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Coral Reef Transplantation to Community-based Management (Case Study: Biawak Islands, Indramayu Regency, West Java Province)

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ABSTRACT

The strategy that needs to be done in a coral reef transplant program is to empower coastal communities that are directly dependent on coral reef ecosystems. The purpose of this study is to determine and analyze community participation in the management of coral reef transplantation ecosystems. Research location in Biawak Islands, Indramayu Regency. The data used in this study are primary data and secondary data. Primary data were obtained by interview method, while direct observations were also made about the social change of fishermen with the coral reef transplantation program. Secondary data was obtained through literature review and analysis of various literature related to research. Analysis of the data used is descriptive analysis, GAP analysis, and stakeholder mapping to see the effect of management. The results showed that coral reef transplantation activities provided new hope for local communities and increased public awareness of the importance of the existence of coral reef ecosystems both ecologically and economically. Based on the results of stakeholder mapping also mentioned that the role of academics (CCMRS-IPB) and the private sector (PHE ONWJ) is the key to the success of coral reef transplant management to be managed by KUB Untung Jaya, besides that the integration of all stakeholders is needed to support the success of the program.

1. INTRODUCTION

Marine resources, including coastal ecosystems, are a source of state revenue that still has the potential to be developed (Wahyudin, 2016). Coral reef ecosystems are important and major ecosystems in coastal areas and have a wealth of biodiversity contained in them. The ecosystem can provide input for the final product in the form of goods and services that are very important for the life of the people in the coastal area. This coral reef ecosystem has a very large ecological and economic function in the coastal and marine areas (Dunning, 2015). The benefits of the existence of coral reef ecosystems make the coral reef ecosystem vulnerable to disturbances originating from human activities, such as water pollution and fishing in ways that are not environmentally

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friendly and by destructive means. These disturbances can cause a decrease in the percentage of coral cover and reef fish productivity (Venkataramanan and Smitha, 2011). Attention to the sustainability of coral reef ecosystems through adaptive management and based on community participation has been widely applied and implemented (Ferrol-Schulte et al., 2013).

The coral reef ecosystem is a coastal system that has ecological and social relations, where ecological changes can cause socio-economic changes and vice versa (Arkham et al., 2015; Wahyudin et al., 2018). Community-based coral reef management is a process of giving authority, responsibility, and opportunity to communities to manage their coral reefs by first defining their needs, desires, goals, and aspirations. This management at the same time gives responsibility to the community so that they can make decisions that ultimately determine and affect their welfare (Wahyudin et al., 2016). The strategic step in managing community-based coral reef ecosystems is to carry out coral reef transplantation programs by involving and increasing the role of the community in managing and maintaining coastal and marine resources they have. The community-based management of coral reef ecosystems refers to 2 (two) concepts, namely: first, needs are a model of coastal community development that should be based on the needs of coastal community groups. Secondly through the approach of local initiatives both coastal and human resources, namely skills and culture (Ife, 2013; Dunning, 2015).

Biwak Islands is one of the islands located in Indramayu Regency, West Java Province and included in the Regional Marine Conservation Area (KKLD). The establishment of a Regional Marine Conservation Area is one of the alternative policies in sustainable coastal area resource management (Dahuri et al., 2008). The Regional Marine Conservation Area (KKLD) of the Biawak Islands and its surroundings was determined through the Decree of the Regent of Indramayu Number 556 / Kep.528 Diskanla / 2004 April 7, 2004. The policy was made as an effort to protect, preserve and utilize the area optimally and with due regard to the principles of sustainable principles. This area is located in the north of Indramayu, which is about 26 miles (± 50 km) from the mainland of Indramayu. This area can be reached by using a fishing boat with a long trip of 4 to 6 hours. Access to this island comes from several surrounding areas, for example, Brondong and Karangsong. Research results from Salsabiela et al. (2014), states that the condition of coral reefs in the Biawak Islands is 45% in good condition, 27% is in fairly good condition and 28% is at a high-risk level with a damage risk index of 2.96 to 3.84.

Based on these considerations, a coral reef transplantation activity is needed through a "community-based coral reef transplant ecosystem management" program so that the coral reef ecosystem and reef fish resources are maintained. Following up on these problems, Pertamina Hulu Energy North West Java (PHE ONWJ) together with CCMRS IPB through CSR funds participated in efforts to preserve coral reefs in the waters of the Biawak Islands, Indramayu Regency. Coral transplant activity is a breakthrough of PHE ONWJ so that it can play a more active role in raising the spirit of biodiversity conservation efforts, moreover it is designed around the waters of the Biawak Islands which is a fairly isolated area but is one of the "fishing ground" of the Indramayu community, so it needs to be supported by providing efforts to rehabilitate coral reef habitats in order to provide good ecosystem services for the maximum benefit and welfare of the surrounding community. The purpose of this study is to determine and analyze community participation in the management of coral reef transplantation ecosystems.

2. METHODOLOGY OF THE STUDY

2.1. Research Location and Time

This research was conducted in 2 places, namely in Brondong Village (KUB Untung Jaya) and Biawak Islands, Indramayu Regency, West Java Province. When the research was carried out in 2 stages, the first stage was coral reef transplantation activities on 2-6 April 2018. The second stage was assistance to KUB Untung Jaya for 3 months from 1 July 2019 to 30 September 2019. The research location can be seen in Figure 1.

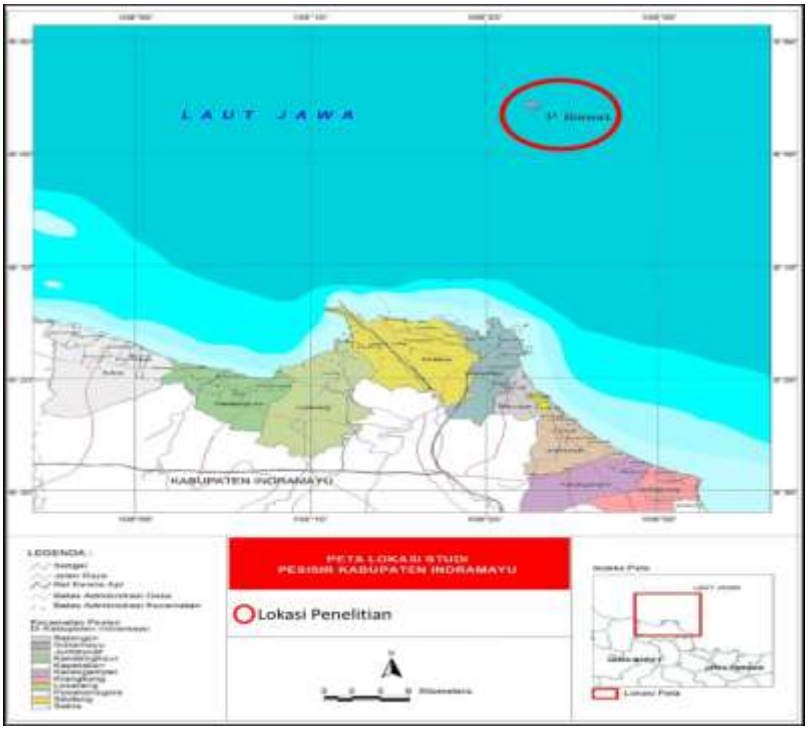

Figure 1. Map of research location

2.2. Data Collection

Data collection is done by methods that are adjusted to the type and nature of the data. The data used in this study are primary data and secondary data. Primary data were obtained by interviewing and observing directly on the social changes of fishermen with the existence of a coral reef transplant program. A participatory approach was also taken to explore community perceptions about the use of coral reef transplantation ecosystems. Secondary data was obtained through literature review and analysis of various literature related to coral reef transplant management.

2.3. Data Analysis

The analysis of the research data was conducted in a descriptive qualitative manner. The data in this study will be processed using Microsoft Excel software. The data analysis method matrix can be seen in Table 1.

2.3.1. Coral reef transplantation activities

The explanation of coral reef transplantation activities is to provide a review or interpretation of the activities that have been carried out. The statistical analysis used is descriptive analysis method.

2.3.2. GAP analysis

Analysis of the participation of fishing groups using gap analysis. Some parameters seen in carrying out this analysis are knowledge, skills, and institutions. Gap analysis is carried out to see what is needed by the community as an effort to improve their welfare, both in the economic and non-economic sectors. This gap analysis is carried out to conduct a program needs analysis, as an important step in this activity. The working principle of the gap analysis can be seen in Figure 2.

Table 1. Matrix methods of data analysis research

No	Procedure	Data collection technique	Data Analysis
1	Coral reef transplantation activities	Obsrvation	Descriptive analysis
2	Community and institutional participation	Interview and observation	GAP Analisis, stakeholders analysis, and descriptive analysis

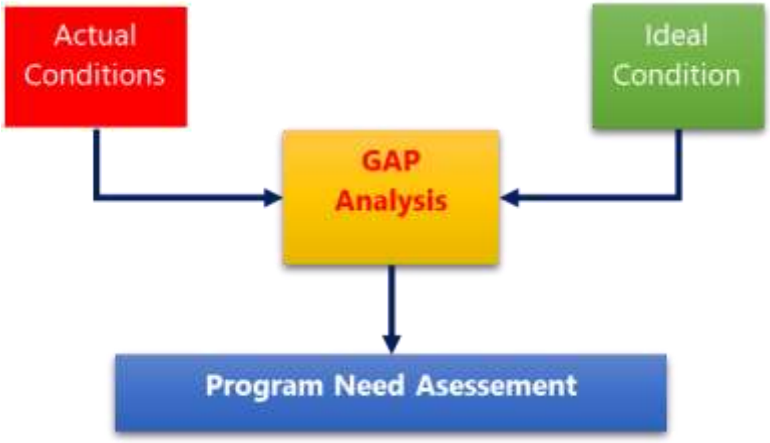

Figure 2. Diagram of GAP Analysis

2.3.3. Stakeholders analysis

Stakeholder analysis is used to map the relationships that occur between stakeholders in relation to sustainable management. The scope of stakeholder analysis is a stakeholder analysis of the actors involved in the formulation of current and future coral reef transplant management policies. The stakeholder analysis was carried out following a series of analyses conducted by Reed et al. (2009) which includes:

1. Stakeholders identification
   To identify stakeholders and their interests, expert opinions (expert opinions), Focus Group Discussion (FGD), snowball sampling and selection are based on secondary data. The stakeholders identified in the district to the community by taking an example in Brondong Village, Indramayu Regency can be grouped into: key stakeholders, key stakeholders, and supporting stakeholders grouped based on the modified stakeholder identification concept from Kivits (2011) and has been used by Nurfatriani et al. (2015) in a stakeholder analysis.

2. Making group and categorization of stakeholders
   To classify and categorize stakeholders, categorization analysis is used which classifies stakeholders based on their level of importance and influence (Reed et al., 2009). The method used to classify stakeholders is to use an interest influence matrix based on interests or interests and the influence of stakeholders in the preparation of coral reef transplant management policies. Assessment of the importance and influence of stakeholders uses a Linkert scale, i.e:

Table 2. Likert scale assessment of stakeholder interests and influences

Score	Explanation
0	Low
1	Less
2	Moderate
3	High
4	Very High

The amount of value obtained by each stakeholder is a point for the importance and influence, after knowing the value of the importance and influence, each stakeholder is mapped into the matrix of interests and influences using Microsoft Excel.

3. Identify linkages between stakeholders
   To identify the relationship between stakeholders, the actor linkages matrices method is used which uses a matrix of stakeholders in each column and row and the relationships between stakeholders are identified in the form of conflict, complements or cooperation. The mapping of the parties is primarily intended to obtain the relative position and the level of influence and level of importance in the current position. In a simple matrix, stakeholder relationship analysis can be seen in Figure 3.

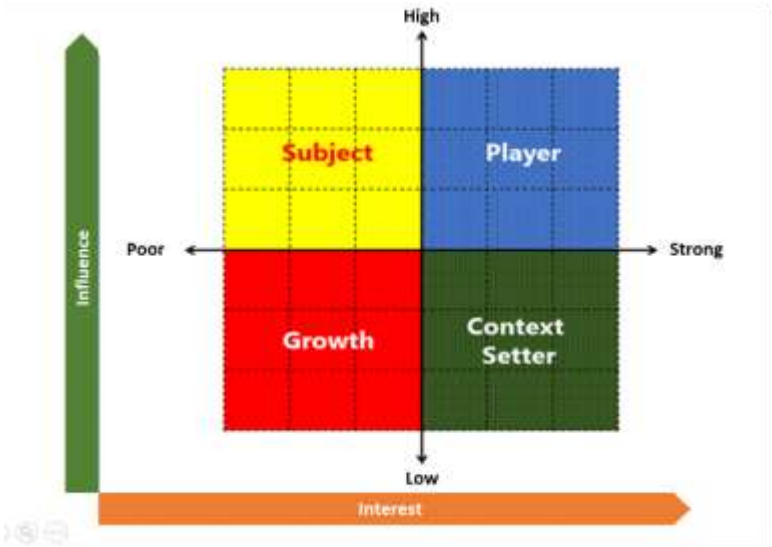

Figure 3. Matrix analysis of the influence and interests of stakeholders

3. RESULT AND DISCUSSION

3.1. Activities of Coral Reef Transplantation

Coral transplantation program is one method to improve coral reefs, this method utilizes the asexual reproduction of coral reefs. Transplantation is a long-term rehabilitation effort for coral reefs because, after transplantation, care must also be taken to maximize the results of transplantation (Subhan et al., 2014). The transplantation method is carried out by utilizing massive dead coral as a substrate (outplant). The transplantation technique is done using coral seedlings that will be transplanted placed in natural holes contained in the massive dead coral substrate or can also be carried out drilling on the substrate to increase the place of seed transplants (Kambey, 2013).

According to Santoso and Kardono (2008) strategies that need to be done in maximizing success in the transplantation process are empowering coastal communities that are directly dependent on coral reef ecosystems. Another way that can be done to manage coral reef areas that have been degraded is using transparent activities involving tourists, this method is applied in Okinawa Japan, where the existing dive shop provides a transplant program conducted with tourists (Okubo and Onuma, 2015). Good management of coral reef ecosystems carried out by local communities will also have a good impact on the community itself where if the coral ecosystem is well managed eating coral reefs will also provide ecosystem services that can support the economy of the surrounding community (Dunning, 2015). Coral reef transplantation activities in the community-based coral reef transplantation ecosystem service management program are divided into 2 (two) main stages, namely: planning and implementation. A description of the community-based coral reef transplantation activities in the Biawak Islands, Indramayu Regency is as follows:

3.1.1. The planning

Indramayu Regency has water characteristics that are not much different from the general water conditions in the north of Java Island. However, the existence of a coral reef ecosystem is an unusual thing in this district. The existence of a coral ecosystem that is identical to the existence of small islands that surround it becomes a necessity for the presence of this ecosystem. Indramayu Regency only has one “archipelago” unity which is currently designated as the Biawak Island and its Surrounding Marine Protected Areas. This, of course, has consequences for the presence of similar efforts and programs to support the status of the region.

At present, the waters around the Biawak islands, which include three "islands", namely Candikia Island, Gosong Island, and Biawak Island, are fishing grounds for Indramayu fishermen and parts of Cirebon. Catching activities carried out mainly occur around September-November, especially

when the season in coastal areas becomes hostile. The islands around Biawak's waters are islands that are geologically protected by coral atolls. However, the condition of the coral ecosystem is quite alarming due to several pressure factors that are mostly caused by destructive fishing, especially in the use of illegal and unregulated fishing gear, such as cantrang.

Pertamina Hulu Energy Offshore North West Java is collaborating with the Center for Coastal and Marine Resources Studies IPB to conduct a community-based coral rehabilitation program through a coral transplant program. The program itself is designed as a form of corporate concern to be able to protect coral ecosystems while building synergies with local communities to jointly manage coral reef ecosystems. The program itself was then packaged and built with the branding "OTAK= Orang Tua Asuh Karang". The name of the BRAIN program is used as branding of activities carried out to be an embryo for long-term program tracing designed community-based. The program itself is carried out as an effort to empower fishing communities to have integrated activities and be able to produce sustainable benefits for all parties, both ecologically, socially and economically.

a) Community Preparation
The OTAK program is carried out through several stages of activities designed in such a way as to become an institutional embryo of partnerships based on the P4 (public-, private-, people- and partnership) approach. This pattern is considered the best model adopted from Dr. Sondiamar, where government involvement as a service provider and service arranger (public) plays a role in the private sector and the people to build a coral reef ecosystem management system that can produce benefits for the welfare of the community.

The OTAK program itself begins by identifying the "champion group" that can be used as the driving force of the program. From the results of the identification of the champions' groups, the Untung Jaya Joint Business Group was chosen to be the driving force of the program. The group was then given integrated training on a community-based approach to the management of coral reef ecosystems that included introducing material to the structure and ecological processes of coral reef ecosystems, factors causing damage and adaptive management efforts. This knowledge is given as part of an integrated effort so that the community has an understanding and understanding to compile this community-based coral reef rehabilitation program (Figure 4).

In addition to ecological and management knowledge, this group was also given knowledge and skills regarding module construction. There are 2 types of modules made, they are hong-shaped and tablet-shaped modules, where the hong module is made of cement and sand while the table module is made of paralon pipe material (Figure 5). The transplant module construction skills are carried out as an income-generating effort for KUB Untung Jaya so that the OTAK program that is implemented in the future can be implemented well and provide benefits for the welfare of the local community.

Figure 4. Training on introduction of coral reef ecosystems and their management

Figure 5. Construction of hong coral transplantation modules

Determination of location is done by various criteria, including (i) the depth of the water is not too deep, (ii) not exposed, (iii) clarity of the waters is relatively good, (iv) coral donors are well available and (v) access to the location can be reached and achieved with relative ease. Community involvement in determining the location of the transplanted module reduction is very much needed, because it is expected that the community can be actively involved in every process, from planning to monitoring and evaluation.

Once known, selected and determined the location of the transplanted module decline, the group was allowed to construct all transplanted modules following the specifications that have been delivered in the training. Completion of several modules was carried out in stages and involved all group members. In this context, the group is given the freedom to make this module effectively and efficiently while prioritizing the quality of construction results that are as expected. The group's skills to meet the module development request with the agreed grace period is a good learning model so that members can be ready when the module order comes later.

On the specified day and date, the entire module requested to be made is ready to be taken down. The entire module was taken by all members to the agreed location as a module dropping area around Gosong Island. The modules are then arranged at the bottom of the ocean waters by forming the letters O - N - W - J (Figure 7). This reduction was carried out with the supervision of CCMRS IPB experts who became partners of PHE ONWJ to build a synergy of this coral transplant-based community empowerment program or later called the OTAK program. After all, modules are well structured and following their placement, the coral transplant process is also carried out by involving all components of the KUB Untung Jaya group members. This process was also followed by the transfer of knowledge regarding the implementation of initial monitoring as an initial condition of the entire coral structure transplanted in the area.

(b) Location Preparation

Determination of the location for the implementation of coral reef transplantation was first surveyed in the coral reef area of Biawak Island and Gosong Island. The survey was conducted by scuba diving and time swimming. The method of measuring coral cover is carried out using the LIT (Line Intercept Transect) method. The point to which the dive site is located is based on information from the Brondong fishermen group who have long made the waters around Biawak Island a fishing operation area. Diving has been carried out at two points south of P Lizard and one-point south of Gosong Island. The results of a survey of the state of coral cover on Biawak Island (Stations B-1 and B-2) and Gosong Island (Station G-1) are presented in the figure below.

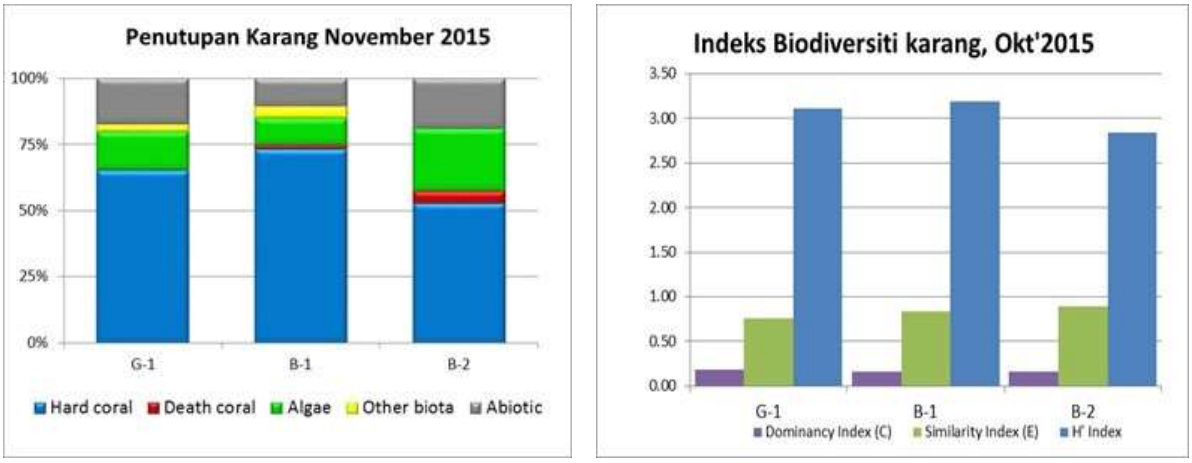

Figure 6. Chart of closure and coral substrate diversity index on Biawak and Gosong Islands

In the picture above, it can be seen that the coral cover at the survey location percent coral cover is included in the good category. Diversity index values from the three stations are categorized as good. From the results of the survey and discussion with the fishing group, the location of the implementation in the south of Gosong Island was determined, a little close to the goba entrance and exit of Gosong Island. Gosong Island has a very large goba with a depth of more than 15 m and surrounded by fringing reefs that resemble atolls. Goba is often used by fishermen as a shelter when the weather is not good. In addition to shelter and rest, Gosong Island has also become a local tourist visit even though it is only a short stopover, because indeed on Gosong Island there are no accommodation facilities at all.

(c) Preparation of Tools and Materials

The preparation of tools and materials is entirely carried out from material stores in the village of Brondong and surrounding areas. The materials prepared for the Transplant Module manufacturing activity are as follows:

- Sand and cement as the main material for forming modules
- Cement additives, to help accelerate and strengthen the hardening of the mortar.
- Zinc chamfer width of 60 cm and large plastic sacks as material for making module molds.
- Rice husk, for filling and forming modules
- Wire ropes for binding to zinc mold.
- Styrofoam 5 cm, formed by cylinders 15 to 20 cm in diameter as a complement to make module holes during printing.

While the tools used to make modules are:

- Hoes
- Sand shovel
- Buckets and cast plastic,
- Bamboo sticks with a diameter of 5 cm along with ± 80cm
- Pliers and
- Spoon cement

3.1.2. Implementation

(a) Module production

The module is made in a warehouse owned by members of a fishing group in Brondong Village which usually functions as a weighing and storage area for catching fish. Module making is preceded by making module molds. The place where the module molds will be made and placed first is given a plastic base mat. The module molds are made using plastic sacks and corrugated zinc gutters. Zinc gutters were made in two pieces, the first of which was the diameter of the largest size of the sack obtained in the village of Brondong. The zinc coil is put into a sack and then filled with husks to the full and compacted to obtain a cylinder wrapped in a 50 cm diameter sack. The neck of the sack's mouth is given a zinc cylinder with a diameter of 30 cm and a height of 5 cm. The

second role of zinc is made larger, with a diameter of 60 cm and tied with wire rope. The second cylinder is installed outside the cylinder of the sack that has been formed so that between them there is a gap of 5 cm thick. This gap will later be cast or filled with sand-cement mortar. So that the gap is fixed and does not change at the time of casting, then in this gap put 5 bamboo sticks that have been provided with the distance between bamboo cultivated the same. The process of making this module mold is presented in Figure 7.

After the mold is ready, the next process is casting the module with mortar which has been given cement hardener. Casting is done in several stages, the first stage is casting with a height of about 10 cm around the mold, then inserted 2 pieces of styrofoam which have been formed ± 15 cm cylinders in the gap in the opposite position. The next step is to continue casting until the two styrofoam sinks ± half, then the bamboo sticks are pulled out followed by leveling the castings to fill the former bamboo hole. When the castings are flat, replace the other 2 styrofoam in the opposite position with the first 2 styrofoam and continue with casting to the neck of the mold (sack). The top of the module is made half a ball, then made 5 niches with a diameter of 2 sd. 3 cm deep 3 sd. 4 cm and the printing stage of the transplant module has been completed. The recesses will later serve as a place to attach coral fragments.

Modules that are already hard enough can be moved to a storage area until they are completely dry. The module will dry completely in shady conditions for about 3 weeks. Storage is cultivated not exposed to direct sunlight. Modules made are 100.

In addition to the module from cement castings, transplanted media from a 1 "diameter" PVC "pipe was also cut into pieces about 30 cm. The paralon pieces are arranged using 'Tee' and 'knee' so that they form a square of 1.5 x 1.5 meters with 2 parallel bars in the middle that divide the area into 3 equal parts. Tee is used to connect the paralon pieces with the middle foot facing upwards which later serves as a hole for 'planting' coral seeds.

(b) Dropped of Module

Module reductions were made on November 24, 2015. The location of the decline is to the south of Gosong Island. Considering this transplant site will someday also be a tourist visit, the laying of the module will be carried out to the west of the wreck of a sinking iron ship, with a basic substrate consisting of rock and rubble. The transplants are implemented at depths of between 4 and 7 meters.

The module dropping from the ship to the bottom of the water is not dropped, but it is done one by one by stretching using a rope. This must be done to avoid rupture of the transplanted module or overwriting the existing module underneath when unloading. The removal of this module requires very good coordination between personnel on board and divers working in water. Such coordination is needed to maintain the safety of both divers and derived modules. After the module is at the bottom of the water and the rope is released, then the diver makes the arrangement or arrange the modules. The modules totaling 100 units are arranged in such a way as to form the letters O, N, W, and J with vertical formation, perpendicular to the coast of Gosong Island. Thus the formation of the letter O is at a depth of about 4m and the formation of the letter J is at the deepest, which is about 7m. The distance between one module and another in one formation is around 1 meter.

(c) Activities of Coral Donor and Transplantation

Coral transplantation to restore damaged coral reefs is by removing live coral fragments from coral reefs that are in good condition to the location of damaged coral reefs. The techniques and procedures are as follows:

- The location of a seedling is carried out around the transplants, namely on coral reefs in good condition.
- It is expected that the location between seedling and transplants has

similar environmental conditions (depth and current conditions).

- Collection of seedlings is done by cutting the parent coral branches in place, and not cutting the parent coral colonies that are located close together to avoid significant damage to the ecosystem.

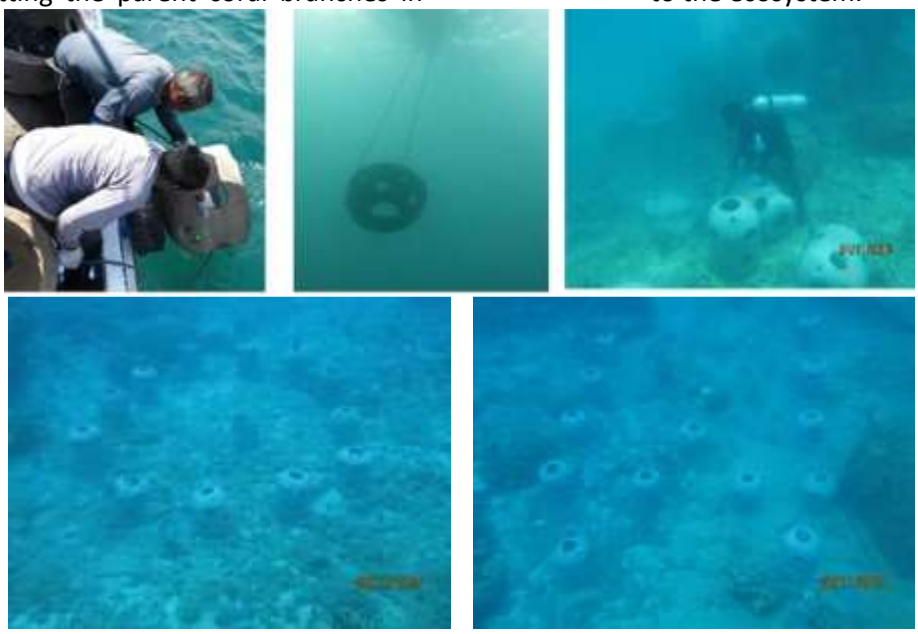

Figure 7. Activity reduction and arrangement of modules and module arrangement formations ONWJ

- Seedlings are cut about 10 cm in size.
- Seed transportation from the location of seedlings to transplantation sites on Gosong Island does not use ships, it is enough to swim because the distance is not far.
- Seedlings that have been cut are then glued to the module by using white cement which was previously made with a mixture of white glue and cement hardener.
- Gluing the seeds is done in a niche (small and shallow hole) which is on the top of the module. So that the coral seeds (fragments) installed in each module are 5 seedlings according to the number of available niches.
- The way to attach is to first fill in the recesses/holes in the module with white cement mixture then the seeds are plugged into it, if necessary, white cement can be added again to strengthen. Likewise, the way to plant seedlings in the paralon media.
- Cultivated seedlings planted in one module consist of only one type, to avoid unhealthy competition if the fragments have grown large later.

Figure 8. Techniques for attaching coral seeds to the transplant Module

Figure 9. Measurement of coral seedlings

(d) Preliminary Data Measurements of coral transplantation

After all the modules are "planted" with coral seeds, then to know the rate of growth later it is necessary to measure the seeds at the beginning of planting. To find out the growth rate of coral colonies can be done by several methods of measurement, namely:

- Linear: for branch length, colony diameter or height from the base,
- Area; Coral crusts or flattens out.
- Volume; total coral volume, volume including gaps in the colony
- Weight; heavy in water or heavy in the air

In the transplanted activities that have been carried out on Gosong Island, the measurements taken include measuring the length or height of the seedlings from the bottom and also measuring the area with photo techniques.

3.2. Community Participation in Management

In the process of community, empowerment to increase awareness and capabilities of the community can not run so fast, the need for assistance in providing direction for strengthening and development of the ability of the community itself. So that the Untung Jaya KUB assistance program to manage and run a coral reef transplant ecosystem services management program in the waters of the Biawak Islands needs to be done. This assistance intends to pay attention and direct the development of the Untung Jaya KUB group in running their businesses and programs that will be carried out. The assistance program is aimed at

developing KUB Untung Jaya by increasing individual capacity and social capital and jointly making changes without ignoring the rights of each individual.

Empowerment is a process and the result is to increase the ability of individuals and communities to be able to work together and actively participate to improve access and control of resources and solve problems. This understanding refers to Zimmerman (2000), World Bank (2002), Suharto (2010) and Brodsky and Cattaneo (2013). This approach focuses on increasing the capacity of individuals and communities in problem-solving. Processes and outcomes in the form of increased power within (motivation, proactive behavior, knowledge skills, leadership, decisions, self-determination), power with (negotiating, cooperating, networks), the power to (influencing and controlling resources), power over (encouraging multilevel involvement) and building resources for the future. The following are the results of the gap analysis of the mentoring activities carried out in the first period from July to September 2018 can be seen in Table 3.

Table 3. Gap analysis matrix in KUB Untung Jaya Facilitation Management Program for Coral Reef Transplantation Ecosystem Services Based on Community Empowerment in Periairan Biawak Islands, Indramayu Regency.

No	Development of KUB Activities for 2 Weekly	Result of Gap Analysis KUB Untung Jaya		
		Actual Condition	**Ideal Condition**	**Program Need Development**
1.	**1st week (1-14, Juli 2018)**			
	Strengthening of Skills: - Use of Computer Software (Microsoft Office and Internet)	The group secretary still does not master and understand the use of software (Microsoft Office and the Internet)	Group secretaries can already use the software (Microsoft Office and the Internet)	Guidelines for using computer software (Microsoft Office and the Internet)
	Strengthening of Knowledge: - Introduction to features on a computer - Evaluation of transplant activities carried out is still lacking - There is a desire from KUB to provide information to other fishermen related to the existence of coral transplants on Gosong Island	- Do not know and understand the features on a computer - KUB members felt the transplant activities carried out were still not optimal - KUB has provided information on the existence of coral transplants on Gosong Island to fishermen	- Members have understood the features on the computer - Transplanting activities can provide motivation to KUB in preserving the existence of coral reefs - All fishermen are committed to maintaining and preserving the sustainability of the krang reef in the waters of Biawak Island	- Guidelines for introducing computer features and their use for beginners (Microsoft Office and the Internet) - Activities with Indramayu fishermen to carry out coral transplantation and monitoring in the waters of the Biawak Islands and surrounding areas
	Strengthening of Institusional: - The discussion of the insurance group of fishermen of KUB Untung Jaya with the Department of Fisheries, but is	- All KUB Untung Jaya members are not yet registered with fishermen insurance - The Untung Jaya KUB website is well formed and contains the	- All members of KUB Untung Jaya are registered in fisherman insurance - The Untung Jaya KUB website is well formed and contains	- Dissemination and mitigation of registration fees related to fishing insurance membership - Assistance and provide

No	Development of KUB Activities for 2 Weekly	Result of Gap Analysis KUB Untung Jaya		
		Actual Condition	**Ideal Condition**	**Program Need Development**
	constrained by the registration fee - Promoting KUB Untung Jaya through the website by uploading photos of KUB activities - The group wants the help of fish trap equipment to look for fish as a substitute for monitoring coral reef transplantation - Establishing Hadi and Takul as the person in charge of the KUB Untung Jaya inventory	activities of group members - The unavailability of help of bubu fishing gear, so that monitoring activities have not been going well - Establishment of Hadi and Takul as the person in charge of group inventory tools	the activities of group members - There is a willingness and initiative from the group to utilize the inventory tools in the development of marine tourism to support monitoring activities - Establishment of a better institutional structure	understanding to members to optimize the investment tools for group economic development - Assistance and direction from the Board of Trustees for better management of KUB
2.	**2nd week (15-31 Juli 2018)**			
	Strengthening of Skills: - Reuse of computer software (Microsoft Office and the Internet)	- Already starting to use Microsoft Office and use the internet	- Can already understand and use software features on a computer	- Guidelines for introducing computer features and their use for beginners (Microsoft Office and the Internet)
	Strengthening of Knowledge: - There are socialization and direction related to the efficiency of the coral transplant method from other stakeholders - KUB Untung Jaya is involved in seagrass transplantation activities and research conducted by other stakeholders - Untung Jaya KUB participated in the socialization of seagrass and coral reef habitat conservation with the Fisheries Service	- Members already understand the efficiency and effectiveness of coral transplantation methods - KUB Untung Jaya is active in socializing and helping / facilitating seagrass transplantation activities carried out by the Fisheries Service with other stakeholders	- Members already understand the efficiency and effectiveness of coral transplantation methods - KUB Untung Jaya is active in socializing and helping / facilitating seagrass transplantation activities carried out by the Fisheries Service with other stakeholders	- The implementation of coral transplantation by different methods - Networking of other stakeholders and other activities related to the preservation of coastal and marine ecosystems
	Strengthening of Institusional: - Not Available Activities	-	-	-
3.	**3rd Week (1-14 Agustus 2018)**			
	Strengthening of Skills: - Not Available Activities	-	-	-

No	Development of KUB Activities for 2 Weekly	Result of Gap Analysis KUB Untung Jaya		
		Actual Condition	Ideal Condition	Program Need Development
	Strengthening of Knowledge: - Not Available Activities	-	-	-
	Strengthening of Institusional: -Facilitating the visit of KPKNL Jakarta 1 to improve the lighthouse on Biawak Island - Untung Jaya KUB Monthly Meeting to discuss contributions which had long stopped	Members are always late to pay monthly fees	Members pay monthly fees well	Annual large meetings accompanied by the Board of Trustees
4.	**4th Week (15-31 Agustus 2018)**			
	Strengthening of Skills: - The daily group executive secretary is already skilled at using Ms Word and making activity plan proposals	The group's daily executive secretary is already skilled at using Ms Word	The group's daily executive secretary is already skilled at using Ms Word	Routine use of computer equipment
	Strengthening of Knowledge: - KUB Untung Jaya participated in the socialization of seagrass planting in the waters of Biawak Island	KUB Untung Jaya does not yet understand how to plant seagrass beds	The group should have understood about planting seagrass beds and their ecological functions	Socializing the importance of seagrass and seagrass planting programs
	Strengthening of Institusional: - Not Available Activities	-	-	-
5.	**5th Week (1-14 September 2018)**			
	Strengthening of Skills: - Not Available Activities	-	-	-
	Strengthening of Knowledge: - KUB Untung Jaya participated in the socialization carried out by the Department of Environment and Forestry related to the impact of climate change and pollutants on the quality of seagrass habitat	KUB Untung Jaya has understood that the existence of seagrass habitats and other coastal ecosystems is very important for the balance of nature	KUB Untung Jaya has understood that the existence of seagrass habitats and other coastal ecosystems is very important for the balance of nature	More in-depth awareness about the importance of seagrass and seagrass planting programs
	Strengthening of Institusional: - KUB Untung Jaya, represented by its	The lack of promotion of KUB Untung Jaya in conducting business in	The group members did a promotion about KUB Untung Jaya who had run a	Distribution of leaflets and billboards to promote the marine tourism

No	Development of KUB Activities for 2 Weekly	Result of Gap Analysis KUB Untung Jaya		
		Actual Condition	Ideal Condition	Program Need Development
	chairman, got an order to accompany tourists who would go fishing in the waters of the Biawak Islands	the field of marine tourism	business in the field of marine tourism	business of KUB Untung Jaya in the Indramayu and surrounding areas
6.	**6th Week (15-30 September 2018)**			
	Strengthening of Skills: - Not Available Activities	-	-	-
	Strengthening of Knowledge: - Not Available Activities	-	-	-
	Strengthening of Institusional: - Conduct monthly meetings to discuss work programs and prepare routine monitoring activities with CCMRS IPB - KUB Untung Jaya received an order from the Fisheries Service related to marine tourism packages to Biawak Island and diving equipment rental for research needs	- Regular meetings held by KUB Untung Jaya are still ineffective and many do not care much - The existence of KUB Untung Jaya in the field of marine tourism business has begun to be seen and understood by the surrounding community and stakeholders	- Monthly and effective group meetings - The existence of KUB Untung Jaya in the field of marine tourism business has begun to be seen and understood by the surrounding community and stakeholders	- There is a need for guidance from the Board of Trustees to strengthen the KUB Untung Jaya institution so that it runs better - Increase promotions and publications about KUB Untung Jaya's business in all media

3.3. Stakeholders Mapping

3.3.1. Identification of stakeholders and their role in managing coral reef transplants

Stakeholders involved in the management of coral reef transplants in the Biawak Islands, Indramayu Regency consist of a key, primary and supporting stakeholders (secondary). The management of coral reef transplants is influenced by the role of internal stakeholders, namely primary and key stakeholders who have roles as implementers, coordinators, implementers, assistants, and facilitators; while external stakeholders include secondary or supporting stakeholders who act as facilitators (Table 2).

Table 2. Stakeholders of coral reef transplantation management in Biawak Islands

No	Stakeholders	Role	Stakeholders Category	Position
1	Center for Coastal and Marine Resources Studis-IPB (CCMRS-IPB)	Educational institutions that facilitate and mobilize fishermen groups in managing coral reef resources to improve the welfare of fishermen	Key	Coordinator, implementator and facilitator
2	Agency of Fisheries in Indramayu Regency (DKP)	Regional authorities that protect the needs of fishermen in carrying out coral reef transplantation programs	Support (Secondary)	facilitator

No	Stakeholders	Role	Stakeholders Category	Position
3	Agency of Environmental in Indramayu Regency (DLH)	Regional authorities that conduct environmental management, pollution control and environmental damage, restore environmental quality, environmental conservation, to protect the integrity of their territory.	Support (Secondary)	facilitator
4	Agency of tourism in Indramayu Regency (Dinpar)	Regional authorities that provide guidance, management, and tourist objects and attractions development, tourism support facilities, fostering, preservation, and development of cultural values in their region, and empowering Pokdarwis in tourism/Regional development.	Support (Secondary)	facilitator
5	KUB Untung Jaya	Group of fishermen have the function to manage and carry out coral reef transplant monitoring activities to preserve coastal resources and improve the welfare of fishermen	Main (primary)	Manager
6	Pertamina Hulu Energy-Offshore North West Java (ONWJ)	Companies that support and facilitate the needs of fishermen as a whole with stakeholders to preserve water resources and improve the welfare of fishermen	Key	Coordinator, implementator and facilitator
7	Port Operations Unit (Syahbandar) in Indramayu Regency	The authority in charge of maintaining the security and safety of shipping is based on regulations in force in Indonesia	Support (Secondary)	facilitator
8	Education sector (school, etc.) in Indramayu Regency	Educational institutions that support and receive the benefits of the program for the benefit of an environmentally sound education to students	Support (Secondary)	Manager

Stakeholders whose position as executors in managing coral reef transplants and experiencing dependence on coastal resources are fishermen of the Untung Jaya Joint Business Group (KUB). Other activities of the group are marine tourism practitioners who are part-time jobs besides being fishermen. When fishermen do not go to sea, besides improving fishing gear and boats, fishermen also act as tourism actors by renting boats to take tourists to the Biawak Islands to see the beauty of their marine resources. The results of interviews with each stakeholder shows that stakeholder expectations between fisheries, the environment, syahbandar, and tourism are expected to go hand in hand, the government is expected to provide education to coastal communities by way of socializing coastal management plans/programs going forward, establishing intense communication with coastal communities, and community awareness so that together with the government to manage coastal areas in the Biawak Islands. According to Campbell et al. (2012), argues that the effectiveness of coastal area management is very dependent on each relevant stakeholder to submit to and comply with existing rules. Prolonged conflicts of authority

and interests will hamper the achievement of objectives to improve the environmental quality of the region and coastal ecosystems.

3.3.2. Stakeholder mapping based on interests and influences in managing coral reef transplantation

Mapping the level of importance and influence of stakeholders in the management of coral reef transplants in the Biawak Islands, Indramayu Regency is urgently needed. Stakeholder mapping will help managers how to involve these stakeholders in achieving their goals (Reed et al., 2009). Matrix of interest and influence is a form of visualization of the assessment that has been done before. The matrix of interests and influences is divided into 4 (four) quadrants, namely: subjects, key players, other followers, and supporters / viewers, the position of each stakeholder will be mapped according to the results of the assessment (Figure 10).

The results of grouping obtained the conclusions of each quadrant as follows:

a. Subjects. Stakeholders with a high level of importance but have low influence. This group should get information related to the program so that they remain satisfied. Stakeholders in this group must be managed as possible so that they do not obstruct the project.
b. Key Players. Stakeholders with a high level of importance and influence. This group is a stakeholder who is usually involved in activities that require important decisions
c. Actor. Stakeholders with low levels of importance and influence. A stakeholder group that always provides information about the development of a program or activity.
d. Supporting / Audience. Stakeholders with a low level of importance but have high influence but have a low dedication compared to other groups.

The analysis results in Figure 10, show that the Office of Maritime Affairs and Fisheries, PHE ONWJ, and CCMRS-IPB are in the position of key players who have high power and interests. PHE ONWJ and CCMRS-IPB initiated this coral reef transplant ecosystem services management program by involving the Indramayu Regency DKP which data meets the needs of fishermen groups in sustainably managing fisheries resources. In its operational condition, the management of coral reef transplant ecosystem services in the Biawak Islands, Indramayu Regency also involves KUB and fishermen to play an important role in managing and running the program. As for the Department of Tourism, DLH and Syahbandar acted as supporters in carrying out a sustainable management program for coral reef transplantation ecosystem services. It is intended that in the future these stakeholders will also contribute significantly in efforts to preserve and preserve coastal and marine resources in the Biawak Islands. In education groups such as schools are in the position of actors, who have a high level of importance and low influence on the management of the area, this is because they have an interest in being able to educate their students.

4. CONCLUSION AND RECOMMENDATION

4.1. Conclusion

As one of the biodiversity management efforts, the coral reef management program is one of the most feasible around Indramayu waters, where the best location for this program is around the waters of Biawak Island. This biodiversity management program is designed based on coral reef ecosystems which are expected through a coral rehabilitation (transplantation) program that can provide long-term benefits for the presence of the benefits of goods and services which in turn can be utilized by coastal communities. This program is based on a community development approach, where community involvement, in this case, a joint business group that is used to fishing in the waters of Biawak, is expected to be the backbone of the management of rehabilitated coral reef ecosystems.

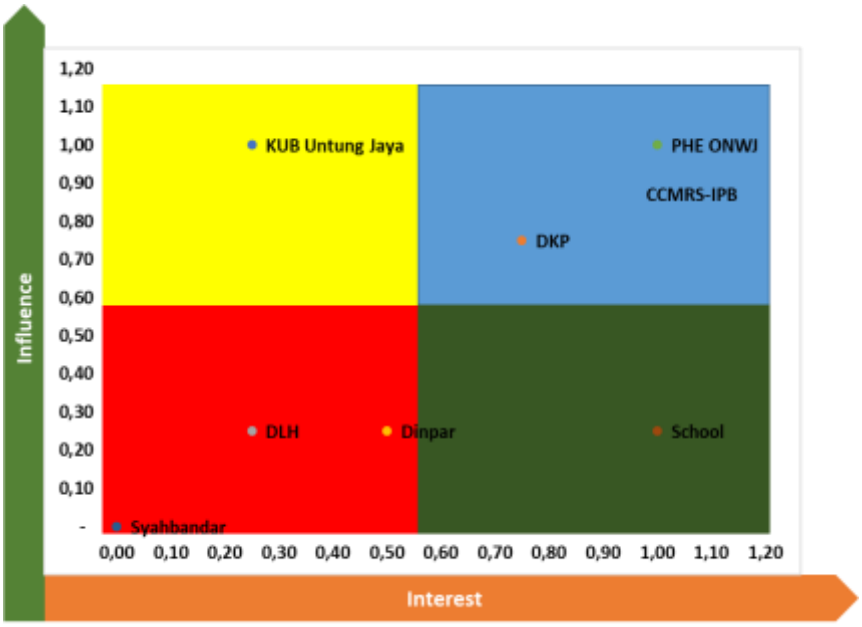

Figure 10. Stakeholder priority map based on the level of importance and influence in the management of coral reef transplant ecosystem services in the Biawak Islands, Indramayu Regency

This model not only provides knowledge about the socio-economic-ecological importance of coral reef ecosystems, but also provides skills to fishermen to be able to carry out transplantation activities in accordance with the design of the module developed, so that in the future similar activities can become additional fields that can provide more economic value to the fishing community in particular and the Indramayu Regency community in general.

4.2. Recommendation

The coral reef transplant ecosystem services management program needs to be developed using the payment ecosystem services (PES) method. The implementation of this PES can later be in the form of mandatory dues every month for marine tourism service managers and community groups who take advantage of the existence of coral reef ecosystems. This activity aims to ensure that coral reef transplantation programs, monitoring, and conservation of coral reefs in the Biawak Islands continue to run independently without being dependent on funding from stakeholders.

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