



Socio-economic and cultural sustainability in local wisdom management at local marine conservation area (KKLD) of Mayalibit Bay, Raja Ampat Regency, West Papua Province

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Abstract. This study had an objective to assess socio-economic and cultural sustainability in local wisdom management at local marine conservation area (KKLD) of Mayalibit Bay, Raja Ampat Regency, West Papua Province, Indonesia. The study applied sustainability index and status evaluation with a Rap-multidimensional technique for data analysis. Field observation found that fifteen attributes of socio-economic and cultural dimensions resulted in index of 50.85, proving a moderate sustainability status.

Key Words: sustainable capacity, sasi, Rap-multidimensional technique, local wisdom, small islands park.

Introduction. Indonesia is an archipelagic state with very large number of islands (17,504), and long coastline (95,000 km) (Siburian & Haba 2016). Between the islands, there lies a group of aquatic area measuring a total of 5.8 million km² and terrestrial area measuring a total of 1,860,359.67 km² (National Center for Survey and Mapping Coordination [Bakorsurtanal] and Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia 2003). With such enormous figures the country possesses abundant coastal and marine resources, in addition to heterogeneous cultural backgrounds. Behind this unique feature, Indonesia has been facing problems in maintaining its sustainable capacity due to excessive fishing, overexploitation, and destruction of coral reefs and mangroves. To make worse, the country is also having trouble with management and activities dealing with coastal zone development because of regulation overleafing and lacking awareness of community-based strategic values of the coastal zone and small islands management (Dahuri 1996).

This study revealed that traditional communities in Indonesia, in particular those inhabited by fishermen, had managed to sustain their tradition in preserving, organizing and arranging, and implementing regulations dealing with the proper fishery exploitation of the coastal zone by empowering traditional institutions and social philanthropies. Mungmachon (2012) contends that local wisdom is capable of providing solutions to problems faced by the community, including environmental problems. Current trends, however, have evidence government reluctance preserve the long-standing traditions by preferring modern sciences in managing the conservation area. In consequence, both local communities and local government (either municipal or provincial) hardly pay attention to supporting the implementation of the conservation area management. Many conservation efforts have failed to achieve their predetermined targets (Kosmaryandi 2012).

Decentralization, in which central government delegates parts of its responsibilities and authorities to lower tier, local governments, has opened opportunities to the more significant role of the local communities and governments to get involved in

the determination and the management of the marine conservation areas (Ferse et al 2010).

Similar to that of other regions in Papua and Maluku, Raja Ampat also applies local wisdom namely "Sasi" in managing the natural resources. This management model, which prioritizes the natural resource sustainability, has been in practice for generations (Handayani 2008; McLeod et al 2009). Sasi requires that commodities of economic fishery, such as "lola" and "teripang", is considered important, as it may be found in some villages and islands. Conversely, the other parts of the islands, which have altered Sasi with modern habits, have found difficulties to maintain this biota (McLeod et al 2009). This phenomenon has motivated civil societies in Raja Ampat to take measures to rethink the Sasi as a model for managing the marine conservation in the islands.

KKLD of Mayalibit Bay in Raja Ampat Regency is part of the Region II of the local small islands park (TPPKD) of Raja Ampat. It is situated in Waigeo Island on the area measuring 53,100 hectares. Mayalibit Bay lies in the middle of the island, almost splitting it into two areas with a narrow head, characterizing the bay as a relatively closed area. Mayalibit Bay is situated on the coordinates of 0°22'14"-0°05'00" South and 130°36'43"-130°59'10" East. It is an aquatic conservation area with massive layered mangroves and sea grass on the coastlines. KKLD of Mayalibit Bay and, furthermore, six other KKLDs, are organized to create protected marine and coastal areas, which play an important role to sustain fishery reproduction and supplies. In addition, the KKLDs are useful for providing environment-friendly marine tourism, socio-economic development facilities, and educational, research, and development activities to Raja Ampat Regency (Ministry of Maritime Affairs and Fisheries of Republic of Indonesia 2012).

This study had an objective to assess the management of local wisdom at the KKLD of Mayalibit Bay in Raja Ampat Regency, West Papua Province from the viewpoints of the socio-economic and cultural sustainability of the local fishermen.

Material and Method. This study applied a descriptive method and qualitative and quantitative approaches. Research was performed at the KKLD of Mayalibit Bay in Raja Ampat Regency. A purposive sampling applied to selecting the research location. KKLD of Mayalibit Bay was selected because of its status as an area for the management of the local small islands park (TPPKD). Villages (kampong) included in the field observation were those having situated nearby "no take zone", "restricted zone", and "other zone" with local wisdom potentials, i.e., Warsambin, Lopintol, Kalitoko, Waifoy, Araway, and Warimak (Figure 1).

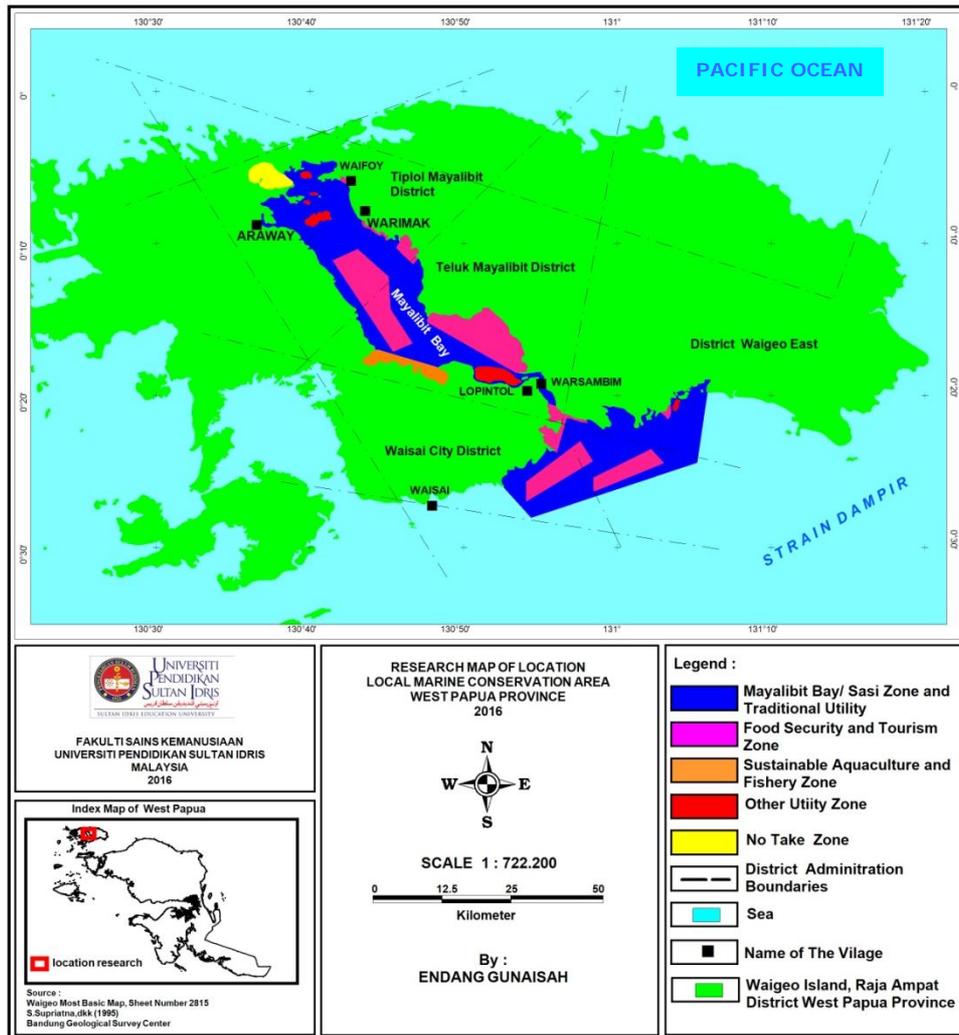


Figure 1. Research location.

Respondents for the study samples were obtained from the fishermen performing their activities at the Mayalibit Bay. Using a simple random sampling technique, this study collected 248 fishermen as the respondents. Data required consisted of primary and secondary data. The primary data dealt with attributes related to socio-economic and cultural conditions, which were collected by interview and questioner dissemination (Table 1). The secondary data derived from geographic and demographic conditions of the fishermen at the KKLD of Mayalibit Bay. This study applied a Rap-Multidimensional technique, a modification of Rapid Appraisal for Fisheries (Rapfish) technique, with a multidimensional scaling analysis (Kavanagh & Pitcher 2004) to discover socio-economic and cultural sustainability. There were four sustainability indices, following Susilo (2003): 0-25 (poor), 26-50 (inadequate), 51-75 (moderate), and 76-100 (good).

Table 1

Socio-economic and cultural dimension

<i>Indicators</i>	<i>Good</i>	<i>Poor</i>	<i>Scores</i>	<i>Scale</i>
Local wisdom is useful for fishery resources management	2	0	0,1,2	0 = useless; 1 = inadequately useful; 3 = useful.
Family gets benefit from local wisdom for fishery resources management	2	0	0,1,2	0 = useless; 1 = inadequately useful; 3 = useful.
Efforts to sustain local wisdom are necessary	2	0	0,1,2,3	0 = no efforts; 2 = few efforts; 3 = plenty efforts.
Social orders (social institutions) are available for supporting local wisdom	2	0	0,1,2	0 = not necessary; 2 = no comment; 3 = necessary.
Local wisdom inhibits fishing activities	3	0	0,1,2,3	0 = yes; 2 = no comment; 3 = no.
Diversification of fishery products	2	0	0,1,2	0 = not available; 1 = a single product; 2 = multiple products.
Alternative income	3	0	0,1,2,3	0 = not available; 1 = one to three alternative jobs; 3 = more than three alternative jobs.
Income rate	3	0	0,1,2,3	0 = less than Rp500,000; 1 = between Rp501,000 and Rp1,000,000; 2 = between Rp1,000,001 and Rp1,500,000; 3 = more than Rp1,500,001.
Change in income in the past five years	2	0	0,1,2	0 = decreasing; 1 = stable; 2 = increasing.
Education	3	0	0,1,2,3	0 = not attending/not graduating elementary school (SD); 1 = graduating elementary school (SD); 2 = graduating secondary school (SMP); 3 = graduating highschool (SMA) at minimum.
Market size	3	0	0,1,2,3	0 = no market is available; 1 = local market; 2 = national market; 3 = international market.
Fishermen perception of local wisdom	4	0	0,1,2,3,4	0 = extremely negative; 1 = negative; 2 = neutral; 3 = positive; 4 = extremely positive.
Fishing catch in current year compared to that of previous year	2	0	0,1,2	0 = stable; 1 = decreasing; 2 = increasing.
Fish species caught in current year compared to that of previous year	2	0	0,1,2,3,4	0 = extremely negative; 2 = negative; 3 = neutral; 4 = extremely positive.
Fishermen participation in fishery resources exploitation	4	0	0,1,2,3,4	0 = extremely negative; 1 = negative; 2 = neutral; 3 = positive; 4 = extremely positive.
Community perception of fishery resources exploitation	4	0	0,1,2,3,4	0 = extremely negative; 1 = negative; 2 = neutral; 3 = positive; 4 = extremely positive.
Fishermen knowledge on local wisdom	4	0	0,1,2,3,4	0 = extremely negative; 1 = negative; 2 = neutral; 3 = positive; 4 = extremely positive.

Results and Discussion. Previous studies have discussed the marine conservation area of Mayalibit Bay. The first study focused on policy and fishery extension (Handayani et al 2016a) with the result of the importance for the policy on fishery extension programme and appropriate education strategy to diminish the threats on the environment. The second study dealt with management effectiveness (Handayani et al 2016b) concluding the need for a synergy of the collective management between municipal and provincial governments towards the effectiveness of the management of the KKLD of Mayalibit Bay. The area apparently has plenty of aspects to offer to the academic communities and to the scientific analyses. In an effort of extending the contribution to the literature, this current study focused on the local wisdom aspect as a means towards social, economic, and cultural sustainability.

Mayalibit Bay is situated in Waigeo Island on the area measuring 106,808 km² and is the longest bay in Raja Ampat Islands, splitting Waigeo Island into two parts. KKLD of Mayalibit Bay lies on an area measuring 53,100 hectares and on the coordinates of 130°52'58" East and 00°25'12.6" South. The area spreads over the Mayalibit coastline during the high tide, heading northeast on the coordinates of 131°06'08" East and 00°19'23" South. It then continues southward to the coordinates of 131°5'45" East and 00°24'02" South, directs to the southwest on the coordinates of 130°54'02" East and 00°27'06" South. The circle completes the journey as the points meet when the line heads for the northwest. KKLD of Mayalibit Bay is an aquatic conservation area located in a bay with massive layered mangroves and sea grasses. The bay is also inhabited with unique sponges and filter-feeder, and cetaceans. In addition, it has become a spawning ground and aggregation sites for Chub mackerels (local names: kembung/lema) (Municipal Office of Maritime Affairs and Fishery of Raja Ampat 2012).

The marine conservation area (KKLD) of Mayalibit Bay (Region II) is one of six conservation areas available in West Papua Province, the other being Ayau (Region I), Dampier Strait (Region III), Misool (Region IV), Kofiau (Region V), and Kawe (Region VI). They are united into one local small islands park (TPPKD) of Raja Ampat. The TPPKD of Raja Ampat is part of Marine Protected Area (MPA) Network. The network is considered as a tool for preventing the Birds Head Seascape (BLKB) from threats and contributing to the conservation of biodiversity and sustainable fishery (Huffard et al 2012). TPPKD Region II of Mayalibit Bay in Raja Ampat Regency is under the administrative authorities of East Waigeo District, Mayalibit Bay District, and Tiplol Mayalibit District. The Region II comprises eleven villages, four in Mayalibit Bay (Mumes, Warsambin, Lopintol, and Kalitoko), six in Tiplol Mayalibit (Warimak, Waifoi, Go, Beo, Arawai, and Kabilol), and one village in East Waigeo (Yensner).

Coastal ecosystem in Mayalibit Bay is relatively dominated by mangrove forest, which spreads from the mouth to the inner part of the bay. The mangrove forest is potential for mangrove crabs and shrimps, the major fishery commodities for the local people. Sea grass also grows in the mouth of the bay and inner coastline, with Sargassum algae dominating just outside the bay. KKLD of Mayalibit Bay with its narrow feature is fragile of damage, which affects the waters or the surrounding environment. Land clearings by converting forest cover nearby the bay area have caused sedimentation and species damage. In particular seasons blooming algae grow excessively, causing the deaths of many fish species (Khazali et al 2011).

The Rap-multidimensional analysis using multidimensional scaling (MDS) ordination technique resulted in socio-economic and cultural sustainability index of 50.85 (Figure 2). In the other words, the sustainability was moderate. This sustainability index was resulted from an assessment of the fifteen attributes. Furthermore, the analysis also recorded stress and R² values of the socio-economic and cultural dimensions. Stress value obtained was 0.15, below 0.25, revealing adequately good result of analysis. Whereas, R² obtained for socio-economic and cultural dimensions of the fishermen resulted was 0.94, revealing that weighted indicators were capable of explaining local wisdom at 95.93% level. In conclusion, all attributes in use were adequate.

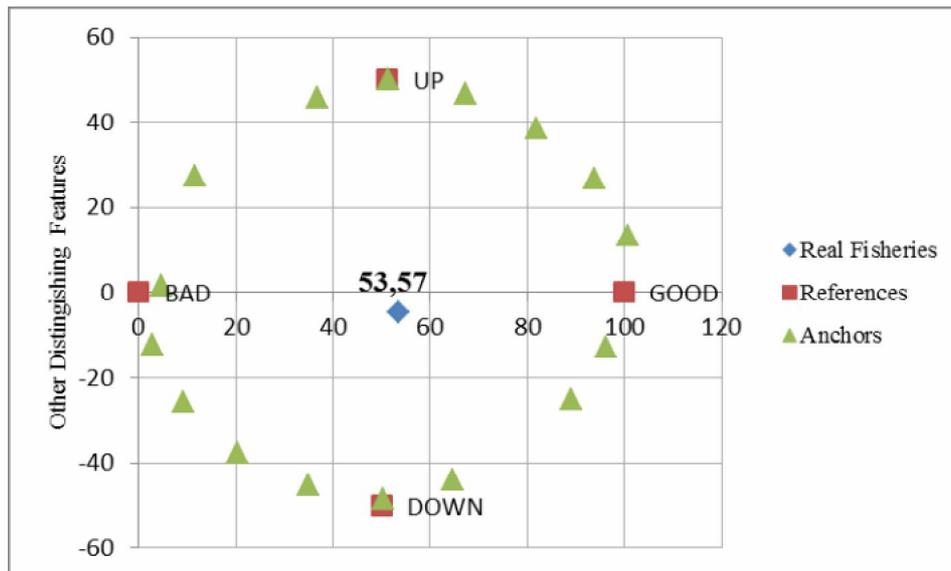


Figure 2. Sustainability assessment of socio-economic and cultural dimensions at KKLD of Mayalibit Bay, Raja Ampat Regency. (Note: Anchors are paths that counterbalance "good" and "bad")

A leverage analysis resulted in four sensitive attributes of socio-economic dimensions with the highest RMS scores: 1) education; 2) social order; 3) income; and 4) fishermen perception of Sasi.

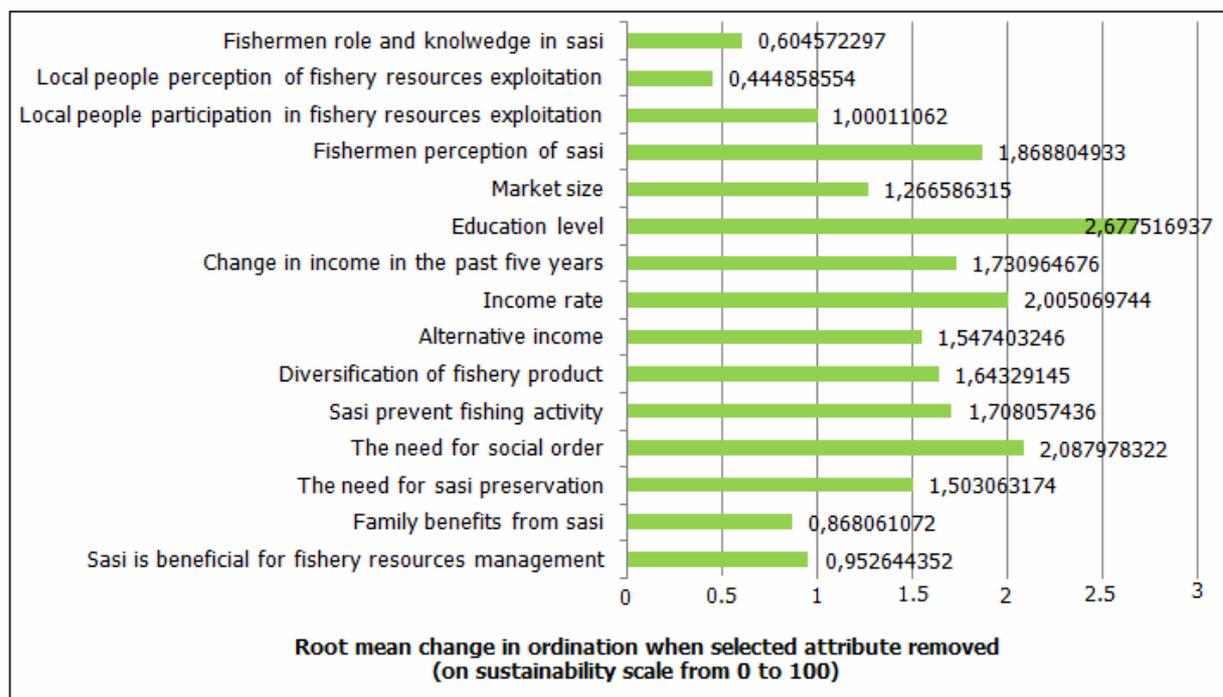


Figure 3. RMS scores for influential socio-economic and cultural dimensional attributes at KKLD of Mayalibit Bay, Raja Ampat Regency.

Education was a very sensitive attribute in the socio-economic and cultural dimensions. Parameters used for detecting natural resources potential were education of local community, education characteristics, and performance of education institutions. Most local fishermen in Mayalibit Bay and Tiplol Mayalibit had a low formal education level (not graduating elementary school) due to poor facilities and learning systems, inaccessible and scarce accommodation and physical infrastructures, limited number of teachers, and

low commitment of the teachers to performing their responsibilities. Accordingly, the highly committed, but in limited numbers, of teachers became overburdened because they had to do multiple duties.

Social order was a sensitive attribute for the sustainable management of the local wisdom at KKLD of Mayalibit Bay in the socio-economic and cultural dimensions. According to Koentjaraningrat (1987) social order is a special norm that regulates a patterned set of actions for particular needs of human in their lives in the community. In German it is so called "Soziale Gebilde", which means illustration and construction of particular institution. Social order or institution contains rules and traditions, delivered either in oral or in written manner, which become reference and guide for each member of the community affected by such rules and traditions. In Mayalibit Bay, a institution namely monitoring community group ("Pokmaswas") has responsibilities for monitoring, managing, and exploiting fishery and marine resources and fishing activity, and maintaining security of non take zone from thefts. The fishermen at KKLD of Mayalibit Bay has Islamic and Christian institutions ("lembaga masjid" and "lembaga gereja") that support social activities and natural resources protection. Local community leaders have an authority to request spiritual leaders to socialize Sasi; otherwise, spiritual leaders may decide to perform Sasi practices, such as "Sasi Pinang" or "Sasi Kelapa", voluntarily. After Christianity, more local people at KKLD of Mayalibit Bay have stopped following Sasi as traditional authority weakens. A local leader explained that, "God is our priority and should we do mistakes or violate Sasi, the harvest will be optimal and we will get nothing."

Income attribute is one of explanatory factors for finding out economic progress of the households, local community, and programs. The locations observed were located on the coastal area with most people making their living in fishery industry, being fishermen. The majority households (62.19%) had monthly income of Rp 1,000,000. There were 18.15% of the households having monthly income between Rp 1,000,000 to Rp 1,999,000, and 12.10% of the households with monthly income less than Rp 1,000,000. Low income had caused difficulties for most households to fulfill their daily needs. In other words, most of people in the research location were still under the poverty line according to standards required by the Indonesian Center for Statistics (BPS) and the World Bank.

Fishermen perception of Sasi is a sensitive attribute for the sustainable management of local wisdom at KKLD of Mayalibit Bay in socio-economic and cultural dimensions. The answered questioners revealed that respondents had high perception rates towards the ongoing practice of local wisdom in each research location. Local wisdom was believed to be an integral part of the daily life of the local people. It had been a long-standing tradition for generations. Sasi (also often referred as "wawe" by some group of the local people), possessed a significant function as a regulatory order for managing the protection, preservation, and exploitation of the coastal resources. The management, fishing activities, and rights and responsibilities of the local people follow such local wisdom, performed mutually as required by local leaders. The local wisdom performs beyond ecological, economic, and social functions since it also contains cultural function in which values and expression of localities are embedded within. Sasi local wisdom practiced by the locals in Mayalibit Bay goes in harmony with the nature. It provides economic benefits because of efficiency principles such as preserving marine and coastal resources for all fishermen, both local and visitors, preventing overexploitation and maintaining shared fishing products for all. The high perception of the local wisdom had proven that it had become integral to the customs and culture of the people living in the coastal area for generations. The ongoing local wisdom fuels the resources sense of belonging and desires to keep the tradition and the culture alive within the community.

Conclusions. According to our study, sustainability indices of socio-economic and cultural dimensions were considered moderately sustainable. Optimizing such attributes as education, social order, income, and fishermen perception of *sasi* are necessary to

improve the sustainability status in the management of local wisdom at KKLD of Mayalibit Bay.

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