Building Resilience Rural Community towards Flood in Malaysia: Prioritizing Resilience Key Components and Drivers for Implementation

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Abstract

Building a strong community resilience towards disaster is often an endogenous process that is linked closely to local customs that, at times, may be operated and/or translated into decision-making processes outside the policy realm. Given the huge influence of local context in shaping the resilience process, community-level actors on the other hands shall not be left alone to chart their pathway. Therefore, it is important for a certain degree of intervention to be introduced mainly to guide and assist the community for a holistic and proper policy and framework development. This process, in turn, might improve the community capabilities to carry out implementation of necessary programs for building community resilience in the short term or longer term. According to scholars in disaster and resilient related studies, the main focus in building resilient community towards disaster is the need for understanding of three key components particularly economic, social and environmental. In this light, a total of 43 resilience factors were identified from the three key components. A field research has been carried out with the primary intention for identification of the internal and external factors that contributed to resilience of rural communities towards flood in Malaysia. Three case study areas, located in the East Coast of Malaysia, have been selected for field observation and household survey using a questionnaire namely (1) Lubok Setol village in Kelantan state; (2) Teladas village in Terengganu state and; (3) Gajah Mati village in Pahang state. A total of 90 respondents participated in the survey that was carried out from January 2018 (i.e. right after the major flood occurred in December 2017) until mid-February 2018. Data analysis has been utilizing the Relative Importance Index (RII) method mainly for prioritizing and categorizing answers key components for community resilience. Answers given with higher RII score will be ranked higher or having higher priority as compared to factors with lower RII score. Overall, adoption of the RII method has enable researchers to identify, rank and formulate a list of relevant factors for community resilience towards disaster. The results might have value in terms of improving current understanding of the concept of community resilience particularly in the context of Malaysia as a developing country.

Keywords
Community resilience; flood; Relative Importance Index (RII); Malaysia

1. Introduction

Resilience community means community that able to bounce back better by reducing risk of lost caused by disaster to community, recover in a short period of time (Hayashi, 2017), thus safeguarding community critical functions and valuable assets. Building community resilience towards disaster is often an endogenous process that is linked closely to local customs that, at times, may be operated and/or translated into decision-making processes outside the policy realm. To explore further on the state of community resilience, a research has been carried out with the primary intention to identify the internal and external resilience factors specifically for flood-related disaster experienced by three rural communities in Malaysia. According to scholars (Chan, 2012; Center for Excellence in Disaster Management and Humanitarian Assistance, 2016; Shaluf and Ahmadun, 2006), Malaysia were highly impacted by flood compared to landslide, earthquake and mudslide, that occurs in rural areas in East Coast of Malaysia. A total of 43 resilience factors were identified from the literature review (from the economic, social and environmental components) and be used for the survey of community. Three case study areas were identified and a total of 90 respondents were interviewed. Main activity of the survey is to rank 43 resilience factors as identified earlier based on Relative Importance Index (RII) method.

2. Literature Review

Based on review of literature, the main concern in building resilient community towards disaster is made up of understanding on three key elements namely economic (Wilson, 2011; Sharifi, 2016; Cutter, 2016; Norris *et al.*, 2008; Ellis, 1999; Avila-Foucat and Martínez, 2018), social (Aldrich, 2012; Wilson, 2011; Sharifi, 2016; Cutter *et al.*, 2010), environmental (Wilson, 2011; Sharifi, 2016; Cutter, Ash and Emrich, 2014), infrastructure (Sharifi, 2016; Cutter *et al.,* 2014), and institutional (Cutter *et al.,* 2014). Of all the elements discussed, only three common elements which received common agreement by all scholars namely economic, social, and environmental. This finding is conjunction with sustainable development theory.

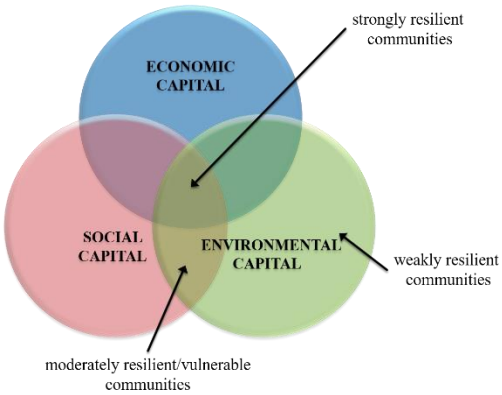


Figure 1. Community resilience capital (Wilson, 2011)

According to Wilson (2011), a community with strong capital i.e. for all three capitals indicating a stronger resilience spirit and will be able to bounce back better when a disturbance occurs (refer Figure 1). Furthermore, a community with well-developed capitals will also easier in disaster recovery and to bounce back.

3. Research Methodology

3.1. Identification of community resilience towards disaster factors through literature review

A total of 43 factors were identified from the literature review and incorporated into the household survey questionnaire. In the survey, each respondent was asked to select their answers based on 5-rank of Likert Scale ranging namely; 1-very low importance, 2-low importance, 3-medium importance, 4-very importance, and 5-highly important.

3.2. Household Survey using Questionnaire

Household survey focused on the factors which contributed in building resilience community. A total of 90 respondents have participated in the survey that was carried out from January 2018 (i.e. right after the major flood occurred in December 2017) until mid-February 2018 (Table 1).

$$n = \frac{n}{1 + N.(e)^2} \quad (1)$$

n - sample size;
N - population size;
e - level of error;

Table 1. Distribution of sample size of all three case study areas

Village	Number of families	% of each village	Sample size (n=90)
Lubok Setol	131	40	37
Teladas	121	37	32
Gajah Mati	70	23	21

Source: Research fieldwork in 2018

3.3. Data Analysis Technique

The Relative Importance Index (RII) technique was adopted for data analysis. The main intention of using RII was to prioritise and categorise answers of all 43 key factors for community resilience in all three key components of economic, social and environment. Previously, the RII technique was used widely in construction management research to rank factors contribute to certain phenomenon. For instance, delay factors in construction projects by (Muhwezi *et al.*, 2014), causes and effects of delays in Malaysian construction industry (Sambasivan and Soon, 2007), and factors influencing project consultants performance (Kamarudin and Samek, 2016; Kometa *et al.*, 1994). Researcher will adopt the same approach but with slight modification into the examination of factors that contribute to rural community resilience towards disaster. All identified factors shall be examined, and rank based on the critically as perceived by the respondent. The calculation of RII value is as follows:

$$RII = \frac{\sum W}{A*N} \quad (0 \le RII \le 1) \quad (2)$$

RII - relative importance index;
W - weight of factor given by the respondents which ranges from 1 to 5 (where 1 represent "strongly disagree" and 5 represent "strongly agree");
A - represent the highest weight (in this case is 5); and
N - represent the total number of respondents

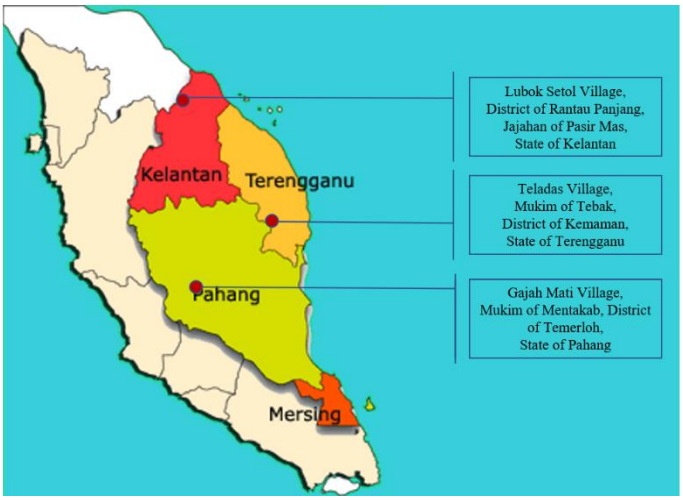
Answers given with higher RII score will be ranked higher or having higher priority as compared to factors with lower RII score. Overall, adoption of the RII method has enable researchers to identify, rank and formulate a list of relevant factors and key drivers for community resilience towards flood.

3.4. Selection of Case Study Areas

Case study areas, focusing on the East Coast regions of Malaysia, have been selected for field observation and household survey. Selection of the case study area are based on five (5) criteria's:

- Traditional village with disaster risk as identified in DPFDN 2030 (Criteria 1)
- Village in East Coast region which experienced frequent disaster occurrence identified by Social and Welfare Department (JKKK) (Criteria 2)
- Village with established disaster response team sub-committee under Village Development and Security Committee (JKKK) (Criteria 3)
- Village with Standard Operating Procedure (SOP) being acknowledge by Disaster Management agencies (Criteria 4)
- Village that participated in Community Based Disaster Risk Management (CBDRM) Program by MERCY Malaysia (Criteria 5)

Based on all five (5) criteria listed above, three (3) potential villages was identified as fulfilled mos of the selection criteria hence selected as the case study areas. These villages are (1) Lubok Setol village in the State of Kelantan; (2) Teladas village in the State of Terengganu; and (3) Gajah Mati village in the State of Pahang. The location and distribution of all three (3) selected villages as case study areas are shown in Figure 2.



State	Village	Comments of Assessment Criteria				
		C1	C2	C3	C4	C5
Kelantan	Lubok Setol	Listed as traditional village with disaster risk	Experienced most frequent flood occurrence in Pasir Mas	Have established disaster response team sub-committee	Coordination meeting lead by evacuation center manager (JKM officer)	Not available
Tereng-ganu	Teladas	Listed as traditional village with disaster risk	Experienced most frequent flood occurrence in Kemaman	Have established disaster response team sub-committee	With SOP acknowledge by NADMA	Not available
Pahang	Gajah Mati	Listed as traditional village with disaster risk	Experienced most frequent flood occurrence in Temerloh	Have established disaster response team sub-committe	Coordination meeting lead by evacuation center manager (JKM officer)	Participated in CBDRM by MERCY

Figure 2. Location and distribution of selected case study areas based on selection criteria.

4. Findings and Results

Analysis of data is organised as follows: (1) calculation and ranking of RII value for all 43 community resilience factors by 90 respondents (refer to Table 2); (2) calculation of RII mean value and ranking into three key components of economic, social and environment (refer to Table 3) and; (3) short-list of 10 most important and 10 least important factors to community resilience (refer to Table 4). Based on the ranking of the components, the three factors of each components that contribute most in building community resilience towards disaster are discussed as follows:

Table 2. Ranking of resilience factors based on RII value/score given by respondents (n=90)

Resilience Factors Components	Number	Factors contribute to resilience	Respondents scores					RII	Rank
			1 - Very low importance	2 - Low importance	3 - Medium importance	4 - High importance	5 - Very high importance		
Economic	1	Economic well-being/advantage	0	0	1	35	54	0.9178	1
	2	Diversified income streams/Diversify source of income	1	0	4	51	34	0.8600	39
	3	Low dependency on external funds	0	0	2	42	46	0.8978	10
	4	Diversified business	0	0	1	51	38	0.8822	22
	5	Employment rate	0	0	1	49	40	0.8867	15
	6	Job opportunities	0	0	1	45	44	0.8956	12
	7	Individual saving	0	0	3	34	53	0.9111	2
	8	Community saving	0	0	3	40	47	0.8978	10
	9	Collectively own local resources	1	0	5	53	31	0.8511	41
	10	Business continuity plan	0	0	5	48	37	0.8711	34

Resilience Factors Components	Number	Factors contribute to resilience	Respondents scores					RII	Rank
			1 - Very low importance	2 - Low importance	3 - Medium importance	4 - High importance	5 - Very high importance		
	11	Village insurance and social welfare	0	0	5	34	51	0.9022	6
	12	Emergency fund	0	0	2	43	45	0.8956	12
	13	Inward investment	2	0	8	47	33	0.8422	42
	14	Connection with regional economy	1	0	7	59	23	0.8289	43
Social/Cultural	1	Close interaction between people	0	0	0	41	49	0.9089	3
	2	Ability to rely on neighbors at times of crisis	0	0	2	39	49	0.9044	5
	3	Availability of skills training and education	0	0	4	45	41	0.8822	22
	4	Good health and sanitation	0	0	3	46	41	0.8844	19
	5	Availability of multiple services	0	0	2	54	34	0.8711	34
	6	Low level of corruption	1	0	3	42	44	0.8844	19
	7	Good communication between stakeholder groups	0	0	0	44	46	0.9022	6
	8	Female empowerment/empowerment of ethnic/religious minorities	0	0	4	48	38	0.8756	30
	9	Open-minded community	0	0	3	47	40	0.8822	22
	10	Good and transparent land ownership regulations	0	0	0	53	37	0.8822	22
	11	Stakeholders in control of development trajectories	0	0	6	43	41	0.8778	27

Resilience Factors Components	Number	Factors contribute to resilience	Respondents scores					RII	Rank
			1 - Very low importance	2 - Low importance	3 - Medium importance	4 - High importance	5 - Very high importance		
	12	Strong governance structure at multiple geographical scales	0	0	1	46	43	0.8933	14
	13	Community bond, social support and social institutions	0	0	1	42	47	0.9022	6
	14	Safety and security	0	0	2	47	41	0.8867	15
Environmental/ Physical/ Infrastructure/ Institution	1	High levels of bio-diversity	0	0	2	51	37	0.8778	27
	2	Good water quality and availability	0	0	0	54	36	0.8756	30
	3	Sustainable soil management	0	0	10	46	34	0.8800	26
	4	Predictable agricultural yields	0	0	2	53	35	0.8533	40
	5	Localized energy supplies	0	0	4	53	33	0.8733	33
	6	Multifunctional environmental resources	0	0	2	48	40	0.8644	37
	7	Infrastructure robustness and redundancy	0	0	3	45	42	0.8844	19
	8	ICT infrastructure	0	0	4	51	35	0.8867	15
	9	Inclusive and multimodal transportation networks and facilities	0	0	4	51	35	0.8689	36
	10	Land use planning and urban design	0	0	3	50	37	0.8756	30
	11	Leadership and participation	0	0	0	44	46	0.9022	6

Resilience Factors Components	Number	Factors contribute to resilience	Respondents scores					RII	Rank
			1 - Very low importance	2 - Low importance	3 - Medium importance	4 - High importance	5 - Very high importance		
	12	Contingency, emergency and recovery planning	0	0	0	55	35	0.8778	27
	13	Equity and diversity	0	0	0	42	48	0.9067	4
	14	Research and development	2	0	1	52	35	0.8622	38
	15	Regulation and training	0	0	1	49	40	0.8867	15

Source: Research fieldwork in 2018

Result from the calculation of RII mean value and ranking of resilience into three key components (economic, social and environment). As presented in Table 3, social/cultural component of the community received the highest mean value of 0.8884 hence considered as the most important component to building resilience community towards flood in all case study areas. Three social factors with highest RII scores are "close interaction between people" (RII=0.9089); "ability to rely on neighbour at times of crisis" (RII=0.9044), and "good communication between stakeholder groups" (RII=0.9022) (refer to Table 2). Mean value analysis ranked the economic component in the second most important component that contribute to resilience community towards flood with mean value of 0.8814. Based on Table 2, three economic factors with significantly high RII scores are "economic well-being/advantages" (RII=0.9178), followed by "individual saving" (RII=0.9111), and "village insurance and social welfare" (RII=0.9022). Meanwhile, environmental/physical/infrastructure/institution is ranked as the third most important component for community resilience with mean value of 0.8773. with reference to Table 2, four environment factors with highest RII scores given by respondents are including; "equity and diversity" (RII=0.9067), "leadership and participation" (RII=0.9022), and "ICT infrastructure" and "regulation and training" shared the same RII score of 0.8867.

Table 3. Mean value of RII and ranking of resilience key components

Resilience components	RII	Rank
Social	0.8884	1
Economic	0.8814	2
Environmental	0.8778	3

Source: Research fieldwork in 2018

Table 4a shows the 10 most important factors contribute to resilience rural community towards flood in Malaysia. Economic considerations are remains as the most important factors for community resilience as mentioned by respondents with "economic well-

being/advantage" (RII score of 0.9178) and "individual saving" (0.9111) were ranked as the highest. However, both economic and social factors received the same share of four (4) factors each in the top 10 most important factors as presented in Table 4a.

Table 4a. Most Important Factors Contribute to resilience Rural Community towards Flood in Malaysia

Number	10 most important factors	Key Component	RII	Rank
1	Economic well-being/advantage	Economic	0.9178	1
2	Individual saving	Economic	0.9111	2
3	Close interaction between people	Social/Cultural	0.9089	3
4	Equity and diversity	Environmental/ Physical/ Infrastructure/ Institution	0.9067	4
5	Ability to rely on neighbours at time of crisis	Social/Cultural	0.9044	5
6	Village insurance and social welfare	Economic	0.9022	6
7	Good communication between stakeholder group	Social/Cultural	0.9022	6
8	Community bond, social support and community institution	Social/Cultural	0.9022	6
9	Leadership and participation	Environmental/ Physical/ Infrastructure/ Institution	0.9022	6
10	Low dependency of external funds	Economic	0.8978	10

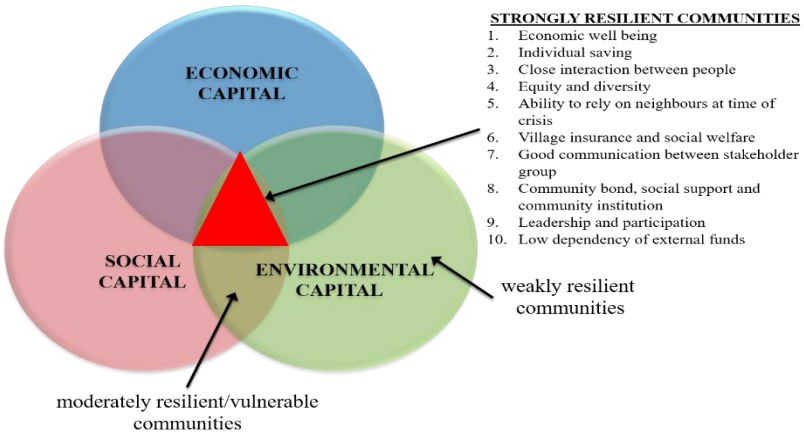
Table 4b. Least Important Factors Contribute to resilience Rural Community towards Flood in Malaysia

Number	10 most important factors	Key Component	RII	Rank
1	Connection with regional economy	Economic	0.8289	43
2	Inward investment	Economic	0.8422	42
3	Collectively own local resources	Economic	0.8511	41
4	Predictable agricultural yields	Economic	0.8533	40
5	Diversified income streams/Diversity source of income	Economic	0.8600	39
6	Research and development	Environmental/ Physical/ Infrastructure/ Institution	0.8622	38
7	Multifunctional environmental resources	Environmental/ Physical/ Infrastructure/ Institution	0.8644	37
8	Inclusive and multifunctional transportation networks and facilities	Environmental/ Physical/ Infrastructure/ Institution	0.8689	36
9	Business continuity plan	Economic	0.8711	34
10	Availability of multiple services	Economic	0.8711	34

Meanwhile, the 10 least importance factors contributed to resilience rural community towards flood in Malaysia is listed in Table 4b. However, based on RII score, there is very small differences on RII score between these factors (i.e. with only ± 0.05 difference). The difference also considered quite marginal as compared to the 10 most important factors as identified in Table 4a. Therefore, it worth to consider, at least from researcher's point of view, to also include these 10 least importance factors in discussions of result and to be included in the later phase of implementation of this study.

5. Conclusion and Recommendation

Building resilience rural community towards flood in Malaysia will able to bounce back better by reducing risk of lost caused by disaster to community, recover in a short period of time (Hayashi, 2017), thus safeguarding community fortune. The aim of this paper is to identify the internal and external factors that contributed to resilience of rural communities towards flood in Malaysia through ranking of factors. As suggested by Wilson (2011), a community with strong capital i.e. for all three capitals presumably showing stronger resilience spirit and will be able to bounce back better when a disturbance occurs. Based on the field research and results presented in Table 2 to 4, it is crucial for building a strongly resilience rural community towards flood in Malaysia to consider for adoption of the 10 most important factors into DRR strategies.



Results from this study also might have value to offer particularly for improving current understanding of the concept of community resilience particularly in the context of Malaysia as a developing country. The process of doing this research and the successful adoption of RII method, in turn, might improve any research works to be carried out on resilient rural community to disasters in the future. Ranking of resilience factors also might assist the community and agencies involved to carry out implementation of necessary programs for building community resilience in the short term or longer term.

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