Vague property status and future risk of mangroves: lesson learned from South Sulawesi, Indonesia

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Abstract. Mangrove forest management in South Sulawesi is challenging due to jurisdictional boundaries to biophysical processes, resource characteristics, and community development dynamics. The research aims to study the future risk of mangrove forest management growing on accretion land due to its vague status. Data and information were collected through in-depth interviews involving 17 key-informants selected by using the snowball method. Mangrove forest in the research site grows on accretion land, and it was classified as state property with Common Pool Resources (CPR) characteristics. Late attendance of the Indonesian government has instigated the "de jure" status of accretion land becomes illegitimate as the local community does not recognize it as state property. The situation leads to the ambiguity of mangrove forest property status, resulting in multilayer property formulation for several products/services/benefits generated. Several strategies to prevent its transformation into other uses are proposed, i.e., (a) improve the community understanding of the economic value of mangrove resource and risk if vanished; (b) strengthening and intensive socialization of regulations both at the local and higher-level; and (c) providing legal access for the community to manage mangrove forest through the development of Social Forestry Program in the area.

1. Introduction

Indonesia as one of the countries with the largest mangrove forest globally, faces crucial problems that would jeopardize the sustainability of the mangrove forests ecosystem and its function [1]. Mangrove forests are a typical forest growing along the coast or river estuaries built by tides and often found in coastal and sloping areas in the tropics and sub-tropics regions [2, 3]. Mangrove ecosystems can be considered "land builders" because of their ability to trap sediments transported from the uplands and the oceans [4]. This sediment trap process is induced by hydro-geomorphic settings that represent the tidal range and coastal geological formation.

Mangrove resource has a vital role in the ecosystem due to its countless real and intrinsic values in ecology, economy, and social aspects [5–7]. The various functions of mangroves provide both tangible and intangible benefits and services. The real benefits of mangrove are usable, marketable, tradable, and highly-priced. In contrast, intangible benefits often cause them to be unidentified, non-quantified, non-tradable, and unable to be valued using the existing technologies and market mechanisms. As a result, in many cases, mangrove resources tend to be undervalued and unappreciated and eventually misused and mismanaged [5, 8].

Also, not all of the mangrove benefits are generated directly from the environment around/near mangrove resources. Some benefits are taken from the outside of the mangrove forest [9, 10]. It means it is difficult to recognize the mangrove ecosystem's entirety value, resulting in negligence in a coastal
area development plan [11]. Consequently, lots of mangrove forests have been degraded and converted to other forms of land use, such as fisheries, agriculture, industry, and housing/urban development [12, 6]. In 2010, Indonesia’s mangrove area was 5,209,543 ha, but in 2016, the area was reduced rapidly to only 2,496,185 ha. It means that the depletion and degradation of the mangrove ecosystem occurred due to intense pressure from many activities in the coastal zone [7].

East Sinjai Sub District is one of six Sub-Districts in Sinjai District, South Sulawesi, located along the east coast and directly facing Bone inlet. Its geographic position has caused the area to frequently confront the risk of natural disasters, including tidal waves, tsunamis, abrasion, seawater intrusion that menaced community settlement, and sources of livelihood of villages along the coast. This formidable challenge encouraged the community to work very hard and made various efforts to overcome it. After a long struggle, they could finally deal with those multiple threats by building mangrove forests along the eastern part of the East Sinjai Sub-District. The community’s success in planting mangroves independently has positively impacted the environment and the people’s socio-economic conditions in the area. Growing mangrove could protect the area along the coast from the onslaught of sea waves and tidal waves, minimize coastal erosion/abrasion, increase available water consumption as salinity has been reduced, and increase aquatic biotas [5, 8].

However, the outsider people devastated these unique benefits as they are not involved in mangrove planting. Therefore, outside people are prohibited/limit to use mangrove resources in the area (non-excludable characteristic), and its use by one party will automatically reduce the opportunity and proportion of other parties to use it (rivalry characteristic) [hard to understand]. Therefore, mangrove forests in East Sinjai have Common Pool Resources (CPR) characteristics. If it is not well managed, there is a risk of massive and over-exploitation of the resource resulting in the damage of resources very quickly (the commons) [13–16].

Furthermore, most of the mangrove forest in East Sinjai Sub District, South Sulawesi grow on accretion land. By law (de jure), accretion land is defined as state land (state property) following the Government Regulation (PP) No. 16 of 2004. The community does not recognize this status and claims that the land belongs to the community (de facto). Hence there are differences between de jure and de facto situation of mangrove forest property status. It probably due to the government’s negligence in dealing with problems faced by the local mangrove community. In the past, they did not receive significant government support when facing various threats from the sea. The government only arrived after the mangrove forest cultivated by the community thrived. In several cases, the existence of accretion lands often creates problems related to their tenure status, as happened in Cilacap, Central Java, and Cirebon, West Java [17].

Ambiguity in mangrove’s property status has resulted in the formulation of multilayer property for several products/services/benefits resulting from mangrove. CPR’s characteristics and vague status of mangrove forest in East Sinjai, South Sulawesi, is very vulnerable for the conversion into a settlement, ponds, and other uses, which in the long run can threaten its existence. The study aimed to evaluate the future risk of mangrove forest management growing on accretion land due to its vague status.

2. Materials and methods

2.1. Theoretical framework
The research used a qualitative case study method. Data and information were collected in various ways, namely, in-depth interviews with selected informants and participatory observation. We used the concept of property rights regimes as the basic theoretical framework in this research [16]. A common-property (common-pool) resources/CPR was classified in four basic property-rights regimes [14, 16]. Open-access means the absence of well-defined property rights where the right access is free and open to all. Private property refers to the situation; the right holder, either an individual or corporation, has the right to exclude others and regulate the use of the resource. State property or Government property implies that the resource’s rights are vested exclusively for the government for controlling access and regulating use. Communal property or common property means that the resource is owned by an
identifiable community of users who can exclude others and regulate use. These four regimes are ideal logical types. However, in reality, resources tend to be held in overlapping combinations of them, and there is variation within each.

Mangrove forest in East Sinjai has two key characteristics of common property: (i) exclusion or access control of potential users is difficult, and (ii) each user can reduce the welfare of all other users (a jointness problem). Based on these two characteristics, some resources are referred to as common-property (or common-pool) resources and are defined as a group of resources for which exclusion is problematic, and joint use involves subtract-ability [19, 20]. This type of resource includes, among others, fish, wildlife, forests, grazing lands, irrigation, and groundwater. Most wildlands, parks, and public spaces also show common property characteristics, while most agricultural land and mineral resources do not [21]. It has been well understood that resources that share the above factors tend to be susceptible to depletion and degradation. This is very risky to the occurrence of a tragedy of the commons [22].

2.2. Data collection and analysis
Determination of informants was carried out using the snowballing method, a non-probability sampling method, to identify, select, and take samples in a network or continuous chain of relationships [23]. The study was made into two stages to get the critical informants for the research. The first identified potential subjects in the population (only one or two might be found initially). The second asking former informants to recommend other people to involve in the research. Hence, initial key informants did not only provide detailed data on the research topic being studied, but they also helped researchers find other key informants or gave access to other key informants. The process was repeated until the information obtained was saturated. It means that when the information submitted by the next informant was the same as the previous informant. In-depth interviews were carried involving 17 key informants, representing traditional elders, community leaders, religious leaders, East Sinjai natural resource conservation farmer group, village and Sub-District personnel, Sinjai District local government (forestry and plantation services, fisheries and marine services, environmental services, Department of Culture, Tourism, and Information), regional development planning agencies, personnel from the fish auction and local business community in fisheries in Sinjai District. The primary data and information collected in this study were the community's understanding of mangrove forest's property status growing on accretion land, products/benefits/services generated from mangrove forests, applicable local institutions, and future risks of mangrove forest. Collected data and information was analyzed descriptively.

2.3. Location
The research was carried out in East Sinjai Sub-District, Sinjai District, South Sulawesi (Figure 1). The District has the best and most extensive mangrove forest in Sinjai District. East Sinjai District, with 71.88 km², is one of the nine (9) sub-districts in Sinjai District. The site areas are situated between the mouth of the Mangottong River and the Bua River's mouth. It is located between 5°12'38.5" to 5°21'07" South Latitude and 120°16'23.9" to 120°27'31" East Longitude with a length of ± 12.8 km coastline. The topography of the area varies from flat, gentle, undulating to mountainous and rugged. East Sinjai District is at an altitude between 0 to 500 m above sea level (asl) consist of 46.65% at 0 to 100 m asl and 53.35% is at 100 to 500 m asl. The area is located in the eastern monsoon climate where the wet months fall between December to June and the dry months between July to November, with the number of rainy days in a year reaching 170 days based on the data from Pasir Puih Station No 418a [24].
3. Results and discussion

3.1. Biophysical condition of mangrove forest in East Sinjai

Typology of mangrove forests in East Sinjai was similar to mangrove forests in other areas characterized by a robust root system that can bind/trap mud during high tide periods. In areas with a high level of mangrove thickness, the soil tends to have sandy clay texture classes. Probably it was due to the decomposition of litter that influenced the soil texture and the binding of dust and mud particles by the roots of mangrove vegetation. Later, these particles will settle and form mud over time. The mud sediment continuously trapped between the mangrove roots of the mangrove trees will become denser and more massive and eventually develop the land. This arising land is often referred to as emergent or accretion soil. In areas without mangrove vegetation, the soil texture class tends to be sandy because no vegetation binds the mud particles [5].

The mangrove forest found in the East Sinjai District, South Sulawesi, resulted from communities’ long-lasting efforts to plant and conserve natural mangrove trees to prevent and overcome natural disasters caused by tidal waves, coastal abrasion, and seawater intrusion. Subsequently, the success of growing mangrove in East Sinjai has inspired people in other areas to grow mangrove as well, and now mangrove has grown well and spread to three sub-districts, namely North Sub-Sinjai District (Lappa, Balangnipa), East Sinjai Sub-District, and Tellu Limpoe Sub-District (Bua).

Later on, mangrove planting continues to be carried out by the community either independently or with assistance from the Sinjai District Government and other related agencies from both the provincial and central levels. Therefore, it is become a concrete manifestation of community awareness and willingness to conserve mangrove resources. At the time of this research, 15 species of mangroves had been identified, and those species, among others, are *Rhizophora* spp, *Avicennia* spp, *Bruguiera* spp, and *Sonneratia* spp [18].

The most dominant two mangrove species in Sinjai District are locally named as "bakau" (*Rhizophora* sp.) and "api-api" (*Avicennia* sp.). The most extensive mangrove forest in Sinjai District is in the East Sinjai Sub-District that stretches from northwest to southeast along the east coast of Sinjai District. Its total area is nearly 70% of the total mangrove forest area in Sinjai District or 758 ha. It was
located in five villages, namely Samataring, Tongke Tongke, Panaikang, Pasimarannu, and Sanjai [18, 25, 26].

The vegetation analysis results on several observation plots also confirmed that mangrove vegetation in the research site was dominated by Rhizophora spp., followed by Avicennia spp., Sonneratia caseolaris and Bruguiera gymnorrhiza. Mangrove density tended to decrease with the growth rate, from 103,611 individuals ha\(^{-1}\) for seedlings to 6,133 individuals ha\(^{-1}\) for saplings and 794 individuals ha\(^{-1}\) at three levels. The results of the assessment of the Importance Value Index (IVI) done by [5] showed that Rhizophora spp dominated at all stages of growth. At the same time, the codominant type was Avicennia spp., followed by other classes (Table 1). Among those mangrove species found at the site, Avicennia spp and Sonneratia spp are less preferred by the people because their cultivation techniques are relatively more difficult. Also, Avicennia spp. have hardwood, making it difficult to split into planks (its wood texture is in layers), and the tree rarely grows straight [27].

Table 1. The result of mangrove vegetation analysis in East Sinjai Sub District.

| Species                     | *D (ind ha\(^{-1}\)) | RD % | F | RF % | D | DR% | IVI % |
|-----------------------------|----------------------|------|---|------|---|-----|-------|
| A. Seedling                 |                      |      |   |      |   |     |       |
| Rhizophora spp.             | 88.889               | 85.79|  0.89| 49.94| - | -   | 135.73|
| Avicennia spp.              | 9.722                | 9.38 |  0.22| 12.48| - | -   | 21.87 |
| Sonneratia caseolaris       | -                    | -    | - | -    | - | -   | -     |
| Bruguiera gymnorrhiza       | -                    | -    | - | -    | - | -   | -     |
| Acanthus ilicifolius        | 2.222                | 2.14 |  0.22| 12.48| - | -   | 14.63 |
| Ipomoea pes-caprae           | 1.667                | 1.61 |  0.22| 12.48| - | -   | 14.09 |
| Scaevola taccada            | 278                  | 0.27 |  0.11| 6.24 | - | -   | 6.51  |
| Spinifex littoreus          | 833                  | 0.80 |  0.11| 6.24 | - | -   | 7.05  |
| Total                       | 103,611              | 1.78 |   |      |   |     | 200.00|
| B. Sapling                  |                      |      |   |      |   |     |       |
| Rhizophora spp.             | 4.844                | 78.98|  0.89| 61.81| - | -   | 140.79|
| Avicennia spp.              | 1.067                | 17.40|  0.33| 22.92| - | -   | 40.31 |
| Sonneratia caseolaris       | 222                  | 3.62 |  0.22| 15.28| - | -   | 18.90 |
| Bruguiera gymnorrhiza       | -                    | -    | - | -    | - | -   | -     |
| Total                       | 6,133                | 1.44 |   |      |   |     | 200.00|
| C. Tree                     |                      |      |   |      |   |     |       |
| Rhizophora spp.             | 750                  | 94.46|  0.78| 50.32| 8.46| 92.92| 237.70|
| Avicennia spp.              | 8                    | 1.01 |  0.33| 21.29| 0.17| 1.89 | 24.19 |
| Sonneratia caseolaris       | 25                   | 3.15 |  0.22| 14.19| 0.38| 4.18 | 21.52 |
| Bruguiera gymnorrhiza       | 11                   | 1.39 |  0.22| 14.19| 0.09| 1.01 | 16.59 |
| Total                       | 794                  | 1.55 |   |      | 9.11| 100  | 300   |

* D (Density), RD (Relative Density), F (Frequency), RF (Relative Frequency), D (Dominance), RD (Relative Dominance), IVI (Important Value Index).

Since mangroves’ planting has been carried out extensively, the land has begun to form into large, dense, and massive lands. According to the Government Regulation (PP) No. 16, 2004, the land created from the sediment has the status of state land owned by the government (de jure). Still, because the accretion land resulted from the community’s hard work, people did not recognize it and claimed it as their own. Subsequently, as accretion land formation is not the result of individual work but rather the result of collective work, claims to the resources are carried out collectively. However, despite the development of collaborative work, deviations also occur due to individualistic and pragmatic behavior. Besides, the relatively large area of arising land formed makes monitoring of mangrove forests somewhat tricky.
3.2. Vague property status and future risk of mangrove forest in East Sinjai

The mangrove forest ecosystem in Sinjai District resulting from participatory coastal rehabilitation is an example of the local community's success story in protecting and managing mangrove resources well. In addition to its benefits for covering coastal areas, planting mangroves also indirectly increase the land area along the coast through the emergence of accretion land. As already explained before, according to the Government Regulation (PP) 16 article 12 of 2004, the land formed from arising land or reclamation in coastal waters, tides, swamps, lakes, and former rivers is directly controlled by the state. Thus, de jure, the accretion land status is state property even though the land was formed due to the community's efforts. Therefore, the mangrove community made a strong rejection and then they made a strong claim the accretion land as community property (de facto). This difference in accretion land status perceptions has implications for the community's right to access the land. The ownership status (property right) will determine what rights a person [16]. The description of the status and rights were described in the bundle of rights concept, as shown in Table (2).

| Bundle of rights | Status |
|------------------|--------|
|                  | Owner  | Proprietor | Claimant | Authorized user |
| Access and Withdrawal | X      | X          | X        | X               |
| Management       | X      | X          | X        |                  |
| Exclusion        | X      | X          |          |                  |
| Alienation       |        |            |          |                  |

Theoretically, the concept of property rights can be used to explain the ownership status of mangrove lands in East Sinjai. Schlager and Ostrom [16] stated that ownership rights in their implementation could be further divided into several forms: access, withdrawal, management, exclusion, and alienation. The right of access is the right to enter a defined physical limit of ownership. The right to use (withdrawal) is the right to get a result or product from a resource. Management rights are the right to regulate internal use patterns and change resources by making improvements. The right of exclusion is the right to determine who will access rights and how these rights are transferred. Alienation is the right to sell or lease one or more of the collective agency rights above.

Subsequently, the property rights are distinguished into five classifications from the lowest to the highest, namely: visitor (authorized entrance), authorized user, recognition (the claimant), proprietor, and owner [16]. Authorized admissions are allowed to enter the resources. Authorized users are given to individuals not only to enter but also to utilize the resources. Claimants are individuals who have the same rights as an authorized user, plus a collective right to determine their management. Proprietors have the collective right to participate in the government and select the participation/exclusion of other parties. Owners have the amplest access rights to enter, utilize, determine the form of management, determine the participation/exclusion of other parties, and the right to trade the resources.

The sources of the rights of access, withdrawal, management, exclusion, and transfer are varied. They may be enforced by a government whose officials explicitly grant such rights to resource users. Such rights are de jure rights in that formal and legal instrumentalities give them legal recognition. Rights-holders who have de jure rights can presume that their rights would most likely be sustained if their rights were challenged in an administrative or judicial setting [16].

The differences in property status between the de jure and de facto situation of mangrove forest in East Sinjai is mainly caused by Government negligence in the past. Therefore, the management of mangrove forests in the area has been based on norms and rules designed collectively by the community through existing local institutions. This phenomenon confirmed that property rights might also originate among resource users [6]. In some situations, resource users cooperate to define and enforce rights among themselves. Such rights are de facto as long as government authorities do not recognize them.
Users who have de facto rights act as if they have de jure rights by enforcing them. This fact can work well as long as there is no conflict and challenge from the de jure right holder. However, in some settings, de facto rights could eventually be given recognition in courts of law if challenged, but until so recognized, they are less secure than de jure right [6].

In managing mangrove forests, the agreed norms and rules held by the local community in East Sinjai are, among others, related to efforts to maintain well-grown mangrove stands and the prohibition of tree cutting except for urgent needs or for common interests such as repairing roads, bridges, and other public facilities. Apart from its vague status, the community's ability to formulate various regulations to protect mangrove plants from functioning optimally as a protector of coastal areas and providing income for the community proves that the mangrove community has been able to manage resources well [25]. Local institutions that can play a significant role as a benchmark for action are also the key for sustainable management of mangrove resources as occurred in Pesawaran District, Lampung [28], in Thailand [29], in Nepal [30], and in other parts of Southern Asia [31].

The land status also limits mangrove forests' status in East Sinjai that grow on accretion land, the community's right to take benefits (which is defined as state property). The opportunity for community access to mangrove resources is, in fact, maximum up to the claimant level with access rights to enter the area, collect yields, and manage the region [16]. Of course, this access is under the owner (in this case, the state/government).

De facto claim upon mangrove forest from the community has implications on the community's access rights. The right should only be at the claimant level shift to the owner level with the perfection of access, excluding other parties and access to transfer ownership of these resources to other parties. As a result, even though it is located in the state-owned coastal zone, in some cases, land can be bought and sold, leased, and converted into residential areas and pond areas when needed [32, 33, 18]. In the long term, if this continues, the community may then tend to plant as many mangrove trees as possible as a strategy to claim land (mangrove plants). The study means that mangrove land/plants' claims might be a hidden strategy/mode of efforts to prevent immigrants' entry from outside into the village [32].

Every household who wanted to be involved in the planting activity must have a share/plot of planting areas ranging from 1 to 5 ha depending on their respective abilities. This participatory arrangement on the distribution of plots has implications to the use of goods and services produced by each plot. People allowed to use mangrove tree stands (for housing construction/repair purposes) are the plots' owners. Thus, even though the group collectively regulates it, the distribution of planting plots makes the community feel they have ownership rights like private property upon their field (private property).

Meanwhile, fishery biota products such as fish, shrimp, and crab are not limited for landowners only, but fellow members can use it (setting traps/looking for fish, crabs, shrimp between mangrove trees). Likewise, the use of mangrove branches for firewood can also be done collectively, such as collective property (common property). The regulation on the use of various products/benefits from mangrove resources has instigated multilayer property status. It results from institutional development (institutional changes) dynamics to the privatization of mangrove resources (Table 4). Multi-layered property management can also be seen as the community's strategy to share benefits and risks (social security), given the diversity of mangrove plots conditions.

The research results about the occurrence of multi-layered property management in East Sinjai confirm that although the four regimes are ideal logical types, nevertheless, in reality, resources tend to overlap, and there is variation within each [6]. This signifies the importance of dividing the status of resource ownership into four regimes, i.e., the private property regime, the common property regime, state property regime (ownership held by the state/gov't), and open access regime cannot be classified explicitly in East Sinjai because the status of resource ownership is layered (multilayer property) for various products/services/benefits generated from mangrove as studied by [18] (Table 3).

Multilayer property on accretion land in East Sinjai has complex implications due to the population growth and urgent economic needs. Population growth and increasing financial markets have caused the increased need of land for settlement. As a result, some mangrove forests have been converted into community settlements and ponds compartments. The present situation would threaten mangrove forest
as mangrove forest conversion into other uses did not only fulfill their own needs (accommodation or livelihood), but some have commercialized it by trading land lots to other parties outside the area [33,18]. If this problem is not anticipated, it will gradually threaten the sustainability of existing local institutions that collectively become the guidance in mangrove resource utilization. Furthermore, commercialization of mangrove forest with vague status such as in East Sinjai can instigate the emergence of free-rider and rent-seeking behaviour.

**Table 3. Multilayer property status for several products/benefits/services generated from a mangrove forest in East Sinjai.**

| No | Property Status | Land | Mangrove tree stand | Product of fishery biota (fish, shrimp, crab) | Firewood | Ecological benefits/services |
|----|-----------------|------|---------------------|---------------------------------------------|----------|-----------------------------|
| 1  | De jure         | State property | State property | Common property | State property | Public property |
| 2  | De facto        | Private property | Private property | Common property | Private property | Public property |

Currently, some of the converted land from accretion land even already has land ownership certificates officially issued by the Minister of Agrarian Affairs and Spatial Planning/The National Land Agency. Information obtained from the key informants revealed that land certificates were issued through the National Agrarian Program (Prona). The Prona Program, as a form of asset legalization activity, is, in principle, the first land registration. There must be a request from the village head, and the number of land parcels to be included in the Prona is at least 50 plots (Regulation of the Minister of Agrarian-Spatial Planning/BPN).

The issue of converting mangrove forests into residential areas and other uses, and the opportunity to register the land, which is state land (de jure) in the Prona program, can occur due to several factors. The first is the land data system (assets) both at BPN and the village government (less information about the history and status of the land to be 'Prona' or perhaps deliberately neglect in the land data collection). Second is the lack of supervision from the Forestry Service that should be in charge of intensive monitoring of mangrove forests conditions in the area. Third, there might be some doubts about the Local Government to enforce strict regulations regarding the vague mangrove forest status due to past indifference. The management of mangrove forests in coastal villages has been mostly carried out collectively by local communities.

### 3.3. Strategy to anticipate the future risk of the massive conversion of mangrove forest in East Sinjai

In managing mangrove forests in East Sinjai, the community has shown their collective action to conserve existing forests. However, people also faced the problem of differences in perceptions about the property status of mangrove forests. The risk of mangrove conversion into residential areas and the expansion of ponds need to be anticipated, especially when there is intense pressure due to population growth and economic demands [34, 35]. Some studies revealed that even though it is located in the state-owned coastal zone, in some cases, mangrove forests can be traded, leased, and converted into residential areas and pond areas when needed [32, 33, 18]. This risk is mostly experienced when the rate of conversion of mangroves to other uses exceeds the community's ability to plant mangroves as compensation for the converted mangrove area.

Several strategies are formulated to prevent mangrove forests' massive conversion into other uses in East Sinjai Sub-District. The first is to provide an understanding of the community of the value of mangrove forests. This should be supported by providing information about mangroves' benefits and the losses that must be borne if existing mangrove forests vanish. Many researchers have conducted several studies on the economic value of mangrove forests. The survey in 2016 estimated that the total economic
value (TEV) of the mangrove ecosystem in East Sinjai is IDR 37,535,809,496 year\(^{-1}\). The total area of mangrove forest in East Sinjai is 758 ha. If the calculation is converted into hectare, the value becomes IDR 49,519,538 ha\(^{-1}\) year\(^{-1}\) or USD 3668 ha\(^{-1}\)year\(^{-1}\) (USD1 = IDR 13,500) [5]. This number is different from the result of meta-analysis on mangrove forests studied in South East Asia, which found that mangrove forests' total value is USD 4185 ha\(^{-1}\) year\(^{-1}\) [33]. The difference in mangrove's total values might be caused by the differences in the study site's biophysical condition. Calculation of the mangrove ecosystem's total economic value in Eastern Sinjai signifies that mangrove forests' intangible benefits are remarkable. The indirect value of mangrove forests to prevent the coastal area from abrasion and seawater intrusion and the role of mangrove as carbon sink and sequestration is IDR 19,679,716,480 or 52.43% of total mangrove economic value [5]. This denotes that if mangrove does not exist there, the cost needed to replace its function is tremendously high. This also proves that the ecological benefits generated from mangrove resources are more significant than direct economic benefits.

However, since most of the ecological benefits are not easily calculated and experienced directly, it is often overlooked in understanding the total value of the natural resource [36, 37]. Advantages of products and services generated from mangrove ecosystems often cannot be attained presently, real and close with the place where people exist. Therefore, in formulating strategies for mangrove resource management, it is urged to increase awareness and understanding of the local community on the value and importance of mangrove ecosystems. Understanding that economic benefits is higher than ecological benefits should be resolved as a lot of evidence verified that ecological functions are more significant than financial functions [5, 6, 38, 39].

The second is to strengthen the regulations both at the local level (written and unwritten norms) and at a higher level through intensive socialization about mangrove forests' status that grow on accretion land. As already elaborated before, well working local institutions can play an essential role as collective norms related to what is allowed and not in mangrove management. Several studies verified this notion, including in Pesawaran District, Lampung, in Thailand, Nepal, and several other areas in Southern Asia [28–31].

Enforcing regulation, though, should be supported by the provision of incentives and disincentives system to prevent free rider and rent-seeking behavior that threatens the sustainability of mangrove forests and at the same time to ensure the regulations to be legitimate. The rights to resources (property rights) owned by the parties would determine one's position on the resource and determine the motivation to maintain and preserve these resources [16, 40]. Resource rights also play an essential role in the sustainability of forest-dependent people's livelihoods and affect forest conditions [41, 42]. Incentives in providing legal access to the community are appropriate, considering the community's success in managing mangroves in the area.

Mangrove forests in East Sinjai do not only function as a protector of the coastal area but also become sources of livelihood for the community [5, 26]. Therefore, socialization about the status of mangrove forests that grow on accretion land should develop mangrove-based livelihood alternatives having forward linkage and backward linkage as compensation for negligence carried out by the government in the past. For the optimal and sustainable use of mangrove resources in East Sinjai, several potential mangroves that have not been explored need to be developed. Some of the mangrove potentials in East Sinjai, among others, are the potency of ecotourism and the use of mangroves as a laboratory as well as a place for education and research. In East Sinjai District, three villages are having potential tourism areas, namely, Tongke-tongke beach in Tongke-tongke Village, Marana beach in Passimarannu village, and Ujung Kupa beach in Sanjai village. If adequately packaged and managed, it can be becoming attractive natural attractions [5].

Besides, harmonious coordination among all stakeholders that directly or indirectly influence coastal ecosystems is a prerequisite to improving overall coastal ecosystems' sustainability. Achieving co-management among stakeholders at a large scale will be important in reconciling among stakeholders and addressing conflicting policy objectives. In this regard, there is a need to improve the effectiveness of traditional conservation practices, expand conservation efforts and funding mechanisms, and develop
integrated strategies that encompass all activities that affect coastal ecosystems vertically and horizontally [42, 43].

The third is to provide a particular policy/regulation related to the use of mangrove forests that grow on accretion land to prevent conversion to other benefits due to its vague property status. This eventually can assure that the regulation becomes legitimate, accompanied by strict enforcement of rules. The social forestry program's development guarantees legal access to manage mangrove forests. The Social Forestry (SF) is legitimated by the Minister of Environment and Forestry (MoEF) decree No 83/2016. The local community is allowed to be involved in sustainable forest management both in the state and private forests to increase social welfare while ensuring environmental balance and socio-cultural dynamics. As stated in the decree, SF's primary principals are justice, sustainability, legal status, participative, and accountable. One of SF’s schemes that can be developed in East Sinjai is Community Forestry (CF). Community Forestry Management Right is the right to manage both protection and production forest areas which have not been encumbered either by management rights or by utilization permit. CF is expected to become a livelihood source for local communities (interdependence between local community and forest). CF permit is granted to local community groups and not to individual persons on the condition that it is prohibited to transfer, change its function, and convert to other uses [44–46].

Granting legal access through the SF program is a win-win solution strategy. By obtaining CF management rights, the community in East Sinjai will be involved directly in forest management and get several facilities from the government. But they also have the responsibility to protect the forest area, which will be evaluated every five years. If during the evaluation period, it is found that the community is not able to manage the forest sustainably, the access right may be revoked. Undoubtedly, CF is a viable approach to promote conservation and rural development in the area where there are a lot of villages that interact closely with its surrounding forest, and most of them are forest-dependent villages [46].

4. Conclusions
The difference in property status between de jure and de facto of mangrove forests with common pool resources characteristics (CPR’s) growing on accretion land in East Sinjai emerged due to government negligence regarding difficulties and challenges coastal area community in the past. This vague status causes multiple property rights to the various products/benefits/services produced, which is vulnerable for being converted into the settlement, ponds, and other uses. This situation, in the long run, can threaten its existence. Several strategies to prevent its transformation into other usages are proposed, i.e., (a) improve the community understanding of the economic value of mangrove resource and risk if vanished; (b) strengthening and intensive socialization of regulations both at the local and higher-level; and (c) providing legal access for the community to manage mangrove forest through the development of Social Forestry Program in the area. This can be achieved through harmonious coordination among all related stakeholders for sustainable management of the coastal ecosystem.

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