

# Determining Factors Influencing Livelihood Strategies Decisions of Coastal Fishermen in Pulau Pangkor, Malaysia

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*This article examines factors influencing varying decisions made on livelihood strategies amongst coastal fishermen in Pulau Pangkor, in the state of Perak in Peninsular Malaysia. Two livelihood strategies - Livelihood Intensification and Livelihood Diversification - were chosen as the key dependent variables. The seven independent variables were social demographic, trend of income, coping strategies, risk associated with fishing activities, willingness to venture, willingness to learn and sustainable income. Since there were more than one dependent variables, and using a newly-developed framework, Structural Equation Model (SEM) was used to assess the relationship between each independent variable and dependent variables. The findings of this research demonstrate that (1) education level, level of income versus expenses, trend of output, coping strategies adopted, risk associated with fishing activities, and sustainable income are significant factors affecting fishermen's choice of livelihood intensification strategies, while (2) education level, level of income versus expenses, trend of output, and willingness to learn are significant factors affecting their choice of livelihood diversification strategies. The findings then were used to build the Livelihood Strategies Determinant Framework (LSDF), which is more appropriate for the coastal fishermen of Pulau Pangkor.*

*Keywords: Livelihood Strategies, Fishermen, Livelihood Intensification, Livelihood Diversification, Pulau Pangkor.*

## Overview

The island of Pangkor (Pulau Pangkor in Malay) is located off the coast of the state of Perak in Peninsular Malaysia. It is a small island with a total area of just over 8 sq km. The island is a well-known tourist destination attracting visitors from the mainland especially during the

weekends. Due to the availability of marine resources, the key economic activity on the island is in the fisheries sector. Out of a total 25,000 islanders, about 64% of the population is involved in the sector (Perak Tourism, 2019). The Fishermen's Association of Pulau Pangkor estimated that there are 897 registered fishermen on the island.

The marine fisheries sub-sector is divided into two categories, i.e. coastal and deep-sea fishing. This research will be focusing on fishermen who carry out their fishing activities within the coastal area, which is defined by the Department of Fishery as the zone less than 30 nautical miles from the coast. According to the Department of Fisheries Malaysia (2016), most fishermen in the State of Perak (where Pulau Pangkor is located) are using drift and gill net, trawl net and fish purse seines, which reflects that most of them are coastal fishermen.

Table 1 shows that the fisheries industry in Malaysia produced 1,458,128 tonnes of captured fish, of which 1,193,006 (82%) were contributed by the coastal fisheries sub-sector. In the state of Perak alone (where Pulau Pangkor is situated), it contributed 264,120 tonnes (22%) of total coastal production of the year, which made Perak the biggest contributor to the coastal fisheries sub-sector. The increment in coastal fish production can be seen from Table 1 until year 2016. At the same time, it is also important to note that the coastal fisheries sub-sector has been heavily exploited and over-saturated beyond sustainable levels in most areas of Peninsular Malaysia as compared to the deep-sea fisheries sub-sector, which still has room for expansion (Busing 2001; Food and Agriculture Organization, 2001). In terms of licensing for vessel and fishing equipment, the Department of Fishery Malaysia has stopped the issuance of licenses for the coastal fisheries sub-sector, with only international waters permits still available, since the resources from the coastal zones are considered saturated (Department of Fishery , 2015).

### **Literature Review**

According to Peng, Zheng, Robinson, Li and Wang (2017) in their studies of China's local farmers, livelihood strategies can be grouped into three categories, i.e. farming, local off-farm and labour-migrant. This is in line with the IDS Sustainable Livelihood Framework by Scoones (1998), which also cited three types of livelihood strategies, namely, agricultural intensification or extensification, livelihood diversification and migration. Peng et al. (2017) presented in their report that farming households had the lowest livelihood capitals, besides natural capital, as compared to local off-farm and labour migrant households, which resulted in the local off-farm and labour migrant community achieving a better livelihood status.

TABLE 1  
Capture Landings of Fisheries 2014-2016

Year	2014		2015		2016	
Zone	Coastal	Deep-Sea	Coastal	Deep-Sea	Coastal	Deep-Sea
West Coast	667,447	81,259	681,377	78,367	721,534	92,224
Perlis	85,158	11,293	73,678	11,821	87,269	12,597
Kedah	152,174	3,936	154,361	2,740	159,467	4,411
Pulau Pinang	45,880	-	49,783	-	56,748	264
Perak	264,120	65,224	283,047	63,806	292,395	74,952
Selangor	91,632	805	90,026	-	93,460	-
Negeri Sembilan	806	-	704	-	717	-
Melaka	1,936	-	2,019	-	1,790	-
West Johor	25,742	-	27,759	-	29,687	-
East Coast	181,383	130,377	165,880	218,898	195,391	240,023
Kelantan	28,477	33,761	39,095	107,348	69,819	148,939
Terengganu	51,618	7,167	46,025	5,160	40,833	3,869
Pahang	45,267	45,879	49,134	62,403	62,471	57,947
East Johor	56,021	43,570	31,626	43,987	22,267	29,268
Peninsular Malaysia	848,830	211,635	847,257	297,265	916,925	332,247
East Malaysia	344,176	53,487	301,472	40,057	278,435	46,840
Sarawak	115,620	41,630	116,426	31,153	111,861	36,132
Sabah	205,686	8,990	167,870	7,573	150,314	9,459
Federal Territory of Labuan	22,871	2,867	17,176	1,331	16,260	1,249
Grand Total	1,193,006	265,122	1,148,729	337,321	1,195,360	379,087
	1,458,128		1,486,051		1,574,447	

Source: Department of Fisheries Malaysia, 2016

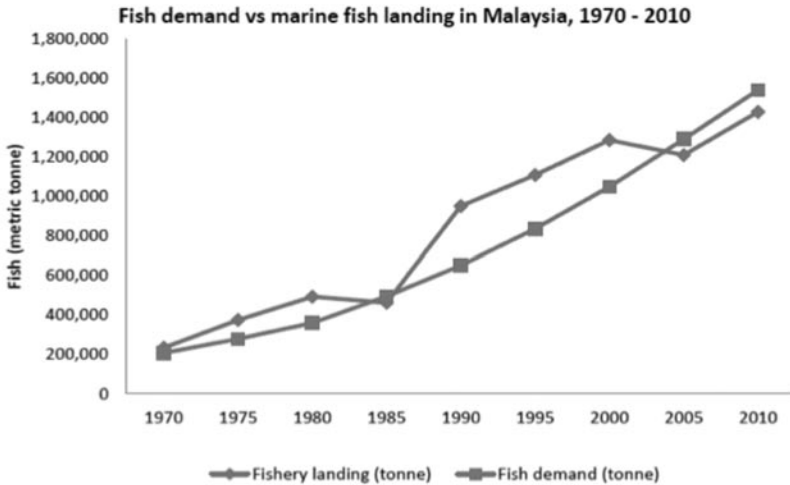
Past research on only two types of livelihoods strategies, i.e. livelihood intensification and livelihood diversification, is highlighted in this article while the third, i.e. migration, was considered insignificant in the context of Pulau Pangkor coastal fishermen.

### *Livelihood Intensification*

Livelihood intensification may occur as a result of an increase in (a) gross output per unit of input, (b) labour input, (c) the value of output, or (d) productivity due to changes in technology (Carswell, 1997). In real life, a combination of all these increases commonly occurs. However, there is no one best combination found yet, as it will depend on the case study chosen. For livelihood intensification to occur, either one or both an increase in demand for output or decrease in the availability of natural resources (and/or labour resources) need/needs to occur (Carswell, 1997).

Demand may increase through population growth, migration or

FIGURE 1  
Fish demand vs marine fish landings in Malaysia, 1970-2010



Source: Teh 2012

increase in market demand in the country or increase in world demand for the output. Demand for fisheries output in Malaysia has increased from 1970 to 2010 as shown in Figure 1 (Teh 2012). This has resulted in Malaysia being an importer of fisheries output, both from marine fisheries and aquaculture. This has been made worse by the fact that most high-value fish species reared and captured in Malaysia have been exported as a result of high world demand for that output (Food and Agriculture Organization 2009). Therefore, it is clear that fishing livelihood intensification is badly needed in Malaysia, and Pulau Pangkor, as one of the major contributors of marine fisheries output in Malaysia, will have to contribute towards that responsibility.

On the other hand, natural resources may increase through the right of access to natural resources (through institutions), which will ultimately increase the value of output per input. However, an increase in labour resources may include increase of output per labour, which can be achieved through training, funding and introduction of new fishing methods and technology. It may also be achieved through an increase in the number of labour input.

Many researchers have classified Southeast Asia fishing livelihood as one that is experiencing capital intensification from small-scale rural fishing (Eder 2009; Salayo, Garces, Pido, Viswanathan, Pomeroy, Ahmed, Siason, Seng and Masae 2008). As a consequence, the tourism sector has always been the alternative economic sector that national or

local governments look to as an option in building the livelihood strategies portfolio of the fishermen community (Fabinyi 2010). This capital intensification is mainly due to the intensification of the aquaculture sector (Pomeroy, Parks and Balboa 2006; Sheriff, Little and Tantikamton 2008), overfishing (Sadovy, Donaldson, Graham, McGilvray, Muldoon, Phillips, Smith and Yeeting 2003), deterioration of ecosystems and severity of environmental problems (Salayo et al. 2008). In other words, a major investment is needed to achieve livelihood intensification in Southeast Asia. This research will examine the feasibility of local fishermen raising capital needed to re-invest in the industry, to acquire new skills or perhaps apply available skills, as a means to intensify their livelihoods.

### *Livelihood Diversification*

Livelihoods in many rural households depend on some combination of agricultural and non-agricultural activities to generate income (Ellis 2000; Zommers 2001). Agricultural activities include enterprises producing food and cash crops and various forms of livestock products, whereas non-agricultural income sources include remittances, pensions, family businesses, rent, etc. (Perz 2005). In terms of the fishing community, both Smith (1979) and Pomeroy (2016) suggested the possibility of developing alternative and supplementary income for fishermen and their households, i.e. diversification to achieve sustainable income. According to Marschke and Berkes (2006), diversification does not benefit fishermen alone, rather it also contributes towards overcoming issues in resource fluctuations, seasonality, changes in accessibility, policy, climate change, etc.

The pattern of diversification differs from one community to another as their goals and motivations for diversification are diverse (Perz 2005). Some households may diversify out of necessity, i.e. to be able to survive unforeseen crises (Ellis 2000), while other households may diversify for a better choice, i.e. to achieve higher goals (Perz 2005). The pattern may also differ between wealthier households and poorer ones. Wealthier households would usually diversify to non-farming (non-agricultural) activities while the poorer households might choose to merely diversify to other forms of farming activities.

According to Ellis (2000), six specific motivations to diversify might include (a) seasonality, (b) risk management, i.e. diversify to industry that is less affected by agricultural output's price fluctuations, (c) coping mechanisms, i.e. coping with a crisis which has caused a loss of income from agricultural activities, (d) labour markets, i.e. taking up opportunities available in other industry which opened doors for diversification, (e) credit market, i.e. to repay loan taken up due to livelihood intensification

or other purposes, (f) household assets, i.e. a household's livelihood strategies in utilizing assets available to them.

External factors which encourage diversification include conventional management projects. As mentioned earlier, overfishing, decline of ecosystems and severity of environmental problems have been the basis of livelihood diversification. Conventional management methods assumed that strict rules and regulations will help to manage natural resources and environment, for example, limits on the catch size or closure of certain fishing ground (Wells, Brandon, and Hannah 1992). However, this has resulted in fishermen diverting their sources of income.

Studies of livelihood strategies of the rural population has shown that roughly 50 percent of rural household income is generated from non-farming activities and from transfers from migrants (Ellis and Freeman 2004), which is also applicable to Asian countries (Reardon 1997). A strong positive correlation between the proportion of household income from the non-farm activities and the household income per capita has been proven in many studies (Barret, Reardon and Webb 2001; Ellis and Freeman, 2004). In other words, there is a positive relationship between livelihood diversification and livelihood outcome.

### **Methodology and Measures**

In proportion to the population of coastal fishermen on Pangkor Island, a sample size of 144 fishermen was considered sufficient based on the Morgan-Krejcie Table. In this study, a total of 165 responses were collected. To ensure a medium to high response rate, a snowball sampling technique was adopted, whereby a few participants were identified in each fishing village and their assistance was requested in order to be introduced to other relevant respondents in their community. Relevant respondents in this study refer to fishermen who fulfil the following criteria (1) fishermen who have been carrying out fishing activities mainly within the coastal area of Pulau Pangkor, and (2) they have been a fisherman on the island for more than 5 years.

Two livelihood strategies "Livelihood Intensification" and "Livelihood Diversification" were determined as the key dependent variables. Seven independent variables observed include socio-demographic, trend of income, coping strategies, risk associated with fishing activities, willingness to venture, willingness to learn and sustainable income. The overall conceptual framework is shown in Figure 2 and this has been used to develop and test the Livelihood Strategies Determinant framework in this study.

Since there were more than one dependent variable, and as it is a newly-developed framework, the Structural Equation Model (SEM) was

used to assess the relationship between each independent variable and dependent variables. The following tests and analyses were conducted on the quantitative data collected: (1) reliability test, (2) validity test (through selection of appropriate participants, consulting professionals on validity of the research instrument, conducting a pilot test and exploratory factorial analysis, and (3) Structural Equation Modelling (SEM) and Pearson correlation analysis (for variables not supported by SEM).

There are a few limitations in the conduct of the study. Although the sample size has achieved the recommended size according to the Morgan-Krejcie Table, a larger sample size would have been useful to further improve the validity of the Livelihood Strategies Framework. Further, the Livelihood Strategies Framework generated can only be used to represent the coastal fishermen of Pulau Pangkor and cannot be generalized for other communities. Lastly, the data collected was based on the fishermen's somewhat limited understanding of the national language, as they tend to use their local dialect in their everyday communications. In addition, due to their limited level of education achieved, some questions might be too difficult for the fishermen to comprehend. This issue has been solved by going through and reading out the questions which fishermen had left unanswered.

### **Analysis and Findings**

200 questionnaires were distributed through the following channels: (1) distributed from house to house and collected back within an hour, (2) met with fishermen on their fishing boats as they repair their fishing gears, read word for word (without explanation of the questions) and their responses were recorded, (3) distributed through representatives from a few villages, and collected the following day, and (4) distributed to fishermen at the petrol kiosks as they claim their subsidized diesel; their contact cell phone number was recorded and the questionnaires were collected the following day. 165 completed questionnaires were collected, corresponding to a response rate of 82.5%.

After the scrutinizing data screening process, reliability test and validity test, the research tools remained with 29 Likert-scale questions and 2 categorical questions, excluding demographic questions. Table 2 displayed the changes to the affected variables and with that, allowed testing of the hypothesis.

### ***Respondents' Profiles***

The sample size of 164 respondents was achieved through the returned printed survey questionnaires, excluding one outlier. Table 3 presents some statistical data representing respondents' profiles. From Table 3, it

TABLE 2  
Changes to the affected variables after removing items through screening process

Variable	Number of items			
	Original (for data collection)	After reliability test	Items removed factor analysis	Remaining items
Income status	2			2
Coping Strategies – Savings	3			3
Coping Strategies – Manage Expenses	3	-1		2
Coping strategies – Loan	4		-1	3
Coping strategies – Subsidies	5	-1	-4	0
Risk	7	-1	-2	4
Livelihood Intensification	4	-1		3
Livelihood Diversification	4		-1	3
Willingness to learn	4	-1		3
Willingness to venture	5		-1	4
Sustainable income	4			4

can be seen that almost 60% of the respondents are aged between 22-44 years. The Malay married males form the largest component of the sample. A third of the respondents only completed primary school education, while another third achieved qualifications equivalent to O-Level education. Three-quarters of the respondents are involved full-time in the fisheries sector.

### *Structural Equation Model (SEM) – Measures of Fit*

#### Measurement model – Confirmatory Factor Analysis Approach

In this phase of analysis, a single constructs measurement (measurement model) was conducted, whereby all six constructs were individually examined for the adequate measurement model as shown in Table 4.

#### Developing Structural Model

The seven measurement models (i.e. constructs), which went through exploratory factor analysis, reliability test as well as goodness-of-fit tests, were linked to form the conceptual model. In the SEM analysis, this conceptual model is referred to as the structural model as shown in Figure 2. The model was loaded onto AMOS version 20 to be tested with results shown in Table 5.



TABLE 3  
Respondents' Profiles

Variables	Categories	Frequency	Percent
Age Group	21 and below	5	3.0
	22 to 34	42	25.6
	35 to 44	55	33.5
	45-54	30	18.3
	55-65	27	16.5
	66 and above	5	3.0
Gender	Male	150	91.5
	Female	14	8.5
Marital status	Single	23	14.0
	Married	134	81.7
	Divorced	7	4.3
Ethnicity	Malay	149	90.9
	Chinese	6	3.7
	Indian	9	5.5
Education Level	Illiterate	5	3.0
	Primary School	60	36.6
	SRP / PMR	40	24.2
	SPM	54	32.9
	Higher Education	5	3.0
Level of involvement in fishing activities	Full-time	125	76.2
	Part-time	39	23.8

TABLE 4  
Measurement Model – Measures of Fit Results

Measures of fit	Chi-square (K <sup>2</sup> )(p>.05)	Relative chi-square (K <sup>2</sup> /df<5)	Normed Fit Index (NFI>.90)	Tucker-Lewis Index (TLI>.90)	Comparative Fit Index (CFI>.90)	Root Mean SquareError of Approximation (RMSEA<.08)
Coping Strategies	.059	1.583	.941	.962	.977	.060
Risk associated with fishing activities	.345	1.065	.985	.997	.999	.020
Livelihood Intensification	.029	4.754	.983	.958	.986	.051
Livelihood Diversification	.456	.555	.995	1.013	1.000	.000
Sustainable Income	.004	4.407	.943	.857	.952	.064
Willingness to learn	.999	.000	1.000	1.013	1.000	.000
Willingness to venture	.861	.150	.999	1.017	1.000	.000

FIGURE 2  
Structural model for Livelihood Strategies Framework (excluding nominal variables)

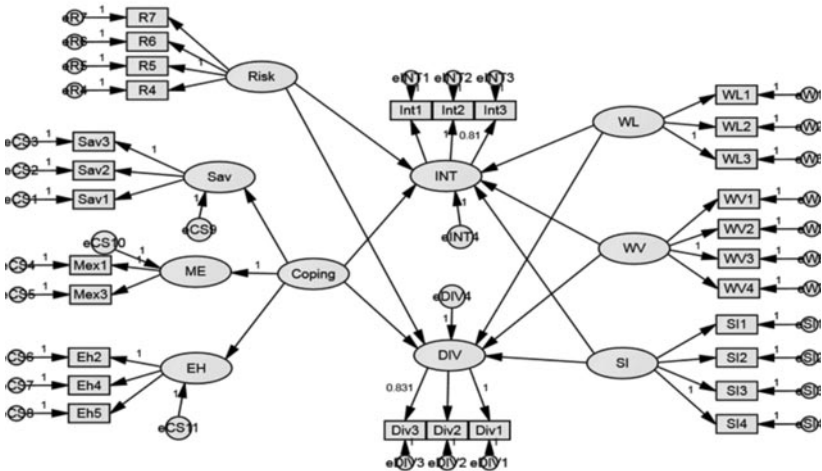


TABLE 5  
Structural Model – Measures of Fit Results

Measures of fit	Chi-square (K <sup>2</sup> ) (p>.05)	Relative chi-square (K2/df<.5)	Normed Fit Index (NFI)>.90)	Tucker-Lewis Index (TLI)>.90)	Comparative Fit Index (CFI)>.90)	Root Mean Square Error of Approximation (RMSEA<.08)
Structural Model	.861	.150	.999	1.017	1.000	.000

**Structural evaluation of the hypothesized model**

Hypothesis 3 to Hypothesis 7 were tested using the structural model to identify how the constructs are related to each other. Table 6 summarizes the standardized coefficients from the estimated structural model along with the relevant p-values.

Correlation test for nominal variables

The limitations of the AMOS Design meant that nominal data is not recognized by the system. Hence, the correlation test for nominal variables was undertaken using SPSS software instead. The following are the results of testing Hypothesis 1 and Hypothesis 2 using SPSS. Table 7 summarizes the results of correlation analysis done.

**Implications of Research Findings, Recommendations and Conclusion**

Based on the test results of Hypotheses 1 to 4, it is concluded that the level of education, level of income versus expenses, trend of output, risk asso-

TABLE 6  
SEM Results

Hypothesis	Hypothesized Paths	Standardized coefficient	p-value	Test results
H3a	Coping strategies → Livelihood intensification	.187	***	Accepted
H3b	Coping strategies → Livelihood diversification	.125	.037	Not accepted
H4a	Risk → Livelihood intensification	.107	***	Accepted
H4b	Risk → Livelihood diversification	.122	.705	Not accepted
H5a	Sustainable income → Livelihood intensification	.077	***	Accepted
H5b	Sustainable income → Livelihood diversification	.091	.196	Not accepted
H6a	Willingness to learn → Livelihood intensification	.048	.475	Not accepted
H6b	Willingness to learn → Livelihood diversification	.064	***	Accepted
H7a	Willingness to venture → Livelihood intensification	.069	.606	Not accepted
H7b	Willingness to venture → Livelihood diversification	.088	.562	Not accepted

TABLE 7  
Correlation of test results

Hypothesis	Hypothesized Paths	R-value	p-value	Test results
H1a	Age group → livelihood intensification	.024	p>.05	Not Accepted
H1b	Age group → livelihood diversification	.412	p>.05	Not accepted
H1c	Household size → livelihood intensification	.683	p>.05	Not accepted
H1d	Household size → livelihood diversification	.970	p>.05	Not accepted
H1e	Level of education → livelihood intensification	.252	p<.05	Accepted
H1f	Level of education → livelihood diversification	.398	p<.05	Accepted
H2a	Income versus expenses → livelihood intensification	.290	p<.05	Accepted
H2b	Income versus expenses → livelihood diversification	.426	p<.05	Accepted
H2c	Trend of output → livelihood intensification	.227	p<.05	Accepted
H2d	Trend of output → livelihood diversification	.521	p<.05	Accepted

ciated with fishing activities and coping strategies available will affect the coastal fishermen's choice of livelihood intensification strategies. The factor which had a stronger positive correlation ( $r=.290$ ,  $p<.05$ ) with choice of livelihood intensification strategies is the level of income versus

expenses, while risk associated with fishing activities had a weaker positive correlation with choice of livelihood intensification strategies based on SEM.

On the other hand, level of education, level of income versus expenses, trend of output and willingness to learn affects their choice of livelihood diversification strategies. The factor which had a stronger positive correlation ( $r=.521$ ,  $p<.05$ ) with choice of diversification strategies is the trend of output while level of education had a weaker positive relationship with the choice of diversification strategies.

In other words, to encourage livelihood intensification, effort needs to be placed on improving their level of income, such as proper management of fishermen allowances, subsidies, proper financial management, and introduction of technology to increase the level of income generated from fishing activities. In order to encourage livelihood diversification, focus should be placed on increasing the level of fishing output, instead of providing more subsidies, as it will stimulate the fishermen's intention to gain more income. When the fishermen realize the limitation of generating output from fishing activities, they might be encouraged to venture into aquaculture activities or seafood processing activities.

#### ***Relationship between livelihood strategies and sustainable income of coastal fishermen***

Results of Hypotheses 5a and 5b shows a significant relationship between the fishermen's view of sustainable income and their choice to intensify, while no significant relationship was found between the same with regards to the choice of livelihood diversification. However, this unusual result could be due to coastal fishermen being satisfied with having only enough financial capital to cover their daily expenses, even if it means nothing extra for the following day. Therefore, to improve the fishermen's livelihoods, compulsory savings for retirement might encourage long-term planning among the fishermen.

#### ***Relationship between willingness to change and choice of livelihood strategies***

Test results of Hypotheses 6 to 7 showed a significant positive relationship between willingness to learn and choice of livelihood diversification, while no significant relationship was found between willingness to learn and livelihood intensification, and willingness to venture and any choice of livelihood strategies.

In view of the results obtained, proper management of workshops is needed to encourage livelihood diversification. In addition, there is a need to provide opportunities in other industries. In order to encourage

fishermen to venture into other industries, they need to be trained to generate other side incomes.

In this research, six recommendations were introduced based on factors affecting the local Pulau Pangkor fishermen's choice of livelihood strategies. Recommendations introduced include (1) proper management of workshops including a transparent process of choosing participants and a follow-up program after each workshop, (2) proper management of subsidies, accompanied by a detailed protocol of selecting recipients, (3) a financial management package which includes compulsory contributions to the retirement fund and workshops on financial management, (4) introduction to an efficient way of generating income, including a rewards scheme to encourage the use of multiple fishing methods and subsidies for companies which provide training and part-time job opportunities to fishermen, (5) exposure to the notion of sustainable income through workshops and educational campaigns.

To conclude, this research has addressed possible ways of encouraging diversification or portfolio livelihood strategies due to the possibility of depletion of fishing resources in the vicinity of Pulau Pangkor. This can be done by first understanding the factors determining the choice of livelihood strategies. Second, this research has identified how the fishermen's perspective of sustainable income affects their choice of livelihood strategies. Third, the research has helped to modify the standardized Livelihood Strategies Determinants Framework, which is more representative of the coastal fishermen of Pulau Pangkor. Fourth, the research helps to determine how willingness to change might affect the choice of livelihood strategies, despite having other resources in place. Lastly, the research helps to suggest appropriate policy implementation to help bring about the desired changes.

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### References

- Barret, C., Reardon, T., & Webb, P. 2001. Nonfarm Income Diversification and Household Livelihood Strategies in Rural Africa: Concepts, Dynamics, and Policy Implications. *Food Policy* 26(5): 315-331.
- Busing, R. 2001. Assessment of Coastal Fisheries in the Malaysian - Sabah Portion of the Sulu Sulawesi Marine Ecoregion.[online] Available at <http://www.fishdept.sabah.gov.my/sites/default/files/uploads/file->

- upload/71/assessment-coastal-fisheries.pdf [Accessed 26 June 2016].
- Carswell, G. 1997. *Agricultural Intensification and Sustainable Rural Livelihoods: A Think Piece*. IDS Working Paper 64. Brighton: IDS.
- Department of Fisheries Malaysia. 2016. *Annual Fisheries Statistics 2016*. [Online] Available at <https://www.dof.gov.my/index.php/pages/view/82> [Accessed 17 September 2017].
- Eder, J. F. 2009. *Migrants to the Coasts: Livelihood, Resource Management and Global Change in the Philippines*. Belmont CA: Wadsworth Cengage Learning.
- Ellis, F. 2000. *Rural Livelihoods and Diversity in Developing Countries*. Oxford: Oxford University Press.
- Ellis, F., and Freeman, A. H. 2004. *Rural Livelihoods and Poverty Reduction Strategies in Four African Countries*. *Journal of Development Studies* 40(4): 1-30.
- Fabinyi, M. 2010. *The Intensification of Fishing and the Rise of Tourism: Competing Coastal Livelihoods in the Calamianes Islands, Philippines*. *Human Ecology* 38(3): 415-427.
- Food and Agriculture Organization. 2001. *Information of Fisheries Management in Malaysia*. [online] Available at <http://www.fao.org/fi/oldsite/fcp/en/mys/body.htm> [Accessed 15 December 2015].
- Food and Agriculture Organization. 2009. *Fishery and Aquaculture Country Profiles*. [online] Available at <http://www.fao.org/fishery/facp/MYS/en#CountrySector-SectorSocioEcoContribution> [Accessed 2 April 2016].
- Marschke, M. J., & Berkes, F. 2006. *Exploring Strategies that Build Livelihood Resilience: a Case from Cambodia*. *Ecology and Society* 11(1): 42.
- Peng, W., Zheng, H., Robinson, B., Li, C., and Wang, F. 2017. *Household Livelihood Strategies Choices, Impact Factors, and Environmental Consequences in Miyun Reservoir Watershed, China*. *Sustainability (Switzerland)* 9(2): 1-12.
- Perak Tourism. 2019. *About Pangkor Island*. [online] Available at <http://www.peraktourism.com.my/about-pangkor-island.html> [Accessed 12 May 2021]
- Perz, S. G. 2005. *The Importance of Household Asset Diversity for Livelihood Diversity and Welfare Among Small Farm Colonists in the Amazon*. *Journal of Development Studies* 41(7): 1193-1220.
- Pomeroy, R. S., Parks, J. E., & Balboa, C. M. 2006. *Farming the Reef: Is Aquaculture a Solution for Reducing Fishing Pressure on Coral Reefs?* *Marine Policy* 30(2): 111-130.
- Pomeroy, R. 2016. *A Research Framework for Traditional Fisheries: Revisited*. *Marine Policy* 70: 153-163.
- Reardon, T. 1997. *Using Evidence of Household Income Diversification to Inform Study of the Rural Nonfarm Labour Market in Africa*. *World Development* 25(5): 735-747.

- Sadovy, Y., Donaldson, T., Graham, T., McGilvray, F., Muldoon, G., Phillips, M., . . . Yeeting, B. 2003. *While Stocks Last: The Live Reef Food Fish Trade*. Asian Development Bank.
- Salayo, N., Garcés, L., Pido, M., Viswanathan, K., Pomeroy, R., Ahmed, M., . . . Masae, A. 2008. *Managing Excess Capacity in Small-Scale Fisheries: Perspectives from Stakeholders in Three Southeast Asian Countries*. *Marine Policy* 32(4): 692-700.
- Scoones, I. 1998. *Sustainable Rural Livelihoods: A Framework for Analysis*. IDS Working Paper 72. Brighton: Institute of Development Studies.
- Sheriff, N., Little, D., & Tantikamton, K. 2008. *Aquaculture and the Poor - Is the Culture of High-Value Fish a Viable Livelihood Option for the Poor?* *Marine Policy* 32(6): 1094-1102.
- Smith, I. R. 1979. *A Research Framework for Traditional Fisheries*. Manila, Philippines: International Center for Living Aquatic Resources Management.
- Teh, E. 2012. *Fisheries in Malaysia: Can Resources Match Demand?* Maritime Institute of Malaysia's Online Commentary on Maritime Issues 10. [online] Available at <https://www.ciaonet.org/attachments/21958/uploads> [Accessed 4 February 2016]
- Wells, M., Brandon, K., & Hannah, L. J. 1992. *People and Parks: Linking Protected Area Management with Local Communities*. Washington, D.C.: World Bank.
- Zommers, A. 2001. *Land and Sustainable Livelihood in Latin America*. Amsterdam, Netherlands: Royal Tropical Institute.