

The Potential Impact of Climate Change Environmental Hazards on Quality of Life of Fishermen Community In Malaysia

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Abstract: Climate change is not a new phenomena and has already bring concerns to us. A lot of community groups have suffered from the impacts of the climate change. Farmers, businessmen, tourists, older people and children are going to be challenged like never before as climate change exerts a multi-faceted influence. Other than these groups, what about the fishermen? Are their social, economic and health aspects are going to be affected by the impacts of climate change? The answer of this question will fulfill the main objective of this paper which is to discover the climate change impact on the fishermen's quality of life. This is a qualitative study where the data was gained through literature analysis and document analysis. Based on the analysis done, it can be concluded that the climate change will obstruct fishermen from doing their routine tasks, bring damages to their belongings, reduce the quantity and quality of the sea faunas which will affect their productivity and expose them to diseases related to malaria, skin problems, fever, flu, cough and other health problems. It is recommended that the fishermen in Malaysia must be socially and economically prepared so that they can face the impacts brought by the climate change.

Key words: Fishermen, climate change and quality of life

INTRODUCTION

Fisheries industry is important to provide persistent food supplies. The current statistic provided by Department of Fisheries Malaysia (DOF) has concluded that in 2009, almost 1,392 million tones metrics of marine fishes have been landed by the Malaysian fishermen. The strength of this sector doubtlessly will assist the country to achieve the mission of making the agriculture industry as the third income generator in Malaysia. To develop the fisheries sector, Malaysia government has established two agencies which are DOF and Fisheries Development Authority of Malaysia (LKIM). These two agencies are responsible for the development of fisheries sector and the development of fishermen community in Malaysia. Under these two agencies a lot of effective programs developed for fisheries sector and fishermen have been initiated. Programs such as Aquaculture Industrial Zone and High Impact Project and KUNITA (Women Entrepreneurs Group Within the Fishermen Community) are well known with their success. However, besides of these success and developments, all of the related parties that rely on fisheries sector must realize that they now have to be prepared and ready to face a new challenge of the phenomena called the climate change.

Climate change impacts are not a new phenomenon and has already become a major concern among the community all over the world including Malaysia. It is expected that the global temperatures will rise up to 1.5 and 4.5 degree celcius over the next century (Nelson and Serafin, 1996).

The environment will most suffered from the impact of climate change. Observation are already supporting projection of increasing sea and air temperature, rising sea levels, acidifying oceans, intensifying storms, changing rainfall patterns and ocean currents. Climate change has been understood to be responsible today, or predicted to be responsible in the future for significant economic losses as well as loss of life and wellbeing health. In unstable or fragile regions or communities, the burden of climate change may bring negative impacts to the aspects of social, economic and health of the community. Developed countries are well prepared for the negative impacts of the climate change with the advance technologies that they have. However, the condition is different with poor and developing countries. They are mostly affected by the climate change due to the less advance technologies they have. Malaysia is one of the countries that face the impact of the climate

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change, and this phenomena is expected to alter the stability of ecological and socio-economic systems. One of the groups that is expected to be socially and economically affected by climate change is the fishermen. This fact has driven this study to its main objective, which is to discuss the potential of the climate change impact on the quality of life of fishermen in Malaysia.

Fishermen in Malaysia:

Before we fulfill the main objective of this study, it is better for us to know about the fishermen in Malaysia. Data presented in Table 1 is the number of registered fishermen in Malaysia in 2005 till 2009. It is a positive indicator that the number of registered fishermen in Malaysia is keep increasing year by year. This proves that fisheries sector is able to attract people to rely on this sector as one of their main incomes. However, besides of this positive indicator, all of them must be socially and economically prepared by the related agencies as a need for them to face the impacts of climate change. This is important as the climate change indeed will bring negative impacts to the fishermen quality of life and this will be later discussed in the next part of this paper. Based on the statistic gained from the official website of DOF, in 2009, the number of registered fishermen was the highest (125,632) between the period of 2005 to 2009. Sabah was the state that come out with highest number of registered fishermen for five consecutive years (2005 to 2009) while Sabah and Sarawak zone was the zone that come out with the highest number of registered fishermen for five consecutive years (2005 to 2009). Based on the data presented, we can conclude that recently there are not too many registered fishermen in Negeri Sembilan and Federal Territory of Labuan.

Table 1: Number of Registered Fishermen in Malaysia

Zone		Number of Registered Fishermen in Malaysia 2005-2009				
State/Year		2005	2006	2007	2008	2009
Northern	Perlis	4,960	5,156	5,766	5,825	6,905
	Kedah	7,215	7,936	8,531	9,429	11,184
	P. Pinang	3,089	3,066	3,193	4,040	5,540
Total		15,264	16,158	17,490	19,294	23,629
East Coast	Kelantan	5,695	6,007	6,714	8,478	9,624
	Terengganu	8,706	8,670	8,651	9,007	10,421
	Pahang	4,539	5,497	5,559	6,654	7,024
Total		18,940	20,174	20,924	24,139	27,069
Central	Perak	8,234	9,143	10,580	10,516	12,156
	Selangor	5,799	6,241	7,078	7,199	7,074
Total		14,033	15,384	17,658	17,715	19,230
Southern	Malacca	1,330	1,112	1,273	1,281	1,844
	Negeri Sembilan	295	300	353	361	460
	Johor	9,310	9,620	9,034	9,706	11,641
Total		10,935	11,032	10,660	11,348	13,945
Sabah and Sarawak	Sarawak	10,344	13,913	11,440	12,694	16,278
	Sabah	20,845	20,845	20,845	23,673	24,691
	Federal Territory of Labuan	341	441	600	818	790
Total		31,530	35,199	32,885	37,185	41,759
Overall total		90,702	97,947	99,617	109,771	125,632

Sources: Department of Fisheries Malaysia 2005-2009

Table 2 clarifies the number of registered vessels in Malaysia. Similar to the number of registered fishermen, the number of registered vessels in Malaysia indicate that this sector has the potential to be flourished. The number of registered vessels in Malaysia in 2009 (48,745 registered vessels) has significantly increased compared to the number of registered vessels in 2005 (36,016 registered vessels). In 2009, Sabah was the state with the highest registered vessels (11,906 registered vessels), followed by Sarawak (6,054 registered vessels) and Perak (5,413 registered vessels). In 2009, Federal Territory of Labuan was the state that recorded the lowest number of registered vessels (287 registered vessels).

Table 2: Number of Registered Vessels in Malaysia (All types of inboard powered)

Zone		Number of Registered Vessels in Malaysia 2005-2009 (All types of inboard powered)				
State/Year		2005	2006	2007	2008	2009
Northern	Perlis	713	687	713	875	1,150
	Kedah	1,744	2,242	2,414	2,506	3,358
	P. Pinang	1,783	2,066	2,141	2,175	2,961

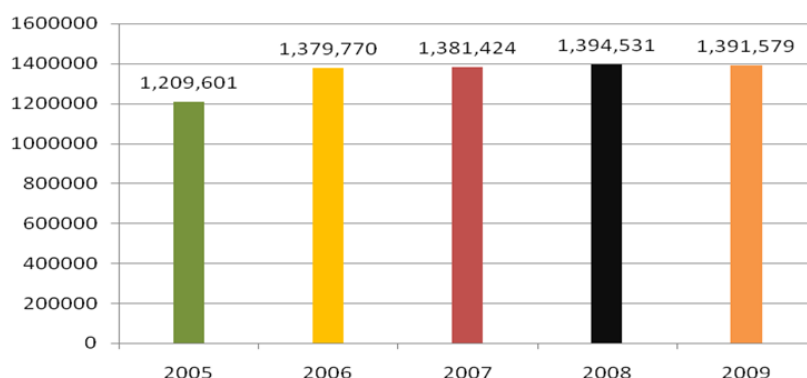
Table 2: Continue

Total		4,240	4,995	5,268	5,556	7,469
East Coast	Kelantan	989	1,268	1,276	1,432	1,290
	Terengganu	2,422	2,409	2,422	2,439	2,906
	Pahang	1,303	1,379	1,441	1,876	1,993
Total		4,623	5,056	5,139	5,747	6,819
Central	Perak	4,606	4,779	4,890	4,899	5,413
	Selangor	2,855	3,032	3,491	3,617	3,943
Total		7,461	7,811	8,381	8,516	9,356
Southern	Malacca	256	981	1,000	1,007	1,157
	Negeri Sembilan	1,202	280	289	303	433
	Johor	4,148	4,360	4,084	4,347	5,264
Total		5,606	5,621	5,373	5,657	6,854
Sabah and Sarawak	Sarawak	3,402	4,214	4,458	4,199	6,054
	Sabah	10,456	10,456	10,456	10,978	11,906
	Federal Territory of Labuan	117	123	146	306	287
Total		13,975	14,793	15,060	15,483	18,247
Overall total		36,016	38,276	39,221	40,959	48,745

Sources: Department of Fisheries Malaysia 2005-2009

Fisheries industry in Malaysia:

Based on the results presented in Figure 2, trend of marine fish landings portray an increase in the period of five years (2005 to 2009) except in 2009 where a total 2,952 tones decline of marine fish landing was recorded. The highest number of fish landed 1,394,531 tones was recorded in 2008.



Sources: Department of Fisheries Malaysia 2005-2009

Fig. 2: Trend of marine fish landings in Malaysia 2005-2009 (in million tones)

Table 3 concludes one of the important findings in this paper. We have been informed that the number of registered fishermen are keep increasing year by year, but do the productivity produced is also increasing? Based on the results presented in Table 3, the average of marine fish landed per registered fishermen was keep declining started from 2006 to 2009. It is a big concern to us that in 2009, the average of marine fish landed per registered fishermen was the lowest (11.077 tones). With the increasing number of registered fishermen, the productivity is predicted to be increased, however that was not happening and one of the causes that might contribute to this is the negative impact of climate change. As we know that one of the negative impacts of climate change is the reduction of quality and quantity of sea flora and fauna and this issue will be discussed in the next part of this paper.

Table 3: Average of Marine Fish Landings Per Registered Fishermen

Year	Number of registered fishermen	Total of marine fish landed (in tones)	Average of marine fish landed per registered fishermen (in tones)
2005	90,702	1,209,601	13.336
2006	97,947	1,379,770	14.087
2007	99,617	1,381,424	13.867
2008	109,771	1,394,531	12.704
2009	125,632	1,391,579	11.077

Sources: Department of Fisheries Malaysia 2005-2009

Figure 3 presents 11 most landed marine fish species in Malaysia where these ten species represents 54% from the overall landings. The other 46% of the landings was represented by the other species. The most landed marine fish in Malaysia is Trash Fish (20%) followed by Round Scad (7%) and Prawn (6%) and Squids (6%). The species of Indian Mackerel, Tuna, Yellow Stripped Trevally and Threadfin Bream represents a total of 13% from the overall landings. Only 2% of Spanish Mackerel and Anchovies were able to be landed in 2009.

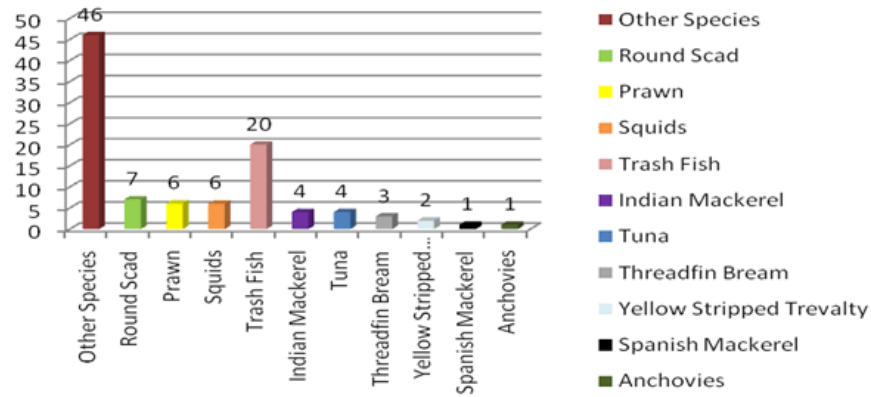


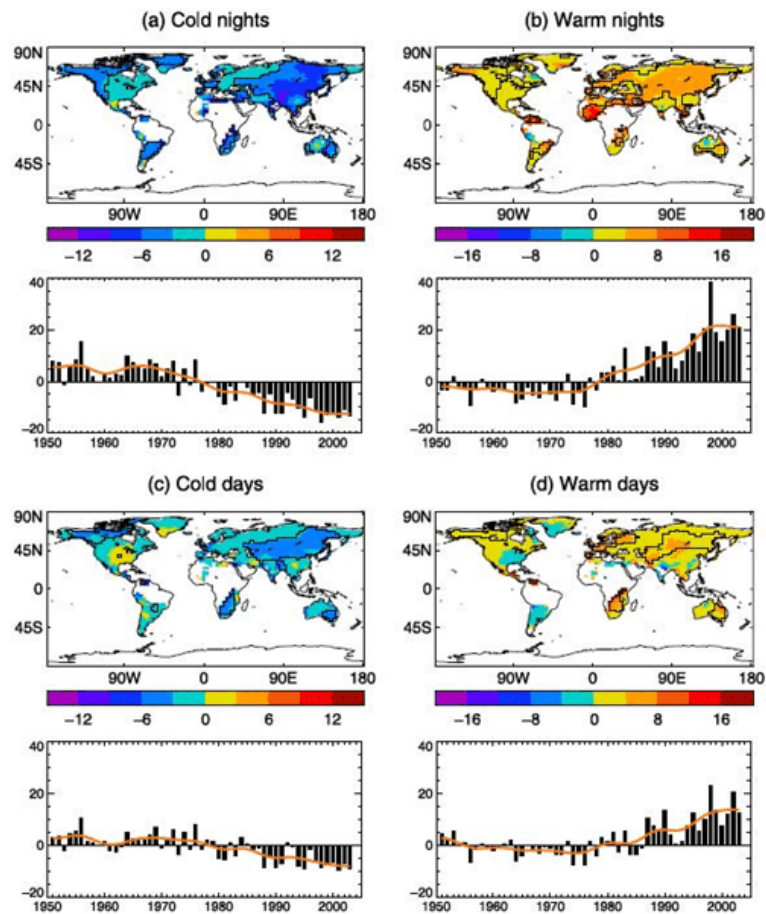
Fig. 3: Marine Fish Landings by Species in Malaysia in 2009 (in percentage).

Global Warming Threat to the sea, temperature and coastal area Sea:

The environment has become the major “victim” of climate change. Sea and coastal areas are among the major affected areas. The environmental impact that is caused by climate change especially on the coastal area is a concern for us. This extreme temperature is also expected to further raise sea level by expanding ocean water. The International Panel on Climate Change (IPCC) estimates that the global average sea level will rise between 0.6 and 2 feet (0.18 to 0.59 meters) in the next century (Perry *et al.*, 2007) Rising sea level increases the salinity of both surface water and ground water through salt water intrusion. If sea level rise pushes salty water upstream, then the existing water intakes might draw on salty water during dry periods. Salinity increases in estuaries also can harm aquatic plants and animals that do not tolerate high salinity. Besides, the negative impact of the climate change also will affect cold and cool water species in low latitudes where extinction is likely to increase and biodiversity will decline. Doubtlessly, these will have negative impact on the quantity and quality of the marine fish. On top of it, climate change without doubt will bring harms to the coral reef. There are three ways that the climate change can bring harms to the coral reef. First, ocean warming is directly reducing coral cover through coral bleaching, second, ocean warming can indirectly kill corals by magnifying the effects of infectious diseases and third is the climate change causing the world ocean become more acidic (Bruno, 2010). Sea currents also will be altered by the climate change. Scientist claimed that the sea water flow will be slowed by the climate change and as a result of this some part of the world will be cool or warm less while the rest of the globe swelters (Bazilchuk, 2009).

Extreme Temperature:

Climate change will result in extreme temperatures which include decreases in the number of unusually cold days and nights and increases in the number of unusually warm days and night. Conversely, in areas where a drought or excessive wetness caused by El-Nino, the impacts have been more intense in the recent years. Alexander *et al.* (2006), through their research have concluded that the world now has experienced a significant alteration in the temperature related to warming. Based on their findings, over 70% of the global land area sampled showed a significant difference in the annual occurrence of cold night and a significant increase in the annual occurrence of warm night and some regions have been affected by this impact higher than other regions (see Figure 1).



Trends (in days per decade, shown as maps) and annual time series anomalies relative to 1961–1990 mean values (shown as plots) for annual series of percentile temperature indices for 1951–2003 for (a) cold nights (TN10p), (b) warm nights (TN90p), (c) cold days (TX10p), and (d) warm days (TX90p). Trends were calculated only for the grid boxes with sufficient data (at least 40 years of data during the period and the last year of the series is no earlier than 1999). Black lines enclose regions where trends are significant at the 5% level. The red curves on the plots are nonlinear trend estimates obtained by smoothing using a 21-term binomial filter.

Sources: Alexander *et al.* (2006)

Coastal Area:

Land loss is another negative impact brought by climate change. Coastal wetland ecosystems including salt marshes and mangroves are particularly vulnerable to rising sea level because they are generally within a few feet of sea level (Perry *et al.*, 2007). Sea level rise also increases the vulnerability of coastal areas to flooding during storms for several reasons. Shore erosion will cause increases of vulnerability to storms, by removing the beaches and dunes that would otherwise protect coastal property from storm waves (FEMA, 2000). Sea level rise also increases coastal flooding caused by rainstorms, because low areas drain more slowly as sea level rises. Other impacts of climate change may further enhance or mitigate coastal flooding. Flooding caused by rainstorms may become worse if higher temperatures lead to increasing rainfall intensity during severe storms. More frequent of tropical storms would increase flood and wind damages. Coastal water supply is also affected by global warming. Based on this fact, the community in the coastal area of the east coast and the west coast of Malaysia have to be prepared against the threat of climate change.

Climate Change Impact on fishermen quality of life:

The climate change does not affect the environment alone. It indeed affects the community. Climate change will negatively adjust many aspects of fishermen quality of life (QOL) such as economic, social and

health. (Moore 1996; McDonald 2006 and Bruce 2008). Fishermen's role in ensuring the food security in our country is important, but besides of their important roles for the country, does their QOL is at a good level? From this query, raise another question, what actually affect their level of quality of life? Does the climate change become one of the reasons? QOL is indeed an important thing to be considered for having a better QOL. QOL covers a numerous meanings. QOL Research Unit of University of Colorado defines QOL as

"The degree to which a person enjoys the important possibilities of his/her life. Possibilities result from the opportunities and limitations each person has in his/her life and reflect the interaction of personal and environmental factors. Enjoyment has two components: the experience of satisfaction and the possession or achievement of some characteristic, as illustrated by the expression: "She enjoys good health." Three major life domains are identified: Being, Belonging, and Becoming"

QOL Research Unit of University of Colorado has focused on four aspects to the best indicator of QOL which are social, health, economic and environment while Felce and Perry (1995) have detected five general dimensions of QOL which are physical well being, material well being, social well being, emotional well being and development and activity. Conversely, aspects such as social, economy and health are always been identified as the significant indicators of QOL. This is not surprising as Burd *et al.* (2009) through their research have emphasized on the aspects of economy, health and education while the existing literatures found out there have been proved that these three aspects are indeed important factors in enhancing communities QOL (Matheson, *et al.*, 2001, Zimmer and Ammornsirisomboon, 2001; Zein 2005 and Cleveland 2008).

Climate Change Impact on Fishermen Economic Activities:

The productivity of the fisheries sector can be influenced by climate change. This is one of the widely studied sectors in the context of climate change (Fogg, 1991; Fleds *et al.*, 1993; Allison *et al.*, 2007 and Henson *et al.*, 2009). The possible changes in temperature and precipitation are expected to have significant impact on the quantity and the quality of the sea fauna. However, nobody knows just how this widespread warming would affect upwelling and the marine food chain over the long run (PCFFA, 1998). A likely result would be to greatly impoverish the fisheries sector in Malaysia for several decades while marine ecosystems are adjusting. This can be the potential threat if some parts of the marine food chain may not adapt. Some of the species are detected will migrate to the other part of the sea to avoid the warm sea temperature caused by the climate change (Combes *et al.*, 2005). Many commercially valuable marine food sources may totally disappear from our waters and could affect the income sources of the fishermen. The unstable weather condition caused by climate change will limit the number of days spend on the sea. Besides, climate change will also affect fishermen health; they will be frequently exposed to disease such as fever, flu and cough resulting in lesser time for them to go out to the sea, thus lower their income. Climate change also will have other indirect effect on fishermen productivity. As we know climate change does bring harms to the sea flora and fauna such as coral reef, squids and prawn. As these flora and fauna have the possibility to be devastated by the climate change, it can affect the tourism activities (ex: fishing and aqua tourism), thus it will also affect the economic aspect of the fishermen whose some of them rely on the tourism industry as one of their additional incomes.

Climate Change Impact on Fishermen Health:

One of the major direct health impacts of climate change would be an increase in heart-related deaths and illness (Tsai and Liu, 2005 and Kay, 2007). Studies have shown that heart related deaths could increase because of climate change. The indirect effect of climate change would lead to an expansion of the area under the influence of the malaria mosquito (Matsuoka and Kai, 1995; Rogers and Randolph, 2000; Hales and Woodward, 2003; Nabi and Qader, 2009 and Gething *et al.*, 2010) and this leads to an increased global population exposed to malaria from current 45% to 60% by the next half of the next century (Matsuoka and Kai, 1995). Matsuoka and Kai (1995) have concluded that the population exposed to the risk of malaria would increase by about 30% in the Asia- Pacific region under climate change. Increase of the heart related diseases (asthma, allergic disorders, and cardiorespiratory) would probably also occur due to climate-induced changes. Based on studies in US, Cline (1992) and Fankhause (1995) have estimated that climate change would increase the death rate by about 27- 40 persons per million population. Other than these, bronchitis, skin disease, fever, flu and cough are also related with extreme temperature of climate change (Epstein, 2002).

Climate Change Impact on Fishermen Social Aspects:

Climate change also without doubt will lower the quality of social life within the community. Individual and social factors such as gender, age, education, ethnicity, geography and language lead to different

vulnerability and capacity to adapt to the effects of climate change (Tugwell, 2007). The extreme temperature will make people not to do or hinder them from doing their usual activities such as recreations and sports (Viner and Agnew, 1999; Tucker and Gilliland, 2007; Morris and Wall, 2009). Frequent storm flood caused by climate change also can cause people to lose their home, places which directly can lower their quality of social life. Shortage of food supply caused by climate change would also affect the social life of the community. Interestingly, McDonald (2006), through his study has found that climate change will be one of the main obstacles for achieving the sustainable development as structures, critical facilities and natural resources are vulnerable to the threat of climate change.

Conclusion:

Based on the discussion, it can be concluded that climate change does have negative impacts on the environment. Sea, coastal areas, temperature, flora and fauna are among the environment components that are critically affected. However, it is more crucial to discover that the climate change will not affect the environment alone, it also will bring threats to the community which in whole fishermen. Based on the literature analysis done, it can be concluded that the climate change will alter the stability of the fishermen's quality of life where the aspects of economic, social and health are highly affected.

Discussion:

Fishermen is an important group in Malaysia. They are among the main engine for the food security in Malaysia. As an important group in Malaysia, they must be prepared socially and economically against the negative impacts of the climate change. First of all, they must be informed and exposed to the things related to the threats of the climate change. The fishermen must know what exactly is the climate change and they must be informed that the climate change will bring negative impacts to their daily life, health and most importantly, to their productivity. Related agencies must be willing to share and communicate the climate change information with the fishermen community. To inform the fishermen about the climate change, mass media such as newspaper, brochure, pamphlets, television and radio can play the effective roles. Besides, exhibitions and seminars also can be conducted. It is good to know that the responsible agency such as DOF has already formed their own technical team to deal with the impact of the climate change. This technical team is responsible in providing advice and technical assistance in things related to impact of climate change to the fisheries sector. Fishermen also can start to initiate their additional income sources as one of the possible ways to overcome the economic threat of the climate change. To do this is not impossible as there are a lot of agencies that are willing to aid the fishermen to generate their income. LKIM for example has a program called community development and fishermen institution which aims to develop the fishermen and their family mentally, socially and economically.

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