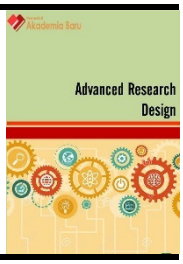
Penerbit Akademia Baru

Journal of Advanced Research Design

Journal homepage: www.akademiabaru.com/ard.html
ISSN: 2289-7984



Climate change impact on coastal communities in Malaysia

Open Access

Norzaida Abas[1,*], Zalina Mohd Daud[1], Norazizi Mohamed[1], Syafrina Abdul Halim[2]

[1] UTM Razak School of Engineering and Advanced Technology Universiti Teknologi Malaysia, Jln Sultan Yahya Petra, Kuala Lumpur
[2] Department of Science in Engineering, Kuliyyah of Engineering, International Islamic University of Malaysia, 53100 Gombak, Selangor, Malaysia

ARTICLE INFO

Article history:
Received 16 May 2017
Received in revised form 22 June 2017
Accepted 2 August 2017
Available online 4 August 2017

Keywords:
Climate change, public awareness and perception, coastal community, adaptation

ABSTRACT

Climate change is undeniably the greatest issue facing our society. Around the globe, increasingly unpredictable weather patterns and extreme weather events are observed, causing considerable risks to human lives, properties and health safety and also on the natural ecosystem. The magnitude and impacts of climate change are growing, and particularly in Malaysia, studies show increases in temperature and changes in rainfall regimes. Such changes have profound implications, especially for coastal communities. Since knowledge and perceptions of the public on climate change could affect the success of implemented adaptation and mitigation options, it is essential to conduct assessments to gather such information. A public awareness and perception study was conducted at Sabak and Tanjung Karang, two coastal communities which were affected by changes in sea level and flooding incidences. The knowledge level and perceptions of climate change among respondents were assessed covering areas such as level of awareness of the respondents, their perceptions of climate change issues, their sentiments on climate change and adaptation measures, their socio-economic activity and the effect on their lives. Results show that majority of respondents were aware of climate change issues and challenges. High levels of concern about climate change were expressed with the majority were worried and uncertain about the climate change impact and hoped for government measures. Almost half of respondents cited significant damage to their properties and reduction in income generation. Overall, the results of the present study gave insights of the affected parties on perceptions and awareness pertaining to climate change, which could potentially be used to promote greater awareness of climate change matters and to gauge the public response to related policies and strategies.

1. Introduction

Knowledge of climate change is a rising matter invoking interest from many quarters. Several categories of climate change are knowledge about how the climate system works; specific knowledge about the causes, consequences and possible solutions and practical knowledge for individual and

* *Corresponding author.*
E-mail address: zaida.kl@utm.my (Norzaida Abas)

collective actions. However public knowledge of global climate change and its associated environmental issues have received little attention globally. Changing deep-rooted habits and behaviours which are detrimental to the health of our planet requires significant understanding of climate change and its impact. This understanding, derived from knowledge of climate change, will lead to a conviction which will bring positive behavioural change in the general public.

Worldwide, increasing unpredictable weather patterns and extreme weather events are reported, posing substantial threats to human lives, properties and health safety. The magnitude and impacts of climate change are escalating, with heat waves in Europe, extensive flooding in Asia and both droughts and floods in the African continent. Particularly in Malaysia, climate change studies show increases in temperature and changes in rainfall regimes. Numerous scientific studies have been done to understand, analysing and predicting changes in climatic conditions of Malaysia [1-4]. A number of studies have shown that the dual monsoon season, namely the North-east monsoon and the South-west monsoon has changed in its intensity and magnitude. The incidence of extreme events is becoming more common resulting in strong winds, heavy rains, high waves and not forgetting droughts as well. The tsunami of 2004, the big floods of 2006 and most recently of 2014 are among the most devastating events to hit Malaysia. The economic loss runs in the billions. Losses of lives, property and for some loss of the source of income are realities that need to be dealt with. The estimated damage assessment for floods uses a conservative figure of USD500 million per year [5].

The outcome of studies on climate change done in Malaysia is representative to a certain extent of other tropical countries, bearing in mind that climate is a very highly variable phenomenon. The knowledge derived out of the various research done could be disseminated and shared with communities of similar climate conditions. Public awareness approach, knowledge sharing activities with the public, as well as mitigation efforts the general public could participate in, are all common things Malaysia and other countries could share. To date, limited work on public awareness of climate change has been done globally. It is thus important that countries sharing similar climate conditions and also similar demographic make-up to consolidate and share their findings. As we know, climate change is happening, and the effect from it could be devastating, so it is the time that we put our efforts together and share our concern.

Since knowledge and perceptions of the public on climate change could affect the success of implemented adaptation and mitigation options, it is essential to undertake assessments to assemble such information. A study to assess the knowledge, awareness and adaptation to climate change impact is conducted in the coastal communities of Peninsular Malaysia. The study aims to ascertain the socio-economic characteristics of the respondents and examine the level of awareness about climate change among respondents in the study area. The study is conducted at Sabak and Tanjung Karang, two coastal communities which are affected by changes in sea level and flood. Tanjung Karang is located on the west coast of Peninsular Malaysia while Sabak on the east coast.

2. Climate Change and Awareness

Climate change has an immense impact on the well-being of all individuals concerned, however many are not aware of it. According to Upham *et al*. [6], climate change issues is regarded less important for most people, compared to other societal issues such as the economy, education, or the threat of terrorism. In Malaysia, a significant fraction of the population is vulnerable to the effects of extreme weather events that are associated with climate change such as droughts and floods. A study by Azura [7] revealed that selected stations along the West Coast of Peninsular Malaysia have an upward trend of sea level rise. Meanwhile, a study on surface temperature by Tanggang *et al*. [5]

found that in the last four decades, most areas in Malaysia experienced warming at the rates between 2.7-4.00/100 years. The impact of such events can be devastating to individuals and the nation as a whole. Without adequate preventive measures, the occurrence of floods and increase in sea level could cause displacement of people and damage infrastructures. Climate change poses a threat to the existing problems of poverty, disease, and inadequate housing by making them worse. The aftermath of flooding bring forth diseases such as cholera, skin diseases, diarrhoea, leptospirosis and so on. These outbreaks are often associated with the contamination of drinking-water facilities, improper sanitation and lack of adequate sewage treatment.

Besides that, agricultural production from eroded or inundated lands will be halted. About 29,000 sq. km of land area within Peninsular Malaysia is at risk of being flooded, which affect about 4.82 million people [8]. The threat from drought is another factor bringing significant effect to the environment and social activities. The 1997/98 El Nino related drought was among the most impactful in Malaysia, putting vast areas of the nation under threat of wild forest and peat fire due to lengthening period of dry weather condition. This scenario caused the country to undergone months of hazy atmosphere that impeded the health of the population. Again, there is an economic deficit as yields from crops and livestock suffers a decrease.

It was estimated that for every 10C temperature rise there would be a 10% reduction in rice yields. Oil palm production may have an undesirable effect due to either a rise in temperature causing drought or increased rainfall that leads to flooding [9]. According to Low and Ahmad Jamaluddin [10], the increase in flood intensity and frequency would incur extra costs for managing water resources due to the adjustments of future flood mitigation strategies and also the current flood mitigation schemes and drainage systems. Similarly, sea level increase would instigate tidal inundation, shoreline erosion, increased wave action and saline intrusion, causing submergence of corals, loss of fisheries resources, plantation lands, and mangrove forests, and possible relocation of coastal infrastructure [11].

Worldwide, decision-makers are confronted with challenges in adapting to a changing climate [12]. Lessening the susceptibility and applying the needed measures to reduce climate change impact are not necessarily the responsibility of governments. The severity of climate change impact calls for public participation to collaborate with decision makers in lessening the vulnerability and how best to adapt to the impacts. The public must be aware and be informed about climate change consequences and the actions they could adopt to adjust to climate change. Awareness raising, therefore, plays a crucial role in the adaptation process of managing the impacts of climate change. Also, political awareness is also as important because policy makers and politicians play the main role in the policy process of adaptation.

In order to achieve the desired outcome in educating the public, awareness raising crusade should have the appropriate strategies for disseminating information. Although awareness campaigns could be different from one another, the essence of the campaigns is fundamentally similar. Most would focus on increasing concern, informing the targeted audience, creating a positive image, and attempts to change their behaviour.

Pugliese and Ray [13] reported outcomes of a Gallup conducted between 2007 and 2008, to survey global opinions on climate change of which two questions were posted to respondents in 128 countries: 1) How much do you know about global warming or climate change? and 2) How serious of a threat is global warming to you and your family? Results of the survey differ by regions, with the highest awareness in Europe and taper down to lowest among adults in sub-Saharan Africa. It is interesting to highlight that adults in Asia are the least likely to answer that climate change is a grave threat while less than a third, 32%, perceive it as a threat.

Communicating to the public a scientific knowledge is a challenge. Bringing it down to the level that people can appreciate to understand minus the scepticism of it being unnecessary fear creation is an approach that requires some strategic thinking. Pidgeon and Fischhoff [14] sug¬gested that instead of assuming what people should know about cli¬mate sci¬ence, a better way of begin¬ning the pro¬cess of cli¬mate change com¬mu¬nic¬a¬tion is to find out what they want to know. There have been many efforts by the international community in promoting public awareness as well as finding ways to reduce the impact of climate change. For example, the general mass media are regarded one of the tools which are frequently employed to influence public opinion of some particular issues. In particular, media is essential in educating and informing the public on effects of the deteriorating environment and related human impact. Many public opinion surveys in developed countries revealed that television and daily newspapers are used as primary sources of information. In Japan, Aoyagi-Usui [15] reported that most of the Japanese public derive information regarding the environmental issue from televisions and daily newspaper. Sampei and Aagoyagi-Usui [16] conducted a study on Japanese newspaper coverage of global warming from January 1998 to July 2007 and how public opinion during parts of that period was influenced by newspaper coverage. It was found that an extraordinary rise in newspaper coverage of global warming from January 2007 correlated with an increase in public awareness on the issue. In the 6th Asia-Europe Journalists' Seminar in 2011, it was discussed how the media could be a more efficient role in increasing public awareness to address the problem of climate change and the need to speed up the global response to this challenge.

3. Materials and Method

Malaysia is a tropical country located 1°N and 6°N in the northern latitude and between 100°E to 103°E longitude. Its proximity to the equator and surrounded by water bodies on most parts of the country, lends it a highly variable and hot climate throughout the year with pronounced monsoonal seasons. The average annual rainfall is around 2500mm, and the average temperature is 27o C. Multi-racial in citizen's composition, its economic activities range from agricultural and fishing activities up to highly technical industrial employment. Even though the industry and services sector dominate the country's economy, about a third of the population depend on the agriculture sector for their source of livelihood, and this makes up about 3.6% of the nation's GNP. In 2010, agriculture, forestry and fishing accounted for 13.3% of total employment of 11.1 million. The fisheries sector of Malaysia plays a significant role in generating income and jobs with foreign exchange. In 2010 it contributed 18% of the nation's GNP [17].

3.1 Data Collection

Two coastal communities were purposively selected for data collection, Tanjung Karang which is located on the west coast of Peninsular Malaysia while Sabak on the east coast. These two coastal communities were affected by changes in sea level and flood, especially Sabak which experiences the calamities quite frequently.

A total only 80 respondents took part in the survey. The study took place in April 2015. The low number of the respondents is due to the flood that affected the areas just before the scheduled time of the survey. A questionnaire is developed and variables of interest include the demography of the respondents, their socio-economic activity, the effect of climate change on their lives which involve displacement and changes in socio-economic activities and their awareness of climate change issues. Data were collected via face to face interviews with focus groups. The respondents were a mixture

of both young and older folks. This study employs both quantitative and qualitative approaches. An analysis of the source of climate change awareness is conducted to reveal their awareness of the phenomenon.

4. Results and Discussion

A total of 80 respondents were surveyed where 47.6% were above 50 years, 52.4% were below 50 years and about 14.3% of the respondents aged more than 65 years old Most of the respondents (40.5%) were in the age group of 34-49 years old. 35.7% of respondents were primary school leavers and 64.3% secondary school leavers. It can be seen that the majority of respondents have an only low level of educational achievement and none completed tertiary education. 64.3% were self-employed, 14.3 % work for private companies and 31.0% were unemployed. The majority of the respondents (90.5%) have been residing in the respective villages for more than 25 years.

Basically, the survey focused on five themes, which were climate change awareness, feelings about climate change, short-term and long-term adaptation measures, extreme events and lastly economic impact.

4.1 Climate Change Awareness

The survey started off with respondents was first asked if they heard of the concept of climate change. 83.3% of respondents indicated they knew about climate change with the main source of information being radio and television (69.0%) and 11.9% obtained the information from various newspapers. The awareness level was quite high with 95.2% of respondents sensed that climate change is happening. The respondents were asked the changes they observed in their surroundings. 88.1% of respondents noticed sea level rise, more diseases 57.1%, increase in coastal erosion 83.3%, inflow of seawater 88.1%, increase in thunderstorm 38.1%, increase in frequency of rain 19.0%, decrease in frequency of rain 81.0%, hotter weather 97.6%, less fish in the sea 85.7%, damages in private property 78.6% and in public property 66.7%.

Perceptions on impacts of climate change were assessed with 83.3% believed that climate change has a negative impact on the community, and 76.2% anticipated that climate change would have an adverse impact on the next generation. 61.9% of respondents said that they were adapting to climate change while 19.0% do not. 78.6% thought about short terms measures only.

4.2 Feelings about Climate Change

The majority of the respondents (92.6%) were scared, 42.5 % did not believe climate change is happening: 66.7% were confused while 90.5% were worried. 83.3% of the respondents felt helpless while 76.2% were sad and most respondents (92.9%) hoped for government measures.

4.3 Perception on Short-term and long-term adaptation measures

Respondents were asked about the adaptation measures undertaken within their village to cope with the impact of climate change. 66.7% of respondents said there were concrete walls, while 90.5% rock walls and 50.0% sandbag walls and 73.8% planted trees. 90.5% of respondents agree that new buildings should be built further inland. 76.2% of respondents were willing to relocate, if necessary.

4.4 Economic Impact on family

Respondents were asked if they experienced economic impact due to climate change. 64.3% says the decrease in household income, and 9.5% cites loss of income and 11.9% of respondents indicated they changed occupation. Respondents were also asked on the damages of property from extreme weather events, 42.9% cites significant damage and 11.9% left homeless while 14.3% said that they have to relocate. Respondents were asked if they receive any help to overcome the economic problems. 41.2% of respondents received cash from state government, 11.8% received money from the federal government, and 11.8% were allocated lots for new homes.

5.0 Conclusion

Undoubtedly knowledge of climate change and its impact on the environment and people's lives should be ingrained in every individual. Public knowledge, awareness and perception of climate change form the basis in dealing with the changing climate and its problems. In this study, the level of awareness towards climate change of coastal community in Peninsular Malaysia is being examined. Respondents from two coastal communities express their perceptions on climate change and how they were adapting to the effects of climate change. Respondents were assessed on five themes namely climate change awareness, feelings about climate change, short-term and long-term adaptation measures, extreme events and lastly economic impact.

It was found that the level of awareness among the respondents is quite high, owing to the mass media coverage of climate change, particularly radio and television. This result is consistent with the results from similar studies conducted in Japan [15-16]. Although the knowledge level of respondents on climate change is little, most of them were aware of the changes in their surroundings, particularly the changing trends in atmospheric temperatures and rainfall patterns. Also, they were aware the effects of these changes on fisheries and water bodies within the community. A high percentage of respondents felt that climate change had an undesirable impact on the community and anticipated that climate change would have an adverse impact on the next generation. About two third of respondents said that they were adapting to climate change. About three-quarter of the respondents showed their willingness to relocate to a safer place if necessary. Respondents also claimed that they suffered from the economic impact with a high percentage of respondents experienced reduce of income. Forty percent suffered significant property damages while about twelve percent were left homeless. Respondents were also aware of the various adaptation measures and aids provided by the government.

This study sheds some light on certain main points regarding perception, awareness and knowledge level of those affected by climate change. From the research results, it is recommended that the mass media need to be continuously engaged in the communication of climate change, particularly through television and radio. The public must be made aware and be informed about climate change consequences and the actions they could adopt to adapt to climate change. It is also recommended that the government constantly involves local communities in the deliberation of climate change policies, collaborating the public and decision makers. Finally, the result of this study would help us in creating public awareness of climate change impact and also determining the best adaptation measures to climate change to be adopted by coastal communities in Malaysia.

Acknowledgement
We like to thank Universiti Teknologi Malaysia for the supporting this research. The research was funded under the Research University Grant Vote 15H74.

References

[1] Juneng, Liew, and Fredolin T. Tangang. "Level and source of predictability of seasonal rainfall anomalies in Malaysia using canonical correlation analysis." *International Journal of Climatology* 28, no. 9 (2008): 1255-1267.
[2] A.H. Syafrina, M.D. Zalina and A. Norzaida, Climate Projections of Future Extreme Events in Malaysia, *American Journal of Applied Sciences.*
[3] Zalina, M.D, Shafrina, A.H., Norzaida, A. and Nor Azizi, M. (2014). Probabilistic analysis of extreme rainfall in Malaysia. *ISI Regional Conference 2014*. Bank Negara, Kuala Lumpur. 17-19 Nov. 2014
[4] Norzaida, Abas, Mohd Daud Zalina, and Yusof Fadhilah. "Application of Fourier series in managing the seasonality of convective and monsoon rainfall." *Hydrological Sciences Journal* 61, no. 10 (2016): 1967-1980.
[5] Tangang, Fredolin T., Liew Juneng, Ester Salimun, P. N. Vinayachandran, Yap Kok Seng, C. J. C. Reason, Swadhin K. Behera, and T. Yasunari. "On the roles of the northeast cold surge, the Borneo vortex, the Madden-Julian Oscillation, and the Indian Ocean Dipole during the extreme 2006/2007 flood in southern Peninsular Malaysia." *Geophysical Research Letters* 35, no. 14 (2008).
[6] Upham, P., Whitmarsh, L., Poortinga, W., Purdam, K., Darnton, A., McLachlan, C. & Devine-Wright, P. (2009) *Public Attitudes to Environmental Change: a selective review of theory and practice.* A research synthesis for the Living with Environmental Change Programme, Research Councils UK.
[7] Radzi, Azura Ahmad. "Trend analysis of sea level rise for West Coast of Peninsular Malaysia." (2009).
[8] Norsam Tasli Mohd Razali (2014). Future of Malaysia Agriculture: Sustainable Agroecosystem Management for Rapid and High Impact Development. myForesight - Malaysian Foresight Institute.
[9] Ramadasan, K., Mohamad Zabawi, A.G., Yew, F.K., Mohd. Yusoff, A. and Hawa, Z.J. 2001. Assessment of the impacts of climate change on key economic sectors in Malaysia: Agriculture. In Chong, A.L. and Mathew, P. (eds): Malaysia national response strategies to climate change. Ministry of Science, Technology and Environment.
[10] Low, K.S. and Ahmad Jamaluddin, S. 2001. Assessment of the impacts of climate change on key economic sectors in Malaysia: Water resources. In Chong, A.L. and Mathew, P. (eds): Malaysia national response strategies to climate change. Ministry of Science, Technology and Environment.
[11] Lee, S.C. and Teh, T.S. 2001. Assessment of the impacts of climate change on key economic sectors in Malaysia: Coastal resources. In Chong, A.L. and Mathew, P. (eds): Malaysia national response strategies to climate change. Ministry of Science, Technology and Environment.
[12] R.H. Moss, G.A. Meehl, M.C. Lemos, J.B. Smith, J.R. Arnold, J.C. Arnott, D. Behar, G.P. Brasseur, S.B. Broomell, A.J. Busalacchi, S. Dessai, K.L. Ebi, J.A. Edmonds, J. Furlow, L. Goddard, H.C. Hartmann, J.W. Hurrell, J.W. Katzenberger, D.M. Liverman, P.W. Mote, S.C. Moser, A. Kumar, R.S. Pulwarty, E.A. Seyller, B.L. Turner II, W.M. Washington, T.J. Wilbanks Hell and high water: practice-relevant adaptation science Science, 342 (6159) (2013), pp. 696–698
[13] Pugliese, A., and J. Ray. "Awareness of climate change and threat vary by region." *Gallup. Retrieved from http://www. gallup. com/poll/124652/awareness-climate-change-threat-vary-region. aspx* (2009)
[14] Jabatan Perangkaan Negara (2014). http://www.statistics.gov.my/portal/index.php