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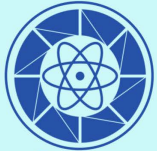
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(RESEARCH ARTICLE)



## The importance of development planning for the utilization of non-timber forest products in supporting the sustainability of protected forest area: A case study of pesawaran Forest Management Units (FMU), Lampung province, Indonesia

Christine Wulandari, A. Nizam Syahiib \*, Popi Tri Astuti, Elza Wahyuni, Samsul Bakri and Hari Kaskoyo

*Department of Forestry, Forestry Master Study Program, Faculty of Agriculture, Lampung University, Lampung Indonesia.*

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### Abstract

The dynamic concept of ecosystem sustainability functions to maintain the benefits of social, economic, and ecological. A protected forest is a type of forest that functions as a life support system. This function is specific, so there is a need for a strategy to develop and maintain the sustainability of natural resources. The forest management unit (FMU) is a regulation of management at the site level. One of the KPHs in Lampung province, namely the Pesawaran FMU, has the potential for non-timber forest products (NTFPs) and environmental services. This research aims to analyze the forest utilization management plan in the Pesawaran FMU register. The number of primary respondents is three based on the Snowball Sampling technique. The analytical method used is the descriptive qualitative analysis based on information on primary and secondary data. It is supported by a SWOT analysis to analyze preferences for forest product utilization plans in the Pesawaran FMU according to conditions in the field. The results showed that all respondents stated that the Pesawaran FMU area had potential natural resources in the form of NTFPs and environmental services. It is necessary to optimize community empowerment so that they have the competence to develop this potential to be utilized as a creative economic business in the form of products selling value and using environmental services as tourist objects. There is a need for stakeholder involvement related to the coordination of management and utilization permits which can increase communication and reduce the risk of conflict.

**Keywords:** Management plan; Forest utilization; NTFPs; FMU

## 1 Introduction

The sustainability of forest ecosystems has become an interesting issue in the last decade [1]. This relates to the excessive exploitation of forest resources and the impact of climate change on humans. The success of forest management is not solely based on how much nominal value we get but on how much the surrounding community can feel the value of ecological and social benefits. Thus, sustainable forest management is a management effort in a dynamic and developing concept to maintain and increase forest utilization's economic, ecological, and social values [1]. One form of area that functions to maintain a life support system is a protected forest, which has problems with illegal logging activities and land conversion considering the status of a protected area should not be carried out logging activities [2]. Potential protected forest areas that can be utilized are non-timber forest products (NTFPs) and environmental services. The potential for NTFPs to play a role in conservation efforts has generated interest and several efforts in developing protected forest areas [3]. This relates to strategies for overcoming land degradation and increasing biodiversity. In forestry planning, the decision-making process can use an optimization approach [4] based on an inventory of the potential of existing natural resources.

\* Corresponding author: A. Nizam Syahiib

Quality and quantity data on potential forest resources are essential in designing sustainable management and utilization plans and seeing the potential of forests, which include protecting watersheds, reducing erosion rates, tourism potential, providing NTFPs, and protecting wildlife [5]. Concerns are still being felt about the potential of forests and sustainable forest management in forestry development. The goal of sustainable forest management is to utilize forest resources to meet current needs without reducing and damaging the needs of future generations [6]. Policies are needed that lead to a human and environmental orientation in the form of community empowerment to create two-way sustainable management. Communities can synchronize with environmental conditions to respond to environmental changes based on local knowledge and wisdom [7]. The government needs to increase community involvement in the implementation of forest management plans. The realization of good forestry institutions is not only seen from the success of management at the central level but also the success of management at the site level through forest management units or Forest Management Units (FMU).

FMU is the spearhead of forest management and serves as an information center regarding the wealth of forest resources. It organizes forest areas into parts that can be utilized by various permits and managed for their use through self-planned and implemented activities (RPHJP KPH Pesawaran). Forest management units are divided into forest functions, including KPHP, KPHL, and KPHK. One of the KPHLs located in Lampung Province is the Protected Pesawaran KPH. Protected forests protect life support systems, maintain the water cycle, climate, and soil fertility and become a source of community livelihoods [8]. Apart from the functions and benefits of protected forests, the condition of forest management still needs improvement, seeing the failure of government policies in conserving natural resources. Even though policies in Indonesia, especially in forestry development, must be synchronized with all relevant policies that have implications for regional development interests and community needs [9]. Many people still need to be involved in forest management programs, and policies prepared by the government cause conflicts that exacerbate people's poverty conditions [10]. Therefore there is an FMU to overcome the above problems starting at the site level. Thus, if the role of the FMU can be carried out properly, then the FMU will become the front line in realizing the harmonization of forest use by various parties within the framework of sustainable forest management.

In the Pesawaran FMU area, several farmer groups have obtained management permits through a social forestry scheme. This permit was granted to resolve conflicts and to improve community welfare in the form of a source of livelihood [11]. In addition, farmers can gain access to the utilization of NTFPs [12] and environmental services. This effort can provide community benefits in improving the economy without destroying the area. The forest utilization plan is in the form of the utilization and collection of NTFPs. The commodities managed by farmers on licensed land are nutmeg (*Myristica fragrans*), areca nut (*Areca catechu*), and candlenut (*Aleurites moluccanus*). Current commodity price data for agricultural commodities in the Pesawaran FMU are nutmeg for Rp. 30,000/Kg, areca nut for Rp. 8,000/Kg, and candlenut for Rp. 6,000/Kg. This price is still meager, considering the excellent market opportunity for this commodity. This occurs due to the need for more optimization of farmers in producing NTFPs and the lack of assistance from stakeholders.

NTFPs and environmental services in the Pesawaran FMU register can be optimized if farmers and the community have good knowledge and skills. The role of the government and stakeholders in the form of assistance supports this. Optimizing this potential is expected to create added value for farmers and the Pesawaran FMU. This study aims to determine the plan for utilizing NTFPs and environmental services in the Pesawaran FMU area. Research of this kind is still scarce, so it is essential to conduct this research to find out strategies for forest utilization in an effort toward Sustainable Forest Management (SFM).

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## 2 Material and methods

This research was conducted in September-November 2022 in the working area of the Pesawaran FMU, Lampung Province, Indonesia. The data used is a combination of primary data and secondary data. The primary data used is the result of interviews with key respondents regarding the potential and strategy for developing NTFPs and environmental services in the Pesawaran FMU. In contrast, secondary data supports the results of the primary data. Determining the number of respondents used the Snowball Sampling technique [13]. The Snowball Sampling technique is sampling where the samples obtained go through a rolling process from one informant to another until the results or data are saturated [14] so that the number of samples is three respondents, including the Head of Pesawaran FMU and Forestry Extension.

The method used is descriptive qualitative, where research results are obtained and explained based on a descriptive study of information obtained through a study of scientific sources (literature study) so that a scientific study and opinion can be formulated based on the formation of an idea [15]. This research problem study is based on collected information about forest management in the Pesawaran FMU, utilization plans, and their relation to social, economic,

and ecological aspects. The data and information were obtained based on literature studies and various scientific publications in the form of relevant scientific books and journals and on the Long Term Forest Management Plan at the Pesawaran FMU. In addition, the SWOT analysis method is also used, based on field conditions and secondary data, to see the management plan at the Pesawaran FMU [16].

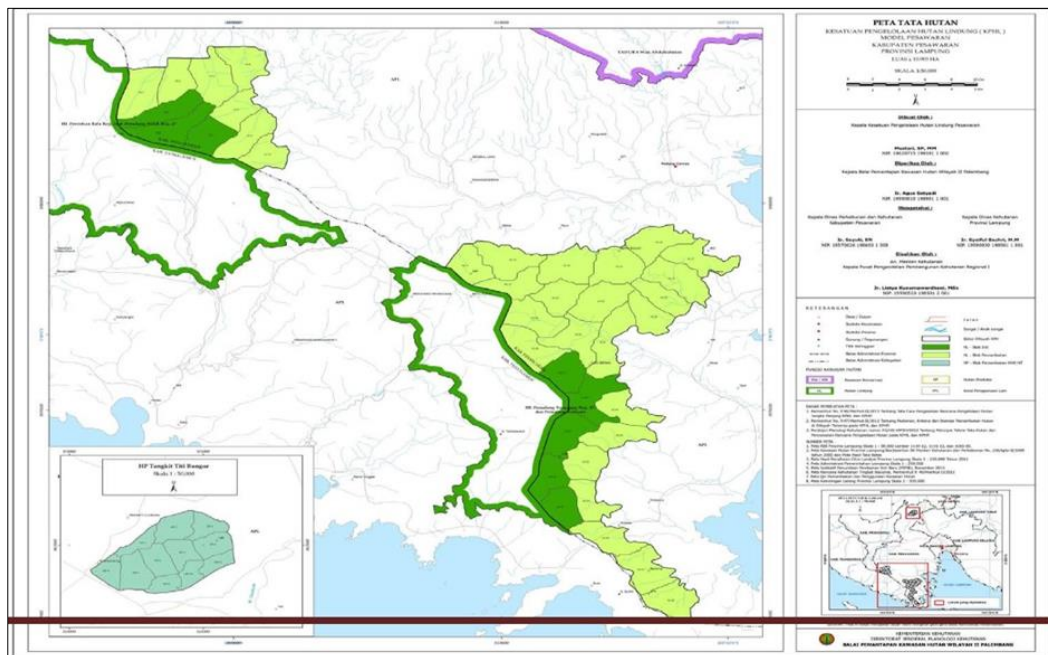
The SWOT analysis identifies and estimates the potential development of natural resources in the Pesawaran FMU. Strengths and weaknesses (internal variables), as well as opportunities and threats (external variables), are analyzed in the SWOT analysis [17]. Based on the results of the SWOT, several alternative conclusions can be formulated, including which opportunities must be utilized immediately. There is sufficient strength to handle them, which challenges require muscular enough strength to overcome them, which opportunities have not been exploited due to substantial deficiencies, and which weaknesses need to be repaired as soon as possible to prevent related opportunities from being lost, and which Barriers are dangerous because they have significant disadvantages. Preparation of a SWOT plan based on factors currently influencing internal and external strategy. The four strategies, namely SO (Strength-Opportunity), ST (Strength-Threat), WO (Weakness-Opportunity), and WT (Weakness-Threat), were generated from a SWOT analysis [18].

According to [19], a literature study is a method of collecting the results of previous studies to answer the problems studied. The literature study in this research includes descriptions and conducting analytical studies on KPHL management and plans for the utilization of NTFPs based on the findings of previous researchers [20] to obtain comprehensive information accurately and objectively and can draw conclusions on root causes and formulations solutions to the problems studied [21].

### 3 Results and discussion

#### 3.1 Overview, Conditions, and Potential of the Pesawaran FMU Area

Based on the Decree of the Minister of Forestry of the Republic of Indonesia Number SK. 438/Menhut-II/2012, one of the FMUs in Lampung province was designated as the Pesawaran Protected Forest Management Unit (KPHL) Area (Unit XII) located in Pesawaran District. The determination of the Pesawaran KPH is divided into register areas 18, 20, and 21 and has an area of around 11,000 Ha. Then based on the 2013 BPKH Region II Palembang Forest Management, the area of the Pesawaran KPH changed to 10,903.56 Ha. Geographically, the working area of the Pesawaran FMU consists of a protected forest (Register 20 and 21) and a production forest (Register 18) (Figure 1).



Source: RPHJP KPH Pesawaran (2015)

Figure 1 Map of the working area of the Pesawaran FMU

The accessibility of the Pesawaran FMU area is excellent, which means it is easy to reach and travel with the condition roads that have been paved and hardened. Based on the interpretation of landscape imagery in 2012, the condition of the land cover in the KPHL area is Dryland Agriculture with an area of ± 8,319 Ha or 76.30% of the total area, Dryland Agriculture with an area of ± 2,178 Ha (19.98%), Shrubs ± 297 Ha (2.72%), Settlements ± 9 Ha (0.08%) and Secondary Dryland Forest covering an area of ± 100 Ha (0.92%). The condition of the Pesawaran FMU is significantly damaged, where forest land is only 0.92% of the entire area. This is due to land conversion into agricultural land dominated by cocoa and banana plants. As for the potential for the forest, plant stands in the Pesawaran FMU, namely Gintung (*Bischofia javanica*), Kelempayan (*Neolamarckia cadamba*), Laosan (*Alpinia galanga*), Mara (*Ricinus tanarius*), and Rempelas (*Ficus ampelas*).

In addition to the potential for wood from forestry and plantation commodities, other potentials that can be utilized in the Pesawaran FMU area are nutmeg (*Myristica fragrans*), candlenut (*Aleurites moluccanus*), sugar palm (*Arenga pinnata*), rubber (*Hevea brasiliensis*), bamboo (*Bambusoideae*), and rattan (*Calamus*) as well as environmental services in the form of waterfalls, the drinking water industry, and nature tourism. The potential for NTFPs and environmental services is managed and developed by collaborating with the community (farmers) and stakeholders. Most of the livelihoods of the people around the Pesawaran FMU area are farming and gardening. Community livelihoods on natural resource management systems can be influenced based on their level of education. The education level of the people in the villages around the area is relatively low, with the average elementary school graduate. Indigenous peoples or local wisdom around the area play a significant role in developing community forestry, often known as Community Based Forest Management (CBFM).

The Pesawaran KPH register area is composed of various types of land cover. This also has implications for the various potential NTFPs and environmental services in the Pesawaran KPH. Non-timber forest products are starting to be in demand by communities around the forest. This is due to the enthusiasm of the people willing to voluntarily replace their cacao plants with nutmeg, candlenut, sugar palm, rubber, bamboo, and rattan (RPHJP Pesawaran). Meanwhile, the potential for superior crops for the KPHL Pesawaran NTFP Program has yet to be identified, so it is necessary to carry out a periodic inventory of potential NTFPs. In addition to the potential for NTFPs, the Pesawaran KPHL area has a lot of environmental service potentials, such as water management environmental services such as springs and waterfalls in Bayas Jaya village register 21 and springs in register 20 Gayau village which can be developed into drinking water industries and nature tourism, which of course will increase the income of the community around the forest and regional income. These NTFPs and environmental services can be used as potential for developing the Pesawaran FMU and improving community welfare.

### 3.2 Problems in the Management of the Pesawaran FMU

Forest encroachment activities, illegal mining, and land conversion, continuously increasing from time to time, are the main problems in managing the Pesawaran forest area. This causes and causes the loss of the primary function of the forest [22]. The constraints and problems experienced by the Pesawaran FMU can be caused internally and externally. For example, there is a difference in the land area between the Minister of Forestry decree and the one based on the forest layout map. Thus, until now, there has yet to be an apparent certainty regarding the boundaries of the working area of the FMU. The certainty of the boundaries of this area is a guideline for land use and management that the community or farmers cultivate.

The role of the community dramatically impacts forest management activities. The current case is the rampant illegal activities such as forest encroachment by the community to fulfill personal interests. As a result, there needs to be more public understanding of the impact of forest destruction on the environment. Therefore, it is necessary to have community empowerment regulations to increase economic capacity and capability. It is not only the community that has an important role. External parties and stakeholders are at the forefront of managing forest areas and delivering infrastructure, facilities, and infrastructure to support management. Increasing the quality and quantity of FMU managers need to be improved so that they can overcome some of the conflicts that occur. Then there needs to be synchronization, coordination, and partnership patterns that assist in the licensing process for the parties involved in the collaborative management of the Pesawaran FMU.

From the observations and interviews with related parties, the damage to the protected forest area was caused by encroachment: illegal logging and illegal gold mining. The community uses land mainly for dry land farming, with the main crops being cacao (cocoa) and fruit trees. Therefore, it is necessary to have the role of external parties in controlling people's behavior patterns. Pesawaran FMU has outstanding potential (NTFPs and environmental services). Based on interviews with key respondents, the main problems in developing NTFPs and environmental services in the Pesawaran FMU are the need for more market access and the optimization of community empowerment. Market access

is essential for the distribution of NTFP production. In addition, there is a need for assistance and counseling to the community regarding the utilization of potential environmental services.

### 3.3 Management Plan of the Pesawaran FMU

As a start in the management plan of the Pesawaran FMU, a management vision and mission were formed as a basis for management. In order to realize the vision, mission, and objectives of the Pesawaran FMU, regulations and management plan formulation must pay attention to essential aspects, including social, economic, and environmental aspects. SWOT analysis is one of the management analyses applied to the Pesawaran FMU. This analysis utilizes the identification of internal and external factors from this agency in the form of strengths, weaknesses, opportunities, and threats, which will be compiled to serve as a reference in formulating KPH Pesawaran management planning policies. Based on the management strategy analyzed by the Pesawaran FMU, the identification of internal and external factors of the Pesawaran FMU was obtained.

Based on interviews conducted with the Head of the Pesawaran KPH and Pesawaran KPH extension workers and secondary data originating from the Pesawaran KPH RPHJP guide, the SWOT formulation is obtained in Table 1.

**Table 1** SWOT Matrix

Internal Factors		External Factors	
Strength	Weakness	Opportunity	Threats
Extensive KPHL management area and adequate accessibility	Inadequate human resources (lack of creativity)	Development of non-timber forest products (HHBK) and environmental services supported by government policies	The high degradation of forest resources and encroachment in the Pesawaran FMU
Good community interest and involvement	Lack of FMU socialization	Good market prospects	Inadequate information and distribution of markets for NTFPs and environmental services
Have a legal basis for managing KPHL following government regulations	Capital limitations	Public and tourist interest in environmental services	Low education and standard of living of people around the area
Potential non-timber forest products and environmental services	Incomplete area potential data (plant composition is still dominant crops)	High diversity of species utilized (Agroforestry)	Lack of training and community empowerment activities
The KPH forms a cooperative	Inadequate facilities and infrastructure	Processing of NTFPs	KPHL area management conflict

Source: Primary Data (2022) and RPHJP KPH Pesawaran (2015)

### 3.4 Strategy for Utilization of Forest Areas and Development of Potential NTFPs and Environmental Services in the Pesawaran FMU Area

Based on Government Regulation Number 6 of 2007 concerning forest governance and the preparation of forest management plans, as well as forest utilization, it can be interpreted that forest utilization is an activity to utilize forest areas, utilize environmental services, utilize timber and non-timber forest products and collect timber and non-timber forest products. Optimally and fairly for the welfare of the society while maintaining its sustainability. A 7,632.48 Ha of a specific area in the Pesawaran FMU is directed into a utilization plan. Several activities and programs have been prepared to realize this policy. The Non-Timber Forest Product (HHBK) development program includes the designation of certain areas as centers for non-timber forest products and NTFP commodity activities. The primary commodities in the Pesawaran FMU area are nutmeg (*Myristica fragrans*), candlenut (*Aleurites moluccanus*), sugar palm (*Arenga pinnata*), and rubber (*Hevea brasiliensis*). In addition, there are several other development plans, such as honey bee cultivation, the development of mulberry plants (*Morus alba*) and silkworm cultivation, and many other forestry commodity developments (RPHJP KPH Pesawaran).

In addition to the potential for NTFPs, there is also potential for environmental services and other facilities that can be developed. Among them is the development of water management environmental services, biodiversity environmental services, the beauty of landscapes and natural tourism, the beauty of integrated and micro-hydro watersheds, and environmental services in the form of carbon sequestration and storage [23]. Based on the results of the interviews, the potential for environmental services currently utilized is related to the condition of the landscape in the form of hills, such as the Kendeng Hills and Terbil Hills, and the utilization of the Ciupang Waterfall. In addition, the development of environmental services in the form of firefly gardens and deep roots. This environmental service potential is only found in several areas similar to the Pesawaran FMU, so optimization and development are needed to maintain its sustainability. The KPHL area is also a potential area for educational activities, namely scientific research and development. Research activities are directed at supporting the management of the Pesawaran FMU forest area so that it is effective and efficient with maximum quality and quantity. KPH Pesawaran facilitates scientific activities and development by collaborating with educational institutions and research institutions in developing science and technology. Forest management that is used optimally and sustainably will help the Sustainable Development Goals (SDGs) program achieve its goals and objectives for the community and the region [15].

Opportunities for developing NTFPs and environment services in the future are extensive and prospective, both in terms of supporting resources and outstanding potential. This can be seen in how enthusiastic the KTH Pesawaran community is, in particular, able to synergize with the FMU to build and transform in a better direction by making certain superior products, although still simple and conventional. Likewise, with environmental services, KPH Pesawaran has developed a better PureView appearance, with Kendeng hill and Ciupang waterfall, so that in the future, it will become a competitive selling point and KTH income added value.

The potential for developing the benefits of forest areas is inseparable from the role and participation of the community in it. NTFPs can provide economic profitability for many forestry-based small and medium enterprises [24], and NTFPs can represent 10-60% of household income [25]. Changes in land use reflect the dynamic activities of the community, so the faster changes in land use can indicate how the community treats natural resources in their area [26]. To maintain management and utilization patterns in the Pesawaran FMU, local community empowerment and optimizing coordination between permit holders need to be improved because the use of NTFPs that exceeds the threshold will impact the balance of the ecosystem [27].

The potential for these NTFPs per commodity has yet to be well distributed. The existing NTFPs processing industry has yet to receive much (minimal) information about the market demand. Market prospects are guaranteed, but farmers still need to be independent in marketing NTFPs which impacts market prices that cannot compete, in which prices are determined through intermediaries. The production price of candlenuts in fruit form is around RP. 5,000-6,000 per kg, and in oil, it is only Rp. 25,000/10 ml. For farmers, this price is still relatively low. Farmers have started trying to sell their managed products to several intermediaries and through online media. Through this concept, farmers' income is hoped to increase by 6% if it is carried out optimally [28]. In the development and improvement of the cultivation of NTFP commodities, it is necessary to have business opportunities with economic value that can adjust the financing capabilities of farmers. This is also in line with market demand and an increase in fluctuating selling prices. If this can happen, the sale of commodities directly from farmers independently can increase the welfare of farmers because income can increase by up to 17% of the income customarily received [29].

The plan for the Provision of Access to Forestry Businesses and a Productive Economy to support program policies and activities in the Pesawaran FMU area requires the support of the community around the forest. Examples of potential NTFPs that can be made into products are candlenuts and nutmeg, which can be used as oil and medicines. In addition, areca nut fiber can be processed into handicraft products such as bags and other accessories [30]. This is inseparable from the main product of NTFPs, namely natural products that are marketed to increase income and improve the economy of the community/farmers. There is a need for a community empowerment strategy to optimize the processing and marketing of potential NTFPs and environmental services. Community empowerment policies are established and implemented through several programs and activities that involve the community, namely as an effort to optimize the Utilization of Forest Resources program consisting of community data collection activities in forest areas, data collection on the area managed by each community in forest areas and strengthening community institutions (RPHJP KPH Pesawaran). Besides that, other community empowerment programs are the provision of seeds and the development of a productive economy. This empowerment effort can be strengthened by optimizing social forestry schemes in the Pesawaran FMU, bearing in mind that the community plays an important role and commitment to forestry development to minimize conflict [31].

To reduce the risk of conflict between communities (farmers) against stakeholders, namely by strengthening coordination between permit holders. The existence of a social forestry scheme can minimize the risk of tenurial

conflicts in the Pesawaran FMU. Coordination and synchronization between holders of permits for the utilization and use of forest areas must be carried out to achieve policy priorities in the Pesawaran KPH [32,33]. Related parties coordinate both from the planning aspect [34] and its implementation, which is facilitated by the Pesawaran KPH with the target to be achieved is the integration of forest management activities with implementation time each year. Following Government Regulation Number 23 of 2021, regarding the preparation of a forest management plan, policies set out for coordination and synergy of activities at the Pesawaran FMU include, among others, carried out with relevant agencies, both the Pesawaran Regency Government, agencies at the Lampung Provincial Government level, and the Central Government and other parties. The private sector in order to support the implementation of the duties of the Pesawaran FMU. The FMU policy is expected to function as an enabling condition for efforts to improve forest governance, slow down the rate of degradation, accelerate forest and land rehabilitation, implement forest protection and safeguards, optimize forest utilization, increase the stability of forest product supply, and provide forest area data and information [35].

#### 4 Conclusion

The Pesawaran FMU area has potential NTFPs in nutmeg, candlenut, clove, cocoa, areca nut, and cardamom. In contrast, the potential for developing environmental services is kendeng hill, terbil hill, firefly park, and ciupang waterfall. The potential for natural resources and environmental services required optimization in their utilization and development. As a strategy towards SFM, community empowerment has a role in utilizing natural resources as commercial products, such as oil, handicraft, and health products. In addition, the development of environmental services can be utilized as a tourist destination that can attract public interest and attention to the Pesawaran FMU area. As a manifestation of this potential development, external and stakeholder involvement is needed as a form of assistance and coordination for managing and utilizing areas and natural resources. Thus, it can increase the level of communication as well as conflict resolution efforts.

#### Compliance with ethical standards

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##### *Disclosure of conflict of interest*

The authors declare no conflict of interest in respect to this article

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