DEVELOPMENT OF SAFETY MODELLING BASED ON HUMAN FACTOR FOR FISHERMEN ZONE A: A CASE STUDY AT MANJUNG'S DISTRICT

Shaiful Bakri Ismail[1], Shamsul Effendy Abdul Hamid[2] , Mohammad Nor Faez Abdullah[3]

[1]*Marine Electrical & Electronic Engineering Technology, Universiti Kuala Lumpur, Malaysian Institute of Marine Engineering*

Technology Lumut, Perak, Malaysia

[2] *Universiti Pendidikan Sultan Idris, Tanjujng Malim, Perak*

[3]*Maritime Management, Universiti Kuala Lumpur, Malaysian Institute of Marine Engineering*

Technology Lumut, Perak, Malaysia

[1] *shaifulbakri@unikl.edu.my,* [2] *shamsuleffendy@unikl.edu.my,* [3]*norfaezabd@gmail.com,*

ABSTRACT

In this paper is about the study of safety level among of fishermen and safety modelling is presented based on human factor. The safety modelling was considered as a potential tool for predicting and analyse the safety of fishermen from the various of accident causes such as sinking, capsizing, hitting the object and take into consideration of human factors. Human factors are categories into three sub-factors which are management, financial and attitudes. These factors are selected based on the errors and unintentional mistakes with the poor of judgement and decision making during the fishery activities. The aim of this research is to design the safety modelling as a preliminary study to prevent an unnecessary accident at sea. A survey was conducted using questionnaires instrument and distributed among 50 fishermen as the main respondents in this research at the coastal area at Manjung's district. The data also are collected from government agency that related in fisheries sector including Malaysian Department of Fisheries (DOF) and Lembaga Kemajuan Ikan Malaysia (LKIM). The outcome of safety modelling will contribute toward the concept of safety and accident causal for fishermen that parallel with the current developments in the fishery industry with a good level of accuracy. This safety modeling was designed and measured using SPSS software and employs a multiple liner regression model to measure the association between variable, showed a good fit of the model (adjusted = 56.47%) with indicates that the precision of the management, attitudes and financial performance. The results can be used by local authorities for enhancing the competencies among the fisherman in term of safety and prevent unpredictable accident.

Keywords: Safety Modeling, Fisherman, Accident, Human Factors

INTRODUCTION

The fishermen's accident statistics issued by the Malaysian Maritime Enforcement Agency (MMEA) found that the case of accidents among fishermen in Malaysia increasing by the year. It is discovered that the number of accidents increased from in 2009 was 19 accidents increased to 43 in 2014 [1]–[6]. Safety at sea is a very serious problem in developing countries. Food and Agriculture Organization (FAO) estimates that roughly 30 million fishers are working aboard 4 million fishing vessels operating in capture fisheries, 1.3 million decked and 2.7 million undecked vessels. About 98% of these vessels are below 24 meters in length, and not covered adequately by international rules and regulations. It seems reasonable that the accident rate in countries for which information is not available might be higher than those that supply statistical information. Thus, the number of global death rates might be considerably higher than the figure of 24,000 deaths worldwide per year estimated by the International Labour Organization (ILO) in 1999 [7]. According to Jon Ivar Harold (2010), there are some key factors to accidents which are the attitude toward security precautions, safety training, job pressures, security management attitudes, co-operation

between colleagues, job satisfaction and attitudes towards regulation and law [8]. In daily activities of fishing, fishermen are always vulnerable to accident risk.

In this research, the study's scope focused on the Manjung district. From 2012 to 2015 is the number of fishermen showing that Perak has the largest number of fishermen in the Malaysian Peninsula. By 2015, the number of fishermen will reach 18,000 people. Only Sabah has more fishermen in the state of Perak with an estimated 25,000 people than the number of fishermen. This study will focus on fishermen registered under the fishermen area (PNK). Perak was the highest in Malaysia for six consecutive years due to the number of fishing catches and the total value of fishing catches between 2011 and 2016 and Manjung is selected as only one location for distributing the questionnaires as this district shows the increasing number of fishermen by year [9]. Thus, this research is aimed to develop a preliminary study by developing a fisherman's safety model based on human factors for fishermen and will help the fishing industry expand by reducing the number of accidents among fishermen. It also helps to build confidence and make the fishermen more productive because of the feel safe while working at sea. These accident factors can be analysed and refined in order to provide solutions.

LITERATURE REVIEW

The literature review is among the main processes that are carried out during the research. This method is a technique used to verify and identify the information and methods used in previous projects. The purpose of the literature review is to provide the reader with a general description of the relevant methods used for the best outcomes. The review of many research papers, written by numerous authors, was discussed in this section.

Safety in Fisheries Sector

Safety is about preventing people from being harmed at work, by controlling the risks and by providing a satisfactory working environment [10]. The statement supported by Maurice (2001), safety has been defined as a state in which hazards and conditions leading to physical, psychological or material harm are controlled in order to preserve the health and well-being of individuals and the community [11]. In the field of fishing activities, the improvement in safety and health at sea has been a major concern of numerous institutions, national government, and non-governmental organizations. As a result, the safety of fishermen always be a concern to the government or non-government and looking forward to minimizing the accidents that occur between fishermen [12].

Fishing is one of the most dangerous activities in the world [13]. The International Labor Organization (ILO) and the Food and Agriculture Organization (FAO) report that, while comprising less than one percent of the world's population, 7 percent of all worker deaths occur in the fishing industry. The ILO estimates that 24,000 deaths and 24 million non-fatal injuries are reported to the fishing industry worldwide each year [7]. The people affected by accidents at sea are often among the poorest in society. The responsibility for the safety aspect in the fisheries sector is very often shared between the governmental body for fisheries and the maritime organization. A successful fisherman safety program requires involvement from the grassroots. The society has to work constantly and effectively for safety at sea in the local fishing villages. Local sea safety committees should be established or re-established to raise awareness of fishermen and their families of the risks, to train fishermen in safety at sea, and to register local accidents at sea reports [14]. In Malaysia, Community Development and Fishermen Organisation been established by Fisheries Development Authority of Malaysia to strengthen commercialization and informational programs of the fishermen's association as a prime mover in the fishery sector and it also boosts the fishermen's standard of living and quality of life by active involvement of fishermen's family members at all levels. The coastal community is playing important roles in Malaysia, especially in ensuring the nation's food security as portions of them are working as a fisherman [15].

The responsibility for the safety aspect in the fisheries sector is very often shared between the governmental body for fisheries and the maritime organization. A successful fisherman safety program requires involvement from

the grassroots. The society has to work constantly and effectively for safety at sea in the local fishing villages. Local sea safety committees should be established or re-established to raise awareness of fishermen and their families of the risks, to train fishermen in safety at sea, and to register local accidents at sea reports [14]. In Malaysia, Community Development and Fishermen Organisation been established by Fisheries Development Authority of Malaysia to strengthen commercialization and informational programs of the fishermen's association as a prime mover in the fishery sector and it also boosts the fishermen's standard of living and quality of life by active involvement of fishermen's family members at all levels. The coastal community is playing important roles in Malaysia, especially in ensuring the nation's food security as portions of them are working as a fisherman [15].

Accident

An Accident is unforeseen and unplanned sequences of events that occur through a combination of multiple causes, resulting in individual physical injury, property damage, and loss. According to Shaari (2007), accidents are defined as unexpected and planned events or circumstances. It can also have business consequences, such as cost of compensation, productivity loss, and a decrease in employee morale. In the past, when referring to an unplanned, unwanted event, the term accident has often been used. To many, the accident indicates a random event that could not have been stopped [16].

Comparisons of the safety record of the fishing industry with other industries indicate that the industry continues to be the most dangerous by a significant margin [17]. At the community level, there is also a high risk of being killed or injured while fishing. Diversity in the causes of accidents categorized by classification or under different headings and specifically related to the size of the ship requires specific laws relevant to each event. According to Murray et al. (2007), the possible contributory causes of the high rate of injuries are a fatalistic attitude to accidents and safety, and a high level of anxiety and worry among fishermen. Most of the accidents happen because of the recurring causes of the accident itself. The factors basically can be divided into three categories which are the human factor, technical factor, and extended factor. Technical factors come from the failure of equipment such as the poor state of the engine, the use of unreliable fishing gear while extended factors mainly include meteorological conditions [18]. This research is focused on human factors that case the number of accidents in Malaysia.

Statistics of Accident

Fishing is considered to be the most dangerous occupation in the world, with an approximate death rate of at least 80 lives per 100,000 fishermen from an International Labor Organization (ILO). This figure is based on data from countries with a system for reporting and analyzing accidents. From the global perspective, the International Labour Organization (ILO) estimates that approximately 24,000 deaths and 24 million non-fatal injuries occur each year in fisheries [8]. The number of accidents involving fishermen in Malaysia is increasing by year. It is found that 19 incidents were recorded in 2009, going up to 43 in 2014 [1]–[6]. Data on the number of accidents by sector between 2015 to 2019 by the Department of Occupational Safety and Health shows an increase in the number of accidents in the Fisheries, Agriculture and Forestry sector from 2454 cases in 2015 to 2730 cases in 2019 [19].

Human factor

Accident-causing human factors are factors that lead to an accident and are directly due to an accident affecting the operator, worker, or personnel. Human factors include, but also go beyond intentional violations of safety rules or participation in risky behaviour. We include such variables as stress, tiredness, poor maintenance and impairment from drugs or alcohol. A comprehensive understanding of the essence of safety, as well as its absence, is a prerequisite for formulating successful measures to improve safety. Analyses of the safety of fishermen and fishing vessels should go beyond the direct causes and effects of accidents such as sinking, capsizing, trips, knock or struck by the object and take into consideration human and organizational factors. Many authors claim that the main reason for accidents in the fishing industry is human error, which is said to account for between 75% and 96% of all accidents in the industry [8]. It became a significant consideration to better understand that human awareness of higher environmental protection, such as accidents at sea that could harm the environment. Most of these accidents were not caused by just one mistake but were caused by several mistakes. The human factor in causing the mistake turns out to be very influential in the occurrence of incidents from the investigation results.

Management

One way to reduce accidents is to improve fisheries management. Current rules and regulations are not strong enough in many fisheries to limit fishing capacity to a sustainable level. The concept of management in this means regulation and enforcement of fishery resources and provides a satisfactory working environment [20]. A good fisheries management is necessary for fishermen's safety. According to Roberts, 2003, if the fishery management wants to take action or decision, it must consider the whole safety aspects of fishermen [21]. Among the issues surrounding trawlers in Malaysia are the lack of fisheries management plans and the lack of funding for fisheries activities management [22]. According to OSHA-EU, 2010, shown deficiencies of work organisation, basic prevention, prevention management, use of occupational safety and health signs and protection, equipment of workplaces, and neglecting of individual factors in common approach can be classified as organisational causes. Safety and health at work might be threatened by more indirect effects of changing organisational practices.

Financial

In small-scale operations or living in coastal fishing communities, as many as 90 percent of these 156 million could be employed. There are still many fishermen who have a problem and belongs to the category of rural poor. Since they are certainly not all poor, the potential extent of poverty in small-scale fisheries would clearly be an upper limit. Fishermen are often classified among the poor, particularly fishermen from Asia. Poverty among fishermen is an issue that needs to be taken seriously. The fishermen cannot enjoy their life like other people because of the poverty that they have to face [23]. Hatcher (2000) conducted a study on the role of public funds in the process of direct subsidy arrangements such as fishing boats, subsidies for shipbuilding and upgrading existing fishing boats. The study results discovered that the funds were able to raise the level of well-being and the quality of life of fishermen [24]. In addition, another study was made by Shaffril et al., (2013). This study is about the Malaysian fishermen's cycle of social adaptation to climate change. The findings show the fishermen mostly only got their education at primary schools and they also not been exposed to fishing technology. Fishermen may survive in disadvantages due to the lack of other knowledge and skills. Naturally, their wages are very low, their quantity of life is also low although fishing industry are most beneficial industry in Malaysia [25].

Attitudes

Attitudes in fisheries like target species chosen, allocation of fishing effort, gear type and fishing method, security, and trip characteristics will be defined by the risk perception of fishermen [26]. In the face of unpredictable circumstances, it is important to understand the factors that underlie the attitudes of fishermen, their decisions and their strategies. Fishermen's attitudes at sea while doing work may depend on the environment as their working environment is not comfortable as they have to remain on the vessel's board staying in the open air for long sea trips. It can be mistakes in understanding that can leads to break rules and procedures.

PROBLEM STATEMENT

Prevention of accidents at work is a major concern of safety. In Malaysia most research about safety and accident more towards the construction and general sector. One of the substantial concerns in the maritime industry is a safety at sea. It involves the prevention of human life, injuries, environmental pollution. In order to improve safety level at sea, maritime authorities have adopted a set of rules and regulations since marine accidents can cause fatal damages to the human life and environment [27], [28]. Recent studies have shown that fishermen are constantly exposed to the risk of accidents while at sea. Every year there is an increase in terms of cases of fishermen accidents. In line with the stated problem statement, as a summary of this discussion, it turns out that it is a necessity to study the human factors that cause accidents of coastal fishermen during fishing operations.

SIGNIFICANCE OF RESEARCH

This research will lead to a deeper understanding of the fishermen's definition of safety that might help them. Furthermore, it takes with an overview of current developments in the fishery industry and completed elements of accident causal. Fishermen can give opinions as they work at the sea about their problems. They may be aware of the danger of their work and more proficient in their work environment. Next, it will also provide suggestions to overcome existing issues. The effort was made to allow relevant parties, particularly government agencies such as the LKIM, the Fisheries Department, the Fishermen's Association Area (PNK) and fishermen-related NGOs. In this regard, this study can summarize the causes of success and failure of efforts to reduce the risk of coastal fishermen's accidents in Malaysia. It is hoped that the efforts of the responsible parties will reduce the risk of fisherman accidents in the country. This study can provide a more comprehensive picture of the security status among Malaysian fishermen from the perspective of lawmakers and policymakers. These accident factors can be analysed and refined in order to provide solutions.

RESEARCH METHODOLOGY

This section discussed the project's methodology. It elaborates detail on research tool with system and hardware development. The methodology for this project is presented which include software tool, design specifications, simulation design and prototype design.

Research Location

Perak is a major fishing source in Peninsular Malaysia, covering 30% of the total catch in 2015 at 350 thousand tons. Perak has 18,042 registered fishermen and 6271 boats. In Perak, the district of fishermen is in Kerian, Manjung, Hilir Perak and Larut Matang [9]. This study will take place in Manjung, Perak. Based on number of fishermen working on licensed fishing vessels by fisheries district, it stated that Manjung is the highest number of fishermen in Perak.

Statistical Package for the Social Sciences

SPSS is commonly used in social science statistical analysis. The best example of SPSS consumer is business analysts, medical researchers, survey companies, government, academic researchers, advertising organizations and data miners. In this study, the data acquired in questionnaires will be analyzed using the SPSS approach methods. It analyzes huge data within seconds anf generating an unlimited range of simple and sophisticated statistical results including simple frequency distribution tables, percentages, cumulative frequencies polygons, graphs, pie charts, binomial and other distribution [29]. SPSS is one of the most widely used programs in social science for statistical analysis.

Pearson Correlation

The Pearson Correlation (r) test was designed to examine the relationship between the variables. In this study, the relevance studied involves independent variables such as management, financial and attitudes. This method used to measure that shows the strength and direction of the relationship between the variables involved based on the Table 1 below.

Table 1: Strength of Correlation

Coefficient Correlation	Explanation
.70 or more	Very strong connection
.50 to .69	Strong connection
.30 to .49	Moderate connection
.10 to .29	Weak connection
.01 to .09	Connection can be ignored

Multiple Regression

Multiple regression is used to identify changes in two or more factors (independent variables) that contribute to changes in a dependent variable and also to determine the predictors of accidents. Three multiple safety level regression analyses are performed separately. The purpose of a regression analysis is to find a reasonable regression equation to predict the average value of a response dependent variable Y that is associated with a fixed value of one independent variable X. If more than one independent variable were used to predict the average value of a response variable, then would need an analysis of multiple regressions.

The statement of the general equation is the basis for assigning a relationship equation between variables. The formula below represents the general equation for relationships between variable of multiple regression. The variables are based of the Figure 1 below:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (1)$$
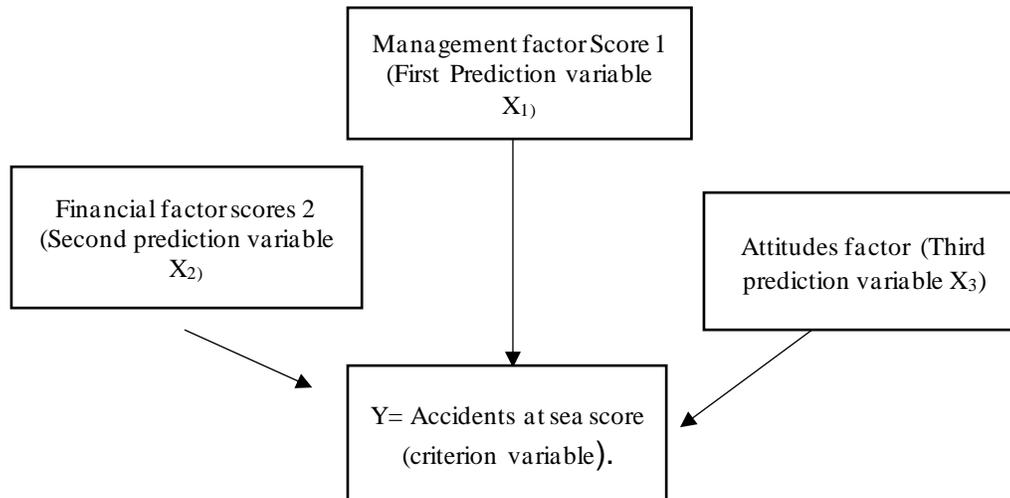
Where:

Y = Dependent variable

Xi = Independent variable

β_0 = the base of the linear regression line on the Y-axis

i = number of factors

β_i = regression line gradient expressing the relationship between the variables.

ε = estimated error

Figure 1: Variables for Regression

RESULTS AND DISCUSSION

This section explains and focuses on the design and analysis of fisherman's safety model. The results were simulated using SPSS software. The regression analysis resulted in a multiple coefficient of correlation (R) of 0.751, which means a strong relationship existed between the dependent variable and the set of predictors as a whole (Table 2). R is similar to the r in the Pearson correlation model of multiple regression, but it only has a positive sign showing the strength of the relationship as a whole regardless of whether it is positive or negative. The derived multiple determination coefficient (R^2) is 0.564, indicating that the set of predictors describes 56.4 percent of differences in the dependent variable. This also indicates that the precision of the management, attitude and financial performance of the factor is 56.4%. The overall regression model was significant even at p=0.000 with F-ratio of 19.839 as shown in Table 3 below. Table 4 displays the regression parameter estimates that reflect that predictor variable's regression coefficient or slope. The t statistics show the importance of the estimates of the constant and each of the parameters.

The regression model has a constant of 1.370 and parameter estimates for attitude, management and finance are 0.122, 0.442 and 0.009 respectively.

Table 2: Model summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.751[a]	.564	.536	.28304

a. Predictors: (Constant), Finance, management, attitude

b. Dependent Variable: safe

Table 3: Anova Analysis

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.768	3	1.589	19.839	.000[b]
	Residual	3.685	46	.080		
	Total	8.453	49			

a. Dependent Variable: safe

b. Predictors: (Constant), Finance, management, attitude

Table 4: Coefficients Result

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.370	.328		4.172	.000
	attitude	.122	.142	.152	.858	.396
	management	.442	.137	.533	3.216	.002
	Finance	.099	.141	.115	.704	.485

a. Dependent Variable: safe

In multiple regression, there two tests of significance to consider. The first requires to look into the significance of the regression model as a whole. As usual, the purpose of the test depends on the value of F, which is the sum of all the explanatory variables between the stated and unknown variations of the dependent variable. In this fishermen safety test, the derived F-ratio (19.839) was sufficiently large to make the variance analysis produces a significant result and indicates that the regression model can fairly be agreed to reflect the relationship between dependent and explanatory variables in the population being studied.

Table 5: Contribution of Independent variables

Independent variable	R	R^2	Variance Explained
Attitude	0.658	0.433	43.3%
Management	0.736	0.542	54.2%
Finance	0.624	0.390	39.0%

In this safety of fishermen analysis, three variables entered in the analysis which is attitude, management and finance were the explanatory variables found to have the power in explaining variation. High values of t are not only associated with significance but also the percentage of variation in the dependent variable that is explained by each explanatory variable. Management with t values 3.216 and significance p=0.002 was such an important variable in explaining safety of fishermen that its inclusion in the analysis increased R^2 of the regression model from 43.3% to 54.2% as stated in Table 5, implying that this variable contributed approximately 10.9% of total explanation in the variation of levels of safety of fishermen. While for the finance can be declared as not a significant explanatory variable, and its inclusion in the regression analysis contributed only 0.09 % to the total explanation.

In general, the analysis yielded a significant regression model with F value of 19.839 and significant at 0.01 level. The derived model is:

$$\text{Safety} = 1.370 + 0.122\, X_1 + 0.442\, X_2 + 0.099\, X_3 \quad\text{...................................... (3)}$$

The safety of fishermen was found to be positively correlated with attitude, management. and finance. The high safety of fishermen was associated with a good attitude, proper management and financially stable. Taking the regression model as a whole, it was found that 54.2% of the variance in safety among fishermen could be explained by the three independent variables. As shown in table 6, at the individual level, management was the most significant variable explaining variations in the safety of fishermen, followed by attitude and financial.

Table 6: Regression Coefficients

Independent variable	Coefficient	T-value	Sig
Attitude	0.122	0.858	0.000
Management	0.442	3.216	0.002
Finance	0.099	0.704	0.485

CONCLUSION AND RECOMMENDATION

Based on the results achieved from data analysis, the management factor contributed more to the safety among the fishermen. This research will be a good reference to fishermen about safety at sea and also will help to build confidence and make the fishermen more productive because of they feel safe while working at sea. In this research, it only used three variables that can be the factors for the safety of fishermen which are management, attitude and financial factors. It is possible to identify more independent variables such as nature, equipment, and group of fishermen and implement some of important laws, procedures and policies that focus only on target groups. Other than that, increasing number of respondents will give an accurate result and support the analysis of regression. Consequently, larger sample sizes will decrease estimation error. This research only covered three locations in Manjung such as Kampung Permatang Pasir, Kampung Sitiawan and Kampung Deralik. It is interesting and good suggestion to expand the location of survey including Kampung Batu 8, Segari and Kampung Acheh.

REFRERENCES

[1]   APMM, "Laporan Tahunan 2011 Agensi Penguatkuasaan Maritim Malaysia, Jabatan Perdana Menteri," 2012.

[2]   APMM, "Laporan Tahunan 2010 Agensi Penguatkuasaan Maritim Malaysia, Jabatan Perdana Menteri," 2011.

[3]   APMM, "Laporan Tahunan 2014 Agensi Penguatkuasaan Maritim Malaysia, Jabatan Perdana Menteri," 2015.

[4]   APMM, "Laporan Tahunan 2013 Agensi Penguatkuasaan Maritim Malaysia, Jabatan Perdana Menteri," 2014.

[5]   APMM, "Laporan Tahunan 2012 Agensi Penguatkuasaan Maritim Malaysia, Jabatan Perdana Menteri," 2013.

[6]   APMM, "Laporan Tahunan 2009 Agensi Penguatkuasaan Maritim Malaysia, Jabatan Perdana Menteri," 2010.

[7]   I. L. O. ILO, "Safety and Health in the Fishing Industry—Report for discussion at the Tripartite Meeting on Safety and Health in the Fishing Industry," Geneva, 1999.

[8]   J. I. Håvold, "Safety culture aboard fishing vessels," *Saf. Sci.*, vol. 48, no. 8, pp. 1054–1061, 2010.

[9]   Jabatan Perikanan Malaysia, "Perangkaan Perikanan Tahunan 1990 – 2019," 2020.

[10]   P. Hughes and L. Hughes, *Easy guide to safety and health*, Second Edi. Routledge, 2015.

[11]   P. Maurice, M. Lavoie, L. Laflamme, L. Svanström, C. Romer, and R. Anderson, "Safety and safety promotion: definitions for operational developments," *Inj. Control Saf. Promot.*, vol. 8, no. 4, pp. 237–240, 2001, doi: 10.1076/icsp.8.4.237.3331.

[12]   P. Antão, T. Almeida, C. Jacinto, and C. Guedes Soares, "Causes of occupational accidents in the fishing sector in Portugal," *Saf. Sci.*, vol. 46, no. 6, pp. 885–899, 2008, doi: 10.1016/j.ssci.2007.11.007.

[13]   P. Antão, T. Almeida, C. Jacinto, and C. Guedes Soares, "Causes of occupational accidents in the fishing sector in Portugal," *Proc. Eur. Saf. Reliab. Conf. 2006, ESREL 2006 - Saf. Reliab. Manag. Risk*, vol. 1, no. September, pp. 741–749, 2006.

[14]   P. Danielsson, M. Kuyateh, R. Ravikumar, A. Westerberg, and Y. Yadava, "Saftey at Sea for Small-Scale Fisheries in Developing Countries - Safety for Fishermen: The Way Forward," 2010.

[15]   H. A. M. Shaffril, A. Abu Samah, and J. L. D'Silva, "Climate change: Social adaptation strategies for fishermen," *Mar. Policy*, vol. 81, no. March 2016, pp. 256–261, 2017, doi: 10.1016/j.marpol.2017.03.031.

[16]   N. L. H. Shaari, "Keselamatan dan kesihatan perkerjaan: satu kajian di sekolah rendah dan menengah di negeri Selangor," Universiti Malaya, 2007.

[17]   J. Wang, A. Pillay, Y. S. Kwon, A. D. Wall, and C. G. Loughran, "An analysis of fishing vessel accidents," *Accid. Anal. Prev.*, vol. 37, no. 6, pp. 1019–1024, 2005, doi: 10.1016/j.aap.2005.05.005.

[18]   M. Murray, D. Fitzpatrick, and C. O'Connell, "Fishermen's blues: Factors related to accidents and safety among Newfoundland fishermen," *Work Stress*, vol. 11, no. 3, pp. 292–297, 1997, doi: 10.1080/02678379708256842.

[19]   J. K. dan K. P. Malaysia, "Laporan Tahunan JKKP 2019," 2020.

[20]　J. Turner and G. Petursdottir, "Safety at sea for fishermen and the role of FAO," in *Proceedings of the International Fishing Industry Safety and Health Conference*, 2002, p. 37.

[21]　C. Roberts, "Commercial fishing vessel safety," in *Proceedings of the International Fishing Industry Safety and Health Conference*, 2003, p. 57.

[22]　A. A. Nuruddin and S. M. Isa, "Trawl fisheries in Malaysia - - - issues , challenges and mitigating measures," *APFIC Reg. Expert Work. Trop. Trawl Fish. Manag.*, no. October, pp. 1–6, 2013.

[23]　R. M. Zain, M. K. A. Kamarudin, and M. H. M. Saad, "Assessment of Quality of Life on Fishermen Community in Kuala Terengganu, Malaysia: A Review," *Int. J. Acad. Res. Bus. Soc. Sci.*, vol. 8, no. 10, pp. 640–650, 2018, doi: 10.6007/ijarbss/v8-i10/4770.

[24]　A. Hatcher, "Subsidies for European fishing fleets: The European Community's structural policy for fisheries 1971-1999," *Mar. Policy*, vol. 24, no. 2, pp. 129–140, 2000, doi: 10.1016/S0308-597X(99)00024-X.

[25]　H. A. M. Shaffril, B. A. Samah, J. L. D'Silva, and S. M. Yassin, "International Journal of Climate Change Strategies and Management The process of social adaptation towards climate change among Malaysian fishermen Article information : To cite this document :," *Int. J. Clim. Chang. Strateg. Manag.*, vol. 5, no. 1, pp. 38–53, 2013.

[26]　O. Huchim-Lara, S. Salas, J. Fraga, N. Méndez-Domínguez, and W. Chin, "Fishermen's Perceptions and Attitudes toward Risk Diving and Management Issues in Small-Scale Fisheries," *Am. J. Hum. Ecol.*, vol. 5, no. 1, pp. 1–10, 2016, doi: 10.11634/216796221605760.

[27]　O. Soner, E. Akyuz, and M. Celik, "Establishing a central operation approval system in ship management companies based on a human reliability assessment model," *Risk, Reliab. Saf. Innov. Theory Pract. - Proc. 26th Eur. Saf. Reliab. Conf. ESREL 2016*, no. September, p. 149, 2017, doi: 10.1201/9781315374987-139.

[28]　C. Hetherington, R. Flin, and K. Mearns, "Safety in shipping: The human element," *J. Safety Res.*, vol. 37, no. 4, pp. 401–411, 2006, doi: 10.1016/j.jsr.2006.04.007.

[29]　D. Arkkelin, "Using SPSS to Understand Research and Data Analysis," *Psychol. Curric. Mater. 2014*, p. 194, 2014, [Online]. Available: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.139.2050&rep=rep1&type=pdf.