Chapter 22
The Effect of Oil Spill from Current Oil Spill Incidents in Malaysia

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22.1 Introduction

Once the oil spill has accidentally been released into the ocean, it can produce huge problems. The oil spill is a dangerous environmental pollution problem that affects the environment and human health (Pham et al. 2021). The oil spills may harm sea creatures, spoil a day at the shorelines and beach, and get seafood dangerous to

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consume. It takes a long time to clean up the oil and evaluate the effects of pollution, and it prevents the ocean from recovering fast. The oil spills are initiated by numerous causes such as accidental leaks from ships and offshore oil platforms and often result in exorbitant economic costs and damaging marine ecological degradation (Shi et al. 2019). The oil spill from tankers or other ships, which contain the transportation of liquid or bulk such as crude oil, fuel oil, or heating oil is a significant source of hydrocarbon inputs into the oceans, lakes, and rivers (Doshi et al. 2017). Once an oil spill incident happens, it will harm the marine environment as well as the maritime population at large. The suffocating and contaminated effects of oil on flora and fauna could cause such effects on public health, the local economy because of the loss of tourism and aquaculture, and historically or culturally significant sites (Chilvers et al. 2016). Once, the pollution has filled the water, it might activate destruction to marine life, caused marine life to die, interrupt human health, and disturb the ecosystems either on the sea or on land (Abdullah 2014). The oil spill is predicted to pollute a much greater area than primarily projected due to aggressive weather conditions (Chung and Lee 2016). Even though oil spill incidents are infrequent, once it happens, it could lead to a catastrophic phenomenon and impairment of the sea, environment, people, offshore activities, fisheries, and economics, and crop a negative image of the country. The cleaning up of oily wastewater and crude-oil spills is a global challenge (Fan et al. 2021). Therefore, Malaysia is highlighting the commitment to pollution control of coastal and marine environments as we need to meet seawater quality objectives. Malaysia is also devoted to meeting the obligations of the quality environment as essential by the Environmental Quality Act 1974 (Mustafa 2012). Thus, this research aims to investigate the significant effects of the oil spill from the current oil spill incidents in Malaysia gathered from 11 expert agencies who are dealing with the oil spill response in Malaysia.

22.1.1 Data on the Oil Spill Incidents

The data on the oil spill incidents in Malaysian water as shown in Table 22.1 were gained from the Department of Environment (DOE) from 2014 to 2022 showing that 130 oil spill incidents have been declared as tier 1 or tier 2 as refer to Table 22.2 (Norazaimah 2019). Statistically, Table 22.1 shows there were 4 oil spill cases in 2022, 7 oil spill cases in 2021, 16 oil spill cases in 2020, 13 cases in 2019, 17 cases in 2018, 22 cases in 2017, 20 cases in 2016, 15 cases in 2015, and 16 cases in 2014. As of now in May 2022, there are no oil spill incidents cases reported as a tier 3 disaster (Azila 2021).

Table 22.1 The tier response (Sullivan et al. 2015)

Year	2022	2021	2020	2019	2018	2017	2016	2015	2014	Total
Cases	4	7	16	13	17	22	20	15	16	130

Table 22.2 The oil spill cases in Malaysian for 2014 to 2020 (Norazaimah 2019; Azila 2021)

Amount of spill	Proximity to operations		
Large of spill			Tier three
Medium of spill		Tier two	
Small of spill	Tier one		

22.2 Literature Review

22.2.1 The Effects of Oil Spill

Once the oil spill incidents occurred, it caused a serious reflection and vulnerability to all of us involving the marine life and ecosystem, economy, social, fishermen, and tourism industry and generated a bad image of the country. The major effects of the oil spill include marine habitats, coastal and health. (**a**) **Marine Habitats**: Even though major oil spills from tankers are rare occurrences, it remains one of the main worries for the numerous stakeholders in marine environmental protection since of the potentially major impacts of oil spills on marine ecosystems, important socio-economic impacts on communities dependent on coastal resources and high costs of clean-up operations (Goerlandt and Montewka 2015). The oil spill is one of the most serious causes of marine pollution which not only brings huge economic loss to society but also influences the marine ecological environment, leads to damages to ecological balance, and leads to the destruction of nature and the organism immediately or in a long term (Farrington 2014). (**b**) **Coastal**: Once the oil spill occurred, the spilled oil easily can penetrate the beach sediments. Coastal sand beaches and seashore meadows are the most sensitive to the effects of oil and have threatened habitats, plants, and small animals along the coast. The polluted spilled oil could also affect the shore vegetation and inhibits the absorption of sunlight which is necessary for photosynthesis and growth of the plants (Pezeshki et al. 2000). (**c**) **Health**: The spilled oil poses direct threats to human health from inhalation or dermal contact with the polluted oil and dispersant chemicals and indirect threats to seafood safety and mental health. An aliphatic and aromatic hydrocarbon are the main components of crude oil. Once the evaporated oil has reached the water surface, it can cause respiratory irritation and central nervous system depression, cause leukemia in humans, nasal tumors, and lung cancers in humans and animals (Solomon and Janssen 2010).

Table 22.3 Likert scale score of 7 points

1	2	3	4	5	6	7
Least important	Less important	Slightly important	Moderate important	Important	Very important	Most important

22.3 Methodology

22.3.1 The Pilot Test

A pilot test involves a small study to test research protocols, data collection instruments, sample recruitment strategies, and other techniques in preparation for research studies (Zailinawati and Schattner 2006). The pilot test involves the distribution of a questionnaire to five samples of the agencies and government authorities which covered the Marine Department, Department of Environment, PIMMAG, and Maritime Academy.

22.3.2 Likert Scale

A Likert scale is used as an important tool in psychology, social survey, and collecting attitudinal data. The Likert scales insist respondents choose amongst the 7-points level of agreement for that statement based on their point of view as shown in Table 22.3. The respondent's level of agreement with the statement provided is measured in the questionnaires using an application of the Likert scale (Dittrich et al. 2007). The scale is frequently utilized in surveys or questionnaires, for benchmarking feedback in several fields (Pescaroli et al. 2020).

22.3.3 The Proposed Summary of Theoretical Framework

Figure 22.1 supports the proposed summary of the theoretical framework which contains on independent and dependent variables of this research. It covers on the effects of the oil spill towards the current oil spill incidents in Malaysia.

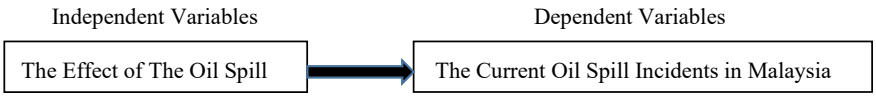

Fig. 22.1 The proposed summary of theoretical framework

22.4 Result and Discussion

The respondent's background shows most of the respondents were male 45 respondents or 76.3%. This is because the predominant gender functions in the maritime field are dominated by a male as this field necessitates masculine employees. The age of 31–40 years old represent most of the respondents or with 32 respondents or 54.2%. This is because at this age most of the respondents have completed their education study by having degree qualifications from various backgrounds to enable them to work in the marine-related field. It shows that most of the respondents have education at a degree level 34 respondents or 57.6%. Meanwhile, for the current position, most of the respondents were in the middle management 25 respondents or 42.4%. Thus, having a position in the middle management inspires the employees to effectively have a good quality working attitude. Meanwhile, the experience of the oil spill with below 3 years or by 27 respondents or 45.8% contributes to the highest responses. This is because not all the respondents are exposed to oil spill incidents directly. Finally, the familiarity of the respondent with the oil spill incidents shows at a moderate level with 33 respondents or 55.9%. Hence, it is anticipated that this respondent profile provides integrity and credibility to the information collected over the questionnaire evaluation circulation.

22.4.1 The Qualitative Analysis of the Effect of the Oil Spill from the Current Oil Spill Incidents

Table 22.3 shows most of the respondents have considered the effect of the current oil spill incidents in Malaysia would create damage to the marine life, ecosystem, and pollution of the seawater. Petroleum is known as one of the most significant contaminants in the marine ecosystem, and oil spills have a long-term effect on the marine environment (Yang et al. 2019). This feedback that supports the desired effect was given by 23 respondents out of 59 respondents in Group A. Meanwhile, the second effect involved 18 respondents on the crop effect on the coastal life, fisheries industries, food insecurity, food supply, and marine community as in Group B. The third group highest is Group C which is on the influence on the marine environment by 12 respondents respectively.

22.4.2 The Quantitative Analysis of the Effect of the Oil Spill from the Current Oil Spill Incidents

To achieve this aim, question No 1 was applied to rate the effects of the oil spill and the expert respondents were then asked to rate the effect on a five-point Likert scale, beginning with 1 for "Least effective" to 5 for "Most effective". All the 59

respondents that provided their feedback have given their ratings on the current effect involved allowing for reliable use of descriptive statistical analysis, mean and standard deviation analysis, and Cronbach's alpha on SPSS version 26 software to test the average consistency of the ratings given by all the respondents on the effects. The feedback received was from 11 organizations and shows most of the organization 90.00% has agreed that the response to the current oil spill incidents in Malaysia is moderately effective, Table 22.4.

Table 22.5 indicates that the mean is at 3.51. It shows that the average group score for the effects of the oil spill from the current oil spill incidents in Malaysia is a higher score of 3.51. Meanwhile, the standard deviation is at 1.023 and measures the absolute variability of the data on the effects of the oil spill from the current oil spill incidents. Table 22.6 shows feedback received from all 59 respondents for this section is valid and acceptable. Table 22.7 shows a measure of internal consistency

Table 22.4 The summary of the feedback

Group	Feedbacks	Total feedbacks	Ranking
A	Create damage to the marine life, ecosystem, pollution of the seawater	23	1st Highest
B	Crop effect on the coastal life, fisheries industries, food insecurity, food supply, marine community	18	2nd Highest
C	Influence on the marine environment	12	3rd Highest
D	Consequently, bad influence on human life, loss of income, human health, socio life	12	3rd Highest
E	Raise the cost of cleaning activities, increase manpower cost, increase the recovery process, increase time consumption	11	4th Highest
F	Effect on claim and compensation, profit, and loss management	5	2nd Lowest
G	Impact on availability of the equipment, maintenance of equipment logistics, transportation	8	3rd Lowest
H	The result of the low agency's collaborations, miscommunication, influence from a bad relationship with another agency	10	4th Lowest
I	The outcome of the low management, lack of Standard Operating Procedures (SoP), insufficient practice of the current contingency plan, lack of training and simulation, inaccurate oil spill trajectory	8	3rd Lowest
J	Affect the problem on economics, investment, politics, and damaging relationship with another country	8	3rd Lowest
K	Influence of the forecast of the insufficient meteorological condition and sea state	1	1st Lowest
L	Harmful to tourism activities, economic lost	12	3rd Highest

Table 22.5 Mean and standard deviation analysis

	N	Mean	Standard deviation
The effect of the oil spill	59	3.51	1.023
Valid N (listwise)	59		

Table 22.6 Case processing summary

		N	%
Cases	Valid	59	100.0
	Excluded	0	0.0
	Total	59	100.0

[a]Listwise deletion based on all variables in the procedure

Table 22.7 Cronbach's alpha reliability statistic

Cronbach's alpha	N of items
0.898	

reliability which is useful for understanding the extent to which the ratings from a group of judges held together to measure a common dimension (Osborne and Dillon 2008). Thus, a coefficient alpha of 0.898 from a maximum of 1 simply suggests that the scale scores obtained from the expert respondents are reasonably reliable (Samuel 2010).

22.5 Conclusion

In retrospect, the questionnaire survey can be counted as successfully conducted within less than two months the time taken for all the respondents to deliver their responses. The researcher has conducted an online questionnaire survey via a google form due to the Covid 2019 outbreak which allows the 59 respondents to respond while they are working from home and have sufficient time to respond to this questionnaire survey. A few reminders were sent to the purposive sampling of the response. Based on the analysis, the results show that the top five effects of the oil spill response are as follows. Firstly, the highest is to create damage to the marine life, ecosystem, and pollution of the seawater. Secondly, crops affect coastal life, fisheries industries, food insecurity, food supply, and the marine community. Thirdly, to influence the marine environment. Fourthly, it creates harm to tourism activities and economic loss. Finally, to raise the cost of cleaning activities, increase manpower cost, increase the recovery process, and increase time consumption.

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academic staff, supporting staff from external organizations together with other associated respondents from several agencies. Without good dedication and cooperation from the team members, it is hard for the research to be finished on time due to the Covid pandemic situation. This research financially obtained funding from the Ministry of Higher Education Malaysia through Fundamental Research Grant Scheme (FRGS) with grant number FRGS/1/2020/SSI03/UNIKL/02/1.

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