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A STUDY ON SHIP SCRAPPING RAGARDING SAFETY, HEALTH, ENVIRONMENT & ECONOMY OF BANGLADESH

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ABSTRACT

This study is part of ECO-EFFI co-operation project which purpose is to develop methods and tools to estimate ships' eco-efficiency. The ECO-EFFI project is part of larger entity called SEEE – Ship's Energy Efficiency and Environment. SEEE is a FIMECC (Finnish Metals and Engineering Competence Cluster) project. The aim of this study is to deliver a report that presents the state, challenges and possibilities of ship dismantling today and give ideas on how to develop the industry in the future. Ships are dismantled to recycle the steel they are built of. It is a relatively young industry as there has been need to break ships made of steel only for around 50 years now. Until recent years the industry has been taking place mainly in the developing countries in Asia at the expense of nature and labourers but as the awareness about the industry has risen there is increasing pressure to invest in the sustainability of ship dismantling.

1.0 INTRODUCTION

The purpose of the study

The purpose of the study is to determine on a general level how the ship dismantling industry works today, how the industry has developed into the current state and what role recycling has in the process. The intention is also to screen the impacts ship dismantling has on the environment and the people who are involved in the industry. The purpose is to compare the consequences that non-regulated dismantling in the developing countries and dismantling in the Western world following international agreements have. The target is also to estimate the development of ship dismantling in the future and draft the features of a "recycling-friendly" ship.

The scope of the study

Ship dismantling is a very complex industry to be discussed comprehensively. This is why the thesis will only concentrate on normal size commercial ships and exclude boats and other small vessels. Also military vessels will be excluded because, as they are owned by governments, the dismantling process of war ships is usually carried out in a different way than that of the open market. The study will focus on ship- and environmental technical main issues. Socio-economic aspects will be introduced but they will have lower priority. Some hazards of ship dismantling for human and nature will be brought up as examples but it is not the intention to concentrate specifically on them.

Research methods

The study will be carried out combining qualitative and quantitative research methods. The focus of the study is on how the ship dismantling industry works and what are the parties involved. Research material consists of rules and regulations affecting ship dismantling. Also conference papers regarding ship dismantling as well as related studies will be studied. It is also studied what ship dismantling could learn from the best recycling practices' of other industries.

2.0 HISTORY AND THE CURRENT STATE OF SHIP DISMANTLING

Ship dismantling is a process that includes actions from removing a vessel's equipment to scrapping the hull and other structures. Until the mid 1900s ship dismantling was a common practice in the ports of Europe although the number of dismantled ships was minimal compared to the current situation. After those days ship breaking began to move to Asia because of the demand for steel and lower labour costs. From the late 1960s to the early 1980s ship dismantling was performed in the more industrialized countries of the continent such as Japan, Taiwan and Korea. For the last 25 years global ship dismantling has concentrated on the developing countries in Asia. The number one ship breaker, by volume, at the moment is India. Other major actors are Bangladesh, Pakistan and China. (European Commission Directorate General Environment 2007, 21) . Until the late 20th century, ship breaking took place in port cities of developed countries such as the UK and the US . Today, most ship breaking yards are in developing countries, with the largest yards at Gadani in Pakistan, Alang in India, Chittagong in Bangladesh and Aliagain Turkey . This is due to lower labor costs and less stringent environmental regulations dealing with the disposal of lead paint and other toxic substances. China used to be an important player in the 1990s. It is now trying to reposition itself in more environmentally friendly industries

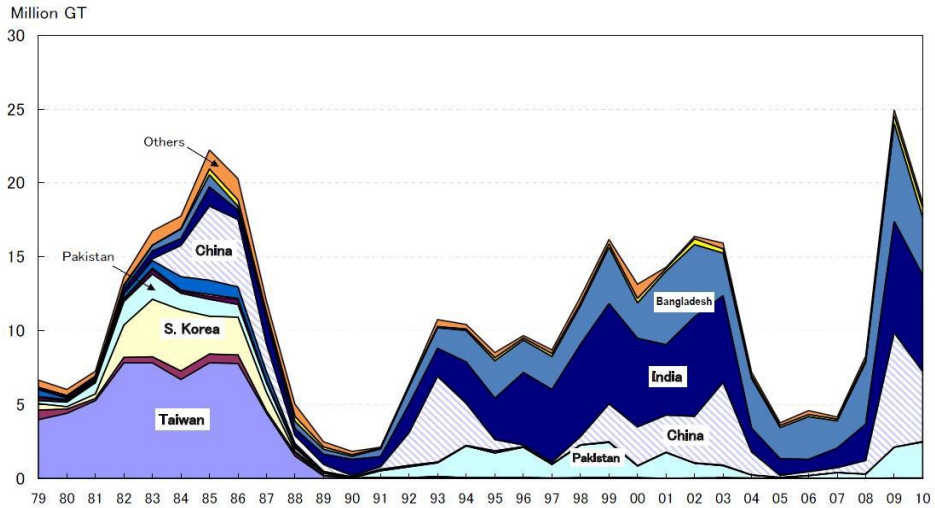

Figure 1. Development of ship recycling industry (The Shipbuilders'Association of Japan, 2012)

The industry has concentrated on Asia's developing countries for purely economical reasons. The ship owners could as well choose to recycle their vessels in environmentally friendly facilities in Europe, the USA or developed Asian countries but it would not make any sense to do that from financial perspective. By selling a ship to a breaking yard, for example in Bangladesh the ship owner can profit quite significantly from a ship considering the value that the ship has on the resale market. On the other hand, it is possible that the ship owner would even have to pay for recycling its vessel in a green recycling facility. (Commission of the European Communities 2007, 5-7)

2.1 Safety

A vessel in operation has all the potential for being a risk to both occupational safety and health and to the environment. The well-established regulative regime governing international shipping covering all stages of building, operation and maintenance, addresses these issues and identifies minimum standards. This maritime legislative framework does not apply to the latter cycle of a vessel's life, namely its retirement and ultimately its "grave". Consequently there are at the moment no standards in relation to ship decommissioning and disposal.

2.2 Occupational Safety

Workers' safety is jeopardized by the absence of basic precautions and work planning, including, but not restricted to:

1 . insufficient or no training;
2. insufficient or no personal protection equipment;
3. insufficient or no monitoring of work operations; and
4. insufficiencies in facilities.

2.3 Risks

Due to the absence of norms about the standard the vessel should be in when it arrives for scrapping, the vessel represents in itself a number of potential risks. Basic risk-reducing or eliminating measures are often ignored and ultimately accidents occur. Some examples are:

1. access to non-breathable atmospheres;
2. hot work in explosive atmosphere; and
3. uncontrolled closedown of systems (e.g. the discharge of CO2 from fire-fighting systems in vacated spaces).

In order assure the safety of the workers it is very necessary to take some steps. The order of taking various steps at the time of emergency are given below:

1.Emergency Response
2.Crane Services
3.Mobile Hydraulic Shear Cutters
4.Shoreside Processing of Metals
5.Fall Protection

2.4 Health

The main elements of exposure affecting workers' health would appear to be:

1. the nature of the work procedures adopted (hard manual labour involving heavy lifting, etc.);
2. long-term exposure caused by working operations and lack of personal protective equipment (PPE); and
3. exposure to hazardous substances/toxins.

The workforce, often migrants, usually live in inadequate facilities on, or in, the immediate vicinity of the site. Noise, inadequate sanitary facilities and general exposure (e.g. discharges to sea, ground and air) originating from the site have obvious short- and long-term health implications.

The exposure to carcinogens and cancer-related substances such as PCB, PAH, heavy metals and asbestos is considerable. These substances are present in almost all vessels. Among some of the

breaking majors, some hazardous materials are reprocessed and returned to the market (e.g. reprocessing of asbestos). The long-term effects of constant exposure to these substances are well known. Their health impact is severe and can be passed on to the following generations. There are no reliable data on health implications and consequences within the ship scrapping industry. It is however evident that the exposure experienced by the workforce have serious short- and long-term effects and that the consequences will include fatalities as well as physical and mental disabilities. Though shipbreaking is a risky occupation and entails life risk due to accident and fatal occupational diseases, but the employers do not provide any PPE (personal protective equipment) in general and appropriate PPE in specialized areas. Labourers are not provided with safety facilities and working equipment such as helmets or gumboots. There is no equipment for machine safety, chemical safety and water safety. Gas cutters and their helpers are cutting the steel plates almost round the clock without protection of eyes, so their eyes are always vulnerable to welding effects. They do not wear any uniform and never use any coverall or hand gloves, goggles, boots and work suit. These types of crude attempts very often cause severe explosions. It is found that the beaches, where ship breaking takes place are strewn with chemicals and toxic substances, small pieces of pointed and sharp iron splinters pasted on the surface of the beach causing injuries. Workers enter into such areas without taking any precautionary measure and work bare footed. Occupational health and safety is not important to the employers, they hardly rarely maintain a First-aid Box.Most of the workers are illiterate, very poor and are not conscious about their health, safety and the dangerous effects of the poisonous chemicals. Accidents are not reported or recorded. If any worker is affected by occupational diseases, he is no more employed by any of the employers. The employers through adoption of various unfair practices usually conceal information when any worker dies due to occupational accidents. In most cases, families of the victims are not informed, as contractors do not use proper names and addresses of the workers and there is no monitoring or inspection by the Inspection and Labour Department of the concerned ministry (Rahman and Tabarok Ullah, 1999). On average one ship breaking worker dies at the yards in Bangladesh every week and every day one worker gets injured. These casualty numbers of poor toiling masses can never be found in any official statistics. It seems that nobody really bothers about the tears of ship breaking workers, they are treated as replaceable instruments for the yard owners. One is lost, so get another to replace him.

2.5 Environment

Ship dismantling of Bangladesh is a reason of concern due to its economic values and environmental hazards. This study focuses on the Ship Breaking and Recycling Industry (SBRI) of Bangladesh to assess the environmental impacts. It was done by analyzing the water quality parameters like, Turbidity, Salinity, Electric Conductivity (EC), Dissolved Oxygen (DO), pH, Total Dissolved Solids (TDS), Temperature, Ammonia-Nitrogen, Nitrate–Nitrogen, Phosphate concentrations of inside and surroundings of Ship Breaking Yard. Turbidity ranged from 7.71 to 119 FTU and 4.07 to 41.74 FTU in inside and outside the ship breaking yard, respectively. Salinity ranged from 0.95 to 14.28 ppt and 0.06 to 0.79 ppt in insde and outside, respectively. Value of EC varied from1.75 to 1280 µs/cm in inside and 0.21 to 15.7 µs/cm in outside, DO ranged from 3.77 to 7.94 mg/l in inside and 1.95 to 5.34 mg/ l in outside. TDS value ranged from1,280 to 15,340 mg/ l in inside and 74 to 825 mg/l in outside of ship breaking yard. Ammonia-N value ranged from 0.46 to 7.046 mg/l, Nitrate-N value ranged from 0.10 to 6.9 mg/l and Phosphate value ranged from 0.175 to 4.75 mg/l in the analyzed water sample. Magnitude of environmental alteration by establishment of ship breaking industry was assessed by quantifying Environmental impact value of Study area and the value was found as -93, where ecological parameters value was found -72, Physico-chemical parameters value was -70 and human interest value was found +49 which indicate negative alt

Ship Breaking and Recycling Industry (SBRI) is a growing industry in the world because of its huge economic importance. Around 95% of the ships mass are valuable steel and they are completely recyclable and after sailing life they are sold for scrapping (Greenpeace, 2001). In the 20th century it was established in industrialized countries such as United Kingdom and United States. In the period of 1960s and 70s ship breaking activities migrated to semi industrialized and low income countries such as Spain, Turkey and Taiwan for the available cheap labor and re-rolled steel mill and market but currently the global center of concern of the ship breaking industry are located in South Asia, specially the Indian Sub-continent (Bangladesh, India and Pakistan). The Ship Breaking and Recycling Industry (SBRI) is a complex process and involved with many health, safety and environmental issues (OSHA, 2001). As the cost of upholding environmental and health and safety standards in developed countries has risen, ship breaking industry has increasingly shifted to poorer Asian countries (Greenpeace, 2001).

Ship breaking activities migrated to Indian-subcontinent due to the low paid available labor, suitable climatic condition and topography, a profitable local domestic and international market with shipping facilities eration on environment relatively less Environmental concern and implementation of laws and exchange rate, relative to the US dollar and currencies of other ship breaking countries (FIDH, 2002). Now a day's Bangladesh is the most efficient and prospective country for ship breaking industry in the world and also for the domestic production. Up to 2.2- 2.5 M tons of national steel production come from the ship breaking industry. There are at least 40 active ship breaking yard and 250-350 re-rolling mills (World Bank, 2010). Around 22,000 worker are directly involved in ship breaking activities and another 200,000 are indirectly employed by ancillary work and after 2009 it increased rapidly (World Bank, 2010). Handling different types of heavy objects, poor access to progressively dismantled ship, heavy metal pollution and other chemical, lack of safety equipment is causes of these types of hazards (OSHA, 2001). At present there are at least 40 ship-breaking yards in the Sitakunda area and extend from Fauzdarhat to Kumira coast (World Bank, 2010, p.34). The Sitakunda coast is suitable for establishment of ship breaking yard for geological, topographical and economical advantages: long uniform intertidal coastline with tidal differences of 6 meters, protection of the Bay of Bengal, favorable weather condition, local market of steel and iron, low labor expenditure, little environmental awareness and moderate implementation of environmental laws (YPSA, 2005).

Pollutants discharged from ship breaking and its impact:

We know that ship breaking industry is one of the profitable industries in developing countries like Bangladesh but there are a lot of health and human hazards. Actually it depends on the size and function of ships. Normally scrap ships is between 5000-40000 tones. And from a ship yard owner can get 95%of steel, 10 to 100 tons of paint, organ tins, arsenic, zinc, cadmium and chromium. Ship not only proves us assets but also huge tons of waste up to various asbestos, thousand litter oils, in addition, hold up to 1,000 cubic meters of lasting oil. The majority of these resources have been defined as unsafe waste. In Bangladesh, ships containing these materials are creature cut up by offer, on open beaches, with no reflection given to safe and environmentally welcoming waste organization practices, Hossain, K.A (2010). From our survey it is really clear that ships are not cleaned perfectly. It is something like eye wash and try to certify ship is fully free from dangerous waste and chemical. This activity is really a threat for both public health and marine environment. It is like a tiny version of a city that discharges each kind of pollutants that a metropolitan area can create like liquid, metal, solid and dangerous solid pollutants.

Workers' Rights Valuation:

Occupational health standards is not available and training as well as protection equipment is not provided in ship breaking yard

 When workers are injured there is no emergency service and access treatment on the job of this industry even ignoring required compensation
 Wages is less than the standards
 Child labor is used there
 No over time
 There are no specific rules for the job securities
 They have no rights to form a trade union

In the common of the shipyards, staffs are being underprivileged of their rights. They work under dangerous conditions but have no right of entry to safety equipment, job safety or a living wage.

2.6 Economy

Performance of Ship Recycling in Bangladesh

Though the ship breaking in Bangladesh started insixties, commercially it started in late seventies. Thepast data of ship recycling showed that Bangladeshplayed a significant role [1] in the ship recyclingworld, particularly during 2004 to 2009. In Figure 1,the share of Bangladesh to the world total of shiprecycling in LDT is shown. In Figure 2, it is seen that Bangladesh led theworld ship recycling during 2004to 2008 and India was just behind it. Before 2004,India was the number one in ship recycling for long period. However, currently India has again retainedtheir leading position in the ship recycling worldleaving China and Bangladesh as their follower. The trend of Bangladesh showed ups and downs in early of this decade, but sharply increased in the last threeyears. In 2009 Bangladesh recycled around twomillion ton scrap. So Bangladesh is now beingconsidered as one of the global leaders in shipbreaking.

A comparison of percentage cost breakdown [4] of breaking a 14800 LDT tanker in three Asian countrieshas been shown in Figure 3. Figure 4 shows estimatedcost and profit related to the same tanker in the three countries. From the figure it is seen that cost profitratio is 2 times higher than Indian ship braking yardsand six times higher than breaking yard of Pakistan. Bangladeshi ship breakers usually offer highest pricewhile purchasing scrap ships, but due to cheap labourand other benefit compared to neighbouring countries, cost profit ratio is high. In 2009 Bangladesh recycled around two million ton scrap ship and thus playing avital role in the global ship recycling market

3.0 CASE STUDY

Ship breaking is an important activity in context ofBangladesh. Though Bangladesh is playing a leading role as a ship breaking nation for a long time, but thedata related to these industries are very rare as theseyards are highly restricted to the commoner. In this study, efforts have been made to assess the social and environmental impact of ship recycling on the basis offield data collected from existing recycling yards. Asample 5000 LDT multipurpose container ship data has been collected for this purpose. Table 2 shows where the materials and components of the sample ship were recycled in Bangladesh. Table 3 shows the contribution of materials and components to the local industries as recycling materials and the amount of pollutants from this ship disposed to the environment . From the Table 2, it is seen that ship braking industry is providing enormous contribution to the national economics through supporting inland shipbuilding industry, construction industry, re rolling mills, steel mills, oxygen plants, and also cable, ceramic, and furniture factories. It provides about 35,000 tons of processed wood & furniture annually and henceforth preventing de-forestation. It's contribution to the national economy is about US$1 billion. On the other hand, ship destined for ship breaking may contain significant quantities of hazardous materials and that is why ship breaking operations involve high risks and harms. In Bangladesh, ship breaking takes place on sandy beaches following very rudimentary ways. Because

of socio economical conditions, labours are very cheap and they do not bother to take any risky job. They do not have even basic knowledge of occupational safety and hazard.

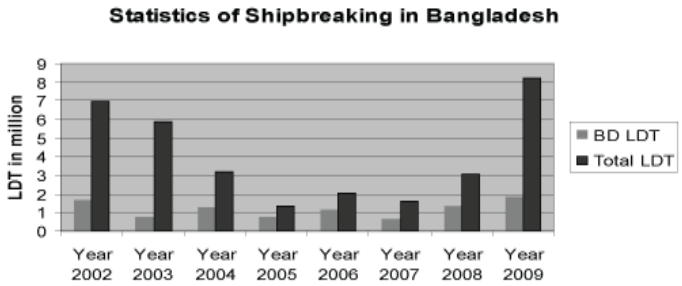

Figure -1 : Statistics of Ship breaking in Bangladesh

Ship breaking is an important activity in context of Bangladesh. Though Bangladesh is playing a leading role as a ship breaking nation for a long time, but the data related to these industries are very rare as these yards are highly restricted to the commoner. In this study, efforts have been made to assess the social and environmental impact of ship recycling on the basis of field data collected from existing recycling yards. A sample 5000 LDT multipurpose container ship data has been collected for this purpose

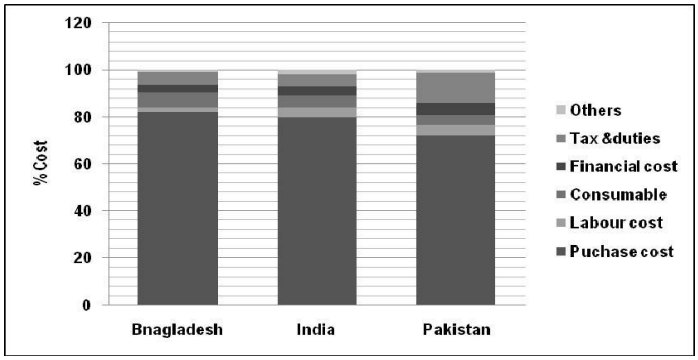

Fig-2 : Comparision of cost breakdown of a sample tank

A comparison of percentage cost breakdown [4] of breaking a 14800 LDT tanker in three Asian countries has been shown in Figure 3. Figure 4 shows estimated cost and profit related to the same tanker in the three countries. From the figure it is seen that cost profit ratio is 2 times higher than Indian ship braking yards and six times higher than breaking yard of Pakistan. Bangladeshi ship breakers usually offer highest price while purchasing scrap ships, but due to cheap labour and other benefit compared to neighbouring countries, cost profit ratio is high.

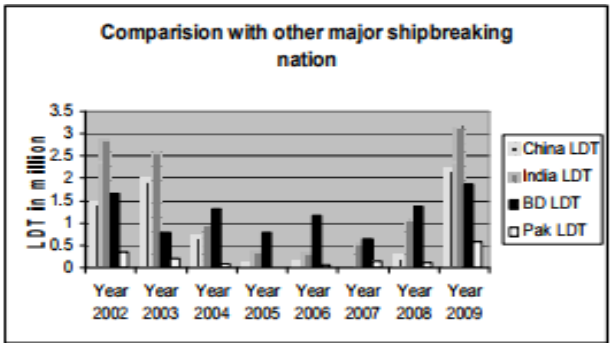

Fig-3 : Comparision among major ship breaking nation

In Figure 4, it is seen that Bangladesh led the world ship recycling during 2004 to 2008 and India was just behind it. Before 2004, India was the number one in ship recycling for long period. However, currently India has again retained their leading position in the ship recycling world leaving China and Bangladesh as their follower. The trend of Bangladesh showed ups and downs in early of this decade, but sharply increased in the last three years. In 2009 Bangladesh recycled around two million ton scrap. So Bangladesh is now being considered as one of the global leaders in shipbreaking

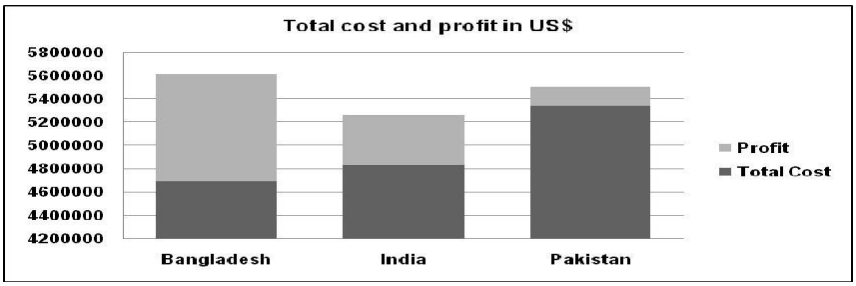

Fig-4 : Cost and profit related to recycling

Figure 5 shows estimated cost and profit related to the same tanker in the three countries. From the figure it is seen that cost profit ratio is 2 times higher than Indian ship braking yards and six times higher than breaking yard of Pakistan. Bangladeshi ship breakers usually offer highest price while purchasing scrap ships, but due to cheap labour and other benefit compared to neighbouring countries, cost profit ratio is high. In 2009 Bangladesh recycled around two million ton scrap ship and thus playing a vital role in the global ship recycling market

4.0 RESULT

Labor Law Act 2006 has provisions on working conditions, health and safety, hours, leave and compensation. However, enforcement and compliance is almost non existent. There is a lack political will and resources on the Government side while the owner's see no reason to comply.
The Government of Bangladesh has recently introduced new national policies and legislation to improve the environmental and occupational health and safety standards in the ship breaking yards. But there is a long way to go. Governance is poor, and enforcement of policies and laws is often non-existent. Politicians and decision makers have vested interests in the industry, and corruption is wide spread making it difficult to enforce rules and regulations.

It is needless to say that it has great impacts on GDP as well. From the above discussions we would like to recommend some essential points which can increase the growth and working environmental safety of this industry in Bangladesh.

1. Existing laws should be strictly enforced by the government.
2. To develop a well-designed working friendly cutting plant, workers safety and environmental issues should be in high concern to make any rules and regulations in this industry.
3. Need to develop a flexible working condition for children as per the ILO convention and the United Nations convention on the right of children.
4. It is very essential to focus on the contribution of the worker those who are involved in this industry and give their continuous effort to national and international economy as well.
5. Government organizations, NGO's, INGO's, civil societies and political leaders should take necessary steps as quickly as possible for ensuring the basic rights of the workers and their family members.
6. Rules and regulations of International Maritime Organization (IMO) and "Hong Kong international convention for safe and environmentally sound recycling of ships" have to be implemented.

5.0 CONCLUSION

Considering the positive role of ship breaking in national economy ship breaking can not be stopped. Rather a sustainable approach should be taken to minimize the negative consequences of ship breaking activities in our coastal zone. However, following steps may be taken for sustainable practice of ship breaking activities in Chittagong coastal area:

1. Government should formulate and implement a national policy and principles for safe and sustainable shipbreaking after having consultation with relevant organizations, employers and workers.
2. Government should include this sector under the ministry of industry defined by the Factory Act, 1965 and formulate a policy so that, worker's rights and welfare; occupational safety & health (OHP) could be ensured and it could be eco-friendly as well.
3. As Fauzdarhat has been earmarked for recreational facilities in the Master Plan of Chittagong, the Master Plan is to be revised till a final study is made by the experts on the impact of ship breaking being developed in its present site.
4. a) A gas free certificate (in true sense) must be obtained before any ship is broken. Oil must be removed and the oil tanks must be thoroughly cleaned either chemically or manually and the ship breakers must obtain a tank clearance certificate from the Mercantile Marine Department before beaching.

b) Vessels must pump out maximum possible quantity of oil at the anchorage before beaching. All the oily sludge, rags, rust, sawdust etc. must be removed and disposed of at a safer place.

c) Vessels causing Marine Pollution by spill, over-flow or dumping of oil or oily sludge etc. will be liable to be prosecuted under Bangladesh Marine Pollution Ordinance.

d) A systematic and periodic inspection of the whole yard should be done before a certificate of compliance is issued by the Department of Environment (DoE) & Department of Shipping for control of pollution during ship breaking.

e) Waste reception facilities with safe management for hazardous materials to be established.

f) Global ship recycling fund should be established by the contribution of stakeholders involved to expedite safe ship recycling for Bangladesh and other ship breaking countries, with transfer of technology and training from relevant international organizations.

5. The sea shall be kept undisturbed as far as practicable for healthy growth of marine biodiversity and human health. Because, many of the ship-breaking components are highly toxic, persistent and carcinogenic in nature and they prove fatal for aquatic food chain & human health.

Therefore,

a) Short and long term scientific study should be immediately started to assess the impacts of ship breaking activities on coastal water, soil and fishery resources, as well as human health.

b) To mitigate the problems and environmental impacts, cooperation & collaboration among scientists, policy makers, owners, local representatives, N.G.O,s, media and different stakeholders must be achieved through consultation, seminars, discussions etc.

6. No ship breaking licenses should be issued to any one unless he produced requisite permission showing that necessary lease of land had already been taken for the purpose.
7. Fire stations and hospitals should be setup near to the yards, for the welfare of the workers and avoiding severe loss by any accident.
8. The authority should select a "certain isolated and protected scrapper's yard" for dismantling the ships instead of the seashore areas.
9. The ship breaking activities should be carried out in a planned and hygienic way. A layout should be designed before starting to break the ship.
10. For sustainable ship breaking policy and its implementation, linkage with international organizations and NGOs; interagency cooperation, strengthening capacity building of the relevant government department through training is must.

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