental projects. (Noor 2012)

Many Malaysian shipyards have been criticized on being over dependent on the government in terms of the seeking of new orders, lacking cooperation between domestic shipbuilders, and lacking skilled labor force (CSIC 2006). However, in general, the shipbuilders have good reputation on manufacturing high-qualified offshore working vessels and cruise ships (王晓惠 2011). Therefore, Malaysia will keep its path on building such ships as well as small-sized vessels (Baird Maritime 2013). As the Malaysian government started to pay more attention to shipbuilding industry, the development of shipbuilding will be supported strongly by the government. Since the current importers of Malaysia-made vessels are mainly Middle Eastern, African countries and some European countries, the government decides to make much effort on widening international markets for its shipbuilding products. (国际船舶网 2012) Moreover, Malaysia will also heavily develop its capability on building offshore facilities and enhancing ship repairing and maintenance activities (Baird Maritime 2013).

Since 2000, Malaysia has emerged as a leading maritime nation in terms of merchant shipping capacity (Investvine 2013). Among many other shipping companies, Malaysia International Shipping

Corporation Berhad (MISC Berhad) is the leading international shipping line of Malaysia. (MISC Berhad 2013). The company is the largest LNG shipping company in the world (王晓惠 2011) and is specialized on energy transportation via LNG carriers and petroleum tankers, as well as offshore facilities construction (MISC Berhad 2013). Since 2008, MISC has been confronting the challenges from global economic crisis, and the company has operation difficulties like many other shipping companies in the world (环球运费网 2011a). As most of its profits come from energy related businesses (环球运费网 2011a; 环球运费网 2011b), and the demand for large vessels was slowed down due to the excess shipping capacity of container ships in China (The Star Online, 2013), MISC decided to shut down its liner services and sell its 16 container ships (环球运费网 2011a; 环球运费网 2011b). However, the situation became better in 2013 when the Malaysian shipping industry found the potential opportunity for exporting complex small and medium-sized ships (The Star Online 2013). Besides shipping industry, Malaysia's ports have also taken many advantages of its special geographical location. Though Malaysia, with other Southeast Asian countries such as Vietnam, the Philippines and Indonesia, has territorial conflicts with China in recent years (Chen 2013), the shipping capacity through the Strait of Malacca does not seem to be influenced. The large amount of shipping through the Strait has accelerated the development of Malaysia's ports, and made the Port of Klang and the Port of Tanjung Pelepas the world's leading container ports in terms of throughput (王晓惠 2011).

In addition, many international companies have operated in Malaysia. For instance, the Norwegian shipbuilder Aker has invested in Malaysia and established Aker Solutions which aims to provide engineering and operational support to the local customers (Aker Solutions 2013), the Danish shipping company Maersk Lines has utilized the convenient location of the Port of Tanjung Pelepas (International Port Technology 2013), and Maersk also operates offshore facilities with the cooperation with Malaysian suppliers (Almeida 2013). In these cases, Malaysia could benefit from international cooperation in terms of seeking new and advanced technology as well as developing port infrastructure and offshore facilities.

In the future, Malaysia could focus on maintaining its world leading position on energy shipping, and further developing its competitive advantages in ship repairing and maintenance, as well as building complex small and medium-sized vessels, cruises and offshore vessels. Moreover, the country should look for more cooperation with international companies and create new engine for the development of its maritime sectors. For example, as the government has driven the green technology agenda (Bernama 2013), and the U.S. Chemical company Eastman has added two plants in Malaysia (Portfolio Business Times 2013), it would bring great opportunities for Malaysia to develop green technology related shipbuilding, and extend its energy shipping.

4.6 THE MIDDLE EAST – THE ARABIAN NIGHTS AND AMBITIOUS MARITIME PROJECTS

By Eini Laaksonen

Despite the global economic slowdown, Middle East is developing as a dynamic maritime hub of shipbuilding, repair, offshore, and shipping. The development is led by the United Arab Emirates (particularly Dubai and Abu Dhabi), Saudi Arabia, Oman and Qatar, in which the region's major ports and shipyards are located and more are under construction. (MarineLink 2009) Of particular

interest is Dubai which, in addition to impressive economic growth and ambitious construction projects, works hard to strengthen its reputation as a centre of shipbuilding and maritime services. (GAN 2013) The city of Dubai emerged as a trading centre in 1833, and in 1970s, Sheikh Rashid bin Saeed Al Maktoum gave instructions for two ambitious projects – the construction of the world's largest man-made harbour at Jebel Ali and the construction of premier shipbuilding and repair yard Jadaif Dubai. Today Jebel Ali is one of the world's busiest ports and Jadaif Dubai as a world-class dockyard. (DMC 2013a; DMC 2013b)

Regarding maritime industry in particular, Dubai's current flagship is Drydocks World (DDW) which has after its establishment in 1983 broadened its operations from repairs to construction, conversion, and offshore platform building. Although orders for also this shipyard declined considerably in the wake of the global economic crisis, the DDW continued aggressive expansion, including strategic shipyard acquisitions in Singapore and Indonesia. To manage the consequent extensive debt load, the company follows a precise long-term business strategy that relies particularly on the future demands of oil and gas industry. (GAN 2013) DDW has recently sought new ways to survive with the USD 2,2 billion debt – for instance, in 2012, DDW formed a joint venture with Singaporean Kuok Group to share its Asian operations with a new partner (Al Arabiya 2012) and almost all the creditors have agreed to reschedule paybacks (GAN 2013). During the 25-year history, the shipyard has repaired over 6 600 ships and today handles on average 350 vessels a year, mostly large crude carriers. Currently DDW is the largest ship repair facility in the Middle East. The newbuilding operations, in turn, began in 1994, after which over 70 projects including drilling rig hulls and seismic vessels have been completed at the yard. DDW operates in compliance with ISO 9001 and 2000 safety and environment systems and provides its employees with accommodation and recreational facilities, for instance. (Ship Technology 2013a)

In addition to DDW, there are also other players in Dubai's maritime sector. Another example is Grandweld Shipyards, which also provides shipbuilding, ship repair and engineering solutions for the maritime and offshore industries. Moreover, to support the development and clustering of maritime expertise in Dubai, Dubai World Group has established a Dubai Maritime City, the world's first purpose-built city for the global maritime industry community on a manmade peninsula. Dubai Maritime City with 227 hectares of reclaimed land comprises industrial, operational, commercial, academic, residential and life-style activities and is to be home to global maritime companies. Grandweld Shipyards recently inaugurated there a new facility, whereas the DDW shipyards are located right next to the Maritime City. (DMC 2011; DMC 2012b) Also a Dubai-based Mubarak Marine is set to build a new industrial complex offering shipbuilding and repair services at the Dubai Maritime City project (CWO 2013). So far over 55 local and international maritime-related organizations have set up a base there (DMC 2012a).

There are also other noteworthy shipbuilding regions in the Middle East. In the United Arab Emirates also Abu Dhabi is rapidly consolidating its position as a noteworthy shipbuilder and particularly as a support contractor for the union's naval and military operations. After its inauguration in 1996, Abu Dhabi Ship Building (ADSB) focused on naval repairs, but has since gradually expanded its expertise to the construction of sophisticated war ships as well as commercial vessels (ADSB 2013). In Saudi Arabia, in turn, Zamil Group Holding is a family owned global investment company that is strongly involved in maritime industry. Zamil Offshore Services is one of the group's affiliated companies and

particularly engaged in serving the offshore oil and gas industry in the Arabian Gulf. In addition to owning and operating one of the largest offshore service fleets in the Middle East, the company is active in offshore shipbuilding, offshore engineering, and in ship and rig repair. (Zamil Offshore 2013) In Oman, Oman Drydock Company (ODC) is specialized in ship repairs, conversions and offshore projects. This yard was established with 100% investment by the Government of the Sultanate of Oman, but is operated by the Korean Daewoo Shipbuilding & Marine Engineering Company Limited. (ODC 2012) In Qatar, Nakilat-Keppel Offshore & Marine Limited (N-KOM) is the country's premiere shipyard providing a spectrum of repair works, conversions and construction for a wide range of offshore vessels. The shipyard is a joint venture of Qatar Gas Transport Company Nakilat and the Singaporean Keppel Offshore & Marine. (N-KOM 2012) It can be concluded that even in the strategically governed Middle East international ownership structures play a role in the maritime sector's development.

When it comes to ports in the Middle East, the best one (awarded by Lloyd's) can be found in Dubai – Jebel Ali Port, the flagship of DP World. With 67 berths and a size of 135km², Jebel Ali is the world's largest manmade harbor and the largest container port between Rotterdam and Singapore. While acting as a strategic maritime link between the East and West, it is one of the most modern ports in the region and operates the world's largest gantry cranes, for instance. Jebel Ali is also a free zone, and the 6 000 companies located in the area benefit from various tax exemptions. Although the massive construction project seemed quite questionable in the 1970s, the port has played a key role in Dubai's transformation into a commercial hub and a modern city. Dubai's DP World, in turn, has a portfolio of more than 65 marine terminals around the world and new ones under construction in India, Africa, Europe and South America. Since the establishment in 2005, the group has expanded rapidly through new port projects as well as strategic acquisitions. In 2012, DP World handled altogether more than 56 million TEU. After completing the new projects, the capacity is expected to reach 100 million TEU by 2020. (DP World 2013a; DP World 2013b; Port Technology International 2010)

As an example of other large ports in the Middle East, one can mention the Khalifa Port project in Abu Dhabi. This port is also located on a reclaimed artificial land and once completed, it will be one of the world's largest ports. The first of the project's five construction phases began in December 2012 and is solely estimated to cost USD 7,2 billion. To protect the Ras Ghanada coral reef on the coast, the port is being built offshore and connected to the mainland with a one kilometer bridge. The port is part of Khalifa Industrial Zone Abu Dhabi (Kizad), and it is to cater the industrial cargo generated in this zone as well as to handle the container cargo from the neighbouring Mina Zayed Port which is to be closed in the future. When completed around 2030, the Khalifa Port's annual capacity is expected to increase from the current 2 million TEU to 15 million TEU. (Ship Technology 2013b) A new massive port project is underway also in Qatar, where a new container port is under construction between the municipalities of Al Wakrah and Mesaieed to replace the existing Doha Port. Also this port is to become one of the world's largest. In addition to the new port, the project comprises also construction of a new naval base for the Qatar Emiri Naval Forces and the Qatar Economic Zone 3 Canal. Like most of the ports in the region, this one will also be linked to the Gulf Cooperation Council rail network linking Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. (Ship Technology 2013c)

The Middle-Eastern countries are currently working hard to diversify their petroleum-dependent economies and, as can be seen, are heavily investing in developing the maritime sector. Such projects may provide opportunities also for foreign businesses and already now the international supplier base of, for instance, the Saudi company Zamil Offshore Services includes companies such as Alfa Laval, Mitsubishi Kakoki Kaisha, Norwegian Maritime Equipment AS, Rolls-Royce, and Wärtsilä (Zamil Offshore 2013). The Khalifa port under construction in Abu Dhabi, in turn, uses automated stacking cranes built by Konecranes, for example (Ship Technology 2013b). Moreover, while the offshore sector is of increasing interest to these still oil-driven economies, particularly products and services related to this sector might provide increasing opportunities for foreign companies. The completion schedules of the megaprojects on artificial land still remain to be seen – particularly when already the existing projects are struggling with financing problems. However, the massive developments in the Middle East should not be left unnoticed since these players have the guts to reach for unbelievable goals and at the same time have the ability to collect state-of-the art expertise from the global markets to make them happen.

4.7 NORTH AMERICA – TWO NATIONS WITH A GROWING INTEREST IN THE ARCTIC

By Hanna Mäkinen

The United States

The maritime industry in the United States is concentrated in the coastal states but several shipyards also operate near the major inland waterways, such as the Great Lakes, the Mississippi River and the Ohio River. The top five states in terms of employment in the shipbuilding industry are Virginia, California, Louisiana, Texas and Mississippi, accounting for some 60% of all private employment in the industry. (MARAD 2013) Since the mid-1990s, both the revenues and value added of the shipbuilding industry have more than doubled whereas simultaneously the employment of the industry has stayed approximately the same, a little below 100 000 persons (Shipbuilding History 2013). Currently there are 113 active shipyards in the U.S.: five public shipyards operated by the U.S. Navy and the Coast Guard; 26 mid-sized or large shipyards, capable of building naval ships and submarines, large cargo ships, drilling rigs and mid-sized vessels of high value and complexity; and 82 small shipyards, capable of building smaller and simpler commercial vessels, such as tugs, towboats, offshore service vessels, fishing vessels, ferries and barges. In addition, there are more than 200 shipyards that are not active competitors in the new-building market but may still be operating as repair yards or fabricators, or are building boats occasionally. In 2012, the U.S. shipyards delivered in total some 1 250 vessels of which more than 80% were inland barges. (Shipbuilding History 2013)

The 26 largest U.S. shipyards are operated by 12 companies: Aker Philadelphia, Austal, BAE Systems, Bollinger Shipyards, Edison Chouest Offshore, Fincantieri USA, General Dynamics, Huntington Ingalls, Keppel Offshore & Marine, Signal International, Vigor Industrial, and VT Halter Marine (Shipbuilding History 2013). Many of them are large international corporations which are operating in various locations around the world and have wide international networks. These companies are specialized in, for instance, building of military vessels, submarines, offshore rigs, offshore service and supply vessels, tankers, passenger ferries, and various smaller commercial vessels, as well as repair and maintenance of various types of military and commercial vessels and floating structures. The federal

government remains an important customer for the industry as for instance in 2012 almost all large deep-draft vessels (9 out of 11) were delivered to the U.S. Navy (MARAD 2013; Shipbuilding History 2013). There is also a wide and competitive network of naval architecture and engineering companies and partial and turnkey suppliers of the marine industry. Furthermore, the American offshore industry is the world's largest and has high-class expertise in offshore solutions (Finpro 2013b; Henriksson & Huhtinen 2013). In addition, the cruise industry is an important part of the U.S. maritime sector – for instance, in 2012 the cruise line industry generated over USD 42 billion in total economic activity to the country's economy, and more than 350 000 jobs (CLIA 2013).

Regarding ports and maritime logistics, the sector is sensitive to the changes in the U.S. national economy and the recent growth in the country's international trade has resulted in rising demand for freight transportation services, including maritime transportation (RITA Bureau of Transportation Statistics 2011; Burnson 2012). There are some 360 commercial sea and river ports in the U.S. (the U.S. mainland, Alaska, Hawaii, Puerto Rico, Guam, and the Virgin Islands) of which more than 150 are deep draft seaports. More than 2 billion tons of domestic, import and export cargo is handled in the U.S. ports and waterways every year. (AAPA 2013) Public ports contribute significantly to the U.S. economy, for instance 13,3 million jobs are connected to the U.S. deep-water seaport industry, i.e. generated directly and indirectly by the port sector as well as exporters, importers and other users of the seaports (Martin Associates 2008). Although port authorities and their business associates have made significant investments to the development of port-related infrastructure, the inadequate connections between seaports, shipping lanes and land transportation networks still create bottlenecks and remain one of the main challenges for the U.S. ports (AAPA 2012a; AAPA 2012b).

The involvement of foreign companies in the U.S. shipbuilding and shipping industries is restricted by the Merchant Marine Act, commonly known as the Jones Act, which imposes requirements for vessels engaging in coastwise trade in the U.S. According to the Jones Act, all commercial vessels transporting goods between ports in the U.S. mainland, Alaska, Hawaii, Puerto Rico and the Virgin Islands have to be built or rebuilt in the U.S., registered under the U.S. flag and have at least 75% U.S. ownership. In addition, all officers and pilots, as well as three quarters of other onboard personnel have to be U.S. citizens or residents. (American Shipping Company 2013; CLIA 2013) One of the central aims of the law, dating back to 1920, is to protect the U.S. national security by guaranteeing the sufficient fleet capacity for military needs and preventing the country from becoming fully dependent on foreign vessels. It also has several other benefits, for instance it ensures that all shipbuilders and shipping companies follow the same national wage, labour, safety and environmental standards, as well as assures reliable and regular connections between the mainland U.S. and its overseas communities. The industry under the Jones Act has a significant impact to the U.S. economy, accounting for USD 14 billion in annual economic output, 84 000 jobs in the U.S. shipyards and 70 000 jobs working on or with Jones Act vessels, as well as over 39 000 vessels representing an investment of USD 30 billion. (Transportation Institute 2009; American Shipping Company 2013) Hence, the law has powerful backing from U.S. shipowners, shipyards, trade unions, and various officials and governmental sectors, among others (Kemp 2013).

However, the Jones Act has received criticism for being protectionist and interfering with the normal functioning of the market. The U.S. citizen crew requirement and the related higher employment

costs are seen to create significant expenses for the shipping industry and thus to increase U.S. freight rates. (MARAD 2011; Bloomberg 2013) The Jones Act has also been accused for increasing the cost of living on U.S. islands, such as Hawaii and Puerto Rico, and distorting trade flows because freight rates for intra-U.S. shipping routes can sometimes be even higher than for longer distances between the U.S. and foreign ports (Kemp 2013). Furthermore, the law protects the U.S. shipbuilding industry from international competition. This has, according to the critics, led to the inefficiency of shipyards as they have not adopted modern and innovative production methods, and high costs of ship construction. Due to the high prices of U.S.-built vessels, the domestic shipowners delay the upgrading of their vessels as long as possible which has made the U.S. fleet, on average, older and less effective compared to international fleets. The Jones Act also limits the U.S. shipping capacity and creates shortages of special types of vessels. In addition, the low investments in the development of production have undermined the competitiveness of the U.S. shipbuilding companies in the international market. (Fielden 2012; Bloomberg 2013; Akina 2013) Moreover, the Jones Act has been accused for hampering natural disaster relief although it was originally designed to help in dealing with emergency situations. The U.S. presidents have been forced to suspend the act for instance after the hurricanes Katrina and Sandy in order to allow the supply of fuel by foreign ships to the areas hit by these natural disasters. (Bloomberg 2013)

Due to the Jones Act, the U.S. market is in many ways inaccessible for foreign shipbuilders and shipowners. U.S. companies cannot purchase foreign-built vessels to be used in commercial shipping within the U.S. and neither are foreign shipping companies allowed to operate in the U.S. domestic trade. For an U.S.-flagged vessel, repair work on the hull and superstructure should also be done at a domestic shipyard. Cruise ships, which are usually foreign-built, foreign-owned and have foreign crews, avoid the Jones Act by stopping at a foreign port during the cruise. (Fielden 2012; Jones Act Lawyers 2013) Despite of the regulatory framework, many foreign companies are still involved in the U.S. maritime industry, for instance as suppliers. Regarding the CBR, Wärtsilä, for instance, has two subsidiaries, Wärtsilä North America, Inc. and Wärtsilä Defense, Inc. in the U.S., producing ship power solutions such as engines and propulsion systems for both civil and military vessels. Cargotec, on the other hand, is present in the U.S. through its brand Kalmar, producing various cargo handling solutions for ports.

The interest in the Arctic is growing in the U.S. as well. The global warming is causing changes in the Arctic which in turn lead to increasing exploration of oil, gas and minerals, as well as growing amount of passenger and cargo ships traveling through the region. To be able to assist the vessels, supervise the activities and respond to possible accidents in the Arctic, the U.S. would need to increase its polar icebreaking fleet. (ABS Consulting 2010; Restino 2013) However, the polar icebreaking fleet of the U.S. is rather small. The U.S. Coast Guard has two heavy polar icebreakers of which currently only one is operational and one medium polar icebreaker which is used primarily for scientific research in the Arctic. In addition, there is one polar icebreaker operated by the National Science Foundation that is used for scientific research in the Antarctic. (O'Rourke 2013) The need to increase the U.S. Coast Guard's icebreaking capacity has been generally acknowledged and leasing of icebreakers from foreign governments or private companies has been mentioned as one viable option together with purchasing of new vessels and reconstructing the existing ones. (ABS Consulting 2010) The size of the U.S. icebreaking fleet is often compared to the significantly larger Finnish, Russian and Swedish fleets, for instance, and Finland has also been used as a point of

reference for the well-managed winter navigation and ice-breaking (Carafano & Dean 2011). Hence, as the Nordic countries' icebreaking expertise has a good reputation in the U.S., the U.S. icebreaking industry could offer business opportunities for the CBR maritime companies specialized in this field.

Private companies, such as oil and gas companies drilling offshore, also have their own equipment for operating in the Arctic conditions (Wolf & Klimasinska 2012) and the offshore sector offers business opportunities for foreign companies as well. For instance, the multipurpose icebreakers of the Finnish state-owned company Arctia Shipping, which operates the Finnish icebreaking fleet, have been participating in Shell Offshore's oil and gas exploration projects in Alaska during the summer season. However, due to the U.S. Oil Pollution Act, the risk of participating in offshore activities in the U.S. continental shelf is also rather high. In case of an oil accident, extensive damages can be claimed from a company involved in the accident based on the act. (Hernesniemi 2012)

Canada

The maritime industry is among the oldest industries in Canada. The country's shipbuilding peaked during the Second World War but has since then experienced a decline, particularly due to the constantly increasing competition it is facing from abroad and inability to respond to that competition. During the recent years, the country has aimed at recreating its shipbuilding industry and restoring the industry's competitiveness. (Milewski 2013; Robertson 2013) Aiming at revitalizing the industry, the Government of Canada announced the National Shipbuilding Procurement Strategy (NSPS) in 2010. NSPS is a long-term plan to renew the fleets of the Royal Canadian Navy and the Canadian Coast Guard by establishing strategic partnerships with two Canadian shipyards, Irving Shipbuilding Inc. in Halifax and Seaspan in North Vancouver, of which the first is building combat vessels and the latter non-combat vessels for the government's needs. (Canada First 2013) The aim of the strategy has been not only to support the two selected shipyards but to create opportunities for the suppliers of the shipbuilding industry in Canada, facilitate the development of advanced technologies and foster innovations, as well as create thousands of jobs across Canada (Industry Canada 2011). However, so far the government's shipbuilding program has received criticism, too, because the involved shipyards have not been able to hold to budgets and schedules, and the rationality of paying a high price for domestic construction instead of buying less expensive ships from foreign builders has been questioned (Milewski 2013; Robertson 2013).

The Canadian maritime industry is driven by various sectors, such as offshore oil and gas production, maritime transportation, security and defense, tourism and recreation, and fishing industry. The maritime industry includes companies specialized in building various types of vessels, such as cargo ships, ferries, fishing vessels, offshore supply vessels, and tugboats, as well as in constructing offshore oil and gas platforms. There are several shipyards operating in the various parts of Canada, and the industry has created a demand for various suppliers of related equipment, technologies and services, as well as companies engaged in ship repair and maintenance. In addition, the industry has experience in designing and constructing naval and coast guard vessels and icebreakers. (Industry Canada 2011)

Regarding ports, the National Ports System in Canada consists of 18 port authorities, considered to be critical to domestic and international trade. These 18 ports handle some 300 million tonnes of cargo annually. (Association of Canadian Port Authorities 2013) The total cargo handled in Canadian

ports and marine terminals in 2011 reached some 470 Mt (Statistics Canada 2012). The major ports in Canada compete directly for cargo with the U.S. ports. In order to maintain their competitiveness Canadian ports have to, for instance, invest in developing infrastructure, services and technologies to meet the growing needs of various port users and ensure the fluent movement of goods and people. The globally growing trade has put pressure on the whole logistics chain and Canada aims to invest in developing it in order to boost its international trade further. (Association of Canadian Port Authorities 2013)

The growth of various Canadian industries, such as aviation and car industries, has often been based on the North American integrated market. However, regarding the maritime industry, the Jones Act prevents the formation of a common market and thus hinders the Canadian industry's growth. (Robertson 2013) The finding and training of skilled workforce is also a challenge for the Canadian maritime industry. Furthermore, there is a significant lack of shipbuilding-related R&D in Canada. The environmental standards are guiding the development of the maritime industry in Canada as well, both the selection of ship equipment and the actual construction process, and the industry is devoting significant efforts to the development of environmentally advanced products and operations. (Cairns 2012) There is demand for foreign technologies and expertise related to environmental-friendly technologies and for instance Finnish Wärtsilä is supplying solutions for LNG-fueled Canadian ferries (Wärtsilä Corporation 2012; Wärtsilä Corporation 2013). As the Arctic region is of great interest for Canadians as well, related solutions are also acquired abroad, and for instance Danish and Norwegian design and naval architecture companies have been involved in Canadian shipbuilding projects (Milewski 2013). Thus, the Canadian maritime industry is offering business opportunities for foreign companies particularly in the fields of cleantech and Arctic solutions, in which maritime companies in the CBR also have special expertise.

4.8 THE PHILIPPINES – FAMOUS SEAFARER SUPPLIER UPDATING ITS MARITIME EDUCATION By Akseli Jouttenus

The Philippines is a country of more than 7 000 islands and it has a coastline of about 36 000 kilometers (The World Factbook 2013). Because of its unique geography, the nation's socio-economic progress has largely been affected by the maritime industry. Shipping links the multitude of islands together and enables the movement of goods and people. Sea has provided for people of Philippines in the past and still it is a means of livelihood to many. Maritime industry has been the driving force of the country's economy, contributing to the development of other sectors such as mining and agriculture. (Sekimizu 2012; WMU 2013)

Maritime industry has spread in almost all the provinces of the country. The islands are filled with clusters of ship operators, ship builders, ship repairers, fishers etc. (Sekimizu 2012; Business Monitor International 2012). Majority of the domestic vessels are passenger (60%) and cargo (28%) ships, which are mostly imported to Philippines. Almost 80% of the shipping operators are single proprietors, while 20% of the ships are operated by corporations. The establishment of road roll-on/roll-off system in domestic shipping has a great positive effect to the country's economy. The new nautical highways will increase the efficiency of transportation of goods and people, create new links between islands and expand the regional markets. (Conti 2013) Although profitable, the

increased volume of traffic is accompanied with the risk of maritime crashes. The country has had a lot of problems with the ferry safety in the past. Often the ships are overcrowded and overloaded which makes the issue even more dangerous. The latest accident happened between the passenger ferry and cargo ship killing at least dozens of people. (Hookway 2013) Even though the Philippine shipping industry is in rather good and stable condition, the Business Monitor International (2012) estimates that the growth of the country's shipping will slightly slow down and points out that the industry will be affected by the global economic slowdown particularly in its key export markets like US, Japan, China and the Eurozone.

The Philippines' ports have played a big role in the socio-economic development of the country. Well managed ports are important part of the effective transportation of people and goods. Port services account for 6% of logistics costs in the Philippines and the logistics market is expected to grow 3–10% a year during the next decade. (Board of Investments Philippines 2013b) According to the Philippine Ports Authority's (PPA 2011) annual report, in 2011 the country's container traffic was 4,9 million TEUs, of which 55% was handled in the ports of MICT and PMO South Harbor. The volume of passengers declined from the year 2012 by 6% to 49,5 million. The Philippine ports serviced 341 455 vessels which was slightly less than the year before. Even though the mission of PPA is to develop and support business in the country's ports, it has been criticized for having conflicting roles in port services as regulator, developer and competitor. Decrease in PPA's involvement in developing and competing of port services would encourage investors to operate private ports in the country. (Remo 2013) PPA has already announced some privatization initiatives especially concerning passenger terminal building operations, cargo handling and development of facilities (PPA 2011).

Shipbuilding industry is growing in Philippines. There are 121 shipbuilding and repair facilities in the country, with ship exports in 2011 USD 638 million, which is 58% higher than it was in the year before that. There are about 45 000 Filipinos working in shipbuilding companies. (Conti 2013; Manila Bulletin 2013) In 2012, the Philippines became the fourth largest shipbuilding country in the world in terms of booked orders. Shipyards in the Philippines have started building more ships with large tonnage capacities, e.g. bulk carriers, container ships and passenger ferries. An example of the country's capacity to build world-class ocean-going ships is the 180 000-DWT commercial ship built by Hanjin Heavy Industries Corporation. (Board of Investments Philippines 2013a)

The Philippines has great potential in global shipbuilding markets. The country has the second largest archipelago in the world with favorable location and skilled manpower. The Philippine government also supports the country's shipbuilding sector. Republic Act No. 9295 was issued in 2004 granting exemption from payment of 12% VAT and allowing foreign investors to fully own shipyards. In 2012, the shipbuilding was included in the Philippine Investment Priorities Plan, which also benefits other industries such as tourism, transportation, oil and steel. According to a study concluded by Japan International Cooperation Agency (JICA) and Nomura Research Institute (NRI) Philippines is a potential shipbuilding and repair hub for oceangoing merchant and fishing vessels in the Asia-Pacific region. (Board of Investments Philippines 2013a; Bair Maritime 2013; Conti 2013)

The Philippines is the leading single supplier of the global maritime manpower (WMU 2013). 25% of the world's about 1,5 million seafarers are Filipinos, with a worth of USD 4,8 billion in foreign currency remittance to the Philippine economy. The value of the remittance has been growing from 2003 averagely 14%. The amount of Filipino seafarers has grown steadily until a minor downturn in

2012. (Conti 2013) The country's favorable circumstances for great maritime manpower include high population, poor employment opportunities in other sectors, suitable geography, the high amount of maritime training facilities and populations' fluency in English. (Baylon & Santos 2011) The country invests heavily in training of its seafarers. The Philippines has more maritime training institutions than any other nation in the world. There are currently 96 operating maritime schools in the country to provide the education of the maritime employees (WMU 2013; Conti 2013). However, there are challenges with the training of the maritime manpower of the nation. Country's continuous struggle to meet the EU standards for the maritime education risks the jobs of about 80 000 Filipino seamen on EU-flagged vessels. The Philippine government has started updating the maritime training programs nationwide in order to avoid the EU ban on hiring the Filipino seamen. (Brago & Flores 2013) The Philippine government has taken action in order to meet the increasing demand of skilled workers in the maritime sector. Creation of a Manpower Development Plan for the shipbuilding sector is one example of this. (Board of Investments Philippines 2013a)

Due to the large number of Filipino seafarers in global fleet, piracy is especially big threat to the Philippines. According to Sekimizu (2012), since 2006 about 750 Filipinos in over 60 ships have been hijacked. The Philippine government has been active in promoting maritime security and taking part in the counter-piracy measures in the region. Another major challenge for the maritime industry in the Philippines is the environmental issues. A lot of maritime traffic in the archipelagic and territorial waters of the country causes problems not only with the safety of navigation but also with marine pollution. The pollution level in the Philippine waters is very high. An average of 23 oil spills a year and some other incidents have fiercely damaged the local municipalities. (Sekimizu 2012; Palma 2009)

Different cooperation opportunities can be found for companies from the CBR with the Philippine maritime sector. With increasing environmental regulations concerning the maritime industry, there are potential collaboration possibilities with the development and production of green technology. For example, the growing Philippine shipbuilding industry is a possible buyer of energy saving technology and environmental solutions. Another potential field of cooperation is the development of maritime training. The Philippine government is updating the country's maritime training programs, which could open doors to maritime education cooperation. Norway has already shown the way by notable involvement in education and training of Filipino seafarers (Royal Norwegian Embassy in Manila 2013). Collaboration possibilities might also be found in the field of maritime safety. The lack of safety in the Philippine waters has been an issue, which could create a demand for international support. While political and security concerns in the country reduce the willingness to do business there, the educated and English-speaking workforce and estimates that the Philippines will be in the top 15 economies in the world by 2050, make it a potential partner in the maritime business (Finpro 2012).

4.9 VIETNAM – MARITIME INDUSTRY BOOSTED BY THE RAPID ECONOMIC GROWTH

By Hanna Mäkinen

Vietnam has experienced rapid economic growth during the last decades and transformed itself from a closed, state-controlled economy into a mixed economy with an increasingly dynamic and competitive private sector and export-driven industries. The Vietnamese maritime cluster, particularly the shipbuilding industry, has been a central part of the economic growth and has a prioritized position in the Vietnamese government's development strategy. Significant state support has been allocated for the maritime sector in order to increase the international competitiveness of both shipbuilding and maritime transport industries and to develop Vietnam into one of the world's major shipbuilding nations. Vietnam has also emerged as an important oil and gas producer which has boosted the development of the offshore sector. Foreign direct investments have contributed significantly to the economic growth in Vietnam, and also the country's maritime cluster is attracting foreign investors from all over the world. (Senturk 2011)

The Vietnamese maritime cluster is characterized by a strong state involvement. Shipbuilding and maritime transportation are governed by the Ministry of Transportation and Ministry of Industry and Trade. The state-owned Vietnam Shipbuilding Industry Group (Vinashin), the largest shipbuilding company in Vietnam, covers some 80% of the shipbuilding capacity in the country. Vinashin has close ties with the Vietnamese government as it reports directly to the Prime Minister's Government Office and the government is supporting Vinashin through various financial incentives, such as soft loans. Besides Vinashin, the Vietnamese shipbuilding sector consists of naval shipyards, shipyards of oil and gas company PetroVietnam, as well as private shipbuilding and marine equipment companies which are mainly operating under foreign ownership or co-ownership. There are about 150 shipyards in Vietnam, of which some 30 have export capacity, and both new-building and repair activities are performed in Vietnamese shipyards. The Vietnamese shipyards are mostly concentrated in producing smaller tonnage vessels, such as tankers, bulkers and multipurpose vessels. (Gille & Bruce 2010; Royal Norwegian Embassy in Hanoi 2013)

Regarding the maritime logistics, Vietnam National Shipping Lines (Vinalines) has a central position in the sector, currently owning some 30% of the Vietnamese fleet (Royal Norwegian Embassy in Hanoi 2013). Vinalines is also owned, regulated and financially supported by the state, covering some 70 member companies in the fields of shipping, port operations and maritime support services, among others (Gille & Bruce 2010; Vinalines 2013). Vietnam has also been building up its port capacity during the recent years and several ports are currently under construction or upgraded, for instance Cai Mep-Thi Vai in Ba Ria Vung Tau province, Cai Lan in Quang Ninh province, and Van Phong in Khanh Hoa province. However, the large number of ports exceeds the current demand and many Vietnamese ports are not utilizing their full capacity. In addition, the cooperation among various actors in the logistics sector is not fluent enough, which undermines the efficiency of their operations. (VietNamNet Bridge 2013; Royal Norwegian Embassy in Hanoi 2013)

The Vietnamese shipbuilding cluster is divided into three sub-clusters – the northern, central and southern clusters. The northern cluster, Hai Phong, is concentrated on bulker-building, the central cluster is specialized in both tankers and bulker, and the southern cluster in the Vung Tau area is an

offshore shipbuilding cluster with a strong presence of international companies, such as Rolls-Royce, STX, and Ezra Holdings. (Gille & Bruce 2010; InnovationNorway 2013) As the majority of the large shipyards in Vietnam are managed by Vinashin, operating in a parent-subsidary model, foreign companies usually enter the Vietnamese market by setting joint ventures resulting in creation of new entities or by acquiring shares in local shipyards (Senturk 2011). Vinashin has also established several joint ventures with foreign companies, for instance with Dutch Damen, Finnish Cargotec and Korean Hyundai. As an example, Norwegians are actively involved in the Vietnamese maritime industry and for instance the governmental organization Innovation Norway is providing support for companies entering the Vietnamese market (InnovationNorway 2013). In addition, Finland has a long history with the Vietnamese shipbuilding industry within development cooperation. The Pha Rung shipyard, located in the northern shipbuilding cluster, has been developed as a cooperation project between Vietnam and Finland since the 1980s. Originally Pha Rung was operating as a repair shipyard but nowadays it is also involved in newbuilding activities and operates under Vinashin Group. (Global.Finland.fi 2012)

The main strengths of the Vietnamese maritime cluster are based on the abundant, literate and inexpensive labour force, as well as the Vietnamese government's commitment and public support for the development of the maritime sector. The shipbuilding facilities are also rather well-developed, both in terms of new-building and ship repair. Furthermore, the geographic location of Vietnam is favourable for the maritime industry and logistics, as it has a long coastline, domestic waterways and multiple ports, and is located along important shipping routes. The Vietnamese maritime education sector is wide, teaching personnel are, in general, skillful and the maritime studies also appear appealing to students. On the other hand, maritime education is rather weakly linked to the industry's needs and practical skills are often not taught sufficiently. (Gille & Bruce 2010) There is a shortage of skilled and managerial workers, resulting in significantly higher salaries of the skillful employees (Senturk 2011). Vietnam is also suffering from leakage of knowledge as talented people seek for more lucrative opportunities in foreign companies abroad (Gille & Bruce 2010).

One of the main weaknesses of the Vietnamese maritime cluster is based on the poor managerial skills in almost all fields, for instance in yard and supply management, financial management and production planning, which has resulted in inefficient operations and low productivity levels compared to other shipbuilding nations. The low productivity levels resulting from the poor management can even be seen to partly override the benefits of low labour costs. (Gille & Bruce 2010) Both Vinashin and Vinalines have suffered from severe financial difficulties due to their involvement in none-core operations, execution of poor investment plans, purchasing of outdated vessels and equipment and massive debts. Both companies' managements have also been found to have committed serious violations and similar cases have taken place in other state-owned enterprises in Vietnam as well. (Thao 2012) Corruption is also a great concern for the Vietnamese maritime sector (Gille & Bruce 2010).

The global economic downturn and the overcapacity in shipbuilding are affecting the Vietnamese maritime cluster as well. The Vietnamese shipyards are suffering from a weak market situation and difficulties to get financing, worsened by their reputation as either not completing orders or producing poor quality. (Gille & Bruce 2010) However, Vietnam's economic growth is boosting the

development of the maritime sector, and particularly oil and gas industry as well as coastal shipping have created increasing demand for vessel capacity. For instance, producing deep water drilling facilities for the Vietnamese oil and gas industry, which is not yet active in those areas, provides future opportunities for the shipbuilding industry. (Senturk 2011)

The Vietnamese maritime cluster has no competence in either design or various after-sales services, and these services are usually imported or outsourced. Furthermore, the level of R&D and innovation activities is rather low in the cluster. In addition, there is currently a lack of domestic manufacturing of both maritime equipment and materials which often need to be imported, creating extra costs for the maritime industry. However, there is political will to develop the local production of maritime equipment and materials, which creates opportunities for the manufacturing industry and offers a way to increase the maritime industry's value added. In order to develop the supportive industries of the maritime industry, Vietnam aims to increase the cooperation with foreign manufacturers for instance in setting up joint ventures, transferring technology, and supporting the establishment of foreign-owned companies. One of the new concepts in the Vietnamese maritime sector is the growing interest in green technologies. The local authorities increasingly demand the abandonment of polluting technologies in shipbuilding and foreign shipowners require that ships have to comply with environmental regulations. Consequently, R&D and innovation cooperation in the field of green shipbuilding and green ship repair can offer business opportunities for foreign companies. In addition, there is potential for cooperation in developing the maritime education in Vietnam, particularly management and vocational skills, and in building up Vietnamese competence for instance in design and after-sales services. (Gille & Bruce 2010)

5 CONCLUSIONS

5.1 SUMMARY OF THE KEY MARITIME CLUSTERS OUTSIDE THE CBR

Based on the earlier analyses on the key maritime clusters outside the Central Baltic region (CBR), it can be concluded that all of them share relatively many competitive advantages as well as disadvantages, although all having a somehow unique position in the global picture. To summarize the findings, the main advantages and disadvantages have been collected to the following table.

Table 1. Main competitive advantages and disadvantages of the key maritime clusters outside the Central Baltic region

| | Main competitive advantages | Main competitive disadvantages |
|---------|---|---|
| Brazil | <ul style="list-style-type: none"> • Long tradition in shipbuilding, plenty of experienced shipyards • Foreign interest in investing in the development, technology transfer • Political interest in establishing international cooperation relationships, both with foreign businesses and universities | <ul style="list-style-type: none"> • Outdated shipyards • Lack of skilled workforce; hinders also the adoption of foreign technologies • High cost of skilled workers • Local content regulation, complex tax system • Weak logistical infrastructure • Strict immigration laws • Slow political decision-making and high bureaucracy |
| China | <ul style="list-style-type: none"> • Strong state support • Low labour costs and large workforce • Building of basic vessels is price-competitive • Large and technologically advanced shipping fleet • Large capacity and handling efficiency of the ports | <ul style="list-style-type: none"> • Low complexity of shipbuilding • Poor management • Low productivity of the shipbuilding industry • Lack of qualified workforce • Lack of cluster networks • Shipping overcapacity |
| Denmark | <ul style="list-style-type: none"> • Strong shipping nation with e.g. world leading Maersk Group; increase in fleet to prepare for the anticipated shipping upturn • Interest in developing cluster on a political level through Blue Denmark program • Various maritime research and education activities in the universities, with the aim to renew education and increase cooperation within research • A frontrunner in the offshore wind power sector as well as arctic knowledge through e.g. Greenland | <ul style="list-style-type: none"> • Loss of shipbuilding may lead to shortage of naval architects • A strong focus on traditional shipping is not enough for developing a competitive offshore sector • Increasing the fleet has not contributed to a corresponding growth in turnover due to the global shipping challenges • Cluster cooperation has developed only recently |

| | | |
|-----------------|--|--|
| France | <ul style="list-style-type: none"> • Recently reformed port network and privatized port operations for greater efficiency • Diverse and modern fleet adaptable to global market changes • World leading offshore sector, renewable energy development in large territorial sea areas • Developed service sector related to maritime business (insurance, brokers, financing etc.) | <ul style="list-style-type: none"> • In European comparison late developed national maritime strategy (2011) still in the implementation phase • Limited cooperation activities across sectors, synergies not clearly benefitted from |
| Germany | <ul style="list-style-type: none"> • Strong and increasingly specialized shipbuilding sector, including naval shipbuilding as an important sub sector • Diverse and developed equipment suppliers as a result of the extensive shipbuilding • Opportunities in the offshore sector, focusing on wind energy projects | <ul style="list-style-type: none"> • Limited political interest • Many shipyards in dire straits due to structural change and present overcapacity of vessels • Diminishing fleet due to financing problems and poor profitability |
| Italy | <ul style="list-style-type: none"> • Strong international actors, mostly in shipping and shipbuilding due to a long history within these sectors • Strong in design • Political support through state ownership of major shipyard group | <ul style="list-style-type: none"> • Diverse and fragmented cluster with limited cooperation between industries • No clear national strategy for developing the cluster in a certain direction due to limited political interest • The economic challenges in shipbuilding and shipping hit hard on the Italian maritime industry due to its strong dependence on these sectors |
| Japan | <ul style="list-style-type: none"> • Reliable relationships within maritime sector • Maritime cluster's close cooperation with the country's banking system • High productivity and domestic production rate in shipbuilding | <ul style="list-style-type: none"> • Ageing workforce • Decreasing competitiveness of the shipping industry • Low competitiveness of ports and port services due to a lack of investments • Strengthening yen |
| The Netherlands | <ul style="list-style-type: none"> • Traditionally a strong shipping nation • Highly developed port operations and large amount of cargo passing the ports to and from Europe partly due to its favorable location • Inland shipping as a development area to create a more efficient logistic chain (opportunities for e.g. specialized shipbuilding) • Focus on cooperative innovation and R&D activities across sectors • International focus, encouraging Dutch companies to internationalize and attracting international actors to the domestic market • An increasingly important offshore sector | <ul style="list-style-type: none"> • Ports the biggest sector, i.e. high dependence on international material flows through the Netherlands • Lack of human resources for high technology and specialized maritime related business |

| | | |
|-------------|---|---|
| Norway | <ul style="list-style-type: none"> • High level of expertise and technologies in the Arctic offshore and subsea operations • Strategic geographical location • Wide variety of operations helps adjusting to market fluctuations • Well networked and dynamic cluster • Well spread marketing networks all over the world • Strong political support for the sector's development | <ul style="list-style-type: none"> • High cost levels • Lack of skilled human resources and difficulties in attracting them to remote areas of maritime business • Uncoordinated development projects • Relatively poor infrastructure in the Northern Norway |
| Russia | <ul style="list-style-type: none"> • Low labour and steel material costs • Advanced metal processing • Expertise in naval shipbuilding and ship hull construction • Political incentive and funding to develop the maritime industry | <ul style="list-style-type: none"> • Dominant roles of military shipbuilding and the state hinder the development of commercial shipbuilding • Lack of knowhow, advanced technologies and equipment related to commercial shipbuilding • Outdated fleet • Lack of qualified work force • Low innovation capacity • Lack of export-orientation and insufficient presence in the international market • Lack of clustering and natural business networks • Challenging business environment |
| Singapore | <ul style="list-style-type: none"> • Strategic geographic location • International melting pot of new technologies and knowledge • Inflowing investments support further development • Stable economy with strongly future-oriented governance | <ul style="list-style-type: none"> • Skills and productivity of the imported workforce • Lack of land with waterfront space – even more efficient land use needed |
| South Korea | <ul style="list-style-type: none"> • Well-developed shipyards, ports and shipping industry • Governmental support • Strong national and international networks • High technology in shipbuilding • High quality of labor force | <ul style="list-style-type: none"> • Low domestic demand in shipbuilding • High fuel and labour costs • Decreasing shipping prices • The appreciated won currency affects profits |

It can be concluded that while the CBR maritime clusters have their own challenges, every other cluster, even the successful ones, have some as well. On this basis, finding the future direction and role for the maritime sector in this particular region requires good knowledge of the global developments and specific areas of expertise in which the efforts will be focused into – eventually not every maritime cluster in the world can be the leader in cruise vessel building or offshore operations. In the current market situation, it seems that the future competitiveness of the CBR actors lies in highly specific niches and areas of expertise, for which there is demand also overseas.

5.2 BUSINESS OPPORTUNITIES FOR THE CBR ACTORS IN GLOBAL MARKETS

The competitive advantage of the CBR maritime companies often lies in specialisation in niche technologies and services, for instance in cleantech, design and engineering, for which there is demand all over the world. In the region's very neighbourhood, the developing shipbuilding sector in Russia provides market opportunities for Finnish and Swedish designers and software and device providers as well as for Estonian and Latvian companies specialised in ship repair and conversion services, for instance. The demand for green maritime products and services is likely to provide considerable market opportunities for foreign businesses all over the world, and companies currently developing solutions for instance for the sulphur regulation in the Baltic Sea region could soon be in a very advantageous position in these markets. The demand for green technologies exists in various regions, both in developing clusters, such as India, the Philippines and Vietnam which aim at abandoning polluting shipbuilding technologies, and in large and successful clusters, such as Japan and Singapore, which are in need of sophisticated green maritime products and services. Concerning cleantech, active selling is needed as there might be room for it even in places in which there is not yet direct demand.

The growing interest in the Arctic and Antarctic regions is creating business opportunities for companies specialised in the related solutions and technologies. Finnish companies have expertise in the designing and building of icebreakers and research vessels for which there is demand for example in Canada, the U.S., China and Australia. While energy production is increasingly shifting offshore, the products and services related to this sector are likely to provide increasing opportunities for foreign companies in Brazil and the Middle East, for instance. However, currently several successful maritime clusters aim at specializing in offshore and Arctic solutions. Consequently, it is important to bear in mind that there is not market for everybody in these sectors either and business opportunities should be sought in particular niche focus areas, or in other alternative sectors, as well.

In addition to technologies, there are markets for intangible expertise as well. For instance, when the buildup and repair of various vessels seems to be shifting to lower-cost countries, the skills of the local workers might not be adequate for handling such large and complicated projects. As a result, some European companies have discovered a market niche in supplying these shipyards with taking care of parts of the whole construction process by using their own high project management skills while using local blue-collar workforce in the host country¹⁰. The field of maritime training and education could also offer business opportunities for the CBR actors, for instance through selling and providing education to Brazil, China and Singapore and developing vocational and managerial education in Vietnam.

The main business opportunities for the CBR maritime businesses outside the home region have been summarized in the following table, first concerning the key maritime clusters, and secondly concerning other interesting regions around the world.

¹⁰ As an example we could mention I.S. Makinen Oy, a Finnish company that supplies complete turnkey projects and soft furnishings for the marine and hospitality industries around the world.

Table 2. Business opportunities for the CBR maritime companies in global markets

| | Business opportunities per country |
|-----------------|--|
| Brazil | <ul style="list-style-type: none"> • Profitable future for large engineering companies and offshore operators • Opportunities also for engineers and suppliers regarding general infrastructure development |
| China | <ul style="list-style-type: none"> • Great potential in engineering and designing specialized vessels that are starting to get built in China • Increasing interest in the Arctic knowhow • Room for various shipbuilding industry suppliers as well, Chinese shipyards need foreign technologies and expertise • Potential cooperation with Chinese shipping companies due to their advantageous price levels and shipping routes |
| Denmark | <ul style="list-style-type: none"> • Cooperation regarding Arctic & cleantech • Cooperation regarding education & research • Cooperation with shipowners through e.g. pooling procurement |
| France | <ul style="list-style-type: none"> • Supplying design and equipment to local shipyards, such as STX France • Opportunities in technology development related to renewable energies |
| Germany | <ul style="list-style-type: none"> • Supplying to local shipyards, such as Meyer Werft • Cooperation with local shipowners in terms of e.g. pooling and financing • Offshore wind projects |
| Italy | <ul style="list-style-type: none"> • Supplying to local shipyards, such as Fincantieri • Refurbishment projects for cruise vessels |
| Japan | <ul style="list-style-type: none"> • Joint development of energy saving and environmental technologies • Cooperation in supplying ship equipment and design |
| The Netherlands | <ul style="list-style-type: none"> • Supplying design and equipment to local shipyards • Cooperation with strong shipowners • Offshore projects • Common interests in developing business with Russia |
| Norway | <ul style="list-style-type: none"> • Offshore projects need workforce • Cooperation regarding Arctic & cleantech • Bring together Norwegian, Russian and the CBR interests to create joint business opportunities |
| Russia | <ul style="list-style-type: none"> • Cooperation within yards through shared vessel production processes • Great opportunities for ship designers, software and device providers, and ship repair and conversion service providers • Increasing needs regarding Arctic shipping services and technologies (icebreakers, navigational systems, etc.), further vessels orders expected • High potential for joint development projects, for instance regarding port operations or environmental concerns in the Baltic Sea |
| Singapore | <ul style="list-style-type: none"> • Demand for expertise in LNG, port construction, energy efficiency improvements and biofuels • This international hub serves as a living lab for new technologies while providing great opportunities for global networking with other present maritime actors • Demand for educational best practices |
| South Korea | <ul style="list-style-type: none"> • Demand for eco-friendly shipping solutions • Some room for high-tech industry suppliers • Increasing interest in the Arctic knowhow |

| | Business opportunities in other interesting regions |
|--------------------|---|
| Africa | <ul style="list-style-type: none"> • Not yet that evident for individual companies, particularly small ones • Antarctic research vessel orders, possible support services • Great needs for general development projects |
| Australia | <ul style="list-style-type: none"> • Need for skilled seafarers and other maritime workers • Cooperation with Australia's Antarctic programme, e.g. building old Antarctic research and supply vessel's replacement |
| India | <ul style="list-style-type: none"> • Possibility for cooperation for the equipment suppliers in newbuilding of an ageing shipping fleet • Possibilities for cooperation as India continues to train large group of maritime professionals and also seeks to improve the education • Cooperation in green technology |
| The Middle East | <ul style="list-style-type: none"> • Gigantic port and yard construction projects provide lots of opportunities for various suppliers • Demand for advanced technologies in offshore oil and gas production |
| North America | <ul style="list-style-type: none"> • Opportunities in the fields of offshore and Arctic solutions, e.g. icebreaking • Demand for foreign technologies and expertise related to environmental-friendly technologies, e.g. LNG fuel solutions • Business opportunities for suppliers of the maritime industry, such as design and naval architecture companies and ship power solution providers |
| The Southeast Asia | <ul style="list-style-type: none"> • Cooperation in energy saving technology and environmental solutions • Cooperation with maritime training and education • Possibility to supply maritime safety solutions • Joint ventures supporting the establishment of foreign-owned companies • Cooperation in developing port infrastructure |

While it is important to make business of the things the CBR actors are good at, it is an interesting question whether this core expertise little by little flows in the hands of these customers. However, by following closely the developments in the maritime sector around the world, it is possible to keep discovering new business opportunities in the global markets while taking best practices back home.

5.3 POSSIBILITIES FOR LEARNING AND BENCHMARKING

In addition to market opportunities, it is important to acknowledge the learning possibilities that the CBR clusters have in other relevant regions. It appears that successful maritime clusters, such as the Danish, Norwegian and Singaporean clusters, benefit particularly from strong triple helix support and well established global business networks. The emergence of a strong cluster rarely takes place by accident. In such clusters the state support often realizes in the form of direct ownership in key companies, but most importantly by clearly defining a vision of the cluster's future and by providing the political, infrastructural and financial surroundings for the industry to flourish. In these clusters all the relevant stakeholders are also committed to investing in this development process. While almost all maritime clusters in the world benefit from relatively strong state support, it cannot be expected that the CBR clusters could be able to reach similar competitiveness without similar support. Although competitiveness ultimately stems from companies, their resources cannot compete with the significant governmental aids provided elsewhere.

State support in the form of vessel orders, however, is a difficult question – in some countries domestic production is supported by state orders (e.g. Canada), whereas in others all orders, even

naval vessels, go through international competitive bidding (e.g. Finland). In Canada, some of the recent domestic vessel orders have not been very successful as the local shipbuilding sector is rather uncompetitive, expensive and cannot keep the agreed schedules. In Finland, in turn, biddings often result in vessels being built abroad, and when eyeing the cost savings, the taxpayers' money is then not used to create future jobs and knowledge generation at home market. Hence, the favorability of such state support depends on the case, but nevertheless the short-term cost savings should always be evaluated against the potential life-cycle effects of the acquisition.

However, a state has a crucial role in the maritime sector's development also as a provider of adequate resources and infrastructure. For instance in terms of education, in Singapore as well as in Denmark both the state and industry actors are involved in guiding the direction of the educational system and investing in it, and in fields where domestic expertise is not enough, educational possibilities are sought outside. The state, the industry, and associations also cooperate in increasing the attractiveness of the sector in terms of future generations.

Although the challenging competitive situation and recent layoffs in the CBR maritime industries make it somewhat questionable whether further efforts should be put in educating more workforce for the industry, it is again a question of vision – do the countries in the region want to have a flourishing maritime sector and make all the required investments, or let it develop more independently and see what will happen? In countries where major yards have been run down, such as in Denmark, the maintaining of maritime expertise is currently a great concern as naval architect education is not attractive for the young, although such knowledge is still of demand in the country. In Germany, to fight the same problem, local shipping companies have established a fund to finance the local maritime education, thus guaranteeing the future availability of skilled German workforce.

In terms of R&D, triple helix cooperation seems to be working well for instance in Singapore and in Brazil, where new research centers are being established with mixtures of public and private funding, even from foreign companies. These institutions are then directly connected to the most relevant stakeholders and can directly serve the needs of the industry – the research projects thus are not solely funded by programmes with time consuming establishment, application procedures and bureaucracy. However, also this requires considerable funding efforts from the stakeholders, again requiring strong political will to invest in the sector's development.

The role of associations has to be also underlined, as in the most successful clusters they are not only supporting the interests of their stakeholders within the national cluster, but are strongly involved also in external issues and marketing particularly, thus creating a powerful forum for the involved companies to gain also international visibility and sell their expertise. In addition, today gigantic maritime conferences and networking events tend to take place in Central Europe and Asia, and representatives of the CBR maritime clusters should take part in these more actively. Moreover, it might be worth considering whether such events could be increasingly organized in the CBR as well. Referring to the need for a vision, if this region aims at having a central role in the global maritime industry, far greater global attention should be drawn to the expertise and actors in this region. While Norway publicly aims at becoming a global hub of maritime expertise, particularly related to Arctic knowhow, and while Russia is one of the main customers for such products and services, the CBR in the middle should also actively define and communicate its role outside. In fact, an interesting idea could be an establishment of a massive business networking event on the Arctic

maritime expertise in cooperation between the CBR, Norwegian, and Russian triple helix actors. With strong international marketing, the event could attract participants and business people from around the world, taking the eyes of global actors to the maritime developments in this region.

When it comes to the industry side, it is very important for all the actors to have a good grasp of the sector's global developments – even for the companies operating only domestically, as international competition is not only outside the borders, it comes to us. In terms of international sales networks, Norwegian businesses seem to be an example of a success story. Similar courage, we-spirit, and planned international networking activities would be highly beneficial also for the CBR clusters. While the Norwegian business environment provides lots of opportunities for the CBR actors, also their existing networks could be of great importance, if possibilities to create joint consortiums for international projects emerge, for instance. In Norway another issue worth looking into is the horizontal cross-cutting cooperation between different sectors (particularly oil and gas production and fishery), which has further supported the specialized development of the maritime industry.

It can be concluded that efficient triple helix cooperation is a necessity in maritime clusters' successful development. It seems that there is room for developing such cooperation within the CBR maritime clusters, as for instance the sulphur directive has caused a lot of discussion of poor cooperation between the industry and authorities. Moreover, in the CBR, all the maritime clusters seem to lack a clear vision and strategy for developing the sector – instead, efforts are put in elaborating various problems and challenges as well as praising the expertise and advancements of the domestic cluster which, after all, relies on a group of individual companies that are active in the global markets. If the whole cluster wishes to take credit of these advancements, all businesses should follow the example of these successful ones and actively sell their expertise. Furthermore, getting back to the global level, even the most successful clusters have significant challenges, but with active triple helix cooperation, brave industry networking, and strong investments in implementing ambitious visions, the clusters continue successful development.

Summa summarum,

- Triple helix cooperation can be very fruitful, but a clear and shared future vision as well as joint commitment is required for this cooperation to be productive. All the stakeholders have to invest in realizing such a common objective as there is no single solution or single actor who could solve the competitiveness problems of a whole sector.
- The role of the state in this development should be determined – full speed ahead towards the shared vision with various support actions, or just providing basic support with unclear future?
- The maritime expertise in the CBR eventually relies on a group of individual companies – to make the sector prosper, the whole cluster requires more efficient international marketing networks. Instead of 'reinventing the wheel', the CBR companies could establish strong participation in the global maritime hubs and that way benefit from the existing networks.
- Various kinds of networking events increase the visibility of the local expertise and serve as match-making forums for businesses. If the CBR, perhaps together with Norway and Russia, wishes to be something big in the future – like the global hub of Arctic maritime expertise – should we show it to the world as well?

6 REFERENCES

- A2 Sea (2013) [Http://www.a2sea.com](http://www.a2sea.com), retrieved 8.10.2013.
- AAPA (2012a) U.S. Port Infrastructure Investment Survey 2012–2016. American Association of Port Authorities. [Http://aapa.files.cms-plus.com/2012%20AAPA%20Port%20Infrastructure%20Spending%20Survey%20Summary.pdf](http://aapa.files.cms-plus.com/2012%20AAPA%20Port%20Infrastructure%20Spending%20Survey%20Summary.pdf), retrieved 10.10.2013.
- AAPA (2012b) U.S. Seaports, Private-Sector Partners Plan to Invest \$46 Billion By 2017 in Port Infrastructure. News Release, June 18. American Association of Port Authorities. [Http://www.aapa-ports.org/Press/PRdetail.cfm?Itemnumber=18583](http://www.aapa-ports.org/Press/PRdetail.cfm?Itemnumber=18583), retrieved 10.10.2013.
- AAPA (2013) Port Industry Information. American Association of Port Authorities. [Http://www.aapa-ports.org/Industry/content.cfm?ItemNumber=1032](http://www.aapa-ports.org/Industry/content.cfm?ItemNumber=1032), retrieved 10.10.2013.
- ABS Consulting (2010) United States Coast Guard High Latitude Region Mission Analysis Capstone Summary. Prepared for the United States Coast Guard. [Http://assets.fiercemarkets.com/public/sites/govit/hlssummarycapstone.pdf](http://assets.fiercemarkets.com/public/sites/govit/hlssummarycapstone.pdf), retrieved 10.10.2013.
- ADSB (2013) About Abu Dhabi Ship Building. Abu Dhabi Ship Building. [Http://www.adsb.ae/CorporateProfile/AboutAbuDhabiShipBuilding.aspx](http://www.adsb.ae/CorporateProfile/AboutAbuDhabiShipBuilding.aspx), retrieved 2.10.2013.
- Agarwal, A. (2013) Innovation Norway New Delhi, 6.6.2013. [Http://www.slideshare.net/innovasjon norge/india-at-nor-shipping](http://www.slideshare.net/innovasjon norge/india-at-nor-shipping), retrieved 28.8.2013.
- Aker Arctic Press Release (2012) Aker Arctic to Design the First Chinese Polar Research Icebreaker. [Http://www.akerarctic.fi/Chinese%20Polar.pdf](http://www.akerarctic.fi/Chinese%20Polar.pdf), retrieved 18.7.2013.
- Aker Solutions (2013) [Http://www.akersolutions.com/en/Global-menu/Products-and-Services/Subsea-technologies-and-services/sls/Worldwide-solutions/](http://www.akersolutions.com/en/Global-menu/Products-and-Services/Subsea-technologies-and-services/sls/Worldwide-solutions/), retrieved 11.10.2013.
- Akina, K. (2013) How to end the Jones Act's protectionism. *The Daily Caller*, July 18. [Http://dailycaller.com/2013/07/18/how-to-end-the-jones-acts-protectionism](http://dailycaller.com/2013/07/18/how-to-end-the-jones-acts-protectionism), retrieved 10.10.2013.
- Al Arabiya (2012) Dubai's Drydocks World sets up Asia joint venture. *Al Arabiya News*. [Http://www.alarabiya.net/articles/2012/06/27/223036.html](http://www.alarabiya.net/articles/2012/06/27/223036.html), retrieved 2.10.2013.
- Almaco (2013) Market Breakthrough in Brazil for ALMACO Group with Newbuilding Contract for 6 Drillships Awarded by EEP. [Http://www.almaco.cc/news/latest_news/market_breakthrough_in_brazil_for_almaco_group_with_newbuilding_contract_for_6_drillships_awarded_by_eep](http://www.almaco.cc/news/latest_news/market_breakthrough_in_brazil_for_almaco_group_with_newbuilding_contract_for_6_drillships_awarded_by_eep), retrieved 9.10.2013.
- Almeida, R. (2013) Maersk Convincer Extended Offshore Malaysia on HTHP Drilling Project. [Http://gcaptain.com/maersk-convincer-extended-offshore/](http://gcaptain.com/maersk-convincer-extended-offshore/), retrieved 11.10.2013.
- Altenburg, T. (2013) Rederier mødes om strategiske indkøbsaftaler. *Maritime Danmark*, Nr. 10. Oktober 2013.
- American Shipping Company (2013) U.S. Jones Act. [Http://www.americanshippingco.com/section.cfm?path=326,346](http://www.americanshippingco.com/section.cfm?path=326,346), retrieved 10.10.2013.
- Andersen, O. (2013) European shipowners call for EU piracy effort in West Africa. *Shippingwatch*, August 1. [Http://shippingwatch.com/carriers/article5772476.ece](http://shippingwatch.com/carriers/article5772476.ece), retrieved 16.9.2013.
- APPEA (2013a) Key Statistics 2013. [Http://www.appea.com.au/wp-content/uploads/2013/07/Key-Stats_2013_web.pdf](http://www.appea.com.au/wp-content/uploads/2013/07/Key-Stats_2013_web.pdf), retrieved 2.10.2013.
- APPEA (2013b) 2013 Policy Priorities. [Http://www.appea.com.au/wp-content/uploads/2013/08/2013-Policy-Priorities_low-res.pdf](http://www.appea.com.au/wp-content/uploads/2013/08/2013-Policy-Priorities_low-res.pdf), retrieved 2.10.2013.
- Arnott, S. (2003) Australian Maritime Clusters-Experiences & Perspectives. [Http://www.tci-network.org/media/asset_publics/resources/000/000/207/original/learning-sarnott-australia.pdf](http://www.tci-network.org/media/asset_publics/resources/000/000/207/original/learning-sarnott-australia.pdf), retrieved 4.10.2013.
- AsiaOne (2013) Singapore retains its crown as 'best seaport in Asia'. *AsiaOne*, May 9. [Http://news.asiaone.com/News/Latest+News/Singapore/Story/A1Story20130509-421489.html](http://news.asiaone.com/News/Latest+News/Singapore/Story/A1Story20130509-421489.html), retrieved 30.9.2013.
- ASMI (2013a) Anchored in Singapore History. Association of Singapore Marine Industries. [Http://www.asmi.com/index.cfm?GPID=31](http://www.asmi.com/index.cfm?GPID=31), retrieved 30.9.2013.
- ASMI (2013b) A Closer Look at the Marine Industry. Association of Singapore Marine Industries. [Http://www.asmi.com/index.cfm?GPID=29](http://www.asmi.com/index.cfm?GPID=29), retrieved 30.9.2013.
- Associated Press (2013) India's PM Singh urges closer maritime cooperation with Japan; says Tokyo 'natural' partner. *Fox News*, May 28. [Http://www.foxnews.com/world/2013/05/28/india-pm-singh-urges-closer-maritime-cooperation-with-japan-says-tokyo-natural/](http://www.foxnews.com/world/2013/05/28/india-pm-singh-urges-closer-maritime-cooperation-with-japan-says-tokyo-natural/), retrieved 20.8.2013.
- Association of Canadian Port Authorities (2013) Industry information. [Http://www.acpa-ports.net/industry/index.html](http://www.acpa-ports.net/industry/index.html), retrieved 10.10.2013.
- Assonave (2013) [Http://www.assonave.it/cms/data/pages/000018.aspx](http://www.assonave.it/cms/data/pages/000018.aspx), retrieved 2.10.2013.

- The Australian (2010) Skills gap hits Australian maritime industries. June 10. <http://www.theaustralian.com.au/business/skills-gap-hits-australian-maritime-industries/story-e6frg8zx-1225877665426>, retrieved 4.10.2013.
- Baird Maritime (2013) The Philippines: A future shipbuilding hub? 3.1.2013. http://www.bairdmaritime.com/index.php?option=com_content&view=article&id=13709:the-philippines-a-future-shipbuilding-hub&catid=69&Itemid=60, retrieved 22.8.2013.
- Baird Maritime (2010) Workboat Malaysia: Growing from Strength to Strength. http://www.bairdmaritime.com/index.php?option=com_content&view=article&id=6270:workboat-malaysia-growing-from-strength-to-strength&catid=98:full-speed-ahead&Itemid=122, retrieved 11.10.2013.
- Baker, M. L. (2011) Toward an African Maritime Economy – Empowering the African Union to Revolutionize the African Maritime Sector. *Naval War College Review*, Vol. 64, No. 2.
- The Bank of Finland Institute for Economies in Transition (2012a) Russia moves to increase port capacity, especially in the Baltic Sea and Pacific coast. *BOFIT Weekly*, No. 36, September 7. http://www.suomenpankki.fi/bofit_en/seuranta/seuranta-aineisto/Pages/vw201236_2.aspx?hl=ports%20russia, retrieved 6.8.2013.
- The Bank of Finland Institute for Economies in Transition (2012b) Russia wants to quintuple its shipbuilding output by 2030. *BOFIT Weekly*, No. 46, November 16. http://www.suomenpankki.fi/bofit_en/seuranta/seuranta-aineisto/Pages/vw201246_2.aspx, retrieved 10.10.2013.
- Barents Observer (2012) South Korea Ties up with Norway on Arctic Shipping. <http://barentsobserver.com/en/arctic/south-korea-ties-up-with-norway-on-arctic-shipping-12-09>, retrieved 6.9.2013.
- Baylon, A. M. & Santos, E. Ma. R. (2011) The Challenges in Philippine Maritime Education and Training. *International Journal of Innovative Interdisciplinary Research*, December 1. <http://www.auamii.com/jiir/Vol-01/issue-01/X5.Baylon.pdf>, retrieved 23.8.2013.
- BBE (2008) Brazil – A Brand of Excellence. Brazilian ports, a safe haven for foreign investment. Ministry of External relations, November 2008. <http://repositories.lib.utexas.edu/bitstream/handle/2152/13799/PUBRevistaBrasilMEPortosI.pdf>, retrieved 9.10.2013.
- Bernama (2013) GreenTech Malaysia Sees RM2.9bil Investment. The Star Online. <http://www.thestar.com.my/Business/Business-News/2013/10/09/GreenTech-Malaysia-sees-RM29bil-investment.aspx>, retrieved 11.10.2013.
- Beskaeftigelse og produktion I Det Blå Danmark (2011) En rapport udarbejdet af Dansk Metal, Danske Maritime og Danmarks Rederiforening. November 2011.
- Bevanger, L. (2013) Arctic Norwegian town looks north to Barents Sea oil and gas. *Deutsche Welle*. <http://www.dw.de/arctic-norwegian-town-looks-north-to-barents-sea-oil-and-gas/a-16863670>, retrieved 14.10.2013.
- BIMCO (2010) Maritime Japan. https://www.bimco.org/en/Education/Seascapes/Maritime_Matters/2010_02_04_Maritime_Japan.aspx, retrieved 20.8.2013.
- Bloomberg (2013) How the Jones Act Blocks Natural Disaster Relief: View. January 1. <http://www.bloomberg.com/news/2013-01-01/how-a-disaster-called-the-jones-act-blocks-disaster-relief-view.html>, retrieved 10.10.2013.
- The Blue Denmark (2013) <http://worldcareers.dk/en/>, retrieved 15.9.2013.
- Blue Revolution (2013) Ministry of Land, Infrastructure and Transport (MOLIT). http://english.molit.go.kr/USR/cyberJccr/m_32375/1st.jsp, retrieved 26.8.2013.
- BMI (2012) Indonesia Shipping Report Q3 2012. *Business Monitor International*. <http://www.marketresearch.com/Business-Monitor-International-v304/Indonesia-Shipping-Q3-7069130/>, retrieved 9.10.2013.
- Boadle, A. (2013) Brazil port modernization bill clears Congress. *Reuters*. <http://www.reuters.com/article/2013/05/17/brazil-ports-idUSL2N0DX1XZ20130517>, retrieved 9.10.2013.
- Board of Investments Philippines (2013a) Philippine Shipbuilding Industry. <http://www.boi.gov.ph/pdf/industryprofiles/shipbuilding/shipbuilding.pdf>, retrieved 22.8.2013
- Board of Investments Philippines (2013b) Sea Port Development/Operations. <http://www.investphilippines.gov.ph/downloads/sector/Sea%20Ports.pdf>, retrieved 23.8.2013
- Brago, P. L. & Flores, H. (2013) PHL still fails to meet EU maritime education standards. *The Philippine Star*, May 29. <http://webcache.googleusercontent.com/search?q=cache:http://www.philstar.com/headlines/2013/05/29/947538/phl-still-fails-meet-eu-maritime-education-standards>, retrieved 23.8.2013.
- Bruun, F. (2013) Aalborg havn vil forbodde feedertrafikken. *Maritime Danmark*, Oktober 2013. Nr. 10.
- Burnson, P. (2012) Top 30 U.S. Ports: Finding the right balance. *Logistics Management*, May 2012. http://logisticsmgmt.com/images/site/LM1205_TopPorts.pdf, retrieved 10.10.2013.

- Business Monitor International (2012) Philippines Shipping Report Q1 2013. Market Research.com, 5.12.2012. <http://www.marketresearch.com/Business-Monitor-International-v304/Philippines-Shipping-Q1-7259464/>, retrieved 21.8.2013.
- Bündnis für Ausbildung und Beschäftigung in der Seeschifffahrt - Maritimes Bündnis (2013) <http://www.forschungsinformationssystem.de/servlet/is/31536/>, retrieved 7.10.2013.
- Byrne, L. (2013) Petrobras Wants Local Content Changes. *The Rio Times*, March 5. <http://riotimesonline.com/brazil-news/rio-business/petrobras-requests-local-content-changes/>, retrieved 9.10.2013.
- Cairns, P. (2012) Canadian Shipbuilding and Repair – About Us. Canadian Sailings, November 29. <http://www.canadiansailings.ca/?p=5416>, retrieved 10.10.2013.
- Calsson, G. (2013) Interview with a representative of Verband Schiffbau und Meerestechnik (VSM), September 13.
- Canada First: Leveraging Defence Procurement Through Key Industrial Capabilities (2013) Report of the Special Adviser to the Minister of Public Works and Government Services. <http://www.tpsgc-pwgsc.gc.ca/app-acq/documents/eam-lmp-eng.pdf>, retrieved 10.10.2013.
- Carafano, J. J. & Dean, J. (2011) Breaking an Ice-Bound U.S. Policy: A Proposal for Operating in the Arctic. The Heritage Foundation, February 24. <http://www.heritage.org/research/reports/2011/02/breaking-an-ice-bound-us-policy-a-proposal-for-operating-in-the-arctic>, retrieved 10.10.2013.
- Caterpillar (2013) Caterpillar Marine Power Systems. <http://marine.cat.com/cda/layout?m=233421&x=7&id=1008002>, retrieved 12.9.2013.
- CESA (2011) Annual Report 2010–2011. Community of European Shipyards Associations. http://www.cesa.eu/presentation/publication/CESA_AR_2010_2011/pdf/CESA%20AR%202010-2011.pdf, retrieved 18.10.2013.
- CESA – Community of European Shipyard Association (2013) <http://www.cesa.eu>, retrieved 15.9.2013.
- CESAM (2013) (Comité d'Études et de Services des Assureurs Maritimes et Transports) <http://www.cesam.org/fr/home.php>, retrieved 18.9.2013.
- Cetena (2013) <http://www.cetena.it/>, retrieved 2.10.2013.
- Chen, A. (2013) Exclusive: China in \$5 billion drive to develop disputed East China Sea gas. *Reuters*, July 17. <http://www.reuters.com/article/2013/07/17/us-cnooc-eastchinasea-idUSBRE96G0BA20130717>, retrieved 19.8.2013.
- Chen, J., Galstyan, M., Huynh, D., Katheerayson, S. & Mendoza, V. (2010) Shipbuilding Cluster in the Republic of Korea. Harvard Business School. http://www.isc.hbs.edu/pdf/Student_Projects/Korea_Shipbuilding_2010.pdf, retrieved 8.7.2013.
- Chen, S. (2013) Malaysia Splits with ASEAN Claimants on China Sea Threat. <http://www.bloomberg.com/news/2013-08-28/malaysia-splits-with-other-asean-claimants-over-china-sea-threat.html>, retrieved 11.10.2013.
- China Daily (2012) China Maritime Economy Becomes New Growth Engine. http://www.chinadaily.com.cn/bizchina/2012-10/05/content_15797438.htm, retrieved 5.6.2013.
- China Economic Net (2013) China's Shipbuilding Output Down 21.4 pct in 2012. http://en.ce.cn/Industries/Basicindustries/201301/16/t20130116_24033424.shtml, retrieved 5.7.2013.
- CLIA (2013) Cruise Lines International Association. <http://www.cruising.org/regulatory/industry-welcome>, retrieved 10.10.2013.
- Cluster Maritime Français (2013) <http://cluster-maritime.fr>, retrieved 16.10.2013.
- CMSI (2013) Overview. <http://usnwc.edu/Research---Gaming/China-Maritime-Studies-Institute.aspx>, retrieved 5.6.2013.
- Collins, G. & Grubb, M. C. (2008). Comprehensive Survey of China's Dynamic Shipbuilding Industry: Commercial Development and Strategic Implications. China Maritime Study, No. 1, August. http://usnwc.edu/Research---Gaming/China-Maritime-StudiesInstitute/Publications/documents/CMSI_Collins-Grubb.aspx, retrieved 3.6.2013.
- Commonwealth of Australia (2008) Rebuilding Australia's Coastal Shipping Industry, Inquiry into coastal shipping policy and regulation. October 2008, Canberra.
- Confitarma – Italian Shipowners' Association (2013) <http://www.confitarma.it/english/page.php?idpage=DBAAAAAA>, retrieved 2.10.2013.
- Conti, N. (2013) Philippine Maritime Industry Prospects and Challenges. German – Philippines Chamber of Commerce & Industry Economic Forum, 23.5.2013. <http://gpcci.org/home/wp-content/uploads/2013/05/FR-PH-Maritime-Prospects-ChallengesGPCCI-5.23.pdf>, retrieved 21.8.2013.
- Costa Cruises (2013) <http://www.costacruise.com>, retrieved 14.10.2013.
- Council Working Party on Shipbuilding (2013) Peer Review of Japanese Government Support Measures to the Shipbuilding Sector. OECD, 4.4.2013. [http://www.oecd.org/sti/ind/C-WP6\(2012\)26-FINAL-ENG.pdf](http://www.oecd.org/sti/ind/C-WP6(2012)26-FINAL-ENG.pdf), retrieved 20.8.2013.
- Country report Indonesia (2001) http://www.unescap.org/ttdw/Publications/TFS_pubs/Pub_2217/pub_2217_Indo.pdf, retrieved 8.10.2013.

- Credit Suisse (2011) Singapore Offshore and Marine Sector, 22 June 2011. https://research-and-analytics.csfb.com/docView?language=ENG&source=ulg&format=PDF&document_id=893777261&serialid=FiJeguqj1Z9EqTQQ%2FvCOoB11YNNjCosYuV69BylXkus%3D, retrieved 30.9.2013.
- Credit Suisse (2013) Singapore Offshore and Marine Sector, 4 April 2013. https://doc.research-and-analytics.csfb.com/docView?sourceid=em&document_id=x505076&serialid=CvfKMzNuBiR5DwUafn47DWgDnZkygA9kjrPK5heoZhU%3D, retrieved 30.9.2013.
- CRI English (2010) China's Maritime Industry. <http://english.cri.cn/7146/2010/07/10/2361s582071.htm>, retrieved 5.6.2013.
- Cruise Business Online (2013). Norwegians know how to build cruise ships. http://www.cruisebusiness.com/images/magazines/2013_02/cbr_2013_02-134-139.pdf, retrieved 5.9.2013.
- Cruise Business Review (2013) Fincantieri. In partnership with nature. 2/2013. http://www.cruisebusiness.com/images/magazines/2013_02/cbr_2013_02-34-49.pdf, retrieved 2.10.2013.
- Cruz, L. G. (2012) Times are a'Changing...Brazil's Future Looks Bright. MTS Logistics. <http://gcaptain.com/times-brazilian-logistics-industry/>, retrieved 9.10.2013.
- CSIC (2006) 马来西亚 推动船舶工业发展. http://webcache.googleusercontent.com/search?q=cache:Q1FG-ZlkjAUJ:http://www.csic.com.cn/csic_cslt/22567.htm%2B%E9%A9%AC%E6%9D%A5%E8%A5%BF%E4%BA%9A%E9%80%A0%E8%88%B9&oe=utf-8&rls=org.mozilla%3Aen-US%3Aofficial&client=firefox-a&gws_rd=cr&hl=zh-CN&ct=clnk, retrieved 30.9.2013.
- CWO (2013) Mubarak Marine to relocate to Dubai Maritime City. *Construction Week Online*. <http://www.constructionweekonline.com/article-23453-mubarak-marine-to-relocate-to-dubai-maritime-city/>, retrieved 2.10.2013.
- Daily Independent (2013) NIMASA plans to make maritime sector Nigeria's economic mainstay. September 6. <http://www.dailyindependentnig.com/2013/09/nimasa-plans-to-make-maritime-sector-nigerias-economic-mainstay/>, retrieved 16.9.2013.
- The Danish Maritime Cluster - an agenda for growth. (2006) Ministry of Economic and Business Affairs. June 2006.
- The Danish Maritime Cluster (2011) Description of activities. <http://www.dkmk.dk/>, retrieved 15.9.2013.
- The Danish Maritime Cluster (2013) <http://www.dkmk.dk/>, retrieved 15.9.2013.
- Danish shipping and the EU agenda (2012) The Danish Shipowners' Association's comments and recommendations for the maritime policy in the EU.
- Danish Shipping Statistics (2013) Danish shipowner's association. May 2013. <http://www.shipowners.dk/>, retrieved 14.9.2013.
- Danmarks rederiförening (2013) Danish Shipping Statistics May 2013.
- Dansk Shifsfart (2013) Danmarks rederiförening. April 2013.
- DCNS Group (2013) <http://en.dcnsgroup.com/>, retrieved 4.10.2013.
- Denmark at Work (2012) Plan for growth in the Blue Denmark. The Danish government. December 2012.
- Department of Economic Development, Tourism and the Arts (2013) Southern support for the Australian offshore oil and gas industry. http://www.investintasmania.com/__data/assets/pdf_file/0020/72227/Tasmania_Delivers_Oil_and_Gas_Industry_Support_English_August_2013.pdf, retrieved 7.10.2013.
- Department of Environment (2013) Dawn breaks on a new Antarctic era. <http://www.antarctica.gov.au/media/news/2013/first-steps-towards-replacement-antarctic-icebreaker>, retrieved 4.10.2013.
- Department of Industry (2011) Australian Government. Marine Industry, Industry Overview. <http://www.innovation.gov.au/industry/marine/Pages/default.aspx>, retrieved 1.10.2013.
- Department of Resources, Energy and Tourism (2010) Australia's Offshore Petroleum Industry. http://www.ret.gov.au/Department/Documents/MIR/FS_1_AUSTRALIA'S-OFFSHORE-PETROLEUM-INDUSTRY.pdf, retrieved 2.10.2013.
- Det kongelige nærings- og handelsdepartementet (2013). Mangfold av vinnere: Næringspolitikken mot 2020. <http://www.oceanspacecentre.no/wp-content/themes/headspin/pdf/STM39.pdf>, retrieved 17.10.2013.
- Deutscher Bundestag (2013) 17.Wahlperiode. Dritter Bericht der Bundesregierung über die Entwicklung und Zukunftsperspektiven der maritimen Wirtschaft in Deutschland. Drucksache 17/12567, 25.2.2013.
- DMC (2011) Dubai Maritime City Phase I operations launched. Dubai Maritime City. <http://www.dubaimaritimecity.com/>, retrieved 2.10.2013.
- DMC (2012a) Dubai Maritime City business and commercial operations thrive in 2012. Dubai Maritime City. <http://www.dubaimaritimecity.com/>, retrieved 2.10.2013.
- DMC (2012b) Grandweld Shipyards Inaugurates Its New Facility at Dubai Maritime City. Dubai Maritime City. <http://www.dubaimaritimecity.com/>, retrieved 2.10.2013.
- DMC (2013a) Resources – Frequently Asked Questions. Dubai Maritime City. <http://www.dubaimaritimecity.com/>, retrieved 2.10.2013.
- DMC (2013b) About Us – Maritime Heritage. <http://www.dubaimaritimecity.com/>, retrieved 2.10.2013.

- Dobronravin, N. (2012) A recorded interview with Professor of St. Petersburg State University at the Pan-European Institute, Turku School of Economics at the University of Turku, November 8.
- Doing Business in St. Petersburg (2011) Shipbuilding cluster. <http://www.doingbusiness.ru/shipbuilding/clusters-business-sectors/shipbuilding-cluster/item>, retrieved 31.5.2013.
- DP World (2013a) History. DP World. http://webapps.dpworld.com/portal/page/portal/DP_WORLD_WEBSITE/About-DP-World/History, retrieved 3.10.2013.
- DP World (2013b) Overview. DP World. http://webapps.dpworld.com/portal/page/portal/DP_WORLD_WEBSITE/Marine-Terminals/Overview, retrieved 3.10.2013.
- Driftsrapport (2012) Breaking waves. NCE Maritime. Norwegian Centre of Expertise.
- Ducruet, C., Lee, S. & Roussin, T. (2009) Local Strength and Global Weakness: A maritime network perspective on South Korea as Northeast Asia's logistic hub. *International Journal of Maritime Affairs and Fisheries*, Vol. 1, Issue 1, pp. 32-50.
- Dutch Institute for Advanced Logistics (Dinalog) (2013) http://www.dinalog.nl/en/about_us/, retrieved 10.9.2013.
- Dutch Maritime Network (2013) http://ec.europa.eu/competition/consultations/2012_maritime_transport/nml_en.pdf, retrieved 10.9.2013.
- DW (2013) Dubai World. <http://www.dubaiworld.ae/>, retrieved 10.10.2013.
- Dyrkoren, E. (2013) An interview with Program Manager for the National Research and Innovation Strategy, Maritim21, Trondheim, August 9.
- ECORYS Research & Consulting (2009) Study on Comprehensiveness of the European Shipbuilding Industry. http://ec.europa.eu/enterprise/sectors/maritime/files/fn97616_ecorys_final_report_on_shipbuilding_competitiveness_en.pdf, retrieved 19.6.2013.
- EDB (2013a) Marine and Offshore Engineering – Industry Background. EDB Singapore. <http://www.edb.gov.sg/content/edb/en/industries/industries/marine-offshore-engineering.html>, retrieved 30.9.2013.
- EDB (2013b) Marine & Offshore – Leading the World in Marine Engineering. EDB Singapore. <http://www.edb.gov.sg/content/dam/edb/en/industries/Marine%20and%20Offshore%20Engineering/downloads/Marine%20and%20Offshore.pdf>, retrieved 26.9.2013.
- Eizema, P., Ng, L. & van Bortel, S. (2012) Business opportunities for Dutch expertise in Smart City Singapore. <http://singapore.nlembassy.org/binaries/content/assets/postenweb/s/singapore/embassy-of-the-kingdom-of-the-netherlands-in-singapore/news/opportunities-for-dutch-expertise-in-smart-city-singapore.pdf>, retrieved 30.9.2013.
- Elomatic (2012) The Elomatic Catalogue 2012. http://www.elomatic.com/publications/elomatic_catalogue_2012/Elomatic_Catalogue_2012.pdf, retrieved 26.8.2013.
- Embassy of Finland (2011) Maatiedosto Singapore – Kahdenväliset suhteet. Embassy of Finland. <http://www.finland.org.sg/public/default.aspx?nodeid=42070&contentlan=1&culture=fi-FI>, retrieved 18.9.2013.
- Eni (2013) http://www.eni.com/en_IT/company/operations-strategies/engineering-construction/offshore/offshore.shtml, retrieved 14.10.2013.
- EPE (2009) Antarctic Expedition Ships. Eco-Photo Explorers. <http://www.ecophotoexplorers.com/AntarcticaShips.asp>, retrieved 7.10.2013.
- Ernst&Young (2013) Arctic oil and gas. [http://www.ey.com/Publication/vwLUAssets/Arctic_oil_and_gas/\\$FILE/Arctic_oil_and_gas.pdf](http://www.ey.com/Publication/vwLUAssets/Arctic_oil_and_gas/$FILE/Arctic_oil_and_gas.pdf), retrieved 10.10.2013.
- Eroke, L. (2013) Maritime Industry Will Overcome Manpower Challenge in 10 Years. *ThisDayLive*, May 20. <http://www.thisdaylive.com/articles/-maritime-industry-will-overcome-manpower-challenge-in-10-years-/147917/>, retrieved 16.9.2013.
- Estrella, G. (2011) Pre-salt production development in Brazil. In *Energy solutions for all – Promoting Cooperation, Innovation and Investment*. The Official Publication of the 20th World Petroleum Congress, 96–99.
- EU-China Maritime Transport Agreement (2002) <http://ec.europa.eu/world/agreements/prepareCreateTreatiesWorkspace/treatiesGeneralData.do?step=0&edirect=true&treatyId=7406>, retrieved 22.8.2013.
- Evers, M. (2013) Northeast Passage: Russia Moves to Boost Arctic Shipping. *Spiegel Online*, August 22. <http://www.spiegel.de/international/world/russia-moves-to-promote-northeast-passage-through-arctic-ocean-a-917824.html>, retrieved 10.10.2013.
- Export-Import Bank of India (2010) Indian Shipping Industry: A Catalyst for growth. <http://www.eximbankindia.com/op/op142.pdf>, retrieved 27.9.2013.

- Federezione del Mare (2012) The Italian Maritime Cluster. Umberto Masucci, Vice President. Sorrento, May 14th, 2012. http://www.mareforum.com/MAREFORUM2012PRESENTATIONS/UMBERTO_MASUCCI.pdf, retrieved 2.10.2013.
- FICCI & EY (2010) The Indian ports and shipping sector: breaking boundaries, tapping potential. FICCI, Ernst & Young. http://s3.amazonaws.com/zanran_storage/www.ey.com/ContentPages/1323715306.pdf, retrieved 24.9.2013.
- Fielden, S. (2012) Jones Act burdens US coastal shipping and impacts energy markets. *Oil&Gas Financial Journal*, October 9. <http://www.ogfj.com/articles/2012/10/jones-act.html>, retrieved 10.10.2013.
- Fincantieri (2013) <https://www.fincantieri.it/cms/data/pages/000048.aspx>, retrieved 2.10.2013.
- Fincantieri Offshore (2013) <https://www.fincantierioffshore.it/branches.html>, retrieved 13.9.2013.
- Finland Times (2013) STX Announces Rauma Shipyard Closure. <http://www.finlandtimes.fi/business/2013/09/17/2470/STX-announces-Rauma-shipyard-closure>, retrieved 11.10.2013.
- Finpro (2012) Philippines country profile. <http://www.finpro.fi/maaprofiilit/filippiinit>, retrieved 27.8.2013.
- Finpro (2013a) Finpro strengthens its support for Finnish maritime industry in France. Press release, May 13. <http://www.finpro.fi/web/english-pages/news>, retrieved 11.9.2013.
- Finpro (2013b) Meriteollisuus seilasi Aasiaan. http://www.finpro.fi/documents/10304/77620/meriteollisuus_seilasi_aasiaan_final_pages.pdf, retrieved 10.10.2013.
- Fiskerstrand BLRT (2013) <http://www.fblrt.com>, retrieved 21.10.2013.
- France24 (2013) S. Korea Bank 'Seeks Sale of STX Europe'. <http://www.france24.com/en/20131010-korea-bank-seeks-sale-stx-europe>, retrieved 11.10.2013.
- Frank Mohn AS (2013) <http://www.framo.com/default.aspx?pagelid=2>, retrieved 5.9.2013.
- Gammelgard, B., Sornn-Friese, H., Hansen, J., Jessen, M., & Larsen, M. (2013) Competencies in the Danish Maritime Cluster: A benchmarking analysis. Danmarks Maritime Klynge – et maritimt kompetenceudviklingsprojekt. <http://www.dkmk.dk/public/dokumenter/CBS%20Benchmarking%20Report%20English.pdf>, retrieved 11.9.2013.
- GAN (2013) UAE strengthening Dubai reputation as a shipbuilding and maritime centre. Global Arab Network. <http://www.english.globalarabnetwork.com/2012092512568/Industry/uae-strengthening-dubai-reputation-as-a-shipbuilding-and-maritime-centre.html>, retrieved 2.10.2013.
- Geoscience Australia (2012) Onshore Petroleum Project. Australian Government. <http://www.ga.gov.au/energy/projects/onshore-petroleum.html>, retrieved 2.10.2013.
- Gican (2013) <http://www.gican.asso.fr/en>, retrieved 4.10.2013.
- Gille, J. & Bruce, G. (2010) Study of the Vietnamese Shipbuilding/Maritime Sector. Final report. Norad Report 10/2010 Discussion. Norwegian Agency for Development Cooperation. <http://www.norad.no/en/tools-and-publications/publications/publication?key=196524>, retrieved 10.10.2013.
- Global.Finland.fi (2012) Kehitysuutisia, 14.6.2012. The Ministry of Foreign Affairs of Finland. <http://global.finland.fi/public/default.aspx?contentid=250769&contentlan=1&culture=fi-FI>, retrieved 16.10.2013.
- GlobalSecurity.org. German Shipbuilding Industry. <http://www.globalsecurity.org/military/world/europe/de-shipbuilding.htm>, retrieved 11.9.2012.
- Government of the Netherlands (2013). Water management: Maritime technology. <http://www.government.nl/issues/water-management/water-top-sector/maritime-technology>, retrieved 11.9.2013.
- Grimaldi Group (2013) <http://www.grimaldi.napoli.it/en/index.html>, retrieved 2.10.2013.
- Habara, K. (2011) Maritime Policy in Japan, *Journal of maritime researches*, 1(1): 65-84 March 2011 <http://www.lib.kobe-u.ac.jp/repository/81004911.pdf>, retrieved 13.8.2013.
- Hand, M. (2013) How Korean Shipping is Battling the Industry Slump. <http://www.seatrade-global.com/news/asia/how-korean-shipping-is-battling-the-industry-slump.html>, retrieved 6.9.2013.
- Hansen, J. F. (2013) An interview with a representative of Danish Shipowner's Association, September 30.
- Hansen, J. F. & Clasen, J. K. (2010). The Economic Significance of Maritime Clusters: Lessons Learned from European Empirical Research. The Danish Shipowners' Association. http://ec.europa.eu/competition/consultations/2012_maritime_transport/dsa_3_en.pdf, retrieved 13.9.2013.
- Headquarters for Ocean Policy (2013) The Prime Minister in Action. Prime Minister of Japan and His Cabinet, 26.4.2013. http://www.kantei.go.jp/foreign/96_abe/actions/201304/26kaiyou_e.html, retrieved 19.8.2013.

- Henriksson, M. & Huhtinen, H. (2013) Arktisen alueen meriliikenteen kehitys vahvistaa Norjan asemaa. *Kauppalititiikka*.
[Http://www.kauppalititiikka.fi/Public/default.aspx?contentid=279637&nodeid=41394&culture=fi-FI](http://www.kauppalititiikka.fi/Public/default.aspx?contentid=279637&nodeid=41394&culture=fi-FI),
 retrieved 10.10.2013.
- Hernesniemi, H. (2012) Merenkulun toimintaedellytykset, kilpailukyky ja julkisen talouden sopeuttamistoimet – Taustaselvitys valtiovarainministeriölle. Research Institute of the Finnish Economy ETLA, Discussion Papers no. 1270. [Http://www.etla.fi/wp-content/uploads/2012/09/dp1270.pdf](http://www.etla.fi/wp-content/uploads/2012/09/dp1270.pdf), retrieved 10.10.2013.
- Holland Trade (2013) [Http://www.hollandtrade.com](http://www.hollandtrade.com), retrieved 9.10.2013.
- How to enable maritime sector to be a success story (2012) Presentations by Danish Maritime Authority at Finnish Transport Agency Maritime Seminar. 19.9.2012.
- Harding, A., Pálsson, G. & Raballand, G. (2007) Port and Maritime Transport challenges in West and Central Africa. Sub-Saharan Africa Transport Policy Program, SSATP Working Paper No. 84.
- Hong Kong Port Development Council (2013) [Http://www.pdc.gov.hk/chi/home/](http://www.pdc.gov.hk/chi/home/), retrieved 15.8.2013.
- Hookway, J. (2013) Philippines Looks for Causes of Deadly Maritime Crash; Investigators Resume Search-and-Rescue Mission That Bad Weather Postponed. *Wall Street Journal (Online)*, August 19. [Http://online.wsj.com/news/articles/SB10001424127887323608504579020304121220462](http://online.wsj.com/news/articles/SB10001424127887323608504579020304121220462), retrieved 17.10.2013.
- IHS Jane's 360 (2013) Russia may seek foreign partner to develop naval shipbuilding sector 20.6.2013. [Http://www.janes.com/article/23443/russia-may-seek-foreign-partner-to-develop-naval-shipbuilding-sector](http://www.janes.com/article/23443/russia-may-seek-foreign-partner-to-develop-naval-shipbuilding-sector), retrieved 4.10.2013.
- IME (2013) Government, associations and companies expressed confidence of strong showing at Indonesia Maritime Expo 2013. [Http://maritimexpo.co.id/sites/sites2.globalsignin.com.2.ime-2013/files/IME2013ClosingPressRelease17Sept.pdf](http://maritimexpo.co.id/sites/sites2.globalsignin.com.2.ime-2013/files/IME2013ClosingPressRelease17Sept.pdf), retrieved on 11.10.2013.
- IMO (2013) Shipping in polar waters. [Http://www.imo.org/MediaCentre/HotTopics/polar/Pages/default.aspx](http://www.imo.org/MediaCentre/HotTopics/polar/Pages/default.aspx), retrieved 10.10.2013.
- IN (2013) Maritime Sector in Brazil. Innovation Norway – Rio Office. NCE Maritime 4.2.2013. [Http://www.ncemaritime.no/download.aspx?object_id=D94A145747514B8DB6BE16B41EACD595.pdf](http://www.ncemaritime.no/download.aspx?object_id=D94A145747514B8DB6BE16B41EACD595.pdf), retrieved 9.10.2013.
- Inatomi, G. (2010) Maritime and Related Industries in Japan. SMBC. [Http://www.marinemoney.com/sites/all/themes/marinemoney/forums/JAP10/presentations2010/Gentalnatomi.pdf](http://www.marinemoney.com/sites/all/themes/marinemoney/forums/JAP10/presentations2010/Gentalnatomi.pdf), retrieved 28.6.2013.
- Industry Canada (2011) Canadian Shipbuilding and Industrial Marine Industry. [Http://www.ic.gc.ca/eic/site/sim-cnmi.nsf/eng/home](http://www.ic.gc.ca/eic/site/sim-cnmi.nsf/eng/home), retrieved 10.10.2013.
- Indonesia Defence & Security Report Q2 (2010), 6–10.
- Infrastructure Australia (2010) National Ports Strategy, Infrastructure for an economically, socially, and environmentally sustainable future. [Http://www.infrastructureaustralia.gov.au/gateways/files/National_Ports_Strategy_DEC2010_v2.pdf](http://www.infrastructureaustralia.gov.au/gateways/files/National_Ports_Strategy_DEC2010_v2.pdf), retrieved 4.10.2013.
- Innovation Norway (2010) Report on Indian Maritime Industry, Prospect for environment friendly technology, Opportunities in Shipbuilding, Shipping & Maritime Education [Http://www.ncemaritime.no/download.aspx?object_id=dd2ca35b26014c248c2c6cc9c5624780.pdf](http://www.ncemaritime.no/download.aspx?object_id=dd2ca35b26014c248c2c6cc9c5624780.pdf), retrieved 25.9.2013.
- InnovationNorway (2013) Maritime: Vietnam – A potential market for Norwegian maritime companies. [Http://www.innovasjon Norge.no/Kontorer-i-utlandet/Vietnam/Marked-og-muligheter/A-destination-for-Norwegian-maritime-companies](http://www.innovasjon Norge.no/Kontorer-i-utlandet/Vietnam/Marked-og-muligheter/A-destination-for-Norwegian-maritime-companies), retrieved 10.10.2013.
- International Boat Industry (2013) [Http://www.ibinews.com/news/italy-marine-industry/](http://www.ibinews.com/news/italy-marine-industry/), retrieved 2.10.2013.
- International Labour Organization (2013) France ratifies the Maritime Labour Convention, 2006 (MLC, 2006) [Http://www.ilo.org/global/standards/maritime-labour-convention/WCMS_205835/lang--en/index.htm](http://www.ilo.org/global/standards/maritime-labour-convention/WCMS_205835/lang--en/index.htm), retrieved 30.9.2013.
- International Maritime Information Website (2010) Japan ship export declines. 28.9.2010 [Http://www.simic.net.cn/news_show.php?lan=en&id=79661](http://www.simic.net.cn/news_show.php?lan=en&id=79661), retrieved 9.8.2013.
- International Port Techonology (2013) Maersk Utilizes Malaysia. [Http://www.porttechnology.org/news/maersk_utilises_malaysia/](http://www.porttechnology.org/news/maersk_utilises_malaysia/), retrieved 11.10.2013.
- Investvine (2013) Malaysia's Shipping Industry in Troubled Waters. [Http://investvine.com/malaysias-shipping-industry-in-troubled-waters/](http://investvine.com/malaysias-shipping-industry-in-troubled-waters/), retrieved 7.10.2013.
- Invest India (2012) [Http://www.investindia.gov.in/?q=ports-sector](http://www.investindia.gov.in/?q=ports-sector), retrieved 30.8.2013.
- Italian Shipping Academy (2013) [Http://www.crpm.org/pub/agenda/1365_inglese_italian_shipping_academy.pdf](http://www.crpm.org/pub/agenda/1365_inglese_italian_shipping_academy.pdf), retrieved 9.10.2013.

- Jakarta Post (2011) Indonesia has yet to tap its cruise industry potential. May 31. <http://www.thejakartapost.com/news/2011/05/31/indonesia-has-yet-tap-its-cruise-industry-potential.html>, retrieved 11.10.2013.
- Jakobsen, E. W. (2010) Deep changes in the Norwegian maritime industry: From conventional shipping to offshore and financial services. MENON Business Economics. <http://etkunnskapsbasertnorge.files.wordpress.com/2010/09/oslo-shipping-exchange-deep-changes.pdf>, retrieved 6.8.2013.
- Jakobsen, E. W. & Espelien, A. (2011) En kunnskapsbasert maritim næring. MENON Business Economics. <http://menon.no/upload/2011/10/04/eknmaritimv2menon-rapportnr10.pdf>, retrieved 6.8.2013.
- Janssens, H. P. L. M. (2005) Dutch Maritime Network: Dutch Maritime Cluster. <http://www.fisherassoc.co.uk/dbimsg/Dutch%20Maritime%20Cluster.pdf>, retrieved 13.9.2013.
- Jati, D. (2012) World maritime leaders lead global industry dialogue at the Asia Pacific Maritime 2012. Indonesia Shipping Times, February 9. <http://www.shippingindonesia.com/indonesian-edition/info/world-maritime-leaders-lead-global-industry-dialogue-at-the-asia-pacific-maritime-2012/>, retrieved 9.10.2013.
- JOC (Journal of Commerce) (2013) Drewry: Uncertainty Around P3 Network to Prompt More Canceled Sailings. September 30. http://www.joc.com/maritime-news/international-freight-shipping/drewry-uncertainty-around-p3-network-prompt-more-canceled-sailings_20130930.html, retrieved 4.10.2013.
- Johansson, P. (2012) Energiantuotannon luvattu maanosa. YLE. http://www.yle.fi/radio1/asia/puheenvuoroja/afrikkaenergiantuotannon_luvattu_maanosa_38834.html, retrieved 12.9.2013.
- Jones Act Lawyers (2013) How Does the Jones Act Apply to Cruise Ships? Blog Post, June 13. <http://www.jonesactlawyers.pro/how-does-the-jones-act-apply-to-cruise-ships>, retrieved 10.10.2013.
- The Journal of Commerce (2013) Netherlands Tops Port Infrastructure Ranking. September 9. http://www.joc.com/port-news/european-ports/port-rotterdam/netherlands-tops-port-infrastructure-ranking_20130909.html, retrieved 11.9.2013.
- Jung, J. J. (1996) The Port Development Strategy of South Korea: To be a load leader in Northeast Asia. http://www.neaef.org/public/neaef/files/documents/publications_pdf/annual_meeting/6th-1996/4.1.Joh_6an_1996.pdf, retrieved 13.9.2013.
- Kauppalehti (2013) Kalakaupungin uudet tuulet. 6.8.2013.
- Kemp, J. (2013) COLUMN-Jones Act is set to stay: Kemp. Reuters, May 2. <http://www.reuters.com/article/2013/05/02/column-kemp-us-shipping-idUSL6N0DJ38A20130502>, retrieved 10.10.2013.
- Keppel (2013) Keppel Corporation – About Us. Official Website. <http://www.kepcorp.com/en/content.aspx?sid=53>, retrieved 18.9.2013.
- Khalid, N. (2006) China's Port Development and Shipping Competition in East Asia. The Asia-Pacific Journal: Japan Focus. 15 May, 2006. <http://www.japanfocus.org/-Nazery-Khalid/1649>, retrieved 6.8.2013.
- Kim, D. S. (2009) Korean Maritime Industry in the World: focused on shipbuilding and offshore activities. Innovasjon Norge. http://www.google.fi/url?q=http://www.ncemaritime.no/download.aspx%3Fobject_id%3D0AFB21CDC88D486C9F2391DDD182A214.pdf&sa=U&ei=mogpUpeAOomm4AS-14D4Cg&ved=0CBkQFjAA&sig2=LieCPQXnTvenXe3qiaqY7w&usg=AFQjCNFvwdi8hOVy62NOhCqmbZNUkP6l8g, retrieved 26.8.2013.
- Konecranes (2013) Konecranes wins record order for container handling equipment from Indonesian terminal operator. Konecranes website. <http://www.konecranes.com/resources/media/releases/2013/konecranes-wins-record-order-for-container-handling-equipment-from-indonesian-terminal-operator>, retrieved 21.10.2013.
- Koranyi, B. (2013) Arctic Shipping To Grow As Warming Opens Northern Sea Route For Longer. *Huffington Post (Reuters)*. http://www.huffingtonpost.com/2013/05/29/arctic-shipping-northern-sea-route_n_3351109.html, retrieved 10.10.2013.
- KOSHIPA (2011) Brief Summary on World & Korean Shipbuilding Industry. <http://brasembseul.files.wordpress.com/2011/06/koshipa.pdf>, retrieved 11.6.2013.
- KOSHIPA (2013a) International Cooperation. <http://www.koshipa.or.kr/eng/koshipa/koshipa3/cooperation.htm>, retrieved 5.9.2013.
- KOSHIPA (2013b) Introduction to KOSHIPA. <http://www.koshipa.or.kr/eng/koshipa/koshipa3/introduction01.htm>, retrieved 9.9.2013.
- Kristiansen, T. (2013) European shipping companies call for EU fleet in West Africa. *Shippingwatch*, June 27. <http://shippingwatch.com/carriers/article5673143.ece>, retrieved 16.9.2013.

- Kuuluvainen, A. (2013) Brasilia – samba, futista ja isoa bisnestä. Presentation at *Teollisuuden ja yliopistojen yhteistyöseminaari: Suomalaisen meriteollisuuden mahdollisuudet – Pk-yritysten kansainvälistymisen polut ja johtaminen* at Turku School of Economics in Finland, 25 August.
- Laakso, A. (2013) Norjan kilpailukyyn lasku Suomen meriteollisuuden pelastus? *YLE*. http://yle.fi/uutiset/norjan_kilpailukyyn_lasku_suomen_meriteollisuuden_pelastus/6849246, retrieved 14.10.2013.
- Laaksonen, E. (2012) How to succeed in international project marketing: Identifying challenges of Finnish projects in the Murmansk Region. In M. Tennberg (Ed.), *Politics of Development in the Barents Region*. Rovaniemi: Lapland University Press, 158-179.
- Laaksonen, E. & Mäkinen, H. (2013) The potential for increasing inter-cluster cooperation between the Estonian, Finnish and Northwest Russian shipbuilding clusters. *Baltic Region*, accepted for publication in 2013.
- Lauer, C. (2013) Interview with a representative of Verband Deutscher Reeder (VDR), September 13.
- Le, M. (2010) The Development of China's International Shipping Industries. In Kee, Pookong & Yoshimatsu, Hidetaka (Eds.). (2010). *Global Movements in the Asia Pacific*. World Scientific Publishing: Singapore.
- Leach, P. (2011) Japanese Shipping Stopped by Earthquake and Tsunami. *The Journal of Commerce*, March 11. http://www.joc.com/maritime-news/japanese-shipping-stopped-earthquake-and-tsunami_20110311.html, retrieved 12.8.2013.
- Lian, L. (2013) National Plan for Coastal Ports. Hong Kong Trade Development Council. http://info.hktdc.com/shippers/vol29_6/vol29_6_trade03.htm, retrieved 20.8.2013.
- Liu, J. (2013) Marine Economy Boots Shipbuilding Industry. China Economic Net. http://en.ce.cn/Insight/201301/31/t20130131_24083974.shtml, retrieved 5.7.2013.
- Lowe, M. (2012) Japan Boosts Coastal Security. *Maritime Security Review*, October 29. <http://www.marsecreview.com/2012/10/japan-boosts-coast-security/>, retrieved 20.8.2013
- Maekawa, H. (2009) Japanese Shipping and Challenges for the Shipping Industry. INTERTANKO Annual Tanker Event, 14.5.2009 http://www.intertanko.com/upload/presentations/thu_0930-1015_maekawa09514rev6.pdf, retrieved 20.8.2013.
- Maersk (2013) First Triple-E named Mærsk Mc-Kinney Møller, 14.6.2013. <http://www.maerskpress.com/NEWS-ROOM/first-triple-e-named-mrsk-mc-kinney-mller/s/f2b9b688-00f3-4ff6-86b0-5a834f48912a>, retrieved 15.9.2013.
- Malaysia – The World Factbook (2013) CIA. <https://www.cia.gov/library/publications/the-world-factbook/geos/my.html>, retrieved 11.10.2013.
- Manila Bulletin (2013) Philippines Now the Fourth Largest Shipbuilding Country in the World. 7.2.2013. <http://ph.news.yahoo.com/philippines-now-fourth-largest-shipbuilding-country-world-091605468.html>, retrieved 22.8.2013.
- MARAD (2011) Comparison of U.S. and foreign-flag operating costs. Maritime Administration, U.S. Department of Transportation. http://www.marad.dot.gov/documents/Comparison_of_US_and_Foreign_Flag_Operating_Costs.pdf, retrieved 10.10.2013.
- MARAD (2013) The Economic Importance of the U.S. Shipbuilding and Repairing Industry. Maritime Administration, U.S. Department of Transportation May 30. http://www.marad.dot.gov/documents/MARAD_Econ_Study_Final_Report_2013.pdf, retrieved 10.10.2013.
- Mare Forum (2013) http://www.mareforum.com/maritime_italy_programme_2013.htm, retrieved 2.10.2013.
- MARIN The Maritime Research Institute Netherlands (2013) <http://www.marin.nl/web/Organisation.htm>, retrieved 13.9.2013.
- MarineLink (2009) Growth in Middle East Shipbuilding, Repair. MarineLink.com. <http://www.marinelink.com/news/article/growth-in-middle-east-shipbuilding-repair/330373.aspx>, retrieved 2.10.2013.
- MarineLink.com (2013a) German Shipbuilding Prospects are Fair & Partly Cloudy, 24.6.2013 <http://www.marinelink.com/news/shipbuilding-prospects355928.aspx>, retrieved 10.9.2013.
- MarineLink.com (2013b) Italian Shipyard Fincantieri Invites Academia Input, 23.9.2013 <http://www.marinelink.com/news/fincantieri-shipyard359029.aspx>, retrieved 9.10.2013.
- Marine Money Offshore (2013) KG structure – open for more than boxships. <http://www.marinemoneyoffshore.com/node/5750>, retrieved 10.9.2013.
- Maritime21 (2013) http://www.maritimecenter.dk/public/dokumenter/EMUC/Konferencer/2012/Erik%20Dyrkoren_Maritim21%20-%2020121206%20-%20English.pdf, retrieved 10.10.2013.
- Maritime by Holland (2013) <http://www.maritimebyholland.com/>, retrieved 10.9.2013.
- Maritime by Holland. Catalogue (2013) <http://www.maritimebyholland.com/EN/363/publications.html>, retrieved 11.9.2013.
- Maritime Cluster Northern Germany (2012) <http://www.maritimes-cluster.de/en/>, retrieved 11.9.2012.

- Maritime Knowledge Center (2013) <http://www.marin.nl/web/JIPs-Networks/Cooperative-Networks/Maritime-Knowledge-Centre.htm>, retrieved 10.9.2013.
- The maritime voice (2013) <http://www.cluster-maritime.fr/article.php?id=3&lang=En>, retrieved 16.10.2013.
- Maritim Forum (2013) <http://maritim-forum.no/om-oss/>, retrieved 10.10.2013.
- Martin Associates (2008) The local and regional economic impacts of the US deepwater port system, 2007. Prepared for: American Association of Port Authorities, June 6, 2008. <http://aapa.files.cms-plus.com/PDFs/MartinAssociates.pdf>, retrieved 10.10.2013.
- Mazzarol, T. (2004) Industry Networks in the Australian Marine Complex, Strategic Networking within the Western Australian Maritime Engineering Sector. CEMI report.
- McGuire, C. (2013) Could Replacement Icebreaker Resuscitate Australian Shipbuilding? *gCaptain*, August 23. <http://gcaptain.com/could-replacement-icebreaker-resuscitate-australian-shipbuilding/>, retrieved 7.10.2013.
- McKinnon, A. (2011) Hong Kong and Singapore Ports: Challenges, Opportunities and Global Competitiveness. Working Paper Series, March 2011. Hong Kong Centre for Maritime and Transportation Law, City University of Hong Kong.
- MDA (2010) Maritime Development in Africa – An Independent Specialist’s Framework. The Brenthurst Foundation, Discussion Paper 2010/03.
- MecroPress (2013) Brazil signs bill expanding private sector participation in the clogged ports. <http://en.mercopress.com/2013/06/06/brazil-signs-bill-expanding-private-sector-participation-in-the-clogged-ports>, retrieved 9.10.2013.
- Mediterranean - the upcoming future recommencement of the re-composition process following the global crisis (2013) <http://www.federazedelmare.it/Home/pubblicazioni/Mediterranean.%20The%20upcoming%20future.pdf>, retrieved 2.10.2013.
- Meyer, H. (2013) Greenpeace’s Arctic 30 Charged as Gazprom Says ‘Tragedy’ Averted. *Bloomberg*, October 3. <http://www.bloomberg.com/news/2013-10-03/greenpeace-s-arctic-30-charged-as-gazprom-says-tragedy-averted.html>, retrieved 7.10.2013.
- Meyer Werft (2013) <http://www.meyerwerft.com>, retrieved 12.9.2013.
- Mickevičienė, R. (2011) Global Competition in Shipbuilding: Trends and Challenges for Europe. http://cdn.intechopen.com/pdfs/16925/InTech-Global_shipbuilding_competition_trends_and_challenges_for_europe.pdf, retrieved 6.6.2013.
- MIDA (2013) Incentives for the Aerospace, Shipbuilding & Ship Repairing Industries in Malaysia. http://webcache.googleusercontent.com/search?q=cache:3MUNu3vYZWcJ:http://www.might.org.my/aironline/Publication/Open%2520Forum%2520DSA%252008/MIDA.ppt%2Bmalaysia+biggest+shipyard&oe=utf-8&rls=org.mozilla%3Aen-US%3Aofficial&client=firefox-a&gws_rd=cr&hl=zh-CN&ct=clnk, retrieved 11.10.2013.
- MIIT (2013) 2012 年全国造船完工量超过 6000 万载重吨新接订单同比下降四成. <http://www.miit.gov.cn/n11293472/n11293832/n11294132/n12858417/n12858628/15121853.html>, retrieved 5.7.2013.
- Milewski, T. (2013) Shipbuilding contract holds \$250M mystery. *CBC News*, May 2 (updated May 4). <http://www.cbc.ca/news/politics/shipbuilding-contract-holds-250m-mystery-1.1300816>, retrieved 10.10.2013.
- Ministry of Communications of the People’s Republic of China (2006) 五大港口群体 八大运输系统 —— 交通部综合规划司副司长任建华解读《全国沿海港口布局规划》, http://www.moc.gov.cn/2006/06tongjisj/06jiaotonggh/gangkough/guihuaajd/200609/t20060920_82356.html, retrieved 20.8.2013.
- Ministry of Education and Culture (2013) Opetusministeri Kiuru Singaporessa: Valtaisa kiinnostus suomalaisiin opetuslalla toimiviin yrityksiin yllätti. Ministry of Education and Culture. http://www.minedu.fi/OPM/Tiedotteet/2013/08/Opetusministeri_Kiuru_Singaporessa.html, retrieved 18.9.2013.
- The Ministry of Foreign Affairs of Finland (2013). Maatiedosto Venäjä. <http://www.finland.org.ru/Public/default.aspx?nodeid=41789&culture=fi-FI&contentlan=1&displayall=1>, retrieved 10.10.2013.
- Ministry of Foreign Affairs of Japan (2012) Japan's Actions against Piracy off the Coast of Somalia. October 2012. http://www.mofa.go.jp/policy/piracy/ja_somalia_1210.html, retrieved 20.8.2013.
- Ministry of Shipping (2012) India Maritime Sector, An overview. <http://www.indiamaritime.in/1/indiamaritimesector.html>, retrieved 27.9.2013.
- MISC Berhad (2013) <http://www.misc.com.my/>, retrieved 11.10.2013.

- Mitchell, T. & Milne, R. (2013) First Chinese cargo ship nears end of Northeast Passage transit. *Financial Times*, September 6. <http://www.ft.com/intl/cms/s/0/010fa1bc-16cd-11e3-9ec2-00144feabdc0.html#axzz2hJZ89QeR>, retrieved 10.10.2013.
- Mitteldeutsche Zeitung (2013) Werften erfinden sich neu, 28.5.2013. <http://www.mz-web.de/wirtschaft/werften-erfinden-sich-neu,20642182,22884022.html>, retrieved 10.9.2013.
- MLIT (2011) Green growth and maritime industries. OECD Council Working Party on Shipbuilding (WP6) Workshop on Green Growth in Shipbuilding, 7–8.7.2011. <http://www.oecd.org/sti/ind/48328713.pdf>, retrieved 20.8.2013.
- Moen, J. S. (2013) Interview with Communications Director of MARINTEK, Trondheim, August 9.
- MOR (2013) Maritime Outlook Report 2013 – Great maritime opportunities. Norwegian Shipowners' Association. [http://www.rederi.no/nrweb/mm.nsf/lupgraphics/Final_6242-Konjunkturrapport-eng-5k.pdf/\\$file/Final_6242-Konjunkturrapport-eng-5k.pdf](http://www.rederi.no/nrweb/mm.nsf/lupgraphics/Final_6242-Konjunkturrapport-eng-5k.pdf/$file/Final_6242-Konjunkturrapport-eng-5k.pdf), retrieved 9.10.2013.
- The Moscow Times (2013a) Head of United Shipbuilding Corporation Fired After 11 Months. May 7. <http://www.themoscowtimes.com/business/article/head-of-united-shipbuilding-corporation-fired-after-11-months/479614.html>, retrieved 10.10.2013.
- The Moscow Times (2013b) United Shipbuilding Corporation Faces Major Overhaul to Fight Slump. September 27. <http://www.themoscowtimes.com/business/article/united-shipbuilding-corporation-faces-major-overhaul-to-fight-slump/486680.html>, retrieved 10.10.2013.
- Motorship (2013) Russian commercial shipbuilding faces serious crisis. May 31. <http://www.motorship.com/news101/comment-and-analysis/russian-commercial-shipbuilding-faces-serious-crisis>, retrieved 10.10.2013.
- Munson, J. (2013) Russia set to dominate Arctic shipping unless Canada, US step up. *Ipolitics*, January 4. <http://www.ipolitics.ca/2013/01/04/russia-set-to-dominate-arctic-shipping-without-canada-us-co-operation>, retrieved 10.10.2013.
- NAPA (2012) ClassNK joins with NAPA to bring best-in-class SEEMP solution to market, 8.5.2012. <http://www.napa.fi/News/NAPA-News/ClassNK-joins-with-NAPA-to-bring-best-in-class-SEEMP-solution-to-market>, retrieved 26.8.2013.
- Ndlovu, N. (2009) SA's new Antarctic research ship. *Media Club South Africa*. <http://www.medioclubsouthafrica.com/tech/1417-new-antarctic-research-ship-for-sa>, retrieved 9.10.2013.
- "Next-Generation Maritime Technologies" Research Programme (2013) <http://www.research-in-germany.de/dachportal/en/Research-Areas-A-Z/Maritime-Technologies/Programmes-and-Initiatives/Next-Generation-Maritime-Technologies.html>, retrieved 15.9.2013.
- Ng'wanakilala, F. (2013) Tanzania signs port deal with China Merchants Holdings. *Reuters*, May 30. <http://www.reuters.com/article/2013/05/30/tanzania-china-infrastructure-idUSL5N0EB3RU20130530>, retrieved 16.9.2013.
- NID (2011) Marine Sector – Marine and Offshore Engineering Industry Sector Report. A critical analysis of the offshore and marine industry in Brazil. Nordic Industries Development. http://www.nordic-industries.com/Downloads/NID_MARINE_AND_OFFSHORE_SECTOR_IN_BRAZIL_2011_SECTOR_REVIEW.pdf, retrieved 9.10.2013.
- Nijdam, M. H. & de Langen, P. W. (2003) Leader Firms in the Dutch Maritime Cluster <https://www.jyu.fi/ersa2003/cdrom/papers/395.pdf>, retrieved 11.9.2013
- N-KOM (2012) About Us – Overview. Nakilat – Keppel Offshore & Marine Ltd. <http://www.nkom.com.qa/overview>, retrieved 3.10.2013.
- Noor, A. M. (2012) Malaysia's Shipbuilding Industry – shifting toward sustainability. *MyForesight*, January 2012. <http://www.myforesight.my/publications/myforesight4/#/0>, retrieved 9.10.2013.
- NOR SHIPPING (2013) Norway-Japan Maritime Innovation Seminar, 6.6.2013 <http://www.messe.no/en/nor-shipping/Program1/Thursday-June-06/Norway-Japan-Maritime-Innovation-Seminar1/>, retrieved 20.8.2013.
- Nordic Industries Development OY (2013) Marine and offshore market snapshot: The Netherlands Offshore: A Local Industry with Global Reach. <http://www.nordic-industries.com/Downloads/NORDIC%20INDUSTRIES-HOLLAND-OFFSHORE%20MARKET%20BRIEF-03062013.pdf>, retrieved 13.9.2013.
- Norwegian electric systems. (2013) <http://www.norwegianelectric.com/?menu=3&id=25>, retrieved 5.9.2013.
- NSA (2004) Development in the Norwegian maritime cluster. 1st European Maritime Cluster Organisation Roundtable Wassenaar, Netherlands 26–27 April 04. <http://www.fisherassoc.co.uk/dbimgs/Norwegian%20Maritime%20Cluster.pdf>, retrieved 5.9.2013.
- NSA (2012) Norwegian offshore shipping companies – local value creation global success. Norwegian Shipowners' Association. [http://www.rederi.no/nrweb/mm.nsf/lupgraphics/Norwegian_offshore_shipping_companies.pdf/\\$file/Norwegian_offshore_shipping_companies.pdf](http://www.rederi.no/nrweb/mm.nsf/lupgraphics/Norwegian_offshore_shipping_companies.pdf/$file/Norwegian_offshore_shipping_companies.pdf)

- NSA (2013a) High North – High Stakes: Maritime opportunities in the Arctic. Norwegian Shipowners’ Association. [http://rederi.no/nrweb/mm.nsf/lupgraphics/Nordomrademelding.pdf/\\$file/Nordomrademelding.pdf](http://rederi.no/nrweb/mm.nsf/lupgraphics/Nordomrademelding.pdf/$file/Nordomrademelding.pdf), retrieved 14.10.2013.
- NSA (2013b) Maritime Outlook Report 2013: Great maritime opportunities. Norwegian Shipowners’ Association. [http://www.rederi.no/nrweb/mm.nsf/lupgraphics/Final_6242-Konjunkturrapport-eng-5k.pdf/\\$file/Final_6242-Konjunkturrapport-eng-5k.pdf](http://www.rederi.no/nrweb/mm.nsf/lupgraphics/Final_6242-Konjunkturrapport-eng-5k.pdf/$file/Final_6242-Konjunkturrapport-eng-5k.pdf), retrieved 6.9.2013.
- NYK Line (2013) Interview about NYK SUPER ECO SHIP 2030. http://www.nyk.com/ENGLISH/csr/envi/ecoship/ecoship_interview.htm, retrieved 26.8.2013.
- ODC (2012) Our Company. Oman Drydock Company. http://www.omandrydock.com/about_odc.html, retrieved 2.10.2013.
- OECD (2012) Indonesia, Regulatory and Competition issues in Ports, Rail and Shipping. <http://www.oecd.org/indonesia/Chap%205%20-%20Ports%20Rail%20and%20Shipping.pdf>, retrieved 9.10.2013.
- OECD-WP6 (2008) The Shipbuilding Industry in China. The OECD Council Working Party on Shipbuilding (WP6) official report. <http://www.oecd.org/china/42033311.pdf>, retrieved 13.6.2013.
- Offshore Holland (2013) <http://issuu.com/offshore-holland/docs/oh7-lr/1?e=2975717/4680775>, retrieved 13.9.2013.
- Olsen, B. (2012) How to enable maritime sector to be a success story? Presentation at Finnish Transport Agency Maritime seminar, 19.9.2012.
- Oritse, G. (2010) Nigeria, South Africa signs MoU on ship building and repairs. *Vanguard*, October 20. <http://www.vanguardngr.com/2010/10/nigeria-south-africa-signs-mou-on-ship-building-and-repairs/>, retrieved 16.9.2013.
- O’Rourke, R. (2013) Coast Guard Polar Icebreaker Modernization: Background and Issues for Congress. Congressional Research Service. <http://www.fas.org/sgp/crs/weapons/RL34391.pdf>, retrieved 10.10.2013.
- OSK (2012) Maritime Logistics Industry, Finding a Conducive Home in Indonesia. <http://m.osk188.co.id/messages/wp-content/uploads/2012/11/Indonesian-Maritime-Logistics-2012-11-20-2.pdf>, retrieved 9.10.2013.
- Osman, N. (2012) Local shipping industry eyes 20 percent growth in the next year. *Jakarta Post*, December 8. <http://www.thejakartapost.com/news/2012/12/08/local-shipping-industry-eyes-20-percent-growth-next-year.html>, retrieved 9.10.2013.
- Oxford Analytica Daily Brief Service (2013) JAPAN: New ocean policy reasserts presence at sea. ProQuest, 8.7.2013 <http://search.proquest.com/docview/1398472169/fulltext?source=fedsrch&accountid=14774>, retrieved 20.8.2013.
- Paananen, K. (2013) An interview with General Director (CEO) of SET Group at the Turku City Hall, June 5.
- Palma M. A. (2009) The Philippines as an Archipelagic and Maritime Nation: Interests, Challenges and Perspectives. RSIS Working Paper, 21.7.2009. <http://www.rsis.edu.sg/publications/WorkingPapers/WP182.pdf>, retrieved 23.8.2013.
- Paschoalin (2010) How to do business in the oil & gas and maritime industry in Brazil. http://www.ncemaritime.no/download.aspx?object_id=5D16D682363E41939308E15B4E9829BA.pdf, retrieved 9.10.2013.
- Peeters, C. et al (1994) De Toekomst van de Nederlandse Zeevaartsector: Economische Impact Studie en Beleidsanalyse.
- Petrobras (2013) Profile – an integrated energy company. The website of Petrobras. <http://www.petrobras.com.br/en/about-us/profile/>, retrieved 9.10.2013.
- PFI & EY (2012) New innings for the Indian ports sector. Port Finance International, Ernst & Young http://www.portfinanceinternational.com/newsletter/2012india/special/PFI_India2012_Ernst&Young_report.pdf, retrieved 28.8.2013.
- Port of Hamburg (2012) <http://www.hafen-hamburg.de/en>, retrieved 11.9.2012.
- Port of Tallinn (2012) Performance Results Analysis. <http://www.portoftallinn.com/performance-results>, retrieved 1.8.2013.
- Port Technology International (2010) Jebel Ali Port – Dubai’s gateway to the world. *Port Technology International*. Edition 41 – Customs & Security, Customs and security. http://www.porttechnology.org/technical_papers/jebel_ali_port_dubais_gateway_to_the_world/, retrieved 3.10.2013.
- Port Vision 2030 (2011) Port of Rotterdam: Global Ports & Urban Development OECD, Paris, 9.12.2011, Stijn Effting, <http://www.oecd.org/gov/regional-policy/49456450.pdf>, retrieved 11.9.2013.
- Portal Brazil (2013) Investing in Brazil – Multinational Companies. <http://www.brasil.gov.br/para/invest/investing-in-brazil/multinational-companies>, retrieved 9.10.2013.

- Portfolio Business Times (2013) Eastman to Add Two Plants in Kuantan. <http://www.btimes.com.my/articles/20131009000129/Article/>, retrieved 11.10.2013.
- PPA (2011) Annual report 2011. <http://www.ppa.com.ph/AnnualReport/PPA%20corrected%20PDF%20for%20web.pdf>, retrieved 23.8.2013.
- President of Russia (2013) Meeting with Sovcomflot CEO Sergei Frank. The Official website of the President of Russia. <http://eng.kremlin.ru/news/5820>, retrieved 21.8.2013.
- Putri, A., Buensuceso, A. & Winata, J. (2013) Pirate Attacks on the Rise in Indonesia: Report. *Jakarta Globe*, July 25. <http://www.thejakartaglobe.com/news/pirate-attacks-on-the-rise-in-indonesia-report/>, retrieved 11.10.2013.
- Pynnöniemi, K. (2013) Venäjän varusteluohjelma ja Kaukoidän telakka: huomiota ajankohtaisesta keskustelusta. The Finnish Institute of International Affairs. http://www.fiia.fi/en/blog/418/venajan_varusteluohjelma_ja_kaukoidan_telakka_huomiota_ajankohtaisesta_keskustelusta, retrieved 10.10.2013.
- Qinetiq, Lloyd's Register and University of Strathclyde (2013). Global Marine Trends 2030. <http://www.qinetiq.com/what/capabilities/maritime/Documents/GlobalMarineTrends2030Report.pdf>, retrieved 18.6.2013.
- Rasmussen, L. (2013) An interview with a representative of projekt Danmarks MaritimeKlynge/the Danish Maritime Cluster project, September 30.
- Remo, A. R. (2013) Gov't urged to privatize ports sector. *Philippine Daily Inquirer*, 25.7.2013. <http://business.inquirer.net/134361/govt-urged-to-privatize-ports-sector>, retrieved 23.8.2013.
- Restino, C. (2013) Icebreaker fleet in U.S. lags behind. *The Arctic Sounder*, January 13. http://www.thearcticsounder.com/article/1202icebreaker_fleet_in_us_lags_behind, retrieved 10.10.2013.
- Reuters (2013) France to launch tender for pilot marine projects. September 17. <http://www.reuters.com/article/2013/09/17/us-france-marine-energy-idUSBRE98G14V20130917>, retrieved 4.10.2013.
- Reve (2009) Norway – a global maritime knowledge hub <http://web.bi.no/forskning/papers.nsf/wResearchReports/FF9BF9873E2F5DB2C125767A0034B521>, retrieved 6.8.2013.
- Review of Maritime Transport 2012 (2012) United Nations Conference on Trade and Development (UNCTAD). <http://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=380>, retrieved 9.9.2013.
- Review 2012 (2013) KOSHIPA. [http://www.koshipa.or.kr/eng/koshipa/koshipa3/news_view.jsp?kind=eng_n&idx=197&s_section=&s_keyw](http://www.koshipa.or.kr/eng/koshipa/koshipa3/news_view.jsp?kind=eng_n&idx=197&s_section=&s_keyword=) ord=, retrieved 4.9.2013.
- Ribeiro, J. (2013) Brazil eyes \$12 bln investments as port law takes effect. *Reuters*. <http://www.reuters.com/article/2013/06/06/brazil-ports-idUSL1N0EH2CY20130606>, retrieved 9.10.2013.
- RITA Bureau of Transportation Statistics (2011) America's Container Ports: Linking Markets at Home and Abroad. Research and Innovative Technology Administration, Bureau of Transportation Statistics, U.S. Department of Transportation. http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/americas_container_ports/2011/pdf/entire.pdf, retrieved 10.10.2013.
- Robertson, C. (2013) Canada's shipbuilding program is too important to run aground on poor planning. *The Globe and Mail*, May 8. <http://www.theglobeandmail.com/commentary/canadas-shipbuilding-program-is-too-important-to-run-aground-on-poor-planning/article11778104/>, retrieved 10.10.2013.
- Ro.Ro. Tranship (2013) <http://www.rorotranship.com/>, retrieved 9.10.2013.
- Rolls-Royce (2013) http://www.rolls-royce.com/careers/working_for_us/our_locations/norway/, retrieved 16.10.2013.
- Royal Norwegian Embassy in Hanoi (2013) Maritime. http://www.norway.org.vn/Norway_and_Vietnam/Business-Cooperation/Maritime/#.UI5DgnfTKwE, retrieved 16.10.2013.
- Royal Norwegian Embassy in Manila (2013) Why Invest. <http://www.norway.ph/norsk/Doing-Business/Why-Invest/>, retrieved 27.8.2013.
- Saipem (2013) <http://www.saipem.com/site/home/activities/ec-offshore.html>, retrieved 14.10.2013.
- Sarkozy, N. (2009) Speech by Nicolas Sarkozy, President of the Republic. Le Havre, July 16. <http://www.ambafrance-uk.org/President-Sarkozy-on-France-s.html>, retrieved 18.9.2013.
- Scott-Rimington, T. (2003) Cairns Maritime Cluster. http://www.tci-network.org/media/asset_publics/resources/000/000/210/original/learning-tscott-australia.pdf, retrieved 4.10.2013.
- Sekimizu, K. (2012) Philippine Maritime Industry Stakeholders Lunch Forum, 8.2.2012. <http://www.imo.org/MediaCentre/SecretaryGeneral/SpeechesByTheSecretaryGeneral/Pages/Philippine-Maritime-.aspx>, retrieved 21.8.2013.

- Senturk, Ö. U. (2011) The shipbuilding industry in Viet Nam. *OECD Journal: General Papers*, Vol. 2010/3.
- Shipbuilding History (2013) <http://shipbuildinghistory.com>, retrieved 10.10.2013.
- Shipbuilding Korea (2008) Korean Shipbuilders' 2008 Management Strategy: Create Blue-ocean for Global Leadership. *KOSHIPA International Magazine*. 25 February, 2008, Vol. 1, No. 1. pp. 4-5.
- Shipbuilding Korea 2011 (2011). KOSHIPA. http://www.industrykorea.net/BCS_Com/Project/PDF/KOSHIPA/koshipa_2011ar.pdf, retrieved 26.8.2013.
- Shipbuilding Report: Marine and Shipbuilding (2013) The Status and Outlook for Korea Major Port Facilities and Traffic in 2011: major ports that are still in energetic states. http://www.shipbuilding.me/Report/Report2012/Port_Report/Port_Report.html, retrieved 26.8.2013.
- Ship Technology (2013a) Drydocks World Dubai Shipyard, United Arab Emirates. *Ship Technology*. <http://www.ship-technology.com/projects/drydocks-world-dubai-shipyard/>, retrieved 3.10.2013.
- Ship Technology (2013b) Khalifa Port, Abu Dhabi, United Arab Emirates. *Ship Technology*. <http://www.ship-technology.com/projects/khalifa-port-abu-dhabi-uae/>, retrieved 3.10.2013.
- Ship Technology (2013c) New Port Project (NPP), Al Wakrah and Mesaieed, Qatar. *Ship Technology*. <http://www.ship-technology.com/projects/new-port-project-npp-qatar-doha/>, retrieved 3.10.2013.
- Ship Technology (2013d) <http://www.ship-technology.com/projects/portofhongkong/>, retrieved 15.8.2013.
- SMD (2013a) Destination: Singapore. Singapore Maritime Directory 2013/2014. <http://www.timesdirectories.com/Indprof/maritime/ED01.pdf>, retrieved 30.9.2013.
- SMD (2013b) Future Ready Port. Singapore Maritime Directory 2013/2014. <http://www.timesdirectories.com/Indprof/maritime/ED02.pdf>, retrieved 30.9.2013.
- SMD (2013c) Rosy Outlook for Cruising in Asia Pacific. Singapore Maritime Directory 2013/2014. <http://www.timesdirectories.com/Indprof/maritime/ED03.pdf>, retrieved 30.9.2013.
- SMIAR (2012) Singapore marine industry's performance in 2012. Singapore Marine Industry Annual Report 2012. <http://www.asmi.com/index.cfm?GPID=329>, retrieved 30.9.2013.
- South Korean Shipyards: Opportunity or threats (2013) <http://www.marinemoneyoffshore.com/node/6294>, retrieved 4.9.2013.
- Sperling, M. (2013) Local Content Requirements in Brazil – Overview of current policy and regulations. Presentation in Hannover, February 26. http://www.hannover.ihk.de/fileadmin/data/Dokumente/Themen/International/Veranstaltungseuebersicht/Local_content.pdf, retrieved 9.10.2013.
- Staalesen, A. (2013a) Going Arctic, Rosneft eyes acquisition of Murmansk shipyard. *Barents Observer*, August 12. <http://barentsobserver.com/en/energy/2013/08/going-arctic-rosneft-eyes-acquisition-murmansk-shipyard-12-08>, retrieved 10.10.2013.
- Staalesen, A. (2013b) New chief shipbuilder mulls Arctic shift. *Barents Observer*, August 14. <http://barentsobserver.com/en/business/2013/08/new-chief-shipbuilder-mulls-arctic-shift-14-08>, retrieved 10.10.2013.
- The Star Online (2013) Malaysian Shipping Industry to Remain Strong This Year. <http://www.thestar.com.my/Business/Business-News/2013/04/05/Malaysian-shipping-industry-to-remain-strong-this-year.aspx>, retrieved 7.10.2013.
- Statistics Canada (2012) Shipping in Canada 2011. <http://www.statcan.gc.ca/pub/54-205-x/2011000/part-partie1-eng.htm>, retrieved 10.10.2013.
- Statskontoret (2010) Stadig eller flexibel kurs? Om sjöfartspolitik i sex länder. <http://www.statskontoret.se/upload/Publikationer/2010/201017.pdf>, retrieved 11.9.2013.
- STC Group (2013) <http://www.stc-group.nl/Pages/1033/HomePage.aspx>, retrieved 13.9.2013.
- StrategyPage (2013) China Builds The Biggest Port In Africa. April 8. <http://www.strategypage.com/htm/htlog/20130408.aspx>, retrieved 16.9.2013.
- STX France (2013) <http://www.stxeurope.com/sites/France/about/Pages/Shipbuilding.aspx>, retrieved 4.10.2013.
- SWOT-analyse af Danmarks maritime erhverv (2012) Notat udarbejdet af Oxford Research A/S for Danmarks Maritime Klynge. December 2012.
- Tan, W. (2013) Initiatives to boost Singapore's maritime industry. Stamford Law Corporation. <http://www.lexology.com/library/detail.aspx?g=05dac666-74ef-462d-85b3-609097d25353>, retrieved 30.9.2013.
- TEM (2013) Vapaavuori: Suomalaisella osaamisella kysyntää Brasiliassa. Työ- ja elinkeinoministeriö. http://www.tem.fi/yriytykset/tiedotteet_yriytykset/vapaavuori-suomalaisella-osaamisella-kysyntaa-brasiliassa.109832.news, retrieved 9.10.2013.
- Thao, P. (2012) The unlearned lesson. Saigon Times, May 26. <http://english.thesaigontimes.vn/Home/features/friday/23653>, retrieved 10.10.2013.

- Tradeology, the ITA Blog (2012) Baltimore's Maritime Applied Physics Finds Success in South Korea. <http://blog.trade.gov/2012/02/29/baltimores-maritime-applied-physics-finds-success-in-south-korea/>, retrieved 2.10.2013.
- Transportation Institute (2009) Jones Act/Domestic Shipping. <http://www.trans-inst.org/jones-act.html>, retrieved 10.10.2013.
- Tsamenyi, M. & Kenchington, R. (2012) Australian Oceans Policymaking. *Coastal Management*, 40:119–132.
- UM (2012) Pääministeri Katainen ja ministeri Stubb Brasiliaan. Ministry of Foreign Affairs of Finland. Tiedote 43/2012. <http://formin.finland.fi/public/default.aspx?contentid=241446&contentlan=1&culture=fi-FI>, retrieved 9.10.2013.
- Vallat, F. (2013) An interview with President of Cluster Maritime Français. October 15.
- Van Oord (2013) <http://www.vanoord.com/about-us>, retrieved 11.9.2013.
- Vauraste, T. (2013) A recorded interview with CEO of Arctia Shipping, Espoo, March 10.
- VDR (2012) Jahresbericht 2012.
- VDR (2013) Daten der deutschen Seeschifffahrt. Ausgabe 2013.
- Ventures Africa (2013) Plans for Shipyard Set to Boost Nigeria's Maritime Sector. *Ventures*, May 8. <http://www.ventures-africa.com/2013/05/plans-for-shipyard-set-to-boost-nigerias-maritime-sector/>, retrieved 16.9.2013.
- Verband Deutscher Reeder (2012) Merchant shipping in numbers. <http://www.reederverband.de/en/facts-figures.html>, retrieved 11.9.2012.
- Verband für Schiffsbau und Meerestechnik (2012) <http://www.vsm.de/VSMWS/videos.xhtml>, retrieved 11.9.2012.
- VietNamNet Bridge (2013) Ports lying still, waiting for vessels. August 8. <http://english.vietnamnet.vn/fms/business/81190/ports-lying-still--waiting-for-vessels.html>, retrieved 10.10.2013.
- Vinalines (2013) Main funtions. <http://www.vinalines.com.vn/?page=info&show=1&id=25>, retrieved 10.10.2013.
- Vorotnikov, V. (2012) Russia approves shipbuilding program. *Baird Maritime*, 9 October. http://www.bairdmaritime.com/index.php?option=com_content&view=article&id=13485:russia-approves-shipbuilding-program&catid=113:ports-and-shipping&Itemid=208, retrieved 10.10.2013.
- VSM (2012) Jahresbericht 2012.
- VSM (2012/2013) Facilities, Production Programmes, Services. 2012/2013.
- VSM (2013) Umweltschutz durch Technik: Made in Germany. Schiffbauindustri 2013.
- Vukmanovic, O. & Koranyi, B. (2013) Russia's revival of Arctic Northern Sea Route at least 10 years away. *The Star*, January 25. http://www.thestar.com/business/2013/01/25/russias_revival_of_arctic_northern_sea_route_at_least_10_years_away.html, retrieved 10.10.2013.
- Vøgg, E. (2012) The Indian Ship building Industry. DIBD – OMII. <http://di.dk/SiteCollectionDocuments/DIBD/The%20Indian%20Shipbuilding%20Industry%202012.pdf>, retrieved 27.9.2013.
- Wagenborg (2013) <http://www.wagenborg.com/en/divisions/wagenborg-shipping.aspx>, retrieved 10.9.2013.
- Wee, V. (2013) Indonesian shipbuilding industry unlikely to meet targets. *Seatrade Global*, August 15. <http://www.seatrade-global.com/news/asia/indonesian-shipbuilding-industry-unlikely-to-meet-targets.html>, retrieved 11.10.2013.
- Wengel-Nielsen, M. (2013) Behov for arbejdskraft og kompetenceløft i offshore sektoren. *Maritime Danmark*, Oktober 2013. Nr. 10.
- Western Shipyard (2013) <http://www.wsy.lt>, retrieved 21.10.2013.
- Wijnolst, N. (2006) Dynamic European Maritime Clusters. Maritimt Forum, Norway and Dutch Maritime Network in cooperation with European Network of Maritime Clusters. <http://www.maritiemland.nl/media/1002165/nml-serie---rapport-30---studie-30.pdf>, 13.9.2013.
- WIR (2013) World Investment Report 2013. United Nations Conference on Trade and Development (UNCTAD). http://unctad.org/en/PublicationsLibrary/wir2013_en.pdf, retrieved 9.10.2013.
- WMU (2013) WMU in the Philippines. <http://wmu.se/news/wmu-philippines>, retrieved 21.8.2013.
- Wolf, C & Klimasinska, K. (2012) Shell-Led Arctic Push Finds U.S. Shy in Icebreakers: Energy. *Bloomberg*, July 18. <http://www.bloomberg.com/news/2012-07-18/shell-led-arctic-push-finds-u-s-shy-in-icebreakers-energy-1-.html>, retrieved 10.10.2013.
- Working on the Norwegian shipyard industry (2013) http://www.nav.no/NAV+EURES+work+and+recruit+in+Norway/Selected+professions+and+industries/_attachment/275600?_ts=13ea7c13fe0&download=true, retrieved 17.10.2013.
- World Cargo News (2012) French port reforms "expensive" (Published 8.3.2012) <http://www.worldcargonews.com/htm/w20120308.060325.htm>, retrieved 18.9.2013.

- The World Factbook (2013) Central Intelligence Agency. Library, 13.8.2013. <https://www.cia.gov/library/publications/the-world-factbook/geos/rp.html>, retrieved 21.8.2013.
- World Maritime News (2013) Shipbuilding at the Heart of South Korea's Economic Development. <http://worldmaritimenews.com/archives/87608/shipbuilding-at-the-heart-of-south-koreas-economic-development/>, retrieved 26.8.2013.
- World Maritime News (2012) Malaysia Aims to Become Global Player in Shipbuilding Industry. <http://worldmaritimenews.com/archives/66695/malaysia-aims-to-become-global-player-in-shipbuilding-industry/>, retrieved 30.9.2013.
- Wyre Tidal Energy (2013) <http://www.wyretidalenergy.com/tidal-barrage/la-rance-barrage>, retrieved 18.9.2013.
- Wärtsilä Corporation (2012) Wärtsilä gets propulsion order for the first LNG powered ferry in North America. Press Release, December 3. <http://www.wartsila.com/en/press-releases/wartsila-gets-propulsion-order-for-the-first-lng-powered-ferry-in-north-america>, retrieved 10.10.2013.
- Wärtsilä Corporation (2013) Wärtsilä's integrated solution selected for two environmentally advanced Canadian ferries. Press Release, September 11. http://www.wartsila.com/en_US/news-releases/Wartsila-Selected-Two-Canadian-Ferries, retrieved 10.10.2013.
- Wärtsilä Press Releases (2008) <http://www.wartsila.com/en/press-releases/Wartsila-strengthens-its-presence-in-South-Korea-inaugurates-new-service-centre-and-office>, retrieved 2.10.2013.
- Xinhuanet (2013) China's Maritime Industry to Keep Growing. http://news.xinhuanet.com/english/china/2013-5/20/c_132395837.htm, retrieved 5.6.2013.
- Xu, Z. (2008) Policy and Practice: The Development of China's Port Industry. Presentation at the United Nations Economic Commission for Europe (UNECE) conference "Hinterland Connections of Seaports: the role of seaports as a link between inland and maritime transport", 17-18 September, 2008 – Piraeus, Greece. http://www.unece.org/fileadmin/DAM/trans/doc/2008/wp5/GE1_Piraeus_Opening_Xu.pdf, retrieved 20.6.2013.
- Yang, M. & Zhu, J. (2011) China's Shipbuilding Industry: An update. EAI Background Brief, No. 592, 13 January. <http://www.eai.nus.edu.sg/BB592.pdf>, retrieved 9.6.2013.
- Yeo, J. (2013) Investing in the Singapore Maritime and Off-shore Industry. The Motley Fool. <http://www.fool.sg/2013/07/09/investing-in-the-singapore-maritime-and-off-shore-industry/>, retrieved 30.9.2013.
- Yusuf, M. & Trondsen, T. (2013) Improving Indonesia's competitiveness: Innovation value chains and cluster-bases for realizing the huge potential of marine and fisheries. *The International Journal of Organizational Innovation*, Vol. 6, No. 1. July 2013.
- Zamil Offshore (2013) Affiliation. Zamil Offshore. <http://www.zamiloffshore.com/en/affiliation.php>, retrieved 2.10.2013.
- Zanini, P. (2013) A phone interview with General Manager (Services, Sales) of Wärtsilä Italia, October 2.
- 国际船舶网 (2012) 马来西亚制定大力发展造船业计划. http://www.eworldship.com/html/2012/ShipbuildingAbroad_1107/61392.html, retrieved 30.9.2013.
- 何广顺 (2012) 海洋经济：国民经济新的增长点. 今日中国. http://www.chinatoday.com.cn/ctchinese/reports/article/201208/30/content_479159.htm, retrieved 5.7.2013.
- 环球网 - 财经 (2012) 交通部官员：中国已与 68 国或地区签署海运或河运协定. <http://finance.huanqiu.com/data/2012-07/2905128.html>, retrieved 7.6.2013.
- 环球运费网 (2011a) MISC 宣布退出班轮业 恐对全行业造成震荡. <http://www.100allin.com/news/1/2/67632.html>, retrieved 7.10.2013.
- 环球运费网 (2011b) MISC 关闭班轮运输业 宣布出售 16 艘集装箱船. <http://www.100allin.com/news/1/2/68091.html>, retrieved 7.10.2013.
- 贾大山 (2008) 专家观察. in 港口与海运业: 见证中国崛起. Ministry of Transport of the People's Republic of China. http://www.moc.gov.cn/zhuzhan/zaixianfangtan/huangjinshuidao/xiangguanziliao/200812/t20081205_542263.html, retrieved 5.8.2013.
- 刘兴增 & 杨光 (2008a) 改革是原动力. in 港口与海运业: 见证中国崛起. Ministry of Transport of the People's Republic of China. http://www.moc.gov.cn/zhuzhan/zaixianfangtan/huangjinshuidao/xiangguanziliao/200812/t20081205_542263.html, retrieved 5.8.2013.
- 刘兴增 & 杨光 (2008b) 开放是助推器. in 港口与海运业: 见证中国崛起. Ministry of Transport of the People's Republic of China. http://www.moc.gov.cn/zhuzhan/zaixianfangtan/huangjinshuidao/xiangguanziliao/200812/t20081205_542263.html, retrieved 5.8.2013.

- 陆娅楠 (2011) 我国海运船队规模跃居世界第三. 环球网 - 财经. 12 July, 2011. <http://finance.huanqiu.com/roll/2011-07/1815652.html>, retrieved 7.6.2013.
- 罗沙 (2013) 国家海洋局报告: 中国海洋经济 2030 年后进入成熟期. 经济参考. http://www.jjckb.cn/2013-05/20/content_445839.htm, retrieved 5.6.2013.
- 牛序谋 (2013) 全线溃败 韩造船航运 2012 不堪回首. 中国船舶工业集团公司 (CSSC). http://www.cssc.net.cn/component_news/news_detail.php?id=13821, retrieved 9.9.2013.
- 苏海河 (2013) 韩国海洋经济开发的经验与启示: 韩国海洋经济面面观. 中国海洋报. <http://epaper.oceanol.com/shtml/zghyb/20130715/63185.shtml>, retrieved 5.9.2013.
- 王晓惠 (2011) 海洋经济对东南亚社会经济发展影响分析. 海洋经济, Vol. 1, Issue 1, pp. 53-61.
- 肖钟熙 (2013) 韩国海运政策调整的回顾. <http://forum.seafta.com/ShowPost?ThreadID=58>, retrieved 9.9.2013.
- 杨钰池 (2009) 应用资料包络分析法来比较台、日、韩三国国轮船队海运竞争优势. Maritime Quarterly, Vol. 18, No. 2, June 2009, pp. 21-43.
- 杨钰池 (2013) 韩国海运政策之介绍. <http://web.idv.nkmu.edu.tw/~hgyang/mp-c81.pdf>, retrieved 3.9.2013.
- 杨光 (2008) 回眸. 港口与海运业: 见证中国崛起. Ministry of Transport of the People's Republic of China. http://www.moc.gov.cn/zhuozhan/zaixianfangtan/huangjinshuidao/xiangguanziliao/200812/t20081205_542263.html, retrieved 5.8.2013.
- 殷毅 (2013) 海运业发展应上升为国家战略——访全国人大代表、宁波港集团总裁李令红. 中国船检, Vol. 3.
- 张力军 (2012) 中国造船业如何走出困境? 财富中文网. http://www.fortunechina.com/column/c/2012-10/04/content_119342.htm, retrieved 6.6.2013.
- 张良 (2011) 中国海运业的现实与突围. 瞭望, 19 September 2011. http://news.sina.com.cn/c/sd/2011-09-19/102123178709_4.shtml, retrieved 5.8.2013.
- 张艳 (2009) 马来西亚: 重视海洋研究与发展. 中国海洋新闻网. http://news.oceanol.com/?optionid=456&auto_id=870, retrieved 11.10.2013.
- 中国报告网 (2011) 2011 年我国航运业现状分析与未来发展趋势. <http://jingzheng.chinabaogao.com/jiaotong/121G234V2011.html>, retrieved 5.8.2013.
- 中国海事服务网 (2011) 深度: 韩国海运业缘何盈转亏. http://www.cnss.com.cn/html/2011/hysczhgc_0823/59237.html, retrieved 6.9.2013.
- 中国海事服务网 (2013) 为什么我国还不是海运强国. http://www.cnss.com.cn/html/2013/hycj_0718/109054.html, retrieved 6.8.2013.
- 中国行业研究网 (2012) 2012 年我国航运业发展态势分析点评. <http://www.chinairn.com/news/20120921/859966.html>, retrieved 5.8.2013.
- 中国网-财经 (2013) 兴海强国 让航运不再“迷航”. <http://finance.china.com.cn/roll/20130711/1627396.shtml>, retrieved 5.8.2013.
- 中华航运 (2013) 韩国实施北极综合政策推进计划. http://info.chineseshipping.com.cn/cninfo/News/Shipping/201308/t20130805_1214497.shtml, retrieved 9.9.2013.



The Smart Comp project is partly financed by the Central Baltic INTERREG IV A Programme 2007–2013.

This report reflects the authors' views and the Managing Authority of Central Baltic INTERREG IV A Programme 2007–2013 cannot be held liable for the information published by the project partners.

Technical editors:

Ms Eini Laaksonen
eini.laaksonen@utu.fi
+358 2333 9565
Pan-European Institute
Turku School of Economics
20014 University of Turku, Finland

Ms Hanna Mäkinen
hasoma@utu.fi
+358 2333 9563
Pan-European Institute
Turku School of Economics
20014 University of Turku, Finland

For more information about the SmartComp publications and events,
please visit www.cb-smartcomp.eu.