



Chiang Mai J. Sci. 2008; 35(2) : 370-381
www.science.cmu.ac.th/journal-science/josci.html
Contributed Paper

Occupational Health Hazards of Ship Scrapping Workers at Chittagong Coastal Zone, Bangladesh

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Received: 14 October 2007

Accepted: 15 April 2008.

ABSTRACT

Ship dismantling in Chittagong coast, Bangladesh is a matter of environmental, health and safety concern. Workers break the obsolete vessels with no protection from explosions, infiltration of asbestos, heavy metals, oil residues, TBT, PCBs, or a cocktail of toxic chemicals contained in the ship. Most of the workers are not aware of the ship borne poisons and their impacts on health and thus they continue work without any protective measures. ASTER imagery, topographic and other maps of Chittagong coast were analyzed; and ship scrapping zone, human settlement, and clinical facilities were identified and mapped. Participatory rapid appraisal (PRA) was utilized to elucidate the opinion of ship scrapping workers to analyze their situation as well as to assess the occupational health hazards. The main causes of accidents in ship scrapping yards are due to sudden fall of steel beam, burning and detonation of gas, suffocation by inhaling CO₂ and other obnoxious gases trapped in ships' chambers. Deep cut; burning; breaking and fracture of bones of hands, legs, fingers and head; fainting and loss of limb are the most common accidents. Most of the workers were found to suffer from multiple diseases and health hazards. Poor safety systems, hazardous working conditions, use of traditional methods of cutting giant ships, absence of appropriate emergency response and lack of precautionary measures are the main reasons for accidents and casualties. There is no health care facility in the surroundings of the ship scrapping zone. Thus, in case of accidents, the patients have to be rushed to the City centers about 10-15 km away, where adequate medical facilities are available. But distance, traffic congestions and high cost are the main hindrance to avail those facilities by the low waged labourers.

Keywords: ship scrapping, toxic chemicals, health hazards, accidents and casualties, medical facility, low waged labourers.

1. INTRODUCTION

Ship scrapping is the process of dismantling an obsolete vessel's structure for scrapping or disposal conducted at a beach, pier, dry dock or dismantling slip. It includes a wide range of activities, from removing all gear and equipment to cutting down and

recycling the ship's structure. It is a challenging process, due to the structural complexity of the ships and the involvement of many environmental, safety, and health issues [1]. Six hundred end-of-life ships are broken annually with none having ever been cleaned by the owner prior to export, and only a very few cleaned before scrapping. More than 3,000 ships with the toxic wastes therein have been exported over the last five years to Asian ship breaking yards [2]. Although the steel is recycled, the toxic substances such as PCBs, metals, asbestos, lead, waste oil, TBT, etc enter into the environment and into the bodies of the workers. A new EU report on the phasing out and scrapping of single hull oil tankers concluded that 2,200 oil tankers would have to be scrapped after the end of their commercial life by the year 2010.

Bangladesh is dependent on ship scrapping for fulfilling its domestic demands for steel and iron. Ship scrapping is not regulated by environmental law, nor is there care for the health and safety of the workers. Workers of Bangladesh break up European vessels with no protection from explosions, asbestos or a cocktail of toxic chemicals contained in the ship. Over the last 20 years more than 400 workers have been killed and about 6000 were seriously injured [3] that indicates the highest accidents and casualties at the yards in the region. Workers cut down steel plates continuously without uniforms, protective gloves, boots and goggles. Workers, local community, beach, coastal water, biodiversity, ground water and air all are at risk during this process. About 50,000 people are engaged directly in the ship scrapping activities at the actual yards, an additional 200,000 people are dependent on scrapping activities including the indirect employment created by re-fabrication, recycling and distribution. Thus the majority of people working with ship scrapping are not working

in the ship scrapping yards, but are engaged with activities mainly connected with the later stages in the reprocessing of materials [4].

At least 297 persons were killed and 600 more injured in all kinds of accidents at the ship scrapping industry in past 12 years. This was revealed by a recent survey on ship scrapping industry of the country by a non-governmental organization [5]. The report identified poor safety systems, use of old methods in cutting giant ships, and lack of precautionary measures as the main reasons for explosions in the yards. The objective of this study was to identify the occupational diseases and health hazards of the ship scrapping workers at Chittagong coast through bottom-up approach. The spatial location of the available clinical facilities was developed by using ASTER satellite image in GIS environment to realize the difficulties of how the workers may avail treatment facilities after any sorts of accident in the ship breaking zone of Chittagong.

2. STUDY AREA

The area of Fauzdarhat is about 7 km beach situated approximately 20 km southwest of Chittagong city. The geographical location of the ship scrapping zone is between latitude 22°25' and 22°28'N, and longitude 91°42' and 91°45'E (Figure 1). In 1983, there were 32 companies involved in the scrapping industry and the number has grown to about 50 in recent years. Parallel ship scrapping activities taking place here represent the second largest facility in the world with respect to the numbers of vessels being scrapped but the largest facility for large vessels, scrapping some 52% of all vessels above 200 DWT (Table 1) due to higher tidal range, suitable intertidal zone for beaching large vessels, cheap labour and slack environmental regulations.

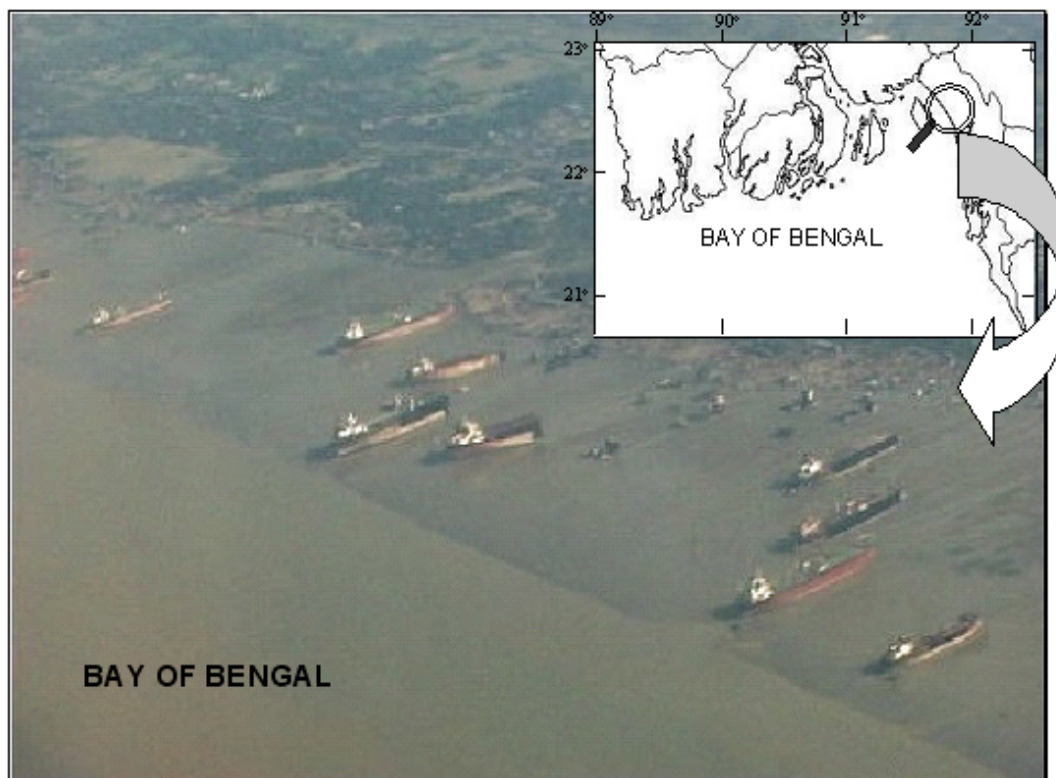


Figure 1. Geographical location of ship scrapping area at Chittagong coastal zone, Bangladesh.

3. MATERIALS AND METHODS

The research team was composed of one environmentalist, one GIS analyst, one human rights expert, two research associates, and one photojournalist. The thematic maps were created using topographic maps at 1:10,000 scale, published by the Survey of Bangladesh and ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) satellite images of February 16, 2004. The topographic maps, satellite data and land use maps were used to develop the required thematic maps. The image processor ENVI (The Environment for Visualizing Images) was used for data analysis. ArcView GIS software was also used to digitize all the maps. The attribute tables were simultaneously created from the analysis.

Participatory appraisal involved a series of qualitative multidisciplinary approaches to

learn about local-level conditions and local peoples' perspectives. The Rapid Participatory Rural Appraisal (RRA/PRA) technique was used applying observation, questionnaire and worker level semi-structured interviews with different groups following Pido [6], Pido *et al.* [7], Townsley [8], IIRR [9] and Hossain *et al.* [10] to gather primary information on occupational health hazards and diseases. The workers under pressure from excessive workload and long working hours are normally reluctant to talk to a research team unless an incentive is offered in exchange for their time. To promote their responses, the research team arranged a 3 day free health care program in association with COSED, a local NGO, to provide free treatment and medicine among the workers, and at the same time to get their opinion about

Table 1. Details of end-of-life ships exported by twenty shipping companies to Chittagong, Bangladesh during 2001-2003 (source: Greenpeace, 2003).

Name of ship	DWT	Date	Country	Price (in M \$)	Price per LDT (in \$)
Kythira	140512	06-12-01	Greece	3,19	138,00
Eliki	152398	06-12-01	Greece	3,25	136,00
Riza	134473	22-11-01	Greece		
Tom	89467	08-11-01	Greece	2,24	140,50
Khark	231712	17-05-01	Iran	6,57	203,50
Lassia	124424	07-06-01	Greece	0,79	192,00
Millennia Jewel	267911	13-12-01	Singapore	5,06	136,00
Concordia I	337700	31-05-01	Greece	8,26	195,00
Boga I	105016	13-09-01	Switzerland	3,48	150,00
Crete	237183	10-01-02	Greece	4,54	135,00
Ikaria	267808	25-04-02	Greece	5,91	150,00
Zante	274513	21-03-02	Greece	5,13	135,00
Skyros	323100	28-02-02	Greece	5,67	137,00
Havjarl	23896	02-05-02	Norway	1,57	146,00
Inger	357345	07-03-02	Norway	5,30	
Kapetan Hiotis	413117	10-10-02	Greece	8,80	155,00
Kapetan Giannis	516895	19-09-02	Greece		143,00
Oak	138973	24-01-02	Greece	3,33	146,00
Cloud	89965	16-05-02	Greece	2,64	158,00
Palm	134970	21-03-02	Greece	3,30	146,00
Challenge	96539	09-05-02	Greece	2,62	156,00
Violet	232323	09-05-02	Greece	5,20	152,00
Providence	20320	02-05-02	Singapore	0,85	140,00
Osaka Maru	123507	05-12-02	Singapore	3,51	175,00
Tai Hung San	233759	02-05-02	Singapore	5,14	150,00
Ocean Hope	123507	17-01-02	Singapore	2,76	140,00
Ryujin Maru	37842	17-01-02	Singapore	1,12	140,00
Iran Touba	317824	03-10-02	Iran	6,50	159,00
Hellespont Paramount	388042	16-05-02	UK		143,00
Hellespont Capitol	388042	16-05-02	UK		143,00
African Addax	83466	09-05-02	Greece	2,20	146,00
Artemis II	135900	31-01-02	Greece		
Crown Jewel I	256737	09-05-02	Singapore	5,88	150,00
Alaskan Jewel	266590	09-05-02	Singapore	6,52	152,00
Gill	16318	21-08-02	Switzerland		
Raya	105016	02-08-02	Switzerland		
Puppy F.	30236	24-01-02	Switzerland	0,97	138,00
Marine Star	76782	21-08-02	UK		
Arctic Blue	484276	15-05-03	Singapore	13,32	197,00
Seamaster	234925	22-07-03	Greece		
Aspilos II	117248	23-10-03	Greece		
Leon	108480	27-03-03	Greece	4,60	195,00
Navigation	64900	23-10-03	Greece		
Hellespont Embassy	413015	22-05-03	UK	11,76	201,00
Ipoh	21090	06-03-03	Singapore	1,37	197,00
Ocean Premier	63975	30-01-03	Singapore	2,09	205,00
Ocean Trader	26908	15-05-03	Singapore	1,34	207,00
Sea Victory	132285	24-04-03	Greece	4,72	215,00
Swansea	271967	31-07-03	Greece	8,28	251,00
Skopelos	274949	22-05-03	Greece	8,11	201,00

DWT: deadweight tonnage is carrying capacity of ship in ton, such as an oil tanker of 200 DWT can carry 200 ton oil.
LDT: light displacement tonnage, almost similar to the net weight of a ship, it is a general used measurement to calculate the scrap value of a ship

the occupational health hazards and diseases in the ship scrapping yards. Before providing them with these services they were requested to give the research team the opportunity to explain the objectives of the research. On special requests, a few pharmaceutical companies supplied medicine, and the Dean of the Faculty of Medicine of the University of Chittagong appointed two physicians to run the program. A total of 216 workers participated in the free treatment program. The workers were required to register on the spot for the health services and given a questionnaire. The research team helped them fill out the respective portion of the questionnaire before allowing them to visit the physicians, who identified health problems and diseases through careful observation, discussion and investigation and filled up the rest of the questionnaire. Completed questionnaires were then collected before giving out prescribed drugs and medicine free of cost. It is essential to diagnose the ship Scrapping issues and appraise the needs of the workers through the bottom-up approaches for more rigorous research and facilitate the formulation of the working plan

relating to the environment and workers' health and safety.

4. RESULTS AND DISCUSSION

The ship scrapping workers at Chittagong coast have to do hard work for long periods of time. There is no evidence of child labour at ship scrapping zone, which may be attributed to the requirement of strong physical ability of the workers unlikely to be met by children and aged persons. About 66% workers fall within 20 and 39 years of age (Figure 2). The number of workers in older age groups gradually decreases.

The workers, from different parts of the country gather in the ship scrapping yards with high expectation of getting a job. Most of them are not aware of the hazardous working conditions, and health risks associated with the work. About 41% workers come from the northwestern part of the country i.e., Rajshahi division, which is known as a less developed part of the country with little industrial and trading facilities resulting in widespread poverty. The landless, poor and workless people travel hundreds of kilometers to find a job. They are often obliged to have a job

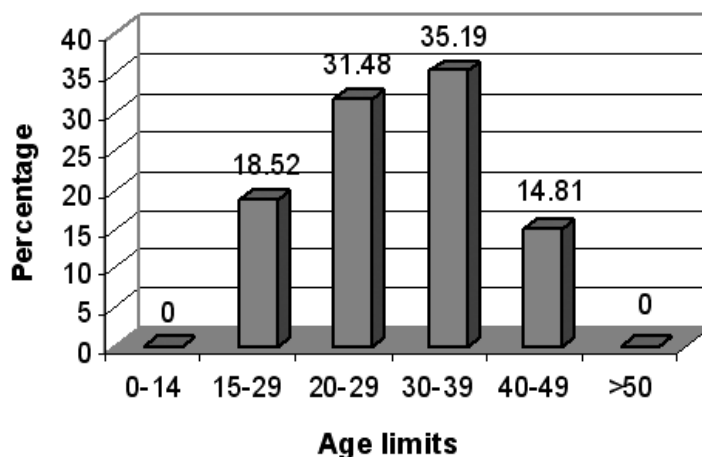


Figure 2. Age limit distribution of ship scrapping workers.

for the sake of their family livelihood not caring about the hazardous working environment. About 35% workers come from the neighbouring districts of Chittagong division attracted by the relatively ready job, mostly migrating from remote villages. Less than 1% workers come from Sylhet division and 1.85% workers from Dhaka division indicating the relative abundance of jobs/works in the newly developed Sylhet region and in the capital city Dhaka (Figure 3).

There are a few different kinds of works accomplished by different categories of workers in the ship scrapping yards. The cutter slices the ship, where the carriers carry the

scrap iron to selected places and the loaders-unloaders are engaged in delivery via truck or lorry. The present study revealed that 32% scrapping workers had left their job within the first two years and 57% workers continued 2 to 10 years (Figure 4). Only 11% workers remained more than 10 years in scrapping yards at Chittagong. During field survey and interview sessions, most of the workers reported that after 10 years of hard work, depreciating health conditions compels them to retire and thus the number in their age group gradually decrease.

A worker's wage depends on the work type and experience. About 75% workers are

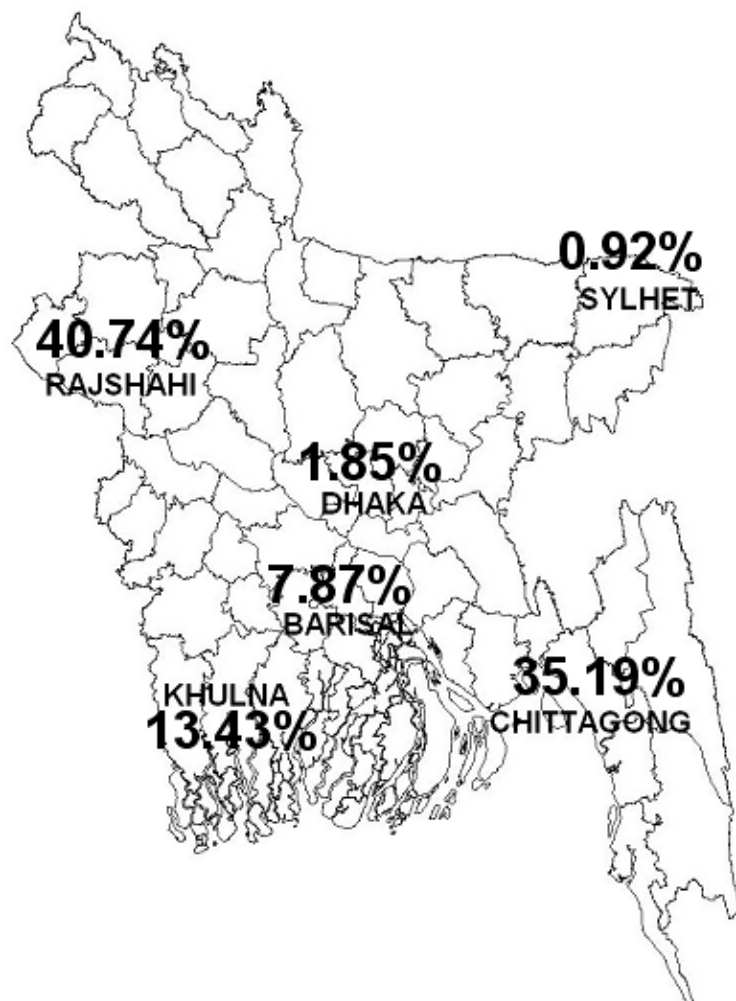


Figure 3. Ship scrapping workers from different divisions of Bangladesh.

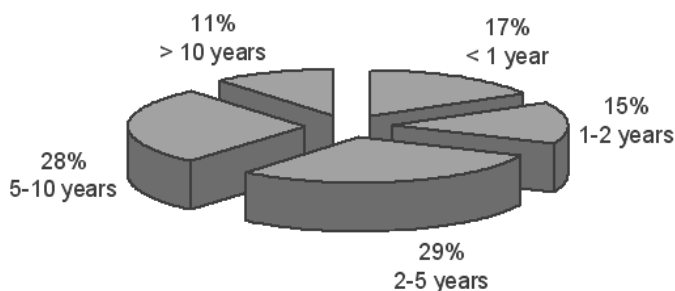


Figure 4. Length of engagement in ship scrapping activity.

employed temporarily with 'no work no pay' basis and get their wages daily at the rate of US\$1.5 to US\$3 per day depending on the experience. The remaining 25% workers are permanent, experienced and technical labour and get their wages on weekly or monthly basis at the rate of US\$45 to US\$75 per month. The working period vary from 8 to 12 hours depending on the business of the yard. About 66% of the 'permanent' workers mentioned that they have no weekly holiday. The previous occupations of most of the workers were agriculture labour, rickshaw/van (tricycle) pulling, construction labour, floating traders, and unemployed.

Most of the workers have no knowledge about the impact of ship scrapping on health. Thus, they are uninformed about safety issues and do not take protective measures. Although the availability of safety gears observed during field investigation included gloves, boots, goggles, and helmets, often workers ended up stripping entire ships with bare hands, sledgehammers and gas torches. The present investigation revealed that 42.13% workers used gloves, 20.37% used boots, 8.33% used caps and 29.17% used goggles in the ship scrapping yards. These protective equipments are inadequate for heavy-duty ship scrapping activities.

The research team identified that most of the ship scrapping activities are potentially risky when it comes to accidents and injuries,

but no first aid facilities was found in the yard. Sudden fall of steel beam and plates, burning by gas flame, suffocation and inhaling CO₂, etc are the main causes of accidents and injuries in ship scrapping yards at Chittagong coast. The workers reported that common injuries are cutting of muscles (50%), breaking and fracture of leg/hand/finger bones (25%), burning by gas flame (6%), loss of limbs (4%) and fainting/unconsciousness (3%).

The major problems mentioned by the workers are poor salary, irregular wages, excess working hours, absence of treatment facilities, dirty working environment, inadequate modern equipment, lack of entertainment, lack of job security, etc. To improve the situation about 91% workers suggest developing a treatment facility in the ship scrapping yard, where about 56%, 54%, 30%, 28%, 22% suggest trade union, enhanced wage, reduced working hour, canteen facility and job security respectively (Table 2).

The workers can be categorized as supervisors, cutters, loaders-unloaders, carriers, helpers, labourers suppliers etc. Most of the cutters have to work in very intense light of welding torches. Though they use goggles, but these are not enough for heavy-duty works like ship scrapping activities and thus they face the problem of eye redness, tearing, burning sensation, blurring of vision and conjunctivitis. Asbestos, smoke, dust, isocyanide gas, volatile chemicals may cause

Table 2. Worker's demand to improve the major problems [n= 216].

Worker's demand	Number of workers	Percentage
Treatment facility	196	90.74
Increase wage	116	53.70
Reduce working hour	64	29.63
Job security	48	22.22
Weekend facility	40	18.52
Compensation	28	12.96
Life insurance	24	11.11
Trade union	122	56.48
Canteen facility	60	27.78
Entertainment	36	16.67
Residence	20	9.26
No comments	12	5.56
Total	216	

respiratory problems. Asbestos dust causes formation of scar-like tissues resulting in permanent breathing difficulties called asbestosis. Other respiratory problems as identified among the workers are asthma, pneumonia, chest pain, cough and sputum. Abdominal, urinary, muscle and skin problems as well as nutritional deficiency are also identified among the workers, which are mainly caused due to toxic metal, oil and chemical contaminations as well as excessive work load, long working hour, monotonous works, irregular eating, insufficient diet, unsafe drinking water, inadequate sanitation, and the likes (Table 3). Most of the workers were found to suffer from multiple diseases and health hazards.

The spatial analyses have clearly indicated the location and extent of ship scrapping zone, human settlement, and clinical facilities in Chittagong metropolitan area. From the spatial patterns of the clinical facilities on the map,

an overall zonation was made for the study area and this includes Chittagong Medical College Hospital, USTC hospital, general hospital, eye infirmary, lions eye clinic, government general hospital, railway hospital, port hospital, private clinics and doctor's chambers (Figure 5).

5. CONCLUSION AND RECOMMENDATIONS

The extent of damage caused by the scrapping of ships to the environment, to the livelihoods of the fisher folk and peasants that share the environment, and to the lives and health of the workers is not exactly known to this day. Absence of data however does not mean the absence of a problem. It just means that neither these communities, nor the workers, nor other authorities are serious about the problem, and are not prioritizing the issues. At present some 250,000 families earn their living from ship scrapping yards, and the industry supplies 60 percent of the

Table 3. Major health hazards and diseases of ship scrapping workers at Chittagong coast [n= 216].

Health hazards	Number of workers	Percentage (%)	Causes
Eye problems	201	93.06	Bright light, fire, dust, oxyacetylene, welding fume.
Redness	45	20.84	
Tearing	51	23.61	
Burning sensation	69	31.94	
Blurring vision	27	12.50	
Blindness	9	04.17	
Respiratory problems	174	80.56	Smoking, asbestos dust, chromates, iso-cyanide gas, volatiles, fire.
Respiratory distress	24	11.11	
Asthma	6	02.78	
Pneumonia	24	11.11	
Cough and sputum	87	40.28	
Chest pain	33	15.28	
Abdominal problems	87	40.26	Toxic metal, oil, irregular eating, poor quality food, unsafe drinking water, inadequate sanitation.
Anorexia	6	02.78	
Nausea	3	01.38	
Vomiting	6	02.77	
Abdominal pain	27	12.50	
Gastric	45	20.83	
Urinary problems	6	02.77	Toxic metals, TBT, PCB, dust accumulation.
Dysuria (painful urination)	4	01.85	
Uremia (kidney failure)	2	00.92	
Muscle problem	171	79.16	Toxic metals, excessive work load, long working hour, monotonous work.
Back ache	108	50.00	
Neck ache	18	08.33	
Knee joint pain	45	20.83	
Skin problem	48	22.22	Contamination of Ar, Cr, Fe, dioxin, PAHs, battery liquid, oil residue.
Itching	36	16.66	
Lesion	12	05.56	
Nutritional deficiency	198	91.66	Lack of balanced diet, low wage, excessive workload, long working hour.
Vertigo	99	45.83	
Head ache	54	25.00	
Weakness	39	18.06	
Anorexia	6	02.77	

total demand of iron of the country.

Although many of the hazardous materials such as asbestos, PCBs, TBT, toxic metals, etc are banned today, a ship built 20-30 years ago still contained these materials. It also carries hazardous and flammable chemicals used for painting, repairing and maintenance. Burning of plastic/PVC coated

electrical and other control system cables is a common practice in the ship scrapping zone that emits hazardous gases. Breaking old or redundant ships - rather than using them as artificial reefs - enables steel (and other parts of the ship) to be re-cycled at a much lower cost than importing and processing iron ore. It also provides for the timely removal of

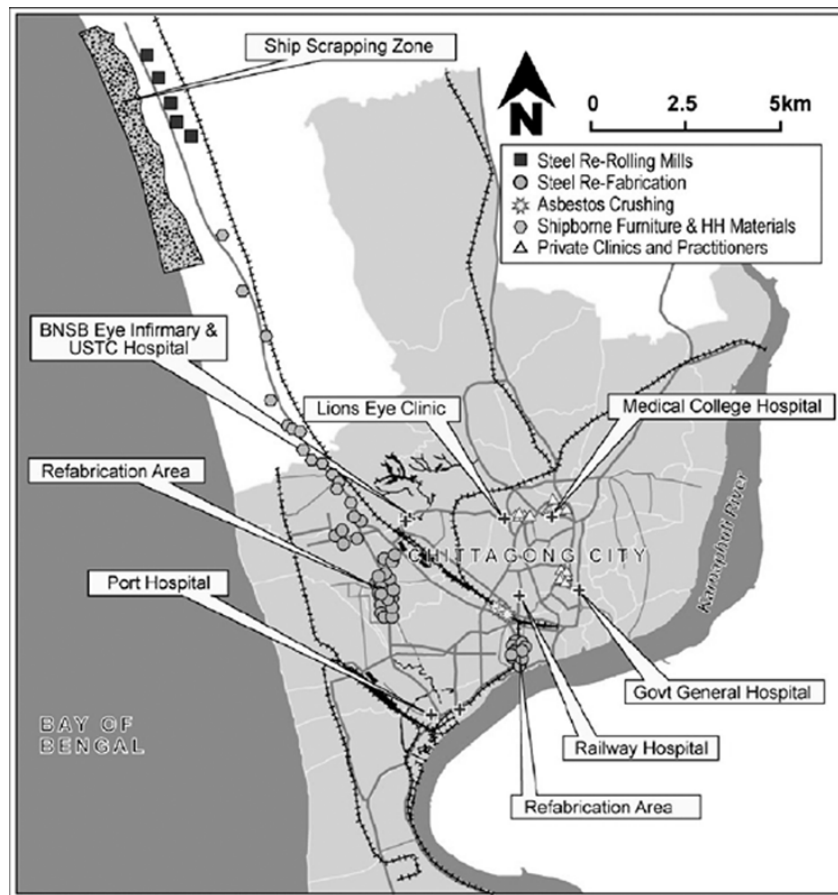


Figure 5. Location of ship scrapping zone with re-fabrication, recycling and distribution sites and clinical facilities in Chittagong city area.

outdated tonnage from international waters. Steel scrap from ship breaking provides an alternative to consume non-renewable ore resources, which allows the manufacturers of steel products to operate at significantly lower cost, time and with more efficiency. In this perspective, ship breaking can be claimed to be a sound sustainable industrial activity [4].

In the future, all ships may carry a “green passport” which would follow a ship from the day it was built. At the moment, certification for dismantling exists but this should only be given to ships, which are safe for scrapping on arrival. The relevant information, such as drawings and plans, necessary for the development of a safe ship

scrapping plan substantially increases safety. An updated list of hazardous substances on the ship to be dismantled provided by the ship owner in accordance with the Basel Convention on the control of transboundary movements of hazardous wastes and their disposal is to be ratified properly. Marine or coastal dry dock need to establish with sufficient cranes, machineries and specific breathing equipments for scrapping ships in controlled way. The yards must have waterproof floors to prevent contamination of ground water. A company with special certification for asbestos, fuel residues and other ship-borne hazardous materials may involve to inventory and remove the materials

for safe scrapping. Installation of oil drains and oil-water separator are essential for safe removal of the oily wastes that can be used as fuel in rice mill or brick field kilns. The development of a safe ship scrapping plan is not costly, but can save lives and environment.

The untrained workers have to carry large piece of iron sheets on their bare shoulders without knowing the weight of the sheets and the employers close their eyes about the legal limit of weights carried by workers. Accidents are not reported or recorded. Moreover, the employers conceal the information, even from the families of the victims, if any workers die due to occupational accidents [11] and avoid paying compensation. It seems that the ship scrapping workers are treated as replaceable instruments; one is lost, so get another to replace him [12].

Appropriate training about the dismantling process and on safety measures is essential for the workers to make them aware of potential hazards. Respective government department, NGOs, CBOs, academic/research institutions should come forward to organize such training, where donors from home and abroad can arrange funds. Introduction of informal or adult education program in workers place can make them aware about safety and precaution, wage rate and working hour, health and sanitation, family planning, and the likes. Thus, the workers need to be empowered economically, personally, educationally and politically to ensure their participation in planning for their future. Formation of worker organization or co-operative can strengthen their competence as well as ensure economic sustainability. The worker empowerment will enhance their capabilities, skills, efficiencies, strengths and explore new ideas for creating alternative income generating options. The aged and disable workers may emerge as small

entrepreneurs of selling ship-borne re-usable toiletries, kitchenettes, electronics, scientific instruments, furniture, etc, which will give them options for creating job opportunities for other people instead of seeking jobs for them.

The process of improving working conditions at a ship scrapping facility should be systematically established in order to bring them to reasonable standards. Occupational safety and health management systems should be implemented stepwise and progressively. Appropriate housing, welfare, safe drinking water and sanitary facilities for all workers need to be developed. Shelters should be made available, at or within easy access of the worksite, for protection from inclement weather and for providing facilities for washing, drying and storing clothing as well as taking meals in an uncontaminated area. The following measures need to be taken to combat physical hazards:

- a) Adopt environment-friendly, highly mechanized and semi-automated and safer Scrapping techniques
- b) Arrange fire fighting facilities in the yard
- c) All persons should wear safety helmets or hard hats to protect the head from injury
- d) Clear or dark goggles or face shield should be worn during welding, flame cutting or other hazardous work
- e) Appropriate gloves should be given for protection from the particular hazard of the work, such as leather gloves are generally better for handling rough or sharp objects, heat-resistant gloves for handling hot objects, and rubber, synthetic or PVC gloves for handling acids, alkalis, various types of oils, solvents and chemicals
- f) Waterproof clothing and head coverings when working in adverse weather conditions
- g) Discharge gases from the chamber and cut the section using torches and mechanical cutter

- h) Introduce craning system for moving steel beam and large iron structure

ACKNOWLEDGEMENTS

We wish to express our sincere appreciation and gratitude to the late Professor Yusuf Sharif Ahmed Khan for his interest and contribution to this work. The authors are grateful to the ship scrapping workers, Committee for Social and Environmental Development (COSED), Human Rights Commission, Chittagong, Beximco Pharmaceuticals Company Limited, Opsonin Pharmaceuticals Company Limited and doctors of Chittagong Medical College Hospital for extending their support to conduct the research work.

REFERENCES

- [1] ILO (International Labour Organization), Draft guidelines on safety and health in ship breaking, Interregional Tripartite Meeting of Experts on Safety and Health in Shipbreaking for Selected Asian Countries and Turkey, Bangkok, 20-27 May 2003.
- [2] Greenpeace, Playing hide and seek: How the shipping industry, protected by flags of convenience, dumps toxic waste on ship breaking beaches, Greenpeace, Netherlands, 2003; 29.
- [3] YPSA (Young Power in Social Action), Workers in ship breaking industries: A base line survey of Chittagong, Bangladesh, Young Power in Social Action, Chittagong, 2005; 79.
- [4] DNV (DET NORSKE VERITAS), Decommissioning of ships - environmental standards: ship-breaking practices/on site assessment Bangladesh, Chittagong. Report No. 2000-3158, DNV RN 590, Norway, 2000.
- [5] YPSA (Young Power in Social Action), Advocacy for a public policy to ensure human rights in ship-breaking industry, Young Power in Social Action, Chittagong, Bangladesh, 2004.
- [6] Pido M.D., The Application of Rapid Rural Appraisal Techniques in Coastal Resources Planning: Experience in Malampaya Sound, Philippines, *Ocean & Coastal Management*, 1995; **26(1)**: 57-72.
- [7] Pido M.D., Pomeroy R.S., Carlos M.B., Garces L.R., A handbook for rapid appraisal of fisheries management systems (version 1), Manila, Philippines: ICLARM, 1996.
- [8] Townsley P., Rapid Rural Appraisal, Participatory Rural Appraisal and Aquaculture. FAO Fisheries Technical Paper No. 358. Rome, Italy, 1996; pp. 109.
- [9] IIRR (International Institute of rural reconstruction), *Participatory methods in community-based coastal resource management*. 3 vols, International Institute of Rural Reconstruction, Silang, Cavite, Philippines, 1998.
- [10] Hossain M.S., Khan Y.S.A., Chowdhury, S.R., Saifullah S.M., Kashem M.B. and Jabbar S.M.A., Environment and Socio-Economic Aspects: A Community Based Approach from Chittagong Coast, Bangladesh, *Jahangirnagar University Journal of Science*, 2004; **27**: 155-176.
- [11] Rahman A. and Ullah A.Z.M.T., Ship breaking (background paper prepared for ILO's sectoral activities programme). London, 1999; 43.
- [12] Hossain M.M. and Islam M.M., Ship breaking activities and its impact on the coastal zone of Chittagong, Bangladesh: Towards sustainable management, Young Power in Social Action (YPSA), Chittagong, Bangladesh, 2006; 54.