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Measuring Islanders' Adaptive Capacity towards the Impact of Climate Change: A Case of Community in Langkawi Island

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Abstract

The progress of climate change is worsening and its formidable impacts would impinge the community's socio-economic routines, especially those who rely heavily on nature stability. This study aims to measure Langkawi Island community's adaptive capacity towards climate change impacts. This study is quantitative in nature whereby via a cluster random sampling, a total of 200 islanders was selected as respondents. The findings show Langkawi islanders had a moderate level of adaptive capacity in three aspects; cognitive, practices and structure. The study places a number of discussions and in anticipation, the findings and recommendations from this study can be referred to by any concerned parties when developing adaptation strategies for island communities.

Keywords: Community Development, Adaptive Capacity, Fisheries Industry Development, Environment Management

Introduction

Climate change is not a new phenomenon and it keeps worsening day by day. Climate change is often debated and seldom resolved because it is involved with many issues such as social, economic and environmental concerns (Oreskes, 2004). As defined by the United Nations Framework Convention on Climate Change (UNFCCC), it is a variation of climate which is attributed, directly or indirectly, towards human activities which changes the composition of global atmosphere, plus it is in addition to the variability of natural climate observed over a comparable period of time. On average, the temperature across the globe has proven to change and Malaysia is included as it undergoes a similar case whereby for the past 30 to 50 years, the temperature recorded have shown warming trends.

Climate change impacts such as rising temperature, rising sea level and erratic weather increases the risk for the community. Fishermen for example, are obstructed from going out to the sea due

to extreme weather while the islanders and the coastal community are threatened by strong winds and extreme waves. Furthermore, these impacts cause marine environmental changes and threatened marine biodiversity and ecosystem (Ottersen et al., 2009; Badjeck et al., 2009). In another study done by Soto (2002) confirmed hot temperatures reduces the number of zooplankton - the main diet for several marine species. This eventually leads to starvation in turn led to the extinction of local species. Manikandan et al. (2016) on the other hand found climate change impacts on the coral which is the main habitat for most of the marine species whereby the rising temperature causes coral bleaching.

As climate change impacts affect the quality and quantity of marine fauna, it affects the wellbeing, livelihood and cultures of the community. The islanders whose most of them rely on fisheries and tourism industries are expected to face formidable challenges of the climate change impacts. Extreme weather, for example, obstructs the fishermen from operating their fisheries activities, while strong wind and waves might damage their houses and public infrastructure. Realizing this, the best way of responding is by strengthening the adaptive ability of the community. Adaptation refers to any actions that absorb the impacts of climate change (Ministry of Natural Resources and Environment, 2009). Nevertheless, prior to strengthen the community adaptation ability, it is important for the concerned parties to measure the current adaptation ability as it provides them a clearer picture of the things needed in line with the community's abilities, interests and needs. Although there is a mounting need to examine community adaptation level, especially among the islanders, the issue still gained less attention among local scholars as the current number of related studies is discouraging, thus In response to this, this study aims to provide a response by measuring islanders (in Langkawi) adaptive capacity towards climate change impact hence to provide policymakers with some indication of local response to climate change in Malaysia.

Climate change in Langkawi Island

Langkawi Island is one of the districts under the state of Kedah. It is an archipelago of 104 islands in the Andaman Sea, some 30km off the mainland coast of north-western Malaysia. Langkawi is an international attraction which welcomes millions of local and international tourists. There are 64,792 people residing in Langkawi with most of them involve in fisheries activities, tourism industry and entrepreneurship. A Number of local studies have recorded several climate change impacts in Langkawi. Jeofry and Rozainah (2013) for example, concluded a rising of 0.19cm per year at Langkawi Sea while in 2050, it is expected the number will increase to 7.5cm in 2050. While Kwan et al. (2011) in his study recorded warmer nights and days in Langkawi. The situation keeps worsening in Langkawi, Razali et al. (2010) concluded northern part of Peninsular Malaysia will be hit frequently by extreme winds in the future while Subramaniam et al. (2011) expecting a rising temperature and less rain in Northern part of Peninsular Malaysia. The occurring and the expected climate change impacts post formidable challenges to the Langkawi community as most of them rely on the nature stability. It is unsure whether fishermen will able to rely on marine resources in the future and the tourism industry players should expect degrading stability of the nature.

Methodology

This study is quantitative in nature (cross sectional survey). An instrument was developed based on the study objectives. In total the instrument consists of four parts and 42 items. Except for demographic sections, for each of the questions asked, the respondents were given an option of answer of five-point Likert scale, ranges from strongly disagree (1) to strongly agree (5). The instrument then was pre-tested among 30 island community in Pangkor. The resulted Cronbach alpha value ranges from .721 to .853 demonstrated the instrument's reliability as it exceeds the recommended value of .700 (Nunally, 1972). The instrument then was validated in terms of its content, item and measurement scale by two experts in community development. Based on a cluster sampling, a total of 200 islanders from Langkawi region were chosen as respondents for this study. The actual data collection was conducted on March 2017. It was conducted at community places of interest such as coffee stall, public hall, LKIM and at their houses. Experienced and trained Enumerators were hired to assist the data collection process. Survey technique was the main collection technique used. Via SPSS version 22, analyses such as frequency, percentage and mean score were carried out.

Results & Discussion

Respondents' Demographic Data

To obtain demographic data on the respondents, a total of nine questions was asked. Based on the results obtained, it was determined that 53.5 percent of the respondents were male and 46.5 percent were female. In this study, most of the respondents with 43 percent aged 26 to 50, only 18 percent aged below 25 years old and the rest were aged above 51 years old. Only 6 percent of the respondents had never been to school, 40.5 percent possessed a primary school level of education, 31.5 percent of the respondents possessed an upper secondary school level of education, while 13.5 percent of the respondents possessed lower secondary level of education. The remaining 8.5 percent of the respondents possessed a tertiary level of education. The majority of the respondents were married (77 percent), 20.5 percent were single and only 2.5 percent divorced/widowed. In this study, the islanders were divided into five different occupation categories; Fishermen, tourism-related, small and medium business, public (e.g: Housewife, student and etc) and private/government related. 16 percent, 16.5 percent, 18.5 percent, 30.5 and 18.5 percent of the total number of respondents were respectively recorded in five categories. The mean score recorded for monthly income was RM1, 253.30. Most of the respondents (28.2 percent) earn less than RM700. A total of 34.5 percent have one to three family members in their homes, 38.5 percent have four to five family members whilst the remaining 27 percent have more than 6 family members in their home. The majority of the respondents has lived for more than 46 years in the island area with a total of 36 percent. The mean score recorded for duration of residing in the island was 37.1 years.

Table 1: Respondents' background

Factor	Frequency	percentage	Mean score
Gender			
Male	107	53.5	
Female	93	46.5	
Age (years)			43.4
≤25	37	18.5	
26-50	86	43.0	
≥51	77	38.5	
Education achievement			
Never been to school	12	6.0	
Primary school	81	40.5	
Lower secondary school	27	13.5	
Upper secondary school	63	31.5	
Tertiary level	17	8.5	
Marital status			
Single	41	20.5	
Married	154	77.0	
Divorced	5	2.5	
Occupation			
Fishermen	32	16.0	
Tourism related	33	16.5	
Small and medium businesses	37	18.5	
Public	61	30.5	
Private/government related	37	18.5	
Income per month (n = 163)			RM1,253.3
<RM700	46	28.2	
RM701-RM1000	45	27.6	
RM1001-RM1500	31	19.0	
>RM1501	41	25.2	
Number of household members			
1-3	69	34.5	
4-5	77	38.5	
>6	54	27.0	

Duration staying at the island area (years)			37.1
<15	24	12.0	
16-30	64	32.0	
31-45	40	20.0	
>46	72	36.0	

Islanders' Cognitive Awareness Towards the Changing Climate

Cognitive awareness refers to the sensitivity and consciousness towards the occurrence of climate change and its impact on the environment as well as their socio-economic routine. A total of 13 items was used to measure the islanders' adaptation with regard to cognitive awareness. Approximately, five items yielded high level of mean score while another eight items yielded moderate level of mean score. The statement regarding uncertainty to rainy season yielded the highest mean score ($M = 4.25$) (Table 2). Based on the results, the majority of the islanders agreed that the weather had been erratic and the temperature was getting hot. Furthermore, most of the islanders agreed that climate change has eroded coastal areas, affecting marine catches and causes the water level in the estuary to be progressively shallow.

Table 2: Statements Measuring Cognitive Awareness

Statements	Mean score
The temperature in this region is getting hot	4.15
The weather on the island became unpredictable	4.22
The rain is becoming more frequent in this region	2.72
The rainy season is uncertain	4.25
Erratic weather leads to reduced sea products	4.08
Erratic weather causes coral reefs to disappear	2.77
The beach here is eroding	3.38
I find it difficult to run daily errands	3.29
The size of catches (fish, crab, shrimp, octopus) are shrinking	3.27
The number of catches is decreasing	4.05
An increase in sea water temperature causes marine catches to flee to the bottom / other reefs	3.40
Fishing necessities to carry out daily activities such as the boat / canoe / fishing tools are often damaged and must be replaced	3.02
Some marine species (fish, squid, shrimp, crab) became extinct and affect the number of catches	3.42

Table 3: Overall mean score for cognitive awareness

Level	Frequency	Percentage	Mean Score	SD
			3.54	0.61
Low (1.00-2.33)	4	2.0		
Moderate (2.34 – 3.67)	121	60.5		
High (3.68 – 5.00)	75	37.5		

Islanders' Practices towards the Changing Climate

Islanders' practices refer to the degree of their readiness to adapt to the changes as a consequence of climate change with emphasis on their economic status, and the degree of their willingness to change without dismantling the relationships and socio-cultural bonds. A total of six items was used to measure the islanders' adaptation with regard to practices. Only one item had recorded a high level of mean score while the remaining items recorded a moderate level of mean score. A statement on how the islanders would encourage to see their family members seek different career path apart from their own field had recorded the highest mean score (M = 4.13) (Table 4). They had demonstrated their interest in learning new skills whether it is related to fisheries/tourism or otherwise. They can diversify their income generating activities - they do not depend entirely on one day job as their main source of income. In addition, they faced no problem in accepting new technologies - which are useful tools needed for their adaptation capacity. The main concern in their practices was their disability to get another job due to having low academic qualifications and insufficient skills.

Table 4: Statements Measuring Practices

Statements	Mean score
I like to learn new skills related to fisheries / tourism (eg: aquaculture, processing salted fish, fish business)	3.20
I like to learn new skills - which are not related to fisheries / tourism (eg: entrepreneurial, vocational)	3.41
If I want, I can get another job apart from the one I have now with the level of education / existing skills	2.86
I can diversify my income generating activities	3.04
I don't have any problem in learning to use new technologies	3.57
I encourage my wife / my children to work outside the field of my current employment to help me increase our family income	4.13

Table 5: Overall Mean Score for Practices

Level	Frequency	Percentage	Mean Score	SD
			3.37	.97
Low (1.00-2.33)	26	13.0		
Moderate (2.34 – 3.67)	90	45.0		
High (3.68 – 5.00)	84	42.0		

Fisheries Structural Assistance towards Climate Change

Structural assistance refers to the existing financial support that should be given to the local community during natural disasters by local institutions; be it the government or community-based institutions to support islanders' adaptation capacity towards climate change impacts. Overall, these aspects have recorded moderate mean scores. A total of nine items was used to measure adaptation with regard to structural assistance. A statement regarding the number of job opportunities that are unrelated to fisheries activities in their areas yielded the highest mean

score (M = 3.51) (Table 6). Most of the islanders agreed that government agencies did not provide sufficient information on current weather condition or give them advice on the adverse effects of climate change. Furthermore, related agencies have a major role to play in providing these islanders with information, technologies, disaster relief structural assistance and education to endure the impacts of climate change.

Table 6: Statements Measuring Structural Assistance

Statements	Mean scores
Government agencies in this area provide weather condition to the islanders.	2.77
In this area, government agencies give advice to the islanders about the adverse effects of climate change.	2.84
There are plenty of other job opportunities (related to fisheries activities) here	3.32
There are plenty of other job opportunities (NOT related to fisheries activities) here	3.51
When natural disaster occurred due to climate change, disaster relief aids will be distributed evenly to the islanders	2.88
Government agencies provide loans for the islanders to repair any damaged infrastructures caused by climate change	3.25
In this area, there are many organizations that can help the islanders to diversify their economic resources	2.93
The island community's climate change survival development planning has been conducted by government agencies.	3.18
Usually, decisions made by government agencies are in line with the requirements and capabilities of islanders.	3.20

Table 7: Overall mean score for structural assistance

Level	Frequency	Percentage	Mean Score	SD
			3.10	.76
Low (1.00-2.33)	34	17.0		
Moderate (2.34 – 3.67)	119	59.5		
High (3.68 – 5.00)	47	23.5		

Conclusion and Recommendations

Overall, Langkawi islanders' adaptive capacity is at a moderate level. It indicates that there is still room for further improvement in the community's adaptation capacity and such matter is important as they need to face upcoming effects of climate change. Although they have high awareness in some aspects of knowledge (cognitive) but more efforts are needed to further strengthen their practical aspects and the same goes to their structural aspects. Government agencies play a major role to educate the islanders on social adaptation, economic adaptation, self-adaptation and more as this strengthens their adaptation and sustain their livelihood.

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