

Analysis of management effectiveness of Local Marine Conservation Area (KKLD) Mayalibit Bay, Raja Ampat Regency, West Papua Province

¹Handayani Handayani, ²Sutrisno Anggoro, ²Boedi Hendrarto,
²Abdul Kohar

¹ Doctoral Program in Environmental Science, Diponegoro University, Semarang, Indonesia; ² Faculty of Marine and Fisheries, Diponegoro University, Semarang, Indonesia. Corresponding author: H. Handayani, handayani_msdp@yahoo.com

Abstract. The establishment of Marine Conservation Area (KKL) is not necessarily becoming desired protection and conservation efforts. Therefore, questions raise whether the KKL management has been performed effectively in order to obtain sustainable outcomes as well as to improve community socio-economic status. This research aimed to analyze the effectiveness of the management of the Local Marine Conservation Area (KKLD) Mayalibit Bay in Raja Ampat Regency, Indonesia. Research respondents consisted of KKL managers and stakeholders from fishery and tourism sectors. This research applied a descriptive study using scorecard-base quantitative and qualitative methods. Results of status/condition identification, planning, management necessity, activity implementation and goal achievement of the activity showed that the KKL Mayalibit Bay obtain a management rate of 73.61%, a rate that put the management on the fourth level category with measurable and observable institutional system management and conservation effect. Perception of most fishermen revealed awareness of environmental sustainability and good knowledge about regulations concerning KKL. However most of them explained that KKL had not given socio-economic benefits.

Key Words: Local Marine Conservation Area Mayalibit Bay, management, effectiveness rate, environment, perception.

Introduction. Indonesia possesses the fourth largest marine fishery production in the world. The country has reached a fully exploited to over exploited level in fishery resources (FAO 2011). Threats on coastal zone and marine are mounted by local people who live nearby the coastal zone, vary impacts of development at the coastal zone and marine ecosystems as well as climate change. The threats and impacts require management of coastal zone ecosystem and resources conservation management since they have become the major living for the people living nearby the area. The significance of coastal zone and marine resources has prompted efforts of protecting these areas by establishing a conservation area. According to Green et al (2012), Halpern & Warner (2002), Parnell et al (2005), Roberts et al (2005), and Valdes & Hatcher (2010), Marine Conservation Area (KKL) is a fundamental instrument by which marine ecosystems are preserved and sustainable socio-economic development is performed.

Efforts of marine resource conservation in Indonesia goes in parallel with the sense of national development, coastal zone community and global conservation development. In principle, these efforts deal with the management of fishery resources and their environment as a whole. According to Law No. 45/2009 on amendment of Law No. 31/2004 on Fishery the Government of Indonesia requires fishery management with an area protection approach. Such requirement is further implemented by the Government Decree No. 60/2007 on Fishery Resource Conservation, which dictates details of efforts of fishery ecosystem or habitat conservation management, including the development of the Marine Conservation Area (KKL). The government has also stipulated a national policy on the conservation management, as mentioned by President Susilo Bambang Yudhoyono at the Convention Biological Diversity (CBD) summit held in Brasil

in 2006. The summit planned 10 millions hectares of the KKL by 2010. Furthermore, the similar campaign was emphasized at the 2009 World Ocean Conference (WOC) (Nainggolan et al 2013). Indonesia has been committing to the improvement of the KKL up to 20 millions hectares by 2020. The country targeted 15.5 millions hectares in 2014, which then currently increases to 15.76 millions hectares. It is expected that the KKL scope will reach at least 4.5 millions hectares in six years to come (KKP 2014). The Local Marine Conservation Area (KKLD) spreads over different places nationwide (Ministry of Maritime Affairs and Fishery 2014). By 2013, there had been 70 KKLDs with the total area of 5,862,164 hectares. Of these figures, Indonesia had 3.64 millions hectares of KKLD, in which one of them is situated in Raja Ampat Regency, West Papua Province (Ministry of Maritime Affairs and Fisheries of Republic of Indonesia 2014).

The establishment of KKLD in Raja Ampat was motivated by intention and commitment of the local people to protect biodiversity of the coastal zone and marine resources as the major living for them. To the present day, there are 6 (six) KKLDs situated in Raja Ampat with a high connectivity, creating a network with biological, economic, social, and cultural aspects, namely KKLD Ayau-Asia, KKLD Wayag-Sayang, KKLD Mayalibit Bay, KKLD Dampier Strait, KKLD Kofiau and KKLD Southeast Misool.

According to Leverington et al (2008) the establishment of water area conservation is not necessarily becoming desired protection and conservation efforts. Therefore, questions raise whether the KKL management has been performed effectively in order to obtain sustainable outcomes as well as to improve community socio-economic status (Day et al 2002; Hockings et al 2006). In addition, Pomeroy et al (2005) contends that evaluation of the conservation area management helps the managers document management efforts in order to achieve goals and to provide progress portrayal to decision-makers as well as stakeholders.

This research aimed to analyze the effectiveness of the management of the Local Marine Conservation Area (KKLD) Mayalibit Bay in Raja Ampat Regency. The research expected benefits of the management to find out efforts performed and progress obtained in the management of the Local Marine Conservation Area (KKLD) Mayalibit Bay.

Material and Method. This research applied a descriptive study with quantitative and qualitative methods (mix method). The research took place at the KKLD Mayalibit Bay in Raja Ampat Regency from January to March 2015. The determination of the KKLD was performed intentionally by way of a purposive sampling provided that KKLD Mayalibit Bay is part of the management area of TPPKD accessible by land and water transportation from Waisai (the capital city of Raja Ampat Regency). In addition, the location has also possessed a regular route on daily basis, which results in high visit rate to the location of KKKPD Mayalibit Bay. The KKLD Mayalibit Bay covers Yensner, Mumes, Warsambin, Lopintol, and Kalitoko villages (Figure 1). Population of research respondents consisted of the KKLD Mayalibit Bay managers, stakeholders of tourism and fishery (fishermen) sectors.

The research used descriptive and explanatory data analyses using score card-based questioners with six stages, which were constructed according to the guidance of the Coremap II-LIPI (2010) and TNC (2011). Each of the total score at each stage of the evaluation had different scores. These total scores were then aggregated. When there was any inappropriate or unanswered question, the total/maximum score had to be adjusted. Data obtained from analysis scorecard analyzed quantitatively by measuring percentage of the value of each element and aggregated and the total percentage. There respondents of this research were 269 fishermen determined by a simple random sampling technique.

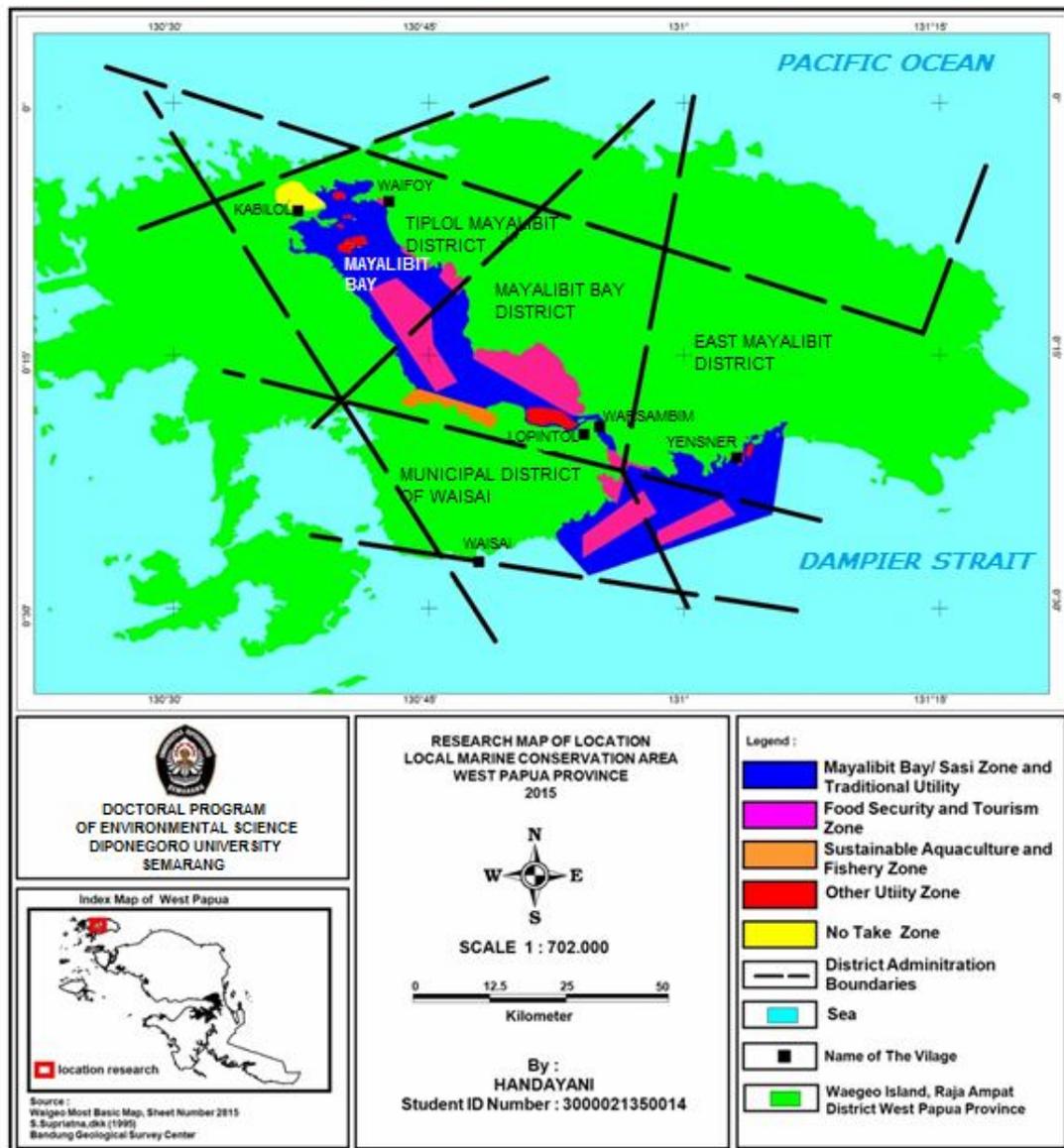


Figure 1. Map of research location.

Results and Discussion. Raja Ampat Regency is situated on the coordinates of 10°5' N-2°20' S and 129°10'-131°25' E, covering 4,600,000-hectare area with the proportion of 85% water and 15% terrestrial. The regency has 610 islands with four big islands, Waigeo, Batanta, Salwati, and Misool. Of the total islands, there are 34 islands inhabited (Municipal Center for Statistics of Raja Ampat Regency 2014). KKLD Mayalibit Bay covers 6 (six) conservation areas, namely Area I - Ayau, Area II - Mayalibit Bay, Area III - Dampier strait, Area IV - Misool, Area V - Kofiau, and Area VI - Kawe. They are integrated into Local Islets Park (TPPKD) Raja Ampat. The KKLD Raja Ampat spreads on 53,100-ha area with the coordinates of 130°52' 50.8" East and 00°25' 12.6" South along the coastline of the Mayalibit Bay at the high tide, heading Northeast to the coordinates of 131°06' 08" East and 00°19' 23" South. The area then continues Southward to the coordinates of 131°05' 45" East and 00°24' 02" South, Southwest to the coordinates of 130°54' 02" East and 00°27' 06" South, pointing to the Northwest to complete the loop with the total area of 53,100 hectares. TPPKD Area II Mayalibit Bay is part of the administrative area of East Waigeo District, Mayalibit Bay and Tiplol Mayalibit. There are 11 villages situated in this KKLD. The establishment of the KKLD is pursuant to the Decree of Raja Ampat Regent No. 66/2007, Municipal Law No. 27/2008, as well as the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia Decree No.

36/KEPMEN-KP/2014 on Raja Ampat Islands Water Conservation Area in Raja Ampat Regency of West Papua Province.

KKLD Mayalibit Bay is a marine conservation area in a bay with multilayer mangrove at large seagrass beds. The area is dominated by unique sponges and filter-feeders around the reefs. This conservation area also becomes an aggregate site for *Rastrelliger* sp. (local name *Lema*) spawning ground. The percentage of living coral covering ranges 0-70% with the average covering of 8.82%. The average percentage of other biota covering, including soft corals, is 27.16%. The average percentage of extinct reefs is 21.93%, whereas the percentage of sand and rubble coverings are 26.85% and 9.50% respectively. Cetaceans are found in this conservation area. Nearby the bay downstream there are varied species, such as sperm whale (*Physeter macrocephalus*), killer whale (*Orcinus orca*), Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), false killer whale (*Pseudorca crassidens*), spinner dolphin (*Stenella longirostris*), Risso's dolphin (*Grampus griseus*), Chinese white dolphin (*Sousa chinensis*). Along with cetaceans, also the dugong (*Dugong dugon*) is found in the area (Lazuardi et al 2011).

There were 2,116 population who lived nearby the KKLD Mayalibit with the main living as fishermen. However, some of them earned their income from plantation. The common fishing gears used during their activities were hook or handline, built-in hook, water gun and *kalawai*. The main transportation for fishermen of Raja Ampat are *ketinting* long boat (15 and 40 HP). The fishing grounds took place nearby the villages.

The assessment of the management effectiveness of KKLD Mayalibit Bay is performed by evaluating 6 (six) stages: current KKP status/condition identification; planning and expectation; necessity identification; activity implementation and outcomes and local people perception (Day et al 2002; Kelleher 1999; Hockings et al 2006; COREMAP II-LIPI 2010; TNC 2011). The assessment reflects each stage of the management and people perception processes.

Background element consisted of 23 questions, which explained the current condition and situation of the KKLD Mayalibit Bay in Raja Ampat Regency. The establishment of the KKLD Mayalibit Bay began with management and zoning plan of TPPKD Raja Ampat (Minister of Maritime Affairs and Fisheries Decree No. 17/2008; Minister of Maritime Affairs and Fisheries Decree No. 30/2010). The determination of the TPPKD Raja Ampat zoning comprised several stages, including activity, meeting with local people, participative zone map development and local tradition declaration. The plan development stage of the TPPKD consisted of development, public consultation, and plan determination of the management of TPPKD Raja Ampat.

Zoning types of KKLD Mayalibit Bay had been mutually agreed by the local government of Raja Ampat through the Municipal Office of Marine and Fishery and/or Local Technical Performing Unit of TPPKD Raja Ampat facilitated by CI and TNC NGOs in collaboration with local people in specific and localistic manner. According to Gubbay (1995) and Kelleher (1999), ecological sensitivity and user need become the primary consideration in zoning development. The determination of zoning and plan of TPPKD Raja Ampat accorded with the Decree of Raja Ampat Regent No. 265/2013 on amendment to the Regent Decree No. 80/2013 on the Establishment of Plan on Local Islets Park Management in Raja Ampat 2012. The national scope of the similar issue is regulated within the Ministry of Marine and Fishery Decree No. 36/KEPMEN/KP/2014 (Table 1).

Table 1
Types, details, zone area of KKLD Mayalibit Bay

Zone types	Zone details	Area (ha)	Percentage (%)
No take zone	No take zone	609	1.1
Restricted use zone	Food security and tourism zone	14.982	28.20
	Aquaculture and sustainable fishery zone	1.398	2.60
Other zones	Zone for other uses	1.377	2.60
	<i>Sasi</i> and traditional zone use	34.734	65.40

The respondents reported that the mechanism of management for protecting and conserving resources against violations within the area, e.g. the use of prohibited fishing gears, as well as zoning and other violations has been "effectively performed" with joint patrol between local people, army, police and local government (acted by Municipal Office of Marine and Fishery). While the monitoring system had been performed effectively, the improvement of the facilities and infrastructures and the monitoring staff were significantly necessary due to the far reaching area of the KKLD Mayalibit Bay. Both civil society and corporations that caught, exploited, and cultured the fishes and other biota commercially and massively using marine ecosystem-damaging fishing gears would be fined at maximum rate of Rp.50,000,000 (fifty millions rupiah) pursuant to Local Law No. 27/2008 Article 23. Concerning area boundaries, the respondents "had already known about and had been informed adequately." The KKLD Mayalibit Bay (TPPKD Raja Ampat) was still at an integrating process level. In other words, the conservation area in Raja Ampat had to be integrated and directed in order to give benefits according to the objective of the establishment of each KKLD, in addition to create the Raja Ampat Conservation Area network. Targets of the establishment of the KKL Raja Ampat Network were institutional unit of TPPKD and KKP management, local government, community, private sector and other concerned parties in order to develop and to manage the Raja Ampat Marine Conservation Area in a collaborative manner. The Raja Ampat Marine Conservation Area Network was part of bigger networks within BLKB (*Bentang Laut Kepala Burung*, or Bird's Head Seascape), which comprised 12 (twelve) KKLDs with the total area of 3 millions hectares. At the moment, the KKP in the BLKB area reached 3.5 millions hectares (Agostini et al 2012).

Stakeholders awareness of threats and conditions of marine resources nearby the KKLD Mayalibit Bay had shown an increase 50-75%, for example, part of water areas in Warsambin and Lopintol, which were the fishing grounds of *Rastrelliger* sp. The areas became spawning ground, nursery ground, and feeding ground, which were made available according to a mutual agreement as stipulated within Decree of Warsambin and Lopintol No. 1/2013 on Method of Management and Use of *Rastrelliger* sp. Resource. Improvement in education and awareness, according to Dahuri (2003), is one of strategies toward preventing problems in the conservation area management.

In reply to the information concerning biophysical, social, cultural, and economic conditions of the local people, as well as fishery and tourism resources at the KKLD Teluk Mayalibit, the respondents reported that the available information had been adequate. However, they demanded more information in order to support the more effective management. According to Pomeroy et al (2005), each KKL has biophysical, governance and socio-economic factors, which, directly or indirectly, affect the whole management performance and to what extent the KKL being performed, which, in turn, affect the changes in several or all concerned factors. Information about tourism potential and commercial use of the area had been available but still inadequate in terms of supporting the management. Furthermore, according to the respondents, the tourism potential of the KKLD Mayalibit Bay had not been properly managed as compared to the tourism management in Meosmansar, South Waigeo, and West Waigeo Districts. The performance rate of the status condition of the KKLD Mayalibit Bay currently was 78.00%.

There were 15 questions dealing with elements toward the objectives and planning of the management of KKLD Mayalibit Bay in Raja Ampat Regency. KKLD objectives and planning had been mutually agreed and implemented in the management and illustration of desired conditions, in line with the national policy on conservation in Indonesia (Law No. 5/1990; Law No. 45/2009; and Law No. 32/2014). The objectives of the establishment of the KKLD Mayalibit Bay and five other KKLDs were as follows (DKP 2012):

- managing five conservation areas (Dampier Strait, Mayalibit Bay, Ayau-Asia, Kofiau and Misool) effectively, efficiently, and adaptively and focusing on achieving goals and targets of conservation;
- environmental-friendly and socially-accepted occupations, which support sustainable economy to be promoted in the five conservation areas;

- local knowledge and traditional values integrated within a system of management of the five conservation areas;
- strong capacity built upon and preserved at municipal, district, and village levels to manage the TPPKD Raja Ampat.

The objectives of the KKLD Mayalibit Bay had been in parallel with the national policy concerning the conservation area management and illustrating biophysical, social, cultural, and economic conditions. To this end, there has been a draft on the plan of Raja Ampat Local Islets Park Management. The institutional development of the networks of TPPKD Raja Ampat is built upon and approached by a stakeholder analysis. The initial process began with stakeholder identification to know which stakeholders to have interest and influence in the management of the coastal zone and marine in Raja Ampat. Among the stakeholders, key players are assigned to DKP Raja Ampat according to primary duties and functions of the DKP to safeguard fishery development and management of Raja Ampat. In addition to these key players, institutional network of TPPKD is also designed under the management of DKP Kabupaten Raj Ampat. The other key players in developing the TPPKD Raja Ampat networks are NGOs powered by the TNC and CI. Other stakeholders function as supporters to the final zoning development of TPPKD Raja Ampat networks.

In addition to the involvement of all stakeholders, the planning stage also consider social and economic impacts on the local people who mostly worked as fishermen. Local culture or local wisdom became one of primary concerns at the stage of area planning. The local people of Raja Ampat possess a unique local wisdom namely *sasi*. *Sasi* is a social norm built upon knowledge, behavior, culture and based on religious system the people believe to control the use of natural resources. *Sasi* allows the local people to interact with one another and with the nature in harmony. *Sasi* aims to regulate use, management and protection of natural resources with high economic values so that these resources can be enjoyed sustainably. *Sasi* in Mayalibit Bay and Tiplol Mayalibit becomes part of the KKLD Mayalibit Bay. Researches by Handayani (2008), McKenna et al (2002), and Donnelly et al (2003) found *sasi* practices in Raja Ampat. The calculation of the area objective performance and planning resulted in 81%.

Needs element is an identification of activity, facility, and infrastructure necessary for the management of the area. There are 9 questions concerning this element. Research and survey activities performed to support the management of the area, as the respondents quoted, had been adequately in numbers, e.g. biological monitoring (coral health/fish nursery site/marine mammals), socio-economic baseline, as well as local wisdom studies by higher education institutions, civil society, and local government. Nevertheless, not all of them in accord with the needs for management. It took time for the researches to respond to the further plannings.

KKLD Teluk Mayalibit is under the management of the Local Technical Performing Unit of KKLD Raja Ampat. The unit assigned a civil servant as the sub-head of Mayalibit Bay and 11 contract staff. However, these numbers are still below the maximum needs for performing the management activities. The KKLD managers were sourced from the Local Technical Performing Unit of KKLD Raja Ampat, civil society, and Conservation International (CI). The interview reported that facilities and infrastructures, such as flats, radio, satellite telephone, and speedboat, at the KKLD Mayalibit Bay had been adequate but an improvement of, among others, cost allocation, was deemed necessary to improve. The maintained budgets had been also adequate but necessary to improve to achieve the effective management. Funding of the KKLD Mayalibit Bay derived from Local Budget, grants (CI, Starling Resources and Walton Family), and environmental maintenance service (entry tariff for domestic and international tourists). The management of this funding followed that of Local Public Service Agency (BLUD) according to the Regent Decree No. 16/2014 on BLUD Grant Reception and Decree No. 17/2014 on BLUD UPTD Governance of Raja Ampat Regency.

According to Government Act No. 58/2008 Article 145 the Local Public Service Agency (BLUD) can be made available for the purposes: a) goods and/or services provision for public service; and b) special funding management for improving economy and/or service to the community. The fundamental consideration on which the BLUD

financial pattern stands are as follows: flexibility in financial management, fundraising and staff administration, financial transparency and flexibility in fundraising. The main spending of KKLD Mayalibit Bay was for gas, logistics, staff salary and operation. The total score of the needs factor in the management was 72%.

Implementation element deals with how activities planned to be implemented. This element is an assessment of the implementation rate, which comprised 13 questions. The activity implementation at the KKLD Mayalibit Bay showed an awareness program in the form of conservation extension for the local people by civil society, CI, The Nature Conservancy (TNC), Coremap and Local Government. However, the implementation was not effective due to lacking quality and gap in the implementation. Monitoring and evaluation activities also took place once in every year on biophysical, fishery resources evaluation, social, economic, and area governance indicators for sustainability and management. KKLD is also the site for the Coremap monitoring program, i.e. in Yensner and Mumes villages. To overcome impacts of the unexpected impacts on the area, KKLD Mayalibit Bay had established a joint team of DKP Raja Ampat, Police, Army, CI and community. This joint team was capable of limiting threats for the sustainability of the area, in particular those related to the prohibited fishing gears.

Results of the objective implementation of the KKLD Mayalibit Bay, as reflected by the interview, had obtained halfway, meanwhile in some parts socio-economic of the local people was not improved since the area had been built. The total score of the implementation factor was 69%.

The interview results and document checks concerning the questions whether legal status, regulations, law enforcement, area borderlines, KKPD Mayalibit Bay integration within larger conservation area management, biophysical, social, economic and cultural information of the local people within the area, fishery information as well as conservation value, such as natural rate, beauty, and rarity of species had been available at the KKLD Mayalibit Bay were dominated by "yes" answer. Furthermore, the information about types and potential of tourism was available but none of them contained community-based commercial management. The information concerning the study results were also more adequate but they had not been used intensively in the management of the area.

The interview also found area boundary marks but most of them were missing due to wind and wave, or human acts. The marks had not been repaired. Concerning education materials at every school, the interview evidenced a local content in conservation but the implementation of the education of the KKLD staff had not been scheduled regularly. The financial management for the KKLD Mayalibit Bay funding derived from entry tariff of the Raja Ampat Tourist Spot, currently renamed Environmental Service Maintenance Tariff. This tariff was an effort by the Municipal Government of Raja Ampat through Local-owned Legal Body of the Local Technical Performing Act of the KKLD Mayalibit Bay (BLUD, UPTD KKLD KKP Raja Ampat), Municipal Office of Marine and Fishery, in collaboration with other stakeholders, such as local leaders and non government institutions. The old tariff of the domestic service increased from Rp 250.000 to Rp 500.000 and of the international service increased from Rp 500.000 to Rp 1.000.000. After the payment had been completed, a receipt had to follow it or alternately, card or souvenir with expiry date of 1 (one) since the payment date. The objective achievement stage consisted of 24 questions about the number of scores to be obtained so the performance rate of the management program, products and services was 76%.

The objective achievement rate of the management began with the KKLD objective achievement. The respondents told that the objective of the KKPD had generally been achieved, possessed analysis on threats and conflicts due to conservation activities impacts. However, fishery condition of the fishery had a slightly improvement, but further improvement were deemed necessary. Biophysical condition improved, and so did fishery resources condition. However, the improvement of social welfare was not significant. The KKLD management also agreed with people's local culture by adopting *sasi* system as part of the conservation area. Conflicts of the use of natural resources decreased because of improving awareness of the people of the environmental

sustainability. The area use had been in accordance with the regulations. Stakeholders, i.e. fishermen effectively participated into decision-making process.

Objective achievement with 15 questions resulted in 66%. Therefore, total of the stages and factors of the KKLD Mayalibit Bay management was 73.61% (Table 2). This result became an evidence that KKLD Mayalibit Bay was in the fourth level category. This level was characterized by measurable and observable conservation effects. The data analysis documented that research hypothesis concerning the KKLD Mayalibit Bay management had been effective was accepted.

Table 2

Element and Effectiveness Score of KKLD Mayalibit Bay Environmental Management

<i>Element</i>	<i>Score (%)</i>
Background–evaluation of current area status condition	78
Planning–evaluation of area objectives and planning	72
Needs–evaluation of needs and management	81
Implementation–evaluation of management activity implementation	69
Output–assessment of the result of management, product and service management program	76
Achievement–assessment of management objective achievement rate	66
Total percentage	73.61

Local people perception element is used for finding out to what extent the perception of the local people toward the mechanism of involvement and satisfaction and management of KKLD Mayalibit Bay. Perception is a process in which individuals regulate and interpret sensoric impressions to give meaning of the environment they live (Robbins & Judge 2008)

Respondents were asked whether they had awareness of the sustainability of the KKLD Mayalibit Bay. Most of them, 82.5% (n = 222) answered “yes” and 17.47% (n = 47) answered “no”. In reply to the question concerning the establishment of the KKLD, 70% (n = 188) of the respondents knew two purposes of the KKLD establishment (to be the site of fish growth and protected area from fishing activities harmful to environment, 18.96% (n = 51) of the respondents answered three purposes of the KKLD establishment, and 11.15% (n = 30) of the respondents answered 1-4 purposes of the KKLD establishment. In response to the question concerning the way to know and to study the purposes of the KKLD establishment, 54.6% (n = 147) of the respondents knew them from meetings, 15.2% (n = 41) of the respondents knew it from posters, and 30% (n = 81) of the respondents knew them from oral conversation around the village between fisherwomen. The answers to the question about the presence of KKLD, 75.5% (n = 204) of the respondents were happy with KKL in their village.

Answers to question of whether the respondents got benefits from the establishment of KKL in Village waters showed that 75% (n = 202) of the respondents said “yes” because the KKL helped reduce exploitation of fishes with prohibited fishing gears such as trawl, *bubu*, and explosives, 19.33% (n = 52) of the respondents said “no”, and 5.58% (n = 15) of the respondents said “I don’t know”. The question concerning the benefits of tourism management activity in the area resulted in 75% (n = 202) of the respondents answering “no” and 25% (n = 67) of the respondents answering “I don’t know”. Respondents who did not get benefits from the tourism activities argued that ever since the area has been activated, no grants from the government were received to develop the tourism potential in their village, such as homestay, compared to the areas in West Waigeo, Mesomansar, and South Waigeo.

The question concerning other activities than fishing that the respondents did for their additional income showed that 85.5% (n = 230) of the respondents answered that they also worked in plantation to fulfill their daily needs; the surpluses of the products from their plantation were sold in their own village. The question concerning the change in monthly income in the past five years resulted in 75.5% (n = 203) of the respondents answering “no change in income” and 24.5% (n = 66) of the respondents answering

"decrease in income". The fishermen's income did not change because of difficult access to the market, in particular for those from Kalitoko, Kabilol, and Waifoy. The fishermen had to spend much operational cost to buy fossil fuel (ranging Rp 10.000-Rp 25.000/litre). To make worse, the fossil fuel was rare because the station was situated in Warsambin, the capital city of Malayibit Bay District. The fishing catch in the area of KKLD Mayalibit Bay were only sold in fresh fishes. Therefore, there must be a product diversification to obtain economic added value. Fishery extension is necessary to improve knowledge, skill and motivation of the fishermen nearby the area of the KKLD Mayalibit Bay. Handayani et al (2016) found that priority scale of the policy on fishery extension in environmental management at the KKLD Mayalibit Bay comprised fishery extension fundings; fishery extension programme; recruitment/placement of fishery extension staff; facility development; systematically constructed materials; and on target method of extension.

Respondents were asked about problems they faced in the management of the KKLD. There were 60% (n = 161) of the respondents who found no significant support from the government to the economic and tourism activities in their villages, 34.5% (n = 93) who found no problem, and 5.58% (n = 15) respondents who said "I don't know". In reply to the question about threats, 72.5% (n = 195) of the respondents reported that the use of trawl by either local or external fishermen in no take zone, restricted use zone, or other zones. There were 22% (n = 59) respondents said that mangrove excessive deforestation caused high sedimentation in the waters. At last, 5.5% (n = 15) of the respondents answered that there were fishermen who used explosives, potassium, or cyanide in utility zone and other zones. Saleh (2010) reports that fishing activities that caused environmental damage related to exploitative manner, which despised conservation values. The establishment of KKL and its regulations may prevent these threats. There were 75.5% of the respondents (n = 203) answering "yes"; 15.5% of the respondents (n = 42) answering "no"; and 9% of the respondents (n = 24) answering "I don't know".

Respondents perception toward the regulations of resource exploitation in the conservation area varied. However, most of them had already known the regulations applied to KKLD, as 80.5% (n = 217) of the respondents knowing the ongoing regulations in the area, e.g. prohibition for catching fish at no take area and *sasi* and *sasi mon* zones. The fishermen were only allowed to catch the fishes in restricted use zone and *sasi* or *sasi mon* zones as long as these zones were publicly opened. Other regulations required that the fishermen were prohibited to catch the fishes with trawl or any fishing gear that cause damages of marine ecosystems in restricted use zone and other zones, such as explosives or potassium. They had to use fishing rods. Furthermore, 75% (n = 202) of the respondents knew the zoning borderlines permitted to fishing activities. Concerning the fishing gears or fishes prohibited, 100% of the respondents had already known and the answer is "yes".

Concerning respondents' perception of involvement and decision-making in area management, there were 68.4% (n = 184) of the respondents who answered "to be involved" and the remaining respondents answered "I don't know". On the question whether the respondents felt satisfied/disappointed with the current KKLD management, 50.5% (n = 135) answered "satisfactory", 43% (n = 115) answered "nothing is special", and 7.41% (n = 20) answered "I don't know".

Conclusions. The management of the KKLD Mayalibit Bay had been effective but human resource for the KKLD management need for further improvement. In addition, program integration between KKL managers, community-based tourism exploitation development, socio-economic aspects improvement by extension and training, and market facilitation as well as people simultaneous awareness were equally necessary to avoid violations at the KKLD Mayalibit Bay. A collective management between local government of Raja Ampat Regency (UPTD KKLD Raja Ampat) and provincial government of West Papua was significant to avoid overlapping between authorities that manage the KKLD Mayalibit Bay since the promulgation of Law No. 23/2014 on Local Government.

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References

- Agostini V. N., Grantham H. S., Wilson J., Mangubhai S., Rotinsulu C., Hidayat N., Muljadi A., Muhajir, Mongondong M., Darmawan A., Rumatna L., Erdmann M. V., Possingham H. P., 2012 Achieving fisheries and conservation objectives within marine protected areas: zoning the Raja Ampat network. The Nature Conservancy, Indo-Pacific Division, Denpasar, Report No. 2/12, 71 pp.
- Coremap II-LIPI., 2010 Guide for the evaluation of the management effectiveness of the marine conservation area in Indonesia. Jakarta: Coral Reef Rehabilitation and Management Program-Center for Sciences and Knowledge of Indonesia (LIPI), pp. 1-27.
- Dahuri R., 2003 [Marine biodiversity: sustainable development assets for Indonesia]. PT Gramedia Pustaka Utama Publishing, Jakarta, 412 pp. [in Indonesian]
- Day J., Hockings M., Jones G., 2002 Measuring effectiveness in marine protected areas - principles and practice. World Congress on Aquatic Protected Areas: What Works Best and How do We Know? Cairns Convention Centre, Cairns, Queensland, 14-17 August, 16 pp.
- Decree of Raja Ampat Regent No. 66/2007 on Marine Conservation Area. [in Indonesian]
- Decree of Raja Ampat Regent No. 16/2014 on Grant Receipt for Public Service Bureau of the Office for Technical Performing Unit of the Water Conservation Area at the Municipal Office of Marine and Fisheries of Raja Ampat Regency. [in Indonesian]
- Decree of Raja Ampat Regent No. 17/2014 on Guide for Local Service Bureau at the Office for Technical Performing Unit of the Local Marine Conservation Area (KKLD) at the Municipal Office of Maritime Affairs and Fisheries of Raja Ampat Regency. [in Indonesian]
- Donnelly R., Neville D., Mous P. J., 2003 Report on a rapid ecological assessment of the Raja Ampat Islands, Papua, Eastern Indonesia. Held October 30–November 22, 2002, The Nature Conservancy - Southeast Asia Center for Marine Protected Areas, Sanur, Bali, 246 pp.
- FAO, 2011 Code of conduct for responsible fisheries. Fisheries and Aquaculture Department, United Nations, Rome, 108 pp.
- Government Decree of the Republic of Indonesia No. 60/2007 on Fishery Resources Conservation. [in Indonesian]
- Government Act No. 58/2008 Article 145 the Local Public Service Agency (BLUD). [in Indonesian]
- Green S. J., White A. T., Christie P., Kilarski S., Meneses A. B. T., Samonte-Tan G., Karrer L. B., Fox H., Campbell S., Claussen J. D., 2012 Emerging marine protected area networks in the coral triangle: lessons and way forward. *Conservation and Society* 9:173-188.
- Gubbay S., 1995 Marine protected areas: principles and techniques for management. Chapman and Hall, London, 39 pp.
- Halpern B. S., Warner R. R., 2002 Marine reserves have rapid and lasting effects. *Ecology Letters* 5:361–366.
- Handayani, 2008 [Assessment of local wisdoms and coastal resources management in Raja Ampat Regency-West Papua Province]. Thesis, Magister of Coastal Resources, Postgraduate Program, Universitas Diponegoro Semarang, 122 pp. [in Indonesian]
- Handayani H., Anggoro S., Hendrarto B., Kohar A., 2016 Policy on fishery extension in local marine conservation area Mayalibit Bay in Raja Ampat Regency, West Papua Province. *AAFL Bioflux* 9(1):20-33.

- Hockings M., Stolton S., Leverington F., Dudley N., Courrau J., 2006 Evaluating effectiveness: a framework for assessing management effectiveness of protected areas. 2nd edition, IUCN, Gland, Switzerland and Cambridge, UK, 105 pp.
- Kelleher G., 1999 Guidelines for marine protected areas. IUCN, Gland, Switzerland and Cambridge, UK, 107 pp.
- Kementerian Kelautan dan Perikanan (KKP), 2014 [Data architectural assessment]. Jakarta, Pusdatin-Sekjen KKP [in Indonesian]
- Lazuardi M. E., Huffard C., Tjandra K., 2011 [Community perception in local marine conservation area of Raja Ampat Regency, Indonesia]. ISBN 978-602-8901-04-8, 65 pp. [in Indonesian]
- Letter of Decree of Raja Ampat Regent No 265/2013 on Amendment for the Decree of Raja Ampat Regent No. 80/2013 on the Plan Establishment for the Management of the Islets Municipal Park in Raja Amat 2013. [in Indonesian]
- Leverington F., Hockings M., Pavese H., Costa K. L., Courrau J., 2008 Management effectiveness in protected areas – a global study. Supplementary report no. 1: overview of approaches and methodologies. University of Queensland, IUCN- WCPA, TNC, WWF, Gattton, Australia, 188 pp.
- Local Office of Maritime Affairs and Fisheries of Republic Indonesia, 2012 Plan for local islets park in Raja Ampat. Data and analyses. Raja Ampat Regency. [in Indonesian]
- McKenna S. A., Allen G. R., Suryadi S., 2002 A marine rapid assessment of the Raja Ampat Islands, Papua Province, Indonesia. RAP Bulletin of Biological Assessment 22. Conservation International, Washington, DC, 191 pp.
- Minister of Maritime Affairs and Fisheries of Republic of Indonesia No. 17/2008 on Conservation Area at Coastal and Islet Areas. [in Indonesian]
- Minister of Maritime Affairs and Fisheries of Republic of Indonesia No. 30/2010 on Plan for Management and Zoning of Aquatic Conservation Area. [in Indonesian]
- Minister of Maritime Affairs and Fisheries Decree No. 36/Keplen-Kp/2014 on Aquatic Conservation Area of Raja Ampat Islands in Raja Ampat Regency, West Papua Province. [in Indonesian]
- Municipal Center for Statistics of Raja Ampat Regency, 2014 Raja Ampat in Numbers, 2014, Municipal Center for Statistics of Raja Ampat Regency. [in Indonesian]
- Municipal Law of Raja Ampat Regency No. 27/2008 on Marine Conservation Area in Raja Ampat. [in Indonesian]
- Nainggolan P., Susanto H. A., Megawanto R., 2013 Coral governance. Bogor, IPB Press, 56 pp.
- Parnell P. E., Lennert-Cody C. E., Geelen L., Stanley L. D., Dayton P. K., 2005 Effectiveness of a small marine reserve in Southern California. Marine Ecology Progress Series 296:39-52.
- Pomeroy R. S., Watson L. M., Parks J. E., Gonzalo A. C., 2005 How is your mpa doing? A methodology for evaluating the management effectiveness of marine protected areas. Ocean and Coastal Management 48:485-502.
- Republic of Indonesia Law No. 5/1990 on the Conservation of Biological Resources and their Ecosystems. [in Indonesian]
- Republic of Indonesia Law No. 45/2009 on Amendment for Law Number 31/2004 on Fisheries. [in Indonesian]
- Republic of Indonesia Law No. 32/2014 on the Sea. [in Indonesian]
- Robbins S. P., Judge T. A., 2008 [Organizational behaviour]. 12th Edition Book 1, Jakarta, Salemba Empat, 175 pp. [in Indonesian]
- Roberts C. M., Hawkins J. P., Gell F. R., 2005 The role of marine reserves in achieving sustainable fisheries. Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences 360:123–132.
- Saleh A., 2010 Strategy for Local Marine Conservation Area (KKLD) management in Liukang Tuppabiring district, Pangkep Regency. Thesis, Program Pascasarjana Universitas Hasanuddin Makassar, Postgraduate Program, Hasanuddin University Makassar, 86 pp. [in Indonesian]
- The Nature Conservancy, 2011 [Guide for improving management effectiveness of marine conservation area in Indonesia]. Bali, Indonesia, pp. 32-49. [in Indonesian]

Valdes A. A. J., Hatcher G. B., 2010 A new typology of benefit from marine protected areas. *Marine Policy* 34:635-644.

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Authors:

Handayani Handayani, Program Studi Doktor Ilmu Lingkungan, Pascasarjana Universitas Diponegoro Semarang, Indonesia, Jl. Imam Bardjo, SH No. 5, Semarang 50241, e-mail: handayani_msdp@yahoo.com

Sutrisno Anggoro, Fakultas Perikanan dan Ilmu Kelautan, Universitas Diponegoro Semarang, Indonesia, Jl. Prof. H. Soedarto, SH, Tembalang, Kota Semarang 50275, e-mail: sutrisno.anggoro@yahoo.co.id

Boedi Hendrarto, Fakultas Perikanan dan Ilmu Kelautan, Universitas Diponegoro Semarang, Indonesia, Jl. Prof. H. Soedarto, SH, Tembalang, Kota Semarang 50275, e-mail: boedi.hendrarto@yahoo.com

Abdul Kohar, Fakultas Perikanan dan Ilmu Kelautan, Universitas Diponegoro Semarang, Indonesia, Jl. Prof. H. Soedarto, SH, Tembalang, Kota Semarang 50275, e-mail: a_kohar_fish@yahoo.com

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