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# The Impact of The Marine Ecosystem Sustainability on Marine Transportation in Malaysia

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*ABSTRACT*

Malaysia's success depends on the marine sector. Malaysia counts on the seas for transportation, communication, and security, but its maritime sector has yet to reach its full potential. The maritime industry growth will enhance water transport. Thus, as ships move and navigate actively, marine life is affected. This literature review is based on comprehensive search and data analysis from studies published form 2018 until 2022. Methodology is used with quantitative analysis about impact of marine ecosystem on marine transportation. This study's findings provide the impact factor and solution of the marine ecosystem on marine transportations. While they have the importance of the marine ecosystem on marine transportation in Malaysia. In conclusion, protecting biodiversity, reducing climate change, sustaining ecosystem services, and guaranteeing the industry's continued existence are all impacted by marine ecosystem sustainability. By implementing sustainable practices, we can save marine species, reduce pollution, and create a future that is both sustainable for the marine ecology and the transportation industry.



## 1. Introduction.

### *1.1. Background and Content.*

One of the important economic areas that will move Malaysia toward prosperity is the marine industry. Malaysia is heavily dependent on the seas for many of its economic and resource-exploitation processes as well as its transportation, communication, and security requirements, but it has not yet fully used the potential of its marine industry. As the use of this marine industry increases every year, it will also increase the movement of water transport. Therefore, when the activities of movement and navigation of said ships are carried out actively, this will also cause effects on marine life in particular.

More than 70% of the earth's surface is covered by marine environments. The marine environment provides a variety of habitats for flora and fauna in marine aquatic systems, from the coast to the deep seabed. Millions of species call this aquatic environment home. Therefore, the marine environment is a great mix of biotic and abiotic components that work together to ensure existence. Marine ecosystems are characterised by different biotic (living) and abiotic (non-living) components. Plants, animals and bacteria are examples of biotic variables; Key abiotic factors include the amount of sunlight in the environment, the volume of dissolved oxygen and minerals in the water, distance to land, depth, and temperature. Marine ecosystems play an important role in the preservation of the environment. For example, water plants help reduce carbon levels in the atmosphere in the same way that land plants do. Aquatic plants take carbon dioxide from the atmosphere and release oxygen back into it. Furthermore, the plants and animals in this maritime ecosystem are intimately connected. Where life, such as fish and other living creatures, are interdependent with flora, such as trees, seaweed, coral reefs, from which fauna seek food to eat, defend themselves from enemies, breeding grounds, and habitats.

Over 3 billion people, or 39% of the world's population, contribute to the funding of marine and coastal biodiversity

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(UN, 2021). As a result, if there are numerous activities and uses that may be done by exploiting the resource, the usage of marine resources is high. Activities that can be completed include fishing, tourism and recreation, shipping commodities by sea, and using water transportation to reach a place. When such actions are active in a certain region and location, it indicates that there is a probability that there may be impacts as a result of such activities one day. As a result, in order to safeguard and preserve the environment, particularly marine life, various efforts and actions to protect them are required. To safeguard marine life, one option is to practice marine conservation. Among the marine conservation goals is SDG 14: Conserve and sustainably utilise the oceans, seas, and marine resources for sustainable development.

Marine transportation provides for 80-90% of worldwide trade, transporting about 10 billion tonnes of containers, solid and liquid bulk goods yearly across the world's oceans (Walker et al., 2019). People and products have travelled by sea across continents and across seas throughout history. Although marine transportation can convey practically any item effectively and efficiently, the advent of air travel is a great accomplishment for perishable and high-value goods. The industrial revolution boosted ship transportation even more by leveraging on the possibilities of internal combustion engine-power, and the following adoption of containerization significantly revolutionised marine transportation once again in the name of efficiency. Next, marine transportation supports global trade, transporting about 10 billion tonnes of containers, solid and liquid bulk goods yearly across the world's oceans. Historically, shipping businesses and ports were subject to little environmental regulation; however, unintentional oil spills in the 1960s caused significant coastal pollution and seabird mortality, prompting the International Convention for the Prevention of Pollution from Ships to be established (MARPOL). MARPOL is the primary international treaty for preventing maritime pollution caused by ships, whether intentional or unintentional. Furthermore, the International Maritime Organization (IMO) employs a variety of tools to safeguard the maritime environment from shipping activity. Nonetheless, marine transportation has a negative impact on the marine environment, including air pollution, greenhouse gas emissions, ballast water releases containing aquatic invasive species, historical use of antifoulants, oil and chemical spills, dry bulk cargo releases, garbage, underwater noise pollution; ship strikes on marine megafauna, risk of ship grounding or sinking, and widespread sediment contamination of ports during transhipment or ship operations. This chapter covers the environmental effects of maritime transportation and analyses the existing mitigation, legal, and environmental performance methods available to enhance global issue management by Tony et al. in 2019.

Malaysia is a country that has land and sea. Because the ocean region has the greatest surface area in comparison to the land area, Malaysia is known as a maritime nation. Malaysia's marine border position is extremely crucial in industry, particularly trade.Furthermore, because this area of Malaysian seas is strategically important, it provides for a wide range of operations and activities that may be carried out in Malaysian waters. For example, trade, tourism, industry, and fishing. These things can benefit the country's economy and well-being. Malaysian waterways are thus the busiest and most active route for marine activity. According to historical trends, it is known as the Malay land and is the focal point of traders from all over the world due to its strategic location and is a route that facilitates or shortens the trader's voyage.

Industrial maritime transport is another contributor to marine ecosystems. This is because they are the main users of sea water throughout their activities such as navigation, shipping and so on. Therefore, various things involving pollution will happen if they are not responsible for inappropriate actions.

### *1.2. Problem Statement.*

The problem found in my research is that sea transport is the main cause of marine pollution. among the problems affecting the sea fishing equipment. Fishing equipment such as trawlers, fishing nets and so on. This is because it will cause small fish to be caught once, so the immune system and the life cycle of marine life there will be stunted. Moreover, it will involve the destruction of the coral reefs if the trawl is left under the bottom for so long. This will cause the habitat of marine life to be affected according Walker (2019).

That is according to Walker (2019) they say about end-of-life disposal by releasing the harmful chemicals, lubricants, or oils used in shipbuilding, shipbreaking has a detrimental influence on the environment. Old ships are sunk to build artificial reefs, which increase protection against coastal erosion and fish habitat, but careful planning is required since badly built structures can harm natural reefs.

Next, spills from ships at the sea are also the sources of the water pollution that leads to destruction to marine life ecosystems. The oil spill was caused while refuelling at sea, a leak in the oil tank, and irresponsible people releasing the waste oil into the sea. When this oil spill occurs, this will cause the water surface to be covered by oil and will cause the fish not to receive oxygen properly. This will cause the fish to die for not receiving sufficient oxygen content according to Walker (2019).

Further remnants from the ships are also a source of the impact on marine life. According to Walker (2019) he and a friend say the waste from the ships in question is sewage waste from the ships, solid waste that should not be discharged into the sea such as plastic. This will cause disturbing the ecosystem of marine life, this will also cause the fish to die due to ingestion of waste that should not have happened. Fish, turtles which are often said by the press media where there is this living thing that dies due to ingestion of plastic where it assumes the plastic is their food. Therefore, continuous research in the field nowadays is essential to make it a matter of attention from the players in the marine transport industry.

### *1.3. Research Objective.*

The specific objectives of this research are:

1. To study the importance of marine ecosystem sustainability on marine transportation in Malaysia.

2. To determine the impact factors of marine ecosystem sustainability on marine transportation in Malaysia.
3. To purpose the solution factors of marine ecosystem sustainability on marine transportation.

### *1.4. Research Questions.*

The research questions include the following:

1. What is the importance of marine ecosystem sustainability on marine transportation in Malaysia?
2. What are the impact factors of marine ecosystem sustainability on marine transportation in Malaysia?
3. How are the solution factors of marine ecosystem sustainability on marine transportation?

### *1.5. Relevance and Importance of the Research.*

With the existence of a vast marine ecosystem that needs to be cared for and preserved. In addition, the things that cause environmental pollution are those that occur from marine transport, which needs to be dammed so that pollution does not occur. Therefore, this research study helps to improve and create new policies, legal frameworks, and effective strategic plans to care for, preserve, and conserve the national environment. The findings of this study will directly benefit Malaysians on the importance of taking care of the environment, especially in matters related to the marine ecosystem. The study also helps in collecting data and responses from seafarers and surrounding people related to pollution caused by marine transport to safeguard the rights and sustainability of marine ecosystems.

### *1.6. Conclusion.*

In this chapter, the authors provide an increased overview of the research. A study's goals and questions should be designed to produce the most relevant and useful findings for that goal. This chapter also explains about marine ecosystem, marine transportation, Malaysia has maritime countries. Lastly about the development of problem statements and then relevance and importance of this research.

## 2. Literature Review.

This literature review on the impact of Marine ecosystem sustainability on marine transportation in Malaysian waters was conducted based on a comprehensive search and data analysis from studies published in the last 5 years on information related to the impact of marine ecosystems caused by marine transport. To carry out this research, a systematic strategy for reviewing the literature was created. The literature was then analyzed using content analysis methods to obtain relevant data for the research.

### *2.1. Key Concepts, Theories and Studies.*

#### *2.1.1. Marine Ecosystem.*

The marine ecosystem is the largest body of water covering 71% of the earth's surface compared to the land surface. However, the global ocean system is divided into five main oceans and several oceans based on historical, cultural, geographical, scientific and size differences, namely the Atlantic, Pacific, Indian, Arctic and Antarctic Ocean basins are the most famous living marine systems according to the author G.G.N. Thushari in 2020. In other words, the marine ecosystem is an aquatic habitat with a high level of dissolved salt. These include open ocean, deep sea, and coastal marine habitats, each with its own set of physical and biological characteristics according to the National Geographic Society (2022). However, according to Huiping (2019) they related by marine resources include substances, energy, and marine space that exist in the marine environment and may be mined and utilized by humans. These resources include marine biological resources, seawater resources, seabed mineral resources, marine renewable energy, and marine space resources. Malaysia's coastlines and oceans are rich in marine biodiversity, ecosystems, habitats, and other natural resources. Together, they provide the population's economic and social requirements, act as coastal protection systems, and produce cash through tourism. The government has made the sustainable development of our coastlines, oceans, and related resources a top priority. Through policy research, timely and suitable inputs into policy-making and ocean coastal zone management, and marine-related educational activities, the Centre for Coastal and Marine Environment (CMER) hopes to contribute to ecologically sustainable ocean management according to the Maritime Institute of Malaysia in 2020.

#### *2.1.2. Marine Transportation.*

Daily basis, marine transportation transports billions of dollars in products, accounting for more than 90% (by weight) of worldwide trade. Cargo-carrying commercial shipping for example merchant marine and non-cargo commercial shipping are both types of marine transportation; it is ferries, cruise ships, this statement from Walker (2019). According to Riley in 2019 the marine transportation accounts for 80-90% of worldwide trade, transporting about 10 billion tonnes of containers, solid and liquid bulk goods across the world's oceans each year. Although marine transportation can successfully and efficiently convey practically any item, the advent of air travel proved advantageous for perishable and high-value goods. Maritime transport, an important mode of transport in international trade, is moving towards digitalization and digital transformation at different speeds in the different domains. So, shipping as part of the logistics chain, is a volatile business that is in a chaotic state owing to energy price volatility, technical immaturity, and future regulatory hikes this statement from Edvard in 2021.

#### *2.1.3. Sustainability of Marine.*

The International Maritime Organization (IMO) has considerable power, both directly and indirectly, because the IMO Convention defines its main objective as the conservation and

"sustainable" use of seas and their resources according to Lee in 2019. Following that, the International Maritime Organization (IMO) established the International Convention for the Prevention of Pollution from Ships (MARPOL) to prevent tanker accidents and minimize their consequences, including pollution prevention of routine operations such as cargo tank cleaning and disposal of oily engine room wastes. MARPOL also addresses chemical pollution, packaged goods pollution, sewage pollution, waste pollution, and air pollution (IMO, 2015a). The United Nations Convention on the Law of the Sea (UNCLOS), approved in 1994, is another example of international regulation to limit the environmental implications of marine transportation (Gulas, Downton, D'Souza, Hayden, & Walker, 2017; UNCLOS, 1982). Next, according to Hiroshige in 2019 an underside strategy should be used to build sustainable systems of marine ecology and civilization. Sustainable systems should improve communication and cooperation with many stakeholders, as well as efficiently manage marine ecology risks. Sustainable development and ecological protection have to be taken as the primary premise in the exploitation and utilization of marine resources, so as to ensure the sustainable development of mankind that statement from Huiping (2019). As a result of the conference, nations around the world presented their plans to develop marine spatial planning, sustainably manage marine ecosystems, conserve at least 10% of the world's marine habitats, end overfishing, provide access for small-scale fishers, reduce marine pollution and ocean acidification, and achieve other ambitious goals, the majority of which are expected to be met by 2020 with statement from Pinheiro (2019).

### *2.2. Key Debates and Controversies.*

#### *2.2.1. The importance of marine ecosystem sustainability on marine transportation.*

It is important to tackle the predicted increase with a view toward both economic and environmental sustainability. Key elements of environmental sustainability are the efforts made by the International Maritime Organization (IMO) and its different instruments to address issues including oil pollution, solid waste disposal at sea, maritime safety, and invasive species, as stated by David Jean-Marie. According to Zhong, 2019 they say that in order to safeguard the environment and develop marine resources, many experts have conducted extensive study. This is because uncontrolled development has resulted in a number of catastrophic events that cannot be understated. The conservation of the marine ecosystem should be emphasised with the promotion of the ocean's sustainable development since doing so will also benefit humans. Lastly, according to Laffoley et.al. They may bring social advantages for the appreciation and involvement with the environment, they can improve marine ecology by conserving and restoring biological diversity, and they can provide significant economic benefits by encouraging sustainable fisheries, tourism, and recreational use of our oceans. Fundamentally, they can support the operation of the ocean's ecosystem, which serves as the world's principal regulating system, and develop resistance to the effects of climate change.

#### *2.2.2. The impact factors of marine ecosystem sustainability on marine transportation.*

The International Maritime Organization (IMO) employs a variety of tools to safeguard the maritime environment from the effects of shipping. Although the IMO is responsible for global shipping safety and security, it has also acknowledged that maritime transportation and port operations have unexpected environmental consequences from Walker (2019). According to Ukpong in 2019 they say the causes of these environmental and social problems, referred to as 'disturbances' in this report, range from oil pollution, acid rain, floods, deforestation, and erosion to sea level rise and tidal activities. Some of the unsettling features are natural, while others are the result of the oil company's exploitation of technology. Next according to the statement from Choong in 2021 the maritime environment is polluted by massive plastic trash and garbage, as well as microplastics, which are created from primary and secondary sources, endangering the aquatic ecosystem's well-being and preservation. To be the significant environmental effect of maritime transportation and record mitigating techniques, legislative mechanisms, or environmental performance indicator systems that are available to solve this worldwide issue. The environmental implications of sea transportation have been covered in greater length in previous chapters, but an overview is provided here. Air pollution, ballast water release containing aquatic invasive species (AIS), cargo waste release, oil spills from ships, waste management and marine-based sources of plastic debris, underwater noise, ship strikes on marine megafauna, grounding or ship sinking, and widespread sediment pollution in ports and harbours during ship transfer or shipwreck activities are all environmental impacts this statement for Tony R. Walker,etc. in 2019.

#### *2.2.3. The solution factors of marine ecosystem sustainability on marine transportation.*

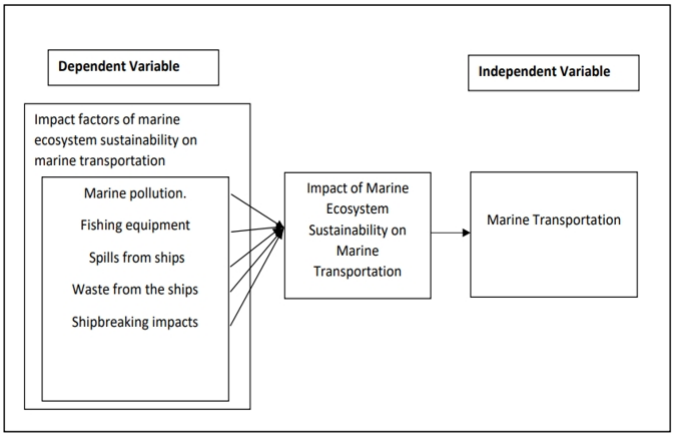
One of the most important management methods in use across the world to mitigate the environmental impacts of maritime transportation is legal regulation of the shipping sector. Port operations and maritime transit providers are connected with environmental protection laws. Beginning with MARPOL four decades ago, the International Maritime Organization (IMO) has enforced international regulations on the shipping sector. The Convention on Marine Pollution Control (MARPOL) 73/78 is still the key legal instrument for preventing pollution from ships. The only countries affected are those that have signed MARPOL. There have been additional recent legislative instruments established to curb shipping's contribution to maritime pollution. This statement from Walker (2019), another critical management strategy, is increasing public understanding of maritime environmental regulations, clean technologies, best environmental management practices, and modern shipping problems on a global scale. The shipping industry as a whole need to be better educated on the importance of anticipating potential problems and taking preventative measures to safeguard the marine environment. In light of this importance, in 2010 the IMO updated the STCW code from 1978 to include new requirements for marine environmental awareness training. Ac-

cording to the new STCW code, maritime workers on some vessels will need additional education and/or certification.

### 2.3. The Thematic Framework of Study.

The most appropriate theories from the collected literature review on the previous chapter were analysed in order to answer all the research questions in chapter 1. For this study impact factors of marine ecosystem sustainability with marine pollution, fishing equipment, spills from ships, waste from the ship, shipbreaking impact is the dependent variable while independent variable is the model of the relationship between the impact factors of marine ecosystem with to marine transportation.

Figure 1: Framework for impact factors of marine ecosystem sustainability on marine transportation.




Source: Authors.

### 2.4. Conclusion.

In conclusion, this chapter described the keyword, theory and studies of literature review. The key debates and controversies from previous research, and it is matched for use in this study. There are independent and dependent variables for the next step to provide the theoretical framework.

## 3. Methodology.

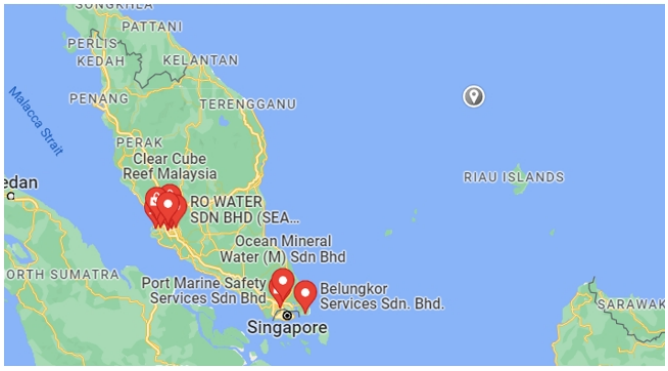
### 3.1. Introduction.

In this chapter they will describe the methods undertaken during the field observation work through the study based on the impact of marine ecosystem sustainability on marine transportation in Malaysia.

### 3.2. Study area.

Malaysia water in the south china sea is my choice of research for this case. Especially about the Terengganu water area. This area is the strategic place because they have any economic activity to develop the state of the water area. For example, oil and gas, supply base, tourism, fishing marine and all activities of marine transportation at Terengganu.

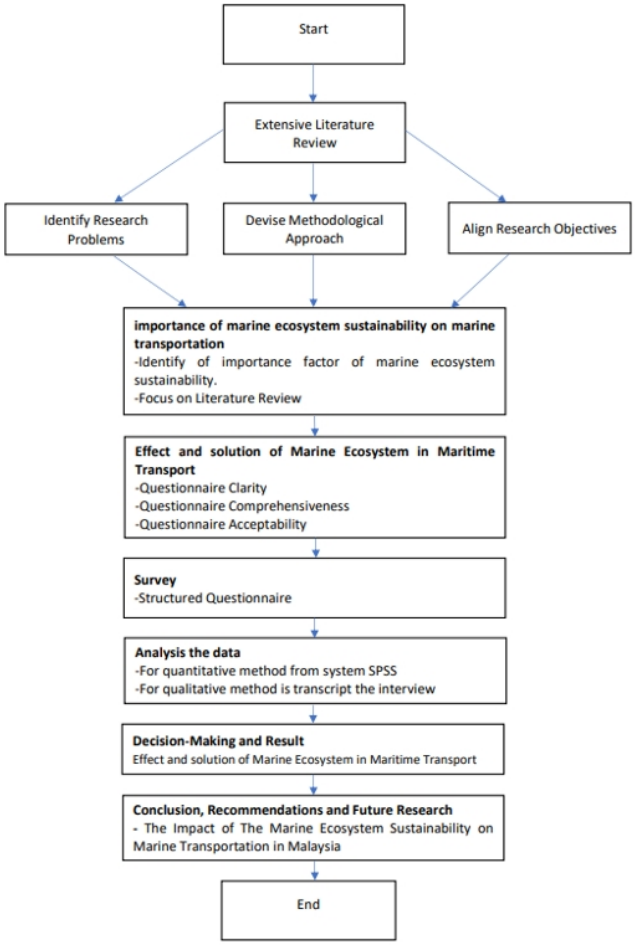
Figure 2: Maps of Malaysia Waters.




Source: Authors.

### 3.3. Research design and framework.

Figure 3: Research Framework.




Source: Author.

Research frameworks start from the title, introduction and then they move to literature review. They come up with a research problem that they identify, devise a methodological approach, and align research objectives before they move to the next step. Next step about the data collection, identify the im-

portance factor of marine ecosystem sustainability for the objective first then they must focus on literature review. For the effect and solution of marine ecosystem on marine transport they use data to get a questionnaire then they move to survey to get a respondent. For analysis data for quantitative they use SPSS system after use questionnaire the data come up from Microsoft excel while the qualitative method transcript the interview. Next step is decision making and the resulting effect and solution of the marine ecosystem on maritime transport. Lastly about conclusion, recommendation and future research about the impact of the marine ecosystem on marine transportation.

### *3.4. Type of Data.*

Qualitative research is conducted to collect and examine information that cannot be reduced to numbers in order to get a deeper understanding of concepts, viewpoints, or experiences (such as text, video, or audio). It may be used for both gaining a broad comprehension of a topic and for generating novel ideas for further investigation. Qualitative methods are widely used in the humanities and social sciences, particularly in disciplines like anthropology, sociology, education, health sciences, history, etc. So on this method identify the importance factor of marine ecosystem sustainability for the first objective then they must focus on literature review.

In quantitative studies, numbers are gathered and analysed to draw conclusions. It may be used for the purposes of averaging out data, spotting trends, investigating correlations, and extrapolating findings to workgroups. Quantitative methods will be used regarding impact factors and solutions of marine ecosystem sustainability on marine transportation. In this study, stratified sampling will be used. In order to achieve more exact results, stratified sampling divides the population into many, non-overlapping groups (strata). This sampling technique is typically employed when one or more population sections have a low incidence when compared to the other sections.

### *3.5. Data collection.*

#### *3.5.1. Quantitative.*

In addition, a questionnaire will be sent out to the relevant participants in this research in order to gather information on the impacts of the marine ecosystem on maritime transportation. The study's objectives (three of those) will be listed on the survey questionnaire that will be made available to participants. Predictions may be produced from the collected, reviewed, and assessed data with the help of data inference.

For the purpose of showing how to manage a questionnaire, we will first establish the goals and objectives of the study, then release a set of questions, select reliable respondents, collect all responses and data through appropriate analysis, and finally construct convincing findings to back up the research. One hundred respondents at the Transportation Company were surveyed online using Google Forms.

In addition, the data will be analysed using Microsoft Excel and the Statistical Package for the Social Sciences (SPSS), saving time since Google forms may be distributed online through email, WhatsApp, and similar platforms, and even when respondents are not in the office. In addition to these benefits, doing a survey online makes it possible to reach a wider audience, extend the response window beyond normal business hours, and expand the geographical scope of the research. However, it seems that only a small percentage of people really fill out survey questionnaires.

## 4. Data Analysis and Discussion.

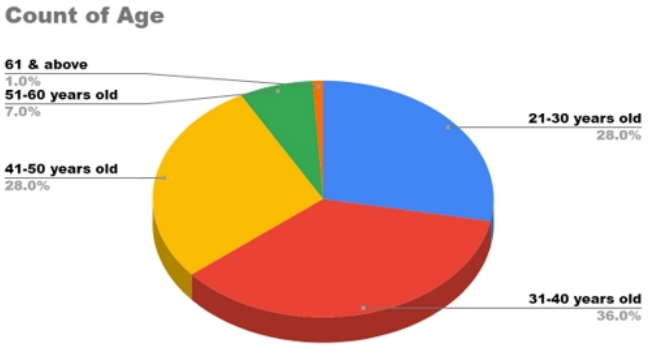
### *4.1. Demographics Respondent.*

Figure 4: Demographics respondent of gender.


Source: Authors.

This Figure 4 shows the percentage of gender information at Malaysia experts on marine transportation. The observation totally from the worker at Malaysia expert on that marine transportation. Based on the result, 52.0% were answered by a population of male which is 52 respondents, it is the highest count of gender on the survey and 48.0% were answered by a population of female which is 48 respondents.

Figure 5: Demographics respondent of age.

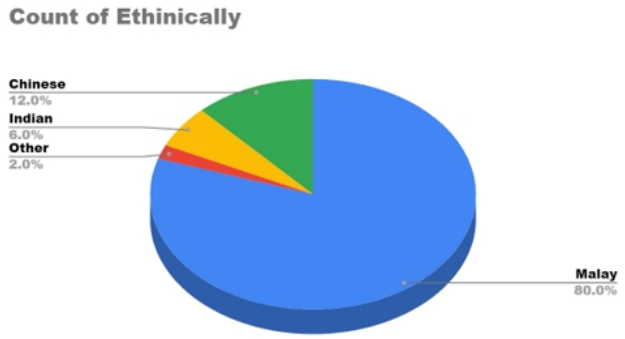



Source: Authors.

Figure 5 as the result of a survey above shows people aged 31 to 40 are the highest percentage with 36.0% consisting of 36 respondents in this survey. Other than that, the same percentage of age was found 21 to 30 and 41-50 years old which is 28.0% which is 28 respondents. Otherwise, the percentage of 51 to 60 is the third highest with 7.0% consisting of 7 respondents and

the last age is 61 and above which is 1.0% that is 1 respondent of the survey.

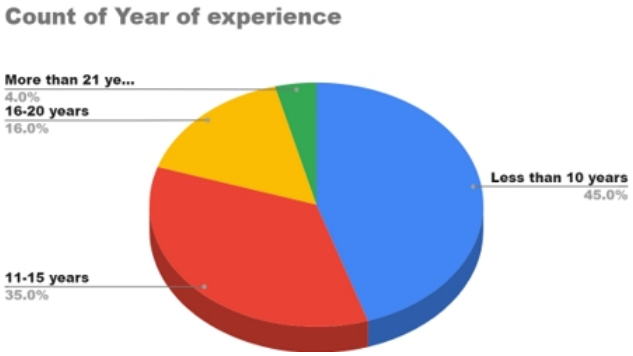
Figure 6: Demographics respondent of ethinically.




Source: Authors.

Furthermore, the Figure 6 shows the ethnically of response which has four categories Malay, Chinese, Indian and Others. Through this observation, the highest of respondents ethnically is Malay with 80.0% answered the survey which is 80 respondents. Next, Chinese is a second higher score 12.0% which is 12 respondents. Moreover, Indian was found to be about 6.0% which is 6 respondent and the low score that is other selected it is about Bumiputera Sabah 2.0% which is 2 respondents.

Figure 7: Demographics respondent of year of experience.

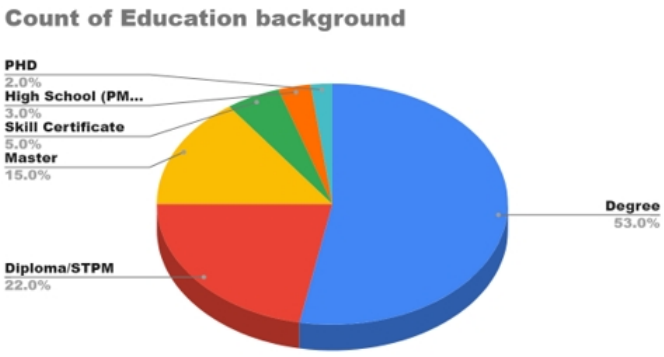



Source: Authors.

This Figure 7 shows the result of years of experience of respondents and there were several inputs on this part which is less than 10 years to more than 20 years. The highest score on that survey answer is less than 10 years with 45 respondents and 45.0% percentage on that survey. Next, 11 to 15 years with a percentage which is 35.0% was scored by 35 respondents. Moreover, 16 to 20 years were found of 16 respondents with 16.0 percent and the lowest on that part is more than 21 years' experience which is 4.0% percent response in that survey.

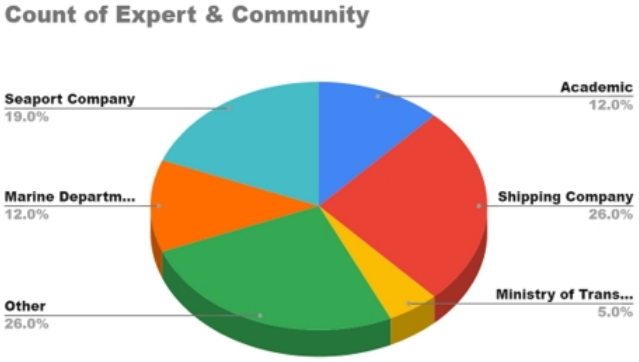
The Figure 8 shows the result of education background respondent and there were several inputs on this part which is Degree is the highest score is 53.0% was found 53 respondents. Next, the Diploma/STPM, which is 22.0% then 48 respondents. Moreover, the Master about the education background they found 15.0% which is 15 responses of respondents. Next, 5.0% is about the Skill Certificate with 5 respondents on that education background. Besides, the High School (PMR/SPM) is 3.0% with 3 respondents about this survey. Lastly about the education background is PHD they with 2.0% on they have 2 respondents only.

Figure 8: Demographics respondent of education background.




Source: Authors.

Figure 9: Demographics respondent of expert and community.



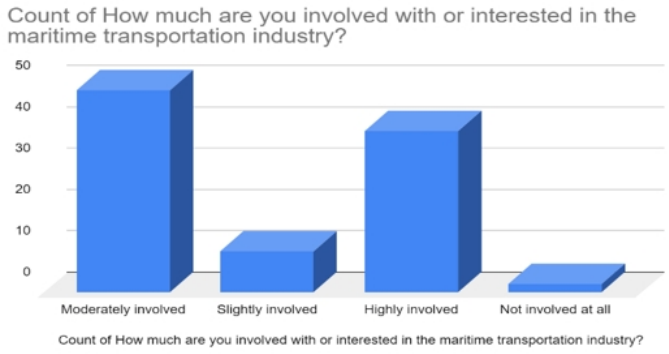

Source: Authors.

Figure 9 as the result of a survey about the expert and community with the position or the workers of the survey. They have academic backgrounds, ministry of transportation, marine department, seaport company, shipping company and others. The highest result on that survey is about 26.0%. They have the same result as the shipping company and the other backgrounds with 26 respondents. Moreover, the seaport company expert has 19.0% responses with 19 respondents on that survey. Next, the same result of that survey is 12.0% with the marine department and academics found 12 responses on that survey. Besides the ministry of transportation, it is the lowest result on that expert and community background they have 5 respondents while the percentage of 5.0% on that survey.

*4.2. First Objectives.*

**First Objectives: To study the importance of marine ecosystem sustainability on marine transportation in Malaysia.**

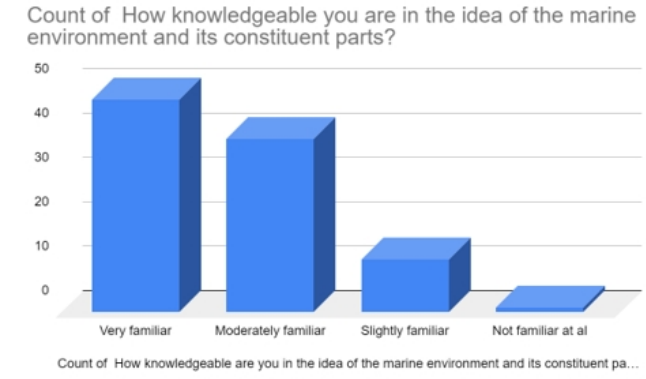
Figure 10: Graft of question number one.




Source: Authors.

On that result Figure 10 this is a question of objective one, it is about how much are you involved with or interested in the maritime transportation industry. The highest percentage on that question is the first answer about the moderately involved with 49 responses on that respondent. The second on that answer is the highly involved 39.0 percent of respondents. Next, the answer about the slightly involved there has 10 percent on that survey area of the answer. Lastly about the respondent's choice it is about the not involved at all they were the lowest of the respondents with 2% of the respondents.

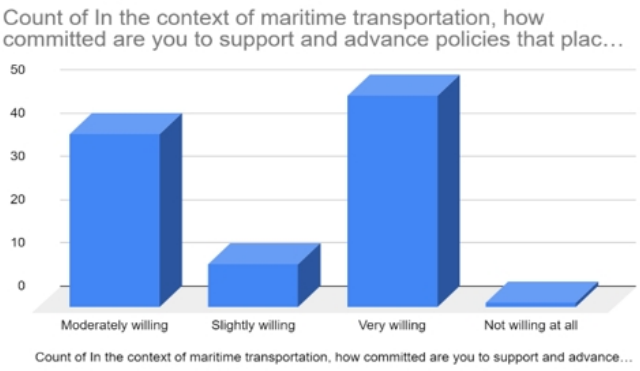
Figure 11: Graft of question number two.




Source: Authors.

The result of Figure 11 is about how knowledgeable you are in the idea of the marine environment and its constituent parts. So, the highest result on that respondent choice of this answer is very familiar with 48.0 percent of the respondents. About the lowest of the chosen on that respondent it is not familiar at all with 1 respondent only on that survey. The second highest of this question is about the answer moderately familiar and knowledgeable in the idea of the marine environment and its constituent parts with 39 respondents on that survey. The last result on that question is from answers slightly familiar with 12.0 percent on that respondent.

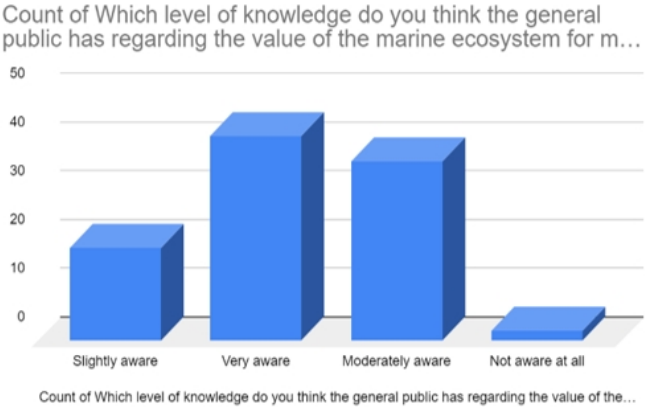
Figure 12: Graft of question number three.




Source: Authors.

Next, figure graft at Figure 12 it is about question numbers three on the first objective. The question is: In the context of maritime transportation, how committed are you to support and advance policies that place a high priority on the preservation and conservation of the marine ecosystem. So, the highest of the survey respondents is the answers of the very willing with 49 percent of the respondents. for the lowest result on that survey is the answer of not willing at all the response with 1 respondent only. The second highest percentage on that survey is moderately willing of the responses on that answer of the respondent. The last part of the percentage on that question is about the answer of slightly willing with 10 respondents.

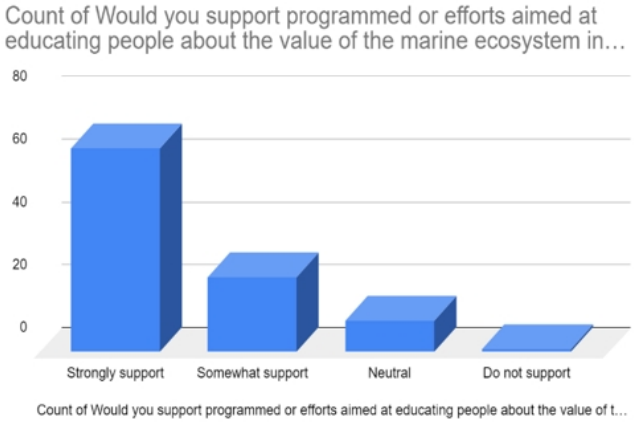
Figure 13: Graft of question number four.




Source: Authors.

On that result of Figure 13 this is question four of objective one, which level of knowledge do you think the general public has regarding the value of the marine ecosystem for maritime transportation. The highest percentage on that question is the first answer about the very aware with 42 responses on that respondent. The second on that answer is the moderately aware 38.0 percent of respondents. Next, the answer about the slightly aware there is 19 percent on that survey area of the answer. Lastly about the respondent's choice it is about the not aware at all they were the lowest of the respondents with 2% of the respondents.

Figure 14: Graft of question number five.




Source: Authors.

Furthermore, figure graft above 14 is about the last question on the first objective. The question is: Would you support programs or efforts aimed at educating people about the value of the marine ecosystem in relation to maritime transportation. So, the highest of the survey respondents is the answers that strongly support 65 percent of the respondents. for the lowest result on that survey is the answer of do not support the response with 1 respondent only. The second highest percentage on that survey is moderately willing of the responses on that answer of the respondent. The last part of the percentage on that question is about the slightly willing with 10 respondents.

**Frequency.**

Table 1: Frequency of the objective one.

| Question / Total Respondents | Interested in the maritime transportation | | Knowledgeable of the marine environment | | Committed to support advance policies | | The general public regarding the value of marine ecosystem | | Support programmed or educating people | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % | N | % |
| Answer 1 | 49 | 49.0 | 48 | 48.0 | 49 | 49.0 | 42 | 42.0 | 48 | 48.0 |
| Answer 2 | 39 | 39.0 | 39 | 39.0 | 40 | 40.0 | 37 | 37.0 | 39 | 39.0 |
| | | | | | | | | | | |
| Answer 3 | 10 | 10.0 | 12 | 12.0 | 10 | 10.0 | 19 | 19.0 | 12 | 12.0 |
| Answer 4 | 2 | 2.0 | 1 | 1.0 | 1 | 1.0 | 2 | 2.0 | 1 | 1.0 |

Source: Authors.

On that figure of the Table 1 there is the frequency of the objective one, to study the importance of marine ecosystem sustainability on marine transportation in Malaysia. The result of the highest frequency is 49.0%. It is about question number one the most interested in maritime transportation and the answer number one is moderately involved that the highest chosen of the respondents. The lowest on that chosen of the respondents is about questions knowledgeable of the marine environment, committed to support advance policies, support programmed or educating people, they have 1.0% respondent on those answers responses.

**Mean, Mod, Median, Standard Deviation, Variance.**

Next, about the explanation on that mean, mod, median and standard deviation and variance. The highest about the mean is question number four is the general public regarding the value of the marine ecosystem. They have 1.81 for the result of mean.

Table 2: Mean, mod, median, standard deviation, variance of the objective one.

| Question / Total Respondent | Interested in the maritime transportation | Knowledgeable of the marine environment | Committed to support advance policies | The general public regarding the value of marine ecosystem | Support programmed or educating people |
|---|---|---|---|---|---|
| Mean | 1.75 | 1.66 | 1.63 | 1.81 | 1.47 |
| Median | 2.00 | 2.00 | 2.00 | 2.00 | 1.00 |
| Mod | 2 | 1 | 1 | 1 | 1 |
| Std. Deviation | .716 | .728 | .706 | .813 | .717 |
| Variance | .513 | .530 | .498 | .661 | .514 |

Source: Authors.

The lowest mean about this objective is question number five: it is about the support programmed or educating people with 1.47 only. Furthermore, they have the median of the objective one for the lowest of the median is question number five. It is about support programmed or educating people with only 1.00 for this part. Overall, on that median on that the objective one is the same with 2.00 about the part. Next, for the mod the highest of this part of the question is question number one it is about interest in maritime transport they have 2 while the overall on that question is the same it has got only 1 of the mods on that part. The lowest of the standard deviation, question number three is committed to support advance policies with 0.706. About the highest on that part is question number four, the general public regarding the value of marine ecosystem with 0.813. Last but not least about the variance, the highest on that situation is the count of question number four is the general public regarding the value of marine ecosystem with 0.661. The lowest of the variance is the committed to support advance policies with 0.498.

### *4.3. Second Objectives.*

**Objectives: To determine the impact factors of marine ecosystem sustainability on marine transportation in Malaysia.**

**Frequency.**

Table 3: Frequency of the objective two.

| Question Total Respondents | Oils spills | | Ships drop their anchors to the seabed | | Ballast water | | Noise in water from marine transport | | Plastic waste | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % | N | % |
| Strongly Disagree | 3 | 3.0 | 3 | 3.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 |
| Disagree | 5 | 5.0 | 8 | 8.0 | 6 | 6.0 | 8 | 8.0 | 3 | 3.0 |
| Neutral | 24 | 24.0 | 21 | 21.0 | 24 | 24.0 | 24 | 24.0 | 14 | 14.0 |
| Agree | 36 | 36.0 | 36 | 36.0 | 26 | 26.0 | 32 | 32.0 | 29 | 29.0 |
| Strongly Agree | 32 | 32.0 | 32 | 32.0 | 43 | 43.0 | 35 | 35.0 | 53 | 53.0 |

Source: Authors.

On that 4.3 about this table, they refer to the frequency about the second objective it is to determine the impact factors of marine ecosystem sustainability on marine transportation in Malaysia. On that table, they have five questions. For the first question the keyword of impact factor is oil spill. Next, they have ships drop their anchors to the seabed; it is the keyword for question number two. The keyword of question number three is they have the ballast water to prevent the impact factor. The next part is the noise in water from marine transport that is the keyword on that question. The last key question is the plastic waste about the impact factor of the marine ecosystem.

The result of the highest frequency is 53.0%. It is about question number four about the plastic waste, the answer is strongly agree that the highest chosen of the respondents. The lowest on that chosen of the respondents is about questions of ships dropping their anchors to the seabed, ballast water, noise in water from marine transport and the plastic waste. they have 1.0% respondents that strongly disagree.

**Mean, Mod, Median, Standard Deviation, Variance.**

Table 4: Mean, mod, median, standard deviation, variance of the objective one.

| Question Total Respondent | Oils spills | Ships drop their anchors to the seabed | Ballast water | Noise in water from marine transport | Plastic waste |
|---|---|---|---|---|---|
| Mean | 3.89 | 3.86 | 4.04 | 3.92 | 4.30 |
| Median | 4.00 | 4.00 | 4.00 | 4.00 | 5.00 |
| Mod | 4 | 4 | 5 | 5 | 5 |
| Std. Deviation | 1.014 | 1.054 | 1.004 | 1.002 | .893 |
| Variance | 1.028 | 1.112 | 1.008 | 1.004 | .798 |

Source: Authors.

Next, about the explanation on that mean, mod, median and standard deviation and variance. The highest about the mean is a question about the impact factor from the plastic waste. They have 4.30 for the result of mean. The lowest count mean of this objective is the question of ships drop their anchors to the seabed. They have 3.86 for the count of mean. Furthermore, they have the median of the objective two for the highest of the median is question number five is the plastic waste. They have the highest count of the median is 5.00. Overall, on that median on that the objective two is the same with 4.00 about the part. Next, for the mod the highest of this part of the question is question number one it is about interest in maritime transport they have 2 while the overall on that question is the same it has got only 1 of the mods on that part. For the next part, the lowest of the standard deviation, question number five is plastic waste with 0.893. About the highest on that part is question number two, ships drop their anchors to the seabed with 1.054. Last but not least about the variance, the highest on that situation is the count of question number two is ships drop their anchors to the seabed with 0.863. The lowest of the variance is the plastic waste with 0.798.

About the elaboration on that objective with the previous study it is to attract the differentiation of that discussion. For the previous study they according from Zhong (2019) Accidental leaks of petroleum and its derivatives during the extraction, refinement, and transportation processes in the ocean will result in an oil film that will block sunlight from reaching the seabed and severely impair photosynthesis in aquatic animals and plants, preventing them from feeding, growing, and reproducing normally. So, the differentiation from my study is that ship-related oil spills and leaks can have serious repercussions for marine life, including fish, animals, and coral reefs. Pollutants such as chemicals and garbage that are released into the environment may also deteriorate water quality and endanger marine creatures.

Next, about the explanation, the fishermen who make a living from fishing are more concerned with their real advantages than with whether their overfishing will harm the sustainable development of marine resources. The only certainty they have is that the more fish they capture, the more economic rewards they will receive. Or simply because of life's pressures. People will be more dishonest if resources are scarce. Given that the complete number of marine resources is known, the more severely harmed the marine resources, the more harmful the marine environment will be according to Zhong (2019) while for my study is the ships anchoring can cause harm to coral reefs and marine habitats, especially if the anchors are dropped directly onto these fragile ecosystems. Anchors may crush and damage coral formations when they are lowered onto the seafloor, disturbing their fragile structure. Because coral reefs develop slowly, this damage can take years or even decades to repair. Anchor chains may cause physical harm as well as drag along the bottom, killing coral and other marine life along their path. The chain's dragging motion can uproot or destroy seagrass beds, which provide critical habitat for many marine animals.

### *4.4. Third Objectives.*

**Objectives: To purpose the solution factors of marine ecosystem sustainability on marine transportation.**

**Frequency.**

Table 5: Frequency of the objective three.

| Question Total Respondents | Enforcing stronger rules and regulations | | Creating and putting into practice sustainable shipping practices | | Collaboration with key parties | | Incentives such as tax breaks or subsidies to shipping companies | | Improving international collaboration and implementing international frameworks and agreements | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % | N | % |
| Strongly Disagree | 1 | 1.0 | - | - | - | - | 1 | 1.0 | 2 | 2.0 |
| Disagree | 4 | 4.0 | 1 | 1.0 | 3 | 3.0 | 3 | 3.0 | 1 | 1.0 |
| Neutral | 12 | 12.0 | 17 | 17.0 | 18 | 18.0 | 21 | 21.0 | 10 | 10.0 |
| Agree | 38 | 38.0 | 37 | 37.0 | 25 | 25.0 | 29 | 29.0 | 34 | 34.0 |
| Strongly Agree | 45 | 45.0 | 45 | 45.0 | 54 | 54.0 | 46 | 46.0 | 53 | 53.0 |

Source: Authors.

On that 4.4 about this table, they refer to the frequency about the third objective it is to purpose the solution factors of marine ecosystem sustainability on marine transportation. On that table, they have five questions. For the first question the keyword of solution factor is Enforcing stronger rules and regulations. Next, creating and putting into practice sustainable shipping practices; it is the keyword for question number two. The keyword of question number three is they have collaboration with key parties. The next part is incentives such as tax breaks or subsidies to shipping companies that is the keyword on that question. The last key question is improving international collaboration and implementing international frameworks and agreements. The result of the highest frequency is 54.0%. It is about question number three about the collaboration with key parties, the answer is strongly agree that the highest chosen of the respondents. The lowest on that chosen of the respondents is about questions one and four, which is Enforcing stronger rules and regulations, incentives such as tax breaks or subsidies to shipping companies. They have 1.0% respondents that strongly disagree about that.

**Mean, Mod, Median, Standard Deviation, Variance.**

Next, about the explanation on that mean, mod, median and standard deviation and variance. The highest about the mean

Table 6: Mean, mod, median, standard deviation, variance of the objective three.

| Question Total Respondent | Enforcing stronger rules and regulations | Creating and putting into practice sustainable shipping practices | Collaboration with key parties | Incentives such as tax breaks or subsidies to shipping companies | Improving international collaboration and implementing international frameworks and agreements |
|---|---|---|---|---|---|
| Mean | 4.22 | 4.26 | 4.30 | 4.16 | 4.35 |
| Median | 4.00 | 5.00 | 4.00 | 4.00 | 5.00 |
| Mod | 5 | 5 | 5 | 5 | 5 |
| Std. Deviation | .883 | .774 | .870 | .929 | .857 |
| Variance | .779 | .598 | .758 | .863 | .735 |

Source: Authors.

is a question about the solution factor from improving international collaboration and implementing international frameworks and agreements. They have 4.35 for the result of mean. The lowest mean about this objective is the incentives such as tax breaks or subsidies to shipping companies. They have 4.16 for the count of mean. Furthermore, they have the median of the third objective for the highest of the median is question number two and five is the creating and putting into practise sustainable shipping practices and improving international collaboration and implementing international frameworks and agreements. They have the highest count of the median is 5.00. Overall, on that median on that the objective two is the same with 4.00 about the part. Next, for the mod the overall count on that mod is the same as the question it is about the 5 mod. Besides the lowest of the standard deviation, question number two is creating and putting into practise sustainable shipping practices with 0.774. About the highest on that part is question number four, incentives such as tax breaks or subsidies to shipping companies with 0.929. Last but not least about the variance, the highest on that situation is the count of question number four is incentives such as tax breaks or subsidies to shipping companies with 0.863. The lowest of the variance is the creating and putting into practise sustainable shipping practices with 0.598.

Furthermore, it is the discussion about the previous study in which the shipowners will be able to analyse their repair and maintenance expenditures in order to avoid detention using this data analysis. Government and policymakers should take into account these high impact risk factors and areas of detainable deficiency that may result in ship detention when improving inspections and governance strategies to optimise maritime safety operations and marine pollution prevention. Following the findings of this study, shipping firms should maintain ISM compliance, fire safety, prompt self-inspection, and crew education to reduce the possibility of ship detention, which might result in economic loss as well as environmental issues according from Chuah et. al (2022) while for my study the collaboration among key parties is crucial to address the impact of marine transport operations on marine ecosystems in Malaysia. By working together, the government, industry, and environmental organizations can pool their resources, expertise, and influence to develop effective strategies and initiatives to mitigate the negative effects and promote sustainable practices.

Next, according to Zhong (2019) the preservation of the maritime ecological environment is the most important link in protecting the global ecological environment, since the status of ecological environment maintenance has a direct influence on human life and development. Aside from plentiful marine animals, there are also a big number of oil, gas, and mineral resources in the vast marine resources, which are strongly tied to human production and living. The degradation of marine resources will not only harm marine species' living environments, but will also have major consequences for human existence while for my studies improving international collaboration and implementing international frameworks and agreements are crucial steps to protect the marine ecosystem from the effects of maritime transportation in Malaysia. International frameworks and agreements provide countries with a common platform for developing and enforcing policies addressing the environmental implications of marine transportation. The use of international standards guarantees uniformity and harmonisation in the approach of reducing the impacts of maritime traffic on the marine ecosystem. It also contributes to avoiding a race to the bottom in which nations compete with low environmental standards. These frameworks frequently include regular evaluations and revisions that take into account scientific advances and growing environmental issues. This flexible approach means that effective solutions may be implemented when new difficulties arise.

## Conclusions.

In conclusion, Malaysia may get various advantages by prioritising marine environment sustainability in maritime transportation. For starters, it assures the conservation of the country's rich maritime biodiversity, including endangered species and unique ecosystems. This preservation is critical for preserving ecological balance and sustaining the long-term health of the marine ecosystem. Maritime ecosystem sustainability in maritime transportation helps to preserve essential ecosystem functions. The coastal areas of Malaysia provide a variety of functions, including nutrient cycling, water filtering, and storm protection. Malaysia can assure the continuous provision of these ecosystem services by reducing pollution, avoiding habitat degradation, and establishing responsible shipping practises, which will benefit both the environment and local residents.

Finally, Malaysia must ensure marine ecosystem sustainability in maritime transportation. Malaysia may protect its rich marine life, preserve coastal ecosystems, fight climate change, and support the economy by implementing sustainable practises. Sustainable maritime transportation practises will contribute to the long-term health and resilience of Malaysia's marine ecosystems, ensuring the country's long-term viability.

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