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Contents

1 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).

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).

2 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).

3 Cluster competitiveness (SWOT analysis)

3.1. Strengths and weaknesses

In general, China's emerging economy, strong support by the state, and the country's huge human potential has 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 stablizing 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).

3.2. Opportunities and threats

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 competiveness 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 competiveness 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).

To summarize, the strength, weaknesses, opportunities and threats of the Chinese maritime clusters are briefly listed in the table on the following page.

Table 1. SWOT-analysis of the Chinese maritime sector

Strengths	Weaknesses
· China's economic growth · State support · Low cost labor · Basic vessel production · Shipping fleet size · Vessel technology related to e.g. large vessels · Port capacity & handling efficiency	· 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**
· 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	· 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

4 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.

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