

## Trend Analysis of Ship Accidents in Indonesia

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*Abstract* - There are so many accident in sea transportation in Indonesia. Accidents occurring in rivers, lakes, and crossing that reached Marine Court in 2005-2010 is due to human error factor (88%), and only a few accidents in the waters caused by natural factors. Given the reasons mentioned above should all accidents can be minimized if prevention efforts from all parties so as not to stumble on the same stone. Water transport accidents occur mainly due to overcrowding and navigation system, which is characterized by a large number of passengers and goods compared to the draft Commission. For passengers who do not have the expertise and skills in emergency situations, it is important to note that users of the waterway into the category of vulnerable population groups (vulnerable). Efforts to ensure the safety of passengers and crew must be a serious problem, especially in this trivial security equipment, such as buoys. Current conditions, many ships that do not have safety equipment that should buoy passengers and crew when the vessel hit the accidents. Most of the accidents occur due to the low awareness of the aspects of security and safety of the crew. The figures differ from the manifest of passengers and number of passengers on the ground become commonplace. There are four main issues in maritime transport, it is said, not the individual agencies or Government willing to hold responsibility for the security and safety, pricing policy, the quality of human resources, as well as the implementation and compliance with the rules are not clear.

*Keywords* – ship accident, trend analysis

### I. INTRODUCTION

Transportation is the lifeblood of society and the economy in Indonesia. Transportation development activities in Indonesia are out of various dimensions (marine transport and others) increases. This is an impacts of economic activity and socio-cultural activities and community. In addition, the process of regulatory reform in the field of national transportation deregulation has also triggered an increase in transport activity. Understand fully that human consciousness towards the preservation of the environment are increasingly high, so that sea transportation accidents which can cause damage to the environment (pollution) become a significant consideration.

In order to further integration of transport infrastructure and facilities that meet the

requirements of security and safety of transport, it is necessary to make a standardization or regulation system and procedures, as well as human resource professionals to realize the service organization of the transport and works order intact as well as to power. Then it is necessary to a system of good governance, where Governments have function as transportation services include coaching against aspects of setting up, monitoring and controlling.

### II. METHODOLOGY

The ship as a means of sea transport, and where many people crave his life. Each time the safety of human life at sea is threatened, both the sailors and the people on board. From the facts and the data obtained that the sea had swallowed accident victims and property which is not small, so that accidents can happen anywhere, anytime and happen to anyone. For that, the crew and passengers need to know about ways to escape if there is an accident on board, first aid and fire safety responsibilities. So the need for training of the crew, especially in the areas of safety for the crew members are experts in rescue techniques, as required by the Convention of the IMO (International Maritime Organization) and the State Governments concerned. Many of the accidents victim at sea are caused by a lack of basic security knowledge and protection of the environment, according to the IMO, its numerous deaths which occurred in the sea caused by the human factor.

Trend analysis of ship accidents in Indonesia gathering data sea transportation accidents that has been published formally by Minister of Communication regarding to the rules and national law, international standards and provisions (unclos, solas, marpol, stcw etc) and also jurisprudence of shipping court.

Processing and data analysis exercised in the study of the trend analysis of ship accident divided in 3 aspect: 1) characteristic of the sea accidents; 2) causes of the sea accidents; 3) trend analysis of sea accidents.

### III. RESULTS

#### A. *Characteristic of the Sea Accidents*

Characteristics of accidents in general are: a. an accident as a rare occurrence b. as an event that accidents do not know when to expect c. accidents as those events Multiple Factors. We could see in Table 1 that characteristic of sea transportation accident.

Table 1. Characteristic Sea Transportation Accident

|      | Accident Typical  | Object   |
|------|---|--|
| WHAT | Accident Type and Safety Indicator:<br>Accident type: sink, collision, grounded, fired  | Ship, Tug Boat, Tanker, Barge  |
| WHY  | Cause of Accident:<br>- Human factor: <ul style="list-style-type: none"> <li>• Carelessness in the conduct of the vessel;</li> <li>• Inability of the crew in mastering a variety of problems that may arise in the operation of ships'</li> <li>• Consciously loading ships in excess</li> </ul> - Technical factor: <ul style="list-style-type: none"> <li>○ Less of carefully in ship design</li> <li>○ Neglect of care resulting in damage to the ship or ship parts which caused the ship had an accident or the burning ship</li> </ul> - Natural Factor:<br>Bad weather factors; the storm, the waves height which is affected by the storm, the current season, resulting in the fog that limited visibility. | Captain, Crew, Port Inspection Officer, Passenger<br><br>Ship Owner, Marine Inspector, Dockyard, Supplier<br><br>Cruise Lines, Ports, BMKG Information |
| WHO  | The Crash and crash victim:<br>a. Ships involved accidents<br>b. Gender (male, female)<br>c. Age  | Captain, Crew, Passenger   |

|       |   |                             |
|-------|---|-----------------------------|
| WHERE | Accident location   | Cruise Lines, Ports, Harbor |
| WHEN  | Accident Time:<br>a. Hours of accident<br>b. Date of accident   | Ship, Captain, Passenger    |
| HOW   | Chronological Events:<br>a. Ship movements<br>b. Ship condition | Ship                        |

### B. Causes of the Ship Accident

From year to year ship accident on Indonesia never decreases. In fact, the cause of the sea accident like repeating the mistakes of the past, that is never far from the accident to bad weather, overloaded, or ships that do not meet the eligibility standards. At least, there are two important reasons of the sea accident in Indonesia. The first, condition of the fleet, the ships transport in general are made without the use of certain standards in safety. In addition, many ships in Indonesia purchased from other countries former fleets.. Treatment of these ships also substandard, aged of the former ship used in Indonesia are usually very old. So that, these ships unseaworthy. Even, maybe in his home country, not actually being used as one of the modes of transport. The second reason is the operational fleet, both aspects of the ship or of the charge. This problem occurs because a lack of standards supervision. Ship which eventually lead to safety problems or dangerous charge excess baggage is not reported. The reason of bad weather and natural conditions, is not the main reason. The Meteorology, Climatology and Geophysics Department (BMKG) always announce the following weather conditions forecast. This is where the role importance of the port to Syahbandar/ harbor Master expressly choose, which permitted sailing ships and boats had to wait for the weather subsided, while that may be withheld by Syahbandar is specialized ships such as the High Speed Craft (HSC).

There are many causes of common sea accidents : a. Bad Weather; b. Fires including malicious payload; c. Ship stability including shifted the cargo; d. No reserve buoyancy due to excessive charge of cargo; e. Grounding (stranding) f. Collision g. Imperfect Design and The structure; h. Human Negligence i. Blow Out (Offshore Oil Platform).

The cause of the ship accident happened to:

1. Operator:
  - a. Ship safety:
    - Many ships created traditionally/ has no certificates
    - Many shipbuilding does not follow the drawing direction of the ship's company which has already approved

- Certificate of many ships already expired
- Less function of communications equipment/navigation vessel
- b. Loading:
  - Excessive loading especially on-deck placement
  - Overboard loading passengers
  - Passenger awareness still lacking
- 2. Supervision authorities:
  - Everybody can exit/enter the ship place where ever
  - The number of supervisor is limited
  - Not all ship stopover could be supervised
  - Possible of careless inspection
- 3. User/community:
  - The lack of public awareness by the importance meaning of the ship safety
  - The salvation will often impose regardless of voyage

Principles of safety transport bring the Government attention for long time., established in 1999 Presidential Decree number 105 year of 1999 on the establishment of the Komite Nasional Keselamatan Transportasi (KNKT) or National Transportation Safety Committee (NTSC).

Government Regulation No. 1 year of 1998 concerning the examination of the ship accident split into five examination categories, namely: a. Sinking ship, b. Ship fired, c. Ship collision, d. Ship accidents which cause the soul of man and wildlife losses of property and e. Ship was run a ground or crashed out.

Examination of the ship accident consisted of a preliminary examination by Syahbandar and advanced examination by The Shipping Court (Mahkamah Pelayaran). Whereas the Legislation of the Republic of Indonesia number 17 year of 2008 about the shipping/ cruise Article 245 states that: Accidents aboard the events experienced by the vessel that may threaten the safety of the ship and/or the human spirit in the form of: a. Sinking ship, b. Ship fired, c. Ship collision, d. Ship was run aground or crashed out. Later in the Article 256 about the investigation of the ship accident stated that: (1) the Accident Investigation Board conducted by the National Transportation Safety Committee to search for facts in order to prevent the occurrence of the ship accident with the same causes. (2) investigation as referred to subsection (1) made against each ship accident. (3) Investigations conducted by the National Transportation Safety Committee referred to subsection (1) is not to determine which errors or omissions on the occurrence of the ship accident. To minimize the occurrence of sea accidents, it requires an effort to rescue the soul in order to satisfy all the rules by the standards and even more to ensure the safety at sea, requires a support in the world. There

are three organizations that govern the safety of the ship. The IMO (International Maritime Organization), ILO (International Labor Organization) and ITU (International Telecommunication Union), Indonesia is one of the three members of the organization and has ratified the convention. The International Standard includes:

1. SOLAS (Safety Of Life At Sea) 1974 and the amendment
2. Marpol 73/78 and the protocols
3. Load Line Convention 1966
4. Collreg (Collision Regulations) 1972
5. Tonnage Measurement 1966
6. STCW 1978 Amendment 1995
7. ILO No. 147 Year of 1976 about the Minimum Working Standards for Crew Commerce.
8. ILO Convention No. 185 year of 2008 about SID (Seafarers Identification Document) which has been ratified by The Legislation of the Republic of Indonesia law No. 1 year of 2009.

The samples of ship accident can be seen on Fig 1 & Fig. 2.



Fig. 1. Ship founder and rolled



Figure 2. Overloaded Boat

### C. Trend Analysis of the Ship Accidents

The ship sank:

1. The root problem of the sunken ship accidents mainly because the ship had filling the water, the ship can take in to leak water through the gastric or by skin due to the ship at any given moment to inclined and making the ship broke. The ship's hull skin can split caused by the condition of the vessels are old or may be caused by the construction of the hull which is thin and not worth it to withstand pressure when the ship moves forward in sea.
2. Document Nautical: Leaks aboard when linked to the territorial waters of Western Indonesia and should be presumed that the waters of the region's many data coral-stone or other disorders such as skeleton buildings offshore or framework/not informed and wreck described and published in document Nautical as well as in the mark exactly with the SBNP (Sarana Bantu Navigasi Pelayaran) or Shipping Navigation Aids.
3. Seafaring Powers Skills: good sailors (Seamanship) in navigation due to the ability of the captain and sailors in terms of keeping and controlling the ship to get know the various threats that could sink the amphibious insertions, are very necessary. Sciences related to the ship movement, ship building, ship stability and handling charge should be known. Ship maneuvers, related to the ways of maneuvering in waves, though-the motion in bad weather (tropical storm) is the science which applies at the time of executing the task.
4. Ship building in this regard is the knowledge relating to the Buoyancy- Meta centre (BM = I/V), the permeability of the vessels and ships at sea performance (Torsion and force). Stability include knowledge about the stability of the negative and the flood (floodable). The handling of cargo (cargo handling) is devoted to the propagator knowledge to the boundary load (load line) and the condition of the ship's hogging and sagging.

Vessel crash out:

1. The data is related to the deep factor on the map and the tidal. The sea depth is associated with the survey results into the sea carried out by establishments that maintain a map of the sea, in Indonesia that have sea immense with 17 thousand islands more resounding depth map, the activity of the sea is very difficult and the cost that is large enough to do, therefore sounding is done only in certain places, so that the sea

depths data for so long have been less well ahead on the beach who received land erosion high enough like beach in Northern Java, the East Coast of Sumatra, and also in South Kalimantan.

2. Officers of the ship's navigation ability factors:  
Sometimes the theories are received in seamanship education cannot fully support jobs at sea, such as for the data about the deep of the sea, real close to the land caused the vessel crash out. Because te hiping like guessing in the dark and it's very dangerous to cause the crash out.
3. A navigational instrument that worked well like radar , echo sounder and so on will be well overcome some problems crash out when sailing in the dark especially when sailing on a river or coastal which have much shallow water.

Fired ship:

1. Mentality crew ship: generally crew ship of various degrees has given training control fires / a fireman (fire fighting), and certified proficiency. The competence crew unquestioning but intrepidity and rapidity act exactly indispensable. The condition of being other than a few gen fires on ships to be uncontrolled because crew ship lose courage to act extinguishing fires. To another ship situation contrarily or confident high and intrepidity formed with a situation exists self trust crew the ship was closely relation with equipment available and unkempt well and intrepidity presented itself from crew it already possessed or may be beaten through education training long enough .
2. Tools and types of fires: fires that spread quickly and followed a great explosion is difficult to be controlled. Other situations, a fire that occurred in the generator engines and safety equipment to put out the fire was difficult because the water pumps for the engine power plant of the generator. Whereas the use of self-contained portable extinguishers for fire volume generators already become great effective. So the equipment and its type as well as the volume of fire was very concerned when the fire occurred on board the ship, therefore the fire became uncontrollable.

Collision of ship:

1. Though the narrow space motion, such as the Super tanker that limited the ability of sports motion, and have been doing for a passing in certain waters (e.g., the Strait of Malacca)

and towing ship as the ship with the same conditions, a moving slowly should deviated other vessels in any condition. The ship can only move in the cruise line is hard to do the following deviations from the bow line plots, therefore something that thwarts and when collision will not be much damaged than the ship was run aground because the out flow then necessarily be inevitably blocking ships.

2. Negligent in doing keep the sea, as do other work while being/navigate (as do; administrative tasks at night, leaving the Ferryman, watches alone, sleep at the working time), then the conditions/situations that had been approached (close quarter situation) collision is not inevitable.

Lacks understanding the application of regulations prevention at collision on the sea (Peraturan Pencegahan Tubrukan di Laut/ P2TL) 1972 by guard.

A lot of ship accidents occurred every year on Indonesian waters, described in Table 2.

Table 2. Number of ship accidents acc to Marine Court Decision

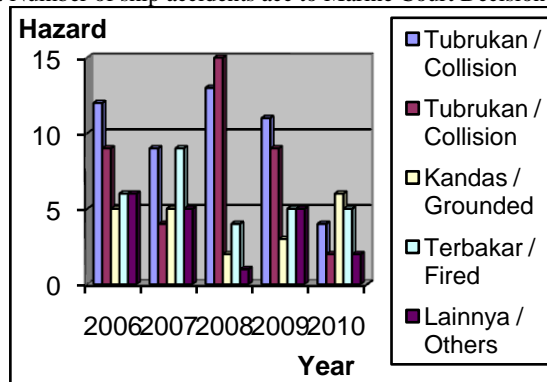
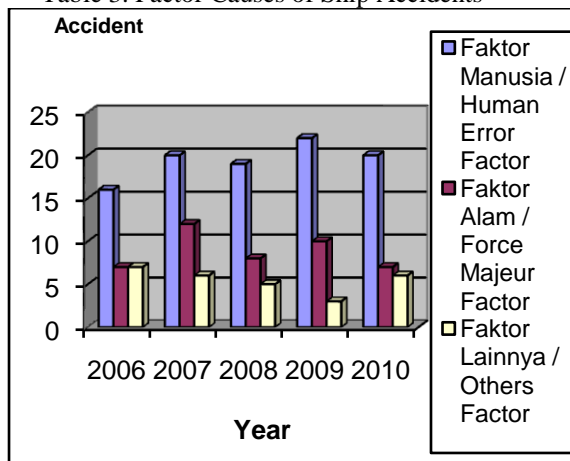


Table 3. Factor Causes of Ship Accidents



Trend analysis is a method of analysis which are intended to make an estimation or forecasting the

future. To do well then it needs forecasting all kinds of information (data) that pretty much and observed periods of relatively long enough, so that from the analysis results can be known until the number of fluctuations are occurring and what factors are affecting to those changes. In theorists, the analysis of time series of the most decisive is the quality or accuracy of information or data that is retrieved as well as the time or the period of this data is collected. The method used for time series analysis is Free Hand Method, Spring Average Method, the Moving Average Method and Least Square Method. In this case would be devoted to discuss the analysis of time series by the method of least squares is divided in two cases, i.e. cases data even and odd data cases. In General a linear equation of the line from the analysis of time series are:  $Y = a + Xb$ : Y is the variable Information you're looking for the trend and X is the variable of time (years). As for finding the value of the constant (a) and (b) the parameter is:  $a = \frac{\sum Y}{N}$  and  $b = \frac{\sum XY}{\sum X^2}$  based on the calculation, it can be seen on the graphs below, that the trend of accidents with linear outline methods for 5 years is increasing. This increase can occur if there is no scenario to suppress the occurrence of accidents.

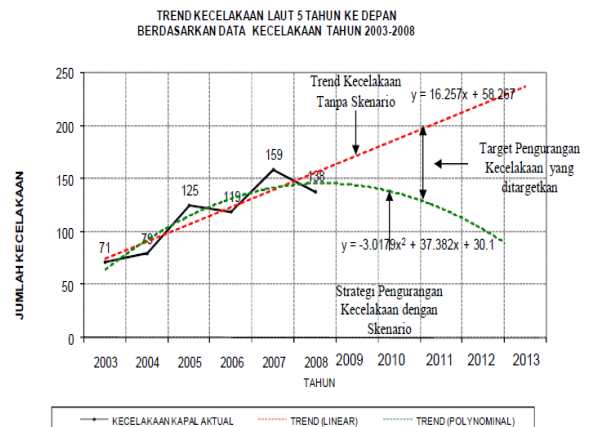


Fig. 4 Trend Analysis of Ship Accidents

#### IV. CONCLUSION

1. High sea transportation accidents in Indonesia at that time should be the concern of all parties, not only the ship owner but also Governments, relevant agencies and communities to be more active in providing information. From the observations, the main causes of marine accidents due to excess cargo from the set, whether the carriage of goods and people. Service users often do not even forced himself to climb aboard the cruise ship was full, despite the determination of origin may post on the Board.
2. Many accidents happened on the boat size < 500GT (Non-Convention) vessel, which was

not governed by the agreement, both certification and security equipment. It should be reorganized the standard system includes the requirements of the ship was seaworthy, the procedures you must perform in predicting the risk of accidents at sea, as found on vessels more than 500 GT (SOLAS, MARPOL and STCW).

3. Indonesian waters are dominated by motor boats, motor yachts, sailing folk and traditional fishermen (fleet ants), so that vulnerability to the risk of accidents during this time many overwrite and often occur in bad weather seasons such as NE Monsoon and SW Monsoon (January and July ), ocean currents and tides, the lack of shipping navigational aids (lighthouses, lighthouses buoys, traffic separation schemes, AIS, etc).

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