

SOCIAL VULNERABILITY INDEX APPLICATION: CASE STUDY IN KAJANG, SELANGOR

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ABSTRACT

The occurrence of natural disaster events has increased exponentially from year to year. One of the most prominent natural disaster events in urban areas is landslides where the complex reaction of development, population and weather increases the vulnerability and sensitivity of community to landslide event. The inability of a community to withstand adverse impact from multiple stressors can increase the vulnerability of a community to natural hazards. Therefore, the purpose of this study was to determine community vulnerability by applying Social Vulnerability Index (SVI) in 10 areas in Kajang. The study used quantitative method by using questionnaire as an instrument and face to face interview to collect the data. A total of 200 respondents in Kajang were used to obtain necessary data on social vulnerability. Software such as SPSS version 25.0 and Excel were used to analyse the data collected. To obtain the level of social vulnerability of an area, SVI schematic was used which included 15 variables and 4 themes of socioeconomic status (SV), household composition and disability (HCD), minority status and language (MSL), and housing type and transportation (HT). Overall aggregation of 4 themes was calculated to obtain the Social Vulnerability Index (SVI). All 10 areas in Kajang are most vulnerable to socioeconomic vulnerability (SV) theme. Whereas, for household composition and disability (HCD) theme, only Mewah Court Kajang, Pangsapuri Cemara and Pangsapuri Seroja are the most vulnerable. While only Taman Bukit Indah and Taman Bukit Mewah are vulnerable to minority status and language (MSL) theme. Lastly, for housing and transportation (HT) theme, only Pangsapuri Seroja is the most susceptible to landslides. Overall value of SVI shows that Taman Bukit Indah and Taman Bukit Mewah are more susceptible to landslide (0.5835). Therefore, to decrease the susceptibility of Kajang community to landslide event, there is a need for strengthening community adaptive capacity to reduce the negative impact of natural hazards. Besides, mitigation effort from the local government can be more effective and help to improve Malaysia's disaster management efforts on natural disaster.

Keywords: Natural Hazard, Landslide, Social Vulnerability Index, Vulnerability, Adaptive Capacity

INTRODUCTION

Natural disaster caused by climate change has increased over time in which it becomes a more alarming issue for the world. Report by Centre for Research on Epidemiology of Disasters (CRED), (2022), reported the number of natural hazard events caused by climate change in 2021 was significantly higher than the average number of natural hazards from 2001 to 2020. The disastrous event affected almost 101.8 million people worldwide with 10,492 deaths and a total loss of nearly 252.1 billion US dollars (CRED, 2022). Including geophysical and hydrometeorological disaster event, there is a significant increase of natural disaster globally (Rahman et al., 2017) and has affected many lives. A natural and potentially deadly phenomenon known as landslide is when rocks, rubble, or dirt move downhill due to gravity (Cruden & Varnes, 1996). In addition to that, weather and climate can increase the probability of landslide.

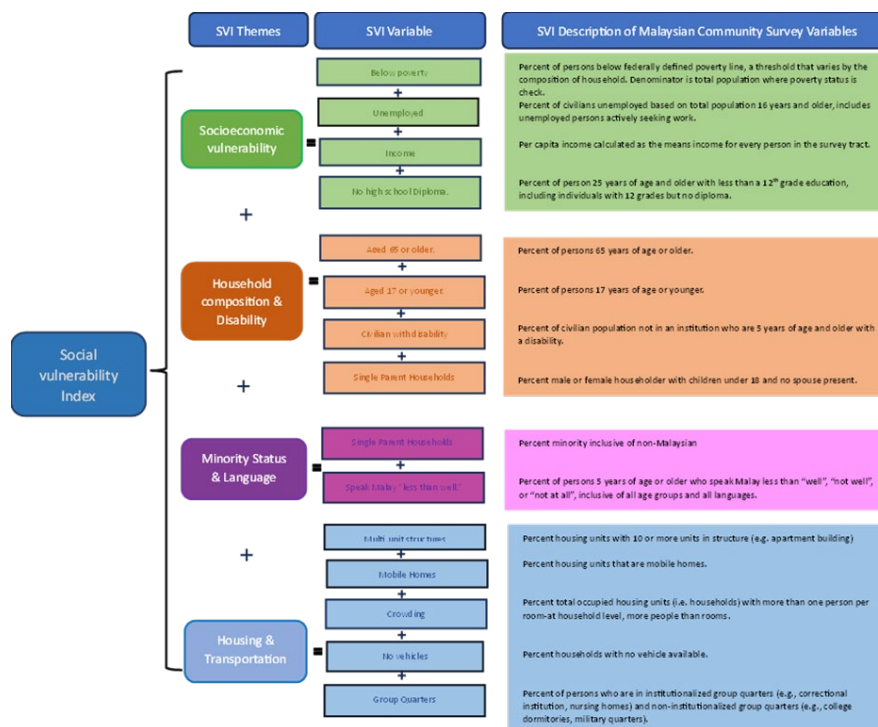
Besides, development and urbanisation can also increase the possibility of geophysical and hydrometeorological event (Nurfashareena Muhamad & Shaharuddin Ahmad, 2014). One of the most prominent natural disaster events in urban areas is landslides where the complex reaction of development, population and weather increases the vulnerability and sensitivity of community to landslide event. As a developing country, Malaysia has been affected by various natural disaster phenomena such as flood, drought, storms, earthquake including landslide. Although the phenomenon of landslide is not as frequent as the other phenomenon such as flood (National Disaster Management Agency (NADMA), 2018), the disastrous event still negatively affects the local communities. The inability of a community to withstand adverse impact from multiple stressors can increase the vulnerability of a community to natural hazards. Therefore, the aim of this article was to develop a Social Vulnerability Index (SVI) with the application of CDC SVI (Centers for Diseases Control and Prevention Social Vulnerability Index) popularised by the United States to determine the vulnerability of Kajang community to landslide events.

SOCIAL VULNERABILITY INDEX

Vulnerability is a notion that has been used as an analytical tool to comprehend and describe the situation of vulnerability to harm and powerlessness and marginalisation of both physical and social systems as well as guide for an action that can reduce the risk of harm and improve the well-being of humans (Adger, 2006). Social vulnerability according to Cutter et al., (2003), is one of the outcomes of inequalities that occur in social situations, where these characteristics influence a group's susceptibility to harm and control their capacity to respond to those social circumstances. More research on vulnerability have been conducted as a result of the rise in natural catastrophe incidents. Therefore, studies on vulnerability are needed in understanding and identifying the community in vulnerable situation.

Social Vulnerability Index (SVI) built by Centers for Diseases Control and Prevention in the United States has a role in identifying and mapping the communities' vulnerabilities and susceptibilities to disastrous event (ATSDR, 2022). The role of SVI includes helping the local government in preparing the local community to natural hazard event and recognising the community exposed to social conditions such as poverty and inequality in their daily lives. Originally, there are four themes and 15 variables encompassing the component of social vulnerability including socioeconomic vulnerability, household composition and disability, minority status and language, housing, and transportation (Figure 1) in which SVI by CDC includes variables such as below poverty, unemployed, income, no high school diploma, age 65 or older, age 17 or younger, civilian with disability, single parent household, minority, speaks English "less than well", multi-unit structures, mobile homes, crowding, no vehicle, and group quarters (ATSDR, 2022; Flanagan et al., 2011).

Figure 1: Social Vulnerability Index (SVI) framework based on SVI documentation



Source: ATSDR, 2022

Social Vulnerability Index (SVI) was used to determine the vulnerability index of a community living in Kajang area that is susceptible to landslide. Table 1 is the schematic model of SVI which had been modified to the suitability of study area. Four themes were maintained but the variables were adjusted to the local community living in Kajang area in which 14 variables; below poverty, unemployed, income, no high school diploma, age 65 or older, age 17 or younger, civilian with disability, single-parent household, minority (non-Malaysian citizen), speak Malay "less than well", multi-unit structure, crowding, no vehicle and group quarters were included (Table 1)

Table 1: SVI schematic modified according to the suitability of study area

SVI Themes	SVI Variables	SVI Description
Social Vulnerability Index (SVI)	Below poverty (SV1)	Percent of persons below federally defined poverty line (< RM2500).
	Unemployed (SV2)	Percent of civilians unemployed based on total population 18 years old and older, includes unemployed persons actively seeking work.
	Income (SV3)	Per capita income calculated as the mean income for every person in the census tract.
	No High School Diploma (SV4)	Percent of persons 18 years of age and older without diploma.
	Aged 65 or Older (HCD1)	Percent of persons 65 years of age or older.

Household Composition & Disability	Aged 15 or Younger (HCD2)	Percent of persons 15 years of age or younger
	Civilian with Disability (HCD3)	Percent of civilian population who are 5 years of age and older with a disability.
	Single-Parent Households (HCD4)	Percent male or female householder with children under 18 and no spouse present.
Minority Status & Language	Minority (MSL1)	Percent minority other than Malaysian citizen
	Speak Malay "Less Than Well" (MSL2)	Percent of 5 years of age or older who speak Malay less than "well" "not well" or "not at all".
Housing & Transportation	Multi-Units Structures (HT1)	Percent housing units with 10 or more units in structure (e.g., apartment buildings)
	Crowding (HT2)	Percent total occupied housing units (e.g., households) with more than 2 persons per room
	No Vehicle (HT3)	Percent household with no vehicle available
	Group Quarters (HT4)	Percent of persons who are institutionalized group quarters (e.g., institutions and college)

METHODOLOGY

Quantitative method was chosen as the main method for this study as it used statistical and mathematical method to analyse the data. Besides, it also used questionnaire as an instrument to collect the data in the field. Questionnaire is devised for the purpose of survey and statistical study. The questions in the survey were mostly dedicated to collect the data of the sociodemographic, household composition, language, housing type and transportation. Questions in the survey included questions on demography, ownership, wealth, resources, health status, social involvement, knowledge and experience of disaster, disaster preparedness, and infrastructure and vulnerability to disaster. These data were needed to examine and analyse the vulnerability status of the respondents in this study.

The sampling technique applied in this research follows Cochran, (1977), determining that the required sample size for the present study is 383 respondents from a total population of 236 240 in Kajang. Nonetheless, there are constraints in gathering the required number of participants, including insufficient time to collect all the data the workforce needed to gather the necessary information. Consequently, a total of 200 respondents chosen to obtain the necessary data to examine the vulnerability of the community living in Kajang area by using purposive random sampling. Data collection activity included survey by using questionnaires and face to face interviews. Respondents in this study must be at least 18 years old and above, residents of Kajang area for at least one year, and lastly respondent must be able to provide informed consent. Every criterion is managed throughout the data collection process to guarantee the authenticity of the responses.

The study area chosen in this study is Kajang, Selangor which is near to Langat River Basin area. Kajang area is one of the developing regions in Malaysia in which the population growth and urbanisation relates to rising vulnerability to environmental hazards. In this study, 10 areas in Kajang town were chosen as the main study area, including Taman Bukit Mewah, Taman Kajang Utama, Taman Lembah Mewah, Taman Bukit Indah, Pangsapuri Cemara, Mewah Court Kajang, Pangsapuri Persona, Pangsapuri Seri Mewah, Pangsapuri Sutera and Pangsapuri Seroja.

The data obtained were collected and analysed descriptively using the Statistical Package for The Social Science (SPSS) computer software version 26.0 and Microsoft Excel. SPSS was chosen because it is a systematic analysis method that produces detailed and accurate statistics on the study involving percentage, frequency, mean, minimum, maximum, and standard deviation. The values displayed were used to understand and analyse the phenomena that occur between natural events and everyday life involving socioeconomics. From the accumulated values, the highest factor of social vulnerability among the respondents could be identified. This is because this study emphasized the aspect of quantity, which is the number that represents the meaning behind the quality of the study results, making the study accurate and unquestionable through epistemological support.

In addition, the analysed data were also required in calculating the Social Vulnerability Index (SVI). Social Vulnerability Index (SVI) was used to determine the vulnerability index of a community living in Langat River Basin area that is susceptible to landslide. SVI was calculated using a schematic built by CDC. SVI is a specially designed formula to allow an assessment of vulnerability to be carried out, which is based on a scale of 0 that indicates an observed area is not threatened while a scale of 1 indicates that an area involved is experiencing high vulnerability. In the production of this article, parameter modification has been done according to the demographic suitability of Malaysia as a study area. From the 15 variables listed by CDC, only 14 variables were used to assess the social vulnerability of Kajang people (Table 1). This is based on the suitability of demographic area. Therefore, four main themes, namely socioeconomic vulnerability, household composition and disability, minority status and language as well as housing and transportation (Table 1) were used to assess social vulnerability of Kajang community.

To obtain the level of social vulnerability of an area based on the SVI schematic, a systematic calculation using a special formula with the help of Microsoft Excel software was made. SVI uses percentile method to calculate the vulnerability of the

community. The SVI method aggregated 14 census variables into 4 main themes. The 4 themes were further aggregated into one vulnerability score (ATSDR, 2022). Three tiers were used to determine the index where:

Tier 1: 14 census variables considered to be indicators of social vulnerability.

Tier 2: grouped from tier 1 variables into 4 related themes of SVI.

- Socioeconomic status - RPL_THEME1
- Household composition and disability- RPL_THEME2
- Minority status and language- RPL_THEME3
- Housing type and transportation- RPL_THEME4

Tier 3: provides an aggregation of the 4 themes and creates overall vulnerability score.

The method of SVI produces three ranking options for each census tract first by vulnerability variables, second by vulnerability themes and third overall vulnerability. The ranking will be calculated using a percentile ranking method where 0 is the least vulnerable and 1 as the most vulnerable and the classification of vulnerabilities can be categorised as follows (Table 2).

Formula:

Percentile ranks for each variable, except for Percentile Income, were calculated as:

$$= \text{PERCENTRANK.INC}([\text{array of census tracts for variable}], [\text{individual census tract}], 4)$$

Percentile ranks for Percentile Income, were calculated as:

$$= 1 - \text{PERCENTRANK.INC}(\text{array of census tracts for variable, individual census tract, [4]})$$

$$\text{Overall} = \text{PERCENTRANK.INC}(\text{array of census tracts for SPL_THEMES, individual census tract, [4]})$$

Table 2: Classification of vulnerabilities

Range	Classification
0.000-0.187	Less Vulnerable
0.188-0.375	Moderate
0.376-0.562	Vulnerable
0.563-0.750	Most Vulnerable

RESULT

Demography Profiling

According to the result of the study (Table 3), the study area for this study mainly focused on Kajang area which included Taman Bukit Mewah (18.0%), Taman kajang Utama (18.0%), Taman Lembah Mewah (17.5%), Taman Bukit Indah (17.5%), Pangsapuri Cemara (8.0%), Mewah Court Kajang (5.0%), Pangsapuri Persona (5.0%), Pangsapuri Seri Mewah (5.0%), Pangsapuri Sutera (4.0%) and Pangsapuri Seroja (2.0%) (Refer to Table 2). Most of the respondents in the study were living in Kajang Utama and Kajang Mewah. For the age of the respondents, majority of the respondents were reported in the category of age 19 to 29 years old (49.0%), 30 to 39 years old (24.0%), 40 to 49 years old (17.5%), 50 to 59 years old (6.5%) and lastly 60 to 69 years old (3.0%). The mean of the age of the respondents in this study was 48 years old.

Majority of the respondents in this study were males with 52.0 percent and females, 48.0 percent. While for the ethnicity, majority of them were Malays (76.0%), followed by Chinese (12.5%), Indians (10.0%) and others (1.5%). For marital status, most of the respondents were married (58.5%), followed by single status (41.0%) and the rest were divorcees (0.5%). Lastly, for the demographic religion profile of the respondents, majority of them were adhered to the religion of Islam (76.0%), followed by Buddha (14.0%) and Hindu (5.0%). The result of the sociodemographic profile of community in Kajang demonstrated that majority of the respondents were Malays and adhered to the religion of Islam. Besides, most of the respondents were also married while only a few were still single.

Table 3: Demographic profiling for Social Vulnerability Index on landslide hazard in Kajang

Demography Profiling	Frequency (%)
Study Area	
Mewah Court Kajang	10 (5.0%)
Pangsapuri Cemara	16 (8.0%)
Pangsapuri Persona	10 (5.0%)
Pangsapuri Seri Mewah	10 (5.0%)
Pangsapuri Seroja	4 (2.0%)

Pangsapuri Sutera	8 (4.0%)
Taman Bukit Indah	35 (17.5%)
Taman Bukit Mewah	36 (18.0%)
Taman Kajang Utama	36 (18.0%)
Taman Lembah Mewah	35 (17.5%)
Age	
19 to 29 years old	98 (49.0%)
30 to 39 years old	48 (24.0%)
40 to 49 years old	35 (17.5%)
50 to 59 years old	13 (6.5%)
60 to 69 years old	6 (3.0%)
Mean age	48 years old
Gender	
Male	104 (52.0%)
Female	96 (48.0%)
Ethnicity	
Malay	152 (76.0%)
Chinese	25 (12.5%)
Indian	20 (10.0%)
Others	3 (1.5%)
Marital Status	
Single	82 (41.0%)
Married	117 (58.5%)
Divorcee	1 (0.5%)
Religion	
Islam	152 (76.0%)
Buddha	28 (14.0%)
Hindu	10 (5.0%)
Christian	10 (5.0%)

*Analysis by author, 2023

Social Vulnerability Index assessment for 10 Kajang areas

above, 10 study areas of Kajang were selected to assess the social vulnerability of the area. Overall, the result of the study showed that most of the respondents in the 10 study areas were vulnerable to HCD2 (1.0000) that is household composition 15 or younger. This is due to the fact that more than half of the respondents are married and have family members; therefore, they are more prone to physical and mental vulnerability. Besides, HT1 (housing units with 10 or more units in structure) is the other variable that is significant in value with seven areas identified as most vulnerable (1.0000). The seven areas were identified as most vulnerable because of the structure of the building they live in. Most of the respondents in the study live in flat, condominium or apartment which is more susceptible to landslide disaster.

While other item such as SV4 (respondents with no diploma) is more susceptible to landslide events. Vulnerable areas include Mewah Court Kajang, Pangsapuri Cemara, Pangsapuri persona, Pangsapuri Seri Mewah, Pangsapuri Sutera, Taman Bukit Mewah, and Taman Lembah Mewah while the other area showed a moderate value of vulnerability. Next variable is HCD1 (household composition with 65 years old or older), and the result shows that areas like Pangsapuri Persona, Pangsapuri Seri Mewah, Pangsapuri Sutera, Taman Bukit Indah, Taman Bukit Mewah, Taman Kajang Utama, and Taman Lembah Mewah are more susceptible to natural disaster events due to the number of elderly people.

Table 4: Percentage value of variables in Social Vulnerability Index

Study Area	Mewah Kajang	Court	Pangsapuri Cemara	Pangsapuri Persona	Pangsapuri Mewah	Seri	Pangsapuri Seroja	Pangsapuri Sutera	Taman Indah	Bukit	Taman Mewah	Bukit	Taman Utama	Kajang	Taman Mewah	Lembah
SV1	50.0%		68.8%	50.0%	40.0%		100.0%	37.5%	60.0%		55.6%		69.4%			42.9%
SV2	10.0%		12.5%	10.0%	30.0%		0.0%	25.0%	34.3%		19.4%		8.3%			37.1%
SV3	RM3240		RM 2593	RM 3130	RM 4400		RM 3175	RM 3175	RM 3240		RM4400		RM 2250			RM 4468
SV4	70.0%		93.8%	70.0%	70.0%		50.0%	50.0%	42.9%		66.7%		25.0%			51.4%
HCD1	10.0%		0.0%	30.0%	20.0%		0.0%	25.0%	14.3%		2.8%		19.4%			17.1%
HCD2	50.0%		43.8%	40.0%	60.0%		25.0%	37.5%	22.9%		58.3%		27.8%			25.7%
HCD3	10.0%		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%		0.0%			0.0%
HCD4	0.0%		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%		0.0%			2.9%
MSL1	0.0%		0.0%	0.0%	0.0%		0.0%	0.0%	11.4%		2.8%		0.0%			0.0%
MSL2	0.0%		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%		0.0%			0.0%
HT1	70.0%		100.0%	100.0%	100.0%		100.0%	100.0%	54.3%		50.0%		30.6%			42.9%
HT2	60.0%		56.3%	70.0%	80.0%		25.0%	75.0%	34.3%		69.4%		50.0%			42.9%
HT3	0.0%		18.8%	0.0%	0.0%		25.0%	0.0%	22.9%		2.8%		13.9%			8.6%
HT4	0.0%		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%		0.0%			17.1%

* Author analysis, 2023

Table 5: Estimate percentile value for each variable in study area

Theme	Variables	Mewah Kajang	Court	Pangsapuri Cemara	Pangsapuri Persona	Pangsapuri Mewah	Seri	Pangsapuri Seroja	Pangsapuri Sutera	Taman Indah	Bukit	Taman Mewah	Bukit	Taman Utama	Kajang	Taman Mewah	Lembah
SV	SV1	0.3333		0.3333	0.3333	0.3333		0.6666	0.3333	0.6666		0.3333		0.6666		0.3333	
	SV2	0.0000		0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000		0.0000		0.0000	
	SV3	0.0000		0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000		0.0000		0.0000	
	SV4	0.6666		0.6666	0.6666	0.6666		0.3333	0.6666	0.3330		0.6666		0.3333		0.6666	
HCD	HCD1	0.3333		0.0000	0.6666	0.6666		0.0000	0.6666	0.6666		0.6666		0.6666		0.6666	
	HCD2	1.0000		1.0000	1.0000	1.0000		1.0000	1.0000	1.0000		1.0000		1.0000		1.0000	
	HCD3	0.3333		0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000		0.0000		0.0000	
	HCD4	0.0000		0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000		0.0000		0.3333	
MSL	MSL1	0.0000		0.0000	0.0000	0.0000		0.0000	0.0000	1.0000		1.0000		0.0000		0.0000	
	MSL2	0.0000		0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000		0.0000		0.0000	
HT	HT1	1.0000		1.0000	1.0000	1.0000		1.0000	1.0000	1.0000		0.6666		0.6666		0.6666	
	HT2	0.6666		0.6666	0.6666	0.6666		0.3333	0.6666	0.6666		1.0000		1.0000		0.6666	
	HT3	0.0000		0.3333	0.0000	0.0000		0.3333	0.0000	0.3333		0.3333		0.3333		0.0000	
	HT4	0.0000		0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000		0.0000		0.3333	

* Author analysis, 2023

 Less vulnerable
 Moderate

 Vulnerable
 Most vulnerable

Table 6: Theme percentile value and overall Social Vulnerability Index value in 10 study areas

Themes Study Area	Socioeconomic Vulnerability (SV)	Household Composition & Disability (HCD)	Minority Status & Language (MSL)	Housing & Transportation (HT)	Overall
Mewah Court Kajang	0.5833	0.7083	0.0000	0.5416	0.2820
Pangsapuri Cemara	0.5833	0.7500	0.0000	0.5000	0.3055
Pangsapuri Persona	0.5833	0.5416	0.0000	0.5416	0.2564
Pangsapuri Seri Mewah	0.5833	0.5416	0.0000	0.5416	0.2564
Pangsapuri Seroja	0.5833	0.7500	0.0000	0.7083	0.2916
Pangsapuri Sutera	0.5833	0.5416	0.0000	0.5416	0.2546
Taman Bukit Indah	0.5833	0.5416	0.5000	0.5000	0.5835
Taman Bukit Mewah	0.5833	0.5416	0.5000	0.5000	0.5835
Taman Kajang Utama	0.5833	0.5416	0.0000	0.5000	0.2708
Taman Lembah Mewah	0.5833	0.5000	0.0000	0.4166	0.3000

*Author analysis, 2023

Table 6 is theme percentile value and overall social vulnerability index value in 10 study areas in Kajang which shows that among the four themes, socioeconomic vulnerability (SV) is the most prominent factor in increasing vulnerability and susceptibility to Kajang community. While the theme of Household Composition and Disability (HCD) shows that only three areas in Kajang are affected by the factor which are Mewah Court Kajang, Pangsapuri Cemara and Pangsapuri Seroja while the other seven areas are deemed as vulnerable only. For Minority Status and Language (MSL), the overall theme shows that this factor does not have much influence on the community in Kajang except for Taman Bukit Indah and Taman Bukit Mewah which are classified as vulnerable. The last theme is Housing and Transportation and the result shows that only Pangsapuri Seroja is the most vulnerable for this factor while the other nine areas are only classified as vulnerable. Overall result of Social Vulnerability Index (SVI) shows that only two areas in Kajang are classified as most vulnerable which are Taman Bukit Mewah and Taman Bukit Indah. While the remaining area is only classified as moderately vulnerable.

DISCUSSION

All 10 areas in Kajang are most vulnerable to socioeconomic vulnerability (SV) theme. Whereas for household composition and disability (HCD) theme, only Mewah Court Kajang, Pangsapuri Cemara and Pangsapuri Seroja are the most vulnerable. Only Taman Bukit Indah and Taman Bukit Mewah are vulnerable for minority status and language (MSL) theme. Lastly, for housing and transportation (HT) theme, only Pangsapuri Seroja is the most susceptible to landslides. Overall value of SVI shows that Taman Bukit Indah and Taman Bukit Mewah are more susceptible to landslides (0.5835). From the result above, this study successfully developed Social Vulnerability Index (SVI) with the application of CDC SVI (Centers for Diseases Control and Prevention Social Vulnerability Index) to determine the vulnerability factor of 10 Kajang areas to landslide event.

From the result, factor like socioeconomic vulnerability needs to be highlighted as the factor can affect the community's lives when at risk. Individual below poverty and did not complete their high school education can be more susceptible to hazardous event as their lack in education and income can limit their act in solving the problem and increases the risk to vulnerable situations. Low-income families are more likely to be affected by natural disasters because of their inability to cope and recover from losses (Hallegatte et al., 2020). Besides, the paper highlighted the importance of disaster risk management in area for a low-income family to decrease the susceptibility of disaster and to reduce poverty. The need for disaster management is because the data from the past study indicates that the impoverished are considerably more susceptible and expose to the financial and human losses resulting from disasters (Rentschler, 2013). Therefore, disaster management is important as it helps in terms of mitigation, preparedness, response and recovery of the affected community.

Besides, factor like household composition and disability can also increase the risk of vulnerability. Household comprising elderly of age 65 years or older or children of 15 years of age or younger is seen as increasing exposure to landslide events. As most individuals in this age category are dependent on working group to survive and live their life. Furthermore, factor such as elderly's health needs to be taken into account as most of the individuals in that age category are highly exposed to risk and harms. They tend to experience greater instances of fatalities and injuries associated with natural disasters compared to other demographic groups (Phraknoi et al., 2023; Zhu & Sun, 2018). Other factor that needs to be highlighted is housing and transportation where multi-unit structure such as apartment and condominium is identified as the housing areas that are more susceptible to the risk of landslide event as higher structure in housing area exposes the community to landslide events. As tall building makes them vulnerable to various hazard events (Rizzo et al., 2024)

Therefore, to decrease the susceptibility of Kajang community to landslide event, there is a need for strengthening the community adaptive capacity to reduce the negative impact of natural hazards. Identifying the community's vulnerability can help local government and local community in mitigation action and prepare these communities to future hazardous event such as landslide. Previously Malaysia's national disaster management was more focused on rescue and rehabilitation efforts for disaster victim, but it was found that mitigation efforts to reduce the impact of disaster among the victims are more effective and sustainable to manage disaster events (NADMA, 2023). Thus, mitigation effort from the local government and the capacity of a community for adaptation is important to increase the community resilience towards natural disaster as well as to improve Malaysia's disaster management effort.

Study regarding Social Vulnerability Index (SVI) has many positive impacts towards disaster management where the data received on the community can be used to identify the factors of vulnerability and susceptibility for each community. Even though victims go through the same natural disaster event, the impact of the disastrous event can be different for each individual depending on their ability and capacity to adapt, community resilience towards natural disaster and community exposure to risk and disastrous event. Hence, identifying and determining the community's susceptibility can increase the resilience of the community as well as decrease the vulnerability towards risk. The local government mitigation efforts can also be more effective and specific to the designated community. In order to maintain sustainability in areas undergoing a rapid urbanization process, strategies need to be carried out in developing the country without implications for the socioeconomic decline of the community, thus causing conflict in their lives. Furthermore, an effective strategy will enable affected communities to behave more efficiently in facilitating the management of natural disasters, thus reducing socioeconomic threats, which will also impact the level of national progress. Good governance is also important in determining the behaviour of urban communities when faced with natural disasters.

CONCLUSION

In conclusion, identifying social vulnerability by using Social Vulnerability Index (SVI) can help determine the factor of vulnerability among the community as well as strengthening community adaptive capacity to reduce the negative impact of natural hazards and mitigation effort from the local government which can be more effective and improve Malaysia's disaster management efforts on natural disaster.

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