Evaluation of managed access approach in Anambas Islands Marine Recreational Park, Riau Islands Province

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Abstract. Managed access with reserved (MAR) is an approach for sustainable fisheries management, combined community-based conservation approach with spatial management to restore and protect Indonesia's small-scale fisheries. This paper examines the implementation of MAR programs in Batu Belah village of Anambas islands marine recreational park, Riau islands province. The structured household survey and semi-structured interviews were conducted along with field observation during December 2018. The descriptive analysis applied to understand community knowledge, acceptance, participation, and perception on the current of marine environmental conditions, while the Analytic Network Process (ANP) used to identify problems and best strategies to improve future actions. Community knowledge and participation in MAR programs are at a moderate level, while community acceptance of MAR programs is at a high level. They mostly responded that the coastal environment is in better condition compared to previous years. Overall, the level of community perception in Batu Belah about the MAR program is in the moderate level category. There needs some improvement in terms of management capacity, creation of economic activities, and government budget allocation for monitoring and surveillance. Intensive community engagement and high commitment of leadership are among the key component to change community behavior and their paradigm regarding conservation perspective and coastal resources management in general.

1. Introduction

Marine Protected Area (MPA) is an area of the intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment [1]. According to government regulation of the Ministry of Marine Affairs and Fisheries (MMAF) PP Number 60/2007 concerning the conservation of fish resources, there are four types of MPAs, namely the Marine National Park, Marine Recreational Park, Marine Natural Reserves and Fisheries Reserves. Marine Recreational Park (MRP) is a Marine Protected Area (MPA) to be utilized for the benefit of marine ecotourism. The success of the management of conservation areas can be seen through ecological, economic, and social indicators. The ecological variables are species diversity and diversity index, fish abundance and
biomass, coral cover; economic variables, namely the costs of managing conservation areas; social variables, namely community perceptions of conservation areas [2].

Anambas Islands is a small archipelago of Indonesia, located 150 nautical miles northeast of Batam Island in the North Natuna Sea right between Malayan Peninsula and Kalimantan Island. Report from Marine Rapid Assessment [3] stated that these islands have outstanding marine biodiversity (coral reefs, turtles, coral reef fish, seagrass, mangroves, napoleon wrasse, and rich capture fisheries) with coral coverage ranging from 6-81%. Rich fisheries resources, both pelagic and coral reef related species become the target for not only small-scale fishermen from surrounding communities but as well as illegal fishing boats from neighboring countries.

The government has taken steps to foster conservation, protection, and sustainable utilization of the archipelago. On 15th July 2014, the Minister of Marine Affairs and Fisheries passed a Ministerial Decree Number 37/MEN-KP/2014, which declared the archipelago as The Anambas Islands Marine Recreational Park and managed as zoning system. The park includes 1,262,686 hectares of diverse coral reef habitats and administratively located wholly within the district/regency of Anambas. In line with the conservation, missions are to protect, preserve, and utilize fish resources. Utilization of conservation areas can be through with a Territorial Use Rights for Fisheries (TURF) management approach [4]. The TURF model was later developed into the Managed access with reserved (MAR), which was integrated with MPAs.

MAR is one of the fisheries management tools that provide access and management responsibilities in certain waters by the local government to community groups with a certain period through a partnership agreement in accordance with passed Perdirjen (Regulation of General Directorate) PRL No. 03/2016. MAR is a partnership program between an Anambas Islands Marine Recreational Park Authority (LKKPN Pekanbaru), MMAF with the Batu Belah Bersatu (B3) Community Group (Pokmas B3), Anambas Islands Regency, Riau Islands Province. The implementation of MAR is located in the waters of Mensabang Island. MAR aims to support sustainable fisheries activities and improve the economy of communities around conservation areas in which people are enabled to manage their own waters area through a MAR program [5].

In the partnership agreement document between LKKPN Pekanbaru No. PK278/LKKPN.4/KKP/PK/XII/2017 with Pokmas B3 Number 01/L3B/XII-2017, it has been agreed about giving access or permits for the utilization of fish resources to Pokmas B3. This group has an obligation to maintain the preservation of fish resources and the environment by control overfishing activities in the authorized area. The hallmark of the implementation of MAR is access rights and exclusivity only for Pokmas B3. Based on the description above, this research is needed that aims to determine the community perceptions of the implementation of MAR to improve community welfare, and then an analysis is carried out to develop MAR development strategies in Anambas Islands Marine Recreational Park.

2. Method and process
The study was conducted in MAR Anambas Islands Marine Recreational Park, Batu Belah Village, East Siantan District, Anambas Islands District, Riau Islands Province, in December 2018. Data taken were socio-economic conditions of the community and implementation of the MAR program. The map of the research location is presented in Figure 1.

2.1. Data collection
This research uses primary and secondary data. Primary data collection is done through direct observation and interview methods with a structured questionnaire. Secondary data collection is done by collecting social and economic data from related institutions such as Anambas Islands Marine Recreational Park Authority (LKKPN Pekanbaru), Anambas working unit (Satker Anambas), Batu Belah Village Government, a community group of B3 (Pokmas B3) and Rare Indonesia. Aspects, variables, methods, sources, and data analysis in this study can be seen in Table 1.
### Table 1. Aspects, variables, methods, sources, and data analysis.

| Aspect                                      | Variable                                                                 | Method                                           | Source                                                                                     | Data analysis                        |
|---------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------------------------|
| Public perception of the MAR program        | • Knowledge of MAR program                                                | Questionnaire and interview                      | Primary: results of the interview (questionnaire). Source: partner fishermen (Pokmas B3) and LKKPN Pekanbaru | Likert scale and analysis using SPSS trial version |
|                                             | • Community acceptance of the MAR program                                 |                                                  | Source: partner fishermen (Pokmas B3) and LKKPN Pekanbaru                                 |
|                                             | • Community participation in the MAR program                              |                                                  |                                              |
|                                             | • Coastal environmental conditions                                        |                                                  |                                              |
| Strategy for developing the MAR program      | • Problems                                                                | Interviews, questionnaires, literature review    | Primary: Results of the interview (questionnaire). Sources: LKKPN Pekanbaru, Satker Anambas, Batu Belah Village Government, Pokmas B3, Rare Indonesia | Analytical Network Process (ANP) with using SuperDecisions software |
|                                             | • Solutions                                                               |                                                  |                                              |
|                                             | • Management strategies                                                  |                                                  |                                              |

**Figure 1.** Research map.
2.2. Data analysis

2.2.1. Community perceptions. Likert scale is a psychometric scale used in questionnaires. The Likert scale was first developed by Rensis Likert in 1932 to measure people's attitudes. According to Sugiyono [6], the Likert scale is used to measure the attitudes and opinions of a person or group of people about social phenomena. Likert scale is done by filling out the questionnaire by the respondents. Determination of the score using a rating scale 1-4. Scores with a Likert scale are presented in Table 2.

| Score | Explanation       |
|-------|-------------------|
| 1     | Very poor         |
| 2     | Poor              |
| 3     | Good              |
| 4     | Very good         |

The community response to the MAR program was processed using Microsoft Office Excel 2013 and SPSS Statistics Trial Version. The stages of Likert scale questionnaire data processing to determine the level of community perception about MAR program are as follow:

1. Class range
   - Maximum score: 
     \[ 30 \times 4 \times 30 = 3600 \]
   - Minimum score: 
     \[ 30 \times 1 \times 30 = 900 \]
   - Class range = 2700

2. Many classes
   - The desired number of classes is three classes

3. Length intervals
   - Class Interval Length = Range of classes/many classes = 2700/3 = 900

4. Class interval limit
   - 900 + 900 = 1800
   - 1800 + 900 = 2700
   - 2700 + 900 = 3600

Three choices of evaluation categories of community perceptions about the MAR program are presented in Table 3 [7].

| Interval | Category |
|----------|----------|
| 900 – 1799 | Low      |
| 1800 – 2699 | Moderate |
| 2700 – 3600 | High     |

2.2.2. MAR program development strategy with ANP. Analytic Network Process (ANP) is a tool used to analyze the priority of MAR program development strategies based on the network that was built after interviews with experts. The data needed for ANP is sourced from the literature review of activity reports, management plan documents, laws and regulations, and others. The scale used in ANP is shown in Table 4. Data obtained from the results of interviews (questionnaires) and network compilation are then compared using pairwise comparisons between elements in the cluster to find out which of the two has greater influence and how much influence (scale 1-9), then processed using the SuperDecisions software.
Table 4. Pairwise comparison scale [8].

| Intensity of interests | Explanations |
|------------------------|--------------|
| 1                      | Both elements are equally important |
| 3                      | One element is slightly more important than the other elements |
| 5                      | One element is more important than another |
| 7                      | One element is clearly more important than the other elements |
| 9                      | One element is absolutely more important than the other elements |
| 2, 4, 6, 8             | The values between the two considerations are close together |

3. Result and discussion
Batu Belah Village population is 699 inhabitants, with 178 households. There are 20 large fishing boats for 40 fishermen, and 12 small fishing boats for 12 fishermen. There are also 20 fishing boats from other villages with 40 fishermen.

3.1. Community perceptions of the MAR program
Community-based coastal resource management is a process of giving authority, responsibility, and opportunity to the community to manage their resources by first defining their needs, desires, goals, and aspirations [9]. This management includes giving responsibilities to the community so that they can make decisions and influence their welfare. To achieve these objectives, analysis of community perceptions regarding community-based coastal and marine resource management, especially MAR activities in the village of Batu Belah.

Community perception of the MAR program is measured on a Likert scale. The higher the score obtained, the better the level of community perception of the MAR program. There are three categories of assessment of the level of community perception of the MAR program, namely the low, moderate, and high categories. The implementation of the MAR program to help reduce the impact of environmental damage due to the pressure of fishery activities and help increase the income of local residents as members of the community group of B3 who have been given the authority to manage the MAR area. Variables of community perception include community knowledge, community acceptance, community participation, and environmental conditions in the Mensabang Bay. The results of the analysis of each variable are presented in Table 5, which are further described in Tables 6-9 below.

All total score values in Table 5 are the community knowledge about MAR variable, the public acceptance of the MAR program variable, the community participation variable in the MAR program, and the environmental conditions of the Mensabang Bay variable, referring to the calculation of the formula above (Number 1-4).

Table 5. Level of community perception in the MAR.

| No | Variable                                | Total score | Category      | Number of questions | Interval of Likert Scale |
|----|-----------------------------------------|-------------|---------------|---------------------|--------------------------|
| 1  | Community knowledge about MAR           | 782         | Moderate      | 9                   | 270-540-810-1080         |
| 2  | Public acceptance of the MAR program    | 601         | High          | 6                   | 180-360-540-720          |
| 3  | Community participation in PAAP activities | 642       | Moderate      | 10                  | 300-600-900-1200         |
| 4  | Environmental conditions of the Mensabang Bay | 458    | High (Good)   | 5                   | 150-300-450-600          |
|    | Category of the total assessment        | 2483        | Moderate      |                     |                          |

The results obtained a total score of the variables of community perception in the MAR region is 2483 and included in the moderate category. The score is located in the 1800-2699 interval. This
illustrates that there still needs to be some improvement in terms of planning and design of attractive activities and sufficient budget allocation for the implementation of MAR programs. Community involvement is needed as an effort of synergy in the framework of managing conservation areas to be sustainable so that it can gradually change the paradigm of community thinking about conservation in the Anambas Islands Marine Recreational Park. The overall level of community perception is presented in Figure 2.

3.1.1. Variable of community knowledge about MAR. The first variable of community perception is community knowledge about the MAR program. There are three categories of assessment of the level of community knowledge about MAR, including low, moderate, and high categories.

The total score of the level of community knowledge about the MAR programs is 782; the score lies in the assessment interval of 540-809. The level of community knowledge about MAR is included in the moderate category, meaning that the MAR program campaign in Batu Belah village can be said to be successful at 72.41%. This is important as a first step for the next stage of implementing the program of activities (Table 6).

Table 6. Level of community knowledge about the MAR program.

| No | Variable | Total score | Max score | % | Mean | Likert scale |
|----|----------|-------------|-----------|---|------|-------------|
| 1  | Knowing the MAR program | 94 | 1080 | 8.70 | 3.13 | Knowing |
| 2  | MAR location | 98 | 1080 | 9.07 | 3.27 | Knowing |
| 3  | No take zone of MAR | 94 | 1080 | 8.70 | 3.13 | Knowing |
| 4  | Utilization zone of MAR | 88 | 1080 | 8.15 | 2.93 | Knowing |
| 5  | Privilege access to MAR area giving to community group of B3 by Anambas Marine National Park management | 89 | 1080 | 8.24 | 2.97 | Knowing |
| 6  | Priority species managed in MAR area | 93 | 1080 | 8.61 | 3.10 | Knowing |
| 7  | Rules of MAR program | 80 | 1080 | 7.41 | 2.67 | Knowing |
| 8  | The penalty of the MAR program | 76 | 1080 | 7.04 | 2.53 | Knowing |
| 9  | Campaign and education about the MAR program | 70 | 1080 | 6.48 | 2.33 | Less knowing |
|    | The total score of variables of community knowledge about the MAR program | 782 | | | | Moderate |

3.1.2. Variable of community acceptance of the MAR program. Community acceptance of the MAR program is the second variable of community perception. There are three categories of assessment of the level of community acceptance of the MAR program, namely the low, moderate, and high categories.

The total score of the level of community acceptance of the MAR program is 601; the score lies in the assessment interval of 540-720. The level of community acceptance of the MAR program is included in the high category, which means that around 83.47% of the MAR program is well received by the Batu Belah communities. This has an impact on the successful implementation of the MAR program (Table 7).
Table 7. Level of community acceptance of the MAR program.

| No  | Variable                                              | Total score | Max score | % (3)/(4)*100 | Mean | Likert scale     |
|-----|-------------------------------------------------------|-------------|-----------|---------------|------|-----------------|
| 1   | The MAR program                                      | 105         | 720       | 14.58         | 3.50 | Really agreed   |
| 2   | MAR area is managed sustainably                      | 108         | 720       | 15.00         | 3.60 | Really agreed   |
| 3   | MAR management involves the community                | 107         | 720       | 14.86         | 3.57 | Really agreed   |
| 4   | Cooperation between the government and the community | 101         | 720       | 14.03         | 3.77 | Agreed          |
| 5   | Monitoring in the MAR area                           | 91          | 720       | 12.64         | 3.03 | Agreed          |
| 6   | Neatly recorded catches in the MAR area              | 89          | 720       | 12.36         | 2.97 | Agreed          |

The total score of variables of community acceptance of the MAR program is 601, which is located at the 600-899 assessment intervals. The level of community acceptance is high, which means that the perception of the Batu Belah community on the MAR program is high.

3.1.3. Variable of community participation in the MAR program. Community participation in the MAR program is the third variable of community perception. The assessment of community participation in the MAR program is divided into three categories, including the low, moderate, and high categories.

The results of the calculation of the total score of the level of community participation in the MAR program are 642, located at the 600-899 assessment intervals. The level of community participation in the program is included in the moderate category, meaning that community participation in the MAR program is 53.5%. Although public acceptance of MAR is high, the interest and participation of fishermen in the MAR program do not automatically increase. The lack of participation is the time of MAR activities to coincide with the time fishermen carry out fishing activities (Table 8).

Table 8. Level of community participation in the MAR program.

| No  | Variable                                      | Total score | Max score | % (3)/(4)*100 | Mean | Likert scale     |
|-----|-----------------------------------------------|-------------|-----------|---------------|------|-----------------|
| 1   | Involved in MAR activities                    | 78          | 1200      | 6.50          | 2.60 | Involved        |
| 2   | Involved in MAR meetings                      | 74          | 1200      | 6.17          | 2.47 | Less involved   |
| 3   | Involved in MAR training                      | 60          | 1200      | 5.00          | 2.00 | Less involved   |
| 4   | Campaign and education about the MAR program  | 72          | 1200      | 6.00          | 2.40 | Less involved   |
| 5   | Involved in the management of the B3 community group | 66          | 1200      | 5.50          | 2.20 | Less involved   |
| 6   | Involved installing MAR boundary markers       | 50          | 1200      | 4.17          | 1.67 | Less involved   |
| 7   | Involved in the decision-making process related to MAR activities | 49          | 1200      | 4.08          | 1.63 | Less involved   |
| 8   | Involved in decision making related to MAR rules | 61          | 1200      | 5.08          | 2.03 | Less involved   |
| 9   | Involved in making decisions related to MAR penalty | 69          | 1200      | 5.75          | 2.30 | Less involved   |
| 10  | Involved in determining members of the B3 community group | 63          | 1200      | 5.25          | 2.10 | Less involved   |

The total score of variables of community participation in the MAR program is 642, which is located at the 600-899 assessment intervals. The level of community participation is moderate, which means that the perception of the Batu Belah community on the MAR program is moderate.

3.1.4. Variable of environmental conditions of the Mensabang Bay. The environmental condition of Mensabang Bay is the last variable of community perception. There are three categories in evaluating the environmental conditions of Mensabang Bay, including poor, moderate, and good categories.

The result of calculating the total score of the environmental conditions of the Mensabang Bay, which is the MAR area is 458; the score is located at the interval 450-600. The environmental conditions of the Mensabang Bay are included in the good category, which means that the perception of the Batu Belah community on the environmental conditions of the Mensabang Bay is classified as...
good at 76.33%. This shows that the environmental conditions of the Mensabang Bay are still supportive of conducting fishery utilization activities, and the MAR program can increase public awareness to maintain the environmental conditions of the Mensabang Bay to remain good (Table 9).

Table 9. Level environmental conditions of the Mensabang Bay.

| No  | Variable                                               | Total score | Max score | % (3)/(4)*100 | Mean | Likert scale |
|-----|--------------------------------------------------------|-------------|-----------|---------------|------|--------------|
| 1   | The waters condition of Mensabang Bay                 | 98          | 600       | 16.33         | 3.27 | Good         |
| 2   | Conservation of coral reefs                           | 110         | 600       | 18.33         | 3.67 | Excellent    |
| 3   | Coral reef rehabilitation                             | 74          | 600       | 12.33         | 2.47 | Good         |
| 4   | Waste management in Batu Belah Village                | 94          | 600       | 15.67         | 3.13 | Good         |
| 5   | Monitoring the waters condition of Mensabang Bay      | 82          | 600       | 13.67         | 2.73 | Good         |

The total score of variables of environmental conditions in Mensabang bay 458 76.33 Good

3.1.5 Research data instrument test result

1. Validity test
A validity test is important to see whether the questions on the questionnaire are appropriate to test the research objectives. Test the validity of the SPSS Statistics trial version using product-moment correlation. This test is conducted to determine the extent to which the questionnaire used is valid or not by comparing the value of r-count and r-table [10]. The r-table value for n = 30 is 0.361. The results of the validity test in this study are all the values of r-count greater than r-table (r-count > r-table), so it can be said that 30 question items are declared valid (Table 10).

Table 10. Validity test results.

| No  | Variable                                               | Total questions (item) | Total respondents | r-count   | r-table   | Result  |
|-----|--------------------------------------------------------|------------------------|-------------------|-----------|-----------|---------|
| 1   | Community knowledge about MAR                          | 9                      | 30                | 0.385     | 0.859     | Valid   |
| 2   | Public acceptance of the MAR program                   | 6                      | 30                | 0.467     | 0.724     | Valid   |
| 3   | Community participation in PAAP activities             | 10                     | 30                | 0.441     | 0.760     | Valid   |
| 4   | Environmental conditions in the MAR region             | 5                      | 30                | 0.423     | 0.844     | Valid   |

2. Reliability test
The reliability test in this study uses the SPSS Statistics trial version, which is by comparing the Cronbach's alpha value with the minimum Cronbach’s alpha value of 0.6. Questionnaire variables are declared reliable if the value of Cronbach's alpha ≥ 0.60, conversely if the value of Cronbach’s alpha < 0.60, it can be said to be unreliable [10]. The reliability test results for all variables used in this study are reliable or reliable with the Cronbach's alpha value obtained ≥ 0.60 (Table 11).

Table 11. Reliability test results.

| No  | Variable                                               | Total questions (item) | Total respondents | Cronbach’s alpha count | Cronbach’s alpha | Result  |
|-----|--------------------------------------------------------|------------------------|-------------------|------------------------|------------------|---------|
| 1   | Community knowledge about MAR                          | 9                      | 30                | 0.806                  | 0.6              | Reliable |
| 2   | Public acceptance of the MAR program                   | 6                      | 30                | 0.620                  | 0.6              | Reliable |
| 3   | Community participation in PAAP activities             | 10                     | 30                | 0.853                  | 0.6              | Reliable |
| 4   | Environmental conditions in the MAR region             | 5                      | 30                | 0.658                  | 0.6              | Reliable |
3.2. Input Program Development MAR

MAR is currently managed by Pokmas B3, established through the Batu Belah village government regulation Number 5/2016 concerning the establishment of the Batu Belah Bersatu Institution for fisheries management authority in the MAR. Pokmas B3 coordinates with the Working Unit (Satker) Anambas as representatives of the LKKPN Pekanbaru as stipulated in the Partnership Agreement on MAR of Batu Belah Village in Anambas Islands Marine Recreational Park. MAR activities involve various aspects of management, including aspects of ecology, socio-economics, utilization, and governance, where each of these aspects there is problems with solutions and strategies.

3.2.1. The problem of Program Development MAR. The problem of the MAR program that results from ANP priority analysis that is dominantly specific per cluster of problems is the issue of utilization on the level code M4 is the intensity of fishery utilization in the MAR region. This problem is closely related to the low interest of fishermen in conducting utilization activities in the MAR area. The priorities of the problem are presented in Table 12.

**Table 12.** The priority value of problems (normalized by cluster).

| Cluster            | Code | Problems/issues                                                      | Normalized by Cluster | Ranking |
|--------------------|------|---------------------------------------------------------------------|-----------------------|---------|
| Ecological         | M1   | Availability of ecological data series                              | 0.331                 | 5       |
|                    | M2   | The condition of coral cover                                        | 0.669                 | 4       |
| Utilization        | M3   | Fishery activities in the PAAP area are not environmentally friendly| 0.244                 | 8       |
|                    | M4   | The level of fisheries utilization in the PAAP region is still low  | 0.756                 | 1       |
| Socio-economic     | M5   | Increased income of the fishing community                           | 0.274                 | 7       |
|                    | M6   | Increased education and awareness of the fishing community          | 0.726                 | 2       |
| Governance         | M7   | Community support for PAAP activities                               | 0.674                 | 3       |
|                    | M8   | The synergy between government/ non-government institutions         | 0.326                 | 6       |

ANP analysis results show that four MAR development problems in Batu Belah village each have priority elements from each problem cluster. The priority of each aspect of the problem can be seen in Figure 3.

Figure 3. The priority level of development problems for the MAR program.

According to Clayton and Myers [11], local people try hard to protect their environment, especially if it is related to their livelihood. Generally, Batu Belah fishermen are very dependent on their environment, so that their livelihood sustainability is highly dependent on the condition of the MAR area and ecosystem. Some of the Batu Belah fishermen are freelance fishermen who are active and fishing outside Batu Belah. Temporary concluded that the problem of utilization needs a manager's
concern in designing supervision in the MAR area to be more effective and attract the interest of fishermen in utilizing the MAR area.

3.2.2. The solution of Program Development MAR. The solutions offered consist of ecological, utilization, socio-economic, and governance aspects. The solution element that has the highest priority value is access to capital or credit union. Funding support from the government, community, or non-governmental institutions such as foundations/NGOs is an important factor in sustainable fisheries practices; this can reduce the activities of fisheries that are not environmentally friendly and enhance biodiversity conservation. In addition, the support and contribution of the village government through the allocation of village funds by providing access to capital for Batu Belah fishermen is one of the best solutions to develop MAR programs. The priority values of the solutions from all aspects are presented in Table 13.

**Table 13.** The priority value of the solutions (normalized by cluster).

| Cluster       | Code | Solutions                                           | Normalized by Cluster | Ranking |
|---------------|------|----------------------------------------------------|-----------------------|---------|
| Ecology       | S1   | Monitoring and evaluation routinely               | 0.872                 | 2       |
|               | S2   | Rehabilitation of coral reefs                     | 0.128                 | 8       |
| Utilization   | S3   | Education and regulatory campaigns for fishermen  | 0.660                 | 3       |
|               | S4   | Provision and maintenance of infrastructure       | 0.340                 | 6       |
| Socio-economic| S5   | Access to capital and credit union                | 0.872                 | 1       |
|               | S6   | Giving scholarships and training                  | 0.128                 | 7       |
| Governance    | S7   | Massive or continuous MAR campaign activities     | 0.490                 | 5       |
|               | S8   | Coordination between government and non-government institutions | 0.510 | 4       |

![Figure 4](image.jpg)

**Figure 4.** The priority level of development solutions for the MAR program.

ANP analysis results show that the solution to the development of the MAR program in Batu Belah village has a priority element of each solution cluster (Figure 4). The highest priority value of the solution is giving access to capital and cooperatives to fishermen members of *Pokmas* B3. This is necessary for the development of community economic enterprises through increased access to resources such as capital/venture capital, information, and technology. With the ease of granting access, it is expected to increase the involvement and active role of the community in MAR activities.
and provide opportunities to develop fisheries businesses to improve the welfare of fishermen, especially members of the B3 community groups.

3.2.3. The strategy of Program Development MAR

The results of the analysis of the MAR program development strategy recommendations based on the ANP tools are presented in Table 14.

Table 14. The priority value of the MAR program development strategy (normalized by cluster).

| Code | Strategies                                                                 | Normalized by Cluster | Ranking |
|------|---------------------------------------------------------------------------|-----------------------|---------|
| 1    | Increased public awareness and human resource capacity                   | 0.210                 | 2       |
| 2    | Strengthening of socio-economic coastal communities                      | 0.260                 | 1       |
| 3    | Increased supervision and maintenance of infrastructure management facilities for conservation areas | 0.165                 | 5       |
| 4    | Protection and rehabilitation of coral reefs as fish habitat             | 0.183                 | 3       |
| 5    | Collection and development of MAR data and information systems          | 0.182                 | 4       |

Figure 5. Priority strategies for developing the MAR program.

The results of the analysis recommend five priority strategies for developing the MAR Program in Batu Belah Village (Figure 5). MAR's development strategy that has the highest priority value is the strengthening and empowerment of the socio-economic coastal communities. Strengthening and empowering is a comprehensive process of the parties involved as motivators, facilitators, and community groups that need to be empowered through increasing knowledge, skills, providing various facilities, and opportunities to achieve access to resources to improve community welfare. The empowerment process includes enabling (creating a conducive atmosphere), empowering (strengthening community capacity and capability), protecting (protecting from injustice), supporting (guidance and support), and foresting (maintaining conducive conditions that remain balanced) [12].

4. Conclusion

The results of the level of public perception in MAR obtained a total score of 2483 and included in the moderate category. The score is located in the 1800-2699 intervals. The aspect of MAR development strategy that has the highest priority value is the strengthening and empowerment of the socio-economic coastal communities with a normalized by cluster value of 0.26. The result of the analysis
rater agreement (Kendall's coefficient of concordance) obtained from the resource of experts is \( W = 0.9 \); this shows that the level of agreement of the source is high.

The management needs to make improvements in terms of planning and design of attractive activities and sufficient budget allocation for the implementation of MAR activities. The involvement and strengthening of Batu Belah coastal communities are needed as an effort to synergize the management of conservation areas to be sustainable so that they can gradually change the paradigm of community thinking about conservation in the Anambas Islands Marine Recreational Park.

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