# Status of Fisheries Resource Utilization with Ecosystem Approach (EAFM) in Lubuk Larangan Area, Teluk Paman Timur Village, Kampar Kiri District, Kampar Regency, Riau

*Status Pemanfaatan Sumberdaya Perikanan dengan Pendekatan Ekosistem (EAFM) di Kawasan Lubuk Larangan Desa Teluk Paman Timur, Kecamatan Kampar Kiri, Kabupaten Kampar, Riau*

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## Abstract

The utilization of fisheries resources in Teluk Paman Timur Village is closely related to local customs. The rule of lubuk larangan limits the community's activities, where the community is prohibited from fishing until a specific time limit. However, changes in river flow have led to sedimentation and siltation, which affects the effectiveness of this lubuk larangan. This study aimed to assess the status of fisheries resources in Lubuk Larangan Teluk Paman Timur, Kampar Kiri District, Kampar Regency, Riau Province, using an ecosystem approach (EAFM). This research was conducted in March-May 2024 in the Lubuk Larangan Teluk Paman Timur area. The methods used in this research are qualitative and quantitative, and respondents were selected through purposive sampling with 15 people. The indicator development model used in this study refers to indicators compiled by the Directorate of Fish Resources. Indicators for each domain were converted into composite indicators through the "flag modelling" technique. Based on the analysis, the flag status for each domain in the Lubuk Larangan area of East Uncle Bay ranges from red to green. Domains with green flags include social, governance, and stakeholders. Domains with red flags are economic. Overall, the status of fisheries resource utilization in the Lubuk Larangan Teluk Paman Timur area received a yellow flag with a score of 20,359. This indicates that fisheries management in the local ecosystem has applied the principles of sustainable fisheries but is not yet optimal. Hence, a strategic plan needs to be established to optimize or improve the condition of existing domains and indicators.

**Keywords:** Ecosystem approach, Lubuk Larangan, Teluk Paman Timur

## Abstrak

PePemanfaatan sumber daya perikanan di Desa Teluk Paman Timur erat kaitannya dengan adat istiadat setempat. Aturan lubuk larangan membatasi aktivitas Masyarakat dimana, masyarakat dilarang menangkap ikan sampai batas waktu tertentu. Namun, perubahan aliran sungai telah menyebabkan sedimentasi dan pendangkalan, yang mempengaruhi efektivitas lubuk larangan ini. Tujuan dari penelitian ini untuk menilai status sumber daya perikanan di Lubuk Larangan Teluk Paman Timur, Kecamatan Kampar Kiri, Kabupaten Kampar, Provinsi Riau menggunakan pendekatan ekosistem (EAFM). Penelitian ini dalakukan pada bulan Maret-Mei 2024 di Kawasan Lubuk Larangan Teluk Paman Timur. Metode yang digunakan dalam penelitian ini adalah metode kualitatif dan kuantitatif, dan responden dipilih melalui metode

purposive sampling dengan total 15 orang. Model pengembangan indikator yang digunakan dalam penelitian ini mengacu pada indikator yang telah disusun oleh Direktorat Sumber Daya Ikan. Indikator untuk setiap domain diubah menjadi indikator komposit melalui teknik "flag modelling". Berdasarkan analisis, status flag untuk setiap domain di Kawasan Lubuk Larangan Teluk Paman Timur berkisar antara merah hingga hijau. Domain dengan flag hijau meliputi sosial, tata Kelola dan pemangku kepentingan. Domain dengan flag merah adalah ekonomi. Secara keseluruhan, status pemanfaatan sumberdaya perikanan di Kawasan Lubuk Larangan Teluk Paman Timur mendapatkan flag kuning dengan skor 20.359. Hal ini menunjukkan bahwa pengelolaan perikanan di ekosistem setempat sudah menerapkan prinsip perikanan berkelanjutan, tapi belum optimal, sehingga perlu ditetapkan rencana strategis untuk mengoptimalkan atau meningkatkan kondisi domain dan indikator yang ada.

**Kata kunci:** Pendekatan Ekosistem, Lubuk Larangan, Teluk Paman Timur

# 1. Introduction

Kampar Regency, Riau Province, has an area of 10,928.20 km² and a population of ±688,104 people. The Kampar River that runs through the region serves as a transport route, a source of clean water, and a fishing area, with *Hemibagrus nemurus*, *Thynnichths thynnoides*, and *Wallago leeri* being the main fish products. One crucial local tradition is the "Lubuk Larangan" in Subayang River, Teluk Paman Timur Village, a fish conservation area managed under local customary law (Budiyono, 2011). The utilization of fisheries resources in Teluk Paman Timur Village is strongly linked to local customs, mainly through "Lubuk Larangan." Under this system, people are prohibited from catching fish. In this system, people are prohibited from fishing in certain areas until a specified time. This rule has been implemented for a long time as part of the village's customary traditions.

Lubuk Larangan in Teluk Paman Timur Village has changed due to environmental degradation and changes in cultural values. The disconnection of the Subayang River caused sedimentation and a decline in fish populations. In 2022 the fish harvest was 5 tonnes, but it decreased drastically to 1 tons in 2023. The development of technology and information is also eroding local cultural values, threatening the sustainability of fisheries resources.

According to research by El Fajri et al. (2021), several essential attributes can improve the sustainability of fisheries resource management, including carrying capacity, high economic dependence on swamp ecosystems, financial benefits of swamps, local wisdom, community perceptions of the environment, swamp area management, monitoring, resource utilization regulations, and resource management institutions. To maintain the sustainability of fisheries resources in Teluk Paman Timur Village, comprehensive management is needed by considering ecological, economic, social, and institutional aspects. One management model that can accommodate all these interests is the Ecosystem approach to fisheries management (EAFM).

The ecosystem approach to fisheries management (EAFM) is a concept in achieving socio-economic goals while considering ecosystems and human interactions with ecosystems balanced through integrated, comprehensive, and sustainable fisheries management (NWG II EAFM, 2014). The sustainable management of fisheries resources is regulated through the Minister of KP Regulation No. 22 of 2021 concerning the Preparation of Fisheries Management Plans and Fisheries Management Institutions in the State Fisheries Management Areas of the Republic of Indonesia. Meanwhile, the division of inland water fisheries management areas is regulated through the Ministerial Regulation of KP RI No. 9 of 2020 concerning the State Fisheries Management Areas of the Republic of Indonesia in Inland Waters.

In this study, the assessment of fisheries management in Teluk Paman Timur Village through the ecosystem approach only uses (4) four domains, namely the social, economic, governance, and stakeholder domains. Data and information are needed to see the status of fisheries resource utilization with the ecosystem approach (EAFM).

# 2. Material and Method

## 2.1. Time and Place

This research was conducted from March to May 2024. Matrix data was collected in the Lubuk Larangan area, Teluk Paman Timur Village, Kampar Kiri District, Kampar Regency, Riau Province.

*2.2. Methods*

The methods used in this research are qualitative and quantitative approaches. The quantitative approach is an inductive research method that emphasizes the objective measurement of a phenomenon. Each phenomenon is translated into several problem components, variables, and indicators to take measurements to take measurements. Each variable is determined by giving different numbers of symbols according to the category of information related to the variable. Quantitative mathematical calculation techniques can be carried out using these numerical symbols to produce a conclusion that applies generally within a parameter.

Data in quantitative research methods are obtained by taking several samples that are considered representative of the population. After that, the sample group is given special treatment, usually through interviews, matrix filling, or experiments. The treatment results are then processed statistically, and research results are produced as numbers. Sampling in this study used a purposive sampling method. Respondents through purposive sampling are carefully selected by researchers who deliberately determine who is included in the study based on criteria or considerations (Lenaini, 2021). According to Sitorus (1998), qualitative data is descriptive data in the form of spoken or written words from humans or about human behaviour that can be observed, and Qualitative data is divided into three categories: observations, conversation results, and written material.

*2.3. Procedures*

Sampling was conducted through primary and secondary data collection. Primary data consisted of interview data. Data was collected over three months, and interviews were structured using an indicator and domain assessment matrix. Boer (2008) states that the interview was in-depth. The determination of respondents using the purposive sampling method with 15 respondents can be seen in Table 1. The verification was verified through interviews and organizing focus group discussions.

Table 1. Details of respondents using a purposive sampling method

| No. | Respondent Group | Number of Respondents (people) |
|---|---|---|
| 1 | Fisheries Service | 1 person |
| 2 | Camat | 1 person |
| 3 | Pemangku Adat | 2 people |
| 4 | Village | 3 people |
| 5 | Fisherman | 6 people |
| 6 | BPD | 1 person |
| 7 | Youth Leader | 1 person |

*2.4. Data Analysis*

In implementing this research, the indicator development model refers to the indicators developed by the Directorate of Fish Resources Management (2022a) (Table 2). The indicator model was built using the DPSIR (Drivers-Pressures-State-Impact-Response) cycle (Turner, 2000). The "flag modelling" technique converted partial indicators from each domain into composite indicators. The flag modelling technique is conducted using a Multi-Criteria Analysis (MCA) approach where a set of criteria is built as the basis for the analysis of the state of fisheries management areas from an ecosystem approach to fisheries management (EAFM) through the development of a composite index (Adrianto et al., 2005).

Table 2. EAFM indicators in each domain

| | Social | Economics | Governance | Stakeholders |
|---|---|---|---|---|
| Indicators | Asset ownership | The trend of fishing production | Compliance with sustainable fisheries principles | Synergy of policies/ programmes/ activities across sectors |
| | Proportion of income. | Change in size of fish caught | Completeness of the rule of law | Stakeholder capacity |
| | Expenditure proportion | Proportion of juveniles/ fish caught not for culture | Local wisdom | Institutionalisation of local scale fisheries management |
| | Economic dependency | Composition of catch | Decision-making mechanism | Local-scale fisheries management institutions |
| | Livelihoods of fishermen | Presence of introduced and invasive species | Ecosystem-based fisheries management policy | |

**Source**: Directorate of Fish Resources Management (2022a); (Directorate of Fish Resources Management, 2022b, 2022c, 2022d, 2022e, 2022f, 2022g, 2022h)

# 3. Result and Discussion

*3.1. Lubuk Larangan Area Management*

For decades, local customary institutions have managed the Lubuk Larangan area in Teluk Paman Timur Village. This management aims to conserve fisheries' resources by not catching small fish during harvest to maintain sustainability and economic value. Lubuk Larangan has a core zone of at least 20% of the total area (± 200 m) where fishing or ecosystem-damaging activities are prohibited. This zone is marked with boundary markers and notice boards and protected from exploitation to ensure aquatic flora and fauna reproduce naturally.

Violations of this rule may be penalized according to Village Regulations. The management of Lubuk Larangan by customary stakeholders is informal, with unwritten rules, but formally recognized through forming a Community Watch Group (POKMASWAS). POKMASWAS is tasked with preventing, monitoring, and reporting illegal fishing and fish theft. Communities must report illegal activities to POKMASWAS, who then report them to the village government for follow-up according to applicable regulations and sanctions (Teluk Paman Timur, 2023).

### 3.2. Fisheries Resource Utilisation System

Teluk Paman Timur Village applies a traditional fisheries management system known as lubuk larangan. Lubuk larangan is a water area prohibited from being fished for a certain period to conserve fish stocks and maintain the sustainability of the aquatic ecosystem. Fish harvesting is done once a year and involves organized divisions consisting of fish catchers, fish auctioneers, fish pickers, divers, and revenue sharers to ensure efficiency and compliance with community rules.

The only fishing gear allowed is nets with a mesh size of 9 inches to prevent the capture of reproductively immature fish and maintain the sustainability of fish stocks (Sari et al. in Prianto et al., 2024). Outsiders and destructive fishing methods such as poison, stun, and bombs are prohibited to protect aquatic ecosystems and ensure fisheries resources remain available for future generations. After the harvest, 65% of the catch is distributed directly to residents, while 35% is sold for village revenue to construct public facilities such as mosques. These arrangements are made through deliberation and reflect the values of democracy and togetherness within the community. Violators of the rules are subject to customary sanctions such as payment of fines, disconnection, or destruction of fishing gear, demonstrating how local wisdom can be applied to manage natural resources sustainably and equitably.

### 3.3. Lubuk Larangan Utilisation Status

The assessment of fisheries resources in the prohibited Lubuk area uses EAFM indicators in four domains: social, economic, governance, and stakeholder domains. The results of the field data analysis of the utilization status of the East Uncle Bay ban hole can be seen as follows. Welfare in sustainable fisheries should also be viewed from the perspective of the social domain. It can be measured through six indicators. The assessment of the indicators can be seen in Table 3.

Table 3. Assessment of EAFM indicators in social domain data analysis

| No | Indicators | nr | Weight | Score | Value |
|----|------------|----|--------|-------|-------|
| 1. | Community Participation | 4 | 19 | 3 | 228 |
| 2. | Fisheries Conflict | 2 | 9,5 | 2 | 38 |
| 3. | Local Agreement | 5 | 23,8 | 3 | 357 |
| 4. | The Role of the Figure | 1 | 4,8 | 2 | 10 |
| 5. | Proportion of Education | 3 | 14,3 | 2 | 86 |
| 6. | Experience as a Fisherman | 6 | 28,6 | 2 | 343 |
| | Total | | | | 1.062 |

Based on Table 3, it can be seen that the composite value of indicators in the social domain is 1,062 (green), which means that the social management of fisheries is in a suitable category. This shows that the condition of the local social domain has optimally implemented the principles of sustainable fishing, so it is necessary to establish a strategic plan to maintain or improve the condition of the existing domains and indicators.

Tabel 4. Assessment of EAFM indicators in economic domain data analysis

| No | Indicators | nr | Weight | Score | Value |
|----|------------|----|--------|-------|-------|
| 1. | Asset Ownership | 1 | 6,7 | 2 | 13 |
| 2. | Income Proportion | 3 | 20,0 | 1 | 60 |
| 3. | Expenditure Proportion | 2 | 13,3 | 2 | 53 |
| 4. | Economic Dependency | 5 | 33,3 | 1 | 167 |
| 5. | Livelihood Situation of Fishermen | 4 | 26,7 | 1 | 107 |
| | Total | | | | 400 |

Based on Table 4, the composite value of the economic domain is 400 (red) and is categorized as lacking, indicating the low role of capture fisheries in households' economic lives. Indicators that raise red flags are income proportion, economic dependency, and livelihood organization. The proportion of income from the fisheries sector in Teluk Paman Timur Village is still low, with a contribution of less than 50% to total household income. This shows that the fisheries sector is not significant enough to fulfil the community's economic needs. Most of the income of fisher households comes from other sectors such as agriculture, animal husbandry, or other side jobs.

The economic dependency of fishers in Teluk Paman Timur Village remains high, with many household's dependent on fishing as the primary source of income. Despite the existence of non-fishing businesses, fisheries remain the mainstay of the economy, making them vulnerable to fluctuations in catches and environmental changes. According to research by Rahman & Suryadi (2021), diversification of income sources is vital to increase the economic resilience of fisher households to the risks associated with declining fishery yields.

In Teluk Paman Timur Village, only 29.6% of 233 households work as fishermen, with 69 fishermen. This profession is not carried out entirely because it depends on water conditions, so the fishermen's livelihood indicator received a score of 1 (red). Amarullah et al. (2020) stated that one of the causes of the low income of fishermen's households is the low income from fishing. Hence, the consumption of food or non-food types also differs between traditional fishermen, with fishermen with outboard motor boats and fishermen without motorized boats. These variables influence the ups and downs of production and household income and expenditure. Salmarika (2019) stated that compliance with the principles of responsible fisheries is related to the norms of fisheries law. The higher the level of compliance from business actors, the better the fisheries principles can be carried out responsibly in formal and non-formal law (Table 5).

Tabel 5. Assessment of EAFM indicators in governance domain data analysis

| No | Indicator | nr | Weight | Score | Value |
|----|-----------|----|--------|-------|-------|
| 1. | Compliance with the principles of sustainable fisheries | 5 | 29,4 | 3 | 441 |
| 2. | Completeness of the rule of law | 4 | 23,5 | 2 | 188 |
| 3. | Local wisdom | 3 | 17,6 | 3 | 159 |
| 4. | Decision-making mechanism | 3 | 17,6 | 2 | 106 |
| 5. | Ecosystem-based fisheries management policy | 2 | 11,8 | 2 | 47 |
| | Total | | | | 941 |

Table 5 shows that the composite value of indicators in the governance domain is 941 (green), meaning fisheries governance management is included in the excellent category. Indicators with yellow flags are the completeness of the rule of law, decision-making mechanisms, and ecosystem-based fisheries management policies. Assessment of fisheries management conditions with an ecosystem approach, which analyzes stakeholders related to fisheries management in an inland water ecosystem, aims to determine the role of stakeholders in the management of fisheries resources in inland waters. For stakeholder assessment, domain indicators can be seen in Table 6.

Table 6. Assessment of EAFM indicators in stakeholder domain data analysis

| No | Indicators | nr | Weight | Score | Value |
|----|-----------|----|--------|-------|-------|
| 1. | Synergy of policies/programs/activities across sectors | 4 | 40,0 | 3 | 480 |
| 2. | Stakeholder capacity | 2 | 20,0 | 2 | 80 |
| 3. | Local Government policy orientation | 1 | 10,0 | 2 | 20 |
| 4. | Local-scale fisheries management institutions | 3 | 30,0 | 2 | 180 |
| | Total | | | | 760 |

Based on Table 6, it can be seen that the composite value of the stakeholder domain is 760 (green) with a suitable category, meaning that the condition of the local stakeholder domain has implemented sustainable fisheries principles optimally, so it is necessary to establish a strategic plan to maintain or improve the condition of the existing domains and indicators.

### 3.4. EAFM Domain Overall Aggregate Assessment Result

The assessment uses EAFM indicators that cover various aspects that affect the sustainability of fisheries in the Lubuk Larangan area. The social domain reflects community welfare and involvement in fisheries management. The economic domain describes the economic welfare of fisheries businesses. The governance domain assesses the effectiveness of applicable rules and policies, and the stakeholder domain evaluates the role and capacity of various parties involved in fisheries management. The results of the overall aggregate assessment of each domain can be seen in Table 7.

Table 7. Ecosystem approach status flag values in the Lubuk Larangan area of Teluk Paman Timur

| Domain | CI | br | CA |
|--------|----|----|----|
| Social Domain Status Flag | 1.062 | 23,2 | 24.638 |
| Economic Domain Status Flag | 400 | 19,6 | 7.840 |
| Governance Domain Status Flag | 941 | 30,3 | 28.512 |
| Stakeholder Domain Status Flag | 760 | 26,9 | 20.444 |
| Σ CD:. | 3.163 | | 81.435 |
| CD Average. | 791 | | 20.359 |

In Table 7, it can be seen that the status value of fisheries resource utilization in the Lubuk Larangan area of East Uncle Bay has a Yellow status flag (value 20,359), which means that the utilization of fisheries in the Lubuk Larangan area means that there are still several aspects that need to be set strategic plans to optimize or improve the condition of existing domains and indicators. Based on the research results by Purwoko et al. (2020), the condition of inland water fisheries in Kampar Regency using the EAFM approach obtained a yellow-green flag status value. The EAFM assessment in the Lubuk Larangan Area of East Uncle's Bay shows a yellow status, indicating that fisheries management is pretty good, but there is still room for improvement. The assessment covers four domains: social, economic, governance, and stakeholders, which have not yet reached optimal conditions. For more comprehensive results, it is recommended to add three additional domains: fish resources,

environment, and fishing technology. Assessment of these three domains will provide a more complete picture of the sustainability of fish stocks, the impact of fisheries on ecosystems, and the efficiency and sustainability of fishing technology. With this approach, the fisheries management status flag is expected to be upgraded to green, indicating sustainable and balanced management.

*3.5. Efforts to Manage the Lubuk Larangan Area of Teluk Paman Timur*

The Lubuk Larangan area of Teluk Paman Timur requires various management efforts to improve the ecosystem's status and the local community's welfare. Based on Table 11, there is a domain that needs attention, namely the economic domain. Improved management in the economic domain can be done through 1) increasing the capacity of fishermen, 2) developing alternative livelihoods, 3) diversifying fishery products, 4) increasing the capacity of fisheries business management, and 5) increasing economic and cultural access saving. According to Ramlah et al. (2022), the development of capture fisheries can be done by optimizing the government's role, significantly improving the welfare of small-scale fishers.

# 4. Conclusions

Based on the results of the study, it can be concluded that the status of fisheries resource utilization through the ecosystem approach in Teluk Paman Timur Village has a yellow flag status (value 20,359), which means that fisheries management in the local ecosystem has applied the principles of sustainable fisheries, but not yet optimal, so a strategic plan needs to be established to optimize or improve the condition of existing domains and indicators. Looking at each domain, the economic domain has a red flag value, which means that the local economic domain has not implemented sustainable fisheries principles, so to improve the management status to be better, improvements need to be made in the economic domain.

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