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SOARING UPWARDS
MALAYSIAN HIGHER EDUCATION

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UNIVERSITI TEKNOLOGI MALAYSIA

Institute of Environmental and Water Resource Management (IPASA)

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BAHAGIAN 1: TEKNOLOGI & INOVASI

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FLOOD RESILIENCE STRUCTURES: SUPERHYDROPHOBIC CERAMICS PRODUCED FROM AGRICULTURAL ASH TO ENGINEER FLOOD PROOF COATING

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1.0 Introduction

Superhydrophobic coating has been widely studied as it offers weather protective properties such as water repellent, antifouling and self-cleaning. In this work, rice husk ash was used to substitute the commercial nanoparticles in the superhydrophobic coating. The rice husk ash contains 97.5 wt. % of SiO_2 and 2.0 wt. % of carbon after pre-treatment using citric acid and calcination at 800 ºC for 0.5 hr. Calcined at lower temperature and longer duration, the ash showed photoluminescence due to the defects caused by higher carbon content. The BET surface of irregular ash particles was measured to be 206.03 $m^2.g^{-1}$ and the average pore diameter is estimated at 5.7 nm. The superhydrophobic coating could be formed easily by spraying the mixture of ash (6 wt. %) and a hydrophobic agent in ethanol solution on a thin layer of commercial adhesive. FTIR spectra confirmed the existence of -CF_2- group on coating when 1H,1H,2H,2H-perfluorodecyltriethoxysilane (HFDS) was added as the hydrophobic agent in the coating formulation. However, the hydrophobic groups on the coating could not be confirmed when stearic acid was added into the coating formulation due to the interference of adhesive layer. The average water contact angle on the ash/HFDS coating (3M-HFDS)/ concrete was 157.9°. However, the hydrophobicity dropped when stearic acid grafting groups was introduced. The near superhydrophobic coatings showed antifouling properties when they were immersed in the slurry solution containing kaolin.

Superhydrophobic coating are promoted commercially as it possesses weather proof properties. Besides water repellence, superhydrophobic coating also offers anti-fouling, anti-corrosion and anti-icing properties. The superhydrophobic surface can be created using lithography techniques, phase inversion, templating process, surface etching, sol-gel method and many more [1-2]. Using these methods, rough surface was created on the hydrophobic materials to generate superhydrophobicity. Hydrophilic materials such as ceramics, however, require both chemical modification and roughness enhancement to create great hydrophobicity. Hydrophobic groups including $–CH_3$, $–CH_2–CH_2–$, and$–CF_3$ are usually grafted on the substrate in order to reduce the surface energy.

Besides the mentioned methods, superhydrophobic coating could be easily formed by adding nanoparticles into the existing formulation to generate the required roughness. A superhydrophobic paint was prepared by Lu *et al.* [3] by adding two types of TiO_2 nanoparticles in an ethanol solution containing perfluorooctyltriethoxysilane. The nanoparticles varied in size, in the range of ~60 to 200 nm and an average size of ~21 nm. Superhydrophobic coating could be easily engineered by spraying the paint on the commercial adhesive coating. Several other researchers also worked on the superhydrophobic coating by spraying. Millonis *et al.* [4] reported on the use of hydrophilic silica nanoparticles in water based fluoroacrlylic solution and the spray of the mixture on heated metallic substrates to form superhydrophobic and superoleophobic coating. However, the hydrophobicity of polybenzoxazine thin layer incorporated with TiO_2 nanoparticles degraded under UV irradiation [5]. This is because TiO_2 generates electrons and holes under UV irradiation, followed by the formation of surface oxygen vacancies for water absorption due to the reaction between photo-generated holes and lattice oxygen. The superhydrophobicity could only be recovered by heat treatment at 200 ºC. Zhao and co-workers embedded TiO_2 partially into the printed arrays of polydimethylsiloxane. Superhydrophobicity was achieved and remained due to the fine roughness created in array printing, even TiO_2 nanoparticles are hydrophilic or wet. Several types of foulant such as dye, rhodamine B, and BSA protein were successfully photodegraded on the superhydrophobic surface after drying [6]. Besides TiO_2 nanoparticles, ZnO, SiO_2 and polytetrafluoroethylene (PTFE) nanoparticles had been studied in the development of superhydrophobic coating as well [7-8]. These coatings on metal surface showed satisfactory corrosion resistance.

In this work, rice husk ash (RHA) is proposed to be used in the preparation of hydrophobic coating. This is because agricultural waste ash especially RHA are abundantly produced in Asia countries with recurring floods. For example, more than two million tons of rice husk (RH) are produced annually in Malaysia which suffers from monsoon floods annually [9]. Thermal combustion of RH at moderate temperatures in air atmosphere yields amorphous silica content more than 90 %. Hence, RHA is a suitable candidate to substitute commercial nanoparticles which is more costly. Besides fluoroalkyl silane modification, stearic acid was used to reduce the surface energy of coating. The near superhydrophobic coating can be easily prepared by spraying on a layer of commercial adhesive. The coating is further tested to confirm its applicability to protect hydrophilic surface from water and slurry.

2.0 Methodology

2.1 Materials

The raw rice husk (RH) was obtained from Padiberas Nasional Berhad, Kuala Selangor Malaysia. Anhydrous citric acid, absolute ethanol and kaolin were purchased from Merck, Malaysia. The fluoroalkyl silane, 1H,1H,2H,2H-perfluorodecyltriethoxysilane (HFDS) was obtained from Gelest Inc. Analytical grade of stearic acid, $C_{18}H_{36}O_2$ (SA), with 95 % purity and methylene blue dye were purchased from Sigma Aldrich. The paint used in this study was Corex aerosol paint (white) while the commercial adhesives were 3M Spray Mount^{TM} Artist's adhesive.

2.2 RHA preparation

The raw RH was washed and dried at 110 ^{o}C for 24 hr. The dried RH was further treated with citric acid for 2 hr at 50 ^{o}C. The treated RH was then filtered, rinsed and dried. In order to obtain RHA which is rich of silica, the RH was calcined in a muffle furnace (Carbolite) at 800 ^{o}C for 30 min, 550 ^{o}C for 6 hr and 650 for 6hr under atmospheric condition.

2.3 Coating preparation and fouling test

Two types of hydrophobic coating solution were prepared by treating the RHA using HFDS and SA respectively. The first coating solution was obtained by dispersing about 3 g of RHA into HFDS/ethanol mixture (volume ratio 1:50 ml). The solution was stirred for 1 hr at room temperature. The preparation of second coating solution was conducted by mixing about 2 g of RHA with 8 mM of SA in ethanol solution. The solution was stirred for 5 hr and sonicated for 30 min at room temperature. The coating was obtained by spraying the prepared solution onto a layer of 3M adhesive on the glass slide or the double layer of paint and 3M adhesive on the glass slide or concrete. Another top layer was sprayed after the previous coating layer was dried. A solution was prepared by adding 35 g of kaolin and 0.1 g of methylene blue dye into 100 ml of distilled water. The mixture was stirred and sonicated to ensure well-dispersion of kaolin and dye. To investigate the anti-fouling property of the coatings, glass slides coated with samples were further immersed in the mixture and then dried at 70 ^{o}C for 12 hr.

3.0 Results and Discussion

The rice husk ash contains 97.5 wt. % of SiO_2 and 2.0 wt. % of carbon after pre-treatment using citric acid and calcination at 800 ºC for 0.5 hr. The modified ash was successfully coated on glass slide and concrete which were previously coated with a layer of commercial adhesive. Non-wetting on the coated concrete was observed in Fig. 1. The highest water contact angle of 163.9 º could be achieved (Fig. 2). Calcined at lower temperature and longer duration, the ash showed photoluminescence due to the defects caused by higher carbon content [10]. HFDS modification caused the loss of photoluminescence more than SA (Fig. 3). In the fouling test, the surface coated with HFDS modified ash showed antifouling properties which do not required cleaning as shown in Fig. 4.

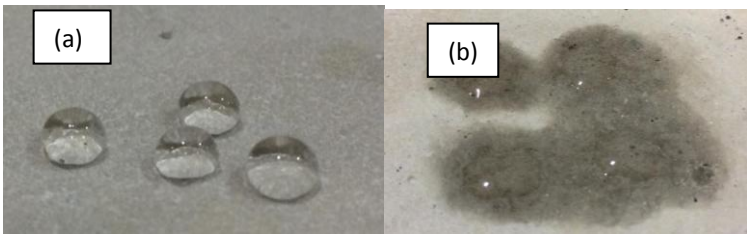

Fig. 1 Water droplets on (a) coated surface and (b) uncoated surface of the concrete.

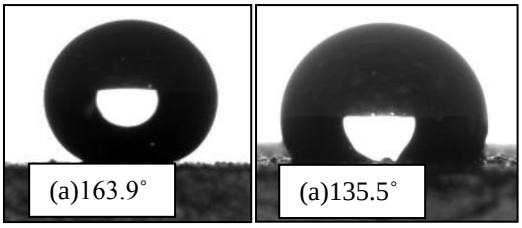

Fig.2 The water droplet on (a) RHA (550 ºC 6 hours) modified with HFDS (b) RHA (550 ºC 6 hours) modified with SA.

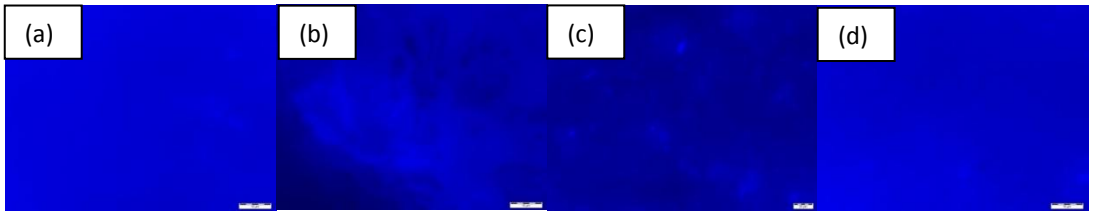

Fig. 3 Fluoroscence images of acid treated RH under fluorescence microscope calcined at (a) 550 °C for 6 hours and (b) 650 °C for 6 hours. (c) RHA (550 °C) modified with HFDS (d) modified with SA under UV light.

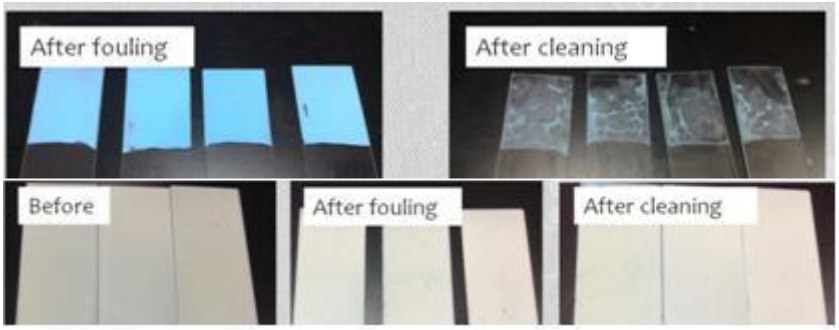

Fig. 4 Fouling test results for uncoated surface (top) and coated surface (bottom).

4.0 Conclusion

The important findings in this work are:

4.1 The RHA containing mainly silica was successfully converted into superhydrophobic ceramics for antifouling coating by chemical modification using HFDS.

4.2 A layer commercial adhesive served as interface for the RHA (pure and modified) coating on smooth substrate successfully.

4.3 The origin of the photoluminescence of silica could be related to the carbon impurity or defect.

4.4 In the anti-fouling test, the coating with HFDS modification could avoid the stain of kaolin slurry with dye.

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DETERMINATION OF PATHOGENIC BACTERIA IN FLOOD AND DRINKING WATERS BASED ON A NEW PH BOUNDARY STACKING TECHNIQUE ON A LAB-ON-A-CHIP DEVICE

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1.0 Introduction

The rapid analysis and accurate quantification of pathogenic microorganisms contamination in water, food, and biological matrices plays a very important role in the field of public health, in particular flooded areas. This increases the requirements of the analytical methods to be able to detect microbial at lower and lower levels, and to do this in a way that ensures the quality of the water supplies on a continual basis. The most common standard method for enumeration of bacteria is the plate count method using either selective or general media for bacterial growth (Jasson, V., et al.). This method has a satisfactory low detection limit (1 colony forming unit) but also requires a long assay time (incubation up to 48 hours) (Oukacine, F., et al.), requires specialist skills (Lantz, A.W., et al.) and is only able to detect culturable bacteria. Hence, there is still a significant focus on developing and improving methods for detecting and quantifying bacterial cells (Oukacine, F., et al.).

Lab-on-a-chip electrophoresis has been the subject of extensive research over the past decade (Bruin, G.J.M.). Nevertheless, the limit of detection of microchip electrophoresis systems is one of the often-cited limitations, particularly in comparison to liquid chromatography, with concentration detection limits typically two to three orders of magnitude worse (Breadmore, M.C., et al.). Recent realization of the complex and powerful ability for sample pretreatment that can be implemented in very simple microfluidic devices is seeing renewed interest in isotachophoresis (ITP) technique. For example, Jung et al. proposed the use of ITP under field amplified sample injection conditions for the concentration of fluorescent dyes (Jung, B., R. et al.). This approach reported a 500000-fold increase in concentration during the ITP stage of their microchip system. Nonetheless, rapid and single step direct detection of pathogenic bacteria in complex matrices at a concentration below 100 cells per mL is still rarely reported.

In this proposed project, by designing a new microchip platform, larger amount of water sample could be injected continuously into the microchip in parallel with the new proposed stacking process, namely pH boundary stacking, to increase the stacking efficiency prior to on-chip separation and quantification. To our knowledge, there is still no work reported by integrating pH boundary stacking into the microchip platform to determine the amount of pathogenic bacteria present in the floodwaters and drinking water samples. In this preliminary study, protein, which possesses similar properties of a pathogenic cell, will be used as the model analytes.

2.0 Methodology

2.1 pH Boundary stacking procedure in lab-on-a-chip system

A schematic view of the experimental microfluidic system set-up is shown in Figure 1. Fluorescence detection using an USB microscope was performed both at the inlet and outlet of the separation channel. A schematic view of the proposed stacking protocol is shown in Figure 2. The separation channel (50 μm (width) × 10 μm (depth) × 200 mm (length)) was first filled with low pH high conductivity background electrolyte (BGE), and the high pH low conductivity sample solution containing trace levels of Chromeo P503-labeled BSA and β-lactoglobulin as well as r-phycoerthrin was continuously flushed through the sample channel (500 μm (width) × 10 μm (depth) × 15 mm (length)). The pIs of the proteins range from 4.1 to 5.1. A positive voltage was applied at the end of the separation channel whilst grounding the sample inlet to initiate the stacking procedure of negatively charged proteins (pH>pI) at the inlet of the separation channel. Electrophoretic separation of the concentrated protein was then accomplished by replacing the solution in the hydrodynamic flow channel with the low pH BGE prior to switching the direction of the electric field, applying negative voltage at the separation channel end. The low pH BGE around the concentrated protein zone drops

the pH below the pI, rendering the proteins positively charged and enables their separation in the applied field.

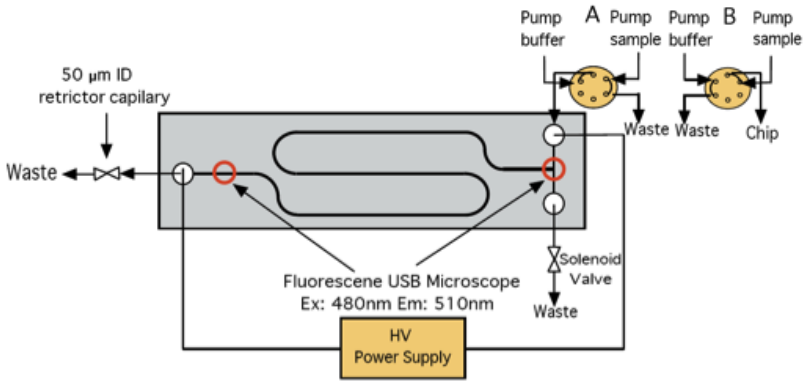

Figure 1: Schematic illustration of the experimental set-up comprising a glass chip connected to a 6-port valve for switching from high pH sample to low pH BGE flow. External flow restrictors and valves were used for fluidic control.

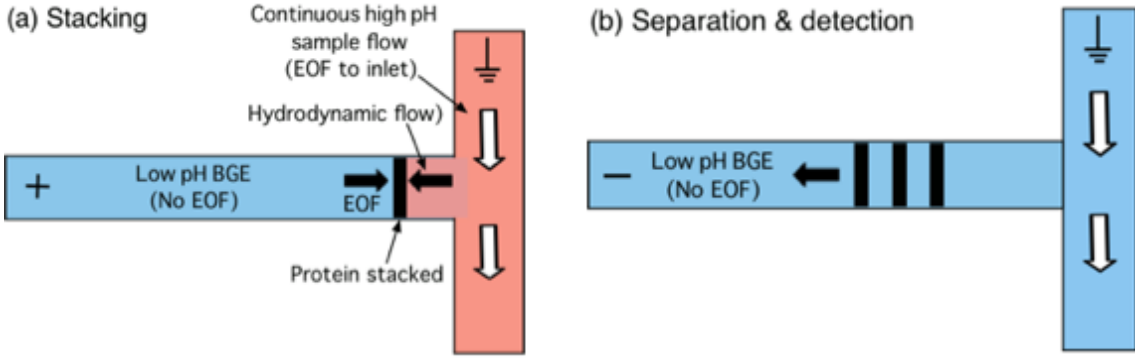

Figure 2: Schematic of stationary pH boundary stacking protocol under continuous field amplified sample injection.(a) Negatively charged protein is concentrated at the pH boundary between low pH BGE and high pH sample flow. (b) In a continuous low pH BGE, the now positively charged proteins (pH<pI) can be electrophoretically separated.

3.0 Results and Discussion

In the proposed stacking protocol, proteins are concentrated at the pH boundary, the position of which is stabilized by balancing the hydrodynamic force created by the sample flow with that of the EOF generated in the high pH BGE. In Figure 3, fluorescence microscopy images confirm the theory by an increase in fluorescence intensity of r-phycoerythrin with time close to the separation channel inlet. Based on image processing, concentration of about 800 – 1000 fold was achieved for the three proteins in approximately 5 min of electrokinetic injection at +5 kV, and the separation and detection of three different protein bands was achieved within 3 min using a separation voltage of –5 kV. Precision of the method was examined and it was found to be lower than 7%.

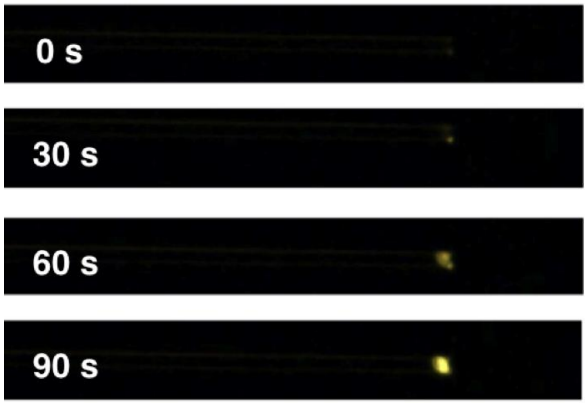

Figure 3. Time sequence images of concentration of R-phycoerythrin in the glass microchannel. Separation channel is filled with 500 mM formic acid (pH 2.5), and the sample channel is filled with 1 nM R-phycoerthrin in 200 mM NH_4OH solution (pH11.25). Sample flow rate: 500 nL/s; Sample loading voltage: +5 kV

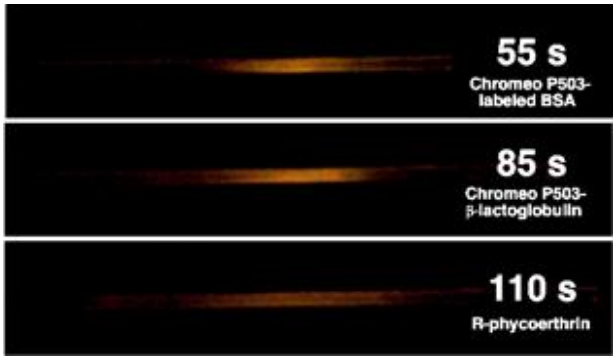

Figure 4. Time sequence images of P503-labeled BSA, P503-labeled beta lactoglobulin, and r-phycoerythrin bands passing the detection. Sample: 1 nM mixture of proteins in 200 mM NH_4OH (pH11.25). Sample injection flow rate: 500 nL/s; Injection voltage: +5 kV; separation flow rate: 10 nL/s (with solenoid valve closed); separation voltage: -5 kV.

4.0 Conclusion

4.1 A simple microfluidic system based on a stationary pH boundary for stacking proteins and potentially pathogenic bacterias, which can be dissipated for subsequent on-line electrophoretic separation is developed.

4.2 This new technique requires the use of only a simple microfluidic structure, eliminating the need for complicated and tedious microfabrication protocols.

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INNOVATIVE DESIGN AND TECHNOLOGY FOR SUSTAINABLE POST DISASTER SETTLEMENT

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1.0 Introduction

Disaster is the set of failures that overwhelm the capability of a community to respond without external help when three continuums: 1) people, 2) community (i.e., a set of habitats, livelihoods, and social constructs), and 3) complex events (e.g., floods, earthquakes, etc.) intersect at a point in space and time (Okada et al., 2014). Disasters are caused by single- or multiple-event natural hazards that, (for various reasons), cause extreme levels of, morbidity, homelessness, joblessness, economic losses, or environmental impacts (Okada et al., 2014). High potential loss exposures of cities and villages in a flood are people, property, infrastructure, business enterprise, government centers, crops, wildlife, and natural resources.Earth's atmospheric-hydrospheric-lithospheric interactions create situations favorable for floods. There are multiple and uncertain drivers of future changes in disaster settlement (Todini, 2000, De Bruijn, 2004, Walker et al., 2004); including, extreme rainfall events, nutrient and pollutant loading, urbanisation effects, land use change, socio-economic trends. Figure 1 shows the global potential risk of urban flooding.

On the impact of climate change, natural disasters are frequently happening in all around the world that cause loss of properties and people lives. Attaining from CIDB annual report, Malaysia is suffering by natural disasters nearly every year. Among natural types of disasters the landslides and flood are the most destructive disaster that happen regularly in Malaysia. The Sri Lanka flood (2003), Indian Ocean Tsunami (2004), earthquake in Bagh, Pakistan(2005), China (2008), Indonesia (2009), Haiti (2010) and Japan (2011) and recently in Philippines (2013), worth billions of reported damages. In Malaysia, climate change is influenced by the Northeast Monsoon and the Southwest Monsoon cause heavy rains and flooding, especially in coastal areas. The annual average rainfall is about 3000mm but not impossible if the intensity of rain storms can result in excess of 100mm per hour and 600mm in 24 hours. The increasingly rapid development is also a major cause of flooding. This is because the surface flow slowed down due to changes in land use. In Malaysia, flooding can be categorized into two types; the Flash Floods and the Monsoon Floods. The Flash floods usually occur in areas with rapid development where the river channel is no longer able to accommodate a very large amount of water when there is heavy rainfall in a short time. Besides of heavy rain factors, other factors such as changes in topography and local drainage system problems cause floods worsens. Human factors have also contributed to the flooding. Humans often make changes to meet the needs and desires of the self has led to the cause of the flooding. Human activities such as resurfacing the roads, forest opening for various development activities and drainage system failure causes to the occurrence of the phenomenon flooding as well.

The flood in 2004 was the worst floods recorded since 1926 in Malaysia. The floods in 2004 were the worst floods recorded since 1926. The cause of flooding has been identified consequence of heavy rain that fell from 8 to 12 December 2004. Kelantan is a state located in the East Coast of Peninsular Malaysia was exposed to the fury of the winds of the Northeast Monsoon. Recently, in Kelantan a flash flood occurred affected by heavy rains brought by the Northeast Monsoon winds blowing from November to March each year causing floods in almost all colonies in the state of Kelantan including Sungai Golok border. The average losses rose from around $US50 billion a year in the 1980s to almost $US200 billion a year in the past decade, totaling $US3.8 trillion from 1980 to 2012 (World Bank, 2013) (Table 1). According to Department of Irrigation and Drainage, Ministry of Natural Recourses and Environment, it is estimated Flood damages cost for RM 915,120

Millions and compromises 4,915,000 persons per year. For example, in December 2014, the northern and eastern states of Kelantan, Terengganu, Pahang, Perak and Perlis were hit by flash floods which demolished around 1,500 houses, and killed 21 persons.

2.0 Methodology

The research investigated the comprehensive list of design features of construction technology for post-disaster settlement through a systematic literature review. In this regards, the systematic review analysis method was used which differs from traditional review methods by adopting a replicable, scientific and transparent process, in other words, a detailed technology (Cook et al.1997; TenBrook et al., 2001). Indeed, the systematic review analysis method minimizes bias through exhaustive literature searches of published studies, and by providing an audit trail of the reviewer's decisions, procedures and conclusions (Cook et al., 1997). The research has used available online databases; web of knowledge, Sciencedirect, Google Scholar, and Scopus, Taylor and Francis, Emerald, and Sage, etc. Through surfing in these databases, the research has identified journals that focus particularly in construction technologies for disasters; such as, International Journal of Disaster Resilience in the Built Environment, International Planning Studies, Disaster Prevention and Management: An International Journal, International Journal of Project Management, and Journal of Civil Engineering and Architecture.

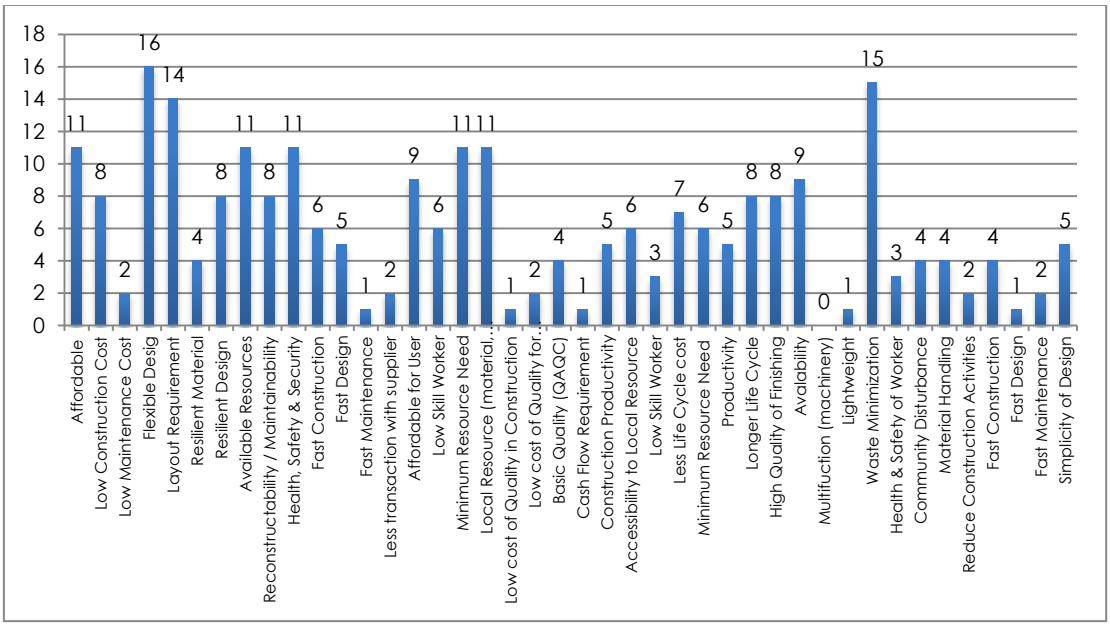

Figure 1 Frequency analysis of Depth of Citation (DoC) of Construction Technology Design Features for Post-Disaster Settlement

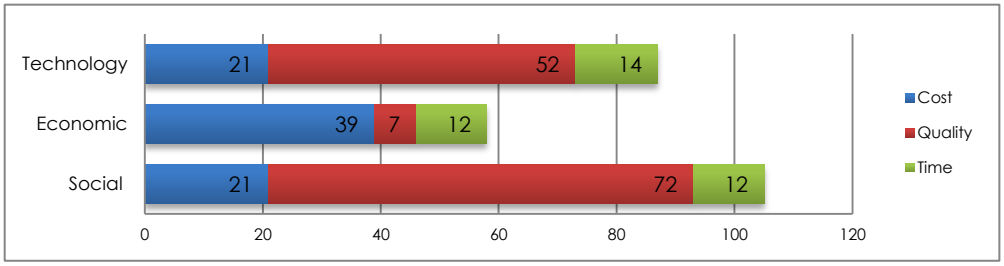

Figure 2 Frequency analysis of sub-categories (Cost, Quality, and Time) in Construction Technology Design Features For Post-Disaster Settlement

Table 1::Expected Contribution of FTWS & FTW to top ten (10) Factors Effects Housing Construction Cost from Malaysian Experience (Source: Sadi et al., 2010, FTW, 2009, Abd. Majid et al., 2009, Abd. Majid et al., 2011a, Abd. Majid et al., 2011b)

Top ten (10) factors effects housing construction cost	**Weight of factor calculating from overal view of "consultant" "contractor" and "real state"**	**FTW Proven Enhancements**
Inadequate labor availability	80.6%	Elimination
Material standard	78.9%	N/A
Design quality	76.6%	Improving
Design change	76.0%	Reduce the risk
Poor financial control on site	74.3%	Reduce the risk
Lack of coordination	73.1%	Reduce the risk
Duration of contract period	72.6%	Elimination
Cost of material	72.0%	Elimination
Disputes on site	70.9%	Reduce the risk
Previous experience	70.3%	Elimination

content analysis table presents the depth of citation (DoC). The depth of citation refers to cumulative importance level of each factor stated by previous researchers. Figure 1 illustrates the Frequency analysis of Construction Technology Design Features For Post-Disaster Settlement in a bar chart. As can be seen, Flexible Design (DOC =16 out of 22 = 72%) has been mostly referred in previous studies; hence, this factor should be extensively considered as a design feature involved in flood disaster settlement. It were followed by Waste minimization (15 out of 22 = 68%), and layout requirement (11 out of 22 = 50%). Notably, Multi-function (machinery) did not receive any citation; although it would be a great technique in flood post-settlement.

Figure 2 shows that social cluster have been considered than technology and economic aspects. Also, the figure shows that quality aspect of social cluster have been considered, which is followed by technology cluster. In terms of cost, the economic cluster has been considered than two other clusters. Understanding climate change effects on ever-growing rate of disastrous natural events, more quick and low-cost technology of dwelling construction for post-disaster settlement is needed in near future.

The current research expresses such a fast, low-cost technology of dwelling construction technologies is highly needed. The research states that novel dwelling construction technology called 'Fast-Track Wall-FTW' would be one of the available and trustable construction technologies applicable for flood post-disaster settlement in tropical countries; such as Malaysia. The 'Fast-Track Wall-FTW' covers extensively the project's "time", "cost" and "quality" while there is construction elimination in use of "human resource", and "machineries". The FTW technology has less construction duration, and less time for rework due to less activities in comparison with other available technologies such as Industrialized Building System (IBS). In addition, the FTW technology does not need of skilled workers required and little management cost.

4.0 Conclusion

4.1 Proper scientific research needed to investigate the basic need, demands of victim and decide to select and supply it in effective time. Indeed reduction in vulnerability and mortality by adaptation of urban transportation networking system is needed. The research highlights a need for a localized approach for urban flood management and transportation service in Malaysia.

4.2 The study identified forty two (42) design and technology features of an innovative reconstruction for sustainable post-disaster settlement folded to social, economic, and technological clusters.

4.3 The study found out those feature have not been equally considered in dwelling construction after disasters occur.

4.4 Based on this study, Flexible Design is the most convergent feature among all features.

4.5 The study indicated that, there are features that can play significant roles in flood post-disaster settlement; such as, Waste minimization, layout requirement, Fast design, fast maintenance, light weight.

This research can aid civil engineers and construction managers regarding benchmarking, and also, development of laboratory model of sustainable post disaster settlement construction technology and design that suite to the tropical requirement in specific to flood.

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ECONOMIC EVOLUTION NOVELTY OF INCREASING ELECTRIC GRID RESILIENCE THROUGH MICRO GRID TO FLOOD ATTACK

Project Information

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1.0 Introduction

Due to the environmentally friendly, power generator demand is increasing. The renewable energy had become the most popular trend of application. This trend becomes the key of fast developing power electronic technology in the world [1]. The evolution of power electronics energy brings up a new grid system name as microgrid. Microgrid defined as generator produces power under 100KW under combination of multiple renewable energies [2]. The improvement of power electronics gives a big leap in the inverter system. Multilevel inverters are now replacing the conventional converter to improve the power quality and reliability. The general type of multilevel inverter is cascaded H-bridge multilevel inverter (CHB-MLI), diode clamped multilevel inverter (DC-MLI) and capacitor clamped multilevel inverter (CC-MLI). Each type has different characteristics where are applied under different circumference. Multilevel inverters have the advantage of harmonics reduction by applying higher number of voltage level with the constant switching frequency [3]. The switching frequency is determined by the modulation technique. Modulation techniques include sinusoidal pulse width modulation (SPWM), space vector modulation (SVM) and optimized harmonics stepped waveform (OHSW) [4]. In this project, selective harmonics elimination (SHE) is applied using a genetic algorithm (GA) method to remove the low harmonics component. SHE applies in the 7-level CHBMIL under pulse width modulation method to achieve low switching frequency.

2.0 Methodology

Maximum Power Poing Tracking

The PV system is one of the renewable energy, which is dependent generator. Irradiation, temperature and humidity of air affect the performance of the PV system. Hence, this makes the PV system has low reliability. Throughout the maximum power point tracking (MPPT) method, maximum harvesting of solar energy achieved. MPPT is a non-mechanical type technique, which enhances the angle of contact with sunlight. There are several types of MPPT algorithm, but the most common use would be perturb and observe (P&O) method[5]. The P&O algorithm is also called hill climbing, which has the advantages of simplicity and low computational power required. P&O algorithm is compared with the previous power data, with initial power to make a decision on increasing or decreasing of the duty cycle. The duty cycle is applied to the DC to DC converter to obtain the desired output with maximum power[6].

The P&O starts with obtaining the voltage and current data of the PV system. Then the data used to obtain power (P_{new}). The algorithm will compare the P_{new} with the previous $P_{new,}$ which was named as P_{new-1}. Furthermore, the flow would compare the voltage between V_{new} and Vnew-1 to determine the value of D by the increment or decrement of D_{float} and then the flow is repeated. Figure 1 indicates the flow chart of the P&O algorithm and how it works.

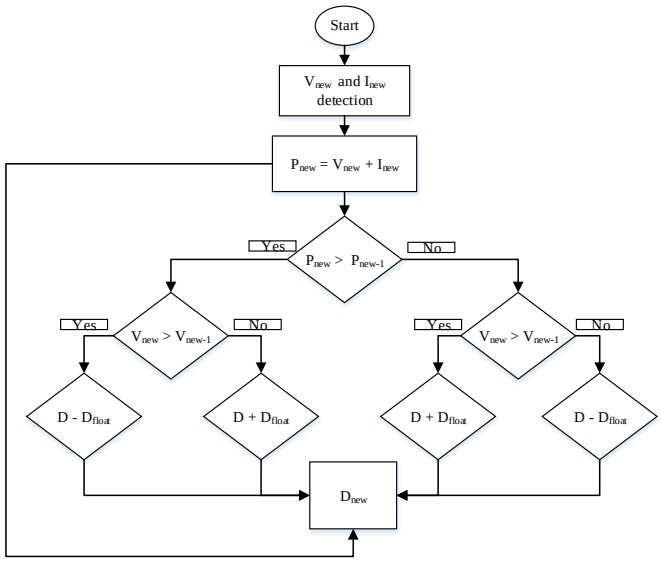

Figure 1: Flow chart of P&O method.

Storage System

The storage system is one of the most important issues of the islanded micro grid system. There are several kinds of storage system example flywheel, capacitor, nickel cadmium, lithium, and lead acid. Overall, the most general use is the lead acid battery dominating the PV system market. In this paper, lead acid battery model built-in Maltab Simulink is used as shown in Figure 2.

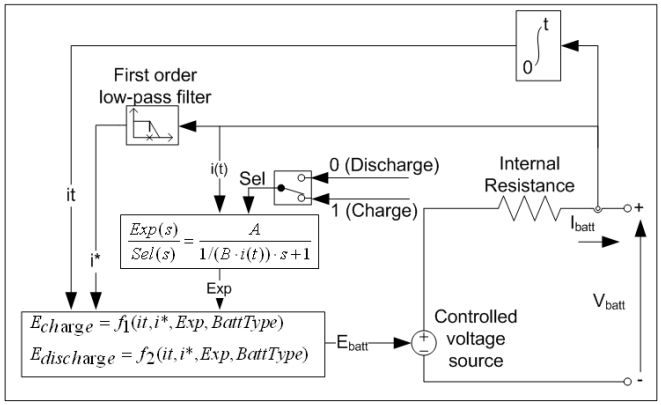

Figure 2: Matlab Simulink Battery model.

The lead acid battery charging model and discharge model are shown in Equations (1) and (2)

Discharge model (i* > 0)

$$f_1\ it, i*, i, Exp\ = E_0 - K \cdot \frac{Q}{Q-it} \cdot i* K \cdot \frac{Q}{Q-it} \cdot it + Laplace^{-1}\ \frac{Exp\ s}{Sel\ s} \cdot 0 \quad (1)$$

Charge Model (i* < 0)

$$f_2\ it, i*, i, Exp\ = E_0 - K \cdot \frac{Q}{it+0.1\cdot Q} \cdot i* K \cdot \frac{Q}{Q-it} \cdot it + Laplace^{-1}\ \frac{Exp(s)}{Sel(s)} \cdot \frac{1}{s} \quad (2)$$

Inverter System

Renewable energy has mostly generated direct current (DC). Hence, to adopt the demand of public, inverters, which convert DC to alternate current (AC) device had been introduced year 1925 and been enhanced performance until today. The PV system is a non-consistence current source so a storage system is required. Cascaded H-bridge multilevel inverter (CHBMI) is used in this paper for DC to AC converter. CHBMI are series of H-bridge inverter connected with a separate DC source as shown in Figure 6. The concept is generating a different voltage level for achieving staircase waveform with high sinusoidal AC voltage waveform[7, 8]. The number of output phase voltage level 'N' in a cascaded multilevel inverter is given by Equation (3).

$$N = 2S + 1 \quad (3)$$

where S is the number of voltage source.

Seven-level Cascaded H-Bridge Multilevel Inverters (CHBMI) are used in this project for inverter part. Switching technique use is the selective harmonic elimination pulse width modulation (SHEPWM) technique with the aid of genetic algorithm (GA). SHEPWM technique is commonly used in the control of multilevel inverter due to low total harmonic distortion (THD) output. The GA algorithm is utilized to solve the nonlinear equations, which are needed in the SHEPWM Fourier series calculation. GA algorithm is capable of optimizing the switching and reduce the Total Harmonic Distortion (THD) [8].

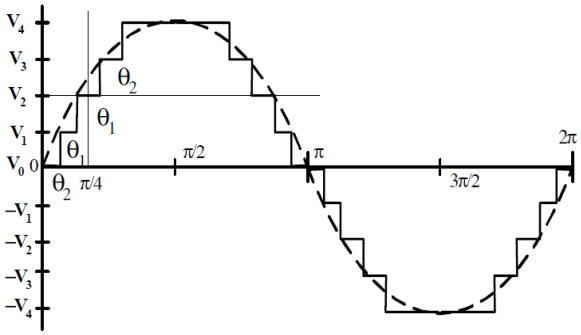

Figure 3: Staircase waveform for a five-level.

Figure 3 shows the staircase output waveform for five-level Cascaded H-Bridge Multilevel Inverters (CHBMI). The waveform has given a mathematical model in Fourier series as in Equation (4),

$$V_{out} = \sum_{n=1,3,5,\ldots}^{\infty} \frac{4V_{Battery}}{2\pi} \times \frac{1}{n} \left[\cos n\theta_1 + \cos n\theta_2 + \cdots + \cos n\theta_k\right] \sin n\omega t \qquad (4)$$

where, V_{out} = voltage output (V), V_{solar} = voltage input (V), n = harmonic component, k = number of switching angles

3.0 Results and Discussion

The simulation can be separated into 2 circuits that are PV system with storage system and storage system with inverter. The two circuits are representing the charging and discharging of storage system. The constructed simulation model is using generic PC array and MPPT for charging circuit. The battery is charged and then is applied for CHBMLI.

Figure 4 shows the DC to DC booster voltages. The lower voltage level is the input voltage, which is in a PV array. The higher voltage level is the output voltage to charge the battery. It was allocated 0.3 second before the converter starts working due to the data collection delays. After that, the converter boosts the voltage level to 240V and above to charge the battery. Throughout the process, there were some fluctuated voltages, which cause the rapid changes of irradiance. The proposed P&O algorithm has a weakness of rapid change of irradiance and unable to make the quick response.

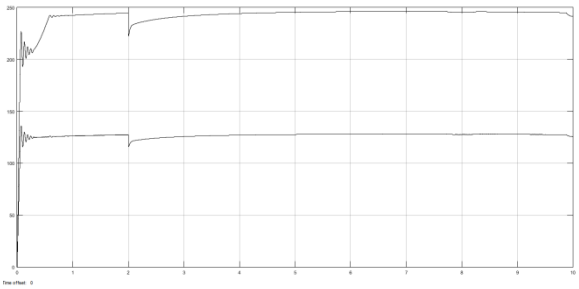

Figure 4: PV output and DC-DC converter output.

Figure 5 shows the voltage of the PV array and the state of charge of battery. Top graph of Figure 5 shows the voltage of the battery. There was a dramatic increase when the time reaches 2 seconds due to the switching of charging starts. Then the charging process continues under 10 seconds, which shows a consistent voltage. The bottom graph shows the SOC of the battery. The charging process starts for 2sec. Hence, there is a gradual increase of SOC across the time.

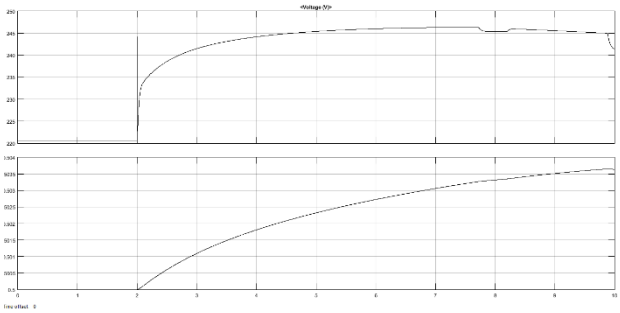

Figure 5: Voltage and SOC battery charging stage.

4.0 Conclusion

4.1 In this project, simulation of a simple PV based standalone microgrid had been carried out.

4.2 The PV proves to be more effective in applying the MPPT with P&O method.

4.3 MPPT enables the input to be charged to maintain the voltage level at 240V to give a healthy charging process to a battery.

4.4 Besides that, the experiment shows disadvantages of P&O method when the sudden change irradiance occurs.

4.5 Meanwhile, the inverter model shows encouraging results of eliminating the 3th and 5th harmonics to a value of 0.38% and 0.23%. Hence, the 7-level CHBMLI can achieve low THD value of 14.58%.

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INDIGENOUS PLANTS AND TUBER AS ALTERNATIVE FOOD TEMIAR OF GUA MUSANG

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1.0 Introduction

The monsoon flood that hit the East Coast of Malaysia recently which might be the worst for these past few decades. This current flood had affected Temiar tribal people in Gua Musang, Kelantan. Temiar tribal people using forest resources as their food supply and medicinal purposes. During the flood, they have to search for alternatives food sources as the flood relief cannot be reached in the nearest time. The forest area that inhabited by Temiar tribal people still rich in natural resources that could help them for food supply during emergencies like the current flood that forced them to search for their own food supply while sheltering in the woods.

Nutritional facts list the percentage supplied that is recommended to be met on human daily diet. There are some nutrients that might be important to be tested for nutritional facts purposes like Vitamin B1, B2, A, C, D3, E, K, and also minerals like Calcium, Copper, Iron, Magnesium, Manganese, Potassium, Selenium, Sodium and Zinc. In this research, various analytical methods are used for the estimation of nutritional facts contained in the medicinal plants and vegetables.

2.0 Methodology

Sampling of indigenous plants and tubers used as alternative food sources during the flood

Field trips were conducted at the hill sites where locals collected the plant food they consumed during the flood. All plant species cited for food purposes were collected from the field. Names of local plant food and tubers, their utilized parts and preparation methods were recorded.

Herborization

Samples were dried, and identified taxonomically based on literature. Each herbarium specimen should include important parts such as leaves, stems, flowers and fruits whenever available. For small herbaceous plants, the whole plant should be collected. (Semenya and Maroyi 2012). Unidentified plants were sent to Bioscience Institute, Universiti Putra Malaysia for identification and verification.

Determination of fat content

Fat content of the processed fruit and vegetable samples was determined by the method described in AOAC. 30 g of the material was weighed accurately which was sufficient to give about 1.0 g of fat in a suitable thimble and dry for two hours at 100±2ºC. The thimble was placed in the soxhlet apparatus and the solvent was extracted for about 16 hr. The extract contained in the soxhlet flask was dried. It was then cooled in the desiccators and weighed. Alternate drying and weighing was continued at 30 min. interval until the loss of mass between two successive weighing was not more than 2 mg.

Calculation:
Mass (%) = (M1-M2/M) * 100
M1= mass in g of soxhlet flask
M2= mass in g of empty soxhlet flask
M= mass in g of material taken.

Determination of the acidity of the extracted fat 10g to 30 g of the sample was weighed and transferred to thimble and plugged in from the top with extracted cotton and filter paper. The thimble was dried for one hour at 100ºC. The weight of the empty dry soxhlet flask was taken. The fat was extracted in the soxhlet apparatus for one hour and the solvent was evaporated in the flask. Traces of residual solvent were removed by keeping the flask in the hot air oven at 100ºC for half an hour. The flask was then cooled and 50 ml of benzene alcohol phenolphthalein solution was added and KOH was taken in 10 ml micro burette. If the content of the flask become cloudy during titration, 50 ml of the reagent was added and the titration was continued.

Calculation:
Acidity of extracted fat (% by mass) = 1.41*V/M1-M

Where, V= volume of 0.05 N KOH solution used in titration after subtracting the blank. M1= mass in g of soxhlet flask containing fat
M = mass in g of empty soxhlet flask

Determination of protein by Kjeldahl method

Proteins are polymers of amino acids. Twenty different types of amino acids occur naturally in proteins. Proteins differ from each other according to the type, number and sequence of amino acids that make up the polypeptide backbone. As a result they have different molecular structures, nutritional attributes and physiochemical properties. Proteins are important constituents of foods for a number of different reasons (McClements, 2005). They are a major source of energy, as well as containing essential amino-acids, such as lysine, tryptophan, methionine, leucine, isoleucine and valine, which are essential to human health, but which the body cannot synthesize.

Proteins are also the major structural components of many natural foods, often determining their overall texture, e.g., tenderness of meat or fish products. Isolated proteins are often used in foods as ingredients because of their unique functional properties, i.e., their ability to provide desirable appearance, texture or stability. Typically, proteins are used as gelling agents, emulsifiers, foaming agents and thickeners. Many food proteins are enzymes which are capable of enhancing the rate of certain biochemical reactions. These reactions can have either a favorable or detrimental effect on the overall properties of foods. Food analysts are interested in knowing the total concentration, type, molecular structure and functional properties of the proteins in foods (McClements, 2005).

The method of protein determination of the processed samples was performed as described in AOAC**.** 2 gm of samples were taken and dried at 105ºC to constant weight and transferred to digestion tube. To each sample 7 g K2SO4, 5 g selenium powder, 12 ml H2SO4 and 5 ml H2O2 was added. It was then heated for 60 min at 400º C. The digestion tube was then cooled to 50ºC-60ºC. 50 ml NaOH was added to the sample. The sample was then titrated with 0.2N HCl.

Calculation:

Protein (%) = Titer value * Volume of acid taken * 6.25 *100/ Sample weight * 0.2N * 1000

Analysis of carbohydrate

A large number of analytical techniques have been developed to measure the total concentration and type of carbohydrates present in foods. The carbohydrate content of a food can be determined by calculating the percent remaining after all the other components have been measured:

%carbohydrates = 100 - %moisture - %protein - %lipid - %mineral

Nevertheless, this method can lead to erroneous results due to experimental errors in any of the other methods, and so it is usually better to directly measure the carbohydrate content for accurate measurements (McClements, 2005).

Determination of Water- and Fat-soluble vitamins

Reversed-phase HPLC is a technique well suited for vitamin analysis. Water-soluble vitamins are often determined using an aqueous mobile phase, while the fat-soluble vitamins use organic-solvent mobile phases, based on their very different solubility properties (Leo et al., 2000). Although simultaneous separation of water- and fat-soluble vitamins has been reported (Dionex Corporation, 2009), the differences in sample preparation and separation mode result in longer separation time for the detection of fat-soluble vitamins. Therefore, the simultaneous separation method is inefficient for many samples.

There have been various attempts to improve the procedures for the determination of B-vitamins. These vitamins have traditionally been analysed using the manual methods of AOAC. These methods involve extraction procedures and chemicals reactions, followed by fluorimetry (B_1 and B_2), spectrophotometry (niacin and folic acid), titration (ascorbic acid and pyridoxine) and microbiological (B_{12}) (Deutsch, 1984). These methods are usually tedious and time-consuming, and may require the use of hazardous chemicals such as cyanogen bromide and niacin determination.

In recent years, high-pressure liquid chromatography (HPLC) has been shown to be powerful tool for the determination of various compounds including water-soluble vitamins (Wills *et al*., 1977; Dong *et al*,. 1988; Speek, 1989). HPLC methods have the advantage of being more specifics, non-destructive and are capable of differentiating between different forms of vitamins with varying biological activity. Several investigators have reported the use of HPLC methods for the determination of B-vitamins in foods and pharmaceutical preparations (Toma & Tabekhia, 1979; Wehling and Wetzel, 1984; Amin & Reusch, 1987a, b; Rees, 1989; Hollman et al., 1993).

Standard preparations for water-soluble vitamins
Water-soluble vitamin standards of VB1, VB3, VB5, VB6, VB12, and VC are prepared by accurately weighing 10 to 20 mg of the vitamin powder and adding 10 to 20 g of DI water to make stock solutions of 1.0 mg/mL for each vitamin. Because of the limited stability of VC, it should be freshly prepared. Because of the limited solubility in water of VB2 and folic acid (VB9), the concentration of stock solution of VB2 is decreased to 0.25 mg/mL in DI water; while that of VB9 is prepared using 20 mM of KHCO3 instead of DI water to make a solution of 0.5 mg/mL (AN 251).

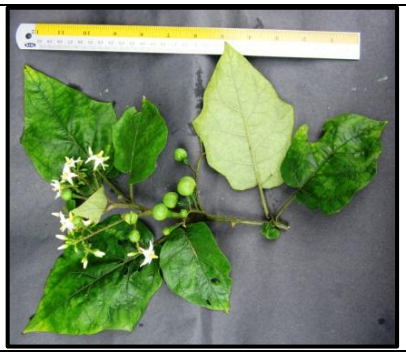
Standard preparation of fat-soluble vitamins
Fat-soluble vitamin standards of VA acetate, VD_2, VD_3, and VE acetate were prepared by accurately weighing 10 to 20 mg of each and adding CH_3OH to 10 to 20 g to form stock solutions of 1.0 mg/mL for each vitamin. The standards for VK1 and β-carotene were prepared using acetone and CH_2C_{l2} instead of CH_3OH. Because of the limited stability of β-carotene, a stock solution of 1.0 mg/mL was freshly prepared every 3 days. The well-prepared stock standards were stored at 4 °C when not in use, and the stock standards of fat-soluble vitamins were stored in the dark. Water-soluble vitamin working standards were prepared from the stock standards on the day of use by dilution with DI water. A mixture of CH_3OH-CH_2C_{l2} (1:1, v/v) was used for fat-soluble vitamins (AN 251).

Interview with the Aborigines (Temiar Tribal)
There were two sets of questionnaire prepared to gather the required information from the aborigines. First questionnaire was entitled '*Tahap Kesedaran Tentang Sumber Makanan Alternatif Ketika Banjir*' and second questionnaire entitled '*Tahap Kesedaran Masyarakat Orang Asli Terhadap Pemeliharaan Hutan*'. The full sets of questionnaires are provided in the appendices.

3.0 Results and Discussion

Sampling of indigenous plants and tubers used as alternative food sources during the flood:
A total of 14 plant samples were identified during the sampling in Gua Musang. Local Temiar and Malay names were recorded. Parts used and preparation methods were documented based on the help of the village head of tribesman. Table 1 reveals the types of plants utilized as alternative food sources.

Table 1: Indigenous plants as alternative food sources during flood season

Local Name	Species Name	Parts Used	Preparation Method	Photo	Altitude	Latitude and Longitude
***Bergentok* (Temiar); *Kulat telinga* (Malay); Ear fungus (English)**	*Auricularia* sp.	Whole fruiting body (note only the brown fungi were identified as alternative food source by the locals)	Harvested and eaten raw.		866 m	04˚ 39'01.7" N 101˚29'43.8" E
***Monggoi* (Temiar); *Terung pipit* (Malay); Devil's fig, turkey berry, wild eggplant (English)**	*Solanum torvum*	Fruits	Fruits are harvested, sliced and boiled / cooked.		729 m	04˚ 39.688'N 101˚29.274' E

Local Name	Species Name	Parts Used	Preparation Method	Photo	Altitude	Latitude and Longitude
***Geraloh* (Temiar); *Beranga n* (Malay)**	*Castanopsis megacarpa*	Fruits	Slice open cupule to reveal brownish nut. Nuts can be boiled / roasted.		922 m	04˚39’01.7” N 101˚29’43.8 ”E
***Keber Moi* (Temiar); Berries (English)**	*Rubus sumatranus*	Fruits	Mature fruits are harvested and eaten raw.		895 m	04˚39’01.7" N 101˚29’45.3 "E
***Karyiel*; *Catak* (Temiar)**	*Molineria capitulata*	Fruits	Fruits are harvested, sliced and boiled / cooked		702 m	04˚39'.688" N 101˚29'.274 "E
***Peng Hong* (Temiar)**	*Erechtites valerianifolia*	Leaf	Young leaves are harvested and cooked / boiled.		828 m	04˚38.920’ N 101˚29.881’ E

Local Name	Species Name	Parts Used	Preparation Method	Photo	Altitude	Latitude and Longitude
***Cerwes* (Temiar); Sappan wood (English)**	*Caesalpinia sappan*	Stem	Branch / stem is chopped and allow water to drip into container. The water extract can be used as alternative drinking water.		749m	04˚39.532' N 101˚29.573' E
***Rebung betek* (Temiar)**	*Dendrocalamus asper*	Shoots	Shoots are cleaned, sliced into small pieces and boiled/stir-fried.		761 m	04˚39.497' N 101˚29.572' E
***Cengkarak* (Temiar); Koster's curse, clidemia, soap bush (English)**	*Clidemia hirta*	Berries	Fruits are plucked and consumed directly.		891 m	04˚38'.664" N 101˚30'.029 "E
***Sayur kelap* (Temiar); *Salang suar* (Malay)**	*Pentaphragma begoniifolium*	Leaves	Leaves are trimmed, washed and cooked.		231	04˚53'58.6" N 101˚46'45.9 "E

Local Name	Species Name	Parts Used	Preparation Method	Photo	Altitude	Latitude and Longitude
Te-ok (Temiar)	*Arenga obtusifolia*	Shoots	Stem is sliced to reveal inner whitish, soft shoot. Shoot should be cooked before consumption.		231	04˚53'58.6" N 101˚46'45.9 "E
Ubi kayu (Temiar; Malay)	*Manihot esculenta*	Cassava roots	Cassava skin is peeled, washed and roasted / boiled.		490	05˚44'45.6" N 101˚51'52.2 "E
Padi huma / bukit (Temiar) Padi bukit (Malay); Upland rice (English)	*Oryza glaberrima*	Grains	Paddy is pound to remove husk, washed and boiled.		485	05˚44'45.6" N 101˚51'52.2 "E
Mong (Temiar) Pokok pijat (Malay); Mexican coriander, spirit weed (English)	*Eryngium foetidum*	Leaves	Leaves are harvested, mashed and stir-fried.		502	05˚16'07.6" N 101˚39'10.9 "E

Determination of nutrition content:

A total of 10 samples (Cerwes, Bersayah, Cawet, Ubi Kayu, Geraloh, Kelap, Mong, Beras Padi, Rebung Betek and Te'ok) from 14 samples collected during the field trips were examined at the laboratory for the nutritional content. Table 2 shown the results of the nutrition content include of Energy, Total Fat, Carbohydrate, Total Sugar and Protein of each sample collected. Ubi kayu and Geraloh and Cawet were identified containing highest of nutritional value sum of Energy, Total Fat, Carbohydrate, Total Sugar and Protein.

Table 2: Nutrition content (Energy, Total fat, Carbohydrate, Total sugar, Protein)

SAMPLE	NUTRITION CONTENT	UOM	PER 100G
Cewes	Energy	kcal	0
	Total Fat	g	0.0
	Carbohydrate	g	0.0

	Total Sugar	g	0.0
	Protein	g	0.1
Bersayah	Energy	kcal	330
	Total Fat	g	0.8
	Carbohydrate	g	63.6
	Protein	g	17.0
Cawet	Energy	kcal	346
	Total Fat	g	1.6
	Carbohydrate	g	70.9
	Protein	g	12.1
Ubi Kayu	Energy	kcal	365
	Total Fat	g	0.1
	Carbohydrate	g	90.0
	Protein	g	0.9
Geralah	Energy	kcal	347
	Total Fat	g	0.2
	Carbohydrate	g	83.0
	Protein	g	3.4
Kelap	Energy	kcal	332
	Total Fat	g	1.7
	Carbohydrate	g	69.6
	Protein	g	9.5
Mong	Energy	kcal	338
	Total Fat	g	4.0
	Carbohydrate	g	65.3
	Protein	g	10.2
Beras Padi	Energy	kcal	113
	Total Fat	g	0.2
	Carbohydrate	g	24.6
	Protein	g	3.2
Rebung Betek	Energy	kcal	23
	Total Fat	g	0.2
	Carbohydrate	g	3.0
	Protein	g	2.2
Te'ok	Energy	kcal	45
	Total Fat	g	0.2
	Carbohydrate	g	9.7
	Protein	g	1.1

Table 3 shown the results of nutritional content that includes Thiamine (Vitamin B1), Riboflavin (Vitamin B2), Calcium, Copper, Iron, Magnesium, Manganese, Potassium, Sodium, Vitamin A, Vitamin C, Vitamin D3, Vitamin E, Vitamin K and Zinc. The samples have the highest content of Potassium and Vitamin D3. Bersayah, Cawet, Kelap, Mong, Rebung Betek and Te'ok have the highest content of Potassium meanwhile Cerwes, Ubi Kayu, Geraloh and Beras padi have the highest content of Vitamin D3.

Table 3: Nutrition content (Calcium, Copper, Iron, Magnesium, Potassium, Sodium, Vitamin A, Vitamin D3, Vitamin E, Vitamin K and Zinc)

SAMPLE	NUTRITION CONTENT	UOM	RESULTS
Cewes	Calcium	mg/100g	7.0
	Copper	mg/100g	0.1
	Iron	mg/100g	1.1
	Magnesium	mg/100g	1.9
	Potassium	mg/100g	3.6
	Sodium	mg/100g	5.0
	Vitamin A	Iu/100g	1.1
	Vitamin D3	Iu/100g	300.4
	Vitamin E	mg/100g	0.03
	Vitamin K	mg/100g	0.3
	Zinc	mg/100g	0.1
Bersayah	Calcium	mg/100g	223.0
	Copper	mg/100g	2.0
	Iron	mg/100g	7.3

	Magnesium	mg/100g	321.2
	Manganese	mg/100g	6.3
	Potassium	mg/100g	1941.6
	Sodium	mg/100g	17.8
	Vitamin C	mg/100g	170.6
	Zinc	mg/100g	4.0
Karyiel	Calcium	mg/100g	950.7
	Copper	mg/100g	2.8
	Iron	mg/100g	9.9
	Mangnesium	mg/100g	406.1
	Manganese	mg/100g	9.1
	Pottasium	mg/100g	2631.0
	Sodium	mg/100g	13.7
	Zinc	mg/100g	4.4
Cawet	Thiamine (Vitamin B1)	mg/100g	0.7
	Calcium	mg/100g	413.1
	Copper	mg/100g	1.6
	Iron	mg/100g	5.3
	Magnesium	mg/100g	279.6
	Manganese	mg/100g	4.0
	Potassium	mg/100g	755.0
	Sodium	mg/100g	20.8
	Vitamin A	Iu/100g	1.8
	Vitamin E	mg/100g	1.6
	Zinc	mg/100g	1.5
Ubi Kayu	Calcium	mg/100g	65.5
	Copper	mg/100g	0.2
	Iron	mg/100g	2.0
	Magnesium	mg/100g	39.5
	Manganese	mg/100g	1.6
	Potassium	mg/100g	446.3
	Sodium	mg/100g	7.0
	Vitamin A	Iu/100g	0.9
	Vitamin D3	Iu/100g	721.5
	Zinc	mg/100g	0.6
Geralah	Thiamine (Vitamin B1)	mg/100g	0.5
	Calcium	mg/100g	18.5
	Copper	mg/100g	0.5
	Iron	mg/100g	2.3
	Magnesium	mg/100g	59.7
	Manganese	mg/100g	0.8
	Potassium	mg/100g	684.9
	Sodium	mg/100g	5.8
	Vitamin A	Iu/100g	3.7
	Vitamin D3	Iu/100g	1063.0
	Vitamin E	mg/100g	0.02
	Zinc	mg/100g	0.5
Kelap	Thiamine (Vitamin B1)	mg/100g	1.0
	Riboflavin (Vitamin B2)	mg/100g	2.7
	Calcium	mg/100g	391.7
	Copper	mg/100g	0.7
	Iron	mg/100g	38.4
	Magnesium	mg/100g	271.7
	Manganese	mg/100g	136.5
	Potassium	mg/100g	2615.1
	Sodium	mg/100g	18.1
	Vitamin A	Iu/100g	13.1
	Vitamin E	mg/100g	0.9
	Zinc	mg/100g	8.0
Mong	Thiamine (Vitamin B1)	mg/100g	18.5
	Calcium	mg/100g	222.9
	Copper	mg/100g	0.5
	Iron	mg/100g	12.7
	Magnesium	mg/100g	123.6

	Manganese	mg/100g	55.2
	Potassium	mg/100g	3003.5
	Sodium	mg/100g	16.1
	Vitamin C	mg/100g	8.0
	Vitamin K	mg/100g	93.1
	Zinc	mg/100g	1.0
Beras Padi	Thiamine (Vitamin B1)	mg/100g	0.4
	Riboflavin (Vitamin B2)	mg/100g	4.5
	Calcium	mg/100g	7.9
	Copper	mg/100g	0.3
	Iron	mg/100g	1.0
	Magnesium	mg/100g	28.1
	Manganese	mg/100g	0.6
	Potassium	mg/100g	51.5
	Sodium	mg/100g	13.0
	Vitamin C	mg/100g	0.5
	Vitamin D3	Iu/100g	479.0
	Vitamin E	mg/100g	0.07
	Vitamin K	mg/100g	0.3
	Zinc	mg/100g	0.8
Rebung betek	Thiamine (Vitamin B1)	mg/100g	1.3
	Calcium	mg/100g	12.2
	Copper	mg/100g	0.2
	Iron	mg/100g	0.8
	Magnesium	mg/100g	10.4
	Manganese	mg/100g	0.3
	Potassium	mg/100g	361.2
	Sodium	mg/100g	3.9
	Vitamin D3	Iu/100g	135.2
	Vitamin E	mg/100g	0.03
	Vitamin K	mg/100g	103.3
	Zinc	mg/100g	0.7
Te'ok	Calcium	mg/100g	45.0
	Copper	mg/100g	0.4
	Iron	mg/100g	1.5
	Magnesium	mg/100g	87.7
	Manganese	mg/100g	2.7
	Potassium	mg/100g	393.8
	Sodium	mg/100g	6.6
	Vitamin C	mg/100g	1.8
	Vitamin D3	Iu/100g	278.1
	Vitamin E	mg/100g	1.4
	Zinc	mg/100g	1.5

Interview session:

Questionnaire 1 entitled *'Tahap Kesedaran Tentang Sumber Makanan Alternatif Ketika Banjir'* was used to interview 80 aborigines (Temiar tribal). The demographic results of the aborigines based on the interview were summarized in Table 4. In this questionnaire, list of food sources obtained from the sampling were given to the respondents and made them identify and recognize the food sources. Table 5 shows the frequency results of aborigines that recognize and did not recognize the list of food sources provided. The same samples were also given to them to identify whether they know the usage of the food sources listed or not. Table 6 shows the frequency results of the aborigines in whether or not they know the usage of the food sources listed.

Table 4: Demographic characteristic of 80 aborigines from the first set of Questionnaire '*Tahap Kesedaran Tentang Sumber Makanan Alternatif Ketika Banjir*'

Characteristics		N	%
Gender	Male	58	72.5
	Female	22	27.5
Age	≤30	26	32.5
	31-40	27	33.8
	41-50	19	23.8
	>50	8	10.0

Education Level	Never attended school	34	42.5
	Primary	16	20.0
	Graduate primary	12	15.0
	Secondary	8	10.0
	SRP	4	5.0
	SPM	6	7.5
Ethnic	Senoi (Temiar,Semai,Semoq Beri,Jah Hut,Mah Meri,Che Wong	80	100
	Melayu Proto (Orang Kuala, Kanaq, Seletar, Jakun, Semelai,Temuan)	0	0
	Negrito/Semang (Kensiu, Kintak, Lanoh, Jahai, Mendriq, Bateq)	0	0
Religion	Islam	18	22.5
	Christian	2	2.5
	Ethiest	60	75.0
Marital Status	Married	63	78.8
	Divorced	2	2.5
	Single	10	12.5
	Widow/widowman	5	6.3
Job	Government sector	1	1.3
	Private sector	1	1.3
	Farming sector (plants)	11	13.8
	Farming sector (animals)	1	1.3
	Farmers	11	13.8
	Hunting for forest products	10	12.5
	Others	45	56.3
Residence	Aborigine traditional houses	12	15.0
	Government house	58	72.5
	Quarters	6	7.5
	By the forest	2	2.5
	Others	2	2.5

Table 5: Recognition of 14 alternative food sources by the aborigines (Temiar tribal)

Food sources		N	%
Ubi Kayu	Yes	80	100.0
	No	0	0
Padi huma/bukit	Yes	74	92.5
	No	6	7.5
Mong	Yes	79	98.8
	No	1	1.2
Keber Moi	Yes	51	63.8
	No	29	36.2
Sayur Kelap	Yes	68	85.0
	No	12	15.0
Teh-ok	Yes	73	91.3
	No	7	8.2
Cawet	Yes	74	92.5
	No	6	7.5
Karyiel	Yes	69	86.3
	No	11	13.7
Bersayah	Yes	76	95.0
	No	4	5.0
Peng Hong	Yes	70	87.5
	No	10	12.5
Geraloh	Yes	57	71.3
	No	23	28.7
Bergentok	Yes	73	91.3
	No	7	8.7
Rebung Betek	Yes	76	95.0
	No	4	5.0
Cewes	Yes	75	93.8
	No	5	6.2

Table 6: Known the usage of 14 alternative food sources by 80 aborigines (Temiar tribal)

Food sources		N	%
Ubi Kayu	Yes	78	97.5
	No	2	2.5
Padi huma/bukit	Yes	74	92.5
	No	6	7.5
Mong	Yes	77	96.3
	No	3	3.7
Keber Moi	Yes	44	55.0
	No	36	45.0
Sayur Kelap	Yes	66	82.5
	No	14	17.5
Teh-ok	Yes	74	92.5
	No	6	7.5
Cawet	Yes	74	92.5
	No	6	7.5
Karyiel	Yes	68	85.0
	No	12	15.0
Bersayah	Yes	77	96.3
	No	3	3.7
Peng Hong	Yes	72	90.0
	No	8	10.0
Geraloh	Yes	56	70.0
	No	24	30.0
Bergentok	Yes	74	92.5
	No	6	7.5
Rebung Betek	Yes	78	97.5
	No	2	2.5
Cewes	Yes	74	92.5
	No	6	7.5

Questionnaire 2 entitled '*Tahap Kesedaran Masyarakat Orang Asli Terhadap Pemeliharaan Hutan*' was also used to interview 80 aborigines (Temiar tribal) regarding the awareness of the aborigines toward the forest conservation. Table 7 shows the demographic results of the aborigines based on the interview. Likert scale items (questions) were used in this interview to study the awareness of the aborigines. Table 8 shows the Likert skale's frequency analysis from the interview session with the 80 selected aborigines.

Table 7: Demographic characteristic of 80 aborigines from the second set of Questionnaire '*Tahap Kesedaran Masyarakat Orang Asli Terhadap Pemeliharaan Hutan*'

Characteristics		N	%
Gender	Male	43	53.8
	Female	37	46.3
Age	≤30	28	35.0
	31-40	36	45.0
	41-50	12	15.0
	>50	4	5.0
Education Level	Never attended school	31	38.8
	Primary Level	31	38.8
	Secondary Level	18	22.4
Ethnic	Senoi (Temiar,Semai,Semoq Beri,Jah Hut,Mah Meri,Che Wong	80	100.0
	Melayu Proto (Orang Kuala, Kanaq, Seletar, Jakun, Semelai,Temuan)	0	0.0
	Negrito/Semang (Kensiu, Kintak, Lanoh, Jahai, Mendriq, Bateq)	0	0.0
Religion	Islam	23	28.8
	Christian	1	1.3
	Ethiest	56	70.0
Marital Status	Married	64	80.0
	Divorced	2	2.5
	Single	10	12.5
	Widow/widowman	4	5.0
Job	Private sector	1	1.3

	Farming sector (plants)	5	6.3
	Farming sector (animals)	1	1.3
	Farmers	18	22.5
	Hunting for forest products	13	16.3
	Others	42	52.5
Residence	Aborigine traditional houses	15	18.8
	Government house	56	70.0
	Quarters	7	8.8
	Others	2	2.5

Table 8: Likert scale items (questions)

Likert Scale Items	Strongly disagree		Disagree		Less agree		Agree		Strongly agree	
	N	%	N	%	N	%	N	%	N	%
B1	18	22.5	18	22.5	16	20.0	8	10.0	20	25.0
B2	13	16.3	13	16.3	8	10.0	27	33.8	19	23.8
B3	11	13.8	17	21.3	10	12.5	19	23.8	23	28.7
B4	9	11.3	16	20.0	19	23.8	29	36.3	7	8.8
B5	9	11.3	7	8.8	4	5.0	46	57.5	14	17.5
B6	6	7.5	25	31.3	24	30.0	11	13.8	14	17.5
B7	10	12.5	22	27.5	23	28.7	20	25.0	5	6.3
B8	11	13.8	17	21.3	28	35.0	19	23.8	5	6.3
B9	3	3.8	5	6.3	4	5.0	50	62.5	18	22.5
B10	5	6.3	3	3.8	4	5.0	38	47.5	30	37.5
B11	7	8.8	9	11.3	3	3.8	41	51.2	20	25.0
B12	9	11.3	23	28.7	36	45.0	4	5.0	8	10.0
B13	10	12.5	14.	17.5	20	25.0	24	30.0	12	15.0
B14	8	10.0	17	21.3	23	28.7	18	22.5	14	17.5
B15	2	2.5	17	21.3	22	27.5	22	27.5	17	21.3
B16	4	5.0	22	27.5	19	23.8	21	26.3	14	17.5
B17	7	8.8	9	11.3	20	36.3	29	36.3	15	18.8
B18	13	16.3	20	25.0	10	12.5	25	31.3	12	15.00
B19	8	10.0	13	16.3	23	28.7	19	23.8	17	21.3
B20	7	8.8	16	20.0	20	25.0	24	30.0	12	16.3
B21	7	8.8	18	22.5	15	18.8	25	31.3	15	18.8
B22	5	6.3	24	20.0	21	26.3	25	31.3	5	6.3
B23	5	6.3	9	11.3	19	23.8	34	42.5	13	16.3

Where,

B1 *Pemeliharaan hutan adalah tanggungjawab kerajaan*

B2 *Masyarakat orang asli merasakan pemeliharaan hutan bukan menjadi tanggungjawab kami*

B3 *Menjaga alam sekitar tidak penting bagi masyarakat orang asli*

B4 *Pendapatan bagi menyara hidup seharian adalah paling utama bebanding pemeliharaan hutan*

B5 *Saya berpendapat masyarakat kami akan dihormati jika dapat menjaga alam sekitar*

B6 *Menjaga dan peraturan pemeliharaan alam sekitar menyusahkan cara hidup kami*

B7 *Kami hanya menunggu dari pihak berkuasa mengambil tindakan dan tidak akan melapurkan jika berlaku pencemaran alam dihutan*

B8 *Kami masyarakat orang asli merasakan pendapatan kami akan terjejas dengan adanya peraturan alam sekitar dan pemeliharaan hutan*

B9 *Kami masyarakat orang asli merasakan penting bagi megadakan kempen pemeliharaan hutan*

B10 *Saya merasa puashati jika dapat menjaga pemeliharaan hutan*

B11 *Saya akan memberitahu media massa jika berlaku pencemaran hutan*

B12 *Saya merasakan adat dan cara hidup lebih penting dari pemeliharaan hutan*

B13 *Saya tidak memperdulikan pembalakan jika ia memberi pendapatan kepada saya.*

B14 *Saya tidak memperdulikan jika haiwan itu semakin pupus dan tidak akan melepaskannya jika ia memberi sumber makanan kepada saya*

B15 *Sya tetap menjalankan pertanian pindah walaupun ia akan menjejaskan pemeliharaan hutan*

B16 *Saya merasakan ia tidak memberi kesan besar kepada pemelihaaran hutan walaupun saya menjaga ,dan menyumbangkannya.*

B17 *Walaupun sumber alam didalam hutan akan pupus selain haiwan kami rasa ia tidak penting jika ia memberi pendapatan yang lumayan kepada kami.*

B18 *Pembukaan ladang Sawit atau projek pertanian secara beleluasa dikawasan hutan tidak memberi kesan kepada pendapatan masyarakat orang asli bahkan memberi peluang pekerjaan*

B19 *Saya lebih suka tinggal dirumah kami dari menerima penempatan dari pihak kerajaan*
B20 *Penjagaan sungai ditempat pelancungan hanyalah tanggungjawab kerajaan*
B21 *Saya tidak akan menasihat pengunjung / pelancung yang datang beriadah dan membuang sampah di merata rata tempat dan ia bukan tanggung kami.*
B22 *Saya akan menjalankan pertanian dengan cara sendiri tanpa mendapat khidmat nasihat dari kerajaan ataupun Jabatan kerajaan.*
B23 *Saya merasakan bahwa tanggungjawab kami untuk menanam atau menyulam semula pokok tumbuhan yang semakin pupus.*

4.0 Conclusion

4.1 A total of 14 alternative food sources (plants and tubers) were identified in Gua Musang area as the food aid of Temiar tribal during the flood season.

4.2 Nutrition content of the alternative food sources were identified by sending the samples to laboratory for the nutrition analysis and all of the food sources contain respective good nutrient for the consumer especially to the focus respondents in this project.

4.3 Most of the Temiar tribal recognized the alternative food sources identified and they also knew the usage of the food sources to be utilized in their daily routine.

4.4 Level of awareness of the Temiar tribal towards forest conservation were identified and it shown that most of them are aware that forest conservation is important and they uphold the forest conservation highly as they are the nearest community to the forest in Gua Musag area.

4.5 Based on the training carried out in this study most of Temiar communities were gained the knowledge in term of usage of indigenous plants and tubers during the flood occur in future. The awareness on forest conservation also were inserted in this training program to minimize the impact of flood disaster.

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EMERGENCY FLOOD RELIEF: AUTOMATIC CHARGING FOR MOBILE COMMUNICATION SYSTEM

Project Information

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1.0 Introduction

During recent flooding in the country, one of the issues lies on the inability to charge mobile phone due to the power cut-off by utility company. Therefore, the introduction of self-charging via RF energy could be one way to solve the issue where the RF patch will be attached to the mobile phone to charge the battery automatically. Currently, there is no technology available such as RF-patch attached to mobile phone for needed/affected people during flooding areas to gain access to harvest energy with great efficiency. By having such development, communication could be maintained at all times by restoring the mobile battery lifetime. The study concentrated on the novel modeling and characterization of a low-power density design of rectenna patch to harvest RF energy for mobile charging application via GSM network.

2.0 Methodology

The efficiency of a radio frequency power harvesting system is determined by the efficiency of the antenna of the system; the accuracy of impedance matching between the antenna and the voltage multiplier of the micro system and the power efficiency of the voltage multiplier that converts a received RF signal to a DC voltage. Figure 1 depicts the basic diagram for the RF power harvester which consists of the antenna which is given by the parameters (*Va, Ra* and *I*), the antenna is divided on the rectifier circuit by LC impedance matching. Voltage multiplier represents the rectifier circuit presented by parameters (I_L, R_L and V_L).

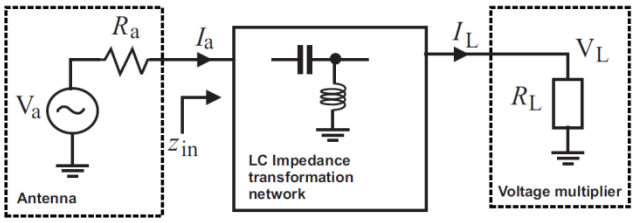

FIGURE1. Block diagram of the receiving RECTENNA (Yuan, 2011).

The power delivered to the load RL is given by equation 1; where A_v is the voltage gain provided by the impedance transformation network (Niknejad, 2007).

$$P_L = \frac{V_L^2}{R_L} = \frac{A_V^2 V_a^2}{R_L} \qquad (1)$$

The maximum power will be delivered from the antenna to the impedance transformation network when

$$R_a = Z_{in}^* \qquad (2)$$

Z_{in}^*= the input impedance of the impedance transformation network. Superscript * denotes complex conjugation. Then; the maximum power delivered from the antenna to the impedance transformation network is given by

$$P_{L,max} = \frac{V_a^2}{4R_a} \qquad (3)$$

For testing the designed RECTENNA, total efficiency is given by equitation (4); hence the global power efficiency of a RF power harvester is defined as the ratio of the incident power of the RF signal to the dc power at the output of the voltage multiplier.

$$\eta = \frac{DC\ output\ power}{Incident\ RF\ power} \qquad (4)$$

The conception of RF harvesters lies in the accurate modeling of the complete rectifier circuit so that its production performance can be produced. The rectifier is designed using a linearized model which will determine its output behaviour.

2.1 Circuit design of the RECTENNA

The proposed design contains microstrip patch antenna as RF input for the circuit, matching circuit and seven stages of Dickson voltage multiplier which convert the RF signal into DC power. The DC output must be regulated to fit the input of mobile battery; for this reason a current regulator circuit is designed as shown in Figure 2.

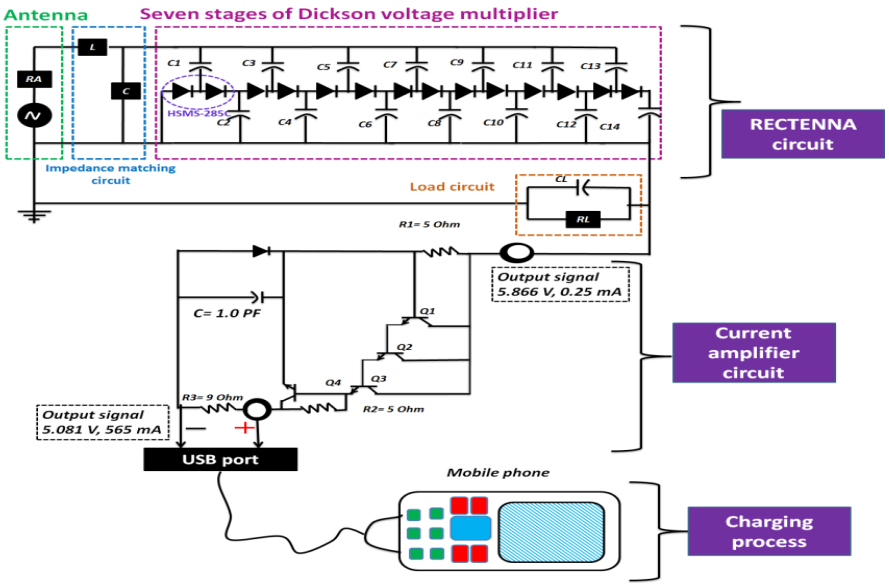

FIGURE2. Circuit design of the overall design

3.0 Results and Discussion

The simulation of the microstrip patch antenna is carried out using CST Microwave Studio 2014. The simulated antenna return loss curve is plotted in Figure. The simulated result for first design shows that the impedance bandwidth covers 0.8931 - 0.9019 GHz, which is equivalent to 10.2 MHz bandwidth at center frequency of 0.89827 GHz with a return loss of -14.718 dBi.

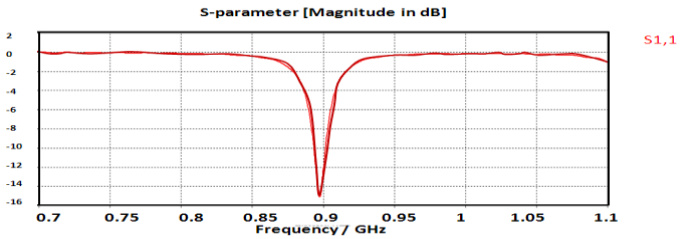

FIGURE3. S-parameter (s11) result for dielectric constant 4.3.

Figure 4 shows the simulated results for H- plane radiation pattern and E- plane radiation pattern in resonance frequency of 0.9 GHz for the design. It can be observed that H- plane radiation pattern are directional with a main lobe directed at zero. The directives of the main lobe are found to be 6.844 dBi.

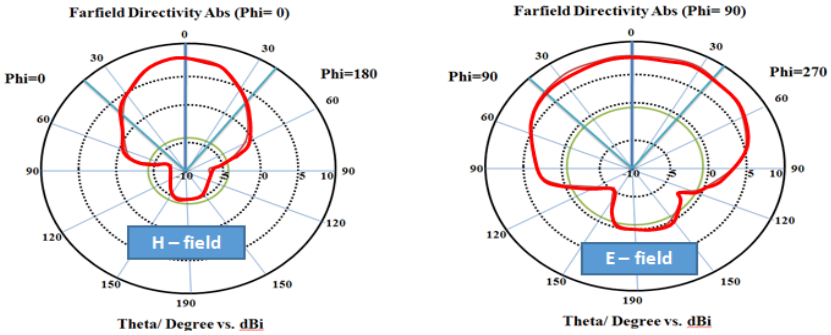

FIGURE 4. H-field & E- field of the microstrip antenna at frequency 0.9 GHz.

ADS simulator 2009 is used to simulate the seven stages Dickson voltage multiplier using harmonic balance mode. Figure 5 shows the circuit design; which contains from antenna, matching circuit, seven stages of the voltage multiplier and finally current amplifier circuit.

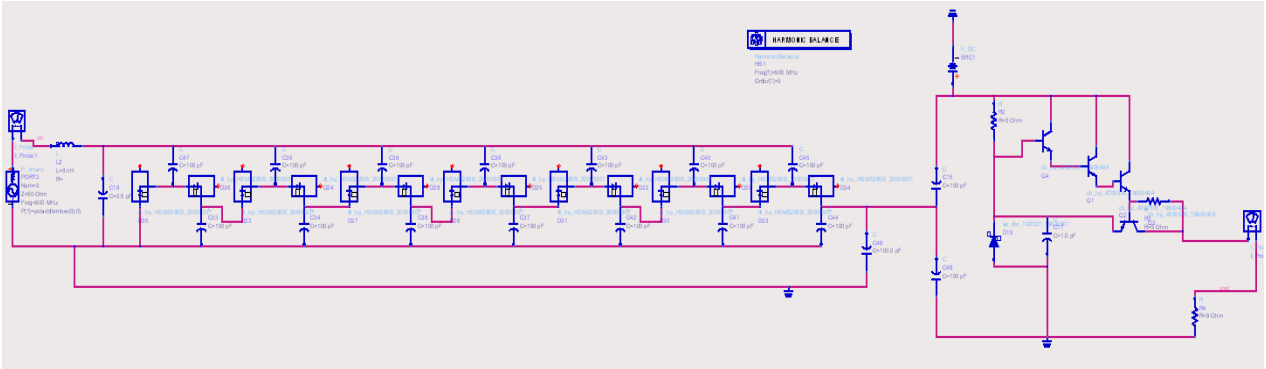

FIGURE 5. Circuit design of the RECTENNA using ADS 2009.

Figure 6 shows the simulation results of the rectifier circuit. The input current and voltage values are 0.012 A, 1.084 V, and the output current and voltage values are 0.565 A, 5.081 V. These results are suitable for charging mobile battery.

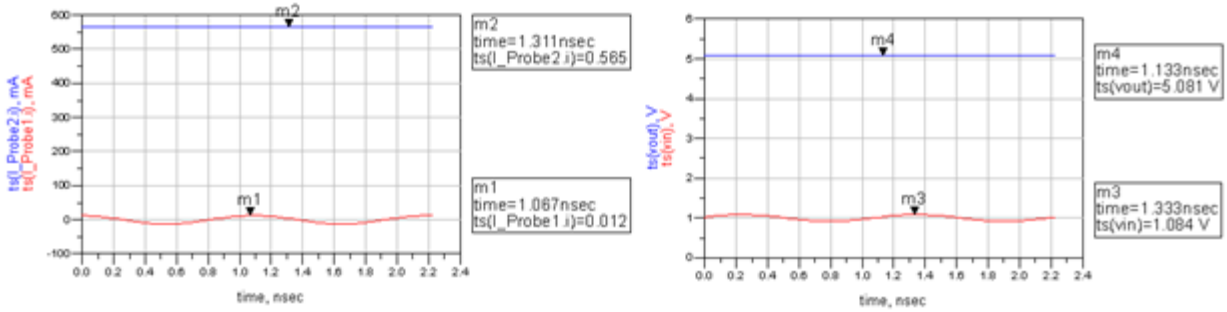

FIGURE 6. Output voltage and current results of the RECTENNA circuit

Figure 7 illustrates the result of the rectifier circuit output voltage and current. The output voltage is measured at 6.12 V which is slightly higher than simulated result. The reason for this difference lies in changing the power level which controls directly the output voltage; Nevertheless, it can be adjusted to match the load requirement of 5 V for mobile phone charging.

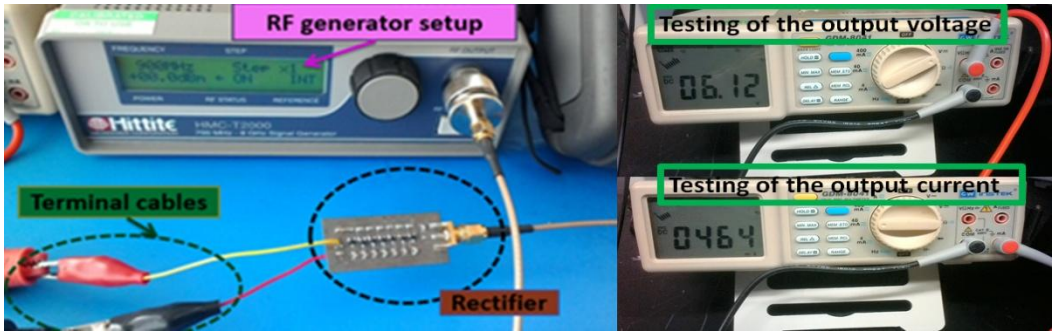

FIGURE 7. Setup of testing the Dickson rectifier.

4.0 Conclusion

This is a summarizing for the important findings of the project:

4.1 Antenna is designed, simulated, fabricated and tested. The results show that this antenna could be a good receiver which can collect the RF signal at 900 Mhz.

4.2 Voltage multiplier circuit is designed, simulated, fabricated and tested. This circuit able to convert the captured RF power and convert it to DC power.

4.3 Currant amplifier circuit is designed to regulate the output voltage and current.

4.4 The Rectenna tested and it charged the battery of mobile.

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A SMART 48V HYBRID SOLAR AND DIESEL GENERATOR FOR TELECOMMUNICATION BASE TRANSCEIVER STATION

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1.0 Introduction

Heavy rain in December 2014 causing severe flood in Malaysia in which the states in East of Malaysia are badly damaged. Disruption of electrical power affected the cellular communication. This research is conducted to design the hybrid solar and generator as a backup supply for telecommunication BTS.

2.0 Methodology

Referring to Figure 2, the smart hybrid solar and generator energy consists of the solar power, grid TNB supply and generator. In this configuration, six 290 W solar panels will charge four 130 Ah 12 V batteries connected in series to form a 48 V battery bank as shown in Figure 1.

FIGURE 1. Six solar panels charging 48 V battery bank installed at School Of Electrical and Electronic Engineering, Universiti Sains Malaysia.

- In the absent of solar and TNB the 6.5kW generator will charge the batteries.
- However, the system will continuously monitor the solar level and TNB supply.
- If the solar voltage level raised to the charging threshold level, the system will be revert back to solar and the generator will be off.

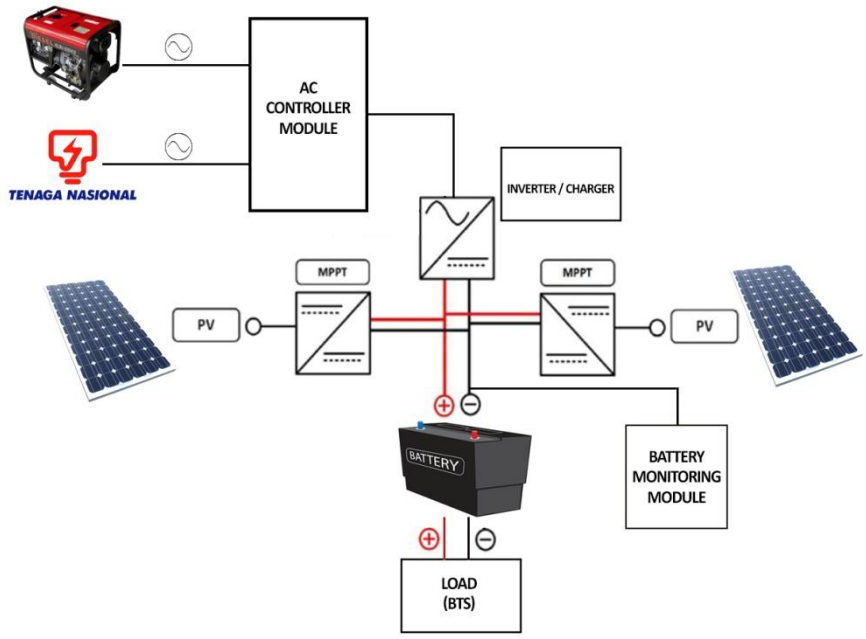

Figure 2: A block diagram of the hybrid solar and diesel generator for telecommunication tower.

3.0 Results and Discussion

Installation of the smart hybrid solar energy system in the real environment required an approval from the telecommunication service provider and that will take a lot of time. In order to conduct the analysis on the performance of the system, the measurement of the generated power from the system need to be carried out. Typically, the BTS power supply is -48 V and derived from the 48 V battery bank. Since the system is not connected to the real load (to BTS) the alternative voltage and current measurement must be done. The load (R) requirement for the system based on 48 V power supply can be calculated as in Equation 1 and 2 (E. Santi, 2002):

$$I = \frac{P}{V} \qquad \text{where P is BTS power, I is the required current and V is 48 V} \qquad (2)$$

Therefore the load (R) can be calculated as follows,

$$R = \frac{P}{I^2} \qquad (3)$$

As an example, to simulate the load for 1 kW power consumption from the BTS, the required load is 2.3 Ω with 20.83 A current from the battery bank and the minimum power rating for the resistor is 1 kW. In other words, the required load bank to test the system for 1 kW power consumption from BTS is 2.3 Ω 1 kW resistor and adjustable load bank is required to measure a different power consumption. This kind of resistive load are expensive. However, since the system has built in 3 kW inverter an inexpensive AC load can be used to draw the current from the battery bank. The AC load bank consists of ten 100 W filament type light bulb connected in parallel are used. The bulbs can be switched on and off individually to simulate the different power consumption.

TABLE 1: Measured battery current for a different power consumption with no solar charging

Load (W)	DC Load Calculated Battery Current (A)	AC Load Battery Current (A)	Differences AC-DC (A)
100	2.03	2.70	0.67
200	4.17	4.86	0.69
300	6.25	6.88	0.63
400	8.33	8.12	-0.21
500	10.42	10.18	-0.24
600	12.50	12.21	-0.29
700	14.58	14.30	-0.28
800	16.67	16.40	-0.27

900	18.75	18.50	-0.25
1000	20.83	20.70	-0.13

Table 1 shows the measured result of the load connected to the AC inverter with the solar charging is off and the calculated current for the DC load directly connected to the battery bank. The result revealed that the AC load connected to the inverter will draw approximately the same current in comparison with the DC load. Therefore the AC load can be used in analyzing the performance of the hybrid solar power system (M. Prodanovic, 2006).

TABLE 2: Measured Battery current For AC load with solar charging is ON

Load (W)	100	200	300	400	500	600	700	800	900	1000
Battery Current (A)	-22.30	-20.30	-18.20	-16.30	-15.20	-13.40	-11.70	-9.80	-0.38	-0.18

Further measurement has been carried out to measure the battery current during the solar charging is occurring. The measurement has been done at 1 pm during no cloud to ensure the solar charging is a peak power. Table 2 is the result of the battery current with the AC load is ON and the solar is charging. As shown in Table 2, the negative sign for the battery current was showing that the battery is absorbing the current from the MPPT charge controller. At low level load, the charging current is high and the inverter uses less current. However, at higher load the charging current is very low since the inverter requires high current.

Based on Table 2, the inverter drawn most of the charging current from the charge controller and as can be seen that at 1 kW of load, the charging current is only 0.18 A while the inverter drawn 20.7 A from the battery bank. Having that in mind, at 1 kW load, the solar energy will run the system for about 4 hours a day and grid supply or the generator supply need to be used for continuous operation. (Mohd Fadzil Ain, 2016)

4.0 Conclusion

The smart hybrid solar, grid and generator supply for telecommunication BTS has been designed and installed in School of Electrical and Electronic Engineering, Universiti Sains Malaysia. The system has the capability to monitor the battery level and switch to the available power that will help in charging the 48 V battery bank to ensure the continuous operation of the BTS.

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DEVELOPMENT OF A HIGH EFFICIENCY PORTABLE SOLAR GENERATOR UTILIZING OPTIMUM SOLAR PANEL ORIENTATION FOR FLOOD EVACUATION CENTRE

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1.0 Introduction

Green energy generation has many long term benefits such as low operating cost and environmental friendly. In Malaysia, particularly, the solar electricity generation potential is 6500MW, while in 2016, grid connected solar PV is only 230MW [1]. Nonetheless, the Malaysian Government has embarked on continuous effort in the development of Renewable Energy through various support and promotion programs [2-3]. However, in Malaysia, solar technology for electricity generation always associated with the Feed-in Tariff (FIT) program promoting the uses of renewable energy resources especially the abundance solar based energy to produce electricity to be sold from industry or evens individuals to the power utilities. Therefore, there are needs of portable solar power generator for green energy electrification during natural disaster, emergency and, search and rescue missions. The most important thing in this prototype design is the adaption of a strong, portable and easy to set up solar panel frame. The mechanical frame hold a lightweight and high efficient solar panel. Since the solar panel power generation is based on its orientation toward the sun to secure optimum power generation, the proposed prototype also focuses on the intelligent algorithm which assist the user for the optimum solar panel position for specific location and date, automatically. Moreover, the algorithm also has the capability to estimate the optimum battery and the solar capacity that is needed in order to electrify specific load capacity. Besides, the electrical parts such as charge controllers, batteries and inverter are stored in water proof mechanical structure. In the next, the invention is explained in details.

2.0 Methodology

Evacuation centre during flood often utilize school main hall or community hall due to its size and strategic locations. Therefore this project calculate the power requirement of school hall in Serdang, Selangor to meet the power requirement of evacuation centre. The school hall has dimension of 80 ft length, 30 ft width and 12 ft height. The main concern is to power up the luminaries installed in the school hall. As shown in FIGURE 1, the school hall has 20 luminaries with 2 fluorescent bulbs in each of them. Since each fluorescent bulb requires 36W, the total power for 20 luminaries is 1440W. Consequently, the energy requirement to light up 20 luminaries for 10 hours is 14.4kWh. In case of using LED bulbs, the individual power is 16.5 W, the total power for 20 luminaries is calculated to be 660W and energy requirement for 10 hours is only 6.6 kWh which is only 45.8 % of fluorescent light.

The energy generation from designed 1 kW portable optimum angle tilted solar generator is calculated to be as below,

$$1\text{kW} \times 5 \text{ hours} \times 0.72 \text{ factor} = 3.6 \text{ kWh} \quad (1)$$

Therefore, 4 unit of portable optimum angle tilted solar generator is needed to power up 20 luminaries in the evacuation centre for 10 hours. While, only two unit need for the luminaries with LED bulbs.

Meanwhile, solar radiation is the main key in determining the amount of energy produced from a photovoltaic module. The rate in which solar energy reaches a unit area is called solar irradiance or insolation and the unit measurement is in Wm^{-2}. The solar irradiance on a clear day is given by $1000Wm^{-2}$. Initially, before the solar irradiance hits the atmosphere, it is called the solar constant, as it goes through the atmosphere; it is divided into several components before being received by the solar array. The three main components are direct, diffuse and reflected irradiance and the summation of the components is known as the global irradiance [5].

85 - 90% of the sun rays are mostly direct irradiance during clear and sunny day. The incidence angle, θi increases as the solar ray hit the photovoltaic surface, reducing the generated power. By using the relationship between the direct normal irradiance, IDN of the surface given in

$$ID = IDN \cos \theta i \quad (2)$$

Therefore, to increase the irradiance captured by the solar module, sun positioning is used to minimize the incidence angle [4].

Besides, the knowledge of the angle involved is important to maximize power generation in photovoltaic arrays. Basically, the sun moves in accurate trajectories, and its location in the sky corresponding to a location on the surface of the earth can be specified by two angles; the altitude angles: α, and the azimuth angle, γ as demonstrated in Fig. 1. The solar altitude angle is defined as the angle between the sun's position and the horizontal plane of the earth's surface from the observer's position (local horizon), where the maximum value of altitude angle is during noon [4]. This angle can be calculated using equation (3), and using information on local latitude, φ, solar declination angle, δ and local hour angle, ω [6].

$$\alpha = \sin^{-1}(\cos \varphi \times \cos \delta \times \cos \omega + \sin \varphi \times \sin \delta) \quad (3)$$

Another angle that describe the solar location is the solar azimuth angle and is defined as the angle between the vertical planes containing the solar disk and a line running due north using equation (4) and using the solar altitude angle, α calculated in equation (3) [4].

$$\gamma = \sin \alpha \times \sin \varphi - \sin \delta \cos \alpha \times \sin \varphi \quad (4)$$

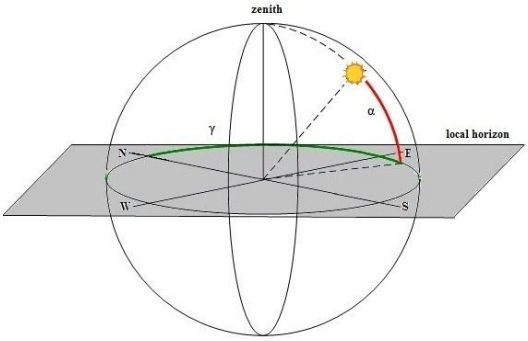

FIGURE1. Position of the sun angle

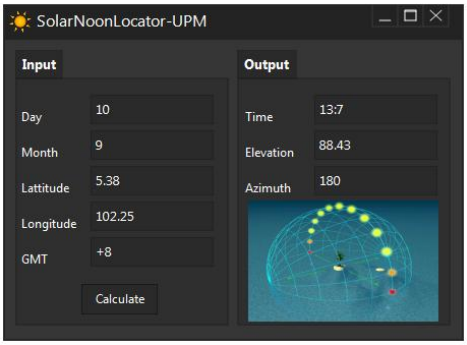

FIGURE 2. Developed GUI for optimum tilted

3.0 Results and Discussion

The positioning mechanism in the proposed design is based on optimum tilted altitude angle and manual azimuth angle setting. The optimum tilted angle calculation is based on solar noon. In order to get solar noon altitude angle, Azimuth angle,γ is equal to 0. As a result,

$$\text{Solar noon altitude angle} = \cos^{-1}(\sin\delta.\cos\phi - \cos\delta.\sin\phi.\cos\partial)) \quad (5)$$

The optimum tilted angle is based on equation 5. The software for tilted angle calculation, namely Solar Noon Locator UPM has been develop using virtual C on windows platform. The developed GUI is shown in FIGURE 2. The user need to input the date, location and GMT data while the software will calculate the optimum tilted angle.

The important tasks in designing optimum angle sun positioning mechanism is the features of lightweight, cost effective and low energy consumption. Thus, non-corrosive steel is used. The simplified structure is shown in Figure 1 where the dimension is 1485 × 1145 × 1310 mm. It is design to be stable with a heavy base. The design is made for retractable so that it can be loaded in truck for mobility to evacuation centre. The azimuth angle setting is done manually to reduce power consumption while altitude angle is moved by the linear actuator with the control of processor. FIGURE 3 shows the mechanical drawing of the structure for holding the solar module and moving the altitude angle toward solar noon.

The structure base is design by taking into account the size of normal pick-truck so that this solar generator can easily be loaded and deported to flood evacuation centre. Meanwhile, the

retractable wing and tilted mechanism design is shown in the FIGURE 4. The designed 4 wings can easily be pulled out to harvest solar energy and push in to minimize its size during delivery or storage. The tilted mechanism assisted by 2 unit of linear actuator remove the necessary of human effort to adjust the optimum tilt angle.

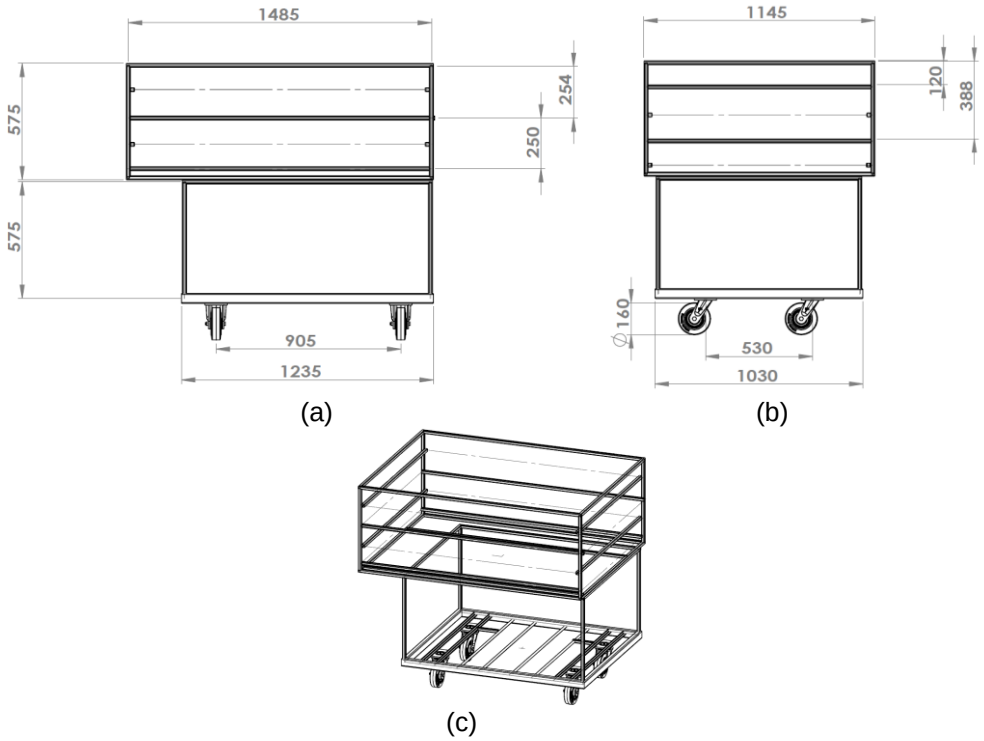

FIGURE 3. Mechanical structure drawing (a) Front view, (b) Side view, (c) 3D view

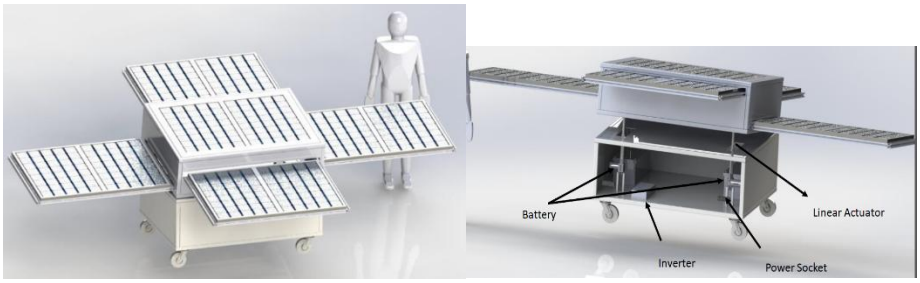

FIGURE 4. Retractable structure with tilted solar module

The altitude angle movement is based on 2 linear actuator which precisely driven by a processor. The processor decide the optimum altitude angle based on calculated angle in the proposed Solar Noon Locator UPM software. The speed of linear actuator is set to be 1 degree per second so that it took 2 second for 88 degree elevation.

The block diagram of developed 1 kW portable optimum angle tilted solar generator is shown in FIGURE 5. It consists of a 1kW solar module, 2 unit 40A MPPT charge controller, 2 unit 12V 200Ah battery bank, and 1kW rating pure sinewave inverter which produce both 12V DC and 240V, 50Hz AC.

The selection of 2 unit of 40A rating charge controller is due to 1 kW solar module is divided in two 2 unit with produce almost 30A at maximum power. While, 2 unit of 12V 200Ah lead acid battery is chosen due to maximum generated energy is 3.6kWh which is 70% of storage capacity of 4.8kWh. The inverter however is selected to be 1kW rating due to power requirement of only 360W to light up10 fluorescent light or 22 LED lights for 10 hours which is a quarter/half of power required for lighting in school hall based on fluorescent/LED light

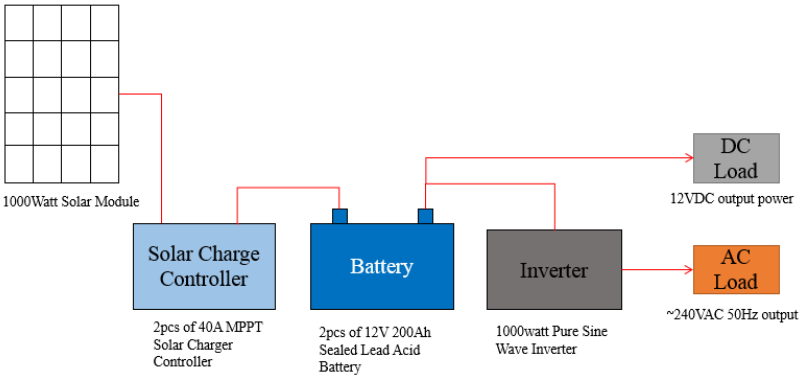

FIGURE 5. Solar energy generator

The developed prototype is shown in FIGURE 6. The solar module can easily be retract so that it can be loaded in pick-up truck for mobility to the flood evacuation centre. The solar module produced required power during field test and able to charge the battery and produce both 12V DC and 240V, 50Hz AC. The output has been tested to light up 36W fluorescent bulbs. However the reliability of the prototype is under testing.

FIGURE 6. Developed solar generator with retractable structure and optimum tilted angle

4.0 Conclusion

Tilted angle is a well-known approach in maximizing power generation in photovoltaic arrays. This approach has been implemented in the developed high efficiency portable solar generator for flood evacuation centre. The product has been design to cater the size of pickup truck and the energy requirement of a school main hall which is usually be the flood evacuation centre. The develop prototype able to light up up10 fluorescent light or 22 LED lights for 10 hours which is a quarter/half of power required for lighting in school hall based on fluorescent/LED light.

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AERIAL DISASTER SITE SURVEYING SYSTEM THROUGH THE USE OF A MIDDLEWARE FOR INTEGRATING WEB INTERFACE, MOBILE APP, AND AIR DRONES

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1.0 Introduction

Sometimes it's impossible for rescuers to reach an area that is flooded until several days after the disaster. It is both expensive and dangerous to go and map natural disaster sites. When a huge flood hit Kelantan last year, rescuers had to resort to the use of helicopters to map out affected area due to the fact that normal land vehicle cannot reach critical areas. Helicopters are costly in terms of money and man power needed to operate it. Besides, manually taking pictures using cameras is tedious and time consuming especially when there are a lot of areas that needs to be covered quickly. We would like to propose the use of a system consisting of a middleware, mobile apps and air drones or unmanned aerial vehicle (UAV) to map out disaster sites. Inputs on disaster locations can be fed to the system via a web interface or via mobile apps (used by the public to report critical areas). The middleware is the core that enables the web interface, mobile apps, and drones to communicate. The middleware will coordinate the inputs and mobilises air drones to survey the area, take pictures with GPS coordinate and report back to the main system. The system will then create an up-to-date aerial view (map) of the disaster site, which could be made accessible to various parties in order to enable better aid distribution, mobilization of rescue teams, and management of rescue shelters.

2.0 Methodology

The creation of the proposed system is divided into 3 phases:

Phase 1: Study of open source air drones
Phase 2: Development of various systems
Phase 3: Deployment and testing of the overall system

Phase 1
---

1. There are several candidates of air drones that can be used in the project. Example includes:
   - Parrot Bebop drone
   - Parrot AR Drone 2.0
   - 3DR Pixhawk based drones
   - APM:Copter compatible drones
2. One candidate will be selected based on these factors:
   - Amount of approved funding
   - Support for easy component upgrade
   - Rich developer API for disaster site survey
   - Durability of the air drone in harsh whether
   - maximum flight time
3. A study on the command interface (API) of the selected drone will done to cover these aspects:
   - drone id
   - autonomous flight control
   - startup and shutdown procedure
   - camera, gps control
   - data storage
   - communication protocols
4. The above info will be used in during the development of the middleware

Phase 2
---

1. Once the first phase is done, phase 2 will commence

2. Phase 2 has two main development activities:
   a) Systems development: Development of the web based system and the mobile apps
   b) Middleware development: Development of the middleware
3. These 2 activities will run in parallel
4. Below are details of each of the development activities:
   a) Systems development
      - Systems development will start with web interface development
      - Development of mobile apps that will cover two of the most common platform
   b) Middleware development
      - The middleware can be divided into 3 main parts:
            part i. Middleware interfacing the air drone
            part ii. Middleware interfacing the web based system
            part iii. Middleware interfacing the mobile apps (android & ios)
      - Development of each parts will commence once the steps related to that part is completed.
            (a) Development of middleware (part i)
            (b) Development of middleware (part ii)
            (c) Development of middleware (part iii)
5. Development of web based system will use PHP, MySQL, and open source image stitching algorithm (e.g. Hugin, stitch panorama)
6. Development of Android app will use Android SDK, while iOS app will use Objective C/Swift (Xcode)
7. Air drone command can be sent using technology supported by its API

Phase 3
---
1. System that has been developed in the previous phase will be deployed into mobile phones and server
2. Testing will be done to study:
   i. Interoperability of web interface with air drones
      - the web based system must be able to send instructions to air drone
      - air drones must be able to carry out instructions
      - air drones must be able to send reports back to the system
   ii. Interoperability of mobile apps with web interface
      - mobile apps must be able to send GPS coordinate & captured images location
      - the web interface must be able to pick up reported locations and images
   iii. Overall interoperability
      - the web based system must be able to pick up GPS coordinate reported by mobile apps and mobilise air drones to roam the reported coordinate, take pictures and report back to the system
      - the captures images must be visualized in the web interface and accessible to all interested parties

3.0 Results and Discussion

The use of a middleware and an affordable air drone is what differentiates the system with other standalone air drone for aerial site surveying, or traditional helicopter based manual aerial mapping using handheld cameras. The web-based system enables better sharing and coordination of aerial survey data to multiple interested parties to expedite decision making process. The use of mobile apps enables better reach and easy reporting by civilians in the event on a disaster strike, which contributes towards fast and accurate response to disaster affected areas.

4.0 Conclusion

4.1 The use of this product may help in better distribution of aid during disaster such as flood, coordinate search and rescue mission, and assist in any decision making process that might require the use of aerial views disaster sites

4.2 The product can be a basis for further research into technology assisted site surveying or research in air drone assisted search and rescue.

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EMERGENCY EVACUATION UTILISING 5D STEREOSCOPIC & AUGMENTED REALITY (EXIT-5DSAR) FOR FLOOD DISASTER

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1.0 Introduction

Emergency Evacuation is the immediate and urgent movement of people away from the threat or actual occurrence of a hazard. A large-scale evacuation of a district because of a flood may create havoc and panic among victims. Evacuation is a plausible measure to lessen death toll in case of an occurrence of a disaster or a danger of disaster. Evacuation can possibly save lives, but an actual emergency training is prohibitively expensive and not practical for a large scale of evacuation. To save costs for emergency evacuation during floods, we can take advantage of modern technologies such as augmented reality (AR) combining with the 5D cinema elements have are very powerful capabilities for humanity and offering opportunities for changing the way people view the world. Thus, 5DAR technology will have a positive impact in reducing mortality and create innovative ways to save lives.

To date, there is no current practice for disaster evacuation preparation or any training program so far for the community in Malaysia because flooding is common natural hazard especially in the peninsula's East Coast region where the occurrence of such floods is considered a way of life. Moreover, many flood preparation or training only involves the members of the rescue services especially the firefighter and police but there is no preparation or training made to public. It is an alarming situation that there is nothing being done to establish proper procedures to respond during emergencies such as floods. Only recently, government's effort is to conduct simulation exercises. The Development and Security Committee (JKKK) across the country will be required to attend training courses to flooding simulation with all agencies under the Ministry of Rural and Regional Development (MRRD) to be better prepared to face natural disasters in the future (UMNO online, 2015). The main objective of such courses is to improve understanding of standard operating procedures (SOP) rescue and evacuation of all JKKK across the country. It is important to ensure that the level of preparedness in their area to provide a more systematic response when disaster recurring. This effort will certainly cost a very large amount of money because it involves numerous staff to run the course while the community involvement is almost impossible. Therefore, this study aims to develop 5DAR-based training system that trains people in need of emergency evacuation with a real environment and virtual materials and instructions.

2.0 Methodology

Phase 1: The orientation of this study is an interpretive approach. The researchers tasked to make sense or interpret the phenomena in terms of interpreting all the sources of data and meaning behind them[10.] The EHE project aims to reveal flood victims' perspectives and understandings, particularly with regards to their post-hoc lived experiences in the natural extreme settings. With the role of observers and interviewers, a team of researchers from University Technology Malaysia (UTM) sought data from the environment and lived setting in order to interpret [11] the participants' experience and perceptions in confrontation with the latest flooding from 15 December 2014 – 3 January 2015. To reach at the better understanding point of the phenomena, the researchers selected the case study design. [12] [13] [14] Purposively, a single case was adopted as to get in-depth insights into the concept of EHE in the extreme-condition of different flooding areas in Kelantan state. The participants were in a confined boundary of space and time during flooding. The research was conducted during two weeks, in different affected regions, Gumusang, and Kulai Krai. These regions were selected because they are typical reported parts of Kelantan state. The regions have been acknowledged by many sources as the top affected regions among other regions.

Phase 2:

Simulation Input System: The simulations use two Kinect sensors, one at the back of the simulator and one at the front of the simulator to ensure that the user is tracked at all times. Real-time positional input is also required as the user will be using an Android phone that will display the items or task that needs to be done by the participant using Augmented Reality technology. The audience can watch the participants move and save the village. With a push of a button the audience (trainer or civilian) can start the rain/hasten the flood to stimulate the player further as necessary for escape training purposes. The simulations are also controllable via a console by the Simulations Operator. All the controller data is streamed via a secured wireless connection to the server running the simulation.
Simulation Output: The simulation systems currently have 5 outputs. The core system comprises of many Microcontrollers and a core server, which controls and transmit the necessary settings. Data from the intensity of the sunlight inside the simulator is sent to the lighting system so that the lights will have almost the correct light intensity. The pictures are displayed in 3D via a stereo projection system. The speed of the wind is controllable wirelessly from the Simultaions Server and will mimic the wind conditions during the days of the flood. There is a flood pond to simulate real flood. As the water level rises in the simulation, wireless controlled water pumps will pump water from the main tank into the flood pool simulating real flood conditions. A wireless controlled rain machine simulates the rainfall on the day of the incident and reflects the amount of rainfall inside the simulations.

3.0 Results and Discussion

Objective 1: The research was conducted during two weeks, in different affected regions, Gumusang, and Kulai Krai. These regions were selected because they are typical reported parts of Kelantan state. The regions have been acknowledged by many sources as the top affected regions among other regions. Thirty-five participants, 11 male and 24 female were interviewed that 60% from Guamusang and 40% of them from Kulai Krai. Respectively, the number and percentage of participants by education were 2 illiterate residents, which were 5.7% of total, 9 at primary level (25.7%), and 24 at secondary level (68.6%). Regarding their age, 57.1% of them under 20, 48.6% between 21-39, 8.6% between 40-59, and 40 % over 60-year-old.
Four groups of questions asked from the victims about EHE. These questions broke down into several items as to understand the process of EHE. The items in the first group are:

- What were the characteristics of the flood?
- What were the characteristics of your house/building?
- If you want to describe yourself in general, what kind of person you are brave, timid, or challenging…?

Second and third groups together are listed as:

- How long did it take between your realization of the disaster and time of evacuation?
- What was your immediate reaction when you found out that there was a flood near your house?
- What was your thinking about, during your evacuation?
- Did you rescue someone during the flood?
- Were you able to recover your valuables (money, gold, Wallet…) before the flood reached your area?

Moreover, the items of the fourth group are itemized as:

- Which direction did you choose to run to?
- Was there any other consideration apart from running away from the house?
- Did you try to sweep away the water entering your house during the flood?
- Were you trapped in the house?

Based on the data, the victims' frequent complaints about their psychological shocks during EHE were a justifiable reason to think about the process of EHE. According to Perry and Lindel[16], human needs dynamic interactions with the environment. Therefore, in the case that human beings are not ready to confront with the environment the psychological shocks are reasonable. The compatibility with the environment in general, and nature in particular, entails the accurate and valid decisions based on the actual needs. [17] Based on the data, the first reaction against the flooding is EHE. The researchers found that the ineffective EHE is the main phenomenon of this study as the researchers expected before going to the fieldwork. Fundamentally, to the extent that these people are being on time and optimized, the compatibility with the natural disaster is going to be more feasible. Therefore, training not only have the significant contribution to enhance mankind's knowledge and skills, but also have the imperative role to improve efficiency and effectiveness to adapt individuals with the coming problems of the ever-changing nature.[18 19 20 21 22]

In order to train the residents and help them to overcome the situation, researchers try to find the main evacuation process in order to find the model to train the individuals. Therefore, three main categories were emerged to complete the process during EHE; namely, predicting, controlling, and action. In other studies, several scholars found other components. For instance, in 1990 Laska [23] mentioned in human decision-making process for evacuation, which is divided into four psychological phases of concern, danger recognition, acceptance, and evacuation decision. Along with Laska, [23] Tobin and Ollenburger [24] alluded to the Red River Basin evacuation model utilized a structure that divides the process into three phases of concern, danger recognition, and evacuation decision. Another example returns to Simonvic and Ahmad [25]. They mentioned that in order to be ready to confront disastrous conditions, there are some noticeable needs for the better preparation:

- Understanding of emergency order processes
- Understanding of human behavior during the emergency
- The communication between the community (family member) affected by the authorities of disaster and emergency management
- Preparedness through simulation, or investigation of ‘‘what-if’’ scenarios.

Basically, he mentioned to evacuation management, and they counted three main components of prediction, control, and response, which are determined in cultural base. In this study, although there is a similarity of the names of components, but the definitions of each component are different. Based on the data in this study, predicting constitutes from three sequential themes of estimating, discriminating, and timing. These elements help residents measure the approximate level of flood with considering the time and type of flood. A typical excerpt from a 28-year-old victim shows the importance of predicting that he says:

> *“Everything happened by sudden in two hours I was shocked, and I didn’t know which way I should run and how to lead my family. It would be good to predict the flooding through weather cast or mobile alert.”*

It is deduced from his statement that residents need to beware of the flooding before entrapping. Generally, in some nations governments put many efforts to mitigate and redirect inevitable floods such as some engineering works and installing advanced computer as to predict with astonishing accuracy where floods will befall and how severe likely to be[7].

Three themes support the concept of predicting, which should be seen in a stepwise order. Estimating, distinguishing, and timing are the themes that are elicited from the data. Regarding the estimating, it is perceived from the participants that there are different ways to estimate the level and time of flooding. Participants mentioned three major ways of estimating such as alarm sensors, media estimation, and traditional estimation. It is emphasized that installed alarming sensors or central alarming to inform the residents to evacuate seems necessary for the residents. Moreover, they emphasized on media role in informing and estimating the flooding. Most of the survived victims indicated in the way that estimates the flood. For instance, one of the 58-year victims expressed:

> *“Before flood I understood the rain will become worse because by our tradition knowledge in our village, we know if the water reaches to the upper part of our legs means we have to evacuate, and it is going to be dangerous.”*

The above excerpt shows that in local areas that they have experience in flooding, and they have some traditional ways to understand the time and level of flooding. It seems that the transferring these kinds of knowledge can help the residents to estimate the time and level of flooding.

Other concepts of predicting are the distinguishing and timing. Respectively, distinguishing refers to river elevation and precipitation, which can be predicted as the type of flooding. Albeit, most flood damages are related to human interest in living near in river valleys[8]. Moreover, the timing is referred to the time that residents should know how long they have time for EHE. Timing includes two themes of the slow and heavy uprising. Usually, slow uprising takes long time to overflow the river to come into the house that sometimes it takes one day. The heavy flooding takes in short time usually reported from one to two hours. Based on the observation and the explanation of participants, researchers came to this conclusion that flooding from river areas different from other areas. Furthermore, the participants mentioned that time management for them was very important to collect their stuff and leading family. Therefore, those areas with the fast uprising could not manage to have effective EHE than those in the areas with slow uprising.

Sometimes the problems of timing of evacuation and the order of actions, and evacuation process are reported as the main issue [26] [27]. According to the data analysis, the middle category between predicting and action are controlling. Some of the participants expressed that during the flood, they tried to challenge with the flood to prevent flood coming inside the house and also some emphasized on the electricity problem during flooding. For instance, one of the victims says:

"I was disappointing during my challenge with water because I did not know what to do close the entries or collecting the needful stuff, so I made a decision to leave struggling and to find the valuable but there was no electricity to find the documents. I was under stressful situation to manage the priority."

By considering all the points from participants like the above excerpt the researchers come up with the controlling as the concept to support their perceptions. Categorically, controlling founds from two sequential themes of closing entries and disconnecting utilities. These elements assist the people to control the aftereffects. In order to control the aftermath disaster the residents during a flood should try to close the entries such as windows and backdoor. Moreover, As to prevent damage from electrical devices and gas, it is offered to disconnect the main electricity fuses and closes the gas flow.

The last but not least category is action, which is located at the end of the EHE process. Normally, the control and predict of behaviors during an emergency is not easy. The experiences of flood evacuation show various problems from happening chaos[27 28]. Based on the data, there are some sequential actions that can help residents to evacuate their house after considering the predicating and controlling stage. These sequential actions are equipping, collecting, recognizing, and leading, respectively. Regarding equipping, the leader of the family should control the family members to wear their safety jackets as an imperative stuff to help them. The next theme after equipping is collecting. Frequently, the victims complained about the situations that after flooding they entrapped, and they could not reach for the food and water that helicopters sent for them and sometimes they needed rope to help others. Additionally, they mentioned to the darkness at night in everywhere and need light to find their way. Moreover, in some cases they mentioned to the difficulty for their valuables and documents. For instance, one 45-year lady expressed:

"It was difficult situation I didn't know what to collect on that moments: my kids, water, money, or our ID cards. I just took my ID cards and available documents, but unfortunately all the docs became wet and dirty."

It is realized from her excerpt that residents at the time of EHE, they don't have enough concentration to collect their basic stuffs. Therefore, the researchers come up with the term, collecting as the item refers to pick up the prepared backpack, which is contained plastic-covered documents, spare keys, valuables, dried snacks, torch, rope, and water.

Last two themes are related to recognizing and leading. Regarding leading residents should recognize which exit door is the best way to exit and try to choose the safe door and after exit choose the best way. According to data from participants at the time of evacuation family members, all are under mental pressure. In some cases, the kids fell down and hurt during final stage of evacuation. Based on the informal discussions with some participants, the researcher came at the point that it is instructive to lead the family with pre-trained practices. At this stage of EHE the leader of the house stays in front of the family members and one of the elder family member stays at the end of members' chain. The following figure 1 shows the links and interrelations among all mentioned categories and themes.

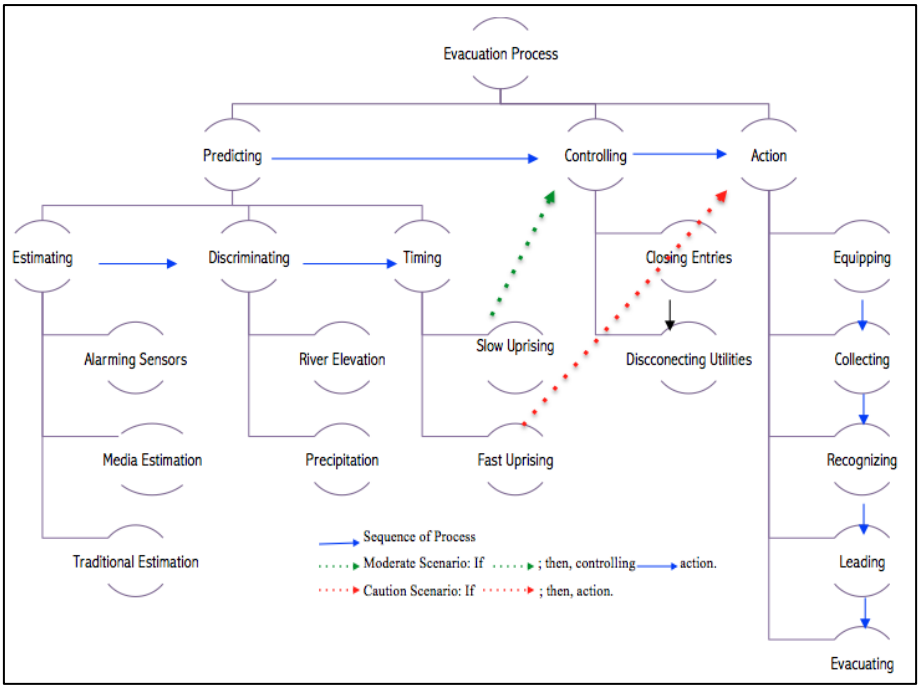

Figure 1. EHE Process Model

It is construed from the above figure that the evacuation process is treated as the systemic process of predicting, controlling, and action. This dynamics system is based on the theory of feedback processes. [29] A feedback system is induced by the contingent situation and behavior. This system has a closed-loop structure that brings results from later actions of the system that refers to control future actions. One class of feedback loops seeks a goal and responds as a consequence of changes to achieve the goal. Hereby, in the elicited grounded model at the predicting stage, estimating, discriminating and timing can help the residents to prepare themselves for EHE. The critical item in predicting stage is, timing, which can be presented as the turning point of the process. Timing determines the sequence of the EHE process from the chain of predicting-controlling-action to the short sequence of predicting-action. The reason refers to the speed of water uprising. In the case of slow uprising, there is an ample time to go through the controlling stage such as closing entries and disconnecting utilities; therefore, the whole process is going to be run step by step. However, In the case of slow uprising, there is an ample time to go through the controlling stage such as closing entries and disconnecting utilities. Therefore, all the process is going to be run step by step. However, in the case of fast uprising, there is not enough time for residents to do the controlling stage, and it is suggested to skip the controlling stage and start the sequences of action stage such as equipping, collecting, recognizing, and leading.

Objective 2: From the findings mentioned above, had led our team in the process of developing the simulation based on VR environment, AR technology functioning utilizing 5D cinematic technology concept. The design & development of the simulation/emergency evacuation training consist of:

1.1 Training Emergency Evacuation during the Flood through VR model

A virtual reality (VR) simulation model for training, human behavior during flood emergency evacuation needs to be developed using a dynamic approach. It simulates the acceptance of evacuation orders by the residents under threat; families in the process of evacuation from their houses; and time required for all evacuees to get shelter and safety. The training models can be conceptualized by considering the flooding conditions and the main set of cultural and psychological factors that govern human behavior during the flood evacuation. The number of family members under the flood danger, the process of evacuation, collecting valuables, flood conditions (precipitation, river elevation, etc.), and different flood warnings and evacuation orders can be included in the virtual training models for evacuation. They are connected to the worries that clue to the threat recognition, which prompts evacuation decisions.

The main purpose of the virtual training model is to enhance the effectiveness of flood emergency evacuation. The model consists of the choices of flood warning method, timing of evacuation order, coherence of the community (family), and upstream flooding conditions. The virtual training model will use and effectiveness will be tested through the evaluation of the effectiveness of different flood evacuation emergency options.

1.2 The Virtual Environment

The Vitual Environment is the hub to link the users, the simulation algorithm, and the real flood zone. Basically, the efficiency of the system highly rely on the applications of the instruments which is supplied. An effective and shortcut method of defining the early conditions and actions can be treated as the two crucial implications that the Virtual Environment should provide. The explicit example of early conditions is the tested procedures or counter measures. In coming parts, some of the most important applications are untaken.

1.2.1 The Virtual Terrain Construction

The virtual terrain is constructed using the real topography map of the area. In real life surveyors uses topography maps to indicate height. However, in 3D height maps are used. The first step taken for this transfer from topography maps to height maps is done with terrain painting. The height maps are hand-painted in RAW format to match as accurately as possible the topography as presented by the maps.

Then, to indicate and create the surrounding villages and scenery a satellite image of the surrounding area is used as an overlay, then maps are improved based on the changes reflected by the satellite maps. There are several areas in which, when referred to the satellite maps are a bit different compared to the data from the topographic map. These include the vegetation and adjustments of the riverbanks done by the local citizens.

1.2.2 The Escape Scenario (at open space/large scale evacuation)

The escape scenario is constructed based on the flood survivors' testimony collected from the interview at Kampung Kerinting. The village position is on the river-bank of Sungai Galas, making it one of the first places to be hit by the flood. As the flood rose the villagers have no way to go, but to climb up the hill and cut through the forest to go to Gua Musang Police Station situated at the back of the hill. The average hill height is 600 ft. All this is done while carry women, children, elderly and handicapped survivors on wheelchairs carried by 4 men.

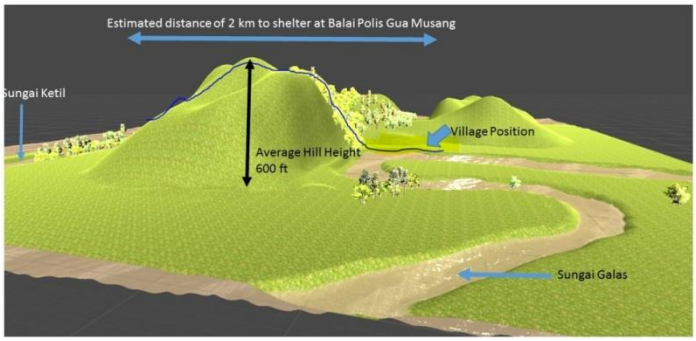

Figure 4: The escape scenario

The player will pose as a Ranger. This character is created based on the story that the survivors are guided through the forest by a village, which was a Ranger. In this simulation the player posing as the ranger will have to navigate the hills and forest to safety. The ranger should find the shortcuts and he emergency exits, while at the same time taking into account the various types of survivors including the elderly and the handicapped.

1.2.3 The Augmented Reality (AR) Technology Components

AR technology components are applied at small-scale emergency evacuation or at individual house of the victims. The escape training sequence starts from inside the house itself as shown in Figure 6 below. The user needs to navigate through the house to find their identification papers and grab out a bag containing essential food and supplies. Carrozzino, et al, (2012) expressed that weakness of properties can be meaningfully compact through disaster plans which is relied on simulation real-time and 3D visualization. In AR system reviewed by Ihsan Rabbi, et al (2012) there was some issued during registration, tracking, illumination, and occlusion. These issues should be strongly considered by the developers. Once done, if they still have time to spare. They have the options to disconnect the stove from the gas line and switch off the electrical items in the house to avoid electrical accidents.

4.0 Conclusion

4.1 Providing the pre-caution services and training program for people with high-risk areas seems necessary as to make them ready to confront with the flooding. Based on the reports, EHE is the initial action of people with flooding condition. Different activities are presented as the needful measures to prepare the residents. These activities include predicting, controlling, and action. In the first, predicting covers estimating, determining, and timing. These three sequential elements help the residents to predict the type and the time of flooding. Next, controlling which consists of two stages of closing entries, and disconnecting utilities. Finally, the process continues with action, which comprises four elements of equipping, collecting, recognizing, and leading, respectively. The interactions and interfaces of all finding factors come into the specific action in confrontation with diverse extreme conditions. On balance, this study also reveals the results in terms of conceptualizing the model of EHE. Ultimately, preventive measures such as prerequisite equipment and certain diet are highlighted to reduce the aftermaths of flooding.

4.2 The study is done to discover an emergency evacuation or EXIT plan, which is needful and benefits extremely with the usage of a well-designed VR Environment and AR functional system. According to review the previous works, little is considered to evaluate the flood existing models. Basically, better modeling and faster simulation techniques should be relied on the emerged data from the real life areas in order to reflect experimental validation. In this study, the limitation of work would return to the limited scale of the evacuation as to develop simulation. However, it can be treated as the initial stages to reach more reliable situations. The water level, which calculated by approximation based on the video of flood in Kuala Kerai still need to be fixed. To add the inaccurate, rainfall data is taken from the meteorological data on the day of the incident is not sufficient because this system only assuming that the rainfall is equal in all areas (do not have cloud and wind data). Therefore, the urgent need to provide a new methodology should be felt as to lead the strand of virtual environment for simulation as well as to control a simulation interactively to evaluate the tested scenarios at runtime.

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GSM-BASED PORTABLE FINDER FOR RESCUE AND RELIEF OF FLOOD VICTIMS

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1.0 Introduction

In December 2014, flood disaster had hit several states in the East Coast of Malaysia and few Borneo districts. There were reports that victims that had to survive without basic necessities for days and found to be in deteriorating health conditions because the rescuers failed to locate them in due time. Large numbers of men power from various agencies had been deployed to the scenes. However, it was extremely difficult to locate the victims because they were scattered everywhere. Poor visibility at night was the biggest challenge for rescue operations, this is due to electricity cut-off and the communication systems networks were inoperable, thus, the operations were limited only during daylight hour. It is therefore a necessity to equip the rescue platforms with flood victim's finder system. At this point in time, the use of mobile phone has become part and parcel of everybody daily life. In time of such catastrophe, victims will naturally look for nearby shelter and make phone calls for help. The unavailability of network services rendered their efforts futile. However, the emitted phone signals can certainly be exploited. The projected device is centred upon the Global System for Mobile (GSM) direction finder technology that can be installed on rescue boats and capable of detecting the presence of flood victims. The founding idea is such that the higher the signal intensity, the closer the rescuer to the victims, and the channel traffic can reflect the number of survivors at that particular area needed to be rescued. As such, more efficient rescue and relief resources can be provided.

2.0 Methodology

The methodology for the prototype development will comprise of literature review, hardware and software assembly, and testing. The methodology can be categorized into 2; Signal Detector Development and Locate and Display Development. Figure 1 is showing more details on the steps for each category.

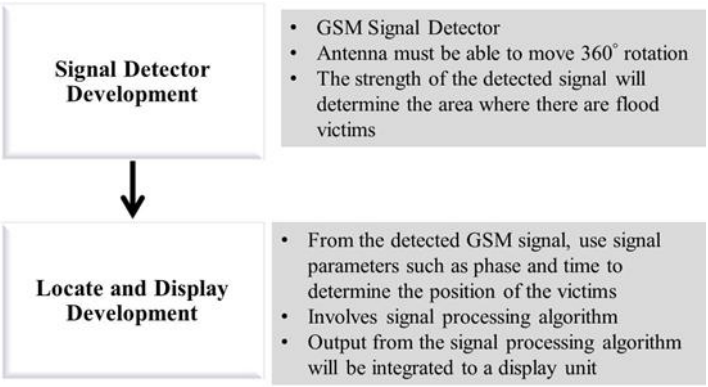

Figure 1. The methodology of the proposed prototype

The main reference that is used as the benchmark for this project is based on the Doppler radio finder. It is one of the simple devices which made to find the source direction of radio signal [1]. The proposed circuitry for the signal detector has been identified as shown in Figure 2. The GSM signal is then connected to an antenna (as shown in Figure 3) in order to receive the GSM signal of 1.8 GHz.

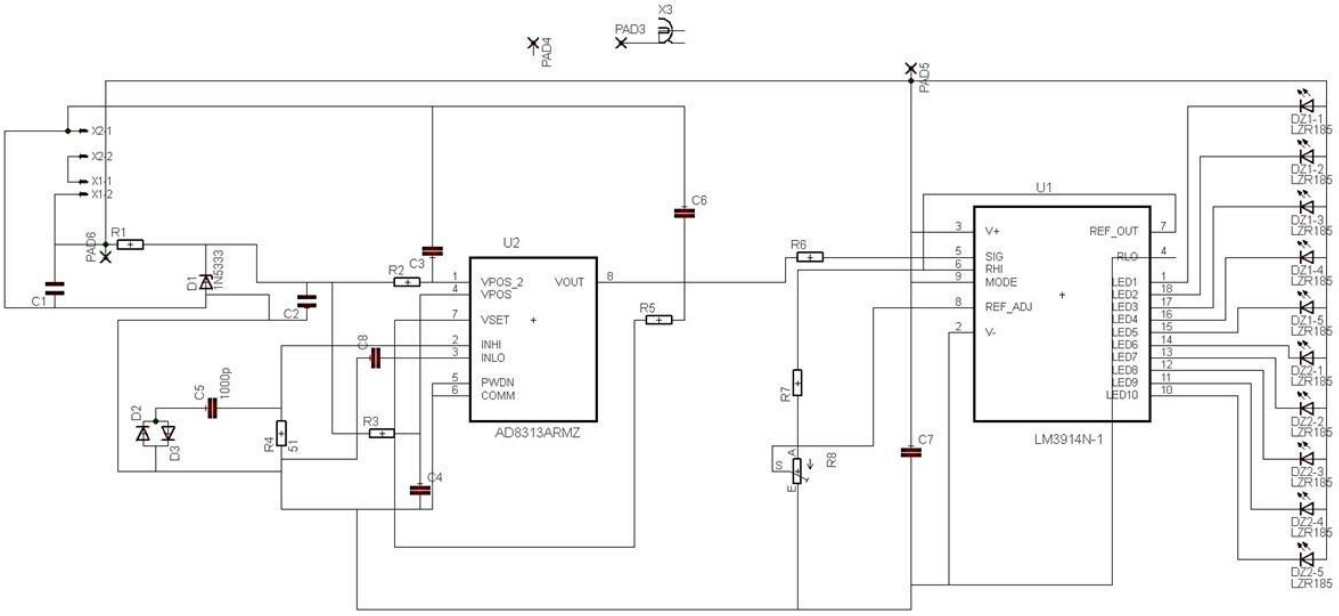

Figure 2. The circuit for the GSM signal receiver [2]

Figure 3.The GSM signal from the mobile phone is detected by the antenna and send to the receiver circuit.

In addition, Arduino programming/coding is implemented to show or display the direction perhaps in terms of coordinate. The output from the 4 antennas will be fed to the input of the Arduino. One of the antennas will detect a much stronger signal in terms of power and the Arduino is programmed to identify which antenna and indicates the direction from which the signal comes from. The block diagram for the whole system is shown in Figure 4.

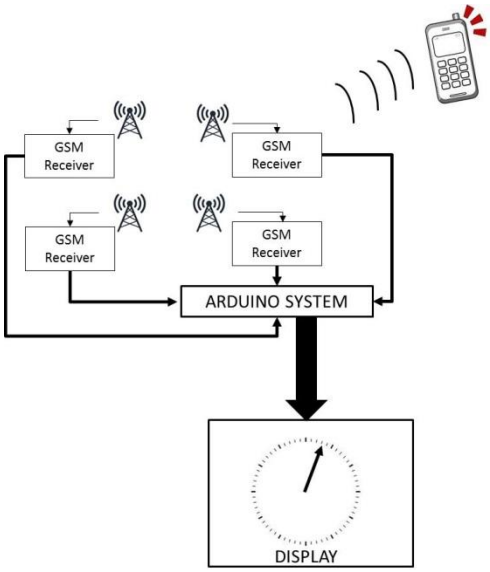

Figure 4. The block diagram of the GSM-based portable finder

3.0 Results and Discussion

Figure 5 is showing the successful detection of the GSM signal at 1.8 GHz

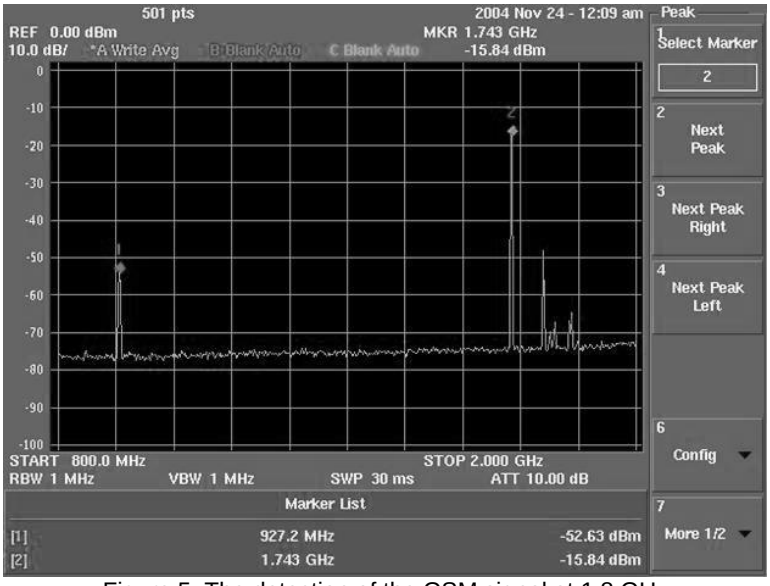

Figure 5. The detection of the GSM signal at 1.8 GHz

4.0 Conclusion/Achievement

4.1 The GSM circuitry that is used to detect the GSM signal has been constructed and the circuit has successfully received the GSM signal

4.2 The programming code for Arduino is used to identify and display the direction of the GSM signal

4.3 A poster of this work was chosen for 'Pameran Hasil Kajian Bencana Banjir 2014' on the 13th April 2016, at Ministry of Higher Education.

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Homebrew RF Test Equipment and Software (http://www.qsl.net/n9zia/wireless/appendixF.html)

SMART SPRING POWERED GENERATOR

Project Information

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1.0 Introduction

Electricity is one of the vital energy in our daily needs. It is largely being used in homes, offices and factories. The highest electricity consumption is used in public places such as street lights, traffic lights, parks and other recreation places. Normally, this energy comes through several sources of energy such as fossil fuels, hydropower and renewable energy. Fossil fuels are powers formed by natural processes, for example, anaerobic decay of covered dead living beings. The age of the living beings and their subsequent fossil fuels is normally a great many years. Hydropower technology use a principle of conversion energy in flowing water to mechanical power which means that the conversion of potential water and kinetic energy into electrical energy [1]. Renewable energy sources are generally considered to be those that are replaceable on a human time scale. For example is solar energy, wind energy and many more [2].

Nowadays, the most critical challenge faced by energy sectors is to provide a continuous energy supply and diversification of various energy resources [3]. Efforts have been made to generate electricity via renewable energies and also, Malaysia is aiming for a low-carbon economy for the people of Malaysia enjoy a good quality of life.

The purpose of this project is to design a new renewable energy system that produces electricity at low cost. The new renewable energy system was designed is called Spring Powered Generator. The main purpose of this project is to analyze and select the suitable generator with gearing to use in spring powered generator system.

2.0 Methodology

This project will present a model representation of utilizing a spring as the energy source for generating electricity for road users. Spring Powered Generator is a new renewable energy system that will be constructed with multiple springs controlled by hydraulic system. The actual system will be installed under the road, since it needs the pressure of the vehicles to stretch the spring coil. Pressure of the vehicle's weight from the road users will be delivered in the spring by the hydraulic system and will be stored as spring force. When the spring is fully stretched it will alert the switch and will move the rotation speed of DC generator and then produce the electricity.

In addition, the power generator system is one of the most important parts in this generation system for producing electricity. This project use direct current motor as a generator. DC motor is a device that converts electrical energy to mechanical energy. DC motor needs current from the supply. When DC motor connected to dc supply, the motor will produce mechanical torque and power. Motor and generator have nearly similarities. While, if a torque is applied in the direction of motion, the rotor in motor accelerates. As the speed increases, the internal voltage increases and exceed the current flow, this situation are called generator [4]. In this analysis, DC motor is used as generator. Generator is device that converts mechanical energy to electrical energy.

Gearing system is used in this system to increasing the speed of the DC generator shaft. Gear is a rotating machine that transmits torque when two of gear meshing and gear ratio is a calculation of speed of two or more gear. The formula of gear ratio is driven gear divided with drive gear, gear ratio will affect the performance of machine that use gear [5].

3.0 Results and Discussion

The overall system of Spring Powered Generator project prototype has been designed. Current sensor was tested in this project for see the accuracy of the sensor. There are three main testing of the experimental work. First is testing direct coupling DC motor with DC generator. Secondly, testing the gearing system (multiple gear) and thirdly is implementation of DC generator at real Spring Powered Generator.

Overall System Of Spring Powered Generator

The overall system of Spring Powered generator has been designed. Figure 3.1 shows the image of a prototype of the system.

Figure 3.1: Spring Powered Generator Prototype

Overall of the system has been designed from development of the model structure to the development of the controlling system. The result of this analysis is from the data have been collected in experimental work and the data from the implementation of DC generator at Spring Powered Generator system.

Current Sensor Test

Table 3.1: Current sensor test

Serial Monitor current data (A)	Multimeter current data (A)	Difference of current (A)
0	0	0
0.03	0.03	0
0.05	0.05	0
0.11	0.10	0.01
0.13	0.13	0

Table3.1 shows the data of current sensor test. This test is to see the accuracy of the sensor compare between current data in serial monitor Arduino with current data in multimeter. Different of this two data is smaller, so, this sensor is very accurate and suitable to use in this project.

Direct Coupling Test And Multiple Gear Test

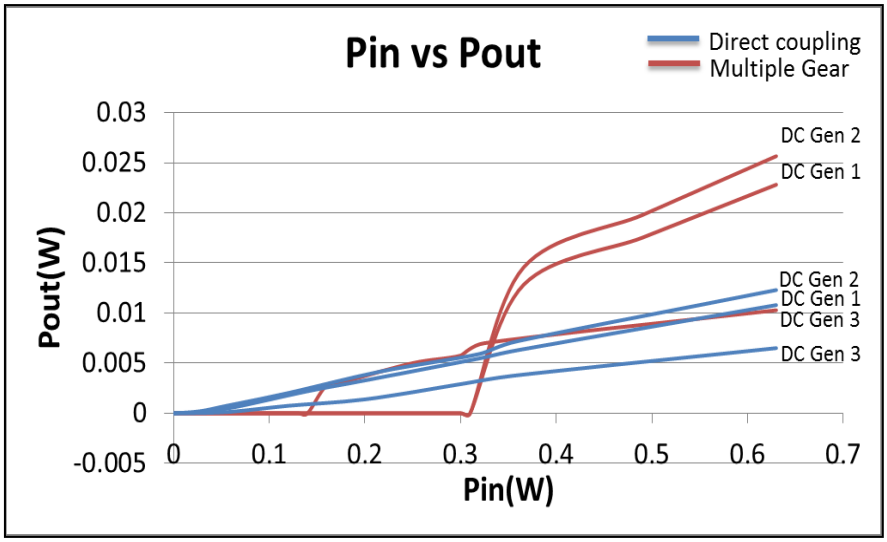

Figure 3.2: Power input vs Power output of Direct coupling test and Multiple gear test

Figure 3.2 shows that Power input vs Power output of Direct coupling test and Multiple gear test. Based on the graph above shows that DC generator 2 with multiple gear produces the highest output, 25.6mW at Pin=0.63W and DC generator 2 with direct coupling produce the highest output, 12.3mW at Pin=0.63W. It shows that the comparison between Direct coupling test and Multiple gear test. The multiple gear of gearing system can increase the power output by 2 times compared with direct coupling. By applying multiple gear, the input power is high compared to direct coupling.

From the tests, it shows that, DC generator 2 have the highest performance based on power output compare with DC generator 1 and DC generator 3 and gearing system multiple gear will increase the power output.

Implementation Of Dc Generator At Srping Powered Generator System

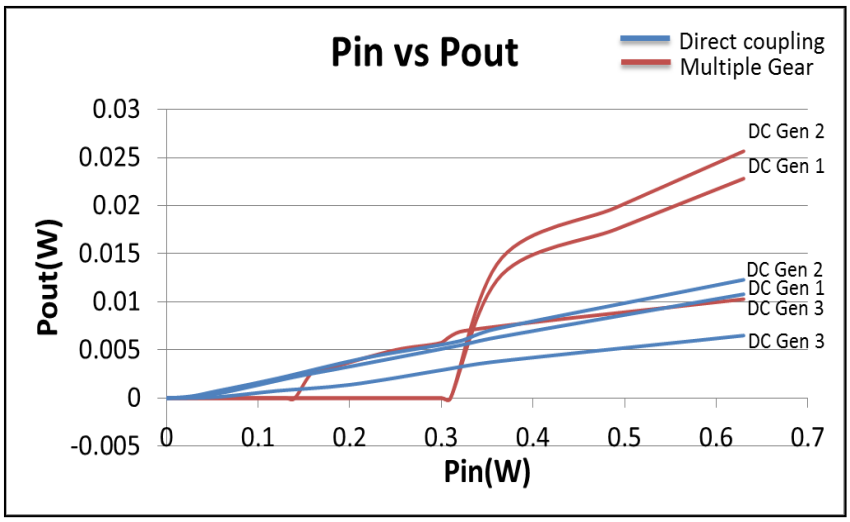

Figure 3.3: Power input of implementation of DC generator with single and multiple gear implementation

Figure 3.3 shows the output of three DC generator with single gear and with multiple gear implement at Spring Powered Generator system. Based on the bar graph, DC generator 2 with multiple gear produce the highest value of power output, 26mW compare with another DC generator. The output power produced by using single gear is lower than output power using multiple gear. It is because DC generator with single gear have less speed.

Single gearing is not suitable to use for Spring Powered Generator system, it is because the force of the spring produce in Spring Powered Generator is high and time of the gear rack moving to rotate the single gear is slow, so less rotation will be occur at single gear.

DC generator with multiple gear of gearing system produces high output in Spring Powered Generator system because it have more gear to rotate, the spring force from the system is high, so the gear can start to rotate when get the high force from the spring, although the gear rack moving to rotate the gear is slow and it will produce high output and it is most suitable for applying in the Spring Powered Generator system.

From the testing and the implementation of DC generator at Spring Powered Generator system, DC generator 2 with the multiple gearing system is the best and most suitable of DC generator and gearing system to use in Spring Powered Generator system.

4.0 Conclusion

4.1 A prototype of a new renewable energy system that produce electricity at low cost have been designed.

4.2 From the analysis of DC generator based on the experiment for Spring Powered Generator application, a best DC generator is selected based on the performance of the output of the DC generator produce the electricity.

4.3 The gearing system with multiple gear is selected to applied with DC generator 2 in this project. This gearing system is suitable to applied with DC generator due to higher force of the spring produce from Spring Powered Generator system and time of the gear rack moving to rotate the gear is slow and also it will increase the rotational speed of DC generator, so more output will be produced.

4.4 Power output produced of the system from DC generator 2 with multiple gear is 26mW. Power output produced from this system can turn ON the LED.

4.5 For the recommendation, the good performance of DC generator with the right gearing system must be used due to the increment of the spring force produced from increased the number of springs in Spring Powered Generator system.

4.6 The selection of the right gearing system must be used to increase number of rotation and speed of DC generator shaft. If the ratio speed of gear of the gearing system is high, it will increase the number of the rotation of speed DC generator shaft. So, it will produce more output power from DC generator that attach with gear. More number of gear can be used due to the increment of the spring force produced from increased the number of springs in Spring Powered Generator system.

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INTEGRATED SUBMERGED ATTACHED GROWTH SYSTEM (i-SAGS) FOR TEMPORARY HOUSING FOR FLOOD VICTIMS

Project Information

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1.0 Introduction

In an event of a major flood disaster, flood victims are usually evacuated or transferred to higher grounds, either to public schools or specific government gazetted areas. When the flood has gone down, majority of the victims' houses may no longer be available as it may be damaged and deemed unsafe to live in and they are placed in temporary houses while waiting for permanent housing to be reconstructed on their land.

The concern is that the sewage treatment from the temporary housing is incomplete as it uses a temporary septic tank which takes time to be operational as it is anaerobic in nature. Also, septic tanks does not provide a complete treatment of sewage wastewater. Septic tanks remove very little carbonaceous compounds, BOD and COD, which makes it not worthwhile for an investment as a decentralized wastewater treatment [1]. Also, with it being anaerobic in nature, there will be no aerobic digestion of nitrogen and phosphorus and ammonia. Failure to remove these nutrients from the sewage wastewater will lead to eutrophication or could even cause blue baby syndrome if found in drinking water of infants [2]. Therefore, there is a need for the sewage to undergo denitrification process to convert nitrate and nitrite into harmless nitrogen gas and released into the atmosphere which comprises of 78% nitrogen gas [3].

Also, the i-SAGS serves as a decentralized sewage treatment facility can be implemented in areas where the temporary houses are built which typically has a low population equivalent (PE) which is usually uneconomical to construct a full sized centralized wastewater treatment facility [4], [5].

2.0 Methodology

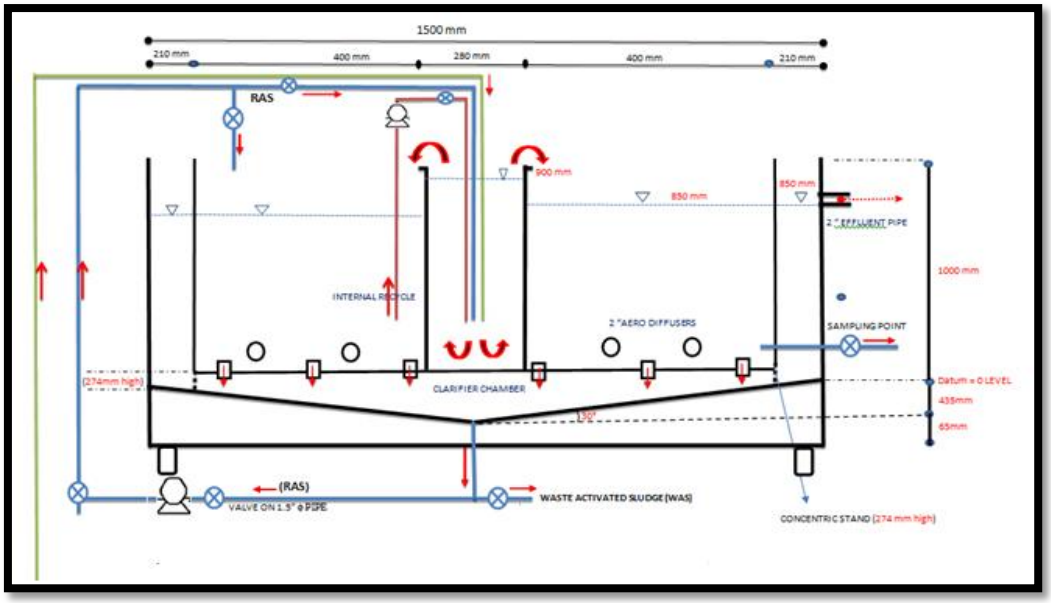

Figure 1: Schematic Diagram of the i-SAGS

Figure 1 shows the concept of the i-SAGS. A pilot plant with a working volume of approximately 2000 litres was fabricated from stainless steel sheets, with three main circular tanks with the most inner cylinder being an anoxic tank, the middle cylinder being the aeration tank and the most outer section being the clarifier. Influent wastewater will be pumped directly to the bottom of the anoxic tank where it overflows into the aeration tank. The aeration tank is where the degradation of organic matters

occurs, also it serves to capture and flocculate suspended and nonsettleable colloidal solids into a biological floc in order to produce a clarified effluent at the end [6]. The settled solids in the aeration tank will settle to the bottom of the clarifier through eight cone shaped holes that is 600mm in length and 60mm in length on the shorter arc of the cone. The collected activated sludge is then recycled at intervals via the means of a timer pump where it will be directed back to the anoxic tank, overflowing to the aeration tank again to maintain the concentration of biomass in both the anoxic and aeration tank. Free oxygen which will be pumped into the tank via two rings of fine air bubbles diffusers powered by an air compressor. The diffusers serve to suspend and give the mixing action of the biomass in the aeration tank.
The degradation of organic matter produces new cells which would then have to be wasted to maintain a suitable food to mass (F/M) ratio, however since the reactor is designed as an extended aeration configuration, endogenous respiration is expected to happen [7]. The extended aeration configuration also eliminates the need to desludge the reactor frequently, giving more economical value to the reactor [8].

3.0 Results and Discussion

3.1 Biochemical Oxygen Demand (BOD)

Influent Flowrate, Q = 930 L/day

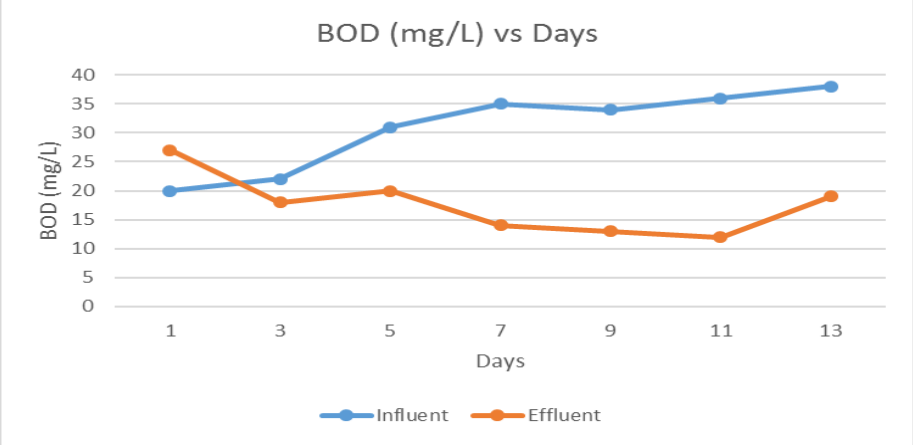

Figure 2 : BOD concentration at Q = 930 L/day

The BOD removal of the i-SAGS on the 2nd run of an influent flowrate of 930 L/day. The BOD concentration on the influent showed an increasing trend between at 20 mg/L on the 1st day and 38 mg/L on the 13th day. The effluent was initially higher than the influent on the 1st day at 27 mg/L but later on dropped down 18 mg/L and fluctuated in the range of 12 mg/L to 20 mg/L after the 3rd day. The increase in effluent BOD could be due to the discharged sludge found in the effluent of the reactor, however with that being said, the BOD value is still within the Standard A of the Malaysian Sewage Discharge Limits.

3.2 Total Chemical Oxygen Demand (TCOD)

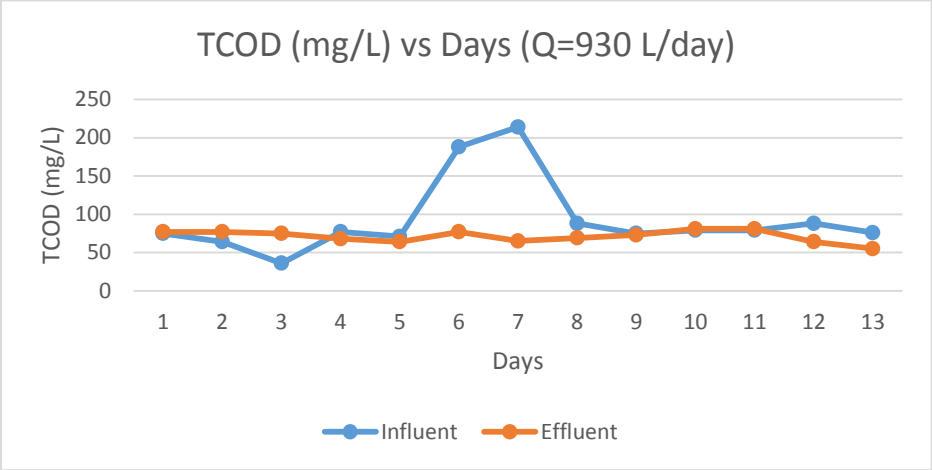

Figure 3: TCOD concentration at Q = 930 L/day

The TCOD concentration for influent flowrate at 930 L/day. The influent TCOD fluctuated from the lowest concentration on the 3rd day at 36 mg/L to the highest TCOD concentration of 214 mg/L on the 7th day. The TCOD for the entire 13 days was at averaged at 93 mg/L. On the other hand, the effluent TCOD concentration was fairly constant at 77 mg/L on the 1st day and 81 mg/L on the 11th day and dropped down to 55 mg/L on the 13th day. Effluent TCOD was averaged at 71 mg/L for the entire 13 days. It can be noted from the Figure below that even with the reactor having some design flaws with the settling of the sludge, the discharge effluent is still within Standard A of the Malaysian Sewage Discharge Standards.

3.3 Soluble Chemical Oxygen Demand (sCOD)

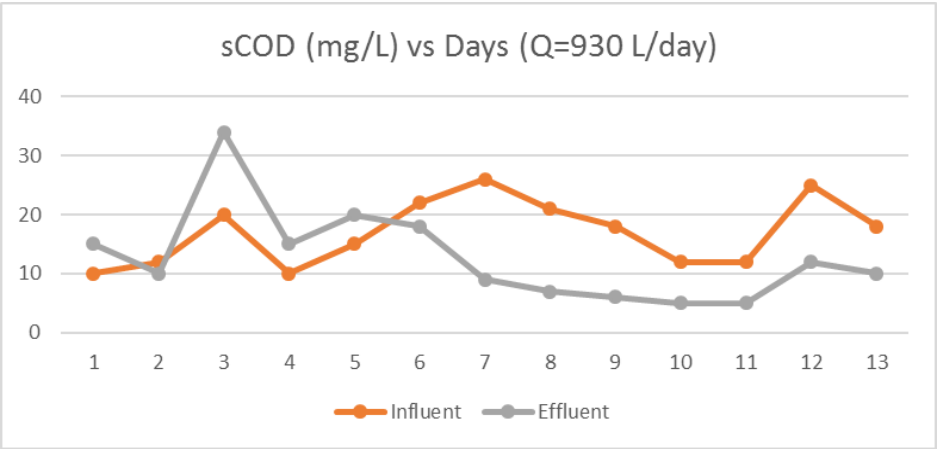

Figure 4: sCOD concentration at Q = 930 L/day

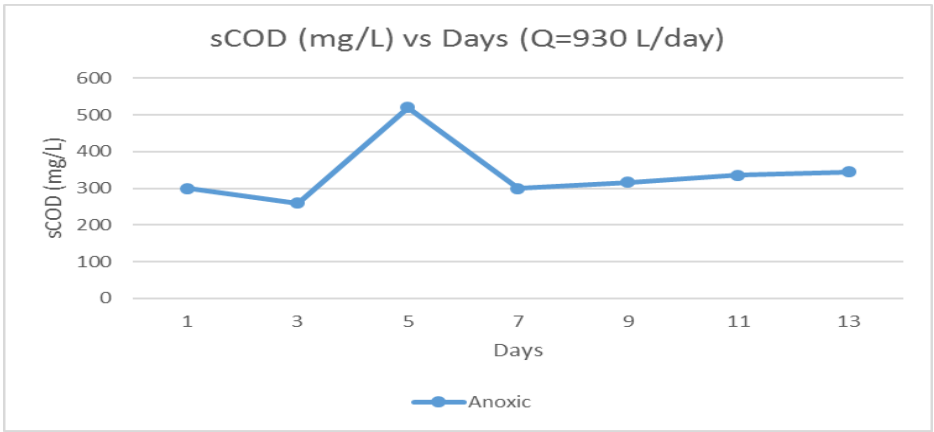

Figure 5: Anoxic sCOD concentration at Q = 930 L/day

The sCOD concentration for influent flowrate at 930 L/day. The influent sCOD fluctuated from the lowest concentration on the 5th day at 9 mg/L to the highest sCOD concentration of 55 mg/L on the 7th day. The sCOD for the entire 11 days was at averaged at 24 mg/L. On the other hand, the effluent sCOD concentration was also seen to be fluctuating similar to the influent sCOD with the lowest reading at 6 mg/L on the 5th day and 28 mg/L on the 6th day and was averaged at 15 mg/L for the entire 11 days. It can be concluded that if the reactor did not experience any problem with settling of sludge at the bottom of the clarifier, the TCOD of the effluent would be somewhat similar to the sCOD reading.

3.4 Total Suspended Solids (TSS)

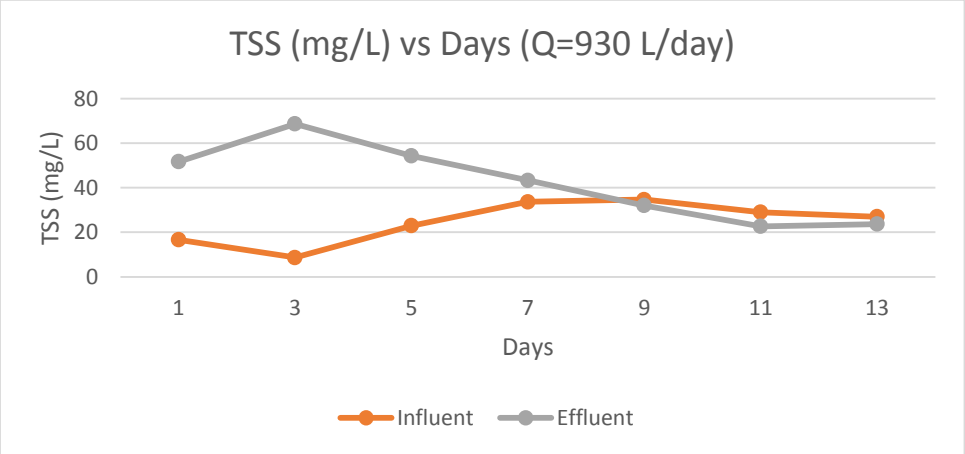

Figure 6: TSS concentration at Q = 930 L/day

The TSS concentration for influent flowrate at 930 L/day. Influent TSS again was fairly low where it gave a reading of 17 mg/L on the 1st day and later on dropped down to 9 mg/L but jumping back up again to 23 mg/L and 34 mg/L on the 5th and 7th day respectively, giving the highest TSS reading on the 7th day. The influent TSS for the entire 13 days was at averaged at 25 mg/L. Besides that, the effluent TSS concentration was noted to be fluctuating with 52 mg/L on the 1st day to 77 mg/L on the 9th day and was averaged at 42 mg/L for the entire 13 days. The discharging of sludge was concluded to be because of the diffusers located at the bottom of the reactor where it separates the aeration tank and the clarifier. The fine air bubbles produced by the diffusers floated up the settled sludge causing it be discharged at the effluent of the reactor.

3.5 Mixed Liquor Suspended Solids (MLSS)

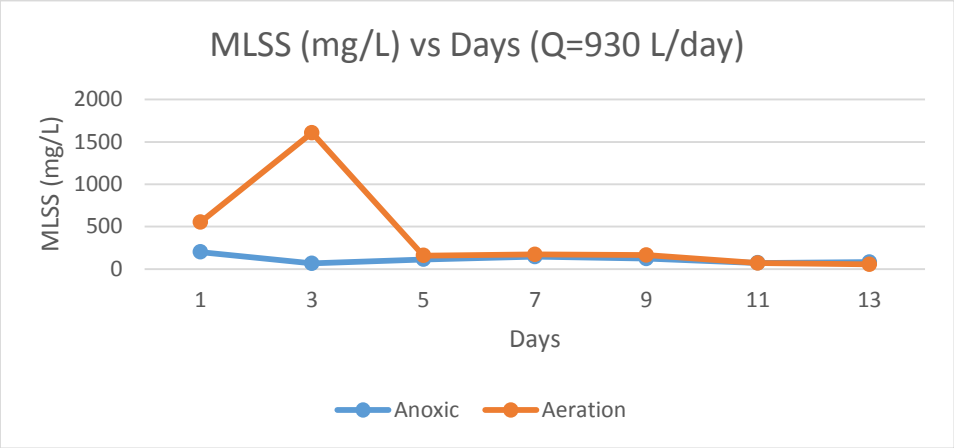

Figure 7: MLSS concentration at Q = 930 L/day

The MLSS concentration for influent flowrate at 930 L/day. The anoxic MLSS was gradually decreasing where it gave a reading of 200 mg/L on the 1st day and 73 mg/L on the 9th day. Besides that, the aeration MLSS concentration was noted to be 553 mg/L on the 1st day and had a sharp increase to 1606 mg/L on the 3rd day and but slowly decreased after that with a reading of 70 mg/L on the 9th day. The increase in MLSS in the aeration tank only was because of sludge was pumped into the aeration tank primarily at the start of the 2nd run on the influent flowrate of 930 L/day.

3.6 Mixed Liquor Volatile Suspended Solids

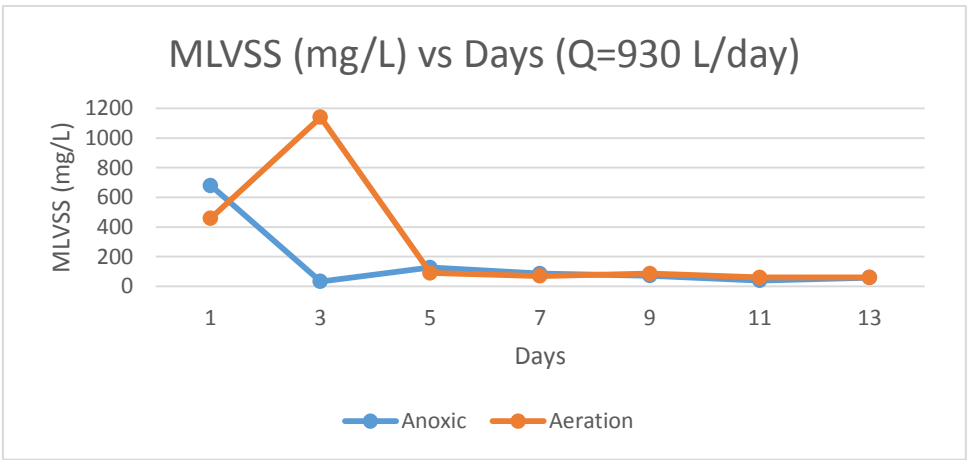

Figure 8: MLVSS concentration at Q = 930 L/day

The MLVSS concentration for anoxic and aeration tanks 930 L/day. The anoxic MLVSS was seen to be gradually decreasing where it gave a reading of 680 mg/L on the 1st day and 40 mg/L on the 9th day. Besides that, the aeration MLSS concentration was noted to be 460 mg/L on the 1st day and had a sharp increase to 1140 mg/L on the 3rd day and but slowly decreased after that with a reading of 60 mg/L on the 9th day. Again, at the start of this trial run of the reactor at new influent flowrate, sludge was pumped primarily into the aeration tank only which would explain the high MLVSS on the 3rd day in aeration tank as the RAS and IR has not have enough time to recycle the sludge into the anoxic tank.

3.7 Nitrate

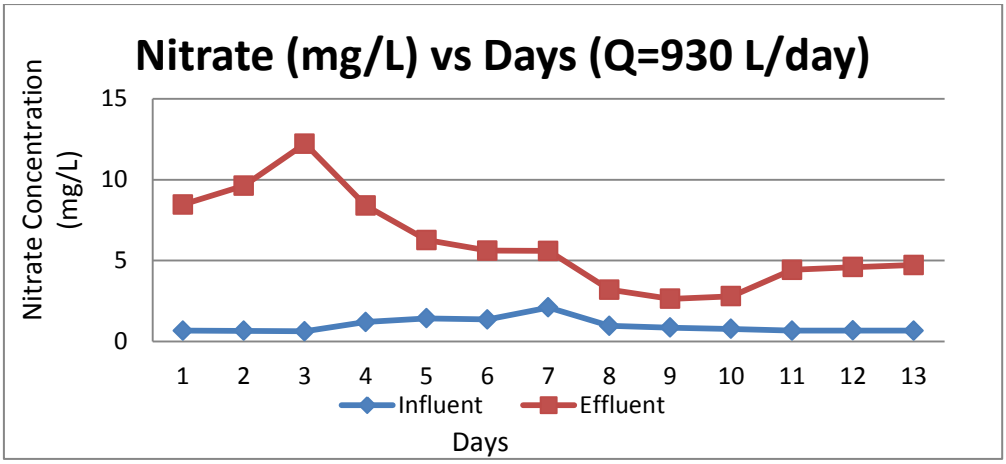

Figure 9: Nitrate concentration at Q = 930 L/day

The Nitrate concentration for influent flowrate at 930 L/day. The influent nitrate for the entire 11 days was at the average of 1.0 mg/L. The highest concentration was on the day 7th which was 2.1 mg/L dropped back down to 0.67 mg/L on the day 11th. On the other hand, the effluent for nitrate concentration was increasing up to the 3rd day which was highest concentration, 12.23 mg/L this because the sludge was added into the reactor. After the 3rd day the concentration was dropped down back to the 6th day. The concentration was maintain on the 6th and 7th day with the concentration of 5.6 mg/L. On the 10th to 13th day the concentration was recorded to be increase this is due to the shortcircuit of the reactor. From the result, it can be concluded that the nitrate in the effluent is high because the nitrate has mixing up with the ammonia that in the process of coverting into nitrate. Therefore, the internal recycle rate need to be increase.

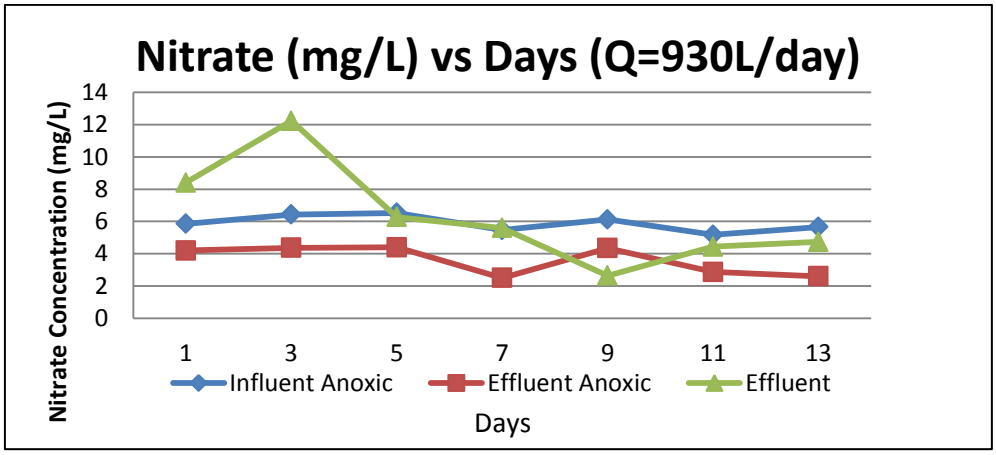

Figure 10: Nitrate concentration at Q = 930 L/day

The line graph for the influent of the anoxic show the similar trend with the effluent of the anoxic. The influent of the anoxic show that Nitrate concentration was 5.86 mg/L on the 1st day and decrease to 2.5 mg/L on the 7th day. The effluent of the anoxic nitrate was gradually increasing where it gave a reading of 4.2 mg/L on the 1st day and 4.4 mg/L on the 3rd day. However, after the 3rd day, the concentration become unstable, alternately increasing and decreasing everyday. From the graph, it shows that the denitrification is happening in the anoxic tank since the effluent of the anoxic tank is lower that the influent of the anoxic tank.

3.8 Ammonia

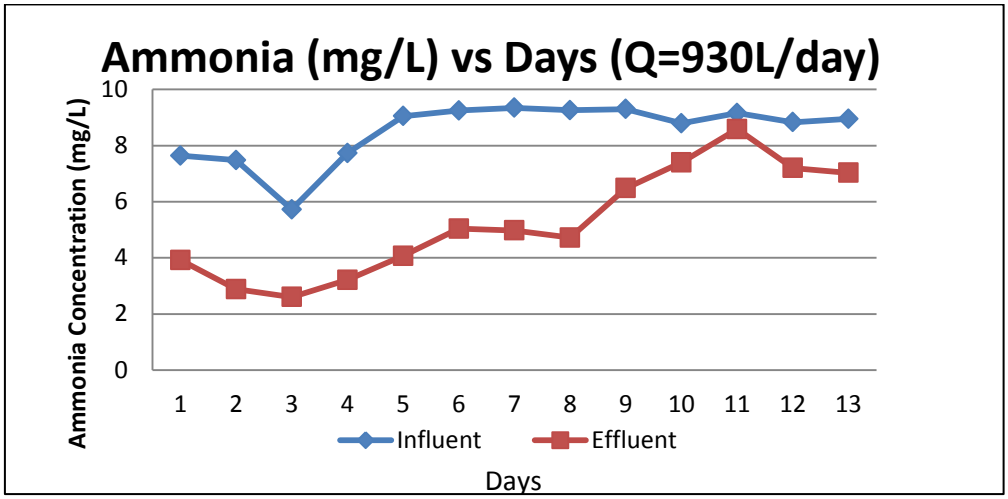

Figure 11 : Ammonia concentration at Q = 930 L/day

The Ammonia concentration for influent flowrate at 930 L/day. The influent of ammonia concentration was 3.92 mg/L on the 1st day and decreasing to 2.6mg/L on the 3rd day. However, after the 3rd day, the concentration start increasing to 9.25mg/L on the 7th day and the concentration was maintain at the average value of 9.1 mg/L. On the other hand, the effluent for ammonia concentration was decreasing until the 3rd day which was lowest concentration, 2.6 mg/L and increasing gradually to the 6th day with the concentration of 5.04 mg/L due to the washout of the biomass. The highest concentration was 8.59 mg/L on the 11th day. Its shows that detention time of the reactor, 15.2 hours is not good enough.

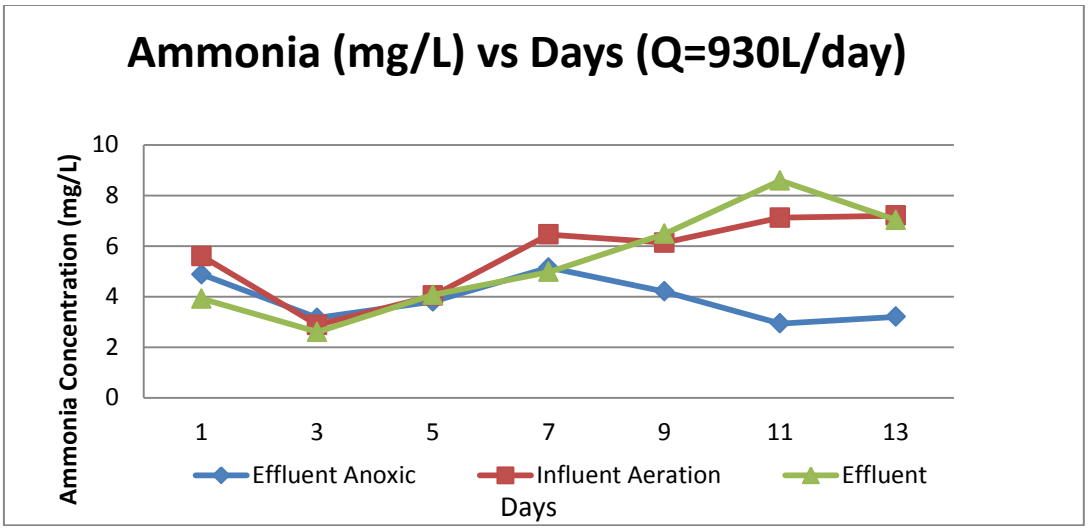

Figure 12 : Ammonia concentration at Q = 930 L/day

The Ammonia concentration for influent flowrate at 930 L/day is shown in Figure 25. The inlfuent of the aeration ammonia was decreasing where it gave a reading of 5.6 mg/L on the 1st day and 2.88 mg/L on the 2nd day. However, after the 2nd day, the concentration was increasing gradually up to 7th day with the concentration of 6.45 mg/L. The concentration was slightly drop on the 9th day and start increasing back on the next following days. While in the effluent of the anoxic tank, the concentration on the 1st day was 4.88 mg/L and decreasing to 3.16 mg/L on the 2nd day. After that, the concentration was increasing up to 5.5 mg/L on the 7th day. It shows that the nitrification is happening in the aeration tank as the amount of the ammonia are decreasing by times.

3.9 Phosphorus

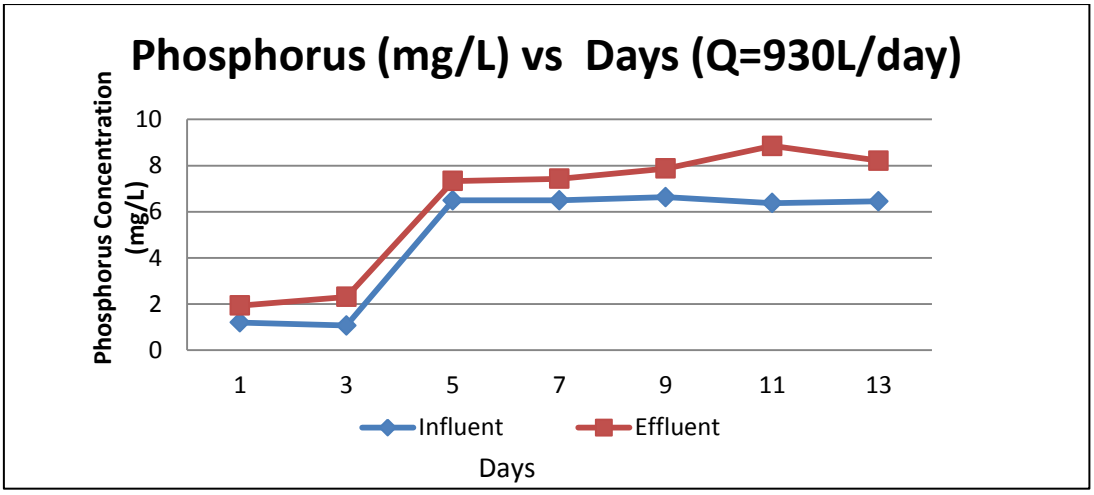

Figure 13 : Phosphorus concentration at Q = 930 L/day

The Phosphorus concentration for influent flowrate at 930 L/day. The influent of phosphorus concentration was 1.2 mg/L on the 1st day and decreasing to 1.7 mg/L on the 3rd day. However, after the 3rd day, the concentration spike up to 6.49 mg/L on the 5th day and the concentration was maintain at the average value of 6.49 mg/L. On the other hand, the effluent for phosphorus concentration was increasing up from 1.94 mg/L on the 1st day up to 7.33 mg/L on the 3rd day. The highest concentration was recorded to be 8.85 mg/L on the 11th day. The spike up of the concentration in the influent and effluent after the 3rd day is because the sludge was added into the reactor.

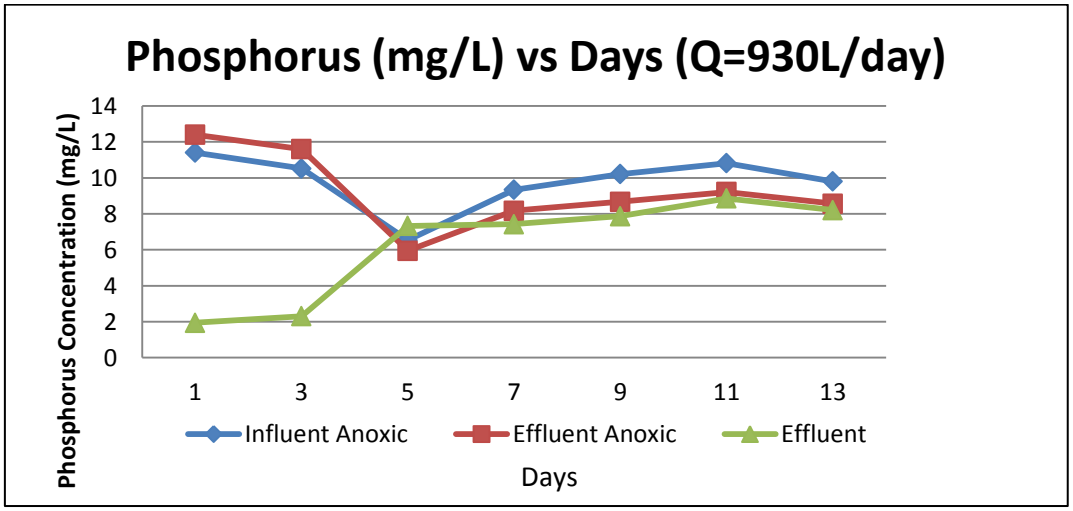

Figure 14 : Phosphorus concentration at Q = 930 L/day

The line graph for the influent of the anoxic show the similar trend with the effluent of the anoxic. The influent of the anoxic show that phosphorus concentration was 11.9 mg/L on the 1st day and decrease to 6.53 mg/L on the 5th day and start increasing back the next following days. While for the effluent of the anoxic, it was recorded to be higher from the influent which is 12.4 mg/L. However, on the 5th day, the concentration was 5.95 mg/L and increasing back the next following days.

4.0 Conclusion

In the current study, the i-SAGS was developed for the simultaneous removal of organics and nutrients. Both nitrifying and denitrifying process was proven to have taken place in this reactor. The following conclusions can be drawns. The i-SAGS works in removing organics as seen in the measurement of sCOD, however it is currently having issues in the clarifier as sludge keeps floating up in the clarifier, causing sludge to be discharged which would explain the slightly high BOD, TCOD and phosphorus content in the effluent. With that being said, the effluent is still within the Standard B of the Malaysian effluent discharge standards. As a mitigation measure, installing baffles in the clarifier are considered the best option as of now to solve the problem.

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REDUCING FLOOD HAZARD BASED ON STRUCTURAL AND NON-STRUCTURAL APPROACHES: A PERSPECTIVE FROM GEOSPATIAL TECHNOLOGY AND HYDRODYNAMIC SIMULATION

Project Information

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1.0 Introduction

The concept of flood hazard management includes flood control management and flood plain management. Traditional flood control measures are generally referred to various engineering type projects aimed at controlling floodwaters, such as building of dikes and traditional flood plain management. Reducing flood hazard and risk can be obtained either through structural and non-structural approaches (Alkema and Middelkoop, 2005; Rahman, 2006). Structural approach aims at physical construction to reduce or avoid possible impacts of hazards, or application of engineering techniques to achieve hazard-resistance and resilience in structures or systems. The non-structural measures includes any measure not involving physical construction that uses knowledge, practice or agreement to reduce risks and impacts, in particular through policies and laws, public awareness raising, training and education. Either approach can be initially tested and implemented through two-dimensional hydrodynamic models to simulate distributed patterns of floodwater flow depth and depth-averaged velocity, and to investigate the hydraulic characteristics of natural floodplains. The important input parameters and the results of the simulations can be significantly supported by current geospatial technologies.

Efforts should be directed towards comprehensive flood hazard mitigation planning covering operation of an overall program of corrective and preventive measures for reducing flood damage. In flood preventive measures, flood emergency planning is crucial in reducing flood impact, especially in urban area. Through several flood scenarios obtained from flood simulation, potential damage and risk can be calculated and used as a basis for environmental impact assessment for development project. According to Abdalla and Li (2010), the use of geospatial technologies in disaster and emergency management has increased due to their accessibility, reliability and effectiveness in providing an accurate representation of the real world phenomena. Geospatial technologies are capable of providing various types of crucial geospatial data to produce meaningful information used for disaster management and decision support process. Geospatial technologies incorporated certain technologies that deal with where, what, when, and how information can be obtained explicitly covering a particular location, increasingly on multiple scales (Sui, 2008). Such questions can be addressed by three different systems, i.e., remote sensing, geographic information system (GIS) and global positioning system (GPS) (Peters-Guarin et al., 2012; Singh and Sharma, 2009).

Recent flood in Kelantan was the worst in the history of the state and superseded the flood occurred in 1967. Two factors were believed to be the causes of this catastrophe i.e. the effect of weather (heavy rainfall) and uncontrolled land management in the upstream area (Azlee, 2015). The unprecedented damages were believed due to the debris flow and timber waste due to uncontrolled logging (Komoo, 2015). During flood in Kelantan, the emergency response was handled by 3 different levels – district, state and federal. However the scale or magnitude of the flood event was beyond expectation and control and further worsen by failed electricity supply and very limited communication. It was also reported that some of the evacuation centres and important agencies (e.g. hospital, fire brigade, and JPAM) were flooded and evacuees had to be transferred to another centre which already occupied beyond its designated capacity. Furthermore there were also some issues in reaching the evacuation centres as well as transporting the evacuees since the water flow is too fast and no suitable landing area for helicopter. This further complicates the process of flood aids distribution.

Previous flood mitigation study by Unit Perancangan Ekonomi Negeri (UPEN) Kelantan has proposed several physical flood mitigation approaches to reduce the impact of floods (UPEN, 1989). The report proposed construction of two dams in the upstream area i.e. Lebir and Kemubu dams. The performance of these proposed mitigation approaches should be evaluated based on the hydrodynamic modelling and flood hazard mapping that account different flood scenarios.The aims of

this paper are, 1) to evaluate the performance of the proposed dam constructions at Nengiri River and Lebir River in reducing flood hazard based on flood simulation, 2) generate flood hazard map for different magnitude of floods that can be used to support emergency response, and 3) determine suitable area for evacuation regardless of different magnitudes of expected flood.

2.0 Methodology

The methodology of this study is divided into 6 stages namely 1) data collection, 2) data pre-processing, 3) flood model schematization, 4) flood modelling for proposed dams evaluation, 5) generation of flood hazard maps, and 6) selection of suitable evacuation centers. The first stage aims at collecting required data for example digital terrain model (DTM), landcover/landuse map, hydrological data, meteorological data, proposed dam specification and location as required for flood modelling. The pre-processing stage responsible for preparing the input data for flood modelling including extraction of DTM from different sources of data i.e. topographic maps and remotely sensed data. The DTM was generated at 10.0 m spatial resolution to suit spatial scale of flood modelling. The hydrodynamic roughness values for the floodplain area was estimated from the landcover/landuse information.

Hydrological data for example river cross section, hydrodynamic roughness of river channel, water level, river discharge over time are required for modelling schematization. This information was obtained from the department of drainage. This information was pre-processed and combined to support the flood modelling stage. The fifth stage will be focussing on generating flood hazard maps that were generated for different magnitudes of floods. The flood modelling accounted the proposed dams in the upstream rivers. The hazard maps were used to evaluate the performance of the proposed dams in reducing flood impacts. In the final stage, based on the same flood simulation results, further intensive spatial analyses were done to identify suitable evacuation centres.

2.1 Description of study area

Kelantan is a part of the east coast states situated at northeast part of Peninsular Malaysia. With total area of 5,830 square miles, it consists of several districts, which are Kota Bharu as capital city, Tumpat, Bachok, Pasir Mas, Tanah Merah, Machang, Pasir Putih, Kuala Krai and Gua Musang. Kelantan River Basin has a tropical climate with temperature ranges between 21 and 31 °C. Approximately, the maximum annual rainfall of Kelantan can reach up to 1750 mm during the monsoon season in November to January. Recent flood in 2014 triggered by monsoon rain has been recorded as the worst in history of the state by The National Security Council. There are six major sub-basins in Kelantan River basin namely Galas, Nenggiri, Pergau, Guillemard Bridge, Kuala Krai and Lebir. Kelantan river constitutes as a major water resource for this state. This river emerges at the confluence of the Galas River and Lebir River near Kuala Krai transform to broader stream. Then, it meanders over the coastal plain until it reached into the South China Sea, which is about 12 km north of Kota Bharu. Galas River flow starts from the merge of Nenggiri river which is rising high on the slope of Gunung Korbu, the second highest peak in Peninsular Malaysia. Whilst, Lebir River starts in the wilds of Taman Negara National Park. Kuala Krai is characterized by hilly land with elevation ranges between 153m and 305m above sea level. The highest land is located next to the boundary of Jeli district with elevation exceeds 915m. In the past the entire area was covered by tropical rain forest and now it is mainly convered by agricultural lands including rubber, oil palm and etc. The territory contains the confluence of two major rivers, the Lebir and Galas. These two rivers form the Kelantan River, which then flows some 70 km northwards through one of the most densely populated flood plains on the Malay Peninsula to its estuary in the South China Sea near the State capital of Kota Bharu.

2.2 Data collection

The data collection includes Digital Terrain Model (DTM), landcover/landuse map, hydrological data, proposed dam specification and location as required for flood modelling. The DTM was generated by combining different data sources i.e. airborne LiDAR, Interferometry Synthetic Aperture Radar (IfSAR) and Shuttle Radar Topography Mission (SRTM). The airborne LiDAR DTM was acquired in 2008 using Optech ALTM 3033 airborne LiDAR system. The spatial resolution is set to 3m. The ifSAR data was acquired in 2009 and the DTM product has 5 m spatial resolution. The airborne LiDAR and ifSAR data were acquired mainly along the main river corridor. The SRTM data with 30m spatial resolution was used to support small portions of area where the proposed dam are located i.e. Kemubu River and Lebir River. The landuse/landcover map was acquired from the Department of Agriculture for year 2010. The hydrological data (i.e. streamflow, water level and flood data) was mainly obtained from the Department of Irrigation and Drainage, Malaysia.

2.3 Generation of Digital Terrain Model (DTM) and proposed dams

The DTM of the study area was generated by combining three sources of data i.e. airborne LiDAR IfSAR and SRTM data (Fig.1). All data was resampled and combined to produce a single DTM with a spatial resolution of 10 m (Fig. 2). According to the flood mitigation report by the Unit Perancang Ekonomi Negeri (UPEN) Kelantan, there were two proposed dams i.e. Lebir dam and Kemubu dam (Fig.2) located in Nengiri River and Lebir River respectively, which aims at reducing flood impact (UPEN, 1989). The Lebir dam was planned to be upgraded to include hydropower and irrigation in future. Table 1 shows the characteristics of both proposed dams. The Lebir dam site is located at about 40 km upstream from the confluence with the Galas River or about 3.5 km upstream of the highway bridge spanning over the Lebir River. The proposed Kemubu dam is located on the Galas River, about 18 km upstream of the Kemubu Railway (Fig. 2). The Kemubu dam on the other hand was planned exclusively for flood mitigation of the Kelantan River basin.

Table 1**:** Characteristics of Lebir and Kemubu dams

Dam	Lebir dam	Kemubu dam
Dam crest elevation (m)	84.9	73.4
Surcharge Water Level (SWL) for 50-year flood (m)	78	63.1
Dam crest width (m)	30	8
Dam height (m)	70	50
Normal High Water Level (NHWL) (m)	70	55.0
Flood control volume (m^3)	860 million	307
Type of dam	Rockfill	Concrete gravity
Embarkment volume (m^3)	4.9 million	150,000

Source: (UPEN, 1989)

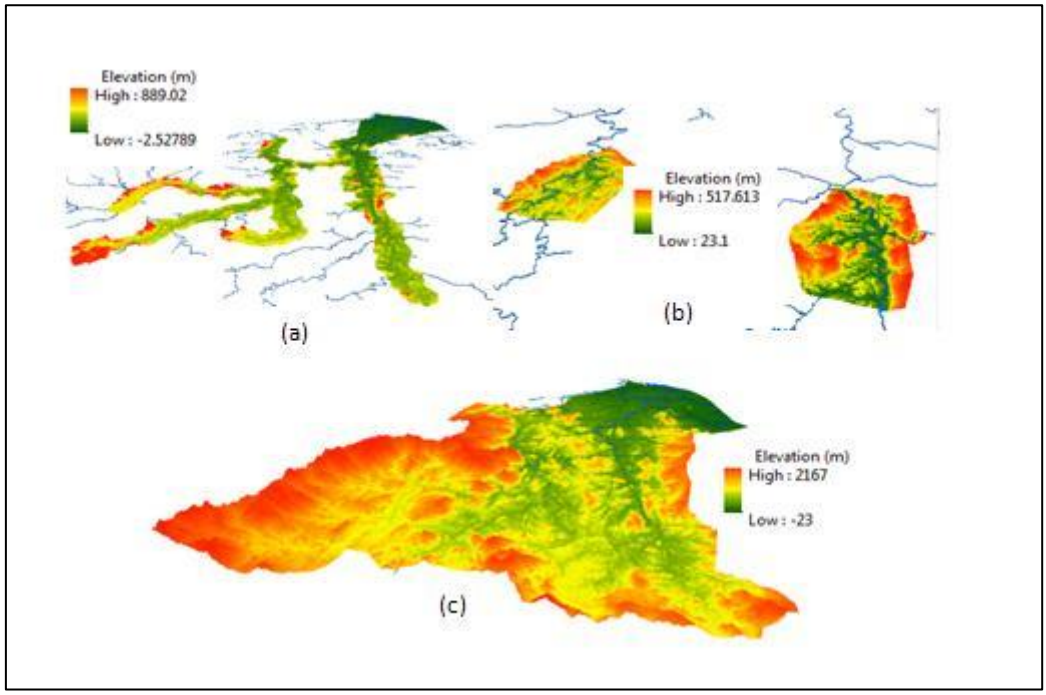


Figure 2 The airborne LiDAR (a), IfSAR (b) and SRTM (c) data.

For the purpose of dam operation simulation, the damsites were physically simulated on the DTM of the study area. The simulation was done based on a simple raised DTM surface, which creates several spillways and allows water to overflow beyond the dam at certain designed level. Both Lebir and Kemubu dams have 3 weirs of the spillways with 78 m and 63.1 m elevation respectively, which was designed for 50-year return period of flood (Fig.3). Some of the areas nearby the Lebir dam have been raised to mimic the construction of the saddle dam to prevent water escape downstream (Fig. 3). The construction of the saddle dams at the Lebir dam were also highlighted by the flood mitigation plan as reported in UPEN (1989). Two saddle dams were planned to be located at about 2km northeast of the main damsite with 35m and 55m high dams respectively. The dams were simulated with a simple DTM raised model and consists several limitations, which prevents several

detailed dam elements for example diversion tunnels can't be integrated in the simulation. The saddle dams were generated based on several trial flood simulations on the proposed Lebir dam. Thorough investigation has been made on the flood extent of the dam and any premature overflows to downstream area, which didn't follow the spillways was blocked by raising the the DTM surface. The process continues until the water overflows at the designed spillways with the pre-determined surcharge water level.

2.4 Estimation of hydrodynamic roughness over floodplain area

The hydrodynamic roughness values over the floodplain area were estimated using landuse/landcover map of 2010 obtained from the Ministry of Agriculture. The study area is divided into six landuse/cover classes namely forest, oil palm plantation, rubber plantation, other agriculture area, built-up area and water body (Fig.3). The map is converted into 10 m spatial resolution to suit the DTM of the study area. Each landcover class in the map was converted to Manning's n values based on the lookup table shown in Table 2.

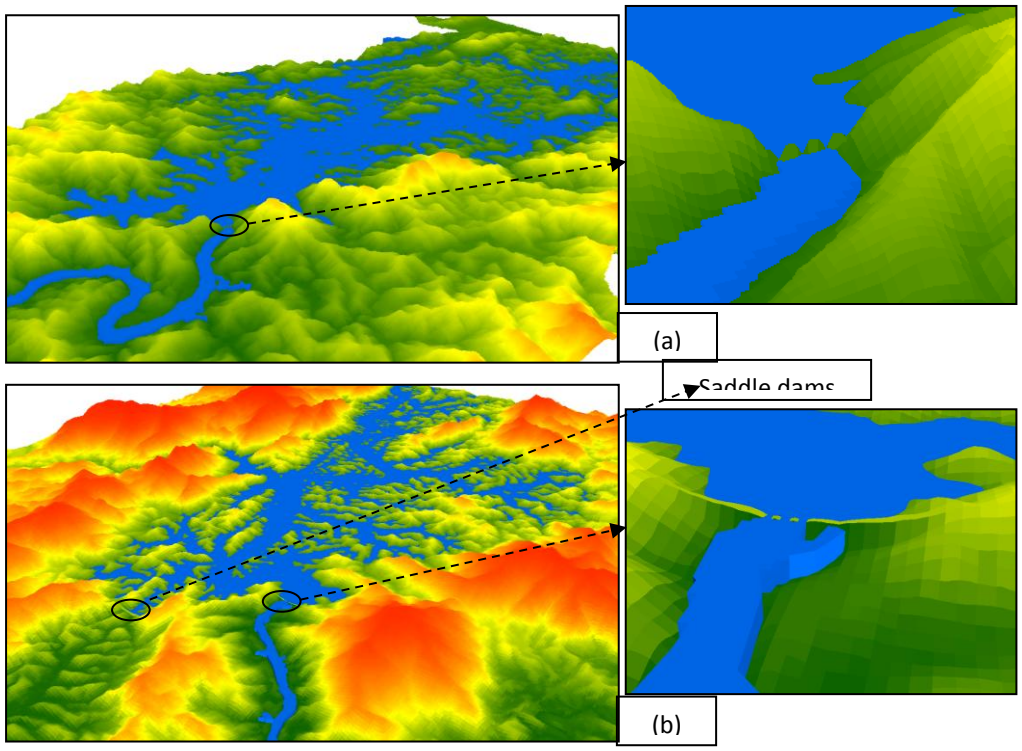


Figure 3 Digital Terrain Model (DTM) and simulated proposed Kemubu dam (a), Lebir dam (b) and saddle dams in the area of Lebir dam

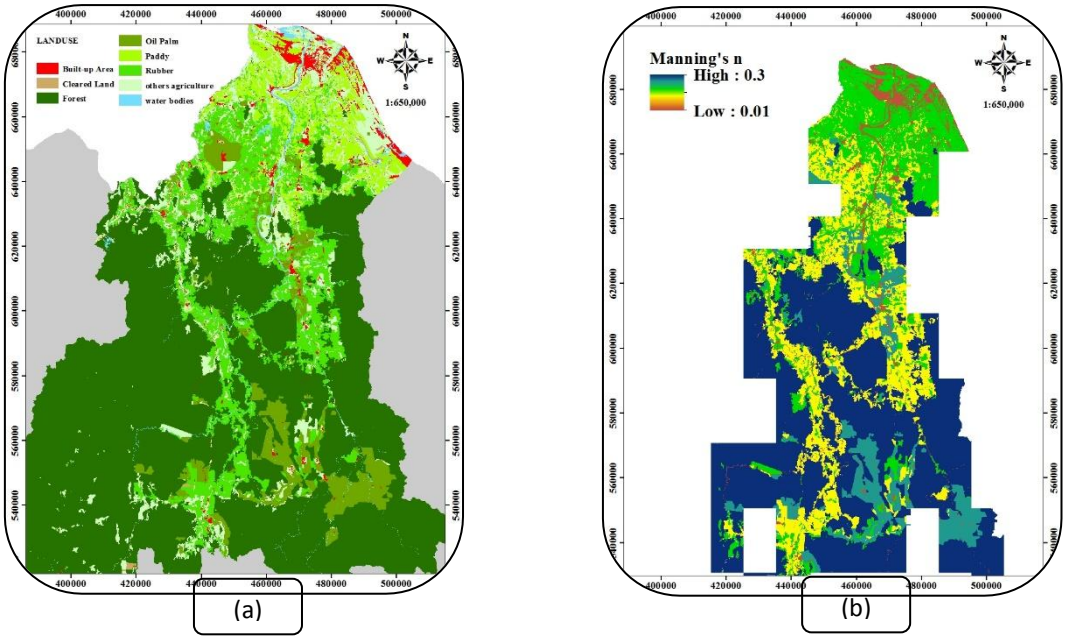


Figure 3 Landuse/landcover map (a) and estimated spatially-distributed manning's n value of the floodplain area

Table 2: Lookup table for landuse/landcover conversion to Manning's *n* values

Land use/cover	Manning' *n*
Forest	0.3
Oil Palm	0.25
Rubber plantation	0.2
Other agriculture area	0.25
Built-up area	0.01
Water body	0.03

2.5 Flood model schematization and modelling

Schematization of flood model was done using SOBEK model, which combines 1-dimensional (1D channel) and 2-dimensional (2D floodplain) models. SOBEK was built by the WL | delft hydraulics, founded in 1927. It is an independent consulting and research institute located in the Netherlands. The SOBEK is a fully dynamic 2D hydraulic model, specifically for floodplain flood modelling. The floodplain area is represented by the 2D grid, which is derived from either the DTM or the DSM in representing the terrain of the floodplain. The computation or solution used for the 2D floodplain modelling is based on the finite different method. The 1D model requires river cross-sections to be defined at the selected locations along the river networks. Based on the hydrology data obtained from the Department of Drainage, a simple method of return period analysis based on Gumbel distribution was used to estimate streamflow discharge and water level for 25-,100-,200-year floods for each boundary condition. The flood modelling tasks were divided into 2 scenarios i.e. before and after development of proposed dams. For each scenario the flood modelling was done for 4 sub-scenarios i.e. flood in 2014, 25-,100-,200-year return period of floods. For each sub-scenario of flood simulation, the flood simulations were divided into 3 different small areas, i.e. Lebir dam, Kemubu dam and Kuala Krai. The output (streamflow discharge and water level) of the flood simulation for the damsites were used for the downstream area of Kuala Krai.

2.6 Generation of flood hazard maps

The flood hazard maps for each flood scenarios of Kuala Krai area is generated based on the worst case scenarios, which accounts the maximum flood depth and flood velocity. Hazard here specifically refers to the results of research and development by DEFRA, which accounts flood depth and velocity (Eq.1) that cause danger to people (Rahman, 2006; Ramsbottom et al., 2006). The flood hazard maps were generated for flood scenarios in 2014, before and after development of the proposed Lebir and Kemubu dams. This allows evaluation of the proposed dams to be made based on the changes in flood characteristics and flood hazard level.

$$FH = D*(v+0.5) + DF \quad (1)$$

where FH is the flood hazard, D is the flood depth (m), v is the flood velocity (m/s) and DF is the debris factor (0, 0.5, 1 depending on probability that debris will lead to a hazard (Table 3)). In this study DF is set to 1. The flood hazard level is assigned based on the value given in Table 4.

Table 3: Guideline for debris factors (*DF*) value (Ramsbottom et al., 2006)

Flood depth (*D*) or Velocity (*v*)	Pasture/Arable	Woodland	Urban
0 to 0.25 m	0	0	0
0.25 to 0.75 m	0	0.5	1
D>0.75 m and\or *v*>2	0.5	1	1

Table 4: Flood hazard rating (Ramsbottom et al., 2006)

Threshold for flood hazard rating	Degree of flood hazard	Description
<0.75	Low	Caution - "Flood zone with shallow flowing water or deep standing water
0.75 - 1.25	Moderate	Dangerous for some (i.e. children) - "Danger: Flood zone with deep or fast flowing water"
1.26 – 2.5	Significant	Dangerous for most people - "Danger: flood zone with deep fast flowing water"
>2.5	Extreme	Dangerous for all - "Extreme danger: flood zone with deep fast flowing water"

2.7 Selection of suitable evacuation centers

Selection of suitable evacuation centers was only based on the combination of the worst-case of all flood scenarios i.e. 25-,100-,200-year return period of floods and flood that occured in 2014. The selection was also based on the available suitable buildings such as school, public buildings, empty land and so on.

3.0 Results and Discussion

3.1 Flood scenarios for Lebir and Kemubu dams

The flood simulations at the proposed Kemubu dam show increase in inundated area behind the dam from 25- year to the real case flood event in 2014. The flooded areas are 18.28 km^2, 21.01km^2, 21.3km^2, and 30.97km^2 for 25-,100-, 200-, and the past event of flood in 2014 respectively (Fig.4). The maximum flood depth and flood velocity were also increased by increasing the return period of flood events (Fig.6). The flood simulations at the proposed Lebir dam show increase in inundated area from 25-year to 200-year return period of flood. The inundated areas are 27.86km^2, 32.1km^2, and 33.89km^2 for 25-,100-, and 200-year return period of floods respectively (Fig.5). The maximum flood depth and flood velocity were also increased by increasing the return period of flood events (Fig.7).

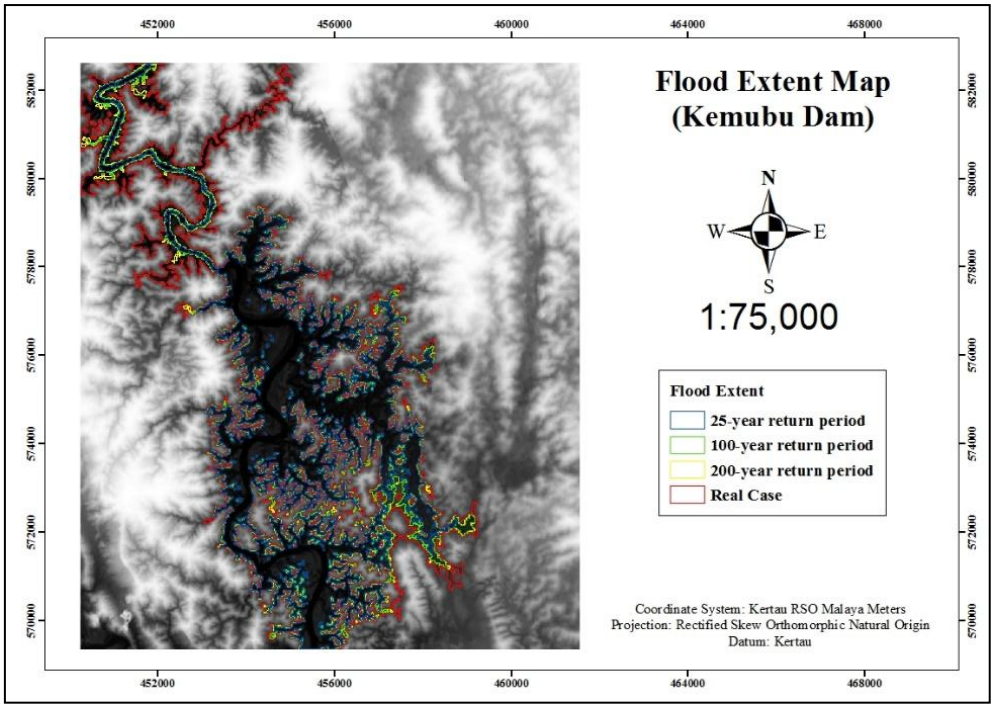


Figure 4 Flood extent of Kemubu dam for the past 2014 flood, 25-,100- and 200-years return period of flood

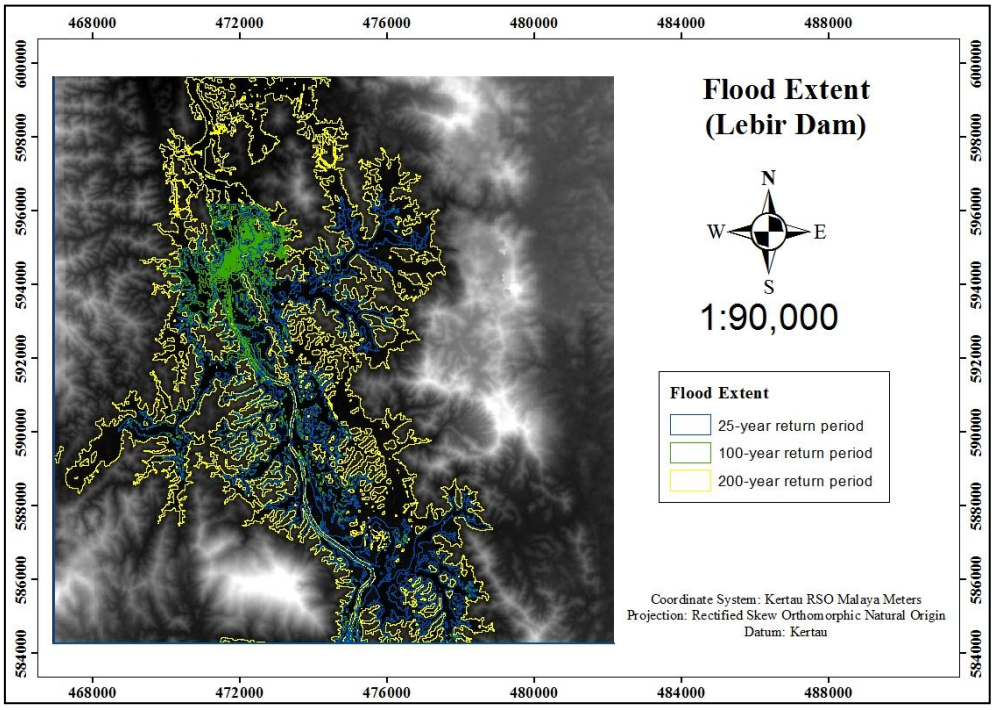
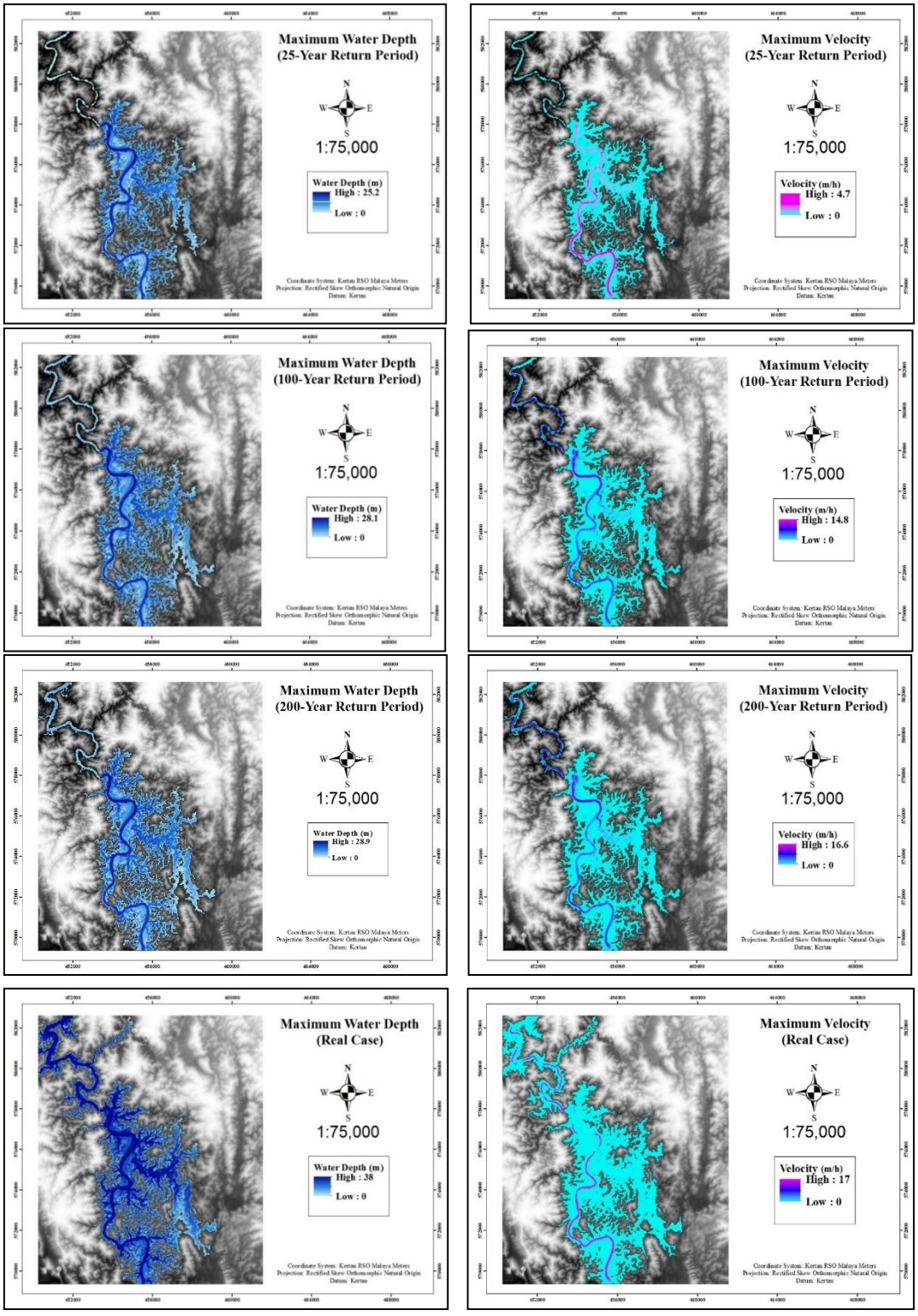
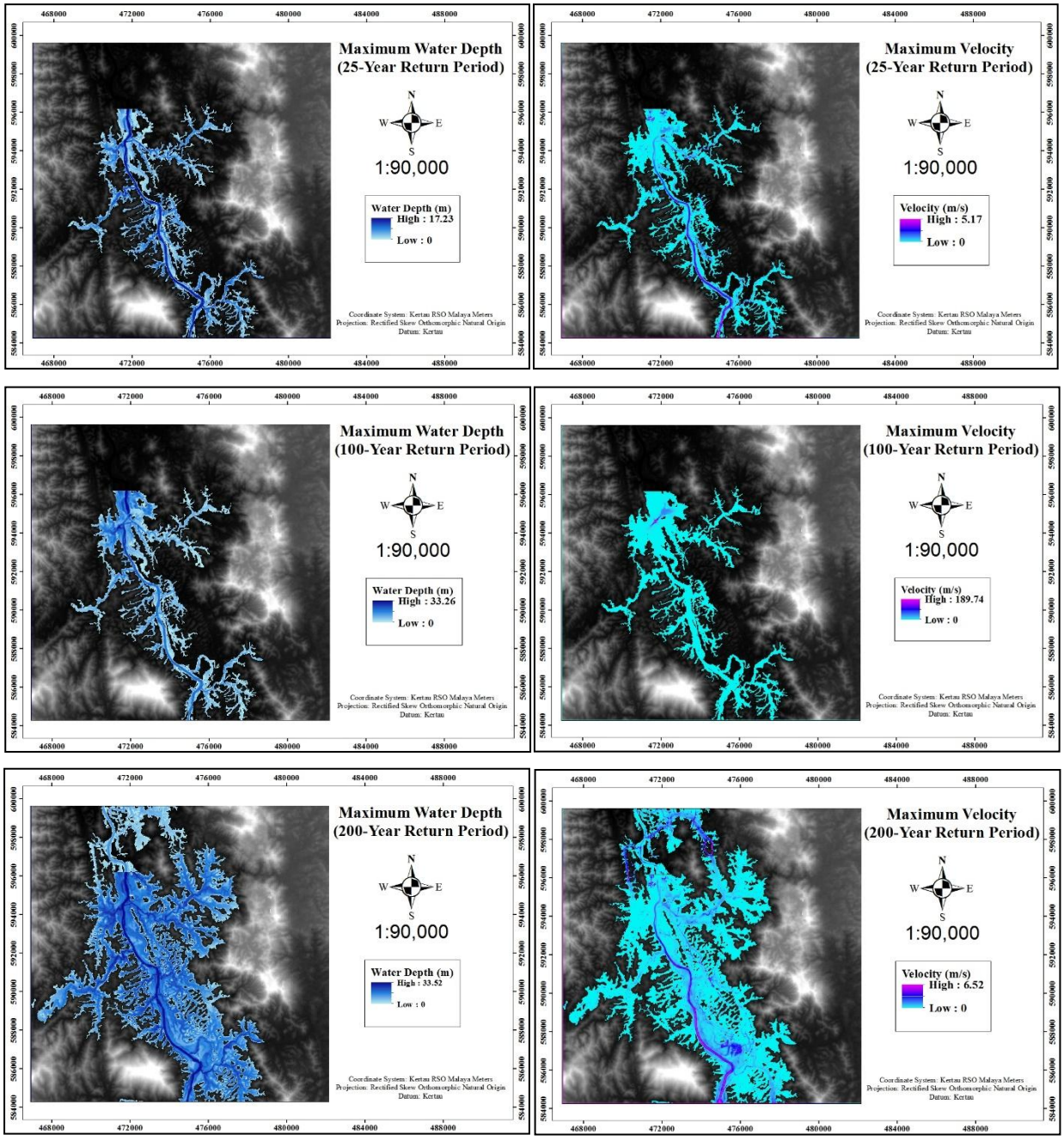


Figure 5 Flood extent of Lebir dam for the past 2014 flood, 25-,100- and 200-years return period of flood



(a) (b)

Figure 6 Maximum water depth for the past 2014 flood, 25, 100 and 200-year return period at Kemubu dam (a), Maximum flood velocity for the past 2014 flood, 25, 100 and 200-year return period at Kemubu dam (b)



(a) (b)

Figure 7 Maximum water depth for the past 2014 flood, 25, 100 and 200-year return period at Kemubu dam (a), Maximum flood velocity for the past 2014 flood, 25, 100 and 200-year return period at Kemubu dam (b)

3.2 Flood scenarios for Kuala Krai before the development of the proposed dams

Fig. 8 to Fig. 11 show flood hazard maps for Kuala Krai area before development of the proposed Lebir and Kemubu dams. In general, area classified under significant and extreme flood hazard increases with the incresing of return period of floods (Table 5). For area with low and moderate flood hazard levels the changes of area did not show clear pattern of increase or decrease. For most of the flood magnitudes, large portion of the agricultural areas were affected by flood compared to build-up areas (Fig.13).

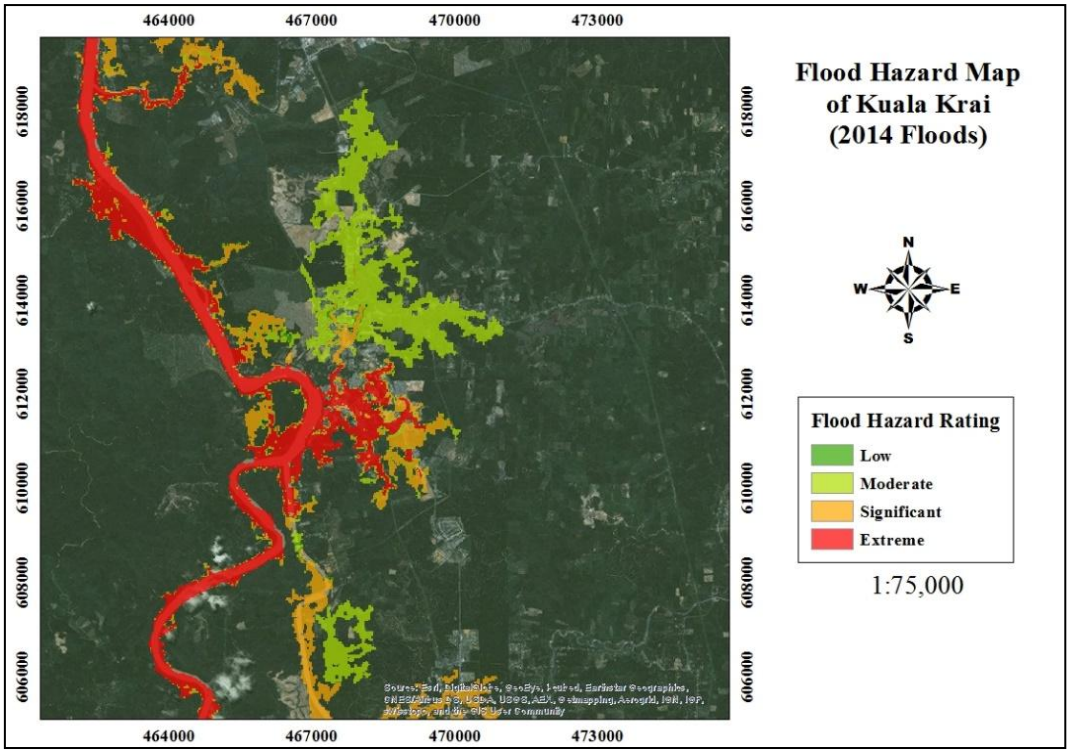


Figure 8 Flood hazard map of Kuala Krai for previous 2014 flood

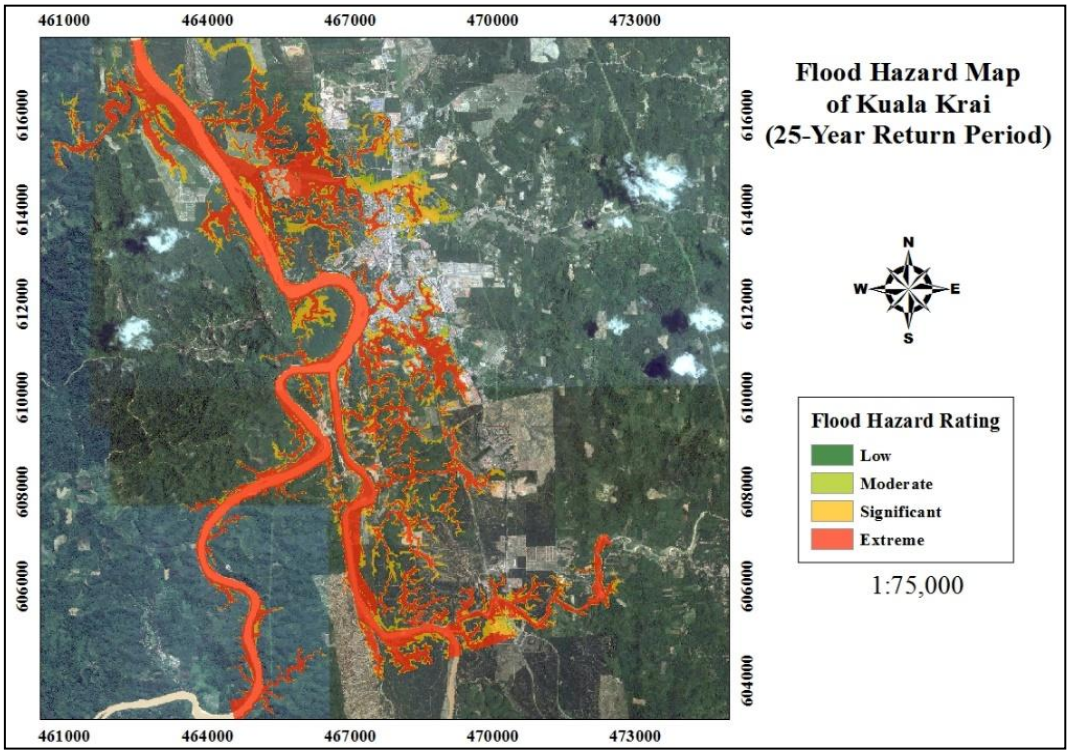


Figure 9 Flood hazard map of Kuala Krai for previous 25-year return period flood

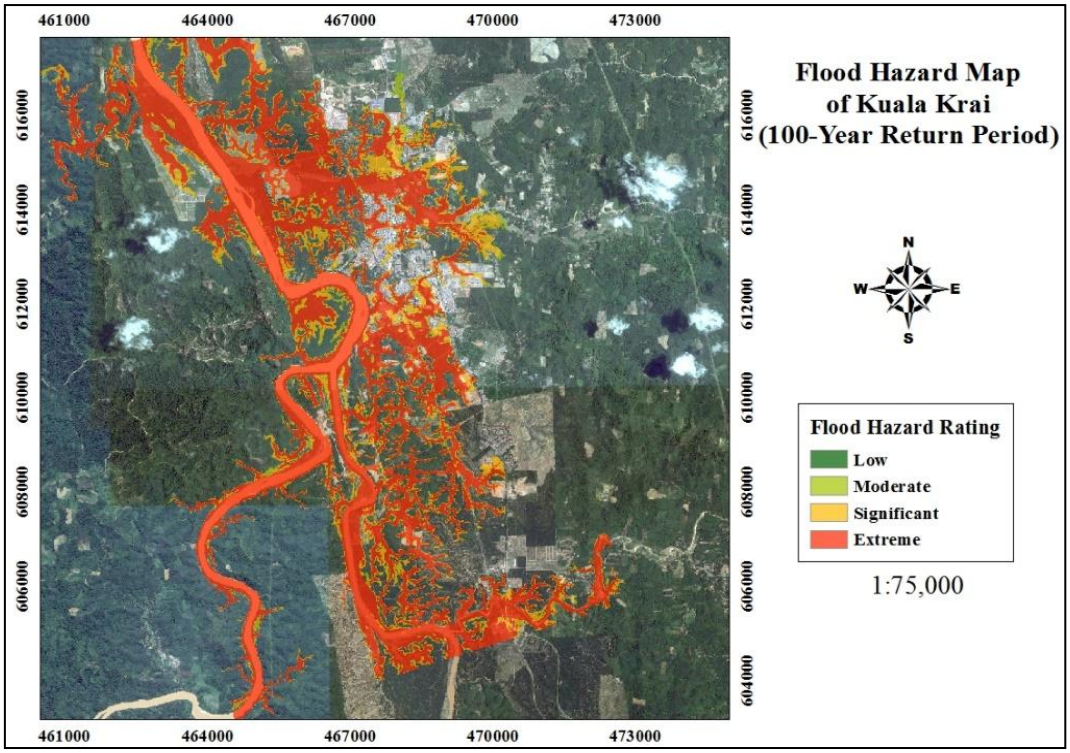


Figure 10 Flood hazard map of Kuala Krai for previous 100-year return period flood

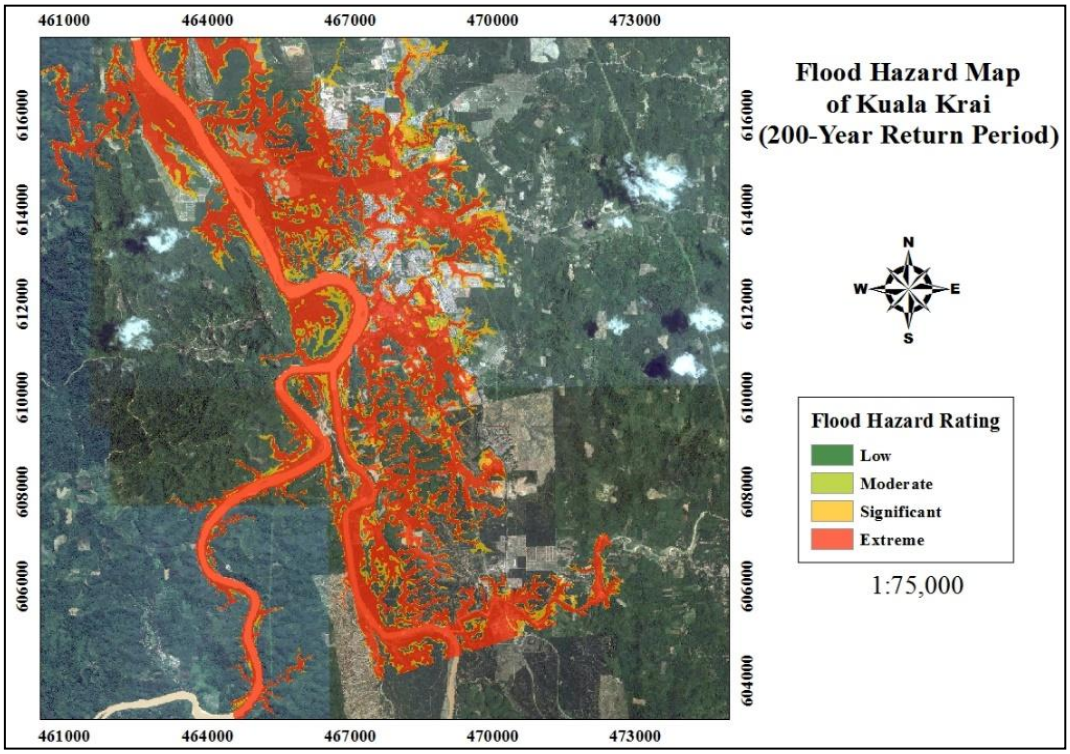


Figure 11 Flood hazard map of Kuala Krai for previous 200-year return period flood

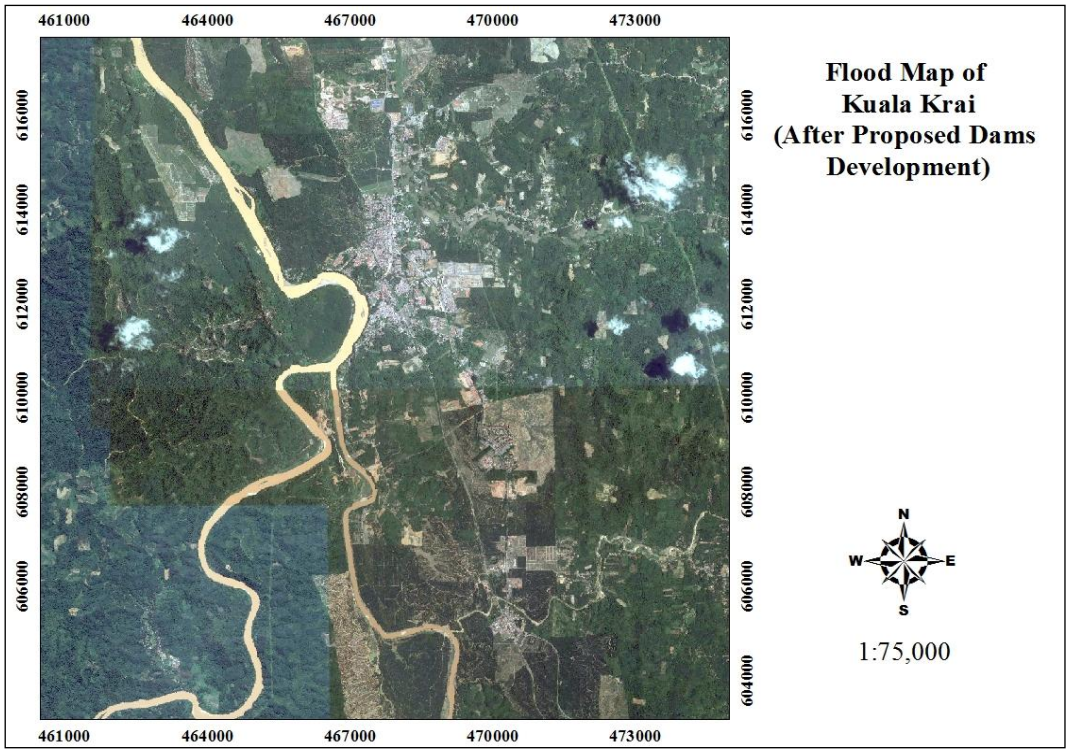


Figure 12 Flood map of Kuala Krai after dam is built.

Table 5: Kuala Krai area classified under different flood hazard levels

Area (sq km) / Events	Low	Moderate	Significant	Extreme
2014 Floods	0.19	8.64	9.82	11.4
25-Year return period	0.06	1.76	6.85	9.82
100-Year return period	0.07	1.95	8.38	29.18
200- Year return period	0.07	1.91	8.57	33.99

The simulation results show that after the construction of the proposed Lebir and Kemubu dams, Kuala Krai will not experience any flood for 25-,100-,200- and even for flood event with similar magnitude with the past 2014 flood (Fig. 12). Based on the flood hazard maps eight evacuation centers have been identified to be safe at the all situation of floods, which are Sekolah Menengah Sultan Yahya Petra, Sekolah Kebangsaan Banggol Guchil, Wisma Persekutuan, Pejabat Tanah, Dewan Sri Guchil, Pejabat Pertubuhan Peladang, Pejabat Pertanian Kuala Krai and an empty land (Table 6 and Fig.13).

Table 6: Proposed evacuation centers at Kuala Krai

No	Place name	Coordinate X (m) MRSO	Coordinate Y (m) MRSO
1	Sek. Men. Sultan Yahya Petra	467476.7639	612771.2702
2	Sek. Keb. Banggol Guchil	467555.9509	613042.8034
3	Wisma Persekutuan	467997.806	612746.1312
4	Pejabat Tanah	468011.0352	612683.2925
5	Dewan Sri Guchil	468397.4123	612940.4941
6	Pejabat Pertubuhan Peladang	468444.2912	612848.6574
7	Pejabat Pertanian Kuala Krai	468569.9686	612676.6779
8	Empty land	470471.7209	606996.5951

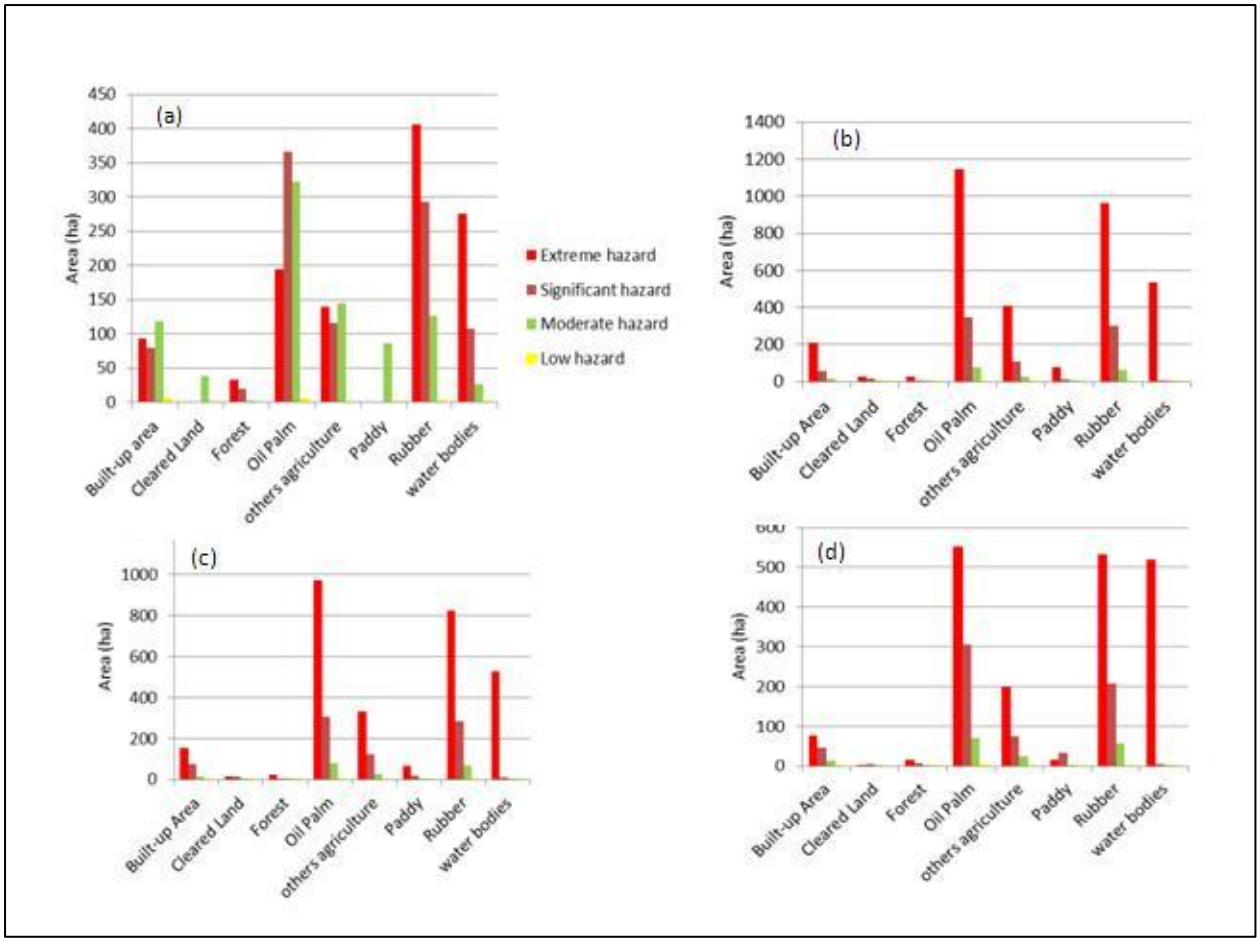
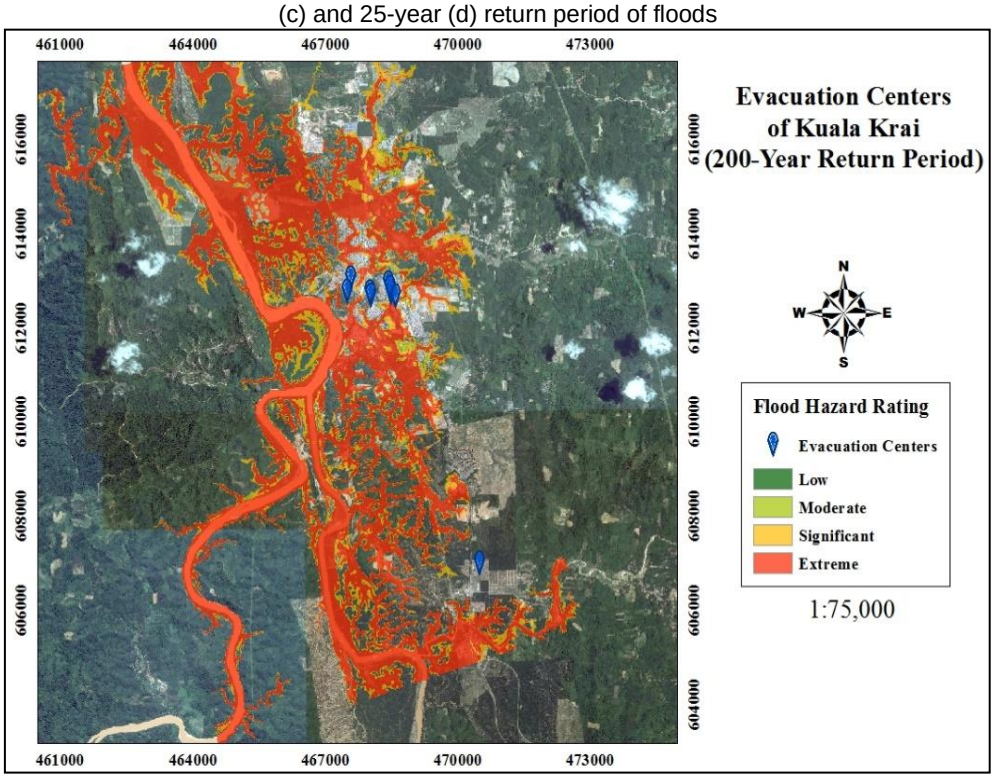
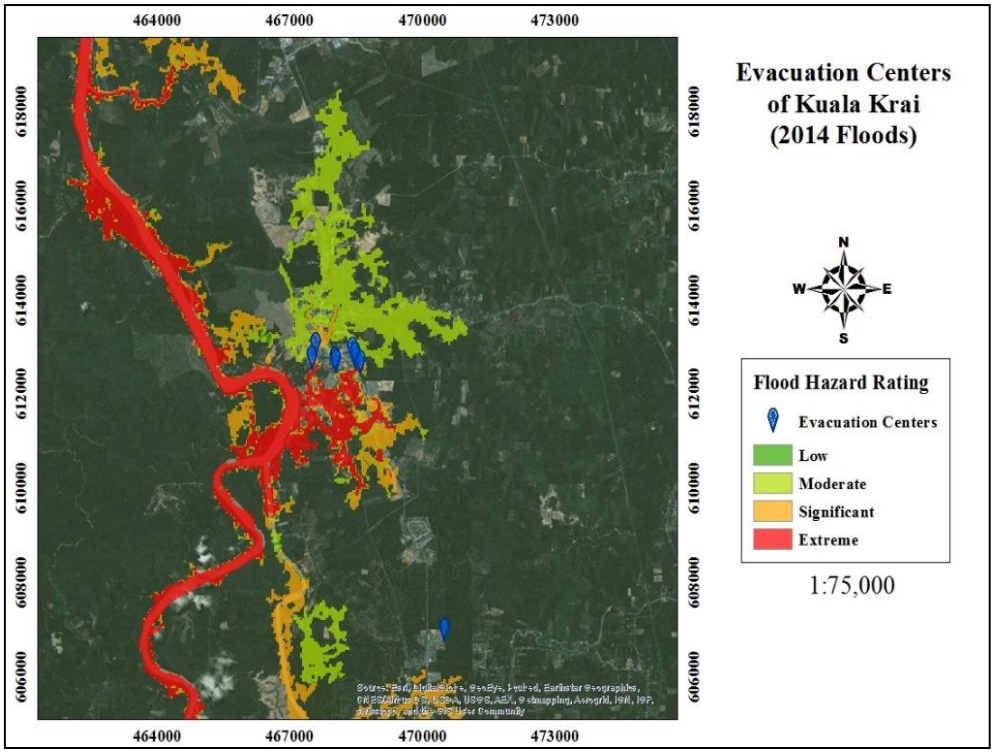


Figure 13 Landuse/cover classified under different hazard categories for 2014 flood (a), 200-year (b), 100-year (c) and 25-year (d) return period of floods



(a)



(b)

Figure 14. Location of proposed evacuation centers overlaid with hazard maps of 200-year return period of flood (a), and the past 2014 flood (b)

4.0 Conclusion

This study demonstrates that integration of geospatial data especially airborne LiDAR and hydrodynamic simulation allows detailed simulation and evaluation of structural measures for flood mitigation. The general behaviour of the proposed dams in migitating flood for downstream area can be simulated at an acceptable level even with a relatively simple raised model of the DTM surface. The flood simulation results after the construction of the proposed Lebir and Kemubu dams have shown no future flood will occur in Kuala Krai area. This result however should be treated very carefully since the simulations were done with several limitations and assumptions. Thus, this study suggests the model should be accompanied by well-calibrated rainfall-runoff models over several relevant sub-basin areas. The proposed dam should also be modelled with a proper plans and detailed specifications for flood mitigation, irrigation and hydroelectric power generation especially for the proposed Lebir dam. Furthermore the proposed evacuation centers should account several other factors including size of the area/building, accessibility, population and so on.

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GREEN SOLUTION APPROACH FOR POST FLOOD ASSESSMENT ON HILLSLOPES STABILITY BASED ON VEGETATION GROWTH BY USING GEOGRAPHIC INFORMATION SYSTEM (GIS) AND ELECTRICAL RESISTIVITY IMAGING (ERI) METHOD FOR HILLSLOPES SUSTAINABLE MANAGEMENT

Project Information

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1.0 Introduction

Hillslope failure is a common hazard that often occurs in Malaysia. Hillslope failure often occurs in the rainy season because the abundant of water flow. The water flow in the soil weaken the foundation of the soil that holds the soil together. It normally occurs in hilly or uplands areas that have been disturbed or develop for infrastructure such as roads, buildings or tunnel. The geological aspect of the study area are important to predict the future condition of the area. The geological aspect include soil and rock profile and groundwater study. Groundwater level is also important because it involved the process of slope failure. The landslide occur usually are due to the interaction between geology conditions to rate of water movement in the soil.

The December 2014 flood in Kelantan tremendously change various geomorphic including the hillslopes geomorphic. The same cases occurred in 1926 and 1967. The flood is due to heavy rainfall that trigger a serious hillslopes failures for both the natural hillslopes and the cut hillslopes. The flood caused failures to the hillslopes along 100 km of Sungai Sam-Dabong-Jeli Highway. Total of 71 recorded failure hillslopes within gradient 45°–90° which includes both with/without civil structures. The objectives of this research is to identify type of vegetation that has potential to strengthen hillslopes, to investigate the hillslopes stability based on electrical resistivity value, to map the hillslopes stability and the vegetation distribution based on identified vegetation, and to model the hillslopes with the recommended vegetation.

2.0 Methodology

The methodologies of this research are divided to several stage (Figure 1):

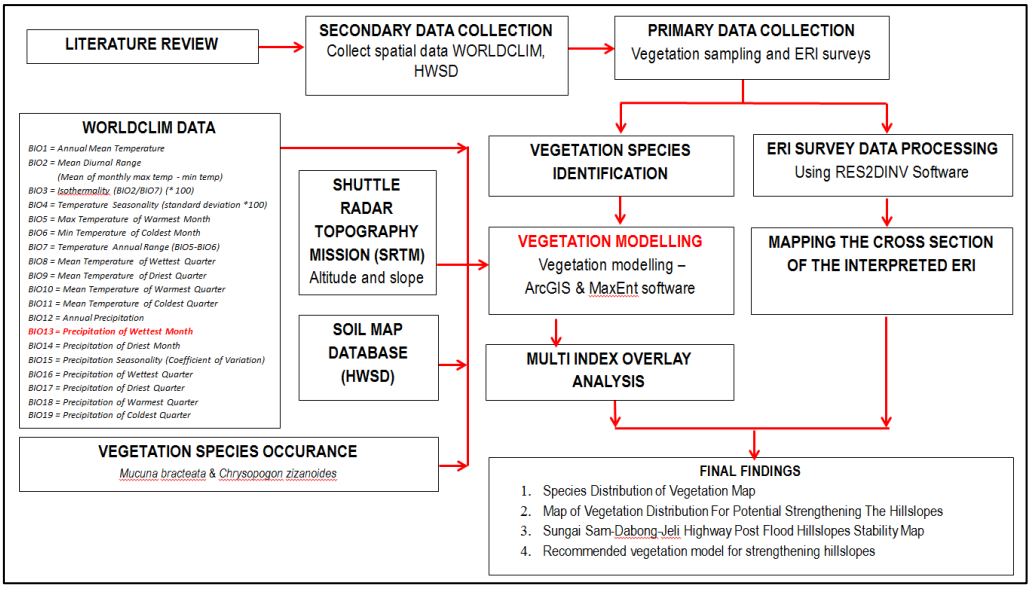


Figure 1: Research methodology flow chart.

2.1 Mapping of The Failures Hillslope

Mapping were conducted to recorded the total number and types of earth material (soil or rock) of the failures hillslopes. The recorded location of each failures hillsopes were transfer to the Geographic

Information System (GIS) database and the Map of Failures Hillsopes Along Sungai Sam-Dabong-Jeli Highway were produced.

2.2 Identification of Vegetation Distribution

The first stage focused on identifying the vegetation distribution on the hillslopes. Out of 33 collected vegetation samples, 8 species has been identified as common plants but the most abundance is the *Dicranopteris linearis*. Other recommended vegetation are *Mucuna bracteata* and *Chrysopogon zizanoides*. Both can help to facilitate water percolation, soil aeration, can persists the deep water flow, help to strengthen the hillslopes, and easily growth with Malaysia's climates.

2.3 Determination of Hillslopes Stability Status using Electrical Resistivity Imaging (ERI) Profile

This survey is to determine the hillslopes stability status by measuring the electrical resistivity of the hillslopes using the ABEM Terrameter SAS 4000 machine. This machine strong signal were used to detect the vertical and horizontal structures changes with the pole-dipole or dipole-dipole configuration from profile lines. The profile lines length is arrange within 40 – 200 meter with electrode spacing between 1 – 5 meter; which is depend on the length of the failure hillslopes. The collected electrical resistivity data were inverted to obtain the real resistivity and the depth of the resistivity image by using Res2DInv software. The bad data points were eliminated to produce the <20% RMS error to get a smooth data. After get the desire value of RMS, the data is display using elevation instead of depth. To include elevation in the result, before reading the data from the software, the elevation data is included in the raw data in the format of DAT. Finally after all the data are inversed, the result will be shown in a profile image.

2.4 Ecological Niche Models (ENMs)

Ecological niche models aim to estimate the fundamental niche of target species and to map their potential habitat distributions across a specified geographic range (Guisan & Zimmerman 2000). Ecological niche modelling techniques provide a framework for reconstructing species distribution models for applications in biogeography, conservation biology and ecology (Elith & Leathwick 2009). Geo-referenced data, recording species occurrence, may be sourced from herbarium specimens, field surveys or permanent plots. The models derived using these techniques can be used to support conservation planning as a quantitative tool (Phillips et al. 2006, Phillips & Dudík 2008). In this study, the GPS data for Dicranopteris linearis species that were recorded during sampling at Jalan Jeli-Dabong-Sg Sam to generate the potential habitat of species distributions (Phillips et al. 2006, Maycock et al. 2012).

Ecological niche modelling techniques aim to represent the ecological requirements of species based on occurrence data and environmental data (Guisan & Zimmerman 2000). These techniques provide numerous opportunities for rapid conservation assessments of tropical plants and animals, but there are also potential limitations to applying them for this purpose (Cayuela et al. 2009). Three components are needed to construct a species distribution model that provides the occurrence data (Austin 2002); an ecological model defining the ecological theory being applied, a data model defining the mode of data collection and a statistical model to represent the statistical theory underlying the technique. Most research on the development of distribution modelling techniques has focused on creating models using presence/absence or abundance data, where regions of interest have been sampled systematically (Austin & Cunningham 1981, Hirzel & Guisan 2002, Cawsey et al. 2002). However, these techniques are not appropriate for the rapid assessment of species which is needed to assess global biodiversity by 2016. This is because occurrence data for most species have been recorded without planned sampling schemes, and the great majority of these data consist of presence-only records from museum or herbarium collections (Graham et al. 2004, Huettmann 2005, Soberón & Peterson 2005).

Ecological niche models require suitable environmental data to define the spatial extent of suitable habitat. The environmental information is gathered at the required spatial resolution for the entire study area and is then stored in a Geographic Information System (GIS). Four main sources may be identified for gathering this environmental data: field surveys or observational studies; digitised land cover maps; remote sensing data (numerical aerial photographs and satellite images); and maps obtained from GIS-based modelling procedures. The modelling technique chosen for integrating these environmental data with the species occurrence data needs to account for the absence of reliable data in areas where the species was not found (Graham et al. 2004). A wide range of modelling techniques have been proposed, which estimate current species distributions or

forecast future species distributions with varying degrees of success (Peterson et al. 2002, Thomas et al. 2004, Araújo & Guisan 2006).

2.5 MAXENT Modelling

Species distribution modelling were developed using MAXENT v 3.3.2 which can be freely downloaded from www.cs.princeton.edu/~schapire/maxent (Phillips et al. 2006). MAXENT is a machine learning method with a simple and precise statistical formulation, and it has a number of aspects that make it well-suited for species distribution modelling (Phillips et al. 2006). MAXENT estimates a species' distribution "by finding the distribution of maximum entropy (i.e. closest to uniform) subject to the constraint that the expected value of each environmental variable (or its transform and/or interactions) under this estimated distribution match its empirical average" (Phillips et al. 2006). It has been used extensively as a tool for estimating species distributions using presence-only data (Anderson 2003, Joseph & Stockwell 2002, Peterson & Kluza 2003, Peterson & Robins 2003, Peterson & Shaw 2003). For modelling presence-only species' data, choices can be made about the complexity of the fitted function. In my work, the data available for modelling typically consists of a list of geo-referenced occurrence localities, such as a set of geographic coordinates where the species has been observed. Additional data on the environmental variables that define the species fundamental niche, which have been estimated across the geographic region of interest, are required to build the model. For modelling plant distributions, environmental data usually include climatic variables (e.g. temperature, rainfall and their seasonal variation), elevation, topography, geology and soils (e.g. López-Toledo et al. 2011).

MAXENT is used to predict which areas within the region satisfy the requirements of the species' ecological niche, and thus form part of the species' potential distribution (Anderson & Martínez-Meyer 2004). The potential distribution describes where conditions are suitable for the occurrence of the species. It also can be used to estimate the species' realized distribution, for example by removing areas where the species is known to be absent because of habitat destruction or areas that it has never colonized because of barriers to dispersal. Natural history museum and herbarium collections constitute the most common sources of occurrence localities for MAXENT modelling (Ponder et al. 2001, Stockwell & Peterson 2002). Occurrence data obtained from natural history records indicate that the species was present at a given locality at the time of its collection. These occurrence data may sometimes misrepresent a species' realized distribution, for example if it is no longer present at a site where it has formerly been collected, or provide an inaccurate representation of its fundamental niche, for example if the collection site represents a demographic sink for the species (Graham et al. 2004).

3.0 Results and Discussion

3.1 Failures Hillslopes Map

The total of 71 failures hillsopes has been recorded (Table 1.1) and mapped on both sides of the highway (Figure 1.2). Only 1 failures hillslope were recorded as rock hillslopes while the rest is soil hillslopes. Most of the failures hillslopes is a shallow failures with length between 40 – 200 meter, heigth <10 meter and gradient between (40 – 68)°.

3.2 Identification of Vegetation Distribution

Out of 33 collected vegetation samples, 8 species has been identified as common plants but the most abundance is the *Dicranopteris linearis* (Figure 1.3). This species were collected at recorded growth between 1–2 meter from the foot of the hillslopes.

3.3 Determination of Hillslopes Stability Status Using Electrical Resistivity Imaging (ERI) Profile

From 71 failures hillslopes, 17 were chosen to conduct the ERI. The recorded real resistivity value range for the detected water percolation between (10–100)Ωm. Most of this water percolation depth is just few meter from the hillslopes subsurface (Figure 1.5). From 17 failures hillslopes, 11 hillslopes (64.7%) were still not stable due to water percolation subsurface (Table 1.2). Due to this, there is possibility of another failure in the future.

3.4 Vegetation Distribution Prediction Modelling Using MAXEnt

The higher the contribution, the more impact that particular variable has on predicting the occurrence of that species. Precipitation of Wettest Month (Bioclimate-13) had the highest predictive contribution of 43.4%. The result were shown in 5 probability value range 0.0 – 0.2 (very low), 0.2 – 0.4 (low), 0.4 – 0.6 (moderate), 0.6 – 0.8 (high) and 0.8 – 1.0 (very high). The modelling for the *Dicranopteris*

linearis shows that the species were suitable with the gradient along the hillslopes and the most abundance especially on the failures hillslopes. Therefore, this species were not helping strengthening the hillslopes and become stable. While the modelling result of the recommended vegetation species (*Mucuna bracteata* and *Chrysopogon zizanoides*) shows that both species were suitable to strengthen the failures hillslopes; *Mucuna bracteata* (Extreme slope : 8 – 30)° and *Chrysopogon zizanoides* (Steep to very steep slope : 30 – 60)°.

Table 1.1 : Hillslopes failures status.

Description					Number
Total failure hillslopes					71
Hillslopes with slope protection wall					10
Hillslopes with failure slope protection wall					7
Selected hillslopes for ERI test					16
Hillslopes Gradient (°)	**1 – 20**	**21 – 40**	**41 – 60**	**> 60**	**Total**
Number of Hillslopes	–	6	53	12	71

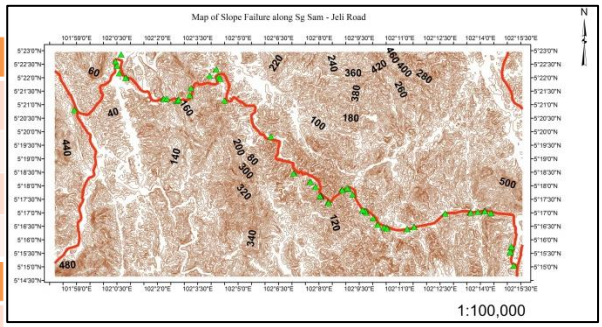


Figure 1.2 : Map of failure hillslopes.

Description	Number	Scientific Name	
Collected vegetation	33	-	
Identified common vegetation	10	• *Dicranopteris pictata* • *Crassocephalum crepidioides* • *Eleusine indica* • *Chromolaene odorat* • *Mucuna brateata*	• *Climedia hirta* • *Panicum clandestinum* • *Melastoma malabathrium* • *Acacia mangium* • *Dicranopteris linearis*
Abundant distribution	1	• *Dicranopteris linearis*	
Chosen vegetation for vegetation modelling	2	• *Mucuna bracteata* • *Chrysopogon zizanoides*	

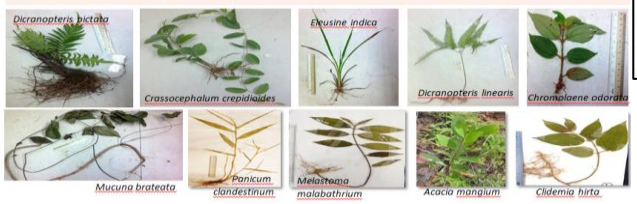


Figure 1.3 : Details of collected vegetation.

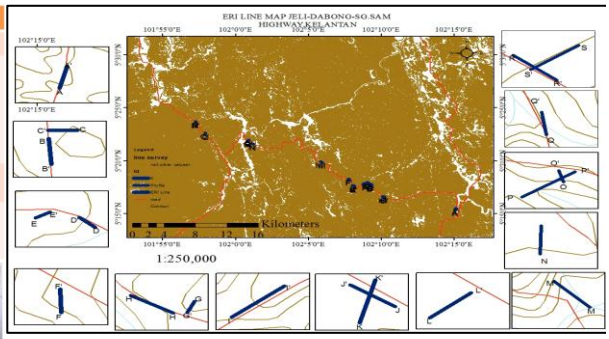


Figure 1.4 : Map of ERI profiles conducted.

Table 1.2 : Failures hillslopes stability based on ERI profiles conducted at 17 hillslopes.

Stability Status	ERI Profiles			Total Profiles	Percentage (%)
Stable	D – D′ E – E′	J – J′ K – K′	R – R′ S – S′	6	35.3
Unstable	A – A′ B – B′ C – C′ F – F′ G – G′	H – H′ I – I′ L – L′ M – M′	N – N′ O – O′ P – P′ Q – Q′	11	64.7

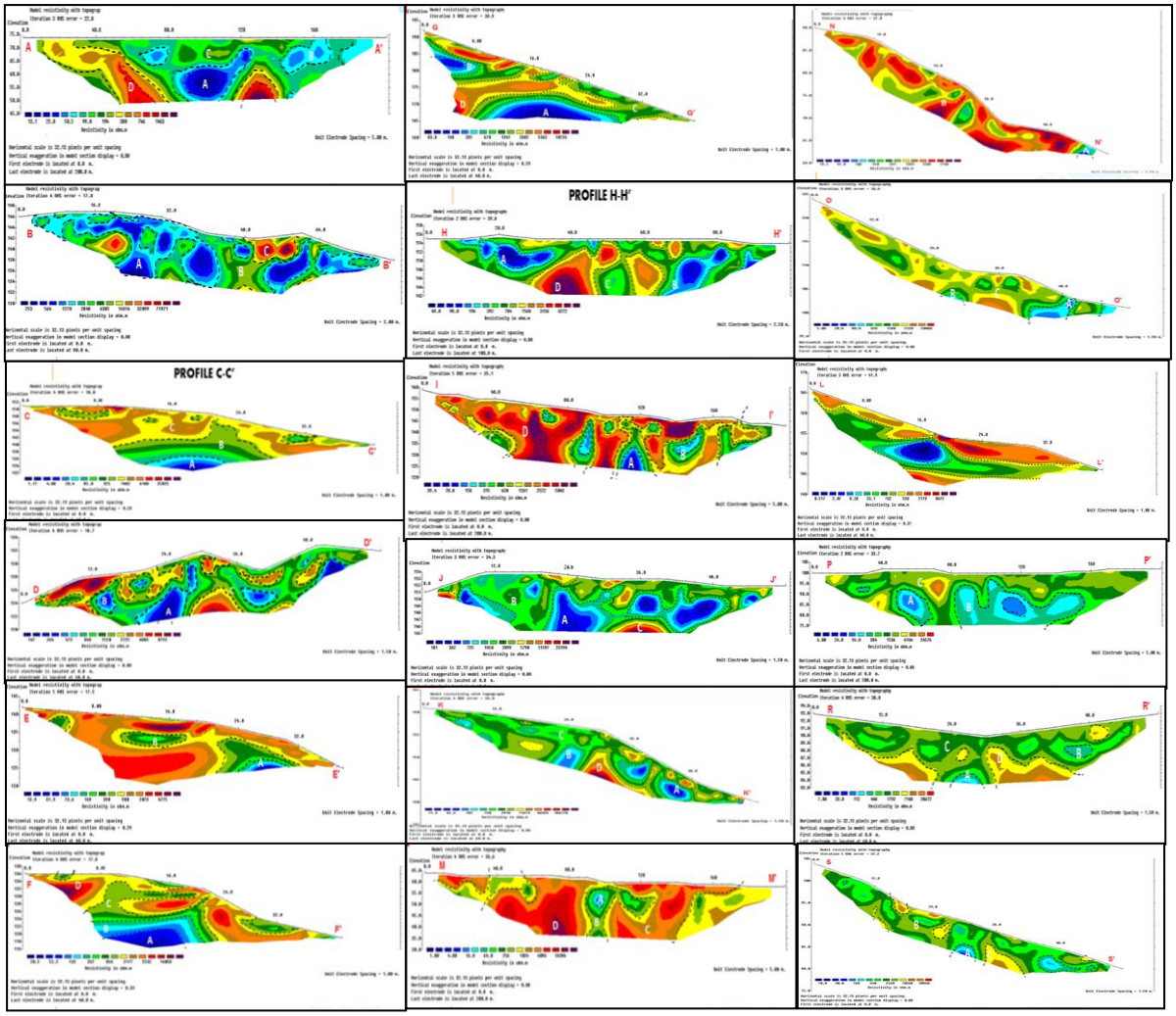


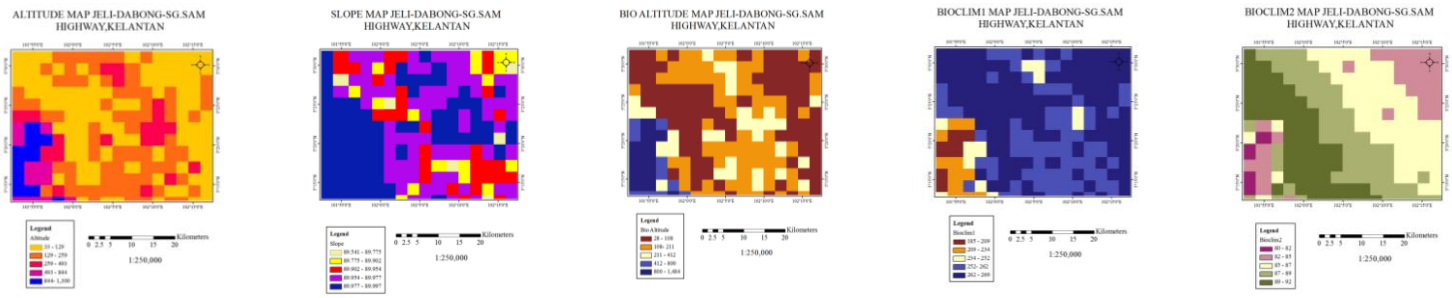
Figure 1.5 : ERI profiles for 17 failures hillslopes.

Table 1.3 : The recommended vegetation species distribution based on slope gradient.

Vegetation Species	*Mucuna bracteata*	*Chrysopogon zizanoides*
Slope Gradient	8° – 30°	30° – 60°
Slope Steepness	Extreme slope	Steep to very steep slope

Table 1.4 : Suitability result of recommended vegetation species to be plant on the failure hillslopes.

Hillslopes Stability Status Based on ERI	ERI Profiles	Hillslopes No	Probability of on Vegetation Species to Strengthen Hillslopes		Implimentation Suitability Using Recommended Model
			Mucuna bracteata (8° – 30°)	Chrysopogon zizanoides (30° – 60°)	
Stable	D – D'	31	Very High	High	Suitable
	E – E'	33	Very High	High	Suitable
	J – J'	37	Moderate	Moderate	Suitable
	K – K'		Moderate	Moderate	Suitable
	R – R'	65	High	High	Suitable
	S – S'		High	High	Suitable
Unstable	A – A'	1	Very Low	Low	Unsuitable
	B – B'	28	High	High	Suitable
	C – C'	29	High	High	Suitable
	F – F'	39	High	High	Suitable
	G – G'	16	Moderate	Moderate	Suitable
	H – H'	17	Moderate	Moderate	Suitable
	I – I'	35	High	Moderate	Suitable
	L – L'	38	Moderate	Moderate	Suitable
	M – M'	43	Very High	Very High	Suitable
	N – N'	52	High	Very High	Suitable
	O – O'	53	High	High	Suitable
	P – P'		High	High	Suitable
	Q – Q'	63	Moderate	High	Suitable



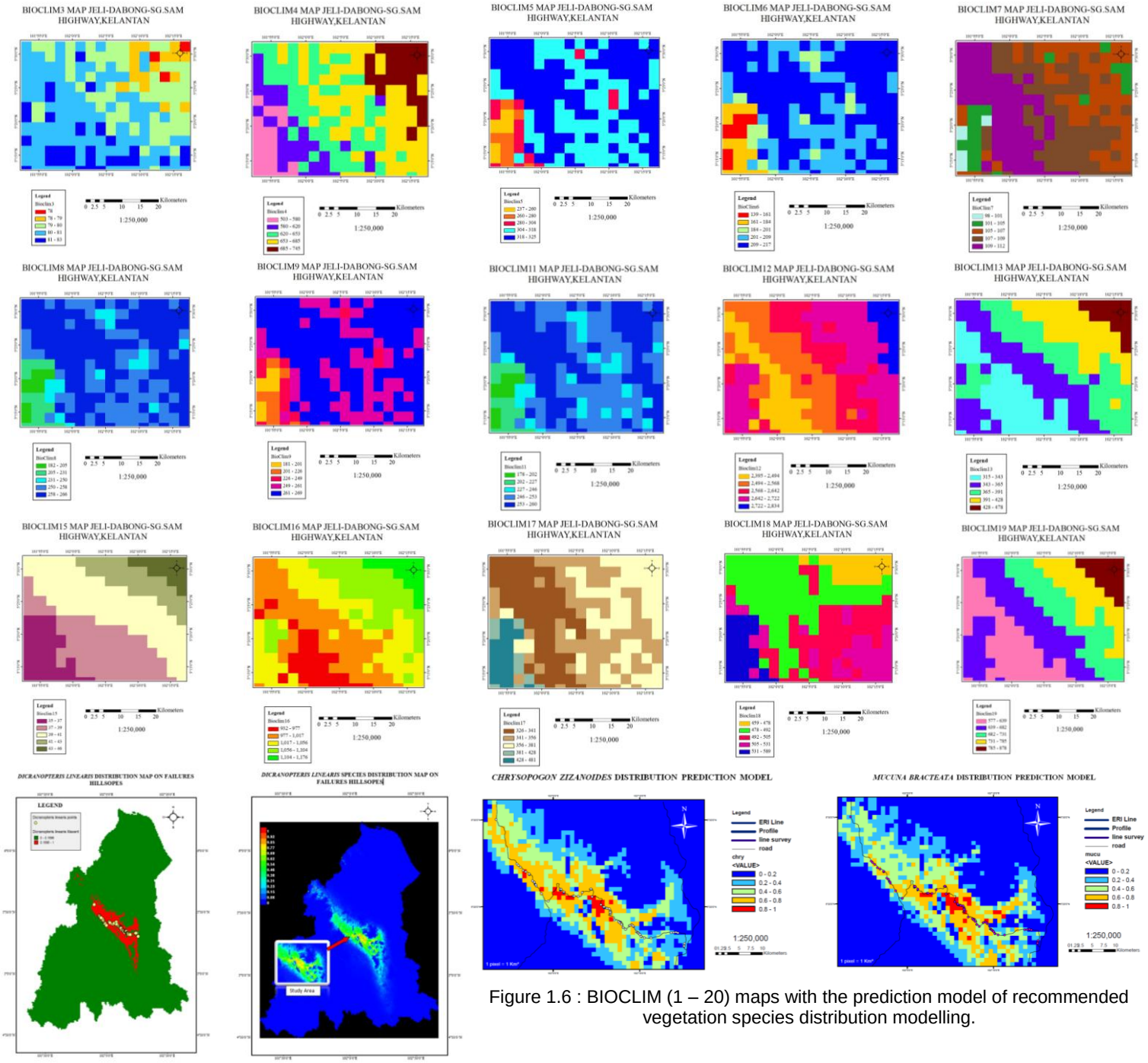


Figure 1.6 : BIOCLIM (1 – 20) maps with the prediction model of recommended vegetation species distribution modelling.

4.0 Conclusion

The summary of the project findings:

4.1 71 failures hillslopes were recorded along the 100 km of the Sungai Sam–Dabong–Jeli Highway on both side of the hillslopes. Only 1 hillslopes were recorded as rock slopes while the rest is soil slopes.

4.2 33 collected vegetation samples shows 8 species is the common vegetation but the most abundance is only 1 species; *Dicranopteris linearis*.

4.3 17 failures hillslopes were chosen for ERI survey; 11 shows instability and has tendency to fail in the future due to water percolation subsurface just few meters.

4.4 The MAXEnt modelling using 22 spatial data for recommended vegetations sows potential species growth; *Mucuna bracteata* (Extreme slope : 8 – 30)° and *Chrysopogon zizanoides* (Steep to very steep slope : 30 – 60)°.

4.5 The species were recommended to be planted to strengthen the hillslopes as an alternative for green solution approach replacing the civil structures in order to reduce the maintenance budget allocate for maintaining the hillslopes stability, enhancing the landscapes, and to improve the sustainable management of hillslopes.

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DEVELOPMENT OF COHERENCE MODELING ALGORITHM FOR RAPID FLOOD INUNDATION MAPPING USING MULTI-SENSOR RADAR SATELLITE IMAGES FOR TROPICAL MALAYSIA

Project Information

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1.0 Introduction

Floods are considered as one of the most common natural disasters in Malaysia. Preparation of an accurate flood inventory map is the basic step in flood risk management. Flood detection is yet significantly complex process due to the presence of cloud coverage in the tropical areas especially in Malaysia and limitations in methodological approaches. Therefore, in the current study an efficient approach is developed and implemented to identify the flooded areas by means of multi-sensor and multi-temporal radar images. The developed algorithm was tested at two study areas namely: Kelantan (2014 flood) and Kuala Terengganu (2009) to map the flooded areas. Both multi-temporal Radarsat and TerraSAR-X as well as Landsat images were classified based on a rule-based object-oriented technique. Then, image segmentation was performed to distinguish the boundaries of various dimensions and scales of objects. Finally, a Taguchi based method was employed to optimize the segmentation parameters. After the completion of segmentation, the rules were defined and the images were classified to produce an accurate flood inventory map for 2014 Kelantan flood and 2009 Kuala Terengganu flood events. Finally, the accuracy of classified images was measured through the confusion matrix. In this research, combination of techniques and the optimization approach were applied as a revolutionary approach for flood detection. The flood inventory map which was obtained by using the proposed approach is showing the efficiency of the methodology which can be applied by other researchers and decision makers to construct flood inventory maps.

Flood is one of the most devastating natural disasters that occurs frequently in Malaysia and causes severe damage to both lives and properties. Due to the huge losses incurred by the Malaysian Government, development of appropriate flood modeling techniques is required for appropriate flood mitigation strategies. Remote sensing (RS) and geographic information system (GIS) techniques can support overall flood management as they can produce rapid data collection and analysis for hydrological and hydrodynamic studies. Rapid satellite-based flood inundation mapping and delivery of flood inundation maps during a flood event can provide crucial information for decision-makers to put relief measures in place. With the development of remote sensing techniques, flood mapping for large areas can be done easily. In this project, coherence derived from multipass SAR interferometry was used, as an indicator of changes in the electromagnetic scattering behavior of the surface, thus potentially revealing flood inundated areas. This research presents development of such techniques, that is, a flood map obtained from both RADARSAT-2 multi temporal images (Kelantant flood) and TerraSAR-X (Terengganu flood) data through proper coherence information. In the second stage, this research used an efficient methodology to recognize and map inundated areas using both RADARSAT-2 and TerraSAR-X imagery. Prior to rule-based classification, multi-resolution image segmentation was performed to detect the boundaries of objects of various sizes and scales. The optimum segmentation parameters were determined using the Taguchi method. The rules were then defined and the images were classified once segmentation is completed. The current research combined the methods and the optimization technique used as an innovative flood inundation mapping application. The successful production of a reliable, rapid and accurate flood inundation mapping confirmed the efficiency of the methodology. Therefore, the developed method can assist researchers and planners in implementing and expediting flood inundation mapping.

2.0 Methodology

Overall workflow implemented to extract flooded areas from TerraSAR-X and Radarsat-2 images is presented in Figure 1. First, SAR images were preprocessed and subsequently converted into sigma nought to represent the ground range rather than slant range. Then speckles are removed from the processed SAR images to reduce their effects on classification results. On the other hand, Landsat images were first converted into reflectance to reduce the effects of sensor malfunction and sun-illumination. Then they pan-sharpened to increase their spatial resolution so that accurate flooded areas could be extracted. After preprocessing step, the images were segmented using multi-resolution segmentation algorithm. This algorithm requires three user-defined parameters, thus they are optimized using Taguchi method. After that, using the best combination of segmentation parameters, the images were classified using some defined rule-sets. Classification results are then further analyzed to extract flooded areas. Finally, flood maps are exported into GIS end their accuracy was measured by different matrices based on a confusion matrix.

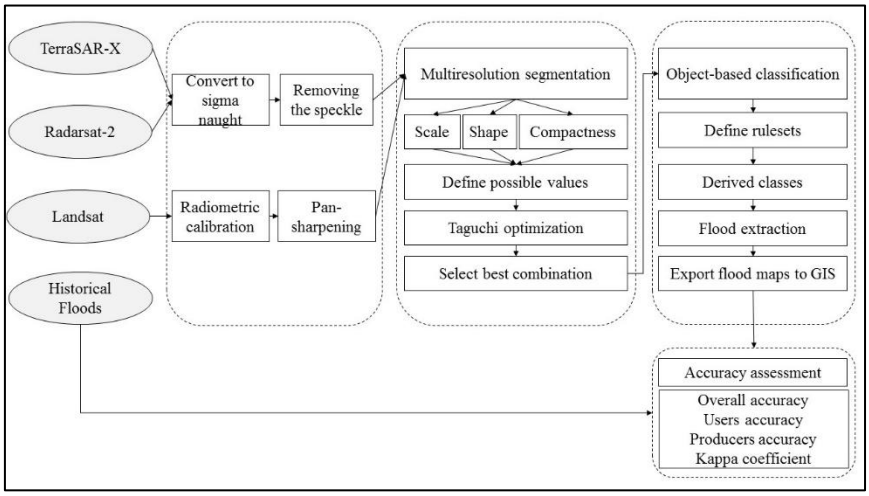

Figure 1: Overall workflow implemented to detect flooded areas in SAR images

3.0 Results and Discussion

Water bodies during the flooding period were extracted from SAR images which includes normal waters and flooded areas. The results from this step were intersected with the normal water bodies extracted from landsat images provided the flooded areas. Fig. 2 shows the flooded areas detected in TerraSAR-X image using the proposed method. On the other hand, Fig. 3 presents the results of detected flood from multitemporal Radarsat-2 images. The results were combined and presented according to the flood events occurred in the study area. Shadow effect was assessed in both Landsat and SAR images; because both study areas are mostly vegetated areas, in Landsat images it was assumed that there is no miscalssfication between shadow and water. However, this issue was seriously considered in SAR images because shadow has significant effect in SAR images. The shadow effect in SAR images was analzyed by evaluating the backscatter values in multitemporal SAR images; water has low variations in backscatter values comparing to shadow and paddy fields. This analysis helped in identification of shadows and remove them from classified images.

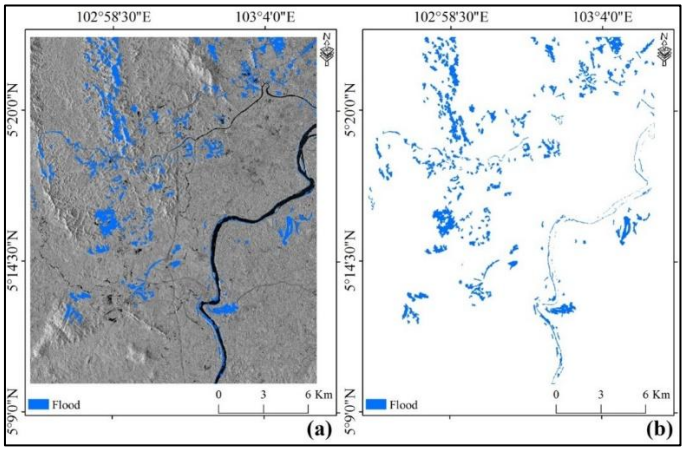

Figure 2: Extracted flooded areas from TerraSAR-X image, (a) overlapped on SAR image, (b) from TerraSAR-X image using the proposed method

The TerraSAR-X and Radarsat-2 images used in the current study were HH polarized. Such polarization data is less affected by variations in water surface roughness caused by wind or vegetation compared with other polarization types (Herrera-Cruz et al., 2009). In addition, the HH-polarized backscattered coefficient generally presents higher contrast between water and land surfaces (Henry et al., 2006). In addition, the results showed that with SAR images, the boundary of water bodies could be more accurately delineated compared with Landsat images. This is because with spatial resolution, pixels are usually mixed from various classes. For example, most of the narrow streams can be misclassified as vegetation or bare lands (neighbour to streams). Thus, using SAR images of non-flooding period could produce more accurate normal water body maps but unfortunately, the cost of projects will be increased. Therefore, more advanced techniques such as integration of spectral unmixing and OBIA is a good topic for future works.

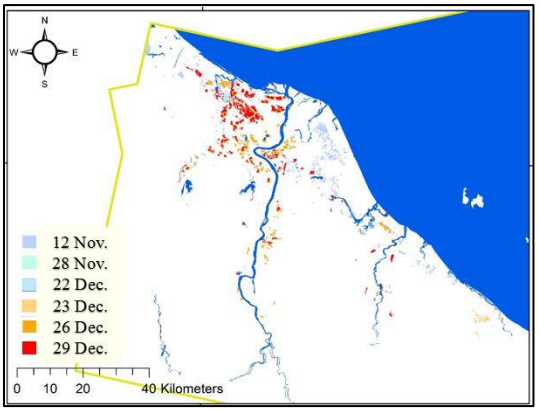

Figure 3: Extracted flooded areas from multitemporal Radarsat-2 images; presented according to flood events dates

4.0 Conclusion

4.1 This study presented a novel method for flood inventory mapping using integration of Taguchi optimization and OBIA for SAR images which has an excellent application in tropical countries like Malaysia.

4.2 TerraSAR-X image was used to develop the flood detection method whereas a series of Radarsat-2 images were used to validate the proposed method. Water bodies during flooding period was extracted from SAR images.

4.3 Taguchi optimization enhanced the segmentation results which significantly enhanced the results of classified images and subsequently the accuracy of extracted flooded areas.

4.4 OBIA allowed the use of texture information for improving the discrimination among various features and thus enhancing the results of extracted flooded areas.

4.5 In addition, the application of OBIA allowed easily the export of flooded areas and calculating their characteristics such as surface areas, locations etc.

4.6 Based on the overall accuracies and Kappa coefficients obtained from accuracy assessment study, the proposed method was considered efficient and reliable for flood inventory mapping. In addition, the method is rapid, easy to implement with common commercial software packages and semi-automatic.

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POWER MANAGEMENT SYSTEM FOR DISASTER RELIEF CAMP BY USING LOW VOLTAGE DC MICROGRID

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1.0 Introduction

In 2014, Malaysia was hit by one of the worst flood disaster in history where more than 100,000 victims have been moved to evacuation centre. In Kelantan area, there are extreme cases where victims have to live without food, clean water and electricity for more than 40 hours due to the severity of floods that prevented delivery of aids (Malaymail Online, 2014). In addition, electricity has to be cut off to avoid electrical hazards to the people.

Electricity supply is one of elements required to support humanitarian aids such as disaster relief centre or camps. Categorized under disaster preparedness, it is needed to provide security and convenient for the victims and their families involved and also for humanitarian workers activities. So far, electricity technology for disaster relief centre is not given serious attention since government's building are normally been used as a centre where electricity is already available. In the meantime, outdoor camps only focused on traditional fuels such as wood, biomass, agricultural waste and conventional fossil fuels for heating, cooking, lighting and fuel driven electric generators for power (Franceschi, Rothkop, & Miller, 2014). However, based on the extreme case during 2014 flood disaster, backup power supply especially portable that could support basic loads such as for lighting and communication devices should be considered.

Motivated by environmental and economic conditions, renewable energy resources such as from solar photovoltaic (PV) is currently among popular technologies used especially for remote and rural electrification. In recent years, tremendous improvements in efficiency and cost effectiveness of solar PV technology have been made (Shah et al., 2012). In addition, there have been intensive efforts to utilize DC in distribution system to supplement the traditionally used AC system (Sidopekso & Taufik, 2013). Moreover, many of today's consumer loads are available at low voltage DC such as LED lightings and hand phone's charger (Ghareeb, Mohamed, & Mohammed, 2013). The advancement achieved in power electronics has made the DC voltage regulation a simpler task and better efficiency. Today's solid-state switching DC converters have a power conversion efficiency in the range of 95% (Shenai, Shah, & Member, n.d.).

2.0 Methodology

The objectives of this project is to design a centralized power sharing scheme at low voltage DC of five nodes with sets of loads, powered from renewable energy resource which is solar PV. The methodology of the project is shown in Figure 1 which consists of DC load configuration, sizing of PV array and balance of system (BOS), simulation and lastly hardware implementation.

Figure 1: Methodology of the project

In general, a relief camp will consist of basic electrical appliances such as lightings, fans and hand phones charger while a common area in a camp could be equipped with compound lightings and refrigerator to store foods and medicine. These loads will be divided according to their power ratings where the high power loads will operate at higher voltage level such as 48V while the low power appliances operate at low voltage level such as 12V. Compared to AC system, the energy conversion losses of DC system is minimized (Amin, Arafat, Lundberg, & Mangold, 2011) since there

is no reactive power losses (Diaz et al., 2015). The list of loads with their respective power rating together with their daily energy requirement is shown in Table 1.

Table 1: Daily Energy Estimation for Relief Camp

No	Appliances	Rated Power (W)	Quantity (Unit)	Operation Hours (h)	Energy Required (Wh)	Notes
1.	Lighting	12	10	6	720	Individual Camp
2.	Fan	12	10	6	720	
3.	Charger	5	10	6	300	
4.	Flood Lighting	30	6	6	1,080	Common Area
5.	DC Air -Conditioning	1,000	1	6	6,000	
Total Daily Energy Required					**8,820**	

Next step would be sizing the solar PV array to meet the required energy demand. The estimation of solar PV array output is based on annual solar energy record which is obtained from Malaysia Meteorological Department (MMD). It is assumed that the output energy of a PV array is a function of peak sun shine hours and temperature. Figure 2 shows the average daily solar irradiation and average maximum temperature for Kota Bharu for 20 years (1994-2013).

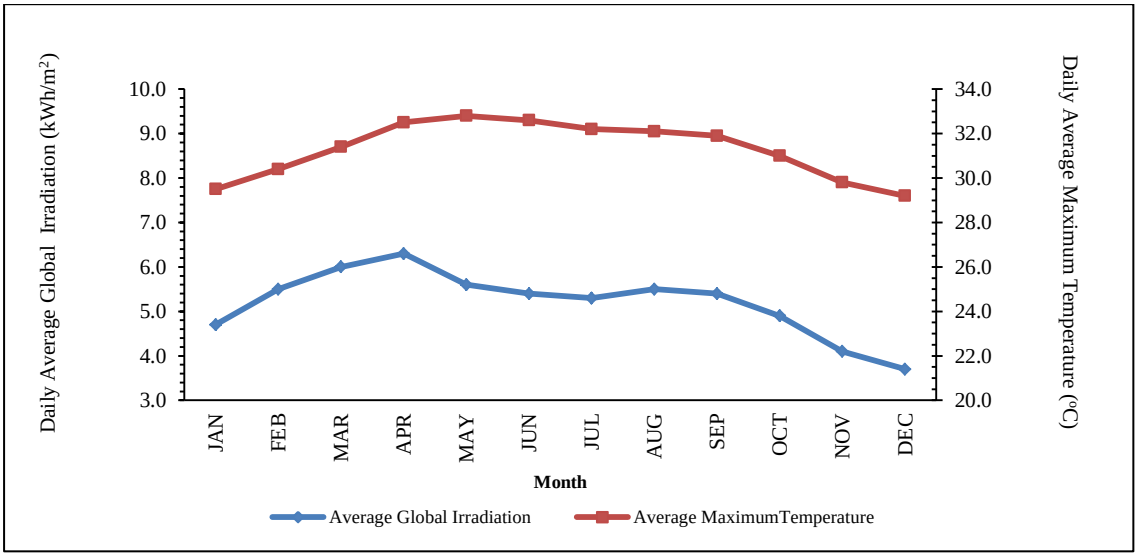


Figure 2: Meteorological Data for Kota Bharu, Kelantan

The estimation of energy generated from PV array is simplified and calculated based on equation below (A.M. Omar, S. Shaari, S.I. Sulaiman, 2012).

$$E_{array} = P_{array} \times PSH_{period} \times f_{temp\_avg} \quad (1)$$

where

E_{array} is PV array yield in kWh
PSH_{period} is Peak Sun Hour
f_{temp_ave} is temperature de-rating factor

The temperature de-rating factor, f_{temp_ave} is given by the equation (2).

$$f_{temp\_ave} = 1 + \left[\left(\frac{\gamma_{pmp}}{100} \right) \times \left(T_{cell\_ave} \times T_{stc} \right) \right] \quad (2)$$

where

γ_{pmp}	is temperature coefficient for Pmp (%/^{o}C)
T_{cell_ave}	is average daily maximum cell temperature
T_{stc}	is cell temperature at standard test condition (STC) (25^{o}C)

The average cell temperature, T_{cell_ave} is given by equation (3).

$$T_{cell\_ave} = T_{amb\_ave\_max} + \left[\left(\frac{NOCT - 20}{800}\right) \times G_{amb\_ave\_max}\right] \quad (3)$$

$T_{amb\_ave\_max}$	is average daily maximum ambient temperature (^{o}C)
$NOCT$	is Nominal operation cell temperature (^{o}C)
$G_{amb\_ave\_max}$	is average daily maximum solar irradiance (Wm^{-2})

The system will operate in stand-alone mode where the power will be totally in DC. However, for special loads that powered by AC, inverter could be used to convert from DC to AC. The energy generated from solar PV array will be stored in the battery bank. The operation and management of the system in is controlled and coordinated by local controller to ensure energy optimization for the micro-grid and to perform protection coordination for the system. Figure 3 shows the block diagram of the system.

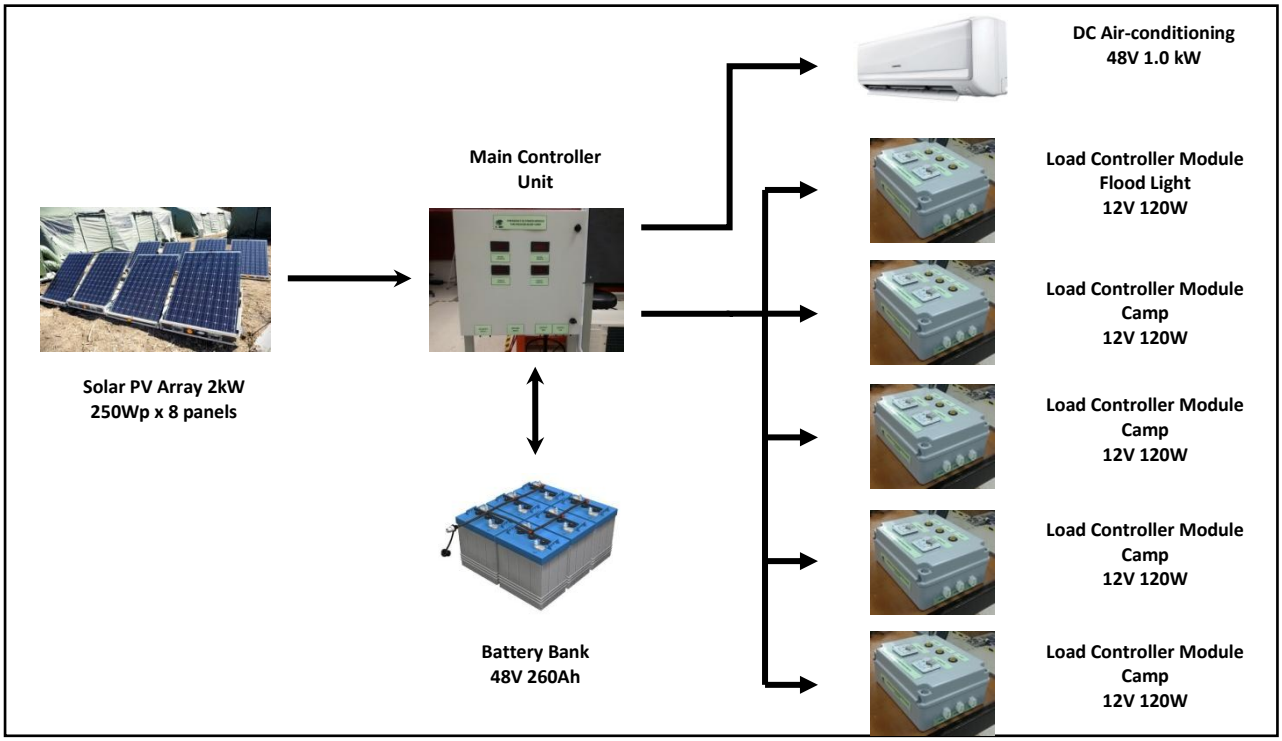


Figure 3: Block diagram of the system

3.0 Results and Discussion

The performance of the system is show in Figure 4 below. For the 2 kW of PV array, the energy generated exceeded the energy demand for every month in a year except in January, October, November and December. If the size is increased to 2.5 kW, then energy demand is not meet only in December. If the size is increased to 3 kW, the energy demand could all be fulfilled but there are huge amount of surplus energy that not be utilized on other months.

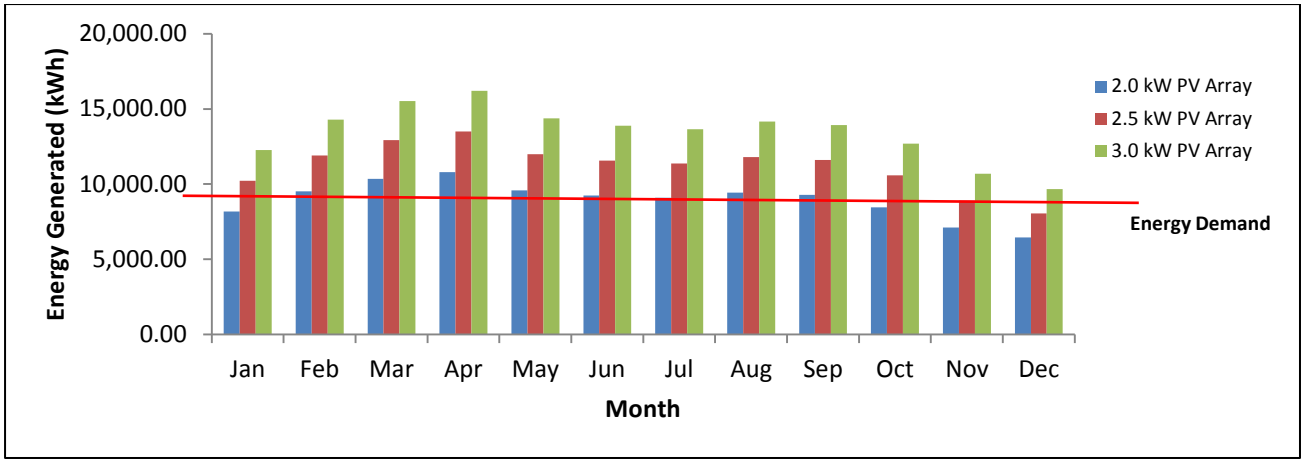
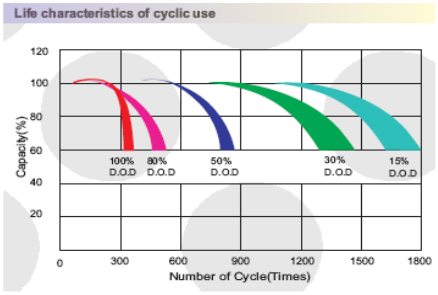


Figure 4: Energy Generated from PV Array for Relief Camp

For battery bank, the performance is shown in Figure 5. The daily energy used only 183.75 Ah which is 35% of depth of discharge. With this characteristic, the battery bank could last for around 1,200 cycles which is more than 3 years. If it is used continuously for 2 days without charging, then it is 71% of depth of discharge and could operate up to 600 cycles which is less than 2 years. If it is used continuously for 3 days without charging, then it is 100% of depth of discharge and could operate up to 300 cycles which is less than 1 years.



Depth of Discharge (DOD)	Voltage Level (V)	Capacity (Ah)
0%	56.0	520
20%	52.0	416
40%	48.0	312
60%	44.0	208
80%	40.0	104
100%	36.0	0

Figure 5: Battery bank performance

4.0 Conclusion

The totally DC power system for disaster relief camp based on renewable energy resource which is solar PV has been studied, designed and developed. The conclusions are:

4.1 The DC load is configured based on load's power rating which are high (48V) and low (12V). The battery bank will be at 48V and DC converter is used to step down the voltage level to 12V.

4.2 The PV array needs to oversize in order to meet the energy demand, since flood normally occurred in December which has the lowest solar irradiation in a year.

4.3 The DC loads are not common to the market especially for cooling, however it has better efficiency.

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DEVELOPMENT OF LOW COST MASS SUPPLIABLE WATER PURIFIER FOR FLOOD DISASTER

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1.0 Introduction

Disastrous flood in Malaysia, since December 2014, leaved huge number of victims with deficiency of water, food, energy and transportation. Lack of potable water is one of the most serious problems, since it is the most vital factor or human life. Since water is relatively heavy goods to be delivered with wrecked transportation system, mass-supplying effective water purification system to the victims would be practical. The system should satisfy following conditions: 1. Low cost and easy to make; 2. Easy to transport, install and operate; 3. Small energy consumption (or powered by renewable energy, inexpensive batteries or human power which are easily accessible on the user's places); 4.Outdoor usable; 5. High credibility, especially on sterilization aspect. Some appropriate technologies, such as charcoal filtering water purifiers is one of good candidate. Generally, sterilization is one of the most important factors in flood situation, since water borne infection frequently epidemics on flood and after-flood. Hence, it is required to develop certain water purification system with highly reliable sterilization even with overused filters. Ozone is effective for water sterilization. Therefore, through this project, we are going to develop converged system of traditional low cost filter and ozone sterilizer.

2.0 Methodology

The project has 4 parts: (1) designing and development of pre-filter; (2) design and development of water sterilizer; (3) converge the filter-sterilizer to make whole system; (4) test the system in actual condition. Carbon based charcoal filter with more site-practical design would be developed. This type of filter has been proven its performance and economic feasibility. However, improvement design can be developed for easier installation and usage. Ozone-sterilizer is effective on killing bacteria and fungi in water. It is proven technology with various commercialized product. However, most of them are in form of in-house application form with relatively expensive cost. The new ozone generating sterilizer which is optimized for outdoor with minimal power and low cost would be developed and applied. The filter and sterilizer would be assembled to make whole system and tested the performance. The water quality would be tested especially on measuring the content of microorganism.

3.0 Results and Discussion

The water sample is taken from sewer outlet which initially records an ATP reading of 2374. The first experiment was conducted by using only PAK filter that shows a significant reduction in ATP reading to 354, which is in about 85.1% has been reduced from its initial reading. This proves that most of the micro-organisms has been removed out of the water sample by using the water filter. The next test is performed using the sterilization method alone, often known as solar water disinfection (SODIS). The ATP reading is reduced to 144 when the bottle containing the water sample was left exposed under the sunlight on sunny day for 2.5 hours with a reduction percentage of 93.9%. The SODIS seems much more effective in killing the micro-organism compared to the PAK filter. However, SODIS does not involved the process of removing chemical contaminants which is harmful to the health of the consumer, whereas it can be done by using the PAK filter. A complementary process of filtration followed by sterilization using the PAK filter and SODIS methods for 2.5 hours in sunny condition has greatly improved the result to 13 which is about 99.5% of ATP has been reduced from the same water sample.

Table 1

Treatment condition	ATP reading	% of reduction
Without Treatment	2374	-
PAK filtered	354	85.1%
SODIS (Sunny, 2.5 hrs)	144	93.9%
PAK filtered, then SODIS (Sunny, 2.5 hrs)	13	99.5%
SODIS (Sunny, 2.5 hrs + Cloudy 4.5 hrs)	71	97.0%
PAK filtered, then SODIS (Sunny, 2.5 hrs + Cloudy 4.5 hrs)	7	99.7%
SODIS (Sunny, 2.5 hrs + Cloudy 4.5 hrs) Followed by 3 days storing at room temperature	466	80.4%
PAK filtered, then SODIS (Sunny, 2.5 hrs + Cloudy 4.5 hrs) Followed by 3 days storing at room temperature	110	95.4%

The second test was carry out once again for the SODIS water sterilization technique with a longer time, and exposing to two different conditions of weather on the same day as shown in Table 1. The ATP reading decrease to 71 and the percentage of reduction is around 97.0%. The integration of PAK filter and SODIS, which made up the whole water purification system also yields a remarkable result when a longer time spend on water sterilization process. Thus it can be concluded that the longer the time water sterilization takes place, the better the result produced from the water purification process. Since the ATP reading is not completely reduced to 0, therefore the micro-organism will start to regrowth when the water sample was left for three days at room temperature, thus showing an increase to the ATP reading as shown in Table 1.

During the flood, it is a common situation when there is no sunlight for the whole day which might caused some water purifying process such as SODIS could not be done. It is almost impossible to sterilize the water using this method because it requires the sunlight to kill the micro-organisms using the UV-A rays and high temperature. As for the PAK filter, only a fairly clean water is preferable to be treated because some micro-organisms, especially in a heavily contaminated water can pass through the sand and charcoal configuration of the filter. The combination of PAK filter and SODIS sterilization method is suitable for most water quality but still it has to consider about the weather which determines the effectiveness of the water purification system.

4.0 Conclusion

4.1 New portable water source can be developed for disaster event, such as flood

4.2 The water source can be also used for remote resident people or military who cannot access to clean potable water easily.

4.3 By mass producing and stockpiling the system, developed from the current project, portable water supply can be more secured in case of natural disaster or emergency.

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A NOVEL MULTI OBJECTIVE MULTI CRITERIA DECISION SUPPORT SYSTEM FOR LOGISTIC MANAGEMENT FOR FLOOD DISASTER

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1.0 Introduction

Flooding is one of the major disasters with damages costing up to USD60 billion per year. United Nations also estimates, more than 500 million people displaced with the number of casualties exceeding 20,000 in Asia only (Dutta, Wright, & Rayment, 2012; Menne & Murray, 2013). Specifically in Malaysia, damages due to flood is estimated to be more than RM1 billion in 2014 alone. Although the flood occurrence is somewhat predictable and cyclic but the severity is often not, due to others several external factors such as the level of general industrialization, deforestation as well as changes in rain patterns. Furthermore, the severity of the impact of flood disaster is highly correlated to the challenge of getting the right help and managing resources to the flood prone area effectively. In condition of limited resources, with high number of constraints and high urgency, optimum decision and right decision are crucial. Furthermore, relevant data required for the decision making is rapidly changing (Blistanova, Katalinic, Kiss, & Wessely, 2014). It is very critical situation, involving the peoples, physically and emotionally.

In crisis management, reliable, fast and accurate decisions are indispensable. Wrong decision can impulsively escalated into a life and death situation. In stance of various outward pressures towards the decision making comprising from the affected family members and the public, the decision made can sometime become no longer objective. In the end, it is not uncommon that the decision was made in favor to those who can exert strongest pressure which often not balancing and optimizing the available resources. Likewise, in crisis, human judgment can deviate from optimal and bias due to sudden increase in the number of constraints and uncontrolled variables (Aue & Okon-Singer, 2015; Savani & King, 2015). Thus, to alleviate this issue of making the right decision, we bring forward the decision support system with an optimization to help better, reliable and unbiased decision making process during critical flood situation. This research proposed a framework which includes two integrated models comprising location ranking via Analytical Hierarchical Process (AHP) and transport scheduling via integer linear programming. The applicability of the decision making model was illustrated through a case study.

2.0 Methodology

An optimized decision-support framework of flood risk environments is developed. This framework encompass of several phases. First phase include; flood zones selection and location rank priority by means of Analytical Hierarchical Process (AHP), the second phase is assignation of the Relief Centre Ranking and the third phase is determination of right method of transport to either evacuate victims or to send supply to victims by Transportation Ranking model. All the models developed in each phases is applied to the villages in Dungun which is one of the mostly affected districts in Malaysia.

2.1 Phase 1: Analytical Hierarchical Process (AHP) for Location Ranking

Saaty established the AHP method in 1970s for investigating and organizing complex decisions based on intelligent and mathematics. This AHP subsist as an Eigenvalue method to the pair-wise comparisons. AHP procedure is abridged as below (Saaty, 1987; Vaidya & Kumar, 2006):

(1) Define the problem or objective
(2) Structure the hierarchy of decision
(3) Create a series of pairwise comparison matrices.
(4) Check the consistency of the outcomes. The consistency ratio (CR) is calculated with the evaluation matrix. The value must not be higher than 0.1
(5) Weight the superiorities and produce cluster comparisons for every cluster element.
(6) Add all weighted rates and obtain its overall priority.

2.2 Phase 2: Ranking of Relief Centre

Relief center ranking is basically design based on transportation model and linear programming. The model consists of following components and as shown in Figure 1 (a).

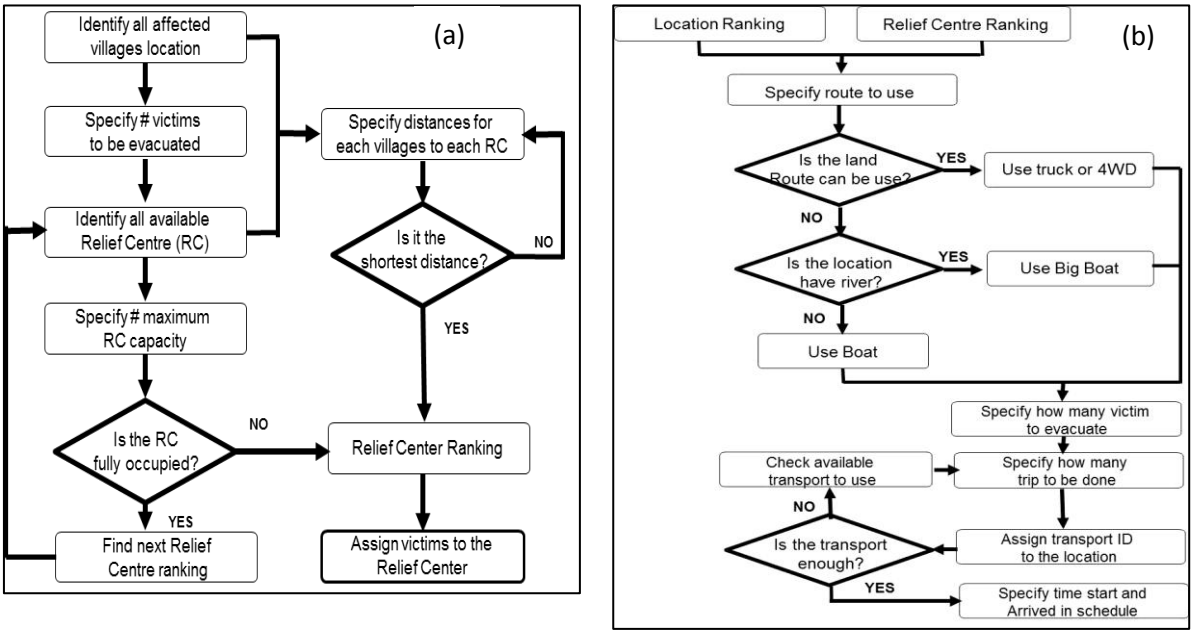

Figure 1. (a) Flowchart of Phase 2: Relief Centre Ranking. (b) Flowchart of Phase 3: Transportation Ranking.

2.3 Phase 3: Transportation Scheduling

Transportation scheduling is based on the location ranking and relief center ranking determined in previous step. The outcomes from the scheduling model are the routes and type of transport to be used for evacuation depending on the accessibility of the routes and the availability of transport. The framework for the scheduling is shown in Figure 1 (b).

3.0 Results and Discussion

Based on Dungun flood report in 2013 and 2014, it can be concluded that major contributing factors of the flood are the alliance of high sea tides, amount of rainfall (exceed 150mm per day, for two days in a row), and high river water level. Thus, the hydrology cluster will expose the major contributing factors as three node elements which are sea tides, rainfall, and river water level. Next important cluster is the location aspect. This is important cluster as it consists of topography of land, either low or high type land, flood spread, and flood depth during flood occurrence. Other influential cluster is the population of each villages. This population involves a demographic and sociology of specified village, which will influence type of supplies and transport needed during rescue period. Consequently, it is included as one of main cluster in the model. The entire clusters are then weighted based on their significant impact on flood disaster.

For weighting factors, the weights for each factor are computed in pairwise comparison matrix as in Table 1. The heaviest weighted factor is Location and slightly followed by Hydrology with weight of 0.4806 and 0.4054 respectively. While Population gives less influence with weight value of 0.1140. The calculated CR of the ruling matrix is 0.03, far less than 0.1, which means the consistency of the judgments is acceptable. AHP steps then continues for scoring each element. After that, the ranking determination process is identified based on the sum product of weight factor and criteria score.

Table 1**:** Pairwise matrix comparison for calculating weights factor

Attributes	Hydrology	Location	Population	Weight
Hydrology	1	1	3	0.4054
Location	1	1	5	0.4806
Population	1/3	1/5	1	0.1140

Other than that, based on weighting factors developed, AHP model can be assessed using Eq. (1). Detailed data is compiled in published journal as reported above. Based on Dungun case study, the suggestible assessment model of location ranking during flood is as follows:

$$y_i = 0.1135x_{1i} + 0.1081x_{2i} + 0.1838x_{3i} + 0.1602x_{4i} + 0.1335x_{5i} + 0.1869x_{6i} + 0.1140x_{7i} \quad (1)$$

Where the subscript x_i is the criteria define by the decision maker person during the crisis. The highest rating represents the prior location to cater during flood and arranged as in Figure 2

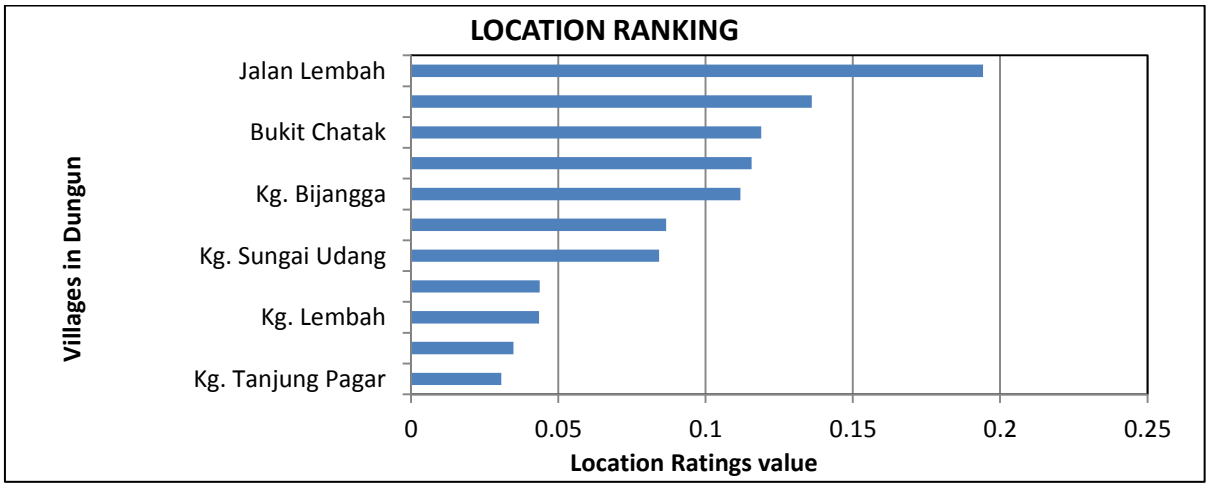

Figure 2 Application of AHP using random criteria determination for location ranking in Dungun

3.2 Relief Centre Ranking

The result of relief center ranking is presented in Excel Spreadsheet and included in Figure 3.

1	KUALA DUNGUN												
2	Objective: Minimize distance			339									
3													
4	Relief Center Ranking	SK Bandar Dungun	SK Pusat Dungun	SK Kuala Dungun	Balai Raya Kg. Lembah	SK Sura	SK Batu 48	Surau Hj Hitam	Balairaya Sura Utama	Balairaya Kubang Miang	#no of Victims		Village
5	Kg. Sungai Udang	80	0	0	0	0	0	0	0	0	80	=	Kg. Sungai Udang
6	Kg. Bijangga	72	0	0	0	0	0	0	0	0	72	=	Kg. Bijangga
7	Kg. Tanjung Pagar	0	72	0	0	0	0	0	0	0	72	=	Kg. Tanjung Pagar
8	Kg. Nibong Bawah	0	8	0	0	0	0	0	0	0	8	=	Kg. Nibong Bawah
9	Kg. Sungai Buaya	0	0	23	0	0	0	0	0	0	23	=	Kg. Sungai Buaya
10	Jalan Lembah	0	0	10	0	0	0	0	0	0	10	=	Jalan Lembah
11	Kg. Lembah	0	0	0	0	0	0	0	0	0	0	=	Kg. Lembah
12	Jln Bunga Raya	0	0	0	0	35	0	0	0	0	35	=	Jln Bunga Raya
13	Kg. Alor Tembesu	0	0	0	0	0	0	0	0	0	0	=	Kg. Alor Tembesu
14	Jalan Kenanga	0	0	0	0	0	0	0	12	0	12	=	Jalan Kenanga
15	Bukit Chatak	0	0	0	0	0	0	0	0	27	27	=	Bukit Chatak
16	#no of Victims	152	80	33	0	35	0	0	12	27			
17		<=	<=	<=	<=	<=	<=	<=	<=	<=			
18		750	500	500	30	500	500	30	50	50			
19	RC Occupied	630	209	330	25	879		30	44	39			

Figure 3. Relief Center Ranking in Microsoft Excel

3.3 Transportation scheduling

For transportation scheduling, optimization have been done for several steps in Microsoft Excel sheets. Final results consist of Rank of location, route of transportation, time used, victims needed to evacuate and the assigned transport with trips. Final dummy transportation scheduling in Excel is as shown in Figure 4.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Start	Arrived	Ranking	Transport	Transport ID	Route	Village	Villagers to evacuat	Relief Centre	Time travel	Load + Unload Time	Capacity per trip	Job sequence
2	8:00 AM	8:30 AM	1	Boat	B01	Jalan Lembah - SK Kuala Dungun	Jalan Lembah	10	SK Kuala Dungun	10	20	8	1
3	8:00 AM	8:30 AM	1	Boat	B02	Jalan Lembah - SK Kuala Dungun	Jalan Lembah		SK Kuala Dungun	10	20	8	2
4	8:00 AM	8:40 AM	4	Boat	B03	Kg. NIbong Bawah - SK Pusat Dungun	Kg. NIbong Bawah	8	SK Pusat Dungun	20	20	8	1
5	8:00 AM	8:35 AM	5	Boat	B04	Kg. Bijangga - SK Bandar Dungun	Kg. Bijangga	72	SK Bandar Dungun	15	20	8	1
6	8:00 AM	8:35 AM	5	Boat	B05	Kg. Bijangga - SK Bandar Dungun	Kg. Bijangga		SK Bandar Dungun	15	20	8	2
7	8:40 AM	9:15 AM	5	Boat	B01	Kg. Bijangga - SK Bandar Dungun	Kg. Bijangga		SK Bandar Dungun	15	20	8	3
8	8:40 AM	9:15 AM	5	Boat	B02	Kg. Bijangga - SK Bandar Dungun	Kg. Bijangga		SK Bandar Dungun	15	20	8	4
9	8:50 AM	9:25 AM	5	Boat	B03	Kg. Bijangga - SK Bandar Dungun	Kg. Bijangga		SK Bandar Dungun	15	20	8	5
10	8:40 AM	9:15 AM	5	Boat	B04	Kg. Bijangga - SK Bandar Dungun	Kg. Bijangga		SK Bandar Dungun	15	20	8	6
11	8:40 AM	9:15 AM	5	Boat	B05	Kg. Bijangga - SK Bandar Dungun	Kg. Bijangga		SK Bandar Dungun	15	20	8	7
12	9:20 AM	9:55 AM	5	Boat	B01	Kg. Bijangga - SK Bandar Dungun	Kg. Bijangga		SK Bandar Dungun	15	20	8	8
13	9:20 AM	9:55 AM	5	Boat	B02	Kg. Bijangga - SK Bandar Dungun	Kg. Bijangga		SK Bandar Dungun	15	20	8	9
16	10:00 PM	10:30 PM	10	Boat	B04	Jalan Kenanga - Balairaya Sura Utama	Jalan Kenanga	12	Balairaya Sura Utama	10	20	8	1
17	11:00 PM	11:30 PM	10	Boat	B05	Jalan Kenanga - Balairaya Sura Utama	Jalan Kenanga		Balairaya Sura Utama	10	20	8	2
19	8:00 AM	8:50 AM	2	Big_Boat	BB1	Kg. Sungai Buaya - SK Kuala Dungun	Kg. Sungai Buaya	23	SK Kuala Dungun	15	30	20	1
20	8:00 AM	8:50 AM	2	Big_Boat	BB2	Kg. Sungai Buaya - SK Kuala Dungun	Kg. Sungai Buaya		SK Kuala Dungun	15	30	20	2
21	8:55 AM	9:25 AM	7	Big_Boat	BB1	Kg. Sungai Udang - SK Bandar Dungun	Kg. Sungai Udang	80	SK Bandar Dungun	10	30	20	1
22	8:55 AM	9:25 AM	7	Big_Boat	BB2	Kg. Sungai Udang - SK Bandar Dungun	Kg. Sungai Udang		SK Bandar Dungun	10	30	20	2
23	9:30 AM	10:20 AM	7	Big_Boat	BB1	Kg. Sungai Udang - SK Bandar Dungun	Kg. Sungai Udang		SK Bandar Dungun	10	30	20	3
24	9:30 AM	10:20 AM	7	Big_Boat	BB2	Kg. Sungai Udang - SK Bandar Dungun	Kg. Sungai Udang		SK Bandar Dungun	10	30	20	4
26	8:00 AM	8:30 AM	3	Truck	TR1	Bukit Chatak - Balairaya Kubang Miang	Bukit Chatak	27	Balairaya Kubang Miang	5	20	10	1
27	8:00 AM	8:30 AM	3	Truck	TR2	Bukit Chatak - Balairaya Kubang Miang	Bukit Chatak		Balairaya Kubang Miang	5	20	10	2
28	8:00 AM	8:30 AM	3	Truck	TR3	Bukit Chatak - Balairaya Kubang Miang	Bukit Chatak		Balairaya Kubang Miang	5	20	10	3
29	8:00 AM	8:26 AM	11	4WD	WD1	Kg. Tanjung Pagar - SK Pusat Dungun	Kg. Tanjung Pagar	72	SK Pusat Dungun	10	20	6	1
30	8:00 AM	8:26 AM	11	4WD	WD2	Kg. Tanjung Pagar - SK Pusat Dungun	Kg. Tanjung Pagar		SK Pusat Dungun	10	20	6	2
31	8:00 AM	8:26 AM	11	4WD	WD3	Kg. Tanjung Pagar - SK Pusat Dungun	Kg. Tanjung Pagar		SK Pusat Dungun	10	20	6	3
32	8:35 AM	9:05 AM	11	Truck	TR1	Kg. Tanjung Pagar - SK Pusat Dungun	Kg. Tanjung Pagar		SK Pusat Dungun	10	20	10	4

Figure 4. Transportation scheduling in Microsoft Excel

4.0 Conclusion

4.1 The decision support system presented is essential to help provide a better, unbiased and reliable decision making process during critical flood situation due to limited resources and ever changing constraints

4.2 This model developed consist of Analytical Hierarchical Process (AHP) as a decision making tool for location risk ranking, transportation and network model to optimize the use of resources such as transports and relief centers.

4.3 Major contributing factors of the flood are the alliance of high sea tides, amount of rainfall (exceed 150mm per day, for two days in a row), and high river water level.

4.4 A district in Terengganu, Malaysia Dungun was selected as case study to illustrate the successful application of the proposed framework. However, the obvious limitation of the current framework is location specific and the input data has to be updated as the location changes. Thus, a more comprehensive data base system is needed to integrate with the current framework for nation-wide implementation.

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INNOVATIVE CONSTRUCTION OF FLOATING LIGHT WEIGHT AFFORDABLE HOUSE DESIGNED FOR FLOOD RESISTANT

Project Information

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1.0 Introduction

In recent development of flood in Each Coast of West Malaysia, a lot of houses have been washed away due to flood. Most of the houses were built by timber and can easily wash away by flood. Therefore, it is very important to look into an alternative way of constructing the house that can float but not wash away by flood. This proposed housing system should take into consideration on the aspect of cost, easy to construct and speedy in time of construction. This research will address all aspects of construction that will also cover on the issue of sustainable construction. Some of the materials that will be considered in the construction are the cold-formed steel, the light-weight concrete and weatherproof cladding. The system will focus on the concept of Industrialised Building System (IBS) to reduce the cost and to reduce the construction time. A floating house is proposed to solve the problem of typical timber house that can easily wash away by severe flooding. Cold-formed steel integrated with foam concrete is proposed for the main structures of the house. It is expected that the proposed system is able to function during high flood season.

2.0 Methodology

Research methodology described in this section covers on literature review on current information, design development, structural behavior, ability to float and establishment of standard design guideline and project documentation. First phase of this research begins with the literature review on types of cold-formed steel section, type of foam concrete and framing system, types of floating structural system, and type of construction and cost of construction. Second phase covers on design development which leads to investigation on material properties, behavior of the cold-formed steel section and foam concrete, formulation of overall structural design including the strength and ability to float. Cost comparison will also be carried out with the existing construction system followed by testing and assessment of the proposed design.

Third phase in this research is to determine the optimum size and shape of the proposed system that can perform well before and during severe flood, and lastly the method of construction and cost of construction will be compared. Testing and data collection are carried out on the load capacity of steel section and foam concrete. Testing on individual steel section integrated with foam concrete for different geometrical configuration will be conducted on the proposed design and the final design will be tested for overall structural performance based on the dead and live load applied before and during flooding. The last phase of this research is to formulate guideline for design and construction, establishment of standardized section and documentation for final reports and publications in terms of design guides.

3.0 Results and Discussion

The proposed model for the floating lightweight structure studied in this research proposal as shown in Fig. 1 has been tested for possible floating structure.. The proposed structure comprised of cold-formed steel section assembled together to form a box section. A profiled metal decking slab with concrete or lightweight foam slab is attached on top of the box section to integrate together as composite structure using tek-screws as studs. The void developed from the formation of box section will be filled with polystyrene materials so that the structure can float. It was proven that the structure was able to function like a pontoon where it can float during flood. Full scale testing of the proposed structure has proven that it can float.

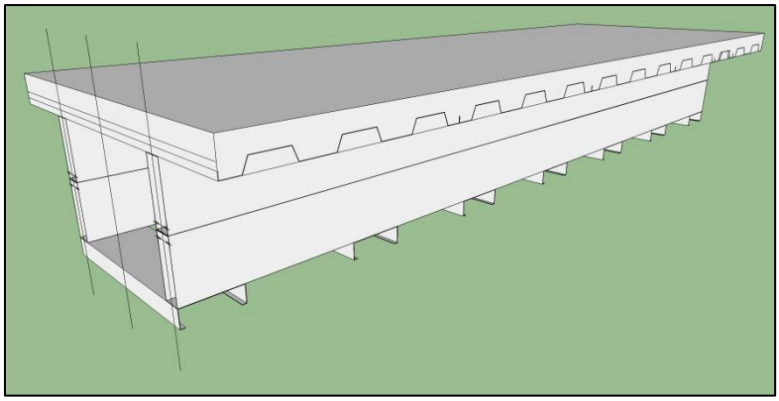

Fig. 1 A composite structure of “box section” to be functioned as floating structure.

4.0 Conclusions

The concluding remarks from the study are listed as follows:

4.1 The proposed lightweight composite slab panel is an innovative idea as floating structure yet capable to carry load with sufficient strength and stiffness.

4.2 The proposed composite structure system comprised of cold-formed steel beam integrated with normal weight concrete is suitable for floating structure.

4.3 The use of cold-formed steel integrated with profiled decking concrete slab and chem board as slab to form a floating structure has been performed very well.

4.4 The use of polystyrene to increase the floating structure was very successful.

4.5 The performance of the floating structure is not restricted to the height of the rising flood water.

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PRODUCTION AND REPLACEMENT OF KELI, C*larias gariepinus* SEEDS AND BROODSTOCKS TO KELI FARMERS AFFECTED WITH FLOOD DISASTERS

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1.0 Introduction

The worst flooding which hit Malaysia on 2014 had caused massive economic losses to fish farmers as farmed fish and infrastructure were washed away and destroyed. The hardest hit areas were at on the East coast of Peninsular Malaysia which recorded highest damage to human life and deterioration of the environment[1]. Fish farmers were among the people whom received highest impact from the flood as they faced with the loss of thousands of ringgit worth of farm assets and fish. Thus, the fastest and best mitigations are by providing the farmer fish seeds to grow and sell, and good quality brood stock to fish farmers engaging in breeding. This project was carried out to do mass production of catfish seeds and fingerlings, produce good quality brood stocks to be distributed to farmer, and provide farm inputs especially brood stocks and seedlings to affected fish farmers to enable them to restock their fish ponds and restart production. Furthermore, this project aims to determine the disease agents which may cause disease outbreak among cultured fish after flood, thus, provide funds and mitigation to enable the fish farmers repair their damaged` fish hatchery and ponds.

2.0 Methodology

Farmers and areas affected with flood prone were identified and several recommendations and suggestions were make in order to help the affected farmers. The production of catfish seeds were carried out several times to produce and prepare seeds to be distribute to fish farmers.

2.1 Production of catfish seedlings

Good quality and healthy male and female catfish were bought from commercial farms as the breeder and maintained under optimum condition with adequate feeding. Artificial breeding of catfish was carried out by first inducing their maturation by injecting with Ovaprim hormone at dosage of 0.25ml/kg for male brooders and 0.5ml/kg for female brooders. Both male and female catfish will be kept and monitored separately for 8 hours. The eggs were collected by using stripping method while sperm of the male catfish were taken by dissecting out the testicular tissues from the abdomen. The eggs and milt were mixed and clean thoroughly before placing in the incubation tank. The fertilization and hatching rate of spawning eggs were monitored regularly. The water quality and environmental condition of the larvae tank were maintained at optimum condition at all times. Feeding was given to all larvae at satiation, at least twice a day. Water was changed regularly to maintain the cleanliness in the fish tank. Fish larvae was reared in the nursery tank until they reached 1-inch length and at which they were transferred to other tank for grow out.

2.2 Determination of disease agents

The water sample affected with flooded area were obtained and analyzed for microbial profile. 0.1 ml of water sample was aseptically streaked onto tryptic soy agar (TSA, Merck©, Germany) and incubated at 35°C for 24 hour. Representative colonies were isolated and restreaked on fresh medium until pure culture was attained. Single colonies were then picked and maintained on TSA agar for further studies. Several tests were conducted on the colonies obtained for preliminary conventional biochemical tests which include catalase and oxidase tests. Morphological observation on the bacteria obtained was carried out by Grams staining. Bacterial identification was identified by using commercial Identification Kit of Analytical Profile Index (API 20 E).

3.0 Results and Discussion

More than 100,000 of catfish juveniles was given to the affected farmer. Juveniles given were in good health and has high resistance towards disease. This was proven as the larvae were shown to attain juvenile stage within a month. Keli juvenile which has bigger appetite and attain bigger size as compare to the normal size were isolated and fed intensively for improving its growth to be kept as future broodstock.Currently, almost 90% of the juvenile stage grown to 7- to 8-inch body length.

Table 1: Bacterial Isolates from the water affected with flood in Kelantan River Basin

No.	Bacteria Name	Grams Staining	Catalase	Oxidase	API(%)
1	*Enterobacter cloacae*	Negative	+	+	82.3
2	*Serratia fonticola*	Negative	+	-	25.9
3	*Erwinia spp.*	Negative	-	+	67.5
4	*Chromobacterium violaceum*	Negative	+	+	91.5

Table 2: Bacterial Isolates from the water affected with flood in Pahang River Basin

No.	Bacteria Name	Grams Staining	Catalase	Oxidase	API (%)
1	*Enterobacter asburiae*	Negative	+	+	82.3
2	*Proteus mirabilis*	Negative	-	+	99.9
3	*Pasteurella pneumotropical*	Negative	+	+	95.4
4	*Serratia marcescens*	Negative	-	+	98.6
5	*Pseudomonas aeruginosa*	Negative	+	+	98.7
6	*Aeromonas hydrophila Type 2*	Negative	+	+	98.5

Most of the bacteria found and identified from water samples affected with flood from Pahang and Kelantan river basins consisted of gram negative bacteria and pathogenic to human and aquatic life. Water samples taken from Kelantan river were shown to have several species of gram negative bacteria such as *Chromobacterium violaceum, Enterobacter cloacae, Serratia fonticola* and *Erwinia spp*.which can influence the growth and survival of the aquatic life. Some of it produces natural antibiotic and useful for treatment for colon and cancer, however, it may cause some irritation or skin lesions to humans and aquatic life[2]. As for water sample taken from Pahang river has contained *Enterobacter asburiae, Proteus mirabilis, Pasteurella pneumotropica, Serratia marcescens* and *Pseudomonas aeroginosa*. Some of the bacteria were very pathogenic and harmful to human and aquatic life as it can cause wound and infection to urinary tract and skin. *Aeromonas hydrophila* is one of the dangerous bacteria pathogens as it infects both fish and humans (Janda *et al*., 1996). It can caused haemorhagic septicaemia which are fatal to aquatic and terrestrial animals (Asha *et al.,* 2004). This can cause low survival and decrease the quality of the aquatic life presents in the water and also may cause disease to humans which have direct contact to the water. Many harmful bacteria were proven presents in the water affected with flood which can cause negative effects towards community, thus, direct contact or used of the water must be avoided and minimised.

4.0 Conclusion

Production of high quality of catfish seeds are able to replace the loss due to flood which was faced by farmers. Several important findings from the research are summarized as follows:

4.1 High qualities of catfish seeds produce and given were able to rebuild back farmers business.

4.2 Several types of bacteria found were pathogenic and harmful for the aquatic lives which indicate flood water were prone to disease outbreak.

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AN IMPROVED AND CENTRALISED AID AND RELIEF COORDINATION VIA 2 WAY INTELLIGENT MOBILE GEOSPATIAL REPORTING ALGORITHM FOR FLOOD VOLUNTEERS

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1.0 Introduction

The recent flood disaster has given massive loss to the victims and damaged to certain areas. The instant aid and relief supplies from various sources have reduced the flood victims' burden at some extent. However, there is an argument that arises on the effectiveness of the aid and relief coordination and distribution to the affected area. Various ad-hoc volunteer communities from non-profit organization (NGOs), private parties and individuals were formed to assist in aid and relief operations. Most of them reported their activities to separate channels such as their local community and public figure's Facebook accounts. It was difficult, particularly for the authority and the volunteers' teams to comprehensively track the areas that have been served, over served and under served in order to plan the types of aid and relief supports and actions that are still required to that affected area and the resources are not wasted. The aim is to establish algorithm for a 2-way mobile intelligent centralised reporting technique for flood volunteers to make informed decision in distributing aid and relief supports. This technique will use an integrated mobile and web based mapping platform to track the volunteers' activities through intelligent reporting tool. The algorithm is anticipated able to consider dynamic geospatial paramaters regarding the movement of volunteer teams with the types of aid they had given and provide instant recommendation for the types of aid and relief that are still required for certain flood area based on their current or preferred locations. It will incorporate a tool for the flood victims to report the aid that they require during the post disaster recovery. This could benefit the related authority such as National Security Council (MKN) to manage the emergence of ad-hoc volunteer teams and to efficiently coordinate the distribution of aid and relief resources.

2.0 Methodology

Phase 1: Developing an algorithm for intelligent mobile tool that able to provide recommendation based on dynamic geospatial parameters. Phase 2: Developing mobile reporting tool for volunteers and flood victims to report regarding to aid and relief needs and distributions. Phase 3: Developing a web based mapping system to instantly visualise and analyse the distribution of volunteer teams, the availability of and the need for the aid and relief resources.

3.0 Results and Discussion

Figure 1 depicts the proposed of 2-way geo-crowdsourcing architecture of e-Bantuan system. The framework consists of mobile and web components. The mobile component is designed to use by the flood ground volunteers to report and update to the system of the efforts that have been conducted using geolocation technology. The built-in GPS that is commonly integrated in every smartphone will be used to position volunteers automatically without a need to key-in the current address. The reports could be submitted to the system via both online or offline synchronization mode, especially when there is a lack of internet access. The mobile component allows volunteers to navigate to the reported locations that require relief efforts using the Google Map Navigator. The intelligent module in mobile component allows volunteers to make task based queries based on their current positions; the module will search the relevant information that fit with their tasks, such as the relief items that have been distributed and vice versa within certain radius. They could search the number of victims that request for the relief efforts, and then navigate to the location.

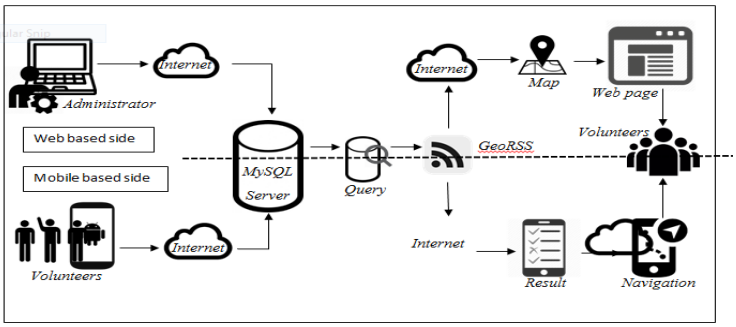

Figure 1: The Architecture Used In The E-Bantuan System

In the web component, the system is designed to record the data submitted by the flood volunteers via mobile component and integrate with disaster response data from the authority. The data recorded in the system will be shared to the mobile volunteers via GeoRSS feeds. The data is filtered based on the user task via dynamic query functions. In this 2-way geo-crowdsourcing framework, the end users such as the first responder and flood volunteers could report the aid and relief efforts that have been conducted to the centralised system; the flood victims could report their requests for flood relief via mobile component. The centralised system will dynamically accumulate the reports submitted to the system and integrate with statistic reports supplied by authoritative sources. The system that could be administered by the authority will continuously update the status responses of each affected location to the mobile flood volunteers via task based queries and GeoRSS feeds.

3.1 E-Bantuan Mobile and Web Systems

E-bantuan is a system that integrates mobile and web platforms to manage relief distributions that focus on volunteers. E-Bantuan is develop to provide two ways communication of data sharing between ground users and central officers. Figure 2 presents two main components provided in the mobile platforms. The red button is to provide an access to database that managed by authority. The blue button is for ground users to report and adding data to database. Through this mobile platform, ground users could perform several tasks as below:

i) Recording the locations and details of relief items either have been or need to be distributed.
ii) Recording the location that act as temporary relief collection centre.
iii) Connect with online map navigation application to show the route to the reported location in the system
iv) View reports from other volunteers related to relief distribution that managed by system administrator
v) Synchronization of the reports stored in the mobile database with the database in the server

Figure 2 The main mobile user interface in e-Bantuan

The intelligent module in mobile component allows volunteers to make task based queries based on their current positions. Figure 3 shows the user interface of the module. The module will search the relevant information that fit with their tasks, such as the relief items that have been distributed and vice versa within certain radius. They can search the number of centers that request for the relief efforts, and then navigate to the location. The mobile modules provides a series of supplies checklists to record the supplies that have been distributed or still required by the victims. Figure 4 presents the mobile interface for volunteers to report their surveys regarding their relief distribution efforts.

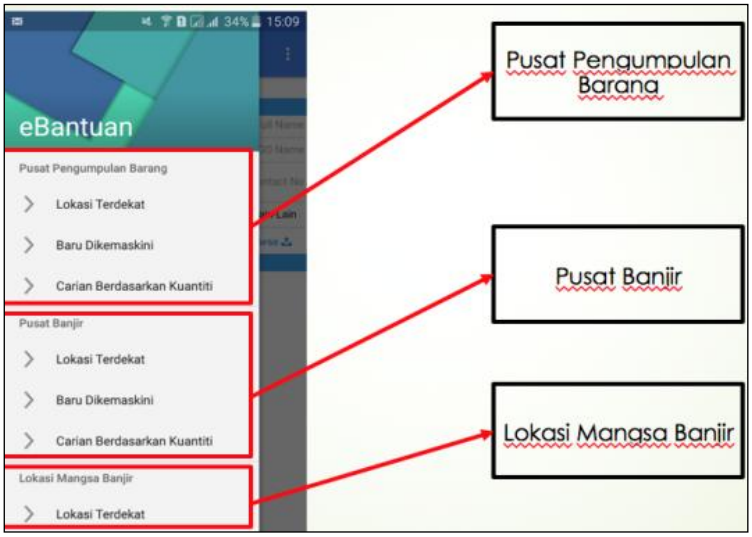

Figure 3 The search module that provide access to data at centralized database

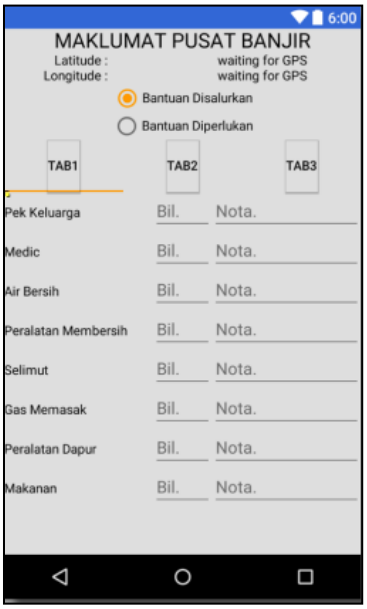

Figure 4 A snapshot of mobile interface for volunteers to report the location and details of relief items either need to be or have been distributed for a victim.

Figure 5 The web module to view the reports submitted by the volunteers to the system

In the web component, the system is designed to record the data submitted by the flood volunteers via mobile component and integrate with disaster response data from the authority. Figure 5 above present the main web user interface for the authorities to view the submitted reports by volunteers. The map showing the locations of victims that requires relief supplies as reported by flood volunteers. The data recorded and administered by the authority can be shared to the mobile volunteers via searching and GeoRSS feeds function.

In this 2-way geo-crowdsourcing framework, the end users such as the first responder and flood volunteers can report the aid and relief efforts that have been conducted to the centralised system; the flood volunteers can report the relief requests on behalf of flood victims via mobile component. The centralised system will dynamically accumulate the reports submitted to the system and integrate with statistic reports supplied by authoritative sources. The system could be administered by the authority and continuously update the status of supplies for each affected location to the mobile flood volunteers via intelligent location and task based queries.

4.0 Conclusion

This project proposed a mobile and web mapping platform to centralize information related to flood aid and relief actions reported by flood volunteers that consists of NGOs members, individual and ad-hoc volunteer teams.

4.1 This system could be used to manage communication between authorities, first responders, flood volunteers and victims for other crisis such as earthquake, bush fires etc. The proposed system could be used to effectively coordinate and manage aid and relief efforts and support involving various groups of flood community volunteers.

4.2 Nevertheless, the proposed system should be implemented in a common platform monitored by the authority, such as the Security Council. The federal and state Malaysian governments, as well as non-profit organizations (NGOs), have developed several applications to share and disseminate information during emergencies. However, there was limited collaboration across the applications.

4.3 The proposed application that incorporate crowd data including from the flood volunteers from various teams could be integrated with the TogetherWithU, a mobile platform that has been developed by the Malaysian government, along with other applications, to assist during disaster.

4.4 A common platform that integrates the information shared by the authorities, NGOs, first responders and citizens is required to systematically collect, analyze and coordinate the actions during emergencies.

4.5 Further study could focus on how to web mining the crowd data that publishes in separate social media and users' networks. This is crucial in order to provide a more comprehensive data to supplement the authorities and relief workers making informed decision during disaster response and recovery stages.

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EXCLUSIVELY ALLOCATED WIRELESS POWER TRANSFER TO FLOOD AFFECTED AREAS FOR EMERGENCY NEEDS RAPIDLY

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1.0 Introduction

Energy harvesting is a very common and widely acceptable technology for a long time. Harvesting energy for low-power embedded devices like wireless sensors presents a new challenge as the energy harvesting device has to be small enough with the sensors. Ambient energy harvesting techniques [1], [2] are very promising main power supply to delivery adequate power to electronic devices. However, the ability to harvest energy from the environment is highly dependent on many environmental factors [3]. A small solar cell [4] installed outdoors can easily give energy to the devices, but It has to be installed into a visible or sunny place that is free from shadow. This means it will have to survive different weather conditions from snow to direct rain and withstand dust accumulation. Besides that, the obvious appeal of harvesting ambient RF energy is that it is essentially “free” energy as there are many mobile, TV and radio base station available. Also, consider the number of WiFi [5] routers and wireless end devices such as laptops. In some urban environments, it is possible to literally detect many of WiFi access points from a single location. However, the signal strength is weak and the supply may not be available regularly and on-demand. Hence, a dedicated wireless energy transfer system is tremendously essential feature to support the deployment of interoperable and economically to flood-affected areas, and these need further research to understand and exploit.

2.0 Methodology

In this work, electromagnetic radiation scheme is used in designing the antenna system with the simulation software. At short to mid-range and mid to long-range, the performance of the developed antenna at Fresnel region and Fraunhofer region is investigated respectively. Several testing is performed to explore the practicality of the developed exclusively allocated wireless power system for LEDs, rechargeable battery, low power consumption devices and smart phone. There are several antenna designs of antenna system that meet various for energy transfer purposes. However, the RF that selected for this application is very important as regulatory and physical considerations that must be accounted for and weighted against. In this work, the operating frequency of 915MHz and 2.4 GHz is used for transmitting power to the harvesting system. The power transfer system must at least operating at 1 watt effective radiation isotropic power in order to tradeoff between distance and received power. Few type of antenna has been designed and developed for the investigation; they are patch antenna, ribbon antenna, hex antenna and log periodic dipole antenna. The antennas are integrated with power source and harvesting system; power source is operating either 915 MHz or 2.4 GHz and harvesting system is consist of radio frequency to direct current converter. In order to power-up the LEDs, Bluetooth devices as well as mobile smart phone; the transmitting antenna and harvesting system is very important as normal WIFI systems and GSM towers are not able to provide the adequate received power. Thus, the developed dedicated WPT prototype is tremendously essential findings; they provides the intuition to deploy an interoperable and economically solution to flood affected areas in supporting electricity needs rapidly.

3.0 Results and Discussion

The obtained result as shown in Table 1 is based on the experimental analysis of a transmitted signal using an amplifier. The received power is recorded and the EIRP (Effective Isotropic Radiated Power) is calculated and recorded with spreadsheet.

Table 1: Result of EIRP and Measured Received Power

Transmitted Power		Received Power		Antenna Gain	EIRP (W)		Transmitted Power		Received Power		Antenna Gain	EIRP (W)
dBm	W	dBm	W				dBm	W	dBm	W		
-15	3E-05	-11.57	7E-05	2	0.00011		5	0.003	7.83	0.006	2	0.0095
-15	3E-05	-11.57	7E-05	4	0.00018		5	0.003	7.83	0.006	4	0.015
-15	3E-05	-11.57	7E-05	6	0.00028		5	0.003	7.83	0.006	6	0.024
-15	3E-05	-11.57	7E-05	8	0.00044		5	0.003	7.83	0.006	8	0.038
-10	0.0001	-6.94	0.0002	2	0.00032		10	0.01	13.04	0.02	2	0.03
-10	0.0001	-6.94	0.0002	4	0.0005		10	0.01	13.04	0.02	4	0.05
-10	0.0001	-6.94	0.0002	6	0.0008		10	0.01	13.04	0.02	6	0.08
-10	0.0001	-6.94	0.0002	8	0.00126		10	0.01	13.04	0.02	8	0.13
-5	0.0003	-1.93	0.0006	2	0.001		15	0.03	18.06	0.06	2	0.095
-5	0.0003	-1.93	0.0006	4	0.0016		15	0.03	18.06	0.06	4	0.15
-5	0.0003	-1.93	0.0006	6	0.0026		15	0.03	18.06	0.06	6	0.24
-5	0.0003	-1.93	0.0006	8	0.004		15	0.03	18.06	0.06	8	0.34
0	0.001	2.86	0.0019	2	0.003							
0	0.001	2.86	0.0019	4	0.0048							
0	0.001	2.86	0.0019	6	0.0076							
0	0.001	2.86	0.0019	8	0.012							

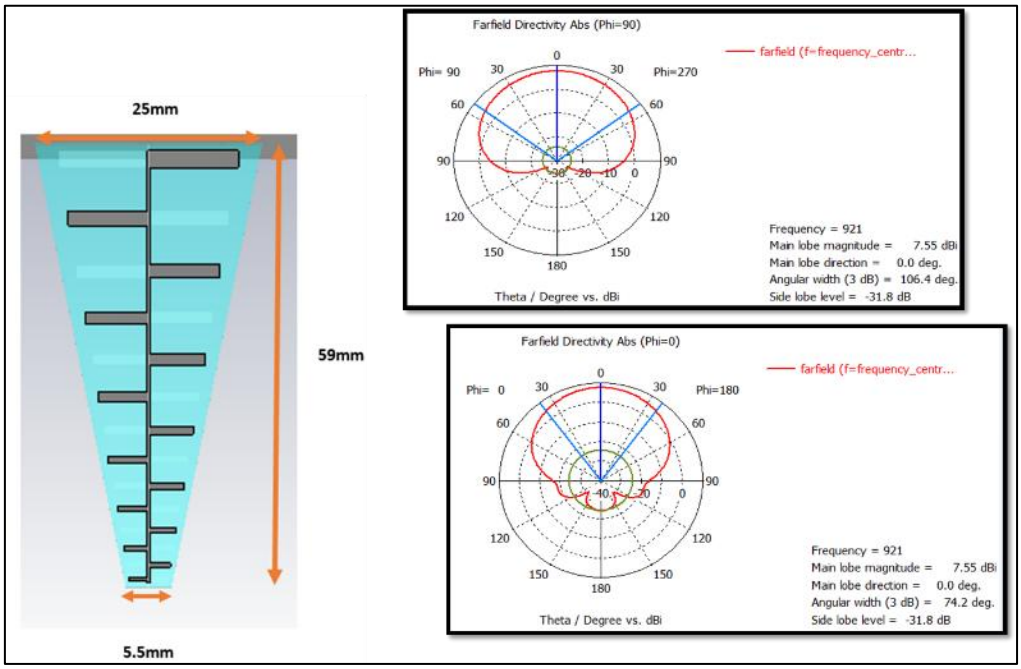


Figure 1 Log Periodic Dipole Array Antenna and Simulation Results

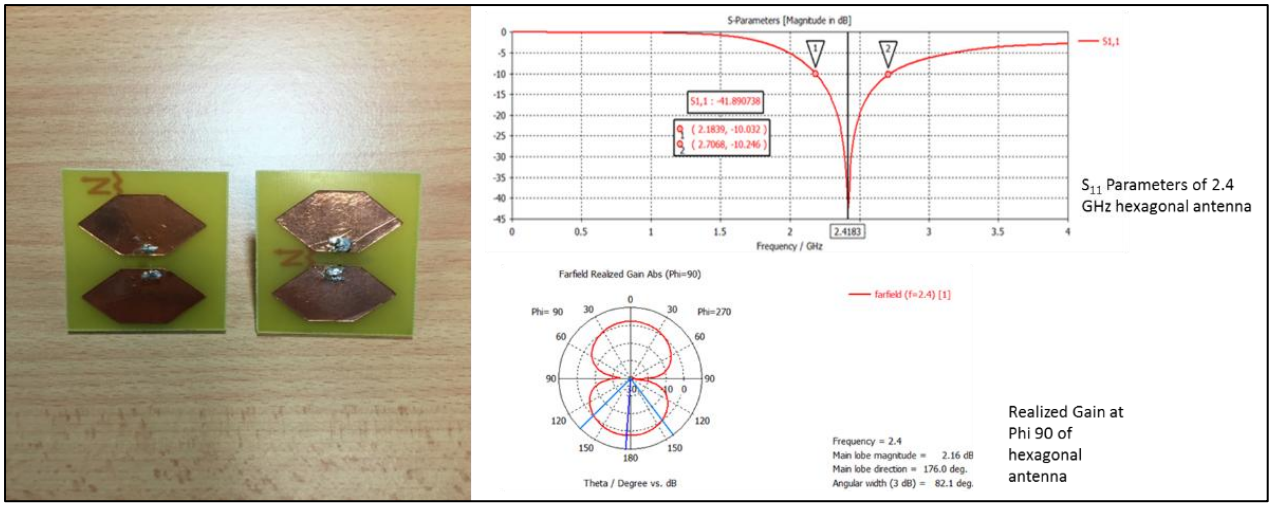
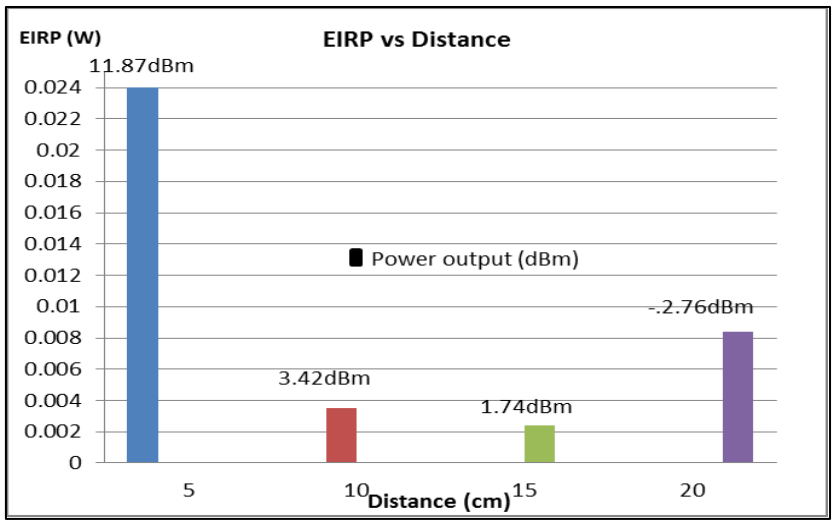


Figure 2 Hexagon Dipole Antenna and Simulation Results

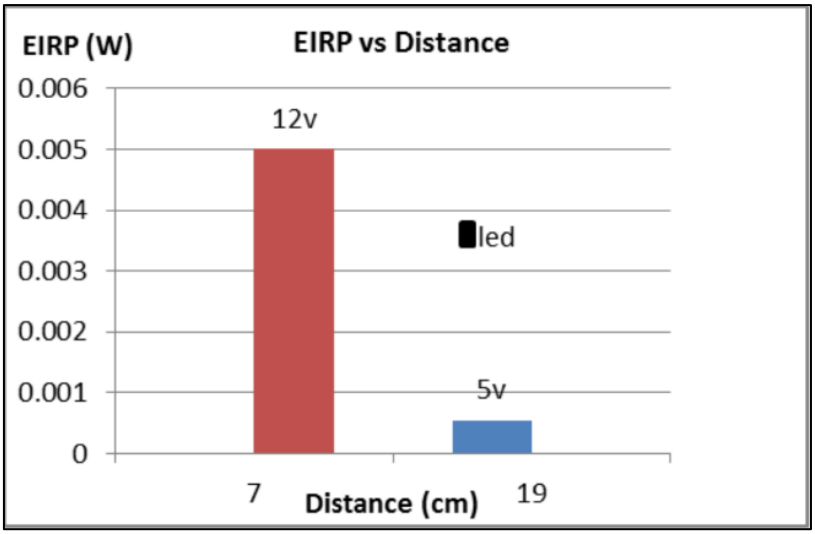
4.0 Conclusion

4.1 Assuming the system is lossless. EIRP = Pt + Gt. Higher transmitted power and higher antenna gain will result higher EIPR values. However the maximum value of EIRP is governed by MCMC.

4.2 Transmitted power at 15dBm/2dBi, received signal strength at particular distance as shown in Figure as below. Higher load required higher received power.



4.3 The 5V LEDs can be lighted up at further distances as compared to 12V LEDs. Besides that, the required transmitted power for 5V LEDs is much lower than 12V LEDs as shown in Figure below.



4.4 It is possible to transfer adequate power to targeted device with proper topology of WPT system. Besides that, instead of one to one, powering multiple of devices is possible too. The system can be integrated with hybrid solar system. Hence, it can be an essential solution to power security during emergency for rapid supply of electricity. It can be used to support rural electrification as bringing electrical power to rural and remote areas by proper designed mechanism.

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URBANIZATION AND INDUSTRIALIZATION: OPTIMIZING DYNAMIC EMERGENCY EVACUATION WITH BIG GRAPH DECOMPOSITION ALGORITHM

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1.0 Introduction

Evacuation operation which is a process of evacuating residents from any dangerous sites to safer destinations in the shortest possible time is of prime importance in emergency management. Evacuation path, numbers and locations of distribution centers and the amount of relief items affect the response time and costs due to the unpredictability of demand and suddenly occurring demand. There has been a limited initiative to find a solution for dynamic emergency evacuation in Malaysia. Uncertainty situation and parameters under emergency evacuation need to be explored, therefore an optimal disaster relief plan to overcome the issues is utmost important to cater large scale evacuations. Numbers and locations of distribution centers and the amount of relief items affect the response time due to the unpredictability demand.

2.0 Methodology

2.1 Phase 1: Data Acquisition and Image Processing

Kuala Krai is selected as a case study due to severe flooding in December 2014. Figure 3.1 is the map of Kuala Krai, State of Kelantan. It was reported that the number of residents in Kuala Krai was reported about more than 100k people. During the flood event in December 2015, many evacuees were evacuated to many relief centers. Relief centers can be schools, public halls, hospitals that normally located at high locations.

2.2 Phase II: Mathematical Formulations

Region Growing

Region Growing is required for segmentation in order to extract the road and river to identify the affected flooded areas of the river. Segmentation is done based on color thresholding, where excessive blue channel (R <= 200, G <= 200, B >= 230) indicate water surface and brightest region (R >= 200, G >= 200, B >= 200 value) indicate the road system. One of the region growing process is segmentation. Segmentation is to partition an image into regions. Some segmentation methods such as thresholding achieve this goal by looking for the boundaries between regions based on discontinuities in grayscale or color properties.

Evacuation Dynamic Vehicle Routing Problem (EDVRP) Formulation

The Evacuation Dynamic Vehicle Routing Problem (EDVRP) involves a dynamic routing of a number of vehicles from the potential flooded area (PFA) / flooded area (FA) to a single or multiple PFA. EDVRP addresses the objective function to find the minimum total travelling time for all vehicles potential flooded area/ flooded area to relief center. This problem is mathematically formulated based on the EVRP formulation stated in Yusoff et al. (2012). The conflict at the intersection was taken into account such as inflow capacity constraints where the number of vehicles can enter a street segment is limited, and it depends on the number of available lanes is adapted from the formulation of intersection formulated by Bretscneider and Kimms (2011).

2.3 Phase III: Design and Development of Modified Region Growing Algorithm

A modified Region Growing Algorithm can interactively segment the flood area based on water level. Two segmentation process were performed, namely river segmentation and path segmentation.

2.4 Phase IV: Hybrid Particle Swarm Optimization-Genetic Algorithm and Graph Decompostion

Solution Representation

The solution representation has adopted based the similar process of nodes expansion and the random selection of priority value (PV) or particle value from Yusoff et al., (2012) . The idea using PV value is still used. The improvement was done with the enhancement of decomposition search procedure with the selection process that consider elitism and reproduction of particles or PV values.

An improved decomposition procedure

It was performed by using elitism strategy and employed to the hybrid of PSO and Genetic Algorithm.

3.0 Results and Discussion

The suggested hybrid algorithm with elitism and a reproduction of particles and means of limiting the movement of particles in the search space, using the search decomposition procedure, random selection support this algorithm. The decomposition of a graph with random selection of PV depends on the number of expanded branches. Hence, the number of nodes traversed by each vehicle is dependent on the branch that was randomly selected. With this procedure at least one vehicle can traverse from flooded area relief center using a valid path because the selection of PV is limited to the number of branches. Based on the evaluation of the simulations, it can be illustrated that several valid paths were able to be determined using 100 populations of particles granted a higher possibility of using less travelling time for the vehicles travelled from flooded areas to the relief center considering the capacity of relief centers and also flood level. With the high possibility of getting a valid node, the best solution would become faster and lead to faster convergence due to the less search space. The calculation of velocity involving exploitation, and exploration of particles has contributed to the solution. The exploitation presents a means of particles to perform a local search while the exploration is globally seeking the best solution, which was gathered from the selection of *Gbest*.

4.0 Conclusion

4.1 A modified region growing algorithm for map superimpose processes were performed todetermine the percentages of water level and path during flooding. The Evacuation Dynamic Vehicle Routing Problem (EDVRP) is introduced in which involves a dynamic routing of a number of vehicles from the flooded area with the objective function to find the minimum total travelling time to move victims to relief center. The enhancement of region growing algorithm and the design of a hybrid decomposition and PSO-GA contributes to the resolution of the EDVRP in optimizing the evacuation time/number of evacuees.

4.2 The suggested hybrid algorithm with elitism and a reproduction of particles and means of limiting the movement of particles in the search space, using the search decomposition procedure, random selection support this algorithm. The decomposition of a graph with random selection of PV depends on the number of expanded branches. Hence, the number of nodes traversed by each vehicle is dependent on the branch that was randomly selected. With this procedure at least one vehicle can traverse from flooded area relief center using a valid path because the selection of PV is limited to the number of branches. Based on the evaluation of the simulations, it can be illustrated that several valid paths were able to be determined using 100 populations of particles granted a higher possibility of using less travelling time for the vehicles travelled from flooded areas to relief centers considering the capacity of relief centers and also flood level.

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INVESTIGATION ON A NOVEL NON-DESTRUCTABLE COMPOSITE MATERIALS FOR THE DEVELOPMENT OF DISASTER RESCUE BOX

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1.0 Introduction

Getting aid and basic supplies to the isolated flood victims are a major problem. Food supplies, medical aids are usually dropped by the rescue helicopter to be collected by the victims. Most of the time, the box and its content are damage by the water or by the impact itself. The research proposes to perform material analysis on local resources to facilitate the design of a low cost green disaster rescue box. Natural fibres derived from renewable resources (plants) are becoming more profoundly important in the composite field due to their green advantages. These fibres are used as reinforcement materials which are then bind by biodegradable polymer-polylactic acid (PLA). Empty fruit bunch (EFB) is a natural fibre that is the leftover from the oil palm's fruit bunch after the fruits are harvested. It is selected and used as the raw material in this study mainly due to its vast availability, renewability and low cost.

2.0 Methodology

The EFB comprised of 25-30 percent stalk and 80 percent hard spikelet (Figure1). The fibres in EFB have various cross section diameters and length.

Figure 1. Cross section of EFB

Fibres Treatment

The fibres were treated with sodium hydroxide (NaOH) solution to remove its residual oil from the external layer of the fibre cell and improve its mechanical properties. It is then cleaned with normal water and dried in the oven at 70°-80°C to ensure no moisture content is present in the fibres. To prepare the samples for experiment, the EFB fibres were crushed and shredded to smaller sizes.

The matrix material used in this research is PolyL-lactic Acid (PLA) $(C_3H4O_2)_n$ from Naturework which is derived corn starch. This biopolymer was chosen due to its renewable origin and biodegradability nature (Jia et.al, 2014 & Oksman et.al, 2003). The EFB fibres are then blended with PLA with 40 wt fibre-matrix ratios. 5% of pure rubber latex is also use in improvement.

Mechanical Testing

The samples undergo mechanical testing to determine their properties and are based on American Standard of Testing Method (ASTM) D638/790 for tensile test and impact test respectively.

Physical degradation Testing
Degradation can be defined as the breakdown of materials resulting from different environmental exposures.

Water Absorption Test /Biodegradation Test
The water absorption test is very important to determine the water absorptivity of the composite. EFB samples with dimension area approximate ±4x4cm^2 is submerged in water for an indicated periods. For each week, the sample were taken out and measure its weight and dimension The weight loss (%) is calculated based on weight difference of the samples measured before and after exposed in water for the indicated periods. In addition, the test can also be used to test the degradation rate of the fibres in water by observing the changes in its dimension.

$$WeightLoss = \frac{InitialWeight - FinalWeight}{FinalWeight} \times 100\%$$

Thermal Degradation Test
Thermogravimetric analysis (TGA) and Differential Scanning Calorimetry (DSC) were conducted to determine the composite thermal characteristics. The samples were subjected to pyrolysis in nitrogen environment to a maximum temperature of 600 °C at a heating rate of 10 °C/min, where the thermal pattern of all the samples were investigated using the analysis. A mass loss indicates that a degradation of the measured substance takes place. In DSC, the sample and an empty reference crucible is heated at constant heat flow. The technique is used to measure the melting point and phase transition of the composite.

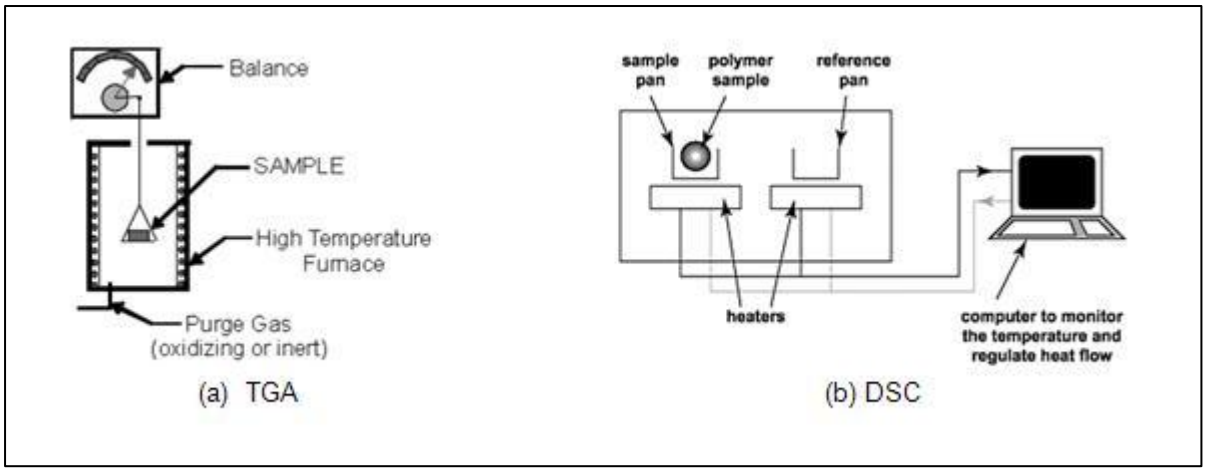

Figure 2: Thermal Characteristics Analysis

3.0 Results and Discussion
It was observed that the impact strength of the EFB composite increased as the fibre loading increased. However, the evaluation of impact strength shows that the increment of impact strength is not significant since the percentage of increase is less than 1%. The impact strength of EFB fibres is on par with other plant fibres. However, the brittleness of the PLA affected the overall outcome. Introducing natural liquid latex to the composite has been observed to reduce the brittleness but affected the *greenness* of the fibres. The EFB composite with PLA only showed a high water absorption properties which would present a problem for this project. A combination of latex in the composite mix reduced the water absorption level significantly as shown Figure 3.

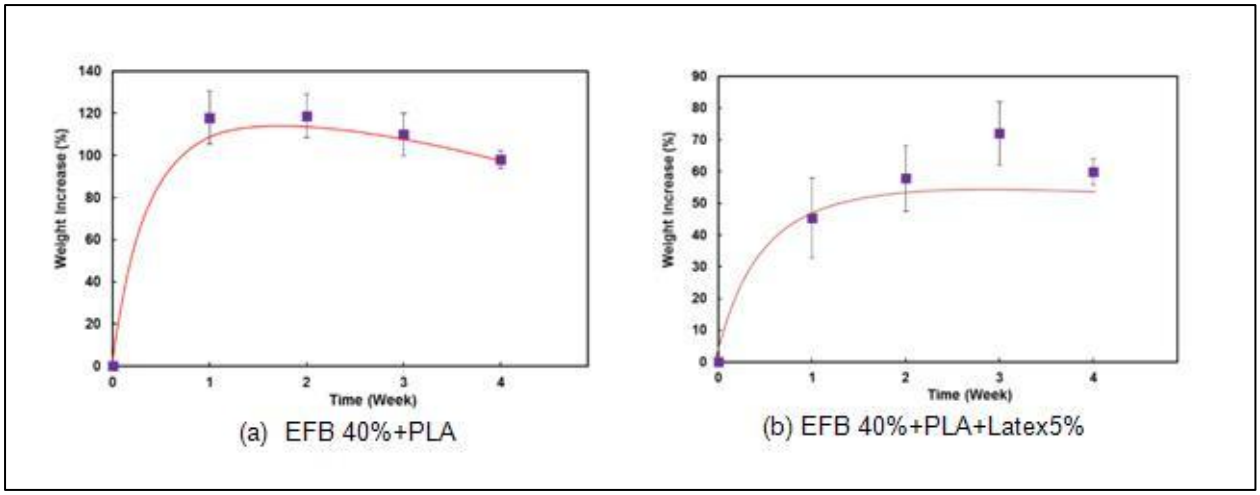

Figure 3: Water Absorption Test

The degradation rate also are high in the EFB+PLA composite but reduced significantly when added with natural latex as shown figures below.

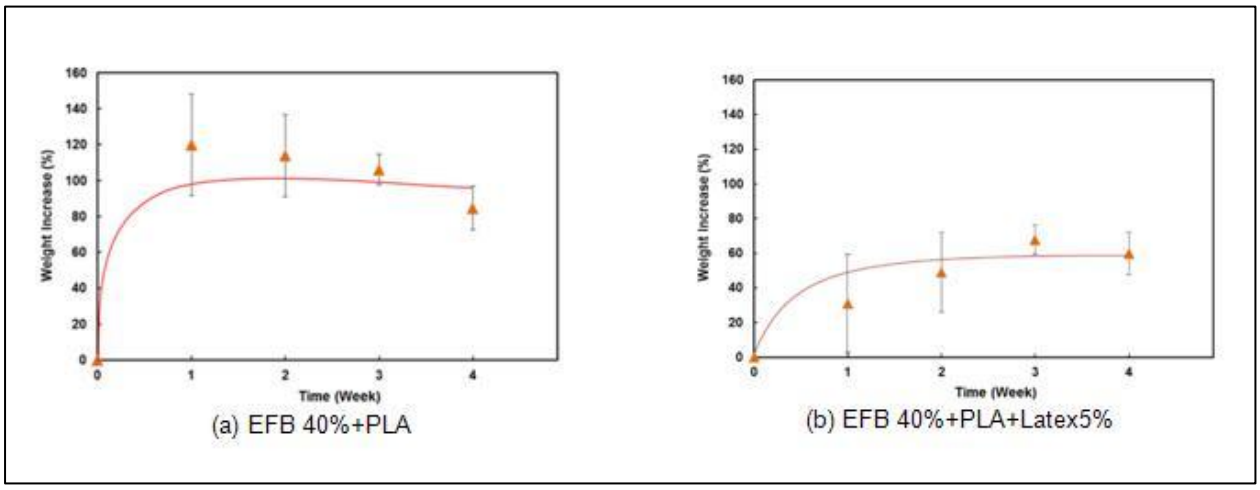

Figure 4: Biodegration Test in Water

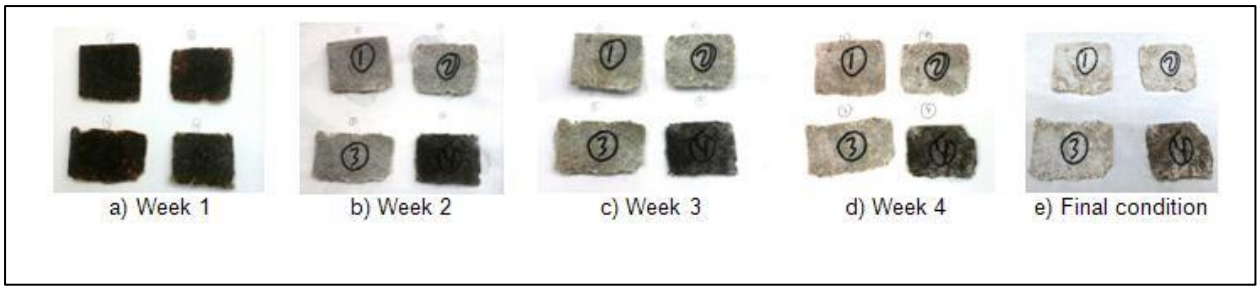

Figure 5: The composite condition after 4 weeks

Figure 6: The composite condition after 4 weeks

Thermal analysis techniques (TGA and DSC) were used to study the effect of natural fibres addition into the polymers. The graph Figure 7(a) showed a steep mass loss showing thermal degradation taking place. Figure 7(b) showed the recrystallization and the melting point of the EFB composite which result in exothermal and endothermal peaks respectively.

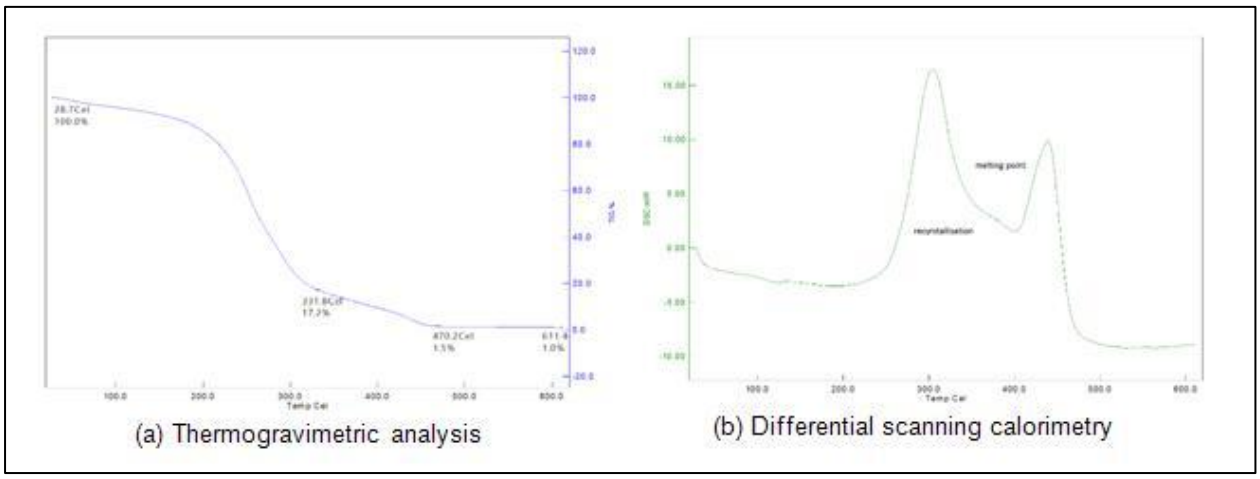

Figure 7: Thermal proerties of EFB composite

4.0 Conclusion

Important findings of the study of are summarized as follows:

4.1 Literature review results revealed nonconformity in the findings because of variation in the kind of oil palm fibre used will affect the properties of the fibre.

4.2 The raw EFB fibres has a high moisture content with 30% dry matter content and 2 percent residual oil, hence the need to make sure that the fibres are completely dry before used.

4.3 The composite will require waterproof coating since the absorption properties are considerably high.

4.4 Impact Energy 40%fibre (J/m)= 216-278 which is quite a high tolerance to impact.

4.5 Biodegradability (4 weeks) = 10-15% in mass reduction (water). Higher mass reduction in thermal degradation.

4.5 Fuel source: can be a source of fuel. Observation- no overpowering smoke or soot and smell can be observed

Project constraint that can be examined during the conduct of this research:

4.6 Cost of green composite is still high due to high cost of PLA and waterproof coating (lignin)

4.7 PLA is brittle --- add natural latex help the properties of the composite but no longer 100% biodegradable

4.8 Potential coating : Lignin (expensive but biodegradable) or wax (but will no longer 100% biodegradable)

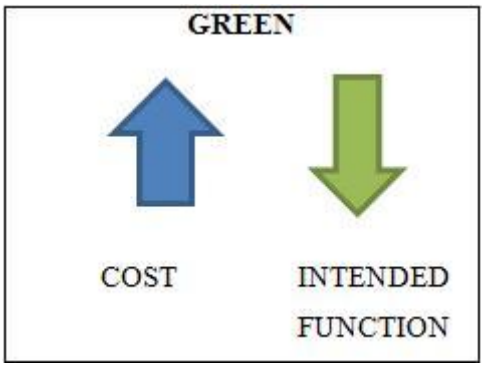

Figure 8: Project constraints- trade-offs

The results indicated that future research towards significant improvements in these types of composites should focus on the optimisation of not only the fibre properties but green matrix material as well.

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RFID-BASED PROPERTY AND EVIDENCE TRACKING SYSTEM FOR POST DISASTER BUILDING ASSESSMENT

Project Information

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1.0 Introduction

Estimation of initial damage, evaluation of building safety and assessment of damage are time series damage assessment steps which are needed in disaster management for buildings. As more description, estimation of initial damage is to apply the disaster relief law, evaluation of building safety is the damage assessment that determines the buildings safety and assessment of damage is the assessment to issue the certification of victims. As a very critical victim's need it is good to mentioned, victims needs the information about housing options at the first one week after the disaster. Therefore, evaluation of building safety, which was the first damage assessment for the individual houses, should be conducted in first few days after disaster. A lot of researchers have done studies in terms of the improving the building component performances in order to introduce solutions to have more resistance structures as well as reducing the probable damage under any kind of disasters such as earthquake, strong winds and flood (Ma, et.al. 2016, Azimi, et.al. 2015, Alhajri et.al. 2016, Azimi, et.al. 2016).

The assessment of building damage must be conducted both quickly and promptly. It is a proven fact that building damage survey using the damage chart is more effective than conventional methods. Survey results comparison and examination are the applied approaches in previous researches related the building damage survey. In order to classification of building damages, Okada and Takai in 1998 were attempted to do classification of building collapse patterns and proposed building damage survey method according to a building damage chart. However, there are few researches for proving the damage chart effect. In 1999, Murao and Yamazaki performed a research on building damage surveying and they concluded that the building damage survey needs the criterion with uniformity and objectivity, and proposed a building damage survey sheet.

Based on soil condition and the structure the building damage can be classified in to four types groups named; No Liquefaction – Engineered Structure, No Liquefaction – Non-Engineered Structure, Liquefaction – Engineered Structure and Liquefaction – Non-Engineered Structure. According to literature, the damage chart for No Liquefaction – Engineered Structure and No Liquefaction – Non-Engineered Structure is already available. The chart for wooden structures, an unreinforced masonry structure and reinforced concrete structure of no liquefaction soil is prepared by Okada and Takai. There is no complete damage chart for Liquefaction – Engineered or Non-Engineered Structure.

In this report, the application of the damage chart for damage assessment using photographic data linked to the GIS database by using RFID tagging system was evaluated for Manek Urai, Kelantan area, and improves the damage map of the mentioned flood affected area.

2.0 Methodology

This study used building damage surveys of 376 damaged buildings in Manek Urai area. Classification of building damage pattern using building damage photographs was taken from Manek Urai after the great Kelantan flood disaster. A proposed the damage chart was undertaken by a surveying team from Universiti Teknologi Malaysia, Faculty of Built Environment UTM. This damage chart classifies the damage, and includes figures of the damage patterns. The definition of this damage chart is illustrated in Figure 1.

In addition, the Built Enviroment Database of Manek Urai, Kelantan is constructed after The Great Flood Disaster using GIS (Lu, 1999). Built Environment database includes the following data such as urbanization area data, real estate tax roll data before the flood, data from the investigation of damaged buildings, human casualty data, and photographs of the damaged buildings. Totally about 1,980 photographs have been taken as well as recording a video of whole the research area. All the information including photographs which supported by video are classified using the damage chart.

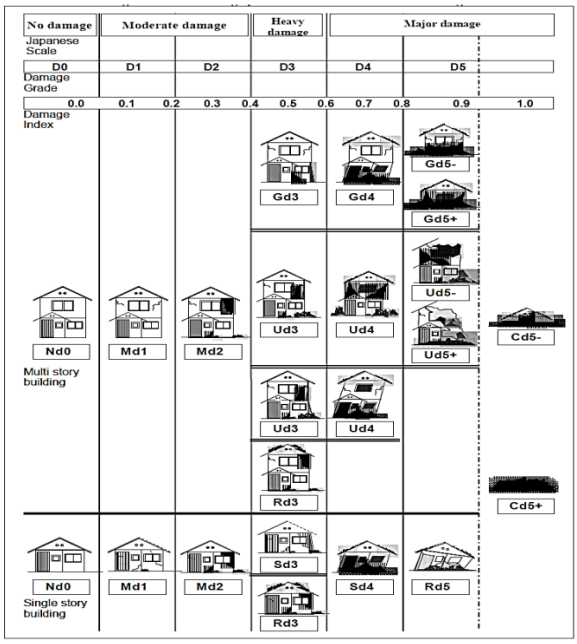

Figure 1: Definition of damage chart, Okada and Takai (1998)

In Manek Urai area, the Department of Quantity Surveying of University Teknologi Malaysia (QS-UTM) conducted survey for preparing actual damage pattern on site. The photographic data of the Built Environment Database is classified based on the damage chart made by Okada and Takai, in order to inspect the building damage pattern in Manek Urai, Kelantan. The survey by QS-UTM determined four grades of damage:

1- No Damage,
2- Rank A (Slight Damage),
3- Rank B (Half Collapse) and
4- Rank C (Total Collapse).

3.0 Results and Discussion

The classification of the damage patterns of buildings in the study area using the damage chart is shown in Figure 4. Consequently, the proportion of total collapse is high at 50.3%. These photographs are including all buildings. However, it can be considered that damaged buildings were the main objects of the photographs. The numbers of the buildings in the study area are given in Table 2. Total of 376 buildings and their positions were confirmed from 1980 photographs. The damage chart made by Okada and Takai was for wooden structures and in Manek Uai, Kelantan area the majority of the structures are wooden, therefore, we investigated building damage to 179 wooden structures and classified the damage pattern of these buildings.

Table 1: Types of building in the study area

Total number of surveyed buildings		376	
Total number of photographs		1980	
Number of the studied buildings	Wooden structures	179	47.6%
	Concrete structures	88	23.4%
	Masonry structures	109	28.9%
Survey by Universiti Teknologi Malaysia, Department of Quantity Surveying, (QS-UTM)	No Damage	73	19.4%
	Slight Damage	29	7.7%
	Half Collapse	85	22.6%
	Total Collapse	189	50.3%

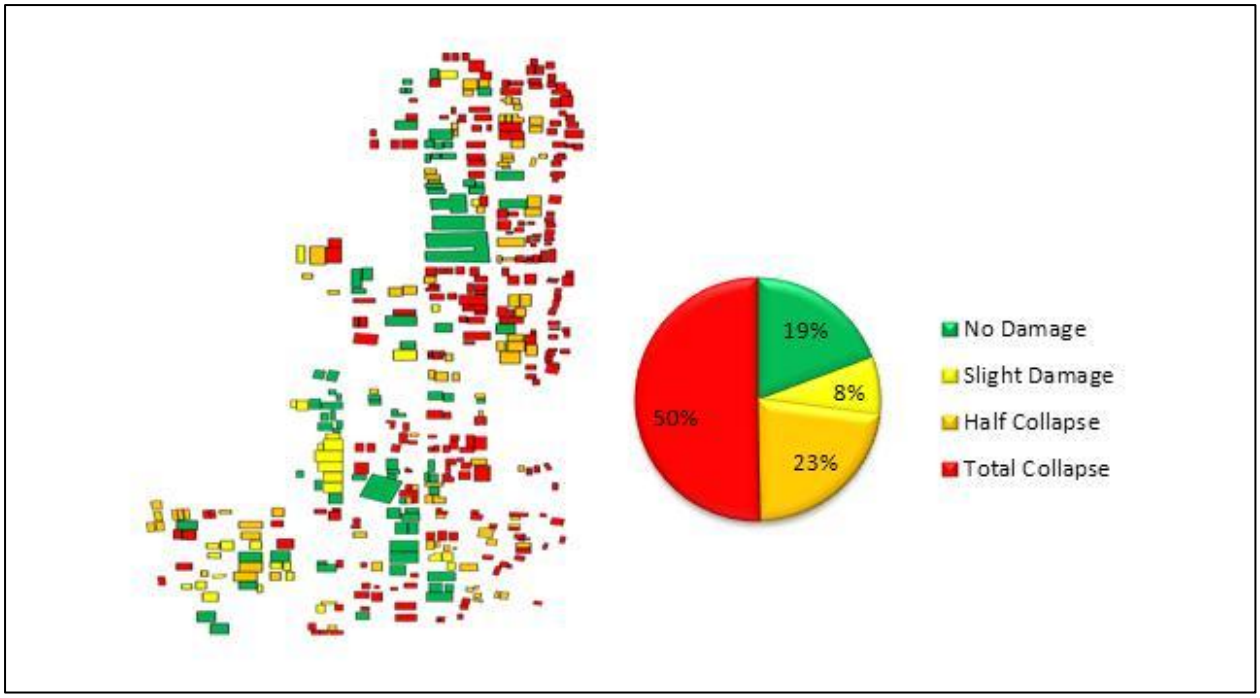

Figure 2: Distribution of total collapse rate in Manek Urai area and target area of the classification study

The developed damage assessment chart incorporated with FEMA building cost model was encapsulated in a computer-based prototype system to simplify the use of the post disaster building assessment. The systematic building assessment system (incorporating with damage assessment chart and established cost evaluation) is expected to enable engineers to adopt a systematic relief response and improving post disaster built environment condition. Evaluation of the prototype system was carried out by industry practitioners to assess the appropriateness and functionality of the prototype system.

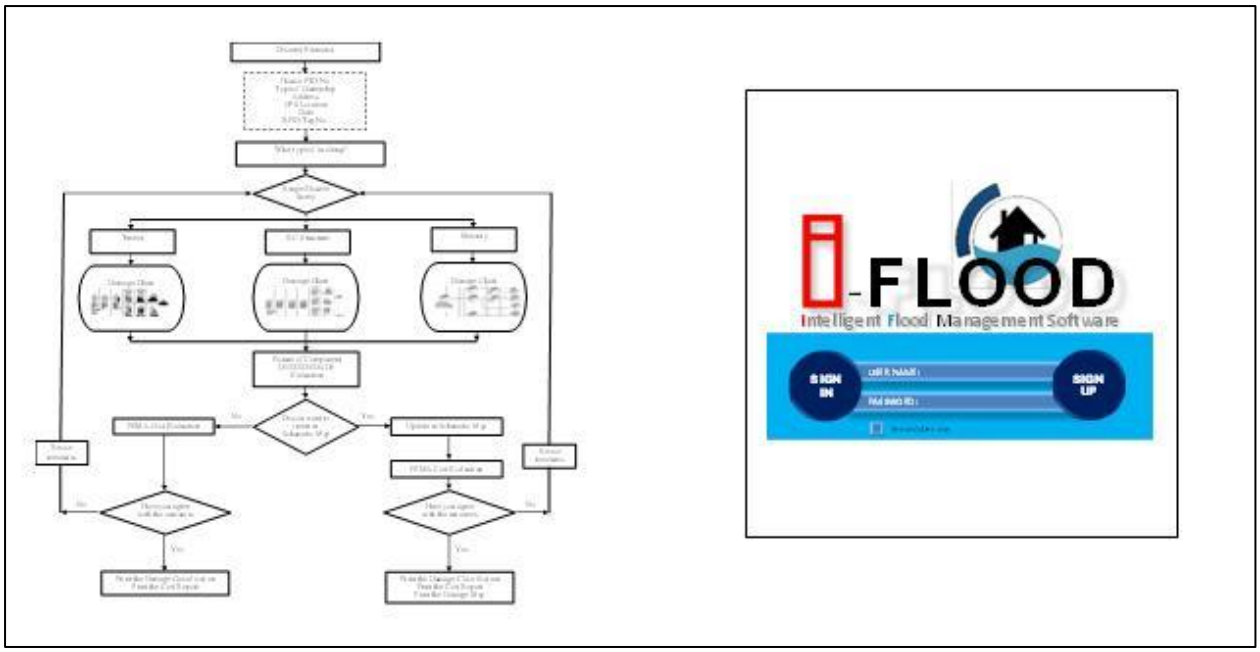

Figure 3: A framework of systematic building assessment model for disaster building assessment

4.0 Conclusion

4.1 376 damaged buildings were observed to discover the damage pattern charts in Manek Urai post disaster area. Damaged building structure was divided into three categories; timber structure, concrete structure and masonry structure.

4.2 Post disaster building assessment can be improved if the building damage pattern chart are well structured and objectively measured. The developed damage pattern chart from Okada & Takai (1998) enables the selection of building types and structured damage pattern that support the assessment of building damage.

4.3 The systematic building assessment model (incorporating with RFID technology and established cost evaluation) was designed to enable engineers to adopt a systematic relief response and improving post disaster built environment condition.

4.4 The developed computer based software is an intelligent building assessment model for post disaster building assessment. The relevance and capability of these tools for addressing disaster management problems have been confirmed and verified through the evaluation workshop evaluated by 9 industry players and 5 university researchers.

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DESIGN, SAFETY AND EFFICACY OF AN MPC GLYCAEMIC CONTROLLER IN A HIGH-RATE OCCUPANCY ICU

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1.0 Introduction

In the ICU, catastrophic disasters may force difficult decisions for intensivist and nurses when demand for round-the-clock care greatly exceeds available resources. Most critical care units routinely function at or near capacity, significantly decreasing available critical care response capabilities for disasters. Critically ill patients often experience physiological stress responses which lead to a highly complex and dynamic metabolic state, making effective treatment of hyper- and hypo-glycaemia difficult. The critical care response to disaster will be challenged and patients care might shift from individually focused to whole group. This study simulates a model predictive control towards safe management of hyperglycaemia, possibly adaptable in the future in the event of disaster.

2.0 Methodology

Virtual trials were performed on retrospective data of 63 critically-ill patients treated under intensive insulin infusion at the ICU of Hospital Tengku Ampuan Afzan (HTAA). A clinically verified patient-specific glucose-insulin metabolic model known as ICING (Lin et al., 2011) is used to account for time-varying insulin sensitivity. ICING (Lin et al., 2011) was developed and validated from critically-ill patients with various medical conditions in the intensive care unit in Christchurch Hospital, New Zealand. ICING model uses previous and current BG values, previous nutrition and previous insulin doses to compute the insulin sensitivity, SI of the patient over the previous time period, based on parameter identification algorithm which fits the model to the clinically observed behavior. The resulting time-varying SI profiles represent time-varying metabolic status for individual patients. Model accuracy is assessed by percentage of fitting error, where fitting error is the error between the measured and the modelled blood glucose levels. Analysis is done on by cohort which reads the statistics on the possible hourly fitting errors (weighing each hour equally) while per-patient is statistics on each individual patient (weighing each hour equally). Testing new interventions with SI profile in simulations provides new outputs. Thus, the profile of SI can be used to create “virtual patients” for testing insulin protocols. These ‘virtual patients’ present the closest view of possible behaviours seen typically in clinical setting. Hence, any BG levels can be simulated for different insulin and dextrose inputs, associated with different control protocols.

3.0 Results and Discussion

In Figure 1, CDF of model fit error for the overall patients fitted to the ICING model is shown. The model achieved a low fitting error at 0.34% per-patient and 0.35% by cohort. This in theory proves that the model is suitable and relevant to be used for Malaysian critically-ill patients. From this study, 63 SI profiles have been generated. These profiles represent virtual patients which is important for model-based controller development. From Figure 2, it can be seen that 50% of critically-ill patients in the HTAA have unsatisfactory control quality in their BG measurement levels. Half of the patients recorded BG levels above 8mmol/L even the target was set at 5.1-8.0mmol/L. This drives the motivation to implement a model-based control in a Malaysian ICU setting. Model-based control provides a more systematic approach in the management of hyperglycaemia, more so in a high-occupancy rate ICU. Rather than using the concept of ‘treat’ to meet target, model-based approach ‘prevents’ to safely manage BG within desired level.

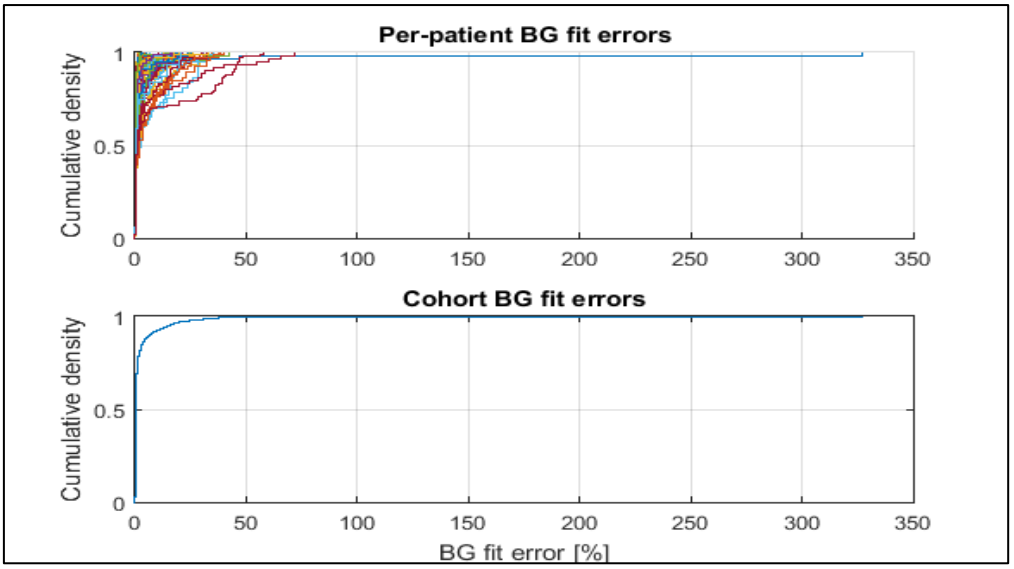


Figure 1

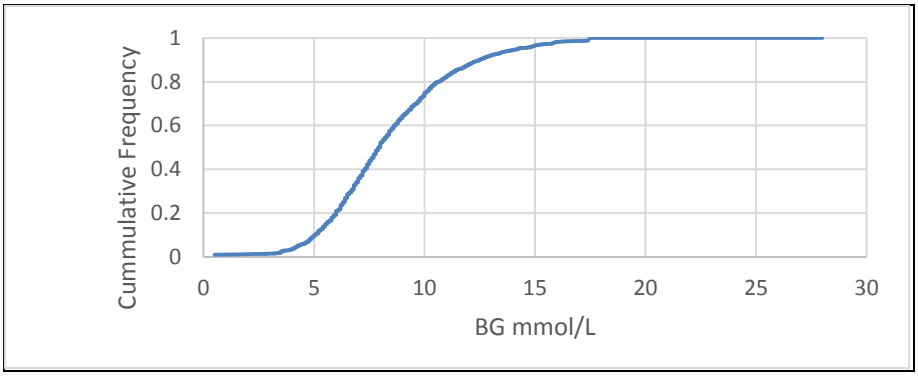


Figure 2: CDF for BG measurement levels (mmol/L) of by cohort analysis.

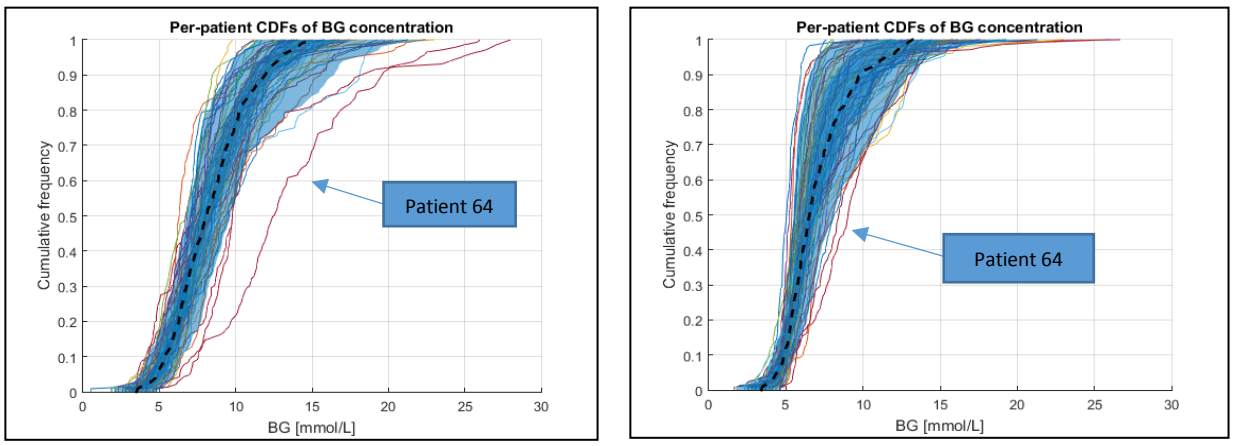
Table 1 presents the comparison of glycaemic control performance between SPRINT and HTAA ICU sliding scale protocol. From the results, the frequency of BG measurements for SPRINT is considerably higher than HTAA by 40.3%. Median of BG levels are lower in SPRINT at 6.8 mmol/L [IQR 5.6-9.0] with 60.65% time within 4.4-8.0 mmol/L. The median of insulin dose for SPRINT is higher at 3.0 U/hr (72 U/day) as compared to 2.0 U/hr (48 U/day) for HTAA ICU protocol. Simulations output with patients having BG level greater than 10 mmol/L is lower in SPRINT at 18.4%. HTAA protocol has lower percentage of patients with BG under 4.4 mmol/L and below. Feed or glucose rate is higher in HTAA protocol as SPRINT tends to drop feed when BG is high.

Table 1: Virtual trials of SPRINT protocol in comparison to clinical data under sliding-scale protocol as practiced in HTAA ICU

	Clinical Sliding Scale	SPRINT Protocol	p-value
Total hours:	8026	8042	≥0.05
Frequency of BG measurements:	3921	5500	≤0.05
BG median [IQR] (mmol/L):	8.0 [6.40-10.1]	6.80 [5.60 -9.00]	≤0.05
% BG within 4.0 - 6.1 mmol/L	23.28	34.35	≤0.05
% BG within 4.4 - 7.0 mmol/L	30.69	48.16	≤0.05
% BG within 4.4 - 8.0 mmol/L	47.03	60.65	≤0.05
% BG within 8.0 - 10 mmol/L	24.76	18.43	≤0.05
% BG > 10 mmol/L	25.94	16.95	≤0.05
% BG < 4.4 mmol/L	4.44	5.16	≥0.05

% BG < 4.0 mmol/L	2.63	2.72	≥0.05
% BG < 2.2 mmol/L	0.15	0.091	≥0.05
Number of Patients with BG < 2.2 mmol/L	5	4	≥0.05
Median insulin rate [IQR] (U/hr):	2.0 [0.5 - 3.0]	3.0 [3.0 - 5.0]	≤0.05
Median glucose rate [IQR] (g/hour):	4.1 [2.6 – 6.1]	2.6 [2.0 - 4.6]	≤0.05

Figure 3 shows the per-patient cumulative distribution functions (CDFs) of BG levels from actual clinical data of HTAA ICU and the performance of SPRINT protocol. From both figures, it can be seen that control of BG from both protocols are relatively comparable. However, there are few outliers for patients receiving sliding-scale insulin. As can be seen in Figure 4(a), one outlier picked as an example is Patient 64. The median BG and IQR for Patient 64 is 13.4 mmol/L [IQR: 11.3 – 17.5]. When the patient is simulated with SPRINT protocol, BG level improved to 9.0 mmol/L [IQR: 7.4 - 11.3].



4(a) Clinical HTAA Data

4(b) SPRINT protocol

Figure 3: CDF of BG levels from 4(a) Clinical HTAA data and 4(b) SPRINT protocol

Figure 4 takes a closer look at the profile of Patient 64. The first panel illustrates the total hours of patient under glycaemic control totaling up to 140 hours. Clinical data is represented by circle (o) while crosses (x) represents BG levels simulated with SPRINT protocol. Under HTAA protocol, the glycaemic control for the first 30 hours is quite difficult to achieve. SPRINT is more rigorous in administering insulin. This is summarized in Table 1 where noticeably higher insulin is given with lower modulation of glucose rate compared to HTAA protocol. Towards the end of stay from 90-120 hours, glycaemic control from both protocols has relatively the same performance. This is the duration when patient's SI improves. However, once SI drops from 120-140 hours, only SPRINT protocol resumes BG control. This is due to SPRINT's patient-specific approach that enables a tight control across all patients. Each insulin and feed nutrition is tailored to patient's condition as indicated by SI. However, SPRINT is known to be taxing as it requires high nursing workload.

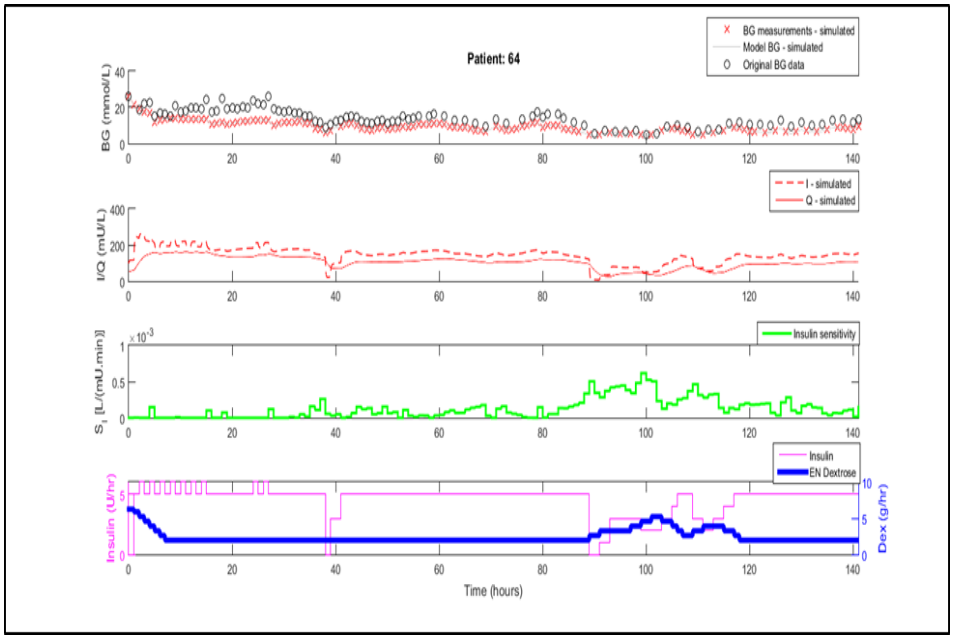


Figure 4: Patient Profiles for Patient 64 under SPRINT protocol. First panel illustrates original BG clinical data (HTAA) and BG simulation results from SPRINT. Clinical data is represented by circle (o) while crosses (x) represents simulated BG measurements from SPRINT. 2nd panel shows the level of plasma insulin, I and interstitial insulin, Q. 3rd panel is the insulin sensitivity, *SI* profile and last panel illustrates insulin and EN dextrose (feed) received by the patient.

4.0 Conclusion

Patients in the critical settings have more variable, dynamic and unpredictable BG. By using model-based, patient's hourly metabolic indicator can be calculated in real-time. Hence, any interventions, for example the amount of insulin or nutrition to be given would be based upon this SI metabolic indicator. Therefore, all treatments will be tailored to each patient unlike a one-size fits all method. Sliding-scale insulin protocol as normally seen in a lot of hospital settings uses a standardized care across patients. More often than not, insulin is the only means of control. ICING on the other hand, uses both insulin and nutrition to predict the required BG. Based upon the low percentage of model-fit error, it is promising that ICING model is suitable and relevant to Malaysian critically-ill patients. Virtual trial simulations using SPRINT protocol indicate that SPRINT is adaptable to Malaysian patients and it has a future to be implemented as a clinical practice change. However, this is a proof of concept and a pilot trial is still needed to validate clinically. This study can be expanded to many other areas for example during post-disaster control where intervention frequency would need to be further apart.

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DESIGN OF A HYBRID RENEWABLE ENERGY SYSTEM DURING FLOOD DISASTER IN MALAYSIA

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1.0 Introduction

Malaysia was hit by one of its worst flood in history back in December 2014 during Northeast monsoon season. It is recorded that the Kelantan state has the highest number of registered evacuees (160,000), followed by Pahang (33,225) Terengganu (31,820), Perak (7,540) and Johor (328) [1]. During flood disasters, electricity generation network is disrupted and affected. 1,960 of Tenaga Nasional Berhad (TNB) substations in Kelantan were forced to be shut down [2]. Electric power is one of the most critical needs in disaster relief centres to operate temporary medical clinics and to support the basic living necessities of the victims [1]. Conventionally, diesel generator is used for emergency power supply at common flood scenario [3] but in this research, renewable energy (RE) becomes the alternative. This is because diesel induces extra fuel costing and contributes to global warming through carbon dioxide emission, whereas RE source is carbon neutral plus the generated power can be sold to gain profit such as under the Feed-in Tariff (FiT) scheme. In this study, a decentralised hybrid renewable energy system (HRES) using solar and biogas energy source is proposed as a measure to flood disaster adaptation in Malaysia.

The objectives of the study are:

- To design and develop a module of solar PV and biogas power generation system to provide electricity at the evacuation centres during flood.
- To design an optimal electricity system that is economically viable, feasible and reliable that it is able to cater for different phases (non-flood and flood) throughout the year.

2.0 Methodology

Figure 1 shows the flowchart on how the research was conducted. Kuala Krai, Kelantan is set as the case study area to demonstrate the flood HRES in which the system can provide 142 kWh/d of basic electricity demand to 300 flood victims at the relief centre at Banggol Guchil Primary School. The basic electricity loads are from lightings, fans, speakers (for announcement purpose), rice cookers, and electric kettles.

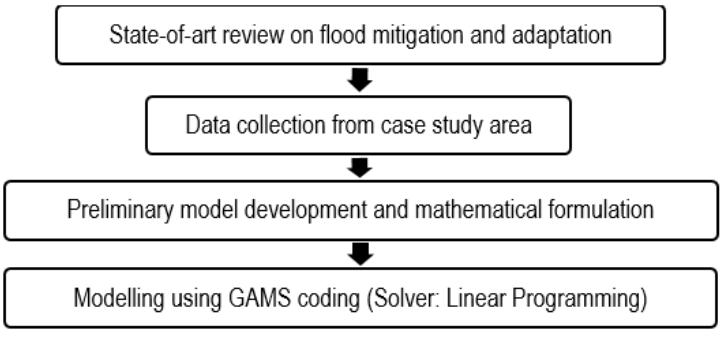

Figure 1: Flowchart of research methodology.

Linear programming (LP) is used to perform the optimization and techno-economic analysis of the flood HRES proposed, using the software called General Algebraic Modelling System (GAMS). The study considers different phases, i.e. “non-flood” (330 days), “before flood” (10 days), “during flood”

(14 days) and “after flood” (6 days). Figure 2 shows the superstructure of the proposed HRES model, used for mathematical formulation and coding in GAMS.

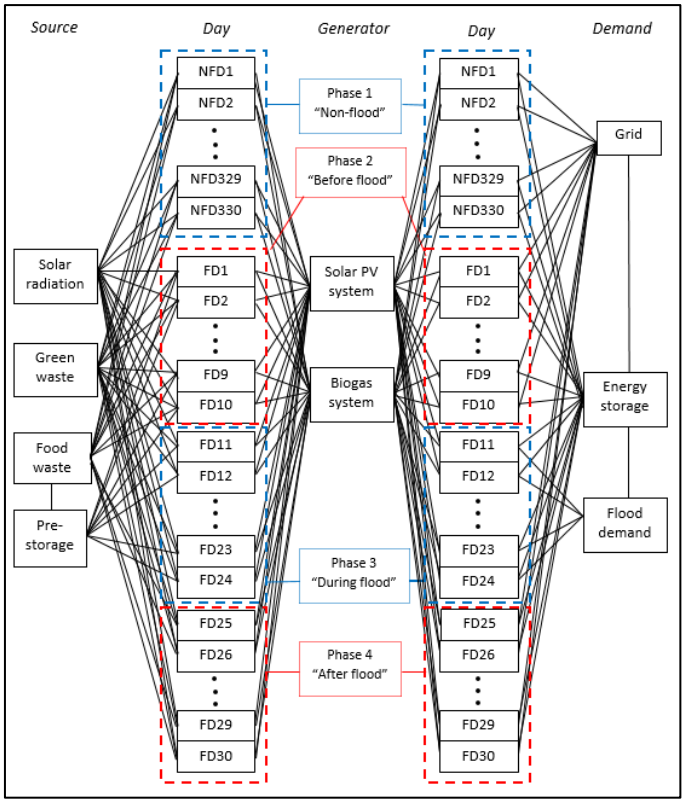

Figure 2: Superstruture of preliminary flood HRES model.

3.0 Results and Discussion

The model reveals that the maximum profit of the flood HRES system is MYR 709,095 per year. The flood power generator consists of a 84.54 kW biogas system and 387.4 kWp of solar PV system. The energy storage energy-related capacity and power-related capacity are revealed as 29.52 kWh and 29.52 kW. The inverter of the system is revealed as 209.20 kW and the rectifier is 55.68 kW.

4.0 Conclusion

4.1 A HRES is a plausible solution as flood disaster adaptation in Malaysia which supplies electricity continuously at flood-prone area, in replace with diesel generator.

4.2 The flood model considers different phases: flood and non-flood which it can function throughout the year. It is also designed as dual-mode hybrid power system (on- and off-grid) is designed.

4.3 The proposed HRES allows system’s flexibility to fully make use of the advantages of each RE resources to achieve both financial and operation stability. In this case, solar which has a higher economic FiT value than biogas is sold for gaining revenue, while biogas which is non-intermittent is used to support the system’s reliability.

4.4 For future work, a stochastic model will be applied since the system deals with high variability data e.g. weather variation.

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HEMODIALYSIS DATA LOSS MITIGATION AND PATIENT TRACKING DURING FLOOD DISASTER

Project Information

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1.0 Introduction

ADNAN Hemodialysis System was developed in year 2013 to fulfil the requirement of hemodialysis service providers, nephrologist, paramedics and dialysis patients initiated by UTM and Chronic Kidney Diseases (CKD) Center of HUSM Kubang Krian with the industry partner. ADNAN provides a cloud based system to manage dialysis patients related to their personnel, medical and medications records, biochemistry record, visiting log details, patient monitoring, center management, reporting and etc.

Initial implementation and verification of ADNAN system was done at CKD and Lestari Hemodialysis Center by end of the year 2014 which is coincident with the flood disaster in Kelantan. As result several improvements need to be done where this PRGS was proposed. The system must be able to operate under various critical situations and need for further upscale process with several additional features.

Internet availability is a main requirement for on-line system to perform data transaction. During the disaster internet availability cannot be guaranteed, hence it will require a technique for user to have an interrupted service. Even local server and intranet may useful for local access, such solution is complicated, consume time for setup and normally fix at one place. In this research we produced a new device named as ViTaL with a capability local server for user to access system during off-line condition, however ease to be used and setup, ease to bring to anywhere and be able to synchronize the data to the cloud server once the internet is available. In addition, ViTaL is equipped with RFID patient tracking identification function to track dialysis patient in the disaster relief center and hemodialysis center. This tracking function can read patient RFID wristband containing patient basic profile which provided to all hemodialysis patients in Kelantan.

2.0 Methodology

Phase 1

To establish infrastructure such as server, platform devices and network to provide cloud services and introduce ADNAN hemodialysis system to all hemodialysis centers in Kelantan which affected by the previous flood disaster. Data coordination will be centralized at Chronic Kidney Disease (CKD) center at HUSM Kubang Krian to identify related technical problems.

Phase 2

Based on the feedback given from the field test activities, a proper data loss mitigation will be designed including the frequency of backup, data backup location, responsibilities of medical officers. This will include enhanced features by utilizating ViTAL device as offline platform to make the system available during disaster, enhancing system and process to comply Personal Data Act for data privacy and security, to establish panic data migration standard process.

Phase 3

Implementing a drill test to test the mitigation plan, collecting and transferring data in off-line mode, mobilizing the ViTAL device to safe places or to synchronize data to the server at coordination place. To ensure there is no data leakage and compromising with external and internal threats. The test drill will also include the implementation of procedure to supply patient with RFID wristband for rescue team to track the patient medical information.

Phase 4

Product improvement and reevaluation, do the maintenance activities on running system and preparing product for commercialization.

3.0 Results and Discussion

An initial implementation of the system is in CKD HUSM Kubang Krian and several private hemodialysis centers in Kota Bharu. Within a year this project is successfully implemented for the whole state of Kelantan which involves one thousand hemodialysis patient scattered over 26 hemodialysis centers (10 government and 16 private hemodialysis centers). The implementation of the system has been growing rapidly with latest hemodialysis centers involved are 43 centers with more than 1400 patients. Now we are handling more than 20 thousand dialysis records in our database and it is expected the number of patients will increase to 5000 patients in near future with several hundred thousand dialysis records. With additional budget of PRGS released by KPT we are able to manage to produce 70 ViTaL devices to distribute to all hemodialysis centers in Kelantan and manage to enhance the system. On the other side, we also manage to Patent Filing the technology and sign a MOA with industrial partner for commercialization.

4.0 Conclusion

The achievement of this PRGS concluded as below:

4.1 ADNAN system is successfully implemented in 43 hemodialysis centers (10 government and the rest are private hemodialysis centers) in Kelantan and part of Johor with current total patient achieved over 1400 patients.
4.2 Distributed RFID identification wristband to 1000 patients in Kelantan.
4.3 Produced 70 ViTaL devices to be placed in each hemodialysis centers in Kelantan
4.4 Produced a Patent Filing entitled : Early Warning and Mitigation Device Filing Number: 2015003068 and a Trademark.
4.5 Signing MOA with Micro Semiconductor Sdn Bhd for Technology Licensing
4.6 Secure contract with Biro Angkasa to use the system and having an initial discussion with Tabung Haji Travel for its medical record usage.

INTEGRATED MOBILE RO WATER PURIFICATION SYSTEM FOR FLOOD DISASTER RELIEF

Project Information

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1.0 Introduction

In this research, the hollow fiber reverse osmosis (RO) membranes for drinking water production were prepared and the performance characteristics of the membranes were evaluated. Polyimide (PI) was selected as the most appropriate polymer as it is among the most promising polymer available for reverse osmosis and Polyethersulfone (PES) was selected for the ultrafiltation. The dope solutions were spun by force convective dry/wet spinning technique. Membrane performances were evaluated using sodium chloride (NaCl) solution. Natural drying and two solvent exchange (methanol& ethyl-ether and methanol& n-hexane) drying methods were used to investigate their influences on morphology and properties of membrane. Specialized design of Integrated Membrane System (IMS) for mobile RO water purification was develop. The integrated mobile RO water purification system is intended to provide quality water support to small units and detachments where distribution of bulk water is not feasible or practical for the flood disaster relief.

2.0 Methodology

2.1 Membrane Preparation

Formulation and parameters of this study was defined based on literature review. The primary dope solution composition was based on Ismail et al. [3] The dope formulation used in preparing UF and RO membranes are adopted from the previous research works. In general, UF membrane will be prepared using dope solution comprising polyethersulfone (PES), whereas the RO membrane will prepared using Polyimide (PI). The common solvent for both UF and RO membrane solution is N-Methyl-2-pyrrolidone (NMP) and water as non-solvent will added at appropriate ratio. Firstly, dried polymer will be first added into solvent and stir until a homogenous solution is formed. It will be followed by adding water. Continuous stirring process (at least 12 hrs) is required to ensure all the components added are completely dissolved and homogenously mixed. Prior to dry-jet wet spinning process, the solution as prepared will be degassed at room condition to remove any micro air bubbles. Post-treatment is necessary to ensure proper forming and adhesion between the top skin layer and the substrate and a good RO membrane in terms of integrity can be produced.

2.2 Fabrication of Reverse Osmosis Hollow Fiber Membrane and Polyethersulfone Ultrafiltration Membrane

Membranes were fabricated using phase inversion technique. In this process, homogeneous polymer solution was transformed in a controlled condition into a gel comprising a polymer rich phase and a liquid polymer poor phase forming the voids. The spinning dope solution was spun by forced convective dry/wet spinning technique described by Ismail et al. [3]. A tube in orifice spinneret was used in the spinning process. The dope was placed in a 1 litre dope reservoir that was subsequently pumped to the spinneret by a gear pump.

The polymer solution flowed through the ring nozzle while the bore fluid (BF) was fed through the inner tube of the spinneret. The fiber passed through a controlled environment air gap before entering the coagulation bath. In the air gap, the pre-nascent membrane passed through a hollow perspex cylinder, which was the forced convective chamber where pure nitrogen gas was flushed at the specified controlled flow rate. Such an arrangement provided a controlled forced convective environment for inducing initial phase separation. The hollow fiber filament then passed through a series of rollers in the coagulation bath. Next, it was then passed through the washing/treatment bath. The fully formed fiber was then continuously collected on a wind up drum of diameter 17 cm.

Once removed, the hollow fibers were immersed in water at room temperature for at least 1–2 days to remove remaining solvent. Prior to testing, the membranes were subjected to a pre-treatment

process to reduce the pore size of membrane [17]. In the pre-treatment process, the membranes were immersed in a water bath at room temperature and the water bath with the membrane in it was gradually heated from ambient temperature to 90 °C in about 20–30 min. The final temperature was kept constant for 10 min. Next, the water bath together with the membranes were cooled drastically to below 60 °C by pouring cold water directly into the water bath to freeze the membrane structure.

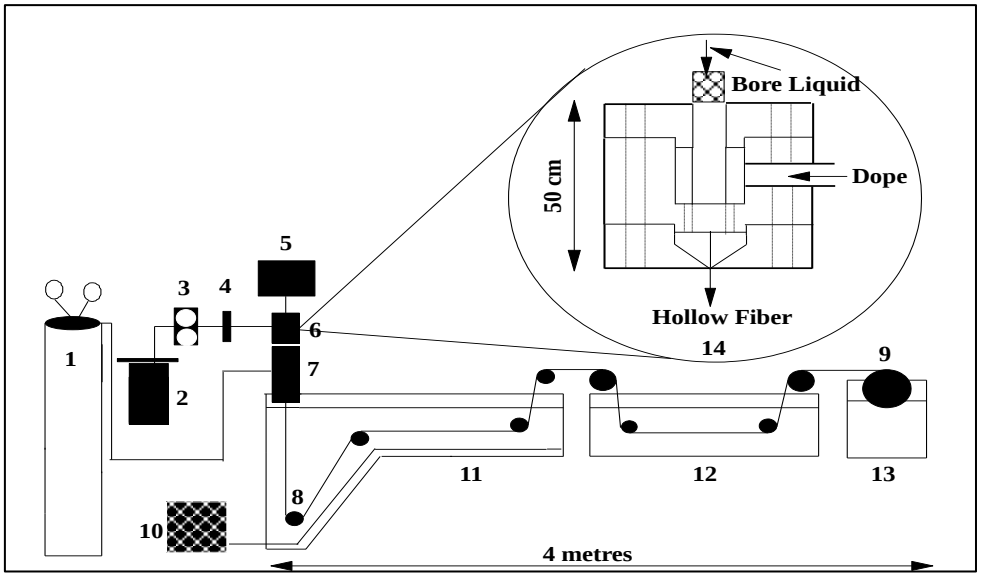


Figure 1: Schematic diagram of hollow fiber spinning system: (1) nitrogen cylinder; (2) dope reservoir; (3) gear pump; (4) on-line filter, 7mm; (5) syringe pump; (6) spinneret; (7) forced convective tube; (8) roller; (9) wind-up drum; (10) refrigeration/heating unit; (11) coagulation bath; (12) washing/treatment bath; (13) wind-up bath; (14) schematic spinneret [3]

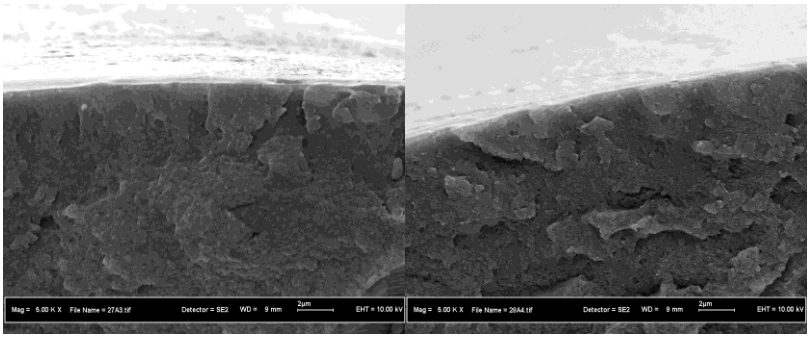
2.3 Integrated Membrane System RO Mobile Design

This mobile RO membrane water purification system design was adopted from combined existing research outcomes with recent technologies and related literatures. Using our expertise experiences, the highlight is how to make such modular process put in small footprint with compact design elegantly, enhanced filtration performance and would be equipped with mobile feature due to make easier in operational. The integrated mobile RO water purification system is intended to provide quality water support to small units and detachments where distribution of bulk water is not feasible or practical. The system provides clean water support without committing larger water production assets from the logistics support structure. The system tailors water production flow rates to the demands of independent Special Operations Forces, detachments and units typically engaged in remote site missions.

3.0 Results and Discussion

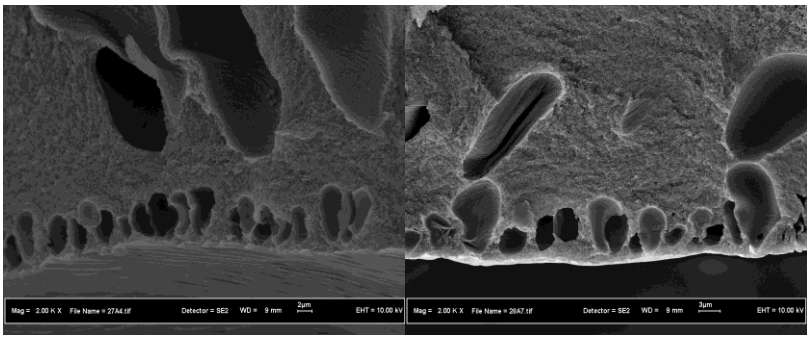
3.1 UF and RO membrane module fabrication

A customized membrane module is required to fabricate so that it can be fixed perfectly into the prototype. Each UF and RO membrane module is consisted of 2500 fibers and is about 0.40m in length, providing a total filtration area of about 1.5 m2. Both ends of module will be potted using epoxy resin and will be closed with a special design housing end cap. The membrane module will then put into a membrane housing made of stainless steel material. Each housing will come with three channels i.e. feed, permeate and retentate which will be connected to respective stream prior to operation. The filtration of this module are inside-out for UF and Outside-in for RO membrane in mode so as a maximum contact area can be obtained between membrane surface and contaminated water sources. From figure 6 (a,b), it can be seen that the porosity of membranes skin layer thichness for ultrafiltration Polyethersulfone and reverse osmosis Polyimide.



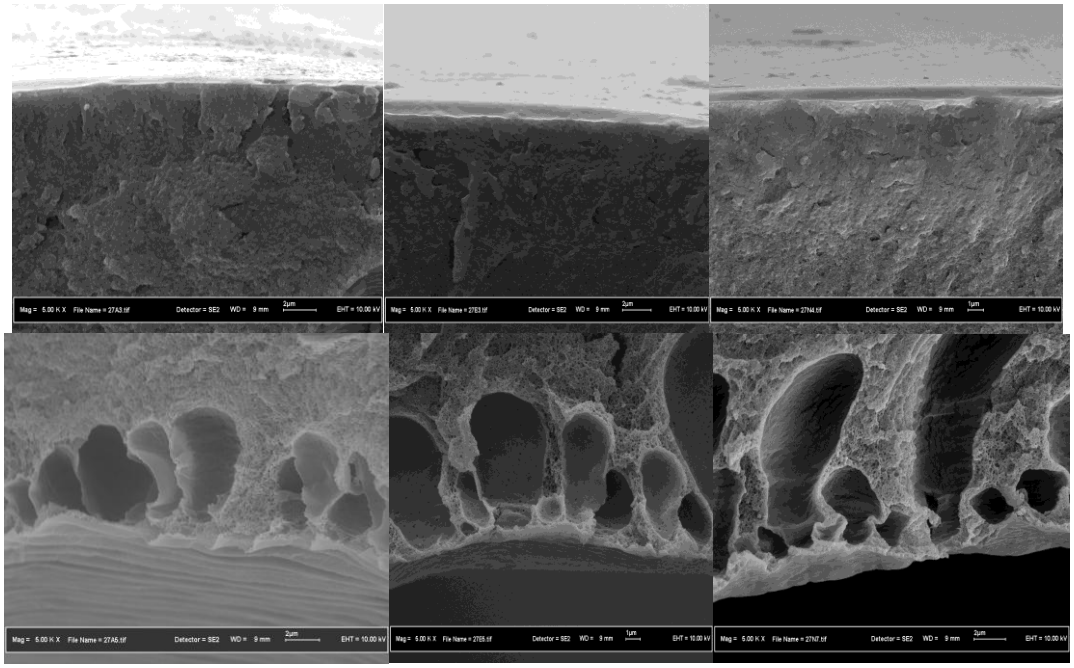
(a) (b)

Figure 2: SEM cross-section images of hollow fiber skin layer with (a) UF Polyethersulfone; (b) RO Polyimide (magnification: 5000)



(a) (b)

Figure 3: SEM cross-section images of hollow fiber sublayer with (a) UF Polyethersulfone; (b) RO Polyimide (magnification: 2000)



(a) (b) (c)

Figure 4: SEM cross-section images of RO Polyimide hollow fiber membrane from various drying method (a) naturally drying; (b) methanol & ethyl ether; (c) methanol & n-hexane (magnification:5000x)

Natural drying process made a porous skin layer membrane become very dense as shown in Figure 4 (a) but the solvent exchange process did not change the properties of skin layer as natural drying process did. Smaller macrovoids were observed in natural drying process which indicated that the original finger-like macrovoids at the inner portion of the as-spun membrane had gradually disappeared after being dried thus the flux rate decreases because the water flow through the

membrane was slower in dense skin layer membrane. However, salt rejections were higher due to small pore size in dense membrane.

For the solvent exchange drying process, finger-like macrovoids at the inner portion were observed (Figure 4 (b, c)) which meant that the structure of as-spun membrane could be preserved using these drying methods [16]. The skin layer produced by solvent exchange process was not too dense or too porous and consequently the optimum performance can be achieved. However, methanol & n-hexane exchange also resulted in physical changes of the membranes such as curling and wrinkling. As a result, the methanol & ethyl ether solvent exchange was selected as the most appropriate drying method.

3.2 Integrated Membrane System RO Mobile Design

Through prototype level experiment trials, the system is capable for producing both clean and drinking water that suitable for sanitation, cooking and drinking purposes although using contaminated river/flood water input source. From the commercialized point of view, such system could be also treated as an asset that will be used from time to time when needed. Figure 5 show the conceptual design of integrated mobile RO water purification that will be install using light vehicle. While Figure 6 was a flow-chart for integrated mobile RO water purification.

Figure 5: Integrated mobile RO water purification was designed to be man-portable, modular and able transportable from place by using light vehicle.

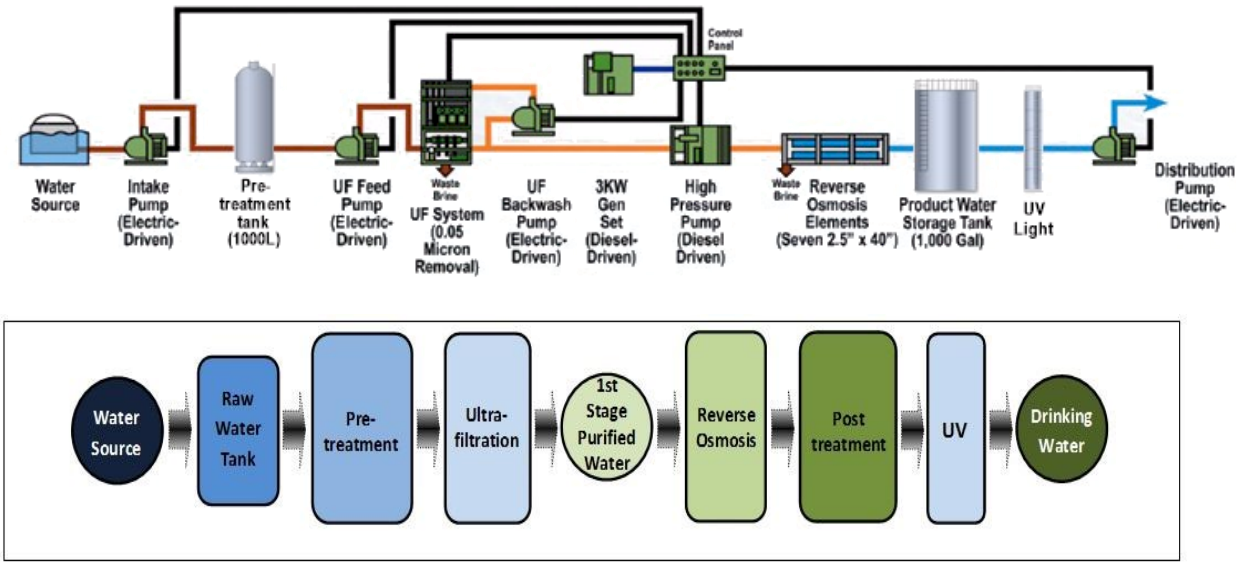


Figure 6: Water purification system process flow-chart

4.0 Conclusion

In order to develop reverse hollow fiber osmosis membranes and ultrafiltration membranes that possess high permeation rates (flux) and salt rejection, the membrane properties and membrane structure are the most important factors. The experimental result showed that:-

4.1 Natural drying process made a porous membrane become very dense thus decreasing the flux rate but increased the salt rejection.

4.2 The solvent exchange processes were found out as the appropriate method to reduce the change of the morphology of as-spun membrane. However, because methanol & n-hexane solvent exchange drying also resulted in physical changes of the membranes such as curling and wrinkling, the methanol & ethyl ether solvent exchange was selected as the most appropriate method to dry the membrane.

4.3 The designing of RO mobile water purification through prototype level experiment trials, the system is capable for producing both clean and drinking water that suitable for sanitation, cooking and drinking purposes although using contaminated river/flood water input source.

4.4 From the commercialized point of view, such system could be also treated as an asset that will be used from time to time when needed.

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SOCIO ECONOMIC (SE)

ESTABLISHING A GENDER-SENSITIVE MODEL OF DISASTER RELIEF AND PREPAREDNESS: A FOCUS ON RELIEF AND PREPAREDNESS IN THE CASE OF FLOOD DISASTER

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1.0 Introduction

The latest spates of flood in 2014 affect Malaysia significantly with its unexpected magnitude. One of the states that is most severely affected by the 2014 flood is Kelantan. The flood has caused many quarters to begin to reflect Malaysia's preparedness in terms of effectively responding to, manage and stem disasters and the extent to which our citizens are equipped to deal with flood emergencies. A study by Magiswary et. al (2010) reveals that although there is a high degree of confidence at surface level, with respondents claiming to be aware of disaster issues and the ability to utilise many of the relevant safety methods, a deeper assessment suggests that there are several areas in which desirable knowledge and understanding is lacking. They suggested that level of disaster preparedness need to be improved to pre-empt, deal with and, ultimately, survive a disaster. Despite all these recommendations, not much has been addressed on the issue of gender in disaster preparedness. Disaster is often seen as equally affecting men and women or that it is gender-blind. In many reports of disasters, however, women experience greater risks than men. Furthermore, men and women have different vulnerabilities and capabilities in coping with disasters. Fundamentally, these vulnerabilities and capabilities are not only influenced by the biological make-up of men and women but also by the social constructs about gender roles relations. Thus, responses to disaster must importantly be gender sensitive and include the use of gender lens and analyses.

Using gender analysis, this study aims to identify the gender gaps in the existing disaster management plan and structures and to ensure that gender perspective is incorporated in disaster management structures, institution and policies. This, undoubtedly, will significantly improve the preparedness and relief program. The development of a model that integrates gender perspectives in disaster management plan will highlight the critical areas or problems and the challenges faced by the women and vulnerable groups that affected by disaster. The development of more gender sensitized disaster management model is important as it will ensure that gender issues and women needs are adequately recognized. The model will also be able to develop criteria for capacity building program to ensure women have equal access to assistance during disaster. Furthermore, the application of this gender-based model by any government agencies and institutions would be able to improve the level of preparedness in coping with disaster and therefore will avoid massive losses and to enhance their socio-economic status and quality of life in the post-disaster environment.

2.0 Methodology

This study applied both quantitative and qualitative methods and also included the desk review of key materials. The study has selected three areas in Kelantan, Kota Bharu, Pasir Mas and Tumpat which have been affected by the recent flood. Data collection has been commenced with the administration of three focus group discussions (FGDs) involving female survivors of the flood and members of relevant village committees. The data from the FGDs was analysed independently as well as for the purpose of developing the questionnaire for the survey. The quantitative phase of the study involves the administration of questionnaire to a sample of 300 adult female and male flood survivors from the three areas. Participants of this study has been selected through purposive sampling and snowballing technique. A desk review of existing disaster management procedures or plans was made to the availability of gender dimensions and the gender gaps in them. As a measure of further understanding the practical aspects of the disaster management, a total of three in depth interviews

also were conducted with key agencies that are ordinarily involved in flood disaster response. Data from the survey is analyzed using SPSS software and a gender-based model is developed using Structural Equation Modelling (SEM), based on the subjective experience of the actors. During the research process, ethical conduct is observed and considered and the informed consent were obtained from all participants.

3.0 Results and Discussion

Gender issues and women resilience during flood disaster are socially constructed under different geographic, cultural, political-economic and social conditions. They have a complex social consequences for women and men. For the purpose of discussion, this study is focusing on gender issues that relates to women specific needs during and after disaster. The study shows that early warning systems should be viewed as one major element in disaster risk reduction. It is not only can reduce the economic and material impact of disasters but most importantly it can prevent loss of life. The inadequate early warning systems can expose flood victims to the potential risk of deaths and multiple types of injuries. In this case, women and small children have often become the major group that affected by the lack of early warning systems. The study also revealed that all of the respondents have a low level of knowledge in disaster preparedness and they did not receive any early warnings despite the facts that they had experienced major floods several times before in their lives.

On top of that, socio-economic status has an impact on the type of vulnerabilities faced by flood victims especially women and the marginal group. Women are most effective at mobilizing the community to respond to disasters (Gangwar, 2013). Based on the interviews, it shows that women played a central role within the families, transporting the children to safety, finding the best way to rescue their families, working together with the men to secure relief from emergency authorities, to meet the immediate survival needs of family members and managing temporary relocation. However, this study found out that women at the evacuation centre are not being given the opportunity for decision-making position. Although the women are quite active in giving aids and helping in the distribution of aids but due to lack of recognition, majority respondents claimed that they ended up doing traditional roles such as cooking and cleaning the centre. Women, girls, boys, and men are all belonging to different age and socio-economic strata. They have a different level of vulnerabilities, and this shapes the way they experience a disaster, and also their ability to recover from it. Not only are women differently affected than men by disasters, but also different groups of women who have different needs and will respond differently in the midst of emergencies.

The needs of women with small children are likely to be different from the needs of single mothers living alone in a village. Such differences of their needs should be taken into account in preparing for disasters. The results collected from interviews, focus-group discussion and survey questionnaire shows that women and young girls do not face the same needs and vulnerabilities during the flood disaster. There are differences within each group and between individuals particularly specific protection concerns and capacities. However, the discussions above also clearly described the lack of gender-sensitivity in the disaster management system. The majority of respondents suggested that there should be a clearer information and procedure in the event of a flood disaster. The study revealed that the inadequate early warning system, lack of appropriate equipment and the shortage of staff in charge has a significant impact on women and young children during flood disaster.

4.0 Conclusion

Although all groups in the society suffer from the devastating effects of floods, majority of the victims are women and children (Olumide, 2008; Mordi, 2011). Focus on gender mainstreaming in disaster management is therefore, critical because otherwise, women will continue to be disproportionately affected by disasters (Kottegoda, 2013). All those working in the area, whether in the field of study and analysis or in the field of relief distribution and emergency response, should recognize the specific needs and concerns of women in a disaster situation as well as the specific contribution that women can make to sustainable recovery and reconstruction. Therefore, the study finds that:

4.1 Disaster preparedness and mitigation through the formation of Women Flood Management Group or club at village level are essential to promote resilience and preparedness. The group should consist of villages, village committee (JKKK), and representatives from each household, especially from those who are most vulnerable. This group will be owned and managed by the communities that will empower individuals and provide communities with advance information on risks that can be readily translated into prevention, preparedness and response actions. Volunteers

from the local villagers can be recruited to manage them and these volunteers will be trained on key issues in flood management.

4.2 The Flood Management Group should represent a balanced gender distribution, as often the case women have lower proportion in the local level political representation. Women are usually absent from the decision-making and planning in Disaster Risk Management. Often the case when priorities are established, the interests of women are often poorly represented. Women often have limited opportunity to decision-making power structures due to patriarchal norms in the society that prevent them from participating in emergency planning and action. Due to their gender role, they have limited interaction beyond domestic sphere compared to men and as a result they are less informed, not well-prepared when disaster struck.

4.3 The study suggested that the village committee and local leaders should work with relevant local government agencies such as JPAM and Fire Department to set up an early warning system to alert villages about incoming disasters through support group via social media etc.

4.4 It is recommended that this Flood Management Group should work with local schools in disseminating information about flood management with both students and teachers in primary, secondary and high schools. Most importantly, more awareness campaigns to promote understanding of women issues during disaster such as access to facilities, decision making, sanitation, hygiene and many others.

4.5 Government should enforce the section of law that protects the rights of women in order to remove all aspects of discrimination against women. Equity and social justice provide a level playing ground for women and men in all life opportunities, including floods-related adaptation. This will remove all forms of disproportionate gender vulnerability.

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RESILIENCE, VULNERABILITY AND ADAPTIVE CAPACITY ASSESSMENT OF EAST COAST COMMUNITIES IN MALAYSIA TO FLOOD

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1.0 Introduction

There are two purposes of this project, which are to assess of the severity of the flood through identification of flood prone areas vulnerable to flood and to assess the flood affected community vulnerability through physical and social aspects. For the first assessment, specific objectives have been drawn to achieve the aim of the study including determination of the factors affecting the flood event, delineation of the flood vulnerability map, assessment of the severity of the flood event based on flood vulnerability map and severity indicator; level of flood and time duration for flood to subside. Physical factors affecting the occurrence of flood were identified and validated using the Flood Vulnerability Map and Severity Indicator. Further verification of the Flood Vulnerability Map was done on the ground to assess the severity of flood. The outcome from the assessment is to set an indicator of flood, which is to identify the important measures that can be applied with best management practices in order to bring improvements to the flood event that would occur in the coming future. A flood vulnerability map was produced using Geographical Information System (GIS) to show the relationship between the attributes and spatial data of the December 2014 flood event in Kelantan. For the second assessment, two aspects were considered as community vulnerability, which are community capitals in terms of humanity, financial, physical, health and social and community internal capacity in terms of worriness, trust to government, preparedness and relocation. According to Bonanno et al., 2010, most of the survivors of a disaster, usually will have posttraumatic stress disorder (PTSD), grief, depression, and stress-related health cost. These aspects are measured by assessing the adaptive capacity, vulnerability towards disaster, psychological resilience, and exposure to disaster. Under these four variables, it is divided into smaller aspects, which are social, economy and health. The concepts of adaptation, adaptive capacity, vulnerability, resilience, and exposure are interrelated and have wide application to global change science. In this situation, these indicators are important in measuring the community response towards disaster. Trust towards government is important. Without trust, support for necessary reforms is difficult to mobilise. The decline in trust in government is serving to underline that trust is an essential in successful policy making but it is often overlooked. A decline in trust can lead to lower rates of compliance with rules and regulations. Community or citizen would become more risk-averse and delaying any decisions in order to have a competitive growth of the country. Encouraging trust in government would help in social well-being as well as economic recovery for future especially when a country was afflicted by political conflicts or natural disasters (OECD, 2013). On the other hand, some studies have demonstrated that the level of disaster preparedness may change as a function of some key personal and psychological factors, including previous disaster experience (Heller et al., 2005), personality characteristics (Heller et al., 2005), self-efficacy (Mulilis & Lippa, 1990), causal attributions (McClure et al., 1999), perceived responsibility for preparedness (Lindell & Whitney, 2000)and amount of concern or preoccupation for a future catastrophe (Weinstein, Lyon, Rothman, & Cuite, 2000). On the relocation aspect, the factors or reasons for the relocations decisions could be sudden natural disaster danger that community experienced which require them to be relocated when the severity levels increased as a result of climate change such as flood prone area. The second factor could be when their means of support are threatened by slowly effects of climate change such as increasing drought frequency, rise of sea level and unsustainable use of aquifers that need to relocate for permanent houses. The third factor could be community needs to find new homes because some parts of their country are troubles from the effects of disaster or climate change such as rising of sea level and erosions of riverbank. Those aforementioned factors were taken into account when flood affected community vulnerability in Kelantan are assessed.

2.0 Methodology

The study was conducted in the State of Kelantan, northeastern Malaysia. Eleven locations in Kelantan were selected based on severity of flood zones namely Kuala Krai, Dabong, Jeli, Gua Musang, Manik Urai, Kemubu, Ketereh, Rantau Panjang, Tanah Merah, Tumpat and Pasir Mas. The total area is approximately 15,000 km^2 with population of 1.5 million people. The flatland in which the above villages are located is subject to floods and the Manik Urai was heavily hit by December 2014 flood which caused bridge and railway bridge damages. There are 4 main rivers in the state namely the Nenggiri River, which flows eastern from the higher slopes of Korbu Mountain. Next, is the Galas River and later on, the Lebir River. From Kuala Krai, the rivers joined to become the Kelantan River, the main river of the state, which flows from Korbu Mountain (2183 m), the second highest mountain in Peninsular Malaysia, towards Kota Bharu in the North region and into the South China Sea. The river 3 flows passing four main towns: Pasir Mas, Tumpat, Kuala Krai and the capital state of Kelantan, Kota Bharu. Methods used including Flood Vulnerability Map (FVM), Development of Flood Vulnerability Index (FVI), Multi-criteria analysis and Questionnaire Survey

3.0 Results and Discussion

The results obtained from the application of methodology will be divided into two parts. First part will discuss Flood Vulnerability Index (FVI), the five criteria of the flood vulnerability index, Flood Vulnerability Map (FVM), flood validation and ambiguity of flood validation and finally the Severity Indicator (SI). The second part will discuss the community vulnerability aspect in terms of worriness, trust on government, preparedness and intension to relocate.

3.1 Flood Vulnerability Index (FVI)

The delineation of Flood Vulnerability Map (FVM) is based on the Flood Vulnerability Index (FVI), an index which estimates the severity of flood by taking five criteria into consideration which is the proximity to river (P), rainfall intensity (R), land use type (U), soil type (S) and elevation (E).

3.2 Multi-criteria analysis: Analytical Hierarchy Process (AHP)

Analytical Hierarchy Process (AHP) was used to assign weight to the five criteria. AHP is also used in the approach to determine the main factors which contributes to the vulnerability of the flood. AHP can address the weight assigning even though the criteria are of different scale.

3.3 Criteria of Flood Vulnerability Index

3.3.1 Proximity to River (P)

Proximity to river was chosen as criteria because the flood event that occurs is due to the overflow of the river bank. As the distance from the river becomes closer, the severity level from flood impact increases. Kelantan is a state where most of its land are low elevation land and close to the river. To address the effect of the proximity of distance from river towards the severity of the flood outcome, GIS is used to set multiple ring buffers along the tributaries. The classes for the buffer or distance from the rivers are as shown in Table 1.

Table 1: Proximity to River classification

Proximity distance from river (m)
<1000
1000 - 5000
6000 - 10,000
11,000 - 15,000
> 15,000

3.3.2 Rainfall intensity (R)

Rainfall intensity from the meteorological data obtained at the rainfall station at Mountain Gagau, indicated that in the duration of 10 days it is 1898 mm, which is approximately equivalent to half of the annual rainfall received which is 4000 mm. As the rainfall intensity increases (particularly in the upstream), the water will end up in the river channel and travel towards northeast into the South China Sea due to the difference in elevation. The huge amount of water that flows then causes the overflow of river bank. This is one of the reasons which explain the severity of flood that had occurred in December 2014.

The mean of total rainfall is calculated for all rainfall stations to show variations on the daily scale. The location of all the chosen rainfall stations was pin-pointed and digitized into GIS environment. They are also rectified to the same projection to match with other maps. After digitizing the points into the GIS environment, the rainfall data is added into its table of attribute data. The pair wise comparison for rainfall intensity is related in a direct relationship. The mean of rainfall which is higher will have a more significant impact towards the determination of flood vulnerability in an area and vice versa.

3.3.3 Land use (U)

Land use type is chosen as criteria because the type of land usage directly affects the fate of water flowing in an area. Due to logging activities and development of various infrastructures and facilities, the land is converted to an impermeable land which decreases the infiltration rate. Besides that, previously dense forests which are good for water infiltration and water retention are cut down to open up more lands for massive development. This worsens the condition especially when there is unusual heavy rainfall. This means that the excess water would have a hard time to infiltrate into the ground and finally end up as a surface runoThe reclassification of land use has to be made from the original data contributed by the Department of Town and Country Planning because the data was too huge and GIS faces troubles to run it. The classification of the original data was very specific where the total class of land use type consists of a total of 12 classes. After reclassification, the classes left are of 7 classes. The grouping done is based on the similar importance of the land use.

4.0 Conclusion

4.1 Vulnerability map successfully produced will determinant factors such as proximity to the river, rainfall, land use, soil texture and elevation map.

4.2 The community is still has trust in government. However, four factors were found as significant predictors of trust. The concept of expectations management in disaster emergency response should be applied when it comes aid and relief issue because people always expect that the government can always fully protect them in catastrophic events. On the other hand, the community in Kelantan's seems to unable to make their self-prepared in engaging the disaster.

4.3 There is clear evidence on the lower community preparedness based on the flood event of December 2014 where more than half (68.8%) of the respondent were group in unprepared group while only 15.8 % are noted as prepared group.

4.4 Nine factors were significant predictors for community preparedness level which are education attainment, household income, age group, and independent variables are impact, trust in government, economy status, awareness, self-preparedness, basic needs, and knowledge.

4.5 In terms of intention to relocate, from eight influence factors identified only five factors are significant predictor and most influenced to relocate namely as Income, Emotion, Finance, Transportation and Knowledge.

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ASCERTAINING THE ENSILING FACTORS IN THE PRODUCTION OF FEED FOR THE MAINTENANCE OF FLOOD AFFECTED RUMINANTS

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1.0 Introduction

Malaysia encountered frequent natural disasters such as flood. Flood occurs during the North-east monsoon season at the end of each year in the states of Kelantan, Terengganu and Pahang. Beside losses due to destruction of infrastructures, floods also destroyed agriculture production which is an important source of income and food security for the rural community. Feed resources for livestock are destroyed during prolong flood and thus ensuring availability of feed to maintain the survived livestock is crucial to keep the animals alive during this critical period and livelihood of the rural community which depend heavily on their livestock. There is a need to develop a “feed bank” to feed the survived animals during prolonged flood. The primary focus of this project is to develop an appropriate feed for ruminant animals, which can be stored over a period and can carry the animals through the disaster and post-disaster periods. To achive this goal, ensiling can be considered as the best presevation method of choice since a well-preserved silage can be kept for a year or longer. The ensiling of crops has been a preferential method in maintaining the energy content of the crops, ensuring a good nutritional value when used as feed. Thus, long term storage of feed can be achieved, and constraints of feed supply from seasons can also be eliminated (Yan Ping *et al*., 2011). Ensiling low quality of tropical crop residues such as rice straw can be improved by mixing with leguminous plant materials at the moment of ensiling; increasing fodder protein, the fermentative quality and nutritive value of ensiling in which they can serve as alternative for taking advantage of biomass surplus during rainy time and to obtain ensiling with high nutritional value without diminishing fermentative quality (Clavero, 2011). Khamseekhiew *et al*. (2001) reported that valuable fodder shrub such as *L. leucocephala* is mostly used species to increase the tropical animal production. *L. leucocephala* is a high nitrogen-fixing browse legume adapted to a well drained soil in the tropics and sub-tropics (Fleischer *et al*., 1996). Despite its abundant availability in these regions, their potential feeding value to livestock is rather limited due to its free amino acid, mimosine, which is toxic to animals (Jones, 1979). However, ensiling has been reported (Hongo *et al*., 1989) can reduces the momosine content to an extent levels for animals. Thus, *L. leucocephala* can be incoorporated together with rice straw for silage making to maintain adequates quantities nutreints particularly protein of the silage.

2.0 Methodology

2.1 Sampling of *L. leucocephala* and silage making

The rice straw was sourced outside and for *L. leucocephala* was collected within UPM vicinity . Fresh material was chopped and mixed according treatments and ensiled in silos. Treatment for ensiling were: T1) 60% rice straw (RS), 40% *L. leucocephala* (LL); T2) 50% RS, 50% LL and T3) 40% RS, 60% LL. The ensiling period took until day 40. Sampling was taken at day 40, for analysis of dry matter (DM), crude protein (CP) was determined according to the procedure of AOAC (1990). The neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) of the silage were observed using method described by Van-Soest *et al*. (1991).

2.2 Animal and rumen liquor sampling

Four rumen cannulated Dorper sheep with body weight about 20.96± 0.85 Kg were used as rumen liquor donors. The sheep were fed twice daily with a diet containing fixed amount of Napier grass and concentrate in a 60:40 ratio. Rumen liquor was sampled before the morning feeding at 8:00 h from four sheep and immediately placed in a warm insulated flask flushed with CO_2 gas before the collection. In the laboratory, rumen samples were strained through four layer of muslin cloth and used immediately for *in-vitro* gas production study.

2.3 *In-vitro* gas production test

The preparation of media for *in-vitro* study was done according to Menke and Steingass (1988). Approximately 0.3 g of dry samples of ensiled rice straw with *L. leucocephala* was placed into the glass syringe using spatula reaaching the bottom part of the syringe. After that the prepared mixture of basal media: rumen liquor (2:1) was added and mixed well before incubation. Samples were incubated for 72 h in an incubator at 39ºC and the volume of gas production (GP) was recorded at 2, 4, 6, 8, 10, 12, 24, 48, and 72 h of incubation. Total gas production at 2, 4, 6, 10, 12, 24, 48 and 72 h of incubation were estimated by displacement of the syringe piston. Net gas production values were corrected by substracting blank values from the samples. The pattern of non-linear gas production was obtained by fitting data of cumulative gas production to the exponential equation:

$$P = b\ (1\text{-}e^{-ct})$$

of Orskov and McDonald (1979) where P represents the cumulative gas production at time *t* (mL), b is the potential gas production (mL/g DM) and C is the rate of gas prodcution (/h). At the end of 72 h incubation, pH of the samples was measured using a pH meter. Liquid phase samples were used for volatile fatty aicds (VFAs) quantification, meanwhile residues were used for *in-vitro* dry matter degradability (IVDMD). For IVDMD, residues were oven dried at 105 ^{o}C for 24 h.

2.4 Animal, housing and design

The experiment was conducted at Animal Research Facilities, Institute of Agriculture, Universiti Putra Malaysia. Twenty eight male Dorper sheep of similar age with an average of 20.96± 0.85 Kg live weight were purchased from a local farm. The animals were randomly divided into four groups with seven animals per group. Animals were kept in individual pens of raised metal floor and at the beginning of experimental feeding they were assigned to the following experimental diet; T1) Basal diet (100% RS: pellet); T2: 60% RS, 40% LL, pellet; T3) 50% RS, 50% LL, pellet and T4) 40% RS, 60% LL, pellet. Animals were fed twice daily during morning (0800 h) and evening (1600 h). Animals were fed *ad-libitum* and fresh clean water was freely available. The feeding trial lasted for eight weeks. Feed refusal of the previous day was weighed and sampled each morning before the next meal to compute feed intake on daily basis. Intake was estimated as the difference between the amount of feed offered and feed remaining after 24 h every day .The bodyweight of Dorper sheep was recorded every two week interval until week eight for body weight gain measurement.

2.5 Statistical analysis

The data were subjected to variance analysis techniques according to the general linear model (GLM) procedures of SAS® 9.0 (SAS Institute). The differences between the means of groups were separated by Duncan's multiple range tests. The statistical model used was:

$$Y_{ij} = \mu + \alpha_i + \delta_{ij}$$

Where Y_{ij} is the observed dependent variable; μ is the overall mean; α_i is the treatment effect; and δ_{ij} is the random error.

3.0 Results

3.1 Effect of different of rice straw and *L. leucocephala* on chemical composition of silage

The chemical composition of silage is shown in Table 1. The pH of ensiled rice straw mixed with *L. leucocephala* was not significantly different ($P > 0.05$) between different ratio, and fall within the range of 5.76 to 5.90. However, the dry matter and crude protein were increased ($P < 0.05$) with increasing level of *L. leucocephala* in the silage. The combination of 40:60 had highest crude protein content which is 12.67% per dry matter basis. The neutral detergent fiber content of 40:60 was the lowest while, acid detergent fiber content of 60:40 was the lowest.

Table 1: The pH and nutrient composition of ensiled rice straw and *L. leucocephala*

Parameter	Diet		
	60:40	**50:50**	**40:60**
Gas production 24h	21.31±0.82[c]	26.23±1.07[b]	29.86±1.17[a]
pH	6.90±0.02	6.90±0.01	6.91±0.01
Total VFA (mMol/L)	43.94±2.12[a]	35.25±1.71[b]	34.97±1.40[b]
Acetate (%)	65.23±0.67	64.62±0.59	63.91±0.43
Propionic (%)	21.44±0.28	21.52±0.22	21.62±0.26
Iso-butyric (%)	1.93±0.21	1.97±0.07	2.05±0.06
Butyric (%)	6.53±0.21	6.82±0.17	7.03±0.12
Iso-valeric (%)	3.13±0.16	3.18±0.13	3.35±0.09
Valeric (%)	1.73±0.15	1.89±0.13	2.05±0.11
Acetic: Propionic	3.05:1	3.00:1	2.96:1

Significantly different at 5% ($P < 0.05$)
[a, b, and c:] Means with different letter within a row differed significantly

3.2 Effect of different ratio of rice straw and *L. leucocephala* on rumen fermentation profile and kinetic parameters

In the *in-vitro* trail, the combination of 40:60 produced the highest amount of gas at 29.86 mL, followed by 50:50 (26.31 mL) and 60:40 (21.31%) (Table 2). Besides that, the total volatile fatty acids production were also significantly higher (P <0.05) in 60:40, followed by 50:50 and 60:40 at 43.94, 35.25 and 34.97 respectively. The gas production rate between different ratio of ensiled rice straw and *L. leucocephala* was significantly different (P <0.05) with higher rate gas of gas produced with higher level of *L. leucocephala.* The *in-vitro* dry matter degradability of 60:40 was the highest followed by 40:60 and 50:50. The gas production kinetic parameters and IVDMD after 72 h of incubation of ensiled rice straw mixed with *L. leucocephala* at different ratio is detailed in Table 3. The rate of gas production (c/ h^{-1}) was higher (P < 0.05) with increasing level of *L. leucocephala*. However, the fermentation of 60:40 (RS:LL) had higest IVDMD at 33.2% followed by 40:60 (RS:LL) at 30.87 and 50:50 (RS:LL) at 28.67% respectively.

Table 2: *In-vitro* fermentation profiles of ensiled rice straw and *L. leucocephala*

Parameter	Diet		
	60:40	**50:50**	**40:60**
pH	5.76±0.08	5.75±0.06	5.90±0.04
Dry matter (%)	2.67±0.05[b]	4.56±0.40[a]	4.91±0.15[a]
Crude Protein (%)	8.56±0.07[c]	11.39±0.29[b]	12.67±0.07[a]
NDF (%)	73.22±0.76[a]	73.90±1.42[a]	66.41±2.11[b]
ADF (%)	48.97±3.49	48.05±0.55	45.26±2.17
ADL (%)	13.66±1.82[b]	20.40±1.66[a]	20.50±0.36[a]

Significantly different at 5% ($P < 0.05$)
[a, b, and c:] Means with different letter within a row differed significantly

Table 3: *In-vitro* fermentation kinetics of ensiled rice straw and *L. leucocephala*

Parameter	Diet		
	60:40	50:50	40:60
a	31.09±0.75[b]	32.31±0.39[ab]	33.27±0.35[a]
b	107.08±6.62[a]	75.87±2.80[b]	59.86±1.79[c]
c/ h^{-1}	0.008±0.00[b]	0.013±0.00[a]	0.017±0.00[a]
IVDMD	33.20±1.04[a]	28.67±0.83[b]	30.87±0.99[ab]

Significantly different at 5% ($P < 0.05$)
[a, b, and c:] Means with different letter within a row differed significantly

3.3 Effect of different ratio of rice straw and *L. leucocephala* on growth performances of Dorper sheep

Table 4 show the effect of feeding different ratio of ensiled rice straw with *L. leucocephala* on growth performances of Dorper sheep for eight weeks. Overall the dieatry treatment had no effect (P >0.05)on daily and cumulative feed intake of sheep. However, the body weight gain and cumulative weight gain, on the other side, between treatment group was significantly different (P <0.05) with sheep fed with control diet had highest value followed by T4, T3 and T2 respectively. Dietary treatment however, had no effect (P>0.05) on the final body weight of Dorper sheep.

Table 4: Growth performance (means ± SE) of sheep fed dietary treatment silage

	Dietary treatment			
Parameters	**Control**	**60:40**	**50:50**	**40:60**
Feed intake (Kg fresh/animal/daily)	1.14±0.00	1.14±0.00	1.14±0.00	1.14±0.00
Body weight gain (Kg/ animal/daily)	0.09±0.04^{a}	0.01±0.00^{b}	0.02±0.01^{b}	0.03±0.01^{ab}
Total feed intake (Kg fresh/animal)	63.70±0.00	63.70±0.00	63.70±0.00	63.70±0.00
Initial body weight (Kg/animal)	19.44±0.67^{ab}	21.383±1.19^{a}	18.71±0.62^{b}	20.96±0.85^{ab}
Final body weight (Kg/animal)	24.72±2.37	21.90±1.32	19.96±0.32	22.57±0.86
Cumulative weight gain (Kg/animal)	5.28±1.99^{a}	0.52±0.24^{b}	1.24±0.47^{b}	1.61±0.33^{ab}

Significantly different at 5% (P < 0.05)
a, b, and c: Means with different letter within a row differed significantly

4.0 Discussion

4.1 Effect of different ratio of rice straw and *L. leucocephala* on chemical composition of silage

In the current study, ensiling of different ratio of rice straw and *L. leucocephala* had no significant (P >0.05) effect on the pH value of silage and fall between the range of 5.76 to 5.90. Increasing level of *L. leucocephala* up to 60% had increased the pH value. The pH value observed in this study is consistent with reports in the literature (Massafera *et a*l., 2015). In the study carried out by Massafera *et al*. (2015), the replacement of aruana grass with leguminous gliciridia in the silage mixture also exhibited high pH values (above 4.8), which may be difficult to control microorganisms spoilage in farm condition that can cause diseases in animals. In addition, Fleischer *et al*. (1996) reported that the whole leguminous whole forages silage had pH 5.27 to 6.22. Leguminous *L. leucocephala* is low in water soluble carbohydrates and has high buffering capacity, which inhibits pH changes (Angthong *et al*., 2007). In additon, study by Alii *et al*. (1983) also found that organic acid development and fall in pH throughout fermentation was very slow. McDonald *et al*. (1991) also postulated that tropical grasses and leguminous plants are not natural ensilage material due to lower water soluble carbohydrate, which are crucial to the success of ensilage. It is therefore, recommended additional additives for example rice bran (RB) and/ or mixing with cereal crops (Phiri *et al*., 2007) will improve the nutrient value of silage. The DM content, on the other hand, had improved in T2; 50% RS, 50% LL and T3; 40% RS, 60% LL by two fold compared to T1; 60% RS, 40% LL. The CP value linearly increased with increasing level of *L. leucocephala*. The 40:60 (RS:LL) had the highest CP (12.67%) followed by 50:50 (RS:LL) at 11.39% and the lowest in 60:40 (RS:LL) at 8.56% respectively. The data obtained was in congruent with (Clavero, 2011) where inclusion of *L. leucocephala* at the rate of 30% or more had improve the fermentative quality and nitrogenous compounds of King Grass silage. There was a decreased in the NDF content with the addition of *L. leucocephala* at only 60% from the total mixture of rice straw silage. Similar result were observed in study conducted by Massafera *et al*. (2015) where they also found that replacement of aruna grass by gliciridia in the silage mixture displayed lower NDF and ADF content besides having linear increased in the CP content. Since *L. leucocephala* is a legumnious plant, it is expected that increase in this forage in silage will linearly increase the CP and reduce the NDF content of rice straw silage as in line with study by Simons and Stewart, (1994). The plausible reason that may account for these results is that legumes exhibit greater nitrogen solubility compared to rice straw that may contribute to higher CP value (Brown and Pitman, 1991). In addition, it is known that crop residue such as rice straw has very low solubility due to cell wall components thus higher ratio of this materials in silage mixture will exhibited higher in NDF content (Dewhurst *et al*., 2003).

4.2 Effect of different ratio of rice straw and *L. leucocephala* on rumen fermentation profiles and kinetic parameters

Gas produced in the *in-vitro* gas production may reflects the extent of feed fermentation and digestibility (Getachew *et al*., 1998). Thus, in the present study the fermentability characteristics of mixture of rice straw and *L. leucocephala* was evaluated via *in-vitro* gas production technique before offer to sheep. The effect of different ratio of rice straw and *L. leucocephala* silage on gas production and kinetics were evaluated in this study using technique by Menke and Steingass (1988). The gas production (GP) at 24 h differed (P <0.05) among treatment diet, where T3; 40% RS, 60 LL had highest gas production (29.86%) followed by T2; 50 RS, 50 LL (26.23%) and the lowest was in T1; 60 RS, 40 LL. The production of gas (GP 24h) linearly increased with level of *L. leucocephala in* the silage mixtures. The similar results was also obsevered in a study carried out by Babayemi *et al*. (2010) where the inclusion of *Albizia saman* pods (ASP) in ensiled cassave wastes had higher gas production. Higher gas production with increasing level of *L. leucocephala* may be due to the increased in the DM and CP of silage. Different ratio of ensiled rice straw with *L. leucocephala* had no effect on the pH value toward the end of the fermentation (72 h). Previous work by García *et al*., (2006) also observed similar pH values averaging near to 7.0 of each fodder ensilage that may be due to the effect of slow fermentation and continuos buffer infusion (Salem *et al*., 2013). However, the total VFAs, on the other sides was significantly different (P <0.05) between treatment diet with T1 had the highest VFAs amount (43.94 mMol/L) while T2 and T3 is not significantly different (P <0.05). Overall, the proportion of actetic, propionic iso-butyric, butyric, iso-valeric and valeric was not significantly different (P <0.05) between all treatment diet. Similar to the present study, Stürma *et al*. (2007) also found that the total concentration of VFAs was affected by the different level of legume in the fermentation of *B. humidicola* mixtures. Highest VFA concentration was observed with the fermentation of *B. humidicola* alone.

The IVDMD of rice straw and *L. leucocephala* silage mixtures noticebly decreased (P <0.05) with higher inclusion level of *L. leucocephala. In-vitro* dry matter degradability of 60 RS: 40 LL was the highest (33.20%) and the lowest is 50 RS: 50 LL (28.67%). Higher level of rice straw (T1) had highest IVDMD which in agreement with work by Stürma *et al*. (2007). In this previous worked, IVDMD was found to decreased linearly with increasing proportion of different shrub legume foliages (*Calliandra calothyrsus, Flemingia macrophylla* and *L. leucocephala)* when mixed with low-quality tropical grass (*Brachiaria humidicola*) but the extent of this suppression differed among species. Unexpectedly higher proportion of rice straw in the silage mixtures had higher IVDMD as in line with Stürma *et al*. (2007) where they observed that eventhough *B. humidicola* is high in fibre and low in protein the IVDMD is very high compared to mixtures of *B. humidicola* with forages. The rate of gas production (c/ h^{-1}) between treatment diet was significantly different (P <0.05). The rate of gas production increased with increased in the level of *L. leucocephala* in the silage mixture. Potential degradable fractions a and b on the other sides, also differed significantly (P <0.05) amongst different proportion of rice straw and *L. leucocephala* in the silage mixture. The finding result was in accordance to Babayemi *et al*. (2010).

4.3 Effect of different ratio of rice straw and *L. leucocephala* on growth performances of Dorper sheep

In the feeding trial, daily and total feed intake of Dorper sheep were not affected (P <0.05) by dieatry treatment. However, dietary treatment had effect on (P <0.05) on daily bodyweight gain and cumulative weight gain except for final body weight. Sheep fed with control diet (100% RS) had better daily and cumulative weight gain compared to those fed with mixed rice straw and *L. leucocephala* silage. The average final body weight of sheep fed with control diet is 5.28 Kg while sheep fed with 60 RS: 40 LL, 50 RS: 50 LL and 40 RS: 60 LL is between 19.96 to 22.57 Kg. The addition of *L. leucocephala* in mixture of rice straw silage resulted in the metabolites production of mimosine, during fermentation, dihydroxypyridine (DHP) which is toxics might have accounted for the lower weight gain of sheep (Oduguwa *et al*., 2013). Besides that, Angthong *et al*.(2007) also reported that mimosine which has similar properties to tyrosine where it become antagonist to this amino acid and will then inhibits protein synthesis and consequently reduces production and growth performance of animal. Increasing level of *L. leucocephala* in ensilage had reduced wieht gain of sheep in comparison to those fed control diet and this is inline with study by Oduguwa *et al*., (2013) where it is suggested that lower level of fodder trees including *L. leucocephala* appears to be more appropriate.

5.0 Conclusion

5.1 Increasing level of *L. leucocephala* improved the quality of silage by increasing the DM and CP content respectively. Besides that,

5.2 The level of NDF content was also reduced.

5.3 In the future, more work should be carried to improve the quality of silage of rice straw mixed with *L. leucocephala* where additives such as rice bran or high carbohydrate feed materials should be added in the silage since *L. leucocephala* contain low soluble carbohydrate and high buffering capacity.

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COMMUNITY FOOD PREPAREDNESS FOR BUILDING CLIMATE RESILIENCE

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1.0 Introduction

In Malaysia flooding is an issue affecting most states, and communities need to know and learn to be resilient against the expected more frequent and higher intensity floods resulting from climate change. The flooding experienced recently in Kelantan, Pahang and Perak have resulted in substantial physical, financial and emotional damage to the flood victims. Due to the large nature of the floods, many victims were unprepared for the impacts to their homes and lives. Some victims had experience floods in their residential area but not to the extent seen recently. Others had not experienced floods but were suddenly affected by them. Many people lost all their home and belongings.

It is likely that these extreme flood events which has been unknown in previous history may become more frequent, partly as a result of man-induced climate change. Down-scaling of the global climate predictions have been carried out for Malaysia by the National Hydraulic Research Institute of Malaysia (NAHRIM) (NAHRIM, 2006; NAHRIM, 2010a, 2010b). The results indicate increasing incidence of both lower and higher rainfall, resulting in extended drought periods and increasing intensity and duration of storm rainfalls. Society needs to be prepared for and adapt to these environmental changes in the future. Awareness and preparedness for natural disasters may enhanced a community's resilience to such disasters. Many existing training modules on community based disaster management concentrate on risk reduction planning and less on the actual actions to be taken by the community.

Community flood preparedness and resilience can be enhanced through implementation of a community awareness and flood preparedness facilitation module. The approach is to train community members who may be expected to play a leadership role in case of flood events. It is hoped that with knowledge gained in the training module, the community members who have participated will have the confidence to take the mantle of responsibility as a team. This study investigates the improvement of knowledge gained due to the implementation of a short training course on flood preparedness. It is expected to contribute to an effective training module which can be useful for use in the Drainage and Irrigation Department's Integrated Flood Management (IFM) programme.

2.0 Methodology

The training modules studied for this project were developed based on two previous training sessions carried out by the Malaysian Water Partnership and in association with several government and non-governmental organisations and Universiti Putra Malaysia. The training was led by the Global Environment Centre. These training sessions were conducted over a period of one full day. Based on the experience from the two sessions, it was decided that community test training should only be conducted for half a day. Based on the time available, only three modules were selected for implementation for the study: 1. Identification of safe escape routes; 2. Treatment for safe drinking water; and 3. Preparation of 'Grab Bag'.

The tool used for assessing flood training effectiveness was a set of questionnaires for pre and post training conditions. The questionnaires were divided into two sections; one for respondent background and another for opinion. The opinion section assessed the respondents' understanding of preparing for floods, specifically focused on the module topics. The questions comprised a series of statements and answers allowed were nominal, that is, No, Unsure or Yes. The sequence of questions in the pre and post-training questionnaires were altered to reduce the effect of respondents remembering and repeating answers made during the pre-training questionnaire. A total of 18 questions were used to evaluate the effectiveness of the modules. The number of questions is associated with the complexity of each module (Table 1). The survey results, indicating change in respondent knowledge before and after training, were tested to detect the change in knowledge gained, related to each module, after training.

Training was provided to two communities: Kampung Sg. Pinang, Mukim Kapar, Selangor, comprising 35 participants; and Kampung Sg Isap, Kuantan, Pahang comprising 70 participants. Two of the participants from Kampung Sg. Pinang also facilitated in Kampung Sg Isap training.

Table 1: Training Modules Tested

Module Topic	Description	Effectiveness Tool
1. Identification of safe escape routes	Observation of the village area, using town watching approach, to identify safe locations and safe access routes to the safe locations. Requirements for signages, and reduction of hazards along routes are also discussed.	11 questions
2, Treatment for safe drinking water	Demonstration of the use of available devices and equipment for filtering river water for use as safe drinking water.	4 questions
3. Preparation of 'Grab Bag'	Demonstration of the requirements for a Grab Bag and the essential items which it should contain for emergency situations when leaving the home.	3 questions

3.0 Results and Discussion

The pre and post training results, indicating change in respondent knowledge before and after training, were tested for symmetry, using non-parametric tests. The results (example in Fig. 1) indicate that results may range in a variety of patterns of negative and positive changes in understanding. The plots also indicated that some results did not display symmetry.

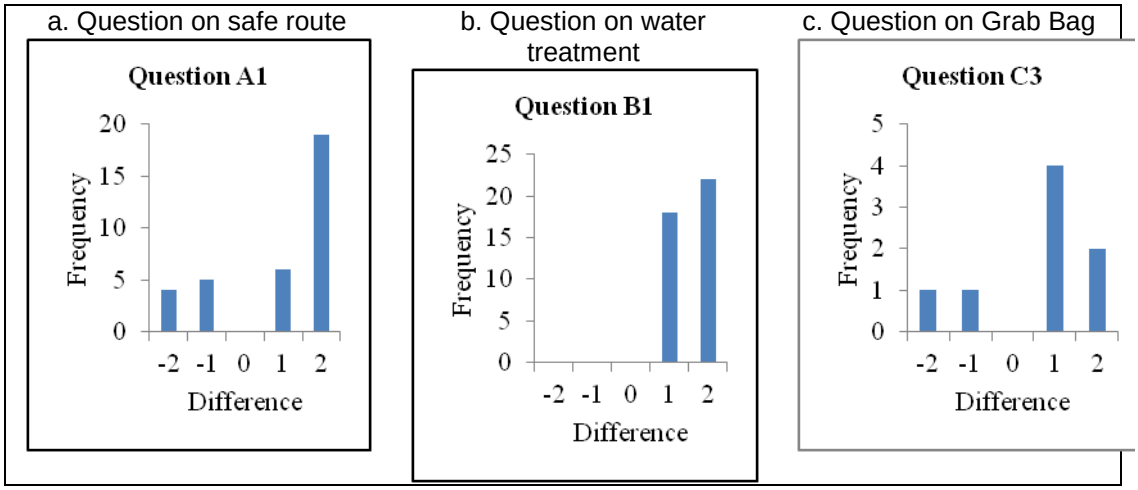

Figure 1: Test for data symmetry for extent in change of opinions from before to after training

Although respondents did show changes in their answers to the survey question from before to after the training, in some cases though, the respondents maintained their original opinion. For example for questions on the appropriate action to be taken if a flood occurred, such as that safe routes during flood events must be known by flood victims; that flood victims need to know the nearest safe area; and that bags for storing important items must be waterproof; many respondents already gave the correct answer.

Sign Test and Wilcoxon's T test was used to assess the effect of training on the community's general knowledge about floods and on their preparedness for floods. The results of the analysis indicated that after the training, there was significant improvement in understanding flood general knowledge and flood preparedness in the Kampung Sg Isap community but that there was no significant improvement in the Kampung Sg Pinang community. The possible reason for this difference may be due to the participants' background experience. The majority (71%) of the Kampung Sg Pinang participants had never experienced any flooding before, whereas most (91%) of the Kampung Sg Pinang participants had experienced flooding. Correlation between respondent background did show that experience of past flood training also facilitated improvement in knowledge and that training activities which involved field work, that is, the town watching activity to identify safe escape routes, also facilitated improved knowledge for preparedness.

4.0 Conclusion

Flood preparedness training was conducted for three aspects of flood preparedness in two flood-prone communities in Selangor and Pahang. The effectiveness of the training was tested using an Effectiveness Tool developed for the training. The results are summarised as follows:

4.1 The study indicates that the training event improve the knowledge of flood-prone community participants in preparing for floods.

4.2 The training can significantly improve flood general knowledge and flood preparedness if the participants had previously experienced flooding. However, it does not appear to greatly effect the participants who had never experienced flooding. This may be due to the difficulty in personalising and imagining what might occur during a flood event.

4.3 The most significant changes in understanding appear to be that closely associated with exposure to new approaches and equipment, such as the method for identification of safe routes, and the possibility of treating flood waters in order to obtain safe drinking water.

4.4 Even a very short training course can enhance a flood-prone community's preparedness for flood events, thus improving their climate resilience capacity.

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EMPOWERING COMMUNITY INSTITUTION'S FOR MANAGING REBUILDING DAMAGED BUILT ENVIRONMENT TOGETHER WITH DISASTER VICTIMS

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1.0 Introduction

Data collection and data analysis is finished. 4 Master students is in the process of writings their thesis and expected to submit on August 2016. 14 papers have been published in Scopus and ISI journal. 7 papers have been accepted at Journal Teknologi and expected to publish of June 2016. 1 Papers has been presented at UPSI as conference proceeding, 2 has been presented at the flood conference at Pullman Putrajaya, while 7 papers have been presented at International conference. 2 book manuscript is in process of editing-UPM and IIUM publisher have agreed to publish it. From this research a PRGS proposal has been submitted to produce prototype on how to re-design Mosques as Disaster relief center, Third force lead by Dr. Raja Shamri from Kelantan had agreed to facilitate 3 mosques to be redesign and be a case study for further and detail research.

2.0 Methodology

This research will be done based on qualitative and quantitative approaches through two (2) major stages of researches which are constructing the program and testing the program
Constructing the Cultural Properties:

a) Content analysis will be carried out through a detailed literature review of the discourse. The source of the literature might be written in Malay and English.
b) Semi structured Interview will be conducted with the expert in Kelantan culture and stakeholder including the victims of flood to determine the cultural properties of the region.
c) A comprehensive workshop will be conducted with the respected parties to triangulate and validate the findings from the interview and content analysis.

Evaluating current procedure on Disaster Reduction Relief Program

a) Semi structured interview and case study will be conducted with government bodies and NGO to get a full picture of our current procedure and relief program.
b) Pilot testing and comprehensive workshop will be conducted to test the findings and propose the cultural-responsive relief procedure and program that had constructed from the first stage.

Research will develop cultural-responsive procedure and relief programme for post disaster (flood) community rebuilding in Sungai Kelantan River Basin. The proposed program empowers the role of existing community institutions, such as community centers and religious facilities like mosques or temples, for supporting or facilitating relief programmes specifically community rebuilding after a disaster occurred.
The targeted user groups will cover all ages and gender including children, youth, adult, elderly people, and women. This research will provide the construct, internal, and reliability validation for the proposed community institutional programme.

3.0 Results and Discussion

This study extensively used primary and secondary data sources to fulfil its research objective. The sampling frame for this study was developed based on previous studies, and on the advice of the experts from various agencies. Fifteen floodplains and disaster-prone zones were identified and observed for the pattern and parameters of flood. The area most affected by flood was identified and finalized as the location for conducting this study.

A qualitative approach was used to collect the primary data. Fifteen respondents were selected from professionals, officers, voluntaries, community leaders and affected communities, and in-depth interviews were carried out with these respondents. On an average, each interview consumed about 35 to 80 minutes to complete. A structured interview was conducted using standard pre-set questions, to get the respondents' viewpoint and opinion on each aspect. Furthermore, all the interviews were recorded and transcribed. Therein, thematic coding (Braun, & Clarke, 2006) and semiotic analysis (Sebeok, & Danesi, 2000) were carried out on the interview transcripts.The results were mainly focused on the four pillar of local knowledge on disaster preparedness, namely observation, anticipation, adjustment, and communication (Baumwoll, 2008). The four pillars were formed based on thematic analysis – observation, anticipation, adjustments and communication.

Disaster risk reduction is a multi-layered system that combines different institutions in the application. Institutions at the highest level provide the policy and strategy for the preparation of pre-disaster and post- disaster activities. However, the root-level institutions are the ones responsible for the realization of all these policies to train people in disaster management as well as providing them shelter and facilities during the post- disaster period. In conclusion, the mosque is a social institution that only that will become the last stronghold for Islamic unity. This is because the mosque is completely neutral and independent of political influence. The mosque has the potential to be used as a centre for disaster management at local level. Factors that benefit the advantages of this mosque are relevant central location, social welfare activities clearly exists and its importance as a centre of social activity, regardless of its physical aspects. And to ensure active participation in the process of disaster risk reduction, Imam skilled and pro-active, or community leader is a prerequisite. Further research on this subject can be focused on the characters of the architecture and requirements of the institutional structure of the mosque in relation to different types of disasters. In addition, cultural studies recommended to be undertaken to assess the people's acceptance of their religious institutions which involve the mosque in disaster risk reduction system.

4.0 Conclusion

4.1 Elements of culture are very critical and indispensable in any future mitigation planning of Flood in Kelantan

4.2 Kelantan historically need to be developed based on its river development, referring to the similar cases in Jakarta, Bangladesh and Thailand.

4.3 Kelantan Culture is unique, has very strong ties and great potential to develop as important elements for future mitigating and flood disaster management policies.

4.4 There are major changes in people culture and lifestyle, before, during and after the flood.

1.1 Malaysia have sufficient disaster procedure but it require political will to make things moving

1.2 The teaching of Islam and appropriate culture are complementing and bounding a robust neighborhood among Malay

1.3 Mosques has play an important and crucial role in the physical and social rebuilding of the flood disaster area. As its close with the culture of the community, become community centre and considered the most neutral community institutions, mosques is the first institution to be clean, built and upgraded after the disaster.

1.4 It is very difficult to change the negative culture of the people but we can manage it through Islam and its customs

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USER PERCEPTION ON CARAVAN AS MOBILE HOMES FOR SHELTER RELIEF CENTER AS A RESPOND FOR FLOOD DISASTER PREPAREDNESS

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1.0 Introduction

Floods in Malaysia are caused by a combination of natural and human factors. The massive flood that hit Kelantan in the year of 2014, by far was the worst in the history of the state. Damages caused by the physical contact of floodwaters with commodities hence leads to the physical deterioration of such commodities. The impacts of the floods give damages to human life and deterioration of the environment. Due to that, the flood management disaster in Malaysia is a strategy based on a technology centred approach in emphasizing on the application of new technologies in flood control, forecasting, warning and evacuation. This research focuses on the effectiveness of proposed mobile homes for the flood relief center provision. The great flood that occurred in Malaysia has revealed a lack of recognition and safety procedures in handling and locating victims including people with disabilities and the elderly. Most of the emergency shelter was identified non universal and inaccessible. The research gaps identified on existing facilities are lacking in privacy, safety and security.

According to Chan, there are few options for human response to disasters namely to protect, to accommodate and to retreat. Therefore, one of the initiatives during flood management disaster is by providing a shelter relief centre. The shelter in the relief centre should be quickly constructed to accommodate the users and the shelter also should be easily accessible by people especially people with disabilities (PwDs) and the age. According to MS 1184:2014 Universal Design and Accessibility in the Built Environment, People with Disabilities (PwDs) include people with hearing, visual, mobility cognitive/learning, hidden impairments and people with diversities in age and stature, including frail persons (PwDs. Hence, the mobile homes is proposed to shelter these flood victims. The concept of mobile homes or portable housing would help people who are in need of the instant shelter after the natural disaster. The research assesses the user perception of mobile homes for shelter relief centre as a response for flood disaster preparedness in Malaysia. The research also studies on how the facilities are available and accessible to cater PwDs in responding to natural disaster relief centre. In addition, the mobile homes that will be provided should be efficient in order to protect the privacy of the users. The aim of this research is to assess the user perception on the effectiveness of mobile homes for shelter relief centre as a respond for flood disaster preparedness in Kuala Krai.

The research explores current issues and problems faced by the flood victims in the case study area during the post flood situations. The objectives are:

1. To do a survey on user perspective on mobile homes as relief centre in Malaysia
2. To explore whether accessible facilities in relief centres for frail elderly, people with disabilities and children are provided at disaster relief center.
3. To provide quick and efficient accessible mobile homes that tackle access and privacy elements to users.

2.0 Methodology

This section highlights the research progress in a structured systematic manner. The framework reveals the flow of the study and incorporates general ideas in how the approach of study is conducted. There are five stages engaged in the progress of study. These five stages are (i) preliminary study, (ii) review of related studies, (iii) data collection, (iv) assessment of data justifications, and (v) strategies and recommendations.

3.0 Results and Discussion

The interview was conducted with the victims to get their perception on the mobile homes for relief shelter. About seven respondents have been approached during the data collection period. The relief shelter are divided by two categories which is temporary shelters and permanent homes. Most of respondent show positive view on the permanent homes especially relief shelter by Jabatan Kerja Raya (JKR) and State Government at Desa Rahmat, Kg. Berangan Mek Nab. Most of permanent houses were comfortable to live since it was well build and supervised by JKR itself. The home units comes with 3 rooms, 2 toilets with kitchen and a living room is the ideal homes said by most of respondents as it was well maintained.

In term of temporary shelters, most of the respondent shows dissatisfaction with the current temporary shelters. This is because of most of temporary shelters does not considers the flood victims' thermal and visual comfort and it is only designed as a shelter. The design and material selected was not suitable with local climate as the container shelters and tent were too hot during the day. This is one of the biggest concerns that most of respondent highlighted. Privacy and safety also become one of the main concern most of respondents, since most of shelter that provided does not considers the privacy of woman and the safety of the houses.

Perkampungan Mercy Tualang was the ideal temporary homes that is chosen by most of respondents since it is fully facilitated with facility and basic necessities and it is well maintained by Mercy Malaysia. Even though it was the most ideal temporary house, there also some weaknesses which was the shelter provided the kitchen to be outside of the house. Based on interview, most of respondents' shows positive response toward the mobile homes as alternative for rapid shelter due to it is mobility and the short time to build. Most of them agrees if the mobile homes were to become the new temporary shelter as the alternative from the current shelter that is provided.

Based on interview, most of respondents shows positive response on the design of the caravan which is more economical, fast to build, easy to maintain, mobile shelter and easy to upgrade the house. The design also was suggest to provide more space for room and kitchen which is for them it is the most important space form them. Most of the respondents also suggest to provide the toilet inside the house which it is seem more accessible than located outside the shelter especially for elderly and disable person.

Total number of questionnaires received were 50. Questions related to Status of Transit Home of the Respondents - Almost half of the respondents (46.7%) are still staying in the transit home and tent provided by the authority after the flood. Most of them are still staying in previous house after it has been cleaned (40%). However, there are a few residents (13.3%) who are staying in temporary tent next to their previous house. There are mixed feeling and assessment made with respect to the basic need provided at the transit center. Answering questions relate to perception toward temporary transit home by respondents. They are also satisfied and very satisfied with safety for extended families (61.2%), a closed area for adult female and girls (55.1%) and bathroom and changing room (65.4%). When asked on their perception on caravan space concept for transit home respondents have various perceptions on it. Almost all of the respondents agreed that the caravan as a temporary transit home should have standard space is of equal size (98%), Standard space is the same but with 2 rooms (93.9%) and/or standard space is the same but with 4 rooms (93.9%). However, majority of the respondents (85.7%) did not agree that Standard space is the same but with 3 rooms. In addition, all respondents did not agree to having large standard space with 2 rooms and 2 bathrooms and having the priority given to other main standard space. However, there is a mixed feeling about having a large standard space with 1 room and 1 bathroom.

Design Prototype

In order to tackle the challenges faced in designing mobile housing and dwelling fit to endure a flood disaster, the design has to be efficient. Efficient design is a design that is easily constructed, shipped, packed, and can be easily assembled on site with minimal effort. The design for this prototype mobile homes is intended for a transitional housing for victims as transitional housing unit allows for occupancy longer than a year while still remaining temporary. From the case studies and interviews, the housing options provided in response to the flood is mostly strictly temporary shelters that only provide survival conditions and it is not a means for the victims to transition back to normalcy and has option as follows:

a) Mobility and Transportation Method

This design was intended to be transported with multiple choice of transportation.

b) Space Planning and Flexibility Options

The mobile homes is intended to ease the transition of the victim to normalcy, hence flexibility in space planning is key towards the objective. An adaptation of the Traditional Malay House is incorporated especially on the areas on how it expands and that the spaces is created due to the needs that arises from its occupants. The obvious trait was to have the Lanai space as a gathering area.. Basic spaces such as a room is incorporated as to segregate the male and female in the family. The mobile homes is intended to be flexible due to the design intention of transitioning from shelter to a home unit.

c) Construction Method and Modular System

In order to counter the problem of a disaster, a quick and efficient way of constructing the homes needs to be fast, quick and easy to assemble, hence the conventional method of construction will be deemed obsolete as it takes a lot of time to build. For this mobile home prototype, a modular system will be used, which consist of 2.4m x 2.4m post and beams which can be used either way. There will be no screw involved and the only way to connect the joints is only using simple pushing method, with no tools needed or involved.

4.0 Conclusion

In conclusion, mobile homes that will be provided should be efficient, provide privacy for the users, it should be easily constructed, ready-made to cater the needs of users during flood disaster. The followings are the considerations in providing mobile homes for shelter relief centre as a respond for flood disaster preparedness. The mobile homes should be;

a) Designed that easily accessible by all users, including people with disabilities (pwds), the elderly and others, for spatial planning should consider privacy, security, accessible to toilet for pwds. However for able body persons should share common toilets.
b) Flexible and base on module. It can be expanded to other type of building typology such as surau, sick bay, and any other communal spaces,
c) Flexible due to the design intention of transitioning from shelter to a home unit. A home requires spaces that gives privacy, hence the design of the mobile home unit can be expanded due to its modular system of 2.4m x 2.4m, where every unit is capable of expanding depending on the needs of its users.
d) Intended to be transported with multiple choice of transportation. Based from the interviews and surveys, most of the areas affected by the flood was cut off and cannot be accessible by road. The only way to transport the mobile housing unit was by boat, and by air be it a drop parachute from a plane or a helicopter.
e) The introduction of flat pack system of the housing units will add an advantage of sending maximum amount of the units in a very limited space which means instead of towing just one unit per car, a dozen unit can be transported to the designated area at a time.
f) Construction Method and Modular System - In order to counter the problem of any disaster, a quick and efficient way of constructing the homes needs to be fast, quick and easy to assemble, hence the conventional method of construction will be deemed obsolete as it takes a lot of time to build.
g) The advantages of this mobile home prototype, a modular system will be used, which consist of 2.4m x 2.4m post and beams which can be used either way. There will be no screw involved and the only way to connect the joints is only using simple pushing method, with no tools needed or involved.
h) The Prototype is designed to be simple enough for a normal person without a construction background to build, especially during flood, the victims cannot really think as a normal person does due to the stressful conditions.
i) As for the foundation system, an adjustable foundation system is used due to uneven soil conditions.

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SOCIO-ECONOMIC VULNERABILITIES OF THE FLOOD AFFECTED PEOPLE IN MALAYSIA: SOME SUGGESTIVE STRATEGIES TO REDUCE SUFFERINGS

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1.0 Introduction

Human beings go through a very solitary life which can suddenly be disrupted due to natural calamities hitting them all of a sudden and in these calamitous situations, people become vulnerable, being helpless and shelterless which results in immense sufferings and distress. Environmentalists and social scientists often conceptualize a holistic viewpoint of such natural disasters and accordingly, explore the indigenous mechanisms to cope with such critical situations. Researchers often cannot ignore the societal experiences of natural disasters and thus consider both emic and etic viewpoints to solve the resultant problems. Among natural calamities, flooding causes great vulnerability to the affected people by destroying their livelihood options and it simultaneously destroy properties, damage bio-diversity and finally pose great threat to the lives of the affected people (see Dolan,.& Walker 2006; Armah et al., 2010; Chan 2012; Karim 2014). To examine such impact of flooding in general and particularly in context to the devastating floods in Malaysia just recently in December 2014, we focus on socio-economic vulnerabilities of the affected people in three villages in the state of Kelantan in Malaysia.

2.0 Methodology

Three villages in Kelantan, named Kampung Laloh, Kampung Manjur and Kampung Manik Urai Lama, were purposively chosen to collect the required data on flood. This research mostly used the qualitative technique of researchers' participating in the field for observations of and informal interviews with the villagers. As part of the qualitative study, the research conducted 3 FGDs in these villages, generating one each at every village. A total of 10 in-depth interviews were conducted in all three villages choosing people from different categories having profound knowledge and understanding about the occurrence. To supplement it further and to make the study holistic and totally enumerative in nature, the research conducted a survey 300 family-households taking 100 each from these three villages.

3.0 Results and Discussion

(1) Problems of Evacuation during Flood:

The villagers were asked to tell about the most severe problems they had encountered during the flood; an overwhelming majority of the respondents mentioned that they had difficulties in evacuation and to get rid of the water flow as most of the transports belonging to them were damaged or not traceable. Moreover, it became difficult to arrange transportation for immediate movement at the time of crises. Many f of the villagers also mentioned that they were little puzzled at that time and was anxious to save their lives.

(2) Housing Problem:

After the flood of 2014, the majority of the villagers are still in the recovery process with a number of people still living in damaged houses. In the entrance of Kampung Manik Urai Lama, at least six families were living in temporary shelters. The shadow line of the water level was still noticeable in many houses. The villagers felt vulnerable as their houses had been destroyed during the flood. Many houses are still without windows, doors, and some are without roofs. Those who are better-off have rebuilt with modern infrastructure. Moreover, because of their social positions some villagers were able to establish good networking with others which helped them to benefit economically to overcome housing problems. Others claimed that although they receive financial support from various sources, the amount of money is not sufficient to rebuild their houses. However, during the later part of our fieldwork conducted in February through March, 2016, we have found that the Government has built up permanent accommodations comparatively at uplands for the poor families who had lost their

houses during the flood thus making them happy and safer. In one of such cases, we have visited such spot in Kg.Manik Urai Lama where the houses are waiting for completion and handing over the keys to the distressed victims of the flood.

(3) Lack of Shelter:
None of the three villages had proper and immediate flood shelters which caused many to seek shelter in nearby schools and up the hills. However, after visiting some schools of that type in villages Kampung Manik Urai Lama and Kg. Manjor, we made the measurement which clearly indicated that the high flood levels (around 25 feet or approximately reaching level 3 of the schools) meant that schools were no longer appropriate shelters nor were they sufficient to accommodate the number of displaced. This caused many to relocate to higher ground but travel was not easy as most had no boats. Although a few boats were given by the government and non-government organisations they were insufficient and did not satisfy their requirements. Families with old people, women, and children suffered a lot when relocating to the mountains. The mountains did not contain proper shelter and people did not receive any food or water until the water level went down. For that reason, these victims remained in the mountains without food and water for two days consecutively and had to wear the same wet clothes for these days as they did not have any alternatives.Sanitation was poor and observing religious rituals was difficult. Thus, we suggest the establishment of a number of formal shelter houses so that the villagers can take care of themselves and their needs, subsequently reducing their vulnerabilities.

(4) Flood Aid:
The villagers claimed that floods in Malaysia are now very common as they experience it in almost every December. Unfortunately, in 2014 the severity of the floods was extraordinary. Many became jobless and homeless leaving them dependent on aid and donations from government and non-government sources. However, were not satisfied with the aid management procedures as during the flood many did not receive food, water, and other basic necessities. Those who had toddlers and infants agonised over the provision of baby food. Moreover, there was no coordination among various donors as many of the villagers complained that some of them received the same things repeatedly while they did not receive other necessities. Apart from that, villagers who were at the central and communicable points of the villages received aid more than the villagers who were in remote parts. In the case of Kampung Manjor located at the borders of Kelantan and Kedah, the villagers did not receive adequate aid from either state.
However, the villagers indicated their gratitude to non-government organisations. Although both government and non-government donors were not prepared in distributing aid, non-government donors tried their best to supply the required necessities from food to housing infrastructure. By staying with the villagers a couple of weeks from 8 am to 5 pm, many non-government organisations from Korea and China donated housing infrastructure. Along with them, some donated housing equipment without mentioning their names. In the same way some universities like UPSI provided financial help to rebuild their houses. However the villagers criticised the duplication of aid given to the same persons because of their active social networking which reflects the requirement of integration in distributing aid.

(5) Land and Agriculture:
Economic activities in rural areas are fully dependent on the type of the land resources available in the village and it is probably the most important indicator for deciding their economic profession that is what happened in the case of our study villages. After informal discussions with a number of villagers, it was found that most villagers worked as labourers in agricultural farms. They work as rubber tappers on plantations owned by outside investors. Most have no agricultural farm of their own, with only a few of the villagers having owned their private land for cultivation. They use these lands for their livelihoods with small and home-based private farms. They cultivate bananas, mangoes, guavas, and other fruits for sale. These farms were devastated robbing people of their incomes. Since the villagers do not go for intensive crop-based agriculture, many of them for that reason do not possess any heavy cultivation equipments. Very few villagers have farm animals. The villagers with cattle and poultry suffered as they tried to bring these animals to the hills but many dies due to high flood levels. Having boats could have changed this outcome.

(6) Trees and Bio-diversity:
All three villages were surrounded by trees. The Kelantan River which caused this recent flooding had big trees along the river banks. These trees were sources of rich bio-diversity and protect the river from erosion. However, field observations show that many of the trees beside the river had fallen after the flood. The villagers felt that they died because saline water mixed with the river water during the flood, caused these trees and greenery to die.

(7) Health issues:
The villagers named the flood 'Bah Kuning' (Yellow Flood) because the deep water level had turned to yellow. They had yellow water all around which they used daily including for ablution and sanitation. Many used this yellow flood water for cooking rice and others. Although, most of the villagers admitted that they did not suffer from diarrhoea or any severe water-borne diseases, but it could have fatal because at the initial few days during flood, there was scarcity of pure drinking water.

Assessing Loss of Properties and Valuables: Apart from the above specific problems, we have estimated people's total loss of properties and valuables, calculated in ringgit which has been shown in Table 2. A calculation of the monetary loss estimated in the three villages comes to RM12,643,927 of which more than 70% amounting to RM 8,856,290 in total, is the loss which came from the destruction of village houses. The remaining loss of 30% came from other items like furniture, transport, land and other properties. Looking at the individual villages, the pattern of loss is almost similar in all three, though the proportion of loss is slightly larger in the case of Manik Urai Lama as the village is located close to the banks of the river.

4.0 Conclusions

It was found that all the villagers during the flood had suffered very badly from lacking suitable shelter which caused them to move up to the highlands and mountains. In addition, lack of proper carrier for shiftment caused massive sufferings for the seniors, women and children. Informal discussions with the villagers also indicate that enormous mismanagement had occurred in the distribution of aids during and after the floods. According to the villagers, those who live in remote parts of the villages did not get proper food and drinking water from the donors. Since the government or any other organizations did not immediately build any shelter houses for the flood victims, the villagers suffered from sanitation problems which affected their privacy. The villagers also mentioned their lack of security as they had to stay with wild animals and snakes roaming in the area. In addition to these vulnerabilities, villagers having farming or farming-related activities also endured badly as many of them lost their crops and animals during those floods. With few exceptions, the observations reflect that all the villagers, regardless of their socio-demographic position, suffered badly from the floods in terms of losing their shelter, food, pure drinking water and also in having access to carriers for shiftment.

During our first phase of the fieldwork in July 2015, we found that many villagers were living inside tents and many others had been placed in poor housing conditions; however, some economically well-off persons had been able to rebuild their houses with modern bricks and sands right after the flood water ebbed away. Field data show that there was significant level of satisfaction with non-governmental organizations as many of the victims were getting financial and non-financial aids from them in rebuilding their houses and replacing other necessities in their lives. In addition, villagers who were dependent on home-based and commercial farms had suffered due to lack of financial investment and water salinity which occurred because of the high water levels. Observations justified the claim of the villagers who mentioned that a huge number of trees had fallen throughout the villages causing natural impact on biodiversity. The common villagers who worked in various rubber plantations had shown their dissatisfaction by stating that the recovery from the floods was absolutely impossible with minimum amount of salary they were receiving from their work.

5.0 Recommendations

(1) Based on the above discussion, it is suggested that the government or policy planners consider building shelter houses in strategic locations immediately to protect the life of the villagers during the flood upsurge and thus reduce their vulnerabilities. (2) Since the people usually unaware and remain unprepared about the calamities and since flood upsurge may occur all of a sudden, it is advisable that a community resilience and preparedness should be well articulated well ahead with the involvement of the local people. (3) Adequate relief, food supply, providing pure drinking water and sheltering services have to be made available instantly during and after the flood. At the same time, there should be some proper coordination in providing aids to the people during the flood so that all the victims receive them equally to mitigate their economic crises and sufferings. (3) As the flood is

occurring at the village level, a community level integrated initiatives should be planned to bring resiliency after the flood.

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COMMUNITY EXPERIENCES ON PREVENTION, PREPAREDNESS AND RECOVER OF THE FLOOD DISASTER IN CULTURAL AND LOCAL WISDOM CONTEXT: LESSON LEARNT FROM ALL LEVELS OF A HOUSEHOLD

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1.0 Introduction

The community needs to handle the disaster management are essential for every level (prevention, preparedness and recovery). The main concerns in managing disaster are capacity building and reduce risk reduction. Thus, this concern is success than we can ensure our community is resilient communities. Thus, understanding community experiences in the context of cultural and local wisdom will be able the policy maker to understand the genuine needs of the community for flood disaster management in the near future. From the review of literature there is a clear evidence of inadequate, such information for managing the community needs in regards to disaster relief and preparedness for the local context.

The main two research questions for this study were 1) how was the experience of every level of household dealing with the flood disaster during and after the flood disaster based on the cultural and local wisdom context? And 2) what are the specific needs of a household in the community in regards to the managing river basin management (based on the social learning approach) and disaster kit to be carried along during evacuation in the context of local practice?

2.0 Methodology

The data for this research has been gathered through in-depth interview guides, tape and video recording of interviews and a diary of the study. Individuals from each level of the household were considered as the key informants. The development of educational package and disaster kit will be based on the category emerged from the analysis and verified by expert and participated respondents.

3.0 Results and Discussion

Based on the data gathered from 77 key informants, the prominent features of this research are: community preparedness in dealing with floods, uneven distribution of rains, unpredictable flood water level, inadequate preparation and supply of food, the proper salvation of community in self-rescue, effectiveness of communication during evacuation, inappropriate indication of water rise in certain areas and signs of nature. The educational package (Flood Emergency Action Guide) consist of all the elements that relevant to the community to practice and five types of disaster kits were designed. These findings were reflected in the experiences together with understanding the value of local wisdom and cultural faced by key informants dealing with the flood disaster and it would be used in creating appropriate programs for preparation in dealing with such disaster in the future.

4.0 Conclusion

4.1 The followings are the category emerged to conclude the main key result of this study

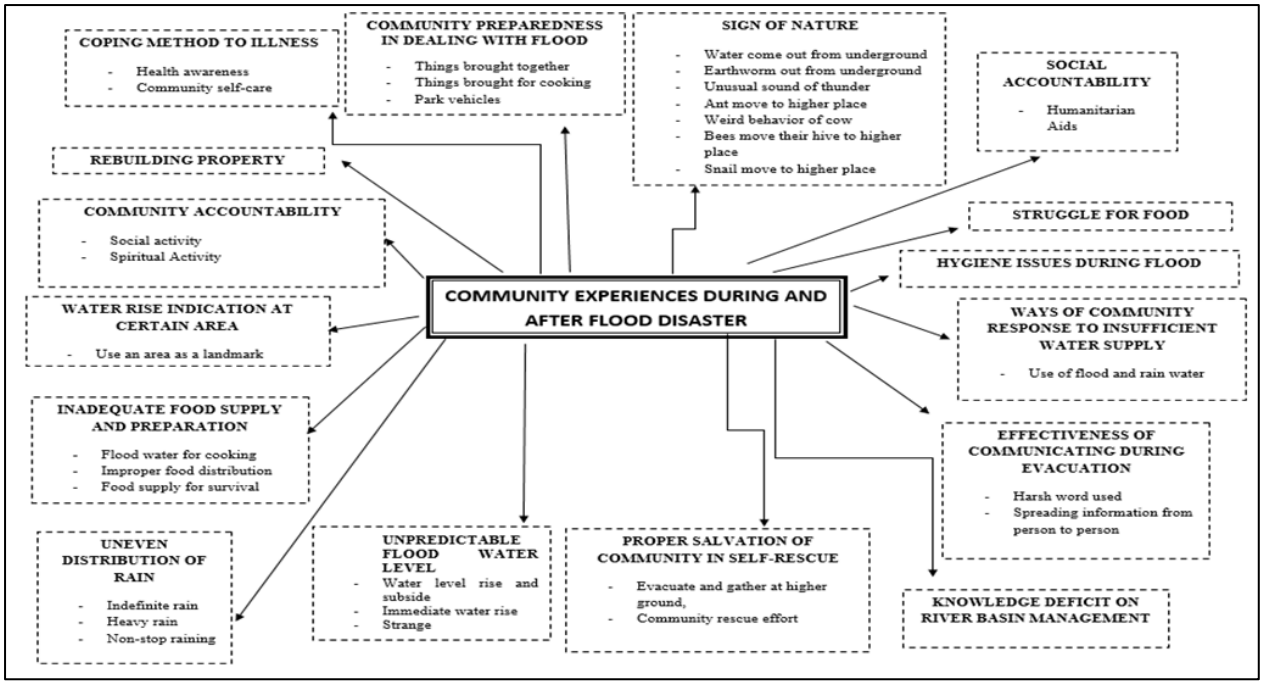

Figure 1: Schematic analysis

4.2 The educational package that will explain about the elements in social learning theory on cognitive factors, environment factors and behavioral factor in which people will evaluate and alter their own thoughts on the events and thus evaluate on what they experienced for the future readiness.

4.3 seven types of disaster kits were designed

MODEL PENGURUSAN DANA DAN SUMBANGAN BENCANA MANGSA BANJIR BERASASKAN INDEKS SYARIAH DI MALAYSIA

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1.0 Introduction

Syariah dan pelaksanaannya memainkan peranan yang penting kepada seluruh umat Islam. Intipati pandangan ini tidak berasaskan kepada aspek hukuman tetapi lebih menekankan kepada matlamat asas syariah (Maqasid Syariah) untuk melindungi masyarakat demi menjaga kemaslahatan umat Islam (Jabatan Kemajuan Islam Malaysia, 2015). Malaysia telah melaksanakan banyak usaha dalam melindungi, menyubur dan memajukan Islam sebagai Agama Persekutuan. Belum wujud lagi sebuah indicator komprehensif untuk menilai tahap keseriusan usaha ini. Malaysia telah melakarkan satu dimensi baru berkaitan Indeks Syariah Malaysia yang belum pernah dilaksanakan sebeum ini. Idea penubuhan Indeks Syariah Malaysia telah dicetuskan oleh YAB Perdana Menteri Malaysia dan sekaligus mampu membuka mata pemimpin dunia Islam dari segi pelaksanaannya, khususnya bagi melihat tahap pematuhan sesebuah negara yang merangkumi keseluruhan aspek perundangan syariah (Jabatan Kemajuan Islam Malaysia, 2015)

Indeks Syariah adalah berdasarkan kepada lima Maqasid Syariah yang utama iaitu memelihara agama, nyawa, aqal, keturunan dan harta. Lima Maqasid Syariah ini digunakan untuk mengukur usaha kerajaan dalam lapan bidang yang utama iaitu perundangan Islam, politik, ekonomi, pendidikan, kesihatan, budaya, prasarana dan persekitaran serta bidang sosial (Jabatan Kemajuan Islam Malaysia, 2015). Berdasarkan pengukuran ke atas lapan (8) bidang utama dengan melihat satu per satu bidang tersebut, adakah ia meliputi lima perkara pokok dalam Maqasid Syariah yang menjurus pada penjagaan agama, nyawa, akal, keturunan dan harta? Dalam konteks ini, perkara penting dalam proses pengukuran Indeks Syariah melibatkan tiga (3) kelompok utama iaitu pemerintah (pembuat dasar), agensi-agensi pelaksana (pelaksana dasar) dan masyarakat secara keseluruhannya menjurus kearah pencapaian maqasid (Jabatan Kemajuan Islam Malaysia, 2015).

Di samping itu, ketiga-tiga kelompok yang menjadi pengukuran bagi Indeks Syariah dijelaskan dengan lebih terperinci. Pertama, kelompok pemerintah iaitu pembuat dasar. Pengukuran dilakukan dengan melihat sejauh mana undang-undang, dasar dan polisi yang dirangka serta program-program dan aktiviti-aktiviti yang diatur mematuhi dan bertepatan dengan syariah lima prinsip Maqasid Syariah, dengan menyediakan keperluan asas yang mencukupi dalam segala aspek kehidupan demi kepentingan rakyat yang terdiri daripada pelbagai kaum, etnik dan kepercayaan. Kedua, agensi-agensi pelaksana atau pelaksana dasar. Berdasarkan kelompok ini, pengukuran dilakukan dengan melihat sejauh mana undang-undang, dasar-dasar dan polisi-polisi yang dirangka serta program-program dan aktiviti-aktiviti yang diatur, mampu direalisasikan dan dilaksanakan dengan jayanya berdasarkan kepentingan lima (5) prinsip Maqasid Syariah, di samping melihat tahap keserasian dan kesesuaian terhadap sesuatu dasar, polisi, program dan aktiviti yang diadakan mampu memberi impak terhadap keperluan masyarakat.

Masyarakat juga merupakan salah satu daripada kelompok utama proses pengukuran Indeks Syariah. Pengukuran dilakukan dengan membuat penilaian dan persepsi masyarakat terhadap undang-undang, dasar-dasar dan polisi-polisi yang dilakasanakan serta program-program dan aktiviti-aktivti yang dijalankan, mampu menjamin kesejahteraan hidup, keharmonian dan ketenteraman dalam kehidupan sama ada secara individu mahupun kolektif berdasarkan kepentingan lima (5) prinsip Maqasid Syariah.

Pengukuran terhadap ketiga-tiga kelompok utama melalui Indeks Syariah dijangka mampu memberi gambaran dan kedudukan Malaysia iaitu, sejauh mana tahap pematuhan Negara terhadap pelaksanaan Syariah Islam, di samping membuka peluang dan ruang kepada penambahbaikan bagi ketig-tiga kelompok utama berkenaan yang terdiri daripada pemerintah, agensi pelaksana dan rakyat. Ia dijadikan rujukan dan panduan kepada pihak yang berwajib bagi melakarkan hala tuju terbaik buat

negara melalui pendekatan wasatiyyah agar sentiasa berada di atas landasan Syariah Islam (Jabatan Kemajuan Islam Malaysia, 2015).

Pembinaan Indeks Syariah Malaysia adalah satu usaha bertahap perintis dan ke hadapan oleh Kerajaan bagi memperkukuhkan komitmen memajukan Malaysia berasaskan model atau acuan yang digubal oleh negara kita sendiri. Ia juga secara tidak langsung menilai tahap keseriusan Malaysia dalam melindungi, menyubur dan memantapkan prinsip serta nilai Islam melalui strategi yang pragmatik dan progrsif berasaskan pada Islam sebagai Agama Persekutuan. Justeru, pembinaan Indeks Syariah Malaysia dapat membuka jalan pada usaha-usaha tajdid (pembaharuan), islah (penambahbaikan), ihya'(penyemarakan), tasbit (pengukuhan) dan ta'wid (pembudayaan).

2.0 Methodology

Metodologi kajian merupakan kaedah yang sistematik untuk menyelesaikan permasalahan kajian. Ianya boleh difahami sebagai ilmu untuk mengkaji bagaimana kajian itu dijalankan secara ilmiah (Kothari, 2004). Pada umumnya kajian ini adalah kajian yang lebih bersifat lapangan yang menggunakan kaedah "mixed methode" iaitu menggunakan rekabentuk penyelidikan kualitatif dan kuantitatif. Melalui kaedah kualitatif, rujukan terhadap dokumentasi bercetak dan temubual pakar telah digunakan. Manakala kaedah kuantitatif menggunakan kajian soal selidik. Gabungan kedua-dua kaedah ini dalam proses pengumpulan data adalah penting untuk mengenalpasti penentuan keperluan asasi dan jenis-jenis sumbangan mangsa banjir berasaskan ISM.

Dokumentasi

Metod ini digunakan untuk mengumpul maklumat dan data-data dari penulisan dan dokumentasi bertulis yang dapat memberikan keterangan dan digunakan sebagai bukti yang sahih tentang sesuatu kenyataan. Ia merangkumi sumber-sumber dalam bentuk buku, jurnal, risalah, disertasi dan tesis, prosiding seminar, kertas kerja, akta, artikel, laporan, risalah dan laman web. Data-data yang diperolehi digunakan untuk membentuk landasan teori sebagai asas menyiapkan kajian ini. Ia terdiri dari sumber primer dan sekunder.

Temubual Pakar

Metod temubual digunakan bagi mendapatkan maklumat secara langsung mengenai bidang yang dikaji. Metod temubual sangat penting kerana isu ini adalah isu yang sangat sensitif dan tidak semua pihak mampu menghuraikannya dengan baik. Temubual yang digunakan adalah separa berstruktur (semi structured interviews) yang mana soalan yang dikemukakan kepada Peserta Kajian (PK) disusun dan ditentukan tetapi PK diberi kelonggaran semasa memberi jawapan dan ia boleh dikembangkan mengikut budi bicara penemubual dan PK (Osman, 2007). Temubual dilakukan terhadap empat orang PK yang dipilih secara sampel bertujuan (purposive sampling) daripada kalangan pegawai-pegawai kerajaan iaitu dari Majlis Keselamatan Negara dan Jabatan Kebajikan Malaysia serta wakil dari agensi bukan kerajaan iaitu dari Islamic Relief Malaysia dan Mercy Malaysia.

Soal Selidik Kualitatif

Seramai 99 orang responden yang terlibat secara langsung dalam bencana banjir di Kelantan pada tahun 2014 telah mengisi borang soal selidik yang telah disediakan untuk mendapatkan maklumat awal tentang kedudukan banjir di Kelantan. Kawasan kajian meliputi tiga daerah iaitu Kota Bharu, Kuala Krai dan Tanah Merah berdasarkan aliran sungai Kelantan daripada hulu ke hilir. Kaedah persampelan yang digunakan dalam soal selidik kualitatif ialah kaedah persampelan rawak mudah (random simple sampling) iaitu responden soal selidik dipilih secara rawak dari kalangan mangsa banjir berpandukan kepada bilangan populasi yang wujud.

Soal Selidik Kuantitatif

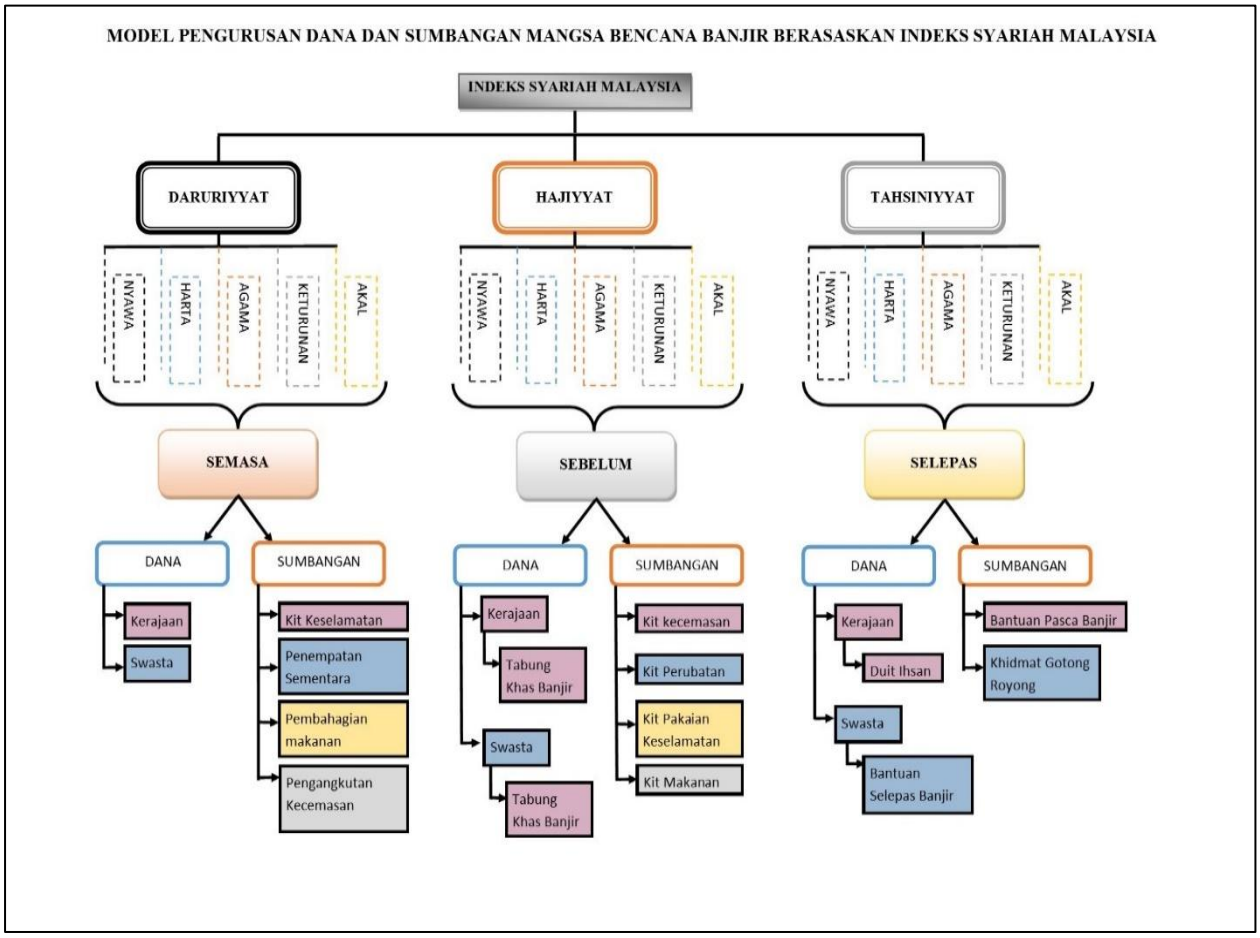
Seramai 456 orang responden yang terlibat secara langsung dalam bencana banjir di Kelantan pada tahun 2014 telah ditemubual melalui borang soal selidik. Kawasan kajian meliputi tiga daerah iaitu Kota Bharu, Kuala Krai dan Tanah Merah. Kaedah persampelan yang digunakan dalam kajian soal selidik ialah kaedah persampelan rawak mudah (random simple sampling) iaitu responden soal selidik dipilih secara rawak dari kalangan mangsa banjir berpandukan kepada bilangan populasi yang wujud. Bagi populasi kajian yang melebihi 1,000,000 orang, bilangan minimum seramai 384 orang sudah cukup untuk mewakili maklum balas bagi populasi tersebut (Krejcie, Morgan, 1970).

3.0 Results and Discussion

Berdasarkan penelitian terhadap beberapa aspek penting dalam pembangunan Indeks Syariah Malaysia, penyelidik mendapati terdapat beberapa perkara dijadikan tonggak utama dalam penstrukturan ISM. Melalui ISM, keutamaan dan keseimbangan serta keadilan dapat diaplikasi dalam pelbagai perkara. Justeru penyelidik mengambil pendekatan untuk menghasilkan model pengurusan dana dan sumbangan mangsa banjir berasaskan ISM. Perkara ini penting untuk memastikan dana dan sumbangan yang diperoleh dapat melengkapi keperluan mangsa banjir serta bertepatan dengan ISM.

Pengurusan Dana dan Sumbangan Bencana Mangsa Banjir Berasaskan Indeks Syariah Malaysia

Berdasarkan kepada pemerhatian dan penilaian penyelidik terhadap ISM, maka ia jelas menunjukkan bahawa ISM mengambil pendekatan teori maqasid shariah melalui pembawaan oleh Imam al-Ghazali. Imam al-Ghazali yang membahagikan maslahah kepada tiga iaitu daruriyyat (Keperluan Asas), hajiyyat (Keperluan Tambahan) dan tahsiniyyat (Pelengkap). Apabila ISM ini diintergrasikan dengan pengurusan banjir, maka terbentuklah satu model pengurusan dana dan sumbangan berasaskan ISM yang meliputi kepada tiga keadaan banjir iaitu daruriyyat diintegrasikan bersama semasa, hajiyyat diintegrasikan bersama sebelum dan tahsiniyyat diintegrasikan bersama selepas. Huraian pengintegrasian model pengurusan dana dan sumbangan mangsa banjir ini boleh dilihat dalam rajah (1) di bawah.



Rajah (1): Model Pengurusan Dana dan Sumbangan Bencana Mangsa Banjir Berasaskan Indeks Syariah Malaysia

Rajah (1) menunjukkan model pengurusan dana dan sumbangan bencana mangsa banjir berasaskan ISM. Model ini adalah merupakan cadangan daripada para penyelidik untuk mengaplikasikan konsep dan prinsip ISM dalam pengurusan dana dan sumbangan bencana banjir. Para penyelidik menggunapakai teori Maqasid Syariah oleh Imam Al-Ghazali sebagai asas pembinaan model ini. Pembahagian fasa banjir boleh dibahagikan kepada tiga fasa iaitu sebelum, semasa dan selepas banjir.

Pengurusan dana dan sumbangan mangsa banjir merupakan antara perkara yang terpenting semsa berlakunya banjir. Kaedah kutipan dan pengagihan sumbangan memerlukan kepada pengurusan yang cekap, amanah, adil dan saksama. Maka pendekatan ISM dan maqasid syariah dalam penentuan keperluan asas dan jenis-jenis sumbangan boleh menjadi garis panduan supaya pengurusan banjir bertepatan dengan kehendak Islam. Semasa berlakunya banjir, ia dianggap sebagai daruriyyat yang memerlukan kepada penjagaan 5 perkara utama iaitu menjaga agama, nyawa, akal, keturunan dan harta. Apabila sesuatu keadaan dikira daruriyyat, maka keperluan asas perlu disediakan bagi memastikan mangsa yang terlibat dapat diselamatkan. Berdasarkan kepada temubual pakar dan responden mangsa banjir, mereka telah menetapkan peringkat keutamaan keperluan asas sumbangan adalah keperluan makanan, pakaian, kesihatan, penempatan sementara dan pengangkutan.

Jika dinilai daripada penetapan keperluan asas oleh mangsa banjir berbanding Islam, ia jelas menunjukan kesamaan sebagaimana yang ditetapkan oleh syarak. Maka penumpuan dan perkara fokus yang perlu dilakukan adalah penentuan jenis-jenis sumbangan mengikut kategori keperluan asas. Justeru, penyelarasan terhadap penentuan jenis-jenis sumbangan mangsa banjir perlu dilihat kepada tiga kategori iaitu sumbangan sebelum, semasa dan selepas banjir. Jenis sumbangan semasa banjir adalah amat penting dan kajian ini akan melihat memfokuskan kepada sumbangan semasa banjir sahaja. Jenis sumbangan ini perlu diselaraskan kepada setiap badan bukan kerajaan (NGO) malah kerajaan untuk memastikan kutipan dan pengagihan sumbangan menepati syarak dan kehendak Maqasid Syariah. Berdasarkan kepada keperluan asas yang perlu disediakan kepada mangsa banjir semasa banjir, maka keperluan asas tersebut dibentuk dalam bentuk kit-kit kecemasan yang memudahkan pengurusan kutipan dan agihan kepada mangsa banjir. Secara umumnya, penyelidik membahagikan kepada kit ibadah, kit makanan, kit kesihatan, kit pakaian, kit pendidikan, kit privasi, kit penempatan dan kit simpanan barang berharga kepada 5 perkara pokok dalam Maqasid Syariah yang menjurus pada penjagaan agama, nyawa, akal, keturunan dan harta.

Kategori 1: (Memelihara Agama) Kit Ibadah

Memelihara agama adalah perkara yang paling utama dalam maqasid syariah tidak kira sama ada dalam keadaan normal mahupun darurat. Penjagaan agama dalam konteks ketika berlakunya banjir perlu dilihat secara menyeluruh agar masyarakat semua faham tentang kepentingan menunaikan kewajipan ibadah walaupun dalam keadaan banjir. Pihak-pihak yang berwajib seperti Majlis Agama Islam Negeri, Ngo-ngo Islam, Universiti Islam dan sebagainya harus mengambil peranan dalam menyediakan kit ibadah seperti telekong wanita, kain pelikat, naskah al-Quran, tikar sejadah, botol spray untuk berwuduk, sapu tangan dan sebagainya. Perkara ini jarang dilihat dalam bentuk-bentuk bantuan banjir yang disediakan selama ini, maka dengan pendekatan pengurusan sumbangan mangsa berasaskan maqasid syariah ini diharapkan mampu membuat satu transfomasi dalam sistem pengurusan banjir di Malaysia pada masa akan datang.

Kategori 2: (Memelihara Nyawa) Kit Makanan Mentah, Kit Makanan Sedia Dimakan, Kit Kesihatan dan Kit Pakaian Keselamatan

Perkara kedua selepas memelihara agama adalah memelihara nyawa. Pemeliharaan nyawa ketika banjir amat perlu dititikberatkan kerana banyak kes yang melibatkan kematian sama ada kanak-kanak, orang dewasa dan sebagainya. Pemeliharan nyawa dalam konteks semasa banjir perlu diberi perhatian penuh oleh agensi-agensi yang terlibat seperti Jabatan Kebajikan Masyarakat, Kementerian Kesihatan, Mercy, Persatuan Bulan Sabit Merah, Jabatan Pertahanan Awam, Tentera, Polis Diraja Malaysia, Pasukan Bomba dan Penyelamat serta Agensi Pengurusan Bencana Malaysia dan sebagainya. Penyediaan kit-kit seperti kit makanan asas, kit kesihatan dan kit pakaian keselamatan perlu disediakan secara terperinci. Keperluan asas makanan dibahagikan kepada dua jenis, iaitu makanan mentah dan makanan sedia dimakan. Kedua-dua jenis makanan ini memerlukan penelitian yang mendalam agar tujuan untuk menjaga kesihatan (nyawa) ketika dharurat dapat dicapai.

Menurut hasil temubual bersama ngo-ngo di Malaysia dan pegawai-pegawai kerajaan yang terlibat secara langsung dalam menguruskan sumbangan kepada mangsa banjir, beberapa jenis makanan telah dikenalpasti sesuai diberikan kepada mangsa banjir. Makanan mentah terdiri daripada Bihun, Mee, Kicap, Gula, Garam, Minyak masak, Beras, Susu Bayi, Tepung gandum, Ikan kering, Ikan, Ayam, Sayur. Manakala makanan sedia dimakan adalah terdiri daripada nasi, roti, air mineral, kopi/ teh /milo, lauk segera, sardin, buah-buahan, kekacang, coklat, kurma, biskut, makanan dalam tin, maggi dan sardin.

Borang kaji selidik turut diedarkan kepada mangsa banjir bagi mengenalpasti kit makanan yang paling diperlukan oleh mangsa ketika berlaku banjir. Berdasarkan kepada kaji selidik tersebut, kit makanan mentah yang diperlukan oleh mangsa adalah beras, minyak masak, garam dan ikan

kering. Beras merupakan makanan mentah yang paling dikehendaki oleh mangsa-mangsa banjir. 89.6 % daripada responden bersetuju bahawa beras merupakan bahan makanan mentah yang paling sesuai diagihkan kepada mangsa-mangsa banjir. Selain daripada itu, 80.8 % daripada responden menyatakan keperluan kepada minyak masak diikuti dengan gula, 75.9 %, garam, 72.6 % dan ikan kering, 69.8 %. Manakala kit makanan sedia dimakan yang paling dikehendaki oleh responden adalah iaitu nasi dan air mineral iaitu masing-masing merangkumi 92.9 % responden. Kemudian diikuti oleh sardin iaitu 85.4 % responden dan lauk segera dengan bancian 76.6 % daripada responden.

Agihan sumbangan keperluan asas makanan kepada mangsa banjir tidak hanya terhad kepada barang-barang yang telah disenaraikan di atas, namun terdapat jenis-jenis makanan lain yang perlu diambilkira berpandukan kepada hasil temubual bersama pakar dan para responden. Berdasarkan pandangan pakar, kurma merupakan jenis makanan yang amat sesuai diedarkan kepada mangsa banjir kerana ia boleh membekalkan tenaga kepada mangsa-mangsa banjir bagi tempoh yang lebih lama.

Keperluan asas kesihatan pula merujuk kepada bekalan ubat-ubatan yang biasanya diperlukan ketika berlakunya banjir. Bencana banjir sering dikaitkan dengan penularan wabak-wabak seperti deman kepialu, kencing tikus dan sebagainya disebabkan oleh pencemaran air yang berlaku. Selain daripada itu, penyakit-penyakit yang biasa seperti demam, batuk dan selsema juga sering berlaku kerana keadaan cuaca yang tidak menentu. Ubat demam merupakan jenis ubat yang paling diperlukan oleh responden dengan bancian 89.4 % diikuti dengan ubat batuk, 85.7 %, ubat sakit kepala, 85.0 %, ubat sakit perut, 84.1 % dan ubat selsema, 82.8 %. Selain daripada itu, ubat gamat juga termasuk dalam senarai ubatan yang diperlukan dengan bancian 78.6 %.

Di samping itu, keperluan asas pakaian keselamatan pula merangkumi beberapa jenis pakaian termasuklah pelampung keselamatan, jaket keselamatan, baju hujan dan kasut but. Penyediakan pakaian keselamatan sangat wajar kerana ianya bertepatan dengan maqasid syariat iaitu menjaga nyawa. Keperluan pakaian keselamatan yang paling diperlukan adalah pelampung keselamatan dengan bancian 62.9 % responden diikuti jaket keselamatan iaitu 60.5 % responden. Selain itu, terdapat juga keperluan terhadap baju hujan dan kasut but berpandukan kepada bancian 55.0 % dan 46.6 % responden.

Kategori 3: (Memelihara Akal) Kit Pendidikan

Bencana banjir turut memberi kesan kepada sistem pendidikan negara. Pelajar tidak dapat ke sekolah dan proses pembelajaran tergendala ekoran banjir yang memusnahkan sekolah-sekolah, prasarana-prasarana, bahan-bahan pengajaran dan pembelajaran serta dokumen-dokumen penting. Justeru, Kementerian Pendidikan Malaysia (KPM), Kementerian Pendidikan Tinggi (KPT) dan Institusi-institusi Zakat boleh memainkan peranan dalam memelihara akal iaitu yang melibatkan kit pendidikan. Pihak-pihak berwajib perlu memastikan proses pembelajaran dan pengajaran tidak terhenti walaupun berlaku banjir. Syarikat-syarikat buku dan agensi-agensi yang terlibat dengan bahan pendidikan berperanan penting menyediakan bantuan pendidikan kepada mangsa banjir seperti membangunkan kompleks sekolah sementara sama ada menggunakan kontena atau di pusat pemulihan banjir. Disinilah peranan guru-guru dan para ahli akademik dalam membantu mangsa banjir khususnya pelajar-pelajar supaya sentiasa diberikan pendidikan walau dalam keadaan mana sekalipun.

Kategori 4: (Memelihara Keturunan) Kit Penempatan Rumah dan Sementara, Pusat Pemindahan Banjir dan Kit Pakaian Asas

Tempat tinggal merupakan hak asasi yang penting untuk seseorang manusia dan ia perlu bagi memelihara keturunan. Bencana banjir memusnahkan penempatan dan menyebabkan kebanyakan penduduk hilang tempat berteduh. Keperluan asas penempatan dibahagikan kepada dua bahagian utama iaitu kelengkapan penempatan rumah dan penempatan sementara. Kedua-dua jenis kelengkapan ini adalah berbeza. Bagi penempatan rumah, keperluan lebih tertumpu kepada bekalan elektrik yang telah terputus akibat banjir. Menurut borang selidik yang diedarkan, sebilangan besar responden iaitu 95.6 % menyatakan keperluan mendesak untuk lampu suluh diikuti dengan lilin, 95.4 % dan mancis, 93.6 %.

Keperluan kelengkapan bagi penempatan sementara pula lebih tertumpu kepada keselesaan untuk mendiami petempatan tersebut. Keperluan asas seperti selimut, bantal dan tikar adalah yang paling diperlukan dengan kadar bancian 92.3 %, 91.2 % dan 90.9%. Kit penempatan sementara yang disediakan perlu menepati ciri-ciri patuh syariah supaya tidak berlaku perkara yang tidak diingini. Antara perkara yang boleh dilakukan ialah menyediakan pengasingan mangsa banjir antara lelaki dan wanita, wanita mengandung, orang sakit dan orang kurang upaya (OKU).

Jabatan Kebajikan Masyarakat (JKM), Agensi Pengurusan Bencana Malaysia (NADMA) dan NGO-NGO turut berperanan dalam menyediakan keperluan asas pakaian untuk mangsa-mangsa banjir. Pakaian yang sesuai sangat dititik beratkan oleh syarak agar dapat melindungi aurat mangsa-mangsa banjir dan memberikan keselamatan serta keselesaan. Pakaian juga penting untuk mengawal emosi mangsa-mangsa banjir.

Keperluan asas pakaian mangsa-mangsa banjir adalah tuala, baju, seluar, tuala wanita dan pampers. Tuala merupakan jenis pakaian asas yang paling dikehendaki berdasarkan kepada 83.2 % responden bersetuju dengan perkara tersebut. Jenis-jenis pakaian asas yang lain adalah seperti baju, 80.4 % dan seluar 79.7 %. Tuala wanita dan pampers juga termasuk dalam senarai pakaian yang amat dikehendaki oleh responden iaitu dengan bancian 78.8 % dan 77.5 %.

Kategori 5: (Memelihara Harta) Kit Simpanan Duit Dan Barang Berharga

Harta adalah aset yang penting dalam kehidupan manusia dan ia merupakan perkara kelima yang perlu dijaga dalam maqasid syariah iaitu memelihara harta. Harta benda milik mangsa banjir yang dapat diselamatkan seperti duit, telefon bimbit dan emas perlu dijaga dengan baik sepanjang berada di pusat pemindahan banjir. Pusat pemindahan yang dipenuhi dengan sejumlah besar mangsa-mangsa banjir memerlukan kepada tempat simpanan khas yang selamat untuk simpanan harta mangsa banjir untuk memastikan semua barang berharga dikumpulkan serta diletakkan di tempat yang selamat. Institusi perbankan perlu memainkan peranan yang bijkasana dalam membantu mangsa banjir dalam menguruskan harta dan barang bernilai. Penyediaan Bank Bergerak dan Sistem Pajak Gadai Bergerak oleh Institusi Bank dan Yayasan Pembangunan Ekonomi Islam Malaysia (YaPIEM) dan sebagainya dilihat mampu menyelesaikan masalah penjagaan harta khususnya duit dan barang bernilai. Perkara ini jarang dilihat ketika berlakunya banjir, maka pihak yang berwajib perlu memikirkan satu pendekatan baru yang boleh digunapakai dalam memelihara harta pada masa akan datang.

4.0 Conclusion

Hasil kajian adalah seperti berikut:

4.1 Kepentingan penyediaan kit-kit kecemasan seperti kit ibadah, kit makanan, kit kesihatan, kit pakaian, kit pendidikan, kit penempatan dan kit simpanan barang berharga adalah diperlukan bagi pengurusan kutipan dan agihan sumbangan semasa berlakunya banjir.

4.2 Penyelidik mencadangkan satu garis panduan penentuan keperluan asas dan jenis-jenis sumbangan semasa banjir perlu diwujudkan berasaskan ISM atau Maqasid Syariah. Kewujudan garis panduan ini akan memimpin dan memandu semua agensi kerajaan dan swasta termasuk semua sukarelawan dalam penentuan kutipan dan pengagihan sumbangan kepada mangsa banjir.

4.3 Kepentingan penentuan keperluan asas mengikut jenis-jenis sumbangan amat diperlukan bagi mengelakkan lebihan sumbangan dan pembaziran berlaku.

4.4 Penyelidik mensarankan agar pihak-pihak berwajib dan seluruh rakyat Malaysia memikirkan kewujudan sebuah Pusat Sehenti Pengurusan Bencana di Malaysia bagi menyelaraskan semua bentuk bantuan daripada semua pihak termasuk kerajaan, ngo-ngo, individu dan sebagainya.

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CADANGAN KERANGKA KERJA KESIAPSIAGAAN MASYARAKAT (INDIVIDU ISI RUMAH) TERHADAP BENCANA BANJIR

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1.0 Pengenalan

Kesiapsiagaan merujuk kepada langkah yang membolehkan sesuatu kumpulan masyarakat seperti individu, organisasi ataupun komuniti memberikan tindakbalas secara berkesan dan mampu pulih dengan lebih pantas apabila ditimpa bencana (Sutton & Tierney 2006). Oleh itu kesiapsiagaan merupakan tindakan atau aktiviti yang dilakukan sebelum suatu bencana terjadi bertujuan untuk meminimalkan kesan risiko melalui tindakan pencegahan yang efektif, tepat pada waktunya, memadai dan cekap dalam menangani darurat ataupun ketika bencana (Gregg et. al 2004; Dodon 2013).

Antara isu yang diperkatakan selepas bencana banjir pada penghujung tahun 2014 yang merupakan banjir yang terburuk melanda Malaysia dalam beberapa dekad ke belakang ialah isu kesiapsiagaan. Kesiapsiagaan atau kesediaan masyarakat untuk menghadapi bencana seperti ini amatlah perlu namun ramai yang tidak bersedia. Usaha bagi memastikan pengurangan risiko bencana ke atas harta benda, nyawa, alam sekitar, harta awam dan sebagainya merupakan agenda utama dan merupakan tanggungjawab kesemua pihak terlibat seperti individu, agensi kerajaan, pihak swasta dan lain-lain badan yang berkaitan. Namun begitu, usaha banyak ditumpukan kepada pengurusan dan bantuan bencana apabila bencana berlaku dan langkah pemulihan selepas bencana menimpa.

Di Malaysia, usaha untuk meningkatkan kesiapsagaan komuniti menghadapi bencana telahpun dinyatakan di dalam Arahan No. 20: Dasar Dan Mekanisme Pengurusan Bencana Negara. Berdasarkan kepada item Perkara 10: Langkah Kesiapsiagaan, “semua Agensi Kerajaan, badan berkanun, pihak swasta dan badan-badan sukarela yang terlibat dalam pengurusan Bencana, hendaklah secara bersendirian atau bekerjasama melaksanakan usaha-usaha meningkatkan kefahaman dan kesedaran mengenai Bencana di segenap lapisan masyarakat” (Jabatan Perdana Menteri 1997). Malahan Perkara 13 di bawah arahan yang sama juga diperuntukkan kepada usaha meningkatkan kesiapsiagaan masyarakat menghadapi Bencana di mana program kesedaran dan kependidikan awam hendaklah dilaksanakan secara berterusan oleh Agensi Kerajaan dengan kerjasama badan berkanun, pihak swasta dan badan-badan sukarela.

2.0 Metodologi

Banjir 2014 melibatkan semua negeri di Malaysia terutamanya Terengganu dan Kelantan. Enam daerah telah dikenalpasti bagi tujuan kutipan data kerana merupakan kawasan paling teruk ditimpa bencana dan melibatkan sejumlah besar mangsa banjir (Jadual 1). Tiga kawasan yang telah dikenalpasti di Terengganu iaitu Dungun, Kemaman dan Kuala Berang di daerah Hulu Terengganu. Tiga kawasan turut dikenalpasti di Kelantan iaitu Kota Bharu, Tanah Merah dan Kuala Krai. Hanya seorang responden yang dipilih bagi setiap isirumah.

Bagi memastikan perbezaan latar belakang dan kedudukan sosio-ekonomi diambilkira, sampel kajian terdiri daripada mangsa-mangsa banjir berdaftar di kawasan-kawasan bandar dan juga di kawasan-kawasan luar bandar. Borang soalselidik diedarkan semasa perjumpaan. Bagi memastikan maklumat yang diberikan adalah betul atau berguna, pengisian soalselidik dibantu oleh pembantu penyelidik yang telah diberikan latihan terlebih dahulu. Pembentukan instrumen kajian iaitu borang soalselidik telah mengambilkira perkara berikut: item yang menjadi ukuran dalam kajian lepas, soalselidik yang telah digunakan oleh menyelidik lain yang boleh diakses dalam talian, temubual dengan badan-badan yang bertanggung jawab dalam menguruskan bencana, dan kajian rintis ke atas mangsa banjir di Kuala Terengganu.

	KELANTAN / Bil. Mangsa		TERENGGANU / Bil. Mangsa	
1.	**Kota Bharu**	**20,363**	Kuala Terengganu	3,492
2.	Bachok	13	Marang	774
3.	Pasir Puteh	209	**Dungun**	**11,996**
4.	Machang	4,187	**Hulu Terengganu**	**4,818**
5.	**Kuala Krai**	**14,007**	Setiu	2,865
6.	Gua Musang	4,390	Besut	6,410
7.	Tumpat	11,213	**Kemaman**	**32,281**
8.	Pasir Mas	16,053		
9.	**Tanah Merah**	**19,453**		
10.	Jeli	846		
	JUMLAH	**90,734**	**JUMLAH**	**62,281**

Jadual 1: Jumlah mangsa di Terengganu dan Kelantan dan kawasan kajian
Nota: Daerah yang dihitamkan adalah kawasan kajian

Indeks Siapsiaga Komuniti (ISK)

Indeks Siapsiaga Komuniti (ISK) telah dibentuk sebagai alat penilaian tahap kesiapsiagaan masyarakat menghadapi bencana banjir. Data yang terhasil mampu menunjukkan tahap kesiapsiagaan masyarakat di sesuatu kawasan mengenai beberapa item penting yang perlu diberi perhatian oleh mereka. Seterusnya, data yang terhasil ini boleh digunakan untuk mengenal pasti bentuk aktiviti kesiapsiagaan yang perlu diutamakan untuk masyarakat terbabit. Oleh itu, ISK dianggap sebagai alat yang boleh membantu perancangan kerjasama dan komunikasi antara pemimpin yang berkepentingan dengan masyarakat bagi memaksimumkan perlindungan kepada pihak terlibat.

ISK dibentuk berdasarkan Model Kesiapsiagaan Komuniti (Matsuda & Okada 2006) yang mengambilkira peranan komuniti dan individu. Pembentukan ISK turut mengambilkira pengukuran kesiapsiagaan yang disarankan Sutton dan Tierney (2006) iaitu pengetahuan mengenai bencana, keselamatan diri, perlindungan harta, tempat perlindungan, bekalan, aktiviti bagi mengurangi kerugian serta pelan komunikasi keluarga. Saranan yang dimuatkan oleh beberapa agensi kerajaan di dalam portal turut diambilkira seperti Portal Bencana Majlis Keselamatan Negara, portal Pusat Pengurusan Bencana Jabatan Kerja Raya (e-Bencana Alam) dan portal Jabatan Pengairan dan Saliran Malaysia (PublicInfoBanjir).

Dalam kajian ini, ISK yang dibangunkan mempunyai lapan dimensi di mana tujuh daripadanya disesuaikan daripada Matsuda dan Okada (2006) iaitu keselamatan rumah, penyimpanan, tempat berlindung, sokongan khas, hubungan komuniti, peralatan dan perhubungan ketika kecemasan. Satu dimensi baru ditambah berdasarkan hasil kajian ini iaitu ‘pelindungan kewangan’. Pengukuran setiap dimensi mengambilkira persiapan individu dan juga komuniti yang terbabit. Maksimum nilai bagi setiap dimensi ialah 5. Pengukuran dimensi ISK seperti dalam Jadual 2.

Jadual 2: Dimensi dan aktiviti ISK

Dimensi	Aktiviti
Keselamatan rumah	Tindakan bagi memastikan rumah selamat daripada bencana banjir mahupun tindakan kianat pihak tertentu ketika ditinggalkan kosong seperti memastikan rumah dalam keadaan kukuh serta litar elektrik dipasang pada kedudukan tinggi
Penyimpanan	Simpanan atau stok keperluan yang disediakan terutamanya apabila perlu berpindah ke tempat perlindungan sama ada secara individu maupun bersama-sama dengan ahli lain.
Tempat berlindung	Tempat berpindah apabila dikehendaki berbuat demikian. Suasana yang dijangkakan di tempat tersebut. Tahap penyertaan komuniti memberi bantuan.
Sokongan khas	Pengetahuan berkaitan keselamatan individu yang memerlukan perhatian khusus seperti warga emas, orang kurang upaya atau kanak-kanak terutamanya kanak-kanak di bawah jagaan rumah anak-anak yatim
Hubungan komuniti	Keterlibatan komuniti dalam persediaan menghadapi bencana banjir seperti bergotong royong membersihkan kawasan atau membantu jiran yang berpindah
Peralatan	Alatan yang digunakan sebagai penanda banjir dan pemahaman bagaimana menggunakan atau membaca alat tersebut

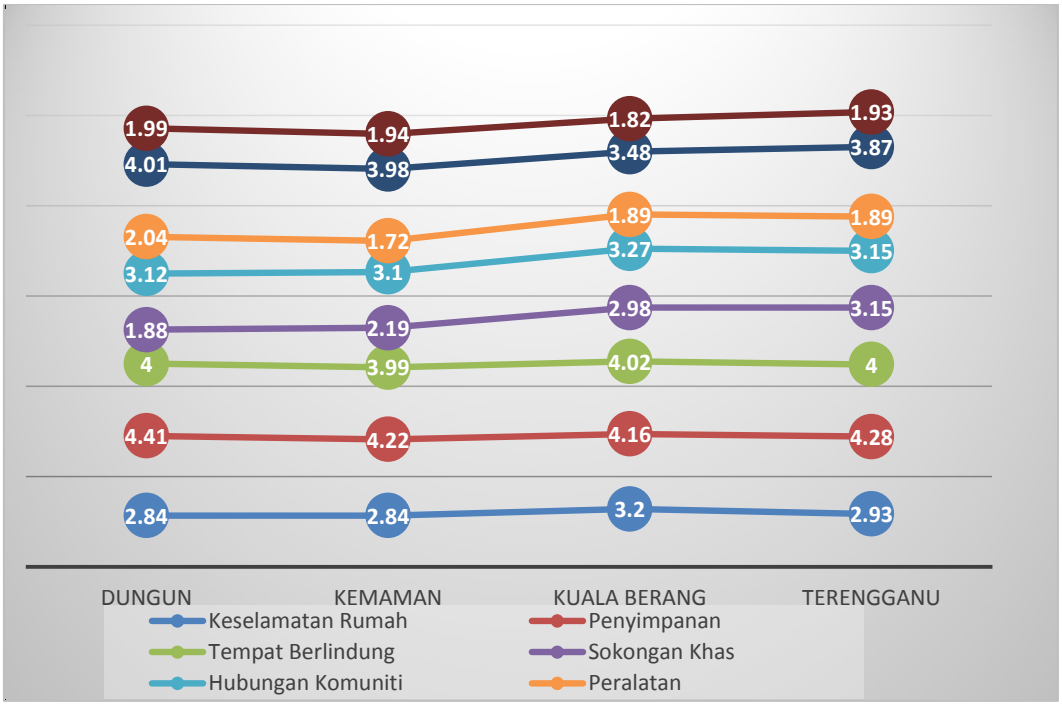
Hubungan kecemasan	Nombor yang perlu dihubungi ketika kecemasan seperti nombor talian 999 serta pihak yang perlu dihubungi ketika berlaku kecemasan
Perlindungan kewangan	Tabungan dan pembelian insuran

3.0 Hasil kajian dan perbincangan

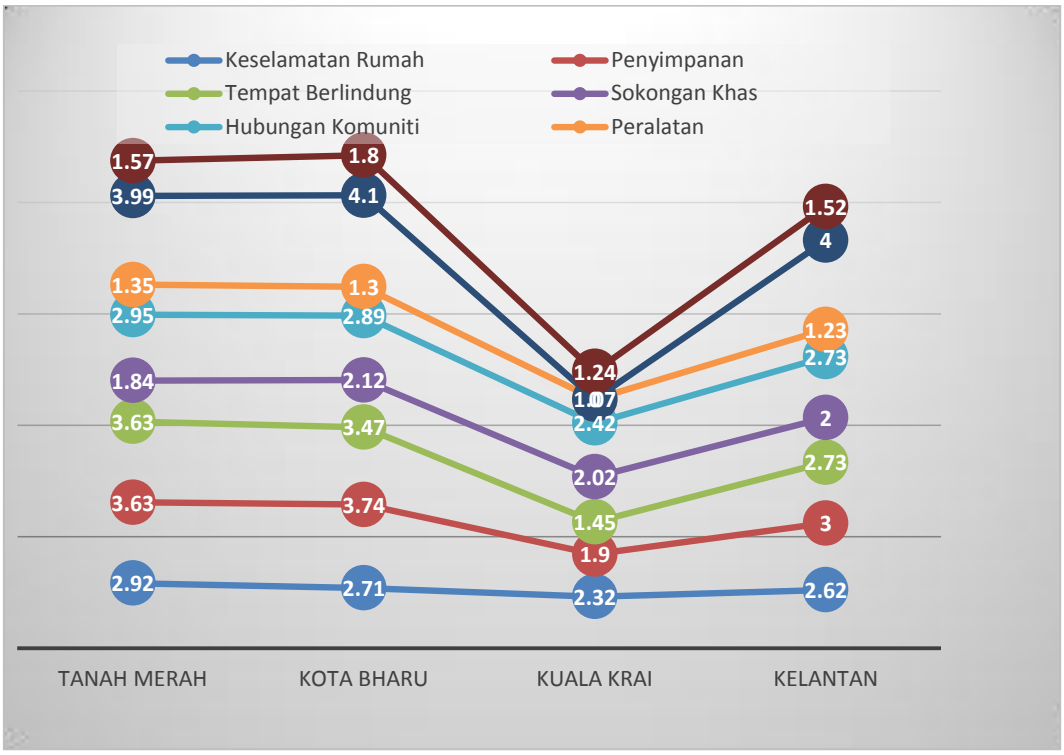
Jumlah soalselidik yang sempurna dan boleh digunakan ialah 921 di mana 114 responden di Dungun, 110 responden di Kemaman, 74 responden di Kuala Berang, 168 responden di Tanah Merah, 215 responden di Kota Bharu dan 240 responden di Kuala Krai. Majoriti responden di kedua-dua negeri adalah wanita (57.9%), dan rata-rata responden berumur melebihi 31 tahun ke atas. Secara purata, majoriti responden mendapat pendidikan yang sederhana iaitu sehingga peringkat SPM/MCE. Namun begitu, berdasarkan hasil soal selidik di bandar-bandar yang membangun seperti Kemaman, lebih ramai responden mempunyai taraf pendidikan tertinggi di peringkat ijazah. Hasil kajian menunjukkan kebanyakan responden (57.3%) adalah terdiri daripada golongan yang berpendapatan rendah iaitu dalam lingkungan pendapatan bulanan isi rumah sebanyak RM1,000 dan ke bawah. Golongan kedua tertinggi ialah mereka yang berpendapatan di antara RM1,000 sehingga RM2,000 iaitu sebanyak 18.7 peratus.

Berdasarkan ISK, secara keseluruhannya responden di negeri Terengganu mempunyai tahap kesiapsiagaan yang sederhana tinggi (Rajah 1). Hasil kajian mendapati responden di Terengganu mempunyai persediaan yang tinggi untuk Penyimpanan (4.28) yang menunjukkan mereka tahu dan sentiasa bersedia dengan barang keperluan yang perlu ada ketika kecemasan. Mereka turut mempunyai pengetahuan tinggi berkaitan proses pemindahan (4.0) bermaksud mereka tahu di mana tempat pemindahan serta laluan yang selamat untuk ke tempat tersebut. Kebanyakan responden mengetahui nombor-nombor penting individu/agensi yang perlu dihubungi di waktu kecemasan. Hubungan di antara ahli komuniti juga baik (3.15) dan saling menyokong. Walau bagaimanapun, hasil kajian mendapati bahawa pengetahuan mereka tentang peralatan yang disediakan untuk amaran banjir adalah rendah. Namun, hal ini mungkin kerana ketiadaan alat pengukur yang diletakkan dikebanyakan kampung yang dilawati. Pada masa yang sama, responden yang kebanyakan berpendapatan rendah kurang membuat tabungan dan tidak mendapatkan perlindungan insuran menjadikan ISK perlindungan kewangan menjadi rendah (1.93).

Bagi negeri Kelantan (Rajah 2), secara keseluruhannya, hasil kajian mendapati kesemua nilai ISK adalah agak rendah kecuali bagi indeks hubungan kecemasan. Ini menunjukkan tahap kesiapsiagaan di kalangan komuniti adalah pada tahap sederhana rendah. Manakala ISK bagi peralatan dan perlindungan kewangan adalah rendah atas sebab-sebab seperti yang dijelaskan di negeri Terengganu. Daerah Kuala Krai mempunyai ISK yang terendah bagi tujuh daripada lapan item. Punca kepada tahap kesiapsiagaan yang rendah ini adalah kerana banjir yang berlaku di akhir tahun 2014 merupakan di luar jangkaan penduduk. Menurut mereka, kali terakhir banjir melanda kawasan mereka ialah lebih kurang 70 tahun yang lalu. Bagi daerah Tanah Merah dan Kota Bharu, banjir merupakan fenomina biasa sahaja. Namun begitu, pengetahuan mereka berkenaan hubungan kecemasan, peyimpanan dan tempat berlindung hanyalah sederhana tinggi sahaja. Mereka tahu siapa dan nombor apakah yang perlu dihubungi di saat kecemasan di samping bersedia dengan peralatan dan bekalan yang sesuai untuk dibawa ke tempat pemindahan. Kebanyakan mereka tahu di mana dan laluan-laluan selamat ke tempat pemindahan yang telah disediakan untuk mereka.



Rajah 1: Indeks Siapsiaga Komuniti (ISK) negeri Terengganu



Rajah 2: Indeks Siapsiaga Komuniti (ISK) negeri Kelantan

4.0 Kesimpulan

Tahap kesiapsiagaan yang tinggi membolehkan seseorang itu menjangka kehadiran bencana dan bertindak balas secara efektif, serta memulihkan keadaan dalam masa yang singkat bagi mengurangi bahaya dan kerugian samada dalam bentuk kewangan, fizikal ataupun mental. Pada kebiasaannya, tempoh di antara amaran dan bencana sebenarnya melanda adalah singkat. Oleh itu, tindakbalas segera dan tepat diperlukan bagi memastikan kemusnahan dapat dikurangkan serta nyawa dapat diselamatkan. Berikut adalah penemuan penting hasil kajian ini:

4.1 ISK menunjukkan tahap kesiapsiagaan masyarakat Malaysia khususnya di Terengganu dan Kelantan adalah pada tahap sederhana rendah

4.2 Secara keseluruhannya responden di negeri Terengganu mempunyai tahap kesiapsiagaan yang lebih tinggi daripada responden di negeri Kelantan.

4.3 ISK yang tinggi adalah berkaitan tempat tempat perlindungan, bekalan dan nombor kecemasan dan yang terendah adalah perlindungan kewangan dan peralatan amaran banjir.

4.4 Pengetahuan tentang kawasan yang diduduki mudah banjir adalah sederhana tinggi, kecuali di kawasan yang jarang banjir seperti Kemaman (bandar) dan Kuala Krai (tidak pernah banjir lebih 70 tahun).

4.5 Majoriti memilih untuk tinggal di kawasan tersebut walaupun sedar akan kemungkinan banjir kerana faktor kekeluargaan.

4.6 Pengetahuan sederhana tinggi (lebih 60%) berkaitan tempat permindahan, bekalan yang perlu dibawa dan laluan selamat ke tempat permindahan.

4.7 Ketiadaan alat pengukur banjir di kawasan kajian adalah tinggi (70%).

4.8 Jumlah keseluruhan yang tinggi tidak menerima sebarang risalah berkaitan banjir (85.1%) dan tidak pernah mengikuti apa-apa latihan atau simulati menghadapi banjir (95.2%).

4.9 Jumlah responden yang menerima amaran awal semasa banjir semakin hampir juga tidak begitu membanggakan iaitu hanya 38.9 peratus, sementara arahan pemindahan yang lebih awal diterima hanya oleh 52.8 peratus responden.

4.10 Angka-angka ini menggambarkan kurangnya peranan yang dimainkan oleh pihak berkuasa dalam memberi amaran dan latihan awal kepada komuniti yang berhadapan dengan bencana banjir.

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DEVELOPING A FRAMEWORK OF FLOOD INSURANCE SCHEME IN MALAYSIA: THE CASE OF FLOOD IN KELANTAN

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1.0 Introduction

Flood is the largest natural disaster occurrence in Malaysia and is expected to exacerbate due to the various extreme weathers in the country. Despite the high risk of flood, flood coverage insurance policy is not always available. To overcome this challenge, the micro takaful is an alternative scheme that is proposed in this study that can specifically aid the poor who are victims of extremely heavy flood. Thus, this study attempts to achieve two objectives. First, to examine the impact of flood risk to the affected community and second, to develop a framework to help the poor. The study has selected Kelantan, an east coast state in Malaysia, as a case study that represents a high risk flood area. The researchers will provide an overview of the specific flood risk and flood insurance available to the affected community in Kelantan. Then a model as an element of risk transfer is proposed as a new scheme to supports the role of the government, the insured, the insurers and other stakeholders. This newly proposed custom-made flood insurance model in Malaysia is named the MicroTakaful Flood Scheme.

2.0 Methodology

This is a qualitative study that specifically focused on multiple case studies. For data collection, this study used a semi-structured interview process, non-participant observation and document analysis. The data analysis technique used in the study was content analysis and was analysed using Atlas.ti 7 software. Poor flood victims of Kelantan as a sample case because to propose insurance coverage on the properties that belong to them. An interview with the focus groups was also conducted to verify the proposed micro takaful flood framework. They are consists of 20 participants from nine representatives of various stakeholders.

3.0 Results and Discussion

The findings are reported according to two research questions which are (1) What are the impacts of flood risks to the affected community and (2) What is the alternative policy available to protect the poor against the flood?

What are the Impacts of Flood Risk to the Affected Community?

Six participants involved in the interview were from Kampung Miak in Gua Musang, Kampung Manek Urai Lama in Kuala Krai; these were all flood victims who were poor. They worked as a rubber tapper, retiree, and gardener and earned an average of RM 500 per month. The impact of flood risks to the affected community consisted of loss of earning, no insurance coverage and unattended disaster assistance.

The research indicated that the affected property belonged to them. In some cases, the building, but not the land, belonged to the victim. In some instances, the properties belonged to them but these were built on the government land. It was revealed that some of them stayed on the inherited land but the property ownership had not yet been transferred. It became a problem when the victims intended to rebuilt the house at the same place. The victims acknowledged that they lived in the flood prone area except for the residents of Kampung Miak in Gua Musang that was considered to have low flood risk. The research also showed that the value of the damage properties ranged from RM 30,000 to RM 85,000 for buildings and the value of the contents is approximately RM 5,000. All of the victims suffered complete losses because their properties were completely destroyed and washed away in the flood. The research also indicated there is a lack of awareness among the poor people on the

needs of having a flood policy. Because of their small income, the poor people did not consider the need of for a takaful protection.
Furthermore, despite being flood prone areas, there is no physical or financial assistance offered from the authority. All participants also claimed that no loss avoidance measures were taken. This is because the water level is normally low and never reached the houses except for the ones located on the lower grounds of the village.

What is the Alternative Policy Available to Protect the Poor People against the Flood?
In order to address the second research question, the researchers designed questions related to the participants' areas, the loss avoidance measures, insurance coverage and any aids provided. These questions were constructed to determine whether there is an alternative policy available to protect the poor people against the flood.

On whether their properties had any insurance/takaful coverage, they all said no. Furthermore, they also did not receive any aids from the welfare department, except for one participant whose father received RM300 from Social Welfare Department (JKM) every month.From the results above, it is clear that there is no alternative policy available to help the poor.

Thus, this scheme is specially designed for flood victims who are very poor as the purpose of this study is to aid the poor. The basic coverage of the policy is to cover the structure and content of the house. The contribution charge of the scheme will be backed by the government and private companies. For the underwriting purposes, the parametric method is suitable for natural event catastrophes because according to this technique, a type of insurance that does not indemnify the pure loss, but ex ante agrees to make a payment upon the occurrence of a triggering event. The triggering event is often a catastrophic natural event which may ordinarily precipitate a loss or a series of losses. It also enables a much more rapid payment as no loss adjusters are required after the event to assess the actual damage. The claim settlement is fast and loss events can be handled faster and more efficiently than with other kinds of insurance-based solutions.
The low income people or the poor have low purchasing power. They cannot afford to pay the contributions fee. In this case, allowing payments to be made in instalments is one of the possible solutions. One may suggest that the government, Government Linked Company (GLC) and waqf may pay the contribution fee. This can be viewed as the company's corporate social responsibility (CSR) strategist. Below is the proposed model.

4.0 Conclusion

This study attempts to acquire a better understanding of the impact of flood risk to the affected community and to propose an alternative scheme to protect the poor. Important findings of the study are summarized as follows:

4.1 There was neither disaster assistance nor aids available even after the participants had lost all their properties after the heavy flood.

4.2 The impact of flood risk to the affected community consist of loss of earning, no insurance coverage and unattended disaster assistance. The value of the damage properties ranged from RM 30,000 to RM 85,000 for buildings and the value of the contents is approximately RM 5,000. All of the victims suffered total loss because of their property floated and washed away.

4.3 In Malaysia, there is no standalone flood insurance scheme available specifically to cover flood.

4.4 This study proposed a new custom-made flood insurance model called the MicroTakaful Flood Scheme (MTFS). A framework has been developed as an element of risk transfer as a newly proposed scheme for any takaful operators or stakeholders to make it as part of their corporate social responsibility (CSR) to the community.

4.5 To make the scheme successful, it is important to have an efficient policy administration whether it is operated by the insurance industry or other party. A third party administrator (TPA) is viewed to be an efficient administrator.

4.6 The research recommends that the government operate their own captive insurance company. The captive insurer is generally defined as an insurance company that is wholly owned and controlled by the government with a primary purpose to insure the risks of its owners.

4.7 In conclusion, the result of this study provides a significant contribution for reducing the government's burden on managing losses as a result of flood. In addition, the

scheme allows interested stakeholders to partake in the contribution fee as part of their corporate social responsibility.

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MEMBANGUNKAN RANGKA KERJA TAKAFUL HARTA UNTUK KELESTARIAN PKS

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1.0 Pengenalan

Malaysia telah dilanda musibah banjir besar khususnya di negeri pantai timur semenanjung, Kelantan pada akhir tahun 2014. Dalam kejadian ini, hampir 70 peratus pelaburan PKS dalam bentuk peralatan, mesin, inventori dan stok barangan siap musnah sama sekali. Tidakkah ada satu skim perlindungan takaful yang komprehensif yang dapat melindungi harta PKS daripada bencana seperti banjir?. Perlindungan kepada risiko banjir menjadi satu isu nasional kerana skim takaful/insurans yang sedia ada hanya melindungi peril asas iaitu kebakaran dan peril banjir hanya dijadikan pilihan untuk dimasukan bersama polisi kebakaran. Oleh itu, pelan pengurusan risiko perlu dikaji semula untuk memberi gambaran yang jelas kepada pemilik PKS dan penggubal dasar pengurusan risiko korporat.

Musibah banjir yang menimpa PKS adalah salah satu faktor persekitaran yang di luar kawalan mereka di mana menyebabkan operasi kebanyakan daripada mereka terjejas teruk. Justeru, kajian ini mengambil inisiatif untuk merangka satu rangka kerja baru skim takaful harta yang komprehensif bagi tujuan melindungi aset PKS apabila berlakunya musibah banjir. Di samping itu, kajian ini juga penting melihat kesesuaian skim takaful tersebut ini dikenakan secara mandatori kepada PKS semasa mereka memperbaharui pendaftaran perniagaan masing-masing. Akhir sekali, kajian ini juga penting dalam mendapatkan maklumbalas daripada tiga pihak terlibat iaitu PKS, pengendali Takaful dan agensi yang mempunyai kaitan secara langsung dengan pembangunan PKS seperti SMECorp, SSM dan KPDNKK terhadap cadangan untuk membangunkan kerangka Skim Perlindungan Harta khusus kepada PKS (SME-ART©).

2.0 Metodologi

Kajian ini menggunakan Teori Prospek *(Prospect Theory)* dimana teori ini menerangkan kaedah individu memilih antara alternatif kebarangkalian yang melibatkan risiko, di mana kebarangkalian hasil diketahui (Kahneman & Tversky, 1979). Teori ini adalah model membuat keputusan di bawah risiko. Bidang kewangan dan insurans adalah antara yang ketara boleh dilihat mengaplikasikan teori ini di mana sikap terhadap risiko memainkan peranan utama (Barberis, 2013). Manakala rekabentuk kajian ini menggunakan kaedah penyelidikan bercampur (mixed mode) iaitu kaedah kualitatif dan kuantitatif. Dalam kaedah kualitatif pihak penyelidik memberi tumpuan kepada kajian kes dan perbincangan kumpulan fokus. Sebanyak lapan kes yang terdiri daripada usahawan-usahawan PKS yang terlibat dengan banjir besar di Kelantan telah digunakan dalam kajian ini. Kajian ini menggunakan kajian kes penerokaan yang bertujuan untuk menentukan persoalan kajian dan untuk menentukan kebolehlaksanaan kajian. Merujuk kepada Yin (2003), reka bentuk kajian yang sesuai bagi kajian ini adalah mengunakan kaedah pengajian berbilang (*Multiple case design*) dengan unit holistik, di mana lapan (8) orang responden daripada jumlah mangsa banjir adalah lapan unit holistik analisis dan setiap kes menyumbang kepada keseluruhan skop kajian. Dalam kajian kes berbilang, di mana beberapa keadaan individu disiasat, mungkin sangat kuat dan berhasil kerana kemampuan untuk membanding dan penemuan.

Populasi kajian terdiri daripada mangsa banjir PKS di Kelantan pada tahun 2014. Saiz sampel kajian kualitatif adalah kecil, tetapi ia memberikan maklumat yang banyak daripada komen-komen daripada responden. Kajian ini menggunakan reka bentuk pensampelan berkebarangkalian untuk menjalankan keseluruhan penyelidikan. Dalam kajian ini, pensampelan penghakiman telah dipilih sebagai jenis persampelan bertujuan. Terdapat seramai 8 orang daripda 10 responden yang terdiri daripada pemilik syarikat PKS di Wakaf Che Yeh dan Kota Bharu yang menjadi mangsa banjir 2014 di Kelantan telah memberi kerjasama untuk mengambil bahagian dalam kajian ini. Di samping itu, kajian ini melibatkan lawatan tapak kerana ia menyediakan pemahaman yang lebih baik mengenai operasi syarikat dan penyelidik perlu membuat beberapa pemerhatian mengenai perkara-perkara berikut (i) bagaimana teratur dan lancar operasi berjalan, (ii) apakah suasana sebagainya -

terutamanya jika penyelidik boleh mendapat peluang untuk bercakap dengan orang yang mereka ini pergi sekitar dan (iii) keadaan benda (sifat iaitu rosak, tahap kerugian) (Yin, 2009).

Kajian ini juga telah menggunakan kaedah perbincangan kumpulan fokus atau lebih dikenali sebagai FGD (focused group discussion) untuk mendapatkan input serta pandangan setiap peserta kepada beberapa persoalan yang berkaitan dengan kerangka skim takaful yang dicadangkan oleh penyelidik serta kaedah pelaksanaan yang berkesan. Sebanyak dua pusingan FGD telah dilaksanakan iaitu pada 4hb Ogos 2015 bertempat di ibu pejabat MTA dan 12hb November 2015 bertempat di Hotel Seri Pacific, PWTC. Sesi FRG melibatkan peserta yang mewakili Malaysia Takaful Association (MTA), SSM, Persatuan PKS, KPDNKK, PIAM, Bank SME dan BNM. Sesi FGD dirakam dan teknik digunakan untuk sesi kumpulan fokus kajian ini mengikuti garis panduan oleh Kruger dan Casey (2000).

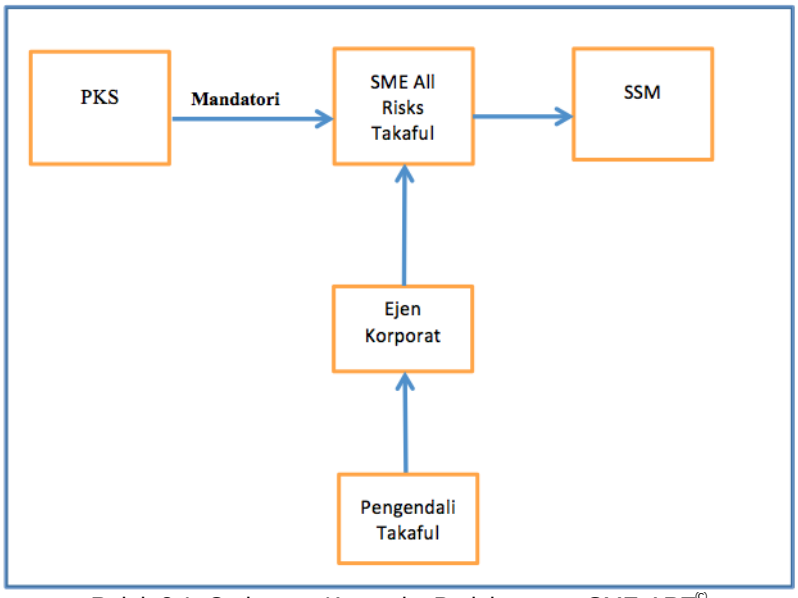
Kajian ini menggunakan satu proses temu bual separa berstruktur dalam Bahasa Melayu, pemerhatian bukan-penyertaan dan analisis dokumen, di mana penyelidik adalah instrumen utama bagi pengumpulan data (Merriam, 1998). Dalam kajian ini, analisis dokumen yang digunakan seperti data penduduk dari SME Corp, SSM, polisi insurans hartanah semasa dari pengendali Takaful dan peta bahaya dari JPS serta maklumat banjir daripada MKN. Dalam kajian ini, analisis kandungan akan dipilih sebagai analisis data bagai membolehkan penyelidik mengkaji artifak komunikasi sosial. Data daripada perbincangan kumpulan fokus telah dianalisis menggunakan ATLAS.ti 7.

Kajian ini juga menggunakan kaedah kuantitatif bagi mengukuhkan dapatan kajian, di mana kerja lapangan telah dilaksanakan dengan mengedarkan borang soalselidik kepada responden yang telah dikenalpasti. Sampel kajian dipilih dengan menggunakan persampelan mudah. Wawancara dijalankan oleh tiga penyelidik untuk memastikan seramai 251 PKS responden menjawab soalan-soalan dengan tepat. Untuk mengenal pasti jumlah kerugian yang dialami oleh PKS di seluruh negeri Kelantan, kajian ini dijalankan di tujuh (7) jajahan termasuk jajahan Kota Bharu, Pasir Mas, Tumpat, Tanah Merah, Gua Musang, Rantau Panjang dan Kuala Krai. Instrumen kajian yang digunakan dalam kajian ini ialah soal selidik yang bertanyakan jumlah kerosakan atau kehilangan harta perniagaan yang dihadapi semasa banjir berlaku. Kaedah ini adalah sesuai dan mudah untuk disoal siasat, mengurangkan wawancara berat sebelah, menjadikannya lebih cepat untuk ditadbir, dan mudah untuk dijawab oleh responden.

3.0 Dapatan Kajian

Konsep perlindungan sedia ada ini sangat membebankan PKS dengan nilai premium yang lebih tinggi, mengakibatkan skim ini menjadi kurang menarik ditambah pula dengan bukti kadar penembusan yang rendah. Kajian ini juga mendapati PKS menghadapi risiko kerugian yang besar apabila banjir melanda kawasan perniagaan mereka. Dari hasil kajian kuantitatif yang dijalankan, dari jumlah 251 PKS di seluruh negeri Kelantan, penyelidik mendapati 88.5% mengalami kerugian kurang daripada RM30,000 dan hanya 2.4% mengalami kerugian melebihi RM100,000. Kajian ini juga telah mendapati kerugian yang ditanggung oleh PKS ialah dari segi kerosakan bangunan, perkakasan, stok bahan mentah, dan stok barangan. Kerosakan kepada premis perniagaan tidak ditanggung secara langsung oleh PKS memandangkan premis yang digunakan bagi operasi perniagaan adalah premis yang kebanyakannya disewa.

Sehubungan dengan itu, kajian ini juga telah berjaya membentuk satu produk perlindungan asas kepada PKS hasil daripada perbincangan bersama 5 orang ahli Persatuan Takaful Malaysia (MTA) yang dihadiri oleh Ketua Pegawai Eksekutif MTA, eksekutif MTA, wakil STMB serta ahli-ahli penyelidik, produk baru tersebut diberi nama tentatif ‘SME All Risk Takaful (SME-ART©). (Rujuk rajah 3.1). Berhubung dengan kaedah perlaksanaan SME-ART©, satu lagi perjumpaan dengan pihak Focus Group Discussion (FGD) yang terdiri daripada wakil Kementerian Perdagangan Dalam Negeri, Koperasi dan Kepenggunaan (KPDNKK), Suruhanjaya Syarikat Malaysia (SSM), Bank Negara Malaysia, Persatuan Insurans Am Malaysia, SME Corporation, SME Bank, Malaysian Takaful Association, Pengendali Takaful di Malaysia telah diadakan dalam membangunkan prosedur operasi perlaksanaan skim ini. Pihak yang berkenaan yang hadir secara dasarnya bersetuju dengan pelan skim ini, dan memohon kajian lanjutan dapat dijalankan dalam menentukan kadar minimum premium takaful. Perlaksanaan di pihak kabinet juga amat perlu kerana ia melibatkan akta serta polisi pendaftaran.



Rajah 3.1: Cadangan Kerangka Perlaksanaan SME-ART©

4.0 Kesimpulan

Konsep perlindungan sedia ada ini sangat membebankan PKS dengan nilai premium yang lebih tinggi, mengakibatkan skim ini menjadi kurang menarik ditambah pula dengan bukti kadar penembusan yang rendah. Dalam kajian ini, seramai 251 responden PKS menunjukkan 88.5 peratus PKS mengalami kerugian kurang daripada RM30,000 manakala 2.4 peratus mengalami kerugian melebihi RM100,000. Untuk mengurangkan kesan musibah banjir kepada pihak PKS, para penyelidik telah merangka Skim Takaful Harta (SME-ART©) untuk memberi perlindungan kepada aset PKS sekiranya berlaku bencana alam seperti banjir. Secara dasarnya pihak takaful bersetuju dengan rangka kerja skim yang dicadangkan untuk diangkat ke peringkat yang lebih tinggi bagi membantu pihak PKS dimasa hadapan jika menghadapi bencana banjir.

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DESIGNING AND MODELING COMPREHENSIVE NATIONAL INSURANCE TO REDEVELOP FLOOD AFFECTED CITIZENS

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1.0 Introduction

Affected flood areas in 2014 are the biggest catastrophic in Malaysia which has left large citizens without homes and losses of income. Most of the affected flood households do not have insurance protection to cover their economic losses and face difficulties in rebuilding their life's aftermaths. Agriculture sectors and business owners suffered huge losses and have difficulties in re-starting their economic activities due to financial burden.

1.1 Objectives of the Study

1) To investigate the risks, coping strategies and vulnerability of flood victims.
2) To assess the losses from economic activities of the flood's victim.
3) To model flood risk reduction strategies for insurers and government in floodplain area.
4) To develop a successful national flood insurance scheme for Malaysian citizens.

1.2 Research Questions

1) What are the risks faced by the flood victims' after the flood?
2) How do the flood victims cope with their risks after the flood?
3) What are their vulnerabilities after the flood disaster?
4) How much losses suffered from their economic activities due to flood?
5) How do the insurers and government mitigate the flood risks in floodplain area?
6) How to develop a successful national flood insurance scheme for Malaysian citizens?

2.0 Methodology

This research employed qualitative method using purposeful sampling technique where in depth semi-structured interview was conducted in Kelantan and Pahang, Peninsular Malaysia. Tumpat was selected as the yearly prone flood area while Kuala Krai and Temerloh are the most affected areas in recent 2014 flood disaster. The first stage of data collection process was carried out to interview eleven participants with different economic activities inclusive of agriculture, livestock breeders, business owners and self-employed individuals.

The second phase of data collection using exploratory expert interview was conducted with Chief Executive Officer from Malaysian Takaful of Association (MTA), Malaysian Retakaful Berhad and Etiqa Takaful Berhad to gather their expert opinion on the risk reduction strategies and the viability to develop a comprehensive national insurance product for the country. Higher rank executives from Etiqa Takaful Berhad and Actuary from JPWall Consulting have been interviewed on the same purpose. Etiqa Takaful Berhad is one of the largest takaful operators and has their own flood insurance namely *Rumah Desa.* Malaysian Retakaful Berhad is the reinsurer to takaful operators which help spread out the risks of insuring natural disaster such as flood. Malaysian Takaful of Association (MTA) is an association to oversee takaful operators.

3.0 Results and Discussion

Data Analysis
First phase of interviews have been conducted in the month of August to October 2015. Interview are audio-recorded and transcribed verbatim and transcript were loaded into Atlas.ti for coding and

analysis. A total of nine codes were identified and grouped by conceptual similarity. Second phase of interviews have been held in the month of September to November 2015 to collect primary data from industries expertise. Semi-structured interview questions were used in this research to obtain openness in discussion, and allowing new ideas to be brought up during the interview as a result of what the interviewee says. A total of eleven codes were identified and grouped by conceptual similarity.

Discussion on Findings based on Themes

Six themes emerged throughout the interviews, there were acceptance the tragedy as a test, rebuilding life and economic activities, defenseless, unpredictably losses, government enforcement, funding and integrated groups channel. The themes were classified based on the research questions. The sub-themes are derived from each of the theme as stated below.

1. Acceptance the tragedy as a test (based on Research Questions 1)
   i) Damaged of business activities and loss of income
   ii) Damaged of resident, equipment and personal belonging
   iii) Higher price for live stocks and aquaculture's feed

2. Rebuilding life and economic activities (based on Research Question 2)
   i) Government support is highly needed
   ii) Alternative economic activities
   iii)Taking loan from the bank, use savings and other sources

Defenseless (based on Research Question 3)

i) Financially burden ii) Health Deteriorated and Ceased business permanently

Unpredictably Losses (based on Research Question 4)

The estimated losses of eleven participants range from RM1,000 to RM300,000. Cattle breeder loss RM200,000 (cows and goats submerged during flood) and did not get any compensation. Grocers' goods damaged and stolen (estimated loss RM30,000), five acres of rubber tree destroyed (estimated loss RM50,000), Photocopiers and stationary damaged (estimated loss RM45,000) and *Patin* breeder cost of losses is RM300,000 during 2014 flood. All of them did not have insurance to cover the losses and have difficulties in rebuilding their economic activities.

4.0 Conclusion

4.1 Government Enforcement (based on Research Question 5)

Enforcement of regulations for buildings in floodplain

Before introducing such national flood insurance, firstly the government has to establish and enforce the building standard code for all premises to avoid heavy damages during flood. Secondly, such regulation not to build any house or premise near the river in certain measurement or radius should be introduced by the rulers.

National Insurance to be made compulsory

It was suggested that the national flood insurance to be made compulsory to all households in the floodplain, since that in the certain area there is a yearly flood. This is to minimize the risks and claim pay out.

Product Bundling

Findings from the interviews suggested that the comprehensive national insurance should be bundled to provide more coverage, promote better penetration rate and normally the pricing is affordable.

Lack of Statistical Data

Systematic disaster data collection and analysis is beneficial to insurers to design the product, while for government agencies, they can use it for decision making thus would reduce disaster risks and build economic resilience.

4.2 Funding and integrated groups channel (based on Research Question 6)

Funding Mechanism

Findings indicated the importance to establish a funding model before introducing the national insurance to public. There are three approaches for Malaysian government to address the contribution (funding) issue on the National Flood Insurance:

- Government to fully subsidized the contribution (poor people)
- Government to subsidize the contribution partially (low Income)
- Participation by self-contribution (other than poor and low income)

The three categories of takaful participants are illustrated in the model as in Figure 1. The funding model is to enable every citizen especially at the flood prone area participate in the scheme. Bank Negara Malaysia should appoint a body to oversee the development, governance and operation of the national flood insurance scheme, even though the operation shall be run by respective insurers and takaful operators.

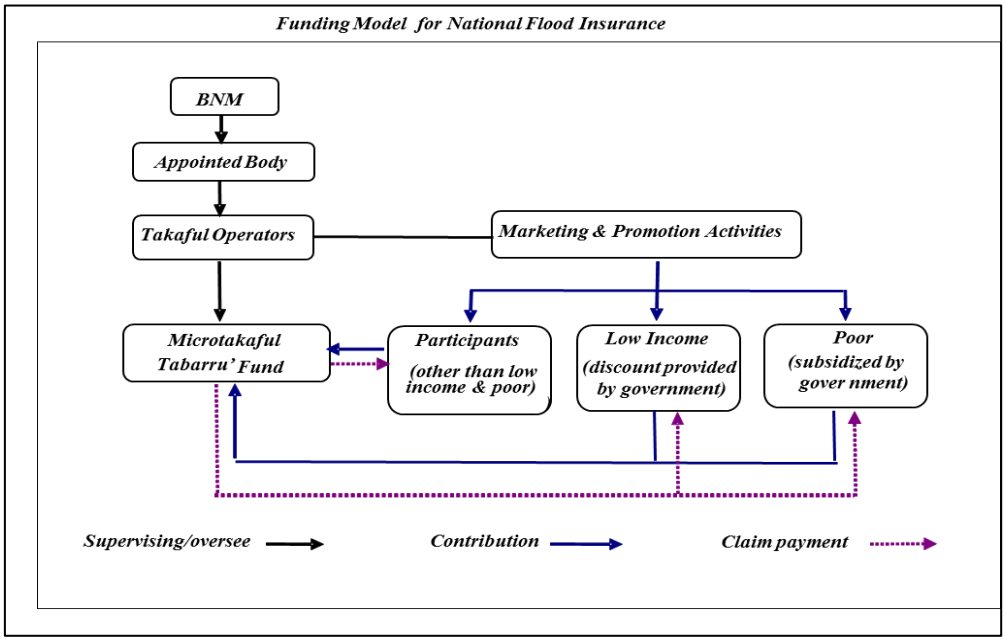

Figure 1: Funding Co-ordination Model (Agriculture and Business)

The management and administration of national flood insurance should be a joint effort of all interested parties, the Ministry of Agriculture, Ministry of Domestic Trade, Co-operatives and Consumerism, SME Corporations, Associations, Cooperatives and insurance companies. This is to ensure the participants are covered by contributing to the plan continuously. 4.2.3 To establish the Responsible Stakeholders and their Functions. The integration of Funding Co-ordination in (ii) shall successfully established the function of each responsible stake holder in National Flood Insurance scheme as illustrated below.

Table 1 National Flood Insurance: Responsible Stakeholders and their Functions

Category	Stakeholders	Function
Insurers	Insurance companies, takaful operators	•Product research & development •Underwriting, Marketing & Operation
Reinsurers	Reinsurance companies	•Acceptance of transferred risks •Enforcement of risk reduction
Regulator of Insurance and Takaful	Bank Negara Malaysia	•Oversee the product development & whole process of national insurance •Enforcement of risk reduction
Ministry of Agriculture	Government agencies	•Distribution channel for farmers, breeders.
Ministry of International Trade and Industry Malaysia	SME Corporation Malaysia	•Central Coordinating Agency for micro, small and medium businesses
Ministry of Domestic Trade, Co-operatives & Consumerism	Co-operatives	•Distribution channel for small enterprises

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PRE DISASTER FINANCIAL INSTRUMENT USING FLOOD MAP FOR ENHANCING COMMUNITY RESILIENCE

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1.0 Introduction

December 2014 flooding in Kelantan river basin caused severe damage to economic and social infrastructure and dealt a serious blow to Kelantan state economies. Mitigation of flood disaster can be successful only when detailed knowledge is obtained about the vulnerability of the people, buildings, infrastructure and economic activities in a flood risk area. Therefore, to identify a community's flood risk, pre disaster financial instrument will be introduced as non-structural mitigation measures know as flood insurance rate map. This instruments will be developed based on geospatial technology using satellite images, cadastral map, type of community building such as residential or commercial, agricultural land, household's income, existing flood map produce by Department of Irrigation & Drainage (DID) and risk perception and risk preparedness questionnaire survey. Flood hazard maps and flood insurance rate map will provided the flood risk zone and flood insurance rate and premium coverage for the affected community.

2.0 Methodology

Flood risk can be produce using four steps (i) hazard assessment; (ii) exposure assessment; (iii) vulnerability assessment; and (iv) risk assessment adapted from Erdlenbruch et al. (2009), and Foudi & Oses-Eraso (2014) as Fig. 1.

Fig. 1: The assessment technique based on risk assessment concept adapted and modified from Erdlenbruch et al, (2009), Muller et al., (2011) and Foudi and Oses-Eraso (2014).

However these paper are focus on development of insurance rate map based on relationship between the spatial variability of insurance, socio economic vulnerability, and natural hazard losses in term of flood hazard. The technique to produce insurance rate map in these paper are based on risk assessment as Fig. 1 but are modified to promoting resilient economies by exploring insurance potential from Osiel et al. (2014) as Fig. 2.

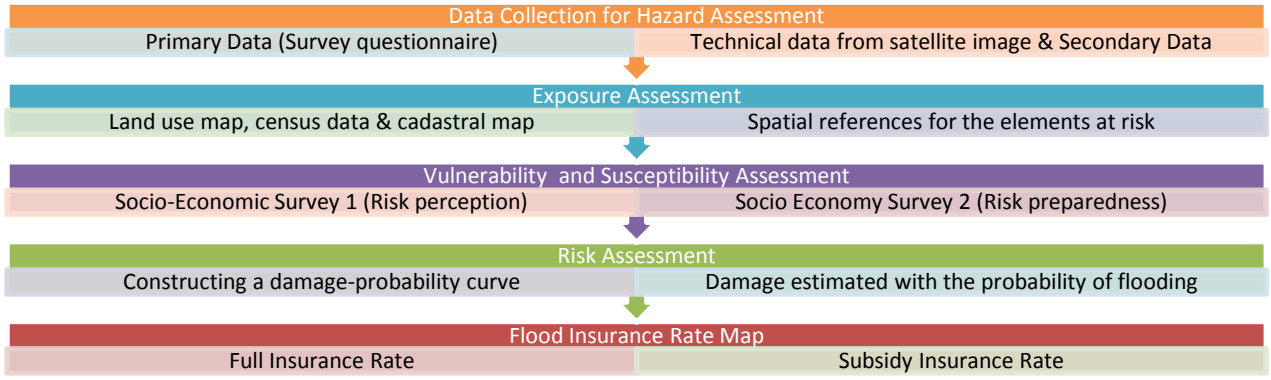

Fig. 2: Methodology to produce Flood Insurance Rate Map based on Risk Assessment Concepts

Exposure assessment is a step to produce flood inundation map or flood map. Exposure assessment objective is to provide spatial references for the elements at risk of being flooded, such as residential, non-residential uses, commercialization area, agricultural uses and people. Flood map are develop using satellite imagery observation data occurring from ALOS2/PALSAR 2 before the flooding ([13/9/2014] and [11/10/2014]), during the flooding (26/12/2014) and after the flooding (07/01/2015) to assess the area that exposure to 2014 flooding and inland waters of Kelantan area extracted to produce flood hazard map shows as Figure 3. After producing flood hazard map, DEM data called GDEM are generated from the ASTER data observed by EOS satellite to produce level of flood map and to differentiate between flood exposure area with river or lake and the inland water (such as paddy field) before the flood (Fig. 4). Aster GDEM identified the feature of river and lakes as green color, the inland water before flood as light blue and the flood area as blue (Fig. 4). Last step of the process is to produce vulnerability, susceptibility and risk map. Geographic information system platform are use in this step. Historical data of flood event for 10 years are integrate using determination concepts and overlay with flood event from ALOS PALSAR2 from 26/12/2014 and 07/1/2015 imagery to produce flood occurrence frequency distribution map as Fig. 5.

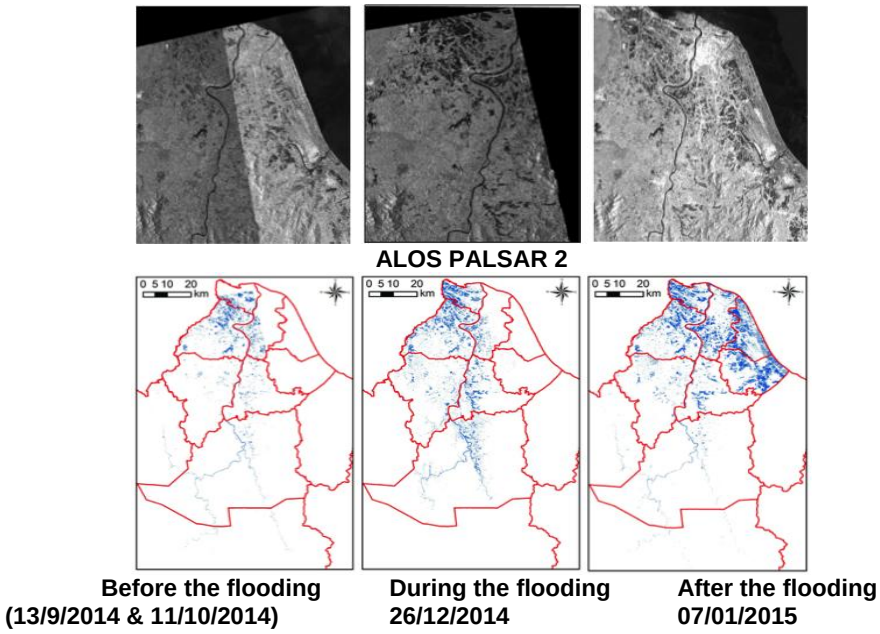

Fig. 3: Extracted inland water before flood, during and after flood using ALOS PALSAR 2 to developed exposure flood area for flood hazard map

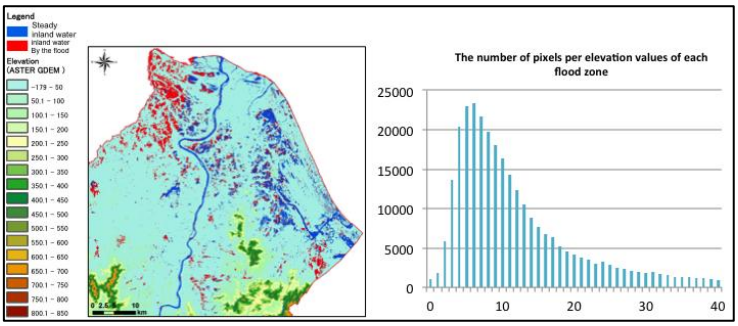

Fig. 4: Generating of DEM data from ASTER GDEM to produce level (height) of flood map and differentiate between flood exposure area with river or lake and the inland water (such as paddy field) before the flood event.

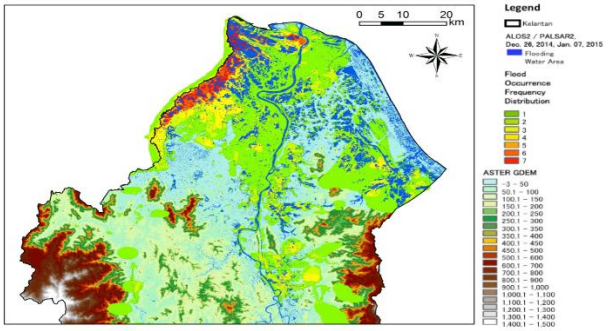

Fig. 5: Flood occurrence frequency distribution map and historical data overlay with flood event from ALOS PALSAR2 from 26/12/2014 and 07/1/2015.

The susceptibility rate to flooding in these research are estimate by socio-economic surveys (risk perception and risk preparedness questionnaire survey). The measurement in the survey form are related to (i) individual and collective preparedness based on a scale from 1 (lowest value) to 5 (higher value); (ii) past experience of floods and focused on the degree a previous flooding have caused financial damage and based on scale 1 (no financial damage) and 5 (considerable damage) and the amount of damage are expected; (iii) perceived effectiveness of countermeasures which respondents were asked to express their opinion of effectiveness in relation with the specific measures adopted at local level and are scale from 1 (agree) and 5 (disagree); (iv) insurance based on agree and disagree and affordable to pay the insurance coverage in case of damages for managing the future flood; and (v) socio demographic variable based on age, gender, job related activities or living near or in flood plain area. The survey design are based on Dutta et al., 2003; Penning-Rowsell et al., 2005; Barbier et al., 2009; and Bremond et al., 2013.

All data are overlay and classified based on risk value index to produce elements at risk in total as flood insurance rate map based on data from socio-economic survey which can be obtained from past experience of floods and focused on the degree a previous flooding have caused financial damage (Merz, & Thieken, 2005 & 2009) and Merz et al., (2004 & 2010).

3.0 Conclusion

Flood occurrence frequency distribution map that are knows as vulnerability and susceptibility flood map are analysis together with socio economic survey data for risk perception and preparedness in geographic information system (GIS) platform to produce flood risk map (Fig. 6).

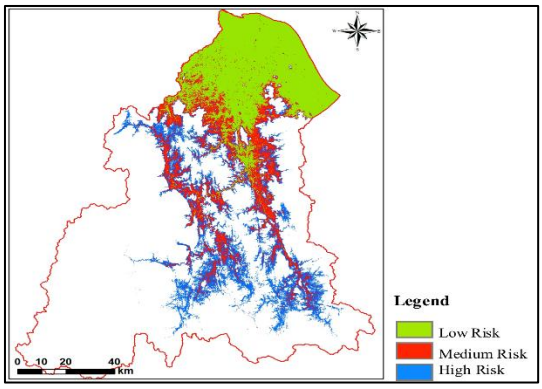

Fig. 6: Kelantan Flood risk map

Pre disaster financial instrument as non-structural mitigation measures know as flood insurance rate map have been sucessfully develop using integration of ALOS PALSAR 2, ASTER GDEM and socio-economic survey. Fig. 7 shows that the 69.1% of respondent affordable to paid RM 50.00 permonth, 12% of respondent effordable to paid RM 300 and 18.9% not willing to paid. Survey results shows that 69.1% affodable to pay RM 70.00 per month for premium insurance rate in high risk area. In these study, prorate from affodable to pay are used and the insurance premium rate for high risk area are suggested to pay RM 140.00 permonth and will be reduced 10% for medium risk area. Therefore, for area with considered as high risk area need to pay RM 1680.00 permonth and medium risk area need to pay RM 1512.00 permonth. However the insurance company can offer the community to add

their premium flood insurance coverage base on the type of house, material and electrical appliance. Flood insurance rate map are publish and shows as Fig. 8.

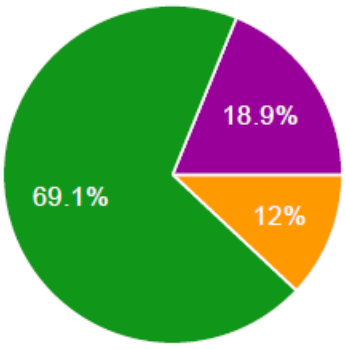

Fig. 7: Respondent affordable and willingness to pay

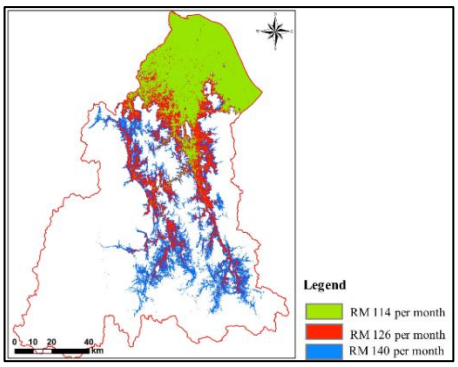

Fig. 8: Flood Insurance Rate Map

In addition to the flood insurance rate map, Community Rating System for Flood Insurance Rate Map (CRaSFIRM) are develop to promote insurance programme which creates financial incentives for communities to lower flood insurance premiums rate. This tools is aimed to reduce the impact of flood on private and public structures and to be adopt and enforce in Sensitive Environmental Area that included as guideline in National Physical Plan. The incentives are divide to four categories i.e. public information example elevation and flood protection and the score point is 300; mapping and regulation as example flood protection assistant and open space prevention to reduce the flood risk with score point are 400; flood damage reduction example drainage system maintenace with score point are 500 and flood prepareness example flood warning program and the score point are 800. If the community at the district level initiate to involve all 4 activities, the community will score 2000 point. The point will be rate as 4 and rating will be base on rating classification from 1 to 6 which 1 is the highest point. Based on the rating, local authorities together with insurance agent will reward the communities flood insurance premium adjustment as example 20% of the premium coverange. CRaSFIRM system are develop to be used with flood insurance rate map as example shows in Fig.9.

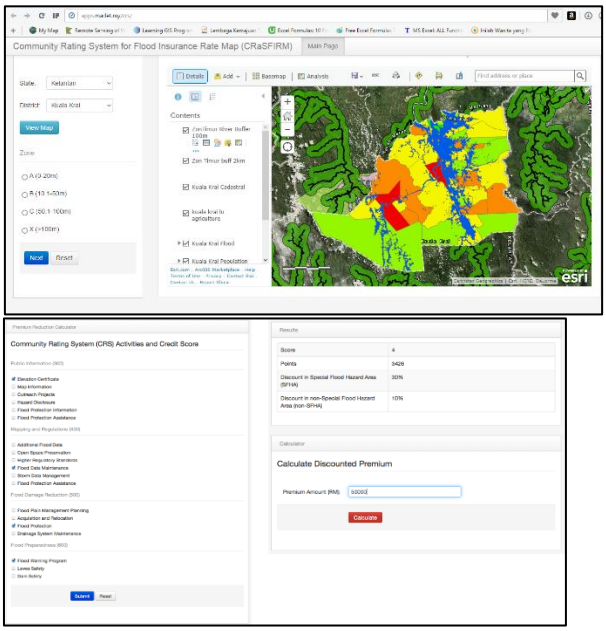

Fig.9: Community Rating System for Flood Insurance Rate Map (CRaSFIRM)

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GOVERNANCE FOR DISASTER RISK REDUCTION: DEVELOPMENT OF STANDARD OPERATING PROCEDURE DURING FLOOD DISASTER IN HEMODIALYSIS PATIENTS

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1.0 Introduction

The recent flood had affected many healthcare facilities, including the hemodialysis centers. End stage renal failure (ESRF) patients are hemodialysis dependant, depriving them from treatment may lead to increased morbidity and mortality. A specific Standard Operating Procedure (SOP) is required during disaster for hemodialysis services to ensure treatments are not disrupted. During our recent flood in Kelantan, we have identified several issues on human resources poor coordination, missing patients' clinical records, logistic issues for patient and medical supply transfer and unsupervised dialysis quality control as the major problems. Nephrologist and nephro paramedic team is developing new SOP to encounter this problem in future. However implementation of this SOP required reliable patient data keeper. Thus the Advance Dialysis Nephrology Application Network (ADNAN) will be used.

ADNAN Hemodialysis System was developed in year 2013 to fulfill the requirement of hemodialysis service providers, nephrologists, paramedics and dialysis patients initiated by Chronic Kidney Diseases (CKD) centre with the industry partner. ADNAN provides a cloud based system to manage dialysis patients related to their personnel, medical and medications records, biochemistry record, visiting log details, patient monitoring, centre management, reporting and etc. This project will utilize the ICT mechanism to assist disaster management programs, initiated during anticipation of the disaster through a systematic data transmission and interpretation from relevant government agencies (Department Of Irrigation And Drainage), and State Health Department.

The verification of ADNAN was done at CKD level and Lestari Hemodialysis Centre by end of the year 2014 for several improvements. This study is proposed to further verify the ADNAN system at several hemodialysis system which affected by flood disaster under various critical situation. Patients data inclusive premorbids, dialysis prescription, medications, dialysis centres, doctors-in-charge, viral hepatitis status and latest blood result parameters will be available on-line with limited access to relevant authorized healthcare staff. The personal dialysis identification “purple bracelet” will be provided to dialysis patients to enable them to be identified as hemodialysis patients by the relevant authorities.

On the other research experience we proposed a secure system for external and internal abnormalities changes detection of the data, examining the compromising activities, preserve data integrity and privacy. Operating with patient data shall compliance with the Personal Data Act regulation. Data cannot be replicated, moved, or changed without any approval, data cannot be opened and misused by unauthorized person and therefore, the system must be able to keep track any data changes and activities.

2.0 Methodology

The SOP will be developed in 4 phases, namely: Phase 1: Identification of stakeholders and the experts and establishing working groups for specific areas (i.e: human resources management, development of web based medical data records, logistics coordination and dialysis quality control). Phase 2: Workshops and Guideline Reviews by the assigned working groups, and development of web based medical record system for hemodialysis patients. Phase 3: SOP development and consensus by the stakeholders. Phase 4: SOP Review and Approval (application of the SOP in a drill). The SOP developed from this study will be applied during flood disaster and the web based medical records will be referred in the clinical management of the patients.

3.0 Results and Discussion

During our recent flood in Kelantan, we have identified several issues, namely human resources poor coordination, missing patients' clinical records, logistic issues for patient and medical supply transfer and unsupervised dialysis quality control as the major problems. The SOP as the output of this study will guide the dialysis pamedics in preventing morbidity and mortality in patients on regular hemodialysis. The SOP will also ensure the continuity of care with acceptable quality of services during disaster. Complications related to dialysis treatments can also be prevented and reduced with effective coordination of human resources and logistics. The SOP was launched in Nov 2015 in Health Campus, USM Kubang Kerian and attended by 300 paramedics from the whole state of Kelantan. The SOP will soon be uploaded to the Malaysian Society Of Nephrology website and referred to by the nephrology fraternity as national guideline.

4.0 Conclusion

A specific Standard Operating Procedure (SOP) for hemodialysis service during disaster is required for hemodialysis services to ensure treatments are not disrupted for the hemodialysis patients. This will ensure the efficiency of mitigation process in any disaster involving hemodialysis patients.

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AN IMPROVED MODEL OF PSYCHOLOGICAL SUPPORT AND HANDLING MENTAL DISORDER ISSUES AMONG VULNERABLE POPULATION

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1.0 Introduction

Recently in December 2014, Malaysia has been affected by the flood disaster. This devastated flood disaster caused loss of properties, infrastructures, lives and livelihood of the flood victims. 2000-3000 houses, infrastructures, and plantation destroyed. In addition, 21 people died and estimation of more than RM 1 billion total loss of houses, properties and infrastructures. Previous study found that post-flood mitigation and relief will last from six to eighteen months. Location that badly affected such river basins of Sungai Kelantan and Sungai Pahang addressed by Malaysian Government in terms of building new houses, infrastructure, etc. More than 500 million allocated for that purpose. However, little is known about the aspect of psychological and mental disorders among the people at the affected area. Many studies reported that the prevalence rate of post-traumatic stress disorders related to natural disasters is currently between 8.6% and 57.3% depending on assessment methodologies, instruments and timing. Previous studies found women were more affected psychologically than men. In addition, children, elderly and disabled people were also found to be affected too. Bangladesh experienced disaster found that 66% of the total sample in the disaster area were psychologically traumatized and required emergency services. Identifying issues that related to psychological and mental disorders and providing scientific therapeutic services is essential for the real recovery from such a disaster. In fact, awareness of the socio-economic status, local culture, tradition, language and local livelihood patterns are important to be considered in designing the therapeutic relief program. Previous study found that addressing the psychological issues and mental health disorders by involving the local community was effective. The outcome of this study is to provide data and plan for the local community, health professionals and government to provide therapeutic relief program for their vulnerable population. This study provides significant data, base on the scientific approach to post-flood mitigation and relief, which will focus on vulnerable population.

2.0 Methodology

A mixed method of both quantitative and qualitative designs will be chosen to answer the research questions. The qualitative data will become the dominant status over the quantitative data (QUALI + Quant). The method will provide strong inference and complement the strength of each methodology to provide more meaningful in-depth data (Brannen, 2005; Creswell, 2003; Morse, 2005). The concurrent strategy mixed models will be used to obtain the data, thus the data can be collected and analyzed concurrently in a short period of time (Schulenberg, 2007; Tashakkori & Teddlie, 2003).The stages of the study will be divided into 6 stages.

Stage 1.

Identity affected area in terms of logistic, resources, volunteers among community, risks, current support given by NGOs, government and etc

Stage 2.

In-depth Interview and focus groups will be conducted amongst vulnerable population (women, children, elderly and disabled people) who can provide data regarding their psychological issues, mental disorders signs and symptoms during and after post-flood disasters. Thematic content analysis will be done and specific themes will be identified.

Stage 3.
Conducting meeting to formulate framework, module, guideline & intervention/program with volunteers, victims, community, experts and professionals
Stage 4
Implementation intervention/program to victims that were badly affected
Stage 5.
Analyze and reviewing the intervention/program
Stage 6.
Briefing and workshop to policyholder and health professionals to come up with strategies for post-flood mitigation and relief

3.0 Results and Discussion

We reach into conclusion that several issues need to be taken into consideration seriously. The issues are information, basic infrastructure, relationship, roles and routine, health and safety, livelihood and resilience. Victims who were still staying in the temporary camps and transit houses need to be given further support psychologically to what they need most. This issues if not tackle effectively will give an impact to victims psychology and further deteriorate their mental health and wellness. Furthermore, this disaster cause emotional trauma and could be the cause of psychological distress caused by a real or anticipated fear of death, physical damage, economic loss or death of a close one family member or relative (Agnieszka Stephien et al, 2007).

Information revealed that the type of support is an important factor especially when the victims are returning back to their permanent residence. Without firsthand information on their current status leads to unease mind particularly their future direction. Information and current status of projects promised by NGOs or government must be disseminate to the victims. Misleading information, will lead to frustration, dissatisfaction which will take a toll on the victim's that already affected psychological status.

Basic infrastructure is an issue highlighted by most of the victims. The present poor leaving conditions especially the tent being unable to withhold heavy rain. The cramped living conditions of the occupants with big family members were also raised. The temperature which sometimes raise to more than 36 degrees Celsius in the afternoon worsen the situations.

The parents highlighted that apart from disturbance of normal routine, educational impacts on children's lives after the flood events were also major concern. Due to uncomfortable condition, they cannot finished their school homework and not going to school. The children were free to move around the camp unmonitored. Most children sleep late and this results in truancy being high in number. Previous study by Mudavanhu (2014) also reported that floods cause loss of learning hours, loss of qualified personnel, outbreak of waterborne diseases, high absenteeism and low syllabus coverage leading to children's poor academic performance. This is in line with Amer (2007) and Okuom et al. (2012) previous studies that disasters result in teachers failing to complete the syllabus, leading to poor performance. Infact, Cyclone Elline (2000) reported that they losing contact hours at school and sometimes do not attend school due to rivers flooded, as some of the bridges were destroyed.

Flood has potential to have impact on human' health and safety. This issue was highlighted by the victims. Their mind still preoccupied with the disaster that they faced recently. They expressed concern and pressured on natural event after experiencing long period of heavy rain. As a consequence, their daily lives are always in a state of alert. Hence, they are worried of repeated flooding (Johana Johari & Najib Ahmad Marzuki 2013). They value information regarding how to manage flood disaster in terms of identifying level of risks and evacuation strategy. Victims also experienced disease known as flood-related health, where this infectious disease are transmitted into endemic public health problem particularly diarrhea. In addition, flood events also related to the mental health issues especially among elderly (Few, Ahem, Matthies & Kovats, 2004).

Our analysis indicated that victim's resilience is important issue. One victim claimed he lost his motivation as his job as cleaner has been taken by other. He claimed that he is not satisfy as he is not engaged in any form of remunerative job. Though he received ample basic needs such as food and clothes but being unemployed leads to frustrations and concern of his future. This finding concurs with Nasir, Zainah and Khairudin (2012) study, whereby flood victims suffered cognitive, emotional and behavioral shortfalls such as fear, hopelessness, anxiety and depression.

This study's analysis found livelihood to be another important theme. Flood victims need to close their business due to the effects of flooding and also transport disruption (Kong et al., 2010). Besides that, they also need to close their livelihood due to loss of equipment for example one of the

victims working as fisherman lost his trawl. Apart from that, loss of income also occurs because of loss of their occupations.

Relationship is an important issue affected by the victims. Victims highlighted that they have problems with their personal sexual relationship and relationship with neighbours in the camp. With all their children living in an open, intimacy relationship among the married couple have been affected. Neighbours relationship is not promising either. Living close to some strangers have not been well received by some of these victims. Previous study also found that flood events can have significant impacts in terms of psychosocial on the people's wellbeing and relationship too (Stanke, Murray & Williams, 2012). According to Stanke, Murray and Williams (2012) flood create social problem which then extend over period of time not only because of flood but also from other stressor which need them to recover their relationship. Furthermore, Haddad and Teixeira (2013) also found flood not only damages to the town which then affecting residence income other than losses and inconvenience but also personal relationship between married people also affected.

Roles and routine is another important issue found in this study. The housewife and children highlighted that they loss their roles and routine they used to. One of the children said that he unable to play his playstation that he missed so much. Many of the housewives miss so much of cooking and sewing activities that used to do during their leisure time and some of them do for their additional daily income. Effects suffered by each victim in Malaysia are different depending on the experiences during the flood. Victims are still faced with the risk of flooding in the future. Loss of roles and routines will increase person stress and anxiety. Thus indirectly affect their quality of life. According to Ferran (1990), one's well-being or quality of life is geared towards how a person can live a normal and quiet life. In which, individual capabilities to lead to a more meaningful social life, joy and satisfaction, and achieve physical and mental ability.

Next, the study revealed the affect of floods to the respondents which caused those feels stress, trauma and sadness in them. It shows that, the respondents who were staying in the camp were having psychological issues due to the incidents. Then, recreational play appeared to be one of the activities that are suitable for them to overcome their psychological issue. The main reason that restricted them to continuously involve in the activity is due to insufficient facilities and limited space.

Based on the interview, it is important to noted that recreational play contribute to the respondents psychological by providing (a) joyfulness, (b) satisfaction, (c) positive distraction and (d) socially participation

`Firstly, the recreational play appeared to be a tool to distract the minds of the children from the floods stressor. The activity able to divert their mind from thinking of the incidents that has happen by enjoying the activity. Some of the respondents said that they still can visualize on what happen during the floods. This can be clearly seen based on one responds from the victim who said "This recreational helps me to forget what have happened recently".

Secondly, the recreational play has given the respondents the experience of joy. Based on respond from a respondent he said that, "This activity able to reduce my sadness and I'm happy participating in the activity". This shows that he is enjoying the recreational play activity. This shows that recreational play able to bring the joyfulness in victims of post flood-flood disaster. Play will allow children to experience the positive and negative feelings including boredom, jealousy, pleasure and enjoyment (Casey, 2007; Lester & Russel, 2010; Scarlett et al., 2005).

Lastly, this activity is socially participated besides the structure was well accepted, as responded by one of the respondents, "The activity makes me able to play with friends". Besides, one of the respond was, "It reduces my stress cause I am happy playing together". According to Lovett (2009), children who are traumatized will have difficulties to engage in social situations as they have problem in problem-solving capabilities due to losing ability in creative play.

Next, this study provides insight into impact of psychological support to post-flood victims. Through interviews and questionnaires, the participants communicated how the intervention program had impact toward their life. This study also highlighted how flood victims give different emphases on their perspectives towards psychological support. The implementation of client-centered approach in the psychological support program brought the attention to flood victims as being the participant of the program. Hence, all the participants' perception will be taken into consideration as to evaluate the effectiveness of the program. The study identified some benefits of the program. These are 1) stress relieving 2) increase the knowledge of flood victims 2) increase motivation in life 3) implement new leisure activity in daily life 4) Provide useful knowledge 5) Encourage continuous participation.

The first point that will be discussed here is the stress relieving. Flood victims exhibited different level of stress, anxiety and different status in which it depended on their period of injury. Through the psychological support done with participants, they perceived it as fulfilling individual expectation with the used of closer approach and catered individualized problem. With proper

recovery process, they were believed to be as happy as they were before the disaster. With the increasing of time post-disaster, any psychological factors level would be better. In the psychological support program, discussion done between the researcher and the participants addressing the problems they wanted to support with. Majority of the participants perceived psychological support as in this program helps themselves to handle stress. This program educates them to manage stress so that they able to manage the negative feelings of worries and fear of repeated flooding. This program also turned them to always be in state of alert and prepared (Johari and Marzuki, 2013). This program that include stress management, has contributed to the victims on how to manage sufferings pain and distress.

Majority of the participants perceived psychological support as a program that increases their knowledge regarding prevention of diseases and manage healthy food and wellbeing. Most of the participant mentioned status of cleanliness of their house and diseases that they had experienced which indicated their understanding about the topic discussed during the speech. Majority of the participants highlighted the importance to participate in the program because they perceived it as able to make them feel motivated in life. In addition, majority of the participants mentioned and discussed among them about the embroidery activity which indicated an interest and drives to perform a new things. Majority of the participants perceived the embroidery knowledge interesting and can be as a leisure activity in which it can be continued in their daily life. However, few of the participants refuse to perform the activity due to their weaknesses of their eye sight and some of them also mentioned about the difficulty to find the embroidery instruments.

Majority of the participants perceived the psychological support as a knowledgable program which encouraged them to practice the learned knowledge they obtained from the program. Most of the participant mentioned about the stress management techniques and the embroidery skills among them which indicate interest to appply them in their daily life. Majority of the participants perceived the program as beneficial in which they interested to participate in this program again in the future. While, two of them do not experienced the benefits of the program which causing them to lose interest to participate in this program. Most of the participant mentioned about the good of the program among them which indicate a good respond from most of the participant.

4.0 Conclusion

4.1 Issues regarding information , basic infrastructure, relationship, roles and routine, health and safety, livelihood and resilience are utmost important to improve support for vulnerable population psychologically, mental health and wellbeing. Constructive program must be developed as a short-term and long-term to improved psychological support and handling mental health disorders to the vulnerable population.

4.2 A recreational play is one of the methods to relief psychological issues among children victims of the post-flood disaster in Kampung Pahi, Kuala Krai, Kelantan.

4.3 Psychological support with program that addressing the issues of livelihood, health and safety, stress, daily routine and leisure activity among victims of women of post-flood disasters found to be effective

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BANTUAN BENCANA DAN KETERSEDIAAN: MEMBANGUNKAN 'PROGRAM KESIAPSIAGAAN KELUARGA' MENGHADAPI BANJIR

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1.0 Pengenalan

Bencana banjir 2014 menunjukkan ketidaksediaan unit 'keluarga' sebagai permasalahan utama kepada pelebaran kos yang terpaksa ditanggung mangsa bencana banjir. Ia melibatkan kos ketara (tangible) seperti kerosakan harta benda dan kos tidak ketara (intangible) seperti gangguan emosi. Permasalahannya, fenomena banjir merupakan hukum alam semulajadi yang berlaku di Malaysia saban tahun. Maka ia sentiasa berpotensi menjadi bencana pada masa hadapan. Memikirkan risiko bencana itu, kajian ini mengambil langkah untuk memperkasa unsur kesiapsiagaan sebagai kunci penyelesaian.

Di samping itu, kajian terdahulu menunjukkan persediaan menghadapi banjir lebih tertumpu kepada pendekatan 'atas-ke-bawah' dan bersifat struktural. Sebaliknya, penyelidikan ini adalah untuk membangunkan 'Program Kesiapsiagaan Keluarga Keluarga Menghadapi Banjir' yang lebih membumi kepada unit masyarakat paling asas iaitu 'keluarga'. Demikian itu, penyelidikan ini mengemukakan beberapa persoalan. Pertama, sejauhmanakah pendekatan sebelum banjir sedia mengutamakan keluarga sebagai strategi penyelesaian? Kedua, bagaimanakah status kemahiran dan pengetahuan mangsa berisiko menghadapi banjir? Ketiga, sejauhmanakah aset yang dimiliki pihak kerajaan dan bukan kerajan mampu berfungsi sebagai sistem amklumat keluarga?

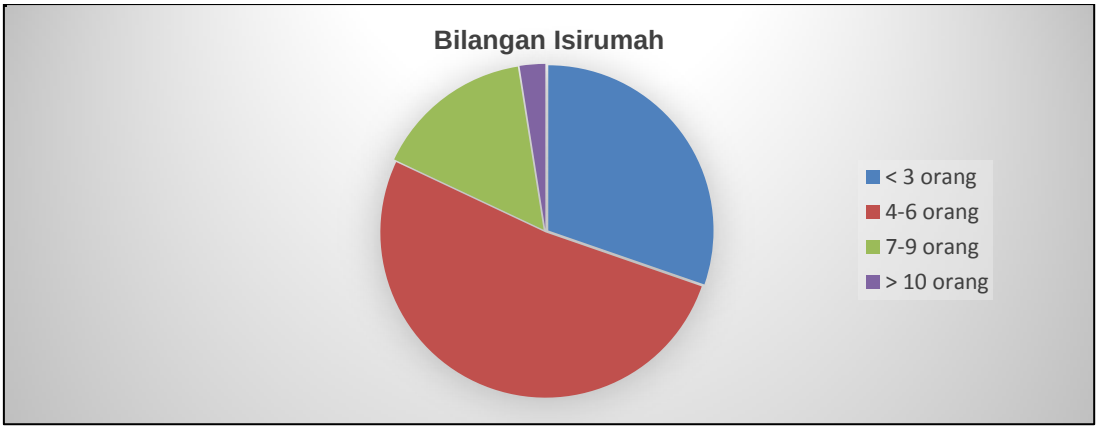
2.0 Metodologi

Kajian ini dijalankan di tiga jajahan dalam Negeri Kelantan iaitu Kota Bharu, Kuala Krai dan Pasir Mas. Pemilihan jajahan-jajahan tersebut adalah berasaskan kekerapan dan intensiti banjir yang dihadapi. Bagi setiap jajahan terpilih, secara bertujuan (purposive), pengkaji memilih 2 mukim sebagai fokus kajian. Dalam mukim yang terpilih, pengkaji memilih secara rawak 100 isirumah yang merupakan mangsa banjir untuk dijadikan responden dalam kajian ini. Kajian ini menggunakan maklumat data primal dan sekunder. Maklumat sekunder adalah data-data daripada jabatan dan agensi kerajaan serta laporan-laporan penyelidikan lepas. Sumber utama adalah maklumat daripada soalselidik ke atas 300 keluarga yang merupakan mangsa banjir. Pengkaji memberi perhatian khusus untuk memastikan keluarga yang terlibat dalam kajian meliputi keluarga yang mempunyai ahli keluarga yang uzur, sakit kronik, ibu tunggal atau orang kurang upaya (OKU). Maklumat-maklumat juga diperolehi daripada perbincangan kumpulan berfokus dengan pemimpin masyarakat dan ahli jawatankuasa banjir di kawasan yang terlibat. Kerja lapangan telah dilakukan pada bulan Mei hingga Ogos 2015

3.0 Results and Discussion

Jadual 1: Latarbelakang Responden

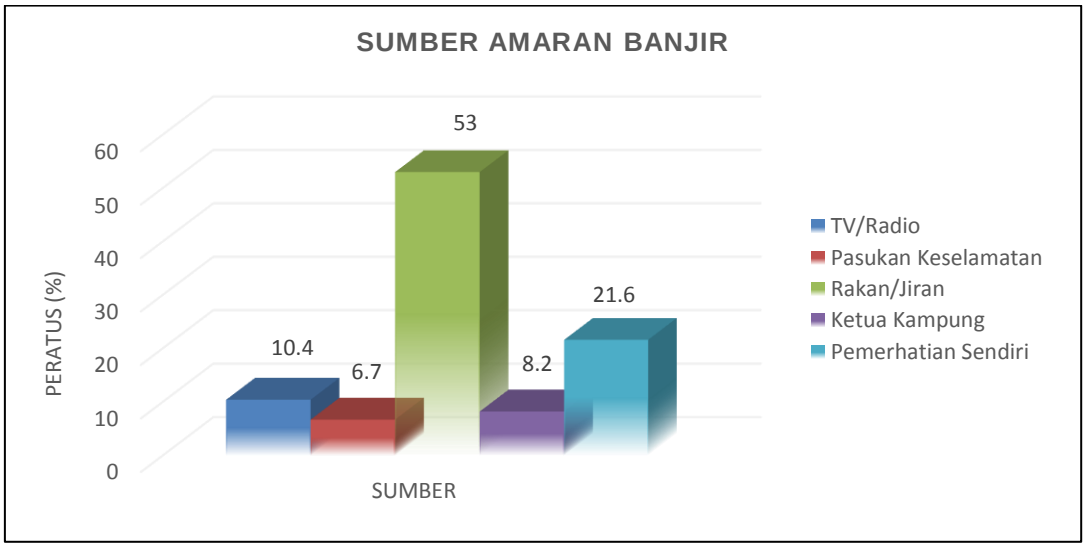
Status		**Peratus (%)**	**Kelas Umur**	**Peratus (%)**
Ketua Isirumah	Lelaki	62.3	Bawah 20 tahun	0.9
	Ibu tunggal	11.7	21 – 30 tahun	12.3
Isteri Ketua isirumah		15.7	31 – 40 tahun	17.1
Ahli isirumah		10.3	41 – 50 tahun	23.7
Jumlah		**100**	51 – 60 tahun	20.9
			61 – 70 tahun	17.5
Jantina		**Peratus (%)**	71 tahun ke atas	7.6
Lelaki		65.7	**Jumlah**	**100**
Perempuan		34.3		
Jumlah		**100**		



Rajah 1: Bilangan isi rumah

3.1 Pengalaman Menghadapi Banjir

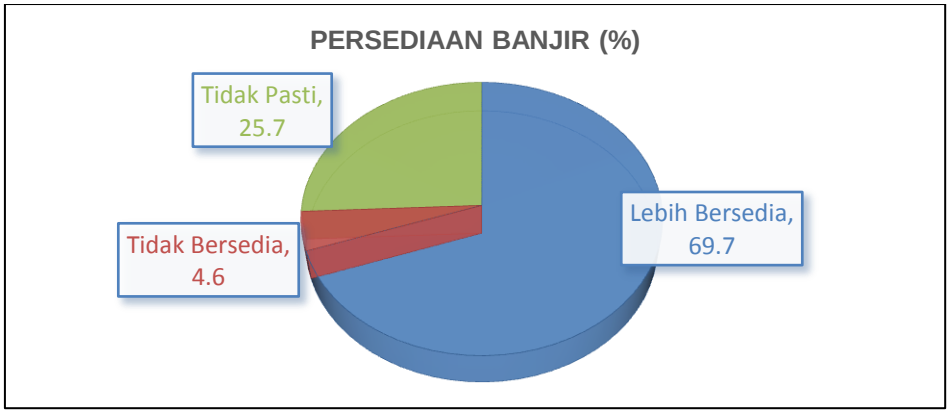
100 peratus responden terlibat sebagai mangsa banjir. 96.9 peratus responden menghadapi pengalaman banjir pada Disember 2014 manakala 3.1 peratus pada tahun-tahun sebelumnya. 71.7 tinggal di pusat pemindahan manakala 28.3 menumpang di rumah jiran/saudara-mara. 36.3 peratus mengakui menerima amaran awal manakala 50.2 peratus tidak mendapat sebarang amaran banjir



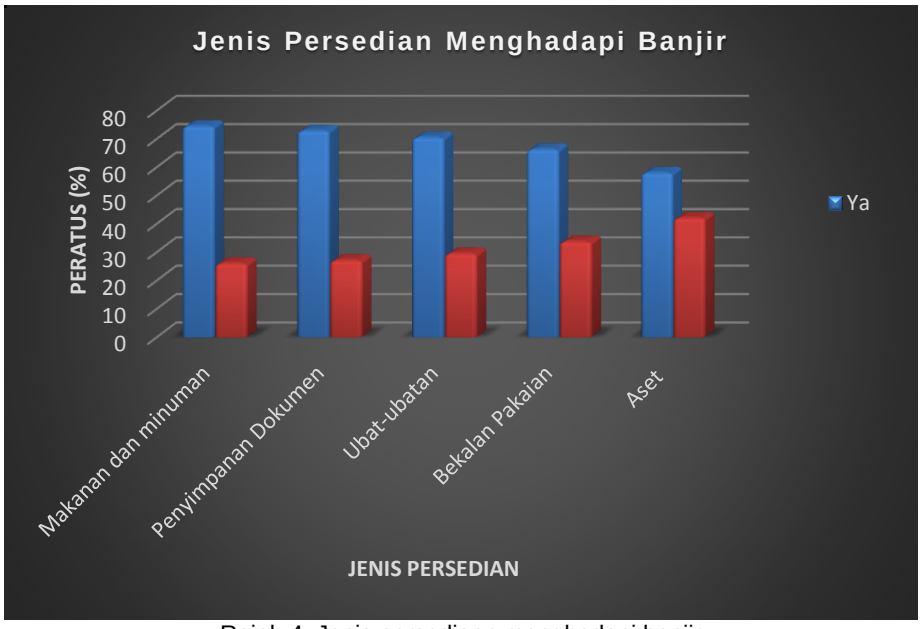
Rajah 2: Sumber amaran awal responden

Jadual 2: Kesulitan dialami oleh mangsa banjir

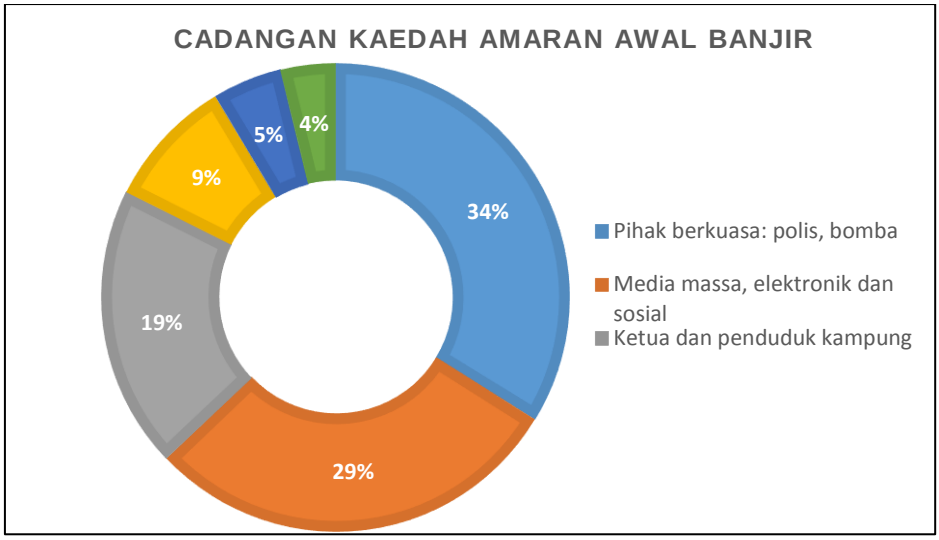
Kesulitan Semasa Banjir	Ya	Tidak	Jumlah (%)
Tidak dapat bekerja	85.1	14.9	100
Anak-anak tidak dapat bersekolah	57.9	42.1	100
Tidak dapat berniaga	50.7	49.3	100
Pengangkutan dan perhubungan jalan raya terjejas	83.2	16.8	100
Tiada kemudahan telekomunikasi	81.8	18.2	100
Aktiviti sosial terganggu	72.4	27.6	100
Aktiviti keagamaan terganggu	70.9	29.1	100
Bekalan makanan tidak mencukupi	66.4	33.6	100
Pakaian bersih tidak mencukupi	61.0	39.0	100
Tiada bekalan air bersih	69.9	30.1	100
Tiada bekalan elektrik	72.6	27.4	100
Kehilangan dokumen penting	6.7	93.3	100
Masalah membersihkan lumpur di rumah	50.2	49.8	100
Masalah pernafasan (debu)	46.6	53.4	100
Masalah bekalan ubat	25.4	74.6	100



Rajah 3: Persediaan Menghadapi Banjir Akan Datang



Rajah 4: Jenis persediaan menghadapi banjir



Rajah 5: Cadangan Kaedah Amaran Awal Banjir oleh Responden

4.0 Kesimpulan

4.1 Bencana banjir yang berlaku pada Disember 2014 boleh dianggap sebagai fenomena luar biasa dan di luar kelaziman banjir yang pernah berlaku pada tahun-tahun sebelumnya.

4.2 Banjir yang berlaku pada tahun ini telah melibatkan hampir keseluruhan jajahan di Kelantan ditenggelami air terutamanya di kawasan Kuala Krai, Gua Musang, Pasir Mas, Tanah Merah dan Kota Bharu.

4.3 Banyak kerugian terpaksa ditanggung melibatkan kemusnahan harta benda, hasil pertanian, ternakan, kemudahan infrastruktur, perniagaan, landskap, persekitaran alam sekitar semulajadi dan kehilangan nyawa manusia.

4.4 Langkah yang lebih proaktif dan berkesan harus diambil oleh semua pihak dalam mewujudkan pengurusan bencana bersepadu terutamanya dalam isu banjir supaya risiko banjir yang berlaku dapat dikurangkan sekiranya berulang pada masa hadapan.

4.5 Sistem amaran banjir yang sistematik perlu dilaksanakan supaya masyarakat sentiasa bersedia untuk menghadapi banjir yang akan berlaku di kawasan mereka.

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VULNERABLE ELDERLY: EXPLORING THE PSYCHOLOGICAL NEEDS, MITIGATION BEHAVIOURS AND RESILIENT IN POST DISASTER

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1.0 Introduction

Elderly, in general, are associated with multiple medical morbidities and increased risk for the neuropsychiatric condition such as depression and dementia. With advancing age, the elderly tend to be more affected by life events stress and could contribute to difficulties in adjustment of the elderly (Denoux and Macaluso, 2006). The vulnerability of this population is due to the fact that they are no longer productive, hence their income security and opportunities for social, cultural and economic participation (including in the labor force) are restricted (García-Peña and Wagner, 2013). The natural disaster such as flood magnified their difficulty. Research suggests that the incidence and prevalence of common mental disorders among elderly after flooding is substantially increased and that these disorders can persist long after the flooding has passed (Stanke et al, 2012).

The post disaster psychological morbidities were found to influence the elderly capability to bounce back (Paton 2001). Not only the elders were struggling with physical destruction, other restraints such as limited financial resources and lack of social support contributed to increase vulnerability towards slow recovery and poor QoL (Glaesmer et al. 2011). Poor QoL has been associated with female gender, very elderly, living alone, sustained disaster related injury, poor, living in slums, lost of independence, loss of family members and properties and low education (Ardalan et al. 2011; Kongsakon et al. 2012). After the disaster, the survivors have to rebuild their lives back, therefore the capabilities to regulate all resources are vital (Cutter et al. 2008). The global climate changes contribute to unpredictable occurrence and magnitude of disaster, yet the local data on the psychological impacts of population is still scarce. Therefore, this study is aimed to investigate the prevalence of psychological impacts among elderly and their quality of life (QoL) after a disaster as well as exploring resilience factors.

2.0 Methodology

This is an exploratory mixed method research design that combines quantitative and qualitative methods from June to August 2015 in Kuala Krai, Kelantan. In 2014 flood disaster, the Kelantan river basin was the worst affected where the Kuala Krai district was the worst-hit with 90% of the area affected by the flood. Stratified sampling method was used; from the District Office (DO) of Kuala Krai, the list of 6 areas according to severity of damages is obtained. 3 areas will be randomly selected via randomly picking three out of six named areas in an individually enclosed envelopes. Health camps were held in the selected areas offering health screening and disaster related hazards talks. The district officer and the community leaders in these areas were approached for permission and their cooperation and involvement was sought again after previous liaison with them. The inclusion criteria include age more than 60, able to understand Malay or English language. The elderly that were too ill to be interviewed and has evidence of severe cognitive impairment was excluded. Eligible elderly who are able to give consent were interviewed by the researchers.The sample size was calculated based on a single proportion formula with a confidence level of 95% and power of 80% ,the calculated sample size was 120. A total 156 were involved in this study. In the first quantitative stage, elderly were interviewed with a semistructured flood survey, Malay Geriatric Depression Scale (M-GDS15) for depression, Malay Impact Event Scale- Revised (M-IES-R) for traumatic stress and WHOQoL-BREF for quality of life (QoL). The interview took about 30 - 45 minutes. The second qualitative stage comprised of three focus group discussions, discussing on the factors that shaped the resilience. This method is able to provide more detailed information regarding how the elderly respond to the disaster which helped the researchers understand how resilience work at both individual and community level. A total of 30 elderly involved in this focus group discussion. The data were transcribed and analysed using thematic analysis.

3.0 Results and Discussion

3.1 Sociodemographic data

The gender distribution in this study was near equal with a slight female outnumbered (52.6%) than male (47.4%). 99.4% of samples were Malay ethnicity with the mean age of 68.15. More than half never received any formal education at any level, unemployed or housewives. Majority of the household income were at the poverty level with less than RM500 (~USD 116.80) per month. Only 1.9% reported to have past psychiatric history with 3.8% of the participants had a family history of psychiatric illness. The mean duration of involvement with floods was 6 days, with more than half admitted of either witnessing (54.5%) or/and experiencing (55.8%) traumatic event/s during the flood. Even though flood in Kelantan is a yearly event, 100 (64.1%) claimed 2014 flood was their first encounter. 48 (30.8%) completely lost their house or damage of the houses were beyond repair; and 12 (7.7%) reported death related flood among their family members.

3.2 Psychological morbidities

The prevalence of PTSD symptoms in this study is 35.30% and the prevalence of clinically significant depression in this study is 41.29% with the prevalence of major depression is 23.20%. Education (p= 0.046) and no previous experience (p= 0.016) have been found to be significantly associated with depression. Majority of the sample were independent in their activitity of daily living (ADL), only 2.56% were ADL dependent. There was no association between physical dependency with depression (p= 0.532) and PTSD (p= 0.322) respectively. Previous experience/s with flood was significantly associated with PTSD (p= 0.045) but not with depression. Level of difficulties due to flood is significantly associated with risk for depression (p= 0.046). There was no significant correlation between age, duration of involvement with flood with the total depressive score. However, depression and PTSD symptoms are moderately correlated (r = 0.342, p< 0.001). This prevalence of elderly depression is higher compared to previous studies where the prevalence of elderly depression in Malaysia community ranges between 6.3% - 18%. (Mukhtar and Oei,2011). Similarly the prevalence of PTSD among elderly in this study is higher than what has been reported elsewhere (Chen et al, 2011; Bei et al, 2013).

3.3 Post Traumatic Stress Disorder (PTSD)

Out of the 18 variables outlined in table 1, seven independent variables were found to be statistically significant (p<0.25) with the psychological domain of IES-R. The variables were age, income, duration of involvement with the flood, type of occupation, the presence of chronic illness, previous history with flood and sustained physical injury during the flood. However, for the behavioral distress, only 5 independent variables found to have significant association. The variables were age, income per month, duration of involvement with the flood, the presence of chronic illness and gender. Based on stepwise, forward and backward method, only variable age and sustained physical injury during flood predict both the psychological distress and behavioral distress. In addition, the duration of involvement with flood only predicts for the behavioral distress. The result from table 1 implicated that for each additional 10 years of age, the score of IES-R in psychological distress would reduce by 5.23 points. Similarly, sustained physical injury during the flood would reduce the IES-R psychological domain score by 12.29 points. The result in table 2 implicated that for every 10 years addition in age predicts a reduction in IES-R behavioural score by 1.57 points and sustained physical injury predicts for a reduction in IES-R behavioral score by 5.70 points. Furthermore the longer the duration of flood predicts for more behavioural distress by each additional ten days involvement of flood would predict an increment of 3.11 points.

Table 1: The final regression model for analysis of psychological distress.

Variable	*SLR		#MLR	
	b[a] (95% CI)	p-value	b[b](95% CI)	p-value
Age	-0.394(-0.65,-0.14)	0.003	-0.523(-0.76,-0.28)	<0.001
Physical injury	-8.566(-19.52,2.39)	0.125	-12.289(-22.19,-2.39)	0.015

*SLR: Single Linear Regression, #MLR: Multiple Linear Regression

Table 2: The final regression model of sociodemographic factors of behavioral distress

Variable	SLR		MLR	
	b[a] (95% CI)	p-value	b[b](95% CI)	p-value

Duration involved in flood	0.388	0.004	0.311(0.06,0.57)	0.017
Age	-0.101(-0.24,0.04)	0.156	-0.157(-0.29,-0.02)	0.022
Physical injury	-5.079(-10.89,0.73)	0.086	-5.698(-11.25,-0.15)	0.044

*SLR: Single Linear Regression, #MLR: Multiple Linear Regression

3.4 Quality of life

Out of 156 elderly, only 8 (5.1%) perceived their QoL as poor or very poor while 96 (60.5%) perceived their QoL as good or very good. Only 12 (7.7%) elderly were not satisfied with their health while 23 (14.7%) were very satisfied with their health. Depression was found to have significant negative correlation (r= -0.445, p< 0.001) with high level QoL in physical well being and with good psychological status (r= -0.440, p< 0.001). The duration of involvement with flood was also negatively correlated with all domains in QoL with physical (r= -0.172, p= 0.032), psychological (r= -0.195, p= 0.015), social relationship (r= -0.168, p= 0.036) and environment (r= -0.185, p= 0.020). Similar findings were found in non disaster period where Ibrahim et al (2013) reported a negative relationship of depression with physical (r = –0.362, P < 0.01) and psychological (r = –0.232, P < 0.01) among elderly settlers in FELDA.

Both the psychological and behavioural domain in IES-R were found not to have significant association with the social relationship domain of QOL. Thus, it was not included for MLR. The MLR revealed that only the psychological domain of Malay translated IES-R predicts for poorer level of QOL in 3 other domains- physical, psychological and environmental well being (Table). For every one point increment in total score for psychological domain, the mean score for the psychological domain would reduce by 0.017, for physical domain by 0.210 and for environment domain by 0.019. . This can be explained by the depressive nature itself where the depressed elderly commonly presented with somatic symptoms (Soh, Kua, and Ng, 2009) and socially withdrawn from the society (Adams and Moon, 2009).

Table 3: The MLR results for IES-R in predicting the factors associated with QOL

Variables	Psychological domain		Physical domain		Environment domain	
	b^b (95%CI)	p-value	b^b (95%CI)	p-value	b^b (95%CI)	p- value
IES-R Psychological domain	-0.017 (-0.030,-0.005)	0.007	-0.210 (-0.035, -0.007)	0.004	-0.019 (-0.032, -0.060)	0.005
IES-R Behavioural domain	0.013 (-0.010, 0.036)	0.274	0.007 (-0.019, 0.034)	0.586	0.014 (-0.011,0.039)	0.272
R^2	0.071		0.110		0.079	

3.5 Resilience

The focus group discussion revealed that the psychological sequels were related with two main themes; unpreparedness and low risk perception. The majority who reported the psychological symptoms either experienced the flood for the first time or the magnitude was beyond their expectation. While monsoon seasons and floods were predicted yearly, their response and action were delayed by the low risk perception. Their preparedness was constructed with their risk perception. Those who have previous experience with the flood has some degree of preparation, however the level of preparation was shaped by the risk perception. Those who experienced flooding regularly have a high level of alertness with prompt response. Two themes emerged with resilience: community preparation and community cohesiveness. The community that has own mitigation measures at both individual and community levels acted fast without relying to the higher authority. They have their own committee and all actions were properly planned ahead before the disaster struck. The committee is led either by the appointed head village, religious Imam or the respected older people in the community. They exercised the local resources.

The community cohesiveness is not only minimizing the impact of destruction, it influenced their ability to restructure back their lives after the disaster and shaped the resilience These strengthened the positive attitudes, emotion regulation and spirituality. Mosques became the relief centres and Imams played a significant role in providing the support for the people during the difficult period. Survivors often anchored faith reasonings to accept the destruction. While they agreed that the external helps have contributed to the recovery, financial constraints became prominent at the later stage of recovery.Two themes emerged in which community preparation and community

cohesiveness help to minimize the impact of destruction, similar to what have been reported before (Priebe, Marchi et al. 2011; Cutter, 2008; Paton, 2001). The communal commitment shaped the community's ability to bounce back and be resilient. Spirituality and the role of religious help in minimizing the disaster impacts. This is attributed to Islamic values in handling grief and despair (Hedayat, 2006) which strengthen the emotional regulation and positive attitudes.

4.0 Conclusions

This study was conducted in a local population has highlighted the significant impact imposed on the elderly following a natural disaster. The community preparedness and cohesive are able to minimize the post disaster psychological impacts and contribute to good QoL despite the massive destruction. The empowerment of local community and integrating the spiritual elements in the disaster management measures warrants attention.

While the cross sectional design of the epidemiological data limits the interpretation, the qualitative methods are able to enrich the findings and strengthen the study. The findings, however, need to be interpreted with caution as the majority of this sample were Malay Muslim and was conducted in the worst hit areas. Nevertheless, this study does provide implications, especially to the policy makers and stakeholders to empower the local community and to exercise the spiritual leaders in the future disaster management measure. The results provide the foundation for the need to improvise the psychological first aid modules to meet the needs of this vulnerable population. Furthermore, multidisciplinary team should work together to screen the survivors for PTSD and depression so that early intervention can be administered.

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NUTRITIONALLY-BALANCED, COST EFFECTIVE, SOCIALLY ACCEPTABLE, AND SUSTAINABLE EMERGENCY FOOD AID DESIGN: A VITAL STRATEGY FOR DISASTER ABATEMENT

Project Information

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1.0 Introduction

Disasters are devastating and deprive affected persons of many rights, including the fundamental right to adequate food recognized universally as early as 1948 under Article 25 of the Universal Declaration of Human Rights (United Nations, 2015). Emergency food aid is an example of a "transfer from donor to recipient countries of food commodities on a totally grant basis" not on "highly concessional terms" (FAO, 1996a). From a global view point, the humanitarian food assistance aims to ensure the consumption of sufficient, safe and nutritious food in anticipation of, during, and in the aftermath of a humanitarian crisis, when food consumption would otherwise be insufficient or inadequate to avert excess mortality, emergency rates of acute malnutrition or detrimental coping mechanisms (Lentz and Barret, 2013).

According to the Malaysian "Policy and Mechanism of National Disaster Management and Relief", the responsibilities of the district disaster management and relief committee is to provide facilities and necessities to victims and rescuers such as food, medical treatment, evacuation and other emergency assistance (National Security Council, 1997). Among the major emergencies, food aid continues to make up the majority of humanitarian appeals, and remains an important tool in response to the flood events. Hence, an accurate food demand prediction is the basis of creating a rational emergency food supply program after a disaster. Moreover, the establishment of a cost effective, nutritionally-balance, socially acceptable and adhere to the guidelines permitted by the World Food Programme (WFP) emergency food aid plan would simulate the understanding nutritional needs, abate hunger and indirectly prevent acute malnutrition, notably during the heavily flood disaster.

2.0 Methodology

2.1 Food prices, dietary data and food composition database

Malaysia food price data (for example data from the Food Price Index) was used for the estimation of average food price. Supermarket visit and online supermarket data were used if the food items is not covered in the food price data. Food items with 'promotion' or 'reduce to clear' price tag have been ignored, and bulk purchase was avoided to minimise selection bias. Nutrient values for the foods were obtained from the Malaysia Food Composition Table (Tee *et al.*, 1997) and Food Composition Guide Singapore (2003). Nutritional compositions of the selected local cooked foods, expressed as per 100g of edible portion were computed using the NutritionistPro and FoodWorks database. Meanwhile, nutritional labelling has been served as a general reference for the canned, processed and ready-to-eat foods.

2.2 Development of 3-day food service-oriented emergency diet menu plan

The newly developed emergency food aid plans was designated to fulfil the following criteria: (i) Low cost; (ii) Nutritious; (iii) Suitable for general population (both men and women); (iv) Sustainable; (v) Socially acceptable; and (vi) Specific to various flood severity related scenarios. For the general population in Malaysia, the menu was designed based on 2100 kcal energy and Acceptable Macro-nutrient Distribution Range (AMDR) for carbohydrate (50-60%), protein (15-20%) and fat (25-30%).

2.3 Diet optimization model

Dietary optimization work has been conducted using linear programming with some modification based on Maillot et al. (2010). In general, the optimization work was started with the most common dietary patterns and incremental steps have been implemented towards patterns that met the recommended nutrient intake (RNI, 2005) and lower in cost. To ensure a complete optimization, compilation of a wide range of individual food items has been carried out at earlier stage. The

mathematical modeling was performed via simplex algorithm and solved using linear programming according to Nghiem et al. (2012). The three nutrient constraint scenarios as listed in Table 1 were modeled in Kingsoft Spreadsheets 2013.

Table 1: Nutrient constraint scenarios for diet optimization modeling

Nutrient constraint scenarios	Parameter
Basic Nutrients (BN)	Energy, carbohydrates, protein, fats, saturated fat cholesterol, sodium, and fiber
Basic and Vitamins (BN+V)	Energy, carbohydrates, protein, fats, saturated fat cholesterol, sodium, fiber , vitamin A, vitamin C, vitamin D, vitamin E , vitamin K, thiamin , riboflavin, niacin, panthothenic acid, pyridoxine, cobalamin, and total folate
Basic Nutrients, Vitamins and Selected Minerals (BN+V+SM)	Energy, carbohydrates, protein, fats, saturated fat, cholesterol, sodium, fiber, vitamin A, vitamin C, vitamin D, vitamin E, vitamin K, thiamin, riboflavin, niacin, panthothenic acid, pyridoxine, cobalamin, total folate, calcium, iron, selenium, zinc, magnesium, and copper

3.0 Results and Discussions

The 3-day food service-oriented emergency diet menu plan for general population is presented in Table 2. The diet menu consists of six planned meals: breakfast, morning snack, lunch, afternoon snack, and dinner. All foods were derived from six major food groups: (1) Rice, noodle, bread, cereals, cereal products and tubers; (2) Vegetables; (3) Fruits; (4) Fish, poultry, meat and legumes; (5) Milk and milk products, and (6) Fat, oils, sugar and salt.

Table 3 shows the average nutrient analysis of the 3-day food service-oriented emergency diet menu plan. In overall, all menu achieved an average of 2055kcal (SD=18.8), 81g protein (SD=2.1), 286g carbohydrate (SD=6.5), 66.2g fat (SD=0.5), 157mg cholesterol (SD=50.7), 1456mg sodium (SD=208.3) and 12g fiber (SD=1.0).

Diet optimisation of food service-oriented emergency diet menu plan for general population were grouped as following: basic nutrients (BN), basic nutrients and vitamins (BN+V) and basic nutrients, vitamins and selected minerals (BN+V+SM). Scenario development and linear programming identified daily dietary patterns that met key nutrient requirements (2100kcal/d) for as little as a median of RM 3.16/d, up to RM 6.83/d for general population whom receiving food aid from food service (Table 4). The present study is the first in Asia region to design and develop a nutritionally-balanced, cost effective, socially acceptable, and sustainable emergency food aid plan for disaster preparedness and abatement. The study was able to identify foods and dietary patterns that addressed nutritional requirements for Malaysian adults for as low as RM 3.16/day. However, increasing the dietary variety and nutrient constraints did increase daily cost when optimized for more expensive alternative foods containing micronutrients such as calcium.

Table 2: 3-day food service-oriented emergency diet menu plan for general population

Day 1	Day 2	Day 3
Breakfast:	**Breakfast**:	**Breakfast**:
Fried Rice Noodles /Mee-Hoon	*Sardine Sandwich*	*Sardine Mayonnaise Sandwich*
-Mee-Hoon 1 cup	-Whole meal bread, 3 slices	-Whole meal bread 1 cup
-Fish ball, raw 2 oz (57g)	-Sardine, canned in tomato	-Sardine, canned in tomato sauce
-Taukua, raw 1/2 piece	sauce 2 oz (68g)	2 oz (68g)
-Sawi, raw 1 cup	-Cucumber, raw 1/2 cup	-Cucumber, raw 1/2 cup
-Oil 1 tbsp	-Margarine, soft 2 tsp	-Mayonnaise, low calorie
Low fat milk 1 cup	Coffee,decaffeinated/caffeinate	1 tbsp
	d 1 tsp	-Margarine, soft 2 tsp
	Sugar 2 tsp	Coffee, decaffeinated/caffeinated
		1 tsp
		Sugar 2 tsp
Morning Snack:	**Morning Snack:**	**Morning Snack:**
Cream Crackers 5 pieces	Marie Biscuit 5 pieces	Cream Cracker 6 pieces
Coffee, decaffeinated/caffeinated	Green apple 1	Green apple 1
1 tsp	Low fat milk 1 cup (200ml)	Low fat milk 1 cup
Sugar 2 tsp		
Lunch:	**Lunch:**	**Lunch:**
Rice 1 1/2 cup	Rice 1 1/2 cup	Rice 1 1/2 cup
Fried Chicken	*Ayam Masak Kicap*	*Sup Ayam*
-Chicken breast, raw	-Chicken breast, raw	-Chicken breast, raw

2.35oz (66g) -Oil 1 tbsp *Vegetable Curry* -Brinjal, raw 1/2 cup -Long beans, raw 1/2 cup -Oil 1 tbsp Plain water 1 glass	2.35 oz (66g) -Oil 2 tbsp *Stir-Fried Taugeh-Taukua With Turmeric* -Taugeh, raw 1 cup -Taukua, raw 1/3 piece -Oil 1 tbsp Plain water	2.35 oz (66g) -Oil 2 tbsp *Stir-Fried Kangkung* -Kangkung, raw 1 cup -Oil 1 tbsp Plain water 1 glass
Afternoon Snack: Cream Crackers 5 pieces Green apple 1 Coffee, caffeinated/decaffeinated 1 tsp Sugar 2 tsp	**Afternoon Snack:** Marie Biscuit 5 pieces Green apple 1 Coffee, caffeinated/decaffeinated 1 tsp Sugar 2 tsp	**Afternoon Snack:** Cream Cracker 6 pieces Green apple 1 Tea powder, decaffeinated/caffeinated 1 tsp Sugar 2 tsp
Dinner: Rice, cooked 1 1/2 cup *Kembong Fish Curry* -Kembong, raw 2.4 oz (68g) -Oil 1 tsp *Kangkung Goreng* -Kangkung, raw 1 cup -Oil 1 tsp Plain water 1 glass	**Dinner:** *Fried Rice Noodles /Mee-Hoon* -Mee-Hoon 1 1/2 cup -Egg, raw 1/2 -Taukua, raw 1/2 piece -Oil 2 tbsp Plain water	**Dinner:** Rice, cooked 1 1/2 cup *Fried Kembong Fish* -Kembong, raw 2.4 oz (68g) -Oil 1 tbsp *Vegetable Soup* -Sawi, raw 1 cup -Taukua, raw 1/2 piece -Oil 1 tbsp Plain water 1 glass

Note: tsp = teaspoon; Tbsp = tablespoon; Cup = 200ml

Table 3: Nutrient analysis of the 3-day emergency menu

Macronutrient	Unit	Mean	Standard Deviation (SD)
Energy	kcal	2055.11033	18.81761
Protein	g	80.553	2.09561
CHO	g	286.19367	6.5473
Fat, total	g	66.277	0.4963
Cholesterol	mg	156.973	50.67697
SFA	g	6.13333	1.45099
MUFA	g	9.46667	3.68792
PUFA	g	7.47333	3.3066
Dietary fiber	g	12.48367	1.04744
Vit A	RE	1244.30033	408.35281
Beta Carotene	mcg	6219.85867	2557.21887
Vit C	mg	144.27067	26.8732
Vit D	ug	6.08633	5.27342
Vit E	mg	7.613	1.53824
Thiamin	mg	1.025	0.1837
Riboflavin	mg	2.40867	0.11161
Niacin	mg	14.88367	1.91732
Pyridoxine	mg	1.31767	0.13688
Folate (Total)	mcg	137.38733	18.21977
Cobalamin	mcg	9.12667	3.37865
Biotin	mcg	1.74233	3.00051
Pantothenic Acid	mg	0.674	0.47821
Vit K	mcg	22.38033	8.39877
Sodium	mg	1456.13833	208.2641
Potassium	mg	1928.247	146.65045
Calcium	mg	855.036	36.59497
Iron	mg	16.91133	1.01137
Phosphorus	mg	1125.978	95.90583
Magnesium	mg	224.11233	7.34931
Zinc	mg	5.10567	0.61445
Copper	mg	1.16133	0.21233
Manganese	mg	1.40467	0.9285
Selenium	mcg	44.31733	18.15555
Chromium	mg	0.003	0.00265
Molybdenum	mcg	12.91867	6.97812
PFA 20:5, EPA	g	0.24167	0.20929
PFA 22:6, DHA	g	0.39567	0.34269

Table 4: Food per person per day achieved via diet optimisation

Selected foods	Total food weights (per person per day, g)		
	Basic Nutrients (BN)	**Basic Nutrients & Vitamins (BN+V)**	**Basic Nutrients, Vitamins & Selected Minerals (BN+V+SM)**
Rice, polished, raw	191	201	294
Rice noodles/ Mee-Hoon, dry	59	47	0
Wheat flour	100	100	0
Chicken, raw	0	0	78
Chicken egg, raw	44	37	27
Siakap fish, raw	9	8	0
Sardine, raw	0	25	21
Soy bean cake/Tau-kua, raw	0	0	200
Bitter gourd, raw	0	0	200
Carrot, raw	0	0	119
Cauliflower, raw	11	0	0
Cucumber, raw	0	0	200
Mung bean sprouts, raw	0	200	200
Okra, raw	0	0	37
Spinach, raw	0	0	200
String beans, raw	0	13	0
Banana Mas, raw	200	121	0
Guava, raw	200	200	164
Palm oil	18	19	15
Blended oil (Palm oil, Groundnut oil, sesame oil)	39	38	30
Cost (RM) per day	**3.16**	**3.36**	**6.83**
Cost in USD per day	0.78	0.83	1.69

4.0 Conclusion

This study established the designation of a nutritionally-balanced, cost effective, socially acceptable, and sustainable emergency food aid plan for disaster preparedness and abatement.

4.1 A 3-day food service-oriented emergency diet menu plan for the improvement of flood disaster preparation has been designed for general population.

4.2 The study has identified foods and dietary patterns that addressed nutritional requirements for Malaysian adults for as low as RM 3.16/day.

4.3 The study also produces policy-relevant information on the effectiveness and implementation of an emergency food aid approach that can inform the allocation of resources in the needed community.

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SOCIO-ECONOMIC WELLBEING: ASSESSING TOTAL FLOOD IMPACTS VIA DIRECT OR INDIRECT AND TANGIBLE OR INTANGIBLE IMPACTS OF FLOOD DISASTERS IN THE SG KELANTAN BASIN

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1.0 Introduction

Flood losses can be classified as direct or indirect losses and tangible or intangible losses. The disastrous flood of December 2014 in Kelantan was a tragedy that devastated the state in terms of flood losses in infrastructure destruction, property damage, crop loss, loss of livelihoods, disruption to normal services and heavy expenses in healthcare. A questionnaire-based cross sectional study was conducted by convenience sampling in Gua Musang, Kota Bharu and Kuala Krai. The total number of respondents interviewed was 477. The results indicate that both direct and indirect, as well as tangible and intangible flood losses were exceptionally large. Of the 477 flood victims, 407 (85.3 %) suffered losses. A total of 346 suffered direct losses in house damage averaging RM3,945.00 per family. A total of 376 victims also suffered losses to house contents, averaging RM5,250.66 per family. Another 179 victims suffered damages to vehicles (including boats) averaging losses of RM23,427.09 per family. In terms of crop losses, 14 victims reported losses averaging RM11,255.36 per family. Another 49 victims reported business losse. The reported overall direct and tangible total losses averaged RM26,622.27 per family. Only a small number of victims received flood relief from government. Results also showed that during huge floods, victims cannot rely on relatives to help them as almost everyone was a victim. However, strong social capital in the form of help from family members, friends, NGOs and the Malaysian public was significant in helping victims cope and recover.

2.0 Methodology

This study adopts a multi-methods approach whereby a combination of complementary research methods which includes historical analysis, use of the `cultural insider' observer approach (i.e. by the author), quantitative questionnaire survey and qualitative interviews highlighting selected exceptional cases. Historical analysis is used for documentation of past floods in terms of frequency, magnitude and severity. Historical flood analysis is used to study how broader physical-socio-political forces have created and perpetuated the flood hazard in Kelantan. As the ‘cultural insider’, the author himself is well positioned to as a researcher with rich experience, having worked in the flood management area for more than 30 years. This approach involves asking research questions as an ‘observer-participant’ and is used in the analysis of key stakeholders (government officials, NGO workers, flood managers and flood victims, and the general public) on their flood losses and their response to the flood hazard. The quantitative questionnaire is employed to study individual/household perception, response and flood loss incurred. The quantitative survey is used within each of four selected sample sites. Finally, qualitative indepth interviews are recorded with selected flood victims to highlight the severity of various flood losses incurred. The merits and demerits of each of the above methods are outlined by Chan (1995). The employment of more than one research method to approach a research question, often called ‘triangulation’, strengthens a study and has become common practice (Fordham, 1992). In terms of research methodology, the triangulation strategy has greater advantage over a single research strategy and is recommended in the literature because of its advantage of possessing the merits of all methods adopted while simultaneously reducing the demerits inherent in them. According to Chan (1995), triangulation contributes to the overall effectiveness of the study as the many research methods adopted complement each other as different areas/objectives in a study are better tackled by different research methods. In this study, a questionnaire-based cross sectional study was conducted by convenience sampling at locations in Gua Musang, Kota Bharu and Kuala Krai. The questionnaire was divided into four parts: Part A collected the respondents’ demographic details; Part B was the perception and characteristics of flood; Part C was on total flood losses; and Part D was on flood relief. The total number of respondents interviewed was 477. The data was analysed by using SPSS software.

3.0 Results and Discussion

Results indicate that both direct and indirect, as well as tangible and intangible flood losses (Fig. 1) were exceptionally large during the December 2014 flood. Of the 477 flood victims, 407 (85.3 %) suffered losses. A total of 346 suffered direct losses in house damage averaging RM3,945.00 per family. A total of 376 victims also suffered losses to house contents, averaging RM5,250.66 per family. Another 179 victims suffered damages to vehicles (including boats) averaging losses of RM23,427.09 per family. This is a huge amount of losses even by the standards of the richer states like Selangor or Penang. In the context of Kelantan, one of the poorest states in the country, such a big loss is devastating. In terms of crop losses, 14 victims reported losses averaging RM11,255.36 per family. Of the 49 victims who reported business losses, the average loss was not given but 4 reported 100 % losses, 9 reported 50 % losses and 36 reported losses below 30 %. A total of 330 victims reported overall direct and tangible total losses averaging RM26,622.27 per family. This is a huge amount considering the low incomes of the victims in Kelantan, one of the poorest states in Malaysia (Che Hashim Bin Hassan, 2011). In terms of indirect and intangible losses, only illness and healthcare costs were reported. A total of 27 victims reported suffering various forms of illness with the average healthcare cost of RM67 to themselves and RM55 to their family members. Although this survey did not find any deaths, it was reported in the newspapers that there were 25 flood-related deaths in the country with 11 in Kelantan. Overall, flood victims in the Kelantan river basin generally suffered severely in both direct and indirect as well as tangible and intangible losses. Many living beside the Kelantan River had their houses, vehicles, crops and livestock completely destroyed and washed away. Many became totally bankrupt as their entire savings and houses vanished in the event. Hence, both direct and indirect flood damages were large as were tangible and intangible flood damage. Hence, it is not enough for the authorities and NGOs to merely provide food and shelter and other tangible aids. Flood victims must be provided with non-material help in terms of counselling, healthcare, education and awareness training and other intangible help. However, despite all the reports about flood aid being given, the results of this study showed that only a small number of victims actually received flood relief from government. The results also showed that during huge floods, victims also cannot rely on relatives to help them as almost everyone was a victim. However, strong social capital in the form of help from friends, NGOs and the Malaysian public was imperative in helping victims cope and recover.

3.1 Direct Flood Damage

Direct flood damages are classified as those damages where the damage is caused by direct contact with flood water. These include damage to buildings (buildings swept away, collapsed or partly-destroyed), damage to building structures (stilts collapsed, floor eroded, door swept away, roof damaged etc), damage to building contents (floor board destroyed, furniture destroyed, fridge destroyed, computer damaged, TV destroyed, carpets damaged etc), damage to vehicles (vehicle engine destroyed, vehicle seats destroyed, tyres damaged etc), damage to people (loss of life, injury or sickness), damage to animals and livestock (drowned animals, injured animals, sick animals etc), and any other flood damage cuased directly by flood waters. Most direct flood damages are tangible as they can be easily quantified and specified in monetary terms. In this study, it was found that direct losses form the bulk of the flood loss suffered by flood victims in Kelantan. This was in line with the total flood damage found earlier by Chan (2015), Mohammad Ghazi Hj Ismail et. al. (2015) and Lai et. al. (2015). These are tangible when they can be specified in monetary terms. In terms of direct flood loss in the present study, the majority of the respondents 85.3 % suffered losses. A total of 346 (72.5 %) suffered direct losses in house damage averaging RM3,945.00 per family while another 376 respondents (78.8 %) suffered direct flood losses to house contents, averaging RM5,250.66 per family. In terms of direct flood loss to vehicles, 179 victims (37.5 %) suffered damages to vehicles (including boats) averaging losses of RM23,427.09 per family. If all these direct flood losses are added together, the total amount is RM32,622.45.

3.2 Indirect Flood Damage

Indirect flood damages are losses incurred by flood victims, whether domestic or businesses, as a result of the interruption/disruption/stoppage of some activity (economic, social or domestic) by the flood. For example, a flood can cause the loss of production in a factory that is forced to suspend production due to its premise being flooded. Naturally, such flooding will also cause direct damage to the factory buildings, its contents as well as its production machines, raw materials and final products. Indirect flood loss can also be in the form of loss of business as a result of interruption in and outside the affected area (as customers cannot come to the business) or traffic disruption cutting off the

business from clients due to the flooded road. Naturally, there are also many other examples of indirect flood loss. Since these indirect flood loss are quantifiable, they can be termed *'Tangible Indirect Flood Loss.*' These also include the extra costs of emergency and other actions taken to prevent flood damage and other losses. These are tangible when they can be specified in monetary terms.Indirect damages are losses that occur due to the interruption of some activity by the flood, e.g. the loss of production due to business interruption in and outside the affected area or traffic disruption. These also include the extra costs of emergency and other actions taken to prevent flood damage and other losses. Since busineses have found it difficult to quantify their losses in monetary terms, it was decided to ask the business operators the percentage of their losses in terms of their normal business. Total Indirect Flood Damage to Business in terms of percentage loss was found to be high as most businesses suffered losses lost between 30 to 50 % of their normal business volume. Since tangible indirect flood losses can be quantified, the research results found that tis category of flood damage is significant.

3.3 Tangible Flood Damage

Tangible flood damages are those damages that can be seen, quantifiable and easily measurable. For example, tangible flood damages to man-made capital or resource flows that can be easily specified in monetary terms is considered such a damage. In contrast, intangible damage is damage to assets which are not traded in a market and are difficult to transfer to monetary values (Merz et. al., 2010). However, according to Jonkman (2007), athough classification of flood damage in terms of direct and indirect, and tangible and intangible is commonplace in the flood hazard research literature, their interpretations and delineations differ vastly. Hence, any attempt to classify flood damage must first define the various categories of damage. Just like direct and indirect flood damage, tangible flood damage can be classified into Tangible Direct Flood Damage as well as Tangible Indirect Flood Damage.

3.4 Intangible Flood Damage

Of all the different types of flood damage, the intangible damages are the most problematic as they are often very difficult to measure and often unquantifiable. The first category of intangible damage is the direct and intangible loss. This includes loss of life; loss of pet animals, lost of family heritage items, injuries to humans and pets, loss of memory, loss of memorabilia, psychological distress, damage to natural and cultural heritage, negative effects on ecosystems, and others. The other category is the indirect and intangible flood loss. This includes trauma, loss of trust government Standard Operating procedures (SOPs), loss of trust in flood warnin system, loss of faith in religion, and others. Intangible damage include casualties, health effects or damages to ecological goods and to all kind of goods and services which are not traded in the market and are not quantifiable in monetary terms. Needless to say, intangible flood damages are far more difficult to assess in monetary terms. They are therefore indicated as "intangibles" , and are very often downplayed or left out of the flood damage assessment equation altogether. Some other forms of intangible flood loss are described as social impacts of flooding. These include the loss of irreplaceable items that money cannot buy. For example, if a family has only one old family group photograph with all the family members present, and this only photograph in the world gets lost, then it is a tragedy as far as this family is concerened. The monetary value of the photographis not much but to the family who lost it, it means the world to them. Stress induced by a flood can be a very damaging damage. It can result in a person being mentally stressed to the extent that every time it rains, the person gets hysterical or paranoid. Even temporary evacuation from the house of a victim to an evacuation centre whilst the flood damage is repaired can be an intangible loss. Overall, intangible losses should include the disruption caused by the flood to the life of the individual household and to the community as a whole. Finally, intangible flood damage need to take into consideration the overall effect of a flood on the physical and mental health of the flood victims. Research in the past has shown that intangible impacts of floods can be more devastating to flood victims than the financial losses incurred (Green and Penning-Rowsell, 1988; Tunstall et. al., 2006; Mohammad Ghazi Hj Ismail, 2015)

4.0 Conclusion

Evaluating flood losses is an important aspect of flood management. Without knowing the losses it would be difficult to convince policy makers and the private sector to take precautionary measures (and allocate sizable budgets) to mitigate against floods. After flood events, government comes up with flood loss estimates, but such estimates are often unaccurate as they fail to take into consideration flood losses that are unquantifiable. Flood losses can be classified as direct or indirect losses and tangible or intangible losses. The disastrous flood of December 2014 in Kelantan was a tragedy that devastated the state in terms of flood losses in infrastructure destruction, property damage, crop loss, loss of livelihoods, disruption to normal services and heavy expenses in healthcare. This study showed that flood victims during the December 2014 flood in Kelantan suffered from both direct and indirect, as well as tangible and intangible flood losses. All these categories of flood damage were found to be exceptionally large. The results indicate that almost all flood victims suffered losses in terms of direct losses in house damage, losses to house contents, damage to vehicles (including boats), crop losses, business losses, and others. The reported overall direct and tangible total losses were very high for each family affected by the flood. Of all the different types of flood damage, the intangible damages are the most problematic as they are often very difficult to measure and often unquantifiable. The first category of intangible damage is the direct and intangible loss. This includes loss of life; loss of pet animals, lost of family heritage items, injuries to humans and pets, loss of memory, loss of memorabilia, psychological distress, damage to natural and cultural heritage, negative effects on ecosystems, and others. The other category is the indirect and intangible flood loss. This includes trauma, loss of trust government Standard Operating procedures (SOPs), loss of trust in flood warnin system, loss of faith in religion, and others. Intangible damage include casualties, health effects or damages to ecological goods and to all kind of goods and services which are not traded in the market and are not quantifiable in monetary terms. Needless to say, intangible flood damages are far more difficult to assess in monetary terms. They are therefore indicated as “intangibles”, and are very often downplayed or left out of the flood damage assessment equation altogether. Some other forms of intangible flood loss are described as social impacts of flooding. This study, as well as other researches in the past, have shown that intangible impacts of floods can be more devastating to flood victims than the financial losses incurred. Hence, it is not enough to provide flood victims with temporary shelter, clothings, food and medical supplies. Flood victims need help to get over intangible flood damage such as counseling, strong social support and education to help them cope and recover.

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A CORPUS ANALYSIS OF FLOOD DISASTER EXPERIENCE AND MINDSET OF KELANTAN RIVER WATER BASIN COMMUNITY

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1.0 Introduction

Flood estimated about 40 percent of natural disaster in world and the greatest potential natural hazard in Asia (Tran, La Ngoc, Le Thi, Tran Thi & Debarati 2011). According to the studies, Malaysia is one of the country in Asia that always hit by flood disaster. Flood is most devastating and significant natural disaster that occur in Malaysia (Sani, Barzani, Ekhwan, Musa 2014:59) especially in Kelantan. Eventhough the districts in Kelantan commonly be hit by this hydrological phenomenon every year, but the flood disaster which took place on 24 December 2014 was an extraordinary flood that absolutely unexpected by the Kelantan River Water Basin community. The 2014 flood was the most biggest flood in the history of Kelantan, considered as "tsunami-like disaster" (Kamarul Aryffin, Shaik Farid, Nik Hisamuddin, Nik Arif, Tuan Hairulnizam, Yazid & Mohd Roslani 2015:1) and was called as '*bah selut*' or '*bah kuning*'. Flood that hit Kelantan in December 2014 leading to a destruction of livelihood of local communities (Wan Ibrahim & Syarif Muhidin 2015:340). Therefore, this study is to explore the experience and mindset of Kelantan River Water Basin Community about the 2014 flood disaster.

2.0 Methodology

This research employs a qualitative approach and corpus analytical approach in its methodology. The data focuses on three instrument which is a face to face interview, FGD (focus group discussion) and picture drawings by children aged between 6-12 years old. A purposive sampling method was employed. 53 subjects were identified and interviewed based on the following categories which is male adults (4n), female adults (13n), teenagers (7n), children (25n) and those of special needs (4n) such as women who delivered baby, pregnant women, elderly citizen and people who had eye 's problem in the local language, i.e, '*bahasa*'. Kuala Krai has been identified as the research site as it was the one of the worst affected districts. A fieldwork conducted at Kampung Bekok and Kampung Mercy (placement for three villages such as Kg. Hujong Tanjong, Kg. Landak and Kg. Jln. Geale). All interviews were digitally recorded and video recorded. These interview data was transcribed and analysed manually using Nvivo program procedure and Wmatrix corpus tools software. From the raw data (transcript), themes, sub-themes and categories emerged. The use of Wmatrix corpus tool generated the frequency of words and collocated frequency words of each category. The result been developed and divided into two parts which is experience and mindset based on concordance, developing the '*KORBAS*' (Corpus). McEnery and Wilson (1996) have described the term corpus linguistics in simple terms as the study of language based on examples of 'real life' language use (Rayson 2002).

3.0 Results and Discussion

3.1 Discourse: Emerging themes

Several themes had emerged and coded such as (i) pre-disaster mindsets (ii) flood disaster experience of phenomenon, (iii) flood disaster experience of difficulties and challenges, (iv) flood disaster impact and (v) post flood disaster mindsets.

(i) Pre-disaster Mindsets

Generally view of their earlier mindset, all of them were believing that they will hit by usual flood every year. The table 1 below showed the earlier mindset of them.

Table 1

Sub-theme	Category
Flood situation	(i) only the usual flood, (ii) no water rising that will drown their homes
Rain	think that is a normal rain

(ii) Flood Disaster Experience of Phenomenon
Victims' expectation of a possibility of a major flood phenomenon in 2014 was made aware through their realisation and witness of several factors and occurrences. As explained by the table 2 below.

Table 2

Sub-theme	Category
Rain	continuos heavy rain fall
Water	the continuos rising water level and sudden, high velocity flow,water condition and colour
Perception	not expected flood different than before, not expected rising water level
Flood warning	instinct of flood disaster victim, no flood warning, meteorology department, electronic media
Causes	low-lying areas, river flow, rubbish, drainage, dam, human action, power of god

(iii) Flood Disaster Experience of Difficulties and Challenges
Several emerging themes were identified through the response of the victims which elaborated as difficulties and challenges experienced during flood. As described by table 3 below.

Table 3

Sub-theme	Category
Hygeine	getting bathed issues, toilet issues
Health	fever, vomitting, allergy, not enough sleep, eye's problem
Weather condition	extremely cold due to heavy rain fall and then heat contributed to the difficulties in dealing with the existing scenario
Lack of facilitites	no electricity, pads, number of boat available, tents
Supply of food and drinking water	insufficient
Communication problems and cut off	cannot contact with family, friends, relatives, rescuers
Marginalizing of victims	being ignored by the rescuer
Obstacles for rescuers	barriers to rescue flood victims

(iv) Flood Disaster Impact
The flood disaster had a great impact on the victims and resulting an awful damage to human life in term of their emotion, loss of property and economic.

3.2 Image Analysis
From the drawings method psychological analysis, merely a description of the event from the children's point of view showed that the children were not traumatized and no extreme strokes to indicate emotional disturbances or crisis after flood. But, the children still can reminded what happened during the flood occur clearly in their drawings.

3.3 Wmatrix Analysis (Corpus Language)
The findings reveal the frequency of words with the top most frequent list of words commonly found in the responses of all categories being '*tak*', '*air*', '*rumah*', '*banjir*' and '*naik*'. These
frequencies of words with its concordance analysis are highlighted to reflect the respondents' mindsets and experiences of the 2014 Kelantan flood disaster.

4.0 Conclusion

From this analysis, important findings of the study are summarized as follows:

4.1 All of the flood victims have the same typical mindset. They believed flood 2014 were usual flood that occur every year.

4.2 Major flood in December 2014 was unexpected by the flood victims.

4.3 The awareness of the major flood based on the traditional knowledge and their realization through the experience facing the flood every year.

4.4 Most of the flood victims did not had preparedness knowledge for survival in the major flood.

4.5 Majority of the respondent expressed the difficulties to adapt during the flood in terms of accommodation, facilities, survival needs and supplies of food and drink.

4.6 Flood 2014 gives a tremendous impact and awful damage to the flood victims in terms of the emotion, losing of house and other properties.

4.7 There is a gap and non-effective communication between the flood victims and the rescuers. Most of the flood victims expressed their disappointed towards the rescuers during flood, same as the rescuer that stated the attitude of the flood victims that causing the difficulties.

5.0 Suggestions

There is some suggestion as follows:

5.1 Community Emergency Programme should be adopted with the cooperation from the community, rescuers, head of community and the authorities. From this programme, the community can express their needs, mindsets and experiences during survival in flood same as the rescuers experience and mindset during saving the victims. This can captured a lot of information with the head of community synergy. It can help the authorities or policy makers to create an effective policy to solve the flood problems.

5.2 Awareness programme also should be conducted to the community (flood victims especially) to build a knowledge among them about the flood and the flood action guide survival (before, during, after). It includes the procedure and safety such as preparedness during flood, what they have to do, what they need to bring, the information about the flood placement in their area, contact number of the relevant emergency rescuer and the awareness of important to follow the emergency and rescuer instruction. From this programme, the community also can be guide to standby the flood survival kit that includes food, water drinking, sanitation and hygeine items, cloths, candle, medicine, baby needs and others.

5.3 The rescuers and the authorities also should improve the flood management system and operations of rescuing the victims. such as:

i. Identify the location that always hit by flood specifically.

ii. Increase the number of rescuer team for each area that identifiy.

iii. Do not focus only on the certain places in the rescue mission- identify the isolated area that probability of flooding.

iv. Improving the flood early warning systems to be more effective in order to facilitate the victims receive any warnings associated with floods.

v. Increasing the number of lifeboats.

vi. Establishment and train a team of local communities (*AJK Kg*.) to prepare and assist rescuers in taking immediate action in the event of flooding.

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LIFESTYLE AND ECOLOGICAL IMPACT OF THE ORANG ASLI BATEK AFTER FLOOD CRISIS

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1.0 Introduction

Recent flood disaster has affected many areas, with east coast Peninsular Malaysia, specifically Kelantan being severely affected. The floodwaters or "Bah Kuning" has wildly ravaged homes and lands to many people within many districts of this state. One of the community that was gravely impacted by this natural disaster was the community of the Orang Asli Batek.

The Orang Asli Batek identify themselves as forest people, where forest is regarded as their true home [Bonta, n.d]. Their settlements are usually non-permanent or semi-permanent and often near water. In these modern days, the Batek have a permanent centre, a settlement set-up by the government known as Pos Lebir located in district of Gua Musang, Kelantan. Pos Lebir is made up of 4 villages (kampung); Kampung Pasir Linggi, Kampung Machang, Kampung Kuala Koh and Kampung Aring 5. Even so, the Batek ethnic group can still enjoy the freedom to congregate and form temporary camps between the forest and this permanent settlement [Bahuchet, 1992].Up till now, the Batek ethnic is still practicing and heavily relying on traditional economy – hunting, fishing and farming.

The impacts of the recent massive flood to the Orang Asli Batek settlements are of substantial concern, due to the pre-existing vulnerabilities and low adaptive capacity of this community. These vulnerabilities relate to, for instances, levels of poverty, poor health and malnutrition status, settlement in outskirt areas, reliance on traditional activities for food security and income, low education levels, inadequate access to facilities and resources as well as limited public health services. It was reported that during the flood event, the humanitarian aids to this group was impeded due to the collapsed of main bridge that connected these settlements to the nearby relief centre [Mohamad Insan, personal communication, February 17, 2015]. Furthermore, this event was truly unprecedented as this was a first time for the community to be affected by flood [Village Chief of Kampung Pasir Linggi, personal communication, February 25, 2015].

There is no available data and information on the impact of flood among the Orang Asli Batek to this date. Thus, the aim of this paper is to analyse and discuss research findings to extend our understandings about flood disaster and their impact towards the Batek's lifestyle and environment.

2.0 Methodology

Mixed methods or methodological triangulation was employed in this study involving both primary data from qualitative (focus group discussion) and quantitative (interviewer-administered questionnaire) approach. It also involved secondary data collection from selected health clinics (klinik kesihatan). In addition, laboratory work was carried out in order to determine the quality of soil and water in these affected flood areas.

The location of this research is at Pos Lebir, Gua Musang. There are four settlements under Pos Lebir administration, however, only three were badly affected by the flood which are: Kampung Pasir Linggi, Kampung Machang and Kampung Kuala Koh. All eligible respondents were informed about the purpose and the procedure of the study. Informed consent was sought from each prospective respondent or the respondent's legally authorized representative. Where appropriate, researchers ensured adequate provisions to protect the privacy of subjects and to maintain the confidentiality of data.

3.0 Results and Discussion

3.1 Sociodemographic

Table 1 shows the sociodemographic characteristics, food security status, body mass index of mothers and children and nutrient intake of the respondents. Analysis of sociodemographic data revealed that the mothers were within the age range of 15 to55 while the children were between the ages of 2 to10 years old.

Table 1: Sociodemographic characteristics, food security status, body mass index of mothers and children and nutrient intake of the respondents

Characteristics	Phase one n=38 N%	Phase two n=19 N%
Maternal educational level		
No education	17 (44.7)	4 (21.1)
Primary school	15 (39.5)	11 (57.9)
Secondary school	6 (15.8)	4 (21.1)
Monthly household income		
<RM691	38 (100)	38 (100)
Food security status of household		
Household insecure	38 (100)	38 (100)
Body Mass Index (kg/m^2) of mothers		
Underweight	14 (36.8)	7 (36.8)
Normal	18 (47.4)	8 (42.1)
Overweight	4 (10.5)	4 (21.1)
Obese	2 (5.3)	-
Child		
Severe thinness	35 (92.1)	15 (78.9)
Thinness	2 (5.3)	2 (10.5)
Normal	1 (2.6)	2 (10.5)
Waist hip ratio		
<0.8	29 (76.3)	16 (84.2)
>0.8	9 (23.7)	3 (15.8)
Energy intake (kcal)		
<RNI	36 (94.7)	19 (100)
>RNI	2(5.3)	-
Protein intake (g)		
<RNI	34 (89.5)	17 (89.5)
>RNI	4 (10.5)	2 (10.5)
Calcium intake (mg)		
<RNI	38 (100)	19 (100)

3.2 Coping Strategies Index

Table 2 reveals the frequency of coping behaviors for households in three villages impacted by the flood.

Table 2: Frequency of Coping Behaviors for Food Security

Phase	Coping Strategy	Never	Frequency 1 – 3 days/week	4 – 6 days/week	Daily
			Percent of	households	
One	Gather wild food and hunt	34.2	42.1	10.5	13.2
	Use less expensive/preferred foods	31.6	55.3	2.6	10.5
	Reduce adult consumption	36.8	50.0	7.9	5.3
	Borrow food or rely on others	39.5	60.5	-	-
	Limit portion size at mealtimes	55.3	28.9	10.5	5.3
	Reduce number of meals/day	57.9	34.2	7.9	-
	Purchase food on credit	76.3	21.1	2.6	-
	Send household members to eat elsewhere	84.2	13.2	2.6	-
	Skip entire days without eating	71.1	28.9	-	-
	Rely on casual labor for food	92.1	5.3	2.6	-
Two	Gather wild food and hunt	42.1	57.9	-	-
	Use less	15.8	57.9	10.5	15.8

expensive/preferred foods				
Reduce adult consumption	31.6	57.9	10.5	-
Borrow food or rely on others	21.1	73.7	5.3	-
Limit portion size at mealtimes	10.5	84.2	5.3	-
Reduce number of meals/day	26.3	57.9	15.8	-
Purchase food on credit	73.7	26.3	-	-
Send household members to eat elsewhere	84.2	15.8	-	-
Skip entire days without eating	57.9	36.8	-	5.3
Rely on casual labor for food	68.4	31.6	-	-

People start to change their consumption habits when they anticipate a problem. They don't wait until food is completely gone [Christiaensen & Boisvert, 2000]. Modest dietary adjustments (eating less-preferred foods or reducing portion size) are easily reversible strategies that do not jeopardize longer-term prospects [Watts, 1983]. Many researchers have noted that as food insecurity worsens, households are more likely to employ strategies that are less reversible, and therefore represent a more severe form of coping and greater food insecurity [Corbett, 1988; Devereux, 1993].

3.3 Focus group discussions

The topics included in the focus group were: experience of flooding, whether they stayed in their home or left it, the meaning of flood to them, reason of flood and food sources during flood.

3.4 Medical Data on Health Impact of Orang Asli Batek after 2014 Flood Incidence

As for medical and health related issue, data were collected from Klinik Kesihatan Aring, Klinik Kesihatan Manek Urai, Klinik Kesihatan Bandar Kuala Krai and Pejabat Kesihatan Daerah Gua Musang for any cases that affected the Orang Asli Batek community immediately after the flood disaster until October 2015. After almost a year of post-disaster period, a total of 380 cases of flood related disorders have been reported. The nature of the cases fall under the umbrella of water-borne diseases, non-infectious diseases, stress disorders, malnutrition cases, death and injuries. For water–borne diseases outbreak, 212 and 116 cases of nose & throat infections and dermatitis cases were reported respectively. For both occurrences, most of these cases (97.6%) were recorded from Kampong Kuala Koh. Cases of conjunctivitis (two cases) and diarrheal (four cases) occurred at Kampung Pasir Linggi and Kampung Machang, with all affected patients were reported to be children under the aged of five-years old. One case of stress disorder from Kampung Kuala Koh was recorded as a result of the flood catastrophe. This patient was referred to the Hospital USM for further treatment. Under the malnutrition category, nine identified children from all three villages received a food basket during routine check-up. Furthermore, 36 children from Kampung Kuala Koh were recognised as having a malnourish status based on their body weight and body mass index (BMI). Fortunately, no causality or death incident was reported due to the previous flood in all settlements.

3.5 Soil result

Based on the result of Gram Stain, Catalase Test and Malachite Green Stain, the only bacteria isolate from soil samples from flooded area is *Bacillus sp.*

3.6 Water result

The water analysis showed that variety of bacteria was identify in the area of affected flood. Based on the biochemical test on water samples many of the isolated bacteria were under family Enterobacteriaceae (Klebsiella pneumoniae, Hafnia alvei, Serratia rubidaea, Serratia odofera, Enterobacter agglomerans, Enterobacter amnigenus, Enterobacter sakazakii, Edwardsiella tarda, Edwardsiella ictaluri and Pseudomonas spp). Bacteria under family Pasteurellaceae (Pasteurella spp), Burkholderiaceae (Burhholderia cepacia), Aeromonadaceae (Aeromonas hydrophila), Vibrionaceae (Vibrio cholera), Alcaligenaceae (Alcaligenes spp), Bacteroidaceae (Bacteroides distasonis) and Moraxellaceae (Acinetobacter sp) also identified from the same water source. All the identified bacteria were Gram negative bacilli and most of them from class Gammaproteobacteria.

4.0 Conclusion

Important findings of the study are summarized as follows:

4.1 The Orang Asli Batek communities employ more severe behaviors in coping with their food insecurity status such as gathering wild foods and hunt, relying on less preferred and less expensive foods and restrict consumption by adults in order for small children to eat.

4.2 During the flood, they survived by consuming wild food sources and water from the rain.

4.3 The traditional medicine namely shamanic practice and the usage of plant-based medicine are still prevalent. Modern treatment seems to be confined to children or during serious illness only. Moreover, poor sanitation practices have aggravated the health conditions.

4.4 Bacteria identified from soil samples were Gram positive and all the bacteria isolates from water samples were identified as Gram negative. Compared to soil samples, various types of bacteria were succesful identified from water samples suggested that the water source in the area of flooded was not suitable for daily use.

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MEMBANGUNKAN SAHSIAH MANGSA BANJIR MELALUI KEFAHAMAN KONSEP IBTILAA' (UJIAN) DALAM MENGATASI TRAUMA BANJIR

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1.0 Pengenalan

Penyelidikan ini akan meneliti aspek kefahaman beragama khususnya berkenaan Ibtila' dalam mengatasi trauma banjir dan peranan kefahaman tersebut terhadap pembangunan sahsiah. Ia dimulakan dengan pernyataan masalah yang secara teorinya melihat peranan pembinaan sahsiah melalui kefahaman beragama dalam menangani trauma. Ia kemudiannya disusuli dengan metodologi yang digunakan untuk kajian ini bagi memastikan data diperolehi secara absah dan analisis yang dilakukan adalah tepat. Penyelidikan ini diakhiri dengan rumusan berkenaan kefahaman konsep Ibtila' dan perkaitannya dengan pembangunan sahsiah dalam mengatasi trauma banjir.

2.0 Metodologi Kajian

Kajian yang bersifat mixed-method ini mengaplikasikan kaedah dokumentasi, soal selidik dan temu bual. Kaedah soal selidik melibatkan 300 orang subjek, manakala kaedah temu bual melibatkan lima orang subjek. Bagi proses penganalisisan data, kajian menggunakan metode kuantitatif iaitu statistik deskriptif dan statistik inferansi untuk menganalisis data soal selidik. Manakala metode kualitatif deskriptif melibatkan metode induktif bagi menganalisis data dokumentasi dan temu bual.

3.0 Hasil dan Perbincangan

3.1 Tahap Kefahaman Mangsa Banjir Tentang Konsep al-Ibtila'

Keseluruhan dapatan dari soal selidik menunjukkan tahap kefahaman mangsa banjir terhadap konsep al-Ibtila' adaah signifikan di mana majoriti mangsa memahami bahawa al-ibtila' dalam bentuk banjir besar yang dialami adalah takdir yang telah ditentukan oleh Allah SWT kepada mereka. Dapatan melalui temu bual pula menunjukkan mereka tidak mengetahui secara khusus pengertian al-Ibtila'. Namun subjek bersetuju dan mengetahui kewujudan elemen-elemen yang terdapat dalam konsep al-ibtila' seperti memperakui bencana banjir yang berlaku adalah ketentuan dan ujian dari Tuhan serta melihat ada hikmah dan pengajaran di sebalik ujian yang berlaku.

3.2 Tahap Sahsiah Mangsa Banjir Dalam Menerima al-Ibtila'

Dapatan ini menunjukkan bahawa tahap penerimaan subjek terhadap al-Ibtila' adalah signifikan. Justeru, aspek penerimaan terhadap ujian yang menimpa seperti ujian banjir besar adalah selaras dengan tahap kefahaman terhadap al-Ibtila' sehingga subjek dapat menerimanya dengan fikiran terbuka dan bersikap positif, malah berusaha dan beriktiar untuk memperbaiki kehidupan mereka. Temu bual yang dijalankan juga menunjukkan dapatan yang sama. Kesemua subjek mengakui banjir 2014 merupakan antara ujian paling berat yang dialami sepanjang hidup namun, mereka memilih untuk berlapang dada dan reda menerimanya sebagai ujian. Subjek bersetuju banjir yang berlaku lebih mendekatkan diri mereka dengan Tuhan. Mereka turut bersetuju bahawa perasaan marah dan kecewa tidak sewajarnya diluahkan kepada Tuhan bahkan sebaliknya doa yang patut ditujukan kepada-Nya. Rumusannya, subjek mampu menterjemahkan kefahaman al-Ibtila' dari sudut amalan iaitu menerima apa yang berlaku secara positif.

3.3 Perkaitan Antara Kefahaman Konsep al-Ibtila' Dengan Pembangunan Sahsiah

Item soal selidik yang dibina mengandungi pernyataan tentang aspek perasaan subjek, kesan banjir terhadap diri, tahap kesan hubungan kefahaman dan pembangunan sahsiah dari aspek fizikal, kognitif, emosi, perilaku dan sosial dan tahap kesan hubungan kefahaman dan pembangunan sahsiah dari aspek pengetahuan agama, akidah, amalan agama, kehidupan keluarga, pencarian rezeki dan hubungan akhlak selepas banjir.

i- Analisis menunjukkan terdapat perbezaan signifikan terhadap tahap perkaitan antara kefahaman al-Ibtila' dengan pembangunan sahsiah dari aspek perasaan. Majoriti subjek menghayati perasaan positif dalam mempercayai kekuasaan Allah. Secara tidak langsung ia mempengaruhi pembangunan sahsiah mangsa banjir dengan memiliki perasaan positif menerima al-ibtila'.

ii- Analisis menunjukkan terdapat perbezaan signifikan terhadap tahap hubungan kefahaman dan pembangunan sahsiah dari aspek kesan banjir terhadap diri. Majoriti subjek menerima ujian banjir dengan perasaan sabar, tawakal, syukur, reda dan berlapang dada apabila mereka memilih item positif. Minoriti daripada mereka memilih item negatif yang memaparkan perasaan marah, kecewa, putus asa, takut, murung, sedih dan rasa bersalah.

iii- Analisis menunjukkan kesemua aspek sahsiah yang dikaji adalah signifikan iaitu terdapat perkaitan kefahaman al-Ibtila' dengan pembangunan sahsiah dari aspek fizikal, emosi dan perilaku dan sosial kecuali kognitif. Dapatan ini menunjukkan penerimaan terhadap al-Ibtila' sebagai ujian dan hikmah dari Tuhan dan bukannya penderitaan yang negatif.

iv- Analisis menunjukkan kesemua aspek kehidupan yang dikaji terhadap subjek adalah signifikan yang meliputi aspek pengetahuan agama, akidah, amalan agama, kehidupan keluarga, pencarian rezeki, hubungan sesama masyarakat melainkan aspek akhlak dan pembangunan jiwa.

Berdasarkan temu bual yang dijalankan pula, kesemua subjek mengakui bencana banjir memberi kesan terhadap diri mereka namun hanya pada aspek fizikal seperti keletihan berbanding kesan psikologi. Gejala trauma seperti rasa sedih berlarutan, bersalah, marah dan lain-lain tidak berlaku. Keyakinan terhadap al-Ibtila' dilihat melahirkan sifat positif seperti lebih bersemangat tinggi dan berkecenderungan mahu membantu mangsa banjir yang lain. Dari sudut pengetahuan agama, subjek mengakui keinginan untuk terus mempelajari agama Islam. Dari sudut kehidupan berkeluarga, bencana banjir dilihat tidak menjejaskan upaya mereka untuk lebih bertanggungjawab terhadap keluarga. Dari sudut hubungan kemasyarakatan, subjek mengakui hubungan antara penduduk kampung yang lebih erat merupakan hikmah di sebalik bencana banjir yang berlaku. Kerjasama yang dijalankan sewaktu banjir berlaku memberi peluang kepada mereka untuk lebih kenal mengenali di antara satu sama lain. Kesimpulannya, kefahaman dan kesedaran berkenaan al-Ibtila' memberi pengaruh terhadap pembangunan sahsiah subjek. Walaupun diakui bencana banjir sebagai ujian yang berat untuk dihadapi namun mereka memilih untuk mengambil sikap positif berbanding aspek negatif yang boleh menyebabkan kesan trauma berpanjangan terhadap diri.

4.0 Kesimpulan

4.1 Wujud hubungan signifikan antara kefahaman mangsa banjir berkenaan konsep al-Ibtila' dengan pembangunan sahsiah mereka.

4.2 Keyakinan berkenaan ketentuan Tuhan dan hikmah di sebalik ketentuan tersebut dilihat memberi peranan penting ke arah pemulihan dan pembentukan sikap-sikap positif.

4.3 Kesedaran beragama memberi pengaruh terhadap emosi seperti rasa tenang, tenteram, lepas dari ketegangan atau tekanan, sabar, tabah dan pasrah.

4.4 Cadangan kepada pihak berwajib agar selain menyediakan sumbangan bersifat fizikal seperti peralatan dan kewangan, mereka juga disyorkan menyediakan khidmat sokongan terhadap psikologi mangsa banjir.

4.5 Persediaan mental dan spiritual kepada mangsa banjir perlu dilestarikan oleh semua pihak khususnya dalam kerangka pengurusan pasca banjir negara seperti menyediakan kemudahan kaunseling dan psikoterapi Islam serta menganjurkan pengajian akidah dan tasawuf

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COPING WITH PSYCHOLOGICAL DISTRESS AMONG WORKERS INVOLVED IN FLOOD DISASTER IN KELANTAN

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1.0 Introduction

While there were many studies done looking at the psychological impact of flood disaster to victims, similar studies among rescue workers like firefighters and JPAM are still limited. Studies have found that PTSD prevalence among first responders' ranges from 10 to 20%, which is intermediate between the prevalence rates of direct victims of disasters (30 to 40%) and the general population (5 to 10%) [8,9]. Whereas prevalence of psychological distress among rescue workers was widely varied depending on the disaster factors such as nature and intensity. Sociodemographic characteristic, work experience and exposure and coping strategies adopted by the rescue workers also contribute to the risk of psychological distress among workers exposed to a disaster.

This study aimed to determine the prevalence of psychological distress among medical and non-medical (firefighters and JPAM) rescue workers on duty during the 2014 flood disaster in Kelantan and its association with sociodemographic and work characteristic also coping strategy used by the rescue workers.

2.0 Methodology

This cross sectional study was conducted between June to september 2015 which is 6 months after the flood disaster. A simple random sampling method was used to select 160 subjects for each medical and non-medical (Bomba and JPAM) rescue workers who were on duty on the 18 to 28 Dec 2014 into the study. The study include worker who were in duty during the disaster period and can understand Malay, whereas those workers with known psychiatric disorders, organic brain disease, cognitive or intellectual impairment were excluded. A newly developed proforma was used to gather the socio-demographic profile, job characteristics and flood related events. While a Malay translated and validated Impact Event Scale -Revised (IES-R) and Brief-COPE-Malay version were used to detect PTSD and types of coping strategies respectively.

The IES-R is a self-report scale used to assess subjective distress in the past 7 days in relation to a particular traumatic events (8). It is rated by the four point Likert scale ranging from "not at all" (score zero) to "extremely" (score four). The IES-R Malay version used in this study had been translated and validated by Shahril et al (unpublished). It shows good reliability with Raykov's reliability rho of 0.92 for psychological domain and 0.84 for behavioral domain (9). This scale corresponds to 14 of the 17 DSM-IV symptoms of PTSD symptoms with a total score ranging from 0 to 88. Those who scored 33 and above was categorized as having PTSD (10).

The Brief-COPE–Malay Version used in this study to measure specific efforts, both psychological and behavioral that people perform to master, tolerate, reduce or minimize stressful events. This scale comprises of 28 items, is rated by the four-point Likert scale, ranging from "I have not been doing this at all" (score one) to "I have been doing this a lot" (score four) with higher score represents greater coping strategies. The Brief-COPE–Malay Version had been translated and validated into Malay language with reported internal consistency of 0.83 (11).

Data were entered and analyzed using IBM SPSS Statistics 22. Socio-demographic, job characteristics and flood related events were summarized using mean (SD) and frequency (%). Both univariable and multivariable analyses were performed to determine the associated factors for PTSD among rescue workers. For univariable analysis, simple logistic regression was used as a screening in selection of variables for further steps in multivariable analysis. Variables with P-value of less than 0.25 were selected for multivariable analysis. All selected independent variables were analyzed using forward stepwise likelihood ratio (LR), backward stepwise likelihood ratio (LR) and then manually using enter variable selection method to obtain a preliminary model. Multicollinearity problem and all possible two-way interactions were checked. Then, preliminary final model was obtained. Fitness of model was tested by Hosmer-Lemeshow goodness-of-fit test. The classification table and receiver operator characteristic (ROC) curve were also used to determine the fitness of the model. The results

were presented in adjusted odds ratio with 95% CI and P-value. P value of less than 0.5 was considered as statistically significant.

3.0 Results and Discussion

3.1 Sociodemographic and work characteristics

A total of 160 subjects from each medical and non-medical workers were recruited into the study. Their sociodemographic and work characteristic were as presented in the table 1 below.

Table 1 : Sociodemographic and work characteristics of the respondents

Variables	Mean (SD)	Frequency (%)
Age	38.5 (9.43)	
Sex Male Female		 168(52.5) 152(47.5)
Marital Status Single Married Divorce/widow		 55(17.2) 259(80.9) 6(1.9)
Education Level Secondary School Diploma Degree Master and above		 193(60.3) 77(24.1) 39(12.2) 11(3.4)
Occupation Doctor Nurse Medical Assistance Healthcare Assistance Officer Lower ranks		 18(11.2) 79(49.4) 9(5.6) 54(33.8) 26(16.3) 134(83.7)
Work characteristic		
Had experience as rescue worker		153(47.8)
Had pre-disaster training		153(47.8)
Had psychological training (PFA)		0(0.0)
Total days in rescue work	8.9(10.00)*	
Total hours per day in rescue work	21.5(13.00)*	
Role during the disaster Rescue Workers Victim and rescue workers		 85(26.6) 235(73.4)
Had loss of family member due to flood		6(1.9)
Had flood related property damage		173(54.1)
Receive basic need assistance		192(60.0)

3.2 Coping strategies used by the rescue workers

The study also examined type of coping strategy used by the rescue workers. Table 2 showed the most and least common coping strategy used by the rescue worker during the flood disaster.

Table 2: Coping strategies used by the rescue workers

Type of coping strategies	Mean	SD
Self-distraction	4.44	1.583
Active Coping	2.91	0.983
Denial	3.24	1.027
Substance Abuse	4.49	1.571
Use of emotional support	3.33	1.350
Use of instrumental support	4.59	1.540
Behavioral Disengagement	3.23	1.275
Focus on and Venting of emotion	3.53	1.256
Positive reinterpretation	4.30	1.530
Planning	4.11	1.309
Humor	3.79	1.259
Acceptance	4.94	1.839
Religion	2.64	1.149
Self-blame	4.15	1.236

3.3 Prevalence of PTSD among rescue workers

Based on IES-R assessment done at 6 months post-disaster the total prevalence of PTSD among the rescue workers was 16.6% and when comparing the two groups non-medical rescue workers had higher prevalence of PTSD than the medical rescue worker (20.6% vs 12.5%, p-value: 0.53). The 20.6% prevalence of PTSD in this study is significantly high when compared to the 28% prevalence reported in more serious earthquake disaster in Yogyakarta which caused hundreds of thousands people lost their homes, 37000 injured, and more than 6000 were killed (17). Possible explanations for the high prevalence could be due to the fact that flood disaster is a rare occurrence in the country as the last reported flood disaster was in 1927. Though this flood disaster was slightly less intense. Lack of physical (1575 non-medical and 250 medical personnel chartered for more than 20,000 flood victims) and psychological preparation (pre disaster training, but no psychological first aid) could be another possible explanation for the high prevalence.

3.4 Prevalence of PTSD and the associated factors

As shown in the table 3 below, after multiple logistic regression analysis 3 variables which is having degree and used of behavioral disengagement and denial were remain significantly associated with the prevalence of PTSD. However there was no significant association seen with other sociodemographic and work characteristics such as sex, marital status, and income.

Table 3: Multiple logistic regressions of factors associated with PTSD

Variable	Wald statistic	Adjusted OR (95.5 CI)	p-value
Education Degree	8.778	0.25(0.10,0.62)	0.034
Coping strategy used Behavioural disengagement	11.426	2.15(1.38,3.34)	0.012
Denial	4.159	2.14(1.03,4.44)	0.041

The study find that rescue workers with higher level of education (degree or above) had lower risk for PTSD. Whereas the use of behavioural disengagement and denial coping strategies put them twice or more likely to develop PTSD following to the exposure to the flood disaster. This finding was consistent with a study by McFarlane (1989) which showed that used of less-adaptive coping strategy like avoidance (behavioral disengagement) and emotion focused coping like denial was associated with poor psychological outcomes.

4.0 Conclusion

The 20.6% prevalence of PTSD in this study is comparably high when matched with the previous studies of more serious disaster. Rare occurrence ad lack of physical and psychological preparation had been suggested to be the possible explanation for this high prevalence of PTSD among rescue workers following the 2014 flood disaster. The study also found that the prevalence of PTSD significantly associated with level of education and used of certain coping strategies. Natural disaster has becoming more frequently uncounted hence pre-disaster training of the rescue workers in the future should include psychological preparation training such as psychological first aid.

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EXPLORING EMOTIONAL DISTRESS AND RESILIENCE IN ADOLESCENT AFFECTED BY FLOOD IN KELANTAN AND THE DEVELOPMENT OF PEER SUPPORT GROUP FOR TRAUMA MODULE

Project Information

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1.0 Introduction

Disaster can give a large impact on the children's psychological wellbeing. They might experience post-traumatic stress disorder (PTSD) which can be comorbid with depression as well as suicidal ideation (Bokszczanin, 2007, Lau et al., 2010, Lai et al., 2013). These symptoms not only present just after the disaster, it can remain high even after years (Liu et al, 2011, Ghazali et al., 2013)

The most important predictors of long-term posttraumatic stress were symptoms of acute and short-term posttraumatic stress, depression, anxiety, and parental posttraumatic stress, low social support, peri-trauma, fear, perceived life threat, social withdrawal, comorbid psychological problem and poor family functioning (Eva et al., 2011, David et al. 2012). The aim of this study was to determine the factors associated with psychological trauma among children affected by flood in Kelantan.

2.0 Methodology

2.1 Validation Study of The Questionnaires

The English version of Sense of coherence (SOC) (Antonovsky, 1993) questionnaire was translated by bilingual experts in psychiatry. The Sense of Coherence (SOC) Scale is a multi-dimensional scale that assesses how people view life and, in stressful situations, identify, use and reuse their general resistance resources to maintain and develop their health. It consists of 13 items which includes three domains; Comprehensibility, Manageability and Meaningfulness. A high score indicates a stronger SOC. Reliabilities of SOC were between 0.74 and 0.91 (Antonovsky, 1993). A validation study of preliminary 13 questions of Malay version SOC-M was conducted among a sample of 160 secondary school children.

Another study was conducted to validate the Malay version of the Trauma Screening Questionnaire (TSQ-M) in another selected school in Kelantan involving 141 secondary school students. The TSQ-M is a 10-item self-rated questionnaire for use with survivors of all types of traumatic stress. It consists of 5 re-experiencing and 5 arousal items. The TSQ was validated for the local population; showed internal consistency Cronbach alpha of 0.73 and concurrent validity with the Clinician- Administered PTSD Scale 0.57. At the optimal cut-off score of 5, the sensitivity, specificity, positive and negative predictive values are 0.80, 0.85, 0.48 and 0.96 respectively (Jaafar et al., 2014).

The data analysis was done in R Studio version 0.98.1103 (R Studio team, 2015) utilizing R version 3.2.2 (R Core team, 215). The questionnaires were investigated for their psychometric properties by confirmatory factor analysis (CFA) using lavaan package (Yves, 2012).

2.2 Study on The Adolescents Affected By The Flood

Subjects: 160 form four students from a school which was located in a village that was severely affected by flood in December 2014.
Instruments: Socio-demographic variables, TSQ-M and SOC-M
Data analysis: Statistical Package for the Social Sciences (SPSS) version 22 was used. Descriptive statistics were used to describe the socio-demographic features of the participants, trauma and the resilience scores. Chi-square, independent t test, Pearson correlation and linear regression analysis were used to determine the relationship between socio-demographic factors, trauma and resilience.

3.0 Results and Discussion

3.1 Phase 1

In this study of SOC-M, it was found that 3-factor model could not be fit due to non-positive definiteness and multicollinearity problems. Thus, one-factor model was favored with the mean score was 48.5 (SD=9. 01). Two questions were deleted; Q4 from meaningfulness domain and Q11 from comprehensibility domain due to low factor loadings and poor model fit if the questions were retained.

For TSQ-M, one question (Q9) was deleted due to very low and insignificant factor loading. The mean score of TSQ-M was 4.2 (SD=2.07). The model fit indices and other psychometric properties of the SOC-M and TSQ-M are summarized in Table 1.

Table 1: Model fit indices, factor loadings and reliabilities of SOC-M and TSQ-M.

Questionnaires	Fit indices	Questions	Factor loadings	Reliabilities[a]
SOC-M one-factor model	χ^2 (df)=77.2 (38), *p*<0.001 CFI/TLI=0.93/0.90 WRMR=0.72 RMSEA=0.08 (90% CI: 0.05, 0.11), CFit *p*=0.03	Q1 Q2 Q3 Q5 Q6 Q7 Q8 Q9 Q10 Q12 Q13	0.43 0.31 0.33 0.34 0.62 0.58 0.61 0.71 0.40 0.41 0.62	0.77
TSQ-M one-factor model	χ^2 (df)=77.2 (38), *p*<0.001 CFI/TLI=0.93/0.90 WRMR=0.72 RMSEA=0.08 (90% CI: 0.05, 0.11), CFit *p*=0.03	Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q10	0.68 0.56 0.49 0.50 0.53 0.25 0.48 0.30 0.52	0.60

WLSMV estimation method was applied.
Abbreviations. CFI comparative fit index, TFI Tucker-Lewis Fit index, SRMR standardized root mean square residual, RMSEA root mean square error of approximation, CFit close fit.
[a] Raykov's rho.

3.2 Phase 2

From 160 participants, male were 86 (53.8%) and female were 74 (46.3%). The mean age was 16.5 (SD=0. 53). Table 2 illustrated the socio-demographic and flood experience of the participants as well as the consequences of the flood.

Table 2: Socio-demographic, flood experience and consequences

	Variables	n(%)	Mean (SD)
Socio-demography			
Number of siblings			5.82(2.84)
Family income (RM)	<1000	126(78.80)	
	1000-3000	23(14.40)	
	3000-5000	7(4.40)	
	5000-10000	3(1.90)	
	>10000	1(0.60)	
Flood experience			
Involvement in the flood	Yes	135(84.40)	
	No	25(15.60)	
Duration of affected (days)			5.94(3.14)
Moving from home	Yes	108(67.50)	
	No	52(32.50)	

Duration of moving (days)			4.32(3.89)
Previous experience	Yes	55(34.40)	
	No	105(65.60)	
Flood consequences			
Effect of flood	House damage	47(29.40)	
	property damage	60(37.50)	
	Physical injury	0(0)	
	No effect	53(33.1	
House condition	Total loss	4(2.50)	
	Damage-unsalvage	16(10.00)	
	Damage-repaired	76(47.50)	
	Not affected	64(40.00)	
Place to stay after the flood	same house	149(93.1)	
	other places	11(6.9)	
Difficulty	Yes	67(41.90)	
	No	93(58.10)	
Degree of difficulty	No	93(58.10)	
	Minimal	28(17.50)	
	Moderate	31(19.40)	
	Severe	6(3.80)	
	Very severe	2(1.30)	

The mean score of TSQ-M and SOC-M was 2.81 (SD=1.70) and 48.58 (SD=9.02) respectively. Four factors associated with trauma score, including sex (p=0. 047), moving from home (p= 0.013), having difficulty after the flood in relation to schooling such as damage of books and school uniforms and living, for example, financial and basic needs (p=0. 024) and the place to stay after the flood, for example, had to stay in a tent or relative's house (p=0. 005). There was a negative correlation between TSQ-M score and SOC-M (r=-0.23, p=0.003). On further analysis using linear regression, three factors had significant association with trauma score which were moving from house, the place to stay after the flood and SOC-M

4.0 Conclusion

The trauma score was found to be associated with moving from house and place to stay after the flood. Majority of flood victims who needed to move from their house went to flood evacuation center. The unsatisfactory condition of the flood evacuation center like the basic utilities, food and privacy may contribute to their trauma compared to those who remain in their house. In addition, the unexpected severity of floods caused the number of flood victims increased beyond the facilities provided.

Even though the duration of staying at flood evacuation center was ranging from one to eight days, some of the victims were unable to go back to their house because of the house was severely damaged or total loss. They were either staying in the tent or at their relative's house. Without the permanent place to stay after the flood, it was explained why they feel more traumatized than others

SOC-M had negative correlation with a trauma score, which means that those who were more resilient, less traumatize they were. The similar finding was also found in many previous studies (Daud et al., 2008, Kukihara et al., 2014).

There were some limitations in this study. Selection of only one school and one affected area might affect the findings in view of traumatic experiences. The child version of TSQ-M could not categorize the students into trauma and non-trauma group, thus could not generate the prevalence of trauma after the flood. Further study need to be conducted to look into the specificity and sensitivity of TSQ-M to be used in children Factors associated with trauma could not be explained in detail by conducting the only quantitative study. A mixed method of study is a better option to gather more information from the victims.

In conclusion, the findings of this study were comparable with other study, but a different methodology is suggested to get a better and more informative result.

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PEMBANGUNAN SEMULA KOMUNITI KE ARAH PERTUMBUHAN PASCA TRAUMA (PTG), DAYA TAHAN, KEMAHIRAN DAYA TINDAK DANP ENGURUSAN ISU PSIKOLOGI SOSIAL

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1.0 Introduction

Major flooding in 2014 is said to be the biggest flood events ever experienced in Malaysia. This is because the rose of the water level was extraordinary, between 5-10 meters. Among the worst-hit areas including Kuala Krai, Manik Urai and Dabung. It is said that the main caused of flooding was an extreme rainfall that last for days, started on December 17, 2014 and lasted on December 24, 2014. Ten weather stations in the areas recorded exceptional amount of rainfall between 580-1765mm. Undoubtedly, the major flooding event in 2014 had major impacts in the affected areas. According to records, the estimated cost of damaged stood at RM2.85 billion, involved 500,000 victims, and 25 casualties. Statistics of natural disasters in Asia and Pacific regions from 1970 to 2014 recorded 11,985 cases of natural disasters. Of these, a total of 5139 cases or 42.9% of these cases recorded occurred in Asia and the Pacific. Floods and storms are a type of natural disaster that occurs most frequently recorded in the region (ESCAP, 2015).

Floods affect people both direct and indirectly. Usually, severe floods will destroy properties such as houses, public facilities, roads, schools, hospitals, farms, and commercial buildings. Heavy flooding also causes damage to communication facilities that are critical to the public such as radio, television, telephone and Internet line. The risk of death and injury are also high during the flood. All of these factors have certainly increased the level of anxiety, stress and depression among victims. Images of the floods will linger and remain in victims' minds/memory. Victims also suffer from what they observed and experienced from communities that are severely affected by floods.

Studies of natural disasters found that flood has long-term potential impact on victims. In fact, several studies have found that natural disasters affect mental healths more than physical. For example, a study conducted in the aftermath of Sri Lanka on tsunami victims found that around 21% of the subjects with PTSD, 16% of the subjects suffered from depression and 30% of subjects experienced anxiety. In terms of coping strategies, the study also found that the majority of subjects gained their power for recovery from social networks such as family and friends, hospital facilities and spirituality/religion (Hollifield, Hewage, Gunawardena, Kodituwakku, Bopogoda and Weerarathnege, 2008). Further, one post-disaster study conducted on victims of the earthquake in China also found that victims suffered from post traumatic stress disorder (PTSD) (Wang, Ni, Chen, Liu, Wang and Shao et al., 2010). These studies are consistent with the findings of previous research that found that victims of natural disasters who have lost their homes, the death of family members, and suffered the injuries have a higher likelihood to suffer from PTSD (Nolen-Hoeksema & Morrow, 1991; Norris & Uhl, 1993). Another evidence is a study by Bodvarsdottir and Malkit (2004) that examined the psychological reactions of those affected by the earthquake in Icelandic. A total of 52 victims involved in the study. The study showed that after 3 months of the incident, 24% of victims suffered from PTSD. Ehring, Razik and Emmelkamp (2010) also conducted a study on volunteers who help the earthquake victims in Pakistan to see the level of PTSD, anxiety and depression. The results showed a large number of subjects experiencing emotional disorders, PTSD, anxiety and depression. There is consistency effects of natural disasters on the psychological well being of people who directly affected by natural disasters. Udwin, Boyle, Yule, Bolton and O'Ryan (2000) concluded that psychological stress reactions after a disaster are serious and permanent.

However, not all individuals who have been faced with a natural disaster will suffer psychological pain as a result of that experience. There are still many individuals who are resilient, who sad resulting from losing someone they love but managed to recover and back to their normal functions. Among factors that are said to play an important influence in helping individuals to bounce back from the bitter experience are resilience and coping strategies. These individuals will grow from their experience even after experiencing many difficulties, known as post-traumatic growth. Post traumatic growth (PTG) is a term used to describe the positive psychological change experienced as

a result of psychological and cognitive strategies in dealing with challenging situations (Calhoun & Tedeschi, 2001). PTG is an individual who is struggling to cope with the new reality after the traumatic experience that will ultimately determine whether the PTG will last (Tedeschi and Calhoun, 2004). Tedeschi and Calhoun (1996, 2004) describes the PTG has four (4) main domains, namely: personal strength, new possibilities, relating to others, appreciation of life, and spiritual change. Resilience refers to the ability to deal with change (Bonano, 2004). Resilience is a transformative process, which is characterised by three interrelated dimensions: recovery, resistance, and reconfiguration (Lepore & Revenson, 2006). PTG is said to be the positive changes in the level higher, after one is dealing with extreme experiences such as trauma. Past studies have found a positive relationship between PTG and resilience (Bensimon, 2012). Resilience and PTG are influenced by several factors such as stress level, personality characteristics and coping strategies (Linley & Joseph, 2004).

2.0 Methodology

This study used quantitative research design. Specifically, this study used questionnaires to collect data. The aim of this study was to examinet the level of hopelessness, anxiety, depression, post-traumatic growth, resilience, and coping strategies among the flood victims in Pantai Timur. Specifically, the objectives of this study were to examine: (1) the level of hopelessness; (2) the level of anxiety; (3) the level of depression; (4) the level of post traumatic growth; (5) level of resilience; and (6) coping strategies among the flood victims. For the purposes of this study, a total of 570 respondents participated in the survey. All respondents involved had been previously identified as flood victims and were came from Kelantan, Terengganu and Pahang. These three states had been most severely affected by the large flood in 2014.

There are six inventories used in this study: Beck Hopelessness Inventory (BHI) to measure hopelessness, Beck Anxiety Inventory (BAI) to measure anxiety, Beck Depression Inventory (BDI) to measure depression, Post Traumatic Growth Inventory (PTG) to measure post-traumatic growth, Connor-Davidson Resilience Scale for measuring resilience, and Brief COPE Inventory (BCI) to measure coping strategies. The questionnaire consisted of 133 items in total. Specifically, the number of items for each inventories are as follow: BHI (20 items), BAI (21 items), BDI (21 items, TGI (10 items), Connor-Davidson Resilience Scale (25 items), and BCI (28 items). The remaining eight (8) items were related to respondents' demographic data. The questionnaire used a dichotomous scale (Yes/No) and Likert format scale for the response format. The reliability of the scale was measured using Conbrach's Alpha and Spearman-Brown coefficient. The results showed that all inventories being used have a high degree of coefficient between .708 to .934.

3.0 Results and Discussion

Table 1 below is the demographic characteristics of respondents in this study. A total number of 570 respondents participated in this study.

Table 1: Demographic Characteristics of Respondents

Variables	Characteristics	Frequency	Percent
Gender	Male	319	56
	Female	251	44
Race	Malays	549	96.3
	Chinese	13	2.3
	Indian	8	1.4
State	Kelantan	352	61.8
	Terengganu	79	13.9
	Pahang	139	24.4
Religion	Islam	550	96.5
	Buddha	12	2.1
	Kristian	3	.5
	Hindu	5	.9
Marital Status	Single	222	38.9
	Married	316	55.4
	Divorce	32	5.63
Employment Status	Students	94	16.5
	Permanent Job	196	34.4
	Unemployed	169	29.6
	Odd Job	111	19.5
Education Level	School Drop Out	42	7.4
	Primary School	59	10.4
	SRP	60	10.5
	SPM	190	33.3

	STPM	28	4.9
	Sijil Kemahiran	30	5.3
	Diploma	89	15.6
	Degree	58	10.2
	Master	14	2.5

Table 2 and Table 3 are the results of the psychological well-being for hopelessness, anxiety, depression, resilient, post traumatic growth and coping strategies.

Table 2: Level of Hopelessness, Anxiety and Depression

Level	Hopelessness		Anxiety		Depression	
	Frequency	%	Frequency	%	Frequency	%
No symptoms					403	70.7
Low	41	7.2	413	72.5	115	20.2
Moderate	475	83.3	117	20.5	51	8.9
High	54	9.5	40	7.0	1	.2
Total	570	100	570	100	570	100

Table 3: Level of Resilience, Post Traumatic Growth and Coping Strategies

Level	Resilience		Post Traumatic Growth		Coping	
	Frequency	%	Frequency	%	Frequency	%
No symptoms			13	2.3		
Low	9	1.6	28	4.9	87	15.3
Moderate	268	47.0	128	22.5	460	80.7
High	293	51.4	401	70.4	23	4.0
Total	570	100	570	100	570	100

Table 4**:** Coping Style Scores

Brief COPE coping style	Mean	SD
Religion	6.40	1.37
Acceptance	5.80	1.35
Active coping	5.64	1.20
Positive reframing	5.60	1.37
Planning	5.57	1.34
Instrumental support	5.53	1.34
Emotional support	5.13	1.39
Self-distraction	4.86	1.48
Venting	4.76	1.49
Self-blame	3.88	1.76
Denial	3.84	1.64
Humor	3.70	1.59
Behavioral disengagement	3.60	1.71
Subtance abuse	2.70	1.46

Studies found that among psychological problems being measured (hopelessness, anxiety and depression), hopelessness scored higher compared to other domains. In the results, it was indicated that the majority of respondents reported moderate level for hopelessness. This is contrast to both anxiety and depression domains in which the majority of respondents reported to had low level of anxiety and depression. However, there were also respondents who scored high for hopelessness, anxiety and depression domains, despite only a few. Hopelessnesss had the highest number of respondents with high score level (9.5%) followed by anxiety (7.0%) and depression (.2%). These findings are consistent with previous studies that showed respondents were experiencing PTSD, depression and anxiety after the occurrence of natural disasters (Hollifield, Hewage, Gunawardena, Kodituwakku, Bopogoda and Weerarathnege, 2008). For psychological positive which included resilience, post traumatic growth and coping strategies, it was found that the majority of respondents reported high level scores for both resilience (51.4%) and post traumatic growth (70.4%) domains. However, coping strategy domain showed that the majority of respondents had moderate score (80.7%), compared to high level score (4.0%). In other words, there was a positive experience occurred, as a result of cognitive and psychological strategies in dealing with major flooding. Also, there was an effort to adapt to the changes that have occurred. Religious beliefs and religious

practice have been identified as an important factor contributing to the growth (Calhoun et al., 2000). The struggle to overcome hardship may result in a better relationship with religion and a better understanding of the spirituality issue (Park et al., 1996). In fact, there are empirical studies say there is a positive relationship between religion / spirituality, cognitive processes and perceived growth (Calhoun et al., 2000; Prati & Pietrantoni, 2009). Studies on coping strategies have found religion as a strategy that had used most often by respondents. Conversely, substance abuse was the least used mechanism to tackle the problem/difficulty. These findings are consistent with previous studies that have found that victims deal with the problem by securing the support of social networks such as family and friends in addition to using religious approach (Hollifield, sewage, Gunawardena, Kodituwakku, Bopogoda and Weerarathnege, 2008). Comparative analysis of the psychological aspects of well-being between the sexes shows differences between men and women in domains hopelessness and anxiety. This is consistent with the findings of earlier studies that show that there are differences between men and women in terms of scores of anxiety, stress and depression (Sankar & Amin, 2016). But for another domain it did not show any significant differences.

4.0 Conclusion

Natural disasters are natural phenomena which can not be easily controlled and predict. Therefore, preparation for natural disasters is critical not only in terms of physical preparation such as technology and physical security aspects but also psychological preparation. There is a consistency in the research findings on the impact of natural disasters on the psychological well-being of victims affected by natural disasters. Therefore, there is a need to identify risk factors that can increase the likelihood of individuals to be affected by natural disasters so that preventive measures can be taken early. In addition, the stabilization of protective factors such as coping strategies and resilience must be strengthened so that victims can bounce back from difficult situations without adversely affected. Finally, there is the need of developing psychological modules specifically to help victims of natural disasters to learn the techniques, skills and knowledge necessary to better cope with disaster.

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PEMBINAAN MODUL KAUNSELING KEHILANGAN YANG SIGNIFIKAN DAN GRIEF DALAM KALANGAN MURID TERKESAN BANJIR

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1.0 Pengenalan

Fenomena bencana alam seperti bencana banjir sudah tidak asing lagi di negara ini. Namun kejadian bencana banjir yang berlaku pada 25 Disember 2014, merupakan sejarah hitam bagi penduduk di negeri-negeri yang terjejas teruk akibat bencana ini. Negeri-negeri yang terlibat adalah Kelantan, Terengganu, Pahang, Johor dan Perak. Kelantan merupakan sebuah negeri yang amat teruk terjejas ekoran daripada bencana ini. Maklumat daripada Bernama yang bertarikh 30 Disember 2014, Pengarah Jabatan Kebajikan Masyarakat Negeri Kelantan telah memaparkan statistik mangsa banjir negeri itu, melibatkan 142,582 orang telah ditempatkan di 317 buah pusat pemindahan yang melibatkan sebanyak 35,894 buah keluarga yang terjejas akibat banjir. Justeru itu, sudah pasti daripada 142,582 orang yang dinyatakan di atas adalah juga terdiri daripada golongan murid sekolah menengah dan rendah yang turut menjadi mangsa daripada bencana ini. Golongan murid ini bukan hanya memerlukan keperluan fizikal asas untuk kelangsungan hidup, namun mereka juga merupakan insan yang amat memerlukan keperluan sokongan psikososial bagi berhadapan dengan isu kehilangan dan grief yang dialami. Isu kehilangan terutamanya berpunca daripada aspek fizikal seperti tempat kediaman, kemudahan asas dan keperluan persekolahan telah mengakibatkan grief berlaku dalam diri murid terlibat. Hal ini menampakkan keperluan kajian dalam membina modul kaunseling dalam kalangan murid terkesan banjir khusus kepada isu kehilangan dan grief. Keperluan ini sangat mendesak kerana keperluan psikososial wajar diberi penekanan demi memastikan kelestarian masyarakat, khususnya murid sekolah.

2.0 Methodologi

Pendekatan kajian yang terlibat adalah secara kuantitatif dan kualitatif dalam memperoleh maklumat berkaitan objektif kajian. Kajian kuantitatif melibatkan pengedaran Soal Selidik Banjir dan Rosenberg Self Esteem Scale (RSES) kepada murid mangsa banjir bagi memperoleh maklumat tentang aspek kehilangan dan grief yang dialami oleh murid terlibat. Manakala kajian kualitatif pula melibatkan sesi kaunseling yang diberikan kepada murid terkesan banjir serta temubual separa berstruktur yang dijalankan kepada subjek yang terlibat, kaunselor pelatih dan kaunselor sekolah bagi memperoleh maklumat berkaitan isu kehilangan dan grief serta keberkesanan modul kehilangan yang dibina.

Selain itu, proses pengumpulan data kajian ini telah dijalankan sebanyak tiga fasa iaitu pada April 2015 (N=418), Ogos 2015 (N=343) dan Mac 2016 (N=18). Data yang diperoleh kemudian dianalisis dan nilai kebolehpercayaan soal selidik ialah Cronbach's Alpha .832. Pada fasa ketiga penyelidik meneruskan kajian dengan menjalankan sesi kaunseling dengan murid terjejas banjir berpandukan modul kaunseling kehilangan yang telah dibina. Namun begitu, hanya 18 orang murid terkesan banjir daripada dua buah sekolah di jajahan Kuala Krai dan Gua Musang yang dipilih untuk menjalani sesi kaunseling tersebut. Pemilihan sampel adalah dengan menggunakan teknik persampelan bertujuan dengan memilih murid yang benar-benar terkesan banjir berdasarkan soal selidik yang telah diberikan. Kaunselor-kaunselor yang terlibat juga telah diberi Training of Trainers (TOT) selama empat jam disusuli dengan taklimat ringkas sebelum memulakan setiap sesi kaunseling bersama murid terkesan banjir.

3.0 Hasil Dapatan dan Perbincangan

Seramai 18 orang murid terkesan banjir telah dipilih untuk menghadiri sesi kaunseling berdasarkan modul kaunseling kehilangan ini. Untuk membuktikan keberkesanan modul tersebut beberapa soal selidik telah digunakan seperti Soal Selidik Banjir, RSES dan juga Soal Selidik Maklum Balas Modul yang diberikan kepada subjek terlibat, kaunselor pelatih dan kaunselor sekolah.

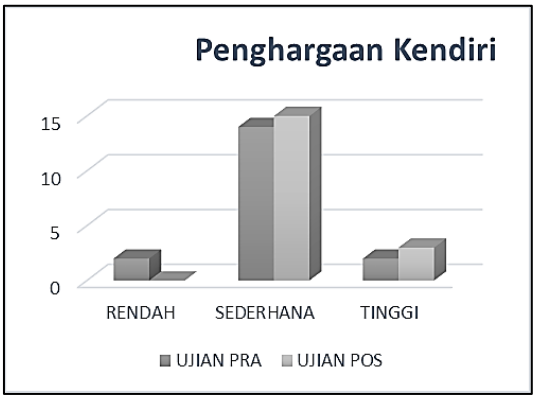
3.1 Soal Selidik Banjir

Jadual 1: Mean Ujian Pre dan Post

	PRE		POST	
	Mean	Std. Deviation	Mean	Std. Deviation
Kognitif	2.99	.319	3.13	.466
Afektif	3.03	.300	3.04	.499
Fisiologi	3.07	.570	3.23	.587
Tingkah laku	3.01	.478	3.21	.529

Berdasarkan jadual 1, selepas menjalani sesi kaunseling, min setiap subjek (N=18) adalah lebih tinggi dari aspek kognitif, afektif, fisiologi dan tingkah laku berbanding sebelum menghadiri sesi kaunseling berdasarkan Modul Kaunseling Kehilangan yang Signifikan dan *Grief*. Hal ini menunjukkan bahawa modul yang dibina berjaya memberi kesan dan impak positif kepada subjek yang terlibat. Menurut Mahyuddin Arsat & Norshahidah Shafie, 2010; Sidek Mohd Noah & Jamaluddin Ahmad, 2005) menyatakan bahawa modul yang dibina perlu mengikuti peraturan dan prosedur yang telah disediakan agar modul yang dihasilkan mampu memberi impak kepada mereka yang menggunakannya. Impak yang terbaik merujuk kepada kesan daripada penggunaan modul iaitu individu berjaya menguasai objektif modul setelah mengikuti modul tersebut. Hal ini menunjukkan bahawa kejayaan individu tersebut sangat bergantung kepada prosedur-prosedur yang harus diikuti oleh pembina-pembina modul dalam menghasilkan sesuatu modul.

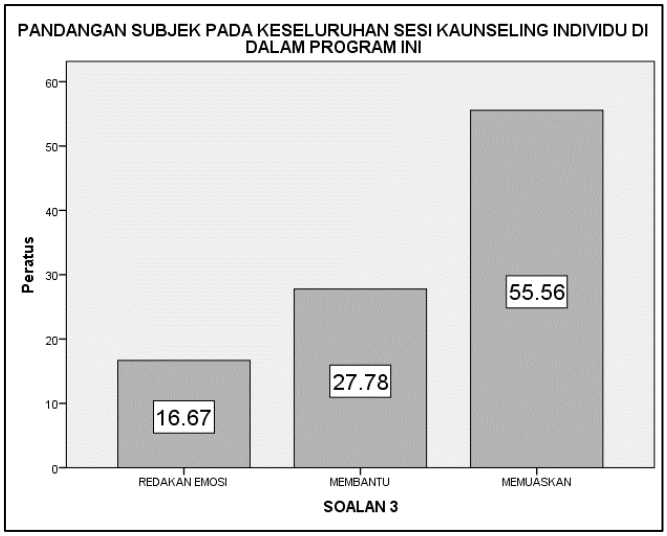
3.2 *Rosenberg Self Esteem Scale* (Skala Penghargaan Kendiri Rosenberg)



Rajah 2 : Penghargaan Kendiri

Rajah di atas menunjukkan perbezaan penghargaan kendiri subjek pada Ujian Pra iaitu sebelum menjalani sesi kaunseling dan pada ujian pos selepas menjalani sesi kaunseling. Ujian Pra menunjukkan 11.1 % (2 orang) subjek mempunyai penghargaan diri yang rendah. Manakala 83.3. % (14 orang) subjek mempunyai penghargaan diri yang sederhana dan hanya 11.1 % (2 orang) mempunyai penghargaan diri yang tinggi. Namun selepas menjalani sesi kaunseling, ujian post RSES menunjukkan bahawa 83.3 % (15 orang) subjek mempunyai penghargaan kendiri yang sederhana dan terdapat peningkatan 16.7% (3 orang) subjek mempunyai penghargaan yang tinggi dan tiada subjek yang mempunyai penghargaan kendiri yang rendah. Dapatan kajian menunjukkan keberkesanan Modul Kaunseling Kehilangan yang Signifikan dan *Grief* terhadap penghargaan kendiri murid terkesan banjir memandangkan terdapat peningkatan dari aspek penghargaan kendiri subjek. Hal ini dapat disokong menerusi pernyataan daripada Kotozaki (2014), yang menyatakan bahawa tahap penghargaan kendiri individu dapat ditingkatkan dengan menjalani terapi.

3.3 Pandangan Subjek tentang Keseluruhan Sesi Kaunseling



Rajah 3: Pandangan subjek tentang Keseluruhan Sesi Kaunseling

Rajah 3 menunjukkan penilaian subjek berkenaan keseluruhan sesi kaunseling yang telah dijalankan. Sebanyak 56% (10 orang) subjek menyatakan secara keseluruhan sesi kaunseling yang dijalankan mengikut modul ini adalah memuaskan. Manakala 28% (5 orang) subjek lagi menyatakan sesi yang dijalankan ini membantu mereka di dalam isu yang diketengahkan. Manakala 16% (3 orang) lagi subjek menyatakan sesi kaunseling individu ini meredakan emosi mereka yang wujud selepas kejadian banjir. Hal ini disokong oleh kenyataan Jamaludin Ahmad (2007), Jamaludin Ahmad, Rosdi Yusof & Siti Rahmah Alias (2011) bahawa modul yang dibina mestilah berupaya untuk menolong individu yang inginkan perubahan berlaku pada orang lain dengan memenuhi syarat-syarat tertentu.

4.0 Penutup

Terdapat beberapa cadangan penambahbaikkan bagi memantapkan lagi Modul Kaunseling Kehilangan Yang Signifikan dan Grief oleh kaunselor sekolah dan kaunselor pelatih. Diantaranya adalah dengan menggalakkan penerokaan secara spiritual disamping memperluaskan modul ini kepada situasi pelbagai seperti peristiwa bencana dan kemalangan lain. Selain itu, terdapat juga cadangan penambahbaikkan dari aspek penekanan dalam membina hubungan serta kesegeraan dalam perlaksanaan modul di peringkat lapangan iaitu sebaik sahaja banjir berlaku, diikuti dengan cadangan supaya modul dipanjangkan kepada 6 sesi kaunseling individu. Selain itu, terdapat cadangan yang mencadangkan supaya modul ini memberi penekanan kepada flaksibiliti jangka masa sesi yang bersesuaian dengan aktiviti yang disenaraikan serta keupayaan klien. Modul ini juga dicadangkan untuk menetapkan jarak masa antara sesi agar menjadi panduan kepada kaunselor yang bakal menggunakan modul ini. Kesimpulannya, kajian ini telah berjaya memaparkan hasil kajian yang menunjukkan beberapa jenis kehilangan signifikan yang telah dialami oleh murid terkesan banjir dan kesan ekoran kehilangan tersebut juga telah diketengahkan. Selain itu, kajian ini juga telah berjaya menunjukkan keberkesanan sesi kaunseling berdasarkan Modul Kaunseling Kehilangan Yang Signifikan dan Grief dalam Kalangan Murid Terkesan Banjir dari perspektif subjek, kaunselor pelatih dan juga kaunselor sekolah. Ternyata Modul Kaunseling Kehilangan yang Signifikan dan Grief dalam Kalangan Murid Terkesan Banjir dapat memainkan peranan sebagai bantuan dan sokongan khususnya dari aspek sokongan moral dan motivasi supaya murid terkesan banjir mampu mengharungi detik-detik sukar ini dengan lebih baik pada masa akan datang.

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FLOOD TRAUMA: THE ROLE OF ISLAMIC RELIGIOUS EDUCATION IN SHAPING PERSONALITY WELL-BEING

Project Information

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1.0 Introduction

Flood can cause severe mental health or emotional consequences to the individuals such as depression and post-traumatic stress disorder, in which it can send shock waves through every aspect of the victim lives due to its tremendous physical and psychological damages. Therefore, to understand the current state of the flood victims in relation to their Islamic religious education in shaping personality well-being; this research employed a comprehensive instrument that describes the various factors affecting the nature of flood victim behaviors such as the state of religious understanding, together with its varied aspects of beliefs systems, structure, the practices of religious principles and values that shape an individual personality.

In this study, particular attention was given to religious personality and knowledge in delineating the role of Islamic background in responding to the flood disaster victims. The issue of Islamic religious education is considered as less reviewed. Though, some other studies in different areas of flood disaster management, such as flood mitigation and flood resilient had been conducted prior. The proficient description on the flood victims psychological effects were described by Nasir, Zainah, and Khairudin (2012). The finding of the study shows that the victims suffered cognitive, emotional and behavioral shortfalls such as fear, anxiety, hopelessness, and depression. Similar to Nasir et al. (2012), Johana Johari and Najib (2013) conducted a study concerning stress, anxiety and depression among flood victim's quality of life in Malaysia. According to them, natural disasters can lead to unpleasant feelings such as depression and anxiety. These factors affect the victims involved which are known as cognitive dissonance where an individual faced with situations that affect their faith in everyday life and caused them to experienced negative emotions.

A framework in the context of Malaysian flood event proposed by Rahaman, Mustaffa, and Ariffin (2014) included social support and impression management as the domains towards the victim's well-being. Besides, Radzi et al. (2014) indicated that the flood victim's well-being has a great influenced by demographic backgrounds such as level of education, income, type of employment, and level of Islamic knowledge. The other factor that might affect well-being is religiosity. Abdel-Khalek and Lester (2013) who studied the relationship between mental health, subjective well-being and religiosity among college students found that a positive correlation between religiosity and well-being were established in that consequence.

Therefore, this study seeks to explore the traumatic event and the influence of religious personality and knowledge among the flood victims in their psychological well-being. In principle, we would like to address further the following question:-

i. What types of traumatic stress faced by the people affected by the recent flood in Malaysia?
ii. What is the relationship between the flood-induced stress, religious personality, religious education/knowledge and the well-being?
iii. Do religious personality and religious education/knowledge mediate the relationship between trauma and well-being?

This study on flood trauma and the role of religious education in shaping personality well-being is aimed to:-

i. Identify the types of traumatic stress faced by the people affected by the flood in Malaysia.
ii. Examine the relationship between the flood-induced stress, religious personality, religious knowledge and the well-being.
iii. Explore whether religious personality and religious knowledge mediate the relationship between trauma and well-being.

2.0 Methodology

This study focuses on two main areas that strongly impacted the flood victims both physically and psychologically. Quantitative data collections have been conducted through questionnaire distributions to the respondents (i.e. previous flood victims) manned by the trained enumerators. A total of 277 respondents (131=Kuala Krai, Kelantan, 146=Temerlon, Pahang) were approached. Trained enumerators administered the questionnaires to the participants. The data obtained from respondents based on the scales given were subjected to reliability analysis using SPSS. The details of the scales are as follows:-

i. The impact of events scales (Weiss & Marmar, 1996);
ii. Muslim religious-personality scales – MRPI (Krauss et al., 2006);
iii. Perceived Knowledge Scales (Krauss et al., 2006);
iv. General health questionnaire-12 (Goldberg, 1978; Noor & Alwi, 2013).

The conceptual framework and the relationship between the four variables are shown in the following Figure 1.

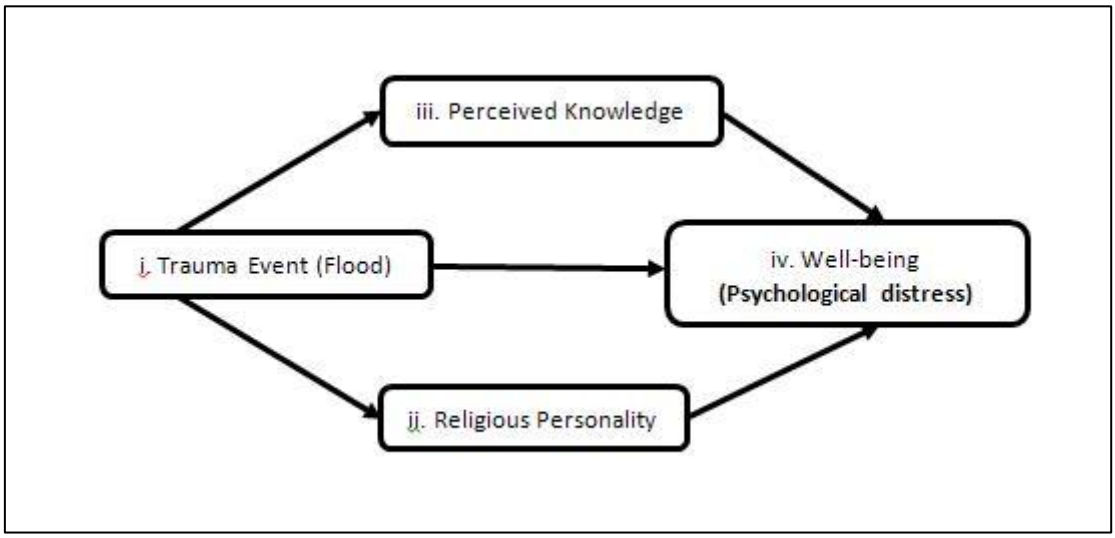

Figure 1: Conceptual framework for measuring processes

3.0 Results and Discussion

Based on the results as in (Tab. 1), the respondents scored a low level of traumatic impact. The scores of IES show that the mean is 33.57, and the SD is 17.7.

Table 1: The results of the impact of trauma, religious personality, religious knowledge and well-being

Code	Variable	N (sample)	Mean	SD
B1	Impact Event Scale (IES)	277	33.68	17.46
	Intrusion	277	12.90	6.59
	Avoidance	277	12.15	7.35
	Hyperarousal	277	8.64	5.47
C1	Religious personality (RP)	277	123.16	18.16
C2	Perceiving knowledge (PK)	277	79.77	17.11

D1	GHQ	277	15.14	6.83

This result is in agreement with what has been underlined by Christianson and Marren (2008). The correlation matrix in Tab. 2 shows all of the variables significantly correlated with GHQ except for religious personality and religious knowledge. The IES and its subscales show positive correlation with the outcome variable (GHQ), in which, it indicated that the higher level of IES, the higher level of GHQ (r= .295, p< .05). High level of GHQ means their well-being is not good condition. For the Religious Personality, there is no significant relationship with GHQ (r= -.069, p> .05). Whereas, Religious knowledge shows a negative correlation with GHQ, which indicated that, the respondents who have high level of religious knowledge, have low level of distress as a good sign for their well-being (r= -.128, p< .01). Therefore, these relationships among those variables are the evident for the relationship between the flood-induced stress and the general well-being.

Table 2: Correlation matrix between the impact of trauma and the other variables.

Variables	1	2	**3**	**4**	**5**	**6**
1. IES	-					
2. Intrusion	.905**					
3. Avoidance	.899**	.687**				
4. Hyperarousal	.894**	.760**	.699**			
5. Religious Personality	.134*	.140*	.122*	.096		
6. Religious Knowledge	.199**	.175**	.215**	.136*	.499**	
7. GHQ	.295**	.301**	.196**	.316**	-.069	-.128*

Note: Significant at ***p< .05,* p<.01*

From a regression analysis, we can see that traumatic event (IES) significantly predicts religious knowledge (RK), b= .195, t= 3.37, p = .001 as a direct effect. The squared multiple correlation coefficients (R^2) value revealed that IES explains 3.97 % of the variance in relationship to religious knowledge, and the b is positive indicated the relationship is positive also; as trauma increases, religious knowledge increases (and vice versa). The religious knowledge (RK) also significantly predicts psychological distress (GHQ), b= -.078, t= -3.37, p = .001. The negative b for religious knowledge indicated that as RK increases, psychological distress (GHQ) decreases (and vice versa). Traumatic event (IES) significantly predicts psychological distress (GHQ), b= .131, t= 5.79, p = .001. The R2 value revealed that IES explains 12.34 % of the variance in relationship psychological distress (GHQ). The positive b for traumatic event (IES) indicated as trauma increases, psychological distress increases (and vice versa).

A measure for the indirect effect of trauma event on psychological distress is also presented after the regression models (b= -.015) with a 95% confidence interval. This represents a relatively small effect, Kappa-squared, κ^2 = .041, CI [.0151, .0858]. These relationships are in the predicted direction as shown in Fig. 2.

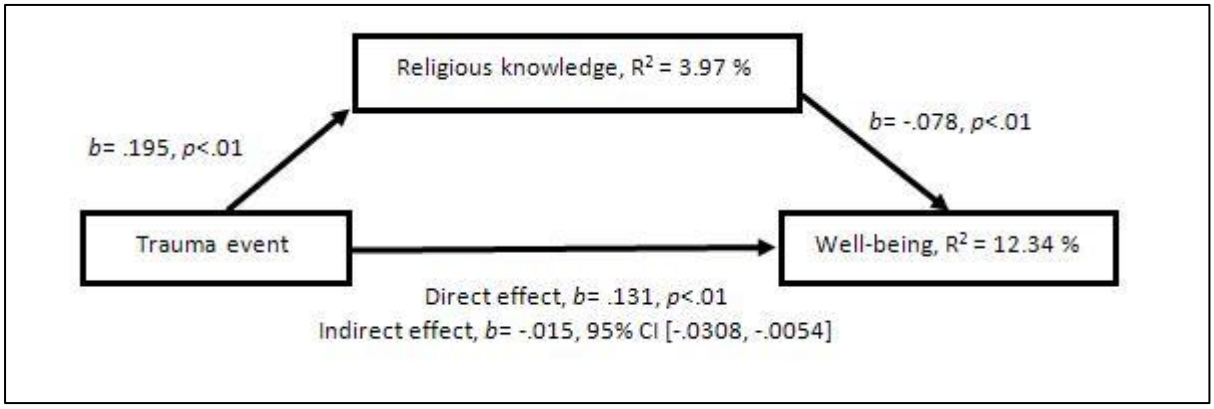

Figure 2: Regression analysis for mediating effect

In short, it is noted that there is a need to explore more on the influence of religious knowledge in mediating the relationship between flood-induced stress and well-being. The regression analysis indicated religious knowledge an important role in mediating the level of trauma and the level of personality well-being. Although a person has a high level of trauma, which is supposed to lead to high level of distress, yet with the high level of religious knowledge, it influenced the relationship between both variables. This strength is due to the fact that religious education provided them with a framework to assimilate the current information, to accommodate challenges and to adjust in according to the obstacles (Pargament, 1994). While Solihu (2007) suggests that God has permitted the possibility of disaster to occur; this very possibility causes His creation to be more meaningful and life rewarding.

4.0 Conclusion

The concept of measuring the role of Islamic religious education in shaping personality well-being of people affected by the 2014 flood disaster, especially in Kelantan and Pahang has been examined. The important findings of the study are summarized as follows:

4.1 This study is significant in providing the evidence that the enhancement of Islamic religious education/knowledge in individual self is a mechanism to lessen/reduce the traumatic stress level during the catastrophic event. Hence this study proofed that the approach of developing the well-being of individual is through the religious education/knowledge. For example, a person has a high level of trauma, which is supposed to lead to high level of distress, yet with the high level of religious knowledge, it influenced the relationship between both variables.

4.2 The total 52.6% of the respondents reported that they acquired religious education through attending Mosque activities and classes. This finding brings the meaning that informal religious education provides a very significant impact on Muslim personality development and well-being.

4.3 This research provide further enhancement to the information in relation to the management of a natural disaster like a flood. The findings can help to refine the psycho-social assessment by considering the religious background of the people who are still traumatized and in needs of continuous consultation, guidance, and motivation to bounce back healthily.

4.4 For the purposes of the Islamic understanding and rationalizing the impact of natural calamities on human well-being such as flood trauma, it is necessary to differentiate between victim to victim and their situations. For example, it is necessary to distinguish between a trauma caused by a disasters that occur due to natural events (or phenomenon or natural law) and continuously observed by the victims with full consciousness from time to time, compare to a trauma caused by the self-misfortunes, negligent and unconsciousness lifestyle that are wrought and done by the victims themselves whom acting contrary to Divine moral values within the time of natural disaster. Without having an appropriate classification between the two types of traumatic symptoms, we will not be able to establish the correct description of trauma faced by the victims of a particular calamity. Consequently, if the type of impact is not correctly identified, there is a chance that any remedial action taken will not produce desired results. Therefore, on the basis of the universal nature of human well-being, the two types of traumatic symptoms coursed by catastrophic events was derived exclusively from the textual analysis of the Holy Quran and should be taken as guidance toward an Islamic understanding in dealing with disaster suffering as such flood trauma.

4.5 The exact religious response to natural calamities may vary from religion to religion as each religion looks at these happenings in according to their perspectives. Generally, religious clergy regards natural hazards such as earthquakes, tsunamis, and floods, as an expression of God's displeasure. This type of communication is known as the indications of the 'wrath of God'. For the Muslims, Christians, and Jews it is also very common to correlate physical disasters with calamities that befell the opponents of the previous Prophets as mentioned in the Qur'an and the previous holy books. Consequently, the impact of the trials and traumatic experiences and with total submissions toward the Almighty (Allah SWT) compelled the believer ability to develop a kind of personality such as:-

i. Able to remove the characters of arrogance, false pride and negligence and man come to realization of their weaknesses in many things and really need the guidance of the Creator, the Almighty, the Most Perfect, and then resort to Him for everything.
ii. Able to remind man of the nature of this life and that he should not become attached to it since this temporal life is only amusement and play together with toil/hustle and fatigue/exhaustion.
iii. Able to remind the believer to avoid being in a state of joy such that they feel arrogance and likewise to avoid a state of sadness and grief such that one feels despair.
iv. Able to remind the believer that whenever there is a test there is a reward and that this cannot be attained except with patience and patience cannot be attained except with a strong will and faith. We should not forget to remember Allah and be thankful for His favors and be patient upon His tests and trials.

Finally, it can be concluded that Flood traumatic stress is a picture of the internal psychological state and condition of the defeated victims, their self-perception and attitude towards the disaster. Consequently, in certain cases and scenarios, this calamity make them lost their sense of religiosity, honor, and self-respect that affects their core personality, feeling unable to change anything, helpless, to persuade, to earn, to escape. However, on the positive side, many people cope with traumatic or stressor events on the basis of their religious beliefs. This coping ability is due to many factors such as their religiousness behaviors and spirituality development through the internal quest of understanding and belief system about the meaning of worldly life and Resurrection World.

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IMPAK BANJIR TERHADAP EKONOMI ENTERPRISE KECIL DAN SEDERHANA (EKS) DI RANTAU PANJANG, KELANTAN

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1.0 Pengenalan

Bencana banjir yang berulang setiap tahun memberikan kesan negatif terutamanya kepada peniaga Enterprise Kecil dan Sederhana (EKS). Mereka terpaksa menanggung kos kerugian akibat kerosakan premis, perabot, kenderaan dan aset. Fokus utama kajian ini adalah untuk (i) melihat kesan ekonomi akibat bencana banjir yang melanda EKS pada tahun 2014 di Rantau Panjang, Kelantan; (ii) polisi kerajaan yang sedia ada untuk menangani bencana banjir tersebut; dan juga (iii) faktor-faktor lain yang memberi kesan terhadap pemulihan perniagaan EKS akibat banjir tersebut. EKS/Perusahaan Kecil Sederhana (PKS) meliputi "perniagaan yang mempunyai jualan tahunan kurang daripada RM300,000 ATAU mempunyai bilangan pekerja sepenuh masa kurang daripada lima orang" (SME Corp. Malaysia, 2013). EKS merupakan penyumbang utama ekonomi negara di mana 97 peratus perniagaan di Malaysia adalah terdiri daripada EKS. EKS dapat membantu masyarakat dalam menyediakan peluang pekerjaan kepada penduduk sekitar, membekalkan barangan dan perkhidmatan, dan juga sebagai perolehan cukai kepada kerajaan. Bencana banjir yang berulang-kali berlaku memberi kesan negatif kepada EKS sama ada dalam jangka masa pendek atau panjang namun kesannya sukar diukur dengan tepat kerana ia bukan hanya melibatkan nilai mata wang tetapi juga merangkumi emosi mereka yang terlibat. Oleh sebab itu, pelan pemulihan bencana adalah penting untuk EKS. Pelan pemulihan banjir merupakan pelan kesinambungan perniagaan sekiranya berlaku bencana yang memusnahkan sebahagian atau semua sumber perniagaan, termasuk peralatan, teknologi maklumat, rekod data dan ruang fizikal sesebuah organisasi. Antara faktor-faktor yang dianggap mempengaruhi pemulihan perniagaan selepas bencana adalah pengaruh makro politik (Burton, Kates & White, 1993), pemberian bantuan (Burton et al., 1993), tekanan emosi dan trauma selepas banjir (Skrabis, 2008), dan pengurusan sistem maklumat (Guard, Carr, Wells, Jeffries, Gural, & Edson, 1992).

2.0 Metodologi

Kajian ini telah menggunakan kaedah temubual dan soal selidik yang mana temubual dilakukan terhadap beberapa agensi kerajaan dan mangsa-mangsa yang terlibat dengan bencana banjir 2014. Kami mendapati tiada pangkalan data yang lengkap dan sistematik bagi mengumpulkan maklumat EKS di Rantau Panjang. Walaubagaimanapun, daripada temubual kami dengan wakil Majlis Daerah Pasir Mas, Cawangan Rantau Panjang, kami diberitahu bahawa terdapat lebih kuramg 3,500 peniaga (3,200 berdaftar dan 300 tidak berdaftar) di kawasan bebas cukai dan di luar kawasan bebas cukai di Rantau Panjang. Kami juga menemubual beberapa agensi kerajaan lain iaitu Majlis Keselamatan Negara dan SME Corporation.

Temubual berstruktur dijalankan dengan 8 peniaga EKS pada bulan Ogos 2015, manakala kajian rintis untuk soal selidik telah dibuat pada bulan yang sama ke atas 106 responden. Kemudiannya, soal selidik akhir diedarkan kepada 255 peniaga-peniaga EKS di kawasan Rantau Panjang, Kelantan oleh pembantu penyelidik yang telah dilantik. Walaubagaimanapun, hanya 251 soal selidik yang dapat digunakan bagi tujuan analisis kerana maklumat yang diberikan tidak lengkap. Terdapat empat hipotesis untuk soalan kajian ketiga iaitu faktor-faktor yang memberikan impak yang signifikan terhadap proses pemulihan perniagaan EKS. Hipotesis-hipotesis ini diuji dengan penggunaan kaedah *path analysis* dalam SEM, seperti yang dinyatakan secara terperinci dalam Jadual 1.

Jadual 1: Hipotesis untuk Soalan Kajian 3

No	Hipotesis
1	H1: Bantuan banjir mempunyai kesan yang signifikan terhadap pemulihan banjir.
2	H2: Makro politik mempunyai kesan yang signifikan terhadap pemulihan banjir.
3	H3: Tekanan emosi mempunyai kesan yang signifikan terhadap pemulihan banjir.
4	H4: Pengurusan maklumat mempunyai kesan yang signifikan terhadap pemulihan banjir.

Data dianalisis menggunakan Statistical Package for Social Science Version 21 (SPSS 21.0) dan AMOS program versi 21.0 (AMOS 21). Prosedur *data mining* telah dijalankan sebelum melaksanakan analisis data sebenar bagi mengenal pasti dan mengelaskan setiap jawapan dengan nilai berangka (nombor) untuk setiap jawapan dalam soalan (Zainudin Awang, 2012). Seterusnya, analisis deskriptif bagi pembolehubah demografi menggunakan SPSS telah dibuat, diikuti dengan analisis faktor pengesahan (CFA) untuk model pengukuran bagi menilai *uni-dimensionality*, kesahihan, kebolehpercayaan serta taburan data. Kemudian, model struktur dianalisis untuk menguji empat hipotesis dengan menggunakan *path analysis* dalam Model Persamaan Berstruktur (SEM).

3.0 Hasil dan Perbincangan Kajian

Kajian akhir telah dibuat selama 5 hari pada bulan Oktober, 2015 menggunakan 10 orang enumerator. Sebanyak 251 soal selidik telah diisi dan kemudiannya dianalisis. Hasil kajian mendapati bahawa kebanyakan perniagaan adalah milikan tunggal iaitu 96.2%. Purata tempoh perniagaan yang dijalankan adalah dari enam sehingga sepuluh tahun. Majoriti perniagaan yang dijalankan di kawasan Rantau Panjang adalah perniagaan peruncitan (76.4%). Purata tahap kedalaman banjir adalah di kawasan perniagaan adalah di antara dua hingga lapan kaki.

Berdasarkan temubual kami dengan SME Corporation dan Majlis Daerah Pasir Mas, Cawangan Rantau Panjang, kami mendapati tiada anggaran kerugian yang dibanci ke atas EKS sebelum ini. Oleh itu, dengan menggunakan soal selidik, kami mendapati kerugian yang dialami oleh responden di kawasan Rantau Panjang adalah seperti berikut:

Jadual 2: Jumlah Kerugian Akibat Banjir

Jumlah Kerugian	Frekuensi	Peratus
RM10,000 ke bawah	129	51.4
RM10,001-RM50,000	106	42.2
RM50,001-RM100,000	12	4.8
RM100,001-RM150,000	2	0.8
RM150,001 ke atas	2	0.8
Jumlah	251	100

Majoriti (51.4%) responden mengalami kerugian kurang daripada RM10,000 dan 42.2% mengalami kerugian di antara RM10,001 hingga RM50,000 (Jadual 2). Kami mendapati kebanyakan kerugian adalah akibat kehilangan hasil jualan dan kerosakan inventori (Jadual 3):

Jadual 3: Perincian Kerugian Akibat Banjir

Jenis Kerugian	Anggaran kerugian (RM) - min	Kos baik pulih (RM) - min
Hasil Jualan	8,575 (n=241)	Tiada
Bangunan	1,538 (n=16)	2,311 (n=9)
Kenderaan	3,067 (n=9)	1,340 (n=5)
Peralatan	2,427 (n=37)	1,450 (n=4)
Inventori	8,622 (n=177)	6,000 (n=1)
Mesin	1,817 (n=21)	5,460 (n=5)
Perabot	1,996 (n=45)	1,129 (n=10)
Kecurian semasa banjir	300 (n=2)	Tiada

Hasil kajian kami juga menunjukkan bahawa 194 responden menggunakan duit simpanan mereka untuk tujuan pemulihan. Hanya dua responden soal selidik yang mempunyai pelan pemulihan dan pelan tindakan kecemasan sewaktu banjir.

Analisis model persamaan berstruktur (SEM) dijalankan terhadap hipotesis yang dibina berdasarkan faktor-faktor yang memberi kesan kepada pemulihan perniagaan. Hasil kajian dapat dilihat melalui Jadual 4. Ujian hipotesis membuktikan bahawa bantuan kerajaan dianggap memberikan impak yang signifikan ke atas pemulihan perniagaan akibat banjir.

Jadual 4: Pemberat regresi dan nilai signifikan

Konstruk	Laluan	Konstruk	Anggaran beta	*Standard error*	*Critical region*	Nilai p
Business_Recovery	<---	Assistance	.388	.107	3.614	***
Business_Recovery	<---	Macro_Politic	.055	.087	.627	.530
Business_Recovery	<---	Emotional_Stress	-.035	.055	-.637	.524
Business_Recovery	<---	Information_Mgt	-.227	.160	-1.417	.157

Daripada hasil temubual yang dijalankan, didapati hampir keseluruhan responden mengaku ada membuat persediaan asas bagi menghadapi banjir. Antara strategi asas yang telah diambil sebagai persediaan banjir adalah seperti mengalihkan atau meletakkan barang-barang niaga serta aset-aset perniagaan di tempat yang lebih tinggi daripada kebiasaan. Selain itu juga, mereka tidak menambah stok barang niaga apabila tiba musim banjir. Para peniaga juga membawa pulang barang-barang niaga yang mudah dialih ke rumah atau ke tempat yang lebih selamat. Peniaga juga mengarahkan pekerja untuk berada di premis perniagaan bagi menghadapi sebarang kemungkinan, termasuk mengelakkan kecurian semasa berlakunya banjir.

4.0 Kesimpulan

Kejadian bencana banjir yang berlaku di Kelantan pada akhir Disember 2014 memberi impak yang besar terhadap ekonomi EKS di Rantau Panjang, Kelantan. Berdasarkan kajian yang dijalankan terhadap ekonomi EKS dapatlah disimpulkan bahawa:

4.1 Para peniaga yang ditimpa musibah banjir ini merasakan bahawa hanya bantuan kerajaan yang akan memberikan impak yang signifikan ke atas pemulihan perniagaan mereka.

4.2 Faktor lain seperti makro politik/birokrasi, tekanan emosi dan pengurusan sistem maklumat dianggap tidak dapat mendatangkan kesan yang signifikan ke atas proses pemulihan perniagaan mereka.

4.3 Kerajaan perlu melihat dan belajar bagaimana negara Jepun menguruskan kesan bencana alam terhadap ekonomi, sosial dan emosi penduduk Jepun yang mengalami bencana (Takao, Motoyoshi, Sato, Fukuzondo, Seo, & Ikeda, 2004; Iuchi, Maly, & Johnson, 2015).

4.4 Sistem pengurusan banjir dalam negara dapat dipertingkatkan melalui langkah-langkah antaranya seperti berikut:

- Latihan kesiapsiagaan EKS menghadapi banjir;
- Piawaian Prosedur Operasi (SOP) EKS menghadapi banjir dan pemulihan akibat banjir EKS;
- Sistem komunikasi yang lebih baik di antara pemberi bantuan dan pemohon bantuan (contohnya,di antara SME Corporation dengan EKS);
- Mewujudkan sistem bancian kerugian banjir yang dialami peniaga EKS;
- Pemantauan lokasi perniagaan yang sensitif banjir oleh pihak berkuasa;
- Mewujudkan sistem agihan bantuan yang lebih adil dan telus;
- Penambahbaikan infrastruktur di kawasan bencana, contohnya infrastruktur saliran, infrastruktur sungai (tambatan banjir di Sungai Golok, benteng dan pendalaman sungai), longkang di sekitar pasar atau kedai dan saliran bila berlaku pembinaan premisyang baru;
- Menyediakan bantuan khidmat nasihat kepada EKS untuk menghadapi banjir dan pemulihan perniagaan akibat banjir;
- Mengurangkan atau mengecualikan sewa kedai semasa banjir.

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Lampiran 1

END OF REPORT

Project Title : Utilization of Mud from Flood Disaster to be used as a Construction Materials

A. Project Information

Start Date : 01/04/2015
End Date : 31/12/2015
Extension Date : 31/03/2016
Project Status : Completed
Project Leader : Assoc. Prof. Dr. Mohd Mustafa Al Bakri Abdullah
I/C Number : 790416-11-5389
University : Universiti Malaysia Perlis (UniMAP)
Address : Center of Excellence Geopolymer & Green Technology (CEGeoGTech), School Of Materials Engineering, Kompleks Pusat Pengajian Jejawi 2, Universiti Malaysia Perlis (UniMAP), Taman Muhibbah, 02600 Jejawi, Arau, Perlis
Contact number : 012-5055020
Project Members : Alida Abdullah, Prof. Madya Dr. Che Mohd Ruzaidi Ghazali, Dr. Liew Yun Ming

B. Project Achievement

Project Progress : 100%
Research Output : Indexed Journal (2), Non-indexed Journal ( ), Conference Proceedings (2), Book Chapter ( )
Talent : RA (1), PhD student ( ), Master student ( ) Final Year Student (1)
List of Publication :

1) Mohd Mustafa Al Bakri Abdullah, Liew Yun Ming, Muhammad Faheem Mohd Tahir, Che Mohd Ruzaidi Ghazali, Kamarudin Hussin And Alida Abdullah, *Flood Mud As Geopolymer Precursor Materials: Effect Of Flood Mud/Alkaline Activator And Na2sio3/NaOH Ratios On Compressive Strength*, Applied Mechanics and Materials Vol. 815 (2015) pp 170-176.
2) Mohd Mustafa Al Bakri Abdullah, Mukridz Md Mohtar, Liew Yun Ming, Muhammad Faheem Mohd Tahir, Kamarudin Hussin and Januarti Jaya Ekaputri, *Flood Mud As Geopolymer Precursor Materials: Effect Of Curing Regime On Compressive Strength*, Applied Mechanics and Materials Vol. 815 (2015) pp 177-181.
3) Mohd Mustafa Al Bakri Abdullah, Liew Yun Ming, Muhammad Faheem Mohd Tahir, Mukridz Md Mohtar, Che Mohd Ruzaidi Ghazali, Kamarudin Hussin and Alida Abdullah, Influence of Flood Mud Alkaline Activator and Na_2SiO_3/NaOH Ratio in Flood Mud Based Geopolymer with Different Curing Condition, Bengkel Kajian Bencana Banjir, 14-15 September 2015, The Everly Hotel Putrajaya (Oral)
4) Mohd Mustafa Al Bakri Abdullah, Liew Yun Ming, Muhammad Faheem Mohd Tahir, Che Mohd Ruzaidi Ghazali, and Alida Abdullah, Flood Mud as Geopolymer Precursor Materials: Effect of Various NaOH Molarity, Persidangan Kajian Bencana Banjir 2014, 4-6 April 2016, Kuala Lumpur (Poster)
5) Bronze Medal (Flood Mud Green Construction Materials) at International Engineering & Technology Exhibition (IETE 2015) 24-25 October 2015, MMU Melaka
6) Silver Medal (Flood Mud Green Construction Materials) at International Invention Show (INOVA 2015), 5-7 November 2015, Karlovac, Croatia

C. Expenditure

Budget Approved : RM 49,200.00
Amount Spent : RM 48,749.47
Balance : **RM 450.53**
% of Amount Spent : **99.08%**

Summary of Research Findings

1.0 Introduction

Concrete is one of the most widely used in construction industry since many decade ago, it is usually associated with ordinary Portland cement as the main component for making concrete. The demand for concrete as a construction material is on the increase. General consumption of natural sources, massive amount production of industrial wastes and environmental pollution require new solutions for a more sustainable development (Rangan, 2008). According to fly ash's property which has strong silica alumina glassy chain, it has been used as supplementary cementing material to substitute Ordinary Portland Cement (OPC). Portland cement is the most used material in the worldwide construction industry but it also has a high level of CO2. Its use tends to become less competitive compared to alternative ecological new binders like geopolymers (Davidovits, 1991 and Mustafa, 2011). The production of OPC also produces combustion of carbon dioxide to the atmosphere which consume to pollution. According to the council's report, the water level of Sungai Kelantan at Tambatan DiRaja, which has a danger level of 25 meters, reached 34.17 meters last month compared to 29.70 meters in 2004 and 33.61 meters in 1967. Effect of the flood, it left behind excessive mud deposits in the state. The level and depth of mud deposits were overwhelming and at the flood afflicted places has caused the ecosystem to be contaminated and disrupted, and become eyesores. Based on preliminary material characterization, the mud from the flood is potentially to be utilize in construction as construction materials such as brick and artificial aggregates by using geopolymerization method. From this research, it is expected to discover the best mix design proportion on producing geopolymer brick from mud deposits and able to compare its properties with current commercial brick.

2.0 Methodology

The research methodology is separated into three (3) phase:

Phase 1: Materials characterization

The mud deposits were collected and analyzed for different parameters to determine the samples characterization as a geopolymer materials. Characterization of raw materials include:

a) Xray fluorescence (XRF)
b) Scanning electron microscopy (SEM)

Phase 2: Sample Mixing and Preparation

a) Mixing

The materials used are as follow:

1. Flood's mud deposits
2. Binder: geopolymer binder [waterglass/NaOH (12M) = 0.6], polymer binder (thermoplastic and thermoset)

Geopolymer paste were prepared by mixing mud deposits with the binder. The ratio of mud deposits to binder is between 0.5 to 2.5. The binder was added to the mud deposits and mixed for five minutes to obtain a homogeneous paste mixture.

b) Moulding process

The paste need to be mould into 100 x 100 x 100 mm cubes.

c) Drying

The mud deposits then will be dry at the temperature less than 100°C.

Phase 3: Sample Testing and Analysis

The testing were done in order to determine the stability of the pozzolan aggregate produced

a) Compressive strength test
b) Water absorption test
c) Density test

3.0 Results and Discussion

Mixture Proportion.

In this study, the effect of solids/liquid ratios and Na2SiO3/NaOH ratios were investigated. Trials and errors have been performed to produce geopolymers based on flood mud at S/L ratios of 0.5, 1.0, 1.5, 2.0 and 2.5. The S/L ratios of 0.5, 2.0 and 2.5 could not be used because of the workability problem of geopolymer paste, which limits the handling and moulding of paste. Thus, the S/L ratios were chosen at 1.0, 1.25 and 1.5. On the other hand, the Na2SiO3/NaOH ratios applied in this work were 0.5, 1.0, 1.5 and 2.0. Table 1below tabulates the detail of the mixture proportions.

Table 1: Detail of mix proportions.

NaOH Molarity	S/L Ratio	Na_2SiO_3/NaOH Ratio	Flood Mud (g)	Na_2SiO_3 (g)	NaOH (g)
14	1.0	0.5	200	66.67	133.33
14	1.0	1.0	200	100.00	100.00
14	1.0	1.5	200	120.00	80.00
14	1.0	2.0	200	133.33	66.67
14	1.25	0.5	200	44.44	88.89
14	1.25	1.0	200	66.67	66.67
14	1.25	1.5	200	80.00	53.33
14	1.25	2.0	200	88.89	44.44
14	1.5	0.5	200	33.33	66.67
14	1.5	1.0	200	50.00	50.00
14	1.5	1.5	200	60.00	40.00
14	1.5	2.0	200	66.67	33.33

Raw Material Characterization. Figure 2 tabulates the chemical composition of flood mud by using X-ray Fluorescence (XRF). The flood mud has 57.9% of SiO_2 and 24.8% of Al_2O_3, which contributes to total content of 82.7%. This indicates that flood mud has high silica and alumina content and could be potentially react in the geopolymerization reaction. The chemical composition (total silica and alumina content) of flood mud is almost similar to others aluminosilicates (e.g. metakaolin and fly ash) that usually used in geopolymer formation (Heah, 2013: Mustafa, 2012).

Table 2: Chemical composition of flood mud analyzed using XRF analysis.

Compound	Flood Mud
SiO2	57.90 %
Al2O3	24.80 %
Fe2O3	10.88 %
TiO2	1.37 %
CaO	0.55 %
K2O	3.43 %
MnO	0.20 %

Figure 1 reveals the morphology. Flood mud has semi oval plate-like structure that is similar to clay materials such as kaolin and metakaolin (Cristobal, 2010: Liew, 2012) . According to several researchers(Davidovits, 2008: Komnitsas, 2007), this platy particle contributes to the smaller surface area for geopolymerization process compared to spherical shaped particle in fly ash and possess low strength. However, for flood mud, we will see how the performance of the geopolymers based on flood mud is in the next section.

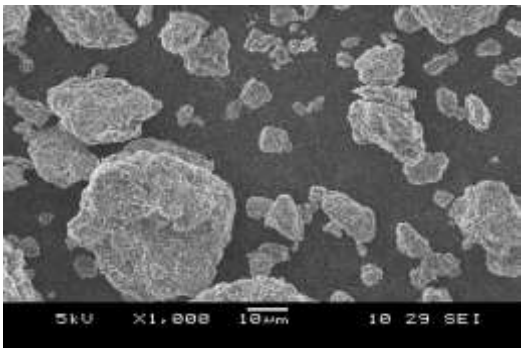

Figure 1: SEM micrograph of flood mud.

Effect of Flood Mud/Alkaline Activator and Na_2SiO_3/NaOH Ratios

Compressive Strength. Figure 3 shows the compressive strength results of geopolymers based on flood mud at varying S/L and Na_2SiO_3/NaOH ratios. Compressive strength of geopolymer samples was tested after 1, 3, 7 and 28 days. At a fixed Na2SiO3/NaOH ratio, the S/L = 1.25 produces

higher strength geopolymer product. Geopolymers with the S/L = 1.0 and S/L = 1.5 showed lower compressive strength. The optimum S/L ratio concluded from this study is only slightly higher than geopolymer system with metakaolin precursor, but lower than the system with fly ash precursor. For instance, Kong *et al.* (2007) suggested the optimum S/L ratios of 0.8 and 3.0 for metakaolin and fly ash geopolymers, respectively. Usually, the S/L ratio is selected based on the workability of the geopolymer paste (Heah, 2012). Plate-like particle in flood mud has limited the flowability of geopolymer paste and hence a lower S/L ratio (high liquid content) was used. In contrast, spherically-shaped particles of fly ash do not restrict its movement in activator solution and thus higher S/L ratio (low liquid content) can be considered. Besides, it is believed that lower activator content at high S/L ratio might be insufficient for the dissolution of raw materials for the geopolymerization reaction (Zuhua, 2009).

On the other hand, at a fixed S/L ratio, the compressive strength of geopolymers increased when the Na_2SiO_3/NaOH ratio was raised from 0.5 to 1.0. The strength decreased at the Na2SiO3/NaOH ratio beyond 1.0. A similar range of Na_2SiO_3/NaOH ratio has been utilized by Pelisser *et al.* (2013) and Poowancum & Horpibulsuk (Poowancun, 2015) on metakaolin geopolymers and calcined sedimentary clay, respectively. However, a different result was deduced by both of the researchers where by geopolymers with Na_2SiO_3/NaOH = 1.0 exhibit only low compressive strength. The deterioration of strength at ratio above 1.0 might probably due to decrease of NaOH content which affected the degree of reaction and final strength development (Tempest, 2009). Even though high sodium silicate content is good for strength development, the NaOH content is also crucial for the leaching of Si and Al to participate in geopolymer formation.

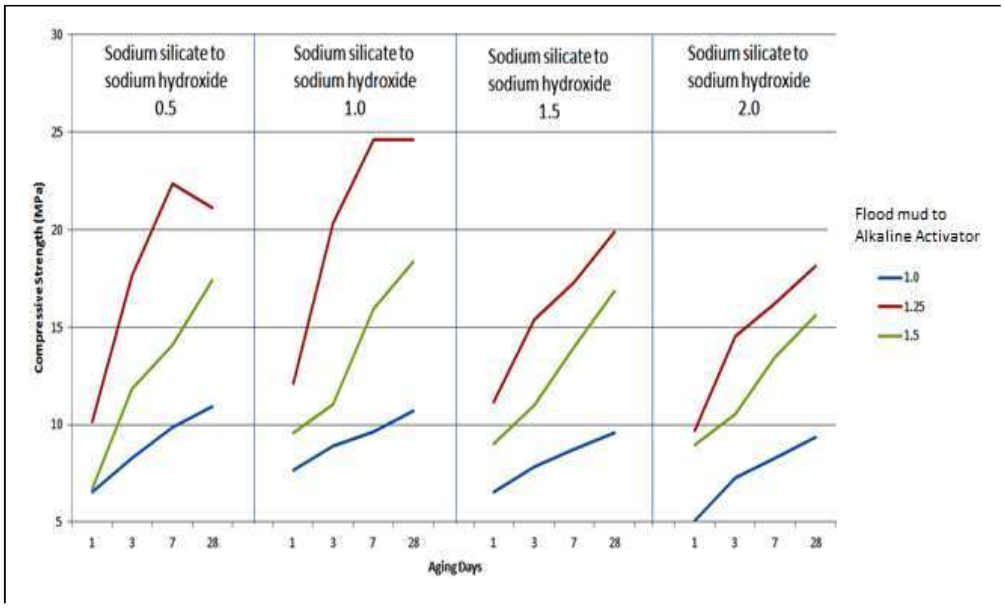

Figure 3: Compressive strength development of geopolymers prepared from flood mud at varying S/L and Na_2SiO_3/NaOH ratios.

In overall, compressive strength increased with ageing day from 1 to 28 days. From the result, it was concluded that the geopolymers based on flood mud exhibits low strength at both high and

low ratios of S/L and Na_2SiO_3/NaOH, similar to all others aluminosilicate precursors (Lin, 2012). From the study, optimum compressive strength (24.6 MPa after 28 days) was obtained at S/L = 1.25 and Na_2SiO_3/NaOH = 1.0.

Microstructural Analysis of Flood Mud Geopolymers. Figure 4 shows the microstructures of flood mud geopolymers with optimum compressive strength (S/L = 1.25 and Na_2SiO_3/NaOH = 1.0) after varying ageing days. After alkali activation, a continuous geopolymer matrix was formed. In overall, few flood mud remnant was left in the geopolymers. Some cracks and larger pores could be clearly seen on the 1st and 3rd day geopolymer samples. However, the pores gradually decreased in 7th and 28th day samples. The pores were becoming smaller with ageing day. These pores were believed to have been left as result of water evaporation. In addition, the surface of geopolymer matrix became smoother from day 1 toward day 28. This was due to the densification of geopolymer matrix day by day (Zhang, 2005). This accompanied the rise of compressive strength as shown in Figure 3.

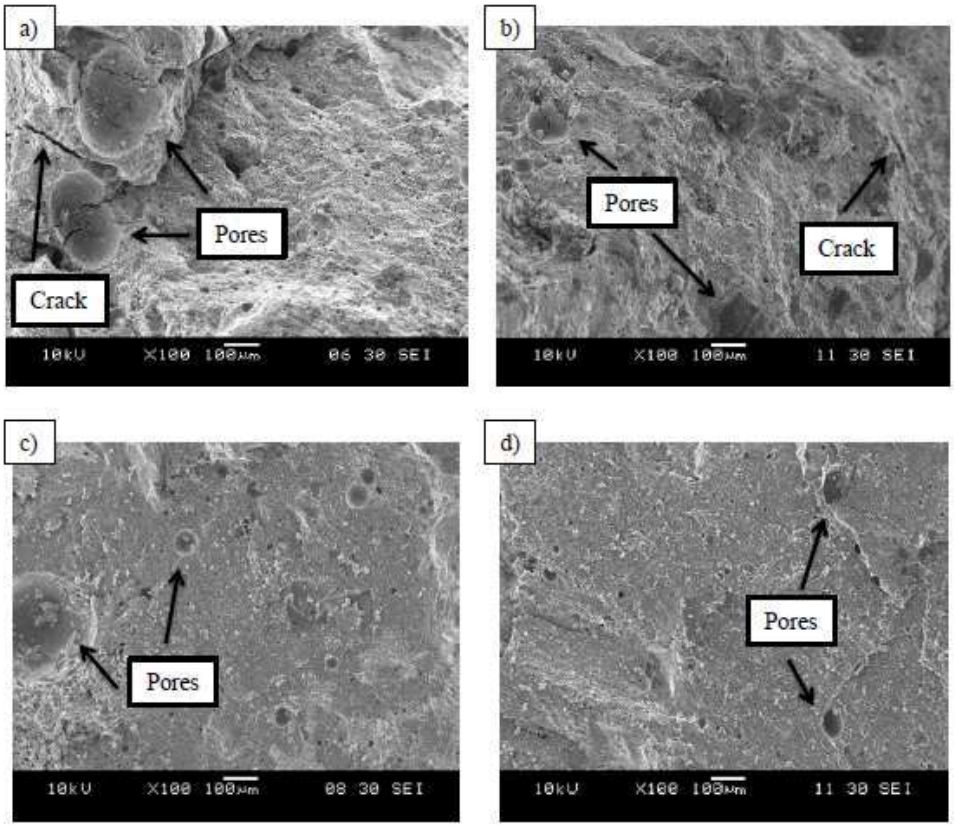

Figure 4: SEM micrographs of flood mud geopolymers with S/L = 1.25 and Na_2SiO_3/NaOH = 1.0 after (a) 1 day; (b) 3 days; (c) 7 days; and (d) 28 days.

Effect of Various NaOH Molarity

Density.
The density test was carried out for flood mud geopolymer clay composites are in cubic size which the average of volume is 0.125cm^3. Three numbers times of samples were tested for each different concentration molarities of sodium hydroxide (NaOH) and then the average value were recorded.

According to Figure 5, it can be observed that the optimum density value for the flood mud geopolymer with different concentration of sodium hydroxide (NaOH) at 1, 3, 7 and 28 days of aging is molarity of 12M. The comparison can be made between the samples of different NaOH solution at all aging days which the highest density value was felled at the sample with 12M of NaOH solution. It can be seen at three out of four aging days were proved as mentioned before.

The density value of the geopolymer samples respectively increased with increasing the concentration molarities of sodium hydroxide (NaOH). But, the density is decreased at the sample with 14M of NaOH solution, and this might be due to excess of OH- or Na+ concentration. Excesses of OH- will be decreased the strength of clay composite and also excesses of sodium content can form sodium carbonate by atmospheric carbonation and may disturb polymerization process (Wang, 2005). In addition, the factor of poor particles packing at beginning of sample preparation also can reduced the density value of samples because of porosity presences.

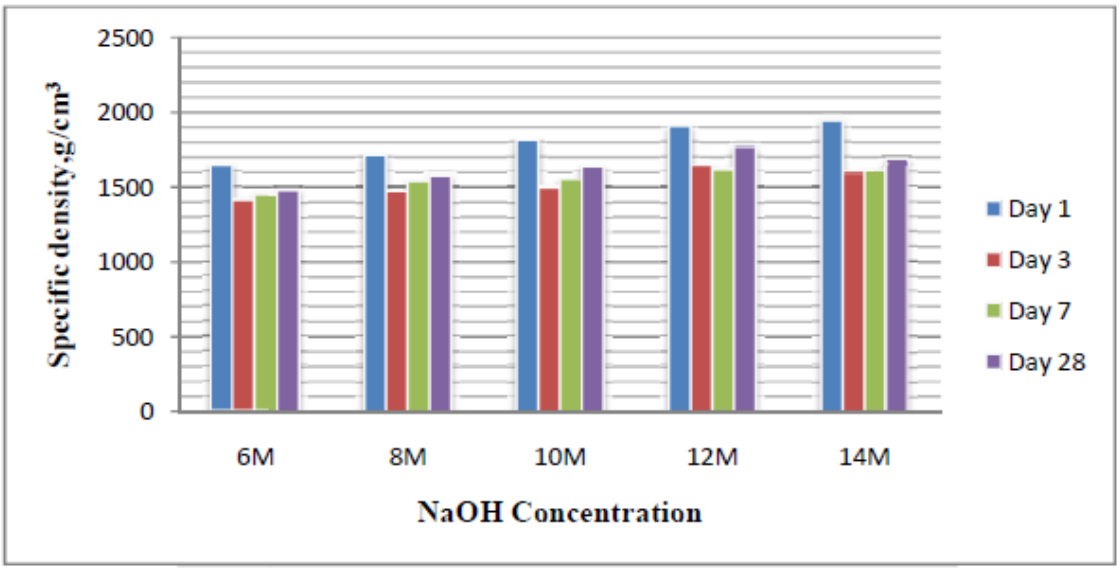

Figure 5. Density of flood mud geopolymer

Water Absorption.
Water absorption test was done to the samples for each different concentration molarities for flood mud geopolymer in order to determine an open porosity. The size of the samples are in cubic size which the average of volume is 0.125 cm^3. The water absorption is expressed as the weight of water absorption of the samples by the dry weight of the samples at saturated. Porosity which is a void fraction is the measurement of empty or void spaces in the sample of composites. It is computed as the fraction of the volume of emptiness over the total volume of the samples.

According to Figure 6, it can be observed that the addition of alkaline activator from the mixture of sodium hydroxide (NaOH) with sodium silicate (Na2SiO3) had an effect on water absorption. The percentages of water absorption decreases with increasing in aging days of the flood mud geopolymer. The geopolymer samples with different concentration molarities from 6-14M showed the percentage of water absorption was 4-12% at the end of the 7 and 28 of aging day's period. The percentage of water absorption for 1 and 3 of aging day's period was 13-22%.

Generally, high amount of voids and pores in the samples, permit high amount of water allowed to be absorped into the samples. Therefore, the samples at the end of 7 and 28 days period possibly to be less porous or high particles packing at the beginning of the samples preparation. The samples was drying at 80 ˚C for 48 hours in oven to obtain full dries mass of sample. This is because the water present in some compound can be free when reaching temperature up to 100 ˚C (Vivian, 2008).

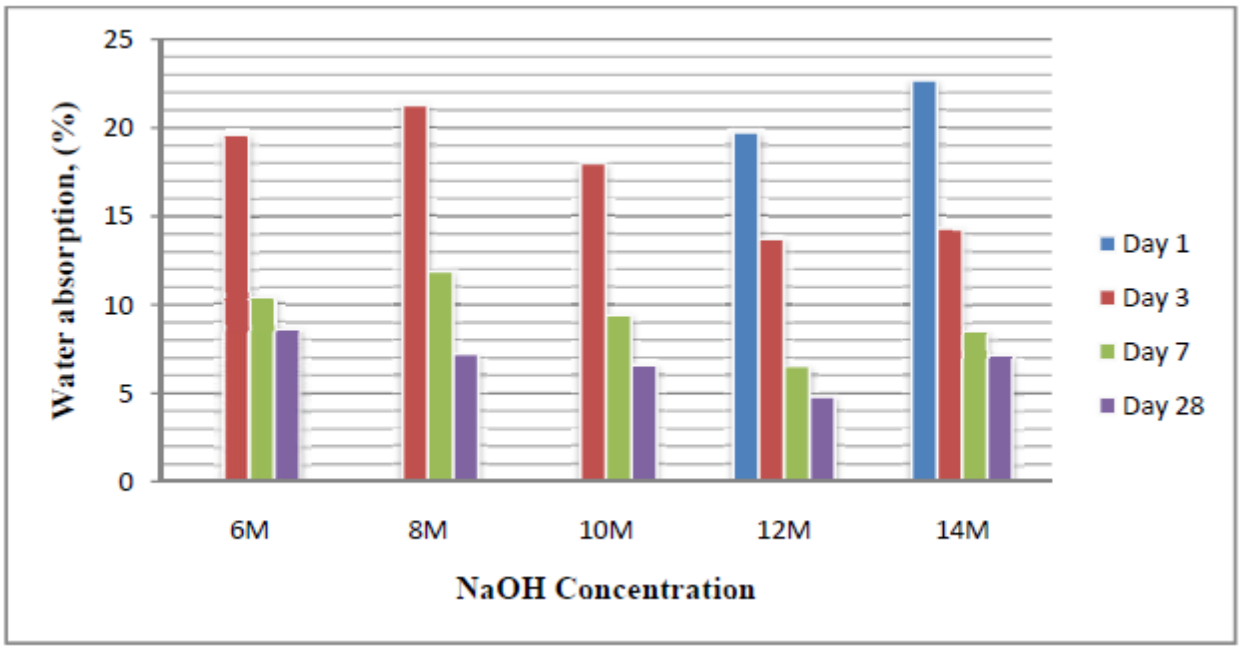

Figure 6. Water absorption of flood mud geopolymer

Compressive Strength.

In this study, the compressive strength test was done to the flood mud geopolymer samples with different NaOH concentration (6M, 8M, 10M, 12m, and 14M) at the age of 1, 3, 7, and 28 days of aging.

The compressive strength result of flood mud geopolymer samples with different concentration molarities were combined as shown in Figure 7. From the Figure 7, they are no constant strength gain between different concentrations of NaOH solution geopolymer samples at day-1, day-3, day7 and day-28. Compressive strength is maximum at NaOH concentration of 12M for 7-day aging implied that there is an optimum alkalinity for activating flood mud. The strength increases with an increase in Na concentration in the activating solutions and as the concentration of NaOH solution increases, the activation of flood mud become quicker and stronger (Wang, 1994, Saleem

Hosam, 2010). Solubility of aluminosilicate increases with increasing NaOH concentration (Xu, 2000).

However, the compressive strength decreases with an increase in NaOH concentration from 12M to 14M. This is probably due to excess of Na+ ions (Hardjito, 2008). On the other hand, 14M of NaOH solution shows the highest strength gain among other concentration on day-3 of aging. This is most probably because of low amount of porous in the samples or high of particles packing on the ample with 14M NaOH solution at day-3 of aging. Besides that, the use of high concentration of sodium hydroxide leads to greater dissolution of the initial solid material and increase geopolymerization reaction and hence higher compressive strength is achieved (Panias, 2007).

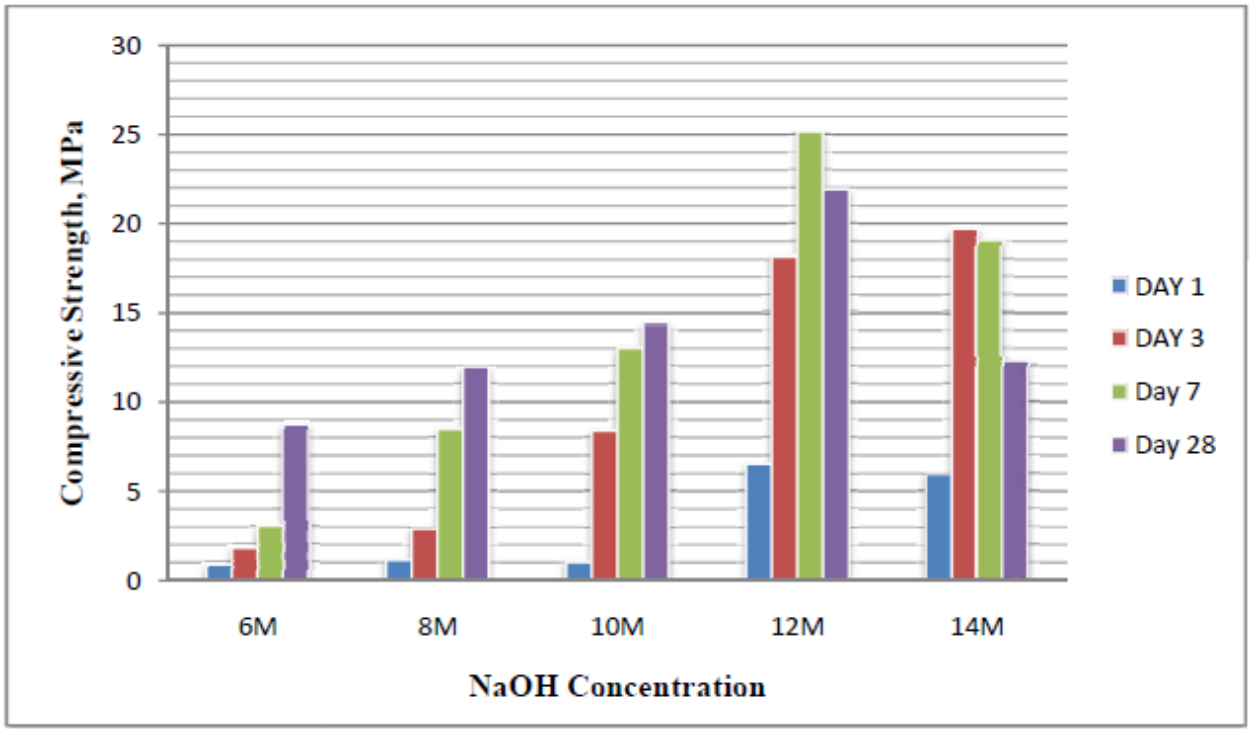

Figure 7. Compressive strength of flood mud geopolymer

Morphology Analysis.

Figure 8 are shows the changes in morphologies of flood mud geopolymer samples for different concentrations of sodium hydroxide (NaOH) solution. It can be observed that the flood mud geopolymer composite samples are exhibits a finer overall distribution compared to the raw flood mud that had been shown in the previous paper (Mohd Mustafa, 2015). This can be seen at higher magnification where both the fine fractions are visible. Difference in microstructures could be distinguished at different concentration. Flood mud has been activated by the different NaOH concentrations of alkali activator solution.

The SEM micrographs in Figure 8 (a) show a mixture of fine and intermediate distribution of particles at low and high magnification for sample with 6M of NaOH solution. Degree of reaction for 6M of NaOH solution is slightly higher strength compared to 8M of NaOH solution. This is because 6M of NaOH solution has higher water content. The water eases the geopolymerization process, leading to higher transportation of ion and hence, the micrograph shows denser structure.

The pores, crack and unreacted of flood mud particles are present in the matrix could limit the strength of geopolymer and lead to the lower compression strength (Panias, 2007). Besides that, the solid-to-liquid ratio also will affects the volume of voids and porosity in the geopolymer which directly influences the strength of geopolymer (Muzek, 2012). When 8M and 10M of alkaline solution is used, the degree of reaction is the lowest and present just slightly of pores. At the surface, also shows slight activation of particles with few partially reacted particles and large amount of unreacted particles as shown in Figure 8 (b) and (c).

In SEM micrograph as shown in Figure 8 (d) and (e), the sample with 12M of NaOH solution appeared to have more sponge-like amorphous gel than other samples, which contributes to highest compressive strength. This shows that the alkaline activation is more effective. The higher the degree of reaction, the higher the compressive strength (Muzek, 2012). However, large part of unreacted flood mud can still be observed in all samples. Strength will be increase if the unreacted part reacted to form a more dense structure. Conversely, when 14M of NaOH solution is employed, sponge-like amorphous gel is slightly lesser. This might probably because of the excess of Na+ ion as stated above.

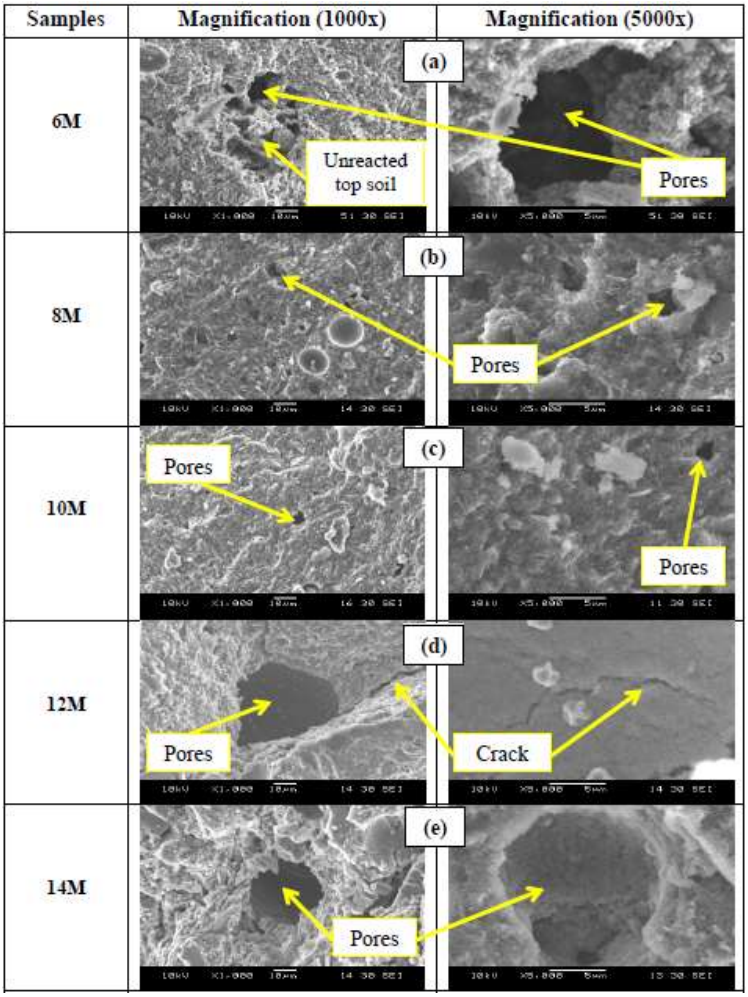

Figure 8. SEM micrograph of flood mud geopolymer: (a) 6M NaOH concentration; (b) 8M NaOH concentration; (c) 10M NaOH concentration; (d) 12M NaOH concentration; (e) 14M NaOH concentration.

4.0 Conclusion

Based on the result, conclusion had been made.

4.1 The result of study indicated that flood mud can be potentially utilized in geopolymerization reaction with favorable strength.

4.2 The flood mud geopolymers can be used as a potential construction materials by using geopolymerization process.

4.3 From the investigation on the effect of S/L and Na2SiO3/NaOH ratios, the optimum ratios of Na2SiO3/NaOH and S/L to produce the geopolymer samples by using flood mud is 1.0 and 1.25, respectively.

4.4 Based on the results, the compressive strength will increased when the NaOH concentration increases until 12M, then the strength drops at 14M of NaOH concentration.

4.5 The strength gain for flood mud based geopolymer materials at 1, 3, 7 and 28 days of aging exhibits different rate of strength development.

4.6 Once again, flood mud is worthy for consideration as source materials as it reduces the waste caused by the flood.

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END OF REPORT

Project Title: Subtheme 1.4.7 Health and Safety: Investigation of a rapid microparticle sorting technique for portable microsensors for on-side detection of contaminants in floodwater

A. Project Information

Start Date	: 01/04/2015
End Date	: 31/12/2015
Extension Date	: N/A
Project Status	: Completed
Project Leader	: Tan Ming Kwang
I/C Number	: 790206-01-6075
University	: Monash University Malaysia
Address	: Jalan Lagoon Selatan,
Contact number	: 03 5514 6202
Project Members	: Hung Yew Mun, Tan Boon Thong

B. Project Achievement

Project Progress	: 100%
Research Output	: One Indexed Journal (under review)
Talent	: One RA

C. Expenditure

Budget Approved	: RM 62,200.00
Amount Spent	: RM 44,992.41
Balance	: RM 17,207.59
% of Amount Spent	: 72%

Summary of Research Findings

1.0 Introduction

The ability to rapidly concentrate particles in an aqueous suspension is highly desired for portable microsensors; a more accurate on-the-field detection of the presence of harmful contaminants relies strongly on the ability to efficiently sort and concentrate these particles prior to the detection process. Previous studies have demonstrated that the concentration of pathogenic bacterias can be carried out efficiently by using surface acoustic waves (SAWs) to induce acoustic streaming. Nevertheless, for integration of these processes on a portable microfluidic platform, a further enchancement of the efficiency of the technique is required in order to reduce the power consumption. Therefore, in this work, we investigate a more efficient technique to induce acoustic streaming atop the SAW device by using amplitude modulation.

Surface acoustic waves (SAWs) offer an attractive alternative to these technologies for driving micromixing and particle concentration, together with the possibility for driving a wide suite of microfluidic operations such as droplet and microchannel transport [1-5], cooling and heating [6-8], and jetting and atomization [9]. The underlying mechanism that enables these operations is the acoustic streaming that arises from the fluid-structural interactions associated with the undulating boundary as the SAW traverses the surface of the piezoelectric substrate beneath the fluid. Not only is SAW acoustic streaming an efficient means for driving chaotic micromixing, it also has the advantage of battery-powered operation via a portable driver circuit, therefore permitting miniaturization and integration of the entire actuation platform together with the chip-based operation. More recently, Shilton demonstrated downward scalability to nanolitre volumes while

still maintaining the ability to rapidly mix the fluids, made possible by increasing the SAW frequency to GHz order. On the other hand, the same SAW platform have been shown to be a powerful tool for driving chip-scale microcentrifugation, in which the azimuthal flow recirculation that arises is sufficiently intense to rapidly concentrate particles suspended in the flow, which can then be exploited for sample preconcentration to enhance biomolecular detection sensitivity and selectivity.

2.0 Methodology

The SAW device used in the study comprised a 128^0 rotated *Y*-cut *X*-propagating, single-crystal lithium niobate ($LiNbO_3$) piezoelectric substrate fabricated with a focusing elliptical single-phase unidirectional transducer (FE-SPUDT) with 30 pairs of fingers. To generate the SAWs, a sinusoidal electric signal generated from a primary function generator (WF1966, NF Corporation, Japan) was amplified using a high frequency amplifier (25A250A, Amplifier Research, USA), and subsequently applied to the FE-SPUDT. The frequency of the electrical signal was set at 30.5 MHz in order to match the resonant frequency f_{SAW} of the FE-SPUDT, determined by the spacing of the electrode fingers of the transducer. For amplitude modulation, a secondary function generator (DG 1022, Rigol, China) was connected to the primary function generator; modulation frequencies of f_m = 1, 5, 10, 15 and 20 kHz were employed.

In order to quantify the total input electric power of the modulated signal to SAW device, the modulation index $m = V_m/V_c$ was first calculated, in which $V_m = (V_{max} - V_{min})/2$ is the modulating signal voltage, $V_c = (V_{max} + V_{min})/2$ the carrier signal voltage, and, V_{max} and V_{min} the maximum and minimum RMS voltages. The voltages were measured using a voltage probe (TPP 0201, Tektronix, USA) connected to an oscilloscope (TDS 2012C, Tektronix, USA). The total input electric power of the modulated signal can then be calculated from $W_e = P_c(1 + m^2/2)$, in which $P_c = V_c I_c$ is the RMS power of the carrier signal and $I_c = (I_{max} + I_{min})/2$ the carrier signal current, wherein I_{max} and I_{min} are the maximum and minimum RMS currents, respectively, measured using an AC current probe (P6022, Tektronix, USA).

In each experiment, a controlled volume of deionized water was carefully pipetted onto the substrate. In order to generate the azimuthal recirculation necessary to drive particle concentration and micromixing in the droplet, the droplet is placed asymmetrically such that only a part of it lies in the SAW propagation path following the symmetry breaking procedure. In this case, the droplet was placed approximately 3 mm from the leading edge of the transducer. In order to maintain its shape, the droplet is confined by patterning a thin layer of superhydrophobic coating (NeverWet, Rustoleum, USA) on the substrate with a 5 mm diameter circular exclusion where the droplet is to be placed in order to prevent its spreading under the SAW excitation. Subsequently, the following experiments were first conducted to measure the acoustic streaming velocity within the droplet and hence quantify the effectiveness of the amplitude modulation in enhancing acoustic streaming and thus particle concentration and micromixing.

2.1 Enhancement in acoustic streaming

To investigate the relationship between the amplitude modulation frequency and the acoustic streaming velocity, 6 μm diameter fluorescently-tagged polystyrene spherical microparticles (Polysciences, USA) were suspended in deionized water droplets with volumes 5 $\mu\ell$ and 10 $\mu\ell$ at a concentration of approximately 5%. We note here that the streaming velocities are insensitive to

the particle size in the 1-10 μm range where the tracer particles are sufficiently large that Brownian diffusion effects can be neglected but sufficiently small such that their presence does not disrupt or influence the flow field. These tracer particles were then illuminated using a 480 nm fluorescence light source (AM4113t-GFBW, Dino-Lite, Taiwan) and their motion tracked using a high speed camera (M310, Phantom, USA) connected to an optical microscope (BX41M, Olympus, Japan) at 20X magnification and 300 frames/s. The particles were tracked using the supplied camera software (PCC 2.2, Phantom, USA) from which their average velocities can be determined, which is a good approximation of the acoustic streaming velocity u_{dc}. These velocity measurements were carried out for three different input powers W_e: 22 mW, 92 mW and 156 mW. For each input power, different amplitude modulation frequencies f_m-1, 5, 10, 15 and 20 kHz-were examined. Additionally, the temperatures of the substrate and the droplet were measured using a thermal imager (TIM160, Micro-epsilon, Germany) at a record rate of 100 Hz.

2.2 Particle concentration efficiency

To demonstrate the efficiency of using amplitude modulation to improve the particle concentration process, we employ the same high speed imaging system to visualize the particle dynamics. More specifically, we determine the time required to concentrate the particles suspended in the droplet through a pixel intensity analysis (Mathematica 9.0, Wolfram, USA) of successive grayscale image frames acquired from the high speed video. The normalized standard deviation of pixel intensity can be calculated by dividing the standard deviation of the pixel intensities for a given frame with respect to that for the first frame. The concentration time t_c can then be defined as the time required for the normalized standard deviation to reach a constant value. The effects of three different sizes of fluorescent polystyrene microparticles, 6 μm, 10 μm and 25 μm in 5 $\mu\ell$ deionized water droplets with the concentration held approximately at 5% were examined. For each particle size, the experiments were repeated using the different input powers and amplitude modulation frequencies specified above.

3.0 Results and Discussion

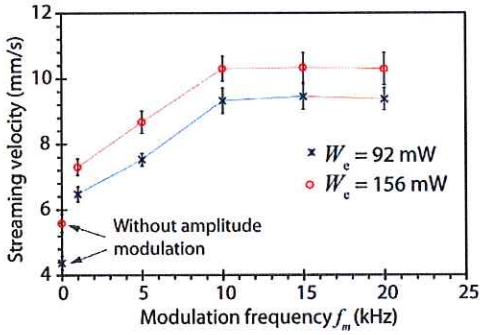

Figure 1: Relationship between the acoustic streaming velocity u_{dc} and the modulation frequency f_m at two different powers W_e = 92 mW (×) and W_e = 156 mW (∘) in a 5 $\mu\ell$ droplet suspended with 6 μm particles. The case f_m = 0 represents the condition in the absence of amplitude modulation. Trendlines were added to aid visualization.

3.1 Enhancement in acoustic streaming

Figure 1 shows the acoustic streaming velocities u_{dc}, measured by tracking the motion of the 6 μm particles within a 5 $\mu\ell$ droplet atop the piezoelectric substrate, when it is excited by 30.5 kHz SAWs both with and without amplitude modulation. With low frequency amplitude modulation (f_m = 1 kHz), the acoustic streaming velocity is observed to increase by approximately 30%

compared to the case where the signal was not modulated ($f_m = 0$). Further monotonic increases in the acoustic streaming velocity can then be obtained by increasing the amplitude modulation frequency until about 10 kHz, after which any further changes in the streaming velocity becomes insignificant. Overall, a maximum increase in u_{dc} of 60% with amplitude modulation frequencies up to 20 kHz was obtained.

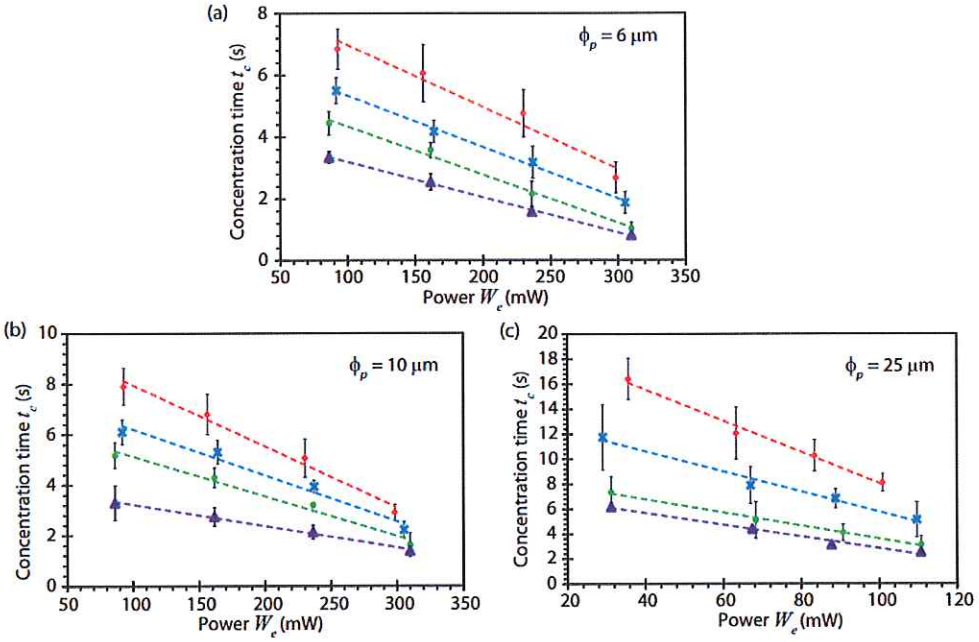

Figure 2: Measure concentration times for (a) $\phi_p = 6\mu$m, (b) $\phi_p = 10\mu$m, and (c) $\phi_p = 25\mu$m diameter particles suspended in a $5\mu\ell$ water droplet excited at different powers W_e and under different modulations conditions: $f_m = 0$, 1 kHz, 5 kHz, and 15 kHz. Trendlines were added to aid visualization.

3.2 Particle concentration efficiency

Figure 2 shows the time t_c it takes for microparticles of various dimensions suspended in a $5\mu\ell$ droplet to concentrate at the center of the droplet as a function of the input power W_e and at different modulation frequencies. It can be seen in all cases that the concentration time decreases significantly as the amplitude modulation frequency is increased, as expected given the increase in the acoustic streaming velocity and, as a consequence, the drag and the shear rate. The former is an important consideration if the particle concentration occurs in the bulk due to secondary meridional convection whereas the latter is important in the shear-induced migration dominant mechanism responsible for particle concentration on the free surface of the droplet, which is the prevalent mechanism in the present case. With increasing amplitude modulation frequencies, it can be seen in all cases from Fig. 2 that the improvement in particle concentration speed however diminishes, as expected given that the increase in acoustic streaming velocities begins to taper after approximately 10 kHz. For a fixed input power of 100 mW, we observe the reduction in the particle concentration time between the case of no amplitude modulation (f_m = 0 kHz) and modulation at 15 kHz to be 50%, 58% and 69% for $\phi_p = 6\ \mu$m, 10 μm, and 25 μm microparticles, respectively.

Interestingly, we note that particles with sufficiently large dimensions, which would not have concentrated without amplitude modulation since the shear-induced drag is insufficient to

overcome the acoustic radiation force which expels the particles to the droplet periphery, are able to concentrate when amplitude modulation is imposed. A simple explanation is that the drag force for a given particle size increases linearly with the acoustic streaming velocity, which is enhanced by a factor of two or three as observed in Fig. 1 under amplitude modulation of the signal. On the other hand, the increase in the acoustic radiation pressure which opposes the drag force is increased marginally when the kHz order modulation is imposed over the MHz order SAW due to the fourth power scaling of the radiation force with frequency. As such, the crossover particle size above which particles no longer concentrate in the centre of the droplet significantly shifts to much larger particle sizes when amplitude modulation is imposed, thus facilitating the concentration of particles with much larger dimensions. It then follows that amplitude modulation therefore forms a useful strategy to circumvent the particle size limitation when concentration is desired, without changing the SAW frequency. Dynamic concentration and expulsion of the particles can also be obtained by switching on and off the amplitude modulation, thus constituting a very simple but yet powerful tool for selective particle manipulation.

4.0 Conclusion

We have demonstrated a simple technique to increase the acoustic streaming velocity in surface acoustic wave droplet microfluidic platforms via amplitude modulation, thus reducing the power requirement, which is crucial in the development of a portable integrated microfluidic platform for detection of harmful biological substance in contaminated flood water.

- With an amplitude modulation frequency of 1 kHz, a 30% enhancement in the streaming velocity is thus observed, increasing to approximately 60% at 10 kHz. The increased viscous dissipation within the boundary layer associated with the amplitude modulation is also accompanied by a modest reduction in the droplet temperature, which is a further advantage particularly for biomicrofluidic applications.
- The intensification of acoustic streaming with amplitude modulation is also seen to translate into faster and more efficient microcentrifugation-driven particle concentration, reducing the time taken to concentrate particles in the centre of the droplet between 50% and 70% depending on the particle size.

In the future phase of the project is to integrate this successful technique with the SAW-based portable biosensor for the on-side detection.

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* Publications claim

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Page: 1 of 1 (1 total submissions)

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Action	Manuscript Number	Title	Initial Date Submitted	Date Revision Due	Status Date	Current Status
Action Links	SNB-D-16-00428	Amplitude Modulation Schemes for Enhancing Acoustically-Driven Microcentrifugation	Jan 24, 2016	Jun 20, 2016	Apr 21, 2016	Revise

The project has completed satisfactorily and has generated 1 indexed journal and contributed to the training of 1 research student. Overall a satisfactory outcome, given the short duration of the project.

26/5/16

END OF REPORT

Porject Title: DESIGN AND CONSTRUCTION OF AFFORDABLE HOME FOR IMMEDIATE RESETTLEMENT IN DISASTER AFFECTED HOUSING AREA

A. Project Information

Start Date	:	01/04/2015
End Date	:	31/12/2015
Extension Date	:	31/03/2016
Project Status	:	Completed
Project Leader	:	Prof. Ir.Dr. Mohd Hanim Osman
I/C Number	:	590103-01-6017
University	:	Universiti Teknologi Malaysia
Address	:	Fakulti Kejuruteraan Awam, Universiti Teknologi Malaysia.
Contact number	:	012-7928366 / 07-5532155
Project Members:		Tan Cher Siang, Izni Shahrizal Ibrahim, Ahmad Baharuddin Abd.Rahman, Arizu Sulaiman, Mushairry Mustafar, Mohd.Azreen Mohd Ariffin.

B. Project Achievement

Project Progress:		100%
Research Output:		Indexed Journal (2), Non-indexed Journal (0), Conference Proceedings (1)
Talent	:	RA (1), PhD student (2)(on-going), Master student (0)

C. Expenditure

Budget Approved:		RM 100,000
Amount Spent	:	RM 97,215.00
Balance	:	RM 2,785.00
% of Amount Spent:		97.22%

Summary of Research Findings

1.0 Introduction

During the disastrous flood in Kelantan in 2014, it was reported that at least 2000 homes were swept off by the flood. In 2015, many houses were damaged by the earthquake in Sabah. Immediate resettlement is one of the priority to be solved after any kind of disaster that cause total damage to houses. In this research, an option for cheap and immediate home has been proposed, ie. using **cold-formed steel** frame, which is classified as industrialized building system (IBS). If it is manufactured and installed for hundreds of homeless villagers after a disaster such as flood, it will be more economic. The advantage of the proposed solution is that, it not only cheaper but can also be used as a permanent building. It can be installed within a short time, involving less workers.

The objective of the prototype research is to produce a construction method using cold-formed steel frame wall system, for low cost homes which are affordable to villagers of disaster affected areas, whilst maintaining the structural stability.

Cost analysis was the first part of the research, design method and finally the installation technique and experimental test to ensure the strength and stability of the building system. The research was carried out in collaboration with Visage Industries Sdn Bhd, the steel fabricator and factory located at Sg. Bakap, Penang, who supply the cold-formed steel materials used in the research.

The second part was the experimental tests on cement board, sub-panel, and full-scale prototype building. For the strength of sub-panel and cement board cladding material, three strength components were tested i.e. shear test, punching shear test, and bending test. In the test of sub-panel, in plane shear test was conducted on three types of cladding ad infill i.e. panel with exmet forming, panel with cement board. The third part of the study is the design of cold-formed steel used in the wall frame. The calculation was to verify that the sections fabricated by the computerized cutting machine comply with the requirement in the design standard.

2.0 Methodology

2.1 Construction Of Framed Wall System

In order to prove that this method is cheaper than the conventional brickwall system, the construction procedure has to be studied. Table 1 shows the differences between framed wall system using cold-formed steel section and brickwall system. Basically, framed wall system can be considered as load-bearing wall. Table 1 shows the difference between framed wall system. The flow of the construction is as shown in Figure 1.

		Framed Wall System	Brick wall system
1	Main supporting member	Gravitational loading from the top is suuported by the studs arranged at closed interval.	Gravitational loading from the top is suuported by the beam which transfer to the supporting column at each end.

2	Structural system	The system is load bearing wall in which the wall is made of framed system.	The system is rigid frame structure with columns generally at each intersection of wall.
3	Wall loading resistance	Framed wall is designed to carry vertical load, it has no shear resistance unless if infilled with concrete.	Wall is not designed to carry load, however it provides some shear resistance.
4	Infill	Mortar, lightweight or foamed mortar, or fibre wool.	Bricks or mortar blocks.
5	Roof beam	Basically no roof beam. The horizontal member transfered loading from the roof truss to the studs of the wall frame. It also acts as horizontal tie member.	Roof beam is an important member. It transfered distributed loading from the roof trusses to the columns at each end.
6	Wall finishing	The cladding board of both sides of wall do not need finishing.	Need skilled worker to do surface finishing.

Cost Analysis

It involved the calculation for the cost of building main structural components, i.e. cold-formed steel frame system for the wall, different choices of cladding material such as cement board, exmet, plywood and gypsum board, roof truss system using cold-formed steel sections, different types of infill materials, and concrete base system, door and window, roofing and ceiling, building services system and other accessories. The cost of the building takes account of the materials and labour. The size of the frame used was 75x38x1.0 mm thickness. Figure 2 shows the photograph of the building, i.e. the erection of the first few frames (left) and after the completion of all wall and truss frames (right). Cement board is seen fixed to the wall frame in the right photo. Figure 3 shows the framework of the building using cold formed steel.

Figure 2 : Cold formed steel section.

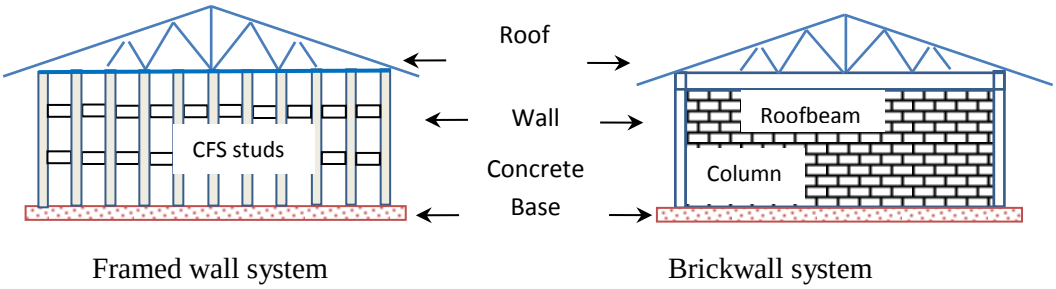

Figure 3: Framed wall system and brick wall system

In general, the construction of this typical simple house can be divided into three stages i.e. concrete base, wall system and roof system. The cost for framed wall system is RM 14,000 whilst for the brickwall system is RM 19,000. However, this costs are still subject to locality condition such as the price of raw materials and rate of salary. For the framed wall system, the costing include framed wall panel, stiffener at wall intersection, cladding x 2 layer, and mortar infill. For the conventional system, it include the brickwall 3 m high, plastering, reinforced concrete column 150x150, roof beam, steel bar (beam), and formwork.

Design Of Cold-Formed Steel Frame

The layout of the 6 x 9 m house is shown in Figure 4. The design of cold-formed steel section is done in accordance to Eurocode EC3. Only the calculation for the studs is presented here since this is the part that is different from the conventional brick wall. There are 14 framed wall panels of this kind.

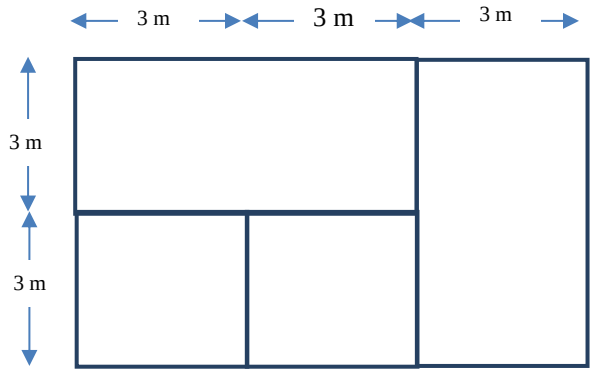

Figure 4 : Layout plan of the prototype house

The total characteristic dead load is taken as G_k = 2.0 kN/m^2 and the imposed load on roof, Q_k = 1.5 kN/m^2. The safety factor for load (BS EN1990 Clause 6.4.3) are permanent load, γ_G = 1.35 and variable load, γ_Q = 1.50. Based on the assumption, the load acting on each stud = 4.45 kN.

The stud used are chanel section VF 70 075 with the dimensional properties D = 69.30 mm, B = 37.30 mm, t = 0.75 mm, and A = 110.24 mm^2. The axial compression capacity of member is calculated based on EN1993-1-3 Clause 6.1.3 and Clause 6.2.2. The axial capacity was calculated as equal to

12.4 kN. Taking account the slenderness, the flexural buckling resistance on major axis is 6.7 kN, which is greater than the design load on each stud. Since it is a double symmetry section, the shear centre is at the middle of the section which increase the torsional rigidity. Therefore, lateral torsional buckling can be neglected.

3.0 Results and Discussion

The major product of the prototype research is guide for the design and installation of the building system. The design guide has been developed for the design of wall frame using cold-formed steel section, truss structural system, and load bearing composite wall system. The manual for the installation of framework, include the architectural and structural drawing were developed in order to facilitate the community folks to construct their homes themselves. It includes the design of load bearing capacity for the bare cold-formed steel frame and the design capacity when it acts compositely with concrete infill.

For the proposed small house of 6m x 9m with 2 rooms, when completed with wall cladding and mortar infill, roofing system, doors, windows, plumbing and basic electrical wiring, the overall cost is estimated in the range of RM 45,000 – 60,000, depends on the quality and price of the materials.

4.0 Conclusion

1. An installation manual has been produced, which can be used by the villagers or unskilled workers to construct their own house without the need of contractors.
2. The structural design guide and cost analysis of the construction system have been produced. It was concluded that the system can be used as a cheaper and better alternative for the peoples affected by disaster.
3. To adopt and commercialize the construction system in the disaster area in future, the technology has to be transferred to the affected community.

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END OF REPORT

Porject Title : **COMPACT, LIGHT WEIGHT AND HIGH PERFORMANCE MEMBRANE SYSTEM FOR SAFE DRINKING WATER**

A. Project Information

Start Date : 01/04/2015
End Date : 31/12/2015
Extension Date : 31/03/2016
Project Status : Completed
Project Leader : Prof Dr Ani Idris
I/C Number : 630202715300
University :Universiti Teknologi Malaysia
Address :81310, Johor Bahru, Johor, Malaysia
Contact number : 019-7776054
Project Members : Prof Dr Noordin Mohd Yusof
Assoc Prof Dr Roslina Rashid

B. Project Achievement

Project Progress : 100%
Research Output : Indexed Journal (1), Non-indexed Journal (1), Conference Proceedings (1), Book Chapter (__),….
Talent : RA (__), PhD student (1), Master student ( )

C. Expenditure

Budget Approved : RM 300,000
Amount Spent : RM 300,000
Balance : RM 0
% of Amount Spent : 100%

Compact, Light Weight and High Performance Membrane System For Safe Drinking Water

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Introduction

The recent flood in Dec 2014 has hit the northern part of the Malaysian peninsula badly and the aftermath of the flood caused much suffering to the people due to the scarcity of drinkable water. Drink DRINKABLE water is also scarce in many places throughout the world and shortages will raise dramatically in the future due to further development and pollutions\. Fresh water shortage threatens a large number of the world population and makes water potentially a critical matter since it has no viable substitution. In addition the occurrence of catastrophes such as the recent floods in Malaysia, tsunami has spurred the need for quick relief in emergencies especially in the water supply. With this in mind there is the need to supply a water supply system which is compact, lightweight and has high performance capable of supplying sufficiently safe drinking water. Due to the damage in infrastructure due to catastrophe, there is the need to ensure that the system should be operated by an independent energy system which can be battery operated, generator set or solar modules. Thus it is the aim of this project is to design, fabricate and develop such a prototype system.

Objective

Design of the components of the system such as the nanofiltration module and other accessories necessary for operation

To fabricate, source the components and assemble them.

To test run the installed system on low energy systems which can be run independently such as batteries which are rechargeable or electrical generator module or solar driven modules

Method

1. Design the components of the system such as the i)Nanofiltration module, ii)Prefilter for protecting the nanofiltration module, iii) backwashing module, iv) disinfection module, v)Raw water module including pipes and tubings (including accessories),vi) Distribution box with control unit (including PLC), vii) Flocculation module and other accessories necessary for operation. (see Fig 1.)
2. Spinning of the hollow fibers and potting the nanofiltration (NF) module.
3. Selecting and fabricating the pre filter system to be placed before (NM) module and also the backwashing module.
4. Selecting the suitable disinfection module, flocculation modules and raw water module including hoses/pipes and tubings.

5. Placing all electrical connection within the distribution box with control unit (including PLC).
6. Supplying system options such as solar modules and electrical generator module, UV disinfection module, storage tanks for purified water.
7. Assembling the components and run it on the rechargeable battery.
8. Finally the performance of the system is evaluated in terms of flux and rejection rates

Results and Findings

In this project the compact, light weight and high performance membrane system for safe drinking water was successfully developed. The components of the system which is the ultrafiltration (UF)/nanofiltration (NF) module and other accessories necessary for operation was conceptually designed as shown in Figure 1. Upon completion of the design, the components are sourced, assembled and installed and the proptotype unit is schematically shown in Figure 2. Subsequently the installed system is run on low energy systems which can be run independently such as batteries which are rechargeable or electrical generator module or solar driven modules. The hollow fiber UF/NF membranes which were spun by MEMTEC PLT which is the Universiti Teknologi Malaysia spinoff company were installed into the membrane system. This prototype is aimed to provide safe drinking water supply as the most fundamental tasks after flooding catastrophes or accidents mainly for Malaysia's topography and climate which pose enormous challenges. Without clean drinking water, the risk of epidemics increases rapidly. More often in these unfortunate places, infrastructure is badly destroyed and thus the challenge is to supply sufficient quality water directly to site on time to these populations. The MT-2500/UF is specifically developed to provide this flood solution. The design specifications are described in Table 1. The main parts of the portable water filtration system shall not weigh more than 60 kg each however the entire machine can weigh up to more than 250 kg.

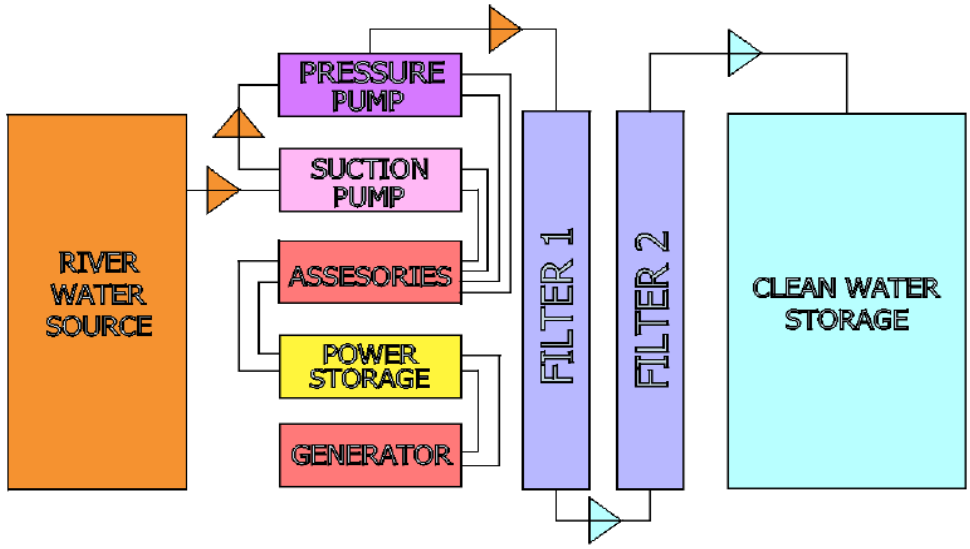

Figure 1: Conceptual design of the compact, light weight and high performance membrane system

Figure 2. The prototype unit of the compact, light weight and high performance membrane system (MT-2500/UF)

Table 1: Technical specifications

Technical specifications	
Transport size (L X B x H)	Approximately 1.20 x 0.9 x1.4 m
Transport mass (including pumps, empty	Approximately 200 kg
Connected load (max.)	Approximately 3000 W, 240 V, 50/60 Hz
Output (subject to the quality of the raw water)	Up to 2500 Lh^{-1}
Membrane specs. (2 to 5 nm)	Can achieve rejection rates as high as 95 to 99%
Operating temperature	+ 3 ^{o}C to + 50 ^{o}C

Table 2: Membrane module sizing

Technical specifications for membrane module	
Membrane module size (L X D)	Approximately 1.21 x 0.21 m
No of modules	2
No of HF/module	9600
Flux rate/module	2675 Lh^{-1} ~ 700 gal h^{-1}
Rejection rate	90- 99%
Pore Size	0.9- 1.2 nm

Conclusion

The prototype unit was successfully developed with all the features of a compact, light weight and high performance membrane system. The water quality from the membrane were tested and meet the world health organisation (WHO) and also the Ministry of Health (MOH) as attached in the Appendix I. It has been installed and tested and the technical specifications are met.

Acknowledgements

The authors wish to thank the Ministry of Higher Education (MOHE) for the financial support to this work through the PRGS funding number R.J130000.7809.4L646, Memtec PLT and First EcoWerks for their technical support.

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MEMTEC PLT
Block 1A, UTM-MTDC Technology Centre
Universiti Teknologi Malaysia
Jalan Pontian Lama
81300 Skudai JOHOR
MALAYSIA

Date of Issue: 2016-04-28
Date of Received: 2016-04-22
Date of Completion: 2016-04-28

Sample Description: Drinking Water

ND denotes Not Detected

NOTE: Specification refers to 25th A Schedule Standard for water (MOH) except Silica, Phosphorus, Pottasium, Molybelenum, Ordour and Total Dissolve Solid refer to WHO-Guidelines for Drinking-water Quality FOURTH EDITION 2011.
Malaysia Food Regulation 1985 TWENTY-FIFTH SCHEDULE (Subregulation 394 (1)).
All analysis result is comply to the specification of Standard for Water.

Acceptance of high flux, high rejection module as filtration technology for meeting Ministry of Health (MOH) drinking water regulation requirements and also WHO guideline for drinking water quality.

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AN1: RA1654266635557399

Dewelli Mohd Amin
Microbiologist
Food Analyst No: MJMM0327
AN2: RA1638627496765628

Test Description	UOM	Result(s)	Spec	Method or Equipment Used
Aldrin	mg/L	ND<0.00003	0.00003	APHA 6630 D (2005)
Aluminium	ppm	ND<0.01	0.2	APHA 3120 B (2005)
Ammonia	ppm	0.3	0.5	APHA 4500 NH3 B & C (2005)
Anionic Surfactant-Detergent MBAS	ppm	ND<0.01	1	APHA 5540 C (2005)
Antimony	ppm	ND<0.002	0.005	APHA 3120 B (2005)
Arsenic	ppm	ND<0.001	0.01	APHA 3120 B (2005)
Barium	ppm	ND<0.01	0.7	APHA 3120 B (2005)
Biocides (Total)*	ppm	ND<0.1	0.1	Biocides Test Kits
Boron	ppm	ND<0.1	0.5	APHA 3120 B (2005)
Bromodichloromethane*	ppm	ND<0.02	0.06	Gas Chromatography

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Lab Ref No.: JL1604-A13573 SN: RS1120123332254172

Test Description	UOM	Result(s)	Spec	Method or Equipment Used
Bromoform*	ppm	ND<0.02	0.1	Gas Chromatography
Cadmium	ppm	ND<0.001	0.003	APHA 3120 B (2005)
Carbon Chloroform extract*	ppm	ND<0.01	0.5	Combustion Infrared
Chlordane	mg/L	ND<0.0002	0.0002	APHA 6630 D (2005)
Chloride	ppm	10.8	250	APHA 4500-Cl- D (2005)
Chloroform*	ppm	ND<0.006	0.2	Headspace
Chlorpyrifos*	mg/L	ND<0.03	0.03	GCMS
Total Chromium	ppm	ND<0.01	0.05	APHA 3120 B (2005)
Copper	ppm	ND<0.01	1	APHA 3120 B (2005)
Cyanide	ppm	ND<0.02	0.07	APHA 4500 CN- C&E (2005)
2,4-D	mg/L	ND<0.03	0.03	APHA 6630 D (2005)
DDT	mg/L	ND<0.001	0.001	APHA 6630 D (2005)
Dibromochloromethane*	mg/L	ND<0.02	0.1	Gas Chromatography
Dieldrin	mg/L	ND<0.00003	0.00003	APHA 6630 D (2005)
Endosulfan	mg/L	ND<0.03	0.03	APHA 6630 D (2005)
Fluoride	ppm	0.2	0.6	APHA 4500 F-D (2005)
Total Hardness	ppm	65.50	500	APHA 2340 C (2005)
Heptachlor	mg/L	ND<0.00003	0.00003	APHA 6630 D (2005)
Heptachlor Epoxide	mg/L	ND<0.00003	0.00003	APHA 6630 D (2005)
Hexachlorobenzene	mg/L	ND<0.001	0.001	APHA 6630 D (2005)
Iron	ppm	ND<0.02	0.3	APHA 3120 B (2005)
Lead	ppm	ND<0.01	0.01	APHA 3120 B (2005)
Lindane	mg/L	ND<0.002	0.002	APHA 6630 D (2005)
Magnesium	ppm	8.8	150	APHA 3120 B (2005)
Manganese	ppm	0.02	0.1	APHA 3120 B (2005)
Mercury	ppm	ND<0.001	0.001	APHA 3112 B (2005)
Methoxychlor	mg/L	ND<0.02	0.02	APHA 6630 D (2005)

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Test Description	UOM	Result(s)	Spec	Method or Equipment Used
Mineral Oil	ppm	ND<0.2	0.3	APHA 5520 F (2005)
Nitrite	ppm	ND<0.01	0.2	APHA 4500-NO2 B (2005)
Nitrate (as NO3-)	ppm	4.0	50	APHA 4500-NO3 B (2005)
Nitrate (as N)	ppm	0.91	10	APHA 4500-NO3 B (2005)
Nickel	ppm	ND<0.01	0.02	APHA 3120 B (2005)
Phenol	ppm	ND<0.001	0.002	MY/STP/069 based on APHA 5530 B & APHA 5530 D(2005)
Residual Chlorine	ppm	0.2	Not Less Than 0.2	MY/STP/041 based on HACH spectrophotometer method 8021
Selenium	ppm	ND<0.001	0.01	APHA 3120 B (2005)
Silver	ppm	ND<0.01	0.05	APHA 3111 B (2005)
Sodium	ppm	11.4	200	APHA 3120 B (2005)
Styrene*	mg/L	ND<0.2	0.2	Gas Chromatography
Sulphate	ppm	10.7	250	APHA 4500-SO42- D (2005)
Zinc	ppm	ND<0.02	3	APHA 3120 B (2005)
Coliform	cfu/100ml	<1	< 1	APHA 9222 B (2005)
E.Coli (Multiple Tube Method)	MPN / 100ml	ND<2	Absent	APHA 9221 E/F
Fecal Streptococci*	in 100ml	Absent in 100ml	Absent	APHA 9230C (2005)
Pseudomonas Aeroginosa*	in 100ml	Absent in 100ml	Absent	APHA 9213 E
Clostridium perfringens	in 100ml	Absent in 100ml	Absent	FDA-BAM Chapter 16
Sulphite Anaerobic Reducing Bacteria*	in 100ml	Absent in 100ml	Absent	APHA 9240 E
pH		7.0	6.5 -8.5	APHA 4500-H+ B (2005)
Colour (ADMI)	ADMI	ND<5	15	APHA 2120 F (2005)
Turbidity	NTU	1.06	2	APHA 2130 B (2005)
Gross Alpha*	Bq/l	<0.1	0.1	APHA 7110- B (2005)
Gross Beta*	Bq/l	<1.0	1.0	APHA 7110- B (2005)

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Lab Ref No.: JL1604-A13573 SN: RS1120123332254172

Test Description	UOM	Result(s)	Spec	Method or Equipment Used
Molybdenum	ppm	ND<0.01	0.07	APHA 3120B (2005)
Odour*		Odurless		APHA 2150
Silica*	ppm	4.2		APHA 4500 SiO2C(2005)
Phosphorus++	ppm	ND<0.01		APHA 4500-P B & C (2005)
Potassium	ppm	4.5		APHA 3120 B (2005)
Total Dissolved Solid	ppm	85.0	1000	APHA 2540 C (2005)

– END OF REPORT –

END OF REPORT

(**maximum 5** pages of end report)

Porject Title : **Developing organizational model on integrated flood preparedness management system for DIY community rebuilding in Sg Kelantan River Basin**

A. Project Information

Start Date : 01/04/15

End Date : 31/12/15

Extension Date : 31/03/2016

Project Status : Completed

Project Leader : Prof. Dr. Hjh. Rahinah Ibrahim

I/C Number : 650901-06-5878

University : Universiti Putra Malaysia

Address : 43400 UPM Serdang, Selangor

Contact number : 03-89464038/ 019-2208468

Project Members : Dr Sumarni Ismail, Dr Mohd Saipol Bari b Abdul Karim, Dr Mohd Mazlan Che Mat, Pn Norhayati Mansor, Cik Rafeah Mustafa Kamal

B. Project Achievement

Project Progress : 100%

Research Output : Indexed Journal (x), Non-indexed Journal (__), Conference Proceedings (__), Book Chapter (__)…….

Talent : RA (x), PhD student (x) Master student (__)

C. Expenditure

Budget Approved : RM 80,000.00

Amount Spent : RM 79,968.93

Balance : RM 31.07

% of Amount Spent : 99.96

Summary of Research Findings

1.0 Introduction

There is a need for better coordination and management of disaster relief and preparedness as per experienced during the recent flood. This study hypothesizes that a dynamic organization for flood disaster relief and preparedness management could be streamlined effectively if multiple stakeholders understand and know the different interdependent tasks involved and when leadership changes are acknowledged for different phases in the complex process. Therefore, there is a need to design an effective operational model for managing the complex tasks in discontinuous situation so representative of the disaster relief and preparedness deployment. The design and building of a shelter-home for dual-function purpose was also approved in the extended period.

2.0 Methodology

The study uses computational case study experiment to test out the organizational behavior of the disaster team members to reflect the actual happenings. It used SimVision™ to simulate and explain the happenings that happened during Week One of the Sg Kelantan flood disaster. The explanation of the results are based on interviews with 3 key informants at the Kuala Krai Command Centre and 1 rescue platoon officer on the field. The study ignores social or news media about the performance of the team. The case study components in developing the computational model are as follow:

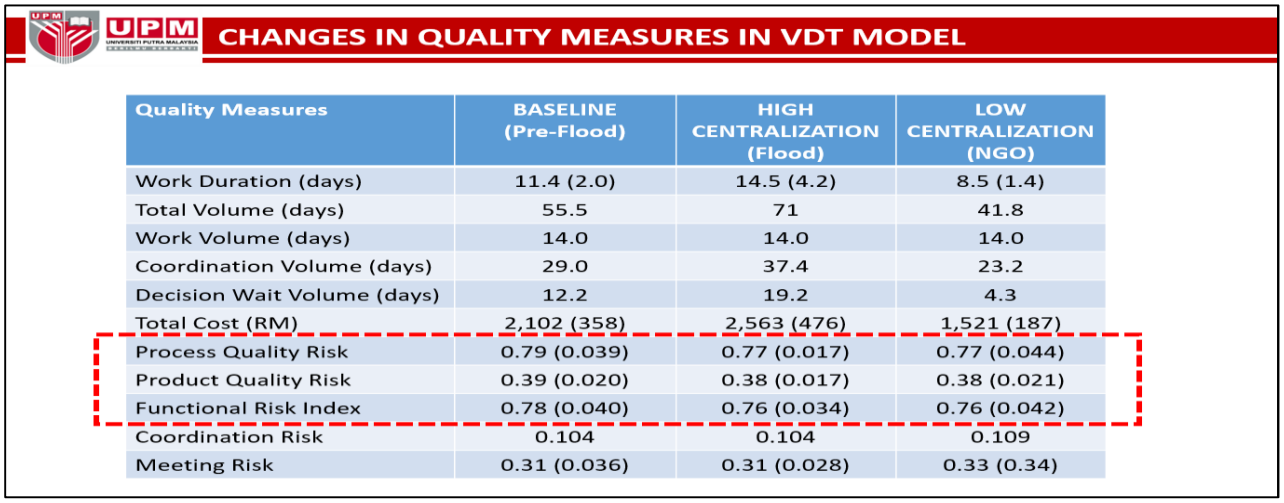
Research Question. What is an effective model for a Value Added Integrated Flood Preparedness Management Programme for Malaysia? *Theoretical Proposition.* A dynamic organization for flood disaster management could be streamlined effectively if multiple stakeholders understand and know the different interdependent tasks involved leadership changes for different workflows and phases in the complex preparation and deployment process. *Unit of Analysis.* This study is focused to the performance of the Kuala Krai Command Centre during the peak flooding period of 2014. *Linking Data to Proposition.* The study divides the data collection procedure into two major parts: 1) based on MKN's *Arahan 20* and 2) field data. *Criteria for Interpreting Data.* The conceptual model for an effective Flood Disaster Management shall have the following criteria for acceptance: Functional Risk Index (less than 0.5), Personnel Risk Index (less than 0.5) and Deployment Schedule (less than 3 days when flood warning is raised).

3.0 Results and Discussion

3.1 MKN's *Arahan 20* Organizational Workflow

The original MKN's *Arahan 20* organizational structure was not functional because no organizations can have two leaders within its structure. In this case, there exist 2 situations. The national to state link and the state to district link was deleted to run the following workflow. We changed the parameter for centralization to reflect the different operational situations for the Disaster Management Team: MEDIUM for pre-flood, HIGH for flooding and LOW for NGO

operations. In all the cases, the revised organizational structure has very high risk (> 0.77) for its process quality risk and functional risk index (See Fig 1). The results was supported by failed organizational performance as per seen on news media during the first 3 days of the peak flooding. We further reviewed the respective critical path flow to observe the complexity of the field operations. The flooding workflow showed all links to be in critical status while the NGO workflow only highlighted one critical path to work on urgently—supporting humanitarian tasks.



CHANGES IN QUALITY MEASURES IN VDT MODEL

Quality Measures	BASELINE (Pre-Flood)	HIGH CENTRALIZATION (Flood)	LOW CENTRALIZATION (NGO)
Work Duration (days)	11.4 (2.0)	14.5 (4.2)	8.5 (1.4)
Total Volume (days)	55.5	71	41.8
Work Volume (days)	14.0	14.0	14.0
Coordination Volume (days)	29.0	37.4	23.2
Decision Wait Volume (days)	12.2	19.2	4.3
Total Cost (RM)	2,102 (358)	2,563 (476)	1,521 (187)
Process Quality Risk	0.79 (0.039)	0.77 (0.017)	0.77 (0.044)
Product Quality Risk	0.39 (0.020)	0.38 (0.017)	0.38 (0.021)
Functional Risk Index	0.78 (0.040)	0.76 (0.034)	0.76 (0.042)
Coordination Risk	0.104	0.104	0.109
Meeting Risk	0.31 (0.036)	0.31 (0.028)	0.33 (0.34)

Fig. 2. Assigning parameters to reflect Pre-flood, Flood and NGO organizational performance for disaster mobilization based to MKN *Arahan 20*'s organizational structure.

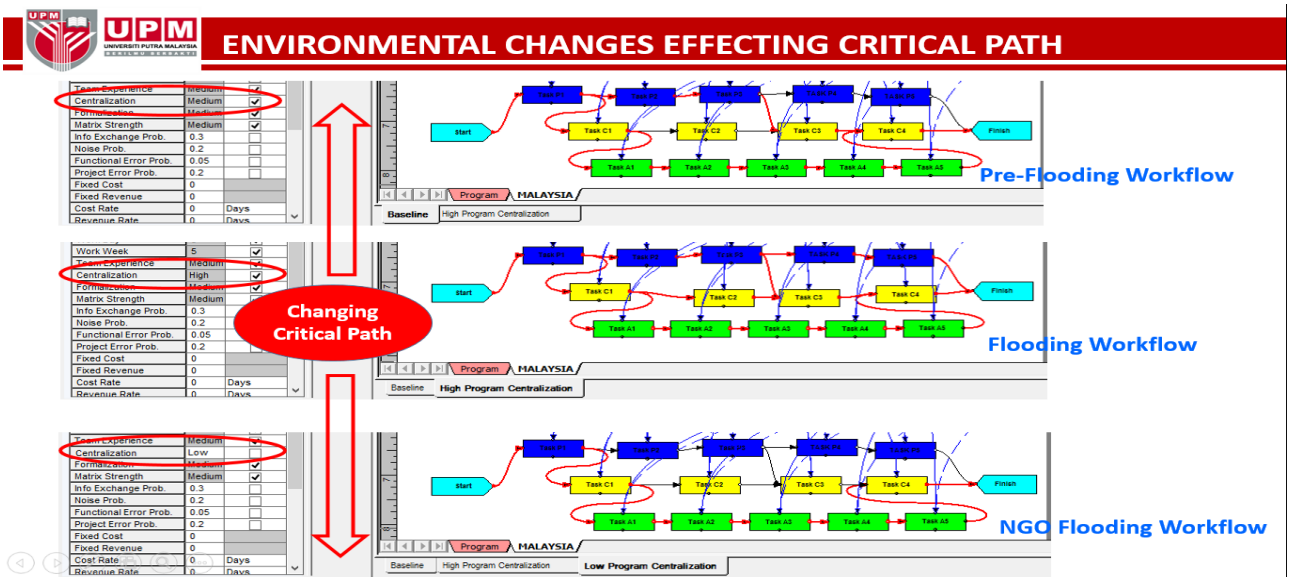


Fig. 3. Critical path changes reflecting parametric assignment for Pre-flood, Flood and NGO organizational performance on MKN's *Arahan 20* organizational structure.

3.2 Actual Disaster Management Team Performance

The actual Kuala Krai Command Centre structure was drawn from interviews with the KJDKK, TKDJKK, Head of Kuala Krai Police and Police Sargent in the field. The first situation was when the KDJKK position was only filled starting January 2015. During the peak of the flood in December 2014, the TKDJKK was responsible for the Kuala Krai Command Centre. The second situation was when the electricity had to be cut thereby making all field posts unable to charge their mobile batteries and were physically cut off to seek diesel supplies for the boats. Thus, the field posts were unable to inform the Kuala Krai Command Centre of their status and updates. The third situation was when the Army leader took the lead at the Kuala Krai Command Centre and mobilization of the army came several days after the peak flood period occurred. Despite the unprecedented work volume, the in-situ organization performed well below the 0.5 risk benchmark.

Quality Measures	Unavailability of KDJKK and TKDJKK in charged	Lost communication and supplies shortages	With Army Leader and TKDJKK support civilian operation
Work Duration (days)	17.9 (0.8)	17.5 (0.6)	17.7 (0.7)
Simulated Work Duration (days)	90.4	87.6	88.3
Total Volume (days)	**398.9**	**379.3**	**385.3**
Work Volume (days)	167.4	167.4	167.4
Rework Volume (days)	33.8	29.6	33.5
Coordination Volume (days)	186.4	178.2	177.1
Decision Wait Volume (days)	11.3	4.1	7.3
Non-labor Cost (RM)	10,787	9,817	9,665
Process Quality Risk	**0.48 (0.036)**	**0.42 (0.38)**	**0.29 (0.047)**
Product Quality Risk	**0.45 (0.064)**	**0.49 (0.072)**	**0.33 (0.079)**
Project Risk Index	**0.41 (0.125)**	**0.38 (0.060)**	**0.37 (0.143)**
Functional Risk Index	**0.48 (0.051)**	**0.38 (0.60)**	**0.28 (0.053)**
Coordination Risk	0.139	0.138	0.138
Meeting Risk	0.41 (0.019)	0.41 (0.016)	0.41 (0.017)

Fig. 4. Organizational performance based on actual Kuala Krai Command Centre operation during different leadership situations.

3 Dual-function Shelter Home

Fig. 5. Completed homestay unit during dry season which turns into shelter during flooding season.

4 Conclusions

4.1 The simulation on the MKN's *Arahan 20* organizational structure highlighted 2 problematic situations where one team member must have two managers.

4.2 The simulation indicated a focused tasks workflow for the NGO compared to multiple concurrent tasks workflow for MKN's *Arahan 20* organization. Although the NGO organization is able to mobilize their tasks faster, both the MKN's *Arahan 20* and the NGO organizations have very high process quality and functional risks that are most likely to breakdown at any time if followed precisely.

4.3 During the span of about 17 days of the 2014 Kuala Krai flood disaster, the KKCC had actually handled more than 380 man days while able to maintain their process quality risk, product quality risk and functional risk index at less than 0.50 which is at manageable stress. The study was informed that KKCC had originally planned for the annual relocation of 3,000 victims as opposed to about 23,169 (Malay Mail 29 Dec 2014) actual relocated victims.

4.4 Despite the late appointment of the KDJKK, loss of communication and the Army moving into the KKCC, the overall organizational performance during the Kuala Krai flood disaster can be considered successful due to the unprecedented increase of flood victims.

4.5 More studies are recommended to analyze the effectiveness and productivity of the KKCC's ad hoc organization during the 2014 flood period which has civilians mix during disaster events and its ability to handle the large number of flood victims within a short time.

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