Coastal community attitude toward program implementation of Marine Protected Area in Berau and Bontang, East Kalimantan

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Abstract. Community attitude toward Marine Protected Area (MPA) management in Berau and Bontang, East Kalimantan is considered unsatisfactory due to interactions of several factors. The objectives of this research are as follows: (1) to analyze coastal community attitudes in managing MPA in Berau and Bontang, East Kalimantan and (2) to analyze the determinant factors influencing community attitudes in managing MPA. Primary survey for data collection was conducted from December 2017 to May 2018 using close-end questionnaire completed by 220 respondents that selected by non-proportionated random sampling from intersectoral fisher communities in Berau and Bontang, East Kalimantan. Inferences statistics based on Structural Equation Modelling (SEM) was performed for analyzing the influence of different indicator groups. This study revealed that community attitudes in regional MPA management in Berau and Bontang, East Kalimantan was neutral to negative and influenced directly by socio economic characteristics, program implementation performance and community motivation. Community motivation were influenced by income generating and community existence acknowledgement, while program implementation performance were influenced by public communication approach and intensity of extension agent roles.

1. Introduction
In the last two decades, coastal ecosystem in East Kalimantan has shown a significant degradation. Rapid development, population increase, climate change and destructive fishing are threatening coastal and fisheries resources, while the communities continue to seize potentials in using or modifying resources for their livelihood and welfare. A substantial improvement is required in the conception of reef resource management in coastal area in East Kalimantan to leverage reef habitat degradation and resource depletion. At the same time such management concept can provide mechanisms to support effective use of reef natural resources and promote ecosystem sustainability.

Starting in 2004, the regional government of Berau District established regional Marine Protected Area (regional MPA) by issued Decree of Head District No. 70/2003 that managed “Kawasan Konservasi Laut Daerah/KKLD” in Berau coastal and marine area. Now days, the status of Berau marine conservation area established through the decree of Marine and Fisheries Ministry No. 87/2016 about “Kawasan Konservasi Pesisir dan Pulau – Pulau Kecil Kepulauan Derawan dan Perairan di Sekitarnya
(KKP3K KDPS)”. Conservation policy also implemented by regional government of Bontang City by issued regional regulation (Peraturan Daerah/Perda) No. 16/2012 that managed community based coastal conservation area in Bontang. It is expected that community based approach may encourage supportive community attitude toward the implementation of coastal conservation program. Sharing of responsibilities and authorities between local fisher community and government should emphasize the supportive community attitudes in establishing MPA program implementation.

Co-management concept acknowledges the adequate capacity of local community to improve their life quality, thus other stakeholders should provide support for them in relevance to their capacity needs improvement. Attitude of community was important to support conservation programme [8]. Attitude of coastal community to support MPA program and communication difficulties between related stakeholders influenced the community participation in Kepulauan Seribu [6]. Similar cases were reported by Clifton [3], Sangadji [11] and Glaser [7] in other Indonesian coastal communities. Coastal community attitude to support MPA East Kalimantan is considered unsatisfactory due to interactions of several factors. Given this fact, the objectives of this paper are as follows to analyze coastal community attitude toward the MPA program implementation in Berau and Bontang, East Kalimantan and analyze variables affecting the level of coastal community attitude on the MPA program implementation in Berau and Bontang, East Kalimantan.

2. Material and Methods

2.1. Framework and methods

New paradigm in designing appropriate development and management of fishery and marine resources evolved from unsuccessful previous efforts and arrangements, which lacking coastal community attitude and often neglecting the presence of coastal communities. Supportive attitude of local community, as new paradigm in fishery and marine resource management, has consider community performance as “subjects of change” with initiatives, motivation, and supportive attitude to manage and conserve existing natural resources in their coastal and marine systems. New paradigm is expected to develop community sense of belonging and sense of responsibility in achieving goals of conservation programs. Motivation has become prominent in evaluating community attitude in natural resource management and requires certain capacity in its implementation [15]. The dynamic of motivation was affected by internal and external factors, both as individual and groups. Learning process can operate functionally as affected by individual characteristics (internal) and perform structurally throughout external factors [2]; [1]. Logical framework applied in this research is provided in Figure 1, while research hypothesis applied were:

1. Motivation driving fisher community attitude in management of MPA is influenced by individual socio economic characteristics and quality/performance of MPA program implementation.
2. Coastal community attitude in MPA is influenced by community motivation and community attitude.

2.2. The main concept of MPA zonation system

East Kalimantan coastal zone is located in the Sulu Sulawesi seascape with unique biophysical settings. The area is rich with natural reef resources, which essential role in supporting the livelihood of the community. In general, the coral reef area of East Kalimantan are branching, massive, tabulate and different types of sea fans and soft corals. Various types of reef fishes exist in the area, ranging from pelagic fishes to demersal reef fishes, from angelfish, butterflyfish, rabbitfish to groupers.

A large number of coral reef ecosystem in East Kalimantan coastal zone were in deprived state at present. The highest portion of coral destruction was related with anthropogenic activities, from destructive fishing practices, industrial pollution, sewage disposal, sand and coral mining, and mangrove cut-down. Destructed reefs and inappropriate fishing practices had resulted in poor fishery resource which are significant as the main source of income for local communities in East Kalimantan coastal zone.
Figure 1. Logical Framework Correlating Different Indicators in Analyzing Coastal Community Attitude in MPA in Berau and Bontang MPA, East Kalimantan.

Considering the rate of fishery resource depletion, regional government and community initiate the establishment of Marine Protected Area (MPA). In particular area of MPA, rehabilitation site was delineated to mark area for coral transplantation and fish restocking activities. Core area of MPA or the no take zone also designated as specific area where extractive activities are prohibited. Coral reef ecosystem in this area is expected to recover naturally, while regular monitoring applied to measure the rate of recovery as represented from live coral cover, reef fish richness, etc. Legal framework of Berau MPA was stated in the the decree of Marine and Fisheries Ministry No. 87/2016 about “Kawasan Konservasi Pesisir dan Pulau – Pulau Kecil di Kepulauan Derawan dan Perairan Sekitarnya(KKP3K KDPS)” and for Bontang MPA was stated in the regional regulation (Peraturan Daerah/Perda) No. 16/2012 that managed community based coastal conservation area in Bontang City. The main concept of zonation system in Berau and Bontang MPA were clearly defined as:

1. Core area or the no take zone: this particular area prohibit any harvesting activites in addition to those promoting resource conservation.
2. Buffer/limited utilization zone: area provided to secure the no take zone or core MPA area. This area can be accessed with particular allocation of timing and types of resource use activites is regulated.
3. Controlled harvest zone: area where several of resource harvest activites are allowed with the use of non-destructive methods or gears and materials.

Table 1. Distribution of community understanding level in managing MPA.

| No | Level of Understanding related to Management of Fisheries Resources | Bontang (%) | Berau (%) | Average (%) |
|----|---------------------------------------------------------------|-------------|------------|-------------|
| 1  | Low                                                           | 2.85        | 1.25       | 2.05        |
| 2  | Moderate                                                     | 40.33       | 98.75      | 69.54       |
| 3  | High                                                         | 56.82       | 0          | 28.41       |
|    | Total                                                        | 100         | 100        | 100         |

Source: primary data
In addition to MPA, local government also conducted other rehabilitation efforts by deployment of artificial reefs. It is a man-made concrete structure deployed in outer reef area, in where previously harvested by fisher community, with particular aim to provide protection or sanctuary for fish. Artificial reefs were expected to promote the recovery of fishery resources in East Kalimantan coastal zone.

2.3. Data Collection

Primary survey for data collection was conducted from December 2017 to May 2018 by using close-end questionnaire completed by 220 respondents that selected by non-proportionated random sampling from intersectoral fisher communities in Berau and Bontang, East Kalimantan. Primary data were analyzed according to Likert 4-scales in order to measure community motivation and other indicators related with community attitude in MPA. Secondary data was collated from various institutions in relation to natural resources condition and related MPA program implementation in East Kalimantan. In order to analyze the correlation between indicators and to generate hypothetical model for this research, a Structural Equation Modelling (SEM) analysis was used.

| No | Community’s Perception of Communication Program Performance | Bontang (%) | Berau (%) | Average (%) |
|----|-----------------------------------------------------------|-------------|-----------|-------------|
| 1  | Low                                                      | 100.00      | 51.25     | 75.63       |
| 2  | Moderate                                                 | 0.00        | 48.75     | 24.38       |
| 3  | High                                                     | 0.00        | 0.00      | 0.00        |
|    | Total                                                    | 100         | 100       | 100         |

| No | Community’s Perception toward the programs initiation and continuity | Bontang (%) | Berau (%) | Average (%) |
|----|---------------------------------------------------------------------|-------------|-----------|-------------|
| 1  | Low                                                                 | 100.00      | 93.75     | 96.88       |
| 2  | Moderate                                                            | 0.00        | 6.25      | 3.13        |
| 3  | High                                                                | 0.00        | 0.00      | 0.00        |
|    | Total                                                                | 100         | 100       | 100         |

| No | Community’s Perception of the Suitability of MPA Conception | Bontang (%) | Berau (%) | Average (%) |
|----|------------------------------------------------------------|-------------|-----------|-------------|
| 1  | Low                                                        | 5.63        | 6.25      | 5.94        |
| 2  | Moderate                                                  | 55.48       | 83.75     | 69.62       |
| 3  | High                                                      | 38.89       | 10.00     | 24.45       |
|    | Total                                                     | 100         | 100       | 100         |

| No | Extension Intensity | Bontang (%) | Berau (%) | Average (%) |
|----|---------------------|-------------|-----------|-------------|
| 1  | Low                 | 100         | 38.75     | 30.63       |
| 2  | Moderate            | 0           | 61.25     | 69.38       |
| 3  | High                | 0           | 0         | 0           |
|    | Total               | 100         | 100       | 100         |

Source: primary data

3. Result and Discussion

3.1. Socio economic characteristics of community groups engaged in reef resource use

Coastal communities of East Kalimantan Coastal Zone in this study were mostly grouped as young adult with average age of 38-years with moderate formal education (average period of formal education spans for 6.4-year) and low capacity of informal education (average periode of informal education equals to 3.6-training hours). Most of the respondents generate low income with average of Rp. 1.983.433,- and low dependency of family members (2.7 individuals). Having average period of working experience
spans for 19.5 years. 69.54 percents of community respondents had adequate scientific background in resource management.

3.2. Quality of MPA management program
Most respondents consider the two indicators of MPA program quality as low and only one indicator regarded as medium. The quality of program initiative and continuity scored the lowest among other indicators, as stated by 96.88% respondents. Another indicators with low score were communication performance or public outreach by the government (75.63%). The suitability / compatibility of program conception was regarded amenable by 69.62% and the intensity of extension agent roles (69.38%) of fisher respondents.

3.3. Community motivation in MPA management
Most of respondents showed considerable motivation for three measured indicators. The highest indicator was to raise income (53.49%). Consecutively, two motives were resource conservation and public acknowledgement in credibility with score 52.28% and 53.37%.

Table 3. Distribution of community motivation in managing MPA.

| No | Motivation to conserve fisheries resources | Bontang (%) | Berau (%) | Average (%) |
|----|------------------------------------------|-------------|------------|-------------|
| 1  | Low                                      | 3.78        | 5.00       | 4.39        |
| 2  | Moderate                                 | 9.48        | 75.00      | 42.24       |
| 3  | High                                     | 86.74       | 20.00      | 53.37       |
|    | Total                                    | 100         | 100        | 100         |

| No | Motivation to get public acknowledgement in credibility | Bontang (%) | Berau (%) | Average (%) |
|----|-------------------------------------------------------|-------------|------------|-------------|
| 1  | Low                                                   | 20          | 1.67       | 14.55       |
| 2  | Moderate                                              | 27.02       | 46.25      | 33.23       |
| 3  | High                                                  | 52.98       | 51.25      | 52.28       |
|    | Total                                                  | 100         | 100        | 100         |

| No | Motivation to raise income | Bontang (%) | Berau (%) | Average (%) |
|----|----------------------------|-------------|------------|-------------|
| 1  | Low                        | 0.93        | 11.25      | 6.09        |
| 2  | Moderate                   | 2.85        | 80.00      | 41.43       |
| 3  | High                       | 96.22       | 8.75       | 53.49       |
|    | Total                      | 100         | 100        | 100         |

Source: primary data

3.4. Community attitudes
The community attitude in MPA management in Berau and Bontang, East Kalimantan Coastal Zone categorized as neutral to negative toward the MPA program implementation. About 76.02% fisher respondents stated their attitude as neutral, while 23.99% mentioned negative attitude in MPA implementation.

Table 4. Distribution of community attitude in managing MPA.

| No | Community Attitude | Bontang (%) | Berau (%) | Average (%) |
|----|--------------------|-------------|------------|-------------|
| 1  | Negative           | 46.72       | 1.25       | 23.99       |
| 2  | Neutral            | 53.29       | 98.75      | 76.02       |
| 3  | Positive           | 0           | 0          | 0           |
|    | Total              | 100         | 100        | 100         |

Source: primary data
3.5. Analyzing indicators of community participation model

Structural Equation Modeling (SEM) was applied to analyze deterministic factors affecting community attitude in MPA Berau District and Bontang City, East Kalimantan. In general, the results was provided in Figure 2.

![Figure 2](image)

**Figure 2.** Structural model of community attitude in MPA Management of Berau District and Bontang City, East Kalimantan (Standardized).

3.6. Analyzing factors affecting community organization capacity (X4)

The equation depicting X3, as resulted from SEM analysis was:

\[
X_3 = 0.08X_1 + 0.74X_2; \quad R^2 = 0.56
\]  

Equation 1 resulted objective information with \( R^2 = 0.56 \), which indicates the X3 was simultaneously influenced by X1 and X2 with 0.56 %, while the remaining factors with 33% influenced by another variables that were neglected in this study. In the initial study, community motivation (X3) was expected to be influenced by socio economic characteristic (X1) and community perception regarding the performance/quality of MPA program (X2). This research confirmed the hypothesis, both of two predicted factors affecting community motivation in managing MPA program in Berau District and Bontang City, East Kalimantan (X3).

From the above results, quality of MPA program served as the prominent factor affecting community motivation in participating their role as primary stakeholder of natural resource management in Berau District and Bontang City. Referring to the model (Figure 2), higher quality/performance of MPA program will significantly formed higher community motivation for raising their income, getting acknowledgement and conserving the fisheries resources (X3).

Indicators within the quality of MPA program (X3) with high potential to affect community motivation was communication program performance and extension intensity. Co-management in fishery-marine resources is a complex mechanism and new for fisher community in East Kalimantan. Both of the factors assisted the community to understand the main principles of MPA. Community need help to understand the concept clearly and then giving right responses toward the conservation program implemented. Previous agreement and arrangement is required to accommodate various needs and...
interests, along with adequate capacity of human resources. Fisher community in coastal area in East Kalimantan expected the translation of MPA conception into practical information and technical steps of management which secure equal rights of benefit distribution as resulted from resource recovery (the use and access in no take zone area).

A consisted finding across different groups of community was related with the interpretation of resource management through MPA implementation. Such discrepancies were related with regulations on activities allowed and prohibited in the designated waters of MPA, particularly the “no take zone area”. Field observation during the research revealed high frequency of nonauthorized users passing through the boundary of no take zone area, particularly for capture fisheries and tourism activities. Several groups of fisher community disagree with such practices, in conjunction with equal sharing of available resource use in the MPA area and unfairness of applied regulation. Some of fisher community groups had forthrightly performed fishing activities in the core MPA area in order to claim the benefit of rich resources available there in. This disobedience of MPA regulation reflects communal disagreement, in addition to inadequate capacity of local government and MPA facilitator in upholding regulations applied.

Ecotourism operator groups of East Kalimantan community is considered to be responsible with such disobedience of MPA regulation by taking tourists to enter the no take zone area to SCUBA dive or snorkel-swimming. Coral reef condition in the MPA has shown improvement with high live coral cover and high diversity of fish, invertebrates, and other resources. Proximity of inhabitant islands and beautiful scenery have stirred the entrance of people who benefited from the natural resource in the MPA, despite the clear sign of marking buoy in the no take zone area. Lacking of control and poor sanctioning of the rule-breaking groups had resulted in social barriers between the overlapping tenure niche groups. Field evidence of the conflict was exemplified by blunt or evasive actions in resource harvesting in the MPA area.

Another communal issue observed during MPA implementation in East Kalimantan was related with sharing of territorial waters for different types of resource harvesting, particularly between commercial mariculture, capture fisheries with different types of fishing groups and tourism. Until present, this problem was observed in both of Berau and Bontang MPA as the consequence to development.

Other indicator showed by services intensity of extension staff in field. Comprehension which made in community when research showed that extension agents are government staff who the easiest learning sources met in field if community organizer organization and community group want discussed about their problem. Extension agents have been starting to facilitate the community to improve the community organization ability aspect as primary user and facilitator in organizing MPA and marine resources widely.

Generally can say that extension agents have given initiative contribution in organizer APL-BM process although not optimal yet and have many limit. This invention agree with Sumardjo opinion [13] with Maoyedi and Azizi [9] who say that advocacy activity as informal education instrument have role in develop organization ability and change community behavior in nature resources organizer to better direction include increase cognitive, affective and psicomotor/conatif aspect.

From above invention can say that quality program is important factor for increase community motivation. If quality of program MPA include quality of program outreach and intensity of extension agent roles are high so community motivation include motivation for increase income, motivation for get confession on credibility and motivation for resource conservation will be high. Findings from this research were also observed by Saad [10] which reinforce the connection of community motivation to raise welfare through implementation of co-management with regulated access to designated protected area.

Other indicator affecting community motivation is the quality of public communication approach applied by the local government. The strategy for public communication approach should address critical gaps in knowledge, while concurrently maintaining discussion between different community groups involved. Co-management should embrace different ideas and consider various issues to set the foundation of program planning and implementation. The idea of closing access to particular MPA area was perceived inversely by different community groups, thus the ultimate goal of promoting
sustainability for coral reef, fishery, and marine resources through MPA implementation was incapacitated, yet as arduous system for the livelihood of particular fisher community groups.

Additionally, communication approach applied by the government neglects critical information which practical and supporting awareness of the local community. Platforms for public communication applied throughout the implementation of MPA East Kalimantan Coastal Zone disregard communal disagreement and other issues available in the field. The important role of communication in co-management program, particularly to support the success of MPA implementation in Indonesia [4].

Intensity of extension agent roles also potential to influence the capacity of community organization for the success of MPA implementation in East Kalimantan Coastal Zone. Intensive advocacy program should foster community motivation, provide lesson-learned for MPA facilitators when dealing with social problems in the field, and set as additional platform in the field supplementing regular program outreach. In personal, intensive advocacy may nurture motivation in safe-guarding the MPA implementation to raise income, to gain credibility in resource conservation, and to secure existing resources for future generations.

3.7. Analyzing factors affecting community attitude (Y1)

Final result of SEM analysis is presented at Equation 2, defining structural variables affecting community attitude for MPA implementation in East Kalimantan Coastal Zone. Combination of quality of program implementation (X2) and community motivation (X3) was thought to positively influencing community attitude by 67%. Co-management attitude of fisher community in East Kalimantan Coastal Zone was more affected by community motivation by 76% compare to 8% of quality of MPA program implementation.

\[ Y = 0.76X3 + 0.08X2, R^2 = 0.67 \]  

Acknowledgement for community credibility related with community attitude in MPA management also served as indicator of community motivation. The community' motive in gaining credible status was at moderate scale. This indicates their wish for recognition as primary stakeholder in co-managing fishery-marine resources, while regards this as competency motive [12]. The influence of community motivation to get recognition of credibility in managing and conserving the fisheries resources was significant in driving community attitude. The eagerness or motivation to contribute significant roles to conserve natural resources for the sake of future generation was one substantial element in driving co-management participation by local communities [11]; [14]. Acknowledgement as primary stakeholder in preserving natural resources is related to emotional bond between the community who yield benefits from the environment with existing resources and served as one indicator of community motivation. The result of other research has articulated that acknowledgement on the community existence may foster community attitude to support coastal management programme [5]. A large portion of fisher community in East kalimantan Coastal Zone engaged with indigenous practices related with fishery-marine resources, which last for generations to generations thus fashioned their daily life and culture. Existing practical capacity in exploring and utilizing various natural resources should be considered as tangible proof of community competence and social capital in re-shaping co-management strategy applied in MPA in East Kalimantan Coastal Zone.

4. Conclusion

Community attitude in performing co-management of MPA in East Kalimantan was categorized as neutral to negative or not a supportive attitude. Factors affecting neutral community attitude indicators (loading factor : the recognition of credibility/public acknowledgement) were socio economic characteristic (ages and experience in managing fisheries resources) and also quality of MPA program implementation (communication approach/public outreach performance) and the intensity of extension agent roles).
Acknowledgments
The effort to develop supportive community attitude in co-management practice or MPA implementation in East Kalimantan should be constructed by ensuring equal-sharing of natural resource management concept between different user groups. In practice, evaluation should improve MPA regulation applied, develop efficient communication program and provide extension services in facilitating community capability who willing to participate in securing MPA.

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