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THE INSTITUTIONAL PERFORMANCE OF CAPTURE FISHERIES MANAGEMENT USING EAFM APPROACH IN BORDER COASTAL OF KALKULUK MESAK DISTRICT, BELU REGENCY OF INDONESIA

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ABSTRACT

Ecosystem Approach Fisheries Management (EAFM) is an integrated and sustainable fisheries management approach. One of the six domains needed to assess the success of fisheries management using an ecosystem approach is the institutional domain which consists of six assessment indicators. The purpose of this study was to determine community perceptions of ecosystem-based capture fisheries management in the institutional domain in Belu regency. The study was conducted in 3 coastal villages in Kalkuluk Mesak district, Belu regency from June to August 2019. The data collection method used interview, observation and documentation techniques and used Likert score assessment with ordinal scale. The results of the study found that in general the institutional domain in fisheries management in Kalkuluk Mesak district is in a moderate status. The indicator for the synergy level of fisheries management policies and institutions is classified as good, the indicators for fisheries management plans are classified as bad, while the other four indicators are classified as moderate.

KEY WORDS

Institutional performance, coastal communities, fisheries management, EAFM.

Fisheries management in Indonesia refers to the Law of the Republic of Indonesia No. 45 of 2009 article 6 paragraph 1 which states that fisheries management is aimed at achieving optimal and sustainable benefits, as well as ensuring the preservation of fish resources. Management of fishery and marine resources is the most important part that must be carried out in accordance with the implementation of the utilization of natural resources based on the principles of benefit, justice, partnership, equity, integration, openness, efficiency, and sustainable preservation. The complexity of the interests and utilization of fishery resources in Indonesia is felt to be very urgent and there is a need for a model / approach in fisheries management. The most likely approach at this time is the Ecosystem Approach to Fisheries Management (NWG EAFM, 2014). This management approach develops the concept of balancing the socio-economic objectives in fisheries management (fisherman welfare, fair use of fish resources, etc.) while still considering knowledge, information and uncertainty about the biotic, abiotic and human interaction components in aquatic ecosystems through an integrated fisheries management, comprehensive and sustainable (Directorate of SDI-KKP, WWF Indonesia and PKSPL-IPB, 2012).

Charles (2001) in his paradigm of sustainable fisheries system, fisheries system management cannot be separated from three dimensions that are inseparable from one another, namely (1) dimensions of fishery resources and their ecosystems; (2) dimensions of fishery resource utilization for the socio-economic interests of the community; and (3) dimensions of fisheries policy. Regarding fisheries management in Indonesia in general and especially in Belu regency, at this time it has not considered the balance of the three dimensions of sustainability. The importance of utilization for the socio-economic welfare of

the community is felt to be greater than the health of the ecosystem. In other words, the approach taken is still partially integrated in an ecosystem boundary that becomes a container for fish resources as management targets. In this context, an integrated approach through an ecosystem approach to fisheries management is very important. The EAFM study expects fisheries management authorities and parties related to fishery and marine resources to have information on the current state of current management and together to find the best solution in improving Indonesian fisheries management.

Belu Regency is the easternmost district of Indonesia which is directly adjacent to the Republic Democratic of Timor Leste which has priority development through the current government policy to encourage the development of border areas in accordance with one of the nine priority programs (Nawacita), namely "building Indonesia from the periphery (Paulus *et al.*, 2018). One of the leading regional commodities is fishery, however the utilization of fisheries potential has not been optimal in terms of the low contribution of the fisheries sub-sector to the income and welfare of fishermen as well as regional income of Belu regency (Paulus *et al.*, 2019; Rehatta *et al.*, 2020). Based on the concept of sustainable fisheries management previously described, this study was conducted to determine the performance of fisheries management in Belu Regency using the EAFM approach through the assessment of institutional indicators in supporting sustainable fisheries management.

METHODS OF RESEARCH

Research sites. This research was conducted in June - August 2019, which are located in three border coastal villages namely Dualaus, Jenilu and Kenebibi, Kakuluk Mesak district, Belu regency.

Data source. Methods of data collection using survey methods through interview and observation techniques. The data collected consists of primary data and secondary data. Primary data obtained from questionnaires, field observations, and interviews with experts. Research experts consist of stakeholders from government, community and researchers. Research experts must have comprehensive knowledge of fisheries management, both technical, managerial and institutional (Paulus and Sobang, 2014) and the selection of respondents is also determined using the snowball sampling technique (Salganik, 2007). Secondary data were obtained from literature studies in order to obtain a theoretical basis and supporting data related to the research material. Other supporting data is obtained from related research reports, journals, bulletins, and so on.

Data analysis. Assessment of the performance of the institutional domain uses an ecosystem approach guide, where each indicator is measured and compared with its assessment criteria and weight, which is based on observations of each attribute and then compares it with a reference point, so that the minimum, medium and maximum values can be determined (Adrianto *et al.*, 2014; KKP, 2013). The results of the indicator assessment in each domain were analyzed using a simple composite based on the Likert score with an ordinal scale of 1,2,3. Through the multi-criteria analysis (MCA) approach, the results of the assessment of each domain are presented in the form of a flag model with the institutional indicator assessment criteria in Table 1. Composite assessment on each of the j-domain (C_{at-i}) was carried out with the formula:

$$C_{at-i} = S_{a-i} \times W_i \times D_i$$

Where:

C_{at-i} = the total EAFM value of one attribute in the i-domain;

S_{a-i} = the i-attribute score;

W_i = the weight of the i-attribute;

D_i = the density of the i-attribute.

Table 1 – Assessment criteria of institutional domain indicators in fisheries management according to EAFM guidelines

Institutional Indicators	Domain	Assessment criteria
1. Adherence to the principles of responsible fisheries	of	<p>The level of compliance of all stakeholders in the fisheries management area to the rules of the game, both formal and informal.</p> <p>Formal rules: score 1 = more than 5 times there were law violations in fisheries management; score 2 = 2-4 times the law violation occurred; score 3 = less than 2 times the violation of the law.</p> <p>Non-formal rules: score 1 = more than 5 times the violation occurred; score 2 = more than 3 times the violation occurred; score 3 = no violation information.</p>
2. Complete rules of the game in fisheries management		<p>1. The extent to which complete regulations in fisheries management are available, to regulate fish resource utilization practices in accordance with the EAFM domain, namely; regulations related to the sustainability of fish resources, habitats and ecosystems, fishing techniques, social, economy and institutions.</p> <p>score 1 = no regulation until there is a fisheries management regulation that covers two domains; score 2 = availability of regulations covering fisheries arrangements for 3 - 5 domains; score 3 = complete regulation available to support fisheries management from 6 domains.</p> <p>2. The presence or absence enforcement of rules and effectiveness.</p> <p>score 1 = there is no enforcement of the rules of the game, there is no evidence in the form of tools and people, there is no warning or punishment; score 2 = there is enforcement of the rules of the game but it is not effective, there are tools and people but there is no action, there is a warning or punishment; score 3 = there is enforcement of the rules of the game and is effective, there are tools and people and there are actions, there are reprimands and punishments.</p>
3. Decision making mechanism	making	<p>The presence or absence of decision making mechanism in fisheries management.</p> <p>score 1 = there is no decision making mechanism, there is a decision but it is not implemented; score 2 = there is a mechanism but it does not work effectively, there is a decision that is not fully implemented; score 3 = there is a mechanism and works effectively, there is a decision to be fully implemented.</p>
4. Fishery management plan (FMP)		<p>The presence or absence of fishery management plan for the fishery management area.</p> <p>score 1 = there is no FMP; score 2 = there is a lesson plan but not yet fully implemented; score 3 = there is a lesson plan and has been fully implemented.</p>
5. Synergy level of fisheries management policies and institutions		<p>1. The higher the level of synergy between institutions (low span of control), the better the level of fisheries management effectiveness.</p> <p>score 1 = conflict between institutions (policies between institutions have different interests); score 2 = communication between institutions is not effective; score 3 = synergy between institutions is running well.</p> <p>2. The higher the level of synergy between policies, the better the level of fisheries management effectiveness.</p> <p>score 1 = there are conflicting policies; score 2 = policies do not support each other; score 3 = mutual support policies.</p>
6. Stakeholder capacity		<p>The amount of frequency for increasing the capacity of stakeholders in ecosystem-based fisheries management.</p> <p>score 1 = no increase; score 2 = Yes, but not functioning (the skills obtained are not in accordance with the job function); score 3 = exists and is enabled (the skills acquired are in accordance with the job function).</p>

RESULTS AND DISCUSSION

Performance and status assessment. The results of the performance assessment and fisheries management status from the institutional domain are generally classified as moderate, where the indicators of the synergy level of fisheries management policies and institutions are classified as good, the indicators of fisheries management plans are classified as poor, while the other 4 indicators are classified as moderate (Table 2).

Table 2 – Results of the assessment of institutional domain indicators and a description of the status of fisheries management in Kalkuluk Mesak district, Belu regency

Institutional Domain Indicators	Score	Status
1. Adherence to the principles of responsible fisheries	2	Moderate
2. Complete rules of the game in fisheries management	2	Moderate
3. Decision making mechanism	2	Moderate
4. Fishery management plan	1	Bad
5. Synergy level of fisheries management policies and institutions	3	Good
6. Stakeholder capacity	2	Moderate

Source: Primary Data.

Adherence to the principles of responsible fisheries. The indicators of compliance with fisheries principles that are responsible for fisheries management that have been established both formally and informally in Kakuluk Mesak district have moderate status with the criteria that there have been more than 3 law violations in fisheries management. The results of interviews with the Department of Marine Affairs and Fisheries, the Atapupu Marine and Fisheries Resources Monitoring Post and the Water Police shows that there are destructive fishing activities with an average frequency of activity in Jenilu village 2 times/year, while in Kenebibi village it was found 3 times/years and repeated again in 2018 violations of fishery activities which were dominated by the use of fish bombs.

Violations and actions taken by the competent authorities in dealing with fishery activities that occur are: (1) incomplete fishing permit documents with a minor category and the action taken is guidance and direction to complete the documents as needed, (2) violations of the access to the fishing area outside the jurisdiction are categorized as light and the action taken is to provide guidance, and (3) fishing activities using non-environmentally friendly tools with a heavy category and the actions taken are conducting socialization, guidance, imposing sanctions and fines in accordance with applicable regional regulations.

The persistence of violations illustrates the lack of compliance with formal and informal laws in the waters of Kakuluk Mesak district, Belu regency. Nababan *et al.*, 2017 stated that increasing fishermen's compliance in supporting sustainable fisheries can be done by encouraging and facilitating fishermen to be involved in fisheries organizations, providing socialization related to sustainable fisheries management, increasing the size of the vessels used by fishermen, and providing capital assistance is expected to increase income. Other activities that can be carried out are providing counseling by fisheries managers through socialization to increase fishermen's capacity, increase fishermen's ability, improve fishermen's knowledge, skills and attitudes (Noviyanti *et al.*, 2015; Amanah, 2006).

Complete rules of the game in fisheries management. The completeness of rules of the game in fisheries management is defined as the level of availability of regulations, equipment, officers and other fisheries management infrastructure and whether there is enforcement of rules and their effectiveness in fisheries management. Indicators of completeness of rules of the game in fisheries management in Kakuluk Mesak district are of medium status with the criteria that there are rules for the game in fisheries management, and the number of rules is fixed and there are warnings and/or penalties.

According to the marine and fisheries office of Belu regency, there are two regulations that support efforts to utilize and conserve coastal and marine resources, namely national regulations and local regulations (Table 3).

Table 3 – Regulations used to support fisheries management in Belu regency

National regulations	Local regulations
1. Law of the Republic of Indonesia number 45 of 2009 concerning amendments to Law of the Republic of Indonesia of the Republic of Indonesia number 31 of 2004 concerning fisheries.	Belu regency regulation Number 6 of 2011 concerning regional spatial planning Belu regency in 2011-2031
2. Law of the Republic of Indonesia number 27 of 2007 concerning the management of coastal areas and small islands	Belu regency regulation Number 11 of 2011 concerning certain licensing fees (the sixth part on fisheries business license fees)
3. Decree of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia number 45 of 2000 concerning fishing business license	
4. Decree of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia No.10 of 2003 on fishing business licensing	
5. Decree of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia number 45 of 2009 regarding the estimation of potential fish resources in the fishing area	
6. Regulation of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia number 5 of 2008 concerning capture fisheries business	
7. Regulation of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia number 2 of 2011 concerning fishing in fisheries management areas	

Source: Primary Data.

Indicators of completeness of existing regulations in Belu Regency include regulations covering 5 domains, namely (1) fish resources; (2) habitat and ecosystem; (3) capture technique; (4) social; (5) economic, but enforcement of regulations related to fishery activities still has obstacles in its implementation. In line with Sulistyowatia *et al.*, 2018 stated that enforcement of rules is still not effective, there are tools and people, and actions even though not all incidents can be prosecuted, there are reprimands or penalties, not all violations have penalties, some are only reprimand or coaching. This is in line with Fabnyi and Dalabajan 2011; Campbell *et al.* 2012b that various regulations in management have been legalized in Indonesia and the Philippines, but their implementation is weak. Paulus *et al.*, 2020 stated that in building the sustainability of border areas that have complex problems, a prospective strategy is needed by looking at the key variables that influence and the level of dependence on development needs.

Decision making mechanism

Institutional mechanisms are defined as institutional methods/procedures in the community built with the aim of determining the effectiveness of decision making in fisheries management. Institutional mechanisms ensure that all management systems are in place. All rules of the game have been agreed upon and become standard procedures in fisheries management. Based on the results of the study, indicators of decision-making mechanisms in Belu regency are classified as moderate with the assessment criteria that there is a mechanism but it is not effective in its implementation, and there are decisions but not fully implemented. This can be seen from the licensing of fishing efforts, operationalization of fishing (fleets and fishing gear) as well as the conservation and restoration of aquatic ecosystems, the authority is transferred indirectly to the marine and fisheries office so that the final decision becomes ineffective. Furthermore, in joint decision-making that was agreed by the village government, it was not accommodated in the final decision determined by the marine and fisheries office. Whereas in the success of the implementation of community development, it is very dependent on the role of the government and society (Paulus and Sobang, 2014; Aprilianti, 2015) so that community involvement greatly affects the effectiveness of decision making, especially since the community is the main actor in fisheries management.

Fishery management plan. In order to support fish resource management policies, the Indonesian government establishes a fisheries management plan (FMP) based on 11 fishery management areas. FMP is a guideline and reference by considering ecological, economic and social aspects in planning, utilizing and supervising fishery activities. Based on the results of the survey and interviews, the FMP indicator is classified as bad, this is because there is no FMP at the regional level, especially the fisheries management plan for Belu regency. However, the marine and fisheries office of Belu regency stated that there is involvement of coastal communities and program support from the local government in carrying out conservation activities and restoring coastal ecosystems such as planting mangroves. FMP can be a clear instrument and direct benefit to the community is an important factor in efforts to involve the community in efforts to manage sustainable fisheries resources (Subhan, 2020).

Synergy level of fisheries management policies and institutions. The level of synergy between policies and institutions in fisheries management can be interpreted as the existence of integrated movements and steps between institutions and between policies in fisheries management so as not to create conflicts of interest and conflicts of policies. Indicators of the synergy level of fisheries management policies and institutions are of good status, with indicators of the existence of synergy between institutions that are running well with mutually supporting policies.

The coordination between institutions (the transportation agency and regional revenue office) in terms of fishery business licensing has been going well in Belu Regency. Likewise with the efforts to handle IUU fishing cases, there has been good coordination between related institutions such as the Police, the Navy, and the prosecutor's office. In its implementation, related institutions / institutions collaborate and are committed to collaborating with each other, while for the study of policy documents, they still adopt more national regulations because the authority of the regions (regency) in managing fisheries areas is already at the provincial and national levels. Fitri *et al.*, 2017 stated that synergy is also needed to implement advisory strategies and institutional strengthening in supporting fisheries management.

Stakeholder capacity. The results of the analysis of the stakeholder capacity indicators are in medium status with the criteria that there is stakeholder capacity but it is not functioning. Stakeholder capacity includes constructive efforts to increase capacity by stakeholders. Fishery stakeholders are various parties directly involved in fisheries management. Fishery stakeholders can come from the government bureaucracy (central and regional), the private sector, the community, universities, NGOs and coastal community organizations. NWG-EAFM, 2014 states that the objective of the indicator assessment is to determine efforts to increase the capacity of stakeholders in the framework of ecosystem-based fisheries management.

Planning activities and fisheries management concepts have been carried out by the marine and fisheries office but have not functioned optimally. Abrahamsz and Wurlianty, 2016 stated that the effectiveness of capacity building in fisheries management is largely determined by the policies implemented. Furthermore, the learning process between individuals, between disciplines, and between types of knowledge, as well as the choice of individuals who pay attention to positions and functions according to their main duties (Haapasaari *et al.*, 2012). Several activities to increase the capacity of stakeholders in ecosystem-based fisheries management have been carried out in Belu regency. These activities include planning activities, fisheries management concepts and capture fisheries counseling. Extension activities accompanied by training related to fisheries management that have been carried out in the three coastal villages 1-2 times/month have benefited the community in running a business in the fisheries sector in Kakuluk Mesak.

CONCLUSION

The institutional domain status of fisheries management with an ecosystem approach in Belu district shows moderate performance values. Furthermore, the six indicators for the

assessment of the level of synergy of fisheries management policies and institutions are classified as good; the indicators for fisheries management plans are classified as bad, while the other four indicators are classified as moderate. In order to improve the status of sustainable fisheries management, it is necessary to improve the indicators of the fisheries management plan and increase the moderate status from 4 indicators to good, as well as maintain the good status of the indicators of the synergy level of fisheries management policies and institutions.

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REFERENCES

1. Abrahamsz, J., & Wurlianty, B. (2016). Dinamika kelembagaan dalam pengelolaan perikanan karang berkelanjutan pada kawasan konservasi kongsnuden, kabupaten seram bagian timur. Dalam Simposium Nasional Pengelolaan Perikanan Karang Berkelanjutan Indonesia (pp. 379-393). Bali, Indonesia: Kementerian Kelautan dan Perikanan Republik Indonesia, COREMAP-CTI, dan WWF-Indonesia.
2. Adrianto L, Habibi A, Fahrudin A, Azizy A, Susanto HA, Musthofa I, Kamal MM, Wisudo SH, Wardiatno Y, Raharjo P, Nasution Z. 2014. Modul Penilaian Indikator untuk Pengelolaan Perikanan Berpendekatan Ekosistem (EAFM). Jakarta (ID): Direktorat Sumberdaya Ikan, Kementerian Kelautan dan Perikanan Republik Indonesia.
3. Amanah, S. (2006). Penyuluhan Perikanan. *Jurnal Penyuluhan*. 2(4), 62-69.
4. Aprilianti, S. (2015). Gaya kepemimpinan lurah sebagai upaya peningkatan partisipasi masyarakat dalam pembangunan (Studi pada Kelurahan Sukun Kecamatan Sukun Kota Malang). *Jurnal Administrasi Publik*, 3(1), 96-101.
5. Campbell SJ, Cinner JE, Ardiwijaya RL. 2012b. Weak Compliance Undermines the Success of no-take zones in a large Government-Controlled Marine Protected Area. *PloS One* 7:e50074.
6. Charles, A. (2001). *Sustainable fishery systems* (p.370) Victoria: Blackwell Science Ltd.
7. Direktorat SDI-KKP, WWF Indonesia, dan PKSPLIPB. 2012. *Penilaian Indikator Pendekatan Ekosistem Untuk Pengelolaan Perikanan (Ecosystem Approach to Fisheries Management)*. Modul Training. Jakarta.
8. Fabinyi M, Dalabajan D. 2011. Policy and Practice in the Live Reef Fish for Food Trade: A Case Study from Palawan, Philippines. *Mar Pol*: 35:371-378.
9. Fitri, A.D.F., Boesono, H., Sabdono, A., & Adlina, N. (2017). Resources management strategy for mud crabs (*Scylla* spp.) In Pematang Regency. *Earth and Environmental Science*, 10 (2), 191-199.
10. Haapasaari, P., Kulmala, S., & Kuikka, S. (2012). Growing into Interdisciplinarity: How to Converge Biology, Economics, and Social Science in Fisheries Research? *Ecology and Society*, 17(1), 6.
11. Kementerian Kelautan dan Perikanan Republik Indonesia. (ID). (2013). *Modul Penilaian Pengelolaan Perikanan dengan Pendekatan Ekosistem (EAFM)*. National Working Group II EAFM, Direktorat Sumberdaya Ikan, Kementerian Kelautan dan Perikanan RI. Jakarta.
12. Nababan, B., Wiyono, E. S., & Mustaruddin, M. (2017). Faktor-Faktor yang Mempengaruhi Kepatuhan Nelayan Tanjungbalai Asahan dalam Mendukung Perikanan Yang Berkelanjutan. *Jurnal Penelitian Perikanan Indonesia*, 23(1), 1-10.
13. Noviyanti, R., Wisudo. S.H., Wiyono, E.S., Baskoro, M.S., & Hascaryo B. (2015). Pengembangan kapasitas diri nelayan dalam rangka pembangunan perikanan tangkap berkelanjutan di PPN Pelabuhan Ratu. *J. Sosek KP*. 10(2), 251-264.
14. NWG-EAFM. (2014). *Penilaian indikator untuk pengelolaan perikanan dengan pendekatan ekosistem (Ecosystem Approach to Fisheries Management)*. Modul.

- Direktorat Sumber daya Ikan, Kementerian Kelautan dan Perikanan Republik Indonesia. p.197.
15. Paulus C. A dan Sobang Y. U. L. (2014). Pembangunan Masyarakat dalam Perspektif Pengelolaan Sumber Daya Berkelanjutan. Undana Press, Kupang, 265: 43-44p.
 16. Paulus C. A., Pellokila M. R., Sobang Y. U. L., Azmanajaya E., 2019 The alternative livelihood development strategy in order to improve local fishermen revenue in the border region of Indonesia and Timor Leste. *AACL Bioflux* 12(1):269-279.
 17. Paulus, C. A., Azmanajaya, E., Pellokila, M. R., & Paranoan, N. (2020). Prospective strategies for sustainable local economic development in support of the SDGs' goals "inclusive and sustainable economic growth" in the border region of Indonesia— Timor Leste, Belu Regency, East Nusa Tenggara Province, Indonesia. *JPhCS*, 1464(1), 012053.
 18. Paulus, C. A., Pellokila, M. R., & Azmanajaya, E. (2018). Local community institutions for sustainable creative and productive enterprises in the border region of Indonesia-Timor Leste in Belu district. *Russian Journal of Agricultural and Socio-Economic Sciences*, 83(11).
 19. Rehatta, B. M., Kamal, M. M., Boer, M., & Fahrudin, A. (2020). Small-pelagic Small-pelagic fisheries management strategic using ecosystem approach at Belu Regency, East Nusa Tenggara. *Journal of Natural Resources and Environmental Management*, 10(3), 446-460.
 20. Salganik, M. J., Douglas D. H. (2007). Sampling and Estimation in Hidden Populations Using Respondent-Driven Sampling. *Journal Sociological Methodology*, 34(1).
 21. Subhan, M. (2020). Strategi Pelibatan Masyarakat dalam Pengelolaan Sumberdaya Perikanan Berkelanjutan. *Jurnal Ilmiah Bahari UGR*, 1(01), 43-46. Retrieved from <https://jib.ugr.ac.id/index.php/jib/article/view/81>.
 22. Sulistyowatia, B. I., Kamal, M., & Yulianto, I. (2018). Penilaian Kelompok Ikan Kerapu dengan Pendekatan Pengelolaan Perikanan Berbasis Ekosistem di Taman Nasional Karimunjawa. *Coastal and Ocean Journal*, 2(3).