Community perception of sustainable peat swamp ecosystem conservation in Buntoi Village, Kahayan Hilir Sub-District, Central Kalimantan

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Abstract. The sustainability of peat swamp ecosystem management requires conservation efforts to prevent the exploitative and destructive utilization of the ecosystem. The real action efforts of conservation activities are closely related to the support from the surrounding peat forest community. The purpose of the study is to determine the level of community perception of peat ecosystem conservation. The method used is quantitative descriptive, with score intervals using the Likert scale. The study results show that respondents’ characteristics indicate that respondents' economic value is in line with the length of stay in Buntoi Village. The value of three indicator community perception is in the high and very high categories. The study results show that the knowledge category of peat ecosystem conservation ranges from 948-1368 (high-very high), the response ranges from 1224-1572 (very high), and community attitude scores from 1260-1584 (very high). Respondents who live > 20 years stated that it is very important to carry out conservation activities. Community perception is agreed and very agree towards conservation efforts in the sustainable use of peat ecosystem. They are ready to participate in all forms of activities, both in private and government programs.

1. Introduction

Indonesia has peat swamp ecosystems ranked fourth in the world (12%) or equivalent to 24 million hectares in Southeast Asia [1]. Indonesia's peatlands are spread in three major islands, namely Sumatra (35%), Kalimantan (32%), Papua (30%), and other islands (3%) [2]. The existence of peat swamp ecosystems provides ecological and economic benefits both for the environment and its surrounding communities. Unfortunately, peatland utilization by the community has caused several environmental damages such as air pollution from fire smoke, shrinkage of biodiversity, damage to the water system, and increased CO2 emissions that contribute to global warming and peat forest conservation for other functions [3].

The sustainability of peat swamp ecosystem management requires conservation efforts to prevent the exploitative and destructive utilization of the ecosystem. Environmentally sound peatland management is indispensable because peatland is one of the future lands when cultivated [4]. Furthermore, the phenomenon of peat ecosystem degradation will result in a decrease in biodiversity and community welfare [5].

The peat swamp ecosystem in Buntoi Village, Kahayan Hilir Sub-District, Pulang Pisau Regency, Central Kalimantan Province, Indonesia, in 2015 experienced fires. It is currently threatened due to
population growth that continues to increase, which requires fulfilling housing and economic needs and development pressures that encourage peatland conversion to other uses. Such conditions need immediate conservation efforts as a concrete action to rehabilitate and preserve peat swamp ecosystem hence achieving harmonious ecosystem balance. The balance between components in an ecosystem has a real impact both on bio-geophysical conditions and the level of community welfare [6].

The real action efforts of conservation activities are closely related to the support from the surrounding peat forest community. Therefore, it is necessary to know public perception towards the sustainability of peat ecosystems. Perception is the process of an individual choosing, organizing and interpreting information inputs to create a meaningful picture of his or her life [7]. According to [8], public perception is indispensable as one of the main foundations before carrying out an activity that impacts the community. This study aims to know the level of community perception of Buntoi Village, Kahayan Hilir, towards the conservation of peat swamp ecosystems. The results of this study are expected to be considered in formulating efforts to conserve the peat ecosystem so that sustainable management based on ecological, economic and social aspects can be realized.

2. Materials and Methods

2.1. Research location and time

The research was conducted in Buntoi Village, Kahayan Hilir District, Pulang Pisau Regency, Central Kalimantan Province, Indonesia. The research was held from October-November 2020. The location of the study can be seen in Figure 1.

2.2. Materials and tools

The main materials used in this study are questionnaires and work maps. Whereas the main tools used are camera, recording device, office stationery and laptop.

2.3. Methodology

2.3.1. Research stages. The research to measure the level of public perception of peat swamp forest conservation starting from preparation, data collection in the field includes primary and secondary data continued by data analysis. Data collection in the field is the main activity to obtain primary data, gained directly by researchers from the objects studied that include documentation of bio-geophysical of peat ecosystem and the socio-economic conditions of the Buntoi Village community.

Primary data collection was carried out through interviews with selected respondents. At the same time, secondary data is obtained from literature studies and various agencies related to this research topic.

2.3.2. Types of data collections. The method of data collection is structured and in-depth interviews using questionnaires. The questionnaire is one of the communication tools in interviews with topics related to the community’s perception of the benefits of peat swamps forests and conservation effort in
sustainable management. According to [9], interviews using structured and in-depth questionnaires are research activities conducted by researchers based on the instrument in written questions whose answers have been prepared (e.g., in the form of multiple-choice). The parameters of the level of perception value (Table 1) taken in this study consist of two variables, i.e., (1) characteristics of respondents and (2) Community perception. The respondents' characteristics include age, occupation, education level, income earned from peat ecosystems, and length of stay in Buntoi Village, Kahayan Hilir. Community perception has 12 questions that include: (a) community knowledge of the existence of peat swamp forests; (b) community response to the benefits of peat swamp forests; and (c) community attitude towards the preservation of peat swamp ecosystems (Table 1).

**Table 1.** Variable public perception level of sustainable peat swamp ecosystem conservation in Buntoi Village, Kahayan Hilir Sub-District, Pulang Pisau Regency.

| Variable Perception | Variable Indicators | Interval Score |
|---------------------|---------------------|----------------|
| Characteristics of respondent | Age, type of occupation, formal education, income and length of stay | |
| Knowledge: community on the existence of peat swamp forest | K1 = Definition of peat ecosystems | 1 = Disagree |
| | K2 = Condition of Peat swamps ecosystem | 2 = Agree |
| | K3 = Peatland utilization techniques | 3 = Very agree |
| | K4 = Diversification of functions and benefits of peat ecosystems | |
| Response: community to peat swamp forest benefits | R1 = Benefits of peat ecosystems for people | |
| | R2 = Environmental and ecotourism services | |
| | R3 = Open access for the public | |
| | R4 = Permitted plant nursery rules | |
| Attitude: community towards the preservation of peat swamp ecosystems | A1 = Socialization activities on sustainable ecosystem management | |
| | A2 = Involvement in peat conservation activities | |
| | A3 = Community is prohibited from using peat ecosystem | |
| | A4 = The role of the community in maintaining the peat ecosystem | |

Remarks: K = Knowledge; R = Response and A = Attitude

2.3.3. **Sampling method of the respondent.** Determination of the number of respondents is done by the purposive sampling technique. Respondents have livelihood from peat swamp. In this research, sampling technique was used to take sample is purposive with total 45 respondents.

2.4. **Data analysis**

Data analysis is done with qualitative descriptive analysis. Qualitative analysis is based on results obtained from direct interaction with respondents. Qualitative research does not include relationships between variables but presents objective data from interview results, and questionnaire answers obtained [11].

The data obtained are compiled based on the modification of the Likert scale with score intervals (1 = disagree; 2 = agree and 3 = very agree) against each question indicator. According to [12] Likert scale is a tool to measure a person's attitude, opinion, and perception of certain activities or situations that are described and affect his life. Next, each respondent's answer results are tabulated based on the frequency, percentage, and average of answers from each question variable using excel tools. In the Likert scale, the variable to be measured is described as a variable indicator. Then the indicator is used as the basis in composing the question instrument. To measure each answer, it is associated with a form of statement or support attitude from the respondent. The score interval on variables and indicators can be seen in Table 2.
Table 2. Score interval for each variable indicator in perception level.

| No | Variable Score Interval and Indicators | Category of perception | Remarks |
|----|---------------------------------------|------------------------|---------|
| A. | Variable Indicator score interval      |                        |         |
| 1  | 0-45                                   | low                    | Score x number of respondents |
| 2  | 46-90                                  | high                   |         |
| 3  | 91-134                                 | very high              |         |
| B. | Variable Indicators All score interval |                        |         |
| 1  | 0-540                                  | low                    | Number of scores x number of respondents x number of variable indicators |
| 2  | 541-1080                               | high                   |         |
| 3  | 1081-1620                              | very high              |         |

3. Results and Discussion

3.1. Characteristics of respondents

Respondents are the main key in determining the value of perception of the object studied. Some of the characteristic factors needed include age, education, occupation, income and length of stay in a place [13].

A person's attitude and insight can affect assessing a problem or condition. It is also related to age and education levels. In general, the level of age and education determines a person's thinking rationally and facts according to his wishes and needs in meeting the needs of his life. Characteristics of respondents can be seen in Figure 2.

Based on figure 2, it can be concluded that most of the respondents are farmers and fishermen. Buntoi villagers utilized peatlands mainly for farming and fishing activities. Apart from collecting wood, peatland is utilized by the local community for growing vegetables, fruits, medicinal plants, rattan and cultivating swallow. Meanwhile, people generally take fish from dense peat trenches and the Kahayan river flow for fishing activities.

Respondents' education level was dominated by junior high school of 67%, elementary school 15%, senior high school 13%, and academy level 5%. Characteristics of respondents related to the length of stay in Buntoi Village were dominated by 45% of respondents who have lived there for 11 years-15 years, while 37% have lived in the area for 16-20 years.

An indicator of respondent characteristics that is quite important to look at is the length of stay of a person or community in one place. The longer a person stays in one place, the more likely the person will get prosperity and comfortable life. According to [14], a person is willing to stay longer in an area...
because the environment and facilities they need can be met. The study results revealed that the length of stay of respondents and the total income obtained from the peat ecosystem is very influential. This can be seen in Figure 3.

![Length of Stay vs Income](image1)

**Figure 3.** Respondents' income level based on length of stay in Buntoi Village.

Figure 3 shows that the value of income derived from the peat ecosystem affects the length of stay of the community in Buntoi Village. This is because someone who stays longer has various types of businesses to meet their needs from the potential of the peat ecosystem, and it directly affects the amount of one's income. Most of the Buntoi villagers who have lived more than 15 years have more than one source of income in the use of peat ecosystems, including agricultural activities, fishermen, rattan handicrafts and wood products with an average income of < IDR 5,000,000 month⁻¹. The people who have lived in the village of Buntoi for 5-15 years have an income of IDR 1,500,000-3,000,000 month⁻¹. Therefore, the value of income originating from the peat ecosystem affects the length of stay of the community in Buntoi Village. These two indicators positively impact public perceptions regarding the sustainability of the peat ecosystem (Figure 4).

![Community Awareness](image2)

**Figure 4.** Community awareness of peat ecosystem conservation based on length of stay.

Figure 4 shows the level of community awareness of peat ecosystem conservation activities based on length of stay. Respondents who live >20 years stated that it is very important to carry out conservation activities. Those who live in the area for 16-20 years and 11-15 years consider conservation...
activities very important by 75% and 69%, respectively. As for people who have lived between 5-10 years, 23% stated that conservation activities are not important to be carried out.

3.2. The value of community perception of peat swamp ecosystem conservation in Buntoi Village

Research to measure the level of community perception of peat ecosystem sustainability was carried out using 12 questions as a benchmark of the perception given by the community. The frequency, percentage and average values can be seen in Table 3.

| Variable | Perception | Disagree | Agree | Strongly Agree | Total | Average |
|----------|------------|----------|-------|----------------|-------|---------|
| Knowledge | K1 | 0 | 0.00 | 21 | 46.67 | 24 | 53.33 | 45 | 100 | 2.53 |
|          | K2 | 0 | 0.00 | 23 | 51.11 | 22 | 48.89 | 45 | 100 | 2.49 |
|          | K3 | 20 | 44.44 | 16 | 35.56 | 9 | 20.00 | 45 | 100 | 1.76 |
|          | K4 | 0 | 0.00 | 29 | 64.44 | 16 | 35.56 | 45 | 100 | 2.36 |
|          | Total average value | | | | | | | | | 2.29 |
| Response | R1 | 5 | 11.11 | 2 | 46.67 | 19 | 42.22 | 45 | 100 | 2.31 |
|          | R2 | 2 | 4.44 | 29 | 64.44 | 14 | 31.11 | 45 | 100 | 2.27 |
|          | R3 | 0 | 0.00 | 14 | 8.89 | 41 | 91.11 | 45 | 100 | 2.91 |
|          | R4 | 0 | 0.00 | 45 | 57.78 | 19 | 42.22 | 45 | 100 | 2.42 |
|          | Total average value | | | | | | | | | 2.48 |
| Attitude | A1 | 2 | 4.44 | 24 | 53.33 | 19 | 42.22 | 45 | 100 | 2.38 |
|          | A2 | 0 | 0.00 | 28 | 62.22 | 17 | 37.78 | 45 | 100 | 2.38 |
|          | A3 | 1 | 2.22 | 1 | 2.22 | 43 | 95.56 | 45 | 100 | 2.93 |
|          | A4 | 1 | 2.22 | 28 | 62.22 | 16 | 35.56 | 45 | 100 | 2.33 |
|          | Total average value | | | | | | | | | 2.51 |

Table 4 shows that as many as 20 people or around 44.44% of the community stated they do not know about correct peatland utilization techniques. However, in general, the community's knowledge of peat ecosystem definition is quite high, with as many as 24 respondents or about 53.33% who stated so. In terms of peatland utilization to diversify business products, as many as 29 people, or 64.44% of respondents, know and understand the products produced from peat ecosystems. Based on the score interval obtained on the knowledge aspect of 2.29 with an agreement with score interval.

The response given by the community in the utilization of peat swamp ecosystems was the highest on the questions related to that peat forest area that the community can widely utilize; 41 respondents, or equivalent to 91.11%, said so with an average score interval of 2.48. Furthermore, as many as 43 respondents, or equivalent to 95%, stated that they strongly agreed to carry out peat conservation activities. The average interval score for community attitudes in supporting the conservation of peat forest ecosystems is 2.51%.

The frequency, percentage and average score obtained are in accordance with the conditions stated by [16], who mentioned about the community's perception of peatland restoration policy in Central Kalimantan. People in Central Kalimantan agree and are willing to conduct peat restoration activities and they support restoration activities. Regarding the types of peat restoration activities, the majority of the community chooses the agricultural sector.

However, environmentally sound peatland management is urged to be implemented considering that peatland is one of the lands for the future if managed well. Therefore, peatland restoration and conservation should be applied to minimize the environmental impact caused by the soil improvement method. As stated by [4], the conversion of disturbed peatlands into cultivated land must be reclaimed first and participatory revegetation is an approach taken for areas close to the community [17]. One of
the efforts to conserve and rehabilitate peat ecosystems can be made by developing the sago plantation industry and fruit and vegetable farming [3].

3.3. Level of perception of Buntoi Village Community towards peat swamp ecosystem conservation

Peat swamp ecosystem conservation is an effort in achieving sustainability and protection and utilization of potential natural resources. The purpose of conservation activities is not only for the sustainability of biodiversity, but also for sustainable use for the community's needs in improving economic and social welfare. The community's perception can be reflected in the concern of peat ecosystem resources, based on knowledge, response, and attitude in responding to the peat swamp ecosystems' current conditions and future expectations.

According to [15], the value of perception can imply a different concept and program, although the object is considered the same. Knowledge reflects a person's ability to think rationally and facts that impact the environment and himself. The response reflects a sensitive attitude that is interpreted as a real understanding that occurs in his life. Meanwhile, attitude is the behavior shown by a person in overcoming an event both in the current and future.

Table 4. Values and categories of community's perception based on knowledge, response, and attitude towards peat swamp ecosystem conservation in Buntoi Buntoi Village, Kahayan Hilir Pulang Pisau Regency.

| No | Variable | Variable Indicator Value | Total Value (value x total number of indicators) | Category Perception |
|----|----------|--------------------------|---------------------------------|--------------------|
| 1  | Knowledge: community on the existence of peat swamp forest | K1 114  K2 112  K3 79  K4 106 | K1 1368  K2 1344  K3 948  K4 1272 | High-Very High |
| 2  | Response: communities to the benefits of peat swamp forest | R1 104  R2 102  R3 131  R4 109 | R1 1248  R2 1224  R3 1572  R4 1308 | Very High |
| 3  | Attitude: community towards the preservation of peat swamp ecosystem | A1 107  A2 107  A3 132  A4 105 | A1 1284  A2 1284  A3 1584  A4 1260 | Very High |

Remarks: (K1-K4) is a question regarding the community's knowledge (R1-R4) is a question related to the community’s response (A1-A4) is a question about the community's attitude

Table 4 shows that Buntoi Villagers are very responsive in addressing peat ecosystem conservation efforts, or their perception is at a high category level. This is because the community is very dependent on the existence of peat ecosystems as a buffer for their lives. For community knowledge related to peat ecosystems with four questions as variable indicators, a total value obtained was between 948-1368 and classified in the high to a very high category, implying that the community understands the importance and function of peat ecosystems. The response level is also in the very high category, with a value between 1224-1572. The attitude is reflected by the community's response to the sustainability of peat ecosystems with a value between 1260-1584.

The peat ecosystem is the residence and source of livelihood for Buntoi villagers, which is carried out by maintaining and utilizing various business activities sustainably. However, the community expects peat forest areas around the environment, agricultural businesses, fishermen, medicinal plants, and food sources to be used as tourist areas. Some respondents again considered that if peat recovery and preservation activities were carried out, the original form of the land would return, and their income would increase.

The response shows that the community agrees if peat forest areas can provide optimal benefits. The community hopes to get training on peat swamp utilization techniques and various product
diversification that can be developed based on potential economic benefits. The community’s attitude towards conservation efforts in the sustainability and restoration of peat ecosystems is positive. They are ready to participate in all forms of activities both in a private and government program. This attitude is based on people's awareness that they live among peat ecosystem areas. Damage to peat ecosystems has become the community's responsibility with the government's support of activities and funds. Strong community attitudes provide the main foundation in supporting the restoration of conservation-based peat ecosystems. In theory and concept, perception determines what a person will do to fulfill various interests both for themselves and for the environment because the level of perception value can reflect the seriousness and concern of a person in assessing something or event.

4. Conclusion
The characteristic of respondents, that is, productive age, education level, source of livelihood, and income, indicates that the economic value obtained by respondents from the peat ecosystem is in line with the length of time the respondents live in Buntoi Village. Domination of the respondents living in Buntoi Village for 11-15 years has an income of IDR 1,500,000-3,000,000 month\(^{-1}\). Respondents with an average income between IDR 3,000,000-5,000,000 month\(^{-1}\) are respondents who have settled in Buntoi Village for more than 20 years.

The level of community awareness of peat ecosystem conservation activities based on length of stay reveals that 100% of respondents who have lived in the area for >20 years stated that it was very important to carry out conservation activities. For those who live in the area between 16-20 years and 11-15 years considers conservation activities is very important by 75% and 69% respectively. As for people who have lived between 5-10 years, 23% stated that it is not important for conservation activities to be carried out.

The community's perception level of the conservation of peat ecosystems is in the high-very high category, which is between 948–1584 points. The highest total value for the knowledge variable related to the definition of peat ecosystem (K1) is 1368 points. The highest value for the community response in conservation activities is about open access for the community in utilizing the peat ecosystem (K3) of 1572 points. Finally, the community's attitude towards the conservation of peat ecosystems dominated is 1584 points mainly related to (A3) the prohibition of illegal use of peat.

The highest average value for the attitude variable is 2.51; then, the response variable is 2.48 and knowledge is 2.29. Thus, the average value shows that the community's perception of peat ecosystem conservation activities is positive, especially in Buntoi village, Kahayan Hilir District, Pulang Pisau Regency, Central Kalimantan. Therefore, they agree to participate in the preservation of the peat ecosystem.

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Authors’ contribution
All authors contributed equally to this work, and all act as the main contributor.