INTERNATIONAL JOURNAL OF CONSERVATION SCIENCE

ISSN: 2067-533X Volume 10, Issue 3, July-September: 555-564 www.ijcs.uaic.ro

INSTITUTIONAL MANAGEMENT ON MANGROVE FOREST. A CASE FROM INDONESIA

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Abstract

The purpose of this research was to identify the institutional differences of mangrove management according to the characteristics of the mangrove, the role of the stakeholders, and the implementation of related regulations. The sampling method used was snowball sampling on East Lampung Regency and Pesawaran Regency; thus, the data analysis method used was Institutional Analysis Development (IAD). The results showed that there were different management methods for mangrove sustainability, depending on its characteristic (Kajapah and Kahayan type), the stakeholders involved based on their interest and the regulations used. The mapping of the stakeholder role depends on the interaction of the stakeholder, resource characteristics, and the regulation used. On Kajapah type there were: i) the University of Lampung, the community around the forest, the local government, the Watershed Management Agency, and the Forestry District of Province as the key players; and ii) the Agency of National Agrarian, Electronic and Print Media, and NGOs as crowds, with the community being the University of Lampung. In the Kahayan type, there were: i) community, fishery and marine district as the crowd matrix; and ii) the Planning and Development Agency, the Forestry District, and the Environmental Agency as the key players.

Keywords*: Kajapah; Kahayan; Mapping stakeholder; Regulation; Institutional Analysis Development*

Introduction

The set of regulations for mangrove management in Indonesia still lack consideration of the mangrove characteristics. The same regulation could be implemented in every single mangrove forest, even if they have different conditions. As a result, the sustainability of some mangrove forests is questionable. About mangrove management, three key factors should be considered in order to maintain sustainability: the different mangrove characteristics, the role of the stakeholders, and the set of regulations used.

These three things are often ignored in the implementation of mangrove forest management. The involvement of different Indonesian technical agencies, i.e., the Forestry Service, Marine, and Fisheries Service, and the Environmental Service, often leads to overlapping activities. Each technical service has laws and regulations that sometimes do not support each other in its implementation. For example, Law Number 41/1999 is concerning Forestry by the Ministry of Forestry and Law Number 27/2017 concerning Management of Coastal and Small Islands by the Ministry of Maritime Affairs and Fisheries. One example of what happened in the 1990s was that the Forestry Technical Office (Forestry District) planted mangrove seedlings while the Technical Office for Marine and Fisheries (Fishery and Maritime

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District) cut down mangrove trees for shrimp farming extensification [1]. Even when a mangrove forest has been damaged, stakeholders involved tend to take no responsibility and blame each other, rather than attempting to find a solution. In the long-term, this situation might harm the mangrove sustainability.

Lampung Province is one of the areas which have actively implemented mangrove management. Some collaboration to manage mangroves has successfully been implemented, with the University of Lampung as the primary entity [1-5]. Still, most of those previous researches did not discuss mangrove management on un-emerged land, namely Khayan Type. As stated by Berger *et al*. [6], mangrove with land showed that management sustainability should be a trans-disciplinary approach, considering scientific factors, mangrove with the emerged land, local need, stakeholders involved, studies of un-emerged mangrove and regulations used. Also, Abdullah *et al*. [7] reported that the scholars who were focused on institutional mangrove rehabilitation were mainly affected by the regulation used, local community, monitoring and evaluation, and lack of political aspects. The most important thing that is never considered for mangrove sustainability is mangrove characteristics, which are essential factors. There are no data on the institutional differences of mangrove characteristic management on both emerged (Kajapah type) and un-emerged (Kahayan type) land. The aims of this research were: i) to determine the differences in institutional management on mangrove (mangrove characteristic, regulation, and the stakeholder role) and ii) to map the stakeholder role on mangrove with emerged and un-emerged land.

Experimental

Determination of research location and respondents

This research was focused on Lampung Province, Indonesia, particularly at East Lampung Regency and Pesawaran Regency. Qualitative methods were used in this research [8]. The respondents were selected by purposeful sampling to identify all stakeholders involved, both direct and indirect users of mangrove utilization. Thus, snowball sampling was used to find representatives of NGOs and local governments.

Collecting data method

This research used both primary and secondary data. Primary data were collected through in-depth interviews with the respondents, while the secondary data used were maps of Citralandsat, villages' monographs, and both national and international journals.

Data analysis method

This research employed Institutional Analysis Design (IAD) [9] to analyze the institutional differences in implementation of mangrove management at research locations.

Results and Discussion

The characteristics of mangrove forest

The characteristics of mangrove forest at both locations (East Lampung and Pesawaran Regency) were different due to their geographic dispersal. In East Lampung Regency, mangrove grows directly to the sea (Fig. 1), while mangrove forest in Pesawaran is generally surrounded by small islands (Fig. 2). This difference causes changes to their biological diversity and the formation of vegetation inside the mangrove forests. *Avicennia* sp. dominates East Lampung Regency since there is forestry near it. In contrast, Pesawaran Regency is dominated by the *Rhizophora* sp., since there is no emerged land due to the small islands surrounding it and the fact that it was protected by large waves.

As reported by Lignon *et al.* [10] that the mangrove forest performed different functions as well as their production of goods and services. Different physiography provided different attributes to mangrove forest. There were diverse constituents, interdependence between parts,

connectedness, and adaptation. The larger variety in the quality and intensity of forcing functions, as well as the structural and functional diversity, allowed the species involved to interact and adjust to the environment in which they develop due to their plasticity. Knowledge of the characteristics of mangrove ecosystems could help to determine exactly how to manage it. Often, the policy of management was the same without looking for differences in it. Mangrove forest along coastal and marine areas needs to be more integrated and dynamic than terrestrial management. This has a significant influence on the marine region and the border between the land and marine environments.

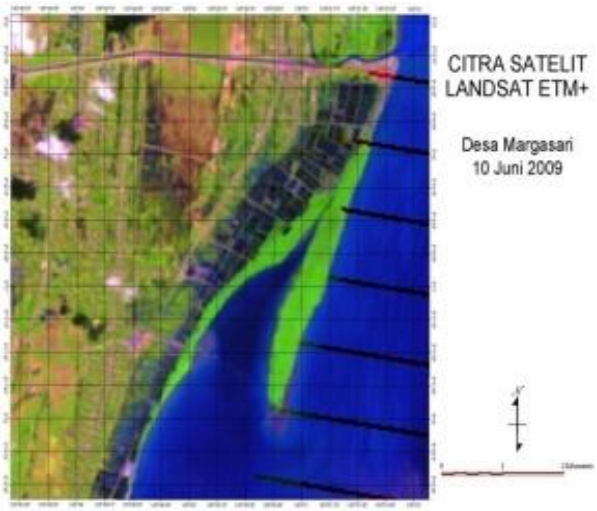

Fig. 1. Mangrove Forest in East Lampung Regency

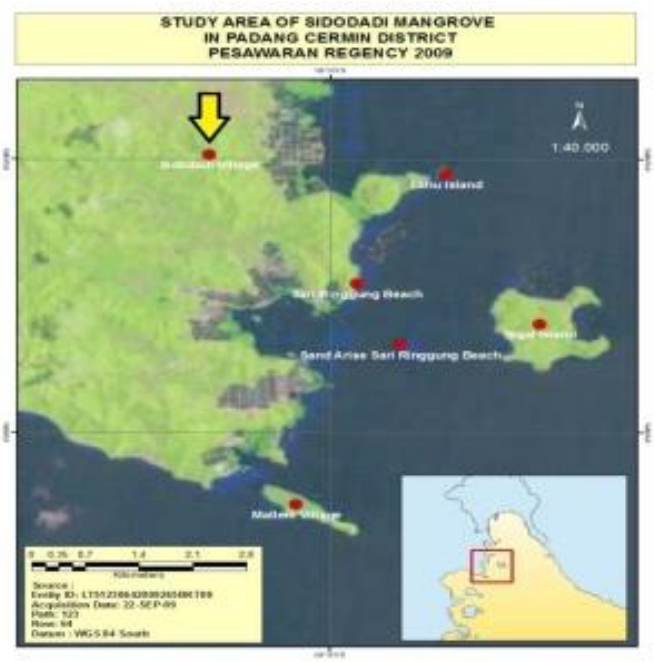

Fig. 2. Mangrove Forest in Pesawaran Regency

The mangrove forest in the study area was a green belt and guarded by the people from 1977-1980. The preliminary mangrove conversion was used for traditional prawn ponds and poultry farms as a tourism area. Prawn farming has a significant contribution to increasing farmers' economic welfare, even though this activity was illegal. Moreover, the land was privatized later and was inherited through generations or sold to a third party.

In 1980-1990, mangrove forest started to open up for legal traditional prawn farming and brought great success after. In the next year, the mangrove management became a big issue due to the government's concern and the awareness of society about mangrove existence and its benefits. As a solution, since 1995, people have started to use modern systems for large-scale prawn farming.

Another problem has arisen lately since the boundaries of prawn ponds had not been well-established; some prawn corporations even extended their ponds by coastal reclamation. As their responsibility, they conducted mangrove replanting. This program has been supported by local governments, NGOs, and the Indonesian National Army.

Mangrove forest evolution on East Lampung Regency started from 1977 until 1990 as open access of resources. People got the benefit of the mangrove by using it in their daily routine. The community, with its headman of the village, was permitted to clear the forest to create 14 traditional prawn ponds. This changed the property of right to private right. The conversion of mangrove forests to another function started from 1977, and was encouraged by the booming world export, especially to Japan, Hongkong, China, America, and some countries in Europe [11], it also occurred in Indonesia, Malaysia, Thailand, Vietnam, and the Philippines [11-14]. The price at that time ranged from Rp 120,000/kg to 13 $/kg, or 11 €/kg. The peak of prawn exports was in 1980-1987, but the production of prawn ponds from mangrove forests caused trouble [1]. The cutting down of mangrove trees destroyed the area along the coast. Then, by 1990, abrasion from the sea reached the prawn ponds. There was no property right on it, and private prawn ponds were eliminated. The area became the sea. However, a natural preserve of mangrove at Teluk Kelumpang Borneo Island was destroyed by the attitude of the local community; for example, socioecology reasons, as well as socioeconomic and sociocultural aspects. There was still a need for guidance from the local and central governments, including planning, organizing, implementing, and controlling [15].

The Forestry District initiated the plantation of Rhizophora in 1995. This led to successful growth up to the sea in 2004). The mangrove vegetation growth induced the sedimentation (land emergence) around it. It was a state property right.

Stakeholder role in mangrove management

There were different stakeholder roles based on the different mangrove characteristics. In the mangrove with the land, the roles involved the community, investors, head of the village, the forestry district, and the university. The community became aware of the importance of mangrove forest stands. The abrasion from the sea had destroyed villages in 1990; the prior initiative of cooperation with the University of Lampung was agreed by the headman of the village. The damage to their village changed their mindset regarding how to manage the mangrove forest. Communication between the head man of the village and the University of Lampung was an vital process to exchange experiences and ideas, and hence was a vital trigger for altering knowledge and perception [16] on cutting mangrove tree for traditional prawn ponds. However, in mangroves without land, there was stakeholder involvement, e.g., community, investor, head of the village, and forestry district, but no university. Some activities of stakeholders were the same, such as mangrove cutting for prawn pond cultivation.

Much of the interest in mangrove management depends on the stakeholders. Non-wood yields, green belts needed education and research, and prawn pond cultivation, led to some of the interest in mangroves.

The University of Lampung applied the *tripartite concept of* cooperation with the community, University of Lampung, and government of regency. The Government consisted of

the Head of Regency, Forestry District, Fishery District, Environmental District, and Watershed Management Agent [1]. In contrast, in mangrove without land emergence, there was a different stakeholder involved.

The role of the stakeholder in mangrove management with land emergence was identified: i) the the University of Lampung, community around the forest, local government, Watershed Management Agency, and Forestry District of Province were the key players; while ii) the Agency of National Agrarian, Electronic and Print Media, and NGOs were the crowds. The mapping of stakeholders was at a suitable pace. The interest was based on their dependence on the mangrove ecosystem, which could be direct or indirect.

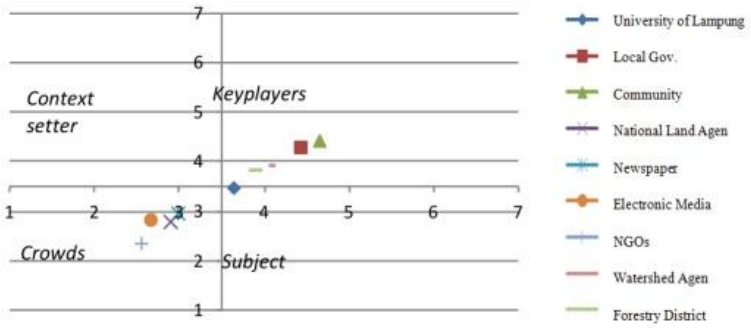

Fig. 3. Mapping of Stakeholder Role on Mangrove Management with Land Emergence

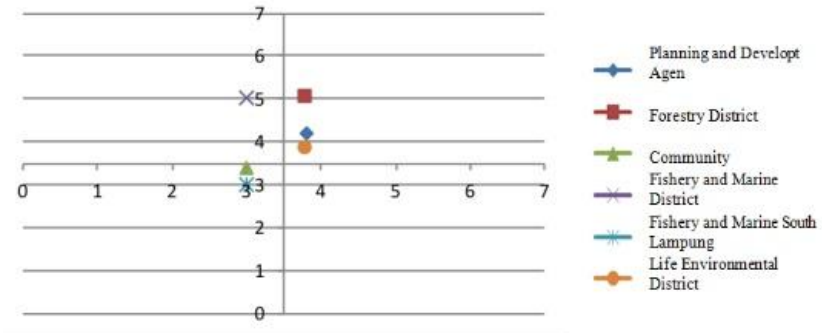

Fig. 4. Mapping of Stakeholder Role on Mangrove Management without Land Emergence

It was shown that different stakeholders are involved in two different mangrove characteristics. In mangrove without land emergence, the community, fishery, and marine district were the crowd position and planning agent, while the forestry district and environmental agency were on the critical player matrix. However, the stakeholder in mangrove with land emergence was the community, local government, and the University of Lampung as key players, while electronic and print media were in the crowd position.

The critical player position in mangrove with land emergence on the community site indicated that this was the only one reason why the community was a key player. The marine abrasion had destroyed the village infrastructure. It was clear to the community how important it is to maintain mangrove forest along the coast. The community felt the importance of mangroves as biological, social, and economic factors to control the life of the land around them. As a common pool resource, mangrove forest should be controlled by groups rather than individually managed. It had been shown that private rights on mangrove ecosystems could give the freedom of access until the transfer of the rights to another. The implication of that is that someone could have different types of rights as follows: a) access, b) withdrawal, c)

management, d) exclusion, and e) alienation rights [17]. The awareness of the community about prawn cultivation by the 13 financiers started in 1987. This happened due to the setback or loss of the cultivation of prawns and abrasion to the land. Significant abrasion came in 1990, where it obliterated 0.5 kilometers of land. As described by Leeuwis *et al*. [16], community awareness could be achieved by mass media campaigns, entertainment-education, visualizing what is difficult to see, and demonstration experiments. However, there were different occasions for the study area; the awareness of the need to maintain mangrove forests was only achieved after damage to the resource itself. To reveal this, exploratory studies were performed using time lines and in-depth interviews with the head of the community and public figures. This is a bad experience for mangrove forest management since there is abrasion to the land on their village. The impact on the community could be seen following interviews.

As reported by Asyari *et al*. [15], involving the community in mangrove management is very important both socially and culturally. Socio-economic indicators, such as utilization based on the absence of access to land, capitalization of the business and source of livelihood, scored 1.717, 0.781 and 0.874, respectively. From the socio-ecological indicators, it can be concluded that the understanding of mangrove forest conservation scored 1.027, environmental services scored 0.753, and the ecological functions of mangrove forest scored 0.735. Socio-cultural indicators which became the foundation supporting the utilization of the sustainable Teluk Kelumpang Natural Reserve mangrove forest, namely: the utilization of cultural function/local wisdom/pond obtained a score of 1.035. The utilization for entertainment functions/recreation/ beach tourism obtained a score of 0.941 and the utilization for educational functions obtained a score of 0.734. Various interests in the community showed the richness of the benefits of the mangrove forest itself.

Local government interest was framed by their primary duty and function. Their primary interests were different, e.g. Forestry district: responsibility in forest policy, rehabilitation, conservation, production and career; Fishery district: responsibility on fishery policy, conservation, production, poverty reduction and career; Planning & Development Agency of Regency: responsibility on research, planning, budgeting, reviewing, and monitoring on program and activities of regency development include mangrove development; Watershed Management Agency: improve the watershed between the upstream-downstream river area, rehabilitate the forest resources; and Mangrove Forest National Agency II of Forestry Ministry (Social Forestry and Land Rehabilitation): gathering data and sources of information about mangrove management in Indonesia, making partnerships with international agencies in mangrove forest management, and institution empowerment in mangrove management [1].

All showed that the interactions among stakeholders depend on the characteristics of the mangrove resources. So far, it depends on its characteristics determined by the regulation of mangrove management that could alter the behavior of the other stakeholders involved.

Regulation on mangrove management

As a renewable resource, mangrove was more vulnerable. The position laid between the land and sea, so the utilization should pay attention to this. There were some regulations in mangrove management, e.g., written or unwritten rules. Unwritten rules were generally carried out from the village and its local officials. As in 1997, mangrove tree cutting was performed for other functions, i.e., prawn farming. The village headman gave a permit for that. Therefore, this followed by the other investors who came from the other village.

Since that time, there has been no coordination among the local government districts to prevent the expansion of prawn farming. This started from one prawn pond then followed until there were 13 prawn ponds. The weak control and lack of regulation on mangrove management were open to conserve or continue the mangrove cutting for prawn ponds.

Mangrove management has changed from time to time; its management has still not been well defined. The regulation was not based on suitable conditions for mangrove resources. Even though there was no difference between mangrove resources and stakeholder roles, the different characteristics of mangroves led to different interactions for performance and management. It was, therefore, necessary to take a close look at the different characteristics, and then the management methods.

The permit for the conversion of mangrove forests to prawn farming was obtained from the village headman. This activity changes the landscape area, from mangrove forest to traditional prawn ponds. To increase the status of the ponds, the farmers were private owners. Each pond was two hectares wide, and the total width of prawn ponds was 13ha.

The interest in mangrove forest conversion was primarily economic. As reported by Kustanti *et al*. [1] and Hidayati *et al*. [11], the international goods market of prawns encouraged mangrove forest conversion. This happened along the coast of Northwest Asia.

There was no regulation of mangrove conversion in that period. It is still a non-formal legal aspect in prawn cultivation. As time goes by, the regulation of mangrove management and related factors improved. There were some regulations, such as: a) Regulation on Spatial Management by Indonesian Number 26 the Year 2006; b) Coastal and Small Island Management Number 27 the Year 2006; c) Regulation Number 41 the Year 1999 about Forestry, and d) Regulation Number 5 (1990) about conservation of resources and the ecosystem. The integration of regulations among the Districts (Forestry; Fishery and Marine; and Domestic Ministry) aimed to harmonize the management stakeholders involved and the sustainability of the resources [1].

Various stakeholder roles in mangrove forest management depend on interest. Some of the primary interests of direct and indirect users in mangrove forests were the existence of the green belt, forest maintenance from conversion to other functions, and the protection of community living [1].

Institutional mangrove management different

The institutional mangrove management aimed to achieve sustainability of the forest and its beneficiaries. The impendence of the actors involved should press boundaries with a decisive role. Property rights in mangrove management are an institution. They are regulated by the relation of stakeholders in mangrove forest management. When it is an open-access resource, it could destroy the resources itself [18, 19]. Therefore, proper rights are needed. The interaction between the actor and the resources of mangroves were different depending on the characteristics. The evolution of mangrove management without land emergence followed an administrative model [4]. The collaboration needs the present stakeholders to run the model, and the role of local institutions in policy decision making is required for the sustainability of forest resources [19-21]. It was different on mangrove management in the study area, which it comes to land emergence. It showed the rights of the private owners without a collaborative model. It also proved that different characteristics of forest resources resulted in different management methods due to the forest, stakeholders involved, and regulations applied [5]. As reported by Abdullah *et al*. [7], from 1980 the mangroves were lost until 2011. It went out to four times faster than the world's land-based forest. This was caused by poor policies of the government, low stakeholder participation, ineffective conservation programs, and a failure to increase awareness among local communities. There was a need for cooperation between the academics, scientists, government agencies, and NGOs.

The characteristics of the area showed less danger compared to the first study. The study area was protected by the island around it. The level of 76 ponds and 226.50 ha showed that more area was saved from the threat of abrasion.

Institutional changes in mangrove development without merging land in this area have become a permanent property right change. This was similar to that reported by Dachang [22], who said that private rights on mountain forest gave independence to the farmer, enabling them to plan, implement and market their products. This aimed to achieve better conditions for economic activity among actors Kasper & Streit [23] and Yustika [24] stated the same for mangrove management.

The changes to mangrove management started from 1970-1980: the mangrove forest was seen as a green belt along the coast; continued from 1981-1990: mangroves were converted into traditional prawn ponds, and from 1991-1995: mangrove management was applied as prawn cultivation had been the focus of attention among the actors due to abrasion disaster. By 1996-2005, prawn cultivation by corporations with private ownership was immense. The existence of

the private corporate in prawn cultivation should be monitored to maintain mangrove forests as a green belt throughout the coast. The bundles of rights were as follows: access & withdrawal, management, exclusion right, and tradable right [25].

The change in mangrove forest was permanently altered. Direct and indirect users are different about mangrove forest utilization. It adapted to mangrove forest characteristics. In mangrove forests with land emergence, direct users opened up the mangroves for prawn using non-modern cultivation methods [4]. While on mangrove without land emergence, direct users opened up the mangrove for modern prawn utilization.

The prawn cultivation was bordering mangroves without land emergence that break sea level of the wave. This could happen because islands surround the environments of mangroves. It is safer for prawn cultivation, especially when it comes to abrasion. Mangrove management with 76 hectares of prawn cultivation in the study area showed a safer indication compared to other areas. However, it cannot last for long. This depends on the environmental management in the area, as it was forbidden to break the mangrove. It requires greater research into how wide the mangrove area as a green belt is needed.

As stated by Kasper and Streit [23], the evolution of property rights on mangrove management was influenced by time and technology. Factually, the evolution of property rights on the mangrove without merging the land is influenced by the characteristics of the resource itself. The technology for mangrove utilization has changed the resources and influences the model of utilization and stakeholders involved. The controversial factor regarding mangrove utilization is that the user can leave the resources if they are not used and damaged [3]. The user can only take economic advantage without considering the sustainability of the resources. The mangrove rehabilitation was poorly controlled by the people around the forest from 1995 to 1997 [4]. The non-energy inertia of the outer of prawn cultivation user has changed property rights.

The indirect use of mangrove management with mangrove conversion to prawn cultivation was found in many countries such as Thailand, Malaysia, Vietnam, and Indonesia [4, 13]. Economic aspects came with a motivation to change the mangrove resource condition in mangrove with and without land emergence. As reported by Krott [26], forest utilization has led to the destruction of forest land. The forest, as a resource to fulfill human needs and enhance development, has experienced changes.

Forest management which involved community participation was far better than state management. This happened in most of Asia but is not happening in Africa and Latin America. Meanwhile, the state forest management was better than open access rights. The same things happen in fishery fields, whereas the state right is better than open access [27].

Butler *et al*. [28] stated that the population growth and the decline in the environment and food security, and weakening cultural ties between islands had nullified any safety valves. Economic pressure, non-working traditional institutions, norm, and governance, and social dysfunction exacerbated resource exploration. Lignon *et al*. [10] stated that the technical information, government support, and information of local communities should be worked over together, is essential for the implementation of integrated coastal management programs. It is possible to manage mangrove areas considering some interests in recreation, tourism, fishing, education and research which they offer, without requiring much manipulation of the mangrove forest system, and then conserving the material and nutrient (energy) flow which sustains its production and controls the water quality for the land.

Conclusion

The institutional mangrove forest management was different for Kajapah and Kahayan type. In mangrove, Kajapah type shows different interactions in ownership in managing resources and stakeholder involvement. In this type, resources are more dynamic and require collective management (communities, universities, provincial and district governments, Watershed Mangement Agents, Print and Electronic Media, and NGOs) compared to Kahayan type mangroves. This type is more stable against abrasion so fewer stakeholders (Fishery and

Marine District, Planning and Development District, and shrimp entrepreneurs) are involved in its management.

Institutional change in Kahayan type has permanently changed property rights. The aim was to achieve better conditions for economic activity among actors. There were internal and external factors which influenced the sustainability of mangrove forest management. The internal factors came from each stakeholder's interest in the mangrove itself, and then external factors came from the market and non-market influences. The dynamics of institutional exchange on mangrove management followed the path line (path dependence) which was not separated. The adaptive efficiency of mangrove forest management will give the community a chance to maximize the opportunity for alternate utilization. Community awareness not to converse the mangrove forest was a lesson learned on adaptive mangrove forest management.

The mapping of the stakeholder role depends on the interaction of the stakeholder, characteristic resources, and regulation used. On Kajapah type there were: i) the the University of Lampung, the community around the forest, local government, Watershed Management Agency, and Forestry District of Province as key players; and ii) the Agency of National Agrarian, Electronic and Print Media, and NGOs as crowds. While on Kahayan type, there were: i) community, fishery and marine district as the crowd matrix; and ii) the Planning and Development Agency, forestry district, and environmental agency as key players.

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Received: September 07, 2018
Accepted: August 26, 2019