UNIVERSITI PUTRA MALAYSIA

INFLUENCE OF ICTs USE ON LIVELIHOOD RESILIENCE MEDIATED BY FLOOD RISK PERCEPTION AMONG FISHERMEN IN THE EAST COAST OF MALAYSIA

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By

BASHIR MUKTAR GARBA

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirements for the Degree of Doctor of Philosophy

February 2018

DEDICATION

This thesis is dedicated to:

My inspiration and beacon of hope……..My mother!!!
A matchless motivator for his unique ways……..My Father
My strength and comfort…….. My Wife and Children

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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Chairman : Associate Professor Norsida Man, PhD
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Small-scale fisheries are important socio-ecological systems contributing towards the attainment of food security, economic wealth and social well-being in Malaysia. They provide about 65% protein requirements of the population while extending a lot of employments opportunities across the fish value chain. However, climate change and extreme events are threatening the sustainability of fishing activities. Climate extreme events like flood disrupts and destroys assets thereby undermining fishing community's developmental gains and livelihoods. Malaysian governments' effort to reduce fishermen's vulnerability towards sustainable productivity, has promoted the use of Information Communication Technologies (ICTs) in the fishing sector. Hence, ICTs are utilized in all stages of fish value chain, from sourcing climate information, advisory services, navigation, down to e-declaration of catches and linkages to markets. Such information as key input to adaptation for Livelihood Resilience (LR) are disseminated through various ICTs.

Yet, an unresponsiveness and unprepared attitude by fishermen towards flood risks communication is reported. Generally, the reactive rather than proactive flood management in the country suggests an unsustainable top-down approach. Furthermore, a paucity of empirical evidences on influences of use of ICTs on LR limits informed planning by authorities. This research, utilized Sustainable Livelihood Framework and Protective Motivation Theory to contribute to literature. It highlights access, utilization of ICTs and preferences (bottom-up input) for flood risks communication. It identified underlying structures for measuring LR and how flood risk perception mediates the relationship between use of ICTs and LR.

Through a stratified random sampling and proportionate distribution in three states of east-coast Malaysia (Terengganu, Pahang and Kelantan states), data were collected using self-administered questionnaire to a randomly drawn sample size of 380 fishermen. Descriptive statistics facilitates the categorization of socio-economics characteristics, levels of LR and perceived importance-performance of risks communications. Results reveals 52.2 % fishermen have low and another 40.9% have moderate LR. 65.5% perceived flood risk communication is important and 64.4% rated the flood risk communication as satisfactorily. Factor analysis reveals five factors with total explained variance of 72.893%, KMO of .878 indicating sufficient inter-correlations and adequacy of sample studied while the Bartlett's test of sphericity was significant (Chi square= 4836.384, P<0.00). The Structural Equation Modelling analysis reveals insignificant relationship between use of ICTs and LR, indicative of full mediation of flood risk perception.

The results suggest that fishermen's specific need of information should be provided through the discovered preferred ICTs. The interaction among variables and the identified influence of the mediator extends an insight into the influence of 'cognitive processes' towards flood preparedness action for LR enhancement. This is a valuable input in flood risk management and other policy formulation on communication for behavioural change in agricultural communities. Detailed assessments within this research provide valuable input in all the five steps of developing National Adaptation Communication Strategy as recommended by United Nations. The integrated model has also presented a framework for understanding influences of ICTs mediated communication on cognitive appraisal of 'risk perception' towards sustainable behaviour change. The academics and practitioners can use this findings and frameworks for further research and also as a baseline for a longitudinal form of studies.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

PENGARUH PENGGUNAAN ICT KE ATAS KERINTANGAN KEHIDUPAN NELAYAN TERHADAP RISIKO BANJIR DI PANTAI TIMUR MALAYSIA

Oleh

BASHIR MUKTAR GARBA

Februari 2018

Pengerusi : Professor Madya Norsida Man, PhD
Faculti : Pertanian

Perikanan berskala kecil adalah sistem sosial-ekologi penting yang menyumbang ke arah pencapaian keselamatan makanan, kekayaan ekonomi dan kesejahteraan sosial di Malaysia. Ia membekalkan lebih kurang 65% keperluan protein kepada populasi penduduk di samping menyediakan peluang pekerjaan merentasi rantaian nilai perikanan. Namun, perubahan iklim dan kejadian cuaca ekstrim mengancam kemampanan aktiviti perikanan. Kejadian cuaca ekstrim seperti banjir mengganggu dan memusnahkan aset sekali gus menjejaskan keuntungan pembangunan dan penghidupan komuniti nelayan. Usaha kerajaan Malaysia untuk mengurangkan kerentanan nelayan melalui produktiviti mampan telah menggalakkan penggunaan Teknologi Komunikasi Maklumat (ICT) dalam aktiviti penangkapan ikan. Oleh itu, ICT digunakan di semua peringkat rantaian nilai perikanan, daripada mendapatkan maklumat iklim dan khidmat nasihat, navigasi di laut, pengesanan kepadatan ikan yang tinggi di laut, sehinggalah e-pengisytiharan tangkapan dan hubungan dengan maklumat pasaran. Maklumat sedemikian sebagai input utama untuk adaptasi bagi Kerintangan Kehidupan (Livelihood Resilience = LR) disebarkan menerusi kepelbagaian ICT.

Namun begitu, terdapat sikap tidak responsif dan tidak bersedia nelayan terhadap komunikasi risiko banjir telah dilaporkan. Secara umumnya, pengurusan banjir reaktif yang dikenal pasti berbanding proaktif dalam negara menunjukkan pendekatan atas-bawah yang tidak mampan. Tambahan pula, terdapat kekurangan bukti empirikal tentang pengaruh penggunaan ICT pada LR mengehadkan keputusan yang dimaklumkan oleh pihak berkuasa. Kajian ini telah menggunakan Rangka Kehidupan Mampan (SLF) dan Teori Motivasi Perlindungan (PMT) untuk menyumbang kepada sorotan karya. Ia menonjolkan akses, penggunaan ICT dan kecenderungan (input bawah-atas) untuk komunikasi risiko banjir. Ia mengenal pasti

struktur asas untuk mengukur LR dan bagaimana persepsi risiko banjir mengantara hubungan antara penggunaan ICT dan LR.

Melalui persampelan rawak berstrata dan pengagihan berkadar antara tiga strata di pantai timur Malaysia (negeri Terengganu, Pahang dan Kelantan), data telah dikumpul menggunakan soalan kaji selidik yang dijawab sendiri oleh 380 orang nelayan yang dipilih secara rawak. Statistik deskriptif memudahkan pengkategorian dan menggambarkan ciri sosioekonomi, tahap LR dan kepentingan prestasi komunikasi risiko yang dipercayai. Keputusan menunjukkan bahawa 52.2% responden mengalami penurunan dan 40.9% lagi mempunyai LR yang sederhana. 65.5% menganggap komunikasi risiko banjir penting dan 64.4% menilai komunikasi risiko banjir sebagai memuaskan. Keputusan analisis faktor menunjukkan lima faktor dengan jumlah varians yang dijelaskan sebanyak 72.893%, KMO .878 menunjukkan interelelasi yang mencukupi dan kecukupan sampel yang dikaji manakala ujian sphericity Bartlett adalah signifikan (khi kuasa dua = 4836.384, P <0.00). Analisis Pemodelan Persamaan Struktur menunjukkan kaitan yang tidak signifikan antara penggunaan ICT dan LR, menandakan pengantaraan penuh persepsi risiko banjir.

Keputusan menunjukkan bahawa keperluan maklumat tertentu nelayan perlu diberikan melalui ICT pilihan yang dikenalpasti. Interaksi diantara pembolehubah dan pengaruh pengantara yang dikenal pasti memanjangkan suatu pandangan ke dalam pengaruh 'proses kognitif' terhadap tindakan persediaan banjir untuk peningkatan LR. Ini adalah input penting dalam pengurusan risiko banjir dan penggubalan dasar lain mengenai komunikasi untuk perubahan tingkah laku dalam komuniti pertanian. Penilaian terperinci dalam penyelidikan ini akan memberikan input yang berharga dalam kesemua lima langkah pembangunan Strategi Komunikasi Penyesuaian Nasional seperti yang disarankan oleh Pertubuhan Bangsa-bangsa Bersatu. Model bersepadu juga telah membentangkan satu rangka kerja untuk memahami pengaruh ICT sebagai pengantara komunikasi ke atas penilaian kognitif ‘persepsi risiko’ terhadap perubahan tingkah laku yang mampan. Para ahli akademik dan pengamal boleh menggunakan penemuan dan rangka kerja ini untuk penilaian lanjut dan juga sebagai garis dasar bagi kajian berbentuk jangka masa panjang.

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I certify that a Thesis Examination Committee has met on 28 February 2018 to conduct the final examination of Bashir Muktar Garba on his thesis entitled "Influence of ICTs Use on Livelihood Resilience Mediated by Flood Risk Perception among Fishermen in the East Coast of Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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Declaration by graduate student

I hereby confirm that:

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- this thesis has not been submitted previously or concurrently for any other degree at any institutions;
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This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
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Name of Chairman of Supervisory Committee: Associate Professor Dr. Norsida Man

Signature: _____
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Name of Member of Supervisory Committee: Associate Professor Dr. Asnarulkhadi Abu Samah

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LIST OF ABBREVIATIONS

AKP	Adaptation Knowledge Platform
AIS	Agricultural innovation system
ARDL	Autoregressive Distributed Lag
DfID	Department for International Development
DRR	Disaster Risk Reduction
DEWN	Disaster Early Warning
FAO	Food and Agricultural Organization
FRR	Flood Risk Reduction
FRAS	Flood Risk Advisory Services
FRR	Flood Risk Reduction
ICT4D	Information Communication Technologies for Development
ICTs	Information Communication Technologies
IPCC	Intergovernemntal Panel on Climate Change
IPA	Importance Performance Analysis
IFAD	Institute for Agricultural Development
LR	Livelihood Resilience
MDGs	Millennium Development Goals
NGOs	Non- governmental Organizations
NRI	Network Readiness Index
NSC	National Security Council
PMT	Protective Motivation Theory
RABIT	Resilience Assessment Benchmarking and Impact Assessment Tool
RIC	Rural Internet Centre

SEM	Structural Equation Model
SLF	Sustainable Livelihood Framework
SLA	Sustainable Livelihood Approach
SDGs	Sustainable Development Goals
UNISDR	United Nations Office for Disaster Risk Reduction
UN	United Nations

CHAPTER 1

INTRODUCTION

This chapter is the introductory part of this research and it describes the background of the study, problem statement, objectives, significance, and scope of the study. The chapter also contains some definition of terms.

1.1 Background of the Study

Climate change is warming the atmosphere and oceans, causing changes in patterns and frequencies of rainfall. This brings devastating effect of climate related extreme events like drought and or flood which are known to disrupt livelihood activities. Flood and other extreme events like heat waves are known to affect the fishing livelihoods by affecting the biophysical distribution and availability of fishes among others, therefore fish catches and by extension the incomes of fishermen (Daw, Adger, & Brown, 2009; FAO, 2013c; Shaffril, Abu Samah, & D'Silva, 2017). The overall effect of climate change on agriculture is reported as capable of affecting global food security, as was mentioned in the fifth assessment report of the Intergovernmental Panel on Climate Change (IPCC). It is clear such effect are of direct consequences to food production system of crops, livestock and fisheries (FAO, 2017; IPCC, 2007, 2014). This devastating consequences of flood on livelihoods, food production and developmental goals, have sparked a renewed global interest on building livelihood resilience through social approach of adaptation practices in most developmental and food security efforts (FAO, 2016b; Tanner et al., 2014). Resilience, which is regarded as a trajectory to sustainable development is defined as the capacity of livelihoods to absorb shocks or disturbances and continue with its main functions (Chinwe Ifejika, Wiesmann, & Rist, 2014; FAO, 2016; Heeks & Ospina, 2015). As such the enhancement of livelihood resilience is subject to reducing vulnerability to extreme events which is directly linked to adaptation practices like preparedness, a practice that is reported as capable of saving up to 80 percent of extreme events' effect (Fox-Rogers, Devitt, O'Neill, Brereton, & Clinch, 2016).

Normally, adaptation practices are based on access, use of climate information and livelihood assets (human, physical, social, financial and natural). Accordingly, the generation, dissemination and utilization of this information is necessary and key to adaptation for livelihood resilience. The services of providing these information are ably facilitated by the Information Communication Technologies (ICTs), which are regarded as pivotal, unrivalled and requisite in communication for adaptive actions (Heeks & Ospina, 2012;Ospina & Heeks, 2010; Pitrėnaitė-Žilenienė et al., 2014; Wang & Li, 2016). ICTs are known to play significant and unique role in data generation, weather monitoring and climate information dissemination. Conversely, in any efforts towards development in the 21st century the ICTs are very essential for

the unlimited number of services they provide (Imam, Hossain, & Saha, 2017; Maiye & McGrath, 2010; Raiti, 2007). These services involve; the provision of information, establishing and maintaining social network, mobilization and creation of awareness towards acceptance and adoption of programs. Major global developmental efforts like the Sustainable Development Goals (SDGs) , Sendai framework, United Nation Framework Convention on Climate Change (UNFCC), Non- governmental Organizations (NGOs), governments and agencies have already underscored the role ICTs can play in resilience building and are rapidly adopting its integration in projects and programs as means of accountability and sustainability (Bahadur, Lovell, Wilkinson, & Tanner, 2015; Baudoin, Henly-shepard, Fernando, Sitati, & Zommers, 2014; Béné et al., 2011; DFID, 2011; Ludin & Arbon, 2017; Malaysia Economic Planning Unit, 2016; Pitrėnaitė-Žilenienė, Carosi, & Vallesi, 2014). It is therefore evident that the place of ICTs in developmental goals achievement and the dissemination of vital and lifesaving information from extreme events like flood tsunamis, and earthquakes is non-negotiable and absolutely essential.

Globally, the most frequent climate related extreme event is flood and its effect is profound on human settlements and livelihoods. Flood has within the period (2000-2012) damaged an estimated whopping $1.5 trillion worth of economic damages in the world. In Malaysia flood is incessant and is said to be affecting about 22 percent of the population (Chan, 2015), this is about the total population of the rural dwellers of the country which is put at about 25 percent by the World Bank (2016). The 2014 flood event in Malaysia is reported to have made the country incur a lot of monetary and material costs and even life loss (Hua, 2015; Karim, Noon, Diah, Tajuddin, & Mustari, 2016; Seri et al., 2014; Wan Ahmad & Abdurahman, 2015). Among the most affected and vulnerable population worldwide to weather extreme events like flood are the fishermen whose dwellings are usually coastal zones. Equally, their communities are always on the line from flash floods and coastal floods, this is of detrimental effect to their overall well-being and the global effort on food security. The fishing communities in Malaysia were also reported to be under such risks, as it is reported that their livelihood, wellbeing, productive and unproductive assets and overall social circumstance are being constantly being threatened by flood (Azril, Shaffril, Hamzah, & Silva, 2016; Shaffril et al., 2017). The fact that when flood occurs it also acts as a vector and help in spreading zoonotic diseases which causes sickness like dengue fever etc. put their health also at risks as well.

Efforts to reduce such risks and achieve overall development has made the Malaysian government to explicitly mention its desire to enhance livelihoods resilience as reflected in the Tenth and Eleventh developmental plans (Shaffril et al., 2012; Malaysia Economic Planning Unit, 2016; Yusof, et al., 2014). Malaysia has also adopted the ICTs as a tool for achieving its socio-economics development and has invested billions of ringgits to develop its ICTs strength over the years (Alias, 2013; Meng, Samah, & Omar, 2013). Furthermore, the country has also subscribed to regional and global declarations for adaptation, resilience building among other developmental goals. It therefore has extended its commitment to efforts like the

Adaptation Knowledge platform (AKP) of the south east Asia nations, which promise to provide a platform for sharing information for collaboration on issues of adaptation, the Hygo framework of 2005 and its successor Sendai Framework for disaster risk reduction, Millennium Development Goals (MDGs) and it successor SDGs, it is also a member in the scientific organization of Intergovernmental Panel on Climate change (IPCC). These points to the unwavering commitments and efforts by the authorities towards the building of a resilient population in the country.

Both mitigation and adaptation measures are adopted in the country, among the mitigation measures taken include limiting the green gases emission, which the country has made a self-declared commitment to stem down the emission of greenhouse gases to 40 percent by the year 2020 and has already achieved 33 percent so far (Zurinah Tahir, AbdulMalek, & Ibrahim, 2016). However, the social dimension of adaptation practices such as preparedness and participation are seen to be poorly done as reported in the Malaysia Economic Planning Unit, (2016), where it is stated that the early warning to flood event are ineffective. This means all climate and weather related information being relayed to the populace did little in pushing them in to taking proactive measures towards flood. Hence, several early warnings and climate information are not responded to by majority of the population who were found unprepared (Khalid & Shafiai, 2015; Nazli, Sipon, & Radzi, 2014; Noorhashirin, Faiza, Mohammad, & Juni, 2016). This shows a clear need for realignment and re-strategizing in the subsequent program design and implementations of adaptation measures. Further analysis revealed an expert centric approach in design and implementation and a reactive rather proactive flood management approach, where aids and rescue services are focussed upon and are almost efficiently provided to victims of such events.

Integration of social dimension to risk reduction emphasizes participatory approach to designs and implementation of such efforts. This is fully ingrained in all global development frameworks and accepted as an avenue of achieving sustainable and equitable development. Hence the top-down approaches and prescriptive design to such flood programs is deemed a recipe for failure at inception or at least unsustainable. The resilience perspective to development therefore addresses this issue and emphasizes the identification of dynamics and complementarities within systems and how they integrate to build resilience through raising the awareness of extreme events risks and their respective risks reduction pathways. This is promoted by providing information, necessary to elicit taking adaptive measures by all, including the socially vulnerable population in their livelihood pursuit within precarious climatic contexts. The graphs in figure 1.2 and 1.3 depict the frequency of flood and its effect on lives and economy respectively. It shows the frequency of flood events in the world and how it is the most frequent event in relation to others like storms , earthquakes etc.

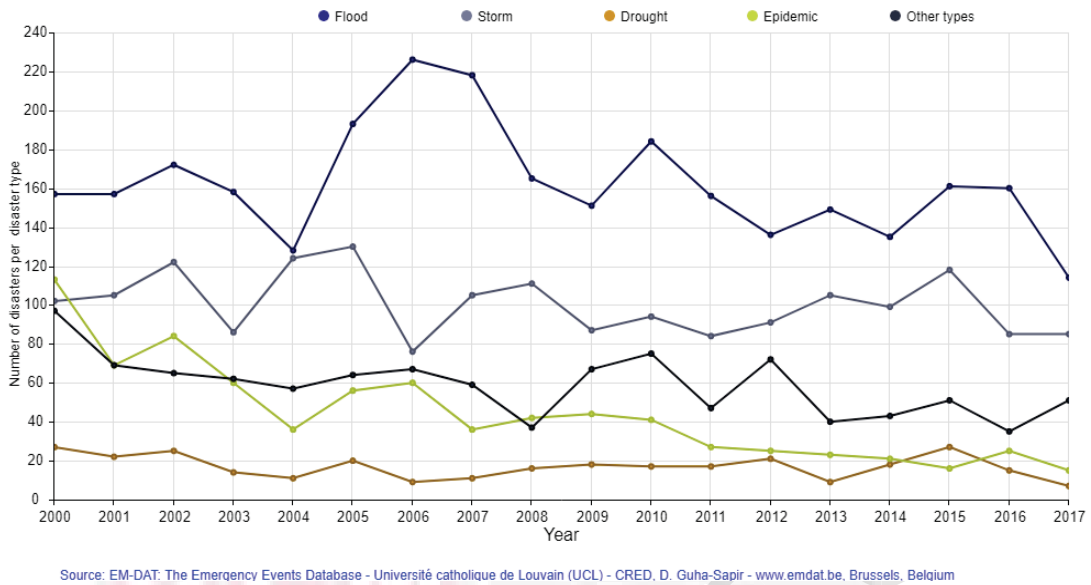

Figure 1.1 : Global Extreme Events Occurrences 2000-2017
Source: EM-DAT: The Emergency Events Database - Universite catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium Database-

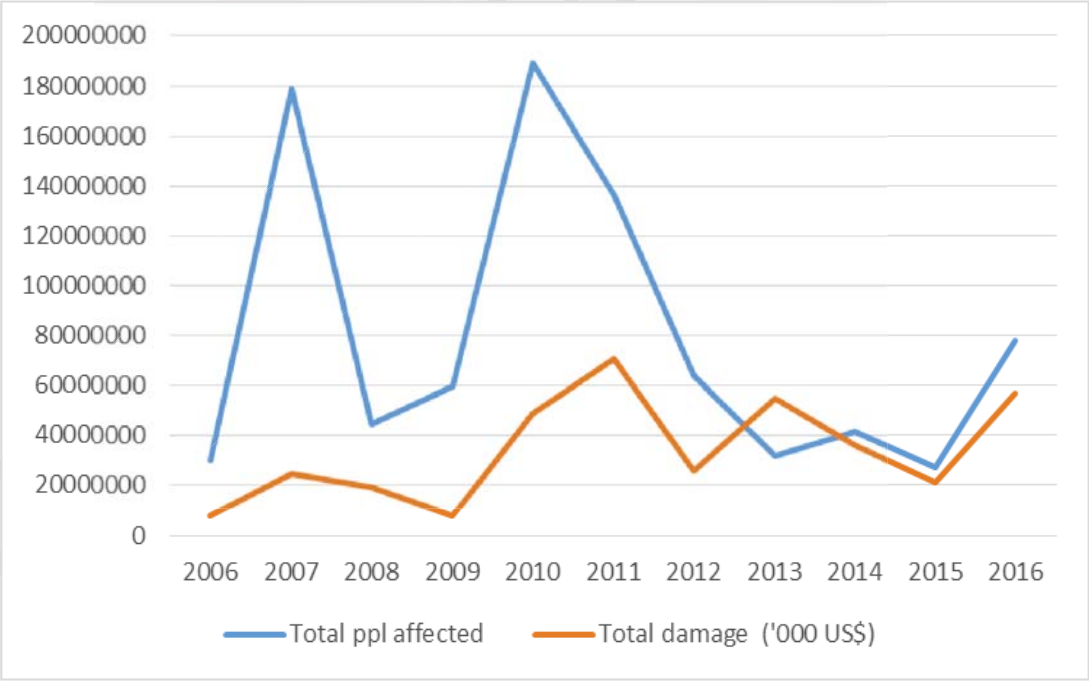

Figure 1.2 : Global flood Damage and Total Number of People Affected 2006-2016
Source: EM-DAT: The Emergency Events Database - Universite catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, BelgiumDatabase

1.2 Issues in the Fishing Industries and Livelihood Resilience of Fishermen in Malaysia

Despite the concerted and conscious efforts in Malaysia towards building resilient population in general and particularly of the fishing industries, there are issues that are threatening the fishermen and their livelihood in the country. These involves the impact of climate change like rising temperature which is known to affect the fish population, although this is global problem, Malaysia has taken measures to reduce the global warming by limiting greenhouse gasses emissions. The pressing effect of extreme events like flood which are seen to be outright disruptive on the fishing livelihood (Muhammad et al., 2016; Shaffril et al., 2017; Vaghefi, Shamsudin, Radam, & Rahim, 2016) are incessant and widespread among the coastal regions. Such disruptive events are known to exert a lot of pressure on their well-being, income, the nation's food security and by extension the overall agricultural sector's contribution to the economy. The welfare of the fishermen and sustainability of the fishing livelihood is of great relevance to global food security as they are an important source of protein supply to a lot of people. In Malaysia great percentage of the population are known to rely on this form of protein, where the per capita fisheries intake is estimated at 50kg per annum (Department of Fisheries Malaysia, 2015b). The fishing industry is also one of the most utilized sectors for poverty alleviation in countries all over the world. Conversely, the food and agriculture organization (FAO) has emphasized the need to build resilient agricultural livelihoods and particularly that of the fishing industry which is among the most vulnerable to climate change extreme events to ensure that the food demand of the world is attained (FAO, 2013b, 2015b, 2016a).

The government has provided number of interventions to reduce the Fishermen' vulnerability in the country, for example the provision of subsidies to diesel, guaranteed monthly stipends and the provision of up to date climate information like early warning and weather forecasts. However, the provided climate information in all its form of weather information, early warnings and even preparedness tips were reported as not having the desired effect. It is for instance concluded by a finding of a research that there is low level of preparedness to extreme events like the incessant flood (Khalid et al., 2015; Nazli et al., 2014; Noorhashirin et al., 2016) among populations. Also a reported exclusion or non-participation in adaptation activities by the vulnerable population (H. Ernawati, Man, Md Yassin, Lawrence D'Silva, & Mohamed Shaffril, 2013; M. Ernawati et al., 2017). The sustainability campaign of projects has been stressing buy-ins of the benefitting population, this is regarded as a sure way of sustainability of the projects. It is believed that people normally owned up to projects that they were involved in designing implementing and even evaluating. As such the need for their involvement at the initial stage through the provision of their specific input is of high importance. As such, in fishing community the fisher's specific input to projects and programs is deemed crucial and desirable for a resilient livelihood.

Furthermore, the fishing livelihood is characterized by an aging population, although that has been tackled by the government through provision of incentives like monthly stipends, the extreme events are seen to further push away the fisher's due to migratory action as a form of individual mitigation measure to reduce risks (Malaysia Economic Planning Unit, 2016). Such individualized decision of vulnerable agricultural communities' dwellers to relocate in order to reduce risks or evade it, usually leaves a vacuum in the production line of the livelihood they are leaving. These salient issues in the fishing sector if not addressed effectively are capable of compounding the vulnerability of the fishermen and thereby eroding their livelihood resilience.

1.3 Problem Statement

Fisheries sector remain a vital source of food, nutrition, income and livelihoods for a great number of Malaysian coastal dwellers. Thus, the attainment of food security is largely dependent on the sector. As one of the global most traded commodity, fisheries products also form part of the foreign earnings of the country. It is a great means to poverty reduction efforts, as it extends livelihood to many families across the fish value chain. However, the sector is vulnerable to climate extreme events like rising temperature, storms and flood. Apart from affecting the biophysical presence of fishing stocks, such extreme events are of immediate disruptive consequence to the fisherman's' income and wellbeing.

The implication is both national and global, as the food security, foreign earnings of the nation and the fish supply to global market are affected among other things. At least more than 125,000 individuals are livelihoods and many more depend on the sector for income, as well as Small and Medium Enterprises (SMEs) that source their raw materials from the sector. Fisheries is a major source of affordable protein to most of the people of the country, where an estimated 55 kg per capita consumption per individual was reported (Department of Fisheries Malaysia, 2015b).

The Malaysian government in its quest to make the fishing livelihood resilient for continued and sustainable fishing activity has developed and has been promoting the use of the robust ICTs by the fishermen. This is at various stages of their activities, from the sourcing of information and advisory services, to the use for direction to fishing density on sea, down to the marketing of the fishing catches. Climate information is an important input in the adaptation to climate change and its extreme events, and with the appropriate action is capable of reducing vulnerabilities and enhancing resilience. Conversely, social dimensions to climate change adaptation like preparedness and participation in adaptive actions has been prescribed as best routes to reducing vulnerabilities to such risks, especially flood related (FAO, 2013a; IPCC, 2007, 2014; United Nations, 2011).

Climate information brings awareness of an impending risks and ways of tackling them while the livelihood assets are necessary to facilitate and supports adaptive action. This is because the assets are organized and deployed for such actions in a systematic way by individuals and governments alike. Evidently, such effects were not observed from the fishermen as they were reported to have been taking little or no adaptive measures. They are unresponsive to such information and advisory services with regards to flood events, as indicated by their being reported as having low level of preparedness to flood event. Since information access and utility are important in adaptation and risks reduction communication, and it is seen to be abundantly provided in the country. The fishermen's unresponsiveness presents a gap worthy of attention by researchers, to unravel the unresponsive behaviour.

Furthermore, researchers have identified the process of risk communications program design and implementation to be loaded with expert centric prescriptive approach. In any social intervention were behaviour is targeted and sustainability is desired the need to integrate the local knowledge and perceived important aspects of the beneficiaries is stressed. Besides, the risk reduction efforts are also accused as being reactive rather than proactive adaptive approaches.

Globally, the social approach to adaptation and flood risk advisory services research are at their infancy stage, as such the need for studies to provide relevant data is obvious. Also, there is none or little empirical evidence exists at best on the influence of ICTs use on Livelihood resilience towards adaptation for environmental sustainability. Available researches are usually focussed on adoption of ICTs or their utilization by fishermen. Besides, such researches are described as non-theoretical in paradigm and un-analytical in approach.

The SLF which gaining popularity in adaptation and effect of ICTs is also accused of being too idealistic and assumes that information automatically spur adaptive action. It neglect the cognitive process triggered by such information before action, such phases like the cognitive stage of 'risk perception 'are described as very relevant in any behavioural change communication (Adelekan & Asiyanbi, 2016; Bočkarjova, Veen, & Geurts, 2011; Fuchs et al., 2017; Kellens, Terpstra, Schelfaut, & De Maeyer, 2013; Lieske, Wade, & Roness, 2014). In view of the foregoing this research therefore seeks to answer the following questions:

1.4 Research Questions

1) What are the types of ICTs accessed and used by the fishermen in east coast Malaysia?
2) What are the preferred ICTs for flood risks communication and livelihood activities of the fishermen in east coast Malaysia?
3) What are the perceived fishermen' level of importance and performance ratings of flood risks communication received?

4) What are the underlying factors of measuring livelihood resilience and its level among fishermen in east coast Malaysia?
5) Do the cognitive factors of flood risk perception mediate the relationship between ICTs use and livelihood resilience?

1.4.1 General Objective

The general objective of this study is to assess the influence of ICTs use on livelihood resilience of fishermen in east coast Malaysia.

1.4.2 Specific Objectives

The specific objectives of this study are:

1) To describe access and use of ICTs by fishermen in east coast Malaysia
2) To identify the preferred ICTs for flood risks communication and livelihood activities by the fishermen in east coast Malaysia?
3) To evaluate fisher's perceived importance and performance ratings of flood risks communication and their levels in east coast Malaysia.
4) To determine underlying factors and level of fishermen' livelihood resilience in east coast Malaysia.
5) To examine the mediation effect of flood risk perception (cognitive process) between ICTs use and livelihood resilience.

1.5 Significance of the Study

The study would inform valuable input in the development of the recommended National adaptation Communication Strategy, as it extends input in all five steps of developing effective communication strategy as recommended by FAO and United Nations Development Programme (FAO, 2011; UNDP, 2011). These are the identification and analysing of the target population-the fishermen, defining of the communication goals which is to reduce risks, the identification of best channels as identified through the preferred channels as revealed by the fishermen and plan and evaluate the program which was achieved through the IPA. It will also inform policy on livelihood resilience enhancement in context of shock, flood risks communication and reduction programs. It has provided a grassroots input thereby informing an inclusive designing of programs that seek to enhance the livelihood and reduce risks. Detailing the area for improvement, where an acceptable and effective communication that both identify the need of the people while involving them in all the process through a double feedback system.

There is also a modest attempt to integrate theories that could be used to measure the effect of ICTs on cognitive process and subsequent action for resilience building. This will also help in explaining the effect and the psychosomatic process a message takes an individual through before the action is contemplated. The integrated framework will be handy for researcher in communication that is interested in understanding the psychological process of communication effect. A tool of analysis the IPA was used in an attempt to evaluate the perceived importance and performance of fishermen to services of flood risk communication through ICTs, which came across as a useful utility tool for extension agents for planning, resource allocation and prioritization of efforts in a cost-effective way.

1.5.1 Theoretical Significance

The theoretical Significance of the study is that it has presented a proposed framework where the Sustainable Livelihood Framework (SLF) theory was extended using the variable of cognitive appraisal from the Protective Motivation. This was applied to assess not only the effect of ICTs on livelihood resilience but the cognitive process that is passed through by an individual when information is received and how that explained the adaptation action and resilience of an individual. The resultant framework will be useful for researchers in behaviour changing communication field. This is an attempt to respond to suggestion to researchers that recommend the integration of cognitive perspective in the assessment of effect of flood risks communication to risk and vulnerability reduction (Kellens et al., 2013; Kellens, Zaalberg, Neutens, Vanneuville, & De Maeyer, 2011; Terpstra, 2011).

1.5.2 Practical Significance

The research output would prescribe solutions to the problem of the unresponsiveness by the fishermen to flood risk advisory services and their refusal to take adaptation practices like preparedness. It highlights factors that may have possibly influenced such inaction which are non-inclusive planning of risk reduction efforts. It has also presented vital information for the formulation of flood risk advisory service that promises to be more effective and acceptable.

1.6 Scope of the Study

The research focuses on the fishermen of the east coast Malaysia who are in the coastal region, this is because of their being located around the coastal region and also the incessant flood that has been affecting them. It does not involve other agricultural livelihood like farming and or plantation management due to resource constraints. Also, the research adopt a cross sectional approach to investigation, however, it is viewed a longitudinal approach would give a more conclusive research findings. Although, this work can be used as a benchmark for further researchers that would want to see the impact of ICTs on livelihood resilience over a period of time.

1.7 Organization of the Thesis

The thesis is organized in five chapters and the summary of each chapter is presented graphically in the figure below and followed by the brief detailing of the each chapter's content. The first chapter discusses the background and highlight the problem of flood on fishing activities, chapter two presents a thorough literature review and chapter three describes methodology while chapter four presented the finding and chapter concludes and recommend based on findings.

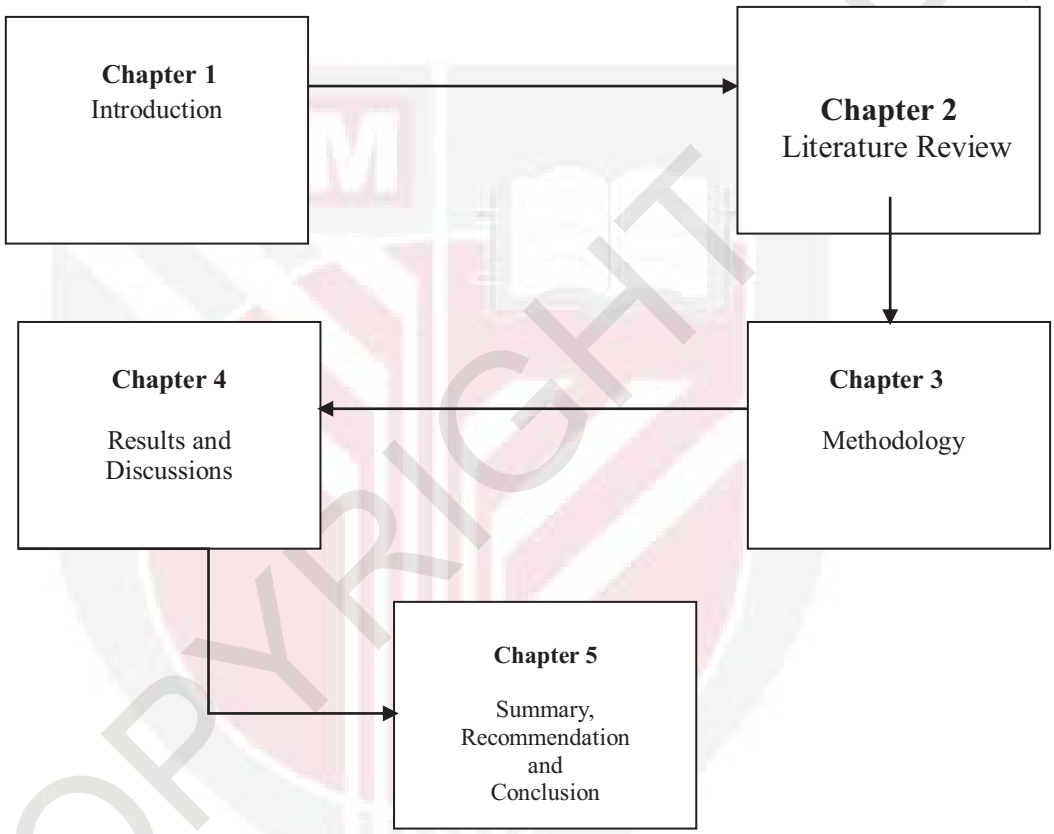

Figure 1.3 : Outline of the Thesis Organization

1.8 Summary

This chapter provide a clear concise understanding of the problems, the identification of the gap has been comprehensively highlighted in the problem statement as it affects the Malaysian rural and fisheries development efforts with particular respect to the flood risk reduction. The significance, scope, significance of the study has been highlighted and the questions and objectives of the research have been all presented in the chapter.

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