



## **AN INVESTIGATION OF COLLISION ACCIDENTS IN THE INLAND WATERWAYS OF BANGLADESH**

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### **ABSTRACT**

*Bangladesh is a country of rivers. The places that are not easily accessible by land transport like roads and railways, inland water transport allows very easy access to those locations. Despite being one of the most popular public modes of transport there remain some major deficiencies in ensuring safety. This study analyzes accidents involving collision by the vessels in the inland waterways of Bangladesh during the period 2005 to 2017. The accident data and relevant information have been collected from the Department of Shipping (DOS) of Bangladesh. A total of 154 accidental events were considered that occurred due to collision by the vessels. About three-fourths of accidents due to collision occur during fair weather which is a matter of great concern. It is found that cargo vessels and passenger vessels are mainly involved in the occurrence of accidents. Annual distributions of accidents show that fatality constitutes a greater proportion of total casualties. At the end of the analysis, some recommendations are put forward to effectively mitigate the collision accidents in the inland waterways of Bangladesh.*

**Keywords:** *Inland water transport, Collision, Cargo vessels, Passenger vessels*

### **1.0 INTRODUCTION**

Bangladesh is a land bestowed with plenty of rivers, canals and waterway channels around the whole country. Besides she has a long coast of Bay of Bengal in the southern zone that allowed her to form the largest delta of the world. This gift from nature has allowed the people to access any locations of the country very easily through waterways. Moreover, it is favored by most of the people of this developing country for being cheaper. It is supported by the fact that, inland water transport carries over almost half of all major freight traffic and one-fourth of all passenger traffic in Bangladesh [1]. So the contribution of this mode of transport to the national GDP of Bangladesh is significant [2].

But, the prevailing condition of safety in the inland waterways of Bangladesh is very poor. A number of inland water transport accidents of the last few decades have grabbed the attention of the whole world. Every year lots of human lives are lost and many more are injured due to these ruinous events. But, it is important to mention that, the accidents of the unregistered vessels and

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boats are not usually recorded by the relevant authorities of the government. So, it is widely claimed that a significant number of waterway accidents are not reported and as such the above figures may well be underreported. The Government of Bangladesh is concern about safety issues of inland waterways and has taken some remedial measures. Still, accidents are taking place that causes severe loss of human lives and properties. As a result, it creates a significant negative impact on the national economy of Bangladesh.

The present study attempts to reveal the accident characteristics of Bangladesh with special importance on collision accidents. Because at present collision is the major cause of accidents in the inland waterways of Bangladesh. Moreover, a significant proportion of casualties have been occurred due to the collision. Unlike the natural causes behind accidents like stormy weather and excessive current; human factors and system faults are responsible for the collision accidents. So it is important to analyze the factors responsible for the occurrence of collision accidents and undertake effective safety measures to mitigate such disasters.

## **2.0 BACKGROUND STUDY:**

It has been found that most of the studies regarding the maritime safety of Bangladesh are based on statistical analysis methods. However, one major problem mentioned by almost all studies is the limitation of accident data. It is found from a study by Awal [3] that the major cause of inland water transport accident in Bangladesh was cyclone & overloading during the period 1995 to 2005. Raiyan et al. [4] analyzed marine accidents in Bangladesh by applying Event Tree Analysis. Hossain et al. [5] applied Fault Tree Analysis to develop a fault tree by analyzing various accident factors like design error, structural failure, and navigational error etc. In a study by Uddin and Awal [6] it was mentioned that the graphical representation of the number of maritime accidents of Bangladesh resembles a wave-shaped form. That is the number of accidents increase and decrease in a periodic fashion. Another study by Uddin et al. [7] it was revealed that 45% of the watercrafts were sunk after the occurrence of accidents.

Despite collision being the major threat of maritime safety of Bangladesh, the research works on this topic have been still very limited. Awal et al. [8] mentioned that in Bangladesh collision accidents is being increased gradually along with the increment of the number of fatalities as well. In another study by Awal et al. [9] 156 collision accidents were analyzed during the period 1981 to May 2007. The study found that collision (39%) was the second major cause of accident during that period. However, in a recent study by Uddin et al. [10] it was found that collision (60.3%) is the major cause of accidents in the inland waterways of Bangladesh during the period of 2005 to 2015. The analysis mentioned that a belief among the general people of Bangladesh is that the major cause of inland water transport accidents in Bangladesh is overloading and inclement weather. But the study argued that this belief is wrong considering the present situation where the collision is principle cause of the occurrence of inland water transport accidents in Bangladesh.

## **3.0 DATA COLLECTION AND METHODOLOGY:**

The prime objective of this study is to accumulate waterway accident information from an authentic source and maintain a technical database. Therefore, accident data were collected from Department of Shipping of Bangladesh. It was observed that the accident data do not contain sufficient information that can help to make a good quality research study. These data give priority to legal issues rather than technical issues. This a serious difficulty experienced while conducting the study. Moreover, there are some important facts that are missing (not specified or unmentioned) in the accident reports. However, attempts have been made to overcome the limitation by sorting out the technical information.

Accident data from 2005 to 2017 were collected that includes 264 accidents. Among those, a total of 154 accident events due to collision are taken into consideration for this study. Then,

statistical analysis is carried out to analyze different aspects of collision accidents that occurred in the inland waterways of Bangladesh. The accident data were analyzed using Microsoft Excel software and the results are represented in both tabular and graphical forms.

#### 4.0 ACCIDENT ANALYSIS

##### 4.1 Accident types

At first, it is important to analyze the different types of accident that occurs in the inland waterways of Bangladesh. It is also important for validating the importance of choosing this specific cause of accident i.e. collision for this analysis. Awal [9] found that collision was the second major cause of maritime accident in Bangladesh during the period 1981 to May 2007. But from figure 1 it is seen that during the period 2005 to 2017 the percentage of collision accidents is significantly very high. Nearly three-fifths (58.3%) of overall accidents is caused due to collision. So, undeniably it can be claimed that prevention of collision accidents will drastically change the vulnerable situation of maritime safety in Bangladesh.

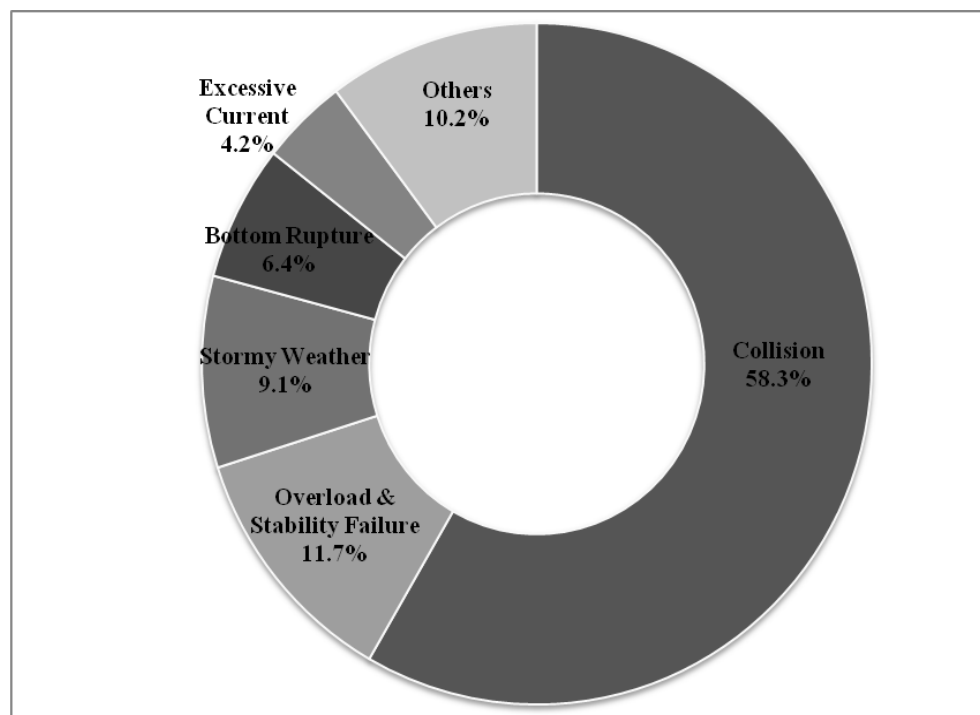


Figure 1: Percentage of accident types in inland waterways of Bangladesh

Figure 1 shows the trend of overall accidents and collision accidents from 2005 to 2017. An analysis by Uddin and Awal [6] revealed that during 2005 to 2015 the accidents follow a wave-shaped pattern. The present analysis also included 2016 and 2017 along with the mentioned years and it is seen that interestingly the pattern is still being followed. Some in-depth analysis including socio-economic factors behind the accidents is necessary to explain this vital issue.

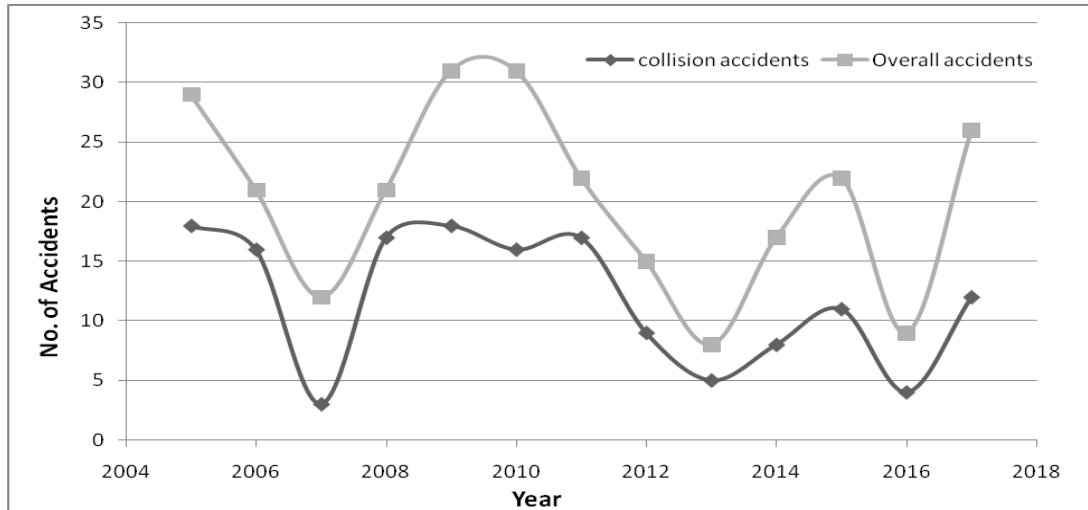


Figure 2: Yearly distribution of overall accidents and collision accidents

It is also seen from figure 2 that the accidents due to collision also follows the similar pattern of overall accidents. Except for the years 2009 and 2010, both the curves can be considered as being similar. This graphical representation reveals the dominating behavior of collision accidents in the inland water transport accidents of Bangladesh. So, it is very important to undertake scientific approaches to analyze the existing potential causes behind collision accidents.

#### 4.2 Casualty Analysis of Collision Accidents

From figure 3 it is seen that that fatality constitutes the major proportion of casualties due to collision accidents. The most interesting fact is that the graphical nature of the trend of fatality accidents is nearly a wave-shaped pattern. Further research and analysis on this fact may reveal some attention-grabbing facts on this topic. From 2005 to 2012 the injury followed a decreasing trend and is almost vanished after 2012. Similarly, after 2012 there is almost no missing and injury due to collision accidents. It is worth mentioning that the missing people after the accident are not recovered as alive. In some cases, a few of them are recovered as dead bodies. So, the number of missing people can be considered as fatalities also.

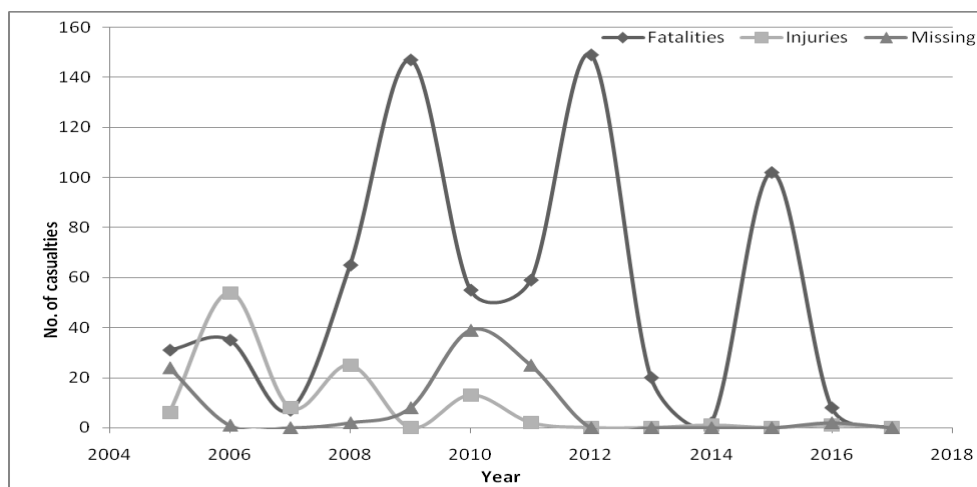


Figure 3: Yearly distribution of number of casualties due to collision accidents

### 4.3 Vessel Involvement in Accidents

It is seen from figure 4 that mainly cargo (32.5%) and passenger vessels (22%) are involved in accidents by the collision. Besides, there are other types of watercrafts like trawlers (7.9%), country boats (2.3%) and etc. that are involved in collision accidents. It can be seen that a significant percentage (32.3%) of vessels remains unspecified regarding their types. Because these are not mentioned specifically in the accident reports of the Department of Shipping. This limitation is also mentioned in another recent study by Uddin et al. [10]. This created a barrier to comprehensive analysis regarding types of vessels involved in collision accidents.

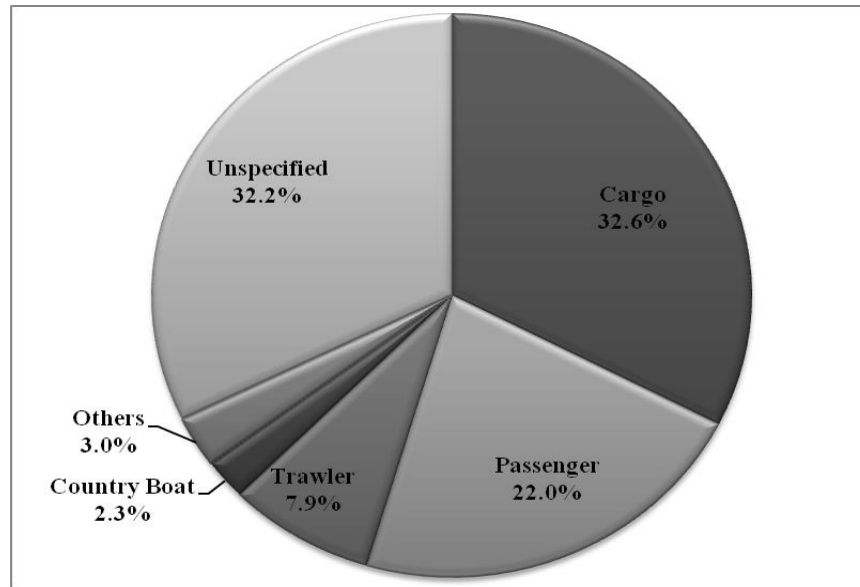


Figure 4: Percentage of vessel types involved in collision accidents

It is found from the analysis that there are some accidents (7.8%) where only a single vessel collides with any permanent obstruction like the pillar of a bridge, pontoon in river terminal etc. But, the major type of collision accidents occurs by the contact of two vessels (87%). Moreover, there are certain incidents (5.2%) where the collision accidents occur due to contact of three vessels.

### 4.4 Analysis of the Consequent Condition of Vessels

It is found that about 70.4% of the vessels remain afloat after the occurrence of the accident by collision. The rest 29.6% are entirely foundered just after the collision. This is a vital issue as it indicates that the fitness level of the vessels is not standard.

Table 1: Distribution of accidents and fatalities based on consequent condition of vessel

Accident pattern based on consequent condition of vessels	No. of accidents	Percentage (%)	No. of fatalities	Percentage (%)
Accidents involving foundered vessel	88	57.1	642	94.4
Accidents involving no vessel foundered	66	42.9	38	5.6
Total	154	100	680	100

Besides, there are almost 57.1% incidents in which a vessel has foundered just after the accident due to collision as shown in Table 1. But the most important fact to mention here is that, these incidents (57.1%) have caused fatality of approximately 94.4% people. This is an alarming fact that represents the actual scenario of safety issues in Bangladesh. The main reason for the loss of so many human lives is the complete absence of life jackets for the passengers inside the vessel. The most pathetic issue to be mentioned here is that there is still no law or regulations to enforce life jackets for passengers inside the vessel.

#### 4.5 District-wise Distribution of Accidents

Table 2 shows the distribution of accidents on the basis of the location of districts. It is seen that accidents due to collision occur at waterway zones of some specific districts. The waterway routes of Barishal, Chandpur, Chattogram, Dhaka, Munshiganj are most vulnerable for the occurrence of accidents. These five districts account for more than 60% of overall accidents. The main reason behind the fact is that these five districts are within the popular and busiest waterway route named Dhaka to Barishal. Though, the major modes of transportation in this route are watercrafts but safety is not ensured at all. So, it can be concluded that, in comparison to all other routes, Dhaka-Barishal waterway route is the most vulnerable for the occurrence of collision accidents.

Table 2: District-wise distribution of accidents

Districts	No. of Accidents	Percentage
Barishal	32	20.8
Chandpur	25	16.2
Chattogram	14	9.1
Dhaka	11	7.1
Munshiganj	11	7.1
Khulna	9	5.8
Narayanganj	7	4.5
Pirojpur	5	3.2
Noakhali	4	2.6
Jhalkathi	3	1.9
Lakshmipur	3	1.9
Patuakhali	3	1.9
Shariatpur	3	1.9
Sunamganj	3	1.9
Others	13	8.4
Unknown	8	5.2
Total	154	100

#### 4.6 Weather and Visibility Condition during Accidents

It is seen from Table 3 that during fair weather the percentage of accidents due to collision is higher than other types of weather. This is a matter of great concern, as it indicates that most of the collision accidents are occurring due to faults in vessel operation. Besides, when the visibility condition is considered, it is seen that during poor visibility condition the proportion of accidents is higher. In addition to that, during good visibility condition, the percentage of occurrence of accidents is also remarkable. When the cross-table is simultaneously analyzed for weather condition and visibility condition, it is seen that most of the accidents occur during fair weather and good

visibility condition (84.38%). Besides, the occurrence of accidents during fair weather and poor visibility condition (70%) is also noteworthy.

Table 3: Weather-visibility condition cross-tabulation

Weather Condition	Visibility Condition						Total	
	Good		Poor		Unknown		<i>n</i>	( <i>%</i> )
	<i>n</i>	( <i>%</i> )	<i>n</i>	( <i>%</i> )	<i>n</i>	( <i>%</i> )		
Fair	54	84.38	49	70	13	65	116	75.33
Foggy	8	12.5	21	30	6	30	35	22.72
Stormy	1	1.56	0	0	0	0	1	0.65
Unknown	1	1.56	0	0	1	5	2	1.3
Total	64	100	70	100	20	100	154	100

## 5.0 CONCLUDING REMARKS

### 5.1 Research Findings:

The Research findings of this study can be summarized as follows:

- At present, the major cause of inland water transport accident in Bangladesh is the collision (58.3%) by the vessels.
- Accidents due to collision mainly occur during fair weather and good visibility conditions. This indicates that the operational and human errors are responsible for the occurrence of collision-related accidents.
- The most vulnerable route for the occurrence of accidents due to collision is the Dhaka to Barishal route.
- Most of the collision occurs by the contact of two vessels (87%).
- In approximately 57.1% incidents a vessel has foundered just after the occurrence of collision. These incidents have caused the fatality of approximately 94.4% overall people died in collision-related accidents.
- Cargo and passenger vessels are mainly involved in the occurrence of accidents caused by the collision.
- The trend of overall maritime accidents and collision accidents mostly resembles to similar shape.

### 5.2 Recommendations:

On the basis of the above study some recommendations to mitigate collision accidents and thereby improving overall safety situation of inland water transport can be outlined as follows:

- At present, there is no rule for keeping modern navigational equipment and communication system like Radar, GPS, echo sounder etc. inside the vessel. New regulations should be made to install these types of equipment inside the vessel on a mandatory basis.
- There is still no rule for keeping life jacket inside the vessel for passengers. This should be made mandatory by issuing new law so that many human lives can be saved.
- The crews, drivers, masters and inland marine engineers and other personnel involved in the operation of vessels should be trained up with proper and regular training programs. Safety drills should be performed regularly onboard to increase the skill and expertise of them.

- During poor visibility conditions like foggy weather and night, special care should be taken to avoid the collision.
- There is a shortage of the adequate amount of navigational aids on the waterway routes. These should be installed properly and sufficiently to avoid accidents due to collision.
- The maritime accident investigation and documentation process are very poor in Bangladesh. It should be improved by incorporating more parameters and information regarding the accident.
- Institutional research should be promoted for in-depth analysis of collision accidents to identify some effective and practical solutions.

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