



Ship recycling, market imperfections and the relevance of a consortium of ship recycling nations in the Indian subcontinent

Emil Mathew

To cite this article: Emil Mathew (2021) Ship recycling, market imperfections and the relevance of a consortium of ship recycling nations in the Indian subcontinent, Journal of International Maritime Safety, Environmental Affairs, and Shipping, 5:2, 23-31, DOI: [10.1080/25725084.2021.1921994](https://doi.org/10.1080/25725084.2021.1921994)

To link to this article: <https://doi.org/10.1080/25725084.2021.1921994>



© 2021 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 25 May 2021.



Submit your article to this journal [↗](#)



Article views: 3153



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 4 View citing articles [↗](#)

Ship recycling, market imperfections and the relevance of a consortium of ship recycling nations in the Indian subcontinent

Emil Mathew 

School of Maritime Management, Indian Maritime University, Chennai, India

ABSTRACT

Ship recycling operation is widely considered as one of the most hazardous activities in the shipbuilding industry due to environmental pollution and health risks to workers. Stringent environmental and labour compliance standards enforced over the past few decades in developed nations have substantially increased the costs, shifting the recycling operations to nations in the Global South where these operations entail lower cost. This paper provides an overview of the ship recycling industry and highlights the consequential adverse effects on environment and human beings in the nations engaged in ship recycling and also elaborates on the guidelines proposed by international organisations to address these issues. It is argued that unless the externalities on the environment and human health are not taken into account, a sustainable model of ship recycling cannot be achieved. The paper proposes the formation of a consortium by recycling nations particularly India, Pakistan and Bangladesh, whose synergies will help to safeguard the interests of the workforce and environment in these countries. A ship recycling industry fund, under the auspices of International Maritime Organisation exclusively for meeting the cost of ship recycling, is also mooted for consideration. The availability of this fund, along with efficient policy formulations initiated by the consortium of major ship recycling nations, can play a major role in addressing the externalities and turning the recycling operation environment- and labour-friendly.

ARTICLE HISTORY

Received 28 February 2021
Accepted 31 March 2021

KEYWORDS

Ship recycling; externality;
ship recycling nations

Introduction

For centuries, shipping has been the cheapest mode of transport of large volume of goods and currently, almost 90 per cent of the goods by volume and 70 per cent by value are transported by sea. Different types of commercial ships such as general cargo ships, bulk carriers, automobile carriers, tankers and cruise ships were developed over the course of the 20th century to meet specific transportation requirements. Typically, ships have an average life of 25–30 years (Frey 2015) and end-of-life ships are recycled. Almost 95 per cent of the parts of a vessel are dismantled and reused (Jain K.P. et al. 2013). Ship recycling, dismantling, demolition and breaking are the terms used interchangeably to refer to breaking of ships to make their parts reusable. Ship recycling is influenced by market fluctuations. The ships that eventually become available for recycling depend on many factors such as lower freight rates due to lower demands, obsolescence, uneconomic repair costs, need for cash by ship owners, regulatory requirements, introduction of innovative technology, changes in the trading patterns and lower resale value in second hand markets (Stopford 2009; Buxton 1991; Karlis T. et al. 2016; Mikelis 2018; Gourdon 2019). It is estimated that almost 1 per cent of the world's merchant fleet is demolished every year (Frey 2015). The number of ships to be recycled is

expected to go up as the number of ships manufactured has been increasing over the years.

Until the beginning of the 1980s, it was mostly the developed nations were engaged in ship demolition activities. But when strict enforcement of environmental and labour safety standards began in these countries, the cost of dismantling at shipping yards touched an unaffordable level (Frey 2015; Mikelis 2018). The additional costs, ensuing from regulations exerted pressure on the ship-owners in the developed nations to search for cost-efficient channels of dismantling. When it was realised that the developing nations did not have stricter regulations on environment and labour standards, they became attractive locations for ship recycling operations. While excess supply of labour and lower wages because of poor enforcement of labour rights brought down the recycling cost, the developing countries were either unaware or unmindful of the consequences of handling hazardous materials. The absence of regulatory enforcement in developing nations proved to be cost-effective as ship-owners and recyclers carried out dismantling operations without investing on environmental protection and labour welfare. End-of-life ships were therefore sent to developing nations after the 1980s (Mikelis 2018; Gourdin 2019).

The process of recycling puts enormous pressure on the natural as well as human resources of the nations where dismantling happens. Recycling leads to the discharge of large quantities of hazardous waste into soil, air and water around the recycling yard and the degradation of the coastal environment endangers the life of living organisms in its vicinity. The working atmosphere is highly accident-prone, as the labour force in the shipbreaking operations work under high-risk conditions. Accidents and illnesses arising out of handling hazardous waste may have a long-lasting effect on the labourers' entire lifetime. Only the interventions of various international organisations to protect labour rights and environmental standards in ship-dismantling nations gradually raised awareness about these vital issues (Hossain M.S. et al. 2008).

Even as the ship-owners benefit from lower cost of dismantling, recycling nations have to bear additional expenditure from their own pockets to maintain quality of life around the dismantling shore and those of people involved and this cost is not passed on to beneficiaries. Similarly, medical expenses borne by the labourers, either due to accidents or illnesses faced during the dismantling operations, are not met by both the beneficiaries – ship-owners and recyclers. External costs arising from clean-up of the coastal environment and expenses borne due to accidents and illnesses of labour force are the negative externalities of the recycling industry. These costs are not reflected in the market price of recycling ships. The inclusion of these external costs would add to the total social cost of dismantling services. In the normal course, the cost of ship recycling should be adequate enough to cover the social costs, such as the external costs spent on environmental protection and those that accidents and illnesses suffered by the workforce entail. In the absence of regulations to internalise these costs, ship-owners have a tendency to over-exploit the environment as well as labour by dismantling more ships, which eventually may lead to an inefficient allocation of the resources. Hence, imperfections in the ship recycling market calls for corrective interventions.

To correct the imperfections arising from negative externalities, international organisations have come up with guidelines to improve the conditions of workers as well as the coastal environment in recycling nations. However, lack of a legal framework for the guidelines (Greenpeace 2000), poor bargaining power of workers (Frey 2015; Saha R.K. et al. 2013) and lack of consensus on shipbreaking among recycling nations (Terao 2011; Pelsy 2008) created a vicious circle, resulting in the continuing onslaught of the problem. Though international agencies have proposed various guidelines, they could not be implemented successfully as the recycling nations have not become parties to these regulations. Excess supply of labour in recycling nations coupled with lack of awareness about the implications of

handling hazardous materials left workers with poor bargaining power. Moreover, competition among major ship recycling nations in the Indian subcontinent led to a lack of collective bargaining power to demand the external cost of recycling from ship-owners.

The first section of this paper examines the factors leading to the transfer of ship recycling operations from developed to developing nations, the nature of recycling markets and the negative externalities arising from increased expenditure of workers and costs for the protection of coastal environment. The next section on international conventions throws light on the various guidelines suggested by different international bodies and the loopholes to circumvent the guidelines. The absence of legal framework for enforcing guidelines, poor bargaining power of workforce and lack of consensus among competing recycling nations on shipbreaking have exposed the vulnerability of the workers and the environment of recycling nations. In the third and the last section, the paper suggests the constitution of a consortium of ship recycling nations guided by an international organisation to represent the interests of the workforce engaged in the industry. Further setting up of a ship recycling fund, raised and maintained by the international organisation, to meet the external cost of recycling imposed on workers and the coastal environment is also proposed.

History of ship recycling

Ship recycling activities underwent several transformations in the last century and recycling operations gradually moved out of developed nations and entered the developing nations of South Asia. Japan was the largest shipbreaking nation in the mid-1960s. But, by mid-1970s, Taiwan had overtaken Japan and continued to be the number one till the end of 1980s. China eventually joined Taiwan, Japan and South Korea in shipbreaking and East Asia emerged as the global centre of shipbreaking in the late 1980s and in the early 1990s. The volume of ship dismantling was 50,000 GT per year in the 1970s, quadrupling to 200,000 GT in the mid-1980s (Terao 2011). The United States also undertook shipbreaking operations till the mid-1970s. China took the lead in 1990s, and India, Bangladesh and Pakistan from South Asia soon joined the shipbreaking nations' list (Rousmaniere and Raj. 2007; Pastorelli 2014). Thus, the concentration of shipbreaking had changed since the 1990s, moving from East to South Asia. According to Clarksons Research of 2019, in the year 2018, 30.8 million dead weight tonnage of vessels were dismantled. About 93 per cent of the recycling was carried out in these three nations of the Indian sub-continent (Table 1).

Studies by Terao (2011) have established a positive link between ship scrapping and economic development of certain nations such as the United States,

Table 1. Composition of the ship recycling market (million deadweight).

| Nations | 2016 | 2017 | 2018 |
|------------|------|------|------|
| Bangladesh | 15.3 | 11.0 | 14.8 |
| Pakistan | 9.7 | 6.9 | 7.1 |
| India | 12.8 | 10.0 | 6.9 |
| China | 5.2 | 5.7 | 0.4 |
| Other | 1.6 | 1.7 | 1.6 |
| Total | 44.7 | 35.3 | 30.8 |

Source: (Clarksons Research 2019).

Japan, Taiwan and Hong Kong. All these nations depended on capital-intensive techniques for ship dismantling, which involved methods other than beaching, and supposedly less environmentally damaging. Beaching method basically involves grounding and imbedding the vessel by driving it to a sandy shoreline at a high speed (Greenpeace International 2000). The developing countries engaged in this form of ship-breaking, have little or no port facilities to support the beaching process. East Asian nations like Japan, Taiwan, and South Korea had undertaken ship demolition in an established wharf in ports using heavy equipment for initial disassembly before dismantling ships into small iron plates and scraps using labour-intensive techniques (Terao 2011). However, by the 1980s, the size of vessels meant for scrapping as well as the tonnage to be scrapped increased and this necessitated dependence on beaching, since alternate methods to accommodate bigger vessels required additional investments in the yards or in other facilities.

The methods of beaching and labour-intensive techniques used extensively for recycling operations manifested in increased accidents and coastal degradation. The occurrence of accidents, stricter implementation of labour rights and environmental and safety standards in developed nations resulted in escalated costs of the recycling operations. According to Sawyer (2002), by the early 1990s, shipyards of Europe, the United States and East Asia discontinued dismantling and moved to other profitable operations. The environmental and health consequences of dealing with hazardous materials such as asbestos, polychlorinated biphenyls (PCBs), tributyltin (TBT) and lead found in superstructures of ships forced state officials to shut down the dismantling operations in most of these nations (Greenpeace International 2000; Saha R.K. et al. 2013; Pelsy 2008; Sawyer 2002). In contrast, cheaper dismantling methods, poor enforcement of environmental and safety standards and excess supply of labour, unaware of their rights, made the dismantling operations more attractive in the Indian subcontinent and hence the global centre of dismantling shifted (Frey 2015; Pastorelli 2014; Greenpeace International 2000; Mikelis 2018). Besides, the presence of child labour at dismantling yards brought the cost of recycling further down, though it produced socially

unjustifiable outcomes (Pastorelli 2014; Saha R.K. et al. 2013).

At present, the three major centres of shipbreaking in South Asia are Alang in India, Chittagong in Bangladesh and Gaddani in Pakistan. The presence of natural yards suitable for breaking by beaching made them the favoured locations to adopt an inexpensive method of dismantling (Patrizia H. et al. 2015). More than 90 per cent of the vessels owned by the developed world (Frey 2015) are dismantled in developing nations of the Indian subcontinent (Greenpeace International 2000). Ship recycling ensures sustainable reuse of the materials of a ship without resorting to extraction of natural resources heavily, but the practices followed at the yard for dismantling in developing nations are deplorable (Gourdin 2019; Mohanraj 2013). Shipbreakers of South Asia make meagre investment on fixed equipment and capitalise on the supply of abundant cheap labour that usually migrate from the interior parts of these nations and are subjected to work in an atmosphere of absence of regulations on safety gadgets in degraded environment. The ship demolition market does not reflect the external costs on labour force and environment, or the market does not internalise the negative externalities of ship recycling market. The actual cost of ship recycling on the society is much higher consequent to the presence of external costs of ship recycling and hence, the negative externalities result in the emergence of public bad or market failure.

Ship recycling market

In the ship recycling markets, the owner who is interested in selling the vessel usually approaches the brokers who are familiar with various cash buyers, who purchase end-of-life vessels for reselling to recyclers. After several rounds of negotiations with the cash buyers, the ship broker mediates the sale, for which he obtains a certain percentage of value of the contract as commission for his services. The cash buyer takes the legal ownership of vessel and resells it to recyclers (Karlis T. et al. 2016). The ship-owner has to deregister the ship and the cash buyer does not reregister the ship or obtain new statutory certificate from a flag state, if the voyage to the recycling yard is within domestic waters. On the other hand, if it has to cross international borders to the recycling yard, the cash buyer has to crew the ship, reregister, obtain valid statutory certificates and insure it for a short duration. A number of open registries or flag of convenience, mostly from the grey or blacklisted nations by Paris Memorandum of Understanding, are preferred for the end-of-life voyage of vessels (Mikelis 2018; Patrizia H. et al. 2015). The costs involved in reregistration, documentation and insurance are to be borne by the cash buyer as the ownership is changed to him.

The recycling yards of top three nations of the Indian subcontinent charge competitive prices to attract cash buyers (Terao 2011). Since the competition in the recycling market is intense, profitability depends either on revenue maximisation or cost reduction, or both, followed by recyclers. Revenue generation of recyclers is volatile, subject to prices of reusable steel and other recyclable items, in addition to the domestic currency exchange rate with the US dollar (Karlis T. et al. 2016; Mikelis 2018). World Bank (2010) released a comparative analysis of revenue and costs to the buyer generated from ship recycling yards of Bangladesh and Pakistan. It indicated that for a ship costing the same for recycling, Bangladesh had a profit margin of 15 per cent, whereas it was only 3 per cent in Pakistan (Table 2). Difference in profitability is accounted by mostly the wage differentials and overall cost of dismantling, consisting of labour costs, taxes, tariffs and duties and financial cost. The recycling nations are competing to quote a higher price to make their yards attractive, even by foregoing basic investment expenditures to maintain minimum environmental and labour standards.

Typically, the financial liability of the ship-owners ends with the transfer of vessels to the recycling yards. The responsibility of ensuring safe working conditions and environment-friendly recycling process lies completely with the yards. Preparing an inventory of hazardous materials and their replacement on board, monitoring for soil, air and water protection, waste storage, waste transport, training of personnel, ensuring personal protection equipment, build structure for cutting zones and waste disposal are the responsibilities of recyclers, in addition to complying with regulations and standards (Gourdin 2019). In the absence of regulations, the negative externality generated from the recycling operation would be transferred on to the environment and to the workers. A globally competitive ship recycling market does not give due importance to the estimation of negative externalities on human beings and environment unless an external legal sanction is imposed on the ship-owners and

recycling yards. Therefore, the present system does not impose obligations on ship-owners during the ship's life and instead shift the burden of recycling on to the recycling nations and the workers involved in the process, ignoring the real capacity of developing nations to assimilate such imperfections (Pastorelli 2014). It is ideal to incorporate the external cost of recycling operations into the market price through "beneficiaries" pays' principle. Under this principle, all the parties who had benefitted from vessels during its life cycle are made liable to contribute towards external cost judiciously.

External costs of ship recycling on workers' health and environment

The market imperfections in recycling market calls for internalising the negative externalities, both on the coastal environment and workforce. If these are left unregulated, producers of externalities, both ship-owners and recyclers, may continue to produce these externalities by over-exploiting the resources, which would result in an inefficient resource allocation (Morris 2013). First, external costs of ship dismantling are largely dependent on four cost variants: (i) costs involved in removal of structural components requiring special treatment; (ii) costs of removing operational waste generated within ship's operational period; (iii) costs involved in improving the capacity of the ship recycling yards; and (iv) the costs to deal with on board generated wastes (Choudhary 2011). Second, external costs on human safety and health relate to the costs of accidents and illnesses faced by the labour force while handling hazardous wastes at the yard. Improper information sharing on long-lasting harmful health effects of handling hazardous waste materials on the life of labour results in asymmetry of information in the labour market. The excess supply of labour in the recycling nations, combined with improper knowledge of the risks of accidents and harmful effects of working in the recycling industry, expose the labour force to a potentially dangerous environment with no cover. Therefore, the wages received by the employees are not inclusive of medical expenses to restore their health to a normal stage in case they are afflicted with ailments during their work. Besides, administration and monitoring costs incurred by public authorities and agencies for monitoring coastal environment too constitute part of the external costs of implementing recycling regulations. The yards with poor enforcement regulations on environmental and labour standards allow ship-owners to escape from internalising these external costs.

Migrant unskilled workers from the interior parts of the nations, having no capacity for bargaining either by lack of inherent knowledge or regulatory checks, are forced to work without adequate protective gadgets in

Table 2. Ship recycling finance (in USD).

| Category | Element | Bangladesh | Pakistan |
|----------|---------------------------|------------|-----------|
| Revenue | Steel | 4,771,500 | 4,992,800 |
| | Other recyclable items | 842,000 | 512,700 |
| | Total Revenue | 5,613,600 | 5,505,500 |
| Costs | Purchase of ship | 3,848,000 | 3,848,000 |
| | Investment costs | 21,900 | 18,300 |
| | Financial costs | 147,900 | 265,700 |
| | Labour costs | 92,700 | 233,400 |
| | Consumables | 302,200 | 230,000 |
| | Taxes, tariffs and duties | 263,000 | 693,600 |
| | Rents, levy and permits | 2700 | 500 |
| | Other costs | 13,800 | 51,300 |
| | Total costs | 4,692,200 | 5,340,800 |
| | Profits | Profit | 921,400 |
| Per cent | | 15 | 3 |
| USD/LDT | | 62 | 11 |

Source: World Bank (2010)

these recycling yards. Moreover, the yards do not provide training facilities to upgrade skills of the workers, who are employed on contract for a short duration. Most of the work in these yards is labour-intensive and quite often results in accidents. But these workplaces are ill prepared to render any adequate medical attention to these accident victims. The International Labour Organisation (ILO) describes shipbreaking as involving high levels of fatalities, accidents and work-related diseases and to be the most dangerous of all occupations (International Labour Organization [ILO] 2019; Pastorelli 2014). The international conventions, treaties and regulations to safeguard the working conditions are not strictly adhered to in most of the yards. A report submitted by Technical Experts Committee constituted to study the conditions of workers in Alang, India, observed that the incidence of fatalities in shipbreaking industry is 2 per 1000 workers, while the all India incidence of fatal accidents during the same period in the mining industry, which is considered to be the most accident prone, is 0.34 per 1000 workers (Sahu 2014).

In the study (Sahu 2014) conducted between April 2013 and May 2014 on the condition of the workers at Alang, it was noted that only a small clinic was available at the yard for medical assistance and the facility is ill equipped to treat patients who suffer from fatal accidents. Further, there is no means to address the health issues of an average of 90–100 workers who turn up with minor injuries each day. The bills of the workers treated in hospitals are not settled by the Employees State Insurance Corporation. Further, lack of registration of migrant workers in district records, unauthorised deductions from wages, lack of overtime wages, delay in payment and lack of insurance protection are some of the routine problems faced by the workers. The workers are not provided adequate protective gears to work in a risk-prone atmosphere for long hours and they have to live without basic housing, sanitation, electricity, drainage systems, drinking water and education for their children. Alang-Sosiya in India provides employment opportunities for around 35,000 unorganised migrant workers directly and for thousands indirectly in allied activities. The National Institute of Occupational Health, Gujarat, carried out x-rays of 94 workers of Alang in 2006–07 and found 15 of them suffering from early stages of asbestos poisoning (Sahu 2014).

Chittagong in Bangladesh, another major recycling site, employs over 50,000 people directly in scrapping activities and around 200,000 workers depend on the shipbreaking industry through allied activities. Workers in Chittagong revealed that after 10 years of hard work in the yard, depreciating health conditions forces them to retire from recycling operations and 66 per cent of them are aged between 20 and 39 years (Hossain M.S. et al. 2008). Another study on Chittagong gave insights on multiple diseases and health hazards faced by the

workers such as abdominal, urinary, muscle and skin problems and nutritional deficiency due to close proximity of toxic metal, oil and chemical contamination, excessive workload, long working hours, irregular eating, insufficient diet and unsafe drinking water (Zakaria, Ali, and Hossain et al. 2012). The medical expenses arising from illnesses and deterioration of health are borne by the workers and market wages do not include these external costs. A study by Jobaid M. I et al. (2014) revealed that even though shipbreaking is considered to be one of the dangerous jobs, the employment of children was considered to be lucrative as the wages paid to them were low. In Chittagong the child employees aged between 7 and 18 years constituted around 10 per cent of the total workers at the yard. It raises concerns on the long-term sustainability and survival of child labourers. A study (Memon A.A. et al. 2016) on the living conditions of Gaddani, Pakistan, indicated that the workers stay in unhealthy circumstances without proper infrastructure, education and medical facilities. The infrastructure provided to counter severe health risks was not sufficient to meet the requirements. Lack of proper treatment of wastes was one of the reasons behind the recurring nature of health issues.

The hazardous and polluting substances from the vessels contaminate the environment and degrade coastal areas, marine environment, fisheries and result in loss of biodiversity (Demaria 2010; Aktaruzzaman, M. et al 2014). The external costs on the environment provide an insight into the extent of exploitation of the environmental resources, which the ship-owners and recyclers treat as available free of cost in recycling nations. In the absence of a proper disposal procedure for asbestos, one of the widely used materials for ship building, the surrounding areas get exposed to asbestos fibres, which is one of the causes behind cancer and asbestosis. Heavy metals, paints, coatings, anodes and electrical equipment that are removed without appropriate protective measures are likely to expose human organs to various levels of hazards that may produce different types of cancers. Oil discharged from the ships causes damage to the marine ecosystem and leads to a reduction in the level of oxygen content in the sea water, which may adversely affect the marine biodiversity. The continuous discharge of wastes and other harmful substances into the coastal waters may affect the coastal ecosystem and the life span of mangroves and other aquatic organisms (Mohanraj 2013). The release of bilge and ballast water into the sea causes pollution of sea water and beach sand. During dismantling, disassembling of air conditioning and refrigerating systems result in the release of chlorofluorocarbons that could be hazardous to the ozone layer. The cost incurred to bring the environment back to its pristine beauty is the external cost that recycling slaps on the environment.

International conventions to regulate recycling operations

The questions of workers' safety and environmental pollution were not the major concerns of the dismantling yards for a long time until a major accident occurred in Taiwan, killing many workers in 1986 (Terao 2011). The statistics of occupational accidents of Kaohsiung City, Taiwan, in 1984 indicated that among 86 serious occupational accidents, 27 occurred in the shipbreaking industry with an overall mortality rate of 2.1 per 1000, which ultimately led to the ban of shipbreaking industry in 1986 (Liu Y.K. et al. 2003). Shipbreaking yards of South Asia, which employ huge labour force and are engaged in large-scale dismantling operations without paying due regard to human safety and coastal pollution, invited the attention of international organisations and associations (Sahu 2014; Terao 2011). The international regulations for the transboundary movement of hazardous wastes were included in the Basel Convention of 1989 (Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Basel 1989). International organisations called for regulatory measures in the conference of Parties of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal in UNEP, and also in international bodies such as the ILO and International Maritime Organisation (IMO). In 2002, Basel Convention published the "Technical Guidelines for the Environmentally Sound Management of the Full and Partial Dismantling of Ships". The ILO published the "Safety and Health in Shipbreaking: Guidelines for Asian Countries and Turkey" in 2003. The IMO came up with "IMO Guidelines on Ship Recycling" in 2003. Lack of legal sanctity reduced the effectiveness of these guidelines to voluntary adoption by the parties involved. Under the auspices of IMO, a diplomatic convention called the "Ship Recycling Convention" was held at Hong Kong in 2009 (Terao 2011; Mikelis 2018). The Convention identified security or worker safety, proper treatment and disposal of hazardous materials and formulation of a ship recycling plan as duties of a recycling yard.

The Hong Kong Convention specifies regulations during different stages of the life of a ship: design, manufacturing, operation, recycling preparation and demolition. At the manufacturing stage, the shipbuilders must collect material declarations of raw materials, parts and machinery from subcontractors, and create an inventory based on that information. Later on, the ship-owners take up the responsibility for inventory management till the vessel is taken for recycling. They also are required to draw up a Ship Recycling Plan in coordination with recycling yards before demolition.

The Convention requires the yards to obtain approvals from competent authorities of recycling nations and be subject to periodic inspections where the dismantling is to be undertaken. The Convention shares the responsibility with all the stakeholders who take part in in the building, operation and recycling of the ship (Jain K.P. et al. 2013).

The Hong Kong Convention is a revolutionary step taken by international bodies to lower the unequal sharing of responsibilities of recycling nations and to provide mechanisms for sustainable or green recycling. The Convention, which was considered as an important step, is not devoid of defects. Exemptions given to ships less than 500 GT, exclusion to non-commercial ships, neglect of guidelines on material disposal and treatment facilities at yard, failure to suggest an alternate method to beaching for dismantling, absence of proper incentives and support mechanisms for dismantling, reflagging of ship to non-party state and absence of third party control by other nations are the areas that nations can easily circumvent the regulations (Terao 2011; Jain K.P. et al. 2013; Patrizia H. et al. 2015). Though considered to be a revolutionary stage in the process of green recycling, lack of legal sanctity of the Convention and mechanisms for implementation make it voluntary for the nations to enforce them. Therefore, the Convention could not produce any significant impact on improving the conditions of the recycling yards.

In 2013, European Union Ship Recycling Regulation (SRR) was adopted to reduce dumping of toxic substances in developing nations with the intention to prevent their negative impact on environment and human beings. This regulation insists the European owners to ensure on board the listing of hazardous substances and to provide a ready-for-recycling certificates to recycle yards. The loopholes in SRR such as lack of financial incentive mechanism for ship recycling, complications associated with reflagging of vessels before the final journey, failure to suggest an alternate method to beaching and lack of restrictions on the use of flag of convenience permit the European owners to circumvent the EU SRR (Patrizia H. et al. 2015; Pastorelli 2014).

Though the guidelines of international organisations had loopholes using which stakeholders circumvented them, the suggestions provided in these guidelines could be treated as revolutionary measures to correct the imperfections in the ship recycling market. They created an awareness about labour rights and the need for upholding environmental compliance standards in recycling nations. Considering the long-term goal of achieving sustainability, the suggestions put forth may have to be collectively adhered to by all the stakeholders to reduce the implications of negative externality.

Proposal for a consortium of ship recycling nations

The guidelines provided by international organisations since the Basel Convention in 1989 could be treated as revolutionary steps to frame policies to reduce the consequences of negative externalities inherent in ship recycling activity. However, the suggestions of the HKC and the EU SRR had certain loopholes, which led to the non-adherence of these suggestions by different stakeholders of recycling. This study examines the problems of negative externalities experienced by the marginalised sections of ship recycling nations and the importance of a collective representation. As discussed earlier, the recycling nations have less stringent rules and regulations to ensure quality of the environment and life of the workforce. These nations are compromising on the coastal environmental quality to gain employment and financial benefit, which is an imminent need. Thus, the bargaining position of the workers in the recycling operations and coastal population of the recycling nations are almost nil and if left unregulated, it may lead to further exploitation of the existing resources. Having understood that around 90 per cent of the ship recycling operations are carried out in three nations of the Indian subcontinent and the workers lack organised support, a consortium of these nations can represent their interests to a greater extent to the wider maritime community.

The top three ship recycling nations of the Indian subcontinent share some commonalities such as use of labour-intensive techniques and beaching method while dismantling ships. The composition, nature and the problems of labour force of these nations are uniform in addition to the environmental degradation and deteriorating biodiversity of their coasts. This provides ample opportunity for the formation and sustenance of a consortium by these nations comprising India, Pakistan and Bangladesh. Since sustainability of the coastal environment and poor stature of the workers are major concerns globally, guidance from an international organisation may be beneficial to the recycling nations. An international organisation, preferably, an organisation under the UN like International Maritime Organisation (IMO) could act as a supporting agency to provide guidance. The need for constituting such a consortium should be highlighted to the recycling nations by IMO. In the absence of such a consortium, there may not be any incentive on the part of either the recycling yards or the ship-owners to voluntarily implement workforce-friendly and environment-protecting policies that may require certain financial investments. Since India, Bangladesh and Pakistan are currently member nations of the IMO, it would be easy to formulate and implement policies under its guidance and also to monitor the internal operations of these recycling nations.

As long as the group interest is placed at the fore with utmost importance, ignoring the competing interests of each of these nations, the consortium is expected to sustain for a long period. If any one of these nations places highest importance to their individual interest over the collective interest of the group, the consortium is likely to break apart. The consortium established should not aim at maximising the individual profit, but has to act as a forum to represent the collective interests of the deprived labour group and prevent the environmental damage caused by the recycling yards. The international organisation has to oversee the functioning of the consortium on a regular basis to ensure its sustainability; otherwise, the collective bargaining power of the marginalised sections as a whole may be lost. In the absence of a consortium, ship-owners would prefer that recycling yard which costs them less and give continuity to the current state of external costs.

The consortium should work in collaboration with the labour and environmental departments of these three nations. Besides the routine task of conducting meetings with the labour and environmental departments, the consortium has to estimate the external costs of ship recycling on environment and human life and the calculation may be done on the basis of "beneficiaries' pays" principle. Appropriate estimations have to be made by taking the benefits enjoyed by ship-owners, considering the specificities of vessels, both under construction and those in operation. Similar to the funds generated in European nations for the recycling of vehicles, a recycling fund may be generated at the time of construction of the vessels (Gourdin 2019). For the existing ships in operation, a percentage of annual operating costs may be set aside towards the recycling fund. The fund so generated and managed by the international body may be transferred on to the recycling nations during dismantling based on the regulatory measures adopted and enforced in these nations. At the national level, yard license issuing authority in collaboration with international organisation may enforce regulations on ship-owners and recyclers. The local monitoring authority may be given the power to issue licenses and also the power to impose tax on ships that call at the recycling yards. The tax so collected could be used by local authority for the provision of developing the yard facilities including safety gadgets, potable drinking water, healthy food, medical facilities, training to the workers, awareness about handling hazardous materials, toilet and living conditions besides ensuring insurance in the event of accidents. The responsibility to ensure a healthy work atmosphere should be guaranteed by the national authority issuing license to the yard and the authority may also be made responsible to check the quality of air, water and atmosphere regularly.

Some of the loopholes of the HKC discussed earlier could be addressed significantly under the new

arrangement if we approach them from the perspective of recycling nations. The HKC neglected the treatment of the hazardous materials at the yard. Proper and regular monitoring of the yard may be carried out by the domestic authority of each nation, since the recycling fund may be used to allocate funding to them on the basis of the corrective steps taken by the recycling yard. The recycling fund created with the assistance of an international organisation could act as a proper incentive and support mechanism at the time of ship dismantling. A portion of the recycling fund may be set aside every year for the development of technology to deal with issue of the treatment of hazardous materials. The issue related to the exclusion of non-commercial ships may be addressed by adopting a differential approach to ships on the basis of their specificities and appropriate policies may be framed by the international organisation in consultation with the consortium for the ships that are on their end-of-life journey headed towards the yards of these recycling nations.

Ship recycling operations of these three nations have the potential to provide employment to many unorganised migrant workers from interior regions of their countries. Moreover, the geographical advantage to follow beaching method for recycling could be looked upon as a cost-effective method of recycling of bigger ships. It is expected that the consortium set up to represent the interests of workforce and coastal community of ship recycling nations can address their problems to a great extent and can improve the quality of the environment and workers. Thus it is imperative to support the need for a representative body for the marginalised, as it could lead to a cost efficient outcome for the entire maritime community.

Acknowledgment

The author would like to thank Dr. Rajoo Balaji for his critical and insightful comments on the earlier draft of this paper.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Emil MatheW  <http://orcid.org/0000-0001-9782-6025>

References

- Aktaruzzaman, M., et al. 2014. "Ecological Risk Posed by Heavy Metals Contamination of Ship Breaking Yards in Bangladesh." *International Journal of Environmental Research* 8 (2): 469–478.
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Basel, 22 March 1989, 28 Int'l Leg. Mt. 657
- Buxton, I. 1991. "The Market for Ship Demolition." *Maritime Policy & Management* 18 (2): 105–112. doi:10.1080/03088839100000034.
- Choudhary, G. K. 2011. "An Analysis of the Creation of a Global Ship Recycling Fund in the Framework of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships." Thesis submitted in Master of Science in Maritime Affairs, World Maritime University, Malmo, Sweden
- Clarksons Research. 2019. Shipping Intelligence Weekly, Issue No.1371.
- Demaria, F. 2010. "Shipbreaking at Alang-Sosiya (India): An Ecological Distribution Conflict." *Ecological Economics* 70: 250–260. doi:10.1016/j.ecolecon.2010.09.006.
- Frey, R. S. 2015. "Breaking Ships in the World-System: An Analysis of Two Ship Breaking Capitals, Alang – Sosiya, India and Chittagong, Bangladesh." *Journal of World-Systems Research* 21 (1): 25–49. doi:10.5195/jwsr.2015.529.
- Gourdin, K. 2019. "Ship Recycling: An Overview." OECD Science, Technology and Industry Policy Papers, No. 68.
- Greenpeace International. 2000. *Shipbreaking: A Global Environmental, Health and Labour Challenge*. Amsterdam, The Netherlands: Greenpeace International.
- Hossain, M. S., et al. 2008. "Occupational Health Hazards of Ship Scrapping Workers at Chittagong Coastal Zone, Bangladesh." *Chiang Mai Journal of Science* 35 (2): 370–381.
- ILO (2019), "Shipbreaking: A Hazardous Work", accessed 22 June 2019. http://www.ilo.org/safework/areasofwork/hazardous-work/WCMS_110335/lang-en/index.htm
- Jain, K. P., et al. 2013. "Critical Analysis of the Hong Kong International Convention on Ship Recycling." *International Journal of Environmental and Ecological Engineering* 7 (10): 684–692.
- Jobaid, M. I., et al. 2014. "Ship Recycling and Its Environmental Impact: A Brief Overview of Bangladesh." *IOSR Journal of Business and Management* 16 (10): 31–37. doi:10.9790/487X-161013137.
- Karlis, T., et al. 2016. "Ship Demolition Activity: A Monetary Flow Process Approach." *Scientific Journal of Maritime Research* 30 (2016): 128–132.
- Liu, Y.-K., et al. 2003. "Mortality among Former Shipbreaking Workers- A 13 Year Retrospective Follow up Study in Taiwan". *Journal of Occupational Health* 45: 36–42. doi:10.1539/joh.45.36.
- Memon, A. A., et al. 2016. "Comprehensive Analysis of Existing Infrastructure Conditions Correlating Ship Breaking Activities and Its Implications on Workers and Community: A Case Study of Gaddani Town and Ship Breaking Industry, Baluchistan, Pakistan." *American Scientific Research Journal for Engineering, Technology and Sciences* 17 (1): 245–257.
- Mikelis, N. 2018. "The Recycling of Ships." http://www.gmsinc.net/gms_new/assets/ads/folder.pdf. Accessed on 21 October 2019.
- Mohanraj, T. P. 2013. "Ship Recycling Industries and Its Environmental Impacts: A Comparative Study, 2321–4171." jsslawcollege.in/wp-content/uploads/2013/12/SHIP-RECYCLING-INDUSTRIES-AND-ITS-ENVIRONMENTAL-IMPACTS-A-COMPARITIVE-STUDY.pdf
- Morris, J. 2013. "Environmental Costs and Externalities, Sound Resource Management Group, Inc." Prepared for the Oregon Department of Environmental Quality, <https://www.oregon.gov/deq/FilterDocs/mmexternalities.pdf> Accessed on 19 June 2019.
- Pastorelli, S. 2014. "EU Ship Recycling Regulation: What's In It for South Asia? EU-Asia at a Glance." European Institute for Asian Studies, Brussels.

- Patrizia, H., et al. 2015. "What a Difference a Flag Makes? Why Ship Owners' Responsibility to Ensure Sustainable Ship Recycling Needs to Go beyond Flag State Jurisdiction, NGO Shipbreaking Platform." *Briefing Paper*, April, Brussels
- Pelsy, F. 2008. "The Blue Lady Case and the International Issue of Ship Dismantling." *Law, Environment and Development Journal* 4/2: 135. <http://www.lead-journal.org/content/08135.pdf>
- Rousmaniere, P. and N. Raj. 2007. "Shipbreaking in the Developing World: Problems and Prospects." *International Journal of Occupational and Environmental Health* 13 (4): 359–368. doi:10.1179/oeh.2007.13.4.359.
- Saha, R. K., et al. 2013. "Safety Management for Bangladeshi Ship Breaking Industries Perspective." *Global Journal of Researches in Engineering & Industrial Engineering* 13 (5): 9–14.
- Sahu, G. 2014. "Workers of Alang- Soshiya: A Survey of Working Conditions in A Ship- Breaking Yard, 1983–2013." *Economic and Political Weekly* 49: 49–52.
- Sawyer, J. E. 2002. "Shipbreaking and the North–South Debate: Economic Development or Environmental and Labour Catastrophe." *Penn State International Law Review* 20 (3): 535–562. Article 4.
- Stopford, M. 2009. *Maritime Economics*. London: Routledge.
- Terao, T. 2011. "From Shipbreaking to Ship Recycling: The Relocation of Recycling Sites and the Expanding International Approach." In *Economic Integration and Recycling in Asia: An Interim Report*, edited by Kojima and Michinda. Chosakenyu Hokokusho: Institute of Developing Economies. 113–127.
- World Bank 2010. "Ship Breaking and Recycling Industry in Bangladesh and Pakistan." <http://documents.worldbank.org/curated/en/872281468114238957/The-ship-breaking-and-recycling-industry-in-Bangladesh-and-Pakistan> Accessed on 15 August 2019
- Zakaria, N. M. G., M. T. Ali, K. A. Hossain, et al. 2012. "Underlying Problems of Ship Recycling Industries in Bangladesh and Way Forward." *Journal of Naval Architecture and Marine Engineering* 9: 91–102. doi:10.3329/jname.v9i2.10515. Accessed on 10 May 2019