A Relationship of Contingency Plan and Related Government Authorities Integration towards an Oil Spill Incidents

Ismila Che Ishak, Muhammad Nur Hakim Normadi, Nazliah Mohd Ali

Abstract: ***The maritime industry relates to the carriage of cargoes activities such as shipping and port operations, including a wide supporting activity offshore oil and gas exploration and production. In addition, the marine industry provides a pillar of national economic growth and prosperity. Generally, most of the enterprises engaged in the maritime business are related to shipping, designing, constructing, acquiring, manufacturing, repairing and maintaining, operating and supplying. However, from the various shipping activities could lead to marine pollution especially an oil spill. This study focuses to analyze the relationship of the contingency plan of oil preparedness and response by government authorities towards the oil spill. 43 respondents from selected oil port and government authorities have participated in the questionnaire survey. The result from the multiple correlations and regression analysis show the contingency plan activity of the preparedness and response are significantly and positively related to the government authority integration towards the oil spill incidents.***

Index Terms: Oil Port, Preparedness, Respon Contingency Plan

I. INTRODUCTION

The marine industry provides one source of income for national economic growth and prosperity. Generally, all enterprises engaged in the maritime business involves several activities such as ship designing, constructing, acquiring, manufacturing, repairing and maintaining, operating and supplying. AFPM (2017), in the oil supply chain, involves processes of oil from oil rig production to short term storage, refining, terminal and point of sale. The oil terminal served as an oil depot in the storage of oil or petrochemical product for the industrial facility and has tankage, supports for the release of products into road tankers or another vehicle. The oil terminal is usually located nearby to oil refineries and some terminal is involved in the pipeline from which they discharge oil or petrochemical.

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Ismila Che Ishak, Maritime Management Section, Universiti Kuala Lumpur Malaysian Institute of Marine Engineering Technology, UniKL MIMET, Lumut, Perak, Malaysia

Muhammad Nur Hakim Normadi, Maritime Operation, Universiti Kuala Lumpur Malaysian Institute of Marine Engineering Technology, UniKL MIMET, Lumut, Perak, Malaysia

Nazliah Mohd Ali, Technical Foundation Section, Universiti Kuala Lumpur Malaysian Institute Marine Engineering Technology, UniKL MIMET, Lumut, Perak, Malaysia

With nearly 4800 kilometers of coastline, Malaysia particularly exposes to marine oil pollution (Wing, C. K, 2005). The study focuses on oil terminal as the terminal is connected to the refinery terminal for liquid natural gas production. The oil refining is oil in its crude form which has very few direct applications (Ekaterina Anyanova, 2011). The refinery operation permits encountering the strong demand for refined petroleum products both domestically and overseas. Malaysia has a set of the legal framework for the elimination of oil in the sea but the law is still not adequate and at the same time threatening the marine environment and causes irreparable damage to marine resources and human security (Kader, S. Z. S. A., & Abdulrazaq, A. O., 2014).

Research Problem

The maritime industry is a major cause of oil pollution which marine transportation forms the problem of pollution. Transportation is important in the human daily routine and is one of the global trade liberalization, International Standardization, and Communication (Hoffmann, J., & Kumar, S., 2013). The transportation of oil production from production sources to the numerous destinations of consumption arguably welcoming more risk and obviously the risk of accidental of oil spills which lead to severe damage to an ecosystem and human society (Chang, Stone, Demes, and Piscitelli, 2014). The oil pollution has created as a foremost problematic in most countries since of their depraved influence on the setting and economy. The contaminations are usually promptly occurred over an extensive area of sea which results in the worsening of the water superiority and the devastation of the marine life. The oil spill provides a negative impact on the marine ecosystem, environmental, economic and tourism industry. Marine pollution occurs as foreign components enter the water and cause marine life to die and human health disrupted and affecting the ecosystem on the sea and on land (Shahian, M.H., Emtiazi, G., Cappello, S., 2012). Thus, this study focuses on the contingency plan towards the oil spill at the oil port.

Research Objectives

The objectives of this study are as follows:

a) To analyze the contingency plan of the preparation and response activity towards the oil spill.

b) To determine the relationship between governments and non-government agency factor on the contingency plan towards the oil spill.

II. LITERATURE REVIEW

Definition of Oil Pollution

Oil pollution defines as a discharge of a fluid petroleum hydrocarbon into the environment, particularly the marine ecosystem and form contamination from human activity. The oil spills may due to the discharge of crude oil from tankers, offshore platforms, drilling rigs, and wells as spills of refined petroleum products, for example, gasoline and diesel. The oil spill can spread fast and wide due to the factor of big waves strong wind. When the spilled oil reached the shoreline there will be interactions with the untouchable habitats of wildlife, sediments, vegetation, and human which causes the shoreline contaminated. The pollution itself acts as dreadful contamination to an ecosystem and affecting the natural habits and ecosystem which causing plants and animals to be dead and extinct as the pollution aftermath can possibly extend till years.

Table. 1 Definition of Oil Spill

Doshi, B., Repo, E., Heiskanen, J. P., Sirviö, J. A., & Sillanpää, M. (2017)	The oil spills are the substantial bases of hydrocarbons inflowing into the receiving aquatic environment
Buist, I. A., Potter, S. G., (2013)	It is as any types of form of pollution that is found in an ecosystem subsequent overwhelming injurious impact towards the organisms in the precise ecosystem and interjecting the progression rate and plant or animal reproduction or by interfering with human comfort, health, property values, and facilities
Mustafa, M., & Ariffin, M. (2011)	Oil spill causes long-term effects on the marine ecosystem and has the potential to remain in the ecosystem for years

The Preparation towards oil spill Incident

Kurtz, R. S. (2008), preparedness as a subtle function limited to the internal workings of an organization, high dependability distinguishes that the operation of today's critical groundwork is not under the governor of a solitary association. In the earlier study by T.H Moller (1997), several ambitious research and development (R&D) on strategic planning has been separately by industry and government. Moreover, regular oil spill response training and exercise programs, the cooperative industry stockpiles, spill experienced staff will assist to decrease the oil spill incidents. The governing authorities in many countries have made a sequence of laws, rules, and policies to safeguard the security of the environment related to oil spill prevention and response. The response team in the organization must follow the regulation or requirement with Standard Operation Procedures (SOPs). The precise errands to the federal and municipal government must be lateral with the private industry in addition to the response plans and agencies are consistent and synchronized by the National Oil-spill Contingency System (NOSCS).

Impact of Oil Spills

The oil spills created damages and harms to affected or involved parties because the oil itself is hard to clean up and the oil spills consist of chemical and other harmful substances. Ojinnaka, C., Osuji, L., & Achugasim, O. (2012), the oil spills involve a release of liquid petroleum hydrocarbon into the deep-sea or environment due to the human error from the actions and form severe pollution which contributes troublesome to lots of parties who affect and reliable to the damages. By focusing on the impacts of the oil spills enlightening and making people understand the importance of preserving the environment and preventing of spilled oil which causes pollution to marine lives, human, social and economy.

III. METHODOLOGY

Theoretical Framework

The previous research adapted from Oyebamiji, M. A. and Mba C. I. (2014), module and derived the dependent and independent variables as shown in Figure 1.

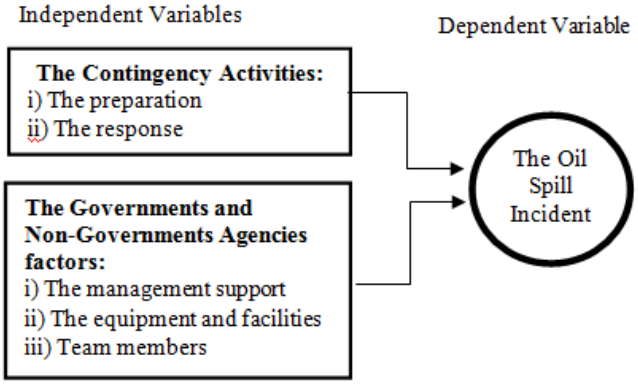

Fig. 1 Relationship with independent and dependent variables

The Dependent Variable (DV) focuses on the oil spill incidents which the oil spill incident must take guaranteed for the effect from management and team members in responding towards the oil spills. The Independent Variables focus on two variables which are contingency plan activities and the requirements process in Standard Operations Procedures (SOPs). In the contingency plan activities include the preparation and response towards the oil spills. Furthermore, the required process standard operating procedure includes the management support, the equipment, and facilities and the team members to response towards oil spill incidents.

Research Instrument

This study involves a quantitative survey method from questionnaire distribution.

The unit of analysis is the individual who is involved in the oil spill preparedness and response activities.

The team is known as an expert of the team members who are involved and experience in the oil spill incidents. A total of 84 population is identified which consists of oil terminal response members at Malacca and Terengganu, government authorities from the government agencies such as the Department of Environment (DOE) and Marine Department. A sample of 60 from population covered 71.43% and 43 or 71.67% respondents have participated in answering the questionnaires survey as shown in Table II. The questionnaire cover questions on general information such as age, academic qualification, working experiences, types of company and activities in implementing of preparation and response towards the oil spill incidents. Respondents from the government sector represent 69.8% or 20 respondents from Marine of Department and 10 respondents from the Department of Environment. Meanwhile, 30.0.2% of 13 respondents are from oil terminals.

Table. 2 Population, Sample and Respondents

No	Parties	Population	Sample	Respondents
1	Oil Terminal, Malacca	30	20	5
2	Oil Terminal, Kemaman	15	10	8
3	Department of Marine	20	20	20
4	Department of Environment	19	10	10
	TOTAL	**84**	**60**	**43**

Likert Scale

To measure the respondent's level of agreement towards statements provided in the questionnaires using an application of Likert Scale (Dittrich, R., Francis, B., Hatzinger R. Katzenbeisser, W., 2016). The Likert scale is used as an important tool in psychology, social survey and collecting attitudinal data. The Likert scales insist respondents choose amongst the 5-points level of agreements for that statement based on their point of view as shown in Table III. The following scale illustrates measure was utilized by using a Likert scale with a score 1 to 5.

Table. 3 Likert Scale Score

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Table 3 shows the Likert scale applied in Part II and III of the questionnaires in providing respondents to express the level of agreement. The Likert scale measurement requires an individual to respond to a series of a statement by indicating whether Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D) And Strongly Disagree (SD).

IV. DATA ANALYSIS AND DISCUSSION

The collected data have been analyzed by using Statistical Package for the Social Science (SPSS) version 25. The analysis involved descriptive analysis, frequency analysis, and reporting frequency distribution, percentage of the demographic characteristics of the respondents and the relationship between dependent and independent variables.

Table. 4 Correlation Coefficient Values

The correlation coefficient value (r)	Strength Beyond Relations (+/-)
1	Perfect
0.8 – 0.9	Very Strong
0.5 – 0.8	Strong
0.3 – 0.5	Simple
0.1 – 0.3	Weak
< 0.1	Very Poor
0	Zero

Table 4 shows the strength of the relationship based on correlation coefficients (Coakes, Steed & Ong, 2009). The correlation coefficient analysis is used to describe the strength of the relationship between variables. Pearson correlation coefficient (*r*) is measured to determine the strength of the alliance between the two variables. To evaluate the correlation the research considers the significance (p) where the value received is less than 0.05. This research is based on the descriptive statistics to summarize a given data set which can be either a representation of the entire population or sample.

Pilot Test

According to Hassan, Z. A., Schattner, P., & Mazza, D. (2006), a pilot test involved a small study to test research protocols, data collection instruments, sample recruitment strategies and other techniques in preparation for research studies. The pilot test involved the distribution of a questionnaire to 29 samples of government authorities from the Department of Environment and Marine Department in Lumut.

Reliability Test

Table. 5 Summary of Reliability Statistic

Reliability Statistics		
Cronbach's Alpha	**Cronbach's Alpha Based on Standardized Items**	**N of Items**
.559	.561	29

Table 5 shows the value of Cronbach's Alpha of 0.559 from 29 pilot test respondents. The Cronbach's Alpha with below than 0.5 indicated questions to be deleted.

Table. 6 Summary of Cronbach's Alpha

Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
109.40-109.80	21.822-30.456	0.231-0.867	0.452-0.608

Table 6 reveals the Cronbach's Alpha for each question whether it is above 0.5 or below. When the value is less than 0.559 the question must be rejected or removed from the questionnaire. If the value is more than Cronbach's Alpha, the reliability and validity of the questionnaire increases.

Normality Test

Table. 7 Summary of Normality Test

Kolmogorov-Smirnov[a]		
Statistic	**Df**	**Sig.**
0.267-0.488	42	.200

A normality test is used to determine the sample or any group of data fits a standard normal distribution and performed by mathematically or graphically. Table 7 demonstrates the Kolmogorov-Smirnov significance value which implies that the data fulfill the requirement for the normality of the data and can be concluded that the normality of the sample has no difference with the population.

Demographics of Respondents

A summary of respondents' demographics is shown in Figure 2.

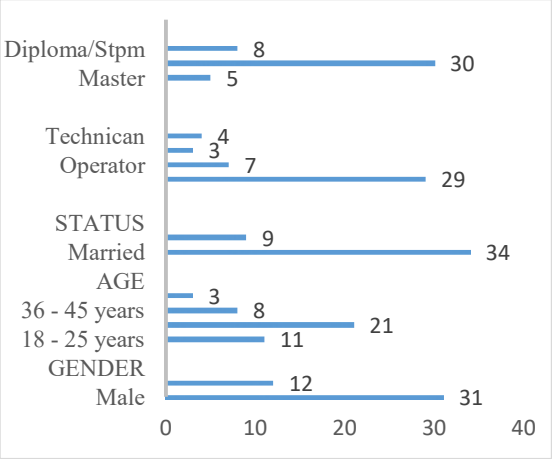

Fig. 2 Summary of Demographics of Respondents

Figure 2 explains the greatest gender is Male by 31 respondents. This is because the marine industry is a monopoly by male workers as a majority. The staff in Marine Department Port Klang and Lumut, Department of Environment, Kemaman, Terengganu, Oil Terminal, Malacca and Kemaman, Terengganu mostly are a male group. This field has a heavy team response oil spill which requires more male manpower while the female is more on the administration department and these different genders can work together. The majority age was between 26 to 35 years as these ages are more suitable to work in the marine field as they have gained some experiences related to the maritime industry. Furthermore, most of the respondent is married. Meanwhile, 29 respondents mostly hold a position in management response team as they are an important person who is involved in the responsibility of the preparation and response in oil spill incidents. Lastly, 30 respondents acquired at least bachelor in order to allow them involves in the maritime industry.

The Contingency Activities

Table VIII shows a summary of the preparation and response feedback from the government authorities related to the oil spills. It displays the information on the preparation and response towards the oil spill. The equipment and team unit contingency activities inspection is conducted periodically once a month. The preparation includes developing specialize team unit of the contingency from expertise background.

Table. 8 Results from closed Ended Questionnaire

Agencies	Preparation	Response
Marine of Department, Port Klang, and Lumut.	-Test equipment -Training -Use Technology Mapping for detect Oil spill -Strategies Planning	-Cooperation with Government and Private Agency -Sampling action -The team responses -Technical
Department of Environment, Kemaman,	-Control: -Area Exclusive Economic Zone (EEZ). -The coastal state assumes jurisdiction over exploration and exploitation of marine recourses	-Action: -Report – take guaranteed 30 minutes feedback on the spillage. -Investigate -Notice -Sampling data information on pollution
Oil Terminal, Malacca	-The training follows the Petroleum Industry of Malaysia Mutual Aid Group (PIMMAG). -Inspection on the equipment and facilities. -Build team unit contingency	-Responsibility the accident at Port Area -Cleaning progress follows the tiered step on the National Contingency Planning
Oil Terminal, Kemaman.	-Equipment -Provided team support services -Monitoring and Training	-Response team action

Regression Analysis

Table. 9 Multiple linear regression analysis

Multi Regression				
Model	**Standard Coefficients**			
	B	**Beta**	**t (value)**	**Sig.**
Adjusted R Square			.542	
F			5.169	.000
Constant	3.633		4.791	
1 Preparation	.131	.173	.590	.742

2	Response	.108	.093	.590	.559
3	The Management	.276	.000	.143	.370
4	Equipment and Facilities	.108	.093	.590	.559
5	Team Unit Contingency	.108	.093	.262	.795

a. Dependent Variable: Oil Spill

b. The preparedness and response staff of the contingency plan unit to being ready to face any oil spill, that important for the requirement from procedure follow the SOP on the good professional level.

Table 9 shows that 54.2% of the total variation in the dependent variable of the oil spill incident is explained by the independent variables. The results are statistically significant as the F value is significant at $p<0.01$.

Mean, Standard deviation and Correlation

Table. 10 Mean, Standard Deviation (SD), Correlation

	Mean	SD	Correlation
Preparation	5.01	3.13	0.031**
Response	7.01	1.87	0.475**
Management	3.42	2.66	0.380**
Equipment and Facilities	6.00	3.91	0.014*
Team Members	4.91	2.99	0.346**

** Correlation is significant at the 0.01 level (2- tailed)

*Correlation is significant at the 0.05 level (2- tailed)

Table 10 expresses the significant results for mean values since the values lie between values 3 to 7 approximately. As reported by Puth et.al (2014), the degree and the direction of such relationships of both variables determined by the correlation analysis. Pearson's correlation coefficient (r) is a measure of the strong association between the two variables involved in this research. This correlation result shows five of the independent variables have a significant correlation with the dependent variable. The first independent variable involves the contingency activity by preparation and response are significantly and positively $r= 0.031$ & $r= 0.475$ respectively. This result shows the correlated with contingency activity towards the oil spill. The second variable involves the government and non-government agencies factor by management, equipment, and team unit contingency was positive significantly correlated with the governments and non-governments agencies factor towards oil spill. Zhong et.al (2011), the correlation analysis has provided influence by steps and precaution measurements which supported. The results indicate that there exists a strong relationship between the variables since the independent variable of the contingency plan activities is significant and closely related to the government with a non-government agency factor.

V. CONCLUSION

The variables which significantly influence the efficiency in contingency plan towards the preparedness and response of oil spill at the terminal include equipment and facilities, environment factor and team unit of the contingency. The equipment and facilities assist in the technical operation. The technology equipment follows a new technology for efficient technical operation during the cleaning operation. The environment factor has determined the accident population area, economic activities, and physical geography. Team Unit Contingency is important as a role team in responding to any of oil spill accidents. The result shows a positive relationship between the contingency plan towards the oil spill at the oil terminals.

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AUTHORS PROFILE

Ismila Che Ishak: was born in Alor Setar, Kedah, Malaysia on 29.10.1072. She has attained higher education studies in Diploma in Business Studies (DBS) from ITM Arau, Perlis in 1993. She sustained a degree in Bachelor of Business Administration (BBA) from Universiti Utara Malaysia (UUM) in 1997. She has fulfilled master in Master in Business Administration (MBA) in 2004 from Universiti Sains Malaysia (USM). Currently, she is undertaking her P.h.D study in Maritime Management at UniKL MIMET as a part-time student basis. Her specialty is in maritime management and management study. She has vast knowledge in teaching courses such as integrated marine pollution control, business management, economics, marketing, organizational behavior, business mathematics, accounting, and finance. She has published papers in conference proceedings, technical notes, and Scopus indexed journals by using the name as Ismila Che Ishak. At UniKL she's also managing final year students for Final Year Projects (FYP) in research. She is an active Chartered Member in International Logistic and Transportation (CMILT) since 2013. Prior to joining UniKL MIMET, she had an acquaintance in teaching from a private institution in Penang and Klang, Selangor for nearly 10 years from 2001 to 2009. On top of that, she had five years working experiences in Seagate manufacturing company from 1997 to 2001. Currently, she is, fortunately, adoring her teaching and learning at UNIKL MIMET and dynamically encompassing herself in research, paper publications, and research grants.

Muhammad Nur Hakim Normadi was born in Melaka on 15.4.1995. He is hired as a Research Assistant (RA) below one internal research grant in UniKL MIMET. He is presently pursuing his degree of Bachelor In Maritime Operation (BMO) at UniKL MIMET, Lumut, Perak, Malaysia. As an undergraduate, he loves linking himself in research and has proficient in conducting research during his final year semester for Final Year Project. Even though he is new in the research ground, but he has revealed his passion for the research field. In addition, he is an energetic student and enjoy in donate ideas, energy in corporate social responsibility and other university events.

Nazliah Mohd Ali was born in Melaka, Malaysia on 8.6.1982. She has gained her higher education studies in Diploma in Computer Science from UiTM Seri Iskandar Perak in 2004. She continued her degree study in Bachelor of Science (Statistic) from UiTM Shah Alam, Selangor, Malaysia in 2007 and obtained her Masters in Statistic from Universiti Sains Malaysia in 2014. Currently, she is doing her P.h.D in Applied Mathematics at Universiti Perguruan Sultan Idris (UPSI) as a part-time student basis. Her concentration is in time series analysis, regression analysis, technical mathematics, statistics, applied mathematics, and mathematical modeling. She started her career in teaching since 2008 till present and had proficient teaching in UiTM and UniKL. She has an attentiveness involving herself in numerous research grants and has selected as a principal and active co-member. She has published in conference proceeding and journals and also actively participated in conferences. She is presently attached with UniKL MIMET in Lumut, Perak, Malaysia as a Lecturer and is supervising students in Final Year Projects, vigorously participate in research and publications.