KOLOKIUM SISWAZAH LESTARI 2021

KSL 2021

BUKU ABSTRAK

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JADUAL KOLOKIUM SISWAZAH LESTARI 2021

Tarikh   : 13 Oktober 2021 (Rabu)
Masa   : 0900 – 1500
Aplikasi : Zoom
Pautan   : https://bit.ly/3kCsgJs

BIL	WAKTU	PERKARA		
	0830 – 0900	Pendaftaran pelajar dan semua warga LESTARI		
	0900 – 0905 0905 – 0920	Bacaan doa Ucapan Aluan Pengarah LESTARI		
SESI 1		Moderator	Prof. Madya Dr. Ahmad Fariz Mohamed	
		Penilai	Prof. Dr. Sharifah Zarina Syed Zakaria	
			Prof. Madya ChM. Dr. Tan Ling Ling	
			Gs. Dr. Nurfashareena Muhamad	
1	0920 – 0940	**Saidatul Akma Hamik | P99953 | KASES** Tajuk : *Retailers' Participation In Surplus Food Redistribution To The Food Bank Program In Klang Valley, Malaysia*		
2	0940 – 1000	**Khalilulnisha Abu Bakar | P98943 | KASES** Tajuk : *Development Of Extended Producer Responsibility Governance Framework For Plastic Beverage Containers Waste For Greater Klang Valley, Malaysia*		
3	1000 – 1020	**Nurul' Ain Jamion | P95673 | SGK** Tajuk : *Penentuan Stesen Kajian Di Paya Indah Wetlands Dengan Menggunakan Kaedah Persampelan DotS*		
4	1020 – 1040	**Mohd Firdaus Bin Mohd Arif | P103823 | SGK** Tajuk : *Impact Of Digital Transformation In Strategic Management And Employee Wellbeing Towards Sustainable Fourth Industrial Revolutions (4IR) : A Case Study in Hospital Tuanku Ja'afar Seremban*		

		Moderator	Prof. Madya Dr. Ahmad Fariz Mohamed
SESI 2		Penilai	**Prof. Dr. Muhammad Rizal Razman**
			Dr. Nor Diana Mohd Idris
			Dr. Lim Chen Kim
5	1040 – 1100	**Nurul Syazwani Yahaya | P99952 | SEADPRI** Tajuk : *Climate Influence On Pollutant Mobilization And Emerging Risks In Selangor River Basin*	
6	1100 – 1120	**Fairuz Reza Razali | P97899 | SEADPRI** Tajuk : *Blue-Green Infrastructure Design Of An Urban Resilience Prototype In River Flood Adaptation And Revitalization: A Case Study In Sungai Pinang, Georgetown, Malaysia*	
7	1120 – 1140	**Husna Aini binti Shaidin | P105963 | SEADPRI** Tajuk : *Keterdedahan Elemen Berisiko di Selangor Terhadap Bahaya Semulajadi*	
8	1140 - 1200	**Alwin Long Su Weng | P100389 | SGK** Tajuk : *Towards Realising Malaysia's Carbon Neutrality: A Study On An Approach With A Heritage Rural Community In Sabah*	
	1200 – 1400	REHAT	
	1400 - 1500	Rumusan Pengerusi Kolokium **Dr. Murnira Othman**	
		Pengumuman Pemenang oleh Timbalan Pengarah LESTARI **Prof. Madya ChM. Dr. Goh Choo Ta** Kategori Abstrak Lanjutan Terbaik Kategori Keseluruhan Terbaik Ucapan Penutup oleh Timbalan Pengarah LESTARI	

RETAILERS' PARTICIPATION IN SURPLUS FOOD REDISTRIBUTION TO THE FOOD BANK PROGRAM IN KLANG VALLEY, MALAYSIA

SAIDATUL AKMA HAMIK (P99953)

SUPERVISORS:
ASSOC. PROF. DR. AHMAD FARIZ MOHAMED
ASSOC. PROF. DR. MIZUHO SATO

1.   INTRODUCTION

Food waste is one of the primary contaminants in the environment. Food waste impacts the environment that significantly contributes to greenhouse emissions, incurs high economic costs and social (Kowalska and Manning, 2020) that are inextricably connected to food security and resource management. Food waste reduction is a challenge for food and waste policies. In Malaysia, a landfill is the most common method for disposing of food waste, and it is relatively inexpensive and straightforward to implement (Lim et al., 2016). Redistribution of surplus food is considered the preferable option to divert food waste from landfills. Retailers concerned about food waste for economic and moral reasons (Gruber et al., 2016) regularly will donate food to charitable organizations such as food banks and social supermarkets (Richter and Bokelmann, 2016). The involvement of retailers in the redistribution of surplus food requires support from the government. Surplus food redistribution to charities has been encouraged and subsidized by the government, significantly reducing the amount of food in the landfill. Therefore, this study investigates the drivers contributing to the insufficiency of government policy and practices to meet the needs of retailers participating in the food bank program.

2.   PROBLEM STATEMENT & LITERATURE REVIEW

Malaysian food waste sources came from residential, commercial, institutional, commercial, and city areas. According to a study conducted by the National Solid Waste Management Department (JSPN) in 2012, the household sector accounts for approximately 44.5 percent of these, while the ICI (Industrial, Commercial, and Institutional) sector accounts for approximately 31.4 percent. The current government strategy is a charitable initiative through a food bank program to curb food wastage in commercial and industrial areas. Retailers' commitment as food donors to redistribute surplus food to the food bank helps to reduce wastage and discarded directly to the landfill. However, donor issues exist due to the shortage of donors to participate in the program among food producers, retailers, food operators and food distributors (The Star Online, 2018). According to a virtual interview with YFBM, scarce donor awareness and insufficient logistic education have led to donors' unwillingness to redistribute surplus food, affecting limited food supplies. Although to promote participation among donors, the government implemented regulations to protect the donor's liability under the Food Donor Protection Act 2020. The reality is there is still a lack of donors involved in the program. Current government policy and practices to support retailers insufficient to fulfil the needs of food donors, and its affected the donor's interest in actively conserving surplus food. Therefore, government support is needed to encourage food donor participation in food bank programs. Unfortunately, Malaysia lacks supportive laws and policies that enable food donations to reach their full impact.

Government policy and practices are defined as government role in a particular area as one of the arts and therefore eligible for government to support the arts (Heikkinen, 2008). In this study, government policy and practices refer to government regulations, government grants, tax incentives, government plan and policy recommendations, government initiatives and programs that support and strengthen food recovery and donation. Therefore, this research explores the drivers of the scarcity of the current government policy and practices applied to donations.

3.   RESEARCH OBJECTIVE

This paper aims to identify factors contributing to the deficiency of government policy and practices to support retailers' participation in food bank programs.

4.   RESEARCH METHODOLOGY

The study was conducted through a semi-structured interview to explore the experiences and perspectives of actors from different government agencies involved directly with the retail food industry, engage with the food bank, and handle food waste issues. These parties can provide comprehensive insights into the rationale of whether government policy and practices in this country are efficient in encouraging the donation of surplus food among the retail food industry. Furthermore, in-depth interviews were conducted via Google Meet on September 2021 with three (3) key informants from government agencies; (1) Distributive Trade and Service Industry Secretariat (SPPIP), Ministry of Domestic Trade and Consumer Affairs, (2) National Solid Waste Management Department (JSPN), Ministry of Housing and Local Government and (3) Solid Waste and Public Cleansing Management Corporation (SWCorp). All key informants were purposively sampled to represent expertise relevant to this study.

5.   RESULT AND DISCUSSION

Based on the views regarding government policy and practices offered in Malaysia to the food bank program for food retailers from key informants from SPPIP, JSPN and SWCorp. It also examines views of the key informant to current initiatives from the government to food banks and food waste, food bank issues among food retailers and their roles in response to this matter. The discussion is presented according to themes: (1) non-tax incentives; (2) non-food donation policy; (3) non-government grants and incentives; (4) food waste regulation deficiency; (5) awareness of food retailers. First, non-tax incentives are provided to food retailers in Malaysia. Some of the public officials involved in this study claimed that there are no tax deductions available in this country due to barriers faced by small businesses that do not earn enough income to be eligible for the deduction. That is something that government should consider to encourage the participation of food donors among the retail industry, such as in the US offer taxpayers tax incentives for food donors. Next, the food donation and recovery policy are essential to apply to the food safety rules. In the United Kingdom (UK), the law applies to food donation of certain food products with damaged packaging and safe food handling (foodbanking.org). Hence, in Malaysia non-food donation policy, yet to be enacted.

Furthermore, government grants and incentives for reducing food waste are available in UK, US, Canada and Peru. In the US, grants and incentives programs funded by the government are considered an important source of funding for food donation initiatives where donors believe tax incentives are insufficient to offset donation costs. However, in Malaysia, government grants are offered to the organization for research activities instead of food donation activities.

Government should consider giving grants and other incentives to improve awareness of food donation among retailers. Moreover, food waste regulation deficiency in Malaysia as food waste is categorized under the Solid Waste and Public Cleansing Management Act 2007 (Act 672). It is vital to have a single regulation for food waste, such as in France, which aims to reduce food waste by encouraging food donation and prohibiting the destruction of unsold food products primarily targeted in the retail sector. In addition, the Food Donation Law adopted in the US, Canada, UK, Argentina, and Peru aims to promote food donation as a solution to food loss and waste. Public officials involved in this study stated that reducing food waste among retailers in Malaysia is considered voluntary since no single regulation related to food waste is enacted.

Last, awareness of food retailers. Instead of blaming the policy and the government, some participants highlighted that retailers should be blamed too. Despite the efforts of states and other relevant parties to enact regulations and provide facilities to support food donation, the initiatives have failed to reach them due to their ignorance. For example, the Food Donor Protection Act 2020 protected food donors from liability for damages caused by those who consume the donated food. Not only that, the government has provided Distribution Centre (DC) for food donors to store perishable items before the food is shipped out. In terms of logistics, the government has provided the 14 one-tonne chiller trucks used to redistribute food to the targeted households and public university students. This initiative acts as a platform to encourage retailer's participation in the food bank program. However, many retailers still do not know and are aware of the initiatives offered by the government and other relevant agencies. Therefore, we cannot blame the states and other related parties for not providing good policy and initiatives, but retailers themselves choose not to take advantage of that opportunity.

6.   CONCLUSION

Results underlined the importance of inducing the feeling of donation to food retailers with a good government policy and practices that could fulfil the needs of food retailers to be protected. Despite liability legislation, distribution centres, and chiller trucks introduced during the implementation of the food bank, food retailers still view efforts from the government as deficient. Because the existing initiatives are concentrating more on facilities storage and logistics, thus their awareness and commitment to participate are still low due to less enforcement from the government. All of the key informants (i.e., SPPIP, JSPN and SWCorp) are at their very best to respond to the food retailers' needs and develop initiatives to realize the national aspiration to improve redistribution of surplus food among food retailers. However, government policy and practices in redistributing surplus food are still insufficient because other segments cannot comprehend the food waste issue. Therefore, flaws in current government policy and practices, as previously discussed, have pointed out that blame does not fall solely on the shoulders of government alone. That should be solved together with food retailers as awareness also influence it.

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LEGISLATIVE AND INSTITUTIONAL FRAMEWORKS OF EXTENDED PRODUCER RESPONSIBILITY FOR PLASTIC BEVERAGE PACKAGING IMPLEMENTATIONS – A COMPARATIVE ANALYSIS BETWEEN GERMANY, JAPAN AND TAIWAN

KHALILULNISHA BINTI ABU BAKAR (P98943)

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DR. YUSUKE KISHITA

1.   INTRODUCTION

Malaysia's population growth and consumption patterns has contributed to the increase of single use plastics and lack of governance of plastic waste will end up polluting water bodies, posing detrimental health risks and cause marine litter. Extended Producer Responsibility (EPR) is a policy approach that has been successfully adopted by many countries to manage and reduce post-consumer waste, including single use plastic packaging (OECD 2016). The Malaysian Government is committed towards reducing single use plastics by 2030 and plans to use EPR as one of its approaches (MESTECC 2018). Gupt and Sahay's case study of 27 EPR programmes have identified that regulatory provisions and take back responsibility are two most important aspects in EPR (2015). Thus, this study focuses on these characteristics, with Germany, Japan and Taiwan as case studies. This article makes an exploratory review of EPR implementations in these countries and to identify common key characteristics and best practices of EPR, with focus on legislative (regulatory provisions) and institutional (take back responsibility) frameworks. The findings can significantly contribute towards the development of Greater Klang Valley's own EPR governance framework.

2.   PROBLEM STATEMENT & LITERATURE REVIEW

Plastic waste makes up 13% of the waste composition in Malaysia (MHLG 2013) and almost 70% of post-consumer PET bottles from the Greater Klang Valley area ends up in landfills (GA Circular 2018). Even though there is an existing legislation and institutional framework to address plastic waste under the Solid Waste and Public Cleansing Act 2007 (Act 672) (Malaysia 2007), there is no specific focus on EPR for plastic packaging. This implies that Malaysia has a weak plastic governance and this supports Dauvergne's opinion that the governance of plastics is often fragmented with unholistic national policies, haphazard implementation and lack of policy coordination (2018). Realising this, the Malaysian Government proposed to address the issues of single use plastics through adopting an EPR approach under the Circular Economy Roadmap of the Roadmap Towards Zero Single-Use Plastic 2018 – 2030 (MESTECC 2018) and this is further emphasised in the recently launched Twelfth Malaysia Plan (Malaysia 2021). For the purpose of this study, Germany, Japan and Taiwan were chosen as these countries successfully implemented EPR for plastic packaging for more than two decades, and this could be partly due to the holistic and effective legislative and institutional framework (Gupt and Sahay 2015, Kaffine and O'Reilly 2015, OECD 2016 and WWF 2019).

3.   RESEARCH OBJECTIVE

For the purpose of this colloquium, the study is carried out to identify and analyse common characteristics and best practices of legislative framework and institutional structure of EPR for plastic beverage packaging in Germany, Japan and Taiwan. The findings of the analyses will be used as a reference point in the development of legislative framework and institutional structure of EPR for plastic beverage packaging for Malaysia.

4.   RESEARCH METHODOLOGY

This is a desktop study using secondary data from existing literature and studies related to legislative framework and institutional structure of EPR for plastic beverage packaging in Germany, Japan and Taiwan, for example study conducted by Gupt and Sahay (2015), Kaffine and O'Reilly (2015), OECD (2016) and WWF (2019). The study applied a 4-step approach. Firstly, determining the suitable countries as case study. The basis of selection is that the EPR schemes have been established for more than two decades to provide the experiences and lessons needed for this analysis. Secondly, the selection criteria for the countries were also based on type of waste stream (plastic packaging for beverages), type of economy (developed and developing) and cultural backgrounds. Thirdly, literature on EPR implementations for beverage containers in Germany, Japan and Taiwan were reviewed. Lastly, common and contrasting characteristics and components within the legislative and institutional frameworks were identified and a simple comparative analysis is then carried out.

5.   RESULT AND DISCUSSION

Even though not many literatures can be found that explains in detail the achievements of EPR for plastic packaging waste in Germany, Japan and Taiwan, it can be assumed that after more than 20 years of implementation, the EPR ecosystem is rather robust. The result of the study above suggests that legislative framework for plastic packaging is a vital component of an EPR system and the legislation makes it mandatory for the producers and other related stakeholders to comply and support the EPR system (Gupt and Sahay 2015, Kaffine and O'Reilly 2015, OECD 2016 and WWF 2019). The legislative framework also evolved over time where it is revised and amended accordingly to accommodate specific needs or to achieve new national/international targets. The takeaway here is that an adaptive legislative framework is imperative and if Malaysia decides to adopt EPR for plastic beverage packaging, EPR-related legislation should be at the top of the to-do list.

Mandatory EPR will force producers to be more accountable (OECD 2001). In terms of institutional framework, all the countries' Ministry of Environment spearhead the implementation and enforcement of these regulations, supported by other ministries/agencies and industry players (Gupt and Sahay 2015, Kaffine and O'Reilly 2015, OECD 2016 and WWF 2019). The governance structure is developed further with the establishment of Producer Responsibility Organisations (PRO) where the producers often create a collective system to fulfil their physical and financial responsibility of managing their post-consumer products. In some cases, the legislations also define the responsibilities of the stakeholders, therefore, it can be concluded that the legislative framework is closely related and fundamental to institutional framework, and vice versa.

6. CONCLUSION

The findings of this study showed that although there are similar key characteristics in terms of legislative and institutional framework, not one is exactly alike. Therefore, it can be said that there is no 'one-size-fits-all' approach in implementing an EPR policy. However, legislative framework is necessary in driving the effectiveness of an EPR scheme and must be further supported with a sound institutional setup to ensure the seamless implementation of EPR. Even though Malaysia already has a legislative framework to carry out EPR for plastic beverage packaging, it still needs to be further clarified and refined including the institutional setup. The future looks encouraging as this can be further explored under the Twelfth Malaysia Plan. With these in place, and an overarching governance framework to guide them, Malaysia will be ready to carry out an effective EPR comparable to the successes of Germany, Japan and Taiwan.

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PENENTUAN STESEN KAJIAN DI PAYA INDAH WETLANDS DENGAN MENGGUNAKAN KAEDAH PERSAMPELAN DotS

NURUL' AIN BINTI JAMION (P95673)

PENYELIA:
PROF. MADYA TS. DR. LEE KHAI ERN
PROF. DATO' CHM. DR. MAZLIN BIN MOKHTAR
TS. IR. DR. GOH THIAN LAI

1. PENGENALAN

Perkhidmatan ekosistem semulajadi seperti paya menunjukkan potensi yang signifikan untuk sekuestrasi karbon atmosfera dalam membantu mengurangkan dan mengadaptasi masalah perubahan iklim (Gumbricht et al. 2017; Lorenz & Lal 2018). Namun, mengenal pasti ciri-ciri fizikal, spatial dan temporal ekosistem paya telah menjadi tugas yang mencabar (Takashina et al., 2018). Maklumat awal berkaitan geospatial adalah diperlukan sebagai prasyarat untuk membangun dan menguruskan ekosistem paya (Margules & Pressey 2000). Justeru, kaedah tinjauan yang boleh dipercayai dan menjimatkan kos untuk persampelan dan pemantauan paya adalah penting agar paya dapat diurus dengan baik dan dilindungi (Pinke et al. 2017). Kaedah persampelan DotS dilihat mempunyai banyak kelebihan untuk diadaptasi dan digunakan oleh pihak pengurusan paya bagi meninjau dan memantau keadaan serta sumber semula jadi paya terutama untuk mengumpul data bagi kawasan yang sangat luas secara sistematik.

2. PERMASALAHAN KAJIAN & SOROTAN KAJIAN

Terdapat beberapa kekangan yang dihadapi untuk menggunakan kaedah tinjauan dan persampelan sedia ada sebagai teknik mengenal pasti ciri-ciri fizikal, spatial dan temporal paya. Contohnya, kaedah yang menggunakan sistem maklumat geografik (GIS) yang mengaplikasikan teknologi penderiaan jauh memerlukan penggunaan kelengkapan perisian dan instrumen yang mahal dan canggih, staf yang berkepakaran, berkelayakan dan terlatih untuk mengendalikan instrumen dan mentafsir data (Chawla et al. 2020; Salari et al. 2014). Kaedah kerangka kawasan pula memerlukan tenaga kerja yang banyak semasa di peringkat persiapan tinjauan persampelan lagi kerana kerangka kawasan persampelan perlu dibangunkan terlebih dahulu sekaligus menyebabkan kos pengurusan meningkat (Jinguji 2014; Takashina et al. 2018). Malah, kaedah ini memakan masa kerana memerlukan penentuan persampelan dan stratifikasi secara berperingkat dengan menggunakan integrasi pelbagai platform, seperti imej satelit, peta digital, perisian GIS dan foto udara (Iglesias 2013). Selain itu, kedua-dua kaedah ini masih turut mempunyai kemungkinan boleh berlakunya kesalahan sistematik semasa sempadan poligon dilukis menyebabkan tafsiran dan terjemahan analisis data tersebut tidak tepat (Bauer et al. 2016). Justeru itu, kaedah tinjauan dan persampelan yang lebih mudah, cekap dengan kos yang rendah perlu diperkenalkan kepada pihak pengurusan paya untuk diadaptasi dan digunakan dalam memastikan kerja tinjauan dan pemantauan keadaan dan sumber semula jadi paya supaya lebih efisien dengan menggunakan kaedah persampelan DotS.

3. OBJEKTIF KAJIAN

Objektif yang difokuskan adalah menentukan stesen kajian di PIW dengan menggunakan kaedah persampelan DotS.
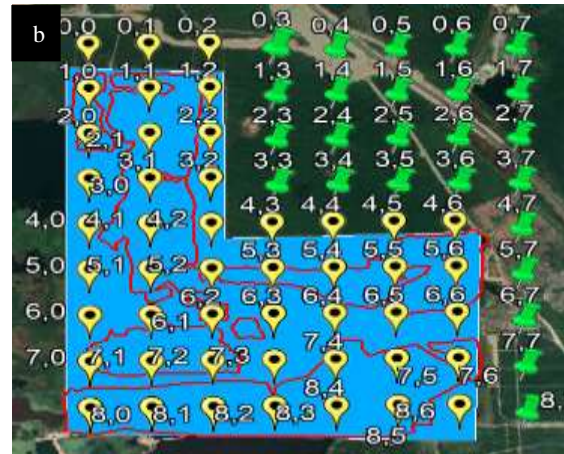
4.   KAEDAH KAJIAN

Profil kawasan kajian PIW seluas 450ha telah dikenalpasti terlebih dahulu sebelum kajian lapangan dimulakan. PIW dikategorikan mengikut habitat tumbuhan yang ada kerana ianya penting dalam menentukan potensi penyerapan karbon dan kualiti air kawasan tersebut (Peh et al. 2017). Kaedah persampelan DotS yang diadaptasi terdiri daripada tiga langkah utama, iaitu persampelan dot, persediaan kajian lapangan dan kajian lapangan (Jinguji & Yuksel 2015). Langkah pertama persampelan dot dijalankan untuk mendapatkan anggaran lokasi sampel dot kawasan kajian dengan hanya menggunakan lembaran excel-mikro (EM) dan Google Earth (GE) yang menjana anggaran sampel dot secara automatik dengan mengambil nilai ketepatan (*aimed precision*) sebanyak 10% sebagai nilai ketepatan yang maksimum. Kemudian persediaan kajian lapangan dilakukan dengan meneliti semua lokasi sampel dot yang telah dijana untuk menganggarkan kesesuaian lokasi sampel dot tersebut sebagai stesen kawasan kajian dan dikod mengikut kategori. Akhir sekali, kajian lapangan dijalankan dengan meninjau lokasi sampel dot yang telah disenaraikan untuk menentukan kesesuaian lokasi tersebut sebagai stesen kajian.

5.   KEPUTUSAN DAN PERBINCANGAN

Langkah pertama iaitu persampelan dot telah menjana sebanyak 72 lokasi sampel dot anggaran secara sistematik dan sama rata pada keseluruhan kawasan sasaran PIW. Sebanyak 47 lokasi sampel dot berada di dalam kawasan kajian PIW. Titik lokasi sampel anggaran ini didapati dijana pada keseluruhan keluasan kawasan kajian PIW yang merangkumi kawasan seluas 444.5 ha. Ini membuktikan teknik DotS mempunyai kebarangkalian yang sangat tinggi iaitu 99% dalam menggganggar jumlah lokasi kajian. Setelah itu, melalui langkah kedua, didapati hanya 37 lokasi sampel dot dianggarkan berpotensi untuk dijadikan sebagai stesen kajian. Kesemua 37 lokasi sampel dot yang direkodkan ini dibahagikan pula kepada kedudukannya sama ada pada kawasan tanah dan air, iaitu sebanyak 17 dan 20 lokasi masing-masing. Langkah kedua ini memberi maklumat awal jumlah lokasi sampel yang berpotensi untuk dipilih sebagai stesen kajian sebelum kajian lapangan dijalankan. Langkah ini sekaligus menjadikan kerja kajian lapangan lebih efisen dan menjimatkan sumber-sumber yang ada (Jinguji & Yuksel 2015). Langkah terakhir iaitu kajian lapangan memerlukan tinjauan ke semua 37 lokasi sampel tersebut bagi memastikan kebolehlaksanaan persampelan di lokasi tersebut, seterusnya dipilih sebagai stesen kajian. Hasil langkah kedua digunakan sebagai rujukan dalam langkah ini. Hasil tinjauan dan pemeriksaan didapati sebanyak 24 lokasi sesuai dijadikan stesen kajian, iaitu masing-masing 11 dan 13 untuk stesen kajian sampel tanah dan air. Pemilihan dilakukan setelah mengambil kira beberapa faktor antaranya adalah keselamatan semasa persampelan dijalankan berdasarkan landskap lokasi sampel dot, kos persampelan dan analisis, ketersediaan peralatan dan teknologi pengukuran serta tenaga kerja mahir yang diperlukan. Koordinat setiap stesen direkod untuk kerja persampelan di PIW dijalankan. Rajah 1(a) menunjukkan latitud dan longitud lokasi sampel dot yang dijana di EM manakala Rajah 1(b) menunjukkan lokasi sampel dot yang telah dijana di GE.

Rajah 1(a) latitud dan longitud lokasi sampel dot, (b) lokasi sampel dot yang dijana di GE

6.   KESIMPULAN

Sebagai kesimpulan, kaedah persampelan DotS sesuai digunakan untuk kajian ini kerana mempunyai kebolehpercayaan yang tinggi bagi menentukan jumlah stesen kajian dan membantu mengurangkan kesilapan berbanding dengan penentuan stesen secara manual. Teknik persampelan grid secara automatik yang sistematik ini memberi ketepatan yang tinggi dalam mengenal pasti maklumat lokasi sampel bagi menentukan dan memilih stesen kawasan kajian dengan tepat dan cepat. Tambahan pula, kaedah persampelan DotS ini menggabungkan teknologi dan perisian sedia ada yang percuma menjadikan kerja kajian lapangan lebih efisien dan praktikal dalam menjimatkan pelbagai sumber. Namun begitu, kekurangan kaedah ini adalah memerlukan sambungan internet bagi menghubungkan perisian yang digunakan.

7.   RUJUKAN

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IMPACT OF DIGITAL TRANSFORMATION IN STRATEGIC MANAGEMENT AND EMPLOYEE WELLBEING TOWARDS SUSTAINABLE FOURTH INDUSTRIAL REVOLUTIONS (4IR): A CASE STUDY IN HOSPITAL TUANKU JA'AFAR SEREMBAN

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1. INTRODUCTION

The shift into industrialisation began with the implementation of machinery usages, where then revolutions started to occur, succeeding each phase as technology developed and upgraded. It's believed that digital changes are traced as early from its ancestry line of the industrial revolution, which began in the 18th century in Britain (Wilson 2014). Digitalisation involves converting data from manual to digital, which improves the traditional way of collecting, recording, and analysing data and is dependent on existing information technology capabilities. Technological changes like any other will create resistance with its dynamic perceived as disruptions to the status quo in social ambience. The technological advancements should be embraced because of their benefits; they should also be critically analysed to prevent the overwhelming side-effects on end-users well-being; it is well-known how the development of the internet and smartphones have profoundly impacted every aspect of economic, political, social, and work environments (Hansen & Salskov-Iversen, 2005; Schumacher et al., 2016).

2. RESEARCH PROBLEM & LITERITURE REVIEW

The current wake by the Commission of Internal Audit Malaysia revealed the hurdles faced by the Ministry of Health Malaysia (MOH) in managing and providing services covers management activities of financial achievement, employee workload, management of the emergency facility, and information technology abilities as reported from findings by Laporan Ketua Audit Negara Persekutuan Tahun 2018 Mengenai Aktiviti Kementerian / Jabatan Kerajaan Persekutuan dan Badan-Badan Berkanun Persekutuan Siri 1 (Malaysia National Audit Department 2018). Transformations of medical treatments are shifted from traditional medicine to modern medicine, which redefined healthcare services into the new settings and conducted in the point of care, hierarchy, physician's authority, population targets, and costs; that goes beyond the latest technologies of information, computing, communication, and connectivity as its connecting patients and providers in a broader range (Meskó et al. 2017; Gopal et al. 2019). Digital transformation in healthcare began with information systems which evolved to fit into its objectives, roles, and characteristics (Zakaria et al. 2016; Hertin & Al-Sanjary 2018). Predominantly within a hospital that uses digitalization in their services is through Health Information Systems (HIS). Digital transformation improves productivity and impacts character affecting organizations, and individuals alike (Parviainen et al. 2017; Diller et al. 2020). Employee wellbeing is essential in ensuring productivity and growth in an organization; however, technological adoption is also influenced by personality, which is a root of wellbeing within individuals (Lee et al., 2018). In personality traits, an introvert or extrovert

is perceived as collective emotion and behaviour, defining that both personalities react according to their characteristics at work and in social environments depending on external stimulation (Schmidt 2016).

3. OBJECTIVES

This case study objective is to investigate the influence of digitalization and personality among doctors in hospitals on job performance.

4. METHODOLOGY

This study collected responses through quantitative close-ended questionnaires from 239 medical doctors, ranging from specialists, general medical doctors, and housemen (trainee medical doctors) in Hospital Tuanku Ja'afar Seremban (HTJS). The scope of healthcare digitalisation chosen for this research was the six applications of Information Systems and Health Information Systems, namely HRMIS (Human Resource Management Information System), SPP (Patient Management Systems / Sistem Pengurusan Pesakit), LIS (Laboratory Information System), RIS (Radiology Information System), OTMS (Operation Theatre Management System) and MyHix (Malaysia Health Information Exchange). The research derived personality traits from The Big Five theory of extroversion, attributed to extroverts and introverts and measured it with the psychometric NEO Personality Inventory (NEO-PI-R) (Costa & McCrae 1992). Job performance was analysed employing the Eight Dimensions of Effective Phrases centred on respondents' self-evaluations (Jr. 2014). The influence of digitalisation as new technologies producing new job roles and new processes focuses on relevant aspects, eases the workload and increases productivity. The employed theories and psychometrics were analysed using a Likert scale with a five-point ascending response option to avoid left-site selection and acquiescence bias as the surveys related to subjective aspects of personality and work environment (Yonnie Chyung et al., 2018).

5. RESULT AND DISCUSSION

The results acquired through the pilot study shown a confidence interval consistency, and later in the actual data collection, the result indicates that there is a good internal consistency of the 32 items (3 items for digitalization, 10 items for personality, and 9 items for job performance) in the scale for both reliability scale test used. From 239 respondents, 62 are specialist (25.9%), 140 general medical doctors (58.6%) and 37 housemen (15.5%). The mean scores analysis shows that digital systems usages in healthcare contribute towards job performance (achievement (3.51), administration (3.47), communication (3.62), cooperation (3.55), delegating (3.53), improvement (3.51), productivity (3.57), and vision (3.55)). Through the mean scores, digitalization influence was confirmed to be relevant (3.88), ease workload (3.51), and increased productivity (3.67), and did not negatively implicate existing workloads and correlates with job performance dimensions as acquired the r Value >0.5. Individuals' personality traits also influenced job performance as respondents of a higher extrovert (74%), or introvert (26%) personality characteristics affect technological usages. The extrovert shows a positive correlation r Value in all 8 job performance dimensions. At the same time, introverts display a negative correlation r Value in 5 of the job performance dimension (achievement, administration, communication, cooperation, vision), concluding extrovert personality incur the most influential and defining the digital personality characteristics at the workplace.

6. CONCLUSION

Although the healthcare information systems (HIS) serve as a relatively small part of the overall hospital management system, they will continue to grow as the adoption, needs, and usage evolves and is predominantly accepted by the patients. Healthcare services in most countries have already introduced digitalization and enhanced their roles as they appreciate the high potential for advancing quality and safety, reducing costs, and creating new service innovations through transformation and technology leaps. By acknowledging these ongoing healthcare developments, prospective studies should not overlook the users' psychological and physiological well-being.

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CLIMATE INFLUENCE ON POLLUTANT MOBILIZATION AND EMERGING RISKS IN SELANGOR RIVER BASIN

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1.   INTRODUCTION

Climate change is expected to enhance the mobilization of pollutants in the surface as well as the subsurface environment (Miller et al. 2017; Jarsjö et al. 2020). More frequent floods will affect mobilization of contaminated floodplain sediments to other areas, turning floodplain from being the sink of pollutants to the source of pollutants (Ponting et al. 2021). In Selangor, the fast blooming industrial activities, including in the upstream areas has brought forth increasing release of toxic waste materials into the environment (Masood et al. 2018). In recent years, river pollution incidences due to illegal dumping of industrial waste has often cause disruptions to water supplies in the Selangor and Kuala Lumpur area (Chowdhury et al. 2018).

2.   PROBLEM STATEMENT

Over the last few decades, the Selangor River basin have been under rapid development, including expansion of industrial areas. Respectively, studies performed in the area showed a strong gradient of heavy metal concentrations moving from upstream to downstream (Daniel & Kawasaki, 2016). In the Rawang sub-basin, an upstream area where many heavy industries are located, river water samples were found to be more polluted than other parts of the river with average concentration of some heavy metals exceed the national standards (Othman et al. 2018; Sakai et al. 2017; Daniel & Kawasaki 2016). Persistent organic pollutants associated with plastic manufacturing industries are also quite prominent in the Selangor River (Santhi et al., 2013). Incidences involving industrial pollutants are commonly reported that often caused disruptions to water supplies in Selangor and Kuala Lumpur area. As flood events aggravated under the impact of climate change and the extent of flood prone area expanded, there may be an increasing risk of floods towards potential point sources of the pollutants, especially in areas that have never been flooded before or when flood level/magnitude is higher than the level that facilities were built to prepare for (Kumasaki & King 2020). An assessment on projected 100-year flood for year 2030 and 2050 for Malaysia shows an increase of flood-prone areal extent by 38.3% and 39.6% respectively (NC3 2018). Therefore, identifying the potential pollutants as well as the exposure of the potential point sources towards floods is a crucial first step towards a better understanding and management of the possible cascading risks on humans, resources and the environment.

3.   OBJECTIVE

The study has three main objectives around the issue of pollutant mobilization under the influence of climatic hazards including: (i) to identify potential pollutants, their sources and susceptibility of exposed elements in the Selangor River basin under the influence of climatic hazards; (ii) to characterize pollutants mobilization in surface/near-surface soils within Selangor River basin under the influence of floods and coastal hazards; (iii) to develop local adaptation framework to ensure long term resilience as well as ecosystem health. Presentation

for the colloquium focuses on the first objective of the study, which is to identify potential pollutants, their sources in the Selangor River basin as well as the exposure of the point sources to floods and coastal hazards.

4.   METHODS

The potential pollutants and their point sources within the Selangor River basin (SRB) were identified using content analysis of published government and local reports. The flood and coastal hazards susceptible areas are delineated from the local soil map using the GIS tool. Soil map is a classical but still relevant approach that is both fast and economic to estimate areas subject to flooding where there is no significant alteration to the stream regimen from man-made works (Cain & Beatty 1968; Sangwan & Merwade 2015). The distribution of the potential point sources were then identified from reports as well as from open sources, and were plotted to overlay with the flood and coastal hazards susceptible areas within the SRB. The exposure analysis to identify the potential point sources that are exposed to floods and coastal hazards were then performed based on the overlay.

5.   RESULTS

Based on the content analysis, heavy metals and inorganic pollutants were found to be the most prominent group of pollutants for the Selangor River. Other significant group of pollutants microbiological, physical, pesticides and organic. The potential point sources comprises industrial areas/factories, livestock farm, aquaculture, wet markets, and landfills. Based on the exposure analysis of the identified potential point sources, 34 industrial areas, 16 livestock farms, 3 aquaculture farm, 4 wet markets, and 4 landfills were found to be exposed to the risk of floods and coastal hazards.

6.   DISCUSSION

The screening of the flood and coastal hazards-exposed potential point sources provides an initial step towards managing/controlling pollutants mobilization under the risk of the climatic hazards. To ensure higher efficacy in appraising future risks of pollutant mobilization, more inclusive monitoring of the sources of pollutants would be necessary (both from the point-sources and non-point sources). In addition to tackling immediate impacts of pollution (e.g. water supply disruptions), the longer term impacts of pollution (e.g. land degradation) on resources should also be appropriately addressed. In the advent of changing climate, mobilization of pollutants may become an emerging risk that could result in more insidious impacts and threaten the health of the ecosystem and its services that are key to societal well-being.

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THE POTENTIALS OF BLUE-GREEN INFRASTRUCTURE AS THE MAIN URBAN DESIGN FRAMEWORK IN FLOOD MITIGATION AND ADAPTATION STRATEGIES IN GEORGETOWN, PENANG

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1.   INTRODUCTION

In these recent years, aligned with the ramification of the Sustainable Development Goals recommendations, alternative flooding mitigation concepts and realization emerged globally, emphasizing the integration between land and water sustainable management (Schneidergruber et al. 2004) and structural and non-structural measures. In Malaysia, the Department of Irrigation and Drainage (DID) has highlighted these ecological measures lately, with collaborative inputs from other built environment professionals. With this as both a reality and a threat, many engineers, architects and planners are pushing creative initiatives to treat flooding as a resource rather than a hazard, as most of the infrastructures along our urban riverfront could not resist the flooding effects, mainly caused by rivers and flash floods. These two types of floods are responsible for most flood deaths in the developed countries (Jonkman, Kelman et al. 2005). With climate change which has brought more precipitation levels and the city's expansion and population growth, the causes of these floods are much related to our ways of planning, designing, maintaining and attitudes. Thus, the primary purpose of this presentation is to analyze an overall understanding of the past and current prevention strategies, with the possibility of implementing an urban resilience design in the urban planning alternative of a hybrid Blue-Green Infrastructure (B-GI). The result of this colloquium paper will then be used as design approaches for the flood-adaptation urban resilience framework that is envisioned to be more effective, resilient and humanistic, and deemed viable for future sustainable design contemplation.

2.   PROBLEM STATEMENT & LITERATURE REVIEW

Flood hazards have challenged river cities worldwide, despite many of them being protected by extensive flood-control infrastructures, such as levees, dams, and channelization (Liao, 2016), which have been designed and applied mainly by engineering-based methods, or 'Grey Infrastructure.' Our cities have heavily relied on flood control to mitigate flood hazards, yet it is criticized for harming riverine ecosystems and increasing long-term flood risk (Burby et al. 2000, Smits et al. 2006). Since the 1960s, our engineers from the DID have developed numerous flood control strategies along the river to increase the conveyance capacity by channelizing the waterways, but mainly with the method of deepening, concretizing, straightening and widening of rivers and drainages (DID, 2009). Although this improved the flooding situations, this technique has degraded the existing ecology and subsequent decline in the ecological habitats (Smits et al. 2006) along the riverfront. Furthermore, these flood mitigation facilities have also discouraged the public from enjoying this precious riverine environment. Even though this minimizes the flooding issues with its outstanding hydraulic performance, it harms the surrounding landscape and leads to a declination of habitats and biodiversity (Wahming et al. 2017) and urban public spaces. As been mentioned recently by

the Deputy Director of DID, "Flood mitigation needs to step forward from defensive to pro-active approaches, and move towards a culture of prevention by managing flood risk and living with floods." (Ghazali, 2019). In reflecting Felix Guattari's (1989), "that now, more than ever, we cannot separate nature from culture" (Sutton, 2000), the research is framed around the following questions: what kind of flood-mitigation methods can be actualized with the concept of sustainable ecologies? Could the alternative B-GI application in urban design flood resilience be practical in the context of Malaysia's riverfront city?

3.   RESEARCH OBJECTIVES

The research has three (3) main objectives, with the final objective of suggesting an urban resilience design prototype focusing on the ideas and strategies of the B-GI principles. However, this colloquium will discuss only the first objective, 'to evaluate the resiliency and sustainability factors of past and current urban design and planning strategies of flood mitigation in Georgetown.

4.   RESEARCH METHODOLOGY (FOR OBJECTIVE 1)

A descriptive analysis has been conducted to determine the key causes of the flood in Georgetown by appraising its specific locations, occurrences, and main effects. This has been done by evaluating significant scientific documents and authorities reports from sources from NADMA, MBPP, DID, NAHRIM and JUPEM, comprising flood maps, alluvium, topographic maps, river capacity and drainage systems. Existing GIS climatic data in precipitation frequency, area expansions, future planning and flood forecasting by the MBPP and MetMalaysia have also been assessed.

Comparative analysis through selected case studies has been done in selecting the best urban design flood resilience strategies that articulate Georgetown's physical and cultural context. Literature review in proposals, actualization strategies and historical changes in the urban flood resilience method have been tabulated, focusing on the B-GI in the urban design framework. These theories and applications will then be refined into the urban planning criteria, architectural built-form and landscaping of the specifically chosen riverfront. The data will be analyzed from scientific journals, books, design reports and project realizations.

Lastly, in justifying the efficiency and sustainability factors of the current flood mitigation strategies, the most affected area needs to be selected as a test site for the final expected prototype. The criteria of the need-gap analysis will be elaborated from the sources of authorities' reports, i.e., the Land Use Map, Penang Planning and Structural Plan 2030, and future planning strategies by the DID, PLANMalaysia, and practitioner proposals. Site Physical Verification (SVP) in the specifically selected location will be done through a detailed analysis of inventories of existing infrastructures, climatic factors and ecosystem conditions, i.e., river capacity, increased runoff rates, projected development expansion, flood storage facilities, drainage systems, debris, siltation in rivers and vegetation types. SVP will be verified using provided GIS reports, supported by manual data analysis through SWOC investigation.

5.   RESULTS & DISCUSSION

As for this colloquium, five (5) main results were outlined from objective one (1) before further research.
1. Inventory of flooding occurrences and specific locations in Georgetown, Penang.
2. Verification of flood exposure and impact level on the residents' (health, social, and economy), infrastructures and ecosystems.

3. Inventory of primary causes of floods and in specific locations.
4. Criteria for determining the best B-GI concept and applications in urban design, flood resilience, and urban spatial quality strategies.
5. Inventoried gaps in current and future planning strategies by policymakers and practitioners.

6.   CONCLUSION

Although with abundant financial aid, planning strategies, and 'Grey Infrastructure' applications, flooding keeps occurring each year in the same location in the city of Georgetown. Additionally, these existing engineering strategies provided and planned subsequently reduced ecological biodiversity and were deemed unfriendly to people-centric spaces and urban growth. With the application of B-GI elements in the urban flood defense infrastructure, the possibility of implementing a comprehensive strategy through urban planning, architecture, engineering and landscape alternatives in the city would be realizable. The European Commission (2019) defines B-GI as a 'strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services' (Ferreira, 2021). The research will unfold the principles of B-GI through comprehensive urban design planning strategies, using its core principles of livability, sustainability and resiliency on the chosen flooded river in Georgetown. As well as needing to minimize and adapt to floods, the proposed site must comply with the B-GI key criteria for its improved greenness, aesthetic and sensory values, air quality, heat stress, and noise reduction, all in a low-stress environment. Concurrently, these provide an opportunity to revitalize the surrounding area by restoring its ecological value and providing additional economic benefits to its community through increased social cohesion and physical activity. Conclusively, it is expected that these urban design flood resilience frameworks will give a means of straightforward suggestions in answering the final research objectives, which will be the urban prototype recommendations.

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KETERDEDAHAN ELEMEN BERISIKO DI SELANGOR TERHADAP BAHAYA SEMULAJADI

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1. PENGENALAN

Proses pembandaran mengakibatkan penumpuan kepadatan penduduk serta beberapa perubahan fizikal tanih yang mengakibatkan masyarakat setempat rentan kepada bahaya semulajadi. Bagi menampung fungsi bandar, kawasan perbandaran dilengkapi dengan pelbagai elemen infrastuktur penting yang menjadi elemen berisiko seperti hospital, sekolah dan balai bomba dalam konteks risiko bencana. Gangguan terhadap elemen berisiko boleh menjejaskan daya tahan bandar tersebut untuk bersiapsedia, menerima dan pulih dari kesan kejadian bencana (UNDRR 2020; Vamvakeridou-Lyroudia et al. 2020). Memahami keterdedahan elemen berisiko dapat membantu proses membuat keputusan dalam pengurusan risiko bencana dan perancangan bandar yang lebih holistik.

2. PERMASALAHAN KAJIAN & SOROTAN KAJIAN

Pembandaran di bandar-bandar di Selangor berlaku dengan pesat. Proses pembangunan dan penumpuan penduduk di kawasan perbandaran mengakibatkan perubahan dari aspek fizikal dan perkembanngan ekonomi. Bebanan pembangunan yang tidak terancang boleh mengakibatkan kejadian bencana. Kejadian tanah runtuh dan banjir merupakan jenis bencana yang paling kerap di laporkan di kawasan perbandaran Selangor (UPBN Selangor 2018). Sistem pengurusan bencana yang berkesan mempunyai 4 fasa iaitu i) pencegahan dan mitigasi, ii)kesiapsiagaan, iii)respons dan iv)pemulihan (NADMA 2021; CFE-DM 2019). Keperluan data dan maklumat yang lengkap serta tersusun di kesemua fasa ini adalah penting di dalam pelan pengurangan risiko bencana dan berpotensi mengurangkan kerugian aset dan kehilangan nyawa (Chong & Kamarudin 2018). Ketersedian dan keseragaman data elemen berisiko perlu diketahui dan kelompangan data perlu diisi bagi memastikan hasil analisis yang lebih tepat dan bermakna (Moriyama et al. 2018). Analisis keterdedahan terhadap data elemen berisiko adalah penting kerana ia berhubung rapat dengan kefungsian bandar sebagai pusat penempatan.

3. OBJEKTIF KAJIAN

Objektif kertas ini terfokus kepada kepada pengenalpastian keterdedahan elemen berisiko terhadap bahaya banjir.

4. KAEDAH KAJIAN

Kaedah yang dilaksanakan untuk objektif ini adalah melalui analisis kandungan dan pemodelan spatial. Kaedah ini turut merangkumi langkah pengumpulan data kejadian bahaya lepas melalui pelbagai sumber dari pangkalan data tempatan dan peta potensi banjir untuk tujuan pembangunan model. Analisis kandungan digunakan untuk pembangunan inventori bahaya dan elemen berisiko (Fasiliti kesihatan, sekolah, balai polis dan balai bomba) di kawasan pilot Mukim Kajang. Pemodelan spatial merangkumi analisis tindan lapis mudah dan kaedah fasiliti

terdekat (*Closest Facility*) dalam Analisis Kedekatan (*Proximity Analysis)* untuk memahami kefungsian elemen berisiko ini dalam pengurangan risiko bencana. Namun, untuk kertas ini hanya terfokus kepada analisis tindan lapis untuk mengenalpasti tahap keterdedahan elemen-elemen tersebut terhadap bahaya banjir.

5.   KEPUTUSAN DAN PERBINCANGAN

Inventori yang dihasilkan mendapati data elemen berisiko dari arkib pangkalan data tempatan (UPBN Selangor) mempunyai kekurangan dan terhad untuk negeri Selangor (Jadual 1).

Jadual 1: Ketersediaan Data Elemen Berisiko di Peringkat Tempatan.

Elemen berisiko SFDRR	Elemen berisiko Sendai Framework Monitor	Elemen berisiko dikumpul dari sumber terbuka	Elemen berisiko dikumpul dari UPBN Selangor
Fasiliti kesihatan	Fasiliti kesihatan	Hospital	Tiada
		Klinik	Tiada
Fasiliti pendidikan	Fasiliti pendidikan	Sekolah rendah	Tiada
		Sekolah menengah	Tiada
Perkhidmatan Asas	Elektrik/kuasa	Stesen jana kuasa	Tiada
	Bekalan air	Tiada	Tiada
	ICT	Tiada	Tiada
	Kumbahan	Loji kumbahan	Tiada
	Sisa pepejal	Tapak pelupusan	Tiada
	Pengangkutan	Tiada	Jalan
	Respons dan kecemasan	Balai polis	Tiada
		Balai bomba	Tiada
		Pusat pemindahan	Pusat pemindahan
	Pentadbiran awam	Tiada	Tiada
Aspek sosial	Bangunan kerajaan	Pusat komuniti	Tiada
		Tempat ibadat	Tiada
		Tapak warisan	Tiada
Aspek ekonomi	Aset pertanian	Tiada	Tiada

(Sumber: UNDRR 2019, UPBN Selangor 2018)

Hasil inventori bencana dijana ke dalam peta GIS dan menunjukkan penumpuan dan pengulangan kejadian banjir di sekitar Bandar Kajang (Jalan Reko). Selain itu, jumlah elemen berisiko dijadualkan dengan 24 buah fasiliti kesihatan, 89 buah sekolah, 1 stesen kuasa, 14 balai polis dan 2 balai bomba. Tahap potensi bagi setiap elemen berisiko direkod dan analisis tindan lapis dijalankan menggunakan perisian ArcGIS Pro 2.7.0 dapat mengenalpasti keterdedahan elemen berisiko dengan kawasan berpotensi terhadap bahaya semulajadi.

6.   KESIMPULAN

Hasil awal kajian ini mendapati terdapat keperluan untuk menghasilkan pangkalan data yang seragam bagi mengenal pasti lompang data. Seterusnya, didapati terdapat penumpuan kejadian banjir, potensi tinggi banjir dan lokasi elemen berisiko di Bandar Kajang daripada peta impak

bahaya. Selain itu, penghasilan peta impak bahaya dapat menambah pemahaman dengan persembahan data yang lebih mesra pengguna.

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TOWARDS REALISING MALAYSIA'S CARBON NEUTRALITY: A STUDY ON AN A PPROACH WITH A HERITAGE RURAL COMMUNITY IN SABAH

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1. INTRODUCTION

Malaysia pledged a greenhouse gas emission reduction of 45% by 2030 compared to the base year 2005 (Yong and Tan 2017; Lian 2018). Power generation alone contributes more than 37% of the carbon emission in Malaysia, thus, it is best to be addressed under the electrification (Aling et al. 2018; HASAN 2018). Sustainable electrification is a complex issue, it requires model and system that may acclimatize multi institutions, complex policies, technologies and needs of the multi-layered communities (Hardianto et al. 2019; Carayannis and Campbell 2010; Amrial, Muhammad, and Muhamad 2017; Halibas, Sibayan, and Maata 2017). Malaysia has achieved 98% electrification; however, there are still 2% populations, which equals to 700,000 rural folks, are living without electricity. Majority of these communities reside in the Borneo island. Hence, it is leading to imbalanced social, economic and socio-economic development (Khengwee et al. 2017; *Malaysia Energy Statistics Handbook* 2020). This paper investigate Malaysia's inclusive low carbon electrification using the multi-helix stakeholders approach to help sustain the traditional and sustainable ways of living for Tagal communities in Sabah (Mayan, Nor, and Samat 2017; Rodrigo 2016).

2. RESEARCH PROBLEMS & RESEARCH HIGHLIGHTS

Electrification foot print is one of the largest components impending anthropocene effect to the planet yet bring about economic development (Eras-Almeida et al. 2020; Susskind et al. 2020; Khengwee et al. 2017). Sabah has the highest recorded System Annualized Interruption Duration Index (SAIDI) and ranked amongst the poorest states in this nation. Hence, an appropriate application of renewable energy (RE) technologies may help improve socio-economic status of the locality while achieving clean and affordable energy. The aim of the study is to explore the multi-helix model approach by combining strengths from the stakeholders namely government, industry, academician, community, NGOs and sponsors towards the common goal in achieving a clean and affordable energy solution.

3. RESEARCH OBJECTIVE

With complex issue at hand, the first research objective is to ascertain all the actors or stakeholders involved in addressing Sabah's concerns for clean electrification and socioeconomic needs. By applying the multi helix model in performing a qualitative research, the paper is able to identify collective problems through the multi stakeholders' engagement. The objective is to identify the missing key actor to be included in overcoming the barriers for a clean, secure and reliable electrification in Sabah.

4.   RESEARCH METHODOLOGY

Qualitative method was applied by collecting data from more than 50 interviews and 2 focus groups engagements. Thematic analysis through the Atlas-ti software to determine the key words associated with the raw data.

5.   RESULTS & DISCUSSIONS

Achieving carbon neutrality through electrification is a cross boundary initiative. Progression of the helix model by adding new actors to perpetuate innovation as the scope or space stretched. A socioeconomic centric innovation's significant actor has been identified via this study to be incorporated in the Carayannis and Campbell's Quintuple Helix Model for success in realizing carbon neutrality in Malaysia. Not for profit motivated community projects were often founded on sponsorship. This is prevailing among pilot projects that may showcase the effectiveness of a particular technology, concept and model. Thus, the sponsor helix, findings from the research is apportioned based on motivation into (i) sponsorship through grants and (ii) sponsorship in the form of corporate social responsibility.

6.   CONCLUSION

The Hexa-helix model is for the socioeconomic centric sustainable development. It is to promote trans-disciplinary policy with stakeholder's engagement in driving innovative projects for a more clean, secure, and inclusive electrification. The research was geared to answer the complexity of carbon neutrality in a micro level with the intention of improving socio-economic needs amongst the Tagal communities in Sabah.

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