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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 snow-ball method and continued by Focus Group Discussion. Design principles for sustainable management of common pool resources from 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.

Keywords: Community, local institution, mangrove function, participatory rule setting,

Introduction, scope and main objectives

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 (Ilman et al. 2016). Mangroves form distinct waterfront forest habitats with dense, undulating canopies in the wet and arid tropics of the world (Duke and Schmitt 2015). It is a typical forest type growing along the coast or river estuaries which is influenced by tides (Hartshorn 2013; Spencer et al. 2016).

Mangrove has an important role and function in ecosystem, it also has unlimited real and intrinsic values in terms of ecology, economy and social (Suharti et al. 2016; Neumann et al. 2017). 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 (Baderan 2013). 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 (Suharti et al. 2016a; Newton and Elliot 2016).

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 (Suharti 2016; Baderan 2013), 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 (Suharti 2017). 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 (Suharti 2017; Hakim et al. 2017) 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, 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. 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.

Methodology

1-Data collection

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-balling method, field observation and continued with focus group discussions (Heale and Forbes 2013).

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. 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.

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 (Fig. 1). Of all mangrove forests in East Sinjai, Tongke-tongke is one 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.

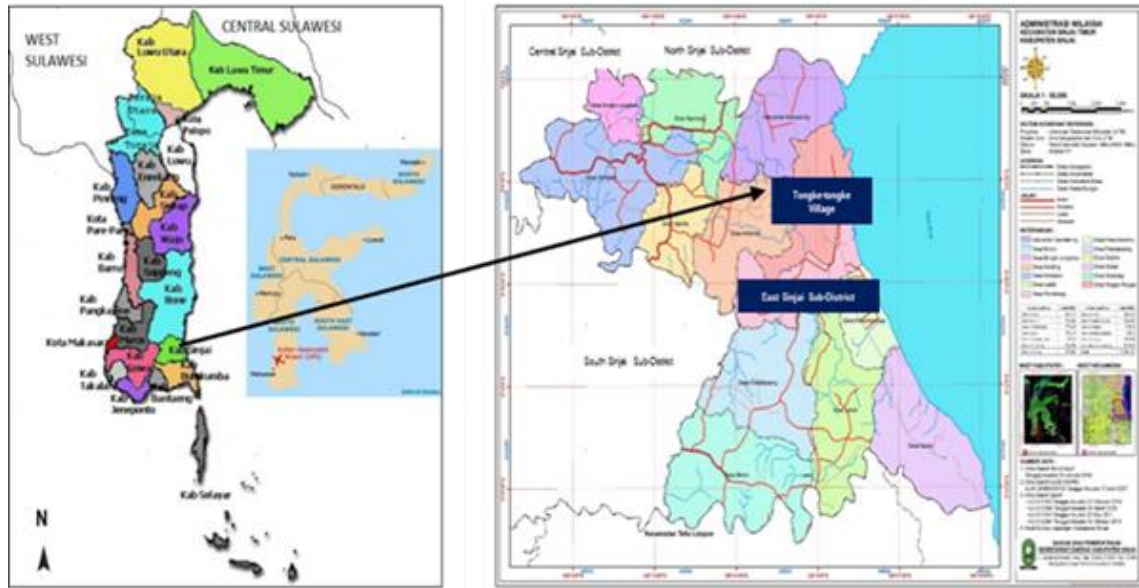


Fig. 1: Tongke-tongke Village, in East Sinjai Sub District, Sinjai District, South Sulawesi
 Source: IOP Proceeding The 4th TREPSEA 2021 (in press)

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, 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.

3-Theoretical Framework

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.

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 (Ostrom 1990; Ostrom 2000). 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
2.	Relevance of the rules governing resource use with local needs and conditions.	There must be a balance between benefit sharing and contribution rules. Unfair inequality may harms collective efforts
3.	Collective and participatory rule-setting	There should be an inclusive decision making process regarding adjustments to the rules for the use and management
4.	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
5.	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
6.	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

7.	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
8.	Building responsibility for managing CPR's in levels from the lowest level to the entire interconnected system.	The allocation, provision, monitoring, enforcement, conflict resolution, and government activities are regulated in various layers of nesting companies

Results

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 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 (Hossain and Nuruddin 2016). In the research site, there are fifteen mangrove species found, but there are three most dominant namely bakau (*Rhizophora* sp), api-api (*Avicennia* sp) and tancang (*Bruguiera* sp).

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 (Suharti et al.2016a; Datta et al.2012). 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 (Baderan 2013; Romañach et al. 2018; Richards and Friess 20 16). The mangrove forest ecosystem in Sinjai Regency is one example of the success stories of local communities in maintaining and managing mangrove resources sustainably. The stages of the community's struggle to succeed in rehabilitating the coastal areas of the East Sinjai coast can be classified into two main periods namely institutional inertia period and institutional working period.

2-1 - Institutional inertia period (1930s – 1980s)

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 houses. Mangrove seeds/seedlings were only collected from surrounding coastal areas, 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.

The period of mangrove development between 1930 -1980's were a stage where the local institutions had not yet worked well (institutional inertia period). In the 1980s, the people 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 destroyed.

2-2- Institutional working period (1984 – now)

The failure of making embankments was a turning point in people's awareness that rock embankments could not protect coastal areas at all. This awareness then encouraged some community leaders to initiate planting 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. The element of mutual trust according to (Hermanto and Swastika 2016); Suharti et al. 2016 b) is an important factor in realizing collective action in establishing collective action. This group then formulates various agreed norms and rules aiming of ensuring that mangroves that have been planted can be properly maintained.

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.

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.

2-3-Forest Governance arrangements in Tongke-tongke 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. Although it has been established in 1984, 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 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 (Ostrom 1990; Romañach et al. 2018).

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.

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. The operational rules 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.

Discussion

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 mangrove management. Several conditions that enable sustainable CPRs management (Ostrom 1990) 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). 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. Synchronization of rules is carried out in accordance with local conditions regarding the time, place, and the availability of managed resources.

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 in the group meeting.

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. The residents of Tongke-tongke who manage mangrove resources live and work 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.

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. 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.

f. Mechanism for conflict resolution

The tenets presented by (Ostrom 1990) 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 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. 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 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 (Dharmawan et al.2016). The success in formulating mutually agreed rules also proves that the rational consideration of individual users to always

maximize utility as feared by (Hardin 1968) did not always occur (Ostrom 1990). 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.

Conclusions

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. 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. 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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