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WORLD MARITIME UNIVERSITY

Dalian, China

**SWOT ANALYSIS OF THE AUTHORIZATION OF CHINESE
SHIP RECYCLING YARDS**

By

SUN FAMING

China

A research paper submitted to the World Maritime University in partial
Fulfillment of the requirements for the award of the degree of

MASTER OF SCIENCE

(MARITIME SAFETY AND ENVIRONMENTAL MANAGEMENT)

2013

Declaration

I certify that all the material in this research paper that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this research paper reflect my own personal views, and are not necessarily endorsed by the University.

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Title: SWOT Analysis of the Authorization of Chinese Ship Recycling Yards

Degree: MSc

Abstract

The competent authority of a Party is required by the Hong Kong Convention to establish a mechanism for authorizing ship recycling facilities under its jurisdiction so as to ensure the compliance of the recycling facilities with the requirements of the Convention. To date, the authorization has not been implemented in the world major recycling states, but it is recognized to be an indispensable section of the sustainable development of ship recycling industry. Hence, this research paper is a study on the SWOT (Strengths, Weaknesses, Opportunities and Threats) of Chinese ship breaking industry on the implementation of the authorization

In order to achieve the desirable objectives, a comparative analysis of Chinese ship breaking industry with the sectors in South Asian recycling states and a study on the recycling standards of South Asian recycling nations and EU region as well as global ship recycling situation are conducted.

As a result of the SWOT analysis, Chinese recycling industry has certain advantages and some weaknesses on the implementation of the authorization over that in South Asian countries, but the weaknesses could be solved or minimized with effective measures. Meanwhile, our major competitive ship breaking states are improving their domestic recycling standards, so further improvements of Chinese recycling technical standards is essential otherwise the strengths of the breaking sector will be weakened or will disappear. Most importantly, the prosperity of ship breaking industry will last

in the next 5 years, so the next 2-3 years will be an optimal opportunity for Chinese competent authority to carry out the authorization.

Basing on the analysis, the author's knowledge and work experience, some possible recommendations for the authorization of Chinese ship breaking yards are proposed.

Keywords: China; Ship recycling facilities; Authorization; SWOT analysis.

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List of Abbreviations

AMRA	AnHui Material Recycling Association
BC	The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
BDI	Baltic Dry Index
BOF	Basic Oxygen Furnace
CANSI	China Association of the National Shipbuilding Industry
CNPC	National People's Congress of the People's Republic of China
CNSA	China National Shiprecycling Association
DASR	Document of Authorization to conduct Ship Recycling
DWT	Deadweight tonnage
EAF	Electric Arc Furnace
EIA	Environmental Impact Assessment
EMSA	European Maritime Safety Agency
EPA	Environmental Protection Administration
EU	European Union
GASRF	2012 Guidelines for the Authorization of Ship Recycling Facilities
GMS	India Global Marketing System
GSRR	Green Ship Recycling General Regulation
HKC	Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
ILO	International Labor Organization
IMO	International Maritime Organization
LC	Letter of Credit
LDT	Light Displacement Ton
MEP	Ministry of Environmental Protection
MEPC	Marine Environmental Protection Committee
MOF	Ministry of Finance

MOT	Ministry of Transport
MSA	Maritime Safety Administration
NDRC	National Development and Reform Commission
ODS	Ozone depleting substances
PCB	Poly chlorinated biphenyl
PPR	Regulations of the PRC on the Prevention and Control of Marine Pollution from Ships
PRC	the People's Republic of China
SC	State Council
SRFP	Ship Recycling Facility Plan
SRR	Regulations of the People's Republic of China (PRC) on the Environment Protection from the Ship Breaking
STA	State Taxation Administration
SWOT	Strengths, Weaknesses, Opportunities and Threats
UNEP	United Nations Environment Program
VAT	Value-added Tax
VLCC	Very Large Crude Carrier

Chapter 1 Introduction

1.1 Background

Ship breaking is an environment-friendly way to dispose end-of-life ships and is an essentially sustainable activity, the benefits of which are felt at global level. A study carried out by Dr Nikos Mikelis (2008, p. 228), the head of IMO Marine Pollution Prevention & Ship Recycling Section, shows that:

If the average age of recycled ships is 30 years and there are 95,000 ships over 100 GT in the world fleet, we could estimate that the average future recycling demand would be around 3,100-3,200 ships per year ($=95,000/30$).

In addition, Yan Heming (2005a), the director of China National Shiprecycling Association (CNSA), notes that approximately 99 percent of items on board a wrecked vessel could be recycled including steel, machinery, equipment and furniture, while there also exist a wide range of hazardous materials onboard ships such as oily waste, asbestos, Poly Chlorinated Biphenyl (PCB), etc. In the course of dismantling of the ships, these substances pollute the environment and have damaging health impacts on the workers and communities surrounding ship scrapping yards.

The civil society therefore campaigned for a safer and a more environmentally friendly ship recycling industry. The first attempt to address this issue worldwide was the adoption of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention or BC) in 1989. This Convention was developed to combat the “toxic trade”, which had been discovered in Africa and other parts of the developing world (Mikelis, 2013). Subsequently, IMO, ILO and other regional organizations respectively adopted guidelines to solve the problems resulting from ship recycling activities.

However, the BC and the guidelines did not establish a special system for ships, so

IMO promulgated a new international Convention known as Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (the Hong Kong Convention or HKC), which is aimed at minimizing the unnecessary risk of ship recycling activities to human health and safety or to the environment.

Regulations in the HKC cover ships' entire economic lives, incorporating the design, construction, operation and recycling, so as to facilitate safe and environmentally sound recycling. Thereinto, it is required by the Convention that the competent authority of a Party shall establish a mechanism which shall include the verification of documentation and a site inspection for authorizing ship recycling facilities under its jurisdiction so as to ensure that ship recycling facilities comply with the requirements of the Convention (IMO, 2009a).

The current world ship recycling market is dominated by Bangladesh, China, India and Pakistan for over 90% of the global retired tonnage has been recycled by these countries (Mikelis, 2011a). It is over four years since the adoption of the HKC, but these major recycling nations have not been implemented with the authorization of ship recycling facilities in accordance with the requirements of the HKC. However, with the increasingly public concern on the ship recycling industry and the ratification of more and more countries for the Hong Kong Convention, the certification of ship recycling facilities will be an inevitable stage to the sustainable development of world ship breaking industry.

1.2 Significance of the research

China is one of the world's biggest ship recycling states and it recycled about 31% and 25% of the ships sent to scrapping yards globally in 2009 and 2010 respectively (Mikelis, 2011b). The ship breaking industry of China is mainly located in the Yangtze River Delta Region and Pearl River Delta Region (Yan, 2005b). It is reported

on Chinese People Net (2007) that there are approximately 100 ship scrapping yards along Chinese coastal zone. China National Shiprecycling Association lists about 30 ship recyclers as its members on its website.

The ship breaking industry has witnessed a rapid development with the supports of a series of national policies since 1982 (Yan, 2005c). The industry creates employment opportunities for thousands of people especially the workers coming from rural areas and supplies Chinese steelmaking sector with large amounts of steel scrap. Despite, the fact that the ship recycling industry is a rising industry in China in terms of both employment and satisfying the demand for steel scrap, the negative environmental and healthy impacts of this industry could not be ignored. A research carried out by Wang Xiangang & Zhang Jiazhu (1999, p. 552) on the occupational hazards of the ship breaking industry which involves 25 ship scrapping yards located in Jiangsu Province reveals that the concentrations of lead smoke, nitrogen oxides, sulfur dioxide, phosphine and asbestos dust in the workplace of 13 scrapping yards have exceeded national healthy standards. Of 2746 workers who have the opportunity to contact the lead element, 39 workers (about 1.42%) have been suffered with the disease of chronic plumbism. Meanwhile, there were 55 significant casualties happened in these yards within the period of five years before the research, which has resulted in 26 deaths and 42 serious physical injuries.

Recently, most ship breakers recycle vessels in a safe and environmentally friendly way in accordance with international standards and the requirements of domestic laws and regulations, and have basically complied with the national development notion of “Green Recycling” (Shi, 2012a). However, the Disease Prevention and Control Center of Shanghai City received 65 documents of chronic saturnism from a ship breaking yard in the first three quarters of 2007 (Kang, Wang, & Shen, 2008, p. 524). This fact reveals that there are still some scrapping yards whose working practice and technical standards are left much to be improved. For instance, the management systems are not

comprehensive; pollution prevention facilities and equipment are not adequate; there is no sufficient personal protection equipment.

Prior to the promulgation of the Hong Kong Convention, Chinese authorities have adopted a series of laws, rules and regulations, i.e., “Regulations of the People's Republic of China (PRC) on the Environment Protection from the Ship Breaking”, “Green Ship Recycling General Regulation” and “Technical guideline for Pollution Prevention related to Ship Breaking” to regulate and control the recycling facilities and activities. In addition, following the adoption of the HKC, China Ministry of Transport (MOT) successively promulgated the “Regulations of the PRC on the Prevention and Control of Marine Pollution from Ships” and “Requirements on Facilities/Equipments/Operation for Pollution Prevention in Shipyard and Ship Recycling Units” to further regulate ship breaking yards in terms of the location of scrapping yards, the emergency equipment allocation, operational safety, pollution prevention measures, etc.

However, the provisions concerning the authorization of ship recycling yards (the authorization or the certification) in the above laws and regulations do not entirely comply with relevant requirements of the HKC, i.e. the absence of procedures and standards for the authorization, the scarcity of the requirements on the “Document of Authorization to Conduct Ship Recycling” (DASR), etc. nor has the certification required by the HKC been put into practice. But there is no available study in China which explores how the competent authority to carry out the certification, what matters will be met and how to address them in implementing the certification. With the approaching of the entry into force of Hong Kong Convention, the authorization of ship recycling facilities will be a major issue that the government of a Party should deal with. Hence, the study on the authorization of Chinese ship recycling yards is of realistic significance.

1.3 Organization of the research

This paper aims at analyzing strengths and weaknesses of Chinese recycling industry in implementing the authorization through the comparison of the industry with the sectors in major South Asian recycling states, and possible opportunities and threats in the external environment so as to give recommendations to relevant governmental bodies to make appropriate preparation for the entry into force of the Hong Kong Convention.

The content of the study is arranged in a logical sequence to obtain the desirable objectives, which is composed of five chapters:

Chapter 1 introduces the background, significance and organization of the paper

Chapter 2 introduces relevant theories and actual conditions of the ship recycling industry, including the relationships among ship building, shipping and ship recycling, the global development and Chinese ship recycling industry.

Chapter 3 is a purely legal part, which shows major articles of the Hong Kong Convention and IMO guidelines concerning the authorization of ship recycling facilities and the key items scattered amongst national regulations and provisions applicable to Chinese ship breaking yards.

Chapter 4 is the focus of the paper, where the strengths, weaknesses, opportunities and threats in the implementation process of the certification are elaborated on.

Chapter 5 provides some recommendations in terms of the implementation of the authorization on the basis of the author's analysis, and draw conclusion of this research.

Chapter 2 Review of the ship recycling industry

2.1 The relationship amongst ship building, shipping and ship recycling

According to the definition in the HKC, “Ship Recycling” (IMO, 2009b) means:

The activity of complete or partial dismantling of a ship at a ship recycling facility in order to recover components and materials for reprocessing and re-use, whilst taking care of hazardous and other materials, and includes associated operations such as storage and treatment of components and materials on site.

Therefore, ship recycling is of termination of a ship’s economic life. Shipbuilding-shipping-shiprecycling is an integrated industrial chain. Compared with shipbuilding industry, the scale of ship recycling industry and its contributions to the global GDP could be described as a drop in the bucket, but almost every vessel must ultimately be scrapped in ship dismantling yards, the boom of shipbuilding and shipping sectors therefore plays a decisive role for the development of ship recycling industry.

2.1.1 The impacts of new tonnage on the ship breaking volume

As the destination of the ship-related business, the recycling industry is necessarily affected by the shipbuilding industry. Generally speaking, Ships have a limited lifespan, which is about 30 years (Mikelis, 2011c). Thus ship recycling volume of a certain year on the global scale was mainly attributed to the introduction of new tonnage within a specific period 30 years before. Definitely the magnitude of new ships in the recent years has a certain impact on that year’s recycled figure, i.e., if the number of new ships introduced to the freight market rises, more aged vessels will be recycled.

2.1.2 The impacts of the freight market on the ship recycling volume

Generally speaking, when the freight markets are paying well for ships, shipowners would prolong the service lives of their ships that are close to or has exceeded their normal operational lives, or would put their vessels that has been laid up for a period of time into the market after a comprehensive maintenance or reconstruction. At this time, the tonnage offered for recycling naturally reduces. To the contrary, when the freight markets are low, the existing vessels that did not reach their regular economic lives would be scrapped by the owners or sold for dismantling in order to mitigate the surplus of their fleet capacities. At such time, there would be a lot more tonnage in the world offered for recycling.

2.2 Review of ship recycling industry worldwide

Global ship recycling industry was initiated in the 1950s. Originally, recycling activities took place primarily in Northern Europe, the United States and Japan, and basically in warships and fishing boats. At that time, the dismantling volume was just 1 to 2 million DWT per year, while the figure increased dramatically in the late 1960s, reaching approximately 5 million DWT, almost 3 times that of in 1950s. During this period, the ship breaking market gradually expanded into a global scale, whilst Japan and China Hong Kong became the major recycling areas in the world. Meanwhile, dry cargo vessels replaced the warships and fishing boats became the primary type of ship being dismantled (Wu, 2012a, p. 18).

The downturn of the world tanker market since 1975 led to the overstock of all size of oil tankers, yet it created the prosperity of world ship recycling industry. As a result, the annual recycled volumes from 1975 to 1978 were over 10 million DWT, and a historical miracle of 20 million DWT was also created on the recycled volume in 1978. Interestingly, Taiwan, Spain and South Korea gently became the top three ship recycling states in the world within this period (Yang, 1993, p. 55).

The world recycling market experienced a third boom after 1980, reaching 42.5 million DWT of dismantling tonnage in 1985, but the figure constantly dropped down in the following several years, especially in 1989, where the global recycling magnitude was just about 3 million DWT. After that, the dismantling volume was kept constant but the world ship recycling center shifted from Taiwan, Spain and South Korea to China mainland and India and then to Bangladesh (Wu, 2012b, p. 19).

The breakout of the global economic crisis in 2008 breathes a new life into global recycling industry. The number of ships delivered to ship recycling facilities continuously jumped up, reaching 57.5 million DWT in 2012. Meanwhile, the world recycling center was transferred to India again (CnshipNet, 2013a).

It can be seen from the statistics on global annual recycled tonnage (shown in Table 1) that in recent years, over 90% of the global retired tonnage has been recycled by the same four countries: Bangladesh, China, India and Pakistan, so other three South Asian recycling states are major competitors of Chinese ship breaking industry.

Table 1: The annual volume of recycled tonnage (In Gross Tons) (million tons)

	2005	2006	2007	2008	2009	2010
World total	3.77	4.59	4.15	8.28	24.96	18.67
Bangladesh	2.11	2.88	1.84	4.18	6.61	3.93
China	0.15	0.25	0.34	0.93	7.74	4.72
India	1.12	0.85	1.33	2.46	7.56	6.53
Pakistan	0.05	0.19	0.38	0.27	2.10	2.44
Rest of the world	0.34	0.42	0.26	0.44	0.95	1.05
percentage of first four to world total	91%	91%	94%	95%	96%	94%

Source: Extract from “UK Collegium of the Society of Naval Architects and Marine Engineers Sponsored by the American Bureau of Shipping.” (Mikelis, 2011)

2.3 Introduction to Chinese ship recycling industry

Chinese ship recycling industry was established in the 1960s. In the first two decades, the recyclers only dismantled and recycled a small number of domestic end-of-life ships. The industry was booming with the support of national tax and other policies after 1982, both the number of scrapping yards and the annual recycling capability increased dramatically, reaching a mere 140 and 2.5 million LDT respectively. Also worthy of note were that Chinese breaking industry in 1992 and 1993 enjoyed over 50% market share in the global market, and became the biggest recycling market in the world. But after the ship breakers fell into financial trouble due to the abolishment of national tax incentives at 1994, approximately 90% of the ship breakers gradually went bankruptcy in the following several years, and the imported volume was wandering between 0.14 and 0.20 million LDT per year (Xu, 2009, p. 53).

In 1998, a new preferential policy concerning the value-added tax for importing scrapped ships was presented to the recyclers again. About 23 big scrapping yards enjoyed this policy. As a consequence, the scales and technical standards in these yards were greatly improved which, in a certain extent, led to the boom of China's recycled tonnage in the next following five years. The recycled volume stood at 1.1 million DWT in 2003, which is the historical peak in Chinese recycling market, but after that the figure constantly went down with the booming of world shipping (He, & Wu, 2012, p. 9).

The outbreak of the global economic crisis in 2008 almost affected every field, but on the contrary, global ship breakers enjoyed the growth of its profits due to the abandonment of a large amount of ships. Accordingly, the recycled tonnage in China ascended significantly after 2008, reaching 4.3 million DWT in 2010 and 5.7 million DWT in 2011 respectively (He, & Wu, 2012, p. 10).

To sum up, in the past three decades, Chinese ship breaking industry has achieved a qualitative transition. Especially in recent years, with the promotion of modern management and the degree of mechanization, the safe and environmental sound recycling capability of breaking yards was considerably upgraded. Most yards nowadays employ pier or dock dismantling methods, and have a relatively powerful competitiveness in the global recycling market in terms of the recycling technologies and crafts, the environmental protection facilities and the production efficiency. Furthermore, Chinese administrations have also taken numerous measures including preferential tax policies, which guide the recyclers to make additional investments in improving the safe and environmental protection standards in order to effectively control and mitigate the rates of accidents, injury and pollution. Today Chinese ship recycling industry has become an environmental protection industry with annual dismantling capacity of 3.5 million LDT (Li, 2012, p. 78).

Chapter 3 International Convention, Guidelines and national regulations concerning ship recycling facilities and its authorization

3.1 The Hong Kong Convention

The issues of safety, environmental protection and occupational health involved in ship recycling activities have aroused widespread concerns in the international maritime community. In order to lessen the relevant risks, IMO adopted the Hong Kong Convention in May, 2009 in Hong Kong, China. The HKC provides applicable technical standards worldwide for ships and recycling facilities in terms of safety and green dismantling. The adoption of the HKC resolved the long-term issue of “legal vacuum” existing in world ship breaking field, just as the notes of Mitropoulos (Wallis, 2009), the former Secretary-General of IMO, that “the approval of the Hong Kong Convention was a good outcome in the circumstances as it has succeeded in putting in place international rules and standards to regulate for the first time a complex and multi-faceted issue”.

Ship Recycling Facility is described in the HKC as “a defined area that is a site, yard or facility used for the recycling of ships”. According to the regulations in the Convention (IMO, 2009c), each Party shall establish a mechanism to ensure that ship breaking facilities under its jurisdiction meet the requirements and standards set forth in the Convention and its Annex. Moreover, each Party shall designate one or more competent authorities and the single contact point to be used by the Organization, Parties to the Convention and other interested entities, for matters related to ship recycling facilities operating within the jurisdiction of that Party.

The regulations of the Convention show that ship recycling facilities under the jurisdiction of a Party shall be authorized by the competent authority of that Party so as to recycle ships to which the Convention applies. It is also required by the

Convention that the authorization shall include verification of documents and a site inspection. After evaluation, the competent authority shall issue the DASR, the form of which has been set forth in Appendix 5, to the facilities who have thoroughly comply with the requirements in the annex. The DASR shall be valid within five years, and the text of which shall include a translation into English, French or Spanish if the language used is not one of these languages. Furthermore, the competent authority shall identify the terms for withdrawing, suspending, amending and renewing the DASR (IMO, 2009d).

Besides the requirements list above, the “Regulations for Safe and Environmentally Sound Recycling of Ship” also provides requirements on ship recycling facility plan, prevention of adverse effects to human health and the environment, safe and environmentally sound management of hazardous materials, emergency preparedness and response, etc (IMO, 2009e).

3.2 IMO Guidelines

In order to ensure the effective and smooth entry into force of the Hong Kong Convention, IMO’s Marine Environment Protection Committee (MEPC) has committed to promulgating guidelines relating to ship recycling activities and facilities since the adoption of the HKC. To date, the following guidelines have been developed and adopted by MEPC to assist ship recycling states in early implementing the Convention’s technical standards (Watkinson, 2012a, p. 25):

2011 Guidelines for the Development of the Inventory of Hazardous Materials, adopted by resolution MEPC.197 (62);

2011 Guidelines for the Development of the Ship Recycling Plan, adopted by resolution MEPC.196 (62);

2012 Guidelines for Safe and Environmentally Sound Ship Recycling, adopted by resolution MEPC.210 (63); and

2012 Guidelines for the Authorization of Ship Recycling Facilities, adopted by

resolution MEPC.211 (63)

Thereinto, the 2012 Guidelines for the Authorization of Ship Recycling Facilities (GASRF) (IMO, 2012) offers guidance to Parties in terms of establishing a scheme to assess ship recycling facilities under their jurisdictions in accordance with the requirements of the HKC. The *Guidelines* states that the ship recycling facility should submit a formal application with an integral Ship Recycling Facility Plan (SRFP) and any other documentation and certification required by applicable international or national legislation to the competent authority for conducting the authorization. The authority may evaluate and verify the application and its documentation within three months. After that, a site inspection should be carried out by the competent authority to check the consistency of the documentation with the actual arrangements and operations at the ship recycling facility. Meanwhile, the GASRF also provides recommendations on site inspection, specific procedural action relating to issuing, amending, suspending, withdrawing and renewing the DASR, validity of the DASR, communication of information, and monitoring of the activities of the ship recycling facility.

Besides, another three guidelines provide relevant standards for certifying ship recycling facilities. For example, the 2011 Guidelines for the Development of the Inventory of Hazardous Materials demonstrates detailed requirements for the ship recycling facility plan.

3.3 Requirements of the national regulations for the authorization of ship recycling yards

The words “Ship Recycling Facility” that frequently appears in the HKC could not be found in current Chinese laws and regulations, since the national provisions generally name it as “Ship Breaking Yard”. Today, the national requirements with regard to the

construction and operation of ship breaking yards are presented in the administrative regulations and industrial standards.

3.3.1 Analysis of the legal validity of the national regulations

According to the Legislation Law of the People's Republic of China (CNPC, 2000a), the National People's Congress (CNPC) and its Standing Committee exercise state legislative power, thus the national criminal, civil and other basic laws shall be enacted and amended by the CNPC, while the State Council (SC) may promulgate administrative regulations in accordance with the Constitution and national laws. It is also elaborated in the Legislation Law that the People's Congress and its Standing Committee of a province, autonomous region and municipality directly under the central government may promulgate local decrees in light of the specific situations and actual needs of its administrative area, but these decrees shall not violate any provision of the Constitution, the national laws, as well as administrative regulations. Meanwhile, the various ministries, committees and bodies directly under the SC, such as Ministry of Transport (MOT), Ministry of Environmental Protection (MEP), National Development and Reform Commission (NDRC), etc., may draft administrative rules within the scope of their authority and mandatory standards in accordance with the actual needs of the industries under their jurisdiction.

As far as legal validity is concerned, there is no doubt that the *Constitution* is of the highest level. It was followed by laws, administrative regulations, local decrees, administrative rules and mandatory industry standards (CNPC, 2000b), which is shown in Figure 1.

It is worthy to note that according to the Legislation Law (CNPC, 2000c), if there is divergence between new clause and old article on the same matter proposed by two national laws, and the applicable provision can not be settled, a ruling shall be made

by the Standing Committee of CNPC. Likewise, if there is a gap between new clause and old article on the same matter proposed by two administrative regulations, a ruling shall be made by the SC.

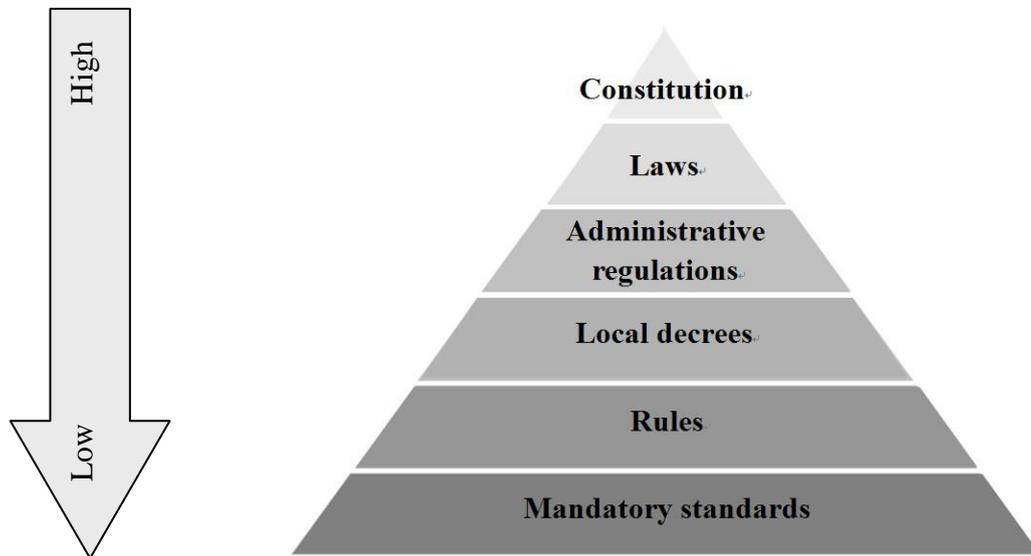


Figure 1 - Legal Validity of National Regulations

Source: Compiled by the author according to the Legislation Law of the PRC

3.3.2 Administrative regulations

3.3.2.1 Regulations of the PRC on the Environment Protection from the Ship Breaking (Ship Recycling Regulations or SRR)

The *Regulations* (China SC, 1988a) was published by the State Council on May 18, 1988 and came into force on 1st June of that year. It is the earliest administrative regulations developed to regulate Chinese ship breaking industry. Article 6 of the SRR states that the construction of a ship breaking yard must prepare an Environmental Impact Assessment (EIA), the content of which shall include geographical location of the yard, status of the surrounding environment, ship breaking scale and conditions, recycling technology, anti-pollution measures, and expected pollution prevention outcome, etc. The EIA of a huge or medium yard shall be verified and approved by the provincial Environmental Protection Administration (EPA) of the place where the

yard is located, while the EIA of a small yard shall be verified by the county EPA and then approved by the EPA who has the authority of much higher level. Without the approved EIA, the ship breaking yard was prohibited from being set up and recycling scrapped ships.

Meanwhile, the SRR also offers regulations on the recycling facilities and equipment. For instance, Article 10 of the SRR demonstrates that in order to recycle wrecked ships, the ship scrapping yard shall be equipped with the facilities and equipment necessary for the prevention of pollution from ship dismantling, incorporating the installations for oil containment, waste oil reception devices, oily sewage treatment facilities, waste recovery and disposal station, etc. Moreover, the yard shall also be verified and ratified by the EPA who has approved its EIA, after that, the yard can acquire an acceptance certificate prior to its entry into operations (China SC, 1988b).

3.3.2.2 Regulations of the PRC on the Prevention and Control of Marine Pollution from Ships (Pollution Prevention Regulations or PPR)

The Pollution Prevention Regulations was promulgated by the State Council in September, 2009 and came into force on March 1st, 2010.

Article 13 of the Regulations states that the enterprises engaged in ship dismantling activities shall establish safety operation and pollution prevention management systems and be equipped with the appropriate pollution prevention facilities and equipment in accordance with national norms and standards relating to the prevention of marine pollution from ships and their activities, as well as get the specific acceptance from the Maritime Safety Administration (MSA). Meanwhile, the PPR also provides clauses for regulating ship breaking activities, manners and sites, i.e., the recyclers should take essential safety and pollution prevention measures when they recycle aged ships so as to comply with the provisions of relevant rules;

operators working for the recyclers should have professional safety and pollution prevention knowledge and skills; the dismantling site should comply with the partition of environmental and marine function zones; the recyclers are banned to recycle vessels by employing beaching method; and so forth (China MOT, 2009).

3.3.3 Mandatory standards

3.3.3.1 Green Ship Recycling General Regulation (GSRR)

The GSRR (China NDRC, 2005a) is a mandatory industry standards drafted by China National Shiprecycling Association (CNSA) and promulgated by NDRC in 2005. The text of the GSRR involves environmental protection, safety production, personnel health protection, etc. The GSRR is formulated in accordance with the Basel Convention, national Regulations and Standards including “Wastewater Discharge Standards”, “Pollution Control Standard for Hazardous Wastes Incineration” and “Occupational Health and Safety Assessment Series”.

According to the GSRR, the space of the scrapping yard should be sufficient for the storage of production materials, equipment and solid waste, and should be separated into such zones as Basic Dismantling, Secondary Dismantling, Storage, Waste Disposal, Emergency Facility and Office. The sewage discharge, the wastes incineration and the disposal of the hazardous materials in the breaking yard should meet the requirements of national standards. Furthermore, the items also regulates breaking yards in other aspects, for instance, recycling yards should set up a specific safety management institutions and appoint appropriate safety management personnel to train new workers; the yards should build a medical room with simple equipment and commonly used medicaments as well as carry out periodic medical examinations for their staff so as to safeguard their health; operators should be equipped with protective suits, gloves, shoes, helmets, ear plugs, masks and goggles; and so forth

(China NDRC, 2005b).

3.3.3.2 Requirements on Facilities/Equipments/Operation for Pollution Prevention in Shipyard and Ship Recycling Unit

The *Requirements* is a mandatory standards concerning ship recycling industry, and was developed by China Ministry of Transport on August 20, 2010 and came into force on November 1st. Ship breaking yards in the *Requirements* were subdivided into four levels according to the maximum recyclable ship size, and were claimed to be equipped with ship pollutants reception facilities and pollution prevention installations suitable to their dismantling capabilities set forth by the international conventions and national regulations. The requirements for the facilities and equipment of the yards in various classes are shown in Table 2. In addition, the *Requirements* also provides provisions on such aspects as open dismantling areas, solid waste transportation tools, personnel protection and training, emergency preparedness and response (China MOT, 2010).

Table 2: Quantity requirements on ship dismantling yards in terms of pollution prevention facilities and equipment

Device name	Level			
	<2,000 GT	2,000-10,000 GT	10,000-50,000 GT	>50,000 GT
Oily water storage facilities (Effective volume, m ³)	100	200	300	400
Oil-water separation facilities (handling capacity, m ³ /h)	10	15	20	20
Oily water interim storage facilities (Effective volume, m ³)	3	3	6	8
Garbage storage facilities (Effective volume, m ³)	20	30	40	50
Solid wastes storage facilities (Effective volume, m ³)	30	40	50	60
Hazardous materials interim storage facilities (Effective volume, m ³)	30	40	50	60

Oil Booms (Length, m)	1200	1650	3000	3600
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Source: (China MOT, 2010)

Chapter 4 SWOT analysis of the authorization of Chinese ship recycling Yards

4.1 Introduction to SWOT tool

SWOT analysis is a method for analyzing internal strengths, weaknesses, and opportunities and threats in the external environment that a research project or a business faces (Arslan, & Er, 2008, p. 907).

The tool is attributed to Albert Humphrey, a management Professor worked for Stanford University in the 1960s and 1970s (Riley, 2012). Ideally, SWOT analysis is one step in a process which helps to discover what the firm does better than other competitors? What other competitors do better than the firm? Whether the firm could make the most of the opportunities accessible? How a firm could recognize the possible threats and should respond to the changes in its external environment? The consequence of the analysis is a matrix of positive and negative factors, which is illustrated in Table 3. Once this is done, the operator would discover something that will assist the project in accomplishing its objectives, or discover an obstacle that should be conquered or minimized so as to achieve the desired results.

Table 3: SWOT Matrix.

	Positive factors	Negative factors
Internal factors	Strengths	Weaknesses
External factors	Opportunities	Threats

Source: Compiled by the author

As far as the certification is concerned, the intention of the SWOT analysis is to maximize strengths, seize opportunities, minimize external threats, and transform weaknesses into strengths. Thus, SWOT analysis will be done in this chapter to analyze the current situation of the authorization of Chinese ship recycling yards.

After that, the author will make some recommendations on the national legislation, implementation strategies and personnel training and education in accordance with the results of the analysis.

4.2 Strengths

4.2.1 National policy support

Vast operational capital is demanded for recyclers due to the large investment, long ship dismantling cycle and the transaction of scrap ships. The statistics indicate that the magnitude of the capital for the transaction of scrap ships occupies 30% to 50% of the recycling costs of a Chinese scrapping yard, while this percentage goes up to 70% in Bangladesh shipbreaking sector, thus most of recycling enterprises resolve this capital issue by means of bank financing (Wu, 2012c, p. 32).

Due to the global financial crisis, the World Bank and the banks in various regions not only increased the loan interest but also mitigated credit lines for ship recycling facilities. Meanwhile, the Letter of Credit (LC) problems, namely some banks reject to issue the LCs to the applicants or the LCs issued by the banks in place where one party of a commercial contract is located could not be accepted by the banks in other places, first occurred to the ship recycling industry on September 2008, and rapidly spread to the whole region of South Asia (Wang, & Zeng, 2011, p. 67). Nowadays, many South Asian recyclers are stuck in a dilemma for the rapid increase of the retired tonnage due to the shortage of cash flow in the transaction of scrap ships, which was affected by credit squeeze and the restriction of the LC (Jia, 2009).

On the other hand, in the past five years, Chinese authority has introduced a series of policies and legal documents to help and stimulate the development of the ship recycling industry. Firstly, the General Office of the State Council developed six

policies for ship breakers through the “Shipbuilding industry Adjustment and Revitalization Plan” (China SC, 2009) which was adopted on February 2009. One of the policies is that ship scrapping yards can obtain concessionary loans from banks. This policy strongly assists domestic yards in solving their financial issues. Secondly, China NDRC (2011) enacted the “National Industrial Restructuring Guidance Catalogue”, where the ship recycling and remanufacturing industry was on the list of “Encouraged Industry Catalogues”. That means it will enjoy national favorable policies in terms of loans, revenue, etc., and the growth of which is encouraged. Last but not least, various provinces and cities have adopted a series of preferential policies, regarding the compensation for the early retirement of old vessels, scrapped ship mortgage financing, etc., to encourage the development of ship recycling yards in their administrative regions (He, & Wu, 2012, p.21).

Undoubtedly, additional investment is indispensable if the authorization of ship recycling units was carried out, but our recyclers have the financial advantage over those in South Asian states for the sake of the support of national policies. This advantage will mitigate the stress of Chinese recyclers caused by the improvement of recycling standards.

4.2.2 Favorable international cooperative relationship

The collaboration of Chinese recyclers with shipping firms (shipowners) in Denmark, Germany, Greece, Japan, Netherlands, Norway, the United Kingdom and the United States has been initiated and highly praised in recent years. For instance, the State Environmental Protection Administration of China signed the “Memorandum of Understanding on Environmental Cooperation” with Netherlands Ministry of Infrastructure and the Environment on February 13, 2002 (Ma, 2009, p. 15). The cooperation covers the environmentally sound dismantling of large vessels, the control of ship breaking activities, recycling technological trainings, etc. The signing

of the Memorandum benefits Chinese recyclers in improving their safety and environmental protection management, working conditions as well as workers' professional quality and capacity. In order to respond to the friendly cooperative agreement signed by the two governments, after a harmonious negotiation in July 2002, Netherlands P & O Nedlloyd Shipping Company signed a "Memorandum of ship recycling project" with the China Jiangyin Changjiang ship-breaking yard to carry out green ship recycling cooperation and activities (Jiang, Xu, & Tang, 2009, p. 84).

The partnerships mentioned above enable overseas shipping firms to better understand Chinese ship breakers' integrity and strength. As a result, more and more foreign shipowners are willing to send their end-of-life vessels to Chinese yards for recycling. The statistics show that the imported proportion of Chinese recycled tonnage has experienced a dramatic growth in the last several years, rising from 46.6% in 2004 to 62.2% in 2008 and to 75.1% in 2011 (Zhou, & Wu, 2007, p. 18; Jiang, Xu, & Tang, 2009, p. 85; Xue, 2012, p. 58). This situation could be attributed not only to the magnitude of global retired tonnage but also to the establishment of the cooperation among Chinese scrapping yards and overseas shipping companies. Therefore, the flourishing international cooperation serves as an incentive for Chinese recyclers to increase additional investments on the safety and environment protection to comply with the certification requirements of ship recycling yards.

4.2.3 Vast domestic demand for steel scraps

Admittedly, ships are recycled primarily in order to reuse their steel. The statistics show that steel scrap accounts for 80% of a ship breaking yard's output, and the trade of which contributes to 90% of a yard's profit (Wu, 2012d, p. 34). So the domestic demand for scrap steel is an impetus to the growth of a state's ship recycling industry. A research carried out by Dr Nikos Mikelis (2013a) shows that global steel production

is growing in spite of the recent economic downturn. Table 4 shows the twelve largest steel-making countries worldwide.

Table 4: The largest twelve steel producing countries (million tons)

	2007	2008	2009	2010	2011
World total	1346.0	1329.0	1224.0	1416.0	1513.0
China	489.3	500.3	573.6	626.7	683.9
Japan	120.2	118.7	87.5	109.6	107.6
United States	98.1	91.4	58.2	80.5	86.4
India	53.5	57.8	63.5	68.3	71.3
Russia	72.4	68.5	60.0	66.9	68.9
Korea Rep.	51.5	53.6	48.6	58.9	68.5
Germany	48.6	45.8	32.7	43.8	44.3
Ukraine	42.8	37.3	29.9	33.5	35.3
Brazil	33.8	33.7	26.5	32.9	35.2
Turkey	25.8	26.8	25.3	29.1	34.1
Italy	31.6	30.6	19.8	25.8	28.7
Taiwan	20.9	19.9	15.9	19.8	22.7

Source: (Mikelis, 2013)

It can be seen from Table 4 that China's steel production is uninterruptedly increasing, which now accounts for 45 percent of the world's production. It is also worthy to note that the magnitude of China's production is over six times that of in Japan, which is the second largest steel producer in the world. There are two main processes in modern steel making (Mikelis, 2013b):

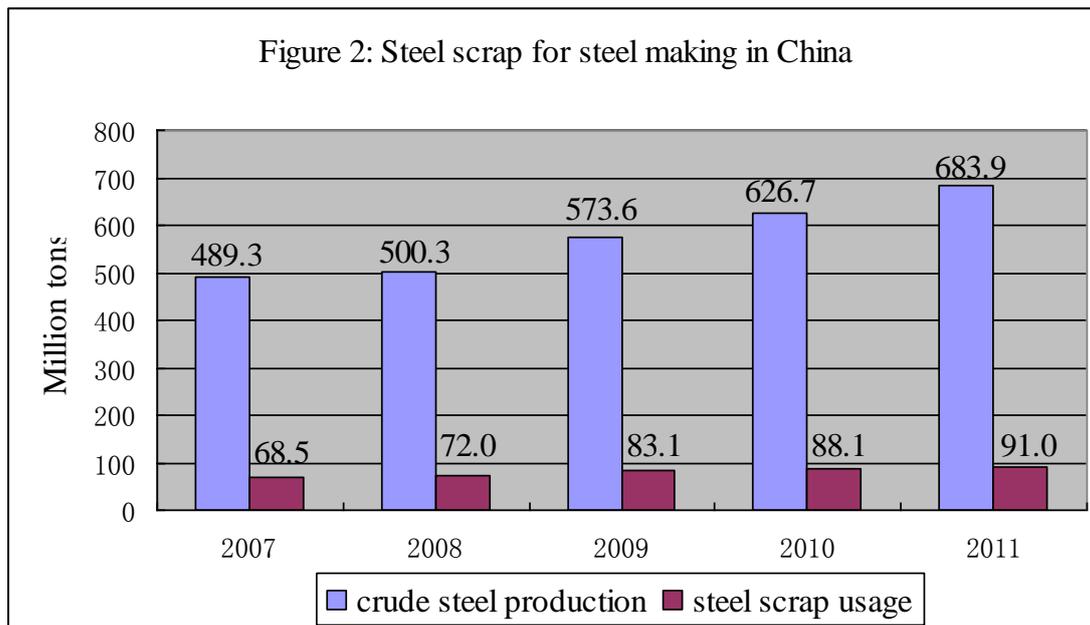
(i) Production from iron ore, first of pig iron in a blast furnace, which is then refined into steel in a Basic Oxygen Furnace (BOF). Some steel scrap is also added in the refining process. Around 70% of the world's steel is produced through this process; and

(ii) Production from steel scrap in an Electric Arc Furnace (EAF). Around 30%

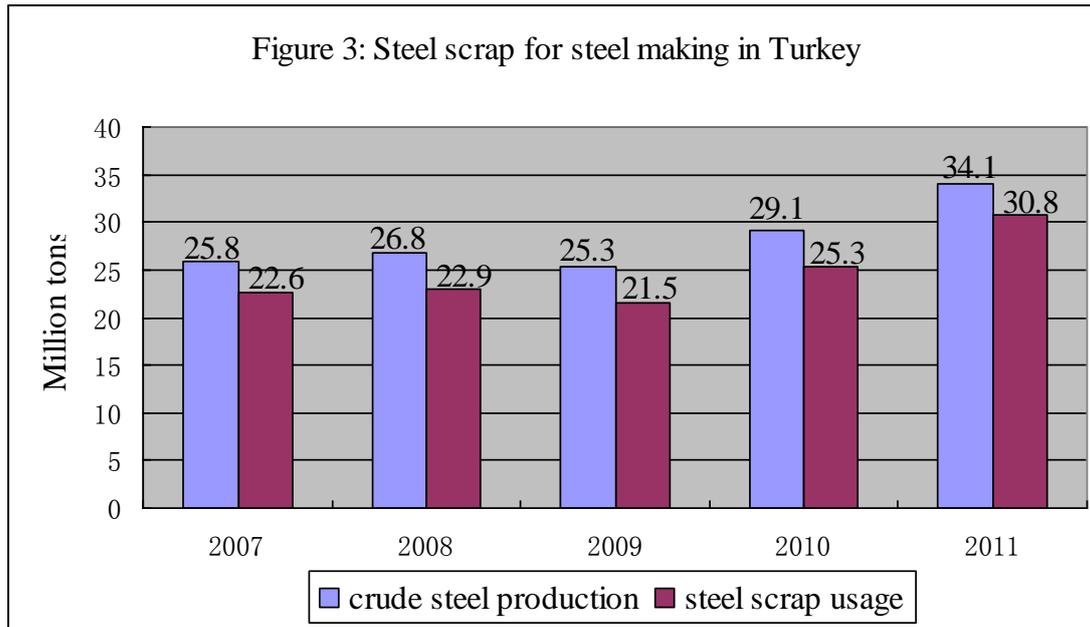
of the world's steel production is based on EAF.

It is estimated that every ton of recycled steel saves around 1.1 ton of iron ore and 0.6 ton of coal (Mikelis, 2013c). From this point, ship recycling industry could save resources.

On the other hand, what about the usage of steel scrap in steel production? Relevant information reveals that contrasted to the world's 70/30 mix (70% v 30%) of BOF and EAF in 2011, China's mix was 90/10, India's 40/60, and Turkey's 25/75 (Mikelis, 2013d). Figures 2 and 3 demonstrate the crude steel production and the utilization of steel scrap over a five year period in China and in Turkey respectively. Obviously, China has a lot of room to lower its production costs by gradually depending more of its production on steel scrap.



Source: Extract from “Ship recycling markets and the impact of the Hong Kong Convention” (Mikelis, 2013)



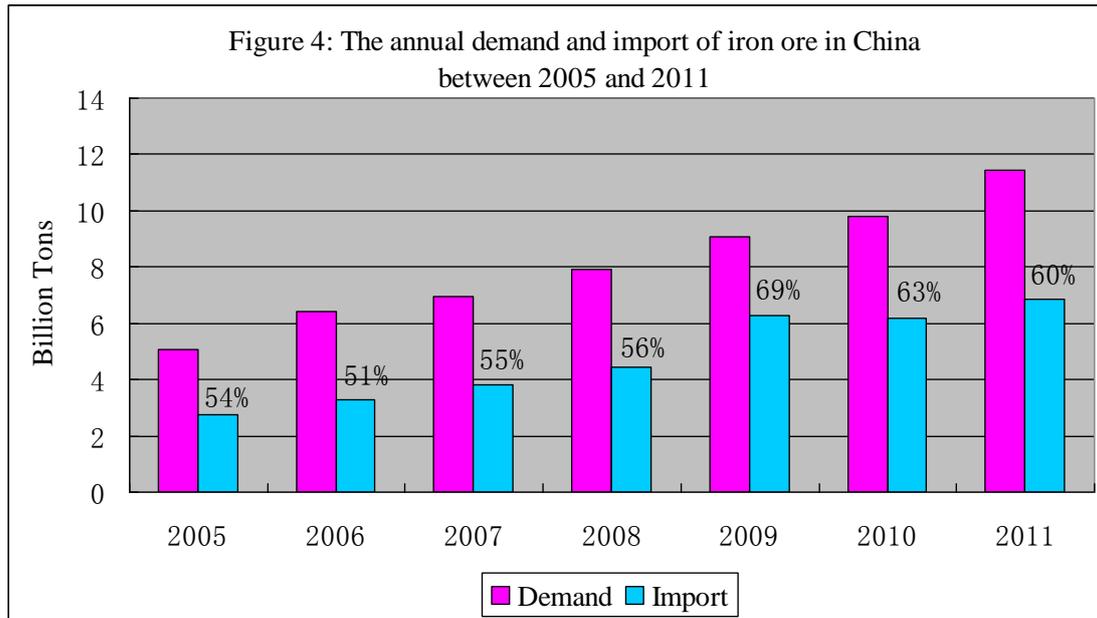
Source: Extract from “Ship recycling markets and the impact of the Hong Kong Convention” (Mikelis, 2013)

Recently, China iron ore production declined sharply due to the strategic conservation of limited mineral resources, and has been unable to meet the steel making demand, so China has to increase the imported iron ore volume (Wang, & Zeng, 2011, p. 65). Table 5 and Figure 4 illustrate the annual demand and import of iron ore in China between 2005 and 2011. Obviously, both the magnitude of China iron ore demand and import rose constantly from 2005 to 2011, the growth of which was over 100%. Meanwhile, the import proportion (I/D) still remained in a high level (more than 50%).

Table 5: The annual demand and import of iron ore in China between 2005 and 2011 (billion tons)

	2005	2006	2007	2008	2009	2010	2011
Demand	5.09	6.40	6.97	7.92	9.1	9.82	11.43
Import	2.75	3.26	3.83	4.44	6.28	6.19	6.86
I/D	54%	51%	55%	56%	69%	63%	60%

Source: Extract from “Why the Magnitude of China’s Iron Ore Import is so Huge?”



Source: Compiled by the author based on the data shown in “Why the magnitude of China’s iron ore import is so huge?”

Undoubtedly, the dependence of China on imported iron ore will in a specific state cause it to be disciplined by other states, while the steel scrap resources supplied by ship breaking yards enables China to relieve its stress caused by the dependence on the import of nonferrous metals. It can be seen from Table 6 and Figure 5 that compared with 85% and 38% of the steel scrap usage to crude steel production in Turkey and world average, the proportion in China was just around 14%. The China Iron and Steel Association estimates that the margin of China annual demand for steel scrap is over 10 million tons, whilst this margin will rise in the future. The steel scrap supplies of the steelmaking industry in 2010 and 2011 were about 88.1 and 91.0 million tons respectively (Wang, 2012, p. 1), but the “Recommendations on the 12th Five-Year Plan of the Scrap Iron and Steel Industry”, which is applicable from 2011 to 2015, states that “the annual amount of steel scrap provided to the steelmaking industry should be between 100 and 160 million tons, and the percentage of steel scrap for steelmaking should be exceeded to 20%” (Gang, 2011a). This statement also reveals that future domestic scrap steel demand will continue to increase.

Table 6: The proportion of steel scrap usage to crude steel production

	2007	2008	2009	2010	2011
World average	40.1%	39.9%	35.9%	37.4%	37.7%
Turkey	87.6%	85.4%	85.0%	86.9%	90.3%
China	14%	14.4%	14.5%	14.1%	13.3%

Source: Extract from “Ship recycling markets and the impact of the Hong Kong Convention” (Mikelis, 2013)

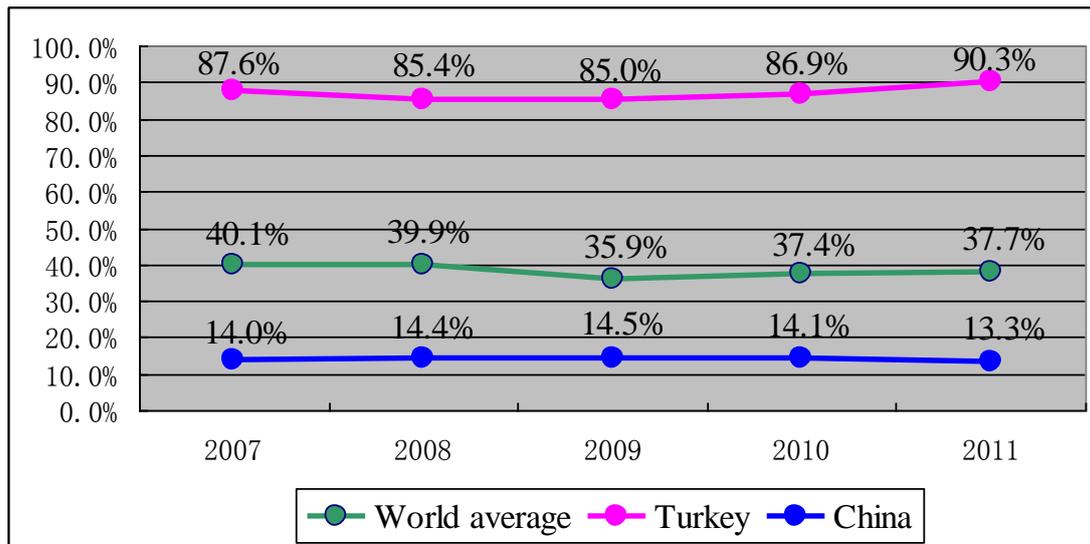


Figure 5: The proportion of steel scrap usage to crude steel production

Source: Compiled by the author based on the data in the “Ship recycling markets and the impact of the Hong Kong Convention” (Mikelis, 2013)

When it comes to the major competitive recycling states, as a result of the implementation of economic liberalization policies, Indian steel industry especially construction and infrastructure sectors have experienced a rapid expansion since the early 1990s. This expansion creates a mass of demand for steel. The relevant statistics indicate that the annual magnitude of India steel producing between 2008 and 2011 was a mere 60 million tons, while India recycling industry supplied the steelmaking sector with 10 to 20 million tons of steel scrap, which was about 30% of the total steel production. On the other hand, the annual steel production in Bangladesh was approximately 8 million tons, but 80% of which has been offered by scrapping yards (Wu, 2012e, p. 34).

It is clear from the above analysis that the volume of Chinese domestic demand for the steel scrap is much larger than that in South Asian recycling states. As a consequence, Chinese recyclers do not need to worry about the trade of their products due to the vast domestic market. This market prospect will drive the recyclers to increase additional investment into the safety production in order to satisfy the requirement of the authorization of ship recycling yards.

4.2.4 Internal strengths of Chinese ship breaking yards

With respect to recycling sectors in South Asian states, Chinese shipbreaking industry has certain advantages in terms of environmental standards, education and training system and the quality of recycling workers.

Regarding the environmental standards, beaching is the predominant method employed by the ship breakers located in Bangladesh, India and Pakistan (Watkinson, 2012b, p. 29). The treatment facilities and individual protection equipment in the scrapping yards are not sufficient due to unfavorable economic conditions, so their working practices and environmental situations are often less to be desired (Zhou, 2009a, p. 24). A study carried out by a team consisting of six members from the International Bank for Reconstruction and Development and the World Bank on the ship breaking and recycling industry in Bangladesh and Pakistan (Sarraf, et al., 2010, p. 5) shows that there is widespread but varying degree of contamination in the scrapping facilities at Chittagong (Bangladesh) and Gadani (Pakistan), with deposits of cadmium, chromium, lead, mercury and oil. In addition, the dismantling technology possessed by the ship breakers is far away from that in other regions. For example, the period of time spent by Chinese recyclers in demolishing a wrecked VLCC is about 3 months, but the figure goes up to approximately 6 to 7 months in the breaking yards of South Asia (Zhou, 2009b, p. 25).

Conversely, statistics show that the financial investment of Chinese scrapping yards on the safety and environmental protection continuously increased in the last two decades, reaching 312 billion RMB just within the period of the “10th Five-Year Plan” (from 2001 to 2005) (Xu, 2009, p. 53). Nowadays most of the enterprises recycle ships in strict accordance with the requirements of relevant laws, standards and guidelines, such as “Laws of the People’s Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes”, “Regulations of the People's Republic of China on the Environment Protection from the Ship Breaking”, “Standards for Pollution Control on the Security Landfill Site for Hazardous Wastes”, etc. These enterprises have basically mastered advanced techniques for the demolition of all kind of ships except nuclear vessels and have effectively overcome such issues as the disposal of sewage, waste oils, asbestos, PCBs and other hazardous materials through the collaborations with professional bodies. Furthermore, these yards have possessed adequate and efficient recycling facilities and equipment, and have high degree of mechanization. Their operational site, dismantling equipment and environmental protection facilities (including oil water treatment device, oil booms, asbestos dismantling equipment, incinerators and emergency equipment warehouse, etc.) have met the requirements of relevant regulations and legal documents (Xie, 2011, p. 31). To date, 18 ship recycling firms have obtained ISO 14001, OHSMS 18001 or ISO 9001 certificates, and nine of these firms have been awarded with the title of “Green Ship Recycling Enterprise” (Jin, 2012a). Yan Heming (2005b) notes that the software and hardware of the majority of ship breaking firms who recycle imported scrapped ships have been closed to or exceed the technical standards set forth in the Hong Kong Convention, while all the members of the CNSA have thoroughly comply with the technical requirements of the HKC.

Considering the education and training system of ship recycling sectors, the India government attempted to improve the trainings of technology, safety as well as vocational knowledge and skills for the people working for the scrapping yards in

recent years, but there are still about 34 percent of the workers especially the technical operators nowadays fail to achieve relevant professional trainings (Mashreque, 2005a). Nevertheless less desirable conditions can be found in Bangladesh as the extent of damage caused by the dismantling of ships to the lives and health of the workers has attracted very little attention from the academic community (Cairns, 2007, p. 275). It is estimated that the number of the senior personnel in Bangladesh recycling industry only accounts for 0.5% of the total workers due to the absence of specific education systems (Mashreque, 2005b).

Unlike the situations of the South Asian recycling sectors, China has a large number of experts in the shipping and recycling field. Meanwhile, a number of Chinese colleges and universities have paid attention to the cultivation of the expertise relating to the ship domain under the effects of national policies. It's estimated that roughly 102 Universities, 1000 Colleges and 80% of Secondary Technical Schools have set up special disciplines or education programs concerning ship and ship recycling fields. In addition, the majority of Chinese scrapping yards have developed vocational training systems for their employees in order to ensure their career development (Wu, 2012f, p. 30).

Finally, what about the quality of recycling workers? According to the statistics, About 60,000 labors in Bangladesh directly engage in shipbreaking activities, whilst the usage of child labor is very common in the scrapping yards with approximately 20% of workers below the age of 15 (Karim, 2009). The percentage of child labor in India ship breaking yards is just 2%, but there are 250,000 workers in the industry, so the number of the child labor is also large. Meanwhile, most of the workers in the two recycling sectors only receive primary education and limited safety trainings prior to their career (Wu, 2012g, p. 30).

In China, there are some 10,000 employees in the ship breaking firms, of which a

considerable part come from relatively poor rural areas. Undeniably, the educational degree of this part of workers is also not high, but the majority of the employees were offered a series of vocational trainings before engaging in the recycling activities. In addition, the workers conducting various types of operations are required to hold the appropriate qualification documents or certificates. The workers below the age of 15 are relatively hard to be found in the scrapping yards (Wu, 2012h, p. 31).

To sum up, compared with the ship recycling sectors in our major competitive states, the impacts of the certification on the majority of Chinese ship breakers are relatively limited, for they do not need further expensive investment to meet the technical requirements of the HKC.

4.3 Weaknesses

4.3.1 Some defects of relevant national laws and regulations

A set of laws, regulations and standards concerning environmental management, safety production and personnel health protection of the ship breaking yards have been in place nowadays, but if the Chinese government intends to implement the authorization of ship recycling facilities in accordance with the requirements of the Hong Kong Convention. The relevant regulations are not sound even though it has been elaborated in the existed provisions that the recyclers shall comply with the technical standards of national regulations, and shall be verified and approved by the competent authorities before they enter the market. The major disadvantages are as follows:

4.3.1.1 The fuzzy status of the competent authority

Article 10 of the Ship Recycling Regulations states that in order to conduct ship

recycling business, the ship breaking yard shall receive the specific evaluation carried out by the EPA who has ratified its EIA and shall obtain a qualification certificate. Meanwhile, article 13 of the Pollution Prevention Regulations shows that the recyclers who intend to be engaged in ship dismantling activities shall obtain the specific approval of the MSA before they entered the recycling market. Obviously, the two Regulations designated various government bodies to be the competent authority in charge of the authorization of ship recycling facilities, thus which departments will be actually responsible for relevant tasks and obligations? In the past, the scrapping yards were verified and ratified by the EPAs, for almost all of them had been in place before 2005 (Du, 2011, p. 20) the time the later Regulations was not yet introduced.

In the light of the definitions in the Legislation Law of the PRC, both of these two Regulations are of administrative regulations, so they have equal legal validity. In addition, the PPR could be classified as new provisions since it entered into force much later than the SRR (the former was adopted on 2009, the latter on 1988). According to the Scope of Application in the Legislation Law, if there is a gap between new clause and old article in respect of the same matter between two administrative regulations, a ruling shall be made by the State Council. To date, the SC has not issued the ruling file, thus if the authorization of ship recycling facilities required by the HKC is conducted in accordance with the existing domestic provisions, it will be difficult to identify the competent authority.

4.3.1.2 Difficulty in implementing some provisions set forth in the Ship Recycling Regulations.

Article 6 of the SRR states that the EIA of a huge or medium yard shall be verified and approved by the provincial EPA in the place where the yard is located, while the EIA of a small yard shall be evaluated by the county EPA and then ratified by the EPA who has the higher authority and jurisdiction over the County EPA. Nevertheless,

there is no explanation in the SRR about how to identify the huge, medium and small yards. Most importantly, it is learned that the EPA is not available in some cities and counties for the relevant responsibilities has been assigned to other agencies (Xu, 2010, p. 10). Therefore, this provision is hard to be implemented actually.

4.3.1.3 The absence of procedural items concerning the certification of ship recycling facilities

The ship recycling yard is required both in the SRR and the PPR to be ratified by the competent authority prior to conducting ship recycling, but there is lack of provisions concerning procedural matters of the certification. For instance, what files or operation system manuals shall be involved in the EIA? What procedures the competent authority should follow to authorize scrapping yards and the time length in which the authorization should be accomplished? What terms the yards shall meet in order to obtain the DASR? What measures or remedies should be taken by the competent authority to respond to the initial failure of the recyclers? Etc. Moreover, there are also lack of provisions with respect to other requirements of the Hong Kong Convention, i.e. Ship Recycling Facility Plan, Document of Authorization to conduct Ship Recycling (DASR), the form, language and validity of the DASR, the terms for the revocation, suspension, amendment and renewal of the DASR, and so forth. Thence, if the designated departments intend to carry out the authorization, they will find that no sufficient provisions in the existed national legislation are to be followed.

4.3.1.4 The absence of the specific technical standards concerning the certification of ship recycling facilities

It is required both in the SRR and the PPR that ship breaking yards shall be installed or equipped with the oil blocking device, waste oil reception installations, oily water treatment facilities, wastes disposal sites, etc. in accordance with the requirements of

relevant national norms and standards. While the detailed criteria were currently represented in two mandatory industry Standards: “Green Ship Recycling General Regulation” (GSRR) and “Requirements on Facilities/Equipments/Operation for Pollution Prevention in Shipyard and Ship Recycling Units” (the Requirements). For instance, the requirements concerning the design and classification of ship breaking yards’ functional areas, the allocation of medical device and the construction of the medical room can be found in the GSRR, while the standards relating to the scale classification of the scrapping yards, the quantity of anti-pollution facilities and equipment have been elaborated in the *Requirements*. Nevertheless, the GSRR and the *Requirements* were promulgated by different ministries (the former was adopted by the NDRC, the latter was developed by the MOT), thus if the certification was put into practice, regarding Chinese practical situations, the two standards set up by various government entities will be relatively hard to be used in the same event.

On the other hand, the standards provided by the GSRR and the *Requirements* are not comprehensive. Firstly, oil leakages may come from the dismantling processes of ships especially wrecked tankers due to the non-standardized operations, but the provisions concerning oil spill collection and control equipment such as Oil Absorption Felt, Oil Skimmers and Oil Dispersants are not available in the two mandatory standards. In addition, according to the Standard Classifications of China National Integrated Wastewater discharge Standard (GB 8978-1996), the oily wastewater discharge of ship recycling yards must meet *Class 2* standards, which means the maximum allowable discharge concentrations for the oily wastewater from the yards is 10 mg/L (shown in Table 7). This criterion is lower than the discharge density (15 mg/L) of general oily water separators, while the *Requirements* just described the handling capacity of oily water separate facilities (10-20 m^3/h) but not presented the discharge concentrations.

Table 7: Maximum Allowable Discharge Concentrations for Wastewater (mg/L)

Pollutant	Scope of Application	Class 1	Class 2	Class 3
Petroleum Hydrocarbons	All discharging work units	10	10	30

Source: Extract from “Integrated Wastewater Discharge Standard” (GB 8978-1996).

4.3.2 A bit gap between recycling standards of some recyclers and the technical requirements of the HKC

Although China is one of the four major ship recycling states, we have to accept the fact that there are still some recycling firms whose working practice and environmental standards leave much to be desired. For example, the pollution prevention and control installations and equipment are not appropriate and sufficient; the safety and pollution prevention management systems fail to be smoothly operated; the number of workers is inadequate or some staffs are lacking in expertise and skills concerning safety and pollution prevention; and so forth. In addition, a part of recyclers are in financial troubles due to such issues as the constant increase of labor costs, the difficulty of loans from banks, the substantial increase of financing costs due to high interests of private loans and the low price of steel scrap (Gang, 2011b). Therefore, these recyclers need an additional period of time to comply with the technical requirements of the HKC, and are possible to be phased out the market if they were compelled to accept the certification immediately. Yet, it is recognized that these recyclers to some degrees contribute to Chinese sustainable development, so their existence has practical significance.

First of all, the shortage of raw materials and the huge steelmaking volume cause our country to spend a mass of foreign exchange every year in importing the iron ore and steel scrap so as to meet the domestic production needs, while this issue could be mitigated through the recycle of end-of-life tonnage since the steel scrap recycled from a ship accounts for 80% of the outputs and the wrecked vessels are relatively

cheap. There are also significant benefits to Chinese economy from the recycling of wood, machinery and equipment that would otherwise have to be imported. Therefore, these ship recycling yards could not only achieve the recycle and reuse of resources, but also help to save mineral resources and national foreign exchange.

Secondly, these scrapping yards contribute to local and regional economic development and social stability for they not only promote the growth of their associated industries and the trade of second hand commodities such as furniture, equipment and machineries but also create large-scale direct and indirect employment opportunities for the surplus labors especially for the labors from countryside.

Finally, these yards as well as its associated industries and activities generate a large sum of revenue for various government entities through the payment of Import Duty, Value-added Tax and other taxes.

In summary, if the authorization of ship recycling facilities is to be carried out in China, how to deal with these breaking yards will be an issue that the competent authority has to face.

4.4 Possible opportunities

4.4.1 Fair atmosphere for international competition

Compared with South Asian ship recycling nations such as Bangladesh, India and Pakistan, China has relatively satisfying facilities and equipment such as more dry pier for ship dismantling, more pollution prevention and control installations, more personnel protection equipment, etc., and relatively stringent and integrated national legislation or working procedures concerning ship breaking activities, all these allow China more advantage over other Asian recycling countries in terms of safe and

environmentally sound recycling of ships. However, just because of this, our recycling costs have kept rising in recent years, reflected by the decrease of the scrapped ship purchase price that Chinese recyclers could offer. A ship recycling market report addressed by the India Global Marketing System (GMS) indicates that up to December 2009, the maximum purchase price of a retired tanker offered by Chinese recycling enterprises was just 315\$ per LDT, while this price went up to 365\$, 380\$ and 400\$ in Pakistan, India and Bangladesh respectively (Bai, 2010a, p. 20). Therefore, compared with these states' employment of beaching method, and less investment into the infrastructure construction, and possession of extremely low labor costs (less than 2\$ per day) (Bai, 2010b, p. 20), Chinese ship breakers are less competitive in the global recycling market in terms of the scrap ship purchase price. This is a decisive factor for why our recycling industry was still in a downturn trend in the last several years.

Fortunately, the adoption of the Hong Kong Convention which intends to address all the issues around ship recycling has posed great stress on South Asian recycling states. For example, in order to promote the image of its ship recycling firms, Bangladesh enacted three decrees prior to the International Shipbreaking Diplomatic Conference, the text of which include: ships must be decontaminated before dismantling; recycling yards with a serious shortage of anti-pollution facilities must be outlawed as far as possible; Imported scrap ships shall be recycled in a safe and environmentally friendly manner (An, 2009, p. 51). Obviously, if the Hong Kong Convention came into force smoothly, it would create a relatively impartial international competitive atmosphere for all stakeholders abide by the convention. Just as Xie Dehua, the vice-chairman of CNSA, notes that the entry into force of the HKC will benefit Chinese ship recycling industry in improving its international competitiveness and maintaining sustainable development within the safe and environment-friendly situation. Xie also suggests that as a safety and environmental protection leader of the same industry, our ship recycling industry may realize its leap frog development by taking advantage of the

opportunity presented by the HKC (Wang, 2009, p. 15).

4.4.2 Good market prospect

Several factors affecting the global recycling market were coming into play since late 2008: firstly, the freight markets has been cooling off a bit due to the global economic crisis; secondly, the introduction of considerable new tonnage put a downward pressure on freight rates (EMSA, 2008, p. 17); finally, the mandatory IMO single-hull tanker scrapped deadline was stipulated in 2010 and has affected several million tons of tanker tonnage (Mikelis, 2013e). As a consequence, an increasingly tonnage was phased out and recycled in ship recycling facilities within the last 5 years (CnshipNet, 2013b). The statistics forwarded by Clarkson Research Studies shows that the global recycled volume in 2011 and 2012 were 45.5 and 57.5 million DWT respectively, both of which has exceeded the historical peak of 42.57 million DWT in 1985 (CnshipNet, 2013c).

The future demand for scrapping is not expected to fall due to the following factors: first of all, the debt crisis of some European Union member states is hard to be relieved in a short period due to the influence of regional economic and social instability, and thus will obviously drag down the recovery pace of world economy (Gang, 2011c). As a result, the freight market will still in downturn for several years. This could also be estimated from the fluctuation of the Baltic Dry Index (BDI), which measures the demand for shipping capacity versus the supply of dry bulk carriers (CnshipNet, 2013d). Figure 6 shows the changes of BDI from 2000 to 2012. It can be seen that the BDI fell considerably in current years, the magnitude of which was lower than 1000 in 2012, almost 20% of that of in 2008. It is predicted that there is still a certain room for the growth of world ship recycling industry since the tonnage surplus will last for a period of time (Ma, 2012).

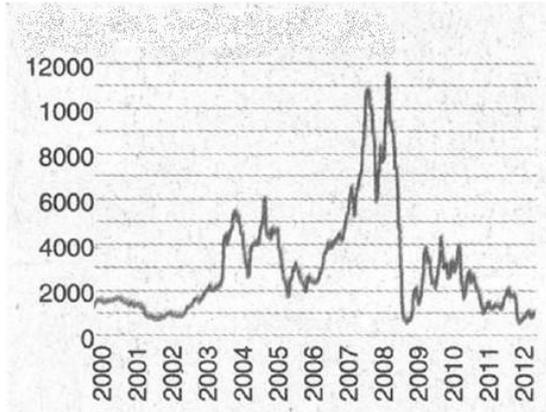


Figure 6: Baltic Dry Index between 2000 and 2012

Source: (Ma, 2012)

Secondly, China, Japan, Korea and some European countries have begun to refuse single-hull tankers to call at their ports since 2010 (You, 2011, p. 56), which means that these vessels are difficult to go forward and will progressively be scrapped; thirdly, the stress of old ships exerted by carbon emissions and energy conservations is gradually increasing; Last but not least, the generation of a massive order book in the shipbuilding yards during the boom years was estimated to be completed in 2008-2012 (Sarraf, et al., 2010a, p. 3).

As the consequence of the factors mentioned above, unless global market conditions change dramatically, a significant part of world merchant fleet will undoubtedly go directly for scrapping, and the supply of global tonnage will also exceed the demand for at least 5 years (Sarraf, et al., 2010b, p. 3).

There is no doubt that the ongoing and stable wrecked tonnage can not only keep Chinese breaking yards running, but also offer a strong support to the competent authority to carry out the authorization of ship recycling facilities.

4.5 Potential threats

4.5.1 The vague interim period before the entry into force of the Hong Kong

Convention

Just like other Conventions, the HKC illustrates the “entry into force” conditions, while it is obvious that the Convention has long way to go prior to its entry into force.

First of all, Article 17 of the Hong Kong Convention states that the Convention will enter into force 24 months after the following conditions are met (IMO, 2009f):

1. Not less than 15 states have ratified the Convention;
2. The combined merchant fleets of the states who have ratified the HKC constitutes not less than 40 per cent of the gross tonnage of the world’s merchant shipping;
3. The combined maximum annual ship recycling volume of the states who have ratified the HKC during the preceding 10 years constitutes not less than three percent of the gross tonnage of the combined merchant shipping of the same states.

However, these conditions are relatively harsh and difficult to be met.

Secondly, the provisions of the Convention covers the interest of multiple stakeholders, including flag states, coastal states, port states, recycling states, shipowners and recycling facilities, whilst the desired benefits are extremely difficult to be met.

Finally, there are some shortcomings in the HKC, which may not achieve a unified interpretation within the stakeholders. For instance, “shipowner” is defined in the HKC (IMO, 2009g) as:

The person or persons or company registered as the owner of the ship or, in the absence of registration, the person or persons or company owning the ship or any other organization or person such as the manager, or the bareboat charterer, who has assumed the responsibility for operation of the ship from the owner of the ship.

However, in the case of a ship owned by a State and operated by a company which in that State is registered as the ship's operator, "owner" shall mean such company. This term also includes those who have ownership of the ship for a limited period pending its sale or handing over to a Ship Recycling Facility.

This definition is slightly different from our interpretation of a shipowner in common sense for it involves the cash buyer and the Convention intends to interpret the buyer responsible as a shipowner. However, only Parties to the Convention will enforce the relevant provisions of the HKC, thus the cash buyer may easily evade the constraint of the Convention in the transaction of wrecked ships by serving as a non-contracting Parties' shipowner. As a result, the contracting Parties' interests can not be effectively safeguarded.

Generally speaking, IMO's Convention will enter into force six years after its adoption, but for the Hong Kong Convention, the former IMO Secretary-General Mitropoulos expected it would enter into force within the following three years after the adoption (CANSI, 2009). Nevertheless nearly four years has passed, to date only six countries including France, Italy, Netherlands, Nevis, St. Kitts and Turkey has ratified the Convention (Fang, 2012, p. 7). Therefore, it is hard to say when the Convention will enter into force. Perhaps, the interim period would be unexpected long. If China carried out the certification earlier than other recycling states, the reduction of our market share in the global market would be possible to take place in this interim period. Thence, the competent authority should take effective measures to minimize the effects of the certification on the ship breaking sector.

4.5.2 The improvement of major competitors' domestic recycling standards

Recently, South Asian recycling nations especially Bangladesh and India who are our major competitors are continuously improving their national recycling standards.

India has made great progress over the last five years. In June 2007, the Supreme Court of India established a panel to develop standard procedures and environment protocols for the Indian ship breaking industry (IL&FS Ecosmart Limited Hyderabad, 2009, p. 3-4). Meanwhile, following the judgment of India's Supreme Court's on the case of the "Blue Lady" in September 2007, India developed new domestic legislation to require recyclers to correspond to most of the regulations concerning safety, training, waste management and environmental protection set forth in the draft Hong Kong Convention so as to ensure that the recycling facilities do not need to establish additional technical standards to satisfy the Convention after its entry into force. It is also worthy to note that significant improvements nowadays have taken place or are taking place among the recycling industry in Alang, India, and many breaking yards are investing in safety measures, environmental protection and social welfare that are above statutory requirements (Mikelis, 2013f).

The Bangladesh ship breaking industry has received much criticism both home and abroad because of its low standards, high rates of serious accidents, contamination, and exploitation of workers (Mikelis, 2013g). In order to transform the image of its recycling industry, the Bangladesh government has taken a series of measures. For example, the government promulgated the Ship Breaking and Recycling Rules in 2011 to regulate all ship recycling activities in Bangladesh (Watkinson, 2012c, p. 29). The content of the rules comprises a permit for a ship recycling facility plan; the examination of ships prior to beaching for the existence of hazardous materials; certification of the workers engaged in hot work operations; the submission of a ship recycling plan by the yards before demolition and other matters relating to workers' safety and environment. Most importantly, over the last five years many improvements have also taken place in individual breaking yards of Bangladesh whose owners have recognized that higher standards will gradually be required, not only by regulations but also by shipowners selling ships to them (Mikelis, 2013h).

As a consequence, if the Chinese government does not further improve domestic recycling standards, the advantage of our ship recycling facilities over those of other South Asian states will be weakened or even disappear.

4.5.3 The improvement of recycling standards in some regions

Following the recognition that the European implementation of the Basel Convention is unable to regulate ship dismantling and recycling activities, and it is essential to introduce workable regulations during the “interim period” of the Hong Kong Convention, the European Commission adopted the “Proposal for a Regulation of the European Parliament and Council on ship recycling” in March 2012. The proposed Regulation is based on the HKC, but some provisions for ship recycling facilities are more stringent than those in the Hong Kong Convention (Mikelis, 2013i). According to the Regulation, the Commission will establish the List of Authorized Facilities. The ship recycling facilities on the list can be located world-wide but shall comply with a set of safety and environmental requirements, and have to obtain an additional site inspection carried out by the Commission. Ships flying the flag of EU member states will be allowed to be recycled only in facilities on that list, and shipowners shall inform their intention of sending ships for recycling in writing form and in due time to the flag states (Watkinson, 2012d, p. 28). Therefore, if the Regulation entered into force, ship recycling yards excluded in the list will be unable to recycle the vessels flying the flag of EU member states.

According to the decision making process of the European Union, the Proposal will have to be negotiated between the European Parliament and the Council of Europe over the coming months. If the negotiations are successful, the Proposal will be finalized, published, and enter into force (Mikelis, 2013j). It is estimated from the current negotiation consequence that the proposed Regulation is possible to come into force earlier than the Hong Kong Convention. Thus, Xie Dehua recommends China’s

relevant governmental bodies and recyclers to make sufficient preparations so as to effectively respond to the challenges presented by the new EU Regulations (Shi, 2012b).

4.6 Summary

To sum up, Table 8 depicts the outcome more clearly.

Table 8: Summary of SWOT analysis

<p>Strengths:</p> <ol style="list-style-type: none"> 1) National policy support; 2) Favorable international cooperative relationship; 3) Vast domestic demand for steel scraps; 4) Internal strengths of Chinese ship breaking yards. 	<p>Weaknesses:</p> <ol style="list-style-type: none"> 1) Some defects of relevant national laws and regulations; 2) A bit gap between recycling standards of some recyclers and the technical requirements of the HKC.
<p>Opportunities:</p> <ol style="list-style-type: none"> 1) Fair atmosphere for international competition; 2) Good market prospect. 	<p>Threats:</p> <ol style="list-style-type: none"> 1) The vague interim period before the entry into force of the Hong Kong Convention; 2) The improvements of major competitors' domestic recycling standards; 3) The improvement of recycling standards in some regions.

Source: Compiled by the author

Through the SWOT analysis tool, the author has identified the strengths, weaknesses, opportunities and threats that the authorization of Chinese ship recycling facilities will probably face, and thus proposes applicable recommendations to the Chinese government and administrations in establishing a mechanism for authorizing ship recycling facilities.

There is no doubt that Chinese recycling industry has certain strengths on the

implementation of the authorization over that in South Asian nations. Admittedly there are also some defects in the national legislations and scrapping yards, but these defects could be solved or minimized with effective measures. Meanwhile, our major competitors are improving their domestic recycling standards, so it is better for the Chinese recycling industry to use the opportunity to preserve its advantage over major competitors in terms of the safe and environmental sound recycling of ships. Most importantly, the entry into force of the Hong Kong Convention will establish the relatively unified and high standards for global recycling facilities, and thus will offer a rare opportunity to Chinese recycling industry to promote its competitiveness in the world market. Furthermore, the boom of ship breaking industry will last in the following 5 years, so the next 2-3 years is an appropriate opportunity for the competent authority to carry out the authorization of ship scrapping yards. If this optimal period for the authorization is to be missed, the competent authority will find it more difficult to carry out the certification.

Chapter 5 Conclusion

5.1 Recommendations

5.1.1 Legislation

5.1.1.1 Regulations

In administrative regulations hierarchy of national legislation, the Regulations of the PRC on the Environment Protection from the Ship Breaking (SRR) is a set of specific administrative regulations relating to domestic recycling industry, but some provisions have been out of date, especially the requirements concerning the authorization, i.e., how to identify the huge, medium and small yards? If the EPA is not available in some cities and counties, who shall be responsible for the verification of the EIAs submitted by facilities? What are the conditions and results of the authorization? Etc. Therefore, it is time to modify the Ship Recycling Regulations so that these issues could be solved as far as possible.

Furthermore, seeing that the EPA and the MSA were assigned with the relevant tasks and obligations related to the authorization respectively in the Ship Recycling Regulations and the Pollution Prevention Regulations, so if the SRR are modified and promulgated, the State Council should also issue a ruling document to designate single competent authority to make sure that the certification could be carried out properly when it is appropriate. According to the functions and structures of various governmental entities, the EPA could be appointed to take the responsibilities. Specifically, the EIA, ship recycling facility plan and other documentations submitted by a recycler shall be verified by the provincial EPA where the recycler is located and is ratified by the State EPA.

5.1.1.2 Rules

In rules hierarchy, the competent authority should develop “Rules for the Authorization of Ship Recycling Facilities” to regulate the authorization activities. The content of the Rules shall include but not limited to the following items: the classification of recycling yards; the corresponding criteria; conditions and procedures of the authorization; DASR and its language, validity and renewal conditions.

As far as the classification of ship recycling yards is concerned, the yards are subdivided into four categories according to the maximum gross tonnage of the ships that they can recycle in the “Requirements on Facilities/Equipments/Operation for Pollution Prevention in Shipyard and Ship Recycling Units”. The categories of yards are shown in Table 9.

Table 9: The classification of ship recycling yards

Class	4	3	2	1
recycling capacity	<2,000 GT	2,000-10,000 GT	10,000-50,000 GT	>50,000 GT

Source: Extract from “Requirements on facilities/equipments/operation for pollution prevention in shipyard and ship recycling” (China MOT, 2010)

It is commonly accepted that this classification is the result of the senior experts’ research, so it is relatively reasonable and could be applied to the Rules.

When it comes to the authorization procedure, it is recommended to be established in the light of the 2012 Guidelines for the Authorization of Ship Recycling Facilities. Firstly, the ship recycling facility should submit a formal application, the Ship Recycling Facility Plan (SRFP) and any other documentation and certification required under applicable international and national legislations to the provincial EPA where the facility is located. The EPA may examine these materials within one month and then compile an audit report. The reports of Class 1 and 2 yards should be

submitted to the State EPA for further verification and ratification, while other reports may be ratified by the EPAs who have verified them. Secondly, if the documentation presented by a yard has been complied with the applicable requirements, a site inspection should be carried out by the competent authority to check the consistency of the documentation with the actual arrangements and operations at the yard. The site inspections of Class 1 and 2 recycling facilities could be conducted by the State EPA within 5 days, while the site inspections of other facilities may be advanced by the provincial EPAs. Similarly, the written report of a Class 1 or 2 recycling facility which contains inspection data and an evaluation of findings should be ratified by the State EPA, and the report of a Class 3 or 4 may be ratified by the provincial EPAs. Finally, if the ship recycling facility fails the initial site inspection, an additional or follow-up site inspection should be conducted after the ship recycling facility becomes fully operational.

Regarding the DASR, it should be issued to the ship recycling facility who has thoroughly met the requirements in terms of the documentation and site inspection. The certificate may be valid for three years and be renewed following the satisfactory completion of a renewal audit.

5.1.1.3 Mandatory Standards

In mandatory standards hierarchy, a part of technical standards relating to the ship breaking yard could be found in the Green Ship Recycling General Regulation and the “Requirements on Facilities/Equipments/Operation for Pollution Prevention in Shipyard and Ship Recycling Units”, but the two mandatory Standards will be relatively hard to be used in the same event due to the fact that they were promulgated by different governmental bodies. Meanwhile, the provisions of the two Standards are not comprehensive. Therefore, the competent authority may develop a specific mandatory standards, which could be named “Guidelines for the Evaluation of Ship

Recycling Facilities” (the Guidelines), according to the actual demand of the certification. The Guidelines may integrate the standards set forth in the GSRR and the Requirement, but the guidelines should further define the detailed conditions for the certification of recycling yards at various levels. For instance, what documentation and certification the ship recycling facility plan may refer to? What about the site, infrastructure and space arrangement of breaking yards? What kind of facilities and equipment should a breaking yard be equipped with and what about the quantities and performances? It is worthy to note that oil leakages may result from the dismantling processes of ships especially wrecked tankers due to the non-standardized operations, so the requirements concerning oil spill collection and control equipment should also be set forth in the Guidelines.



Emergency equipment warehouse



Oil Spill Dispersant Application Equipment



Oil Dispersants



Oil Skimmers

Figure 7: Emergency equipment warehouse and oil spill response facilities possessed by oil spill response enterprises

Source: Compiled by the author.

Pictures: Downloaded from oil spill response units' websites: <http://www.longshanhb.cn/index.html>, <http://www.byseaclean.com/cn/SinglePage.aspx?tid=567> and <http://www.szjefp.com/cn/>

Also worthy to note that there are a number of oil spill response enterprises in the majority of coastal cities in China. Just as Figure 7 shows, these organizations have possessed plenty of advanced oil spill collection and clean equipment and materials such as oil absorption felt, oil skimmers and oil dispersants. If the *Guidelines* elaborate its provisions on emergency recycling facilities, for the sake of saving cost and efficiency, it is better to permit the scrapping yards to possess the facilities by means of voluntary agreements with the oil spill response units nearby so long as the desirable objectives are successfully achieved.

5.1.2 Strategies

5.1.2.1 Pushing forward the entry into force of the Hong Kong Convention

Even though the Hong Kong Convention has some shortcomings, undeniably it creates a global legal framework for addressing the issues arising from ship recycling sectors. Most importantly, the entry into force of the HKC will improve the competitiveness of Chinese scrapping yards in the international market. Furthermore, China is not only the world's second-largest economy but also a major shipbuilding, shipping and ship recycling country, so China has a certain say in shipbuilding, shipping and ship recycling sectors and even economic field. Thence, Chinese relevant governmental departments may strive as much as possible to give impetus to the entry into force of Hong Kong Convention by taking advantage of China's influence in the world maritime and economic community, and thereby promote the growth of our recycling industry.

5.1.2.2 Adherence to an appropriate implementation strategy

As for the recyclers who need a certain period of time or should make some efforts to meet the technical standards of the HKC, the competent authority may start step by

step the implementation of the authorization so as to mitigate the impacts of the authorization on these recyclers. Firstly, in the interim period before the entry into force of the HKC, the certification could be first applied to the scrapping yards whose working practices and environmental standards have complied with the requirements of the HKC, and only the authorized yards were permitted to recycle imported aged vessels. Secondly, the competent authority may encourage other ship breakers to increase investments in operational systems, hazardous materials treatment facilities and personnel protective equipment, or stimulate the merging of some small yards. Finally, the competent authority must apply the authorization to all of the domestic scrapping yards, and close the yards that can not thoroughly comply with relevant standards set forth in the applicable international and national legislation, so as to boost the growth of Chinese ship breaking industry.

5.1.2.3 Development of additional national policies

It is recognized that taxes account for a large proportion of the recycling costs of a ship scrapping yard. Yan Heming (2005c) notes that the current ship-scrapping price in the global market is often higher than its actual value, and the expensive price as well as the Import Tariff and Value-added Tax have led to the operational difficulties of most of ship recyclers. At the present stage, recycling countries have to support their breaking industries by adjusting domestic taxes to ship recycling since they can do nothing to affect the global ship-scrapping price.

The India government has introduced a series of economic liberalization policies since 1991, including the abolition of the restrictions on the import wrecked ships and the introduction of preferential tax policies for the recyclers in importing foreign end-of-life ships, as a result, the total tax for the demolition of a overseas retired vessel paid by the recyclers nowadays only accounts for 15% of the ship's transaction price. The similar favorable tax policies are also applied by the Bangladesh

government to the ship breakers under its jurisdiction. The breakers should only pay 7.5% and 2.5% of a ship's value for the import duty and the site tax respectively before 2010. After that, the government increases the percentage of the import duty to 12.5% in order to respond to the public criticism on its low recycling standards following a number of serious pollutions and injuries in the ship breaking industry. Despite of the additional import duty, today the total tax bear by the ship breakers for the demolition of a foreign wrecked ship is just 15% of the ship's value (Wu, 2012i, pp. 36-38).

In December 2008, China Ministry of Finance (MOF) together with the State Taxation Administration (STA) promulgated "A Notice with respect to the Value-added Tax (VAT) Policy on Renewable Resources", which states that the VAT collected from renewable resource recycling sectors involving the ship scrapping industry will be refunded to the taxpayers. This Notice come into force on January 1 2009, yet it was just valid within 2 years. Nowadays, the total magnitude of the import tariff and value-added tax paid by the Chinese scrapping yards in recycling an imported aged ship has exceeded 20% of the ship's total value, and it is much higher than that in India and Bangladesh (Jin, 2012b). The high tax is also a key factor restricting the competitiveness of the Chinese recycling enterprises in the global market.

It is clear that if the certification was put into practice, ship breaking yards have to increase additional investments in improving recycling standards which, in a certain extent, will further aggravate their financial burdens. Therefore, the Chinese government may moderately lower the import tariff rates and continue to perform VAT preferential policies in order to stimulate the growth of the recycling industry and facilitate the implementation of the certification.

5.1.3 Personnel training and education

5.1.3.1 Auditor selection and training

The competent authority may cultivate a group of auditors in advance in order to conduct the verification of the documentation submitted by recyclers and the site inspections at the yards. The auditors may be selected from each provincial EPA and subdivided into managerial experts and technical experts, and should be offered with various trainings and tests according to their different tasks and obligations. Following the trainings and examinations, the qualified managerial and technical experts could be designated to carry out the assessment of the documentation and site inspection respectively. Moreover, the authority may also develop an auditor database so as to facilitate the formation of auditor teams.

5.1.3.2 Initial training and certification of workers

The recyclers are required by the provisions of the HKC and national legislations to establish appropriate education and training systems in terms of recycling technology, operational safety, environmental protection awareness, etc. for their workers so as to improve the overall quality of the employees and thus minimize the rate of accidents and pollution. However, it is experienced that if these trainings are thoroughly accomplished and controlled by the recyclers themselves, the effects is possible to be not satisfactory due to the supervisors' weak safety awareness or the consideration of cost-saving. Therefore, the workers' initial mandatory training is better to be held by the competent authority.

It is recommended to the competent authority to establish an initial training and certification system for the workers engaged in ship recycling activities. Meanwhile, the workers could be divided into various categories and levels, i.e., Senior Emergency Director, General Emergency Director, Operator, etc., and may be provided with different trainings so as to ensure that the staffs of scrapping enterprises

possess the expertise and skills prior to performing ship dismantling activities. The trainings may include but not limited to the following items: relevant applicable international conventions as well as national laws, regulations and standards; the properties, risks and disposals of various hazardous materials; routine personal protection; occupational health and safety. Following the trainings and tests, the workers may be awarded with specific qualification certificates.

5.2 Conclusion

This study is intended to analyze the strengths, weaknesses, possible opportunities and possible threats in implementing the authorization of ship recycling facilities in China. During the study, many authoritative research papers or statistics on the recycling industry are found on websites, but they are read and downloaded with restriction, thus some comments or data are used in this paper, i.e., the imported proportion of China's recycled tonnage, the magnitude of the import tariff and value-added tax paid by the Chinese ship breakers in recycling imported wrecked vessels, etc., were mainly extracted from other individual research or master's theses available. Probably, these comments or data are not one hundred percent accurate, but generally speaking, by using SWOT analysis tool, issues concerning the certification are identified. It can be seen from the analysis that the establishment and implementation of a mechanism in China for authorizing ship recycling facilities is indispensable even though there are gaps between some breaking yards and the technical requirements of the HKC.

The date for the entry into force of the HKC cannot be predicted, but IMO is making great efforts to push forward the early implementation of the HKC. It is believed that the Convention is possible to come into force earlier with the efforts of the global maritime community than expected.

Undoubtedly, the entry into force of the HKC will inevitably exert some negative effects on Chinese ship recycling industry, but it will also benefit the industry in promoting the standards concerning environmental protection, occupational health and safety, and improving its international competitiveness. Therefore, the Chinese government and its relevant authorities should get well prepared for the entry into force of the HKC and achieve the safe, clean and sustainable development of the Chinese recycling industry.

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