Conditions for Successful Local Collective Action in Mangrove Forest Management: Some Evidences from Eastern Coastal Area of South Sulawesi, Indonesia

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Abstract. Resource management characterized by Common Pool Resources (CPRs) requires collective action for its sustainable management. CPRs with “rivalry” and “non-excludable” features face overexploitation problems because unlike the nature of pure public goods, the use of CPRs by one user will reduce the chances of other users taking advantage of it. This study aims to analyze the most appropriate local institutions and tenure arrangements for sustainable mangrove management in Eastern coast area of South Sulawesi, Indonesia. Data and information were collected through in-depth interviews involving key informants selected by using snowball method and continued by Focus Group Discussion. Design principles for sustainable management of common pool resources of Ostrom has been used in this study as an analytical framework which illustrate the structure of rules established and imposed by the local CPR’s institutions. The findings show that collective action in sustainable mangrove management can be achieved through accepted rules and agreements that are participatory formulated. The agreed norms and rules have enacted as a benchmark for collective action in maintaining mangrove and to enforce sanctions for violators. The success of the community in sustainable mangrove resources management is mainly supported by the existence of several prerequisites that facilitate collective action. It is necessary to strengthen regulations both at the local and higher level through socialization to the community along with the development of incentive and disincentives system.

1. Introduction

Problems threatening the sustainability of ecosystems and the function of mangrove forests have been experienced by many countries, including Indonesia. Mangrove forest of Indonesia is the largest in the world reaching 22.4% of the world's mangrove area or around 3.22 million hectares [1]. Mangroves form distinct waterfront forest habitats with dense, undulating canopies in the wet and arid tropics of the world [2]. It is a typical forest type growing along the coast or river estuaries which is influenced by tides [3, 4]. Mangrove has an important role and function in ecosystem, it also has unlimited real and intrinsic values in terms of ecology, economy and social [5, 6]. The various functions of mangroves generate tangible and intangible benefits and services, from the environment around/near mangrove resources and from far outside the mangrove forest [7]. This has resulted complexity in valuing the entire mangrove ecosystem and often has caused negligence in coastal area development plan. Therefore, it requires a deep
understanding of the interrelations between social, economic, political, and environmental dimensions for effective management [5, 8]. As a result, lots of mangrove forests have been degraded and converted to other forms of land use such as fisheries, agriculture, industry and for housing/urban development [9, 10]. Since the last two decades, awareness on the value and importance of mangrove forests has been increasing and various conservation and rehabilitation efforts have been carried out in many countries including Indonesia. However, its success rates are still very limited. Many factors are thought to be the cause of the low achievement of mangrove rehabilitation and conservation efforts, including the lack of public awareness of the importance of mangrove forests [5, 7], sectoral management, conflicts of interest and the negative impact of activities on marginalized community groups. In addition, the lack of coordination between institutions and the lack of community involvement (using a top-down approach), one fits all policies and negating the potential role that the community can contribute to mangrove rehabilitation efforts are also the causes of this low achievement [11]. Policy initiatives and planning for mangrove forest management activities are highly dependent on the strength of local communities and their level of participation as well as recognition and support from the government. This is in line with [11, 12] who revealed that mangrove forest planning and management will be successful if the community can fully participate in the activities.

The success of the community in managing mangrove resources on the east coast of South Sulawesi, precisely in East Sinjai District, Sinjai Regency is an example of a success story that proves the ability of local communities to overcome various problems and complexities in natural resource management. However, despite having relatively similar condition (biophysical, socio-cultural and economic), the success of mangrove resource management did not occur broadly and evenly in all coastal village areas of East Sinjai. There are still many areas with poor mangrove forest performance and have not been able to function optimally both economically and ecologically. This condition raises questions about what factors might that cause these differences. This study aims to analyze the most appropriate local institutions and tenure arrangements for the success of sustainable mangrove management characterized by CPRs in the Eastern coastal area of South Sulawesi.

2. Materials and Methods

2.1. Data collection and analysis

This research is a qualitative research using the case study method. We used triangulation method to collect data and information. Triangulation in research is the use of more than one approach scrutinizing questions namely in-depth interviews with selected key informants using the snow-ball method, field observation and continued with focus group discussions. The aim of using more than one approach in data collection is to increase confidence in the findings through confirmation of propositions using two or more independent measures. Triangulation method is used to avoid the potential bias arising from the use of a single methodology. This technique is used to confirm the suggested findings, but can also be used to determine the completeness of the data [13].

In-depth interviews were conducted involving 17 key informants on behalf of community leaders, head of farmer group, traditional leaders and personnel from local Government of Sinjai Regency. Key informants were obtained through the snow-ball, a non-probability sampling method, to identify, select, and take samples in a network or chain of sustainable relationships. The information collected includes data on various norms and rules in mangrove resource management, both operational and collective rules, facts that occur, level of understanding and compliance with existing norms and rules. Collected data and information obtained from the interviews were then presented and discussed in a series of focus group discussions to confirm whether the data and information submitted by the key informants were valid.

We used qualitative techniques to analyze forest conditions in the study sites including the history of community’s struggle to manage mangrove forests independently, community’s perception and assessment on forest condition changes.
2.2. Research location
The research was conducted in the area of Sinjai District, South Sulawesi, with a focus on mangrove forest of Tongke-Tongke Village, East Sinjai Sub District (Figure 1). Of all mangrove forests in East Sinjai, Tongke-tongke is of two villages with good mangrove forest conditions that can function properly as a protector of villages along the coast as well as a source of community income. Mangrove forest in Tongke-tongke Village is a result of independent community management and it represent characteristics of mangrove forest in Sinjai Regency. The success of the community in managing forest area in the area is an example of a success story that proves the ability of local communities to overcome various problems and complexities in natural resource management.

![Figure 1. Tongke-tongke Village, in East Sinjai Sub District, Sinjai District, South Sulawesi](image)

Tongke-tongke Village is 5 Km from the District Capital and 7 Km from the Capital of Sinjai Regency. The village has an area of 4.75 km², where the area extends from The North to The South following the coastline with an altitude between 0 - 25 m asl and a slope level of 0 - 8%. With flat and sloping morphological conditions, this area is influenced by sea tides and often inundated by sea water during high tide. Furthermore, the village location is directly expose to Bone bay. The border of Tongke-tongke Village to the north is Sinjai Utara District, to the south is Panaikang Village, to the West is Kaloling Village and Saukang Village and to the East is Bone Bay.

2.3. Theoretical Framework
Many factors are the key to successful management of natural resources by local communities. Maximizing benefits and minimizing uncertainty are some of the factors that become the keys for the success of community participation [14].

Mangrove forests in East Sinjai have two main characteristics of (CPRs) i.e. (i) difficulties to exclude or control potential user access, and (ii) each user can reduce the benefit of all other users (a matter of unity). Based on these two characteristics, some resources are referred to as shared (or common-pool) resources/CPRs and are defined as a group of resources whose exception is problematic, and shared use involves reduction/subtractability. These types of resources include fish, wildlife, forests, grazing land, irrigation and groundwater [15]. Most wild lands, parks, and public space also reveal the same property characteristics, while most agricultural land and mineral resources do not. Resources that share the above factors are prone to depletion and degradation.

Apart from risk factors and resource scarcity, the success of the community in managing mangrove resources sustainably in Tongke-tongke is also supported by the existence of several conditions that facilitate collective action in natural resource management. Local institutions role for forest management, especially those related to maintenance, monitoring and product harvesting were evaluated qualitatively on the basis of their existence of agreed rules, rule enforcement effectiveness, and community’s compliance with the applicable rules [15,16]. An evaluation of the overall institutional
strength of the forest governance systems was done by using Ostrom's design principles as the theoretical and evaluative framework (Table 1).

**Table 1. Eight design principles describing group efficacy that facilitate effective CPRs management**

| No. | Principles                                                                 | Explanation                                                                                                                                 |
|-----|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | Define clear boundary of resource and,                                    | The identity of the group having rights to CPRs and the boundaries of the shared resource are clearly determined                               |
|     | Relevance of the rules governing resource use with local needs and         | There must be a balance between benefit sharing and contribution rules. Unfair inequality may harm collective efforts                          |
|     | conditions.                                                                |                                                                                                                                            |
| 2.  | Collective and participatory rule-setting                                  | There should be an inclusive decision-making process regarding adjustments to the rules for the use and management                            |
|     | Effective monitoring of users and resource conditions                      | Managing commons is inherently vulnerable to free-rider behavior. There should be a responsible monitoring system for the management of CPRs and ensures its protection |
| 3.  | Determination of strict sanctions for each violation                       | Each violation of the rule for CPR management or extraction face graduated sanctions depending on the seriousness of the violation or repetition of violations |
| 4.  | Mechanisms for conflict resolution between parties                        | There must be an efficient (low-cost) and fast conflict resolution system that is fair by all group members                                |
| 5.  | Recognized rights to manage CPRs                                           | Government allow groups to self-organize CPRs management by forming own internal rules of conduct. Externally imposed rules are unlikely to be adapted to local circumstances |
| 6.  | Building responsibility for managing CPR’s in levels from the lowest level to | The allocation, provision, monitoring, enforcement, conflict resolution, and government activities are regulated in various layers of nesting companies |
|     | the entire interconnected system.                                          |                                                                                                                                            |

3. Result and Discussion

3.1. Characteristic of Mangrove Forest in Tongke-Tongke Village
Mangrove forest in Tongke-Tongke Village, East Sinjai District, Sinjai Regency, South Sulawesi, covers an area of 173.5 hectares. The condition of mangrove forests in Tongke-Tongke Village, East Sinjai Sub District is similar to mangrove forests in other areas, which are characterized by a strong root system that can bind/trap mud carried by high tide [17, 18]. The condition of the soil can be categorized into two types, namely sandy beaches and muddy beaches. Sandy beaches are dominated by gray sand and a little black sand, while muddy beaches contain a lot of humus resulting from sedimentation and sedimentation from river flows in addition to silt from the sea [19].

In areas with a high level of mangrove thickness, the soil tends to have a sandy clay texture class, this is due to the decomposition of litter which also determines the soil texture class and the binding of dust and mud particles by plant roots [20]. Whereas in areas without mangrove vegetation the soil texture class tends to be sandy because there is no vegetation that binds the mud particles. Mangroves spread all over the world and Indonesia is one of the countries having the largest mangrove forests in the world. Indonesia has the most diverse mangrove in the world with 202 mangrove species [21]. Among those 202 species, 43 species (including 33 species of trees and some shrubs) are classified as true mangrove species, while the rest are found around mangrove forests as associated mangrove species [22]. In the research site, there are fifteen mangrove species found (Table 2), but there are three the most dominant namely bakau (Rhizophora sp), api-api (Avicennia sp) and tancang (Bruguiera sp).

3.2. Dynamics of Mangrove Forest Development in Tongke-tongke
Mangrove forest is one of the few pristine ecosystems in the world and it offers a large number of
ecological, economic, and protective functions and services [5, 6, 23]. Due to the recognized importance of mangroves and the ongoing threat to its sustainability, action has been taken for the conservation and sustainable use of mangroves. Unfortunately, several management and policy efforts have not been fully successful in ensuring the conservation and sustainable use of mangrove resources, due to a variety of reasons both technical and non-technical [5, 7, 24, 25]. The mangrove forest ecosystem in Sinjai Regency which is the result of coastal rehabilitation carried out by the community independently is one example of the success stories of local communities in maintaining and managing mangrove resources sustainably. The development of mangrove forests in Tongke-tongke has gone through a long and winding process. The stages of the community's struggle to succeed in rehabilitating the coastal areas of the East Sinjai coast of South Sulawesi can be classified into two main periods namely institutional inertia period and institutional working period.

### Table 2. Mangrove Plant Species Diversity in the Research Site

| No. | Species | Local name | Family         |
|-----|---------|------------|----------------|
| 1   | *Rhizophora macronata* | Bakko / Bakau | Rhizophoraceae |
| 2   | *Rhizophora apiculata* | Bakko / Bakau | Rhizophoraceae |
| 3   | *Avicennia alba* | Api-api | Avicenniaceae |
| 4   | *Avicennia marina* | Api-api | Avicenniaceae |
| 5   | *Avicennia officinalis* | Api-api | Avicenniaceae |
| 6   | *Bruguiera cylindrica* | Bakko Panda | Rhizophoraceae |
| 7   | *Bruguiera gymnorrhiza* | Bakko Panda | Rhizophoraceae |
| 8   | *Sonneratia alba* | Padada | Sonneratiaceae |
| 9   | *Sonneratia caseolaris* | Padada | Sonneratiaceae |
| 10  | *Aegiceras corniculatum* | Otti-otti | Myrsinaceae |
| 11  | *Ceriop sp.* | Cokke | Rhizophoraceae |
| 12  | *Hibiscus tiliaceus* | Haru | Malvaceae |
| 13  | *Nypa fruticans* | Nipa | Palmae |
| 14  | *Terminalia catappa* | Ketapang | Comretaceae |
| 15  | *Pandanus tectorius* | Pandan | Pandanaceae |

3.2.1. Institutional inertia period 1930s – 1980. The long history of mangrove forest development dates back to the 1930s. Initially, mangrove tree population in the area was very small. Coastal communities have made small efforts to plant mangroves themselves behind their homes. Mangrove seeds/seedlings were only collected from surrounding coastal areas when people go to the sea to look for fish. Therefore, the number of collected seeds/seedlings was still very limited. However, even though they are only planted on a small scale, mangrove trees have started to function a little as protection for the surrounding area from the waves and sea breezes.

Unfortunately, the initial efforts ended in vain when in the early 1940's. Economic pressure pushed many people to convert mangrove forests into fish ponds. As a result, the area became completely unprotected and when it was hit by the tidal waves it was badly damaged. Although there were still people who continued to try to rehabilitate the coastal area, but due to the very small and without support from the Government, the efforts have not been able to offset the ongoing damage. This went on for nearly 40 years. The impact was an increase in water salinity which made water not suitable for consumption, a lot of damage to settlements, significant decrease in fish catches and eventually the destruction of community ponds. This severe damage of the area raised community’s awareness and then became their turning point of the people’s to improve the situation and save the environment.

Although the people already realized the imminent danger from the sea, most of them did not understand well the potential benefits from mangrove planting efforts as coastal area protection, hence the appreciation for mangrove trees was still very low. This is quite reasonable considering that mangroves are slow growing species with relatively low market price. The basic question that arises is if they planted mangroves, what benefits will they obtained? Moreover, planting mangroves in coastal areas is not easy, it requires persistence and continuous replanting efforts until mangrove can grow well.
Therefore, apart from individual internal factors/characteristics (age, education and land area owned), factors that also affect people's willingness to participate in planting mangrove are understanding about potential benefits that will be gained by planting mangrove. [26] revealed that knowledge and information factors also affected the level of community participation in efforts to overcome environmental problems.

During this period, efforts to plant and maintain mangrove plants were carried out independently without any coordination between community members. As a result, mangroves that have been planted are often damaged due to being hit by fishing boats passing along the coast, being exposed to nets that have been spread or being cut back for planting. The absence of rules that are mutually agreed upon by community’s members have resulted in mangroves not growing properly. The period of mangrove development between 1930 -1980’s (Figure 1) were a stage where the local institutions had not yet worked well (institutional inertia period).

Until 1980’s, planting mangrove to protect coastal settlement area was not priority. Even, in the 1980s, the people of Tongke-tongke tried to cope with natural conditions by constructing embankments for breaking waves made of coral rock. The stone embankment that was built for almost two years is expected to protect the settlement area during the highest tide season. However, it turned out that the rock embankment did not last long, in just a few months the embankment was crushed by the waves so that two years of hard work were useless.

3.2.2. Institutional working period 1984 – now. The failure of making embankments in 1984 was a turning point in people's awareness that rock embankments could not protect coastal areas at all. Meanwhile they saw that even though the mangroves were small in number they were still able to withstand the waves and winds during high tide. This awareness then encouraged some community leaders to initiate and ask others to plant mangrove together to save their settlement and surrounding environment. Some of these initiators then initiated the formation of the farmer group called “Aku Cinta Indonesia” (I Love Indonesia/ACI farmer group). The cohesiveness among the community cannot be separated from the growing trust between group members and between the group and the initiators who initiate the planting mangrove. The element of mutual trust according to [27, 28] is an important factor in realizing collective action in an activity which in this case is saving the coastal areas in East Sinjai. This group then formulates various agreed norms and rules aiming of ensuring that mangroves that have been planted can be properly maintained. In 1984 Local Government of Sinjai District started to put attention on the condition of coastal settlement in the area. Institutional development and counseling programs from related agencies were provided for the community, and in 1988, ACI Farmer Group then was enacted to become the Natural Resources Conservation Group I Love Indonesia (KPSA-ACI).

The success of the Tongke-tongke community in planting mangroves independently has had a real positive impact, among others, the release of the village from coastal erosion/abrasion, crashing waves and tidal waves; decreased water salinity; abundance of aquatic biota such as shrimp fry, and crab which can be easily caught thereby increasing the income and welfare of coastal communities. Similar case also happened in the Philippines where the conservation of mangrove ecosystems involving local community institutions was able to restore mangrove function optimally both ecologically and economically so that the benefits (tangible and intangible) far exceeded the benefits obtained if mangroves were converted into shrimp pond areas which was previously thought to provide enormous benefits [29]. This shows that in an activity development, the existence of a stable institution is the first step for economic growth [30] as well as the improvement of the welfare of the people [27]. Local institutions that can play an effective role are also motivated by factors of respect and "trust" or mutual trust among community members who believe in a reciprocal relationship, namely that other people will not behave detrimentally if they also do not harm others [31; 28]. The period in which the community has succeeded in formulating various mutually agreed upon norms and rules shows that during that period the local institutions have begun to operate (institutional working period).

The success of planting mangroves in Tongke-tongke further inspired other areas around it so that mangrove plants have now spread to three sub-districts. Mangrove development continues to be carried
out by the community both independently and with assistance from the Sinjai Regency Government and related agencies from both the provincial and central levels. The form of public awareness is to keep planting and developing mangroves. Area of Sinjai mangrove forest in 2013 reached 1,157 hectares.

Thus, the ability of the community to formulate various rules to protect mangrove plants so that they can function optimally as a protector of coastal areas and at the same time as a source of community income proves that the community has been able to manage mangrove resources independently in East Sinjai (institutional self-governing period). Local institutions that are able to play an effective role as a benchmark for action are also the key to success in managing mangrove resources sustainably as is the case in Nepal [32] as well as in other Southern Asia areas [33]. In order for mangrove forests to continue to develop and function optimally, community in Tongketongke village needs support from various parties, especially the local government which has authority over the status of mangrove forests in East Sinjai. If the government, through its authority, actually comes up with various formal policies and regulations that are not in line with local regulations that have been running so far, it can become a disincentive for the independence of mangrove resource management in East Sinjai.

3.3. Forest Governance Arrangements in Tongketongke Village

One of the local institutions that have been established and played a major role in the conservation of mangrove forests in Tongke-tongke is the KPSA-ACI group (the conservation group for natural resources - I love Indonesia). Although it has been established in 1984 (during the early stages of planting mangroves in Tongke-tongke), the KPSDA-ACI group was just formally inaugurated in 1988 with support from Local Government and its related agencies. The ACI group that has received formal legal support already has a statute/bylaws (AD/ART) and has an organizational structure with several sections in day-to-day management. For daily operational of mangrove management, community formulate rules that cumulatively influence the form of activities to be taken and the impacts that will be faced as a consequence which are formulated in operational rules (rule in use) and collective choice [15; 24].

3.3.1. Operational and collective rules. Operational rules exist at the implementation level which are formulated based on collective rules agreed upon by group members. Operational rules regulate when, where and how to use every resource unit, who and how to monitor its use, what information should be conveyed or stored and what forms of reward and sanctions will be given for the use of a resource unit and the impact it causes. Hence, the operational rules agreed upon in mangrove forest management in Tongke-tongke arrange the use of mangrove resources for group members. Utilization includes catching marine biota (fish, shrimp, crab) by setting traps in the plots traps, collecting firewood, and catching bats. Other operational rule is related with designing layout of the plots. The mangrove plots have an alley between 10-15 m wide that enables fishing boats to pass and enter the village. The distance in the hallway is adjusted according to the needs.

Those everyday settings are not in the form of written rules, but the form of an oral agreement has been agreed and adhered to by all members. All members have the same rights and obligations regarding mangrove resource management. If there are differences of opinion about the implementation, completion is done in groups through regular monthly meetings. The operational rules for mangrove management in East Sinjai also addressed the issue of monitoring and the obligation to preserve the area as well as law enforcement/imposing sanctions if a member commits a violation. Each member of the group becomes an overseer for the other members. If there are members who violate the group rules, then they will be given sanctions in the form of social warnings or if someone cuts the mangrove trees without permission and/or for clear reasons, they will be given sanctions to plant as many as the number of mangrove trees cut and ensure that the planted seeds grow well (replanted repeatedly until the mangroves grow well).

The collective rules in mangrove forest management are more related to agreements/policies about the direction and strategy of resource management that will be carried out. Collective rules concern the
arrangements regarding the involvement of resource users and user preferences in resource management [34]. The formulation of this collective rule involves stakeholders related to mangrove forest management in East Sinjai, namely the Village Head, Local Government and local NGOs.

3.3.2. Conditions for Successful Local Collective Action in Mangrove Management. There are many factors became the keys for the successful management of natural resources by local communities. Maximizing benefits and minimizing uncertainty are key factors to success [28]. Apart from risk factors and resource scarcity, the success of the community in managing mangrove resources sustainably in Tongke-tongke is also supported by the existence of several conditions that facilitate collective action in natural resource management. Several conditions that enable sustainable CPRs management [15] are used to evaluate the success of mangrove resource management in East Sinjai as follows:

a. Clarity of management area boundaries
Several previous research results show that cooperation in society increases when user groups obtain certainty of rights in resource management and have exclusion rights (the authority to prohibit outsiders from entering their managed areas) [15]. This is usually done by clearly define the boundaries of the management area and user groups. Clarity of resources and groups entitled to use resources can reduce the chance of conflict and increase their commitment to established rules, reduce uncertainty in resource tenure and clarify who will bear the costs of collective resource management. In Tongke-tongke Village, boundaries are clearly defined using boundary markers and through face-to-face discussions with external entities entering the area. This clarity of territorial boundaries ultimately eliminates conflicts between local communities and outsiders.

b. Relevance
The distribution of benefits in accordance with/proportional to the costing rules is one of the conditions that facilitates collective community action to carry out sustainable resource management in Tongke-tongke. Synchronization of rules is carried out in accordance with local conditions regarding the time, place, and the availability of managed resources. Mutually agreed rules are ensured to run well and are must be obeyed by all members of the community. Although the rules exist, if not well implemented it will lead to failures, such as the ineffectiveness of the Watershed Forum (DAS) in watershed management causing the number of watersheds categorized as critical in Indonesia continues to increase instigated sedimentation rates and flood frequency continues to increase.

c. Collective and participatory rule-setting
In Tongke-tongke, operational rules for the use and management of mangrove resources were formulated by the KPSDA ACI group and decided jointly by group members in accordance with local customs and prevailing social norms. These rules can be changed by consensus among members of the KPSDA ACI group in the group meeting. Although there may be some external influences during the formation and modification of operational rules, all decisions were taken by consensus among all group members.

d. Monitoring effectively
Effective monitoring is absolutely necessary in the independent management of natural resources because there are always conditions that tempt some individuals to cheat to the detriment of others [15]. The residents of Tongke-tongke village who manage mangrove resources live and work in the area around the mangrove forest, both as fishermen, farmers, firewood collectors and bat seekers. This condition is very beneficial because they can monitor as well as act as direct guardians of the condition and utilization of mangrove resources. The willingness to carry out joint monitoring and the dependence of the community on mangrove resources for the life and livelihoods of the community creates a strong sense of belonging to mangrove resources.
e. Determination of strict sanctions for each violation
Giving strict sanctions for any violation of the use and management of mangrove resources is also a principle developed by local institutions in Tongke-tongke. According to [15], the imposition of sanctions is necessary because mutually agreed regulations have been socialized beforehand and every violation committed will reap sanctions and if it is repeated, it will result in heavier sanctions. Examples of violations are cutting down mangrove trees without prior notification and using it for unclear purposes. In cases like this, that person is obliged to replant mangrove trees and maintain them until it grow well. The results of the study also indicated that rule breakers never repeat violations again because they realize that the sacrifices that must be borne as sanctions for violations are greater than the benefits received. Finally breaking the collective rules becomes an option that doesn't appeal to them at all.

f. Mechanism for conflict resolution
The tenets presented by [15] assume that several types of conflicts in the use and management of natural resources will still occur in the field, even though various rules have been clearly formulated and in detail. Conflict is unavoidable because it is a consequence of team work. Conflict is the result of behavior and it is an integral part of human life [35]. Conflict emerge may be due to differences in the interpretation of the rules among users. If these conflicts are not resolved at low cost and in an orderly manner, it will become a disincentive for users to comply with mutually agreed rules. Conflict resolution in Tongke-tongke Village is set in stages. Internal conflicts related to the extraction and distribution of benefits from mangrove resources are resolved between conflicting members in a family manner. Conflict resolution actually is seen as an adjustment process, which itself can be subject to procedures to contain and regulate conflict behavior and ensure a fair outcome. This is also in accordance with the results of studies on local communities in the Arau watershed in managing protected forest areas where conflicts in management between residents are resolved through family negotiations [36]. Meanwhile, more complicated conflicts will be resolved in the assembly through a meeting of all members groups as well as with facilitation by local forestry staff where necessary (if conflict arises due to external factors).

From the description above, it is evident that the ability to identify the capacity of individuals involved in a situation to design their own regulations based on their knowledge and then formulate rules to protect the preservation of existing resources are the main key to successful mangrove management in Tongke-tongke. For the success of collective action in mangrove management, integrating local community knowledge and local adhered norms in program activities implementation especially related with natural conservation, will become the initial important step for its success [37]. The success in formulating mutually agreed rules also proves that the rational consideration of individual users to always maximize utility as feared by [38] did not always occur [15]. Eventually, as the structure and function of mangroves is site-specific, there is no “one-size-fits-all solution”. all efforts for mangrove conservation and rehabilitation should be formulated with adequate site-specific information rather than global generalizations and should be combined with price-based instruments, such as carbon credits, payments for ecosystem services, taxes on deforestation and certified green products, which would increase the value of maintaining and protecting mangroves rather than converting them for other uses (Lee et al. 2019).

4. Conclusion
The dynamics of the mangrove forest development process in Tongke-tongke Village show that even without the support of the government, collective action to plant mangroves can be realized through various rules and agreements formulated collectively by the community, although it requires a long and winding process. The success of the community in managing mangrove resources is also supported by the existence of several conditions that facilitate collective community action, namely; clarity of area boundaries; relevance of rules, collective and participatory rule-setting; determination of strict sanctions; effective monitoring; and conflict resolution mechanism. Those six conditions guide residents in interacting with mangrove resources. The research results strengthen the theory of self-governing
institutional development where operational rules (rule in use) and collective choice can be used as a benchmark for action for each member of the community in treating mangrove resources.

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