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Review Article

PREPAREDNESS AND RESPONSE ON OIL DISCHARGED FROM PASSENGER VESSELS

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Abstract
This research aims to analyses on the preparedness and responses of discharged oil from passenger vessels. The research emphases on the procedures of handling process from the discharged oil through the passenger vessels at jetty area. It is crucial for the ferry terminal authorities to preserve jetty from any oil pollution. The elements *of sources and effects of the oil spills* are categorized as the independent variables towards the dependent variables of preparedness and response to the discharged oil of passenger vessels. A method of questionnaire survey has been applied in this research and has received 80 sets of questionnaires from the targeted respondents located at the Lumut Jetty, Perak, Malaysia. The closed ended questions comprised of the demographical background of the respondents', elements preparedness and response. The descriptive and frequency analysis, multiple correlations and multiple regression have been applied for the data analysis. The finding has indicated that the behaviour of the surroundings area at the Lumut Jetty has indicated as the main contributory factor to preparedness and response towards the oil spills.

keywords: Oil Discharged, Oil Spill, Passenger Vessels, Preparedness, Response

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INTRODUCTION

Ferry is a boat or ship for transmission passengers and goods, predominantly over a relatively short distance and as a regular service (Oxford Dictionary, 2019a). Jetty is a arrival phase or small dock at which vessels can berth or be anchored or a bridge or staircase used by passengers boarding an aircraft (Oxford Dictionary, 2019b). Jetty is a complex operation located side by side to other marine industry. As compared to ports, the environmental pollution resolution is complex due to the divergence types of pollution, sources and business nature (Alderton, P. M, 2013). Since jetty is connected with tourism industry and has generated incomes growth for local businesses, it is crucial for the passenger vessels as captain at the jetty to preserve and protect the marine environment. The captain of the ferry must be in charged focusing on the discharges oil (Uyi. S, (2018). The environmental pollution at jetty is happened from a predictable phenomenon of its long operation. Ferry is a commercial vessel formation to carry passengers, a small sizes of cargoes and occasionally vehicles across rivers and seas for short cross water passage. The ferries at Lumut Jetty regularly transmits passenger such as tourist who wants to visit Pulau Pangkor. The rosters of the ferries have shuttle from Lumut Jetty to Pulau Pangkor are repeatedly on daily basis.

Problem Statement

On the jetty daily repetitive, cargo management and ferry operations could origin accidental of oil discharges and emission. This research prominences to analyse the preparedness measured by related ferry communities for instances jetty management staff, captain of the ferry and passengers ferry towards the preparedness from the discharged oil from the passenger vessels. Furthermore, to evaluate the response action towards the liquidated oil spills from the passenger vessels. In other words, to determine what are the actions taken when the oil spills have occurred at jetty area. In addition, it is also to research whether the Lumut Jetty authority has a good exercise of the discharged oil management.

Research Objectives

This research is aimed to fulfil these following research objectives:

a) To evaluate the factors influence the preparedness measurement by the related community of Lumut Jetty towards the discharged oil from the passengers vessels.
b) To investigate the response plan taken by the related community towards the discharged oil from the passenger vessels.

Location of Research

The research has preferred Lumut Jetty located in Lumut, Perak, Malaysia as a locality of the research. It is because the jetty is used as a tourist attraction to Pangkor Island and the usage of the passenger ferry is high in demand and a possibility in discharging the oil into the sea. This jetty is situated in the Straits of Malacca on the west coast of Peninsular Malaysia in Perak State. This terminal is a passenger terminal that conveys passengers to Pangkor Island by three operating companies which are by Syarikat Mesra Feri, Syarikat Duta Pangkor, and Syarikat Pan Silver. The ferry schedule to Lumut from Pangkor Island starts from 7.00am to 8.30pm. Meanwhile, from Pangkor Island to Lumut starts from 6.30am until 8.30pm. Usually, it takings almost 30 minutes to arrive at Pangkor Island from the terminal jetty. Therefore, the busy schedule trips lead to a high risk of the sea to pollute from the discharged oil.

Figure 1. The Passenger vessels Terminal, Lumut Jetty, Perak

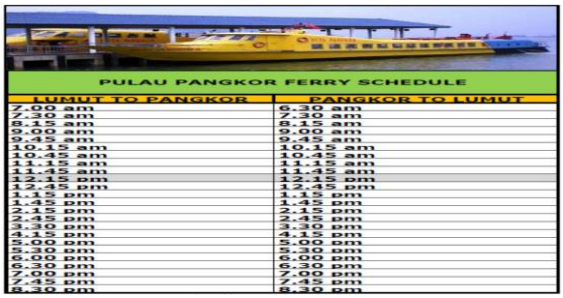

Figure 2. The Ferry Schedule

Significance of Research

This research would sustenance to explore the elements on what has caused the oil spills that may effect of the marine environment at nearby Lumut Jetty in Perak, Malaysia. The higher practice of the ferry vessel schedules contributed to the higher probability of the discharged oil into the sea. Its outcome would throw light on potential method that may help derive better in conserving marine pollution on ways to manage the effective clean up method taken by the marine authority's contingent on the oil spills. Besides, the ferries crews' behaviour need to be improved as it resulted as a factor lead to the discharged oil, elevation the awareness to the marine pollution among the jetty staff and public. Lastly, from the result it aids to recommend an establishment effective strategies and response plan by the associated authorities of the Lumut Jetty in the development and submission of the oil spills preparedness and response.

LITERATURE REVIEW

The oil pollution has deliberated as a contamination of earth, environment with materials and have impede with human hearth, quality of life and natural functioning of the ecosystem by any oil constituents (Pezeshki, S.R, 2000). The jetty and port are also an influence factor to marine pollution. The staff at port and jetty are handling the cargo operations which may have a high casual to cause accidental discharges and emissions. Most of the reason, the marine pollution at port and jetty happened due to the inattention of the crew for instances the absence of awareness on the oil management of the ferries at the jetty (Uji, S, 2018).

Sources of Oil Spill

There are several sources to the oil spill incident cases. This research concentrations on three frequent sources of the oil spills based from the previous research as shown in Table 1. The sources covered human errors, vessel and accidents.

Table 1. Sources of Oil Spills

Sources of Oil Spills	Authors, Years																	Frequent
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
-Human Errors		*		*		*	*				*	*		*					7
-Vessels	*								*	*			*		*		*		6
-Intentional Spills		*																	1
-Accidents/ Collisions		*	*						*							*			4
-Maritime Operations			*						*										2
-Exploration & exploitation				*			*												2
-Human Activities						*													1
-Natural Disasters		*																*	2
-Offshore					*			*											2
Port and Jetties									*										1

LegendsA- Abdulrazaq, A.O (2014), **B-**Salako. A (2012), **C-** Hassler, B (2011)**, D-** Anderson**,** C.M (2000), **E-** Gill, D. A (2014), **F-** Farrington, J. W. (2014), **G-** Ajide, O. M. (2013), **H-** Li, P., Cai, Q (2016), **I-** Iduk, U. (2015)**, J-** Perić, T. (2016), K-Theophilus, S. (2017), **L-** W.Y. Liu (2017), **M**-Kang, Zhang & Bai (2016), **N-** Mistra, K. B (2015), **O-** Matsuzaki, Y (2017), **P-** Moulas, D (2017), Q- Bakhtiari, R (2017), R- X. Liu & Wirtz, (2006)

Table 1 shows the summary for the sources of the oil spills which covered human error, vessels, intentional spills, accidents, maritime operations, explorations & exploitations, human activities, natural disaster, offshore, port and jetty. Generally, these factors are found as the sources to the oil spills. This research focuses on three frequent sources as follows:

Human Errors

The commodity practice of the vessel is high in volume and is likely to increase of the risk in causing the accidents which mainly through by human as the operations mostly is handled by human. It produced the high rate of incidents possibility from the human errors during the operations onboard. The classification of human factor is divided either by individual errors or an organizational mistakes which have caused of 80% of the oil discharges and marine accidents at open sea (Elise D.C, 2006). A situation and system are easier to change as compared to human condition especially dealing with people who are well-trained and well-motivated. The human risks are mainly generated by the problems made during the human performance (Reason, J., & Hobbs, A. 2017).

Vessels

Usually, the oil pollution from vessel are caused by formation of oil discharged from ships, wastewater discharged, solid wasted and garbage discharged and collision between two vessels. It triggered consequences of the vessels likely to discharged pollutants such as oil liquid from the tanks, noxious liquids, sewage and contaminated ballast water which have been released into the sea (Iduk, U., Samson, N. 2015).

Accidents/ Collisions

The oil pollution incidents are instigated by shipping accomplishments from ship operations such as loading or discharging of oil, bunkering, oil transfer. Meanwhile, the operational contamination are caused by tankers during collision, grounding, hull failures, fire and explosion. The incidence of the oil spills appeared to be on the upsurge due to discharge of waste or accidents of collision of crude oil tankers, as well as spills of refined petroleum products (for example petrol, diesel), offshore platforms, drilling rigs and wells, and the practice of heavier fuels by large ships for instance the bunker fuel, or the spill of any oily waste or waste

oil (Oyebamiji, M.A, 2014). It is also triggered from accidental leaks from ships and offshore, oil platforms and it is frequently outcomes in an excessive economic costs and overwhelming marine ecological deprivation (Shi, Wang, Luo, & Zhang, 2019). The oil spilled from the ships and tankers counting the transportation fuel used by the vessels or cargos such as crude oil, fuel oil, or heating oil are the substantial bases of hydrocarbon inputs into the oceans, lakes, and rivers (Doshi, et al. (2017).

Images of spilled oil

Figure 2. Accidents of two

Figure 3: Oil discharged from vessels

Effects of Oil Spills

Once the oil spill incidents have transpired, it has resulted in a bad image and hazard to all of us including the marine life and ecosystem, economic, social, fishermen, tourism industry and created a bad image to the country. The explanations of the effects are enclosed as follows:

Marine habitants

Even though the major oil spills from tankers are infrequent incidences, it remnants one of the central worries for the various stakeholders in marine environmental protection since of the possibly foremost influences of oil spills on marine ecosystems, important socio-economic impacts on communities reliant on on coastal resources and high costs of clean-up operations (Goerlandt. F & Montewka, J, 2015). The oil spill is one of the extreme severe origin of the marine pollution which is not only conveys enormous economic forfeiture to the society, but also stimuluses the marine ecological environment, and leads to the indemnities in ecological stability, leads to the destruction of nature and the organism immediately or in a long-term (Farrington, J. W, 2014).

Coastal

Once the oil spill occurred, the spilled oil easily can penetrate the beach sediments. A coastal sand beaches and seashore meadows are the most sensitive to the effects of oil and has threatened habitants, plants and small animals along the coastal. The polluted spilled oil could also affect the shore vegetation and inhibits an absorption of sunlight which is necessary for photosynthesis and growing of the plants (Pezeshki, S. R, 2000).

Health

The spilled oil has pretenses straight intimidations to human health from inhalation or dermal assembly with the polluted oil and dispersant chemicals, and unintended threats to seafood safety and mental health. An aliphatic and aromatic hydrocarbon are the leading mechanisms of a crude oil. Once the evaporated oil has reached the water superficial, it can caused cause a respiratory irritation and central nervous structure depression, cause leukaemia in humans, nasal tumours, and lung cancers in human and animals (Solomon, G. M, 2010).

Images of the Oil Spill Effects

Figure 4. The exposed fish to oil spills

Figure 5. Oil slick at coastal beach

Figure 6. Effected vegetation

Figure 7. Health effect

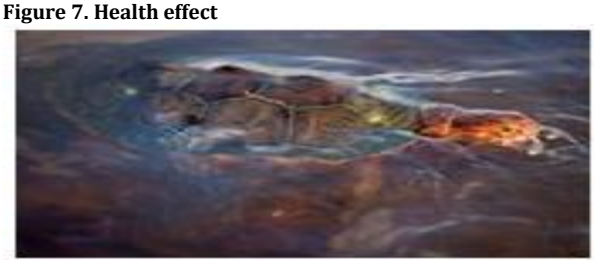

Figure 8. Mammal effects

METHODOLOGY

The data compiled were analysed in a procedural way to address the whole research questions. In this feature, clarifications were given based on the analysis prepared on data established from the survey and the numerous interviews that were conducted. The data were accomplished and analyzed consuming the Statistical Package for Social Science (SPSS) software version 25.

Data Collection Method

A questionnaire survey method was applied for this quantitative research. The research delivered a total of 80 questionnaires composed from the respondents at Lumut Jetty restricted of the passenger's vessels, jetty management staff and the captain of the ferry. The questionnaires were alienated into three sections such as: Section A, B, and C comprised of *Part A:* demographical background, *Part B*: sources and effects

of the oil spills and *Part C*: preparedness and response towards the oil spill incidents.

Scope of Research and Unit of Analysis

The unit of analysis of this research involved an individual among passengers, jetty management staff and the captain of the ferry who have contributed in responding the disseminated questionnaires.

Populations, Samples and Respondents

The *population* is a large group of individuals to be studied and refers as an entire set of subjects. Meanwhile, a *sample* is a set to be nominated from the population and *Respondents* are groups of people obtain from the sample who desire to answer the questionnaire. The sampling method allows information obtained from a part of a larger group or gets a sample of the target population. A purposive sampling technique was applied to the directed population ranges from passenger vessels, jetty staff and captain ferry as shown in Table 2.

Table 2. Population, Samples and Respondents

No	List of Population	Population	Samples	Respondents
1	Passenger Vessels	200	100	60
2	Jetty Staff	50	30	10
3	Captain Ferry	30	20	10
	Total	280	150	80

Response Rate

The target for the purposive sample in this research was 150 people which required 150 sets of distributed questionnaires. However, only, 80 respondents contributed in this research contained of 60 from passenger vessels, 10 from jetty staff at 10 from captain ferry. The response rate is 53.33% and the unsuccessful rate was 46.67% due to respondents failed to answer the distributed questionnaires, jetty staff were busy with working schedule during the distribution of the questionnaires which was held during festival period after a week of the festival break, the captain ferry was on schedule in a different shift basis and the research did not accomplish to meet all of them during the circulation process, The passenger vessels were unwilling to participate in the questionnaires survey as the passenger vessels were demanding to look after own family matters while waiting for the ferry to arrive at jetty.

Table 3. The Response Rate

Group	Quantity	Response Rate
Managed to response	80	Successful rate: =80/150 X 100%=53.33%
Failed to response	70	Failure rate: =70/150 X 100%= 46.67%
Total	150	Total response rate=150/150 X 100= 100%

Research Framework

This research has determined the relationship between two variables of the Independent Variables (IV) and Dependent Variables (DV). The two independent variables contain of sources and effects of the oil spills. Meanwhile, the dependent variable covered preparedness and response towards marine pollution at Lumut Jetty, Perak, Malaysia. Figure 9 shows a proposed conceptual framework of this research.

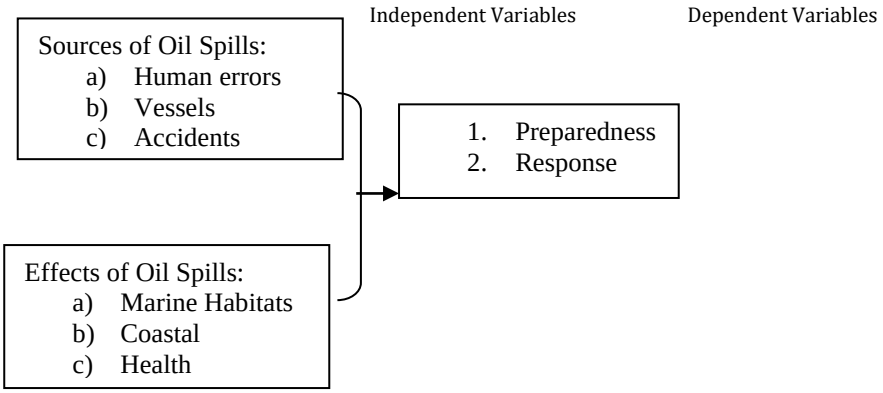

Figure 9. A Proposed Conceptual Framework

DATA ANALYSIS AND FINDINGS

From the collected data related to the research, an analysis was conducted for descriptive, frequencies, percentage for Part A of the respondents' background. Meanwhile, for Part B analysis was applied analysis for multiple correlation and multiple regression to link and test the relationship of the independent variables and dependent variables. The collected data were analyzed with reference to the research questions.

Profile of Respondents

Table 4 shows the profile of the 80 respondents. Gender: 56.2% were male due to the maritime industry such as navy industry has extra male as it is a weighty industry and all the ferry captains are also male. Age: Most of the respondents were 31.2% are at age range 26-35 years as Lumut area is bounded by marine education centers such as UniKL MIMET, IKM. Kolej Vokasional, Open Universiti and Kolej Komuniti which 90% are male students and these male group like to go to Pangkor Island during weekends. Education Level: since most of the respondents were at 26-35 years old and hold degree in maritime at 31.2% and required some basic knowledge on maritime and can contribute in the distribution of the questionnaires. Married: 65% of respondents mostly are married because maritime industry needs experienced people

and carry higher responsibility and created less mobility to another companies. Race: 50% of the respondents are Malay. This is because the mainstream population at Lumut are domineering by Navy society among Malay group of citizen. Citizenship: 93/8% majority of the respondents are Malaysian as the respondents are working with Malaysian flag state ship.

Table 4. The Respondent Background

Background of Respondent	Descriptions	Frequency	Percentage
Gender	**Male**	**45**	**56.2**
	Female	35	43.8
Age	18-25 years old	15	18.8
	26-35 years old	**25**	**31.2**
	36-45 years old	20	25.0
	46 years old and above	20	25.0
Education	Ph.D	8	10.0
	Master	7	8.8
	Degree	**25**	**31.2**
	Diploma	20	25.0
	STPM	10	12.5
	SPM	10	12.5
Marital status	**Married**	**52**	**65.0**
	Single	28	35.0
Race	**Malay**	**40**	**50.0**
	Chinese	20	25.0
	Indian	15	18.8
	Others	5	6.2
Citizenship	**Malaysian**	**75**	**93.8**
	Others	5	6.2

Pilot Research

The pilot test was steered among 30 respondents. 10 respondents were from Marine Department, 10 respondents were from Jetty Organization and 10 respondents were from Department of Environment in Lumut, Perak, Malaysia.

Reliability Test

The total of 14 items were requested in the questionnaire and produced a value of Cronbach's Alpha at 0.841 from the pilot test questionnaires. It is a mutual dimension used to measure the reliability of questionnaires from the Cronbach's Coefficient Alpha internal steadiness reliability. When the reliability coefficient value is closer to 1.0, thus its reliability is excellent as shown in Table 5, 6 and 7 respectively.

Table 5. Range of Reliability Test Result

Item-Total Statistics				
Elements	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Sources & Effects	57.45-57.89	20.602-25.947	-.114-0.595	0.815-0.857

Table 6. Cronbach's Alpha Value

Reliability Statistics	
Cronbach's Alpha	N of Items
.841	14

It shown the pilot test result obtains from the Cronbach's Alpha Value at was 0.841 lies between the $0.9 > \alpha \geq 0.8$ and at good internal consistency.

Table 7. Cronbach's Alpha Value

Cronbach's Alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Pearson Correlation Analysis

A Pearson Correlation is applied as it is a statistical technique to display the association among the tested variables. This research pragmatic a bivariate analysis that measures the strength of association between independent variables towards the dependent variables. The value of the correlation coefficient varies between +1 and -1 and has indicated a perfect degree of association between these variables.

Table 8. The Pearson Correlation Analysis

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14
B1	1													
B2	.28*	1												
B3	.22*	.56**	1											
B4	0.21	-0.11	-0.01	1										
B5	.26*	.36**	.39**	0.21	1									
B6	.41**	.37**	.35**	-0.02	.35**	1								
B7	0.05	.35**	.37**	0.22	0.14	.27*	1							
B8	.28**	.25*	.36**	0.19	0.3**	.32**	.28*	1						
B9	.30**	.42**	.52**	0.06	.40**	.40**	.50**	.38**	1					
B10	.26*	.40**	.51**	0.06	.47**	.51**	.43**	.25*	.54**	1				
B11	0.09	.25*	.40**	0.02	.27*	.27*	.43**	.28*	.42**	.45**	1			
B12	0.42	0.19	.33**	0.13	.27*	0.22*	.41**	.22*	.49**	.35**	0.54**	1		
B13	0.09	.52**	.43**	-0.18	.30**	0.29**	.54**	.36**	.52**	.44**	0.51**	.49**	1	
B14	0.04	-0.03	-0.25	0.15	-0.1	0.04	0.1	0.04	-0.18	-0.16	-0.29	-0.12	-0.13	1

Multiple Linear Regression Analysis

A Multiple Linear Regression analysis is smeared as a technique for prophesying the value of multiple variables. The dependent variables are preparedness and response of the oil spills from the independent variables such as sources and effects. There are six independent variables of vessels, human errors, accidents, marine habitat, coastal and health were regressed on preparedness and response. The result of the regression analysis as shown in Table 9.

Table 9. The Multiple Liner Regression Analysis

Variables	Preparedness	Response	
1. Sources of Oil Spills: a) Vessels b) Human Error c) Accidents	0.184	0.182	R^2
	0.162	0.161	Adj. R^2
	0.184	0.182	R^2 change
	8.657	8.586	F value
	8.657	8.586	F change
	0.000	0.000	Sig. F change
2. Effects of Oil Spills: a) Marine Habitat b) Coastal c) Health	0.042	0.011	R^2
	0.017	-0.014	Adj. R^2
	0.042	0.11	R^2 change
	1.694	0.439	F value
	1.694	0.439	F change
	0.191	0.647	Sig. F change

The result specifies that 18.4% and 18.1% of the total variation in the dependent variable preparedness and response is explained by the independent variables for sources of the oil spills correspondingly. The model is statistically significant since the F value is significant at p =0.00 < α =0.05 for preparedness and response of the sources of the oil spills. Whereas, for the second independent variables, the result reveals that 4.2 % and 1.1% of the total variation in preparedness and response can be enlightened by the effects of the oil spills correspondingly. Moreover, the model is significant since the result displays the p-value=0.00 < α =0.05.

DISCUSSION, CONCLUSSION AND RECOMMENDATION

Discussion

Sources of The Oil Spills

It is streamlined that the three sources of the oil spills are recognized as the foremost factors that donated to the preparedness and response by the passenger vessels, jetty management staff and captain ferry at Lumut Jetty, Perak, Malaysia. The result have proved whereby if p>0.01, therefore the independent variables is a positive relationship with the dependent for significantly to control oil spills.

Effects of The Oil Spills

Second variables concentrated on effect of the oil spills which have shown to have a positive and significant relationship with the response towards the oil spills, except for marine habitat is negatively regressed with the oil spill response. A stronger value from the effect of oil spills produced a higher obligation by the answer, The government authorities should ensure a clean environment around the Lumut Jetty whenever an oil spills incidents occurred from the ferry movement schedules. The elements of consequence are factors the triggered and influenced the time restriction by the marine authorities to performance on the oil releases to preclude the marine pollution at Lumut Jetty from become extra worsen.

Conclusion

The objectives are positively accomplished in this scope of research. For the first objective, the preparedness measurement occupied by the associated respondents and government authorities towards the oil spill is very important for the purpose of the oil spill contingency plan. In addition, crucial decision requirements will regulate the response rate of the oil spill control and prevention. The drive of the second objective in this research is to categorize the response plan on oil spill in minimizing the oil pollution at sea. The findings of this objectives have been analysed and discussed using theoretical framework. It is found that these two objectives have a strong relationship among independent variables and dependent variables. The preparedness and response of the oil spills may be should controlled and preclude towards oil spills at sea become extra deteriorate from time to time.

Recommendations

The specific three recommendations are as enclosed on the ship review regulations and standard, Standard Operation Procedures (SOP) and an attentive consideration to vessel design are as follows:

Ship Inspection Regulations and Standards

Most of the respondents proposed these recommendations for future benefits and whereby, to prevent the marine pollution from the discharged oil from the ferries is that the ship classification society shall tighten the revision on every ship

inspection regulations and standards whether the ships fulfill the requirements of the ship hull as stated in SOLAS and IMO rules and guidelines created by the maritime bodies.

Standard Operation Procedures (SOP)

Each of the Standard Operation Procedures (SOP) must be published by the Department of Environment (DOE). In the previous cases it must has to be reported to Department of Environment (DOE) to handle the oil spills incidents and propose the response plans by the related authorities regarding the amount of spilled oil. When the oil spills incidents happened, the maritime related bodies such as Standards of Training, Certification and Watchkeeping for Seafarers (STCW) must undertake a systematic schedule for training of three times per year. It is because the reply team members obligation be attentive and almost ready at any time whenever the oil spills occurrences to happen.

Attentive attention to vessel design

The respondents also recommended to provide an attentive continuous attention on vessel design, construction, operation to support passenger-to-ship transfer operations, especially for passenger vessels and its operations. The issues that should be emphasized covers the nature extent of the vessels such as the vertical plating and parallel bodies on vessels, the size and placement of mounting points and lifting equipment, engine capabilities, and the potential for excessive freeboard.

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