

# Drastic expansion of ship breaking yard in Bangladesh: a cancerous tumor to the coastal environment

Hasan Muhammad Abdullah<sup>1\*</sup>, M. Golam Mahboob<sup>1,2</sup>, Ahammad Al Biruni<sup>3</sup>

<sup>1</sup>River Basin Research Center, Gifu University, Gifu 501 1193, Japan

<sup>2</sup>GIS&RS Lab, Bangladesh Agricultural Research Institute, Gazipur 1701, Bangladesh, <sup>3</sup>Faculty of Engineering, Gifu University, Japan,

\* Corresponding author, E-mail: hasan@green.gifu-u.ac.jp

**Abstract**— Bangladesh has vast coastal and marine resources along its south edge. The coastal area of the country is known as one of the highly productive areas of the world. However, this coastal zone is often perceived as a zone of multiple vulnerabilities, environmental destruction and pollution. Manmade Hazards like ship breaking yard is now made it more vulnerable. Ship breaking area in Sitakunda coast was monitored for last two decades using temporal satellite imagery and statistical data. The results revealed that ship breaking activity is increasing day by day due to lack of environmental regulations. This causes huge physicochemical and biological degradation of coastal environment. In two decades, the land destruction becomes double. Aerial information from temporal Landsat imagery showed that, negatively impacted coastal area increased by 308.7% from 367 ha (1989) to 1133 ha (2010) like a growing cancerous tumor in the Sitakunda coast.

**Keywords:** Beach breaking; ship recycling; environment monitoring; coastal pollution; remote sensing.

## INTRODUCTION

Bangladesh is one of the largest deltas in the world, with a coastline of 710 kilometers [1]. This coastal land is the basic natural resource, providing habitat and sustenance. About 30 million people of Bangladesh are coastal inhabitants. They are relying on agriculture, fisheries, forestry, salt panning etc for their livelihood. Thus environment of coastal zone is very important [2]. Coastal zones refer to areas where land and sea meet [3]. It has been delineated in various ways [4]. Moreover the land use in the coast is diverse and often conflicting. In Bangladesh it is intensively used for agriculture, settlements, forests, shrimp culture, natural fisheries, salt production, industrial and infra-structural developments and tourism [5]. The coastal areas are ecologically important, as they provide a number of environmental goods and services to people [6]. The coastal zone contains critical terrestrial and aquatic habitats, such as the mangrove forests, wetlands and tidal flats. Unfortunately, the coast of Bangladesh is identified as a zone of multiple vulnerability [5], [7], which is prone to severe natural disasters such as cyclones, storm surges and floods [8]. Combined with anthropogenic hazards [9], the coastal and marine environment is under threat. Natural catastrophe is hard to avoid but hazards like manmade pollution can be avoided or controlled at minimum level.

Ship breaking is one of the manmade hazards in the coast of Bangladesh like many other developing countries. Ship breaking or ship demolition is a ship disposal activity, involving the breaking up of ships for scrap recycling. Until

the late 20th century, ship breaking took place in port cities of industrialized countries such as the United Kingdom and the United States. Now, most ship breaking yards are in Chittagong in Bangladesh, Alang in India, Aliaga in Turkey and near Karachi in Pakistan due to lower labor costs and less stringent environmental regulations dealing with the disposal of lead paint and other toxic substances. The global shipping industry heavily depends on ship breaking enterprises in the developing world to dispose of deep-sea vessels [10]. Of the approximate 45,000 ocean-going ships in the world about 700 (1.55%) are taken out of service every year [11]. At the end of their sailing life, ships are sold, so that the valuable steel about 95% of a ship mass can be recovered [12]. Bangladesh retained second position after India in terms of volume of recycling [11]. [13] showed that about 52% of big ships were dismantled in Bangladesh.

Indiscriminate and haphazard ship breaking activities in pristine intertidal and biodiversity rich coastal area of Sitakunda, Chittagong is now a barren. The area is severely degraded with loss of its physical, chemical & biological characteristics. Moreover, to develop new ship breaking yard agricultural land, coastal forest which act as a buffer between sea and coastal land are being encroached. This destruction of coastal zone is directly related with number of ships recycled or in other word, amount of scrap recycled in term of LDT (Light Displacement Ton: the weight of a ship without anything on board, used to determine the value of a ship which is to be scrapped) in particular time. Due to restriction of field sample collection by yard owner and absent of government information regarding environment and ship breaking statistics, we tried rather passive investigation of ship breaking on coastal environment with the following objectives: (i) to understand the trend of Sitakunda ship breaking activities in compare to other countries from different data sources, and (ii) to monitor the expansion of ship breaking yard over the last two decades from temporal Landsat imagery.

## MATERIALS AND METHODS

### Study area

Sitakunda is an administrative unit in the Chittagong District of Bangladesh. It is a seashore area situated a few kilometers north of Chittagong where most of the ship breaking yards are concentrated. Annual average temperature is between 32.5 °C (90 °F) and 13.5 °C (56 °F), with an annual rainfall of 2,687 millimeters (106 inch). Fig.1 shows the study area.

### Landsat imagery

Three cloud free Landsat 5 TM multispectral satellite imagery acquired on January 05, 1989, December 19, 1999, and January 23, 2010 were used in this study. The study area was subsetted from the original full scene image which was geo-registered with the Survey of Bangladesh topographical sheet (1:50,000). The Bangladesh Transverse Mercator System (BTM) was used as the coordinate system which is an area-specific standard UTM projection system for Bangladesh.

### Data collection

The data related to ship breaking statistics were collected from the Clarkson's ship register, Lloyd's ship register and monthly ship breaking reports of Cotzias group [14]. The information covers a wide range of data on all merchant ships; including type of vessel, size of vessel, place of scrap, scrap price etc.

## RESULTS AND DISCUSSION

Coastal environment of Bangladesh has been degrading due to beach breaking of ships. This is very primitive, unethical, risky, unhealthy and hostile towards environment. This environmental degradation is directly related to amount of ship being dismantled in term of LDT.

More area is needed for increasing amount of ship being recycled. Long-term average data of ship recycling (Fig. 2) showed that Bangladesh played a vital role in the world. Approximately 23% of LDT has been recycled in Sitakunda thus Bangladesh is just behind India which is the number one in ship recycling over long period. However, currently India and China leads the ship breaking world and Bangladesh follows them closely (Fig. 3). The trend of Bangladesh showed zigzag in early of this decades but sharply increased in the last three years. From 2004 to 2007 Bangladesh led in the global business in term of amount LDT recycled but in 2009 India achieved number one position and Bangladesh followed China the second leader in ship recycling world. In 2009 Bangladesh recycled around three million ton (LDT) scrap. So Bangladesh is one of the global leaders in ship breaking.

In Bangladesh ship breaking business has not been evolved in a day. It has been developed gradually passing through various stages of its development. Though the ship breaking in Bangladesh started in sixties, commercially it started in late seventies.

There is no distinct and well-balanced policy for ship breaking in Bangladesh. In fact, until now it has not been declared as an industry by the government. [15] described that, ninety percent internal demand of iron-steel of Bangladesh was being supplied by the ship breaking industry.



Fig. 1: Location of the study area

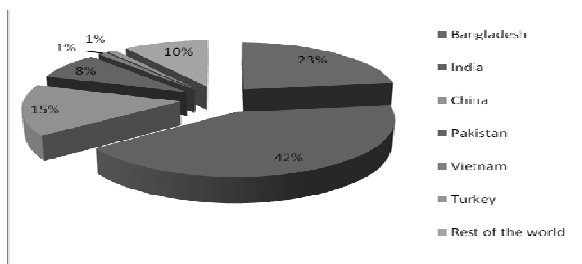


Fig. 2: Historical ship recycling volumes 1994-2009, all types by region (Share of LDT)

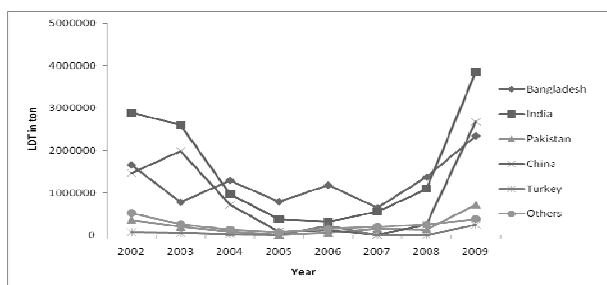


Fig. 3: Amount of LDT recycled by major recycling countries in different years

The economic activity in Alang was dramatically decreased during 2006. One of the reasons of the slowdown of the activity in Alang was due to India imposed certifications which ensure that the oil tankers are free of gas residues before they are scrapped [16], while Bangladesh does not enforce such obligations.

In Sitakunda the ships are broken up on the shore, where 90% of the vessel body lies in the tidal water with the front part on the beach. That means it is impossible to prevent oil pollution. There is no dry dock system at any of the companies, which could prevent the release of liquid pollutants into the environment.

Earlier study [17] revealed that the sediments and soil at the ship breaking yards are highly contaminated with mineral oil and other pollutants. A list of pollutants is given in Table 1.

A 1995 study, which looked at fish from local markets in selected Asian and Oceanian countries, concluded that the presence of butyltins was extensive. This was due to ship-scraping activities, antifoulant sources and sewage disposal in those countries [18]. The contribution of Sitakunda ship yard in beach breaking is increasing day by day. As there is no environmental certification requirement for ship to enter Bangladesh territory.

Table 1. Pollutants in the recyclable ship

Pollutants	Materials containing pollutant
Asbestos	Hanger liners, mastic under insulation, cloth over insulation, cable, lagging and insulation on pipes and hull, adhesive.
Polychlorinated biphenyls (PCBs)	Rubber products such as hoses, plastic foam insulation, cables, silver paint, and habitability paint.
Lead	Lead and chromate paint, lead ballast, batteries, generators, and motor components.
Excess noise	With grinding, hammering, metal cutting, and other activities.
Fire	Ignited insulation, matting, lagging, and residual fuel; and from lubricants and other flammable liquids.
Others	Heavy metals in ship transducers, ballast, and paint coatings; mercury in fluorescent light tubes, thermometers, electrical switches, light fittings, fire detectors

More and more hazardous ships are coming to the Sitakunda. Table 2 shows the number of ships and LDT recycled by different countries during the month of May 2010. This prevails that Bangladesh is in competitive position. Moreover it is clear that Sitakunda breaks larger ships compared to other countries. Average size of the recycled ships during the May was 12041 LDT.

As the ship breaking activity has not been officially recognized as an industry [19], exact number of companies involved in ship breaking in Bangladesh, is not yet clear. But newspaper and locals reported that more than 100 companies are involved in this business.

There are some companies in developed world, who recycle ships in environment friendly ways called green recycle. Total capacity of green recycle is around 780,000 LDT/year which is quite small in compare to global recycle demand (60-70 million LDT/ year). Unfortunately obvious goal of the major portion of ships to be recycled is the beach of developing world. Moreover, phase out of single hull oil tanker causes extra effects on the environment of developing countries like Bangladesh [20]. It is declared by International Maritime Organization [21] that all single hulled oil tankers should be withdrawn from the service before 2015.

As the accelerated phase out is scheduled to be happened by 2010 with 18 million LDT or by 2015 (base scenario) with 15 million LDT to be recycled from the oil tankers only, this might give additional load to the environment of Sitakunda. Due to an accident during beach breaking of an oil tanker in Alang in 2006, India restricted the recycling of oil tanker. So, Sitakunda is to get a lion share of oil tanker recycling business. This gives an additional load on Sitakunda's environment. Fig. 6 showed that beach breaking at Sitakunda is not only destroying the coastal environment but also pose a threat to coastal forest and agriculture for their activities and future expansion. It is also clear from the figure that heavy land degradation is being occurred.

Table 2. Ship breaking statistics for the month of May 2010

Breaker	Units	LDT	Average LDT/Ship
Bangladesh	86	1,035,572	12042
India	221	1,603,377	7255
China	80	482,908	6036
Pakistan	53	395,631	7464
Turkey	79	80,464	1019
Other	53	144,392	2724
Total	572	3,742,344	6542



Fig. 6: Destruction of forest for new ship breaking yard (Image source: GoogleEarth)

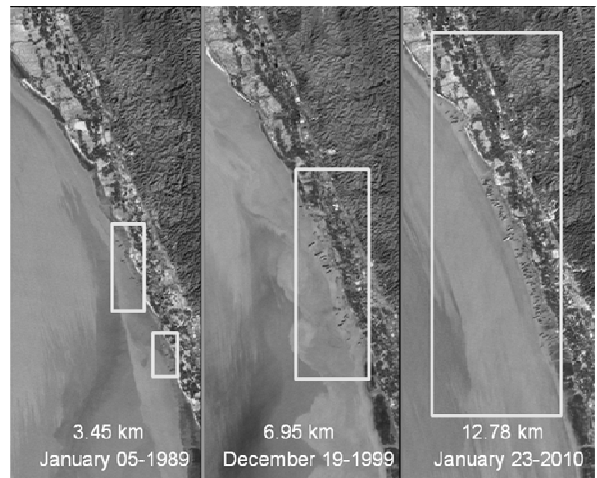


Fig. 7: Expansion of ship breaking yard in last two decades observed from Landsat TM imagery

Table 3. Areal information of negatively impacted area

Year	Area (ha)	Length (km)
1989	367	3.45
1999	890	6.95
2010	1500	12.78

Finally, aerial information derived from satellite imagery (Fig. 7 and Table 3) revealed the drastic expansion of ship yard from 3.45 km in 1989 to 12.78 km in 2010. Negatively impacted land area shown in Table 3 appears like a growing cancerous tumor in the coastal environment of Sitakunda with expansion of 1133 ha (308.7%) and 523 ha (142.5%) in 2010 and 1999 respectively compared to the total impacted area of 367 ha in 1989. The expansion rate is somewhat multiplicative in nature. It is not hard to understand that what might be happened in the future if this trend tends to continue.

### CONCLUSION

Coastal environment is delicate. Harnessing and exploiting its opportunities in systematic and coordinated way is essential to make it a sustainable resource. Moreover, it contains several important and critical ecosystems. Unfortunately some part of this coast is used for ship breaking, causing huge environmental loss. Now Bangladesh has to decide whether it would allow continuing its coast to be used as a dustbin of developed world or not. It is an urgent need for sustainable development of the coastal resources. Monitoring of the coastal activity is important in order to save the coastal ecosystems. This monitoring system can give valuable information to the environmentalist, policy maker and different stakeholder interested in coastal environment and resources.

### REFERENCES

[1] A.K. Azad, K.R. Jensen and C.K. Lin, "Coastal aquaculture development in Bangladesh: unsustainable and sustainable experiences", *Environmental Management*, Vol. 44, Issue 4, 2009, pp. 800–809. DOI 10.1007/s00267-009-9356-y

[2] WARPO (Water Resources Planning Organization), "Living in the coast: people and livelihoods", *Integrated Coastal Zone Management Project (ICZMP)*; Simon Centre (5th Floor), House 4A, Road 22, Gulshan, Dhaka 1212, Bangladesh, 2004, pp 3–17.

[3] M.R. Islam (ed.) "Where land meets the sea. A profile of coastal zone of Bangladesh", The University Press Limited, Dhaka, 2004.

[4] ESCAP/UN, "Coastal Environmental Management Plan for Bangladesh", United Nations Economic and Social Commission for Asia and the Pacific (ESCAP/UN). Dhaka, Bangladesh, June 1987.

[5] MoWR, "Coastal Zone Policy", Ministry of Water Resources, Government of the People's Republic of Bangladesh, Dhaka, 2005.

[6] N.J. Beaumont, M.C. Austen, J.P. Atkins, D. Burdon, S. Degraer, T.P. Dentinho, S. Derous, P. Holm, T. Horton, E. van Ierland, A.H. Marboe, D.J. Starkey, M. Townsend and T. Zarzycki. "Identification, definition and quantification of goods and services provided by marine biodiversity: Implications for the ecosystem approach", *Marine Pollution Bulletin* Vol. 54, Issue 3, 2007, pp. 253-265.

[7] Millennium Ecosystem Assessment, "Ecosystem and human well-being: synthesis", Island Press, Washington, 2005, pp.112.

[8] G. McGranahan, D. Balk, B. Anderson, "The rising tide: assessing the risks of climate change and human settlements in

low elevation coastal zones", *Environ Urban*, vol. 19, issue 1, 2007, pp. 17–37.

[9] Le-Le Zou, Yi-Ming Wei, Driving factors for social vulnerability to coastal hazards in Southeast Asia: results from the meta-analysis, *Natural Hazards*, 10 March 2010, DOI 10.1007/s11069-010-9513-x

[10] P. Rousmaniere and N. Raj, "Shipbreaking in the Developing World: Problems and Prospects. *Int J Occup Environ Health*, vol. 13, 2007, pp. 359–368.

[11] FIDH, "Where do the 'floating dustbins' end up? Labor Rights in Ship breaking Yards in South Asia, The cases of Chittagong (Bangladesh) and Alang (India) (Investigative Mission Report)", International Federation for Human Rights, Paris, No. 348/2, December 2002.

[12] Greenpeace [Online], "Ship breaking", Ship breaking site English, Accessed 2005, Available at [www.greenpeaceweb.org/shipbreak](http://www.greenpeaceweb.org/shipbreak)

[13] DNV, "DNT NORSKE VERITAS", Technical Report, Norwegian Ministry of Environment, Norwegian Ship owners Association, Norway, 1999.

[14] Cotzais Shipping Group [Online], Accessed June 2010, Available: [www.cotzais.gr](http://www.cotzais.gr)

[15] M. Ronning, "Stuck in the Mud: On ship breaking labour, condition and environment in Chittagong, Bangladesh", Report, 2000.

[16] F. Pelsy, "The Blue Lady Case and the International Issue of Ship Dismantling", *Law, Environment and Development Journal*, vol. 4, issue. 2, 2008, pp. 135-148.

[17] E. Vardar, M. Harjono, "Ships for Scrap V - Steel and toxic wastes for asia", Greenpeace Report on Environmental, Health and Safety Conditions in Alia'ga Shipbreaking Yards, Izmir, Turkey, 2002.

[18] K. Kannan, S. Tanabe, H. Iwata and R. Tatsukawa, "Butyltins in muscle and liver of fish collected from certain Asian and Oceanian countries", *Environmental Pollution*, vol. 90, issue. 3, 1995, pp. 279-290.

[19] G. Feringa, "Ship Recycling in Bangladesh – Findings of Baseline Survey", Draft Report to the ILO, 2005.

[20] European Commission Directorate General Environment, "Ship Dismantling and Pre-cleaning of Ships", Report no. 64622-02-1, issue 2., 2007.

[21] International Maritime Organization [Online], "Report 2003", Accessed: July 2010, Available: [www.imo.org/newsroom/mainframe.asp?topic\\_id=758&doc\\_id=29](http://www.imo.org/newsroom/mainframe.asp?topic_id=758&doc_id=29)