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Climate Change and Migration: A Case Study of Coastal Household in Delta Mahakam – Kalimantan

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Abstract. Migration in response to climate change should not be seen as a failure to adapt, but as a strategy undertaken to maintain households' resilience. Objective: This research aims to explain the migration decision-making process of Delta Mahakam households. In detail, this research will consider the impact of climate change in the migration decision-making process of households who emigrated from their village. The increasing number of households migrating from their village suggests the importance of understanding the reasons underlying their movements. Methods: The data collected included qualitative data from in-depth interviews. An interview guide was formulated to facilitate in-depth interviews and generate a better understanding of migration behavior. Expectation: Migration is one of the strategies undertaken to maintain the economic resilience of coastal households. Result: Rising seas is one of those climate change impacts in Delta Mahakam. The impact of climate change forces the household to abandon their hometown. Migration decisions of coastal households in Delta Mahakam are complex, involving both economic and non-economic considerations. These results provide an understanding of how climate change will reshape future population distributions. Keywords: environmental migration, household, coastal, decision-making process, climate change, sea-level rise

1. Introduction

Migration dynamics become complicated when the flow of population movement is associated with the phenomenon of environmental change, which has increased in intensity in recent years, including in several regions in Indonesia [1]. Environmental change is described as environmental degradation, land-use change, disasters and climate change variability. These changes can have an impact on economic activity and quality of life. As a result, hydrometeorological disasters, such as floods, drought and erosion, can trigger the movement of people out of their home regions. Also, disruption or reduced economic benefits from the impact of increased greenhouse gas emissions can trigger disruption of economic activity of the population, which in turn will drive migration decisions [2]. Even so, conceptualizing the relationship between migration and environmental change is the complexity of migration dynamics, which is influenced by the phenomenon of environmental change [3].

Migration is seen as an alternative strategy for the maintenance of household income and not an individual decision. The households need to maintain their livelihood when environmental changes interfere with their living. This condition generally occurs in migration due to the impact of environmental changes. Although migration is not a direct response to the effect of the degradation of environmental resources, the condition of environmental change can be one of the threats to household economic security. This condition can have an impact on migration decision making as a strategy to reduce household economic vulnerability [2]. However, the intention of contemporary migration decisions is not only restricted to facing economic needs. Contemporary migration decisions can be individual strategies aimed at achieving increased social mobility or merely fulfilling lifestyles [4]. Besides, [5] indicates the emergence of new characteristics in the study of migration dynamics, known as liquid migration. Migrants with these characteristics have high mobility, and the intentions of displacement are difficult to predict and can change very quickly. The fundamental strategy of liquid migration is to open up opportunities for every opportunity in various regions.



Environmental changes that will be the focus of this research is the mangrove area of the Delta Mahakam, Kutai Kartanegara Regency, East Kalimantan Province. The loss of mangrove forests marks environmental changes in this area. The government's program to increase agricultural land further aggravates environmental changes in the Delta Mahakam [6]. Degradation of mangrove ecosystems in the Mahakam Delta is caused by changes in coastal ecosystems, mainly due to human activities. The settlement, fish pond and industrial development are the leading causes of damage to the Mahakam Delta ecosystem [7],[8],[9],[6]. Economic development activities that do not pay attention to the integrity of the ecosystem have caused almost the entire delta region to experience environmental degradation. These various conditions of environmental change further aggravate environmental damage and have implications for changes in the livelihoods of local communities. Changes in local community livelihood can be seen from several things such as the peril of community economic income due to disruption of land productivity, flooding, availability of clean water and pollution.

The objective of this research is to explain the migration decision-making process of Delta Mahakam household. In detail, this research will consider the impact of climate change in the migration decision-making process of household who emigrated from their village. The increasing number of households migrating from their village suggests the importance of understanding the reason underline their movements.

2. Methods

This research used primary data to explore the objection and research questions. Qualitative approaches with the descriptive method were used for this study to understand the issues related to the migration decision-making process. Descriptive methods is a research method that is trying to find a proper explanation of activities, object and people. Descriptive research methods associated with the process of collection of facts, identify and predict relationship within and between variables. With qualitative research methods, we can relate ideas, perceptions, opinions and belief of research objects which will be examined and all of them cannot be measured with numbers. Primary data collection will use the in-depth interview. An interview guide was formulated to facilitate in-depth interviews and generate a better understanding of migration behavior.

In qualitative research, the subject of research is the informant/participant who provides research data through interviews. The informant of this research is the head of the household in Delta Mahakam, Kutai Kartanegara Regency, East Kalimantan Province. Meanwhile, the object of this research is the impact of climate change on the migration decision-making process. Participant recruitment is the first stage process of selecting an individual from the population to participated in the research study population [10]. The participant in qualitative research is chosen because they have experience and understand the research phenomena. In this research, I used purposive recruitment for the flexibility process.

The first data collection in this research was in-depth interview techniques. An In-depth interview is a method of collecting data with a conversation between interviewer and interviewee to discuss specific research topic in depth. An In-depth interview is a meeting between two peoples to exchange information and idea through question-answer that can be constructed meaning in a particular topic [11]. The interview is also a tool to re-check or proof information and also the technique of direct communication between the researcher and participants.

To gain information, the researcher needs a semi-structured interview guide. In this interview, the interviewer asks a question and motivate the participant to share their perspective and experience [10]. The interview took place in a comfortable atmosphere, and most of the participant was free to share their migration experience. The average duration of the interview ranged from 15 to 30 minutes. The interview was recorded using a digital recorder. For the data analyzed, this research use a transcript from the in-depth interview.

3. Results and Discussion

3.1. Migration

The simple understanding of migration is moving activities. Migration is a movement by people from one place to another to settle temporarily or permanently in the new destination. Migration is also defined as a movement of a person or group of one unit's geographic regions across the political or administrative borders. Lee [12] explained migration as a permanent or semi-permanent change of residence. He stated that "no matter how short or how long, how easy or how difficult, every act of migration an origin, a destination set of obstacles" [12]. Based on Lee's theory, the factors of migration decision-making are 1). Factors associated with the area of origin; 2). Factors associated with the area of destination; 3). Intervening obstacle; 4) Personal factors.

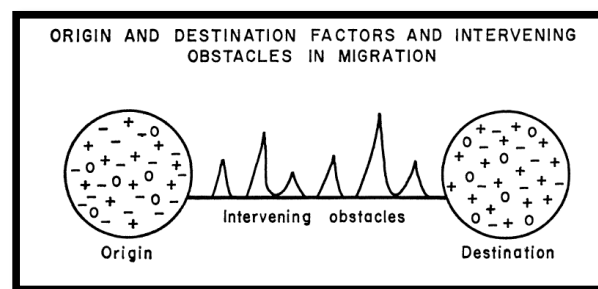


Figure 1. Theory Push and Pull of Migration [12]

The “+”, “o”, and “-” signs in figure 1 represent the factors that attract people from and to the area of origin and destination. Every migrant can have different factors because those factors are influenced by personal factors such as income and duration of stay. Migration may result from the balance between “+” and “-” factors, but the intervening obstacles have to be overcome.

Based on Lee's theory, a push and pull model determined by positive and negative factors in areas of origin and destination, intervening variables, and also personal factors. Factors in the form of push and pull consist of a variety of variables such as the labor market, the difference in wage levels, land ownership, ethnicity and familial ties, transportation, access to various facilities and political factors in areas of origin. Personal factors, such as level of education and experiences, is the most influential factor in the migration decision-making process.

The motivations for migration are affected by a push and pull factors. Push factors always exist at the point of origin and pull factors in the destination. Migration can only occur if the reason to migrate is remedied by the corresponding pull at the destination. In the context of economic reasons, push factors are often characterized by the lack of job opportunities in origin and pull factors are the economic opportunities in the destination area. In the context of student migration, the pull factor of their ability to migrate is compromised of four elements: student's family and personal history, the experience of mobility, experienced adaptation to another culture and their personality [13].

3.2. Decision-making

This research used a rational choice theory to understanding the decision making process of migration. The concept of rational choice theory starts with the idea that individuals have preferences and choose according to those [15]. The decision to migrate fully committed by individual level, even though the decision making is a multifaceted process with the interaction of diverse component that contributes to an individual's decision.

Becker [16] states that an individual will choose one of several alternatives in determining a choice. An individual will choose an alternative that gives maximum advantage for them. With their rationality, an individual would embrace the economy and another principle such as psychological on deciding on minimum cost and risk. The rational choice theory is subjective through and through [17]. An individual has a rational belief and option available to them.

Making rational choice depends on the source of information of the individuals. It is impossible to assume that all individuals can have information to make the best choice among the alternatives. Therefore, the quantity and quality of information have profound effects on choice.

Rational choice theory is used as one of the approaches in the decision to migrate on the individual level. This theory is in a micro-level approach for understanding the decision-making process of the individual. According to Todaro, a significant boost of migration is a rational consideration of the advantages (benefits) and expenses (cost). With their rationality, migrants attempt to maximize their decision based on advantages and disadvantages. They also have a probability of success of their decision before they migrate in the destination places. Making a rational choice of a decision depends on the availability of information from the migrant. The quality and quantity of information will affect their decision.

3.3. *Migration and Decision-making Processes*

The emergence of new nuances in the dynamics of migration in the era of globalization become inevitable. Although the main driving factor of contemporary migration is similar to the traditional migration, namely economic motive. Kahanec and Zimmerman [18] suggest that the mobility of the population regarding the phenomenon of globalization is generally done by people who have the expertise or higher education, as well as voluntary. The process of the globalizing world participates an essential role in the increase in migration flows, mainly voluntary to non-economic motivations, such as going to school, getting married or retiring. Also, a variety of non-economic motivations, such as interest in the lifestyle in certain regions started to encourage residents in an area to move to another region [19]. Even so, Drbohlav (nd) suggests the motivation of migration, both economic and non-economic, cannot be explained separately because generally interrelated and multi-casual. This can give an idea of the complexity of the dynamics of contemporary migration. In describing the complexity of contemporary migration, Van Hear [20] also proposed mixed migration terminology to describe the diversity of migration flows and migration motivation diversity contained in a migration decision.

Decision in this research refers to the process of decision-making, which began with the identification of a problem, make the specification of objectives/target achievement reflects troubleshooting, make comparisons of various alternatives and evaluate the consequences that would result from each alternative, and then topped with a choice made against several options behaviors that contribute toward achievement of the goals / objectives — assuming that basing this rationality is that the perpetrators of the decision-maker / actor will select actions/behaviors that can give results in total, or the most significant satisfaction / maximum will be obtained [22], [21].

Migration decision-making can be classified into three "classic" approaches to describe the decision-making process, the behavioral approach, economic and structural approach. This behavioral approach introduced by a geographer named Wolpert [23] which is applied in the study of Hugo and Mantra. In development economics approach, an approach that is most widely used in the study of rural-urban migration, both of which occur in African countries and Indonesia. The structural approach, introduced by Mc Gee (1978), when studying the rural-urban migration in countries of Southeast Asia.

The behavioral approach sees the movement of people as a result of decisions made by individuals or a group of people who have more significant advantages displacement than anticipated expenditure. Hugo said that the movement is in response to physical pressure, economic, social, cultural and environmental. This pressure can be the potential to move. Every person needs to be satisfied, and their aspirations are to be realized, if the needs or aspirations can not be met at the residence of origin, then the pressure/stress will occur. Mantra then classifies stress into two categories, socio-economic and psychological. Both of these pressures were general cause to migrate.

In the structural approach, this concept begins with dualistic models. Boeke (1953) and Lewis (1958) distinguishes between the cities of capitalist development with the 'rural' is more subsistence, which in turn encourage rural-urban migration. Decision making according to the structural approach because the individuals concerned are feeling the pressure and inequality caused by structural changes on the socioeconomic conditions society, such as the mechanization of agriculture since 1950 and industrialization in some urban areas after 1967 has led to the migration of rural-urban in East Java.

Decision-making process at the level of the individual in the relationship between migration and social media can be seen from two main components. First, the reasons/motivations underlying the choice/decision made, including the reason for choosing the destination of migration. To gain a deeper understanding of the reason/motivation (rationality), the component 'subjective norm' and 'perceived behavioral control' was also the subject of study. Studies on 'subjective norm' look at the influence of expectations (or experience) of others towards the understanding of decision-makers actors; whether it is also a consideration actor before making a decision; whereas the discussion about 'perceived behavioral control' is the actor's perception of the ownership of the asset and the presence/absence of experience to perform the migration. Second, the decision-making mechanism of discussion includes the actor's decision-makers; sources of information acquisition; and decision-making time.

3.4. Decision-making Process of Migration and Climate Change in Delta Mahakam

Bardsley and Hugo [24] explained that three main processes could be used to understand the effects of climate change on migration patterns: (1). Increasing experience on the risk of environmental disasters and other related socio-ecological events; (2). Changes in trends in the condition of natural resources that affect access and effectiveness of its use; (3). Have a risk perception of the effects of climate change.

Based on what Bardsley and Hugo conveyed, it is increasingly evident that various factors must be considered to determine migration patterns in the context of climate / environmental change. The occurrence of a series of environmental changes, such as global climate change, environmental degradation and degradation of coastal and marine ecosystems, are factors that can directly affect migration through environmental factors.

Environmental changes encourage migration through its influence on the economic factors in terms of decreasing productivity (agriculture) and other aspects of livelihoods. Decreased agricultural productivity will have an impact on decreasing household income. Households can be increasingly vulnerable if there are no other alternatives for household income. This condition can encourage people to migrate and restricted the ability of people or households to migrate. The impact of these environmental changes is thus very diverse, depending on the characteristics of the household as well, so that it can produce diverse migration patterns. People who are classified as the poorest, are the most vulnerable population groups whose livelihoods face the negative impacts of environmental change.

The existence of disruption to the ecosystem, not only found in the rapid onset events but also because of environmental events that are classified as slow onsets, such as drought and land degradation. The occurrence of these two events can lead to the failure of productivity of agricultural products, which then encourages displacement on a large scale, for example, in Africa in 2011. Conversely, a relatively small reduction in productivity, only encourages short-term population mobility, both to villages and cities, to seek other alternative income.

Based on the research by social scientists, it can be said that environmental change does not always lead to displacement migration. However, voluntary out-migration can also be driven by a decrease in the value of living in a place. When the level of tolerance of people to environmental conditions decreases, this can lead to the migration of large numbers of people from the affected area. In the context of the Mahakam Delta, migration patterns that occur can be said to show more patterns of voluntary movement than forced.

3.4.1. Impact of Climate Change on Livelihood

The threat to shrimp production as the primary source of income of Delta Mahakam fishers continues with more and more abrasion events which have caused damage to shrimp ponds. Environmental degradation, as a result of uncontrolled mangrove conversion, has damaged the function of mangroves as a protector from rising sea levels and abrasion has a direct impact on people's lives. This condition is of course exacerbated by the phenomenon of climate variability change which has also begun to be felt by residents of the Mahakam Delta.

Villagers in the Mahakam Delta feel that life in the Mahakam Delta is becoming worse. Over investment that occurred in the mid-90s due to world market demand pressure and rising dollar prices as an incentive to open large-scale ponds proved that the decision to convert mangroves into ponds based solely on short-term profit interests had permanent effects.

After the shrimp boom in the mid-'90s, pond production significantly decreased from year to year. In early 2000, shrimp losses were significant enough to make pond production collapsed. Fisher considers that the loss of shrimp due to the passage of their ponds by mining industries pipes that cause disease in shrimp. However, there are also arguments that shrimp losses are due to poor pond management patterns. The traditional pond system makes water salination uncontrolled, and water saturation causes disease. Besides at that time, shrimp production in Southeast Asia at that time was indeed having problems with the spread of the white spot virus.

The threat to shrimp production as the primary source of income of Delta Mahakam fishers continues with more abrasion effects which have caused damage to shrimp ponds. Environmental damage, as a result of uncontrolled mangrove conversion, has damaged the function of mangroves as a protector from rising sea levels and abrasion has a direct impact on people's lives. This condition is exacerbated by the phenomenon of climate change which has also begun to be felt by residents of the Mahakam Delta.

"There was never an increase in seawater or high waves? Not really, Ma'am, we came here, right here in the 90s. There were no abrasions in the 2000s. In the 90s in the distant land, there might have been around 100 meters. Up to 100 meters missing? Yes, even the embankment of the pond was already blocked. More than 50 meters. The forest is deflating. That is now the limit of the embankment." (Interview with Village Official in Anggana)

The issue of climate change is not an issue that is understood by the population related to the impacts they are experiencing. A different perception emerges on the part of the community that the possibility of a mightier abrasion is indicated due to land subsidence due to mining activities.

"... abrasion cannot withstand that wave, the tide, the more years we see, the higher water we do not know what causes it, is the land going down because we are around here, aren't we in the oil and gas region bu. We can name it automatically, right, but we do not know the cause. Because of some complaints from farmers, the more the embankment is raised every year, the more runoff water remains ... " (Interview with Villager in Anggana)

In Anggana, the community has felt the impact of damage to the pond due to abrasion and tides that are getting stronger with patterns that are not as usual. Several village officials explained that there are now many ponds that are not only not operating but have been abandoned. Most of the pond owners in Sepatin are outsiders who pay the pond keepers to take care of their ponds. There are relatively many ponds that have been left behind, but village officials say that the village does not have a record of ownership of the farm. Meanwhile, farmers from the village are still trying their capital to continue operating. There is no inventory of pond areas that have been damaged and abandoned. However, based on interviews with village officials, the number of ponds left behind is already relatively large.

3.4.2. Environmental Migration in Delta Mahakam

Migration related to environmental change began to attract the attention of scientists who discussed it from various points of view. By 2050 it is projected that there will be around 200 million people in this world who move as a consequence of environmental changes that are getting worse and is change demographic [25].

To understand the effect of environmental change on population migration, the scholar can use the Pentagon model [26]. According to the Pentagon, the drivers of population movement consist of five drives factors: social, economic, political, demographic, and environmental. Each of these factors can affect each other in influencing the decision-making process of migration. Pentagon model is a combination of pull factors, push factors, and intervening factors that facilitate or limit population movements. In the context of this research, the intervening factors are livelihood and climate change. According to the Pentagon model, people have limited options for voluntary migration and forced migration. However, environmental changes (including climate) occur slowly.

Based on the results of in-depth interviews with residents of the Delta Mahakam, before deciding to migrate, residents had already taken multiple strategies to adapt. One of the adaptations of the

villager is increasing the height of pond embankments up to 50 centimeters annually. However, their ponds still flooded inside.

"... The dike is not visible when sea-level rise. Every year we add height, but it is useless. The damage to our village is too sharp. Seawater inundates the entire area... Every year..." (Interview with respondents in Anggana)

According to some residents, land subsidence is the cause of ponds flooded with seawater. This condition is different from what was conveyed by an officer from the Department of Fisheries and Maritime Affairs of the Regency of Kutai Kartanegara. He said that the rising sea level when rising is due to the influence of climate change. The study of Sutrisno et al. [27] shows that climate change is characterized by sea-level rise ranging from 0.15 to 0.75 cm/year. Even though the villagers did not mention the factors of climate change, indications of the phenomenon of climate change were already apparent. When their environment was getting worse, residents decided to leave their homes.

The phenomenon of climate change is indicated by the rising sea level, which is increasing rapidly, aggravating the lives of residents in the Mahakam Delta. The most visible impact in the study area was the occurrence of pond damage due to abrasion and higher tides with irregular patterns. Observation results showed that the residence and shrimp ponds belonging to the population were submerged in seawater so that they could no longer be used. The impact of environmental damage compounded by climate change has caused population income in the village; most of the fishery business went bankrupt.

The impact of climate change in Delta Mahakam showed since 6-7 years ago. Villagers left their homes because of seawater infiltration in their land. Based on the experience of the population, it can be seen that the livelihood stress factor, which is marked by a decrease in income and the damage factor to the dwellings and ponds, which are assets. It explains their decision-making process of migration.

4. Conclusions

Rising seas is one of those climate change impacts in Delta Mahakam. The impact of climate change forces the household to abandon their hometown. Migration decisions of coastal household in Delta Mahakam are complex, involving both economic and non-economic considerations. These results provide an understanding of how climate change will reshape future population distributions. This study is critical because the results show migration due to changes in the global environment. Based on the results, a group of people in the Delta Mahakam decided to move. However, some have decided to settle down and adapt to the impacts of climate change.

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