

## FOREST VILLAGE COMMUNITY ADAPTATION STRATEGY IN THE MERATUS MOUNTAIN POST FLOOD: CASE STUDY IN PATIKALAIN VILLAGE, HULU SUNGAI TENGAH REGENCY

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### ABSTRACT

*Major problem which is faced by forest village community on Meratus Mountain, who are located around forest area are accessibility and forest resources scarcity, that can be utilized after big flood in Meratus Mountain, because the community are highly dependent on land usage and forest product. Forest areas that were affected by the big flood, are income resources, source of farm land, and have protection and climate control function, which are utilized by forest village community directly or indirectly. The purpose of this research is formulate forest village community adaptation strategy in Meratus Mountain post big flood. Research method approach, that use to achieve the purpose are quantitative and qualitative approach. The results found survival adaptation strategy by maintaining farming system, gardening, and utilization of timber and non-timber forest product, which had been carried out by the community for generations.*

**Keywords:** strategy, adaptation, flood, Meratus mountains, forest village

### INTRODUCTION

A large flood is happened on South Kalimantan, in 2021. The Data, Information and Disaster Communication Center of National Disaster Management Agency (2021) reported that 10 districts/cities were affected by flood in South Kalimantan Province. It was reported that 24,379 houses were flooded and 39,549 residents evacuated. Meanwhile, 15 people have died. South Kalimantan Government have set flood disaster emergency response status on January, 14th 2021. The Meteorology, Climatology, and Geophysics Agency (2021) informed, flood in South Kalimantan is started by high rainfall and high sea waves at the same time, where the high rain intensity made the big flood. The rainfall were very high, almost 10 days in a row. The capacity of Barito River, which normally holds 230 million cubic meter of water, was flowed by 2.1 billion cubic meter of water then. So, it was overflowed on 10 districts and cities.

The National Institute of Aeronautics and Space (2021) stated that the narrowing of forest areas has increased the risk of flood in South Kalimantan. The analysis results about the causes of flood in South Kalimantan Province's Area, show a contribution of forest shrinking in past 10 years on flood risk rising in South Kalimantan's Area. Land cover data shows that from 2010 to 2020, there was area degradation of primary forest, secondary forest, rice fields, and shrubs, respectively 13 thousand hectares (Ha), 116 thousand hectares, 146 thousand hectares and 47 thousand hectares in South Kalimantan.

Hulu Sungai Tengah was the regency, which was worst affected by flood on area of 1,691.29 Ha and inflicted damage to 64,400 houses (Syam'ani, 2021; Arifin, 2021). The flood was not only hit the urban area, but also hit on rural area, especially rural forest which is located at the Meratus Mountain foot, where some villages are inhabited dominantly by Dayak Meratus

Community. The Community was isolated because of broken road and bridge, when the flood happened. Post flood impact their broken settlement and social life, that rely their life activity on existing forest resources. Dayak Meratus Community do 3 main activities such as farming, gardening, and crafting forest product. Flood causes biophysical changes on forest area and social changes on forest vilage community. That changes make crucial problem for Dayak Meratus Community, which is located in and around the flooded area.

Based on background of the research, which is has been described, this research purpose are (1) Analyze changes of biophysic environment condition, before and after changes due to flood impact, (2) Analyze changes of forest village social environment condition, before and after changes due to flood impact, (3) Analyze forest village community strategic action to adapt biophysical environment and social environment changes due to flood impact, (4) Formulate model of forest village community adaptation strategy for biophysical environment and social environment changes due to flood impact.

The urgency of this research is to find a model formula of forest village community adaptation strategy to anticipate forest area changes caused by flood. So, pacing with the adaptation strategy model, the government can contribute by giving some policy, which support forest village community to survive (existence) and improve their life (welfare) to face the forest area changes due to flood impact.

## **METHODOLOGY**

### **Research sites**

Based on the initial data, that has been collected, namely through preliminary observations of the planned research location (site) the stages of determining research location are carried out as follows: Determine the flood-affected districts in Hulu Sungai Tengah Regency and one district will be selected as the research sample . Based on a study of the settlement map and map of forest areas and land affected by flood in one district, one village/kelurahan will be selected as the research location . Based on the steps above, can be determined that the location of this research lies in the Patikalain Village, Hantakan Sub-District, Hulu Sungai Tengah Regency

### **Research Types and Approach**

Based on the research type, this research is included in explanatory or explanative research type. Explanatory research is a research type that is oriented to explain the cause and effect of a social phenomenon, that is determined as object of study. While the research method approach used to achieve the research purpose is qualitative approach which is used to analyze data derived from views in the forest village communities's perception.

### **Data Collection Technique**

Qualitative data collection techniques are carried out by triangulation techniques, it is a data collection from the same source in various ways including combination of participatory observations, in-depth interviews and documentation. Sources of data are collected from key informants and research informants.

### **Data Analysis**

This research will be analyzed with qualitative approach based on the Miles and Huberman interaction model. Based on the Moleong formulation, qualitative data analysis by the Miles and Huberman model is an interaction analysis model consisting of three activity flows that occur simultaneously after the data collection period, so it can describe a situation systematically, factual and accurate, regarding the fact on field related to the coal-based

forest village community’s adaptation strategy which includes stages: (1) Data reduction (2) Data display (3) Conclusion drawing (verification).

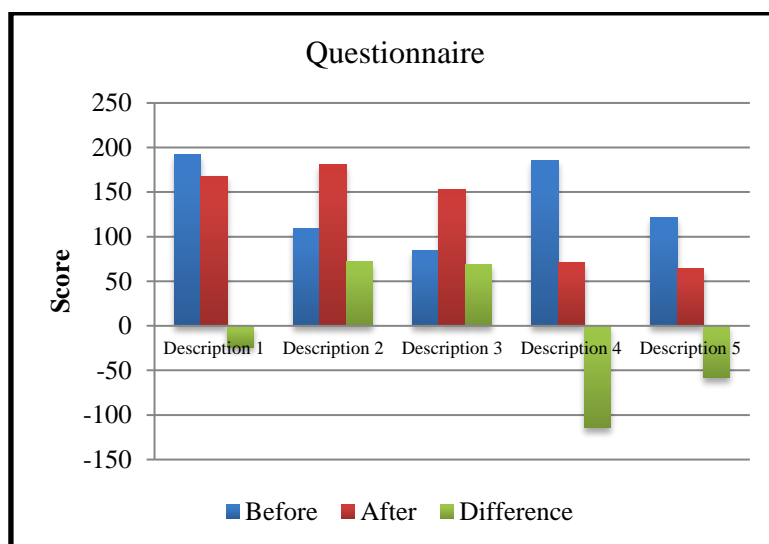
## RESULTS AND DISCUSSION

### Community Social Change

#### 1. The Role of Forest Resources for Forest Village Community

Forest resources have important role in life, both directly (tangible) and indirectly (intangible), the role of forests can be directly seen with evidence of the forests existence as source of wood based materials, amount of field or land needs for rice fields, gardening, and various other biodiversity that we can use directly. We can feel the indirectly role of forest by the evidence that the forest is a provider of oxygen, water systems regulator, and sources of fulfillment.

The results of quantitative analysis and hypothesis testing about forest resources role for forest village community after the flood occurred, show average score of condition aspect measuring on forest resources role for village communities before and after flood was 138.4 down to 127.4. Based on the calculation of the *Wilcoxon Signed Rank Test*’s result (data analysis of the SPSS version 22 program), the Z value obtained is -2.869 with a probability value of average difference test scores on socioeconomic conditions before and after is 0.004 ( $P = 0.004$ ) where less than 5% of research critical limit ( $\alpha = 0.05$ ) or as  $P \leq \alpha$ , and the calculated Z value  $-2.869 < 1.96$ , so the hypothesis decision is accepted ( $H_a$ ) or which means there are significant difference in the role of forest resources condition for the village community before and after the flood. This means that the difference in the role of forest resources condition for the village community tends to decrease, it can be seen from the average score before and after the flood on each variable or sample taken in the study.



**Figure 1.** Score Changes in The Role of Forest Resources Condition for the Community

Based on the results of *Wilcoxon* test on the condition variable in the role of forest resources for village community as contained in the research instrument, show significant difference. This significant difference experience change from conditions before and after the flood, where the value of forest resources varied, in form of material yields value, environment services and social services for community around the forest. Efforts to increase

forest resources value are highly dependent on forest resources management ability, starting from the production of forest products and their marketing.

**Table 1. Wilcoxon Test Results of Socio-Economic Conditions (Role of Forest Resources for Community)**

No	Description	Z	P-Value	Information
1	The amount of various benefits from forest production aspect are obtained by the community	3,464	0.001	Significant
2	The system of production and consumption of forest products is subsistence without clear marketing	5,982	0.000	Significant
3	The system of production and consumption of forest products is commercial with clear marketing	5,597	0.000	Significant
4	Amount of land needs for rice fields and gardening is available in the forest	7,412	0.000	Significant
5	Within the peat swamp forest area there are sources of fish	5,385	0.000	Significant

Based on the table above, it can be explained that the production and consumption system of forest products is subsistence without clear marketing channels and distributions, and is commercial with clear distribution and marketing channels are significant, then the amount of land/forest land needs for rice fields and gardening is available in the forest area is also significant, after the flood where the availability of land for rice fields and gardening for the village community is reduced. Before the flood happen in the forest area, fish resources were available, while after the flood occurred, the availability of these sources was reduced significantly. Scoring in the aspect of Socio-Economic Conditions on variable in the Role of Forest Resources for Village Communities can be seen in the following table:

**Table 2. Scoring in Socio-Economic Conditions (Role of Forest Resources for Community)**

No	Description	Before (X)	After (Y)	Difference (YX)
1	The amount various benefits from the aspect of forest production are obtained by the community	192	168	-24
2	The system of production and consumption of forest products is subsistence without clear marketing	109	181	72
3	The system of production and consumption of forest products is commercial with clear marketing	84	153	69
4	The amount of land needs for rice fields and gardening is available in the forest	185	71	-114
5	Within the peat swamp forest area there are sources of fish	122	64	-58
<b>Total</b>		<b>692</b>	<b>637</b>	
<b>Average</b>		<b>138.4</b>	<b>127.4</b>	

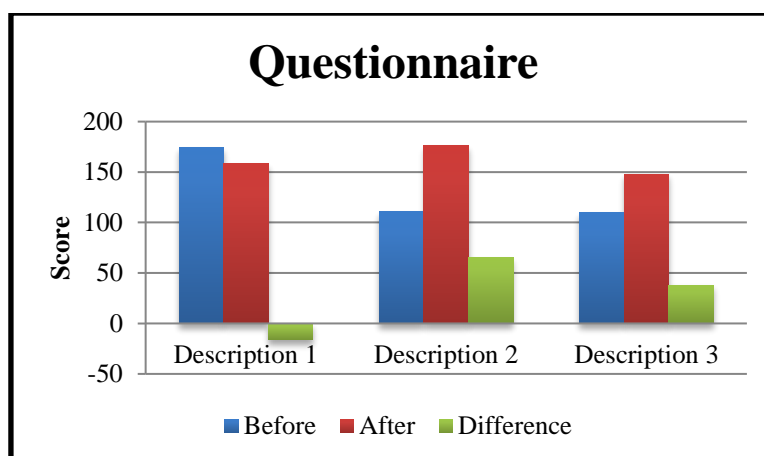
The biggest change is on item of decreasing the amount of land needs for rice fields and gardening available in the forest and the smallest is on item of various benefits from the aspect of forest production obtained by the community. The existence of floods, caused decreasing in forest production function as a source of income, such as fishery resources, farming and fruit gardening land which were previously a source of livelihood for forest village community.

Prior to the flood, the production of forest products obtained by the community was subsistence without clear marketing channels and distributions due to the absence of a definite market. This condition has changed after the flood, where it is commercial to market forest resources like fruits garden product such as bananas, but for processed community products, it is still subsistence without clear marketing channels and distributions because there are not many enthusiast. Before the flood, land needs for farming and gardening was very easy to obtain, so a lot of villagers had a job as farmers, but after the flood, the availability of land for farming and gardening decreased because a lot of community lands were affected by landslides, made the function of forest production down. It was same as the availability of fishery resources, before the flood, there were abundant fishery resources in the forest, but after the flood the fishery resources became reduced and made the river dirty and polluted, so fishing in the river was very difficult.

## **2. Socio-Cultural Condition of Forest Village Community**

In conducting quantitative analysis and hypothesis testing on the status and social role for village community before and after the flood, it can be seen in several instruments studied, namely the position of fathers, mothers and children in various roles in their family life. Prior to the flood, the role of parents was responsible for making a living to meet family needs. By nature, women have reproductive and production roles, but for rural women in the village which are the object of research, that function has changed and is even more inclined to the production function. The main reason for women positioning themselves more as a function in earning income, is for economic reasons, because income and businesses in the forestry and agricultural sectors are not sufficient to fulfill all needs, especially to fulfill the need for daily food.

The results of quantitative analysis and hypothesis testing about the community social conditions on the status and social roles after the flood occurred, namely average score result of the measurement on the condition aspect of the role of forest resources for the village community before and after the flood was 131.67, increasing to 160.67. Based on the calculation results by the *Wilcoxon Signed Rank Test* (data analysis of the SPSS version 22 program), the Z value obtained is -4.536 with probability value of the average difference test scores on socioeconomic conditions before and after 0.000 ( $P = 0.000$ ) where less than 5% of research critical limit ( $\alpha=0.05$ ) or as  $P \leq \alpha$ , and the calculated value  $Z -4.536 < 1.96$ , so the hypothesis decision is accepted ( $H_a$ ) or which means there are significant differences in the role of forest resources condition for the village community before and after the flood. This means that differences in social conditions of the community regarding social status and roles tend to increase, it can be seen from the average score before and after the flood on each variable or sample taken in the study.



**Figure 2.** Score Changes in Status and Social Roles for The Community

Based on the results of the *Wilcoxon* test on variables in social condition of the forest village community regarding status and social roles as stated in the research instrument, there are significant differences. Significant differences experienced changes from conditions before and after the flood, namely the position of the father in the family who acts as the breadwinner of the family's economy in earning a living or livelihood sourced from the forest, the position of mother and child in the family whose role is to assist the father in earning a living or livelihood sourced from the forest is significant in the post-flood period. This can be seen in the following table:

**Table 3.** *Wilcoxon* Test Results on Community’s Social Culture Condition (Status and Social Role)

No	Description	Z	P-Value	Information
1	The position of the father in the family as the breadwinner	2,828	0.005	Significant
2	The position of the mother in the family plays a role in helping the father	5,139	0.000	Significant
3	The position of the child in the family plays a role in helping the father	3,212	0.001	Significant

The biggest change on item The position of the mother in the family plays a role in helping the father, while the smallest on item The position of the father in the family as the breadwinner. Scoring from the aspect of the socio-cultural conditions of the community on the variables of status and social role can be seen in the following table:

**Table 4.** Scoring on Socio-Cultural Community Condition (Status and Social Role)

No	Description	Before (X)	After (Y)	Difference (YX)
1	The position of the father in the family as the breadwinner	174	158	-16
2	The position of the mother in the family plays a role in helping the father	111	176	65
3	The position of the child in the family plays a role in helping the father	110	148	38
<b>Total</b>		<b>395</b>	<b>482</b>	
<b>Average</b>		<b>131.67</b>	<b>160.67</b>	

The condition before the flood was that the father's position in the family played a role as the breadwinner in earning a living or livelihood, while the position of the mother and child only helped the father in earning a living or livelihood. This is different from after the flood where the role of making a living is carried out by fathers and other adult family members due to decrease in father's income in earning a living for household needs, jobs for mothers and children for example, to be able to work in the production of snack products such as taro chips do not require a diploma or higher education, only with special skills such as being able to cook and neat (clean) can already work at the Batang Alai Forest Management Resort.

Regarding the change in people's mindset towards environment where rural communities have the following characteristics: The lifestyle of the people is very simple, Rural people are generally solid, harmonious, unified and very family-oriented, customs are still upheld in life, most people live depending on forest products, the community also has a friendly, polite and caring nature for the environment. The mindset of the community in this study, are related to environment change, that are open minded and acceptive to policy changes, changes in the mindset of family members which carry out routines so far, mindset changes on dealing flood in order to increase awareness on the importance of disaster management efforts and mindset changes in protecting environment cleanliness due to flood.

The results of quantitative analysis and hypothesis testing on the impact in social mobility aspects of forest village community before and after the flood showed the average score before the flood was 107.25 and after the flood increase to 175.75. Based on the calculation results of the *Wilcoxon Signed Rank Test* (data analysis of the SPSS version 22 program), the Z value obtained is -6.917 with probability value of the average difference test scores on socioeconomic conditions before and after is 0.000 ( $P = 0.000$ ) where less than 5% of research critical limit ( $\alpha = 0.05$ ) or as  $P \leq \alpha$ , and the calculated value  $Z -6.917 < 1.96$ , so the decision is accepting hypothesis ( $H_a$ ) or which means there are significant differences in aspects of the community's mindset before and after the flood. This means that differences in social conditions of the community regarding the mindset of the community tend to increase, which can be seen from the average score before and after the flood on each variable or sample taken in the study.

Table 5. *Wilcoxon Test Results on Changes in Community's Mindset*

No	Description	Z	P-Value	Information
1	Changes in community's mindset toward the environment that is open minded and acceptive to policy changes	4,735	0.000	Significant
2	Changes in the mindset of family members due to flood that is carrying out routines	5,715	0.000	Significant
3	Changes of mindset on dealing with flood in order to increase awareness on the importance of carrying out disaster management efforts	6,451	0.000	Significant
4	Changes in community's mindset in efforts making to maintain environment cleanliness due to flood	5,872	0.000	Significant

Based on the results of the *Wilcoxon* test on aspects in socio-cultural conditions of the community on community's mindset variable as contained in the research instrument on several aspects that show significant changes, namely: Changes in community's mindsets toward the environment that are open minded and acceptive to policy changes, Changes in family members's mindset due to flood that are carrying out routines so far, Changes in mindset on dealing with floods in order to increase awareness on the importance of taking

action in disaster management efforts and Changes in community's mindsets in efforts making to maintain environment cleanliness due to floods. For more details can be seen in the above table.

The biggest change in community's mindset can be seen from the change in mindset on dealing with flood in order to increase awareness on the importance of carrying out disaster management efforts, while the smallest can be seen from the change in community's mindset toward the environment that is open minded and acceptive to policy changes. Scoring from the aspect of the socio-cultural conditions of the community on the social mobility variable can be seen in the following table:

**Table 6. Scoring of Changes in People's Mindset**

No	Description	Before (X)	After (Y)	Difference (YX)
1	Changes in community's mindset toward the environment that is open minded and acceptive to policy changes	124	170	46
2	Changes in the mindset of family members due to flood that is carrying out routines	91	162	71
3	Changes of mindset on dealing with flood in order to increase awareness on the importance of carrying out disaster management efforts	98	184	86
4	Changes in community's mindset in efforts making to maintain environment cleanliness due to flood	116	187	71
<b>Total</b>		<b>429</b>	<b>703</b>	
<b>Average</b>		<b>107.25</b>	<b>175.75</b>	

The public environment and orientation to nature of the community in the village are strongly related to nature, due to geographical location of the village. People who live in villages will be overly determined by beliefs and natural laws, as in the life mindset. Changes in community's mindset toward the environment are open minded and acceptive to policy changes after the flood, after the changes in community's mindsets along with advances in information technology that is so fast, it is able to change community's way to think about the environment. Regarding the change in the mindset of family members due to the flood which is carrying out routines so far, before the flood the community still carried out routines, for example, such as housewives whose activities were running or managing the household, cleaning the house etc., after the flood housewives had new routines, namely to work in the production of taro chips.

Changes in mindset on dealing with floods in order to increase awareness on the importance of carrying out disaster management efforts, before the flood the community would never suspect that a disaster would befall their village, because the position of their village was on the side of the mountains which have many trees whose roots are binding firmly on the ground, but after the flood the community realized the need to make disaster management efforts so in case, there was a follow-up disaster that is happened, the community would be able to determine how the process would go in the future.

Before the flood, the general habit of the community towards the environment was littering to the river. Changes in mindset on efforts making to maintain environmental cleanliness due to flood have been carried out by the community after the flood, for example, the community worked together in cleaning the environment which was very dirty due to the presence of garbages from broken houses and repairing broken bridges.



### B. Forest Village Community Adaptation Strategy

In order to make it easier to formulate an adaptation strategy model for forest village community due to flood, key success factors are needed, based on Internal Environmental Analysis (ALI) and External Environmental Analysis (ALE) with a SWOT (Strengths, Weaknesses, Opportunities, Treats) analysis approach . The strategy was designed through analysis of internal and external environment by considering aspects of rationality, maximization and achievement-orientation. Internal Environmental Analysis (ALI) consist Strength and Weakness, while the External Environment Analysis (ALE) consist Opportunities and Threats. Based on results of the Internal Environment Analysis (ALI) consists Strength and Weakness and External Environment Analysis (ALE) consists Opportunities and Threats, it can be seen strength score is 2.87, weaknesses score is 0.80, opportunity score is 2.19 and threat score is 0.93. The relationship between these factors can be seen based on Figure 3 below:

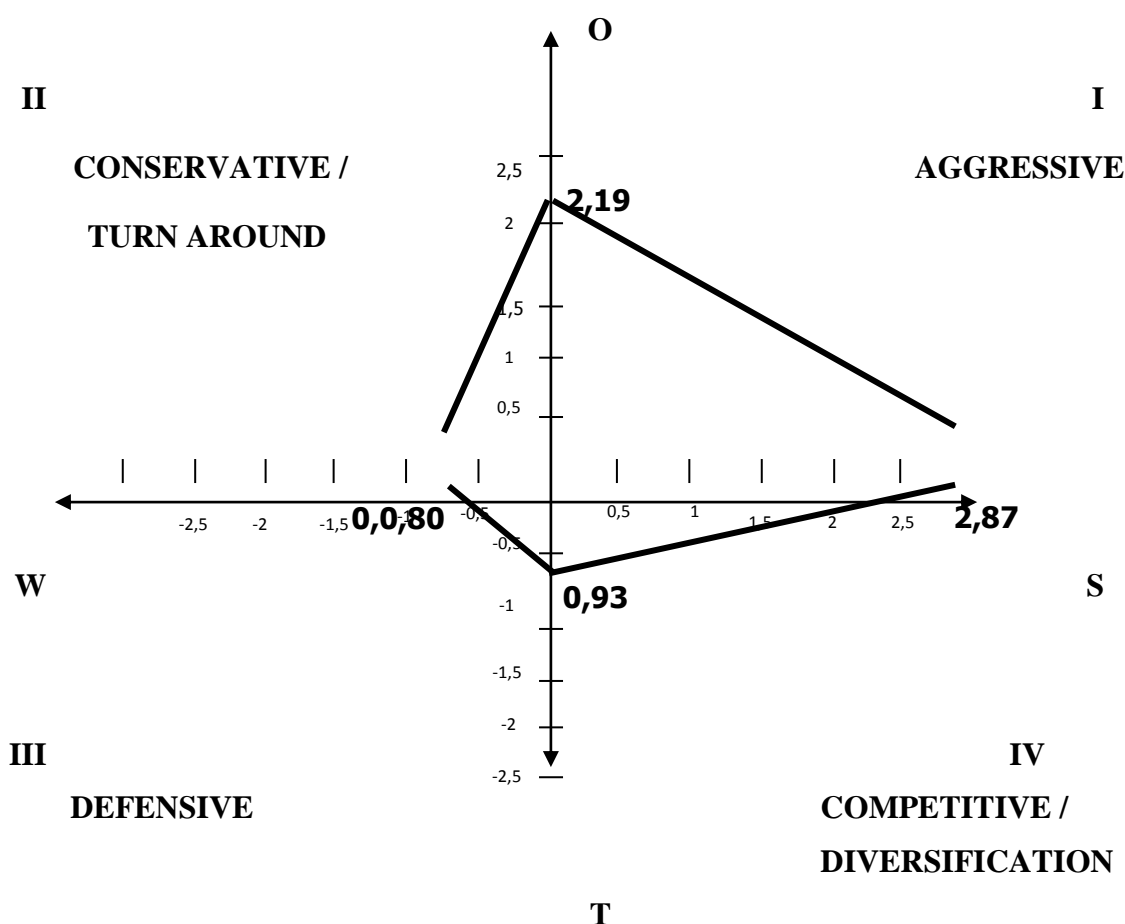
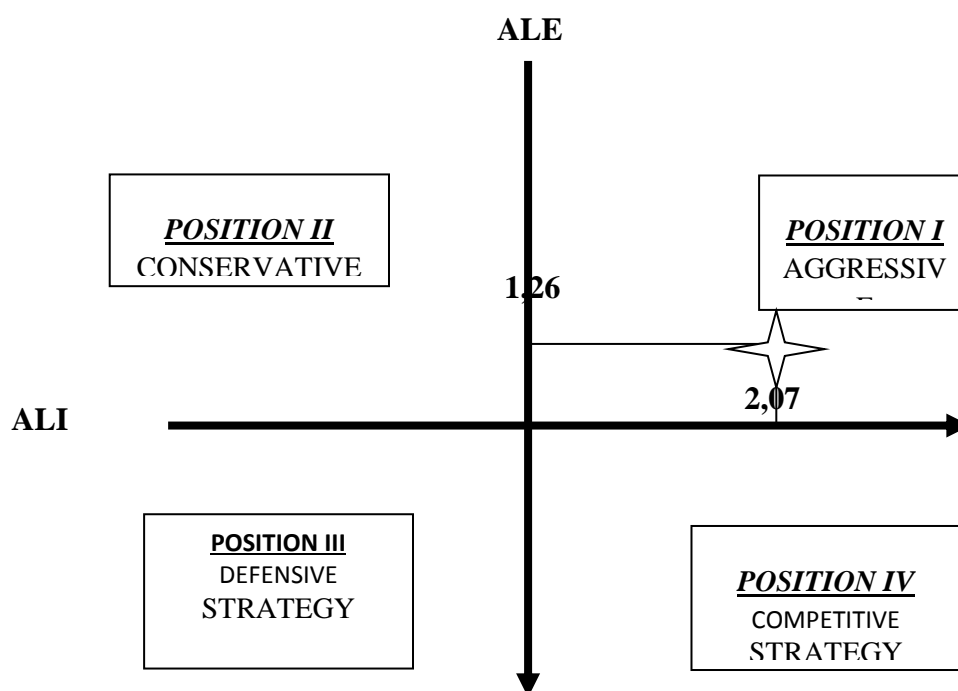


Figure 3. Relationship Between ALI and ALE Factors

Based on the score, it is known that the ALI value is 2.07 and the ALE value is 1.26, both values are obtained by subtracting the value of strengths and weaknesses and subtracting the value of opportunities and threats. Both ALI and ALE values are positive, so it can be concluded that their strengths are greater than their weaknesses. While the opportunities that exist will be able to overcome the threats that arise. Therefore, an appropriate adaptation strategy for forest village community is needed on dealing changes in forest areas due to big floods. This can be done by mapping the score results into Figure 4. as follows



**Figure 4. Determining Position of the Forest Village Community Adaptation Strategy**

Based on the mapping stage, it can be seen that the position of the forest village community is in strategy I, namely the Aggressive Strategy. This shows that with the strengths they have, the forest village community must be able to maximize the opportunities that exist while improving the identified weaknesses. Therefore, when determining the strategy and key success factors, it must be more directed to the aggressive strategy. The strategic actions are actions which is taken based on active behavior, specific actions which are designed to achieve goals clearly and measurable, so that they are related to rationality, maximization, and *achievement-orientation*. To determine the key success factors of strategy, the highest value will be chosen from sum result of relationship between the strategy and the three factors above, which will be determined next, 4 key success strategies whose value ranking is highest in each category which includes the SO, ST, WO and WT strategy categories. So, based on results of the SWOT analysis, it was found that the adaptation strategy model for forest village community was oriented to the 4 strategies above where in dealing on changes in the biophysical environment and changing social environment, forest village community could adapt on farming systems, plantations and gathering forest products.

The adaptation strategy which are carried out by the forest village community supports the four theories that underlie this research, namely Parsons' structural functional theory, Max Weber's rational action theory, George. H. Mead's symbolic interactionism theory and Bennet, Rambo and Martin's Open System theory. The four theories do not exclude each other but complement each other. Based on the functional theory of structural Parsons mentioned that the process of change that will lead to a balance in the social system and changes in the evolution of society will lead to adaptability growth in order to lead to the balance, quoted by Parsons (2010) based on the theory of rational action of Max Weber that behavioral adaptation of forest villages community are carried out by individuals to be free to choose and all actions are determined by internal factors (spirit, mind, self) of humans themselves not by the environment, quoted from Johnson (1986). Meanwhile, from the theoretical aspect of symbolic interactionism, George. H. Mead states that a symbol generally has a number of functions for actors. One of the existing symbols meanings states

that symbols allow people to avoid being enslaved by their environment. According to Blumer which is quoted by Paloma (2003), According to Bennet (1976); Hidayat (2008), they will be able to be more active than passive in self-regulating what they will do. While the theory of Open Systems Bennet, Rambo and Martin provide the basic assumption that the process of selection and adaptation is a process that occurs when social systems and ecosystems relate to each other in open systems. Selection and adaptation in open systems is intended to maintain a balanced reciprocal relationship between ecosystems. and social system so that the social system still *survive* through the flow of matter, energy and information. This is also in line with the results of research by Reed et.al (2013) which states that the ability to adapt effectively with broad absorption is needed where the adaptation strategy scenario must be a synergy between poverty alleviation and conservation of ecosystem services. Socio-cultural factors will also influence people's choices of adaptation strategies. Research by Arthur and D. Hilhorst (2012) states that adaptation to climate change must be carried out in line with social processes and the history of institutions that grow and develop. This is also in accordance with Poerwanto's (2000) opinion which states that the relationship between humans and the biogeophysical environment is not only a dependency relationship but in the form of a mutually influencing relationship and is able to change the biogeophysical environment.

## CONCLUSION

1. As a result of serious flooding in forest area of the Meratus Mountain then there are eleven forest village community behavioral adaptation to biophysical environmental changes. strategic action on adapting to the biophysical environment changes which are caused by flood is a strategic action that is based on active behavior, specific actions which are designed to achieve the strategic action-oriented among others on rationality, maximization and success oriented (*achievement-orientation* ).
2. The adaptation strategy of forest village community due to flood is a survival adaptation strategy while maintaining the system of farming, gardening and utilization of forest products, both timber and non-timber product which have been carried out by the community for generations.

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