

The coastal community awareness towards the climate change in Malaysia

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Abstract

Purpose – The present paper attempts to investigate the awareness of coastal community towards climate change in Malaysia and to explore the factors associated with their awareness toward the climate change.

Design/methodology/approach – This is a quantitative study where a set of questionnaires was developed based on reviews of literature and series of instrument development meeting. Through a multi-stage cluster sampling, a total of 210 respondents from three coastal villages in Peninsular Malaysia were selected.

Findings – The coastal community are shown to record a high mean score on their awareness toward changes relating to the sea, temperatures and the coast. Surprisingly, fishermen are found to be less aware toward climate change compared to other groups, such as housewives/retirees and students. Further analysis confirms that there are significant differences regarding coastal community awareness to changes relating to the sea, temperatures and the coast.

Research limitations/implications – This study represented the answers of 210 respondents who were randomly selected from three coastal villages in Peninsular Malaysia, and the results might be enriched if the number of respondents is increased and respondents from other villages are included. A future study should be conducted to gather information on the possible effects, rather than focusing on the respondents' awareness. Additionally, because of the nature of the topic, non-governmental organizations (NGOs) and officers from environment-related agencies should cooperate during the research.

Practical implications – It is recommended that information management activities with regard to the climate change should be actively conducted by NGOs, universities and related parties.

Originality/value – Most of the related studies are scientific in nature, leading to a gap relating to the social aspects of climate change, particularly in terms of communities' awareness toward the climate change. Moreover, a number of local studies have produced inconsistencies in term of their results regarding the awareness of the climate change among the community. In response to this, the current study aims to fill this gap.

Keywords Climate change, Vulnerability, Rural development, Adaptation, Coastal community

Paper type Research paper



Introduction

The coast has always been an area of significant hazards, and this situation is worsening with the climate change phenomenon currently taking place (IPCC, 2012; Nicholls *et al.*, 2007). Globally, the climate change is threatening both the coastal areas and the coastal community. The rising sea level is predicted to produce adverse impacts such as submergence, coastal flooding and coastal erosion on the coastal system and low-lying areas (IPCC, 2012; IPCC, 2014). The impacts are expected to affect the socio-economic activities of the coastal community (Nicholls *et al.*, 2007). According to Small and Nicholls (2003), nearly a quarter of world population stay within 100 km of the coast, and this number is expected to increase in 2030 and, doubtless, this population is vulnerable toward the impacts of the climate change. Taking a specific case in Australia whereby the climate change had reduced coastal community sources of food, negatively impacted their mental and physical health, exposed to extreme events and forcing people to be relocated (Zander *et al.*, 2013; Petheram *et al.*, 2010). Referring to the economic part, another study done in Mexico had demonstrated on how badly the climate change can affect the coastal people with higher reliance on fishing activities and left them with fewer alternatives of income-generating activities (Morzaria-Luna *et al.*, 2014). Furthermore, Niang *et al.* (2014), in their study in Senegal, confirmed on the impacts of climate change on farming activities and community settlements while in The Philippines, climate change had damaged public infrastructure, obstructed fishermen from doing their fishing routine and a decrease in farming yield (Sales, 2009).

Similar to the global scenario, the climate change too is affecting the coastal areas in Malaysia. It has been proven that the coastal community in Malaysia are facing rising temperature (Kwan *et al.*, 2011; Wai *et al.*, 2005); rising sea level (Awang and Abdul Hamid, 2013; Sulaiman and Zainal Abidin, 2012; Ercan *et al.*, 2013); unstable rain patterns and thunderstorm (Wan Azli, 2010); strong wind and waves (Muzathik *et al.*, 2011; Razali *et al.*, 2010; Sapuan *et al.*, 2011); and unstable northeast monsoon patterns (Kajikawa *et al.*, 2012; Suhaila *et al.*, 2010). Such changes, according to several local scholars, had a profound impact on the coastal community – who rely heavily on natural resources, including the sea, the coast and mangrove areas for their fisheries, tourism, small- and medium-sized enterprises (SME) and social activities (Shaffril *et al.*, 2013; Omar *et al.*, 2013; Muhammad *et al.*, 2012; Fahmi *et al.*, 2013). As groups that are “close” to the environment, coastal community are expected to be aware on the climate change. Awareness is derived as a measure of awareness – it was assumed that a greater awareness among the rural community toward climate change will lead them to be better prepared to face the numerous hazards as a result of climate change. Thus, being aware to climate change will provide communities with adequate knowledge and awareness to overcome the impacts of climate change. Furthermore, being aware toward climate change denotes the possibility of the community being informed and able to produce reactive and proactive plans toward the phenomenon, which, consequently, reduce their social vulnerability. Adger *et al.* (2005), on the other hand, concluded that awareness is one of the resilience components that need to be strengthened in facing crises and improve responses when they occur. Eventually, coastal community who are knowledgeable, better prepared and responsive are more likely to prevent the impacts of climate change from being a longer-term social disaster.

To date, several local and international scholars have focused on the phenomenon of the climate change in Malaysia, resulting in a plethora of literature in this field

(Kwan *et al.*, 2011; Wai *et al.*, 2005; Awang and Abdul Hamid, 2013; Sulaiman and Zainal Abidin, 2012; Ercan *et al.*, 2013; Wan Azli, 2010; Muzathik *et al.*, 2011; Razali *et al.*, 2010; Sapuan *et al.*, 2011; Kajikawa *et al.*, 2012; Suhaila *et al.*, 2010). However, most of these environmental studies are applied in nature, leading to a gap relating to the social aspects of climate change, particularly in terms of communities' awareness toward the climate change. Moreover, a number of local studies have produced inconsistencies in term of their results regarding the awareness of the climate change among the community. Shaffril *et al.* (2013) and Abu Samah *et al.* (2011), for example, have clarified that most of the coastal community have felt the occurrence of the climate change, while a different view was expressed by Omar *et al.* (2013), who claimed that a portion of the coastal community perceived that there is nothing strange with the climate nowadays. Such a scenario has resulted in a query – are the coastal community in Malaysia being aware enough on the climate change? These questions led to the aim of this study which is to investigate the awareness of coastal community toward the climate change and to further explore factors that influencing their awareness toward the climate change.

This kind of study is important, as it offers a number of implications. First, it contributes to the body of knowledge so that a fresh understanding of the awareness of coastal community toward the climate change can be understood. Second, based on the specific information and recommendations suggested, it can assist policymakers in constructing concrete strategies to further buttress suitable social adaptation strategies toward the climate change. Third, the findings from this study can serve as a foundation for future studies germane to the communities' social awareness toward the climate change in Malaysia.

Coastal community in Malaysia

The length of coastal areas in Malaysia equates to 4,675 km, of which a total of 2,068 km is in Peninsular Malaysia and 2,607 km is in East Malaysia. Malaysia has an established Coastal Zone Management (CZM) in place, in which the main aim is to sustain a clean and healthy living approach to resources, and, at the same time, fulfill economic development needs. Coastal community are important groups, particularly in terms of their roles in strengthening the nation's food security. While the majority of coastal community in Malaysia consist of fishermen, other groups such as laborers, businessmen, SME entrepreneurs, housewives, retirees and students also exist (Muhammad *et al.*, 2012; Fahmi *et al.*, 2013; Omar *et al.*, 2013). The majority of coastal community members are "senior" villagers (aged between 40 and 65 years), who have lived in the areas for many years (between 15 and 30 years) (Muhammad *et al.*, 2012; Shaffril *et al.*, 2013).

In terms of income, most of the coastal community are low- to moderate-income earners (Muhammad *et al.*, 2012; Omar *et al.*, 2013; Shaffril *et al.*, 2013); with regard to their economic activities, most of the coastal community in Malaysia generate their income from the fisheries industry (e.g. fishermen, fisheries products), while some are involved in SMEs (Fahmi *et al.*, 2013). Among the famous SME products of coastal community in Malaysia are *keropok lekor*, *satar* – both are snacks made from fish, dried fish and cuttlefish and salted fish. In some parts of the coastal areas, members of the community are involved in agro-tourism activities, in which most of the income is generated from the homestay industry, recreational fishing and boat rental (Muhammad *et al.*, 2012).

Shaffril *et al.* (2013) demonstrated the strength of social relationships among the coastal community, which are constructed via several social activities. It is common practice for coastal community, particularly fishermen, to spend time together in the evening talking or play checkers at *wakaf* (small shelter for coastal community, usually located near to the fishermen jetty) (Shaffril *et al.*, 2013). The members of coastal community enjoy working together and cooperating in community activities such as cleaning the village, *merewang* (local term for mutual help during wedding fest) or helping at the mosque with respect to religious activities (Shaffril *et al.*, 2013). Furthermore, their strong social bonds are based on active information sharing among them; this includes information specific to weather, which is commonly shared among groups such as housewives and fishermen, while information related to fisheries activity is commonly shared among the fishermen and SME entrepreneurs (Omar *et al.*, 2013).

The climate change in Malaysia

According to a number of local studies by Wai *et al.* (2005), Kwan *et al.* (2011) and Tanggang and Juneng (2011), the rising temperature is the most obvious evidence of the climate change in Malaysia. Wai *et al.* (2005) confirmed that the temperature in Malaysia has risen by between 1.75 and 2.69°C over a period of 50 years (1951-2000), while Tanggang (2007) detected a rising temperature of between 0.5 and 1.5°C over a period of 40 years in selected areas in the East-Coast region of Peninsular Malaysia. A study conducted by the Intergovernmental Panel on Climate Change (IPCC) (2007) forecasted that the temperature in Malaysia will rise by between 0.6 and 4.5°C in 2060, while a study by Kwan *et al.* (2011) detected significant changes in terms of warmer days and nights in some places and cooler days and nights in others, in Malaysia.

The climate change can also be detected in the pattern of rainfall. For example, Suhaila *et al.* (2010) detected a significant increase in rainfall intensity and extreme occurrences across Peninsular Malaysia. Wan Azli (2010) proved that Malaysia has experienced unusual frequencies of rainfall and floods, an increase in strong winds and more frequent thunderstorms. Subramaniam *et al.* (2011) proved that over a period of 30 years (1981-2010), areas such as Alor Star and Kota Bharu will face significant changes in terms of rainfall patterns. Further proof of the changing patterns of rainfall in Malaysia was provided by the National Hydraulic Research Institute of Malaysia (NAHRIM) (2006), which claimed that the East-Coast region in Peninsular Malaysia will face significant increases with regard to rainfall frequency in 2050, while the West-Coast region of Peninsular Malaysia will face significant decreases with regard to rainfall frequency in the same year. Increased rainfall will, in turn, lead to disasters related to flooding and landslides. Rising sea level is another impact of the climate change in Malaysia. Awang and Abdul Hamid (2013) detected a sea-level rise of 6.45 mm per year at Pulau Pinang and Perak Border waters; 4.26 mm at Perhentian Island, Terengganu; and 2.73 mm at Mersing water. Sea level increases have an effect on the strength and height of the waves, and extreme waves have been identified as one of the major contributors to coastal erosion and the destruction of mangrove forests in Malaysia (Mohd Ekhwan, 2006). The Food and Agricultural Organization (FOA) (2007) concluded that the destruction of mangrove forests in Malaysia has been occurring at a rate of 0.8 per cent per year. Additionally, it is concerning to know that out of a coastal length of 4,675 km in Malaysia, 288 km is subject to Category-1-type erosion, which indicates that

the areas are facing erosion which poses immediate danger of collapse or damage to shore-based facilities and infrastructure (Department of Irrigation and Drainage Malaysia, 2012). Mohd Ekhwan (2006), meanwhile, stated that 65 coastal areas in Malaysia – most of which are located in the East-Coast region of Peninsular Malaysia – are facing serious coastal erosion. Suhaila *et al.* (2010), on the other hand, have looked onto the unstable monsoon pattern in the East-Coast region states such as Terengganu, Kelantan dan Pahang.

The impacts of the climate change on coastal community in Malaysia

The climate change has resulted in serious coastal erosion in Malaysia, and, within the local scope, comparing to the impacts of flooding or rising temperature, coastal erosion and extreme waves are the most important impact of climate change on the community. Among the affected communities are those in Pengkalan Atap village, which is located in Kuala Besut, Terengganu; in 2011, a total of 41 families from the village were relocated, as their houses were destroyed by coastal erosion and extreme waves. Mohd Ekhwan (2006), who conducted a study in Kuala Kemaman, Terengganu, concluded that 90 per cent of the locals' settlements had been destroyed by erosion or extreme waves, while 5 per cent of cemetery areas and 3 per cent of communication systems have been affected by the erosion. Sabak, a coastal area in Pasir Puteh Kelantan, has also been facing a coastal erosion problem since the 1980s, and the coastal erosion has resulted in a number of relocation programs for the local community (Sinar Harian, 2012a). Malacca is another example of an area facing coastal erosion; here, a number of infrastructure facilities were destroyed due to extreme waves and coastal erosion, while, in Batu Pahat Johor, it has been reported that the coast has eroded by 2 m every year, and this affects local agriculture activities and causes a loss of investment to farmers (Sinar Harian, 2012b; Utusan Malaysia, 2012).

Badjeck *et al.* (2009) explained on the impacts of the climate change on both – the environment and the community. Badjeck *et al.* (2009) has concluded that climate change has resulted in instability of the environment elements (e.g. ocean currents, rainfall, sea level rise, temperature, etc.). Consequently, this instability has negatively impinged the quality and the quantity of the marine flora and fauna, while lessening the frequency of fishing operation of those who rely on the stability of the environment to run their fishing routine. In addition to this, the instability impacts the community livelihood and wider society and economy.

What has been mentioned by Badjeck *et al.* (2009) is much related to the local coastal community, especially on the impact of climate change on the community livelihood. As the climate change is expected to worsen and continuously threaten the coastal community, relocating them is seen as one of the best responses. Nevertheless, as mentioned by Badjeck *et al.* (2009) and supported by Marshall *et al.* (2009), this action can lead to self-conflict among community members, as some of them have a strong attachment to the place and refuse to be relocated. In another perspective, Badjeck *et al.* (2009) touched on the need for effective livelihood strategies to cope with the climate change, in which, as for now, based on several reasons, the coastal community are seen to possess less effective livelihood strategies in facing the climate change.

First, the coastal community does not have effective livelihood strategies, as most of them are weak in term of financial possession (Shaffril *et al.*, 2013; Abu Samah *et al.*, 2011; Omar *et al.*, 2013). Such scenario is contributed by the fact that most of them are

running the economic activities at a subsistence level (Muhammad *et al.*, 2012; Fahmi *et al.*, 2013). Second, coastal community are seen to possess a weak livelihood strategies as they are not fully ready to face the threats of climate change – most of them only possess a moderate level of adaptation capacity (Shaffril *et al.*, 2013). Furthermore, the climate change also resulted in a higher risks to coastal community health and life. In a number of studies, the climate change is associated with increased cases of malaria and diarrhea, dengue, respiratory diseases, morbidity and mortality related to ground-level ozone, heat stress, skin diseases, asthma and stress (Pinto *et al.*, 2011; Searle and Gow, 2010; Confalonieri *et al.*, 2007; Vandentorren and Empereur-Bissonnet 2005; Van Lieshout *et al.* 2004). Abu Samah *et al.* (2011), on the other hand, suggested that the climate change has increased the risks related to conducting fishing routines, as current weather is very unstable are difficult to predict. Additionally, the climate change can result in loss to livelihood assets. Tanggang (2007) has explained that occurrence of extreme events can cause destruction of public facilities which cost millions of dollars, while Mohd Ekhwan (2006), on the other hand, has concluded that most of the coastal community houses are built from wood or from a combination of wood and concrete, which results in a low resistance to extreme weather events such as waves, storms and high winds.

The importance of community awareness toward the climate change

As the impacts of the climate change on coastal community are hazardous, it is becoming increasingly important for coastal community to be aware toward environmental changes. It is important to examine such awareness, as climate change risks can be accessed by human perceptions – such as their awareness toward the climate change (Marshall *et al.*, 2009; Smith *et al.*, 2000). This underlines an important facet of risk that accentuates the role of social structures or conditions in determining a system's exposure toward climate change. The awareness of a community to the climate change is largely determined by how strongly it relies on the environment and its resources for socio-economic activities (Marshall *et al.*, 2009). In many instances, factors of individual difference such as income, occupation, location of settlement, gender, duration of living in an area and educational achievement have a profound impact on community members' awareness and capacity to adapt (Shah *et al.*, 2013; Below *et al.*, 2012; Combest-Friedman *et al.*, 2012; Abu Samah *et al.*, 2011; Teka and Vogt, 2010; Marshall *et al.*, 2009). Those who settle near to the shore, for example, are more aware and exposed to the climate change (Combest-Friedman *et al.*, 2012), and the same goes for those who rely heavily on natural resources for generating an income, such as fishermen (Marshall *et al.*, 2009; Abu Samah *et al.*, 2011; Teka and Vogt, 2010). Wamsler *et al.* (2012) and Below *et al.* (2012) accentuated the importance of educational achievement, as those with a better education are expected to be more aware to climate change, as they are more likely to be exposed to climate change information. Shah *et al.* (2013) concluded that males are less vulnerable to the impacts of climate change compared to females, and this is a result of their awareness toward climate change. Abu Samah *et al.* (2011) concluded that those who have lived for many years in an area are expected to be more aware toward environmental changes, as their experience of the area enables them to understand the natural changes in the area.

Malaysia is among the countries in ASEAN that has strength in terms of surveillance and enforcement in CZM administration which is supported by the government;

however, community-based management is still lacking (Nasuchon, 2009). Here, information with regard to communities' awareness toward climate change will contribute information that is vital for developing a climate change adaptation strategy that takes into account risk knowledge, prevention, warning systems and recovery (Marshall *et al.*, 2009; Shaffril *et al.*, 2013). As mentioned above, most coastal community members are seniors, who have been found to have better communication skills and possess more knowledge on environmental changes (Muhammad *et al.*, 2012; Fahmi *et al.*, 2013; Omar *et al.*, 2013). These two elements – better communication skills and increased environmental knowledge – make members more aware toward any changes, and obtaining information from such people is deemed important, as it will assist policymakers and concerned parties to anticipate and minimize the negative social and economic impacts of the climate change on coastal community.

Methodology

Research design

This research used a quantitative study, in which the instrument in the form of survey questionnaire was used as the main tool in the data collection process. Quantitative method is based on objective measurement and statistical analysis of numeric data to comprehend and clarifies a phenomena or issue.

Instrument development

The instrument was prepared based on reviews of the literature. It consists of five main parts, namely, demographic (seven questions), awareness toward temperature changes (four questions), awareness towards sea changes (four questions), awareness toward rain changes (five questions) and awareness toward coastal changes (four questions). For the demographic section, the respondents were given open-ended and closed-ended options, while for the remaining parts, the respondents were given a five-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was then validated by a number of experts and a series of instrument-development meetings. The validated instrument was then pre-tested at Kuala Paka, Terengganu; the resulting Cronbach's alpha value of 0.799 exceeds the recommended alpha value of 0.700 (Nunnally, 1978), which reflects the instrument's strength and reliability.

Research area and sampling

To determine areas of data collection and the respondents, a multi-stage cluster sampling technique was performed. At the first stage of sampling, zones in Malaysia were listed and then three out of five zones were randomly selected, namely, East-Coast, Northern and Southern. At the second stage, all states within the selected zones were listed and, again, a state was randomly selected to represent each selected zones and the selected states were Terengganu (East-Coast zone), Kedah (Northern zone) and Johor (Southern zone). Next, all coastal villages within the states were listed, and a coastal village was randomly selected to represent each selected state. The selected villages were Kuala Paka village (Latitude: 4.6500° Longitude: 103.4333°) (represented Terengganu), Pulau Sayak village (Latitude: 5.6667° Longitude: 100.3333°) (represented Kedah) and Sedili Kechil village (Latitude: 1.8500° Longitude: 104.1500°) (represented Johor). All of the selected villages are affected by the climate change, whereby Pulau Sayak, Kuala Paka and Sedili

Kechil are located in areas that are risked by strong wind and waves, rising temperature, coastal erosion, heavy rain and unstable northeast monsoon pattern (Suhaila *et al.*, 2010; Kwan *et al.*, 2011; Wan Azli, 2010). From these three villages, a total of 210 respondents were selected and they represented various types of professions such as fisherman, public/private servants, self-employed, housewife/retiree and student. The number of respondents was determined via a G-Power analysis where the process of getting the minimum number of sample for each analysis, was determined by G Power software. Power can be understood as the chance that the test will detect a statistically significant difference or relationship when such difference or relationship exists. Power also refers to the probability to reject the null hypothesis when there is need to do it. It is generally accepted that power should be 0.80 or greater, that is an 80 per cent or bigger opportunity of finding statistically significant difference or relationship when there is one. To meet the objectives determined, inferential analyses such as independent *t*-test and ANOVA need to be performed. Referring to the G-power analysis, based on the moderate effect size, alpha value = 0.005 and the magnitude of power between 0.90 and 0.95, the suitable number of sample to perform independent *t*-test is 176 and the suitable number of respondents to perform ANOVA (six groups) is 132. To have a bigger sample size is not a problem as Mohammad Najib (1999) stressed that a bigger sample size will strengthen the reliability and validity of the instrument.

Data collection

The data collection process was conducted from February 2013 to April 2013. The main method of data collection was via survey. The data collection process was conducted by the researchers and assisted by a number of experienced and trained enumerators. On average, 25 minutes were allocated for each respondent in the survey process.

Analysis

For analysis purposes, descriptive statistics such as frequency, percentage and mean were calculated, while inferential analysis using ANOVA and independent *t*-test were performed to determine any differences that might occur in the respondents' awareness towards climate change in relation to a number of selected factors.

Results and discussion

Demographic findings

A total of 210 respondents were surveyed; most of these were from Kedah (35.7 per cent), followed by Johor (35.3 per cent) and Terengganu (29.0 per cent). A total of 60 per cent were male and the mean score recorded for their age was 37.5 years. It can be seen that the majority of respondents have only a low level of educational achievement, as only 6.2 per cent of them possess a tertiary level of education. As the respondents' settlement areas are located in coastal and rural regions, most of them rely on fishing activities for their income, while some of them are self-employed laborers. The mean score for their income per month is RM 1,039.5 (roughly equal to USD 346.33), which exceeds the poverty level set by the Malaysian Economic Planning Unit (EPU) of RM 720 (roughly equal to USD 240). The majority of the respondents are "senior villagers", as the mean score recorded for duration living in the village is 27.7 years and a total of 33.8 per cent of them have lived in their village for 16 to 25 years (Table I).

Factors	Frequency	(%)	Mean
<i>States</i>			
Terengganu	61	29.0	
Kedah	74	35.2	
Selangor	75	35.8	
<i>Gender</i>			
Male	126	60.0	
Female	84	40.0	
<i>Age (years)</i>			
15-20	37	17.6	37.5
21-30	44	21.0	
31-40	35	16.7	
41-50	48	22.9	
51-60	29	13.8	
≥61	17	8.1	
<i>Income per month</i>			
<RM 500	49	23.3	1,039.5
RM 501-1,000	90	42.9	
RM 1,001-1,500	37	17.6	
≥RM 1,501	25	11.9	
<i>Education level</i>			
Never been to school	27	14.8	
Primary school	53	16.2	
PMR/LCE ^a	46	24.8	
SPM/SPMV ^b	71	22.9	
Tertiary level	13	11.4	
<i>Occupation</i>			
Fisherman	52	24.8	
Public/private servants	34	16.2	
Self-employed	52	24.8	
Housewife/retiree	48	22.9	
Student	24	11.4	
<i>Duration living in the area (years)</i>			
1-5	23	11.0	27.7
6-15	21	10.0	
16-25	71	33.8	
26-35	37	17.6	
≥36	58	27.6	

Table I.
Respondents
demographic data

Notes: ^aMalaysia lower education certificate; ^bMalaysia education certificate/Malaysia vocational education certificate

Awareness toward the climate change

Though this study is social in nature, it supports the applied studies of [Kwan et al. \(2011\)](#) and [Tanggung \(2007\)](#), who claimed that the climate in states such as Kedah, Terengganu and Johor has changed. The respondents in the present study recorded a

high mean score for their awareness toward the climate change with regard to the sea, temperature and coast and a moderate mean score for the climate change with regard to rain (Table II).

Differences in coastal communities' awareness toward the climate change

Three factors, namely, states, profession and gender have recorded significance different with respect to the respondents' awareness toward temperature changes (Table III). Generally, all of the respondents from the three areas exhibited high awareness towards temperature changes (mean score > 3.67). Further analysis confirms that the respondents in Kedah recorded the highest awareness toward temperature changes, and this is significantly different to the awareness toward temperature changes recorded by the communities in Terengganu and Johor. This scenario is surprising, *Kwan et al. (2011)* stated that higher temperature changes have been identified in Terengganu and East Johor compared to Kedah, which suggests that the respondents in Terengganu and East Johor would be more aware toward temperature changes. Compared to Kedah, the mean score for awareness in Terengganu and Johor might be reduced by those who are less aware toward such changes; this might be explained with reference to *Abu Samah et al. (2011)* explained that most coastal community members have lived in the area and have been involved in fishing for many years, thus leading some of them to claim that they are "immune" to, and feel less aware towards, the climate change.

Profession is another factor that recorded a significant difference; surprisingly, fishermen recorded the lowest mean score on awareness toward temperature changes. Despite their "daily communication" with nature and their great reliance on the sea, within the scope of this study, fishermen were found to be less aware toward the changes, and the demonstrated findings are not in line with international studies done by *Marshall et al. (2009)* and *Teka and Vogt (2010)*. Again, a suggestion by *Abu Samah et al. (2011)* might explain this scenario, which is again that fishermen's long-term involvement in fishing operations has made them "immune" toward such changes. Compared to activities within other professions, such as government/private staff, housewives/retirees and students, who are more "indoor" in nature and seldom impacted by the climate, exposing these people towards increasing heat or heavy rain might stimulate their awareness of the climate change and create more awareness among them toward it.

State is the only factor that recorded a significant difference in terms of awareness towards sea and coastal changes. Kedah recorded the highest awareness, which might be due to the fact that people's perceptions of sea conditions have significantly changed following the tsunami disaster in 2004. Further analysis confirmed that Johor recorded the highest mean score for awareness toward coastal changes, and recorded a significant difference compared to the other two states. These findings might be

Climate change	Mean
Temperature	4.05
Sea	4.33
Rain	3.32
Coast	3.85

Table II.
Mean score on
awareness towards
the climate change

	Environment changes	<i>F</i>	<i>p</i>
	<i>Temperature</i>		
	Age	0.653	0.660
	States	7.901	0.0001*
	Duration living in area	0.666	0.616
	Profession	3.045	0.018*
	Income	0.991	0.398
	Educational achievement	0.146	0.995
	<i>Sea</i>		
	Age	0.521	0.761
	States	5.198	0.006*
	Duration living in area	0.991	0.414
	Profession	1.759	0.138
	Income	1.874	0.135
	Educational achievement	0.472	0.757
	<i>Rain</i>		
	Age	0.133	0.055
	States	1.739	0.178
	Duration living in area	0.804	0.524
	Profession	1.616	0.171
	Income	1.938	0.125
	Educational achievement	1.546	0.190
	<i>Coastal</i>		
	Age	0.034	0.625
	States	3.354	0.037*
	Duration living in area	1.051	0.382
	Profession	1.154	0.333
	Income	0.647	0.586
	Educational achievement	0.913	0.457

Table III.
Differences in coastal
community
awareness towards
the climate change
(using ANOVA)

explained by the fact that East Johor is located in the East-Coast region of Peninsular Malaysia, an area that is exposed to the changing monsoon each year. Monsoon changes have been detected as the one of the primary causes of coastal erosion in Malaysia (Wong, 2003), and this has created several problems, as outlined above (Mohd Ekhwan, 2006; Department of Irrigation and Drainage Malaysia, 2012).

No significant difference was recorded for any factors with regard to awareness toward changes in rainfall. Further analysis confirmed that all of the groups studied recorded a moderate mean score for awareness towards rain changes (mean score between 2.34 and 3.67), which denotes the possibility that there have been no obvious changes with regard to rain pattern from the viewpoint of the respondents. Within the scope of this study, this finding might be explained with reference to a local study by the NAHRIM (2006), which confirmed that the rain pattern in Malaysia has gradually changed, although a significant change will only be experienced by the western and eastern coastal community in the year 2050.

Educational achievement did not show any significant difference with regard to awareness toward the climate change, and these results oppose the findings of

international studies done by Wamsler *et al.* (2012) and Below *et al.* (2012), who claimed that educated people will have a higher awareness toward the climate change as they have access to a number of advanced information sources (e.g. the internet), and are expected to be exposed to more information. Nevertheless, within the scope of this study, this smooth flow of information can create a different scenario. Shaffril *et al.* (2013) confirmed that coastal community will commonly spend time together late in the evening, in places such as coffee stalls and *wakaf*; here, and chatting is a common activity, which enables informal way of information sharing and exchanges.

Gender also reflected a significant difference: surprisingly, the female respondents recorded a higher mean score compared to males in term of their awareness toward temperature changes (Table IV). Again, this is not in line with Shah *et al.* (2013). This scenario can be related to the profession factor; earlier analysis suggested that while males tend to work more outdoors, females work more often indoors, as the majority are housewives and students, resulting in most of them conducting their daily routines in their house and school buildings. They are thus exposed less to the heat, which make them less “immune” to the changes.

Conclusion and recommendations

The study offers several unique findings. Fishermen were found as the least aware group toward the climate change, though, generally, people will think that they are more aware toward the climate change due to their daily interaction with the climate. Abu Samah *et al.* (2011) argued that fishermen’s long-term involvement in fishing operations has made them “immune” toward such changes and lowering their awareness towards the climate change. These results are, in fact, concerning, as fishermen are one of the most dependent groups on nature, and should be taught what climate change is all about. Shaffril *et al.* (2013) stressed the importance of possessing environmental knowledge among local fishermen, as it will assist them to understand the climate change, its causes or its impacts on them, their families and their communities.

Environment changes	Mean score	<i>F</i>	<i>p</i>
<i>Temperature</i>		3.108	0.002*
Male	3.92		
Female	4.24		
<i>Sea</i>		0.438	0.662
Male	4.31		
Female	4.35		
<i>Rain</i>		1.159	0.248
Male	3.27		
Female	3.38		
<i>Coastal</i>		1.197	0.233
Male	3.80		
Female	3.92		

Table IV.
Differences on
coastal community
awareness towards
change in the factor
of gender (using
independent *t*-test)

From the findings, it is suggested that knowledge management practices within the community, and between the community and the relevant agencies, should be strengthened. Data offered by the study provide the agencies opportunities to have a better information management strategies for specific group of communities as one of their efforts to further increase the coastal community awareness toward the climate change. Having a high level of awareness will assist the coastal community to lessen the risks associated with the climate change, while, at the same time, making them aware of any opportunities that might arise from the climate change.

The importance of information sharing between the community and related parties (e.g. relevant parties and non-governmental organizations (NGOs)) should be accentuated and actively conducted in a number of ways. First, as suggested by [Nursey-Bray \(2011\)](#), researchers should share and disseminate their research findings with regard to the climate change with the local community. Furthermore, universities, particularly those located near to coastal areas, should provide their students with environmental courses, seminars and classes. The information obtained can then be shared with the coastal community via formal or informal events. Within local settings, universities such as Universiti Malaysia Terengganu (UMT), Universiti Sultan ZainalAbidin, Universiti Teknologi Mara (UiTM) (Dungun branch) and Universiti Malaysia Pahang (UMP) (Pekan Branch) are located near to coastal areas, and thus able to perform such a function.

A study by [Fielho \(2008\)](#) accentuated the roles of concerned parties in sharing and disseminating climate-change information which is aware to the communities' interests and needs. For example, climate change information that is more technical in nature is unlikely to attract much attention from the community, compared to information relating to the impact of climate change on socio-economic activities. [Shaffril *et al.* \(2013\)](#) looked at the experience of agencies such as the Malaysia Civil Defence Department (MCDD), Mercy Malaysia and AMAN Malaysia in leading climate change-related programs and handling climatic threats locally and internationally, and their experience should be seen as vital in enhancing community awareness toward the climate change.

Furthermore, agencies such as Fisheries Development Authority of Malaysia (LKIM) and the National Association of Fishermen (PNK) should put effort into conducting courses and seminars on what climate change is all about. In addition, as interpersonal communication is preferred by the majority of communities, particularly those in rural and coastal areas ([Shaffril *et al.*, 2013](#)), trusted and reliable interpersonal sources, such as relevant government officers (e.g. fisheries extensions officers, agriculture extension officers, district officers), village leaders, jetty leaders and vessel skippers should be used as "environmentalist teachers" for coastal community. Their knowledge on the climate change should be strengthened, and in return they can share this knowledge with the coastal community.

This study represented the answers of 210 respondents who were randomly selected from three coastal villages in Peninsular Malaysia, and the results might be enriched if the number of respondents is increased and respondents from other villages are included. A future study should be conducted to gather information on the possible effects, rather than focusing on the respondents' awareness. Additionally, because of the nature of the topic, NGOs and officers from environment-related agencies should cooperate during the research.

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Further reading

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