

Analysis of Total Economic Value of Ecosystem Mangrove Forest in the Coastal Zone Pulokerto Village District of Kraton Pasuruan Regency

Ibnu Sina¹, Maryunani², J. Batoro², N. Harahab²

¹Doctoral Program of Environmental Science, University of Brawijaya, Malang, Indonesia

²Lecturer University of Brawijaya, Malang, Indonesia

Abstract In the mangrove forest in the village of Pulokerto there are shrimp and fish production belongs to the people. Formation of mangroves in the coastal village of Pulokerto Kraton District Pasuruan Regency of generally the same, namely *Avicenniaspp* are found from the boundary township residents, local pond until far ahead that the raised ground which is the result of a meeting of coastal sedimentation and precipitation from the sea. Total Economic Value of mangrove ecosystem in the coastal village of Pulokerto District of Kraton Pasuruan Regency is the sum of the values of the benefits, ie the value of Direct Benefits, value Indirect Benefits, Value Benefit Options, and Value Benefits Existence. The results of this study explains that the indirect benefits of mangrove forest ecosystems in the village Pulokerto District of Kraton Pasuruan has the greatest percentage is 90.74% with a value of Rp. 4,807,905,315.53/year. The value of indirect benefits that most of this will explain the ecological benefits of mangrove forests of the greatest compared economic and social benefits. While the direct benefits ranks second largest with a value Rp.185.145.655,00. This considerable value due to the value of benefits and other organisms that were around the village Pulokerto mangrove ecosystems. The total value of direct benefits directly provide an indicator of the economic benefits. Similar results were obtained from studies conducted by Rangkuti (2013) in which the closure of the mangrove contribute significantly to the daily catches of shrimp and crab/biota (confidence interval of 99%). Furthermore, other benefits identified are the benefits of choice and the benefits of existence. Other benefits quantification results obtained successively benefit value amounted Rp.16.440.975,00 selection /year (3.97%) and the value of the benefits of the presence of Rp. 20,782,079.29 /year (0.52%). Comparison of the benefits resulting from the mangrove forest ecosystem reinforces that the ecological value of mangrove forests are the greatest. Therefore, the public should realize the importance of the village Pulokerto mangrove ecosystem management while maintaining sustainability. This means that changes in the mangrove forest ecosystem with shrimp pond system will become resistant and ecologically significant impact damage to coastal environments is no longer a barrier from the crashing waves on the edge of the mainland.

Keywords Mangrove Forest Ecosystem, Total Economic Value

1. Introduction

The development concept that integrates ecological, economic and social referred to as sustainable development. The concept of sustainable development has been implemented in development activities, ranging from planning, implementation and evaluation stages. United Nations Environment Programme (1998) stated that development policy world today and in the future lead to a wise management of natural resources based on the principle of conservation without causing environmental damage (Alikodra, 2012).

Further development (sustainable development) under the Act No. 4 of 1982 regarding Basic Provisions Environment

enhanced by Act No. 23 of 1997 on Environmental Management, can be achieved with a condition that the environmental management must based on ability harmonious and balanced environment.

Coastal and marine resources is a great potential that can be harnessed to promote development. Coastal resources is of major concern is the fisheries, mangroves and coral reefs (Dahuri, 2001). The mangrove forest is one of the important components of the ecosystem for the coastal region. The mangrove forest is a typical tropical forest types growing along the beach or estuary and is influenced by the tide.

Mangrove is a unique ecosystem that occupies a transition area around the tropical and subtropical beaches (Giri, 2007; Nagelkerken, 2010). Typical characteristics of mangrove forest ecosystems is always influenced by the tides, tolerant to high salinity, and able to grow on muddy ground conditions with anaerobic reaction (Nagelkerken, 2010;

McLeod and Salm, 2006). A mix of land and water ecosystems makes the mangrove ecosystem full of productive resources (Bouillon, 2008). With the potential of natural resources and land owned mangrove forests are used as the area of aquaculture, timber resources, as well as tourism destinations. Furthermore, the utilization then growing not only in the aspect of the land, but also as a source of pulp raw materials, medicines, and foodstuffs (Giri, 2007).

Utilization of mangrove resources unwisely been implicated in environmental degradation and mangrove forest area as a whole. Remaining mangrove forest in Indonesia is estimated at 3.5 million ha with the degradation rate reached an average of 530,000 ha/year (Noor, 2012; Anwar and Gunawan, 2011). The pressure on mangrove forests become a crucial issue because it can contribute significantly to carbon emissions and increases risk of flooding, intrusion of sea water or abrasion (Bouillon, 2012; Datta, 2010).

Pasuruan regency is one of regencies in East Java that gets the attention of the provincial government in the implementation of mangrove rehabilitation program. It is implemented that the East Java province has been the rehabilitation of mangrove in 2013 with the proportion of planting most of Pasuruan in the amount of 110 000 (CTF, 2013). Mangrove rehabilitation efforts in Pamekasan was done in Daytona Beach in the Village area PulokertoKratonPasuruan District of 50 ha. Mangrove rehabilitation had positive effects on people's lives,

especially the local community. Nature and resources in it including mangrove forests will provide economic value and high benefits to humans if humans treated him well. Mangrove rehabilitation is an effort of good treatment of man against nature. In addition, mangrove rehabilitation will affect the total economic value of the mangrove.

Utilization of mangrove forest ecosystems conducted Pulokerto village communities in the District of Kraton Pasuruan Regency more emphasis on the interests of certain individuals or groups. Utilization of mangrove forest ecosystems more done for the benefit of the economy that is mine shrimp (aquaculture acreage). Besides a small part exploit mangrove forests to be used as firewood. The impact of the activities of people who are not managed properly tend to cause damage, namely the emergence of uncontrolled damage to ecosystems.

Therefore it is important to analyze the total economic valuation of mangrove forest ecosystems in the Village area Pulokerto Kraton Pasuruan District of 50 ha. Given the importance of the ecological function of mangrove forest ecosystems with the goal can be managed and utilized in an integrated and sustainable. A sustainability perspective mangrove forest management will be the basis to build a strategy and coastal area management policy. Therefore, the results of this study diharapkan can support the implementation of sustainable development, particularly in the management of mangrove forest ecosystems in the Village area Pulokerto District of Kraton Pasuruan Regency.

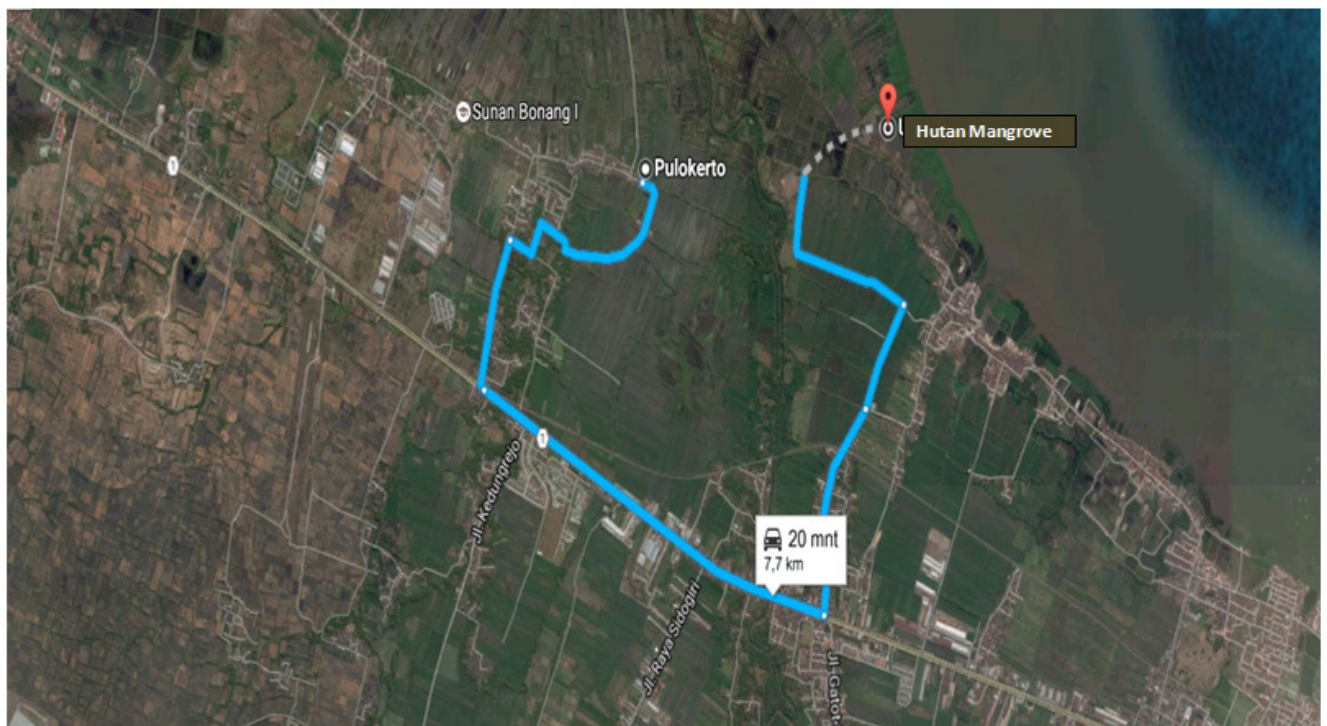


Figure 1. Research Location Map

This research was conducted in the Village area Pulokerto District of Kraton Pasuruan Regency. Map of research sites in the Village area Pulokerto District of Kraton Pasuruan Regency, East Java Province can be seen in the picture above.

2. Research Methods

Economic assessment of mangrove forests in the study using two stages as did Ruitenbeek (1992), namely: (1) Identify the benefits and functions of mangrove forest ecosystems, and (2) to quantify all the benefits and functions of ecosystems in the value of money (rupiah). The following description of each stage in the study:

2.1. Identify the Benefits and Functions of Mangrove Forest Ecosystem

The first step of this phase is to identify all the benefits and functions of the ecosystems to be studied. Benefits and functions identified for all the research include:

1. Benefits Direct (Direct Use Value). The formulation is as follows:

$$ML = \sum_{i=1}^6 ML_i$$

Where:

ML = Total direct benefit (Rupiah)

ML1 = reception mangrove wood (Rupiah)

ML2 = reception fruit production (Rupiah)

ML3 = reception roof palm (Rupiah)

ML4 = acceptance fish production (Rupiah)

ML5 = reception shrimp production (Rupiah)

ML6 = acceptance crab production (Rupiah)

2. Indirect benefits (Indirect use Value). The formulation is as follows:

$$MTL = \sum_{i=1}^4 MTL_i$$

Where:

MTL = Total indirect benefits (Rupiah)

MTL1 = Retaining Abrasion (Rupiah)

MTL2 = Feeding Ground

MTL3 = Spawning Ground

MTL4 = Nursery Ground

3. Benefit Option (Option Value). Benefits of choice in this study will be brought closer by reference to the other using of mangrove forests such as the rental value of the house, the rental value of ponds and recreation

$$MP = MPPI$$

Where: MP = Benefits selection

MPPL = Benefits Other use options

4. Benefits Existence (Existence Value). To determine the value of WTP benefits of this presence is by using Contingent Valuation Method (CVM). Its formulation is as

follows:

$$MK = \left[\sum_{i=1}^n MK_i \right] / n$$

Where:

MK = benefits where

MKI = benefits of the presence of the respondent to-i

N = the total respondents

5. Benefits of Inheritance (Bequest Value). To determine the value of WTP benefits of this inheritance that is constructed by using the method of Contingent Valuation Method (CVM). Benefits of inheritance can be formulated as follows:

$$MW = \left[\sum_{i=1}^n MW_i \right] / n$$

Where:

MW = benefits of inheritance

MWI = benefits inheritance of respondents to-i

N = the total respondents

6. Economic Benefit Value Total. Economic benefit value is the sum total of all the benefits that have been identified from mangrove forest ecosystems studied with formulated in terms of the formula:

$$NMET = ML + MTL + MP + MK + MW$$

Where:

NMET = Value Benefits Total

ML = Direct Benefits

MTL = Indirect benefits

MP = Benefit Options

MK = Benefits Presence

MW = Benefits of Inheritance

2.2. Quantification All Benefits and Functions Added to the Value of the Rupiah (IDR)

Quantification technique used in this study, such as: (1). Market value. The approach used to market value commodities can be traded directly on the ecosystems studied, for example, the value of the fish, shrimp, crab, and the others. This approach is used to obtain value for money (rupiah) for the direct benefit of mangrove forests, and (2) Price Indirect. This approach is used when the price mechanism fails to assign a value to the commodities ecosystem studied, which is to the benefit and function indirectly (indirect use value) built with Contingent Valuation Method (CVM).

3. Empirical Results

3.1. Value Direct Benefits Mangrove Forest Ecosystem in Pulokerto Village

1. Benefits Results of Fishpond

Community tiller farms located in coastal areas and

mangrove forest in the village of Pulokerto District of KratonPasuruan generally still rely on tides for income / expense of water and is done traditionally. Therefore the system water exchange is openly committed to follow the ups and downs. Water changes performed at least once a month at the time of high tide. Commodities are cultivated namely Tiger Shrimp (*Penausmonodon*), milkfish (*Chanos-Chanoos*), and mujaer (*Oreochromusmosambicus*).

The fish farmers/tenants always sell pond in TPHT by way of cash payment. Berkisara tiger shrimp prices between Rp 76000.00 - 88000.00 RP / kg. The selling price of fish

measuring consumption which are marketed through TPHT ranges between Rp 13.000,00- Rp 17000.00/kg depending on the size of the fish. Tilapia fish for consumption measures are derived from the catch daily or seasonal harvest is sold at RP 11000.00-16,000.00 / kg. Though the price fluctuated in TPHT but not significant, the main problem in this TPHT is a lack of capital and management were less than fair to the members. A complete description of the ponds in mangrove areas in the coastal area in the village of Pulokerto presented in the table below.

Table 1. Results of Embankment on Mangrove Forest Areas in Coastal Zone in the Village District of Kraton Pasuruan Regency Pulokerto

Commodities	Analysis	Minimum	Maksimum	Average
Tiger shrimp	Total catch (kg/ha/yr)	85	163	124
	Price (RP)	76.000,00	86.000,0	81.000,00
	Value (RP/ha/yr)	19.380.000,00	42.054.000,00	30.132.000,00
Bandeng	Total catch (kg/ha/yr)	115	173	144
	Price (RP)	13.000,00	17.000,00	15.000,00
	Value (RP/ha/yr)	4.485.000,00	8.823.000,00	6.480.000,00
Nila	Total catch (kg/ha/yr)	72	176	124
	Price (RP)	11.000,00	16.000,00	13.500,00
	Value (RP / ha / yr)	2.376.000,00	8.448.000,00	5.022.000,00

Source: Primary Data Processed, 2016

From the above table explained that the biggest harvest comes from Tiger Shrimp with an average catch of 124 kg/ha/year and the average value of the catch Rp. 30,132,000.00/ha/year. While the average catches of fish ie 144 kg/ha/year with an average value of Rp. 6,480,000.00/ha/year and average catches for tilapia by 124 kg/ha/year with an average value of Rp. 5,022,000.00/ha/yr. Through economic or financial analysis calculation derived income received by the community pond in the in Coastal Zone Pulokerto Village District of Kraton Pasuruan Regency overall as presented in the table below.

Table 2. Revenue Pond on Mangrove Forest Areas in Coastal Zone Pulokerto Village District of Kraton Pasuruan Regency

Analysis (RP / year)	Minimum	Maksimum	Average
Total catch (kg / yr)	91	171	131
Price (RP)	33.333,0	39.667,00	36.500,00
Value (RP / ha / yr)	26.241.000,00	59.325.000,00	41.634.000,00
Cost (RP / ha / yr)	7.760.000,00	16.175.000,00	11.967.500,00
Benefits Value (RP / ha / yr)	18.481.000,00	33.501.000,00	29.666.500,00

Source: Primary Data Processed, 2016

From the above table it is known that farming is done to give a yield of 91-171 kg /year with a value of Rp. 26,241,000.00 Rp. 29,325,000.00 /ha/year. As for the cost incurred include depreciation costs, maintenance and operating costs with a total cost of Rp 7,760,000.00 to Rp. 16,175,000.00. Then the value of the benefits derived from farming is Rp. 29,666,500.00 /ha/year.

2. Benefits Biota Coastal Area

a. Daily shrimp

Daily shrimp production that consists of wild shrimp *Penaeusplebejushess* (Fire shrimp) and *Penaeuspicillatus* (shrimp cap). Types of fish/shrimp daily catches include: shrimp fires, cap shrimp, crab and tilapia whose seeds are not stocked (derived from nature/impes). Bubu usually installed during the afternoon and retrieved (removed) in the morning. The catch is usually directly collected daily and brought to auction place Tambak results/Auction Place fish (TPHT/TPI) for sale. Daily catches of shrimp by the community are presented in the table below

Table 3. Catch Shrimp Daily on Mangrove Forest Areas in Coastal Zone Pulokerto Village District of Kraton Pasuruan Regency

Analysis (RP / year)	Minimum	Maksimum	Average
Total catch (kg / yr)	524	1.232	878
Price (RP)	23.450,00	47.600,00	35.525,00
Value (RP / ha / yr)	12.287.800,00	58.643.200,00	35.465.500,00
Cost (RP / ha / yr)	1.430.000,00	5.705.000,00	3.567.500,00
Benefits Value (RP / ha / yr)	10.857.800,00	52.938.200,00	31.898.000,00

Source: Primary Data Processed, 2016

From the above table it can be seen that the natural shrimp fishing carried out by the respondents to produce 524-1232 kg/ha/year with a value ranging between Rp. 23450.00 Rp. 47.600,00.000. Daily catches of shrimp are usually carried out every day by using tools such as traps that mounted on the inlet/out water. Costs incurred in the amount of Rp Rp1.430.000,00-. 5,705,000.00 with an average cost of Rp. 3,567,500.00. Bubu prices currently range between Rp 120.000,00 - Rp. 200,000.00 / unit and will last for 1-2 years. Bubu initial installation will begin 15-20 days after the start of fish / shrimp are grown. Even some tenants will install three days after the water trap filled. If at any time catches decreased, then the installation is stopped for 3-5 harikemudian in pairs again. Based on Table 3, it can be seen that the value of the benefit derived from the daily catch is equal Rp.31.898.000,00.

b. Crab

The catch crabs in the mangrove forests in the coastal area of the village of the District Pulokerto Kraton ranges 475-812 kg/ha/year with an average of 643.5 kg/ha/year in which the sales value of around Rp. 58500.00/kg to Rp. 89500.00/kg. The resulting value of the crab sales reached Rp. 27,787,500.00 / ha / yr-Rp. 72,674,000.00/ha/year with an average of Rp. 50,230,750.00/th. As for the cost expenditure of Rp. 2,450,000.00 /ha/year-Rp. 5,125,000.00/ha/year. Then the average value of the benefits generated through the capture of crabs is Rp. 46,443,250.00 / th. The catch crabs by the community are presented in the table below.

Table 4. Catch Crab on Mangrove Forest Areas in Coastal Zone Pulokerto Village District of Kraton Pasuruan Regency

Analysis (RP / year)	Minimum	Maksimum	Average
Total catch (kg / yr)	475	812	643,5
Price (RP)	58.500,00	89.500,00	74.000,00
Value (RP / ha / yr)	27.787.500,00	72.674.000,00	50.230.750,00
Cost (RP / ha / yr)	2.450.000,00	5.125.000,00	3.787.500,00
Benefits Value (RP / ha / yr)	25.337.500,00	67.549.000,00	46.443.250,00

Source: Primary Data Processed, 2016

Based on interviews with sources as crab catcher who have decades that the information obtained during the fishing season, crabs in ponds can reach 1 kg / ha.

c. Eel

The catch eels in coastal areas Pulokerto Rural District of Kraton range 350-1290 kg /ha/year with an average of 820 kg/ha/year in which the selling price ranges from Rp. 12500.00 / kg to Rp. 15800.00 / kg. The value generated from the sale of eels reached Rp. 4,375,000.00/ha/yr-Rp. 20,382,000.00/ha/year with an average of Rp. 12,378,500.00/ha/yr. For the cost of Rp. 1,350,000.00/ha/year-4,500,000.00/ha/year. Thus the average value of the benefits generated is Rp. 9,453,500.00/ha/year. Generally catches and revenue eel catcher coastal village of Pulokerto District of Kraton is presented in the table below.

Table 5. Catch Eels on Mangrove Forest Areas in Coastal Zone Pulokerto Village District of Kraton Pasuruan Regency

Analysis (RP / year)	Minimum	Maksimum	Average
Total catch (kg/year)	350	1.290	820
Price (RP)	12.500,00	15.800,00	14.150,00
Value (RP/ha/year)	4.375.000,00	20.382.000,00	12.378.500,00
Cost (RP/ha/year)	1.350.000,00	4.500.000,00	2.925.000,00
Benefits Value (RP/ha/year)	3.025.000,00	15.882.000,00	9.453.500,00

Source: Primary Data Processed, 2016

d. Snake

Catching snakes is done by using nets mounted on the edge of the mangrove plots in the early afternoon and was appointed day. There morning anyway arresting night. If we assume that the snake is bought and sold, the estimated net benefits from these snakes are: Rp. 11,000,250.00/ha/yr. This value is obtained by multiplying the estimated catches with the selling price elsewhere (surroget market) and reduced utilization costs. The catch snakes by the community are presented in the table below.

Table 6. Catch snakes on Mangrove Forest Areas in Coastal Zone Pulokerto Village District of Kraton Pasuruan Regency

Analysis (RP / year)	Minimum	Maksimum	Average
Total catch (kg/year)	1672	2.978	2325
Price (RP)	5.800,00	7.550,00	6.675,00
Value (RP/ha/year)	9.697.600,00	22.483.900,00	12.378.500,00
Cost (Rp/ha/year)	1.390.500,00	8.790.500,00	2.925.000,00
Benefits Value (RP / ha / yr)	8.307.100,00	13.693.400,00	11.000.250,00

Source: Primary Data Processed, 2016

e. Bird

Based on interviews with resource persons from the village community Pulokerto unknown number of species of water birds that used by the community as much as 5 types of birds grouse (*Dendrocygnajavanica*), Stork (*Leptoptilosjavanicus*), blekok (*Ardeolaspeciosa*), herons (*Bulbulis ibis*), and chicken-ayaman (*GallicrexCenerea*). Average net benefits generated Rp. 38.66875 million / year. This value is obtained from the multiplication of the catch with the selling price and the reduced cost of utilization. The catch birds by the community are presented in the table below.

Table 7. Catch Birds on Mangrove Forest Areas in Coastal Zone Pulokerto Village District of Kraton Pasuruan Regency

Analysis (RP / year)	Minimum	Maksimum	Average
Total catch (kg/year)	1734	6506	4120
Price (RP)	8.750,00	11.250,00	10.000,00
Value (RP/ha/year)	15.172.500,00	73.192.500,00	44.182.500,00
Cost (RP/ha/year)	3.780.500,00	7.247.000,00	5.513.750,00
Benefits Value (RP/ha/year)	11.392.000,00	65.945.500,00	38.668.750,00

Source: Primary Data Processed, 2016

f. Kilung-kilung

The catch kilung-kilung the mangrove forest ecosystem in the Village Pulokerto Distric of Kraton t range 977-2197 kg / ha / year with an average of 1587 kg / ha / year in which the sales value of around Rp. 5,617,750.00 / kg to Rp. 17.53206 million / kg. The average value of the benefit obtained is Rp. 9,281,405/ha/year. The catch-kilungkilung undertaken by the community are presented in the table below.

Table 8. Catch Kilung-Kilung on Mangrove Forest Areas in Coastal Zone Pulokerto Village District of Kraton Pasuruan Regency

Analysis (RP / year)	Minimum	Maksimum	Average
Total catch (kg / yr)	977	2197	1587
Price (RP)	5.750,00	7.980,00	6.865,00
Value (RP / ha / yr)	5.617.750,00	17.532.060,00	11.574.905,00
Cost (RP / ha / yr)	1.437.000,00	3.150.000,00	2.293.500,00
Benefits Value (RP / ha / yr)	4.180.750,00	14.382.060,00	9.281.405,00

Source: Primary Data Processed, 2016

Based on calculations obtained by the total value of economic benefits other biota that is Rp. 146,745,155.00 per year as presented in table 8. The value of the benefit derived from crab biota Rp. 46.44325 million. While the benefits obtained through the lowest-kilungkilung benefit is Rp. 9,281,405.00.

Table 9. Total Value Benefits Other Biota on Mangrove Forest Areas in Coastal Zone Pulokerto Village District of Kraton Pasuruan Regency

No.	Type of Biota	Average value
1.	benefits Crab	31.898.000,00
2.	Shrimp Benefits Daily	46.443.250,00
3.	benefits Eels	9.453.500,00
4.	benefits Snake	11.000.250,00
5.	benefits Birds	38.668.750,00
6.	Benefits Kilung-Kilung	9.281.405
Total Value of Benefits Other Biota		146.745.155,00

Source: Primary Data Processed, 2016

3. Benefits of Wood Mangrove

Potential firewood, branches of mangrove wood is still one of the alternative sources of energy or as firewood for cooking purposes for some people. Utilization of firewood is generally done by the people living around the mangrove areas, while most other people take advantage of the gas stove as a source of energy / fuel. Results of mangrove wood extraction for firewood by local communities are presented in the table below.

Table 10. Results Firewood Decision on Mangrove Forest Ecosystem Area in Coastal Zone Pulokerto Village District of Kraton Pasuruan Regency

Analysis (RP / year)	Minimum	Maksimum	Rata-Rata
Total catch (kg/year)	690	936	813
Price (RP)	12.200,00	18.750,00	15.475,00
Value (RP/ha/year)	8.418.000,00	17.550.000,00	12.984.000,00
Cost (RP/ha/year)	3.350.000,00	5.150.000,00	4.250.000,00
Benefits Value (RP/ha/year)	5.068.000,00	12.400.000,00	8.734.000,00

Source: Primary Data Processed, 2016

In addition, there are some communities who use motorcycles as a means of conveyance timber/branches of mangrove trees due to a considerable distance from their settlements. Communities around the timber typically take as much as 3-5 times a week, with a 3-5 tie results per tripnya. Based on Table 6.11, it can be seen that the price per bundle of firewood between Rp. 12200.00 - Rp.18.750,00 with the resulting value of Rp. 5,068,000.00 - Rp. 12,400,000.00 per year.

3.1.1. Value Total Benefits Direct Mangrove Forest Ecosystem

The results of this study with reference to the value of the identification of direct benefits from mangrove forest ecosystems with the data obtained from the community as a direct perpetrator. The results of in-depth interviews with people around the mangrove forest ecosystem as a principal activity can be explained that the direct benefits of mangrove forest ecosystems surrounding communities experience consists of three main components and include eight types of benefits. The immediate benefits are (1). the benefits of farming; (2). benefits and other organisms consist of natural shrimp; crab; eels, birds, snakes, and kilung-kilung; and (3). benefits of forest products in the form of standing forests (wood). Recapitulation of the results of identification of the type and value of the direct benefits of mangrove forest ecosystems in the Village District of Kraton Pulokerto can be seen in the table below.

Table 11. Total Value of Direct Benefits of Mangrove Forest Ecosystem Area in Coastal Zone Pulokerto Village District of Kraton Pasuruan Regency

No.	Analysis	Amount (RP / year)	Proportion (%)
1.	Benefits Tambak	29.666.500,00	11,00
2.	Other Biota benefits	146.745.155,00	85,00
3.	Benefits of Forest (Firewood)	8.734.000,00	4,00
Total Value of Benefits Direct		190.196,561,32	100 %

Source: Primary Data Processed, 2016

In the table above can be explained that the biggest beneficiaries of the value of mangrove forest ecosystems in the village Pulokerto obtained from catching other biota, with the benefit value of Rp. 146,745,155.00 / year in which the proportion reached 85.00%. While the lowest value of the benefits obtained from the forest for firewood to the benefit value of Rp. 8,734,000.00 / year.

3.2. Value Indirect Benefits of Mangrove Forest in the Village Pulokerto

Mangrove forest ecosystems in addition to having direct benefits received by the people in the village Pulokerto District of KratonPasuruan also has indirect benefits. The indirect benefits of mangrove forest ecosystems in the village Pulokerto as follows:

1. Benefits of Coastal Protection

The physical benefits are benefits as a drag abrasion

estimated from the manufacture of hydraulic structures, namely the breakwater (break water). Based Analysis Unit Price Work (AHSP) Field of Public Works issued by the Research and Development Department of Public Works of the Republic of Indonesia (2012), that the cost of facility construction of breakwaters (break water) size of 150 mx 20 mx 10 m (length x width x height) of Rp 1,563 .217.000,00. The length of the beach and mangrove forest in the coastal village of Pulokerto District of Kraton is 6800 m, the cost of making a breakwater with a durability of 20 years is wholly Rp 70,865,837,333.00. However, if the values when divided in 15 years gained Rp 4,724,389,155.53 annually. So, to replace the function of the protection of coastal mangrove ecosystems in Coastal Zone Pulokerto Village District of Kraton Pasuruan Regency is Rp 4,724,389,155.53 / year.

2. Benefits of Feeding Ground

Benefits of mangrove as a provider of natural feed approximated using a regression equation extent of mangrove and shrimp production as practiced by Suryaperdana (2011), namely:

$$Y = 3,783x + 23,33$$

where:

Y = Production shrimp (Kg)

X = area of mangrove (ha)

Extensive mangrove areas in the Village area Pulokerto is 81.19 ha, estimated by the mangrove area may be obtained in shrimp production amounted to 1,232 kg per year. The results of interviews with respondents obtained feed price is Rp 14,000 per kg and the feed requirement is 2 kg per kg of shrimp. Based on these data, it can be obtained by the value of the benefits of mangroves as a provider of natural feed by multiplying the production of shrimp feed prices and feed requirements per kg of shrimp, in order to get the value of Rp 83,516,160.00 per year.

3. Indirect benefits the total value of Mangrove Ecosystem

Indirect benefits derived from mangrove ecosystems contained in coastal areas Pulokerto Village District of KratonPasuruan is (1) the benefits of the results of coastal protection, and (2) the benefits of Feeding Ground. Recapitulation of the results of identification of the type and value of the indirect benefits of mangrove ecosystems in coastal areas Pulokerto Village District of KratonPasuruan can be seen in table 12. Through economic valuation calculation produced a total value of indirect benefits of mangrove ecosystems contained in coastal areas Pulokerto village is Rp. 4,807,905,315.53.

Table 12. Value Total Indirect benefits Mangrove Forest Ecosystem in Village Pulokerto District of Kraton Pasuruan Regency

No.	Analysis	Amount (RP / year)
1	Benefits of Coastal Protection	4.724.389.155,53
2	Benefits of Feeding Ground	83.516.160,00
Total Value of Indirect benefits		4.807.905.315,53

Source: Primary Data Processed, 2016

In the table above shows that the greatest benefit indirectly obtained through the benefits of mangroves as coastal protection with a value of Rp. 4,724,389,155.53. While the benefits of mangroves as Feeding Ground contributed Rp. 83,516,160.00. It is concluded that the ecological ecosystem of mangrove forests have an important role to protect the coastal plain region to reduce abrasion and environmental damage.

4. Value Option Mangrove Ecosystem Benefits

The results of this study identifies that the characteristic ecosystem of mangroves in the coastal village of Pulokerto has two benefits are direct benefits to rural communities of the coast and indirect benefits as ecological benefits. The other benefits of mangrove forest ecosystem is the benefit of choice. Benefits of choice can be explained as follows:

a. Benefits of Biodiversity

Benefits of choice in this study using the calculation of the benefits of biological diversity (biodiversity) of mangrove ecosystems as proposed by Ruitenbeek (1991). The value of ecosystem biodiversity benefits of mangroves in the coastal village of Pulokerto District of Kraton Pasuruan Regency is Rp 15/ha/year. The rupiah exchange rate against the dollar at the time of the study, namely Rp 13,500 (Bank Indonesia-BI, October 2016), while the total area of mangrove in the study site is 81,19 Ha. So the value of biodiversity obtained is Rp. 16,440,975.00, as shown in the table below.

Table 13. Values of Biodiversity Benefits of Mangrove Forest Ecosystem in Village Pulokerto District of Kraton Pasuruan Regency

No.	Analysis	Value
1.	The value of biodiversity in the coastal Village Pulokerto (Rp)	15
2.	Exchange rate (1 RP = Rp) -Oct, 2016	13.500
3.	Mangrove Size (ha)	81,19
Biodiversity value per year		Rp. 16.440.975,00

Source: Primary Data Processed, 2016

b. The Existence Value

Value of the benefits of the presence of (the existence) of the ecosystem of mangrove forests in the coastal village of Pulokerto sub-district of Kraton Regency Pasuruan is computed using the Contingent Valuation Method (CVM). The value obtained from the WTP rata-rata 132 respondents i.e. Rp RP 26.564/Ha/year. Average WTP of Rp. 2,000 26.564/Ha/year multiplied by the vast mangrove ecosystem 782.34 Ha, so that the existence of the benefit value obtained is Rp. 20,782,388.00. The results of the analysis show that the respondent's level of education is high tend to be providing value the existence of a higher educational level than the respondents is low.

3.3. Total Economic Value of Mangrove Ecosystems in the Village of Pulokerto

Total Economic Value (Total Economic Value) of mangrove ecosystems in the coastal village of Pulokerto

sub-district of Pasuruan Regency, the Palace is a summation of the values – the value of benefits that has been outlined above. The value of direct benefits (Direct Use Value), the value of the benefits Indirectly (Indirect Use Value), the value of Option Value, and the value of the benefits of the existence of the (Existence Value). Next do mangrove benefits overall quantification as presented more information in the table below.

Table 14. Total economic value of Mangrove Forest Ecosystems in the Village Pulokerto District of Kraton Pasuruan Regency

No.	Categories Benefits	Net Benefit Value (Rp / ha / year)	Proportion (%)
1.	Direct Use Value	185.145.655,00	4.76
2.	Indirect Use Value	4.807.905.315,53	90.74
3.	Options value	16.440.975,00	3.97
4.	Existence Value	20.782.079,76	0.52
Total		5.030.274.025,29	100

Source: Primary Data Processed, 2016

In the table above can be explained that the indirect benefits of mangrove forest ecosystems in the village Pulokerto District of Kraton Pasuruan has the greatest percentage is 90.74% with a value of Rp. 4,807,905,315.53 / year. The value of indirect benefits that most of this will explain the ecological benefits of mangrove forests of the greatest compared economic and social benefits. While the direct benefits ranks second largest with a value Rp.185.145.655,00. This considerable value due to the value of benefits and other organisms that were around the village Pulokerto mangrove ecosystems. The total value of direct benefits directly provide an indicator of the economic benefits. Similar results were obtained from studies conducted by Rangkuti (2013) in which the closure of the mangrove contribute significantly to the daily catches of shrimp and crab / biota (confidence interval of 99%).

Furthermore, other benefits identified are the benefits of choice and the benefits of existence. Other benefits quantification results obtained successively benefit value of Rp choice. 16,440,975.00/year (3.97%) and the value of the benefits of the presence of Rp. 20,782,079.29 /year (0.52%).

The result of the calculation of the total economic value derived from the coastal area of mangrove forest ecosystems Pulokerto Village District Subdistrict Kraton Kraton is known that the mangrove ecosystem has a benefit and a very important function as economic resources and ecological resources. Comparison of the benefits resulting from the mangrove forest ecosystem reinforces that the ecological value of mangrove forests are the greatest. Therefore, the public should realize the importance of the village Pulokerto mangrove ecosystem management while maintaining sustainability. This means that changes in the mangrove forest ecosystem with shrimp pond system will become resistant and ecologically significant impact damage to coastal environments is no longer a barrier from the crashing waves on the edge of the mainland.

4. Conclusions

Results of research conducted resulted in several conclusions, including the following: Calculation of the total economic value derived from the coastal area of mangrove forest ecosystems Pulokerto Rural District of Kraton Kraton district has benefits and a very important function as economic resources and ecological resources. Indirect benefits of mangrove forest ecosystems in the village Pulokerto District of Kraton Pasuruan has the greatest percentage is 90.74% with a value of Rp. 4,807,905,315.53 / year. While the direct benefits ranks second largest with a value Rp.185.145.655,00. The other benefit is the benefit of choice and the benefits of the existence of values obtained benefits amounting Rp choice. 16,440,975.00 / year (3.97%) and the value of the benefits of the presence of Rp. 20,782,388.00 / year (0.52%). Based on the extensive mangrove coastal village of Pulokerto District of Kraton is 81.19 hectares, the total economic value of the mangrove ecosystem in the village Pulokerto is Rp 5.030.274.025 /tahun or an average of Rp. 419,189,502.1 / ha / year.

The results of this study provide advice or recommendations to government Pasuruan, among which are: The need for planning, implementation, monitoring and proper socialization of the Government of Pasuruan in the management of mangrove ecosystems in the coastal area of the village of Pulokerto District of Kraton both in terms of rehabilitation, maintenance, and / or conservation of mangrove ecosystem itself. In addition, the importance of cooperation among all stakeholders involved in formulating, planning, implementing, and overseeing every program and policy in order to maintain the sustainability of mangrove ecosystems in the coastal village of Pulokerto District of Kraton Pasuruan.

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