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Analysis of social and economic aspects of management of marine and coastal resources based on EAFM (Ecosystem Approach to Fisheries Management) method in Banda Aceh City

E Miswar^{1*}, D Natasya¹, M Irham¹, R M Aprilla¹, S Agustina², J M Affan¹

¹Department of Fisheries Resources Utilization, Faculty of Marine and Fisheries, Syiah Kuala University, Banda Aceh, 23111, Indonesia

²Department of Marine Science, Faculty of Marine and Fisheries, Syiah Kuala University, Banda Aceh, 23111, Indonesia

*Corresponding author's email: edymiswar@unsyiah.ac.id

Abstract. The study was conducted from January to February 2018 located in Lampulo sub-district of Kuta Alam Banda Aceh, Kampung Jawa, Aceh Province. The method of data retrieval was taken from primary data (interview and questionnaire) and secondary data (from related institution and references). The sampling used was purposive sampling method with 15 respondents. Data analysis used was ordinal-based on liker score 1, 2, 3 to each indicator such as; economic domain, fishery household income (RTP), saving ratio and asset ownership, and social domain which is stakeholder participation, fishery conflict and local knowledge in management of fish resources. The overall average indicator scores are 2. The management of coastal and marine resources ecosystems in Banda Aceh city conducted precisely in Kampung Jawa, Lampulo village. The result showed that economic domain is classified with the acquisition of composite value 53.33, and social domain is classified very well with the composite value of 88.88.

1. Introduction

Fisheries management is an obligation mandated by constitution No. 31/2004 and reaffirmed in the law improvement No. 45/2009, in the context of the adoption of the law. Indonesia is expected to be able to manage all fisheries resources as well, so that their economic, social and sustainability potential is maintained.

Social and economic justice has broad implications because it related to education and justice. In order to maintain the sustainability of fisheries resources, Indonesia in this case the Banda Aceh region as the centre of fishermen's economy in Aceh requires a good approach to fisheries management by paying attention to the dimensions of economic and social development [8]. This can provide optimum socio-economic benefits for the community and cannot be separated from the dynamics of the ecosystem that becomes the living medium for the fish resources themselves.

The application of the ecosystem approach to fisheries management based on EAFM (Ecosystem Approach to Fisheries Management) is a concept of how to balance the socio-economic goals in fisheries welfare fisheries management [9]. Therefore, this study aims to evaluate and asses the socio-economic domain of the management aspects of EAFM-based coastal and marine resource ecosystems. Through the implementation of the ecosystem approach to EAFM management in the social and economic fields has developed, but there are still problems related to the management of socio-economic fisheries. Such as the lack of participation of the fishermen community towards the importance of economic



development and existing social conflict. Hence, this study is related to the assessment of the status of socio-economic development in an integrative study is very necessary.

2. Materials and Methods

2.1. Time and place of study

This study was conducted on January to February 2018, around Gampong Jawa, Lampulo, Banda Aceh (Figure 1). Respondent were determined based on fisherman data in Gampong Jawa that operated around Lampulo port which expected to give represented information.

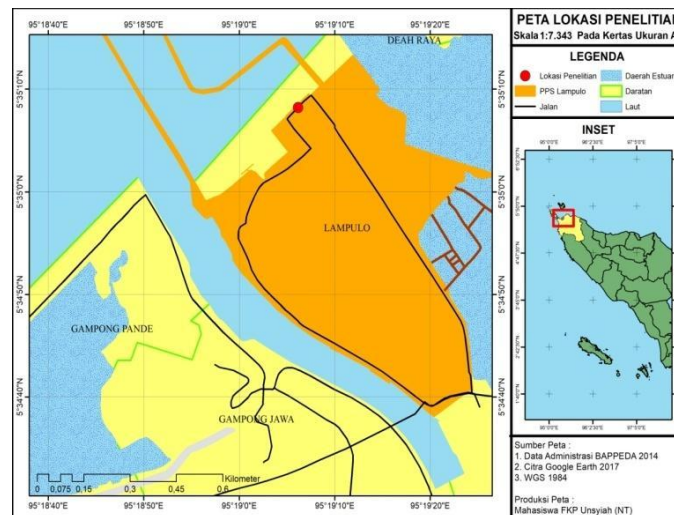


Figure 1. Site Study

2.2. Data analysis and assessment of economic and social indicators

The analysis of this research focuses on the economic and social domains, the ecosystem approach to sustainable fisheries management and the EAFM analysis itself is a management plan that focuses on more detailed activities and action plans including the activities of stakeholders, plans for controlling, utilizing and enforcing established rules in the strategic plan link to include economic and social domains. Data were analysed using a simple scoring system using ordinal based liker scores 1,2,3 which results in the greater the score, the better [5]. This analysis method used an assessment of each economic and social domain indicator. Data that has been collected and processed were used to answer the problems raised in the study. Data processing techniques that were carried out based on the indicators assessed then analysed using a simple composite analysis. The results of the assessment of the EAFM indicator were displayed in the flag model (flag modelling) [3].






2.3. Composite index and value assessment

The results of each indicator per social and economic domain were the index value of this indicator, which were added to the index value from other indicators in the social and economic domains into a composite index domain value of social and economic. Then, the assessment of the EAFM indicator becomes a multi criteria system that leads to the composite index value related to the level of achievement of fisheries management in accordance with the EAFM principle. The total index value obtained is then analysed using simple composite analysis based on arithmetic averages which were then displayed in the form of a flag model with criteria as in Table 1. This composite value was the conversion of the total value of all indicators, which were categorized into 5 criteria classification and displayed using the flag model form.

2.4. EAFM domain value classification

This classification is needed to see how far the value is obtained EAFM that is reviewed. Classification is also set on a scale of 1-100 as follows:

Table 1. Flag model with criteria.




Composite Score Value	Flag Model	Description
1-20		Bad
21-40		Not Good
41-60		Moderate
61-80		Good
81-100		Very Good

The aggregate score value derived in 5 groups categories, where the category illustrates 5 enhancing the influence of the EAFM domain that was reviewed [6].

3. Results and Discussion




Based on obtained data using questionnaire and fishermen interviewing, Panglima Laot, and related institutions on the economic domain, there are several indicators, including: (1) fisheries household income, (2) savings ratio, (3) ownership asset show the average rating condition produced in the medium or unfavourable condition with a yellow flag, which generally results in indicators that are visible from the ratio of savings and ownership of existing assets. While the income indicator of Fisheries Household (RTP) gets a low score based on the colour of the flag obtained, namely red, based on the low income generated by fishermen with a predetermined UMR. The total index value of the generated economic domain is 4640.

Table 2. Economic Domain Analysis of Fishermen

Economy	1*	2*	3*	Total
Result	Less than minimum income	Income towards loan interest rates are the same	Fixed asset value less than 50%	
Score				
Quantity	40	35	25	
Index Score	2030	1160	1450	4640

Composited analysis result from every EAFM indicators in the social domain of fishermen, namely (1) indicators of stakeholder involvement, (2) fisheries conflict, (3) utilization of local knowledge on resource management Fish produce an indicator that is in good condition, namely an indicator Stakeholder participation and indicators of the use of local knowledge in fish resource management can be seen as a green flag. Indicators of fisheries conflict classified as unfavourable or moderate conditions. The total result of the index value generated by the social domain towards the application of EAFM is 7733.

Table 3. Social Domain Analysis of Fishermen

Social	1*	2*	3*	Total
Result	Stakeholders participated more than 50%	Conflict that happened more than 2 times/year	Utilization of local knowledge in fish resource management	
Score				
Quantity	33,33	33,33	33,33	
Index Score	2900	1933	2900	7733

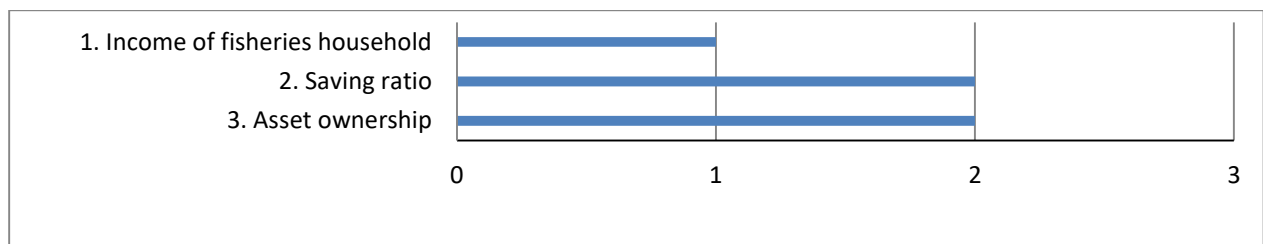


Figure 2. EAFM description indicator economy domain on the management of coastal and marine resource ecosystems

On figure 2, it can be seen the acquisition of scores on each economic indicator. It is produced that the fisheries household income indicator has a score of 1 that has relative low value, while the savings ratio and asset ownership indicators find a relatively moderate score of 2.

3.1. Indicator of fisheries household income

The results on the average fishery household income in this case obtained with a low score, which means the income situation of the Kampung Jawa fishermen operating at Lampulo PPS (Ocean Fisheries Port) is in bad condition, this is due to the fishery household income produced by fishermen less than the Minimum Regional Wage (known as UMR) income has been determined by the government.

The results of the fishermen's income are seen from the size of fishermen's income per trip. Fishing gears used as livelihoods for Kampung Jawa fishermen include trawl rings, fishing rods, and gillnet. The profit sharing system is also applied to the distribution of results when fishermen get their catch per trip, where the average crew members get 10%, handler 10%, *Toke Bangku* 10% and the rest is for ship owners and operational costs for the next trip. The average income of fishermen in the Kampung Jawa, Lampulo experienced a rise and fall, this is because when the fishing activities is not running as expected and smooth. Weather is the main factor for their income. When the weather is bad the fishermen will have no income.

3.2. Ownership of assets

Ownership of assets is a comparison between the number of productive assets owned fishery households currently with the previous year. When earning assets from fishermen's household increases then given a high value and vice versa. Production set is a household asset used for fishing activities, cultivation fish, fish processing, or fish trade, even other economic activities [4].

The measurement of ownership of the assets aims to see the ability of the fisherman's households in increasing its economic efforts. The ownership of assets is a comparison between the numbers of productive assets owned by fisheries households today with the previous year. If the productive assets of fisherman households increase, they are given a high score equal to 3 and if productive assets are reduced, the score is equal to 1. This value can be modified more by comparing the percentage change in asset ownership. The results show that the ownership of productive assets of a fisherman households remain less than 50% of the majority of businesses.

The figure 3 indicates the stakeholder participation on social interests and conflicts get a score of 2 while in on fish resource management they have a score of 3 which means the status is good.

1) Stakeholder participation

The results of the study on the participation of stakeholders that effectiveness participating produced a score of 3 where more than 50% took part in handling fisherman activities. The generated status is in a good condition as seen from the flag model produced (green colour), where the Panglima Laot here plays a role in dealing with problems what happens to fishermen, whether it's a problem in the area fishing ground and other fishermen problems [7].



Figure 3. Description of the EAFM social domain indicator for management coastal and marine ecosystems.

2) Fisheries conflict

The level of potential conflict in the fishing community is caused by the problem between the fishing ground conflict and fishing gear conflict as for other conflicts that occur regarding the regional policy conflicts on activities between sectors. The results of the research related to this indicator caused conflicts that occurred in the kampung Jawa, Lampulo as much as > 2 times a year which a status of not good. In response to the fisheries conflict, fishermen need the stakeholders' roles, namely Panglima Laot and local government to carry out conducive efforts. According to local fishermen the conflicts that occur are always resolved in deliberation to build more conducive conditions. The conflict measured from this indicator is to see the management conditions which is caused by the implementation of fish resource management policies, where the higher the frequency of fisheries conflicts, the more difficult the management of resources fishery [1].

3) Utilization of local knowledge in fish resource management

The use of local knowledge in the management of fish resources is a measure of the existence and effectiveness of local knowledge in management activities fish resources. There is no local knowledge in resource management activities fish that is followed by the effectiveness of the application of local knowledge in activities fish resource management [2].

In both domains after obtaining the results of the score, the weight and the index value of each economic and social domain indicator will get a value of composite, flag colour and description according to the results of the range of values. Domain economy in ecosystem-related fisheries management shows medium results, indicated by obtaining a composite value of 53.33 with a description of medium and yellow flag. On the social domain shows very strong results both in fisheries management indicated by obtaining composite values of 88.88 with excellent description and dark green flag on this domain.

Table 4. Following are the results of the calculation of the economic and social domain scores:

Domain	Composite Score	Flag Model	Description
Economy	53,33		Moderate
Social	88,88		Very Good

The final score obtained from both economic domains is categorized as moderate and the social domain is categorized as very good which are 53.33 and 88.88 in the implementation of EAFM. Management of ecosystems that are closely related to fisheries must be supported by every stakeholder and fishing community so that they can continue to improve fisheries management more optimally.

4. Conclusion

The aggregate value of the economic domain is 53.33 with the medium category and the value of the social domain is 88.88 categorized as good status. The assessment of EAFM indicators reviewed from the economic domain and social domains gets a score that tends to be good. The majority of scores obtained by the economy are currently and there are even ones get a score of 1 because there is still a lack of income of the existing fishermen. While in the social domain get a majority score of 3 but there

are still in moderate status so that it requires a management strategy, guidance of stakeholders in order to better support the management of EAFM-based fisheries ecosystems.

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