

Local Institutional Strengthening in Sustainable Lake Fisheries Resources Management System (Case Study of Tempe Lake, Wajo Regency, South Sulawesi, Indonesia)

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ABSTRACT

Local community wisdom, as a traditional practice in sustainable lake fisheries resource management, can serve as a key solution in preserving the lake's potential as a sustainable ecosystem. This research aimed to analyze: (1) traditional community practices as a form of local wisdom manifested through the institutional use of fishery resources in Lake Tempe; (2) stakeholder interests in the utilization of these resources; and (3) strategies for integrating effective traditional practices into a sustainable fisheries management system. This qualitative research, conducted using a case study method, revealed that the community's utilization of Lake Tempe is largely domestic and based on local institutions passed down through generations. These include traditional practices such as institutional cappeang, palawang, bungka toddo', and ceremonies like maccerak tappareng. Stakeholders' power relations and interests in the use of Lake Tempe's fishery resources are varied and complex. The integration of local institutions into formal structures strengthens the community's role in managing the lake's fishery resources. The reinforcement of these local institutions fosters a collaborative management system involving the government, the community, and the private sector, jointly responsible for maintaining the economic and ecological sustainability of Lake Tempe's resources.

INTRODUCTION

In Indonesia, the authority to manage fishery resources is vested in the government, specifically through the Minister of Fisheries, as outlined in the Laws of the Republic of Indonesia No. 45 of 2009. However, in the framework of regional autonomy and decentralization of government, the authority and power are delegated (decentralized) to the regions (Laws of the Republic Indonesia No. 32 of 2004). In addition, fisheries management must take into account customary law and local wisdom, as well as community participation (Laws of the Republic Indonesia No. 45/2009). The elaboration

of authority must be followed by the development of system and mechanism of relationship between central government, provincial government and regency/city government to promote synchronization and integration between macro policy and technical policy as well as the implementation of fisheries resource management. The determination of operational policies for fisheries resources management at the regional level (provincial and regency/city government) must be able to develop policies at a more operational level to be used in marine and fisheries management according to the characteristics of each region or area (**Widarmanto, 2018**). Thus, the management and utilization of fishery resources can be done well if it includes the participation and involvement of all stakeholders, including local wisdom practices that have become a tradition for the community in question.

A lake is a body of stagnant water on land that occupies a relatively small area on the Earth's surface compared to marine and terrestrial habitats (**Guerrero, 1999**). Based on data from the **Minister of Environment (2012)**, lake ecosystems in Indonesia store 25% of the world's germplasm, supply 72% of surface water and provide water for agriculture, community raw water sources, agriculture, hydroelectric power plants, tourism and others. However, today many lakes in Indonesia have experienced degradation caused by population growth, forest land conversion in lake watershed areas, pollution and erosion (**Gobel & Koton, 2017**). At the National Conference of Indonesian Lakes I in 2009, 15 lakes in Indonesia were determined to be increasingly threatened due to environmental damage and pollution in the catchment area (DTA) to the lake waters, as well as endemic species starting to experience extinction (**Partomo *et al.*, 2011**). One of the lakes included in the data is Tempe Lake, located in South Sulawesi Province.

Tempe Lake is one of the lakes that has considerable potential in South Sulawesi Province. Administratively, Tempe Lake is located in 3 different district administrative areas, namely Wajo District, Sidrap District and Soppeng District. Most of the Tempe Lake area is located in Wajo District, which reaches 70% of the total area of Tempe Lake. Related to the dynamics of inland water resources, Tempe Lake also has dynamic characteristics based on the volume of water that follows the seasonal pattern. In the dry season, the lake water volume is 9,087 ha, while in the rainy season it covers an area of 25,858 ha. In 1948-1969, Tempe Lake was recorded as a lake capable of producing 55.000 tons of freshwater fish per year and has decreased from year to year (**Wajo Regency, 2019**).

One approach that needs to be done in maintaining the sustainability of the lake is through strengthening local institutions (**Akbar *et al.*, 2022**). Revitalization and integration of local community institutions, as the traditional practices in a sustainable lake fisheries resource management system, can be used as a solution in maintaining the potential of the lake as a sustainable ecosystem. Institutional strengthening is a process by which individuals, organizations, and social systems increase their capacity and performance in managing resources, goals, and the surrounding environment (**Fawzy,**

2012). Local institutions that are manifested in the form of local wisdom in the management of lake fisheries resources are essentially a process of controlling human or community actions so that the utilization of lake fisheries resources can be carried out wisely by heeding the rules of environmental sustainability (Said, 2021). Strengthening the capacity of local communities as actors in fisheries resource management (people-centered development) will encourage a community-based fisheries resource management system (Community Based Management) based on experience and social learning. Carter (1996) defines community-based management as a strategy for achieving a people centered development where the focus of decision making with regard to the sustainable use of natural resources in an area lies with the people in the communities of that area, where the center of decision-making regarding the sustainable use of resources in an area is in the hands of organizations in the community in the area (Putri *et al.*, 2020). This research aimed to analyze the traditional practices of the community as a form of local wisdom manifested in the institutional utilization of fishery resources in Tempe Lake, assess stakeholder interests in the utilization of fishery resources in Tempe Lake, and develop a strategy for effective integration of traditional practices into the sustainable management system of Tempe Lake fishery resources.

MATERIALS AND METHODS

This research was conducted in the coastal area of Tempe Lake, Tempe District, Wajo Regency in March- May 2022. The location was chosen purposively with the consideration that the forms of local wisdom are still found and still preserved by the community in the utilization of Tempe Lake as a livelihood. The type of research is qualitative research with a case study method. The determination of the method refers to the explanation that social researches often speak of case studies, which focus attention on one or few instances of some social phenomenon, such as a village, family, or a juvenile gang (Babbie, 2004). Data collection techniques used were observation, interview and literature study. The data collected included primary data and secondary data. Secondary data were obtained through literature study. Primary data were collected through in-depth interviews and questionnaires. In-depth interviews were conducted with certain people purposively, i.e. people who were considered to know the issues under study. In addition to the purposive method, the selection of informants was also carried out by snowball, namely through information from informants who had been previously interviewed while still referring to the principle of triangulation (Miles *et al.*, 2014). During the research, 53 research informants were found. They were fishermen, farmers, community figures, traditional figures, local government and State Civil Apparatus from the relevant agencies. Data analysis was conducted based on a qualitative data analysis framework that analyzes through interpretation and understanding. The data obtained were analyzed in a componential analysis by going through three stages: First, qualitative data analysis carried out through the process of reducing rough data from field notes;

Second, data presented in the form of narrative text, then classified according to the theme of the problem, and third, drawing conclusions based on data reduction and presentation.

RESULTS AND DISCUSSION

Overview of the research area

Tempe Lake is an ancient lake located in South Sulawesi Province. The lake occupies three districts, namely Wajo, Soppeng and Sidenreng Rappang. The lake area at the peak of the rainy season can reach approximately 47,800 ha at an altitude of 10 meters above sea level with a catchment area of 4587 km². The water depth is about 3m during the rainy season and 1m during the dry season (**Nugraha, 2019**). This lake is generally utilized as a freshwater fishing area by fishermen and agricultural areas, plantations and residential areas on the outskirts of the lake. In addition, Tempe Lake has a biodiversity of rare animal species (endemic fish and migratory birds), a source of raw water reserves for agricultural irrigation, a source of drinking water, a water tourism destination, a source of water for natural gas mining, and conservation interests (**Marjuki, 2016**).

Tempe Lake, which was formed from the depression of the Asian-Australian earth plate, is located in the Welannae Cenranae River Basin and has an area of 47,800 ha at an altitude of 10 meters above sea level with a catchment area of 4,587km². Annual rainfall in the lake area is 1,400 - 1,800mm/ year, while in the watershed area it is 1,400 - 4,000mm/ year. The water level of Tempe Lake until 2001 showed a normal condition, in the dry season, the lake area only reached 1,000 ha, while in normal conditions the area reached 15,000-20,000 ha. The rivers leading to the lake consist of 23 rivers included in 2 watersheds, namely Das Bila and Das Walanae, while the river flow from the lake (outlet) is only one, namely the Cenranae River with length of 70km (**Andrian *et al.*, 2008**).

The utilization of Tempe Lake from time to time follows the tidal pattern. During high tide in the rainy season, the land area of Tempe Lake is inundated, and the local people utilize it as a fishing area. When the water recedes in the dry season, the land area on the coast turns into an agricultural area, which local residents utilize by planting various crops and fruits. By following the tidal pattern, in general, the livelihoods of local residents in Tempe Lake are fishermen and farmers. They are called fishermen when they engage in fishing and farmers when they manage agricultural areas. Most local people classify themselves as having a "dual profession", namely as fishermen and farmers.

Forms of local wisdom of the community in Lake Tempe

The fishing community living in Tempe Lake has local wisdom in the form of customary laws that originate from beliefs and develop through an adaptation process that has been passed down from generation to generation. This local wisdom is believed by

the community to create harmony, compatibility, balance and sustainability between humans, the settlement environment and the natural environment. It is believed by the community that if these traditions and customary laws are violated, it will damage the balance of the life system in the lake environment. Conceptually, in the approach of human ecology theory, it is said that in environmental management the reciprocal relationship between humans and their environment must be the basis of sustainable management. Human ecology on the one hand can be seen as a part of autecology, namely the ecology of a single species (*homo sapiens*). When humans are seen as social creatures, human ecology can use synecology so that human ecology is social (**Abdullah, 2017**). Ecology human interaction with the environment is a part of the ecosystem, humans are ecologically dominant living things since humans can compete better to meet their needs. Analytically, **Dharmawan, (2007)** distinguishes the scope of human ecology in two systems, namely natural systems and social systems. The two systems are interconnected continuously and regularly through the flow of energy, material and information so that the process of selection and adaptation occurs. The human environment is defined as everything around humans affecting human life itself.

The Tempe Lake in its management is more domestic, where the management system of the Tempe Lake by the local community is very philosophical, socialistic and localistic (**Arief, 2022**). The fisheries resource utilization system in the Tempe Lake community, which is deeply rooted in local environmental culture and has been preserved to this day, is closely linked to the social system, justice, and humanism. The system is described as follows:

Ongko rights

In the beginning, the Wajo Region was still a sovereign kingdom. The people had the freedom to utilize lakes, rivers and swamps. At that time, the entire Tempe Lake had the status of arajang rights (customary rights). Based on the legal subject, there is ongko rights of arajang officials and ongko rights of individuals. Hak ongko is a customary rule concerning the utilization of lake space, which involves rules on the location of fishing grounds (*cappeang*, *palawang*, *bungka toddo'*, *salu-'salu'*, and *pakkaja lalla'*), rules on the location of settlements, fishing prohibition areas and areas where floating vegetation grows in the water. Based on information obtained from various sources of information, the description of each local wisdom in question is described as:

a) Cappeang area

The *cappeang* area is a fish breeding location located on the shore of the lake. This area is controlled by several groups determined based on the results of the auction every three years. The fish breeding period in the *cappeang* area will end by itself if the water has begun to recede at the limit of the height of the *belle'*, which is a bamboo blade stuck to the bottom of the lake. If the *belle'* installed at a certain

distance has appeared on the surface of the water, the cappeang period ends and will be replaced by palawang.

b) Palawang area

The palawang area is a specific part of the lake located about 100 meters from the lake shore (sipattembakeng) with clear boundaries, marked by a bamboo fence (belle') set at 1.25 meters high. Palawang plots are generally semi-circular with a radius of about 50 meters (sapaddempereng bojo). The length of the radius of this circle also serves as a benchmark for the distance between two palawangs so that boat traffic lanes remain. The shape follows the model of the fishing gear used, called capping. The right of ongko over palawang comes into effect when the lake water recedes so that the upper end of the belle` appears on the surface of the water. At that time, exploitation of fisheries resources is the monopoly of the ongko right holder (solo ownership). Conversely, when the tide rises and the belle` sinks again, the ongko right ends and the palawang also changes. Thus, at first the ongko right to palawang was limited to arajang officials (a kind of lungguh), then it changed so that individuals could also own it. Palawang is also a fish breeding site controlled by individuals or groups based on the results of an auction conducted by the government with the approval of the local adat leader. Palawang rental prices can reach tens to hundreds of millions per three years. This is so that the utilization of the fish breeding area is not monopolized by people who can afford it, but can also be controlled alternately for community members who are interested in participating in the auction. For fishing communities that do not have enough material ability to control cappeang or palawang, there are still fishing grounds that are allowed outside of these two areas by making a breeding ground in the middle of the lake called bungka toddo'.

c) Bungka toddo' area

The Bungka toddo' area is a set of aquatic plants (grass) localized in certain parts of the lake, by sticking bamboo as a barrier. This set of aquatic plants is floating vegetation that holds fish in the middle of the lake in such a way that it covers a certain area of the water surface. Underneath, it then becomes a gathering place for fish looking for food. Thus, it functions like bait. Bungka toddo' is an effort to catch fish by forming a certain area in the lake area. The boundaries of the area are marked by using bamboo stakes as poles and splints as boundaries. The center is filled with various water plants to attract fish into the bungka toddo area.

Harvesting or fishing is done when the water starts to recede. The receding water causes the fish to be trapped, making it very easy to catch. When the lake water level is less than 1.25 meters high around the area of the bungka toddo' bamboo stakes, belle' of woven bamboo is installed as a perimeter fence. After two weeks of belle' installation and as the water recedes, the belle' fence is progressively narrowed while fishing activities are carried out using fishing gear

such as serok, bubu, and lanra nets. To conduct a bungka toddo business, a capital of 60.000.000 to IDR. 80.000.000 is required, which consists of bamboo stakes, belle', and workers' wages. Meanwhile, the yield from the business can reach Rp. 100.000.000 in one harvest. The size of one bungka toddo' according to the applicable regulations is 125 x 125m, or has a maximum circumference of 500m. In addition, the distance between one bungka toddo' and another is at least 200 meters.

d) Salo'-salo`

Salo'-salo` (creeks) are another form of customary fishing rights. Historically, creeks are man-made and, as such, are private property that can be passed down from generation to generation (occupation theory). Exploitation of the fishery resources contained in the salo'-salo` is entirely at the discretion of the owner. Typically, the ongko rights to salo'-salo` are cultivated by the owners themselves and some are auctioned to others. For the river (natural), it is entirely the right of the arajang. In certain parts of the river (natural), there are potential places to catch fish with certain fishing gear. The place is called ajjulukeng and the fishing gear is called julu`. This place (ajjulukeng) is auctioned annually to the people, and the winner of the auction will get the ongko rights for a period of one year. When the ongko rights to the salo'-salo` expire, it is immediately auctioned again. Outside the areas designated for cappeang, palawang, bungka toddo', and salo'-salo', people are free to fish using various types of gear that do not threaten the fish population in the lake. Fishermen in these areas are known as *pakkaja lalla'* (free fishermen). While living on the water is permitted throughout the lake, it is not allowed in the cappeang, palawang, bungka toddo', and salo'-salo' areas. These regulations help prevent conflicts among community members over fishing spots and ensure harmony within the lake.

1. Maccerak tappareng

Maccera' tappareng in the tradition of the Bugis (Wajo) community is a customary system directly related to Tempe Lake, which has been in place since the ancestors of the Bugis people inhabited the area and utilized the Tempe Lake as a place to make a living by fishing. Some of the customs that have been practiced for generations include the way of behavior and ritual ceremonies in maintaining a harmonious relationship between humans and the natural environment of the Tempe Lake. It was found that the belief in the existence of spirits, who inhabit and protect the lake, has become part of the daily life of the community. Therefore, in addition to serving as breeding grounds, fishing g, fish protection zines, and residential spaces, the Tempe Lake also contains sacred areas.

The Tempe Lake is home to several sacred areas believed in by the local fishing community. These sacred areas are marked by yellow or red flags on high poles, making

them clearly visible from a distance when crossing the lake by boat. These areas are used for the maccera' tappareng ceremony, where offerings are made to the lake's ruler.

The maccera' tappareng ritual, or traditional ceremony, is held at the beginning of the fishing season. It is interpreted as a ceremony for earth alms or to ward off bad luck. The ritual aims to ensure that fishermen avoid disasters during their fishing activities and obtain a bountiful catch, contributing to their prosperity. The ceremony is led by a Maccua Tappareng and involves offering food to the lake's ruler, including the ritual slaughtering of buffalo heads and communal eating.

The ceremony is sacred and takes place at midnight. The following day, a rowing boat race and boat carnival are held, featuring various shapes and themes that symbolize abundance. The costs of the traditional ceremony are covered by the self-help contributions of the Tempe Lake fishing community. The maccera' tappareng is performed annually, marking the beginning of fishing activities and requesting permission and protection from the lake's ruler. Sometimes, new boat owners or those using new boat engines for the first time also sponsor the rituals and offerings.

Additionally, there are several prohibitions that the fishing community must observe as part of the customary system, which has been maintained since the time of the Bugis ancestors. These prohibitions are intended to respect the fish and the ruler of the lake, ensuring the balance of the ecosystem and the sustainability of other life forms. Violations are believed to disrupt the natural balance and threaten the lake's ecosystem.

The prohibitions are as follows:

- Fishing in the lake is prohibited from Thursday night until Friday afternoon after zuhur prayer to allow fish breeding and give fishermen a rest and time for Friday prayers.
- Crossing dead bodies in the lake is forbidden.
- Washing mosquito nets in the lake is prohibited.
- Fishing without wearing a head covering is not allowed.
- Singing in the lake is restricted to fish-calling songs (elong bale).
- Public displays of affection between young people are prohibited in the lake.

These prohibitions honor the fish and the lake's ruler, who is believed to be a divine representative guarding the Tempe Lake. Violating these rules is thought to anger the ruler and cause the fish to disappear. Offenders are punished by being banned from fishing for three days and required to perform the maccera' tappareng ritual at their own expense without community assistance. This ritual serves as an apology to the lake's ruler for any transgressions. Community members act as supervisors, reporting violations to the Maccua Tappareng.

Analysis of stakeholders' power and interests in utilization in Tempe Lake area

Stakeholders are intended as parties that can influence or be influenced (receive impacts) by decisions taken or can also be defined as people, groups or institutions that have concerns and / or can influence the results of an activity (**Kusumedi & HB, 2010**).

Thus, it can be concluded that, stakeholders are all parties both individually and in groups that can be influenced and/or affect decision-making and the achievement of the objectives of an activity. In this study, Foucault's theoretical framework of power is used as an analytical tool (Lynch, 2010), as most studies conducted in relation to natural resources consider government power as state power that works through oppression and repression without seeing that power also exists in the communities that utilize these natural resources (Syafiuddin, 2018).

Free fishing areas (common use) for the general public, in addition to the entire surface of the lake, can also carry out fish breeding activities with a system of ownership through the mechanism of cappeang, palawang and bungka. Outside the area, the community can carry out fishing activities with simple fishing technology such as trawls / nets or mallanra or makkaja lalla. The following is an overview of the power relations and interests of stakeholders involved in the free fishing area (common use) when the water rises or floods take place.

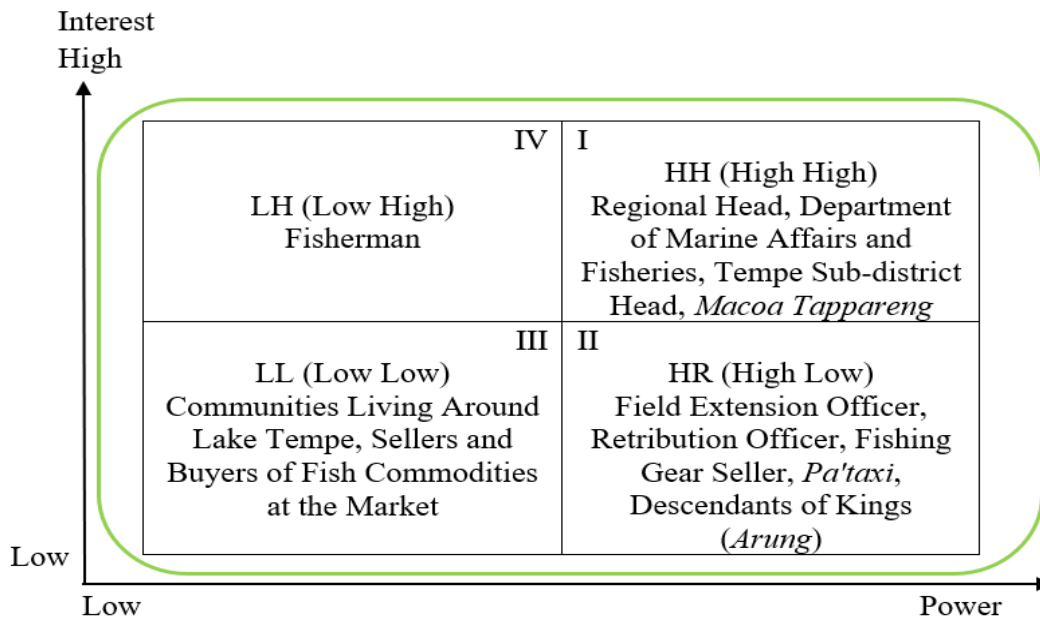


Fig. 1. Quadrant of stakeholders based on power and interest matrix involved in the common use fishing area of Tempe Lake

The description of the analysis of power and interests in the utilization of fishery resources in the ownership area of Tempe Lake based on local rules, is described as follows:

1) Cappeang area.

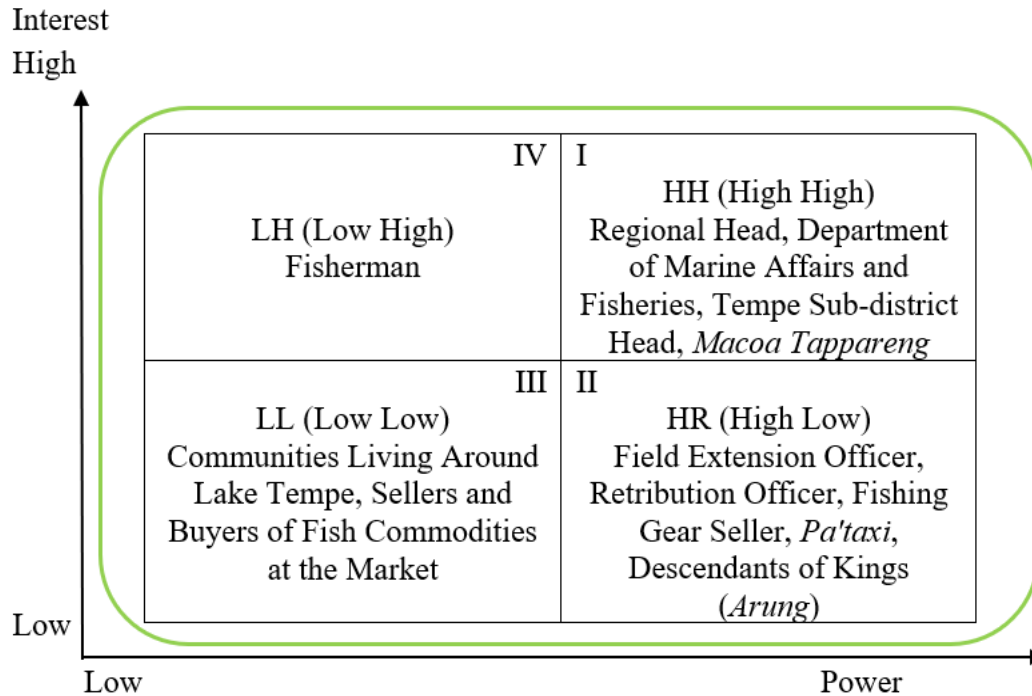


Fig. 2. Quadrant of stakeholders based on power and interest matrix involved in Tempe Lake Fringe Area (Cappeang)

2) Pallawang area

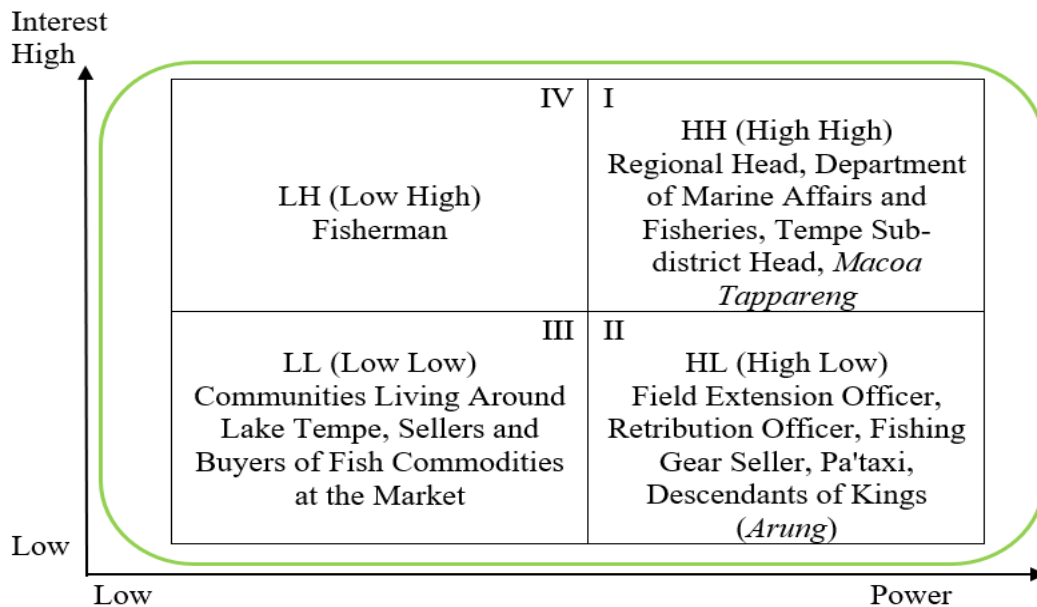


Fig. 3. Quadrant of stakeholders based on power and interest matrix involved in Pallawang Lake Tempe area

3) Bungka Toddo' area

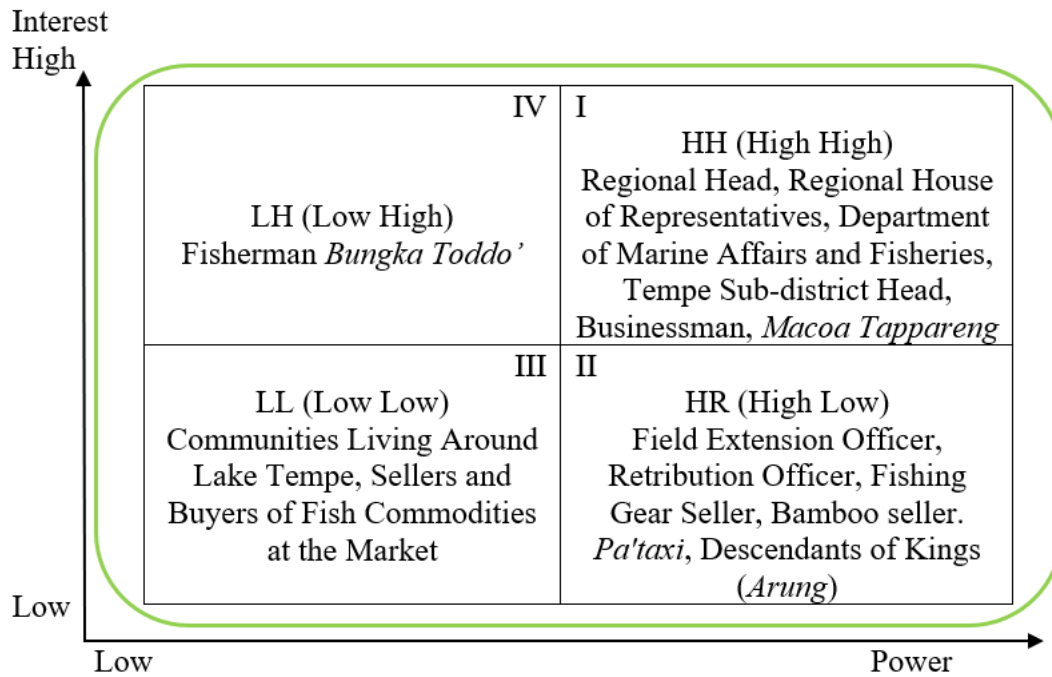


Fig. 4. Quadrant of stakeholders based on power and interest matrix involved in Bungka Toddo' area

In the common use/open access fishing area, cappeang fishing area, pallawang fishing area and bungka tododo fishing area, stakeholders are mapped according to their roles and functions in utilizing their power and interests, as well as how these stakeholders interact with each other and have varying power and interest relations, which are strong and moderate, even for weak power relations toward the utilization of fisheries resources in the Tempe Lake. Therefore, strengthening local institutions and integrating them into formal institutions is important as the basis of community power in utilizing and managing their own natural resources contextually.

Scenario of strengthening local institutional capacity in Tempe Lake utilization

With the goal of empowerment in interconnectedness, the strategy of strengthening community institutions based on local wisdom, especially in the utilization of fishery resources in the Tempe Lake, requires: (1) an increase in the income of the community at the lower level and a decrease in the number of people below the poverty line; (2) the development of community capacity to increase productive socio-economic activities of the people living around the Tempe Lake; and (3) the development of community capacity and the increasing capacity of community institutions, both officials and residents. This condition can be achieved by:

- a) Creating an atmosphere and climate that allows community potential to develop (enabling).

- b) Strengthening the potential or power possessed by the community (empowering)
- c) Protecting the weak from becoming weaker and preventing unbalanced competition and exploitation of the strong by the weak.
- d) Avoidance of excessive exploitation of resources by providing alternative activities with economic value, so that in the end, the damage to Tempe Lake can be minimized in a compromise manner.
- e) The support of various parties to revitalize the social system and traditional institutional system of the community based on local wisdom and provide incentives for its acceleration so that the performance of local institutions in accommodating development programs can be targeted and effective, especially in the management of fishery resources in the Tempe Lake.
- f) Implementation of a collaborative management model of the Tempe Lake (government, community, private sector) to improve economic development, ecological sustainability of the lake and empower the surrounding community. This is in line with the data reported in the study of **Jamu *et al.* (2011)** who elucidated that the lake planning policies must be carried out in an integrated manner to address various ecological, socio-economic and external factors that threaten the sustainability of the lake ecosystem as a source of livelihood for the surrounding community.

CONCLUSION

The exploitation of the Tempe Lake by the community is more domestically based on local institutions inherited from previous generations in the form of utilization arrangements such as cappeang, palawang, bungka toddo' and traditional ceremonies in the form of maccerak tappareng. The position of stakeholders in utilizing fisheries resources in the Tempe Lake has power relations and interests that vary greatly. The integration of local institutions into formal institutions is the basis of community power in utilizing and managing the fisheries resources of the Tempe Lake contextually. The strengthening of local institutions for the management of Tempe Lake has an impact on the collaborative management system between the government, the community and the private sector who are jointly responsible for maintaining the economic and ecological sustainability of lake resources.

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