

A STRONGER SAFETY REGIME IS VITAL TO ENSURE SAFER PASSENGERS' MOVEMENT AT INLAND WATER TRANSPORTATION SECTOR OF RIVERINE BANGLADESH

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Abstract

Operators of passengers' vessels in the Inland Water Transportation (IWT) sector of riverine Bangladesh are being regularly challenged which results accidents of different magnitude with loss of valuable lives and properties. There have been very limited research works on accident related issues in the IWT sector which reveal the root causes. As a result, there is very slow or no improvement on safety standard at this sector. This study includes an assessment of the existing legal framework along with different technical snags that contribute in prevailing unsafe conditions of the passengers' vessels in the IWT sector. The research has been a mixed approach based on primary and secondary data. Apart from the study of available documents, qualitative and quantitative data have been collected from stakeholder groups in both the private and public sectors. At field levels key information have been gathered from accident prone areas in Bangladesh. By analysis of available information and data, this paper argues that the legal framework has limitation in certain major areas of governance along with technical matters which allow to build unsafe vessels in the IWT sector of Bangladesh. Finally, recommendations have been drawn to assist in strengthening the safety regime through building technically fit vessels, which need to be operated under appropriate management to ensure safer transportation in riverine Bangladesh.

Keywords: Safety, Passengers, Vessel, Legal Framework, Design and Construction

Introduction

Safety during operation of passengers' vessels in riverine Bangladesh has been a major concern over the years. This is vivid from recurring accidents of different magnitudes. Statistics on accidents and fatalities over a period of 20 years (2000-2020) are shown in Figure 1. It is seen from Figure 1 that there is not a single year without any accident in the sector. The frequency of accidents over the decade is not stable either. There are rise and fall in the total numbers. This

fluctuation may be due to various reasons like a degree of seriousness on how the authority took initiatives to warn the operators on weather as well as human activities from time to time. In the case of fatalities, it is observed that the number was higher in the years from 2000-2005 compared to the period from 2010 to 2015. This apparent lower number of fatalities may not speak that the safety situation has improved. It could be due to sporadic precautionary measures and occasional discontinuity of vessels' movement during inclement weather condition.

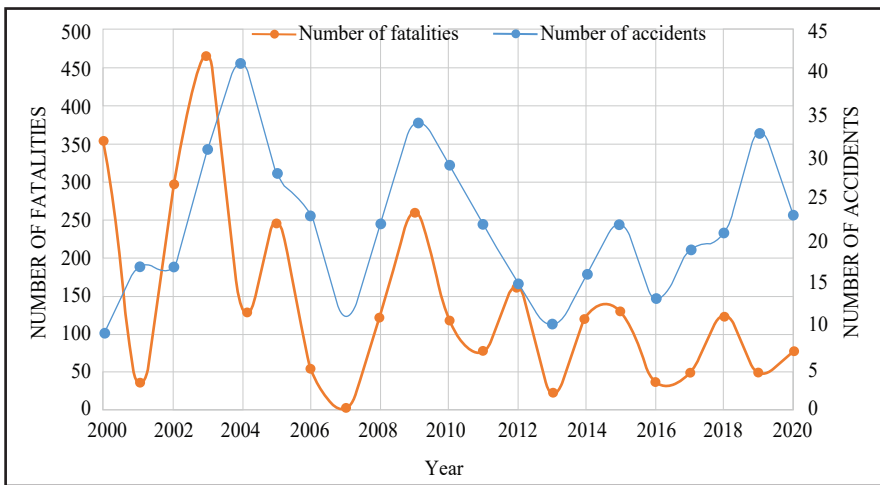


Figure 1: Year Wise Statistics of Riverine Accidents and Fatalities in Bangladesh

Information shown at Figure 1 are taken on the basis of the First Investigation Report (FIR) lodged in local police stations and cases filed in the marine court. Number of missing persons was not considered in many reports. A few recent accident cases reveal the fact that there still remains plenty of areas of concern regarding safety aspects of passengers, which demand stronger regime to improve the overall safety standard. Some of the major accidents on different occasions are summarized in Table 1.

SL	Date	Vessel	Location	Casualty
1	25th May 1986	MV SAMIA	The Meghna	600
2	20th August 1994	MV DINNER	The Meghna	300
3	11th December 1999	FERRY	The Meghna	63
4	3rd May 2002	MV SALAHUDDIN	The Meghna	370
5	8th July 2003	MV NASRIN	The Meghna	500+
6	17th November	MV COCO-4	The River Tentulia	75

7	12 March 2012	MV SHARIATPUR-1	The River Meghna	140
8	15 May 2014	MV MIRAJ-4	The River Meghna	200
9	29 June 2020	ML MORNING BIRD	The River Buriganga	32

Table 1: Summary of Major Accidents in Riverine Bangladesh.
Source: Department of Shipping (DoS)

Present study finds that some of the major accidents were not properly investigated by competent authority or if investigated, reports were not preserved well. It may be noted that when RMS Titanic sank on 15 April 1912 in the North Atlantic Ocean, the world maritime community had raised voice together. Subsequently, International Maritime Organization formed the first convention on Safety of Life at Sea (SOLAS) in 1914, the second in 1929, the third in 1948, and the fourth in 1960. Life is important both at sea and elsewhere. Author thinks that if this convention could have been named as Safety of Life on Water, situation could have been different now for IWT sector as well.

The trend of riverine accidents of different magnitude with casualties and loss of life over the last 45 years have been analyzed. The study was based on recorded data of 719 accident cases in the office of the Department of Shipping (DoS) of the Government of Bangladesh (GoB).

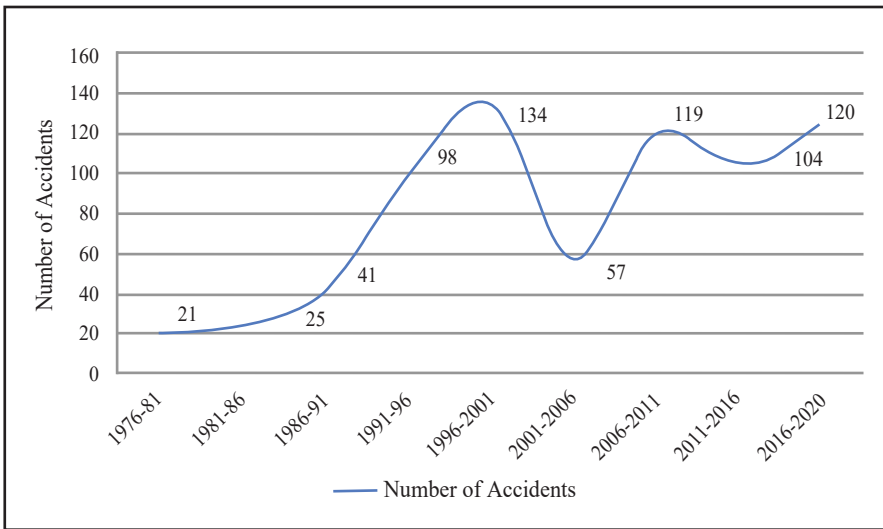


Figure 2: Number of IWT Accidents in 45 years, Source: DoS

The trend is seen at Figure 2. It is observed that there are two downward drifts during 1996-2002 and again in 2012-2020. The study of some accident

documents (one major accident is with ML PINAK 6, capsized on 14 May 2015)¹ also tells that that governance at IWT sector was not appropriate enough. It is also seen that the accident cases are not always thoroughly investigated using internationally recognized models to find the root causes. In most of the cases the important recommendations are also not implemented by the vessel owners properly and safety issues continue to exist in the system. Author noticed that there is no practice developed to publish the investigation reports for public in Bangladesh as is done in many developed countries. As a result, credibility of the investigation remains under question and root causes are hardly revealed. Operators of the IWT passengers' vessels continue to remain under challenge and overall safety standard tend to remain low.

In present study, primary data is taken through physical survey by the author himself at field, interviewing key informants from different groups of stakeholders, Focused Group Discussion (FGD) and taking experts' opinion during survey. Secondary data has been taken from relevant research findings, government and non-government offices, websites of both national and international organizations. As many as 12 stakeholders' groups have been involved. Majority of relevant data have been collected from Department of Shipping (DoS), Bangladesh Inland Water Transport Authority (BIWTA), Bangladesh Inland Water Transport Corporation (BIWTC), Survey offices of the government, office of the association of the owners and different national and international websites. At the field, simple random sampling has been done to collect data. Five accident prone areas i.e., Barisal, Patuakhali, Hatiya, Bhola and Mawa of the riverine Bangladesh have been under the study for a prolonged time between 2015-2019.

Literature Review

Quite a few research studies have been carried out where both local and international researchers have made valuable contributions. A few studies have been mentioned here.

Majority of the available research findings with statistical analysis mention about immediate causes of accidents to happen. Causes which have been identified by different researchers are: dangerous or improper overloading; collision during movement; foundering, bad weather; incident of fire; grounding

¹ Hossain, "PINAK- 6 sinks with hundreds of in the middle of the river the Padma", The daily Prothom Alo, 04 August 2015, p. 1.

etc.² A statistical analysis of the hazards involved with the indigenous technology-based marine vehicles in Bangladesh was featured extensively in a group study³ and revealed some interesting findings. Studies showed majority of accident cases at rivers of Bangladesh which happened over a period of 26 years (1981-2007) were due to collision but root causes were not identified. Out of 67 cases, vessels having a length within 40 to 60 metres fell more into accidents (44%), vessels 20 metres and below were the second-highest (27%), vessels of length from 20 to 40 metres were the third-highest (17%) and vessels of 60 metres and above were minimum (12%). This study also reveals loss of stability due to rushing of passengers, overloading, and grounding as the main causes of the accidents. The findings left ample chance to carry out further study about stability failures of poorly constructed vessels. A native researcher's comments published in the proceedings of the International Conference on Marine Technology MARTEC 2010⁴ which stated: 'Navigable waterways to be classified in both dry and monsoon season based not only on water depth but also on the sea state conditions clearly indicating the suitability of the type of vessels (especially passengers' vessels) plying at night'. It has not been mentioned about the areas which should come under sea state conditions. While discussing the type of open/closed type boats (sunken boats, 11/2 to double-decker), it has been stated that boats are designed and built without any international classification society's rule and putting the extra burden on operators. By studying available documents of investigations with the DoS, it is seen that legal actions are taken on many cases but due to slow judicial processes the victims are deprived of proper justice on many occasions. The defaulters are hardly taken into task and wrong practices are continued. Lawson, C. & Weisbrod, R. (2005),⁵ in the early part of the century made a comparative study in the fatality rates of a number of countries in the

² Z.I Awal, M.R Islam and M.M Hoque, "An Analysis of Passenger Vessel Accidents in the Inland Waterways of Bangladesh", Proceedings of the Marine Technology Conference 2006, University of Hasanuddin, Indonesia, 2006, p. 211-21.

³ Z.I Awal, "A Study on Inland Water Transport Accidents in Bangladesh: Experience of a Decade (1995-2005)", Proceedings of the International Conference on Coastal Ships and Inland Waterways, London, Royal Institution of Naval Architects (RINA), 2006, p. 67-72.

⁴ A Dev, "Sustainable Growth Inland Waterways of Bangladesh Through Innovation: A Way Forward", Proceedings of MARTEC 2010, The International Conference on Marine Technology, BUET, Dhaka, 11-12 December 2010, p. 45-52.

⁵ C Lawson and R Weisbrod, "Ferry Transport: The Realm of Responsibility for Ferry Disasters in Developing Nations", Journal of Public Transportation, vol 8, no. 4, 2005, p. 17-24. Available at: <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.897.4167&rep=rep1&type=pdf>.

developing world. The study shows Bangladesh was one of the worst-hit countries, where accidents had occurred (Dec 2000 – May 2004) due to both natural and manmade reasons. Although the statistics are different after two decades, some of the main reasons have not altered. Major safety related issues are still in existence, which results frequent disastrous consequences in the river routes of Bangladesh. Huq et al. 2003⁶ attempted to trace out the causes of Launch Disasters and the geographical distribution in Bangladesh over a period of 23 years (1977-2000). The team studied 140 cases, and found that zone wise Barisal, Bhola, Patuakhali, Chandpur and Dhaka areas had 69.55% of accidents altogether. The root causes including legal aspects were not discussed.

Existing Legal Framework

Inland Shipping Ordinance (ISO) 1976⁷ is the main instrument for the survey, registration and control of navigation of vessels plying on inland waters. This was published in the Bangladesh Gazette, Extraordinary, on 21 September 1976 by the Government of the People's Republic of Bangladesh (Ministry of Law and Parliamentary Affairs). In pursuance of the proclamation of the 20th August 1975 and the 8th November 1975 and in the exercise of all powers enabling him in that behalf, the President promulgated the ordinance, which is called 'The Inland Shipping Ordinance 1976 (ISO-1976). As part of the ordinance, following regulations have been examined:

- a. Regulations for steel made vessels in 2001
- b. Inland Water Vessel (Passengers') Regulation, 2001
- c. Inland Water Vessel (Freeboard) Regulation, 2001
- d. Inland Water Vessel (Stability) Regulation, 2001
- e. Inland Water Vessel (lifesaving) Regulation, 2001
- f. Inland Water Vessel (Fire Safety) Regulation, 2001
- g. Inland Water Vessel Examination Curriculum (Inland Master, Driver etc.) Regulation, 2001
- h. Inland Water Vessel (Employment, Examination and Awarding Certificate) Regulation, 2001

⁶ N.A Huq and A.M Dewan, "Launch Disaster in Bangladesh: A Geographical Study", *Geografia*, vol 1, no. 2, 2003, p. 14-25. ISSN 0126-7000.

⁷ Ministry of Law, Available at: <http://bdlaws.minlaw.gov.bd/act-531/section-14712.html>, accessed on 29th December 2021.

- i. Inland Water Vessel (Minimum Safe Number of Crews) Regulation, 2001
- j. Inland Water vessel (Vessel Movement) Regulation, 2001

ISO 1076 has been modified until 15 March 2005 after incorporation of the following amendments:

- I. The Inland Shipping (Amendment) Ordinance, 1979 (Ord. NO. XIV of 1979)
- II. The Inland Shipping (Amendment) Ordinance, 1983 (ORD.NO.XI of 1983)
- III. The Inland Shipping (Amendment) Ordinance, 1989 (Ord.NO.XV of 1989)
- IV. The Inland Shipping (Amendment) Ordinance, 2005 (Act No.13 of 2005)

Observations and Analysis on Legal Instruments

From scrutiny of the existing laws, FGD with concerned experts on the legal matters and associated stakeholders, it reveals that safety related certain provisions in the ordinance need further review and amendment. Applicability of the rules for passengers' vessels has been ambiguous from safety point in view. The term "Passengers' Vessels" for IWT sector has been defined at Inland Shipping Ordinance (ISO) 1976 as a vessel carrying 12 or more passengers for revenue. Three categories of passenger vessels are operated at the IWT sector which include: Motor Vessel (MV) of length 65 feet or more having capacity of passengers 100-1500; Steel made Mechanized Launch (ML) of length below 65 feet having capacity of passengers below 100; and traditional wooden or steel made Mechanized Boat (MB) of smaller size. ISO 1976 is applicable to vessels carrying minimum 12 passengers having length 20 metres (65.6 feet) or more. Again, to have correct stability criteria, the rules (Chapter 2, Section 6) are applicable for vessels with size only for vessels above 24 metres, which is ambiguous. There are numerous passengers' vessels already registered and skip the criteria for stability requirements as per the existing rules. These are exposed to danger during any sort of inclement weather. Almost 70% stakeholders' representatives opined that regulatory framework is weak and need to be strengthened. Some of the major observations on the available Legal Instruments have been described.

a. **Builders of Vessels.** The law itself does not say anything about the ‘builders of boats and vessels’ who build ships/craft at random along the riversides. Due to the absence of guidelines in the laws and rules, anybody could attempt to raise a yard for repairing and building small to medium size watercraft at any place they find suitable without any formal permission of the government at the beginning. This is a limitation in the existing legal framework. Section 2 of Chapter -1 does not define the designers and builders of vessels and has no indication of the building yards and process of registration for the same.

b. **Category of Vessels.** These chapters I and II introduce basic elements of the laws regarding Inland Vessels in the context of Bangladesh. When these laws were initially drafted, the researcher deduces that it was the period when there were vessels propelled by steam, sail and paddlewheel power also. In the present-day context, steam-powered boats are not there in the IWT sector of the country. Time will not be far off when there would be battery-powered hybrid boats or solar powerboats also. It is thus inferred that provision for similar options may also be there in the laws.

c. **Duplication of Responsibilities.** Existing law does not clearly define areas of responsibilities of different stakeholder’s departments; as a result, there arise chances for overlapping /duplication of responsibilities.

d. **Offences and Subsequent Penalties.** As per ISO 1976, monetary penalties to the defaulters gradually lose importance with the devaluation of currency due to inflation. Again, frequent amendment of the laws and regulations dealing with pecuniary penalties is a very time-consuming process. Instead of currency, if penalty units are introduced, it may be a simpler and quicker method of adjustment of fees and charges. That is why Australian Maritime Safety Laws have a penalty in terms of units (a certain amount of Australian Dollar equal to one penalty unit) for any breaches of law in Australia at federal, state and territory levels. Section 4AA of the Crimes Act 1914 sets the monetary amount of a penalty unit, which is A\$210 as of 1 July 2017.⁸ This is a useful example for the local judiciary which may be implemented in Bangladesh. In that case, if the value of taka changes, the law may remain the same, and the value of penalty units need to be only declared based on socio-economic condition by the finance/treasury department.

⁸ AMSA, “Australian Government, Australian Maritime Safety Authority webpage”, 2020, Available at: <https://www.amsa.gov.au/vessels-operators/domestic-commercial-vessels/paying-infringement-penalty>.

e. **Standard Operating Procedure.** The administration, including the regulatory agencies, become helpless when the situation gets out of control, and eventually, they leave everything to the will of God for any untoward incidence to happen. Lack of Standard Operating Procedure and its implementation simultaneously appears to be a reason for major complications and problems experienced.

f. **Section-44(3) (Shipping Casualty and Report Thereof).** Upon receipt of the report of shipping casualty under sub-section (2) of upon receipt of any information from any reliable source the officer in charge of the police station shall as soon as possible, and in any case not later than twelve hours of the occurrence of the casualty, make a report in writing of the facts and circumstances of the casualty to the Government, Director-General, the District Magistrate and the Upazilla Nirbahi Officer within the limits of whose jurisdiction the casualty has occurred'. No indication of keeping or protecting the physical evidence. The rule also does not say who would investigate, as these are mostly technical matters that need an opinion from specialists/assessors qualified to conduct accident analysis. Absence of any neutral board to conduct investigation keeps scope that may lead to biased decisions. In this respect the National Transportation Safety Board (NTSB)⁹ of USA sets an example to carry out un-biased investigation for maritime accidents to find the root cause.

g. **Section-47(1) (Constitution of Marine Court and Legal Procedure to Lodge Cases).** There shall be constituted one or more Marine Courts consisting of a Magistrate of the first class to try the offences punishable under this Ordinance. Observations in relation to court, investigation, manning/certification and penalty related issues by Chapter of ISO 1976 are as follows:

(1) The number of the marine court has been mostly one, although there has been a provision to increase. (Chapter IV, Section-47). The section may mention when to open a second or subsequent Marine Court.

(2) Regarding keeping evidence of any accidents and casualties, the provision by master or owner, the provision in the rule/law is scanty. This has a deleterious effect in determining the root causes of any occurrence (Chapter IV, Section -48).

⁹ National Transportation Safety Board (NTSB), Available at: <https://www.nts.gov/investigations/Marine/Pages/default.aspx>.

(3) The investigation team does not need to have a member who is qualified to conduct maritime investigations with appropriate tools and knowledge; this may be a mandatory requirement. (Chapter IV, Section 45).

(4) Interview of Public Prosecutor and reputed lawyer of Supreme Court who is also involved in Marine court reveals that there are a number of instances of filing cases at two different courts, which complicate the situation and delay justice. There are records of stay order for a number of accident cases after some progression. Examples of cases are for accident cases of MV PINAK, MV MIRAJ, MV MOYUR, MV LIGHTING SUN, MV SHAROSH. In this respect home ministry of the Government of Bangladesh have clear instruction to the police department for handing over the cases to the marine court who have specialists to deal with the maritime related cases. On the other hand, local administration with police department take advantage of Section 45 and use Code of Criminal Procedure without having any competent specialized person with maritime knowledge of ships and its operation, as such procrastinate the judicial procedure, and ultimate sufferers are the poor victims. They are continuously harassed, and the perpetrators remain unfettered.

h. Section-54B (Voyage Without Telecommunication Equipment prohibited). This states:

(1) Inland ship carrying: (a) one hundred or more than one hundred passengers'; or other items (including the specified amount of cargo) shall not proceed on any voyage or be used in service unless she has been provided with such telecommunication equipment as may be prescribed.

(2) The Government may by order exempt from the operation of this section any inland ship or class of inland ships, if it is of the opinion that, having regard to the nature of the voyage in which the inland ship is engaged or other circumstances of the case, the provision of the telecommunication equipment is unnecessary or unreasonable. In this respect, the main observations are:

The law seems to be erroneous and ambiguous. A vessel that is authorized to carry passengers for revenue should have communication equipment or facility. Similar to that of an aircraft. Whether the aircraft has 20 passengers' or 100 passengers', it has to have communication set. Government may employ an

internet provider company to support the passenger vessels with an internet facility at inland waterways to communicate with the ground station and with other vessels afloat for safety reasons.

i. **Section-55 (Voyage During Storm Signal Prohibited).** It states, 'No inland ship shall proceed on any voyage or be used for any service when a danger signal of the storm is hoisted or there is a reasonable apprehension of storm'. Measures taken under such provision creates ambiguities and vessels' owners take advantage of stopping operation with a minimum warning (Signal no -1). This has encouraged owners not to improve the standard of vessels' construction to face adverse weather conditions.

j. **Section-56A (Compliance with Rules for Preventing Collisions, etc.).** This section states 'While underway, every inland ship shall comply with such rules for prevention of collisions or relating to steering and sailing as may be prescribed'. Rules need to be spelt using proper seamanship terms and be comprehensive. In this section, rules are not well spelt out for the operation of the inland ship. Collision regulation similar to that mentioned at IMO's COLREG may be adopted. IMO Resolution 58 (For Domestic Vessels) for Vessel Traffic Service may be a useful reference to take a lesson.

k. **Section-67 (Penalty for Over-loading of Passenger Vessels / Improperly Loading).** It states 'Where on any voyage for revenue purposes, an inland ship carries onboard or in any part of the vessel passengers in excess of the number set forth in the certificate of survey of the ship as the number of passengers which the ship or the part thereof is fit to carry, 67 (b) the owner or his representative, if present, onboard the inland ship or at the terminal at the time of the voyage, loading or unloading or master of the inland ship shall be punishable with fine which may extend to Taka three hundred for each passenger so in excess up to a maximum of taka one lakh'. Here the main observation is that the rule does not provide adequate punishment to defaulters as agreed by 50% of the respondents (officials and members of the marine community). At the same time, 33% disagreed that the award or the punishment of safety rules is adequate. Similarly, Section 67A, Section 67B have similar observations, which relay an inadequate scale of punishment. Wrong practice is continued without any hesitation by the owners which are vivid even after data collection was over by the

author (Despite there being directives not to carry extra passengers on launches, most of the launch authorities are not complying).¹⁰

l. Qualification of Examiners. There is no rule regarding the qualification and experience of examiners to provide competency certificates, (Chapter III, Section-38).

m. Discretionary Power of the Authority in Manning. Relaxation in manning of inland ship through satisfying the Director-General by owners create an opportunity for breach of transparency, which needs amendment. (Chapter III, Section 37).

n. Inland Ship Safety Administration (ISSA). Absence of a Functional Safety Administration is prevailing. National Shipping policy states clearly which was promulgated in 2000. This is not widely circulated in the country. Although there are indications of it in the ISO 1976, the safety administration has not been formed as per the original proposals of paid consultants to the governments.

Observation and Analysis of Design and Construction of Vessels

Design and Construction of inland vessel are guided by the relevant sections and rules of ISO 1976. Available organizational set up at the DoS has limitations to test all the designs and drawings before giving approval, which was revealed during FGD. DoS generally approve not more than 250 designs on an average in a calendar year. The authority controls the total number depending on the traffic at different routes. Once the design is approved, construction of vessels is supervised by a panel Naval Architects enlisted by the DG Shipping as panel supervisor. Vessels having less than 20m in length, the set of drawing mentioned in the rule need not be made and sent for approval to administration. This again appears not justified as vessel having a length less than 20m are constructed and being used at random for carrying passengers' and many accident cases are found with such vessels due to design faults at the study area. By law, a designer cannot be made fully responsible for such an important job, and in case of design failure, they would not be responsible. Present rules/ regulations need an amendment to solve this issue.

¹⁰ The Daily Prothom Alo, "Last Minutes Crowd at Sadarghat", Available at: <https://en.prothomalo.com/bangladesh/last-minute-crowd-at-sadarghat>.

There have been instances of indiscretions in the process of design approval, construction supervision and survey of vessels in the department. Out of all respondents from the stakeholder's department (BIWTA and DoS), about 90% agreed that the standard procedure is not followed to approve the designs and rest 10% remained neutral. Physical inspection at yards along the rivers also found that construction is being done at several places without any approved design at hand. In this respect, the legal framework allows unscrupulous activity among the stakeholders as the law is also not very clear on the issue and no provision of penalty for the designers and owners.

In this respect, the Australian National Law for marine safety has been accessed as a reference. Australian Maritime Safety (Domestic Commercial Vessel) National Law Act 2012 (as amended) specifies duties relating to design, manufacturing etc. of domestic, commercial vessels. (Division 2, Section14). The Law says: 'A person who designs, commissions, constructs, manufactures, supplies, maintains, repairs or modifies a domestic, commercial vessel, or marine safety equipment that relates to such a vessel, must: ensure so far as reasonably practicable, that the vessel or equipment is safe if used for a purpose for which it was designed, commissioned, constructed, manufactured, supplied, maintained, repaired or modified, as the case may be'.

Twenty-four designs available with the DoS have been studied, almost a dozen vessels' structures have been surveyed, and design houses consultants have been interviewed. Study shows that about 80% of those designs are not comprehensive, and none had any details of structural drawings. About 75% of the Naval architects at design houses opined that vessels are not designed to suit local requirements as shown in Figure 3. The design mostly depends on the intention and limited budget of the owners without give appropriate attention on stability and other safety criteria.

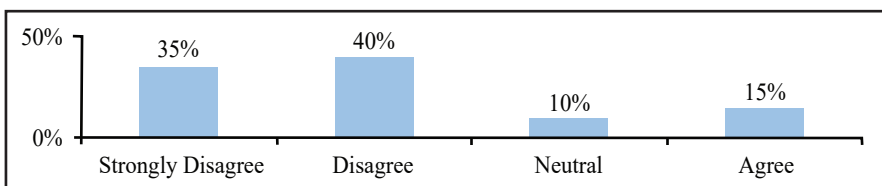


Figure 3: Vessels Designed and Built in Bangladesh to Suit Local Requirement

FGD at DoS revealed that the existing number of surveyors are not enough to complete (only about 50% of 13450 registered vessels can be surveyed) the

annual survey of the registered vessels under the department. Inland passengers' vessels are not built by taking assistance from any classification society. This is a major cause of concern in the department as they could not have any classification society as yet as per the ISO 1976. Survey data at field from design houses' members, associated builders and academicians have been taken with preset questionnaire on the standard of design of passengers' vessels. 31% of the respondents opined that the riverine vessels are not designed as per international standards, and 75% agree that these are not even designed to suit local requirements. Due to limitation of towing tank facilities, owners' unwillingness to spend sufficient budget behind design aspect, majority of the designs are copy of the previous designs which were not based on appropriate calculations considering shallow water effects and weather conditions at different geographical locations. The designers mostly try to satisfy the investors' requirements as there is no classification society's rule yet in force in the country, who can supervise as per standard rules and certify. As a result, cost-saving gets priority over other factors. The result is the production of finished vessels that are vulnerable to any kind of adverse weather condition.

ISO 1976, Rule-8 says the static angle of the heel for stability criteria should be 10 degrees, considering all passengers are assembled at one side of the vessel. Again stability criteria (A or B) is to be fulfilled as per rules set by the Inland Shipping (stability) Rules, 2001. Most of the designers select criteria B as it is easier to comply even though it results unsafe stability situation. This fixed degree of the heel and no explanation about varying loading conditions and operation at local waters need further clarification to make the vessel capable of facing the adverse situation. This situation may be improved by a complete review of the existing rules in conjunction with other international standards, including those of the IMO set rules, which have applicability for vessels operating at domestic or internal waters. Existing design and construction criteria has been doubtful. Study of accident cases by the author as well as previous researchers show that the majority of cases (83%) with the sinking of the vessels had been with vessels of length below 60 meters. Particularly vessels of length between 40-60 metres were the worst affected (45%). Woefully, 12 accident cases of vessels reveal that the vessels which were sunk due to collision were mostly poorly designed and constructed. Physical inspection of similar vessels has been done which show a grim picture rather as these are not having any watertight compartments and reserved buoyancy to avoid sinking immediately after any damage. Design house respondents do not differ in stating that the designs are unsafe.

A study has been done on the principal particulars of 200 passengers' vessels, which were in operation at the southern region of Bangladesh over a period of 20 years (1986-2016). It showed that 92 % vessels having length shorter than 40 metres had Length to Breadth ratio between 4 to 5, which is considered unsafe from stability consideration as these all have very low free board. Obviously, such vessels are more vulnerable during inclement weather. Vessels of length between 40 to 50 metres had this ratio between 5 to 6 and those above 50 metres had this ratio between 5 to 5.9. These are considered some examples of unsafe design. However, there is further scope of study in this respect.

It has been found that to minimize the cost of construction, the owners take advantage and set standards to have vessels with very less freeboard. This obviously makes the vessels vulnerable to flooding with a slight wind and wave pressure on average rough water at the river. Design should be based on water conditions prevailing around the Padma during monsoon and at the confluence of the rivers near Chandpur or at rivers near Bhola, Payra and adjacent areas at the southern part of Bangladesh, which remain rough throughout the year. Considering the ever-changing climatic conditions of Bangladesh and around, nobody would guarantee that while the vessels are on a cruise, wind speed will not increase suddenly. Moreover, the safety of life cannot be compromised with the socio-economic condition of passengers'. Again, people need to travel during monsoon and rainy seasons for livelihood. As model testing towing tank facilities are not available in Bangladesh, designers do not set any criteria of simulating adverse conditions at rivers of Bangladesh. Main focus should be on the safety of passengers' in inclement weather and preventing flooding with an average speed of wind which is acceptable by the international standards for passenger vessels. IMO has given some standard for passengers' vessels which are adopted by many countries at domestic waters including lakes. The standard laid down by IMO and RESOLUTION A.749(18) was adopted on 4 November 1993. It indicates code on intact stability for all types of ships covered by IMO instruments, which are as shown at Table 2.

In Intact stability criteria (1 and 2)	The minimum range of stability (a, b , c)
1.The area under the righting lever curve up to the angle of the maximum righting lever should not be less than 0.08 meter-radians.	a. Length less than 100 meters: 20°
2. The static angle of the heel due to a uniformly distributed wind load of 0.54 kPa (wind speed 30 m/s) should not exceed an angle corresponding to half of the freeboard for the relevant loading condition, where the lever of wind heeling moment is measured from the centroid of the windage area to half the draught.	b. Length greater than 150 m: 15° c. Length 100-15 m: by interpolation

Table 2: IMO Guidelines for Stability Criteria of Inland Vessels

Guidelines similar to those of Australian Maritime Safety Administration (AMSA) and IMO may be consulted by local designers after the necessary amendment of rules. Owners occasionally try to influence designers to meet their commercial needs even at the cost of safety. Builders also tend to follow those instructions and there are instances that they deviate from the approved designs (51.9%) as shown in Figure 4. Members from the design houses as well as some builders’ representatives were asked whether vessels are always constructed as per approved designs.

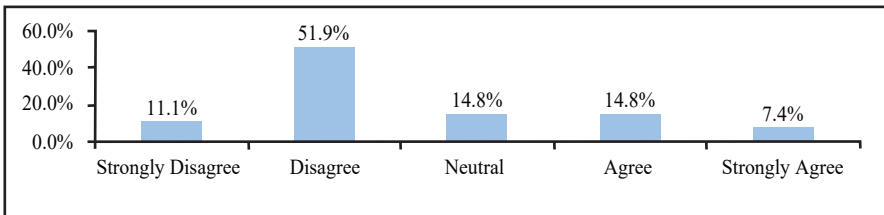


Figure 4: Opinion of Owners to Get the Vessel Constructed as per Approved Design

Panel supervisors detailed by the DoS are responsible mostly for inspection at the construction site. 83% of respondents from the yard/ DoS mentioned that regular inspection at the construction site is not done as shown in Figure 5. Personnel at construction yards and design house members were asked whether inspections are done at regular interval during construction.

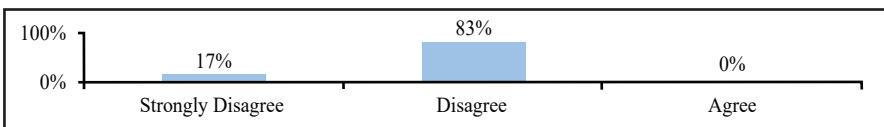


Figure 5: Inspections are Done on Regular Basis During Construction

Operation of Sunken Vessels

Recorded data with the DoS shows about 256 sunken deck vessels (one and half deck vessels) are operated at five river ports in Bangladesh with risk. These vessels have no standard designs and as per experts' opinion, such vessels should have been stopped to operate much earlier. The vessels have poor stability criteria and have no water tight integrity as per international standard. The authority also has similar opinion on such vessels. However, due to weaker safety administration, such unfit vessels are being operated at random, which only reflect inappropriate governance in the sector.

Conclusions

Safe operation of passengers' vessels is often disrupted due to occurrences of accidents with huge loss of valuable lives and property. Associated investigation reports and researches hardly expose the root causes related to legal issues that impact governess processes. To ensure safety standard of international level at IWT, a strong safety regime is prerequisite. The existing rules have need to be strengthened and implemented as per the guidelines at national shipping policy. Inland Ship Safety Administration (ISSA) has not been adequately strengthened, which needs to be functional and participatory.

Survey reveals that the majority of designs of the IWT passengers' vessels have shortcomings, which result in unsafe construction. Accident reports also show that vessels that were sunk on different occasions at rivers were due to faulty design. It is also revealed that there is hardly any control on the dimensions of vessels. The vessels are not standardized and stability criteria prior construction are not considered according to international standards which need to be reviewed. The existing law needs clear provision for shipbuilders, who regularly build vessels anywhere they would feel like. The authority appeared concerned about it, but it needs to resolve through the formation of laws. Existing law does not make it mandatory for owners to keep communication sets for vessels with a carrying capacity of fewer than 100 passengers. This situation poses the operators with a challenging situation for which they can hardly do anything. Rules as regards to selection of crews for manning, design approving process, supervision of vessels' construction, and infrastructure need to be reviewed. This would result in a more transparent process which would ensure better safety standards and a transparent system. Existing laws regarding scales of punishment and penalty are old and need to be reviewed to make them more effective in line with other international systems available. There is no provision in the laws for designers, builders, and

guidelines on sharing responsibilities between stakeholders' departments for more effective governance. IMO's prescriptions for IWT may be considered as useful guide, which is not much discussed at IWT.

Recommendations

The regulatory framework for IWT needs to be strengthened by amending the existing rules of the Ordinance and Subsequent transformation of these into Acts. Areas that need more attention are penalty clauses to confirm suitability, demarcation of responsibilities and accountability for institutions to avoid duplication, design and stability criteria for vessels as per international standard, accountability system for inspectors, supervisors, designer, judiciary, the welfare of crews, etc.

From design point of view, there has to be significant improvement on the quality of vessels. Stability criteria of vessels be set to suit river conditions at all seasons at different routes, considering the safety of the vessels in existing scenario and in line with international standards (IMO). Design criteria be reviewed, freeboard to be adequate to save vessels from flooding easily, length to breath/width ratio for vessels having length 45 metres or less shall be of magnitude 3.5 or below and for vessels with length higher than 45 metres may be below 5.5. Provision of reserve buoyancy for vessels be compulsory, to save from sinking. Design of vessels is to be made keeping the focus on the safety of personnel on board and user friendly. Internationally accepted norms and standards should be maintained considering that rivers are now regionally connected. IMO's guidelines may be followed so that safety matters are not compromised. Laws regarding activation of classification society may be implemented without any compromise.

About Author

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