

The Impact of Implementation New Regulation on Maritime Industry: A Review of Implementation BWTS

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Abstract. IMO as an international institution has issued various regulations about the safety and environment. Based on regulations regarding BWT (Ballast Water Management) issued by IMO on international conventions to control ballast water was held in 2004. Indonesian Presidential Regulation number 132 of 2015 states that it has participated in ratifying the Convention. The impact of implementing regulations passed on the existence of several maritime industry sectors must be assessed and considered. The installation of instruments on ships causes incur greater costs to be spent by shipowners which have an impact on the survival of the industry. This study analyzes the impact of applying this regulation by conducted a literature study to examine the maritime industry that will be affected and potential costs that will be required after implementation of this regulation. The result of this study has found analyze of impact implementation of new regulation should be determined. The method to determine this impact can be done using simulation such as a developed dynamic system.

1. Introduction

The International Maritime Organization (IMO)[1] is the only international regulatory body for safety and control pollution caused by activity in the maritime industry through the prevention of marine accidents or sea pollution. The growth of the shipping industry in the late 1960s IMO introduced a series of measures to prevent pollution and minimize their consequences. The most important measure was the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 relating thereto (MARPOL 73/78). The topics discussed in the MARPOL include the impact of ballast water in several countries. Ballast water is very important to keep the safe operation of the ship. Ballast water is used to control trim, draft, stability, and tension on ship hull caused by adverse ocean conditions or as a result of changes in cargo weight[2]. However, on other side ballast water can make major threats for the environment, public health, and economy. This problem is due to the spread of Invasive Alien Species (IAS) or Harmful Aquatic organisms and Pathogens (HAOP)[3].

In an effort to prevent pollution and environmental damage to potential damage from the implementation of ballast water management, IMO has provided guidelines for preventing the spread of new species of organisms or sediments in water from ballast water carried by ships by controlling and processing ballast water to minimize the transfer of organisms and dangerous water pathogens. To optimize efforts to prevent the spread of organisms in waters by ballast water, IMO entered into a binding agreement by entering into a convention in 2004 to overcome this problem. This agreement was named the International Convention for the Control and Management of Water Ballasts and Ship Sediments (Water Ballast Management Convention or BWM Convention), by applying two management standards[4]:



1. In the D-1 ballast water exchange Standard regulation agreement. This regulation is carried out by rinsing the water ballast three times in the sea more than 200 miles from the coastline with a depth of more than 200 m. This method is very effective because organisms from coastal waters cannot survive in the ocean or organisms from the ocean cannot survive in coastal waters.
2. Standard D-2 about ballast water treatment standards for ballast water performance which set water quality standards. This standard regulation requires treatment for water ballasts that are found to contain more than 10 microorganisms per cubic meter measuring more than or equal to 50 microns. With this water treatment, it is expected that there will be no more microorganisms that escape to the new environment so that environmental damage can be prevented.

Since September 2017 the Ballast Water Management Convention Standard has been adopted with the understanding that the D-1 standard will continue to become the D-2 standard in September 2024 covering new and old vessels. The implementation of the convention standard for ship owners to comply with the convention standard indicates there will be an increase in operating costs and capital. The cost of implementing this BWTS system or instrument is used for installation, maintenance, and operation. Indonesia has ratified convention about Ballast Water Management in 2015 through Presidential Regulation No. 132 of 2015[5]. The ballast water regulation aims to minimize the risk of new species entering this other water area having several standards. By ratifying this convention, Indonesia becomes the determining country or King Maker which will make the convention in full force entry into force from months after Indonesia submits the Accession Charter.

The implementation of international conventions for ballast and sediment control and management of ships in 2004 for Indonesian-flagged vessels is regulated through Circular of the Director of Shipping and Maritime Affairs Number UM.003/8/6/ DK-17 dated April 25, 2017, which states that the ships with flag state of Indonesian who voyage to another country must comply with D-2 regulatory standards[6]. Other problems with the D-2 standard issued by IMO, the shipowner's organizations raised other concerns related to equipment standards in accordance with the convention and also the approval process that must be carried out by the shipowner. This concern is due to the lack of references and the lack of equipment recommended by IMO. Responding to shipowner concerns about how to choose, install equipment and gather information about various equipment related to D-2 standards. Until now, studies on the selection of tools and methods that can be used to comply with D2 standards and improve performance, assess efficiency, and provide options by ranking various technologies available in the market can give shipowners the choice to install equipment according to their needs. The shipowner hopes to be able to run his business with a stable regulatory atmosphere[7]. This is very reasonable so that business activities carried out have certainty and do not experience turbulence due to the implementation of regulations.

The studies are needed to analyze the impact of implementing regulations so that this research is conducted with a literature study to determine the financial impact of the implementation of maritime regulations according to the perspective of the shipowner. The discussion on this research also will be presented with efforts that will be taken based on previous research. The expected outcome of this literature study is to determine the effect and relationship between the implementation of maritime regulation on the maritime industry and finally what methods have been carried out by previous research to analyze the effect of implementing maritime regulation.

2. Literature Review

The studies of the maritime industry have been widely studied by researchers. The topics of the problem being studied also variation from economic management and factors which influence the existence of the maritime industry. The shipping industry consists of many stakeholders ranging from small firms to large organizations. Some stakeholders have been identified as the most significant such as insurers, classification societies, cargo owners, shipowners, and ship yards[8]. The occurrence of the titanic ship accident, IMO concern to improve the shipping of the world through the implementation of regulations on safety and environmental pollution. Implementation of this regulation causes additional costs from install equipment to comply with regulations by the shipowner.

Several previous studies stated that the maritime industry is the industry that has the most regulations compared to other industries even though it aims to improve safety standards at sea. However, regulatory changes have resulted in additional costs for shipowners or operators. These costs are included in the implementation costs to meet regulatory requirements. As a result, shipowners typically face the risk of a conflict of interest between consumers and their market share. The shipping industry needs more capital such as capital budget because of aging fleets and increasingly high ship safety requirements.

The research has done by Abrahamson (1982) [9] explores the comparison of the nature and scope of social and economic regulations in the shipping industry. This research using an analytical method to analyze economic impact focusing on levels of cost and service. To measure the effectiveness of the major international conventions in the area of safety, pollution, search and rescue, and work-related measures. The results show a complex picture where the average time between adoption and entry into force was calculated to be 3.1 years [10].

The introduced new regulation may cause conflicts of interest among various parties that are affected. The problem is shipping service users are demanding regulations that will improve safety, environmental, and security standards. But on the other hand, the industry is concerned about the potential costs caused by new regulations. [11]. Total costs caused by the new regulations were estimated based on known fuel consumption and the costs imposed on each vessel type and size [12]. Some research to determine the shortage of application of the international regulations adopted by IMO related to maritime safety, and the shortage of legal measures to support safety at sea and protection or reduce marine pollution. This research improves special measures for procedures of marine accident investigation, with case study are highlighted, and the importance of identifying the liability [13][14].

The costs incurred by an implementation need to be reduced by determining the efficiency values of the types of instruments installed and the benefits of the newly introduced maritime regulations. Good performance management is needed to elaborate on the value of its efficiency when evaluating ship owner organizations related to implementing regulations. [15].

The total annual loss caused by NIS to agriculture, human health, and the environment in Southeast Asia is estimated, Losses and costs to the agricultural sector are estimated too. Reviews some of these commissioned studies to analyze the effects of the implementation and the possibility of modal shift. Some research concerns to simulation study of route choice for comparatively high-value cargo and developed business models for the production, installation, and maintenance/operation of BWTS in some countries [16][17][18]. In the analysis, the focus was on BWTS manufacturers (suppliers of equipment and instrumentation), maritime service companies (shipyards and consultants), and shipping companies.

The implementation of new regulations requires plans so that the benefits and impacts can be optimized and run according to the rules through the process of design and embodiment of a BWT system retrofit on a relatively complex (concerning the ballast system) ship. Recommendations for the installation of a ballast water treatment system needed plans, assessment through the design, and are key markers to which assurance can be measured [19].

The maritime industry involves many stakeholders including the flag state, shipowner, ship operator, coastal state, cargo owner, cargo owner, shipyard, crew ship, and insurance. The method of measuring the impact of risks to changes in maritime regulation on tanker owners operating internationally so that the impact of changes in maritime regulations affecting the maritime industry is simulated and an analysis of its impact on CAPEX, OPEX and Freight of tankers by using a quantitative method approach and simulated using dynamic system [20][21].

Research conducted by Setyohadi (2018) [21] shows that system dynamics are capable of providing very accurate risk assessment (financial consequences) results from changes in maritime regulations. However, the effect of this regulatory change is not too significant due to a large number of variables other costs indirectly and not recorded as compliance costs.

Based on studies conducted by researchers that focus on topics relevant to studies conducted in the last few years, various efforts and ways to control the financial impact of implementing regulations in the maritime sector are shown in Table 1 below.

Table 1. Researches of implementation regulation on ship industries at a few years

Author/years	Title	Method	Result
Gerhard (2019)	Installation and use of ballast water treatment systems: Implications for compliance and enforcement	Analysis of Descriptive	Based on this analysis, shipowner appears to primarily rely on two treatment technologies in Australia and the United States to meet compliance.
Setyohadi (2018)	Dynamic response of risk management model to mitigate impact of maritime regulatory changes: Oil tanker owners perspective	Dynamic System	The result shows that changes in regulations can have a catastrophic impact on the sustainability of the oil tanker business
Tjahjono, (2018)	The implementation of ballast water management in Port of Tanjung Emas Semarang: Strategy and model	Analysis Descriptive using SWOT	BWT facility has also been provided by the port administrator, Pelindo III company, for bulk carrier and tanker vessels to discharge their ballast water.
Abuelenin (2017)	The impact of shortage implementation of the international regulations on maritime safety	Analysis Descriptive	Determines the shortage of application of the international regulations to maritime safety, and the shortage of legal measures to support safety at sea and protection or reduce marine pollution.
Pitana (2017)	The Usage of Crumb Rubber Filtration and UV Radiation for Ballast Water Treatment	Experiment	Build a ship's ballast water treatment prototype that used to inactivate microbial water in ballast water that can be standardized by IMO Ballast Water Management Convention.
Fearnley (2017)	Lessons Learned in Ballast Water Treatment Equipment Retrofit and Commissioning	Analysis	Process of design and embodiment of a BWT system retrofit on a relatively complex (concerning the ballast system) ship.
Rivas (2015)	Innovation in product and services in the shipping retrofit industry: A case study of ballast water treatment systems	Model multi-level	Simulated the port-based systems (PPS) model as the highest potential for eco-efficient value creation and a possible can be designed for this kind of technology and stimulate port-based ballast water treatment systems rather than onboard ballast management systems.
Karahalios (2015)	A study of the implementation of maritime safety regulations by a ship operator	System of Hierarchical Scorecards (SHS) Using Fuzzy set modelling	Proposes Measure an extendable and applicable to implementation costs and benefits of a newly introduced or existing maritime regulation by ship operators
Zhang (2015)	Maritime Labour Convention, 2006 and the Chinese seafarers: How far is China to ratification?	Analysis Descriptive	Simulated impact in terms of policy, regulation or legislation as well as in the attitude and behavior of the key stakeholders in China which not yet ratified the Convention has the largest number of seafarers.
Karahalios (2015)	A risk appraisal system regarding the implementation of maritime regulations by a ship operator	System of Hierarchical Scorecards (SHS)	Demonstrate its applicability on evaluating a ship operator's organization concerning his regulatory implementation

Holmgren (2014)	Modelling modal choice effects of regulation on low-sulphur marine fuels in Northern Europe	Macro-level and agent-based models to analysis	performance impact of the new fuel requirements by simulating shipments using TAPAS simulation
Bacher (2013)	Evaluating the costs arising from new maritime environmental regulations	Analysis Descriptive	Total costs caused by the new regulations and allocated to sea traffic to Finland
Le Floch (2011)	The influence of fiscal regulations on investment in marine fisheries: A French case study	Analysis Descriptive	The study about the fiscal policy on observed investment strategies.
Karahalios (2011)	A proposed System of Hierarchical Scorecards to assess the implementation of maritime regulations	System of Hierarchical (SHS) (Combine AHP and fuzzy set)	Carry out a cost and benefit analysis generated from the implementation of a newly introduced regulation
Knapp (2009)	Does ratification matter and do major conventions improve safety and decrease pollution in shipping?	Economy model use ordinary least squares (OLS)	Measure the effect of the major international conventions in the area of safety, pollution, search and rescue, and work-related measures.

3. Discussion and Conclusion

3.1. Discussion

The maritime industry is complex and many stakeholders are interrelated with one another. Stakeholders in the maritime industry include:

1. Flag state

The flag state has responsibilities for its ships registered with the flag of his country. Therefore, every ship registered in a country must comply with the applicable regulations in that country.

2. Coastal State

Coastal State is also known as Port State players who have the authority to ship foreign ships wishing to enter the port.

3. Classification Society

The classification body acts as the body that ensures ships are following regulatory requirements and standards.

4. Shipowners

The shipowner has the responsibility to comply with all regulations issued by IMO so that the shipowner becomes the first participant to exposed the impact of regulatory changes because almost all costs imposed on ships are borne by the shipowner.

5. Insurance

Insurance is a party that provides financial protection to the shipowner.

6. Shipyard

The shipyard is the company building the ships. One of the shipyard duties and responsibilities is to ensure that shipbuilding meets regulatory standards.

7. Cargo owner

Cargo owner does not have authority over-regulation, but the cargo owner has an important role to play ensuring the implementation of safety standards on ships

8. Crew members

The crew is the party most exposed to the risk in the event of an accident or other unexpected things during the operation of the ship

Following the stakeholders directly affected by the implementation of the new regulation are ship operators and shipowners. But in the shipping business operations, there are several models based on their operation. For example, shipowner carries out its shipping activities or rent their ships. This

difference will be seen if the type of charters selected in the charter contract greatly affects the shipowner.

This shipping industry is very helpful for a country's economy and can facilitate transportation of the supply and demand of world commodities such as staples, industrial materials, finished products, passengers, and vehicles to livestock. The growth of the world economy is greatly influenced by the shipping industry. So that economic growth will be proportional to the growth rate of the number of ships, ship size and more efficient ship design. This growth rate is caused by several factors including technological advancements and compliance with ships to regulations so that more advanced ships result in faster and more efficient shipping times.

Shipowners must improve the management model of shipping costs considering shipowners must increase shipping costs due to compliance with regulations. But on the other hand, they must reduce shipping costs to be able to compete with other ship companies. Management of the total financial impact of the changes in regulations on OPEX, CAPEX, and ship freight. The impact of changes in maritime regulation can be classified according to the impact area. Impact area is the type of influence/impact resulting from changes in maritime regulations. Impact areas due to changes in maritime regulations consist of:

- 1) Ship Instrument
- 2) Ship Operation
- 3) Ship Cargo
- 4) Crew
- 5) Environment
- 6) Security

The direct impact on the ship owner's perspective involves compliance costs according to regulations involving installation, maintenance, and operation costs. The costs incurred will affect the shipping costs that must be offered to charters or cargo owners. Shipping companies will be less competitive if they offer high shipping or freight costs.

This regulation regarding the implementation of ballast water has confused shipowners. In addition to having to set a business strategy for competitiveness, shipowners must also consider implementation techniques that include equipment installation, additional operational costs, and maintenance. To choose equipment installation, to date the shipowner must determine the type of equipment to be used following the specifications of the ship. In choosing this instrument, several considerations will be considered factors such as the size of the ship including the volume of the ballast water tank and the engine room as the place to install the equipment. The availability of tools is also a consideration because it will affect the amount of costs that will be incurred. Besides, the equipment specifications also need to be adjusted to the ship so that the costs incurred due to this installation do not cause operational and maintenance costs to increase.

The selection of important equipment is done to be one of the strategies to keep the company competitive. The competitiveness of a shipping company is influenced by several factors including ship technology, ship specifications, business network, and company profile. Analysis of the relationship between implementations that require the addition of tools that will affect the amount of shipping costs can be seen in Figure 1 below.

The model to the simulation that can be developed to simulate this problem is to develop a dynamic system method with a causal loop diagram approach. The advantages of the dynamic system method with the causal loop diagram approach include being able to see an overall problem, both in terms of scope and time, so that it can help develop models to mitigate the impact of implementation over a longer time. Through the description of the causal relationship in the causal loop diagram, our model becomes more explicit so that it can be the basis of how we make decisions and actions will be better. Also, the Causal Loop Diagram allows our model to be simulated with various conditions so that it can be compared with other models of problems encountered so that it can provide better decision making choices.

Some parameters that are used as variables in the causal loop include operational costs which are incurred after the installation of new instruments, the availability of vessels, and the demand for ship charters. Freight costs are expected by charters at low prices but the installation of this instrument will

increase investment and operational costs which will affect freight costs. In the causal loop, there will be oppositeness relations marked with O and sameness marked S.

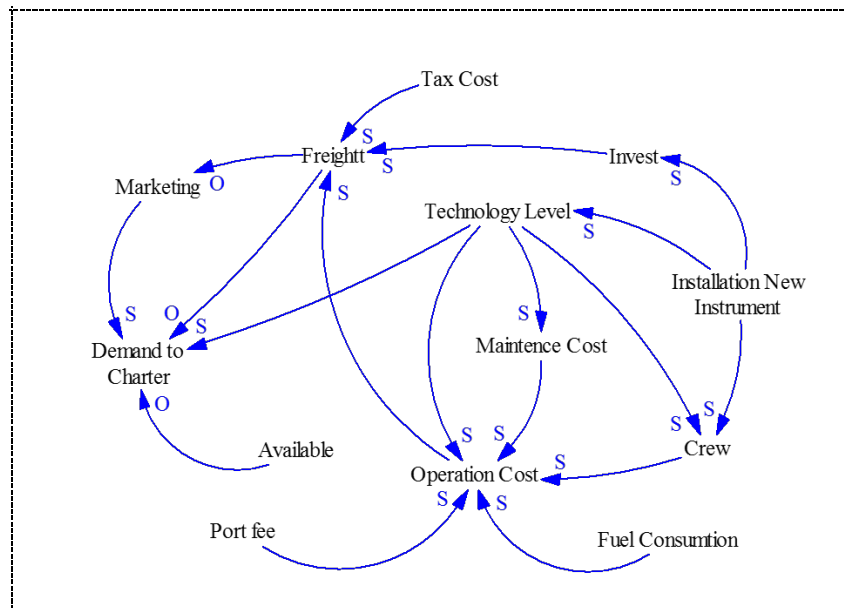


Figure 1. Causal diagram

The causal relationship above shows the relationship between various parameters resulting from the implementation of ballast water treatment to the parameters of investment costs. These investment costs will cause an increase in other costs such as operational costs, crew. The increase in costs will be included in the freight by the shipowner as a fulfillment of the costs incurred. On the other hand, the demand for charter is greatly influenced by freight, marketing, or company profile and also the availability of ships. The marketing of this shipping company also determines the competitiveness of a shipping company because at this level of marketing the type of charters to be implemented will be determined so that those who will bear operational costs will be determined based on the type of charters.

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The future of the research about implementation new regulation is needed regarding the impact of aspects arising from implementation by conducting studies using methods that can explain the relationship between parameters so that it is more relevant to the actual situation such as in the Indonesia area. Continue the research with the object of regulatory change research other than those in this study and integrate all regulations and all types of ships to give a full picture of the overall impact of the implementation of new regulations.

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