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# **The Role of the University in Community Engagement for Environmental and Water Education: The Example of Universiti Sains Malaysia**

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## **Abstract**

The modern university in the current era is more than just an institution of teaching, learning, research, discovery and knowledge depository. Times have changed and society is becoming more demanding. To stay relevant, universities need to evolve and change to serve a wider scope of societal needs. A university needs to serve and benefit communities, and in order to do that effectively, it needs to engage with communities in a symbiotic relationship. This paper looks at how a university can form smart-partnerships with communities (which include the private sector, non-governmental organisations and the wider public) to enhance environmental and water stewardship. The project is focused on environmental education, specifically on water, involving Universiti Sains Malaysia, Penang Water Supply Authority, Salcon Berhad, Water Watch Penang and local schools. It involves creating greater awareness and education on environment and water amongst the students. Universiti Sains Malaysia and Water Watch Penang facilitators give talks and demonstrate various water sampling and water testing methods. Observation and measuring equipment are employed to test the physical, chemical and biological water quality of a selected river. Participants are evaluated before and after the activity. Pre and post assessment results showed that participants score better in the latter. Results show that their level of awareness and knowledge on the environment, river and water has significantly improved. This project exemplifies how Universiti Sains Malaysia has engaged communities effectively and successfully carried out its corporate social responsibility.

Keywords: University-Community Engagement; Smart Partnership; River Water Quality Assessment; Environmental Education; Water Conservation.

## **1. Introduction**

The traditional role of the University is to run research, discover new theories and products, and generally provide education at the highest levels. However, times have changed and universities need to change to be relevant. Universities need to touch-base with local communities, and university-community engagement should go beyond mere outreach. Communities are not mere “objects” of research or “beneficiaries” but because of higher education have rich resources and expertise which universities can tap into. Ideally, universities should seek mutually beneficial relationships with communities to address pertinent community/societal issues and needs. Conceptually, the Triple Helix Innovation Model (THIM) is one that is followed by modern universities as it focuses on university-industry-government relations. The THIM focuses on the importance of higher education for innovation and places great emphasis on knowledge production and innovation in the economy in the creation of the *knowledge economy* (Etzkowitz and Leydesdorff, 2000).

Another layer is added in the form of the Quadruple Helix Model (QHM) which embeds the THIM by adding as a fourth helix the ‘media-based and culture-based public’ and ‘civil society’. The QHM involves the *knowledge society, knowledge democracy* for knowledge production and innovation. As such, the sustainable development of a knowledge economy requires a coevolution with the knowledge society (Carayannis and Campbell, 2009). However, as universities, industries and communities become more complex, this has led to the Quintuple Helix Innovation Model (QHIM) which is even broader and more comprehensive by adding the helix (and perspective) of the ‘natural environments of society’ (Carayannis et. al., 2012). Hence, the QHIM focuses on the *socioecological transition* of society and economy via an ecologically sensitive environment. Within the framework of the Quintuple Helix innovation model, the natural environments of society and the economy also should be seen as drivers for knowledge production and innovation, therefore defining opportunities for the knowledge economy. The European Commission in 2009 identified the socioecological transition as a major challenge for the future roadmap of development. The Quintuple Helix is envisaged to produce a win-win situation between ecology, knowledge and innovation, as well as creating synergies between economy, society and democracy. Hence, the role of the university in community engagement for environmental and water education is very relevant. Environmental and water education are two areas of ecological concern, to which the Quintuple Helix innovation model can be applied with great potentials.

With the ultimate QHIM, universities and communities can contribute resources and expertise to each other with a commitment to sharing and a reciprocity which embraces a two-way symbiotic partnership. Increasingly, community engagement and benefitting communities have become central to modern universities. University has the expertise and community has the needs. Current trends in higher education place higher than ever expectations on universities who are now expected by society, the community and the government to make meaningful and tangible contribution to national, regional and international growth and well-being. Hence, the core functions of universities have evolved. Universities must now develop and apply knowledge with society in mind, and then their core functions have to build not only on academia but also upon communities that can offer solutions to societal problems. More and more, the public acknowledges the immediate needs for universities to embark on university-community engagement due to current changes in knowledge generation and diffusion, the need to address critical social, economic, cultural, and environmental concerns, to encourage engaged learning and to acknowledge academic involvement in nation building. University-community engagement is all about building relationships and in the process transforming both parties. Even a university multi-faith centre can be used as a vehicle for community engagement (Adams, 2015).

All over the world, universities are trying very hard to be as connected and relevant to their communities as possible. University-community engagement may well be a “new paradigm” in the continued development and relevance of universities. Watson et. al. (2011) document that university missions are increasingly moving away from primarily focussing on academia towards more compelling and immediate social issues such as poverty alleviation, public health improvement, achieving universal primary and secondary education, and enabling locally controlled economic development. In Universiti Sains Malaysia (USM), the role of university is seen as a collaborator in a Collaborative Model Approach between university, Ministry of Higher Education, NGO, industry and community. The center for collaborative approach is either demand-driven or values driven, and this approach focuses on providing local solutions to solve global problems via knowledge assimilation to create greater impact

(Asma Ismail, 2017). Universiti Sains Malaysia has developed an international network of universities interested in such noble aims called the Asia-Pacific University - Community Engagement Network (APUCEN). APUCEN was launched on 13th July, 2011. It now involves 19 countries and 87 institutions as a regional network of 65 universities (and academic institutions of higher learning) concerned with promoting the culture of university-community engagement in a proactive, inclusive, holistic and participatory way (<http://apucen.usm.my/index.php/en/> Accessed 10 October 2016). Like other university-community networks, APUCEN is driven by the belief that universities cannot be separated from their communities, and that both need to work together to co-create knowledge to enhance the social, economic and environmental well-being of their communities. APUCEN firmly believes that university-community engagement must extend beyond philanthropy, outreach and extension or service. Instead, universities should seek symbiotic relationships and partnerships with their communities that benefit both in terms of addressing both the needs of university and community.

At an operational level, Universiti Sains Malaysia has developed three university-community-industry engagement spheres, viz. APUCEN, the Regional Centre of Expertise (RCE) Penang (RCE Penang) on Education for Sustainable Development (ESD), and the Southeast Asia Sustainability Network (SEASN). All three spheres are platforms from which USM launches all its university-community engagement programmes. For example, Lai et. al. (2014) illustrated in detail how the university can form smart-partnerships with the private sector and non-governmental organisations (NGOs) to enhance environmental and water education. The community-engagement programme involves Universiti Sains Malaysia (USM), Penang Water Authority (PWA), Salcon Berhad (SB) and Water Watch Penang (WWP). This collaborative effort is seen to be beneficial for all parties involved. The university gets to engage with industry and community, as well as to learn from each other.

## **2. Objectives**

The general objective of this paper is to examine the role of Universiti Sains Malaysia in community engagement under the subject of environmental and water education. Specifically, it is to ascertain whether the local communities have been engaged meaningfully, as well as whether their awareness, understanding and commitment towards environmental and water conservation has been enhanced.

In terms of the programme, the general objective is to increase awareness and education of the importance of river, water and wastewater management amongst young children (between 10-12 years old) and teachers in Penang State. The specific objectives are as follows:

- (i) To engage the local communities (in this case orphans, school children and teachers) with USM
- (ii) To increase awareness and education of the importance of river, water and wastewater management amongst orphans and primary school children in Penang State via monthly talks at selected schools followed by hands-on experience of river water monitoring, visiting and learning about water treatment and wastewater treatment at selected plants.
- (iii) Training of Trainers (TOT) - To train a group of teachers (from schools and orphanages) who are then able to become facilitators who will be qualified to teach the monitoring of river water quality and explain water and wastewater treatment

- processes. This ensures the sustainability of the project as the teachers who have undergone the training will be able to conduct similar activities with their students.
- (iv) To give an opportunity for orphans and primary school children a chance to go out into the field, experience an outing, and learn useful skills of river quality monitoring, of the importance of water and wastewater treatment, and interact with staff and students of university and NGO.
  - (v) To monitor the fluctuation of river water quality of the Sg Air Terjun as results of water quality the selected rivers will be uploaded on the USM-Section on Industry-Community Network (BJIM) website, USM-School of Humanities (PPIK) website, the participating school's website and the participating NGO (Water Watch Penang's) website.
  - (vi) To inculcate a sense of responsibility amongst school children (who will in turn influence their parents and siblings) in terms of the value of water, water use, pollution due to wastewater, and the commitment to do something to protect water catchments, rivers and water resources.

### **3. Methodology**

Universiti Sains Malaysia [via the School of Humanities] and Water Watch Penang (WWP) provide their staff [Project Researchers] to run/facilitate the monthly activity. Each month, either one orphanage or one primary school in Penang is selected to participate. The size of the group is 40 participants (e.g. for a school, it will be 3 teachers and 37 students). They are then divided into various groups with a teacher and facilitator in each group. The USM and WWP facilitators give them a briefing on the importance of rivers, water and water catchment. This was followed by a demonstration on water sampling and water testing methods on the physical, chemical and biological water quality assessment techniques. At the end of the programme, the students are again required to fill in another set of questionnaires which has the same questions in the earlier questionnaire, but the questions are re-numbered differently and asked in a different manner. The two questionnaires are then compared to see whether a student has achieved any improvement in his/her awareness and understanding of the issues at hand (Chan, 2004).

### **4. Results and Discussion**

Under this project, USM has engaged in a smart-partnership with the PBAPP Sdn Bhd (a private water company who funded the project), local communities (school teachers and students) and Water Watch Penang (WWP), a non-profit organisation set up in November 1997. WWP's objectives are to create awareness for water conservation amongst the general public, build capacity for the public and other water consumers on water demand management, conduct research on water issues, run water education with students and create a water "sensitised" society that conserves water from the one that wastes water now. All these objectives are aimed at achieving sustainable management of water resources towards overall sustainable development. Hence, the project falls in nicely with the project aiming at enhancing environmental awareness, especially in terms of water issues. The biggest success story is the establishment of a long term partnership with the Penang Water Corporation on raising water awareness and education amongst the public and school children. Under this partnership, the PBAPP Sdn Bhd commits to fund WWP an annual grant to run annual water awareness and education programme for the public and schools in Penang. This programme is titled "Water Awareness and Education Programme for Penang State" and was launched in

1999. Related to this programme is its success in the incorporation of EE (inclusive of water conservation) as an extra-curricular activity in schools. In addition, WWP has maintained a steady flow of water conservation articles and letters to the major newspapers in order to raise awareness and sensitise the public. Overall, this programme has raised the level of awareness and education on the importance of water amongst the public, teachers and students in Penang. Another success story is that WWP has managed to draw many professionals who are experts in water management as its volunteers/members. As such, USM has gained access to expertise that is invaluable in water resources management that is used effectively in the field of public awareness and education.

This project was initially envisaged to start a symbiotic relationship that showcased smart-partnerships between USM (BJIM and School of Humanities [PPIK]), and local communities (orphanages and schools), private company (viz. PBAPP Sdn Bhd and NGOs (WWP)). USM-BJIM and PPIK provide the expertise and water testing equipment, local communities provide the target participants (orphans, primary school children and teachers), private sector provide the funding and facilities (water treatment plant for educational visit) and NGOs provide the facilitators to run the project. The facilitators of this project are staff and students of USM and staff of WWP.

Results of the evaluation of the two questionnaires on the participants to see whether a student has achieved any improvement in his/her awareness and understanding of the environmental and water issues, it was found that throughout the 4 years the programme has been run, there were significant improvements in participants’ awareness and knowledge after they had completed the programme. The results are shown in table 1.

Table 1: Level of Improvements shown by participants of the programme.

Year	Percentage Level of Improvements in awareness and education based on answers to 10 questions ( % )
2013	26.55
2014	18.12
2015	20.86
2016	16.59

This project has certainly developed much closer ties between USM and society (industry/business sector, NGO, and local communities) as this project requires collaboration between all these parties (Measured by increased engagement and links). There is now greater awareness and understanding of the importance of water, rivers, water catchments and their conservation amongst participating orphans, children, students, teachers and their family members (via “spill-over” effects). This will help create a more environmentally-conscious society in Penang, especially amongst the younger generation. Learn Skills in river water quality monitoring through simple water testing techniques such as river flow, pH, dissolved oxygen and suspended solids, and using biological indicators. Cleaner rivers via River Clean-up (Gotong Royong) as participants do a river clean-up (collect garbage etc) along the target river every month an activity is carried out (Measured by Water Quality Testing). Greater attachment to nature and love for nature amongst participants (Measured by Questionnaire Survey). Enhancement of USM’s Corporate Social Responsibility (CSR) via BJIM. This project will enhance USM’s contribution to society and engagement with local communities, all within USM’s core vision of a sustainability-led and caring university of the people (Measured by increased engagement and links). Enhancement of Smart-Partnerships between



university (USM BJIM-PPIK) and industry (PBAPP Sdn Bhd and IWK), and NGO (WWP) and local communities (orphanages and schools). BJIM is all about industry-community networking, and this project fits the bill perfectly (Measured by increased engagement and links). Training of Trainers (TOTs). More teachers who have attended the programme will be trained to a level that they can carry out the same programme on their own (Measured by the number of teachers undergoing the training programme). Chan (2015) documents how a smart partnership of university-private sector-NGO-community engagement in environmental and water education can bring enhancement in environmental awareness in Malaysia.

Results of the project show that there are huge benefits and impacts to the community, especially the teachers and students who participated in the programme. Community benefits greatly from the project and gets to know USM much better resulting in closer ties between USM and local communities (Measured by increased engagement & links). Community sees USM with a different view as a social and environmental-friendly organization, and no longer the “ivory tower” that harbours professors/lecturers and the few selected students entering the university each year (Measured by increased engagement and links). Community learn skills free-of-charge and benefits from USM’s expertise in river water quality monitoring. Community learns skills about water testing techniques such as river flow, pH, dissolved oxygen and suspended solids, and using biological indicators (insects and macro-invertebrates) as water quality indicators will be carried out (Measured by number of teachers trained and survey). Community has an opportunity/outlet to go for an educational outing and do meaningful tasks such as River Clean-up (Gotong Royong) (Measured by cleaner rivers). Community gets a chance to see the beauty of nature and the outdoors (river, forest, flora, fauna, wildlife, etc) when most urban inhabitants do not. The benefits to young children is tremendous. At the end of the project, an estimated 2,772 participants have benefited from the training (Measured by number of participants). Benefits to teachers are also significant as under the Training of Trainers (TOTs), more than a hundred teachers who have attended the programme, and they have been trained to a level that they can carry out the same programme on their own. This will enhance their continuous life-long education and improve themselves as teachers. At the end of this project, the 108 teachers who participated were all trained to run similar projects.

A synthesis of the programme (activities and output) in terms of objective of the paper, which is to examine the role of Universiti Sains Malaysia in community engagement under the subject of environmental and water education, would be that USM has succeeded in engaging the local communities (teachers and students), the private sector, and NGOs in running the programme. In terms of the themes of the programme, which is to enhance environmental, water and river awareness and education, it is clearly seen via the results of the questionnaire surveys on the participants, that overall environmental awareness and education has significantly improved. Hence, it can be concluded that the project has brought positive benefits as far as sensitizing the participants are concerned. It can also be synthesized that collaboration between university, private sector, NGOs and communities can be very useful and benefits all involved. Ultimately, it is synthesized that the environment, specifically rivers and water are the greatest beneficiaries as people become more educated and sensitized about environmental and water conservation.

## 5. Conclusion

This paper shows that a modern university such as USM in the current era is more than just an institution of teaching, learning, research, discovery and knowledge depository. Times have changed and society is more demanding. To stay relevant, USM had to evolve and change from a largely teaching and research-based university to a more multi-focus university that serves a wider scope of societal needs. The study shows that USM has successfully served and benefited surrounding communities, and USM has in the process, engaged with communities closely in a symbiotic relationship. This paper found that USM has developed smart-partnerships with communities (which include the private sector, non-governmental organisations (NGOs) and the wider public) to enhance environmental and water stewardship amongst communities. The project which focused on environmental education, specifically on water, involving Universiti Sains Malaysia (USM), Penang Water Supply Authority (PWSA), Salcon Berhad (SB), Water Watch Penang (WWP) and local schools, was effective in enhancing greater awareness and education on environment and water, especially amongst teachers and students. USM and WWP facilitators also benefited as they were given opportunities to give talks and demonstrate various water sampling and water testing methods. In the project, observation and measuring equipment were employed to test the physical, chemical and biological water quality of selected rivers, and this documents the water quality of the rivers concerned. As participants were evaluated before and after the activity, the pre and post assessment results showed that participants scored better in the latter. Hence, results show that participants enhanced their level of awareness and knowledge on the environment, river and water after having gone through the programme. This project exemplifies how USM has engaged communities effectively and successfully carried out its corporate social responsibility (CSR).

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# Assessing Different Types of Flood Losses in Kelantan State in Malaysia during the December 2014 Flood

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## Abstract

Malaysia is a flood-prone country, especially in the east coast state of Kelantan which is exposed to seasonal Monsoon floods. Floods are a major seasonal environmental disaster affecting Kelantan state, bringing significant flood losses, viz. direct or indirect losses and tangible or intangible losses. The December 2014 flood that hit Kelantan state was a very severe flood that brought flood losses in terms of loss of lives, injury, infrastructure destruction, property damage, crop loss, loss of livelihoods, disruption to normal services and losses due to expenses in healthcare. The methodology uses a questionnaire-based cross sectional convenience sampling method in three pre-selected flood hit sites of 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 losses. The reported overall direct and tangible total losses averaged RM26,622.27 per family. Yet, 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.

Keywords: Direct Flood Damage; Indirect Flood Damage; Tangible Flood Damage; Intangible Flood Damage.

## 1. Introduction

Malaysia is routinely affected by floods as the country is exposed to Monsoon winds and experiences heavy rains in deforested urban areas. Historically, Winstedt (1927) studied and documented "The Great Flood of 1926" during the colonial period. More recently, however, deforestation and rapid development have led to greater frequencies of flooding in many parts of the country (Chan, 2016a). Floods inundate a significant proportion of lowlands near rivers and floodplains and affect a significant percentage of the country's population (Ahmad Hussaini, 2014). Flood losses come in many forms: direct or indirect losses and tangible or intangible losses (Chan et al., 2002). Tangible flood losses are those that are directly attributable to flooding. Such losses may occur as direct or indirect flood damages. Often, as tangible and direct losses are relatively easier to quantify, they are included in most flood loss assessments but intangible and indirect losses which are more difficult to quantify are seldom included (Mohammad Ghazi Hj Ismail et al., 2015). Intangible flood losses are those that are

not easily quantifiable and often cannot be measured in monetary terms. For example, losses of life or permanent injury are not quantifiable in monetary terms. Hence, intangible losses are often not included in the monetary flood loss evaluation. Consequently, there is a misconception that direct and tangible losses are far greater than indirect and intangible losses. In developed countries, indirect and intangible losses have been shown to be very severe (Green et al., 1983a; Green et al., 1983b; Green and Penning-Rowsell, 1988; Green et al., 1983c). In Malaysia, Chan (2016b) has also shown that such losses during the 2014 floods in the east coast states of Peninsular Malaysia are significant. Intangible flood damages include loss of life and limb, cost of preparedness which include flood warning, planning and public awareness and education, inconvenience caused by floods, loss of school hours, loss of sleep and mental torture, stress and anxiety, health effects and other non-quantifiable losses. In most developing countries where the flood loss evaluation is not well developed, intangible flood losses are under-estimated and very often left unevaluated. This gives a false picture of actual overall flood loss. Studies in Thailand floods show that both tangible and intangible flood damages affect the Thai economy significantly. Lekuthai and Vongvisessomja (2001) showed that tangible damage assessment, which is the monetary value of all direct and indirect physical damages, is documented in great detail in Thailand. However, because of many difficulties, intangible damages are seldom assessed or taken into account. They developed the 'Anxiety-Productivity and Income Interrelationship Approach (API)' to quantify the intangible damage in monetary terms. Their results indicated that intangible flood damage in the Bangkok area can be significant. In Germany, Dassanayake et. al (2015) studied various methods for the evaluation of intangible flood losses and their integration in flood risk analysis. They found that there are relatively few studies evaluating intangible flood losses as compared to tangible flood losses. They used cost-benefit and multi-criteria analyses to assess the intangible losses and found that such losses can be significant.

In Malaysia, Chan (1995) had earlier studied and documented both direct-indirect and tangible-intangible flood damages, and found that despite being smaller in monetary terms, intangible flood loss can be mentally devastating (Chan and Parker, 1997). The disastrous major flood in December 2014 in Kelantan State 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. The floods were reported as one of the most significant and severe floods in Kelantan's history (Bah Kuning). It brought severe damage to the victims' property, crops and livestock, business as well as to their mental and physical health which affected their daily life. This study aimed to assess the actual reported damage as well as the victims' response to flood impacts among residents at several locations in the Kelantan River Basin. More recently, as a result of climate change and rapid opening of forested areas, floods have occurred with increasing frequencies and severities (Chan, 2015). Teoh and Boo (2011) reported that the Johor floods of 2006/2007 inflicted more than RM1 billion in economic losses. Flood impacts are varied and not easy to estimate. Property and structural damages are only a small part of the total impacts of floods. Physical (tangible) and direct losses can be quantified. Indirect and intangible losses, however, can be very serious and long lasting (Penning-Rowsell and Parker, 2002). Human lives are also lost almost every year and hundreds of thousands of flood victims suffer illnesses either directly or indirectly due to floods (Nasir et al., 2012). Flooding is a routinely seasonal hazard that occurs almost on an annual basis in varying degrees of magnitude (Keizrul Abdullah, 2002). However, of late, floods have occurred with increasing frequency and severity in many parts of the country (Chan, 2013). In terms of damage, the country's estimated annual flood damage is about RM915 million (Ahmad Hussaini, 2014). The

damage includes crop losses, property damage, infrastructural damage, loss in business and industries, etc. Human lives are also lost almost every year. In some severe cases of flooding (for example in 1967, 1971, 1988, 1996, 2006 and 2010), significant loss of life have occurred. Yet, most estimates of flood damage are concentrated on physical damage. For example, Teoh and Boo (2011) reported that the Johor floods of 2006/2007 inflicted more than RM1 billion in economic losses, but down-played the fact that six lives were lost. They also reported that in 2011, the floods in January saw the evacuation of over 40,000 people in Johor, Melaka, Negri Sembilan and Pahang. Again, the loss of three lives was not highlighted. In the December 2014 massive floods that devastated the states of Kelantan, Terengganu, Pahang and Perak, again damage to infrastructure estimated at RM2.9bil was emphasised although nearly 400,000 people were victims and suffered various types of losses/damages (The Star, 21 Jan 2015). The focus on physical and direct damages was highlighted when the Malaysian Government announced that RM800 million had also been allotted for repairs and reconstruction of basic infrastructure such as schools, hospitals, roads and bridges. For Budget 2015, RM893 million would be set aside for flood mitigation projects (The Star, 21 Jan 2015). However, flood impacts are varied and not easy to estimate. Property and structural damages are only a small part of the total impacts of floods. Routinely, government and the private sector only estimate the physical (tangible) and direct losses that can be quantified as they are easier to quantify. Indirect and intangible losses, however, can be very serious and long lasting (Penning-Rowsell and Parker, 2002). Human lives are also lost almost every year and hundreds of thousands of flood victims suffer illnesses either directly or indirectly due to floods. Nasir et al. (2012) have documented that the psychological impacts of floods on victims can be much more severe and long-lasting than physical damage. Their study showed that flood victims suffered cognitive, emotional and behavioural shortfalls such as fear, anxiety, hopelessness, helplessness and depression. The researchers recommend that strong social support from people who are well equipped with knowledge and skills in the management of stress, anxiety and other psychological problems.

## **2. 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 in-depth 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 (Frankfort-Nachmias and Nachmias, 1992). 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 (Figure 1). 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 (Table 1). The data was analysed by using SPSS software.



Figure 1: Location of Study Sites in Kelantan State (Source:Malaysia-3, nd)

Table 1: Sample Areas by Ethnic Groups in Kelantan

Sample Sites	Ethnicity				Total
	Malay	Chinese	Indian	Others	
Gua Musang	242	2	2	1	247
Kota Bharu	102	18	10	0	130
Kuala Krai	99	1	0	0	100
Total	443	21	12	1	477

**3. Analysis and Discussion of Results**

Results indicate that both direct and indirect, as well as tangible and intangible flood losses were exceptionally large during the December 2014 flood. Of the 477 flood victims, 407 (85.3 %) suffered losses (Table 2). A total of 346 victims 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 (Table 3). 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 (Hassan, 2011). Table 4 and Table 5 look at indirect and intangible losses. Results show that 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 (Aldrich, 2012). Intangible losses are seen in the different types of diseases suffered by flood victims in Kelantan. Fever and stress appeared to be the most serious. Overall, however, types of sicknesses were not significant as the number of cases was small.

Table 2: Sample Areas by Flood Damage Suffered in Kelantan

	Question: Did you suffer a Flood Loss during the December 2014 flood?			Total
	Yes	No	NA	
Gua Musang	226	16	5	247
Kota Bharu	119	11	0	130
Kuala Krai	62	38	0	100
Total	407	65	5	477

Table 3: Number of Households Reporting Total Damage to House (Malaysian Ringgit)

1-100	101-1000	1001-2000	2001-3000	3001-4000	4001-5000	5001-10000	10001-40000	No Damage	No Comment	Not Applicable	Total
3	44	46	27	22	18	22	10	33	7	15	247
3	10	3	18	11	22	37	4	15	0	7	130
1	31	8	1	3	0	1	1	27	2	25	100
7	85	57	46	36	40	60	10	75	9	47	477



**Table 4: Number of Respondents and Types of Diseases in Sample Sites in Kelantan**

Site	Fever	Running Nose	Vomiting	Skin Disease	Others	No Sickness	Cough	Dengue	Stress	Total
Gua Musang	1	1	6	2	6	218	1	0	12	247
Kota Bharu	3	0	1	0	1	120	0	0	5	130
Kuala Krai	13	3	6	1	4	50	6	2	15	100
Total	17	4	13	3	11	388	7	2	32	477

**Table 5: Number of Sick Respondents and the Costs of Treatment Paid for Illnesses Suffered During the December 2015 Flood in Kelantan**

	Cost (Ringgit) of Treatment for Various Diseases									Total
	11-20	21-50	51-100	101-150	151-200	200 & Above	No Cost of Treatment	No Comments	NA	
Kelantan	1	6	0	0	0	2	217	5	16	247
Pahang	0	3	1	0	0	0	121	0	5	130
Terengganu	0	2	5	3	5	6	57	7	15	100
Total	1	11	6	3	5	8	395	12	36	477

In Malaysia, floods can cause a range of damages to residential and commercial properties located on rural and urban floodplains. While the damages in rural areas are usually confined to residential properties (with farm properties usually doubling up as residential premises) resulting in the loss of livestock and crops, and damage to building structure and contents, urban flood damage involves both damage to residential and commercial properties. And because of the high density of residential and commercial properties, infrastructure and public utilities in urban areas, urban flood damage is expected to be much higher than in the rural areas. Flood damage records have been and are still being collected by government departments and agencies on an ad hoc basis, i.e. whenever a flood occurs. As such, damage statistics are incomplete, irregular, and only covers government owned properties and utilities, the only exception being crop damage. Based on these records the estimated flood damage in Malaysia is of moderate extent compared with other neighbouring countries but this could largely be due to the underestimation of damages

#### **4. Conclusion**

Malaysia is considered a flood-prone country, especially in the east coast which is exposed to seasonal Monsoon floods. Floods are a major seasonal environmental disaster affecting Kelantan state, bringing significant flood losses. The December 2014 flood that hit Kelantan state was a very severe flood that brought flood losses in terms of loss of lives, injury, infrastructure destruction, property damage, crop loss, loss of livelihoods, disruption to normal services and losses due to expenses in healthcare. The methodology uses a questionnaire-based cross sectional convenience sampling method in three pre-selected flood hit sites of Gua Musang, Kota Bharu and Kuala Krai. The results indicate that both direct and indirect, as well as tangible and intangible flood losses were exceptionally large. Almost all affected flood victims suffered losses of some sorts. Most suffered direct losses in terms of damage to house structures, damage to house contents, damage to vehicles (including boats), crop losses, livestock losses and other damages. Victims in the business sector also reported significant business losses. Overall, both direct and indirect losses were high. However, 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. The results, however, showed that 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.

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# Colonial Complexity of Voices: Focalisation and Realism in Agnes Keith's Novel, *Beloved Exiles*

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## Abstract

This paper aims to demonstrate how the fiction of Agnes Newton Keith, the American wife of a British colonial officer in Sabah, utilises the multiple point-of-views through the use of “focalisation,” as a means of creating an ideologically ambivalent mode of realism. Genette’s theory of focalisation (1972) will be applied, as this model—which coincidentally appeared in print for the first time, in the same year as *Beloved Exiles* was published in 1972—provides an entirely appropriate method for analysing narrative technique in fiction, and Keith’s fiction in particular. The narrative technique in *Beloved Exiles*, works to disclose, in an even-handed manner, the inner conflicts and motivational forces of the major characters, thus enabling Keith to conduct a psychological exploration of both native and colonial figures or types, within the one novel. We therefore argue that the text achieves Genette’s notion of “impartiality,” by providing alternative narrations to some characters/events in novel, with no single version being privileged over another. *Beloved Exiles* can thus be seen as a remarkably successful, retrospective attempt at presenting the ethically complex “truth” of life in colonial era Borneo. In doing so, we suggest that the novel prompts a timely reassessment of colonial writing itself.

Keywords: Colonial Complexity; Focalisation; Realism; Novel.

## 1. Introduction

Written by Agnes Newton Keith, *Beloved Exiles* (1972) explores the life of Sara Evans, an American wife to a British officer named Charles Evans during British colonisation in North Borneo. Keith has also written several other books, which are based on her own experiences living in Borneo namely *Land Below the Wind* (1939), *Three Came Home* (1948) and *White Man Returns* (1951). However, *Beloved Exiles* is the only fiction written by Keith while others are qualified as autobiographies relating to Keith’s Borneo experiences.

*Beloved Exiles*, sets in between 1930s to 1940s, explores the Evans’ lives in a fictional place called Elopura, which is located in Borneo. Besides the Evans’, other characters’ lives are also extensively explored in the novel. For instance, the life of Charles’ former mistress, Yuki is narrated, which in a way, explains the reason behind her decision to be a mistress to a few wealthy men. This type of narration illustrates different thoughts of characters in the novel, and it has provided a sense of “impartiality” to the novel; a type of narrative writing which the author is not being biased in his or her writing, and this is achieved through narrating the story with multiple point-of-views.

Although Keith was a part of British colonisers due to her husband’s work as a Conservator of Forests and Director of Agriculture of North Borneo for British Empire, she has provided an “impartial” narrative in *Beloved Exiles*. Therefore, in order to explore and prove this “impartial” narrative executed by Keith, the theory of “focalisation”, as introduced by Genette (1972), is utilised through the characters’ point-of-views in the novel.

## 2. Theory of Focalisation (Genette, 1972)

Focalisation acts to show a connection between the focaliser (*who experienced the experience?*) and the focalised (*what is the experience?*) by searching this connection in any paragraph of the novel. The focaliser is not necessarily the narrator (external focaliser), because the characters are also capable of narrating the events they experience from their own perspectives (character or internal focaliser). Types of narrators – heterodiegetic or homodiegetic – can be used to identify the identity of the narrator (Nieragden, 2002). Heterodiegetic narration refers to a narration which the narrator is not one of the characters and does not involve in any plot of the story. Meanwhile, homodiegetic narration refers to a narration which the narrator is one of the characters in the story and does somehow involve in the story. Although the focaliser could be determined by referring to the narrator's position such as narrator's point of view, this relation is not clearly determined as focalisation also takes place without the use of conversational speech, and it usually reflects the inner thoughts and emotions of the character (Bradford, 1997). As there is no clear demarcation in determining the identity of the focaliser when the characters' thoughts and emotions are involved, this focalisation technique can create confusion in revealing the source of focalisation. The complexity of verifying the focaliser is further explained in the analysis of *Beloved Exiles* through two characters: Sita and Derek.

## 3. Methodology

In this paper, a close reading on Keith's *Beloved Exiles* is being applied, centering on five characters with different background and nationality: Sara Evans, Sita, Yuki, Derek Stevenson and Colonel Kenchichi Goto. Sara is the American wife of a British colonial officer named Charles, and Sita and Yuki are two local women who pose as the mistresses of the colonisers in North Borneo. Meanwhile, Derek, who runs a business in North Borneo, is Sita's lover and "owner", and Colonel Goto is a Japanese officer during the Japanese occupation in Borneo and Malaya. Although this novel gives its focus on Sara, other characters are not neglected; in fact, they are given their own voices and agency in the narratorial participation or focalisation of the novel. In this respect, focalisation is used to delve into every character's inner conflicts in this period of turbulence.

By referring to Genette's theory of focalisation as the main tool of analysis, the characters' mental conditions and complex relationships are unmasked, and Keith's use of focalisation technique in her novel enables us to determine her ability to create an impartial work by incorporating multiple voices in the novel.

## 4. Analysis

To prove Keith's method of balancing multiple points-of-view to create an ideologically ambivalent mean of realism, "focalisation" technique is used to examine five important characters of *Beloved Exiles*, namely Sara, Sita, Yuki, Derek and Colonel Goto as mentioned in the methodology section. Although Keith is a Westerner and a coloniser, she is not biased in her writing as she includes multiple voices of the colonised and the coloniser. This narrating style is capable of exploring the thoughts of two different characters in relation to one situation, which is often seen through Derek and Sita. The presence of the thoughts and perspectives of different characters has made the novel "impartial" by not representing only one community.

One of the important characters in the novel is Sara Evans. There are instances where Sara feels she is different than other Westerners in Elopura due to her American nationality as the Western community in Elopura mostly consists of the British people. In this respect, Sara's perspective in certain matters sometimes crosses the boundary of a Westerner and a coloniser as she sympathises with the Eurasian children who are estranged at birth by their own fathers and society. Sara's dilemma is described as follows:

Sara was listening intently, profoundly interested, not knowing what to say as this strange half-world was opened up before her. It had been easy for her to condemn race prejudice as unjust; but was it possible, she wondered, to escape from surroundings of easy virtue? Was it possible for children who had been spiritually strangled at birth to walk freely and proudly in the same warm sunshine as those who were prayed for, longed for, and loved even before their birth? How far could environment compensate for heritage? (Keith, 1972, p.107)

The excerpt above indicates Sara's role as the focaliser, and this is observed by examining Sara's dilemma between her conscience and her powerlessness to change the situation of these Eurasian children. Based on the excerpt above, it is indicated that the position of the focaliser is character focaliser instead of external focaliser, because the readers are guided into the mind of the character and exposed to her thought and opinion.

Sara's dilemma in regards of Eurasian children is due to her observation that Eurasian children are not welcomed in the homes of their fathers. There is a Christian orphanage in Elopura where illegitimate children of wealthy foreign men are sent to live there. It is a common practice in Elopura, and it is rare to have these children growing up in the homes of their fathers. Even Charles sends his son, whom he has with Yuki, to the orphanage before he meets Sara and marries her. This is mainly because Western community does not accept Eurasian children due to their Asian parentage. The children also are not accepted by the local community in Elopura because of their fathers' identity as the colonisers in Borneo. This situation is exposed through Mother Mary, a nun who is in charge of the orphanage:

We have everything here. Malays, Chinese, Indonesians, Dusuns, Muruts, and of course Eurasians. Where the fathers are Europeans – that is why the children are here. The mixed blood and circumstances of their birth make them unwelcome in homes of either race (Keith, 1972, p.106).

Keith introduces the issue of Eurasian children in the novel, and the presence of this issue indicates the realistic aspect of the novel; the novel exposes the social situation in Elopura in regards to how the society views and treats the Eurasians. Eurasians, in general, were regarded as an inferior, anomalous and impure race during British colonial era. This prejudice is due to the Eurasians usually were born out of wedlock, and their mothers were not from high social standing (Yap, 2011). The mothers, who are local women, served as companions to the Europeans who wanted female companionship. The prejudice faced by the Eurasians is reflected through the treatment of the society of Elopura towards the Eurasian children in the novel.

To provide perspective from the locals, the narrator introduces Charles's former mistress, Yuki. In her introduction to Yuki's life, Sara describes Yuki's life before, during and after meeting with Charles. Sara uncovers Yuki's struggles to support her and her brother in the novel. Some of Sara's thoughts of Yuki run as follows:

Yuki, not then seventeen, was very seductive and had no outlet for her charms in the dilapidated surroundings on the jungle's edge. The idea of going to live with a man, with money involved in the deal, did not shock her. It was quite in line with the Japanese tradition of virtuous young girls who sold themselves to save father or brother. By their standards, Richard was justified in asking this. In any case, Yuki knew that the best she could hope for in legitimate marriage was an impoverished farmer husband and a childbearing, burden-carrying life on a miserable farm on the jungle's edge, an existence which she already knew and hated. As Richard had guaranteed, she was a virgin, but she accepted the fact that she wouldn't go through life like this, that the seal was there to be broken. Whoever did this with most profit to her was best (Keith, 1972, p.113).

In this excerpt, Sara demonstrates her sympathy on and understanding of Yuki's state of existence and circumstances. This focalisation somehow "justifies" Yuki's action of being a mistress and explains her actions throughout the novel. Thus, Sara's focalisation provides a balanced representation between the coloniser and the colonised.

Sara relates the struggles of people of Elopura in relation to Japanese occupation in the latter part of the novel. Like the other characters, the voices of the Japanese are given chances to be heard, such as Colonel Kenchichi Goto's. Colonel Goto is an important figure of Japanese army, being one of its commanders to be sent to Southeast Asia during Japanese occupation. Despite being Japanese, Colonel Goto is not well-accepted by his fellow officers due to his American educational background and his admiration of Western customs. Being alienated and lonely, Colonel Goto reaches out his hand to Sara, who is a prisoner kept in the camp under his charge, for a companionship. The narrator describes Colonel Goto and Sara's relationship as follows:

At these meetings the colonel contributed more courtesy than manner, and yet this very courtesy was something he suspected was secretly scorned by his prisoners. With many of them he could feel their thinly hidden hostility, while with others he found a self-serving servility. But with Sara he thought he felt a growing empathy, in spite of the fact that each knew theirs was a relationship filled with distrust on both sides – and could not be otherwise. This tenuous bond between them fed on a recognition of their mutual need for something more than war's violence (Keith, 1972, p.227).

Colonel Goto's thoughts on his prisoners are indicated in the above extract. Goto and Sara share a complex relationship, in which both are involved for a certain purpose; Goto longs for an intellectual companionship while Sara believes in Goto's authority to change her and the other prisoners' fate. In this novel, the focalisers are not only limited to the Westerners and the locals, but they are also comprised of the Japanese, as exemplified above. Keith has included characters of different backgrounds to represent the voices of the Westerners, the locals, and the Japanese. The presence of several voices, which represent different communities, illustrates the "impartiality" of the novel.

When Derek and Sita are first introduced in the earlier chapters of the novel, there are some instances when the focaliser's identity is not made obvious. As discussed in the theory section, there is an overlapping role of the focaliser between Sita and Derek in describing the former.

When she was still just a girl it had pleased her to be childless, chiefly because of her satisfaction with her own beauty. Her body was finely made – like a young tree, Derek thought, because she was so slender and strong and her breasts were like a tropical fruit, small, full, blushing and shapely – and her bottom was like the rounded behind of a young girl. Her hands and feet were beautiful, especially her feet. With straight, slim toes and scarlet-painted toenails showing in fragile, open sandals, they were delightfully different from the deformed extremities of European women. And in a community where life and vitality seemed limited, Sita burned with them, and her sexual joys brought satisfaction to them both. Could anything improve her? She herself had sometimes wondered. Derek appeared not to think so. Happily set up in luxury in the big house with Chinese cook and two amahs to be supervised, a motorcar with a Malay driver to take her about, Sita had her own empire (Keith, 1972, p.67).

The excerpt above shows the complexities in determining the focaliser's identity. Derek takes the role as the focaliser in "Her body was finely made – like a young tree, Derek thought, because she was so slender and strong and her breasts were like a tropical fruit, small, full, blushing and shapely – and her bottom was like the rounded behind of a young girl". The rest of the paragraph further describes Sita's beauty. While Derek is the one who enjoys her beauty and passion, there is an additional point-of-view added to the narrative. The lines "Could anything improve her? She herself had sometimes wondered" is told from Sita's perspective. In this context, Sita serves as the focaliser. Then, the focaliser's role shifts to Derek. Through the interchange of focalisers in the narrative, two voices of the characters could be heard. This emphasises the effect of using character focalisation as Derek and Sita have different desires and possibly expectations in the outcome of their relationship, and this shows the complexities of Sita and Derek's relationship.

The conflicts in the novel are intensified in the following paragraph where Sara is coerced to sleep with Colonel Goto in order to save her husband, Charles who is accused of conspiring against the Japanese army. The paragraph also touches upon Sara's circumstance during Japanese occupation and the ill-effect of war:

She did not immediately use the bath, for she was caught by her own reflection in a three-quarter-length mirror on the wall, an ornately etched Chinese affair more for decoration than for reflecting an image, but sufficiently revealing to hypnotize Sara, who had not seen herself in anything larger than a pocket glass since being imprisoned. Now she searched curiously in the scrolled depths among the flowers and fronds, the cracks and spots to find the likeness of the girl whom she remembered – the bright girl who knew better than others, who was going to avoid their mistakes, who was never going to let herself go to seed – Sara the bride. Now she found a deeper difference in her face than just loss of youth. Pre-war Sara had had the face of a girl who took off on flights of fancy, a dreamer of dreams, a disciple of bright ideals. In the mirror tonight she saw an austere woman who understood the realities of want and suffering, who accepted the narrow balance between life and death, who knew death as an intimate foe – but fought tenaciously for life (Keith, 1972, p.236).



Sara's inner conflicts above demonstrate an instance of internal focalisation that even the narrator does 'dare' not intervene. In an attempt to save her husband from a gallows, Sara as a 'dutiful' wife has to sleep with her own enemy, or for that matter, an enemy of her Western civilisation and 'sacrifices' herself and her principles religiously or otherwise. Such an inner conflict (and perhaps, a motivational force of Sara as the major character) thus enables Keith to conduct a psychological exploration of such colonial figures or types, within the novel portraying the realistic aspect of the novel written during the war.

This focalisation technique, notably internal focalisation, applied by Keith allows the readers to explore different thoughts and perspectives of characters with different backgrounds. For instance, two characters may have different views and thoughts on a certain event, which both of them experienced. *Beloved Exiles*, which sets during the British colonial era and the Japanese occupation period, presents multiple focalisations, and these focalisations may also reflect the social standing of the focalisers. For example, Sara, whose husband works for the British Empire, is a woman from high social position, and this is reflected through her focalisations of the Eurasian children and Yuki. Her focalisations from the perspective of a privileged Westerner by some means invite the readers to sympathise with the Eurasian children and Yuki. However, during Japanese occupation, the readers are tempted to sympathise with Sara, because she has lost her 'privileged' position as a coloniser being an intern in the prison camp. This indicates the focalisation technique is capable of observing the thoughts of the characters to expose the struggles and difficulties faced by each focaliser.

## 5. Conclusion

In conclusion, Keith's *Beloved Exiles* has achieved the notion of "impartiality" as proposed by Genette. Keith has incorporated multiple voices and points-of-view in her work, creating a balance of narration without being biased towards certain characters. No character's thought is being privileged over another, and this narration style is accomplished by the use of focalisation. By integrating multiple focalisers, Keith has successfully delivered "truth" in representing the turbulent era of British colonisation in Borneo and enhanced the realist aspect of her novel.

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# **The Application of Ordinary Least Squared (OLS) in Property Valuation Process for Service Improvement in Local Authorities**

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## **Abstract**

Property valuation is conducted to determine the value of a property. In retrospect, this activity has been carried out using traditional methods such as comparable, cost and investment method respectively. The local authorities conduct this activity to determine the property tax in its area as a way to generate funds for community service expenses. This is not only tedious but costly as well as it involves uncountable properties in a large area. Thus, problems occur as most of the revenue collected from the property tax would be used to cover the valuation activities expenditure. This would lead to interrupted services to the community because of limited budget. However, due to the evolution of technologies, a more advanced valuation method has been introduced through spatial analysis method. The inclusion of this method in Geographic Information System (GIS) tools has transformed the property valuation process into a much more efficient and accurate property value estimation. This ability is necessary because the incidences of property values are locationally distributed. Furthermore, many complex phenomena that change spatially and temporally are best understood by analyzing them in a visualized manner. In this paper, the author demonstrates the use of Ordinary Least Squared (OLS) in assisting the valuers in estimating the best value for the property. The property area under the jurisdiction of a local authority namely Kota Kinabalu City Hall (DBKK), was used in this study. Ultimately, this paper had proved the effectiveness of OLS in producing the property rating valuation model that can show the variations in property value and subsequently, improve the process of property valuation for local authority. It is capable in estimating property values of large quantities in a short time with little manpower needed and low in cost. Based on the result, the building quality factor has been identified as strongest positive influence to the property value while the topography factor provide the strongest negative influence. Although the study only capable to produce an average model which was around 50% in accuracy, this can be improved in future study using alternative method. Consequently, the revenue from the property tax can be fully utilized; hence the local authorities could provide adequate services to the community.

Keywords: Geographic Information System (GIS); Ordinary Least Squared (OLS); Property Valuation

## **1. Introduction**

Valuing property is an important task for valuers to estimate the property value. The property valuation not only helps the local authorities to calculate suitable property tax to generate income for area development but also guiding the investors to find a marketable property, coordinate the developers in identifying the potential area to build property and assists the property owners for refinance or selling purposes. Presently, valuation of property is conducted at routine and is carried out manually using traditional methods. This approach is

expensive as well as very time consuming and inefficient especially when involves large number of properties that need to be assessed (Daud et al., 2006). Generally, property tax valuation needs to be conducted by the local authorities every five years which is in accordance with the Local Government Act 1976. Unfortunately, the valuation was normally carried out after 10 or 20 years (Dzurllkanian Daud et al., 2008). Table 1 shows the pending revaluation exercise by Local Government in Malaysia. As stated in Table 1 below, only 16 local authorities had performed revaluation within five years after the end of last revaluation, while 29 others conducted the revaluation after 6 years or more.

Table 1: The Pending Revaluation Exercise by Local Governments in Malaysia

<b>Pending Revaluation (After Last Revaluation)</b>	<b>Frequency</b>	<b>Percentage (%)</b>
1-5 years after 5-year end of last revaluation	16	35.6
6-10 years after 5-year end of last revaluation	11	24.4
10-15 years after 5-year end of last revaluation	7	15.6
More than 15 years after 5-year end of last revaluation	11	24.4
Total	45	100

Source: Dzurllkanian Daud (2012)

Consequently, the rating values of the property were generally behind the current market value. The problems would create social services inequalities in the administration of property tax during the process of valuation (Netzer, 1966; Aaron, 1975; Santoso, 1989). Heavy burden for the poor, the wage earner, and those on fixed income when unfairness occurs in imposing property tax. Therefore, an advanced valuation methods are needed to produce a fair and equal property tax to the community.

Recent innovations in Geographic Information Systems (GIS) technology that contributed to the advanced valuation methods seem to have a profound effect on property valuation. This has been proven by most researchers in recent studies such as Hamid (2007), Buyong (2008), Cichociński and Parzych (2006) and many more. The transfer of academic work to practitioner needs is spurring these innovations. Property valuation practitioners have long valued the importance of ‘location, location, location’ in their industry, yet their incorporation into valuation methodology is often implicit. This paper outlined the capabilities of GIS for property valuation support with the integration of OLS analysis that was conducted in Kota Kinabalu under the jurisdiction of Kota Kinabalu City Hall (DBKK). Kota Kinabalu area was selected as the property values in this area produce the highest index in Malaysia (JPPH, 2012). Therefore, this study would test how accurate the OLS capabilities in producing the residential property valuation model in Kota Kinabalu area.

## 2. Literature Review

The development of property value model using spatial statistics was conducted since 1960s in which linear model was first introduced (Lancaster, 1966). The linear model which was later called OLS was one of the earliest approaches used in spatial statistics to produce property value model. The development during that time, however, faced difficulties in expanding the spatial statistics approach because of lack of technology which limited its scope and appeal (Pace, et al., 1998). Nevertheless, since the 1990s, the usage of spatial statistics for property value modelling was accelerated due to the rapidly growing GIS software (Kulczycki and Ligas, 2007). Other studies were conducted by Tse and Love (2000) to measure residential property values in Tsing-Yi, Hong Kong using OLS. In that study, the prediction

accuracy of the OLS model was increased by producing multiple models with different set of independent variables. The study found that the property type and neighbourhood amenities were important housing attributes to be included in the model. The usage of GIS was also necessary to define position and estimate the distance of the neighbourhood effect. Ibrahim Sipan (2009) applied OLS to produce an Automated Valuation System for property rating in Kulai, Johor which involved 1500 transaction data. The study shows that OLS was a suitable model to be used in the study area compared to other models such as Geographical Weighted Regression (GWR), Kriging and spatial hedonic modeling.

### 3. Background of Kota Kinabalu

Property within *Dewan Bandaraya Kota Kinabalu* or Kota Kinabalu City Hall (DBKK) jurisdiction is the city council which administers the city and district of Kota Kinabalu in the state of Sabah, Malaysia was used as study area. Figure 1 shows the location of Kota Kinabalu in Sabah. Kota Kinabalu is a large area that consists of many zones. However, due to data constraint, only selected zones in city and urban area were used for the study which includes Kota Kinabalu, Luyang, Luyang Timur, Teluk Likas, Sembulan, Tanjung Aru, Damai, Kolam, Ridge, Kepayan, Dah Yeh and Signal Hill.

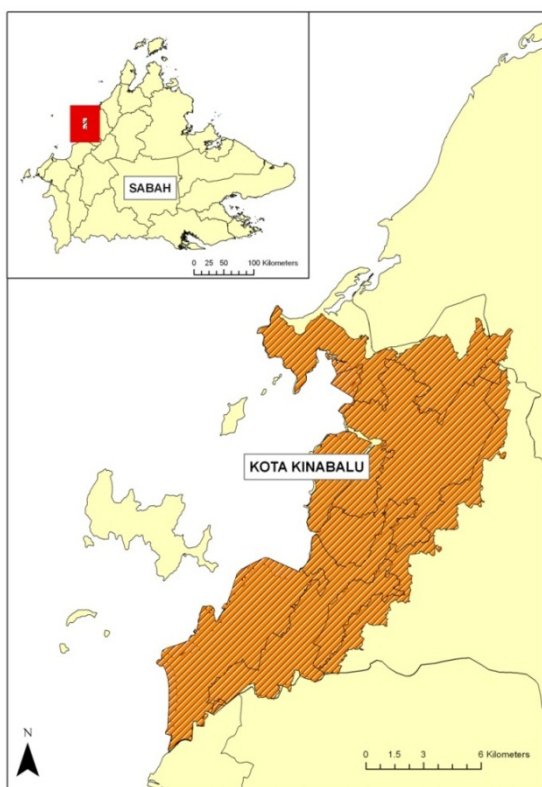


Figure 1: Location of Kota Kinabalu area (shaded) in Sabah

#### 4. Model Development

Originally, the study collected 14,520 data observations for the whole area of DBKK through selection of residential property valuation data excluding apartments, flats and condominiums within the urban area. However, after data cleaning and removing of missing or incomplete data, only 5,625 records were retained for the analysis which represented about 38.74% of the residential property in the study area. This was good enough to be used as sample to develop and test the property rating model. The model was developed by using the Ordinary Least Square (OLS). This model could be written as in equation (1) below (Charlton and Fotheringham, 2009):

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_n x_{ni} + \varepsilon_i \quad \text{for } i = 1 \dots n \quad (1)$$

Where;

$y$  - the vector of observed values

$\hat{\beta}$  - the vector of estimated parameters,

$x$  - the design matrix which contains the values of the independent variables,

$\varepsilon$  - the model error value

In this study, the dependent variable of  $y$  was the property tax value, and the independent variables of  $x$  were chosen from the database developed. Model error of  $\varepsilon$  would be acquired after the OLS model was analyzed. Based in the OLS equation, variables to be used in determining property tax value were identified and would be discussed in the following section.

ArcGIS version 10.1 with its spatial statistics components of Ordinary Least Squared was used in this study to conduct the analysis and generate the output.

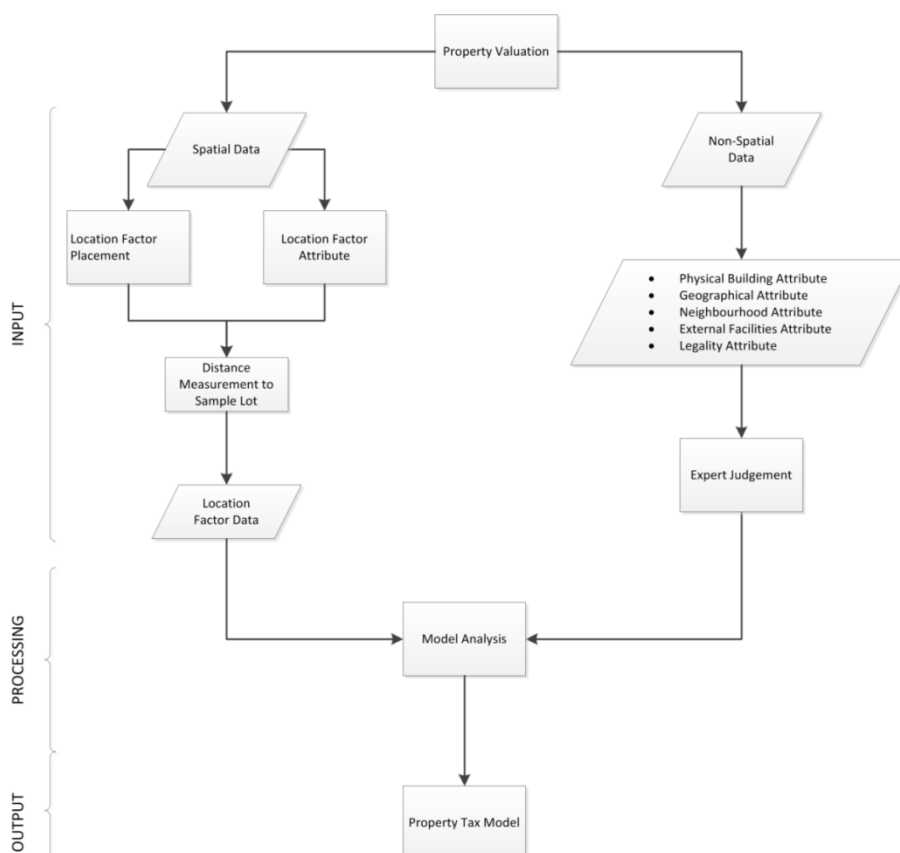


Figure 2: Property rating valuation modelling framework

## 5. Variable Selection

After undergoing data pre-processing and cleaning, 14 independent variables were selected to be used to estimate the dependent variable. All data selected was determined as free from any spatial autocorrelation error using Moran's I analysis. The dependent variable is the property rating value that was imposed by the DBKK to the property owner. This variable is measured based on currency scale in ringgit Malaysia (RM). The 14 independent variables chosen for the model were reduced coverage area (RCA), land area, building type, building quality and various location factors. Table 2 provides the descriptions of data variables used in the OLS analysis.

Table 2: Description of data variables for OLS analysis

Property Value Influence Factor	Description	Measurement
SHOPMALL	Shopping Mall	Scale (Using GIS)
POLICECTR	Police Station	Scale (Using GIS)
POSTOFFICE	Post Office	Scale (Using GIS)
OFFICECTR	Office Complex	Scale (Using GIS)
FIELD	Open Space	Scale (Using GIS)
BANK	Bank	Scale (Using GIS)
CHINTEMPLE	Chinese Temple	Scale (Using GIS)
HINDTEMPLE	Hindu Temple	Scale (Using GIS)
RCA	Reduced Coverage Area	Scale
LAND_AREA	Land Area	Scale
TOPOG	Topography	Ordinal
BUILDQ	Building Quality	Ordinal
FLOODP	Flood Prone	Ordinal
SANITATION	Sanitation	Ordinal

All the data above were included in the ArcGIS attribute table in which the OLS was performed. The ArcGIS's OLS was conducted using "Enter" method which similar to other statistical software such as SPSS. Once the variables were selected and analysed, the output from ArcGIS's OLS could then be assessed and compared to determine which model best represent the DBKK area for property tax purpose.

## 6. Analyzing the Result

In the result analysis, model performance was examined referring to the measurement of adjusted  $R^2$  values. The higher its value, the better the accuracy of the model. High accuracy of the property value estimation would be produced if the measurement of  $R^2$  was high. In this study, the  $R^2$  achieved 0.504 value indicated that the OLS model explains approximately 50.4% of the property tax value. This figure indicates average accuracy estimation of the model as it achieved slightly more than 50%. To determine the strength and type of relationship the independent variable has to the property tax value, the coefficient for each of the independent variable that statistically significant at 95% confidence level were measured. Table 3 shows the coefficient value of each independent variable which also called as property value influence factor. The coefficient reflects the expected change in the property rating value for every one unit change in the property value influence factor. For example a coefficient of 602.877 associated with building quality (BUILDQ) representing RM currency may be interpreted as RM602.877 of property rating value. This shows that BUILDQ gives a

high increase to the residential property value in the study. While Flood Prone produces moderate positive relationship. The other factors of RCA, land area (LAND AREA) and FIELD, BANK, Chinese Temple (CHINTEMPLE) and POSTOFFICE also gave positive increase albeit lower coefficient value of less than 2. However, the topography (TOPOG) indicated strong negative relationship with -246.54. This shows that the variable decrease the property value with RM246.54. Other variables that produce negative influence were shopping mall (SHOPMALL), POLICECTR, OFFICECTR and Hindu Temple (HINDTEMPLE) but with weak relationship of coefficient value of figures between 0 to -2.

Table 3: Relationship type of property influence factor with the property tax value.

Property Value Influence Factor	Coefficient (B)	Significant Level	Relationship With Property Tax Value
CONSTANT	-960.574	0.0000	Strong negative relationship
SHOPMALL	-0.781	0.0000	Weak negative relationship
POLICECTR	-1.238	0.0000	Weak negative relationship
POSTOFFICE	1.165	0.0000	Weak positive relationship
OFFICECTR	-0.339	0.0000	Weak negative relationship
FIELD	1.105	0.0000	Weak positive relationship
BANK	0.222	0.0000	Weak positive relationship
CHINTEMPLE	0.196	0.0000	Weak positive relationship
HINDTEMPLE	-0.327	0.0000	Weak negative relationship
RCA	0.221	0.0000	Weak positive relationship
LAND_AREA	0.203	0.0000	Weak positive relationship
TOPOG	-246.54	0.0000	Strong negative relationship
BUILDQ	602.877	0.0000	Strong positive relationship
FLOODP	77.7	0.0000	Moderate positive relationship
SANITATION	-208.083	0.0000	Strong negative relationship

Therefore, once the model was accepted, the new tax value can then be generated. This can be done automatically and faster although there are thousands of data involves. The property tax value can also be visualized using GIS tool to show the distribution of the new property tax value. The distribution of the property tax value in Figure 3 shows that parts of Bukit Padang, Likas and Tanjung Aru zones (dark color) contributed highest property values in the area. Based on the result in Table 3, there is a high probability that the high values occurred because of the high influence from the building quality in that area. Additionally, this could also attribute due to the location factor as the affected zones are situated nearby attractive places such as hillside view, recreational parks and beach. On the contrary, large parts of Sembulan and Kepayan zones (light color) obtain lowest values in the area as this was due to large amount of squatters and low cost houses that can be found in the areas.

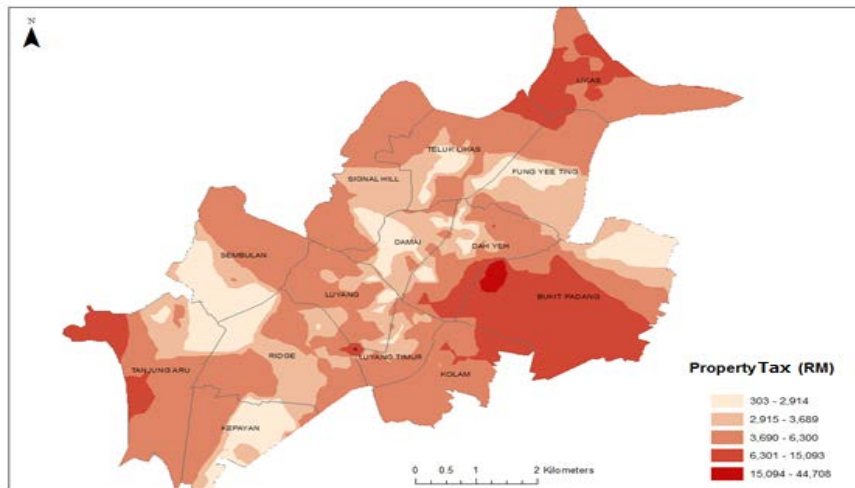


Figure 3: Distribution of the new property tax based on OLS model in DBKK area

## 7. Conclusion

This paper shows a property tax valuation method using GIS and Ordinary Least Squares (OLS) which is capable of estimating a large-scale property value in the area and subsequently assists the local authority in providing efficient property tax estimation. Although the model achieve average results (only 50% accuracy), this can be improved by using other methods such as spatial regression modelling to find out whether the dependent or any of independent variables are spatially auto-correlated. This could be a major contribution to improve revaluation exercise such that accurate property tax could be obtained and at the same time, cost, duration and manpower can be minimized. Other than that, unfairness in imposing tax especially to the lower income can be avoided as the community pay taxes based on accurate property valuation estimation. By producing a fair and equal property tax with the revenue collected fully utilized, an uninterrupted and efficient service would be received by the people.

## 8. Acknowledgement

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# Tackling Poverty Issues in Malaysia: A Spatial Dimensional Approach

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## Abstract

Poverty has been a major problem for many years. Moreover, eradicating poverty has become the first agenda of the United Nation Sustainable Development Goals (SDG). Malaysia has succeeded to reduce its poverty rate from 49.3% in 1970 to 15% in 1990, then, to just 0.6% in 2014. Policies implemented since 1970s have succeeded in reducing the number of poor households. However, poverty rate reported at national or state level may not be a true reflection of poverty of the country. At present, poverty rate is reported at a state level which might be too general to illustrate a true representation of poverty. Taking the Northern Region of Peninsular Malaysia as an example, this study used Geographic Information System (GIS) to map poverty rate by sub-districts and investigate local differentiation among sub-districts. Poverty data was obtained from *e-kasih* database and combined GIS database. GIS functions were used to map poverty rate, demographic burden and poverty hotspot in the study area. The result indicated that poverty rate is highly correlated with regional differentiation, where location played a significant role in identifying areas with high number of poor population. Thus, in eradicating poverty, a uniform policy implemented at national level may not be sufficient to tackle the pockets of poverty at the local level. It is timely, therefore, for a spatial dimensional approach to be used to complement existing poverty eradication strategies.

Keywords: Poverty, Malaysia, Geographic Information Systems.

## 1. Introduction

Poverty alleviation has been receiving increasing attention by planners and decision makers not only in developing countries but also in developed nations. Poverty can be viewed from various dimensions. World Bank (2016), for example indicated income poverty, education and health poverty, tenure insecurity, personal insecurity, income insecurity, and social and political exclusion/disempowerment as six dimensions of poverty. Furthermore, poverty can also be seen from a geographical perspective where space or location also becomes one of the determinants of poverty. The spatial dimensional approach has started to gain importance in describing the conditions, visualizing the location of the poor and identifying the relationship between the location of the poor and the surrounding environment or infrastructures (Moral, 2010; Kamarudin and Sulaiman, 2011)

Various studies conducted have shown geographical or spatial dimension as important determinants in identifying distribution of poverty. As indicated by Vista and Murayama (2011) in the study conducted in Albay and Camarines Sur Provinces in Bicol Region, Philippine, access to road infrastructure, proximity to major markets, rate of land distribution, bias in fiscal decentralization policy, and aspects of agro-climatic condition, i.e. elevation, slope and rainfall, have significant effects on poverty incidence. Their study concluded that geography and facets of public policy have a strong impact on the state of poverty. Furthermore, the study by Kneebone (2014) in the United States also indicated that the poor

becomes more concentrated into highly disadvantaged neighbourhoods since people living in those areas faced various issues such as worse health outcome, high crime rate, high school dropout, and few job opportunities. In Malaysia, the study by Samat et al. (2012), Samat and Knight (2013) used spatial dimensional approach to illustrate poverty and access to services by measuring access of population to facilities, namely, food retailers and health facilities retailers. Similarly, Samat (2013) used GIS to map poverty rate in Malaysia which allows regional differentiation among states to be visualized. This approach allowed local and regional differentiation to be properly visualized and understood.

Moreover, poverty should be visualized at local scale in order to capture the reality behind the statistics (Moral, 2010). In many countries poverty rate is reported at a country or state level which might be too general to visualize the true picture of poverty as there is substantial spatial and community variations within the state. This implies that adopting the country or state measure might be misleading statistics, therefore, there is a need to address poverty at the small geographical scale. This paper used Geographic Information System to map poverty rate by sub-districts and investigate local differentiation among sub-districts in the Northern Region of Peninsular Malaysia.

## **2. Background of the study**

Several international policies have been adopted to eradicate poverty; major among these were the Millennium Development Goals (MDG), which ended in 2015. The MDG report 2015 indicated that the 15-year effort to achieve the eight goals set out in the Millennium Declaration in 2000 were largely successful across the globe, while acknowledging shortfalls that remain. For example, the number of people living in extreme poverty has declined by more than half, falling from 1.9 billion in 1990 to 836 million in 2015 (UNDP, 2016). The data presented indicated that global effort with targeted interventions, sound strategies, and adequate resources managed to successfully reduce the number of people with extreme poverty. However, the number of poor remains high within certain areas and regions. Thus, concerted effort to eradicate poverty continues where it becomes the first agenda within Sustainable Development Goals (SDGs), subsequent global effort towards sustainable development after MDG. This agenda gains global support and agreement to end poverty and hunger, in all their forms and dimensions, and to ensure that all human beings can fulfil their potential in dignity and equality and in a healthy environment between now and 2030 (UN, 2015).

At a national level, available literature has shown that Malaysia has achieved the goal of alleviating poverty well even before the mentioned date of MDG, 2015. Malaysia has succeeded to reduce poverty rate from 49.3% in 1970 to 15% in 1990, then, to just 0.6% in 2014 (EPU, 2015). This has led Malaysia to successfully declare the victory against overall poverty in the country. This success was due to the rational policy adopted by Malaysian government to eradicate poverty and ensure equity among its all inhabitants (Elhadary and Samat, 2012).

For example, after independence, several policies and programs were introduced and implemented to foster economic development and at the same time reduce overall poverty. Among the policies introduced were Pre-New Economic policy (PNEP) 1960 – 1970, New economic policy (NEP) 1971 -1990, National development policy (NDP) 1991-2000, National Vision Policy (NVP) 2001–2010 and Government Transformation Plan (NTP) 2011-2020,

which aimed to nurture economic growth and eliminate overall poverty in the country (EPU, 2013). Available literature has shown that, these policies and its related programmes had succeeded in promoting economic growth and thus reducing the incidence of poverty very sharply (Elhadary and Samat, 2012). However, the incidence of poverty is still slightly higher in some geographical areas as indicated in Table 1 (EPU, 2013; Abdul Khalid, 2014).

As indicated in the table below, poverty in Malaysia was at 1.7% (2012), however, few states such as Sabah (7.8), Kelantan (2.7), and Sarawak (2.4) had poverty rate that was higher than the national rate (EU, 2015). Poverty among ethnic groups also indicated that Bumiputera had the highest which was at 2.2, while Indian at 1.8, with poverty rate for Chinese was only 0.3. Regional differentiation also can be visualized between urban and rural areas, where the rate was 1.0 and 3.4 respectively. This figure indicated selective targeted intervention policy is needed to fully eradicated poverty in Malaysia.

As Malaysia has the vision to be a developed nation, there is the need to shift from addressing the absolute poverty to relative poverty (Elhadary and Samat, 2015). According to Mohamed and Xavier (2015), although the incidence of poverty was significantly reduced in Malaysia, pockets of poverty exist with high incidence among specific ethnic groups and localities. In the same line Nair (2010) indicated that rural, urban and stubborn poverty are still critical problems that need to be resolved.

Table 1: Incidents of Poverty by Ethnicity, Strata and State, Malaysia, 1970-2012

Year	1970	1984	1992	1997	2002	2009	2012
Malaysia	49.3	20.7	12.4	6.1	6.0	3.8	1.7
<b>Ethnic</b>							
Bumiputera	64.8	28.7	17.5	9.0	9.0	5.3	2.2
Chinese	26.0	7.8	3.2	1.1	1.0	0.6	0.3
India/Indian	39.2	10.1	4.5	1.3	2.7	2.5	1.8
Lain-Lain/Others	44.8	18.8	21.7	13.0	8.5	6.7	1.5
<b>Strata</b>							
Bandar/Urban	21.3	8.5	4.7	2.1	2.3	1.7	1.0
Luar Bandar/Rural	58.7	27.3	21.2	10.9	13.5	8.4	3.4
<b>State</b>							
Johor	45.7	12.2	5.6	1.6	2.5	1.3	0.9
Kedah	63.2	36.6	21.2	11.5	9.7	5.3	1.7
Kelantan	76.1	39.2	29.5	19.2	17.8	4.8	2.7
Melaka	44.9	15.8	8.5	3.5	1.8	0.5	0.1
N.Sembilan	44.8	13.0	8.1	4.7	2.6	0.7	0.5
Pahang	43.2	15.7	6.9	4.4	9.4	2.1	1.3
Pulau Pinang	43.7	13.4	4.0	1.7	1.2	1.2	0.6
Perak	48.6	20.3	10.2	4.5	6.2	3.5	1.5
Perlis	73.9	33.7	19.8	10.7	8.9	6.0	1.9
Selangor	29.2	8.6	4.3	1.3	1.1	0.7	0.4
Terengganu	68.9	28.9	25.6	17.3	14.9	4.0	1.7
Sabah/F.T Labuan		33.1	27.8	16.5	16.0	19.2	7.8
Sarawak		31.9	19.2	7.3	11.3	5.3	2.4
F.T.Kuala Lumpur		4.9	1.7	0.1	0.5	0.7	0.8
F.T.Putrajaya	-	-	-	-	-	-	-

Source: EPU (2013)

Poverty may be viewed from various dimensions. Spatial dimensional approach uses GIS analytical capabilities to visualize and establish spatial relationship between poverty and other geographical factors (Moral, 2010; Keebone et al., 2014). GIS provides a platform for analysing spatial and non-spatial data and testing possible policy scenarios prior to its implementation.

### 3. Methodology

This paper aimed to investigate and map poverty rate at local level. This study was undertaken in the Northern Region, Peninsular Malaysia comprising of four states namely Perlis, Kedah, Penang and North Perak (Figure 1.a). The reason for selecting this study area is due to poverty rate in these states were quite high as compare to national poverty rate which is at 0.6 percent in 2014 (EPU, 2015). In addition, this area is planned under Northern Corridor Economic Region where it was planned to become Malaysia's modern agriculture zone, attraction for

tourists' destinations, and regional leader in the electronics and electrical sector. Furthermore, it can become a world-class economic region by 2025 for people to invest, live and bring up families in a safe, clean and sustainable environment (Sime Darby Berhad, 2007).

Data used this study were obtained from poverty database called *e-kasih* maintained by the Implementation Coordination Unit (ICU), Prime Minister's Office, Malaysia. The unit of analysis given was individual record, but for mapping purposes sub-district was used. This study mapped poverty rate, calculated proximity of each sub-district to higher education institutions, hospitals and urban centres. Then, the study calculated and mapped demographic burden. Finally, this study investigated hot and cold spot of poverty rate.

Poverty rate was calculated by Equation (1) below

$$Pov\_rate = (No\_Poor / POP2010) * 100 \quad (1)$$

Where

*Pov\_rate* = Poverty Rate

*No\_Poor* = Number of Poor population,

*POP2010* = Total Population of years 2010

The study also measured spatial proximity of each sub-district to existing infrastructures. This was undertaken by using *NEAR* function which measured the proximity of each sub-district to hospitals, the proximity of each sub-district to higher education institutions, the proximity of each sub-district to major urban areas. Finally, the study mapped demographic burden for each district. *Near* function is available in ArcGIS 10.1 software (ESRI, 2016). This study then calculated demographic burden using Equation (2) below.

$$burden = (old\_youth/work\_pop)*100 \quad (2)$$

where

*burden* = demographic burden

*old\_youth* = population under age 15 years + population above age 60 years

*work\_pop* = working population.

Finally, the study mapped hotspot the incident of poverty and demographic burden in the northern region. Getis-Ord  $G_i^*$  was used to identify hot and cold spot of poverty. The statistics were mapped to visualize the distribution across space.

#### 4. Results and Discussions

As indicated above (Figure 1.b), poverty rate ranged from 0 - 2.55 across the study area. A few sub-districts namely Sok, Padang Terap and Ah in Kedah and three sub-districts namely Chuping, Arau and Abi in Perlis had poverty that was higher national poverty rate which is at 1.7. Other sub-districts had poverty rate which was lower than of the national poverty rate. The study, then measured distance of these sub-districts to existing facilities namely higher education institutions and health facilities and urban centres. As indicated by Figure 2 below there were sub-districts that were quite far from existing higher education institutions, the farthest away were more than 50 km. These sub-districts included areas in Sik and Hulu Perak. Similarly these areas were also far, approximately 56 km, from existing health centres.

This was probably due to the topography and number of population within these areas was quite small, thus no facility was located there.

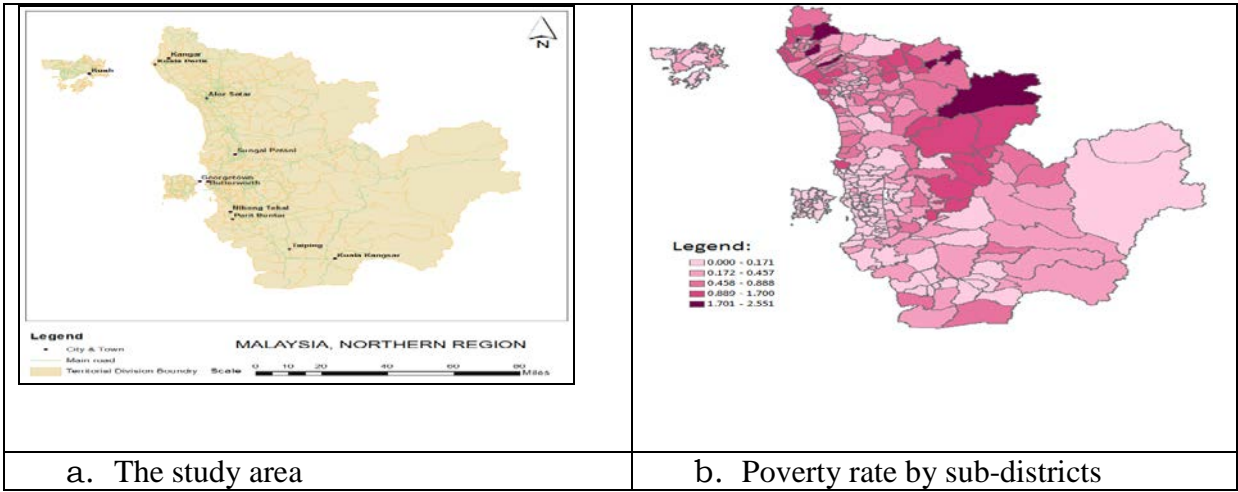


Figure 1: The study area (a) and poverty rate in northern region of Peninsular Malaysia (b).

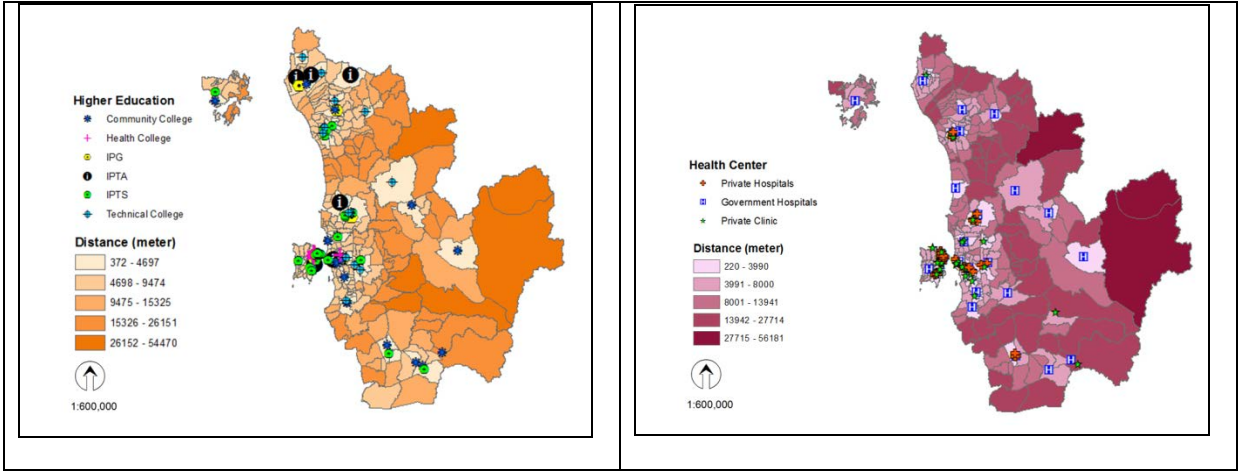


Figure 2: Proximity of sub-districts to (a) higher education institutions and (b) health centres.

The study then mapped distance of sub-districts and location of major urban areas which potentially provided greater employment opportunity and better services to the population. As indicated by Figure 3.a, some of the sub-districts were more than 100km away from existing major urban centres, thus, low accessibility to employment and services centres. Finally, this study mapped demographic burden of the study areas as indicated in Figure 3.b. Areas with high demographic burden were in Hulu Perak, Selama and Larut Matang in Perak. There were only one sub-district in Penang (Mukim 4 of North of Seberang Perai, Penang) had high demographic burden.

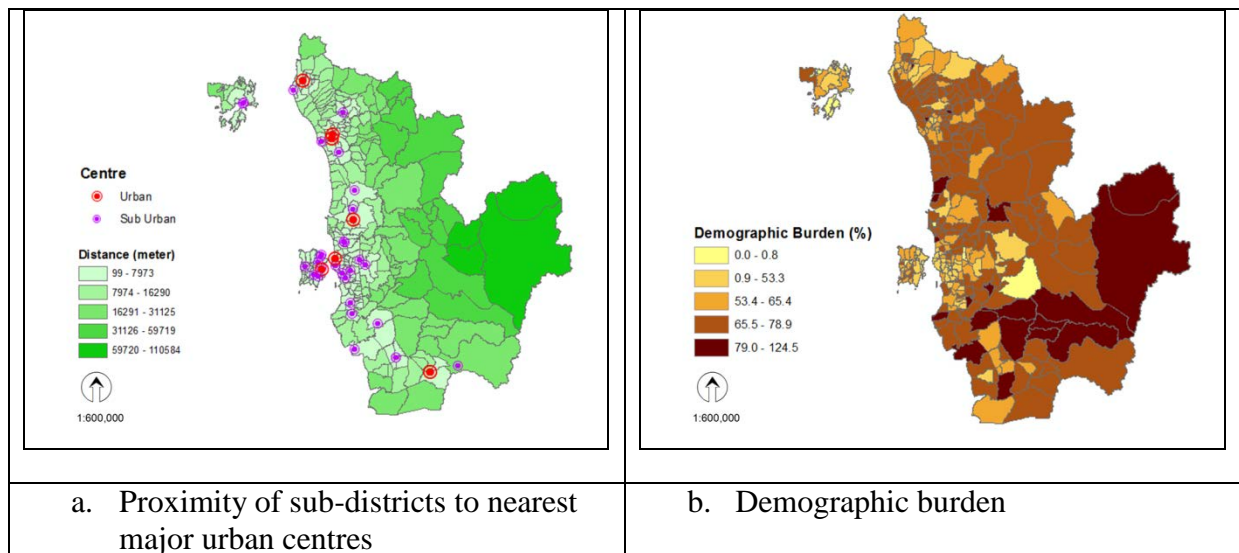


Figure 3: Poverty rate by sub-districts, Northern Region Peninsular Malaysia

Finally, this study mapped statistically significant spatial clusters of high values or hot spots and low values or cold spots (ESRI, 2016) of poverty incidents in the Northern Region. As indicated by Figure 4.a. below, hot and cold spot of poverty can be clearly seen. Most districts in Kedah and all districts in Perlis were identified as hot spot areas or having high poverty rate. While Langkawi, Penang State and its neighbouring districts were identifies as cold spot or having low poverty rate. These patterns can be associated with economic activities of the states where the economic activity concentrating on agriculture activities as having high poverty rate as compared to areas concentrating on industrialization and tourism activities. Looking at Figure 4.a. demographic burden showed different view. As indicated in the figure, Langkawi and Penang State were among the cold spot or having fewer burdens demographically. This result means the proportion of youth and old population to working population is small. On the other hand, all sub-districts in Kedah and some sub-districts of northern Perak had the hot spot or having higher number of youth and old population.

As indicated earlier, in Malaysia, poverty is often reported using statistics at a national or state level. This general statistical might not be able to portray the exact location that needs interventions. GIS analysis used in this study could be used to generate maps of high and low concentrations of poverty, thus provide useful information for planners to identify appropriate location for intervention strategies and resources allocations.

## 5. Conclusion

Poverty which has become major problem for many countries needs to be viewed from various perspectives. Apart from six dimensions of poverty indicated by World Bank (2016), spatial dimensional approach is also relevant in investigating poverty. This study explored the usage of GIS in mapping poverty rate and investigated spatial accessibility of the population by sub-districts and higher education institutions, health facilities and major urban centres in northern region of Peninsular Malaysia Furthermore, this study also mapped hot and cold spots of poverty and demographic burden. The method used in this study provides new approaches in looking at poverty data. With its analytical capability of combining data from various sources and scale, GIS provides useful way of analysing poverty data. Further analysis is needed to establish spatial correlation between the incident of poverty and



geographical factors identified in this study. The approach used may be used to complement existing methods of investigating poverty such that appropriate intervention strategies and resource allocation may be devised to sustainably eradicate poverty.

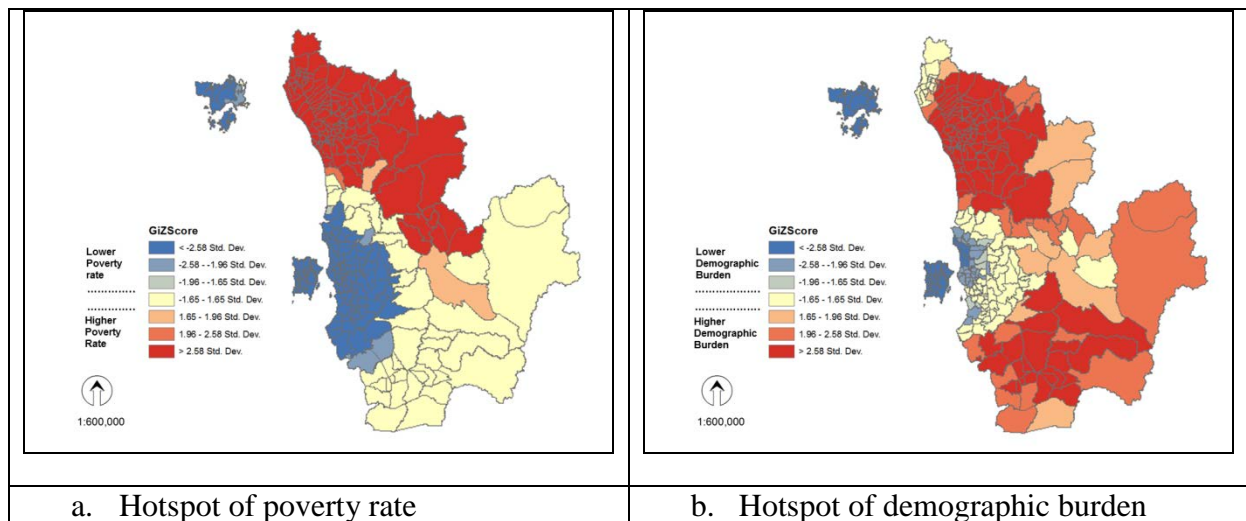


Figure 4. Statistically significant hot spot calculated using Getis-Ord  $i^*$  using ArcGIS 10.1 software.

## 6. Acknowledgement

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# **Conservation and Environmental Impacts of Tourism in Kinabalu Park, Sabah**

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## **Abstract**

Since Kinabalu Park has been declared as Malaysia's first World Heritage Site in 2000, the tourism industry in the park has grown tremendously. People from all over the world come to appreciate the park's unique natural attractions and also to climb to the peak of Mount Kinabalu. These developments, however, indirectly increase the use of the park's natural and cultural environment for tourism, resulting in environmental resources being adversely impacted upon. This paper aims to identify the impacts on the environment and the conservation efforts that are being done to overcome the problems. The findings are gathered by a semi-structured interview on 20 staffs from various organizations in Kinabalu Park. The impacts addressed are presence of invasive species, environmental issue and degradation, earthquake incident and conservation efforts. In order to sustain the tourism industry for a long period in this protected areas, proper planning and sustainable solutions are needed. Thus, Mount Kinabalu can be better managed in a more organized, efficient and sustainable basis. Overall, improving conservation efforts, stricter enforcement and the practice of sustainable tourism will enhanced the sustainable management of Kinabalu Park in the long run.

Keywords: Conservation; Environmental impact; Kinabalu Park

## **1. Introduction**

Tourism is the fastest growing industry in the world and the fastest growing component is tourism in natural areas. Tourism is a major contributor to the economies of many countries. However, the impacts sometimes overshadow the benefits. Impacts of tourism at protected areas can be either positive or negative but park management are more concern on most negative impacts. Negative impacts observed are overcrowding, overdevelopment, unregulated recreation, pollution, wildlife disturbance and vehicle use. Positive impacts of tourism identified are the economic justification of conservation efforts and strengthening of political and economic support for protected areas conservation and management.

Kinabalu Park is a well conserved National Park managed by Sabah Parks since 1964. The purpose of this Park's establishment was to conserve the biological and physical resources, spearheading scientific research and enhancing educational values, increasing recreational and tourist activities, preserving cultural and historical values and instituting management procedures to support other strategic. Sutera Sanctuary Lodge (SSL) was introduced at Kinabalu Park in 1998 to take over the management of the tourism facilities such as accommodation, restaurant and souvenir shop. In 2007, another private company, Mountain Torq manage the tourist activity at the top of Mount Kinabalu, Via Ferrata at the height of 3,200 meter to 3,776 meter. It is the world's highest Via Ferrata in a UNESCO World

Heritage Site. Although there were other company introduced at Kinabalu Park, Sabah Parks still manage the administration, conservation, research and climbing mountain activities.

## **2. Tourism at mountain environment**

Worldwide, mountain environments have attracted tourism. Tourism in natural areas occurs in its natural settings but has added emphasis to encourage understanding and conservation of the place natural environment (Newsome et al., 2006). Moreover, enjoying the view of nature is considered as the primary objective. Mostly the natural areas are gazetted as protected areas and managed by the relevant organizations.

Indeed, the environmental impacts of tourism have been extensively investigated in some developed countries such Australia, the USA, the UK (Pickering and Hill, 2007) and some developing countries such as India and Nepal (Zhong et al., 2011). A number of mountain environments have experienced considerable population increase in recent years that leads to environmental degradations. The mountain vegetations and soils sensitive to disturbances, are likely to be slow to recover. With the vegetation and soils under stress, mountain areas are vulnerable to transboundary pollution, especially damage by tourism. Changes in environmental conditions may alter the composition of species and their population size in communities and ecosystem (Miller and Spoolman, 2010). A high and continuous impact potential may exist at locations where many trails, roads, facilities and infrastructure. Tourism impacts on the environment as reviewed above not only damage or disturb the natural/cultural resources upon which tourism development depends, but also affect tourists' experience. This raises the question as to how to maximize visitor's experience while minimizing their impacts on the environment. Conservation is the act of preserving, guarding or protecting the biodiversity, environment, ecosystem and natural resources by management. Conservation efforts ensure tourism activities in protected areas are sustained.

Kinabalu Park covers 75, 370 hectare and is a granite intrusion formed 15 million years ago. Due to the high number of endemic species of flora and fauna that can be found only within Kinabalu Park, it is been declared as Malaysia's first World Heritage Site in 2000. It contains up to half of Borneo's birds, mammals and amphibians. It is the habitats of up to two thirds of Borneo's reptiles. Kinabalu Park has been identified as one of Malaysia's center of plant diversity and designated as a Centre of Plant Diversity for Southeast Asia. It is also one of the world's 13 hotspots for biodiversity and one of the 234 sites that have been designated as the primary center of plant diversity in the world (Hong, 2007). Kinabalu Park rich biodiversity is due to the altitude ranging from about 450 m up to height of 4,095 meter, the mountain provides a variety of life zones from tropical lowland and hill rainforest to tropical forest, sub-alpine forest and scrub on the higher elevations (Kurzweil, 2013) with different temperature and climate. Moreover, the mountain has past history of glacial and drought events that encouraged diversity in plants evolution. In addition, the diverse geology gave rise to variety soil types. Many of the plants grow in soils that is low in phosphate but contain high amount of iron and metals, a toxic combination for many other plants but ideal for Mount Kinabalu's endemic plants.

According to Sabah Parks, the number of visitor for 2014 is 714, 164 and about 58, 428 of them are climbers compare to the year 2005 is only 434, 495 visitors and 43,154 climbers. On the 5<sup>th</sup> June 2015, Kinabalu Park was hit by an earthquake and the tourism activity was stopped for a few weeks. Thus, the number of visitors decreased but is slowly increasing back

after climbing activity resume. Many improvements on management of the park were done after the incident in order to recover the park conditions.

### **3. Methodology**

This is an exploratory research to identify the tourism impacts on the environment and the conservation effort being done to overcome the problems. The study probes respondents' thoughts and extract data grounded in the field. The use of purposive sampling allows a deeper understanding as expressive respondents were able to describe clearly their personal experiences (Williams and Soutar, 2000). Similarly, Kvale (1996) also states that interviews are conversations, and defines qualitative interviews as 'attempts to understand the world from the subjects' points of view to unfold the meaning of people's experiences, and uncover their lived world prior to scientific explanations. Three important characteristics of the qualitative method are: (1) most of the data are in the forms of written and spoken words, and observation; (2) there is no direct numerical interpretation in qualitative data; and (3) the motive in the qualitative method is often exploration (Zaiton, Aziz and Mohd Rusli, 2013).

20 in-depth interviews with the staff that work in Kinabalu Park consists of 7 Sabah Parks staffs, 8 Sutera Sanctuary Lodges staffs, 2 Multipurpose Cooperative of Sabah Parks Staff (KOKTAS) and Persatuan Malim Gunung Kinabalu (PEMANGKINA) staffs and 1 Mountain Torq staff. The interview duration was approximately 30 minutes to 45 minutes, allowing the respondents to identify and talk more about the impacts and conservation works in Kinabalu Park. The pre-defined research questions were used as a semi-structured interview guide, but the answers to those questions were intended to be open ended, allowing the interview to be fully expanded at the discretion of the interviewer and the interviewee. Data analysis in the qualitative research starts with collecting the required information from the field and sorting it into categories. The information received is formatted into a story, and finally written into a report (Denzin and Lincoln, 1994). Thus, the main role of the in-depth interviewer is to explore the respondents' points of view, feelings and perspectives.

### **4. Result and Findings**

This section will discuss about the impacts of tourism towards the environment and the conservation efforts done. Tale 1 provides a summary of the responses and will be discussed in the following sections.

Table 1: Summary of Respondents' Opinions

	Respondents' opinion
Presence of invasive species	Dandelions are seen abundant in the park and along the summit trails. (Interview respondents 3, 4,6,7,12,15 &16)
Environmental issue and degradation	Littering. (Interview respondents 5,8,9,17 & 19) Plucking the plants and disturbing animals. (Interview respondent 14 & 18) Soil degradation. (Interview respondents 17 & 20)
Earthquake incident	Shortage of clean water. (Interview respondents 1 & 2) Trails damaged. (Interview respondents 10 & 11)
Conservation effort	Eliminate invasive species and clean-up programme. (Interview respondents 3 &13) Brief on park's rules. (Interview respondent 5) Relocating and replant plants. (Interview respondents 10 & 13) Consultation from expert. (Interview respondent 11) Carrying capacity for climbers. (Interview respondent 5) Post-earthquake improvement. (Interview respondent 11)

#### 4.1. Presence of Invasive Species

The dandelion is one of the invasive species of concern to the park management because it is one of the requirements of the World Heritage Site that no invasive species are present in the park area. The dandelions are found almost everywhere in Kinabalu Park surrounding, from the park HQ area until the summit of the mountain. It had been a persistent issue for the park since 1998 or 1999 when it was first noticed (Ruben Sario, 2011). This is evidenced in the following responses:

*“When you walk everywhere in the park area, this dandelions can be seen abundant”*  
(Interview Respondents 3, 4, 7 & 12).

Respondents 6, 15 and 16 said that *“If you go and climb the mountain, you can see the dandelion also. They are all over the place”*. The park management was unsure how the species ended up in Kinabalu Park. Most probably it could be the dandelion seeds that accidentally tag on the visitor shoes or bags from foreign lands. Dandelion is a common weed from Northern Hemisphere and it is a tenacious species where they can either propagate through its roots or seeds and it dispersed by wind. That could be the reason why this invasive species are abundant at mountain areas as high as 3,350m.

## 4.2. Environmental Degradation and Issue

Littering is an act of making a place untidy with rubbish or a large number of objects left lying about. Almost in every visitor's attraction, littering is one of the main problem even though there are rubbish bins provided at the walking and summit trails, especially places that are crowded with visitors. Littering prohibited signs are seen in the park area but still there are some irresponsible visitors that litter around the HQ areas and also along the summit trails. This can be evidenced in the following response, "*There are some visitors that just throw their rubbish anywhere*" (Interview Respondent 19). According to interview Respondents 5 and 8, "*Along the summit trail there is rubbish, so I help to pick it up during climbing up or going down.* Another Respondent 9 expressed, "*There are also kind climbers that help to collect the rubbish they saw*".

Waterscape is an important environmental element for a tourism destination. Sewage, garbage, and other sources of pollution associated with tourism activities can lead to the eutrophication of a water setting, spread of infectious diseases, and degradation of water conservation forests (Zhong et al., 2011). Moreover, rubbish being thrown in the drains or in the rivers and this will cause decrease the cleanliness of the water and will cause foul odour. According to Respondent 17, "*Some of the visitors even litter the small river or drainage in the park. There are rubbish bins provided*".

Tourism impacts on vegetation include biodiversity loss, deterioration of the community structure, and decrease in plant productivity or even the extinction of some species. Kinabalu Park is a protected area filled with diverse of flora and fauna, some of it are endangered or vulnerable. So supposedly the plants and animals cannot be plucked or disturbed. According to respondent 14, "*I had seen some of the visitors disturb the plants in the park area*". Tourism activities can also have a direct impact on wildlife in terms of disturbance on their habitats and behaviors. Whittaker and Knight (1998) identified three different types of behavioral reaction of animal's avoidance, attraction, and habitations as being fundamental in understanding wildlife responses to humans. This can evidence as, "*The visitors feed the animals. So the animals will depend on human to feed them*" (Interview respondent 18).

If environmental protection was ignored, the nutrients contained in the soil would be reduced and salinization and acidification would occur. Specifically, trampling reduced soil coverage, heightened soil compaction, reduced water absorption and increased the formation of surface runoff which further led to soil erosion (Zhong et al., 2011). In addition, wastes changed the structure of the soil and reduced soil biological activities. Soil erosion and bare grounds occur at summit trail and also at the trails in the park area due to frequent use by the visitors. According to Respondent 20, "*Roots are exposed because many visitors walk at that area*". Another interview respondent 17 said that, "*The plants do not grow at the area that always being step on. So the soil become loose because no grip from the roots*". Thus, it becomes more severe when it's raining.

## 4.3. The Earthquake Incident

After the earthquake incident, the environment at Kinabalu Park becomes more vulnerable. Large boulders toppled down the summit area destroying at least three rest-houses at Laban Rata and the summit trail. The eastern and western parts of the mountain have been badly scarred by a series of landslides and rock falls in the aftermath of the quake. The other impacts of the earthquake are mud floods at rivers along Mount Kinabalu's foothills.

According to Respondent 1, *“Because of the landslide, the main river are filled with loosened rocks, soil and plants and causing mud floods”*. Respondent 2 said *“No clean water available and it takes some time for the river return to normal”*. The Kadamaian and Penataran River to the west of the mountain and Mesilau Kiri and Mesilau Kanan Rivers have been ecological destroyed.

Both of the trails, the Timpohon Trail and Mesilau Trail are affected by the earthquake. The large boulders destroyed both of the trails. This can be evidence as, *“The trail to the summit were blocked by the large rocks”* (Interview Respondent 10). Respondent 11 said that *“The Mesilau Trail is heavily damaged. Worst compare to the other trail”*. The Mesilau Trail remaina closed because more repair have to be done at the trail and the management focus on the Timpohon Trail first. Now, there are two trails available for climbers to the summit, the Ranau Trail that is on the eastern side where climbers get breathtaking views of the Ranau area. The other trail is Kota Belud trail, on the western side of the mountain and climbers can see part of the Kota Belud district. Both trails are from Panalaban and will meet at Sayat Sayat before climbers head for Low’s Peak, the summit.

#### **4.4. Conservation effort done by the Park Management**

Sabah Park has to eliminate the dandelion in order to keep the World Heritage Site title. The dandelions are a concern for the park because the population is increasing even after the elimination of the plant because this species is fast and easy to reproduce. *“The dandelions is a concern for the park because the population is increasing and after the elimination of the plant, it still growing. I had joined the elimination of the dandelion to clear it up”* (Interview informant 3). Eliminating dandelions programme also being done by Sabah Parks with collaboration other organizations such as SSL, KOKTAS, PEMANGKINA to eliminate dandelions around Kinabalu Park until the summit and had been ongoing since it was found.

Sabah Parks collaborate with other organizations such as SSL, KOKTAS, PEMANGKINA and sometimes with schools to clean up litters around Kinabalu Park. *“Almost every year, we do the clean-up programme at the park”* (Respondent 13). Moreover, briefing is given by the mountain guides about the do’s and don’ts that includes littering. This is evidenced by, *“We told the climbers that do not litter along the trails. There are rubbish bins at the huts along the trail”* (Respondent 5).

The first activity done before reconstruction of the new routes for climbing to the summit was relocation of endemic plants that might be affected by the new routes. The Sabah Parks Botany Unit with a team of mountain guides collected endemic floras such as the orchids and rhododendrons species at KM 6.5, the new climbing route to the top of mountain. According to Respondent 13, *“We relocate them away from the trail and also add new species specimens to Sabah Parks Herbarium”*. Respondent 10 said *“We also do replanting variety of trees, herbaceous plants and creeping ferns”*. The unit replanted the vegetations on Summit Trail at KM1.5 that have collapsed due to the earthquake.

For reconstructing the new trails, Sabah Parks seek expert consultation from Japan and Canada. According to Respondent 11 *“This is the first time we encounter with this problem, so we need help from people who have experience dealing with this problem”*. The move to set up the Kota Belud trail as an alternative to Ranau trail was initially aimed at providing an emergency escape route for climbers in the event of any emergencies due to natural disaster. Previously, the Mesilau Trail before being closed, was made as alternative to the Timpohon Trail to prevent overcrowding. The Mesilau Trail starts at Mesilau Nature Resort while

Timpohon Trail starts from Kinabalu Park HQ and the trails meet at Layang-Layang (Carson's Camp).

Based on Najed et al. (2014), carrying capacity is the maximum number of tourists accepted in one area and if this number exceeds, the frequent damage would come into the natural environment. There is only carrying capacity for climbers because it depends on the number of accommodation available at Panalaban. But there is no restriction on the number of visitors coming to the park per day. Accommodation capacity as a determinant of carrying capacity is not a viable solution because if overcapacity, soil erosion will occur especially during monsoon seasons (Er, 2014). After the earthquake incident, the carrying capacity for climbers had being reduced to 135 climbers per day from 192 climbers per day previously due to limited accommodation at Panalaban. A few of the accommodation are destroyed by the falling rocks. Almost every day reached the carrying capacity of climbers. During peak seasons such as public or school holidays, the carrying capacity maybe exceeded because sometimes it is overcrowded. This is evidenced in the following responses, "*The rooms are always full during the holidays*" (Respondent 5).

Furthermore, seismic equipment will be installed on Mount Kinabalu to improve earthquake monitoring activities and to ensure climbers are better informed during an earthquake. The seismic sensors will be install at 15 locations determined by experts including geologists. Another safety effort that will be done is installation of a special breaker to stop rock falls on the problematic segment of the Mount Kinabalu trail similar to avalanche breakers used in the Swiss Alps. The breakers are to ensure better safety for climbers. According to Respondent 11, "*There are still many loose boulders and rocks at the Low's Gully area*". There is a need to set up breakers to stop rock falls during tremors in the future.

## **5. Conclusion**

In conclusion, this paper explored the staffs' opinions on presence of invasive species, environmental issue and degradation, earthquake incident and conservation efforts. Kinabalu Park is a sensitive environment and became more fragile after the earthquake incident with aftershock still occurring. The mountain was damaged quite badly but most of the restoration work are still on-going. If there is more tourism demand due to the expansion of physical facilities, it will damage bring more negative impacts on nature if no proper management is enforced. Many efforts in terms of conservation work or visitors safety have been improve by Sabah Parks with the help of other agencies. The ideas are that tourism could help care for the environment and nurturing awareness on the desirability to minimize the physical and social impacts of tourism in the future. Studies of environmental impacts have been conducted from a tourism perspective and lack a systematic discussion based on the environmental or ecological sciences. There is a need for more environmental research studies to be undertaken using primary data and long-term monitoring from the perspective of environmental sciences.

## **6. Acknowledgment**

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# Community Perceptions of the Cultural Ecosystem Services of River Corridors Recreational Spaces in Sungai Pinang Catchment Area, Malaysia

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## Abstract

In response to the needs for recreational spaces or areas to counter rapid urbanization, natural elements that co-exist within urban areas serve as the much-needed space and function. River corridors that are used as recreational areas in cities create balance and promote social-ecological well-being. Based on the Urban Gradient Model, river corridors are observed to have changed with land-use from the upstream (natural land-cover) to downstream and river mouth (anthropogenic land-cover). Social-ecological systems framework describes how an anthropogenic land counters environmental deterioration and human activities increase it. Thus, each affects the ecosystem services of the urban communities in opposite ways. Therefore, this article aims to investigate urban communities' perceptions of cultural ecosystem services obtained from the river corridor's recreational areas. Three river corridors in the Sungai Pinang catchment area, namely Sungai Air Terjun (upstream), Sungai Air Itam (midstream) and Sungai Pinang (downstream) were selected and questionnaires were distributed based on ethnic groups, to a total of 105 respondents. An 18-item Likert scale was used to measure the level of ecosystem services obtained by the respondents. The overall results indicated that all of the respondents scored high levels for the benefits that they obtained. The results showed that the urban river corridors were regarded as recreational areas compared to their aesthetical, spiritual, educational, social interaction and identity functions. These findings indicate that the respondents placed a low value on the river corridors, thus, showing little place-based relationships. In sum, the lack of value on the place-based relationships should drive the management of the river corridors' recreational areas to focus more on how to increase the other cultural ecosystem services of Sungai Pinang.

Keywords: Ecosystem services, river corridor, Sungai Pinang.

## 1. Introduction

Urban rivers and its corridors can be considered as a space that can deliver a wide range of benefits to the urban community through the provision of recreational area along the river corridors. According to the Riverfront Development Guidelines enforced by the Malaysian Department of Irrigation and Drainage, the term 'river corridor' refers to the river, including the area extending 50 metres beyond the river reserve on both sides (DID, 1996). However, river reserves receive increasing attention from the DID due to their significant ecological and recreational functions (Zainal, Nor, and Lee, 2010). The interactions between the river ecosystems and the social systems are seen as mutual interactions. Humans are able to adapt to the environment and so does the ecosystem. Human or society may alter an ecosystem and impact the conditions of the environmental. Similarly, an ecosystem which adapts to the human social system will rearrange themselves in response to the actions caused by humans. In the context of this study, the social-ecological system can be analysed by using a

comparative approach that uses gradients within and between different areas in the cities (Boone et al., 2012). This approach is suitable to examine the impact of the urbanization that occurred, and it is a useful mechanism to identify the differences between areas. Cities themselves can be arranged into gradients along with a variety of social, economic, spatial, and biophysical dimensions, such as the population, water use, or pollutants emitted (Boone et al., 2012). Currently, urban activities and urbanisation have resulted in an urban community that lives a life that is full of stress due to their hectic daily routine. Therefore, in the context of this study, a recreational area in an urban setting can accommodate urban community's needs for natural elements as means of alleviating the pressures of life. As such, river corridors provide the natural green-blue space much needed by the urban community. Thus, it is pertinent to assess the interaction between the river ecosystem and the cultural services received by the urban community through various recreational activities conducted in these areas. This article aimed to focus on urban communities' perceptions of the cultural ecosystem services obtained from the river corridor recreational activities.

## **2. Literature Review**

The concept of ecosystem services has steadily gained the attention of environmental scientists, managers and decision makers (Müller and Burkhard, 2012). Ecosystem services provide benefits to humans in four distinct categories namely in terms of provisioning services, supporting services, regulating services and cultural services (MEA, 2005). This article focuses on the cultural aspects of the ecosystem services that provide humans with intangible benefits and is of significant value to social, psychological, and human well-being such as for aesthetic, recreation, health, social interaction, education, nature exploration, and spiritual benefits (MEA, 2005). According to Plieninger et al. (2013), some research has outlined the importance of non-material benefits provided by the ecosystems, particularly in the cultural landscape formed by the interaction of humans and the environment. Nevertheless, the cultural ecosystem services concept is very rarely considered and applied in the valuation of the ecosystem services. In some instances, research have indicated that the dependence of humans on cultural services has increased more rapidly than on the regulating services, while the dependence on the provisioning services has reduced (Guo et al., 2010). According to Anna (2004), humans will visit an area with a considerable number of ecosystem components such as green spaces to find their inner peace and to unite with nature. Therefore, the concept of the cultural ecosystem services should be applied more widely to study the relationship between humans as the social systems and the natural ecosystems. Issues related to ecosystem services have been reviewed by a number of researchers in the past. Most studies are related to the ecosystem health and its benefits to mankind and very limited research on water sources (blue spaces) and the concept of human well-being (Brede et al., 2010; Gledhill and James, 2008; Völker et al., 2010), such as reviewing the extent to which the relationship between the water quality and the environmental conditions can influence the perception of the user against the benefits obtained while performing their recreational activities at the river corridor. Although the relationship between green areas and human well-beings are often studied, the study on the blue elements in the green areas is still negligible (Han, 2003; Laumann et al., 2001; Ulrich et al., 1991). Due to fewer studies focusing on blue spaces, various aspects have yet to be examined because as to date, there is still no systematic study that reviews how human well-beings and blue spaces like rivers relate to each other (Völker and Kistemann, 2011). Qureshi et al. (2013) stated that more research to expand the understanding of a community's perceptions towards green-blue spaces is needed in order to plan and design inclusive, suitable urban areas that fit the concept of

sustainable cities and communities.

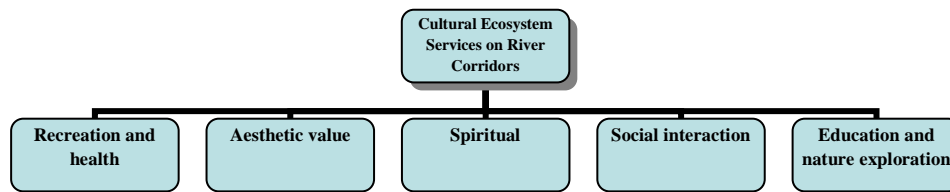


Figure 1: River corridor cultural ecosystem services studied in Sungai Pinang Catchment Area

Water is an important element in landscapes and adds aesthetic values (Kaplan and Kaplan, 1989). The benefits of the water element or blue space in an urban setting can be seen through perceptions, landscape design, river rehabilitation and recreational activities carried out along the river corridors (Völker and Kistemann, 2011). Most of the studies today focus on the importance of landscape and green areas, but there are many types of blue areas (Gledhill et al., 2009). Lianyong and Eagles (2009) expressed their criticism that less attention has been given to blue spaces or landscapes by academia. Issues such as how blue spaces improve the living conditions of human well-beings and how the benefits provided by this space should be studied in terms of its role to balance the assessment of the natural ecosystem, and not only focus on green spaces. Indirectly a study of this nature urges urban planners and stakeholders to evaluate and provide a comfortable area for urban communities to carry out their activities in the blue spaces. The existence of suitable areas for recreational activities along river corridors is able to influence and positively change the perception of the urban community towards urban rivers. Teng et al. (2011) stated that river corridors could meet human needs related to the environment through recreational activities. However, the usage as a recreational area has the potential to weaken the environment if not well managed. White et al. (2008) pointed out the importance of prior experience in the development of place attachment and perceptions of recreation impacts. Thus, research that gives special attention on understanding the perceptions of recreational activities carried out at different locations and the water quality along an urban gradient contribute to the improvements of the river corridors' values and usage by the urban communities. Furthermore, a social-ecological framework which applies a comparative gradient approach enhances the understanding of an urban ecosystem. McDonnell and Hahs (2009) stated that urban gradient and urban-rural gradient examine the changes over time in one or more study areas. In addition, this comparative approach will lead to the development of significant social-ecological research findings that create basic knowledge required for sustainable urban development. Whittaker (1967) introduced a framework that can be used to investigate the extent of the interaction between urban development and environmental process. This approach can also be applied to study the effects of urban development on natural ecosystems. Ecological conditions in urban areas can be systematically analysed by measuring the changes in the ecosystem's structure and their functions at various stages of the municipality (McDonnell et al., 1990). However, it is imperative to remember that the relationship between human activity within the environment and the rapid urbanization process is something that is very complex to assess.

### 3. Methodology

The study adopts a quantitative approach by employing survey questionnaires to obtain data. A total of 105 questionnaires were distributed at three locations (35 for each site). Perceptions of the benefits obtained through river corridor recreational activities were evaluated via 18 items of the Likert scale constructed based on the cultural ecosystem services category (see

Figure 1). 105 questionnaires were distributed, and the number of questionnaires was decided based on the population distribution in the North-East District in Penang Island, Malaysia. As of 2014, the North-East District of Penang Island was occupied by about 533,000 people (Department of Statistics, 2014). The ratio based on ethnicity was used in the selection of respondents. The calculation was made, and as a result, the ratio is 9 (Malay): 22 (Chinese): 4 (Indian) that led to a total of 35 respondents for each site. The Likert scale ranges from “strongly disagree (1) to strongly agree (5) and were interpreted to determine the level of benefits obtained for each respondents (Table 1) by using the formula (i). Descriptive statistics were used to examine the respondents’ characteristics and their perceptions. The Relative Importance Index (RII) was applied to determine the ranking of the items as given by Equations (i) and (ii) (see Muhwezi et al., 2014 for more discussion on RII).

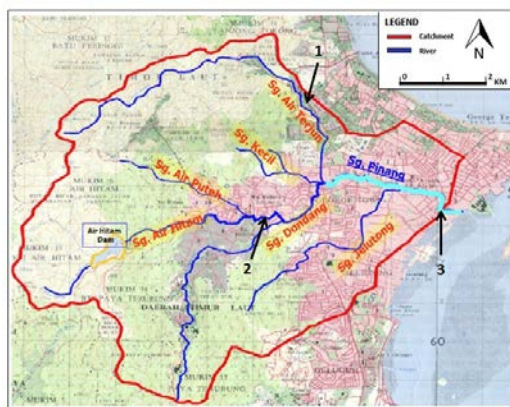


Figure 1: The study area (Sg. Pinang catchment)

Note: 1- Sg. Air Terjun, 2- Sg. Air Itam, 3- Sg. Pinang

Source: Department of Irrigation and Drainage (DID), Penang (2015)

$$\text{Summed score} = \text{frequency of each item} \times \text{scale} \quad (i)$$

$$\text{Benefits} = \sum_i \text{likert score} \quad (ii)$$

where,

$i$  = items 1 to 18, Likert score = 1 to 5

Table 1: Range for summed score and RII for perceived benefits obtained

Summed Score	Level of benefits obtained	RII
18 – 41	Low	0.000 – 0.333
42 – 65	Moderate	0.334 – 0.667
66 – 90	High	0.668 – 1.000

#### 4. Results and Discussions

Descriptive findings in Table 2 give an overview on number of respondents involved in river corridor recreational activities at three rivers. Based on this study, the findings indicated that all of the respondents scored a high level for cultural benefits obtained from the river corridor’s recreational activities (Table 3). All the respondents at Sungai Air Terjun (100%) and the majority of respondents at Sungai Air Itam (82.9%) and Sungai Pinang (74.3%) scored a relatively high level of cultural benefits. The results showed only a slight decrease in the percentages from the upstream to downstream. This indicates that the benefits obtained are only slightly reduced. In addition, there is an increase in the level of benefits obtained by respondents at Sungai Air Itam when comparisons are made between the upstream to the downstream (moderate level from 17.1% at the upstream to 25.7% at downstream of Sungai Pinang). The recreation and health benefits are the most valued by all respondents at Sungai Air Terjun, Sungai Air Itam, and Sungai Pinang (refer Table 4). Education and nature exploration category rank the second highest benefit obtained at Sungai Air Terjun (nature appreciation, RII=0.897) while the category ranks as third highest for Sungai Air Itam (nature appreciation, RII=0.817) and Sungai Pinang (get to know the current state of surroundings, RII=0.817). Besides, spiritual benefits are ranked fourth at Sungai Air Terjun (get closer to God, RII=0.886), while they rank second at Sungai Air Terjun (impressed with the creation of nature, RII=0.817). However, the findings indicate that all the three rivers show some differences in their lowest benefits of CES. The social interaction category is ranked as the least beneficial advantage of Sungai Air Terjun (interact with the local community,

RII=0.743). Meanwhile, respondents at Sungai Air Itam ranks aesthetic value in the last position with RII=0.726 for the item ‘get inspiration and solution’ and spiritual benefits is the last item ranked at Sungai Pinang with RII=0.629 for item ‘get closer to God’.

Table 2: Profile of respondents

Variable	Sungai Air Terjun		Sungai Air Itam		Sungai Pinang		Total f [%]
	f	%	f	%	f	%	
<b>Gender</b>							
Male	16	45.7	13	37.1	18	51.4	47 [44.8]
Female	19	54.3	22	62.9	17	48.6	58 [55.2]
<b>Total</b>	<b>35</b>	<b>100.0</b>	<b>35</b>	<b>100.0</b>	<b>35</b>	<b>100.0</b>	<b>105 [100]</b>
<b>Age</b>							
< 20	4	11.4	2	5.7	1	2.9	7 [6.7]
21 – 30	14	40.0	17	48.6	11	31.4	42 [40.0]
31 – 40	4	11.4	13	37.1	11	31.4	28 [26.7]
41 – 50	8	22.9	1	2.9	5	14.3	14 [13.3]
> 51	5	14.3	2	5.7	7	20.0	14 [13.3]
<b>Total</b>	<b>35</b>	<b>100.0</b>	<b>35</b>	<b>100.0</b>	<b>35</b>	<b>100.0</b>	<b>105 [100]</b>

Table 3: Level of perceived benefits obtained

Level	Score	Sungai Air Terjun		Sungai Air Itam		Sungai Pinang	
		f	%	f	%	f	%
<b>Low</b>	18 – 41	-	-	-	-	-	-
<b>Moderate</b>	42 – 65	-	-	6	17.1	9	25.7
<b>High</b>	66 – 90	35	100	29	82.9	26	74.3

Overall, the results showed that all the respondents agreed that they obtained high cultural benefits from the river corridors ecosystem at all the three locations within the George Town urban gradient. This result proves that river corridor recreational spaces can accommodate urban community’s needs for natural elements as means of alleviating their stressful life from the cultural ecosystem services offered by the river corridors. However, it is worth noting that even though the quality of the river water deteriorated significantly from upstream to downstream, the level of benefits obtained only declined slightly from upstream to downstream. This is an indication that the quality of the river water may not be the motivation or deterrent for the respondents and community at large to enjoy the river corridor recreational areas. This is an important aspect that could significantly change the approach or strategy adopted by the river management authorities in George Town and other cities. Further analysis was conducted to determine the pattern for individual rivers. In general, all the items were relatively important as indicated by the RII values of more than 0.600. The results revealed that urban river corridors were regarded more as recreational areas compared to the other cultural benefits (aesthetical, spiritual, education, social interaction, and identity). On the one hand, this implies that to the local community, an urban river corridor is an important space for recreational purposes to benefit their health and well-being. On the other hand, efforts are needed to increase the ecosystem values of the river corridor and subsequently increase the local community’s perceptions about the importance of rivers in the current urban setting. This is to ensure more cultural benefits such as the identity and sense of place that can significantly contribute to place river ecosystem in the hearts and minds of urban communities which are essential to a successful river conservation and restoration efforts.

Table 4: Rank of perceived benefits of cultural ecosystem services (CES) at three rivers.

Ranking		Sungai Air Terjun (RII)		Sungai Air Itam (RII)		Sungai Pinang (RII)
1.	A	Rest and relaxation (0.920)	A	Rest and relaxation (0.920)	A	Rest and relaxation (0.888)
2.	A	Health benefits (0.914)	A	Health benefits (0.823)	A	Health benefits (0.863)
3.	A	Positive feelings (0.903)	A	Positive feelings (0.823)	D	Spend time with family/friends (0.851)
4.	A	Peace of mind (0.897)	A	Peace of mind (0.817)	A	Positive feelings (0.829)
	E	Nature appreciation (0.897)	C	Impressed with the creation of nature (0.817)		
			E	Nature appreciation (0.817)		
5.	-		-		A	Peace of mind (0.823)
6.	A	Get clean and fresh air (0.891)	-		E	Get to know the current state of surroundings (0.817)
	B	Experience nature and its beauty (0.891)				
7.	-		A	Emotional stability (0.811)	A	Emotional stability (0.806)
8.	A	Emotional stability (0.888)	A	Get clean and fresh air (0.806)	B	Experience nature and its beauty (0.777)
			E	Get to know the current state of the surroundings (0.806)	D	Interact with local community (0.777)
9.	C	Get closer to God (0.886)	-		-	
10.	C	Get closer to nature (0.880)	D	Spend time with family/friends (0.800)	A	Get clean and fresh air (0.771)
11.	C	Impressed with the creation of nature (0.874)	C	Get closer to nature (0.794)	E	Nature appreciation (0.731)
12.	E	Get to know the current state of surroundings (0.863)	C	Get closer to God (0.794)	E	Identify the existence of a natural landscape (0.709)
	E	Identify the existence of natural landscape (0.863)	-		C	Impressed with the creation of nature (0.709)
13.	-		B	Experience nature and its beauty (0.777)	-	
			B	Hear the sounds of nature (0.777)		
14.	D	Spend time with family/friends (0.857)	-		B	Hear the sounds of nature (0.697)
					B	Get inspiration and solution (0.697)
15.	B	Hear the sounds of nature (0.846)	E	Identify the existence of natural landscape (0.771)	-	
16.	E	Get to know the cultural characteristics (0.840)	E	Get to know the cultural characteristics (0.754)	C	Get closer to nature (0.663)
					E	Get to know the cultural characteristics (0.663)
17.	B	Get inspiration and solution (0.788)	D	Interact with the local community (0.743)	-	
18.	D	Interact with local community (0.743)	B	Get inspiration and solution (0.726)	C	Get closer to God (0.629)

Note: Cultural ecosystem services sub-categories: A) Recreation and health, B) Aesthetic value, C) Spiritual, D) Social interaction, and E) Education and nature exploration

## 5. Conclusion

Urban river corridors have the potential to be developed as important recreational areas in an urban area for balancing and enhancing the social-ecological well-being of the local population. Through this article, urban river corridors were identified as a space that provides a wide range of cultural ecosystem services. This study has attempted to identify the benefits of the cultural ecosystem services available through recreational activities at the river corridors. The urban river corridors obtained many benefits from the ecosystem which make these urban spaces as the key contributor to sustainable cities and communities. Different locations along the rivers in an urban setting offer different activities that can be carried out and different benefits that can be offered to the community. In addition, the perceived importance of the cultural ecosystem services and the perception of the actual situation may give important insights into community's actual demands for a particular services and characteristics. Town planners and stakeholders should assess the diversity of the recreational activities that can be carried out at different locations along the river corridors based on the local communities' perceptions of the benefits that they wish to obtain before they design and develop the urban rivers. In addition, more efforts are required to increase the values of the rivers to the urban communities to encourage more support for river conservation and restoration efforts. Therefore, the river corridors' ecosystem services and urban community's preferences should be taken into account in decision-making so that urban social-ecological well-being can be met.

## 6. Acknowledgement

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