

Climate Change, Adaptation and Livelihood Resilience in the Context of Tourism Development

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ABSTRACT

QuillBot will write your text for you. Paste or write something here and then press the Paraphrase button. Climate change is marked by frequent occurrences of drought and huge waves, which affect agriculture and fisheries. These sectors are the major means of livelihood of the majority of households in Karimunjawa Islands. This article assesses the capacity of farmers and fishermen to adapt and resiliently manage the risks of climate change. A case study method is used here to collect information on how communities learn from past experience, knowledge and efforts, to enhance understanding for their continued existence/survival, adaptation or tenacity in the face of climate change. A number of key informants were interviewed thoroughly, chosen from purposeful and snowballing samples. Key informants were those who were regarded as people with knowledge ability about data and information appertaining to climate change in Karimunjawa, as individuals, heads or members of a household or a community. The results of research also show that intervention that aimed to build resilience of the farmers' and fishermen's households was directed towards increased household incomes, diversification of the means of livelihood and enhanced food security. Tourism development that involves the community contributes greatly to increasing household income and diversifying livelihoods. In order to step up resilience to climate change, there was variation among households in adopting a combination of the act of independent adaptation such as restraining the cost of living, modifying food consumption, and relying on social networks.

Keywords: *Climate Change, Vulnerability, Coping Strategy, Adaptation, Resilience, Karimunjawa Islands.*

1. 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 impact of climate change due to their climate change sensitivity and climate change adaptability [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 emissions are one of the causes of global climate change today. Indonesia is experiencing continuous environmental degradation at a rapid rate, Indonesia's greenhouse gas emissions are mostly caused by forest

fires and environmental degradation. As a country that is very vulnerable to climate change, Indonesia needs to adapt to these different environmental pressures. Indonesia is also a world leader because of the country's desire to reduce its glass emissions by around 26 percent[3]. Because of climate change, the country has a tough development task. Drought, heat waves, coastal abrasions, sea level rises and floods are some of the impacts of climate change that in Indonesia have been significant [4].

As an archipelagic country, Indonesia has a population spread across coastal areas and small islands. The coastal and small island communities are at the forefront of the impacts of climate change. Various studies have been extensively studied on the impacts of climate change in coastal areas. Climate change studies have been conducted for coastal systems and lowland areas by McLean et al.[5] and Nicholls et al.[6]. Meanwhile, Klein and Nicholls[7] sum up the nature of

the challenges of the coastal zone with rising seabed and present a conceptual framework for assessing the coastal zone's vulnerability to rising seabed. Leary et al. also conducted case studies related to the vulnerability of coastal areas and small islands, assessing the impact and adaptation to climate change [8]. The population pressure, increased space and resource demand, and poor economic performance can, in essence, undermine the sustainable use of the ocean and coastal areas [9]. Furthermore, climate change brings environmental, economic and social challenges to coastal and climate change [10]. Climate change studies, adaptation and livelihood security related to the development of tourism, especially in small islands, have not been widely carried out.

Tourism is one of the potential of the coastal area. It is hoped that developments in tourism will help to adapt and resilience livelihoods to climate change [17]. In the current global era, however, the development of tourism must accompany an understanding of the resilience of the socio-ecological system. Tourism is a good example of a socio-ecological system (SES complexity:)'s This is because tourism is dependent on natural resources where elements such as economy, politics, psychology, anthropology and ecology are interlinked and cross-factors are present. International and cultural relations, cross-sectional relations [18].

If a major transformation in tourism development is unavoidable, a reform and reorganization system is needed. In other words, communities can cope, adapt and reorganize without compromising ecosystem services. Resilience is frequently associated with economic opportunities and options for maintaining and promoting adaptation and learning [19]. Walker et al. [20] define resilience as "the ability of the system to absorb and reorganize disturbances while retaining its original function, structure, identity and feedback." Adaptability is also defined as "the ability of actors in the system to influence and manage resilience" [20]. Adaptation and resilience of the community are mobilized to use local resources to reduce or adapt to environmental pressures and associated risks [21][22]. The development of adaptive capacity by the participation of local communities will be impeded if they feel that their resources for adaptation are limited [19].

We worked with people living in the village of Karimunjawa in this study. Rural communities in Karimunjawa live on the small Karimunjawa islands in the Java Sea region. These small islands, in addition to their high marine potential, are highly vulnerable both to various ecological system disturbances and to physical, natural, ecological, socio-cultural and political disturbances [23]. One of the archipelago's high potential is the tourism sector [24].

The Indonesian Government focuses today on the development of small islands in relation to the tourism

industry as conservation areas. Over a period of seven years, tourism development in Karimunjawa has grown considerably, as demonstrated by the growing number of foreign and domestic tourists [25]. There is rapid growth in tourism facilities [26]. It is interesting to study the community's adaptation and dependency to the socio-economic and ecological changes in the region as well as sustainable tourism in the expansion of Karimunjawa's tourist areas.

In this paper the phenomenon of adaptation and livelihood resiliency in tourist villages on Karimunjawa Island are described by using the adaptive cycle as an exploratory diagnostic tool as a socio-ecological system. Socio-ecological system dynamics and direction of change. This article draws on the tourism development experience of highly vulnerable communities in the island of Karimunjawa. This study uses a general vulnerability model to detect and describe the exposure, sensitivity and adaptation of poor households in Karimunjawa Island to changing conditions. This paper presents an overview of climate change, adaptation and security of livelihoods. This paper describes the interactions between the conditions experienced by people confronted with climate change and climate adaptation opportunities.

The following are structured: after the background description, the literature review and the study field's features in the introduction, the methodology used is explained, the results are presented, analyzed and discussed, and finally conclusions can be drawn.

2. METHOD

2.1. Study Area

In Karimunjawa Island, one of the small islands in the Java Sea, we conducted field trials. The islands of Karimunjawa are 45 nautical miles, or around 83 kilometers northwest of Jepara city, Central Java with an altitude of 0-605 m above sea level. Geographically, between the 5o40'39" - 5o55'00" and the 100o31'15" 'East Longitude' area of 169,800 ha consists of 7,120 ha of land, and 162,680 ha of water [26].

The climate in the Karimunjawa region 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 [26]. 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.

Most of the people in the Karimunjawa sector work in the informal sector, i.e., 88,56% as the fishers (59,53%) and farmers (19,32%), while others work as farm laborers, construction workers, craftsmen, traders, farmers, and mechanics [27]. In fact, it is very difficult to distinguish between fishing and farming communities, and to classify them into two groups in terms of livelihoods, because they may be involved in both areas. They grow the fields at certain times, but also fish or manage inland fishing [28].

2.2. Methods

By using a case study method, we examine how people bring their expertise, know-how and efforts with them, which will allow them to progressively adjust and strengthen their sustainability in the face of climate change. Detailed interviews were carried out with 5 informants selected by the method of snowballing. The technique is considered very suitable in terms of efficiency in unit cases according to the expected criteria. Researchers contact a small group of people who are relevant to the subject of research and use it to make contacts so that this method no longer requires a sampling framework. Naturally, the sample is not random, so the

general image of the population may not be well represented [29]. These key people are the most capable people in the tourist village, where they can provide important information and data as individuals, households, and communities. Some of them also undergo a process of adaptation and resilience to livelihoods.

In Karimunjawa, the study of adaptation and resilience strategies adopted by farmers and fishing households has important implications for the success of future climate adaptation. We conducted a qualitative analysis of the informants' livelihood adaptation strategies. The adaptation of communities to climate variability is being examined, since this is one of the adaptation strategies most frequently mentioned [30][31][32]. Empirical data were collected at the household and village levels for this strategy.

2.3. Data Analysis Method

In-depth interview data were processed, coded and analyzed based on content analysis principles [33]. The inductive approach and manual coding technique were used to conduct data analysis. Analysis begins by categorizing transformation indicators, from which the community draws its experience, knowledge, and efforts to reduce its vulnerability to the expansion of tourism.

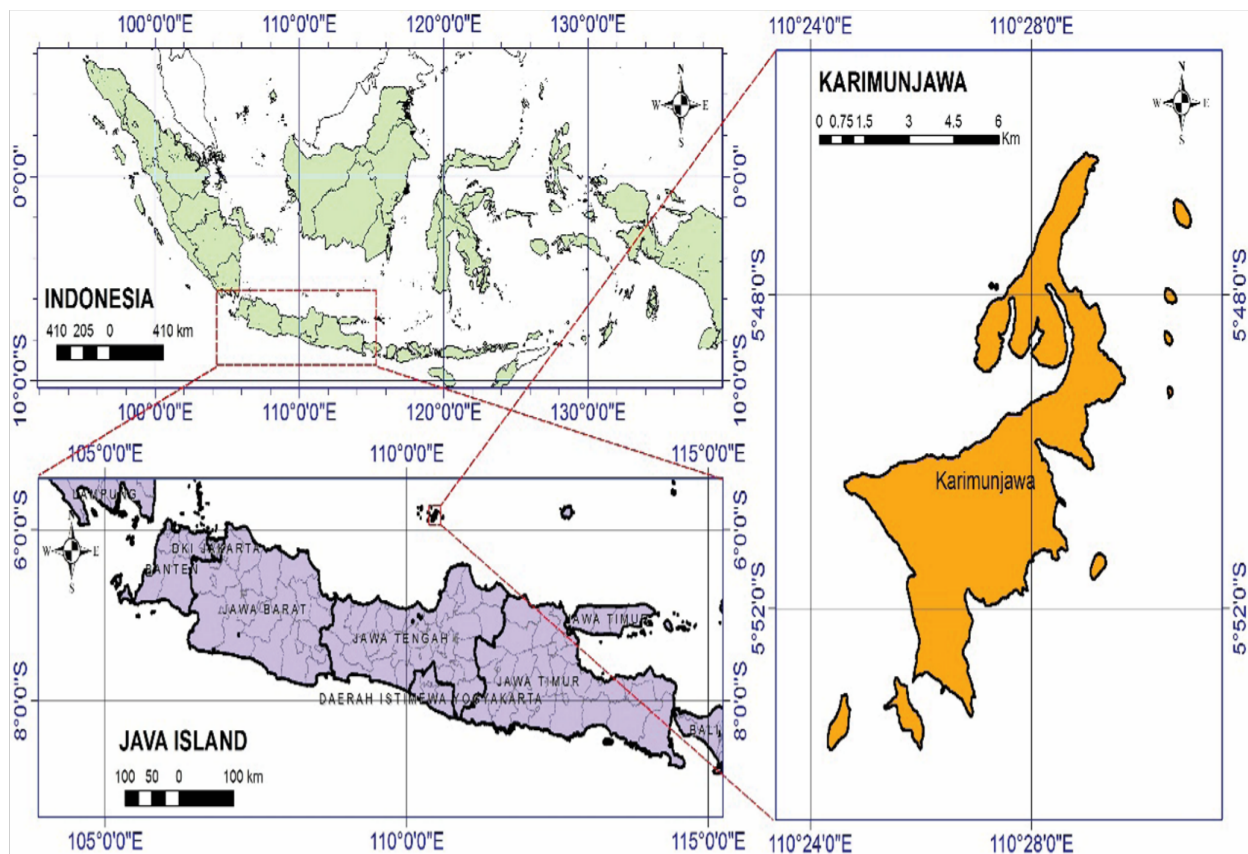


Figure 1 Map of study area

3. RESULT AND DISCUSSION

3.1. Analysis of Household Livelihood Adaptation Strategies

In general, people rely on intuition for action in public attitudes and perceptions [34]. The people of Karimunjawa have suffered badly from climate and seasonal changes. They are used to discover their own

innovative and straightforward ways to deal with uncertainty and catastrophe and do not wait for external assistance as presented at table 1. Karimunjawa households have little access to alternate livelihoods and income. This demonstrates the community's restricted access to other livelihoods and economic alternatives. As a result, it is very difficult to create a livelihood base and get out of poverty. To improve livelihoods, various informants made proposals which can be taken into account in adaption strategies as presented at Table 2.

Table 1. Karimunjawa autonomous adaptation summary

Area of concern	Autonomous adaptation practice
Fisheries	<ul style="list-style-type: none"> ▪ Os Fishing in favorable weather for longer time ▪ Complementary income sources: <ul style="list-style-type: none"> ▪ Farming ▪ Other fishing jobs (e.g., drying of fish and sale of fish) — — Small business operation ▪ To make handicrafts ▪ Work on farms and fish pools during harvest. ▪ The Non-farm labor (e.g. tricycle cab driving and guide, tour leader)
Agriculture	<ul style="list-style-type: none"> ▪ Change in plantation and agricultural patterns ▪ including the diversification of plant crops – rice, maize, vegetables and root crops
Food Safety	<ul style="list-style-type: none"> ▪ Increased stock of household food ▪ Dividing food sources (such as drying fish and harvesting shellfish) ▪ Planting of root plants and plants
Extraordinary weather events	<ul style="list-style-type: none"> ▪ os Houses reinforcement ▪ os Dependence on conventional weather forecasts by fishermen in particular ▪ Debt of neighbors or families
Others	<ul style="list-style-type: none"> ▪ Loans ▪ Sale of assets (e.g. household appliance, land and livestock) ▪ Reduction in food and basic needs expenditure ▪ Change in environmental attitude ▪ Towards God's Praying

Table 2. Recommended measures for adaptation strategy

Category	Recommended adaptation measure
Human/ technical	<ul style="list-style-type: none"> ▪ Future Tourism Development Training ▪ Climate change seminar/training, disaster management, alternative livelihoods and fisheries laws
Financial	<ul style="list-style-type: none"> ▪ Credit access to enhance livelihoods ▪ The subsidies for agriculture
Infrastructure	<ul style="list-style-type: none"> ▪ Building evacuation center and wall of the sea ▪ Improvement of roads, road lighting and irrigation
Others	<ul style="list-style-type: none"> ▪ Reduction in employment ▪ Amelioration of the investment climate (especially for handicraft and tourism) ▪ Rehabilitation of the mangrove ▪ Towards coral preservation

3.2. Livelihood Resilience

Fisheries and Agriculture are the main activities of most households in Karimunjawa; but the intensity of these activities have begun to decrease. The strategies of households for 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. 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. The strategy of diversification is very important in Karimunjawa owing to limitations of farmland, a decline in fisheries products and climate change. 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 fulfilment 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 as been adopted by some households in Karimunjava.

Table 3 shows the contribution of tourism to household life in Karimunjava is very large. The Karimunjava people's livelihoods shifted from fishing and agriculture to tourism in response to declining income from fishing and agriculture. This also coincided with the development of tourism in Karimunjava. Tourism promises a better life with immediate availability of money. This allure is what draws local residents to tourism-related activities. Initially, tourism services, souvenir production, and sales were considered a side industry. As tourists continued to arrive in increasing numbers, the Karimunjava people

immediately gave up their jobs and many chose to focus on tourism. On the other hand, Climate change's effects have a significant impact on their livelihoods, particularly in agriculture and fishing as presented at table 4.

This transformation raises concerns about the long-term viability of livelihood options reliant on tourism. Typically, such development is supported to generate additional revenue for local populations, so enhancing the sustainability of their livelihoods [35]. Tourism growth in Karimunjava is affecting all aspects of local life. In other words, tourism does not result in the enhancement and diversity of livelihood methods [36], but rather in their substitution. While tourism growth provides a plethora of new revenue streams, these streams must be evaluated in terms of their contribution to sustainable development [37].

Table 3. Contribution of different activities to household needs in Karimunjava

	Crops	Livestock	Employment	Harvesting Trees/Plants		Fishing	Tourism
				Wood	Thatching Grass		
Immediate needs							
Food	*	*	***			**	
Water/ Energy				***	*		
Indirect needs/assets							
Cash		*	***			**	**
Investment		**	**			*	*
Input to Production		***	*			*	**
Cultural	*					**	**
Social Capital						*	**

* indicates a minor or indirect contribution
 *** Indicates that the activity makes a major contribution to a need.

Table 4. Climate change impacts on livelihoods in Karimunjava

Type of Livelihood	Impact
Fisheries	<ul style="list-style-type: none"> ▪ Income loss as a result of less fish catch/fewer fishing days ▪ Peril at sea/death ▪ Sickness ▪ Substantial damage to fishing equipment ▪ Unemployment ▪ bad credit ▪ Savings loss ▪ Household food insecurity
Agriculture	<ul style="list-style-type: none"> ▪ Income loss: crop loss/damage ▪ Household Food insecurity ▪ Reduced fertility of the soil ▪ Animals that are ill or feeble ▪ bad credit ▪ Savings loss
Labour	<ul style="list-style-type: none"> ▪ Income reduction ▪ Unemployment ▪ Migration to metropolitan areas in search of work ▪ Savings loss ▪ loans

4. CONCLUSION

The community response to enhance livelihood resilience might be viewed as an instance of adaptation [38]. Adaptation strategies aim to address not only reduced susceptibility to climate change, but also livelihood sustainability and resilience. It is now commonly recognised that strengthening people's capacity to adapt to present conditions serves not just current and future needs, but also makes a significant contribution to long-term climate change adaptation. Additionally, it is being increasingly recognized that while adaptation to climate change is not practicable on its own, it may be integrated into development programs aimed at enhancing livelihoods and community capacity.

At the local community level, adaptation can be defined as the efforts made by communities, particularly the poor and vulnerable, to retain their livelihoods and the role played by natural resources and external services in livelihood activities. Strategies for enhancing the resilience of communities, particularly the poor, must be built on a foundation of the most effective measurable and greater commitment to the asset base, as well as efforts to improve service delivery. Local adaptation methods targeted at increasing livelihood resilience are critical because they will have a significant impact on communities' ability to cope with the effects of climate change.

The examination of adaptation and livelihood resilience in this study is effective as a tool for assessing adaptation capacity because it is capable of identifying local vulnerabilities, (ii) increasing understanding of macro and micro level enabling conditions for adaptation, and (iii) identifying locally relevant resilience building options. This study articulates the vulnerability of human and social capital, emphasizing the critical need to build human and social capital in Karimunjawa as a prerequisite for livelihood stability in the small island settlements. A soft strategy that focuses on human capital and capital development will promote community resilience, enabling communities to pursue resilient livelihood plans. The Karimunjawa case study demonstrates that analysing livelihood assets elicits information about critical elements influencing livelihood dynamics.

While national strategies are critical for developing an overarching strategy and a general adaptation strategy for countries, implementing these strategies at the local level requires a unique method that takes local factors into account. Tourism development initiatives in rural areas are quite effective at enhancing local communities' adaptive capacity and livelihood resilience. Institutions of local government, particularly provincial governments, are critical in providing an enabling climate for local adaptation. They are more equipped to comprehend local situations and determine the most

effective course of action. Provincial governments' adaptation activities, which take into consideration the disparities across villages, can help manage climate challenges and disaster risks more effectively.

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AUTHOR CONTRIBUTIONS

Conceptualization (BS, SEP, ABS); Material research preparation (SEP, ABS); Methodology (SEP, BS); Data collecting (BS, ABS); Data analysis and visualization (SEP, BS, ABS); Writing—original draft (BS, SEP, ABS); Presentation (BS).

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