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An Analysis of Accidents in the Inland Waterways of Bangladesh: Lessons from a Decade (2005-2015)

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Abstract

The Inland Water Transportation (IWT) system of Bangladesh is one of the most significant modes of transportation for being easily accessible and less expensive. Though Bangladesh own geographical benefit of having a huge inland waterway network but there are severe safety deficiencies in this sector. This study has analyzed the data of accidents that took place during 2005 to 2015 in the inland waterways of Bangladesh. Accident data were collected from the Department of Shipping (DOS) of Bangladesh. The accidents has been analyzed according to different variables such as vessel types, location of accidents, time distribution of accidents, final condition of vessels after the occurrence of accidents and others. A total of 229 accidental cases were considered for the study. The Geographical Information System (GIS) is applied for identifying the most vulnerable locations and waterway routes for waterway accidents on the basis of frequency of the occurrence of accidents. The analysis revealed that the major causes of waterway accidents are collision, Nor'wester or storm, overloading, stability failure, excessive current, bottom damage. The analysis shows that cargo vessels and passenger vessels are facing more accidents compared to other types of vessels. It was also observed that many accidents and relevant information often remain unreported. Moreover, the recorded waterway accident data are also not much informative for conducting standard research works. Finally, some recommendations are put forward with a vision to build up a safer waterway transportation system for Bangladesh and for further research and investigations.

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1. Introduction

Bangladesh possesses an exclusive geographic location having a massive network of approximately 700 rivers which is about 7% of the total area of the country. The entire area of the country consists of 24,000 km extensive network of inland waterways [1]. The Inland Water Transportation (IWT) system of Bangladesh is the oldest mode of transportation that carries nearly one third of total passengers and goods of the country. The length of navigable inland waterways is approximately 5,968 km, which however, decrease to 3,600 km during dry seasons. Different types of vessels use to ply over the inland waterways of Bangladesh like Cargo vessels, Passenger Launches and ferries, Fishing vessels and boats, oil tankers, steamers, trawlers and country boats etc.

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But, in spite of having such vast waterway network and transportation significance, safety in this sector is not ensured at all. In Bangladesh, waterway accident and associated fatalities and injuries are still taking place. But, these accidents do not occur due to a single factor. As described by Islam [2], BIWTA [3] and Chowdhury [4] the factors that generate the waterway accidents are vessel design factor, operating environment factor, human factor, enforcement and educational factor. All types of vessel face accident more or less in Bangladesh. Passenger vessel accident is a serious issue for Bangladesh. An analysis of passenger vessel accidents of Bangladesh was done by Awal et al. [5] where some significant findings were found and some important recommendations were put forward. Another study by Awal et al. [6] analysed the collision type of accidents by the marine vehicles of Bangladesh. An investigation by Islam et al. [7] analysed the maritime accidents of Bangladesh specially the overloading and inclement weather related accidents. A study by Awal [8] dealing with 197 accidents revealed that majority of the accidents during 1995-2005 in the inland waterways of Bangladesh had occurred due to overloading and cyclone (43% of total accidents). In Bangladesh different types of waterway accidents take place, such as collision, Nor'wester or storm, overloading, stability failure, excessive current, bottom damage, structural failure and others. Collision type accidents occur by the contact of a vessel with another vessel or any other permanent obstructions on the waterway like pillar of bridge and etc. Accidents due to Nor'wester or storm and excessive current generally occur during monsoon season when the weather frequently becomes inclement in nature. Overloading can be defined as carrying load that is excess to the designed capacity of a vessel. Iqbal et al. [9] mentioned that overloading is not a pure naval architecture problem. Stability failure type accidents usually occur due to poor design of vessels. Accidents related to excessive current take place due to high tide and excess water wave created by the nearby moving vessel. Bottom damage refers to the damage of underside hull of a vessel by any underwater obstruction. Structural failure related accident refers to any mechanical failure or structural damage in the vessel.

According to the database of Department of Shipping (DOS) of Bangladesh, nearly eighteen hundred people have died, injured and found missing due to inland waterway accidents in the last ten years (2005-2015). But, it is important to mention that, the accidents of the unregistered vessels and boats are not recorded by the relevant authorities of the government. So, it can be said that significant number of waterway accidents are not reported and thus the above mentioned statistics do not reveal the actual situation of waterway accidents. That means the actual number of casualties is even more than the stated value. So it can be claimed undoubtedly that the accidents of the inland waterways have become a serious issue for the whole nation at present.

2. Data collection and database development

An authentic and comprehensive database is required to carry out accident related research activities. One of the major objectives of this study is to accumulate and maintain a technical database from which detailed analysis of accidents and research works can be carried out. The waterway accident data were collected from the Department of Shipping (DOS) of Bangladesh. Though the source is authentic, but the technical standard of reporting is poor. Many of the vital parameters of the accidents are not reported at all. Awal et al. [5] developed a spreadsheet database structure for the analysis of passenger vessel accidents in Bangladesh. A database structure similar to that structure has been developed based on some technical information consisting of 6 main categories. These categories are then grouped into 17 sub-categories. Fig. 1 shows the database structure.

3. Accident analysis

3.1. Accident type

In this study, different types of accidents were identified; such as collision, Nor'wester or storm, overloading, stability failure, excessive current, bottom damage, structural failure and others. Their respective percentages are shown in Fig. 2. From the analysis it is quite apparent that collision (60.3%) is the dominant cause of the accidents. Nor'wester or storm related accidents (8.7%) take place when the weather is inclement in nature.

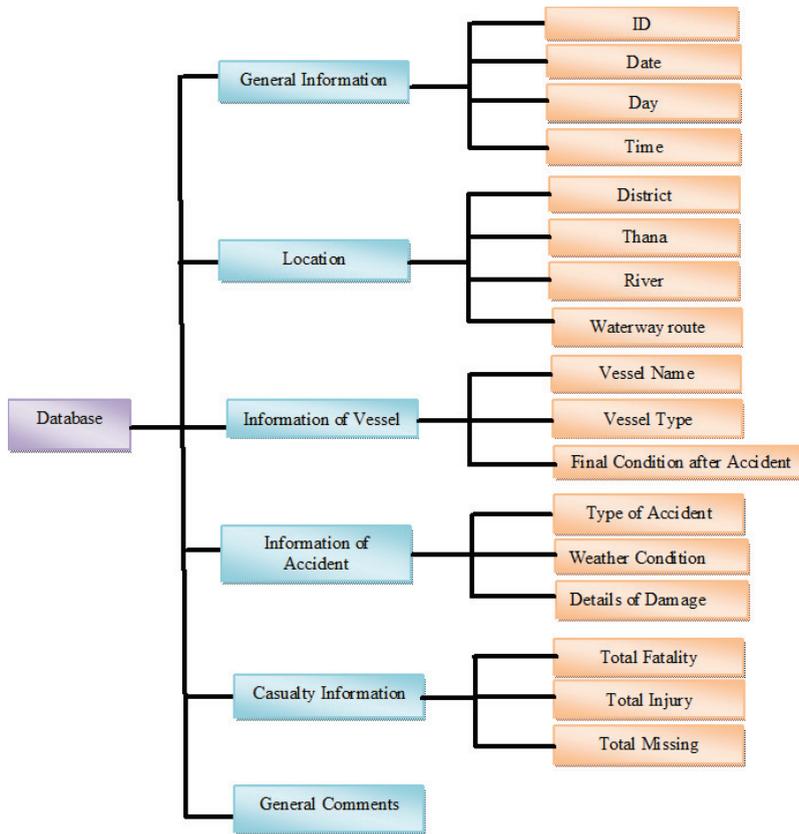


Fig. 1: Database Structure

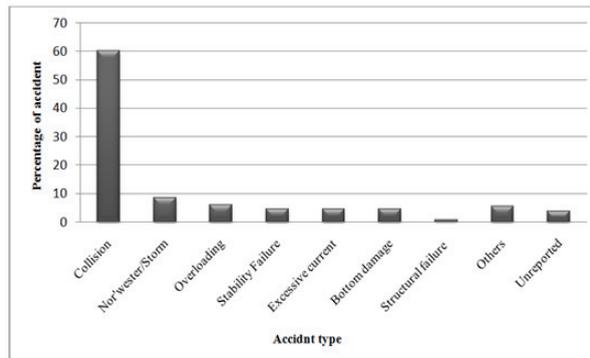


Fig. 2: Percentage of different types of accidents

3.2. Accident locations

By using the Geographical Information System (GIS) the analysis of accident locations was done as shown in Fig. 3. The whole country was divided into several sectors according to the frequency of occurrence of accidents for an interval of 5. It is seen that the northern part faces lesser proportion of accidents since vessels cannot ply over there suitably due to shallow draft of waterway channels. The southern part of the country experiences major portion of waterway accidents. This occurs due to the presence of more waterway routes and channels through which huge

number of vessels use to ply. Barisal, Chandpur and Chittagong are the topmost hazardous districts of Bangladesh for the occurrence of inland waterway accidents. It has been also observed that the waterway along the Padma-Meghna river approaches i.e. from Manikganj to Barisal districts is the most vulnerable route for the transportation of vessels.

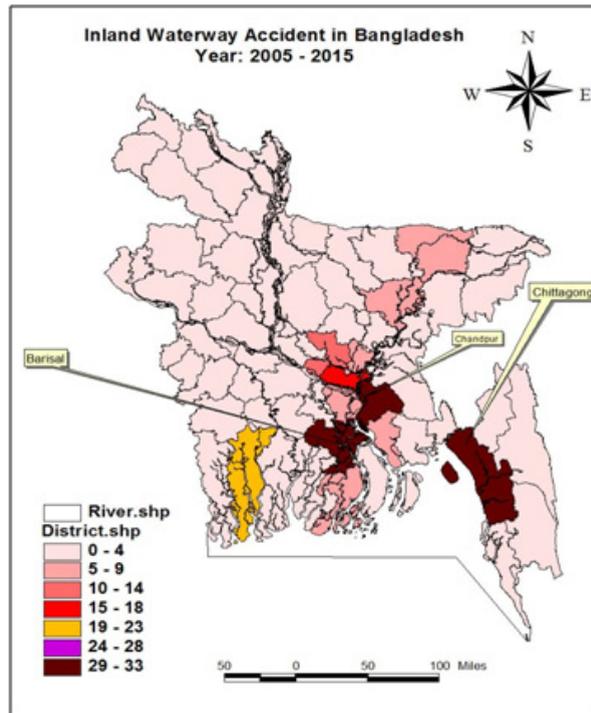


Fig. 3: Location of accidents

3.3. Types of vessels

From Fig. 4 it is evident that cargo vessels (27%) and passenger vessels (26.3%) are the leading vessel types responsible for accidents in the inland waterways. Among others oil tanker, country boat and trawler, dumb barge, fishing vessel etc. have smaller percentage. About 32.3% percent of all the accidents had not clearly specified the types of vessel which remain unreported due to poor system of data collection and accident investigation.

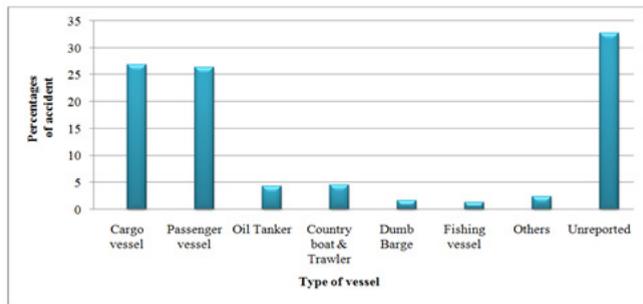


Fig. 4: Percentage of type of vessels under accident

3.4. Involvement of number of vessels under particular accident

Waterway accidents may occur by a single vessel or more than one vessel. It is seen from Fig. 5 that maximum number (57%) of accidents has occurred by the contact of two vessels. A single vessel undergoes accident for 38% cases. For rare cases (5%) three vessels have contact to cause accidents which are mainly of collision type accidents.

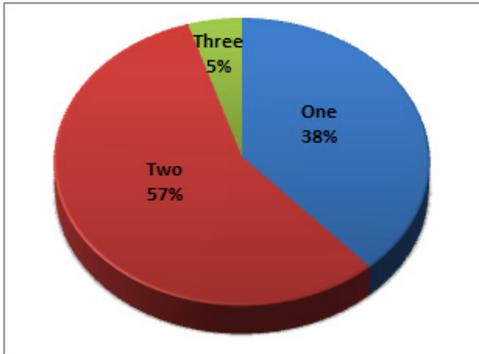


Fig. 5: Percentages of number of vessels under particular accident.

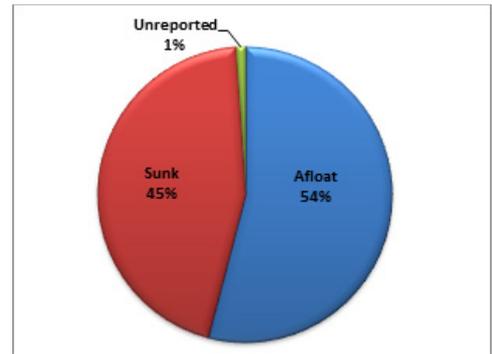


Fig. 6: Percentages of ultimate fate of vessels.

3.5. Ultimate fate of vessels after accident

Fig. 6 indicates the ultimate fate of the vessels that were under the accident. It is seen that near about half (45%) of all the vessels under accident are sunk under the water which is a vital issue; since, it increases the probability of death by drowning. Again, the vessels that remain afloat after accident often had severe damage.

3.6. Accident time

By analyzing the accident time (Fig. 7) it is found that, accidents occur all round the clock. Scarcity of sufficient navigational aids is one of the main reasons for occurrence of accidents in the night time. The most important point is that a major portion of the accidents have the time unreported, which indicates that accident investigation, data collection and recording process are below standard.

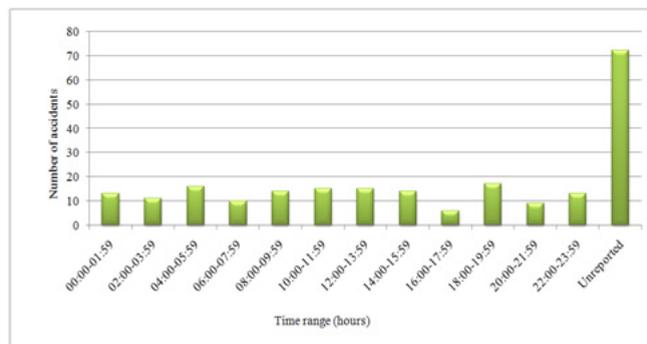


Fig. 7: Hourly distribution of accident

3.7. Accident type-month cross tabulation

Table 1 shows the month wise distribution of different types of accidents. It is quite clear from the table that collision type of accidents occur all round the year. But during the months of January, February and August more accidents had occurred due to collision. Most of the accidents due to storm have occurred in the monsoon season (March-July). The accidents due to overloading and excessive current occur more or less round the year. The bottom damage related accidents has taken place when the water depth is less. So, during monsoon season due to presence of adequate water depth, bottom damage related accidents usually do not take place.

Table 1: Distribution of accident types against months

| Month | Collision | Nor'wester/ Storm | Overloading | Stability Failure | Excessive current | Bottom damage | Structural Failure | Others | Unreported | Total |
|-----------|-----------|-------------------|-------------|-------------------|-------------------|---------------|--------------------|--------|------------|-------|
| January | 19 | 0 | 2 | 2 | 0 | 2 | 0 | 3 | 0 | 28 |
| February | 18 | 2 | 2 | 3 | 2 | 0 | 0 | 0 | 0 | 27 |
| March | 13 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 16 |
| April | 11 | 4 | 0 | 2 | 2 | 0 | 0 | 1 | 2 | 22 |
| May | 5 | 6 | 2 | 1 | 3 | 0 | 0 | 0 | 1 | 18 |
| June | 5 | 3 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 13 |
| July | 9 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 12 |
| August | 17 | 1 | 3 | 1 | 0 | 2 | 0 | 3 | 1 | 28 |
| September | 12 | 0 | 3 | 0 | 2 | 2 | 0 | 1 | 2 | 22 |
| October | 11 | 0 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 16 |
| November | 7 | 0 | 1 | 0 | 1 | 2 | 1 | 1 | 1 | 14 |
| December | 11 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 13 |
| Total | 138 | 20 | 14 | 11 | 11 | 11 | 2 | 13 | 9 | 229 |

4. Concluding remarks

4.1. Research findings

The research findings from this study can be summarized in the following way:

- Collision is the leading cause of waterways accidents in Bangladesh. Nearly two-third of all waterway accidents occurs due to collision. It has been observed that during winter season (January and February in particular) a significant number of collisions took place. During this period the day light is limited and often the weather is foggy. Perhaps these are the contributing factors behind this type of accident.
- Passenger and cargo vessels are the dominant types of vessels responsible for the accidents in the inland waterways of Bangladesh.
- About half (45%) of all the vessels are sunk after the occurrence of accident. This may be due to the poor design and structural strength of the vessels.

4.2. Recommendations

Considering the above facts it is indispensable for Bangladesh to take immediate steps for mitigating the number of waterway accidents. It will save lots of human lives and assets. Recommendations for the development of waterway safety condition on the basis of the above study can be outlined as:

- To reduce collision type of accidents foggy weather condition should be handled carefully. The horn or siren and searchlight of the vessels should be checked regularly to perform their actions effectively. Sufficient amount of navigational aids (Cardinal marks, lateral marks and buoy etc.) and other signs & markings should be installed on the required locations of waterway routes for both night and day navigation.
- Enforcements should be made stricter to stop plying vessels during inclement weather condition.
- To prevent overloading the loading capacity of the all the vessels should be checked before any voyage. For passenger vessels, passenger counting system should be adopted.
- To reduce the stability failure related accidents, all the vessels should be designed and constructed by expert and skilled naval architects.
- The fitness of all the vessels should be checked on regular basis.
- Proper and regular training program for the vessel drivers, masters and driver instructors should be arranged. Their competence and skill should be examined regularly.
- To save human lives in emergency situations availability of sufficient amount of life saving appliances should be ensured on all the vessels.
- Effective accident investigations should be conducted so that the actual cause of accident can be found out and its associated preventive measures can be implemented.
- Awareness campaign and distribution of leaflet and booklet containing waterway transportation safety messages for all people can be arranged by the regulatory bodies at all waterway and river terminals. In the media channels some advertisement and drama containing safety awareness may be publicized regularly.

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