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CLIMATE CHANGE AND LIVELIHOODS: ADAPTATION PRACTICES BY RURAL TOURISM COMMUNITIES IN KARIMUNJAWA ISLAND

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Abstract. The impacts of climate change have caused the changes in temperature, seasons, rainfall, sea level, storms, floods, drought, and extreme temperatures. Communities that are at the forefront to get the impacts of climate change are coastal and small island communities, one of which is tourism places. Karimunjawa is as one of areas that get the impact of the climate change. However, in a period of seven years, the development of tourism in Karimunjawa village has experienced a large increase as evidenced by the increasing number of foreign and domestic tourists. This paper aims to describe the phenomenon of adaptation and livelihood resilience in tourism-based villages on Karimunjawa Island as a socio-ecological system by applying the adaptive cycle as an exploratory diagnostic, dynamics, and direction tool of change in the socio-ecological system. This research utilizes a qualitative analysis of the livelihood adaptation strategies adopted by the informants. From the result of this study, it can be perceived that strategies to strengthen the resilience of communities, and especially the poor, must be based on a combination of the most effective measurable and increased commitment to the asset base and measures to provide better services. Therefore, local adaptation strategies are aimed at building livelihood resilience are very important because they will greatly affect the ability of communities to face the impacts of climate change. Tourism development policies in rural areas are very effective in building adaptation capacity and livelihood resilience of local communities. Local government institutions, particularly provincial governments, play an important role in fostering an enabling environment for local adaptation.

Keywords: climate change; livelihood: tourism communities

I. INTRODUCTION

Within a few years, the impacts of climate change serving various countries have become increasingly pronounced. Several countries experience changes in temperature and rainfall, sea level rise, storms, floods, drought, extreme temperatures, and changes in seasons [1]. Indonesia as a developing country is experiencing increased vulnerability due to uncertainty and risks of climate change. Developing countries are very vulnerable to the impacts of climate change because of their sensitivity to climate change and their adaptability to climate change [2].

In particular, as the largest greenhouse gas producing country in the world, Indonesia has received a lot of attention regarding climate change. Greenhouse gas emission is one of the causes of global climate change currently. Indonesia is experiencing continuous environmental degradation at a rapid rate, Indonesia's greenhouse gas emission is mostly caused by forest fires and environmental degradation. As a country that is very vulnerable to climate change, Indonesia must adapt to these various environmental pressures. Indonesia is also at the forefront of the international spotlight because of the country's desire to reduce glass emissions by around 26 percent [3]. The country has a tough development task because of climate change. Drought, heat waves, abrasion in coastal areas, sea level rise, and flooding are some of the impacts of climate change that have significantly emerged in Indonesia [4].

As an archipelagic country, Indonesia has a population spread across coastal areas and small islands. Communities that are at the forefront of the impacts of climate change are coastal and small island communities. Various studies related to the impacts of climate change in coastal areas have been widely studied. Studies related to climate change for coastal systems and lowland areas have been carried [5]. Meanwhile, Klein and Nicholls summarize the nature of the challenges facing the coastal zone with sea level rise and present a conceptual framework for assessing the vulnerability of the coastal zone to sea level rise [6]. Case studies related to the vulnerability of coastal areas and small islands that assess the impact and adaptation to climate change have also been conducted [7]. Basically, population pressure, increasing demand for space and resources, and poor economic performance can undermine sustainable use of the ocean and coastal areas [8]. It is added that this the environmental, economic, and social challenges that climate change brings to coastal areas and climate change [9]. Studies on climate change, adaptation, and livelihood security in the context of tourism development have not been widely carried out, especially in small islands.

One of the potentials of the coastal area is tourism. It is hoped that tourism development will be able to contribute to the adaptability and resilience of livelihoods in the face of climate change [10]. However, the development of tourism

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in the current global era must be accompanied by an understanding of the resilience of the socio-ecological system. Tourism is a good example of the complexity of a socio-ecological system (SES): This is due to the dependence of tourism on natural resources, where there are interconnected elements such as economy, politics, psychology, anthropology and ecology, cross cultural factors, cross-sectional, and international relations [11].

When a large-scale transformation is unavoidable in tourism development, a system for reform and reorganization is required. In other words, communities are able to cope with problems, adapt, and reorganize without compromising the provision of ecosystem services. Resilience is often associated with economic opportunities and choices that can be used to maintain and promote adaptation and learning. [12] defines resilience as "the capacity of a system that undergoes changes to absorb disturbances and reorganize it while maintaining its original function, structure, identity, and feedback". They further define adaptability as “the capacity of actors in the system to influence and managed resilience” [13]. Adaptation and community resilience are mobilization to utilize local resources to reduce or adapt to environmental pressures and associated risks [14] . The development of adaptive capacity through the participation of local communities will be hampered when they feel that their resources are limited for adaptation [15].

In this study we worked with people living in Karimunjawa village. Rural communities in Karimunjawa are people who live on the small island of the Karimunjawa region at the Java Sea [16]. Apart from having high marine resource potential, these small islands are very vulnerable to various disturbances in the ecological system, as well as physical/natural, ecological, socio-cultural, and political disturbances [17]. One of the high potential resources in an archipelago is the tourism sector [18].

Indonesian government is currently focusing on developing small islands as conservation areas in relation to the tourism industry. In a period of seven years, the development of tourism in Karimunjawa village has experienced a fairly large increase as evidenced by the increasing number of foreign and domestic tourists [19]. There is a rapid growth in facilities for the tourism business [20] . It is interesting to study the adaptation and dependence of the community in the face of socio-economic and ecological changes in the region, as well as the development of sustainable tourism in the growth of tourism areas in Karimunjawa [21].

This paper is intended to describe the phenomenon of adaptation and livelihood resilience in tourism-based villages on Karimunjawa Island as a socio-ecological system by applying the adaptive cycle as an exploratory diagnostic, dynamics, and direction tool of change in the socio-ecological system [22]. This paper draws on the experience of tourism development involving highly vulnerable communities on Karimunjawa Island. This study uses a general model of vulnerability to identify and describe exposure, sensitivity, and adaptation in changing conditions among poor households on Karimunjawa Island. This paper provides an overview of the areas of climate change, adaptation and livelihood security. This paper focuses on outlining the interaction of conditions experienced by people facing climate change and opportunities to adapt to the climate.

II. RESEARCH METHODS

Study Area

We conducted field studies on Karimunjawa Island, one of the small islands at the Java Sea. Karimunjawa Island is geographically located 45 nautical miles or about 83 kilometers northwest of the city of Jepara, Central Java with an altitude of 0-605 m above sea level. Geographically it is located between 5o40'39 "- 5o55'00" and 100o31'15 "East Longitude, which has an area of 169,800 ha, consisting of a land area of 7,120 hectares and a water area of 162,680 hectares [23].

The climate in the Karimunjawa Island is influenced by tropical climates with the influence of sea breezes that blow throughout the day with an average rainfall of 3,000 mm per year, with an average temperature of 26-30oC, a minimum temperature of 20oC, and a maximum temperature of 34oC. Relative humidity between 70-85% with air pressure ranging from 1,012 mb [24]. The study area is characterized by four seasons that occur throughout the year, namely the eastern, first, western, and second season. West monsoons with the west winds the biggest affect the life of the people in Karimunjawa. This West Season causes large and high waves that can cause large and high waves that can interfere with sea transportation activities [24].

Most people in Karimunjawa work in the informal sector, i.e. 88.56% with the highest percentage as fishermen (59.53%), and as farmers (19.32%) whereas others work as farm laborers, construction workers, artisans/craftmen, shopkeepers/tradesmen, breeders and mechanics [25]. As a matter of fact, it is very difficult to distinguish between the communities of fishermen and farmers, and classify them into two groups in terms of means of livelihood because in reality many of them are engaged in both spheres. At certain times they cultivate the fields, but at other times they also go fishing or manage inland fisheries [26].

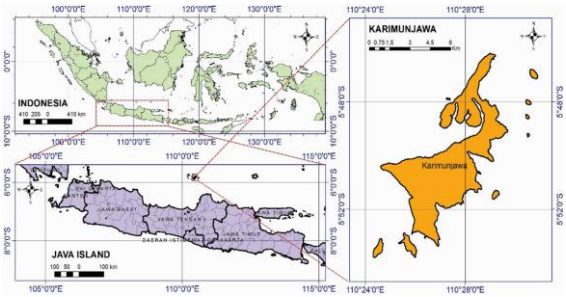

Figure 1. Map of Study Area

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By adopting a case study method, the researchers explore how people bring their experience, knowledge, and efforts that will gradually enable them to adapt and increase their livelihood resilience amid climate change. In-depth interviews were conducted with 5 informants who were selected using the snowballing sampling method [27]. The technique is considered very appropriate in terms of effectiveness in obtaining unit cases according to the expected criteria. Researchers make initial contact with a small group of people who are relevant to the research topic and use them to establish contact each other, so that this method no longer requires a sampling frame [28]. The sample is not random, therefore, the general picture of the population may not be well represented [29]. These key people represent the most capable people in the tourist village, where they are able to provide some important data and information as individuals, households, and members of the community. Some of these people are also undergoing a transformation process of adaptation and livelihood resilience [30]. Investigating adaptation and livelihood resilience strategies adopted by farming and fishing households in Karimunjawa has important implications for the success of future climate adaptation. We conducted a qualitative analysis of the livelihood adaptation strategies adopted by the informants. We explore adaptation to climate variability by communities as it is one of the most frequently cited adaptation strategies[31]Empirical data related to this strategy were collected at both the household and village levels. Data from in-depth interviews were organized, coded and analysed utilizing the principles of content analysis. Data analysis was being done by the inductive approach and manual coding technique[32]. The analysis process begins with categorizing the indicators of transformation from which community withdrew their experiences, knowledge, and efforts to minimize their vulnerability on tourism development [33].

III. RESULTS AND DISCUSSION

Analysis of household livelihood adaptation strategies

In general, people rely on intuition for action in public attitudes and perceptions. The people of Karimunjawa have suffered badly from climate and seasonal changes [34]. They are used to find their own original and simple ways of dealing with uncertainty and disaster and not wait for outside intervention (Table 1). Households in Karimunjawa have limited access to alternative livelihoods and income. This shows the limited access of the community to alternative livelihoods and income opportunities [35]. As a result, they have great difficulty building a livelihood asset base and moving out of poverty. To help improve livelihoods, several recommendations were provided by informants that could be considered in adaptation strategies (Table 2).

Table 1. Summary of autonomous adaptation practices in Karimunjawa

Area of concern	Autonomous adaptation practice
Fisheries	▪ Longer time fishing in good weather ▪ Complementary income sources: • Farming • Other fisheries-related employment (e.g. fish drying and fish vending) • Small business operation • Handicraft making • Labour during harvest in farms and fishponds • Non-agricultural labour (e.g. tricycle cab driving and guide, tour leader)
Agriculture	▪ Change in planting schedule and cropping patterns ▪ Diversification of crops planted – rice, corn, vegetables and root crops
Food Security	▪ Increasing household food stock ▪ Diversification of food sources (e.g. drying fish and gathering shellfish) ▪ Planting root crops and vegetables
Extreme weather events	• Reinforcement of houses Reliance on traditional weather forecasting especially by fishermen • Debt of neighbors or relatives
Others	▪ Loans ▪ Sale of assets (e.g. household appliance, land and livestock) ▪ Reduction in expenditures on food and basic necessities ▪ Change in attitude towards the environment ▪ Praying to God

Table 2. Recommended measures for adaptation strategy

Category	Recommended adaptation measure
Human/ technical	▪ Training of tourism development ▪ Seminar/training on climate change, disaster management, alternative livelihoods and fishery laws
Financial	▪ Access to credit to improve livelihoods ▪ Agriculture subsidies
Infrastructure	▪ Construction of evacuation centre and sea wall ▪ Improvement of roads, street lighting and irrigation system
Others	▪ Increase in employment ▪ Enhancement of investment climate (especially for handicraft and tourism) ▪ Mangrove rehabilitation ▪ coral conservation

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Livelihood Resilience

Fisheries and Agriculture are the main activities for most households in Karimunjawa; but, the intensity of these activities has begun to decrease. The strategies of households are making a living in Karimunjawa vary widely, but the general strategy is that each household member carries out various activities to contribute to one or more household needs [36]. Most households rely on a variety of natural resources and off-farm earnings, i.e. from side jobs or to a lesser extent, from relatives' remittance [37]. The strategy of diversification is very important in Karimunjawa owing to limitations of farmland, a decline in fisheries products and climate change [38]. Table 1 gives a simple summary of the variety of needs and household activities in Karimunjawa and shows the most important activities that contribute to the fulfillment of basic as well as indirect needs. As seen in the Table, each activity contributes to several needs. Fishing and tourism, in particular, contribute to several needs of the households. Some fishermen carry out economic activity in tourism i.e. as boatmen, tour guides, souvenir shopkeepers, food vendors, and ojek (motor-cycle taxi) drivers. Although tourism is a new undertaking, it has been adopted by some households in Karimunjawa [39].

The contribution of tourism to household life in the transformation of the Karimunjawa people's livelihoods from fishing and agriculture to tourism occurs toward the background of reduced profits from fishing and agriculture [39]. This also coincides with the development of tourism in Karimunjawa. Tourism promises a better life with immediate availability of money. This attraction is what makes local people involved in tourism-based activities. Initially, tourism services, production, and selling of souvenirs were a side business [40]. As tourists continued to arrive in increasing numbers, the Karimunjawa people immediately gave up their jobs and many of them chose to focus on tourism. On the other hand, the impacts of climate change greatly affect their livelihoods, especially in the agriculture and fisheries sectors (Table 4).

This transition raises the issue of the sustainability of livelihood options that depend on tourism. Such development is usually promoted to provide additional income for local communities to improve the sustainability of their livelihoods [41]. The tourism development in Karimunjawa is bringing about comprehensive changes to local livelihoods. In other words, tourism does not lead to the improvement and diversification of livelihood strategies [42], but, the replacement is one of livelihood strategies for another. Although tourism growth generates a multitude of new income opportunities, these opportunities must be assessed in terms of their contribution to sustainable development [43]

Tabel . Climate change impacts on livelihoods in Karimunjawa

Type of Livelihood	Impact
Fisheries	▪ Income loss: low fish catch/less fishing days ▪ Danger at sea/loss of life ▪ Sickness ▪ Damage to fishing equipment ▪ Unemployment ▪ bad credit ▪ loss of saving ▪ Household food insecurity
Agriculture	▪ Income loss: loss/damage to crops ▪ Household Food insecurity ▪ Reduced soil fertility ▪ Sick or weak livestock ▪ bad credit ▪ loss of saving
Labour	▪ Income loss ▪ Unempoyment ▪ Migration to urban centre to work ▪ Loss of saving ▪ Loans

IV. CONCLUSION

The community response in an effort to increase livelihood resilience can be understood as a form of adaptation. The goals of adaptation strategies are not only to address reduced vulnerability to climate change but also the sustainability and resilience of livelihoods. It is now widely accepted that increasing people's capacity to deal with current conditions not only serves current and future needs, but is also an important contribution to adapting to long-term climate change. It is also increasingly recognized that adaptation is not possible for climate change alone, but that they can be incorporated into development programs to improve livelihoods and community capacity.

Adaptation at the local community level can be understood as the efforts of communities, especially the poor and vulnerable, to maintain their livelihoods and what role natural resources and external services play in livelihood activities. Strategies to strengthen the resilience of communities, and especially the poor, must be based on a combination of the most effective measurable and increased commitment to the asset base and measures to provide better services. Therefore, local adaptation strategies are aimed at building livelihood resilience are very important because they will greatly affect the ability of communities to face the impacts of climate change.

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Looking at the adaptation and livelihood resilience carried out in this study is effective as a tool for assessing adaptation capacity because it is able to (i) uncover local vulnerabilities, (ii) build understanding of the macro and micro level enabling conditions for adaptation, and (iii) identify resilience building options which are locally relevant. This study articulates the vulnerability of human and social assets, thus, establishing the fundamental need to increase human and social capital in Karimunjawa as a prerequisite for building livelihood security in its small island communities. A soft approach that targets the enhancement of human capital and capital will increase the level of resilience of communities, thus, enabling sustainable livelihood systems for communities can pursue robust livelihood strategies. The Karimunjawa case study shows that the analysis of livelihood assets provides insight into important factors in livelihood dynamics.

While national strategies are essential in framing an overall strategy and a general strategy of adaptation for countries, the way these strategies are implemented at the local level requires a specific approach, which takes into account local conditions. Tourism development policies in rural areas are very effective in building adaptation capacity and livelihood resilience of local communities. Local government institutions, particularly provincial governments, play an important role in fostering an enabling environment for local adaptation. They are in a position to understand local conditions better and know how best to deal with them. Adaptation actions by provincial governments, which take into account differences between villages, can better address climate issues and disaster risks.

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