Flood Local Knowledge and Its Transferred Possibilities in Ayutthaya island, World Heritage Site of Thailand

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The essential of local knowledge in disaster management recently expressed by many researches, but transferring processes have not been clearly clarified yet. This paper aims to examine flood local knowledge and its transferred possibilities in Ayutthaya island where flood disaster annually strikes once for every year. The study examined flood local knowledge which exists in Ayutthaya island and picked up two unique knowledge to study of its transferring processes. The results revealed the perceptions of community to their flood local knowledge and its transferred processes. In-depth, social knowledge has been concerned as one factor which influences the transferred effectiveness.

Key Words : *Flood Risk Reduction, Local Knowledge, Knowledge Transfer, Ayutthaya Island*

1. Introduction

Ayutthaya island located in Ayutthaya province, central part of Thailand. Historic City of Ayutthaya and Associated Historic Towns were granted Cultural World Heritage status by the World Heritage Committee. They were the evidence of the highest prosperity of a Southeast Asian civilization in the 14th-19th centuries AD.[1] Rainy Season of Thailand beginning in July till October. In September and October, the heavy rain gererally take place, the quantity of water in river will overflow and flood along river bank.

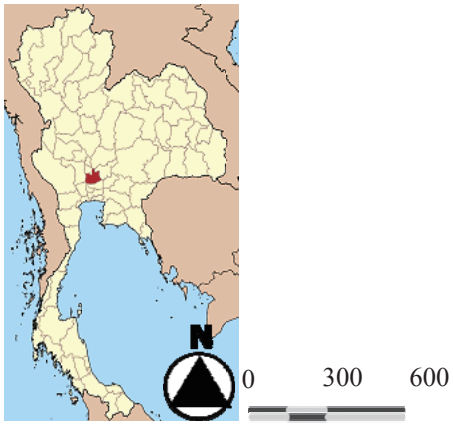

Fig. 1 Thailand map [2)]

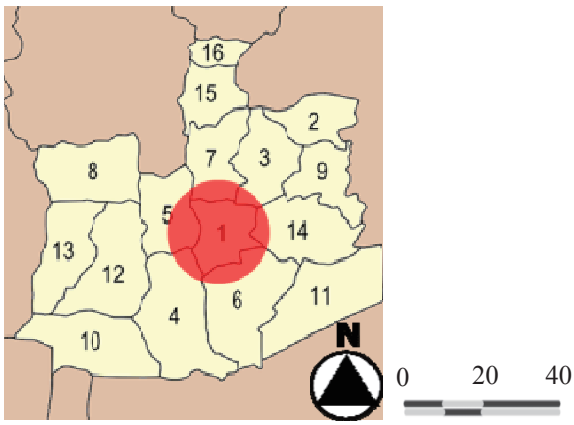

Fig. 2 Ayutthaya province map [3)]

From pre-survey found that, since these designated areas are risky to be striked by flood every year, the localities have learnt and used local knowledge to tackling with flood for long time. However, flood local knowledge in Ayutthaya island are now not being well-known as before but some of current community members still holding these precious knowledge and using it in their daily life. Goals of this research are to mainly, examine flood local knowledge which existing in Ayutthaya island and looking for its transferred possibilities. The study areas in this research comprised with 3 communities. These three areas are the most vulnerable to be hit by flood because their land height is quite low and very close to the river.

Hau-Lor community is primitive economic centre which serve for surround communities as the market. Hua-Lor market covered by many commercial buildings and its density is high. Its building high density has blocked the water flow direction, when it has rain and level of water is rising, it causes urban flood as a result . Pom-Phet community is located in the southeast of Ayutthaya island where the confluence of 2 main rivers, the Jhaophraya River and the Pasak River, collide and inland erosion problem was seen there. U-thong community is located in the south of Ayutthaya island where is close to the Jhaophraya river. U-thong community situates just opposite site of the south water gate of the island. In the case of opening water gate for water flow when flood take place, this area surely be flooded. For all information used in this research are significantly limited to imply to the study areas boundary mentioned earlier. The analyses and interpretations were made based on the information got from questionnaire and interview. This research has distributed 120 copies of questionnaire and conducted an interview with community, government official from Ayutthaya Municipality and Fine Art department. In each sampling areas, Hua-lor, Pom- Phet, U-Thong, community was distributed 40 copies. 120 copies were returned by complete information.

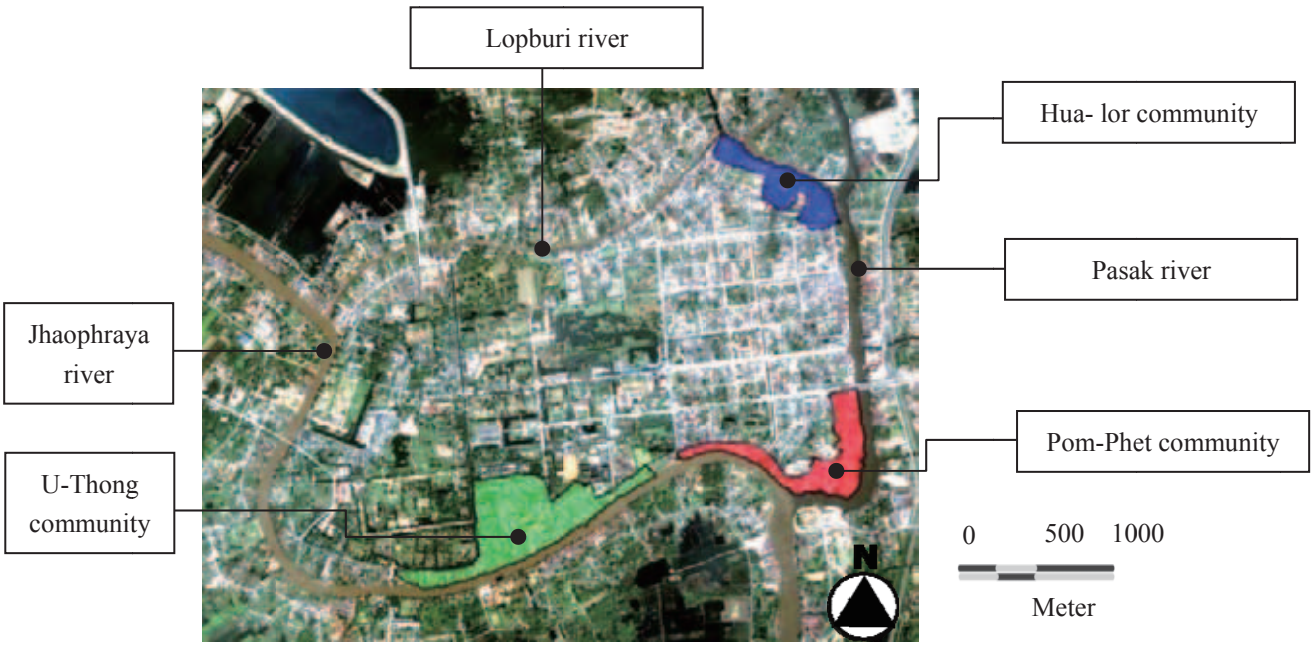

Fig. 3 Study area and the location of the main river map [4)]

2. The Uses of Flood Local Knowledge in Ayutthaya

The knowledge mentioned as local knowledge due to it was initially constructed and innovated by locality, according to their experience and flood risk circumstance. In Ayutthaya where community live with the river from the ancient time, local community have created the strategies to live along river bank and applicably combined with their daily life.

The pillar house style was used in common among community recently, communities tend to had built their houses in modern style with no lift up space, and it is also one reason of flood because the building

obstructed flow of the water. There are several types of pillar house due to combination of modern architecture styles and traditional one. Pillar houses originally made by wood stuck on high pillar and leave first floor space for wind to flow. The remaining of pillar houses in Ayutthaya island still could see many along the river bank surround the island. Even though the traditional one is not less vanished but the contemporary style still have seen in the island and its purpose to reduce flood risk still be functioned as old time.

The localities have used wooden boat as one transportation modes rather on foot or cart, formerly and car, recently. Until now water transportation is convenience for them, since the island is surrounded by the rivers, so that community lived along the rivers could also use their boat when flood taking place. Meanwhile some house, located not along the river, which never used boat for transportation, they are recently suffered for transportation problem rather than houses along the river bank where already had the boat in their house.

Since, there is no weather forecast or warning system before, the traditional climate knowledge forecasting has been used as locally observed variables and experiences using combinations of plant, animal, insects, and metrological and astronomical indicators. For example; if the cloud is line and clustered, there will be flood in a day. If the water in the river has changed its flow and color, flood or drought will happen depended on what color water is, if ant start to march and bring food, there will be rain and the level of rain is depended on where they march to and what kind of food did they bring with them, if the frogs near the river make some wired and continuous noise, there will be rain in a day, if mosquitoes are increasing, there will be rain, etc. The original of knowledge came from the needed of community as farmer who would like to predict the coming of flood, then they can be prepared to operate what it works for their farms. This knowledge is supernatural and non scientific proved, but community believed in these forecasting and have used in daily life. Normally, this kind of local knowledge is orally stories which were merged by fable, proverbs, song or poems.

After the modern technology became the major measurement, structural measures for reduce flood risk have been installed all over the island, for its master aim to protect heritage properties from flood damage. The embankment around the island mostly was constructed by Fine Art Department from Central Government Allocation. Fine Art Department will consider prioritize to construct in the areas that ruin or monument are placed first, meanwhile Ayutthaya Municipality will concern the area that flood effects citizen. Localities also leant to adapt modern technology in use to cope with flood in their own ways. For the houses which have change form pillar house style to non-lift up basement houses, Sand bags and Concrete Walls are used to create the barrier to prevent the water to come inside the house.

(1) Strengths and Weaknesses of Flood Local Knowledge

This research has been argued on enormous of flood local knowledge's essential, but it does not intent to claim that local knowledge is a panacea for community. In this part provide the fact that local knowledge also has its limitation, meanwhile its strengths will mention, and the weaknesses of it will also show.

Local technologies based on traditional, indigenous knowledge, skills of community and have been used extensively, the strength is obvious, there is not necessary to have well-educated or special expert skill in use of local knowledge. Localities are normally not so well-off, therefore the measure they have invented basically base on the low cost installation. It is generally low cost rather than the technical one. Some local knowledge, like flood early warning local knowledge or pillar house (in case if it was inherited), does not cost for installation at all. Since, some of local knowledge does not have to construct any facility so local knowledge does not need time for construction. Moreover, local knowledge reflected the wisdom of community. Community has improved their self-esteem when they use local knowledge and even better if their knowledge is accepted by others and increasing of community wisdom, also increases community participation as well. Because of familiarity with local knowledge, community has trended to participate in the activities, they are confident to use the knowledge and they are sure that they will do their best due to their skill.

In the other hand, not just the advantage which they have, their limitations are also seen. Some local knowledge are not accurate without combine it with the expertise knowledge. For example; Sand bag or concrete wall will be more effectiveness, if the people who construct it know the engineering expertise skill. The scale of mitigation and preparedness for the local knowledge is also quite narrow. Compare with the technical scale as Dam or dike the sand bag barrier has less scale of protection. Local knowledge is much more individual skill which is difficult to manage and be organized. It is hard for community to express their 10 years experience. It is hard to learn those knowledge if you are not familiar with it or has experience before.

Therefore, it cannot argue that other knowledge and technologies as Engineering knowledge is useful to combine with the local knowledge. Even if in use of Warning System combine with early flood warning local knowledge, the prediction will be more accurate and effectiveness. Moreover, the Telecommunication skill, how to use telephone or speaker to distribute the information in large scale after flood is predicted are also required in the stage that flood is about to take place.

(2) The Chosen Local Knowledge

Out of all local knowledge mentioned earlier above, this study has chosen two unique local knowledge with well-known among Ayutthaya island community, which are Pillar House and Ant's natural flood response knowledge. In this part provide more details of the chosen local knowledge, providing below.

a) Pillar House

The house's pillar is approximately 2 meters in height due to its purpose to be settled along the river or flood plain where resident is convenience for agricultural activity. The height created open space on the ground floor, originally takes the function as a living room for family member to sit and talk or for welcoming the guests. In large scale, it provides the impervious surface of the city which it can potentially mitigate flood severity by absorbing water and allowing water run through its flow. Nowadays, Pillar houses initially designed for tackling with flood are decreasing by displacement of modern buildings. Some of pillar house styles are changed for multi-function., namely first floor of pillar house was adjusted to be one of house spaces with permanent construction like concrete, so open space in first floor are disappeared.

Fig. 4 The differences of Pillar House and Non-Pillar House (Author)

b) Ant's Natural Flood Response

Ant's Natural Flood Response is based on the local wisdom climate forecasting. The ants and grasshopper story has been told as bedtime story long time ago. The story is about differing of ant and grasshopper's behavior. Ant who always works hard, keeps tracking for food and brings to his nest, even his nest is far and high. Whereas, grasshopper who is always happy with his morning singing. Every day he wakes up, has some dews and then goes sing a song. When the rainy season comes, ant's nest is fruitful with stock food meanwhile grasshopper is starving to death. Its proposed is actually hidden some hint to the kid to notice the behavior of the Ant and predict for the rain. The story is well-known among Ayutthaya Island community as a funny fable, but the hidden hint of the story may not be clearly defined when the story is told nowadays.

3. Conceptual Theories and Hypotheses

David Lazer (2000) argued that Social Network has an influence on Information Transfer and in the way that the more complex, competitive, and dynamic an informational environment, the greater the value of strong ties relative to weak ties.[5] Knowledge as pillar house and ant's natural flood response are tacit knowledge which need understand of culture and it limit in particular area. In light of this, from this point and beyond, Social Network has been focused and concerned as one factor which could stimulate local knowledge transfer.

(1) The Strength of Ties Model

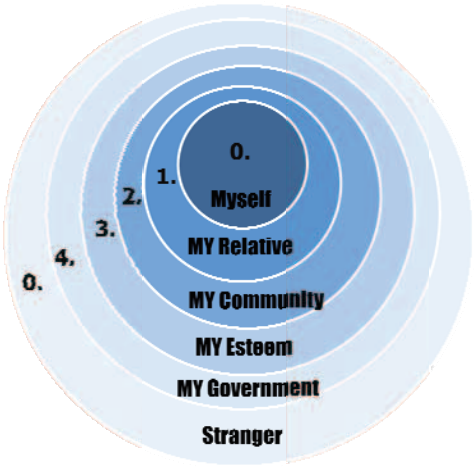

Fig. 5 The Strength of Ties Model (Authors)

* My Relative- tie: as parents, grandparents, children, etc; My Friend- tie: as Friends, Co-Worker, Community, Neighborhood or one who you are not stranger and used to have any activity together but your relative; My Esteem- tie: as Teacher, Monk, etc. person that you respect but not your relatives; My Government- tie: as Government Official, Staff, etc.

Social network analysis views social relationships in terms of nodes and ties. Nodes are the individual actors within the networks, and ties are the relationships between the actors. They can be many kinds of ties between the nodes. Research in a number of academic fields has shown that social networks operate on many levels, from families up to the level of nations, and play a critical role in determining the way problems are solved, organizations are run, and the degree to which individuals succeed in achieving their goals. [6] In this study, nodes are person who engage with local knowledge transfer process. Person who send the knowledge called "Senders" and person who receive the knowledge called "Receiver". Namely, Receivers are the questionnaire respondents and Senders are person who respondents have learned the mentioned knowledge from. To define the strength of ties in Social Network, this research prioritized the ties according to the closeness as a kinship as show in Fig.5

The meaning of these figures is that the closet to "Myself" is the "Strongest- tie". This can imply that the strongest-tie in this study is "My Relative" and the weakest – tie has been set as "My Government- tie". Next interpretation is that "My Relative- tie" has stronger- tie than "My Community- tie" and "My Community-tie" have stronger –tie than "My Esteem-tie" and so on. In contrary side, "My Government- tie" has weaker-tie than "My Esteem-tie" and "My Esteem-tie" has weaker-tie than "My Community-tie" in ordering. The strength of the tie also mention "Myself", mean the Respondent learnt the knowledge by themselves, such as from media as a book, newspaper, television, radio, etc., which in this paper will not conclude it to analyze the effectiveness of transferring. Because knowledge transfer concept is transfer knowledge, from someone to someone. Therefore, "Myself" was given 0 group of Network tie as shows in the figure. In the same way as "Stranger", which show here to created the limitation of the ties. For Stranger, its call "An absent-tie" and this paper will not include for the analysis.

(2) Knowledge Management Levels

When the knowledge was transferred to the individuals, there are two separate learning activities occur as Perception means the way to take information and Processing means how to deal with information.[7] Namely, not everyone has the same potential to manage the knowledge their got. From learning process concept, this paper has combine concept of perceived and processed local knowledge that respondents get and take any action to response with the transferring process, it so called in this paper "Knowledge Management Levels" Therefore, this research has set the level into 6 levels which shows below in Fig 6.

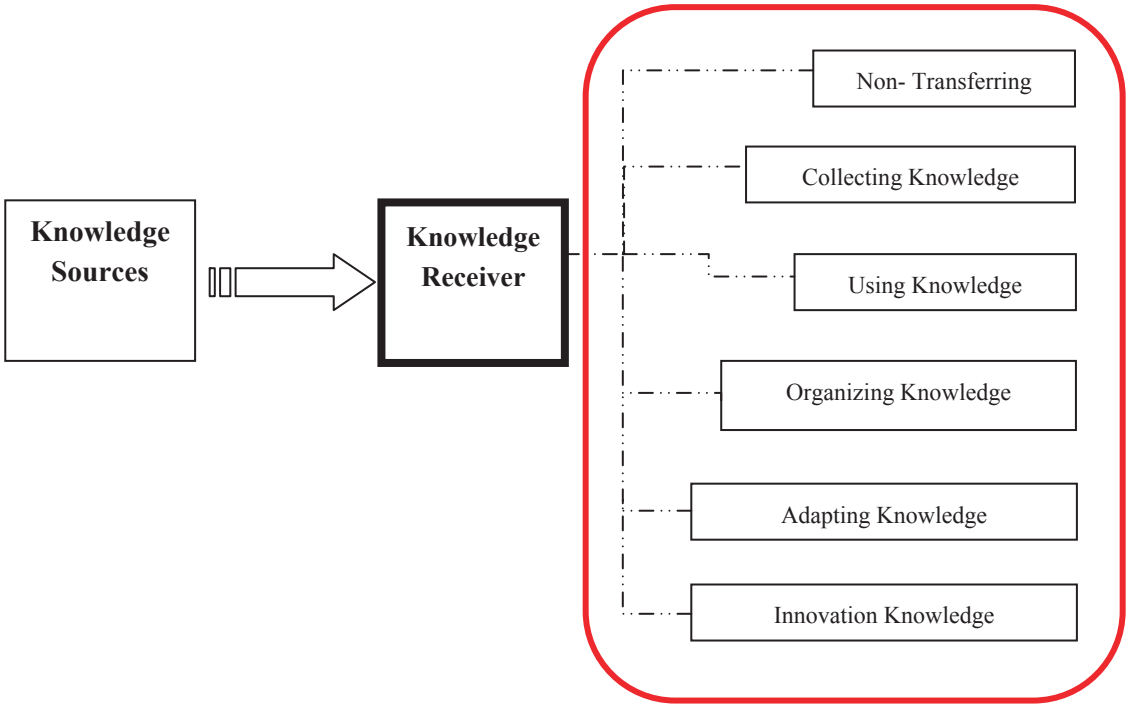

Fig. 6 Flow chart of knowledge transfer and 6 levels of community self-protection (Authors)

Level 1: Non- Transferring-Receivers do not understand anything about the knowledge at all. Level 2: Collecting Knowledge -Receivers understand and believe that this knowledge is useful. Level 3: Using Knowledge-Receivers understand, believe that this knowledge is useful and experienced to use this knowledge. Level 4: Organizing Knowledge -Receivers understand, believe that this knowledge is useful use this knowledge and will adjust or improve it in the future. Level 5: Adapting Knowledge - Receivers understand and believe that this knowledge is useful and have already adopted or adjusted this knowledge before use. Level 6: Innovation Knowledge -Receivers have learned about the knowledge profoundly. After all understanding and adaptation, Receivers found new knowledge based on the original one.

(3) Hypothesis

The hypothesis was set, due to concerned issue mentioned earlier, as "Strong- tie Social Network has effectiveness transfer of flood local knowledge rather than the Weak- tie Social Network." Namely, the strong-tie one should have influenced on knowledge management level in the higher level rather the weak-tie one.

Null Hypothesis (H0: $\mu1 = \mu2 = \mu3 = \mu4$)

: Stronger- tie effectively transfer flood local knowledge in the same level as Weaker- tie

Alternative Hypothesis (H1: $\mu1 > \mu2 > \mu3 > \mu4$)

: Stronger – tie effectively transfer flood local knowledge rather than Weaker- tie

* There is at least one pair is correct

μ1: Variable 1: The knowledge transferring effectiveness of "My Relative - tie"
μ2: Variable 2: The knowledge transferring effectiveness of "My Community - tie"
μ3: Variable 3: The knowledge transferring effectiveness of "My Esteem - tie"
μ4: Variable 3: The knowledge transferring effectiveness of "My Government - tie"

4. Social Network and Flood Local Knowledge Transferring

Transfer flood local knowledge by orally mechanism via social network is focused in this study. This part will analyze the data got from 120 copies of questionnaires which were distributed in Ayutthaya island.

Table 1 Different effectiveness of flood local knowledge transfer in each social network tie

PILLAR HOUSE KNOWLEDGE								
Sender	The Level of Knowledge Transferring Effectiveness						Total	Average Score
	Level 1 *Value = 0	Level 2 *Value = 1	Level 3 *Value = 2	Level 4 *Value = 3	Level 5 *Value = 4	Level 6 *Value = 5		
Relative μ_1	0	27	47	8	6	0	88	1.92
Community μ_2	0	15	9	2	2	0	28	1.68
Esteem μ_3	0	4	0	0	0	0	4	1.00
Total	0	46	56	10	8	0	120	1.83
Percentage %	0%	38.3%	46.7 %	8.3 %	6.7 %	0%	100%	

ANT'S NATURAL FLOOD RESPONSE								
Sender	The Level of Knowledge Transferring Effectiveness						Total	Average Score
	Level 1 *Value = 0	Level 2 *Value = 1	Level 3 *Value = 2	Level 4 *Value = 3	Level 5 *Value = 4	Level 6 *Value = 5		
Relative μ_1	0	0	64	26	19	0	109	2.59
Esteem μ_2	0	0	5	4	2	0	11	2.73
Total	0	0	69	30	21	0	120	2.6
Percentage %	0%	0%	57.5 %	25.0 %	17.5 %	0%	100%	

For Pillar House knowledge, the no. of respondents who, the most answer about Knowledge Management Level is Level 3 at 56 respondents. Mean that the majority of respondents understand, believe that this knowledge is useful and experienced to use this knowledge. My Relative – tie is the most frequent chose to be Sender at 88 respondents and in the same way as its effectiveness, the biggest average score is the effectiveness from the sender as My Relative –tie at 1.92. In conclusion is that $\mu1 > \mu2 > \mu3$, mean that, My Relative-tie has the best effectiveness to transfer local knowledge for Pillar House Knowledge. Therefore, Alternative Hypothesis is ACCEPTED.

For Ant's Natural Flood Response, the no. of respondents who, the most answer about the Level of knowledge transferring effectiveness is Level 3 at 69 respondents. Mean that the majority of respondents understand, believe that this knowledge is useful and experienced to use this knowledge. My Relative – tie is the most frequent chose to be Sender at 109 frequencies. Meanwhile, the biggest average score is the effectiveness from the sender as My Esteem –tie at 2.73 and My Relative –tie at 2.59 in ordering. In conclusion is that $\mu3 > \mu1$, mean that, My Esteem-tie has the best effectiveness to transfer local knowledge for Ant's Natural Flood Response Knowledge. Therefore, Null Hypothesis is ACCEPTED.

The result confirmed that social network ties have influence on local knowledge transfer and in each social network ties has different influence on the community's level of knowledge management. This study found three types of social network ties which were identified as the effectiveness ties to transfer different types of local knowledge which were chosen in the study. Transferring flood local knowledge is sensitively, not everyone who possesses the knowledge and willing to transfer can do, concerning on the matching of them can result the best effectiveness for community to understand and properly use local knowledge.

5. Conclusions and Discussions

Social Network can be one instrument for Ayutthaya community to increase their possibility of transferring knowledge. Emphasize on the ties of Social Network for Senders which match with the knowledge that project to transfer will get the best effectiveness of transfer. The findings of this paper are (i) See the overall score comparing of those knowledge, Ant's natural Flood Response has highest average score of Knowledge Transfer Effectiveness, this is can imply the good matching of social network tie and characteristic of knowledge. This is also affect the opportunity of community to develop their self-protection (ii) Consequently, when see the effectiveness of Senders who are in My Esteem- tie in Ant's natural Flood Response knowledge, even there were just 11 respondents, but the average score of this tie exceeded the average score of all senders. The rising of teacher and monk role in knowledge transfer for flood reduction local knowledge has been seen here. (iii) From this point lead to the confident of this research to conclude that My Esteem- tie is the best matching tie to transfer knowledge which merged with Fable and Proverbs.

Further study of this research is to classified flood local knowledge and matching with the appropriate social network which stimulate effective transfer processes. The study will also include the study of bridge network, to avoid the circumstance of social network disruption which causes the local knowledge transfer discontinue as a result.

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