

Perception, participation, food security and community welfare around urban conservation area. Case study: Dusun Besar Lake Bengkulu, Indonesia

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Abstract. Many people living in rural areas that border conservation areas in Indonesia are categorized as poor and irrespective of natural resources. This study aims to examine the socio-economic conditions, such as perception, participation, food security, and welfare of the people living around the Dusun Besar Lake conservation area, Bengkulu City. The research was conducted in 6 villages bordering Dusun Besar Lake nature reserve and natural tourism park, namely Timur Indah, Surabaya, Dusun Besar, Sidomulyo, Sumur Dewa, and Nakau Village with 86 respondents. The data analysis methods used are: 1) class intervals to determine the level of community perception and participation towards Dusun Besar Lake Nature Reserve and Natural Tourism Park, 2) the proportion of food expenditure to determine the level of household food security, and 3) calculation of the welfare index score on households. The results showed that the average community perception towards preservation of nature reserves (CA) and natural tourism parks (TWA) was in the good (score 3.76) and moderate (score 3.47) categories. Food expenditure is 52.83% of total household expenditure. Based on food expenditure, food security can be categorized as secure (43.02%) and insecure (56.98%). On average, welfare of community households around urban conservation areas is included with 69.77%, 27.91%, and 2.33% in the high, moderate, and low-level categories. Therefore, households with moderate and low welfare need special attention from the government because they have food insecurity with relatively good perception and high participation.

Key Words: Dusun Besar, food expenditure, food insecurity, nature reserve, tourism park.

Introduction. Conservation of natural resources is needed to improve the quality and diversity of existing resources (Government of Indonesia 1997). Therefore, this led to the allocation of approximately 552 units of conservation areas covering 27.4 million hectares of land, by the Indonesian government to rural areas, for the conservation of natural resources (Ministry of Environment and Forestry 2018). According to Santosa (2004), 80% of Indonesian territory is made up of rural areas that are generally adjacent to natural resources and bordered by conservation areas. In addition, people living in these conservation areas are categorized as poor due to the low levels of food security and welfare.

Neelakantan et al (2020) stated that households around Indian national parks have a lower food consumption score of approximately 80%. Furthermore, the food security of farmers in conservation forest areas is categorized low, despite their ability to maintain forest sustainability (Andrieu et al 2019). According to Richardson et al (2011), national park conservation policies also have a negative impact on the welfare of rural households around the area, especially those whose means of livelihood is farming. However, this condition can be surpassed by providing compensation.

Public perception and participation are considered an effective measure used to protect environmental eco-trade-offs and improve community livelihoods in conservation

areas (Zhang et al 2020). On average, there are positive and unevenly distributed impacts associated with combining conservation activities with village economic development on household welfare between 15.09% and 28.14% (Okumu & Muchapondwa 2020).

Over the past 20 years, the government and support organizations have realized that the long-term integrity of conservation areas in low-income countries have strongly influenced the support of surrounding rural communities (Ferraro 2002). However, few studies have analysed the impact of conservation areas establishment.

Therefore, this research examines the socio-economic conditions of communities around the Dusun Besar Lake conservation area. Among them are perception, participation, food security, and welfare. This research was also carried out in urban conservation area because the Dusun Besar Nature Reserve and Natural Park is in the center of Bengkulu City, Bengkulu Province. The Lake comprises of a total area of 577 hectares, with 489 hectares in the form of nature reserves and 88 hectares in the form of natural tourism parks (Ministry of Environment and Forestry 2019).

Material and Method

Study site. This research was carried out from March to June 2020, in 6 rural areas that are directly adjacent to the Dusun Besar Lake conservation area in Bengkulu City, namely Timur Indah, Surabaya, Dusun Besar, Sidomulyo, Sumur Dewa and Nakau as shown in Figure 1.

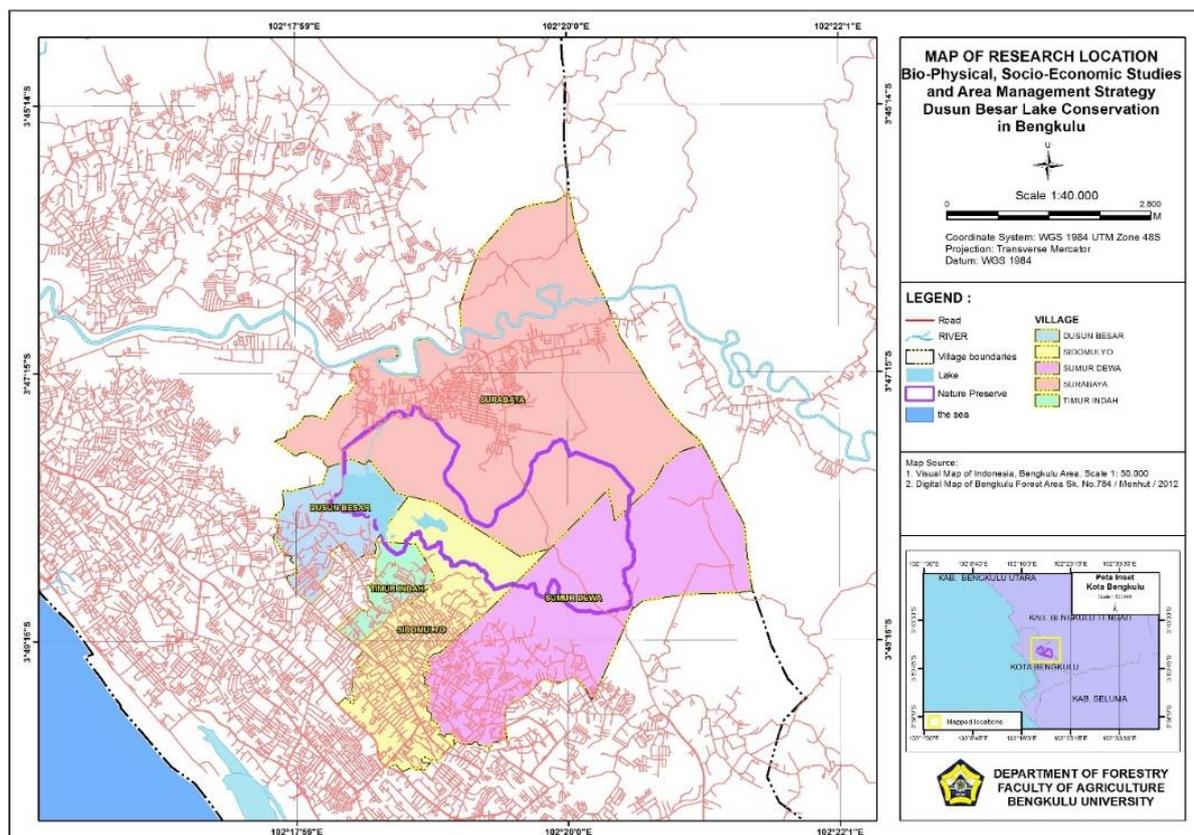


Figure 1. Map of the research location (University of Bengkulu 2020).

Data collection. This research consists of primary and secondary data which were obtained through related literature studies, interviews, and questionnaires on respondent characteristics, income, food, and non-food expenditure, perceptions, participation, and household welfare.

Sampling. The population in this study consists of communities living in villages that are directly adjacent to Dusun Besar Lake. The number of households in 5 villages around the lake are 13,956 households and those who live directly adjacent to the lake represent 10% or 1,396 households, and 6% were selected for this research. Respondents were selected from 86 households, with 15 in Timur Indah, 15 in Surabaya, 15 in Dusun Besar, 11 in Sidomulyo, 15 in Sumur Dewa, and 15 in Nakau Villages.

Perception and participation analysis. The data analysis consists of respondents' perceptions towards the nature reserve and natural tourism park of Dusun Besar. Meanwhile, participation is related to the community's ability to preserve natural resources and conservation areas. Perception consists of 23 indicators and participation consists of 22 indicators. The class interval for each indicator is determined using the following equation (Riduwan 2009):

$$PI = \frac{NST-NSR}{JK} \dots\dots\dots (1)$$

where : PI = interval length
 NST = highest score
 NSR = low score
 JK = number of classes

The category of community perception and participation towards nature reserves and natural tourism parks consists of 3 classes, namely:

1. Score 3.67 – 5.00 : Good perception or high participation.
2. Score 2.34 – 3.66 : Moderate perception or participation.
3. Score 1.00 – 2.33 : Poor perception or low participation.

Household food security analysis. Household food security is calculated based on the expenditure proportion. The proportion of food expenditure to total household expenditure is calculated using the following equation (Arida et al 2015):

$$PF = \frac{PP}{TP} \times 100\% \dots\dots\dots (2)$$

where : PF = proportion of food expenditure (%)
 PP = food expenditure (IDR)
 TP = total household expenditure (IDR)

The criteria for food expenditure proportion are as follows (Rahmi et al 2013):

1. Food security: food expenditure is less than or equal to 60% of total household expenditure and in the low category.
2. Food insecurity: food expenditure is above 60% of total household expenditure and in the high category.

Household welfare analysis. Household welfare is assessed using a score transformed into an index. Table 1 shows the calculated scores used to determine the category of household welfare based on a set of criteria consisting of 7 indicators (Statistics Indonesia 2015).

Table 1
Welfare level indicators

No	Indicators	Criteria	Score
1	The education level of household heads	Colleges	5
		Senior High School	4
		Junior High School	3

		Elementary School	2
		Not Completed	1
		Elementary School	
		No School	0
2	Proportion of working family members	1	3
		$x < 1, x > 0.49$	2
		$x < 0.5, x > 0.25$	1
		$x < 0.25$	0
3	Have adequate house walls	Concrete	3
		Wood	2
		Bamboo	1
		Others	0
4	Per capita Floor Area (number of hamlets)	$\geq 8m^2$	3
		$< 8m^2$	0
5	Have access to adequate sanitation	There is a latrine	1
		There is no latrine	0
6	Main Lighting	Electricity	1
		Others	0
7	Ownership of Goods	Bicycles, boats, radios, motorbikes, televisions, fridges.	Respectively 0.5
		Car / motorboat	1

The welfare indicator has maximum and minimum scores of 20 and 0, respectively. These scores are systematically determined using an index which can be written in the form of an equation as follows:

$$SK = \sum_i^7 X_i \dots\dots\dots (3)$$

$$IK = \frac{SK}{SM} \times 100 \dots\dots\dots (4)$$

where : SK = total welfare score
 IK = welfare index
 Xi = indicator score-i
 SM = maximum score
 i = 1,2, 3, 4, 5, 6, 7

The household welfare index is grouped into three categories, determined by the following equation:

$$RK = \frac{IK_{max} - IK_{min}}{JK} \dots\dots\dots (5)$$

where: RK = the range of welfare index classes
 IK max = maximum welfare index
 IK min = minimal welfare index
 JK = the number of classes or welfare categories

Assessment based on 7 welfare indicators showed that the maximum and minimum indexes are 100 and 0, respectively. The number of classes is 3 with the following criteria:

1. Low welfare : index 00.00 - 33.33
2. Moderate welfare : index 33.34 - 66.66
3. High welfare : index 66.67 - 100.0

Results and Discussion

Respondent characteristics. Table 2 shows that the characteristics of respondents observed in this study include age, formal education, length of residence, number of household members, and family dependents. The results showed that most of the communities around the conservation area that became respondents were part of the productive workforce, which is classified productive between the ages of 18-50 years (Tohir 1993). Approximately 54.65% of the respondents were between the ages of 18-50 years with an average of 49.2 years. According to Ramdhani (2011), the older the farmers, the worst their perception on conservation of forest is and vice versa. Besides that, Yuwono (2006) stated that the older the person, the harder their ability to accept changes.

Table 2

Respondents' characteristics

No	Respondents' characteristics	Criteria	Total
1	Age	18-50 years	54.65%
		> 50 years	45.35%
2	Formal education	No school	2.33%
		Elementary school	32.56%
		Junior high school	13.95%
		Senior high school	40.70%
		College	10.47%
3	Length of residence	≥ 23 years	43.02%
		< 23 years	56.98%
4	Number of household members	<4 persons	45.35%
		≥ 4 persons	54.65%
5	Number of family dependents	<3 persons	44.19%
		≥ 3 persons	55.81%
6	Income (Indonesian rupiah - Rp)	Rp 2,387,220	51.16%
		≤ Rp 2,387,220	48.84%

Education level is an internal factor influencing one's thinking and the speed in transferring information. In this study, approximately 40.70% of the respondents' formal education is at high school level. However, the differences in low socialization levels regarding conservation areas tend to affect perceptions (Wahyuni & Mamonto 2012).

The length of residence of the community in the conservation area is on average 23 years. This is in the long category for someone to stay in an area. A total of 43.02% of people have lived in nature reserve (CA) and natural tourism parks (TWA) areas for a long time and they tend to have an attachment to the use of existing resources (Hamid et al 2011). According to Wijaksono (2013) the longer a resident lives in an area, the greater the possibility of possessing a sense of positive effect.

The respondent's family comprises of an average of 3 people that are influential in improving the community welfare. The percentage of families that depend on below and above the total number of 3 people was 44.19% and 55.81%, respectively.

Respondents' incomes are calculated for one month from the main and side work of household members. The study showed that the average household income of the community around the Dusun Besar Lake conservation area in Bengkulu City is IDR 2,988,570, with IDR 2,840,314 and IDR 148,256, allocated to basic and side income. It shows that the community monthly income has exceeded Bengkulu's UMK (City Minimum Wage) of IDR 2,387,220.00 (Bengkulu Provincial Government 2019). Conversely, this is different from the average income level of households around Halimun Salak national park, which is only IDR 115,000 per month and below the UMR (Regional Minimum Wage), in West Java and Banten Provinces (Adalina et al 2015). Soekartawi (1998)

stated that changes in the income level tend to affect the quality and quantity of goods to be consumed.

Perception and participation. The community closest to the conservation area consists of a group of people that play major roles in preventing damage. Table 3 shows that community perceptions and participation play an important role in the preservation of the nature reserve (CA) and natural tourism parks (TWA) of Dusun Besar Lake.

Table 3
Categories of public perceptions and participation towards CA and TWA

Criteria	Perception		Participation	
	CA	TWA	CA	TWA
Score	3.77	3.74	3.49	3.45
Category	Good	Good	Moderate	Moderate

Public perceptions towards the preservation of nature reserves (CA) and natural tourism parks (TWA) are in good categories. According to Cahyadinata et al (2019a), this is slightly different from the perception of fishermen towards the mangrove ecosystem, which is in the very good category with an average score of 4.23. Furthermore, communities around the conservation area believe that the status of nature reserves and natural tourism parks can preserve the Dusun Besar Lake conservation area. Meanwhile, CA and TWA tend to provide direct and indirect benefits to the surrounding community, by creating a beautiful environment and providing clean air. However, irrespective of the communities' awareness of the CA and TWA status, their economic activities are limited because the related regulations need to be obeyed to provide good opportunities.

The level of public perception in managing the Sibolangit Nature Reserve is high in terms of knowledge and benefits of the natural reserve existence. Sembiring (2016) stated that the internal factors influencing the respondents' perceptions of management in Sibolangit Nature reserve are age, main occupation, residence distance, number of family dependents, income, and gender.

The communities have good perception in the conservation area. Most of them have a good perception on nature tourism parks (63.95%), while just 55.8% have a good perception on nature reserves, as shown in Figure 2. Other research shows that people's perceptions towards the status of the Ko' mara Wildlife Reserve in Takalar District are different. The people living in Karemanepasa and Karepatodo hamlets have a moderate level of perception, while those in Ballaborong have a low level (Hamdan et al 2017). Furthermore, Rahajeng et al (2014) stated that the public perception towards conservation in the Sempu Island nature reserve area of Malang Regency is low and amounts to 54%.

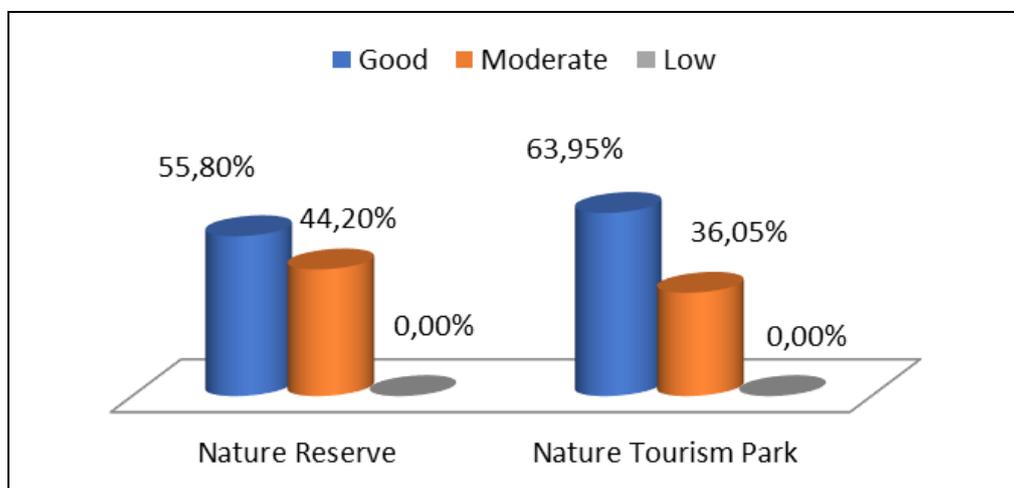


Figure 2. Community perceptions of nature reserves and nature tourism parks.

Community participation around the conservation area is in the moderate category, which means that the majority are aware of government regulations regarding CA and TWA. Therefore, they have never violated regulations related to its sustainability, such as fishing, disposing of garbage and household waste around conservation areas, clearing land, and cutting wood areas as well as trees. The surrounding community is also willing to participate in protecting the CA and TWA ecosystems both as a group and individually. The community tends to reprimand and report anyone that cuts down or damages trees. The fishermen's participation in the mangrove ecosystem on Enggano Island is in a remarkably high category, with an average score of 4.35 (Cahyadinata et al 2019a).

Most of the communities around the conservation area have a high level of participation in the conservation of nature reserves and natural tourism parks. Furthermore, 53.49% and 65.12% of the people have a high participation level in the conservation of nature reserves and moderate in the preservation of nature tourism parks as shown in Figure 3. Other research shows that as many as 37% of the community participates in managing national parks to providing economic benefits. These activities include not carrying out illegal logging in forest areas, monitoring, and reporting acts of destruction by certain parties as well as not hunting protected animals (Daulay & Hidayati 2017).

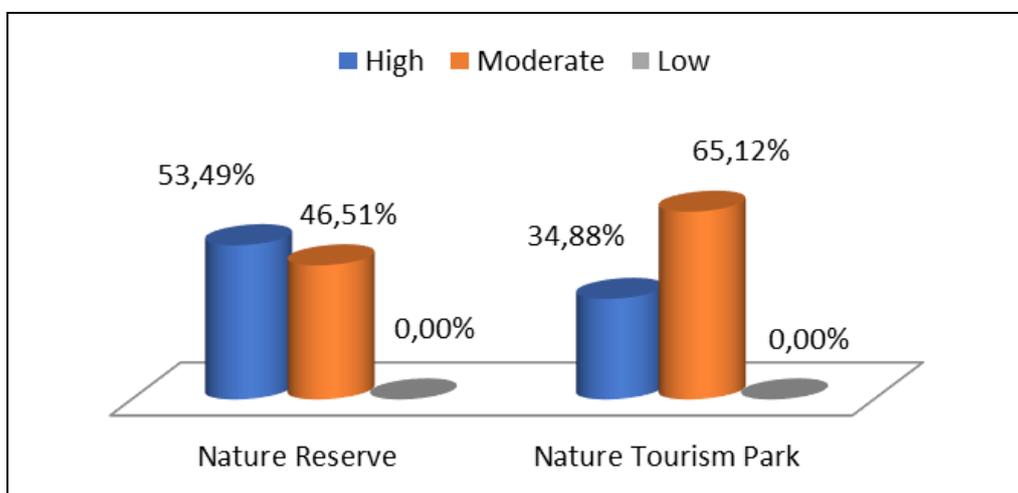


Figure 3. Community participation in preserving nature reserves and nature tourism parks.

The number of people willing to participate in forest conservation is quite high, with a percentage of 90% (Irnawati 2019). According to Rahajeng et al (2014), community participation in the conservation of the Sempu Island nature reserve area of Malang Regency is high, at 56%. Community participation in conservation is important and when it is high, it provides a better understanding. Therefore, the behavior between groups differs between people with high and low participation and can be used as a reference for future development (Zhang et al 2020).

Good perceptions and high participation are inseparable from public knowledge on the conversion of some nature reserves into natural tourism parks. Approximately 61.63% of the communities are aware of the change in a nature reserve (CA) to become a nature tourism park (TWA). The communities possess information on these changes through government officials and the mass media. However, this is opposed to the research carried out by Rahajeng et al (2014), which stated that the level of community knowledge on conservation is low, at 35%.

The level of food security. The total household expenditure is calculated from the sum of food and non-food expenditure with a monthly average of IDR 4,519,432 as shown in Table 4. The total expenditure of this household is greater than the total monthly income of IDR 2,988,570. This means, that the household components of food or non-food ingredients are obtained by producing their products. The calculated income is real income, and the expenditure is real and non-real expenses. Several households produce

rice, vegetables, fruits, chicken meat, and eggs with a value of IDR 1,530,862 or 33.87% of total expenditure.

Table 4

Total average household expenditure

No	Types of Food Expenditure	Total Average Expenditures (IDR/Month)
1	Food Expenditure (PP)	2,387,648.00
2	Non-Food Expenditure (PN)	2,131,784.00
	Total	4,519,432.00

Figure 4 shows that the percentage of food expenditure is slightly larger, at 52.83% compared to non-food at 47.17%. The lower food consumption score of 80% is inversely proportional to the finding of households around Indian national parks (Neelakantan et al 2020). This is like the study conducted by Amaliyah and Handayani (2011), which shows that the proportion of non-food items is 37.06%, and the average food expenditure is 62.94%. Table 4 shows that the largest average household expenditure is on food amounting to IDR 2,387,648, while the rest, which is approximately IDR 2,131,784 is used for non-food.

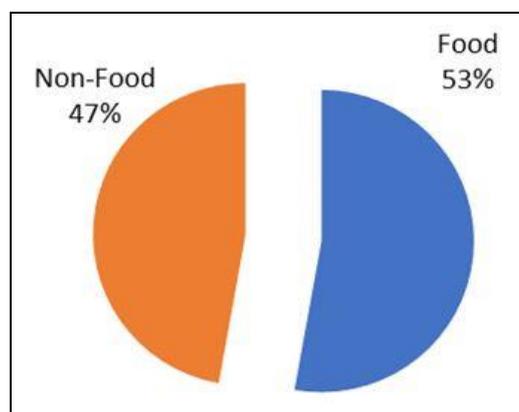


Figure 4. Household expenditure.

Households allocate a monthly amount of IDR 2,387,648 per month to meet their basic food needs, such as rice, fish, milk, chicken, fruits, and vegetables at 14.66%, 10.64%, 8.76%, 5.95%, 2.93%, and 2.57%, respectively. The largest non-food expenditure of IDR 2,131,784 per month is allocated to house rental, at 33.62%. This means, there are still many people living in urban conservation areas, that do not own houses. The allocation of non-food expenditure for education, transportation, clothing, and health was 25.81%, 10.81%, 6.84%, and 5.36%.

Food expenditure still accounts for a large part of total household expenditure and always greater than non-food. The decrease in the level of welfare increases the number of poor households, therefore, in such situations, food needs are prioritized with a focus on cheap and useful commodities. Households with a high level of welfare can meet their food, and non-food needs (Purwantini & Arianti 2008).

The proportion of food consumption expenditure is the percentage of the amount compared to the total expenditure (Arida et al 2015). The share of food expenditure is an indicator of security, therefore, the greater the share the less the security. The higher the people's welfare in a country, the smaller the share of the population's food expenditure and vice versa (Deaton & Muellbauer 1980).

The average household of the community around the conservation area is classified as secure in terms of food. According to the existing criteria, when the proportion of food consumption is below 60% of the total, the household has food security. However, when viewed as a whole, it shows that many people have food insecurities with the total food consumption above 60% of total household expenditure.

Figure 5 shows that a total of 56.98% and 43.02% of households are in the insecure and secure categories.

The study also showed that the share of food expenditure by farmers' households is 16.67% with 53.33%, 10%, and 20% in the sufficient, vulnerable, and inadequate food categories (Amaliyah & Handayani 2011). Other research on household food security shows that 19%, 74%, and 7% are in the poor, sufficient, and low categories (Cahyadinata et al 2019b). Other research on household food security around forest areas shows that the most diversified farming households present the smallest trade-off between food security and forest conservation (Andrieu et al 2019).

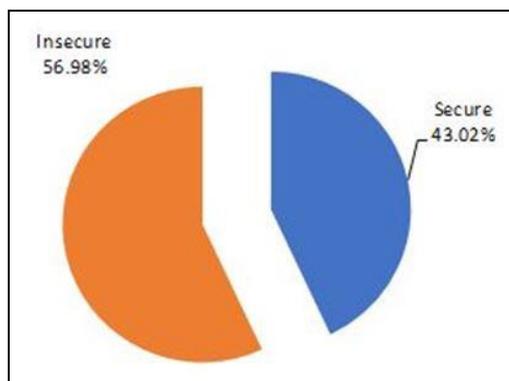


Figure 5. Percentage of household food security.

Welfare level. The education level of household heads living around urban conservation areas is in the moderate category, with 5.81% not completing elementary school, while 11.63%, 25.58%, 13.95%, and 43.02% are in colleges, elementary, junior, and senior high schools. Household members consist of 4 people on average. One half of them, the husband and wife, working to meet their daily needs. The income is also allocated to build houses with a concrete wall.

Houses owned by the community have an average area of 87.23 m² or 21.81 m² per capita, and are equipped with household facilities such as bathing, washing, and toilet. However, only 2 households (2.33%) did not have these facilities. The main household lighting is electricity provided by National State Electricity Company (PT. PLN) and the items generally owned are bicycles or motorbikes, televisions, refrigerators, and boats. Table 5 shows that there are 60, 24, and 5 households in the high, moderate, and low welfare levels.

Table 5

Household welfare level

No	Criteria	Score	Total (households)
1	High welfare	0.00-33.33	60
2	Moderate welfare	33.34-66.66	24
3	Low welfare	66.67-100	2

Figure 6 shows that 69.77%, 27.91% and 2.33% of respondent households were in the high, moderate, and low level of welfare. On average, the community households around the Dusun Besar Lake conservation area in Bengkulu City have a high level of welfare. Furthermore, the fishermen in Enggano Island, Bengkulu Province is in the moderate category with an average welfare index of 59%, while 36%, 62%, and 2% are in the high, moderate, and low welfare categories (Cahyadinata et al 2019c).

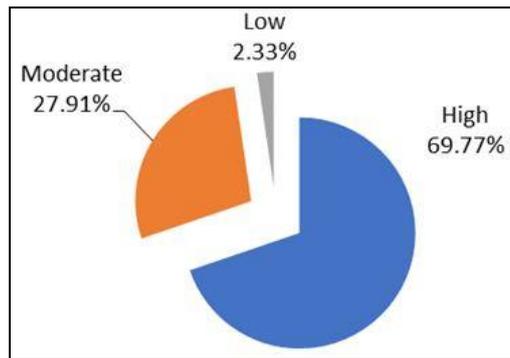


Figure 6. Level of household welfare.

Other research shows that national park conservation policies provide a negative impact on the welfare of rural communities with the most affected ones being located in the surrounding environment of the national park (Richardson et al 2011). According to Robinson and Lokina (2011), forest conservation tends to impose restrictions on access by the community, with a decrease in the overall quality. Various efforts are made to improve the communities' welfare adjacent to conservation areas, one of which is by combining nature conservation with household economic empowerment. However, the results are usually associated with the uneven empowerment, which tends to affect rich households while the poor do not feel the impact, irrespective of their participation (Bandyopadhyay & Tembo 2010).

The conversion of the nature reserve area (CA) into natural tourism park (TWA) provides opportunities for people to carry out economic activities, such as opening businesses. Therefore, the direct economic benefits from ecotourism are supported by the government for infrastructure and local entrepreneurship (Chang & Gunnarsdotter 2012). Approximately 84.88% of the research respondents were interested in opening businesses in the natural tourism park area. The majority of interested people, aimed at opening culinary business and souvenir stalls with the community expecting immediate development to boost their economy. In the long term, this business opportunity is expected to increase community income, food security, and welfare of those living around the urban conservation areas.

Household welfare of communities around the conservation area is influenced by perceptions, participation, and level of food security as shown in Table 6. The higher the community welfare, the better the perception of nature reserves and natural tourism parks.

Table 6
Perception, participation, food security and household welfare

No	Welfare	Perception		Participation		Food Security
		CA	TWA	CA	TWA	
1	High	Good	Good	Moderate	Moderate	Secure
2	Moderate	Good	Good	High	Moderate	Insecure
3	Low	Moderate	Moderate	High	High	Insecure

Community participation in preserving nature reserve resources and natural tourism parks is inversely proportional to the welfare level. Therefore, the higher the welfare, the lower the participation, which means that people with moderate welfare, have higher participation in protecting nature reserves compared to nature tourism parks.

Furthermore, household food security is directly proportional to welfare, which means that the higher the welfare, the better the food security. Meanwhile, households with moderate welfare have vulnerable food security with high participation in maintaining the preservation of existing resources in nature reserves. Approximately 30.24% of low and moderate welfare groups of people need special attention in efforts to develop community economic activities in and around the conservation area because they

are included in the food insecurity category. The inability of households to meet the food needs of people and exploit the existing resources in nature reserves and nature tourism parks tend to increase income.

Conclusions. The following conclusions were drawn based on the research objectives:

(1) Public perception is in a good category, while community participation in the preservation of nature reserves (CA) and natural tourism parks (TWA) are moderate. Furthermore, 53.49% and 65.12% of the community participates highly and moderately in preserving nature reserves and natural tourism parks. Meanwhile, 55.80% and 63.95% have a good perception of the preservation of nature reserves and natural tourism parks. Perception shows a value that is almost the same as perception. Efforts are needed to increase perceptions so that participation will also be better.

(2) The entire community households around the Dusun Besar Lake conservation area are included in the food security category with 56.98% and 43.02% in the insecure and secure categories. Food security can be increased by increasing income, through alternatives livelihoods.

(3) Households around the Dusun Besar lake conservation area in Bengkulu City have a high level of welfare with 69.77%, 27.91%, and 2.33% in the high, moderate, and low categories. Households with moderate and low categories need special attention from the government because they have food insecurity with relatively good perceptions and high participation.

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References

- Adalina Y., Nurrochman R. D., Darusman D., Sundawati L., 2015 [Socio economic conditions of communities around Mount Halimun Salak National Park]. *Jurnal Penelitian Hutan dan Konservasi Alam* 12 (2):105-118 [in Indonesian].
- Amaliyah H., Handayani S., 2011 [Analysis of the relationship between proportion of food expenditure and consumption with rice farmers household food security in Klaten Regency]. *SEPA* 7 (2):110-118 [in Indonesian].
- Andrieu N., Canto G. B., Gracia G. S. C., 2019 Trade-offs between food security and forest exploitation by mestizo households in Ucayali, Peruvian Amazon. *Agricultural Systems* 173 (2019):64-77.
- Arida A., Sofyan, Fadhiela K., 2015 [Analysis of household food security based on proportion of food expenditure and energy consumption]. *AGRISEP* 16 (1):20-34 [in Indonesian].
- Bandyopadhyay S., Tembo G., 2010 Household consumption and natural resource management around National Parks in Zambia. *Journal of Natural Resources Policy Research* 2(1):39-55.
- Bengkulu Provincial Government, 2019 [Bengkulu Governor Decree Number: N.502.NAKERTRAN 2019 concerning Bengkulu City Minimum Wage in 2020]. Bengkulu [in Indonesian].
- Cahyadinata I., Fahrudin A., Sulistiono, Kurnia R., 2019a Perception and participation of fishermen in the sustainable management of mud crab on the outermost small islands (Case study: Enggano Island, Bengkulu Province, Indonesia). *International Journal On Advanced Science Engineering information Technology* 9(4):1330-1336.
- Cahyadinata I., Fahrudin A., Sulistiono., Kurnia R., 2019b Food security and multidimensional poverty of mud crab fishermen household in small and outer island of Indonesia. Case study: Enggano Island, Bengkulu Province. *AAFL Bioflux* 12(4):1196-1207.
- Cahyadinata I., Fahrudin A., Sulistiono., Kurnia R., 2019c Household welfare of mud crab fishermen in outermost islands. Case study: Enggano Island, Bengkulu Province, Indonesia. *AAFL Bioflux* 12(2):564-573.

- Chang M. S., Gunnarsdotter Y., 2012 Local community participation in ecotourism and conservation issues in two nature reserves in Nicaragua. *Journal of Sustainable Tourism* 20(9):1025-1043.
- Daulay D. N. O., Hidayati D. W., 2017 [Communities perceptions to batang gadis national park management, Mandailing Natal Regency, North Sumatera Province]. *Proceeding Biology Education Conference* 14(1):233-240 [in Indonesian].
- Deaton A., Muellbauer J., 1980 An almost ideal demand system. *The American Economic Review* 70(3):312-326.
- Ferraro J. P., 2002 The local costs of establishing protected areas in low-income nations: Ranomafana National Park, Madagascar. *Ecological Economics* 43(2002):261-275.
- Government of Indonesia, 1997 [Law of the Republic of Indonesia number 23 of 1997 concerning environmental management]. State Secretariat. Jakarta [in Indonesian].
- Hamdan, Achmad A., Mahbub A. S., 2017 [Public perception of the status of the Ko'mara Wildlife Reserve in Takalar Regency]. *Jurnal Hutan dan Masyarakat* 9(2):105-113 [in Indonesian].
- Hamid R., Zulkarnaini, Saam Z., 2011 [Analysis socio economic community forest village post activities HPH PT. Siak Raya Timber in Pelalawan District, Riau Province]. *Jurnal Ilmu Lingkungan* 5(2):130-148 [in Indonesian].
- Irnawati, 2019 [Community participation in conservation of nature reserve forest in Saporkren Village, South Waigeo District, Raja Ampat Regency]. *Median* 10(1):28-38 [in Indonesian].
- Ministry of Environment and Forestry, 2018 [Status of Indonesia's forests and forestry 2018]. KLHK. Jakarta [in Indonesian].
- Ministry of Environment and Forestry, 2019 [Decree of the Minister of Environment and Forestry Number: 79/MENLHK/SETJEN/PLA.2/1/2019 concerning changes in function in the main function of forest areas from part of the Dusun Besar Lake Nature Reserve Area to become a Nature Tourism Park]. KLHK. Jakarta [in Indonesian].
- Neelakantan I., Defries A., Sterling E., Naeem S., 2020 Contributions of financial, social, and natural capital to food security around Kanha National Park in central India. *Regional Environmental Change* 2020:20-26.
- Okumu B., Muchapondwa E., 2020 Welfare and forest cover impacts of incentive-based conservation: Evidence from Kenyan community forest associations. *World Development* 129(104890):1-16.
- Purwantini T. B., Ariani M., 2008 [Patterns of food expenditure and consumption in rice farmer households]. *Dinamika Pembangunan Pertanian dan Perdesaan* 2008:1-16 [in Indonesian].
- Rahajeng M. A., Hendrarto B., Purwanti F., 2014 [Knowledge, perception, and community participation in conservation in the Sempu Island Nature Reserve, Malang Regency]. *Diponegoro Journal of Maquares*: 3(4):109-118 [in Indonesian].
- Rahmi R. D., Suratiyah K., Mulyo J. H., 2013 [Farmers household food security in Ponjong District, Gunung Kidul Regency]. *Agro Ekonomi* 24(2):190-201 [in Indonesian].
- Ramdhani H. S., 2011 [A study on socio economy and public perception toward Corporate Social Responsibility (CSR) in Industrial Plantation Forest Company, PT Nityasa Idola, West Kalimantan]. IPB University. Bogor [in Indonesian].
- Richardson R. B., Fernandez A., Tembo G., 2011 Wildlife conservation in Zambia: Impacts on rural household welfare. *World Development* 40(5):1068-1081.
- Riduwan, 2009 [Introduction to social statistics]. Alfabeta. West Java [in Indonesian].
- Robinson E. J. Z., Lokina R. B., 2011 A spatial-temporal analysis of the impact of access restrictions on forest landscapes and household welfare in Tanzania. *Forest Policy and Economics* 13(1):79-85.
- Santosa I., 2004 [Empowerment of forest farmers through adaptive behavior renewal]. Disertasi. IPB University. Bogor [in Indonesian].
- Sembiring A. W. S., 2016 [Public perceptions of the management of the Sibolangit Nature Reserve (the case in the community of Batu Mbelin Village, Sibolangit District, Deli Serdang Regency, North Sumatera)]. Thesis. IPB University. Bogor [in Indonesian].

- Soekartawi, 1998 [Basic principles of agricultural economics]. UI Press. Jakarta [in Indonesian].
- Statistics Indonesia, 2015 [Fishery business household welfare analysis]. BPS. Jakarta [in Indonesian].
- Tohir A., 1993 [A piece of Indonesian agricultural knowledge]. Rineke Cipta. Jakarta [in Indonesian].
- University of Bengkulu, 2020 Map of research locations for biophysical, socio-economic studies and management strategies for the Dusun Besar Lake Conservation Area in Bengkulu. Bengkulu.
- Wahyuni N. I., Mamonto R., 2012 [Community perceptions of national parks and forest resources: a case study of Aketawaje Block, Aketajawe Lolobata National Park]. *Info BPK Manado* 2(1):1-16.
- Wijaksono S., 2013 [The effect of length of stay on the level of community participation in the management of the settlement environment]. *ComTech* 4(1):24-32 [in Indonesian].
- Yuwono, 2006 [Community perception and participation of community forest development partnership pattern in Musi Rawas District, South Sumatra Province]. Thesis. IPB University. Bogor [in Indonesian].
- Zhang Y., Xiao, Cao R., Zheng C., Guo Y., Gong W., Wei Z., 2020 How important is community participation to eco-environmental conservation in protected areas? From the perspective of predicting locals' pro-environmental behaviours. *Science of the Total Environment* 739(139889):1-10.

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