ECONOMIC VALUATION OF MANGROVE FOREST AREA IN KOLONO BAY SOUTH KONAWE REGENCY

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Abstract-It is greatly necessary to take into account to degradation of resources since any management policies neglecting degradation of natural resources will result inmisleadingpolicies. Thus, it is necessary to conduct a research to determine economic valuation of mangrove forest resources. It is expected that results of this research can support management of coastal areas particularly mangrove forest in order to create conservation and habitat restoration policies. This research aims to determine the economic value on mangrove forest in Kolono Bay. The method used was TEV (Total Economic Value)consisting of use value directly using market value. The use value did not directly use replacement cost approach and option value used benefit transfer approach. Non-use value consists of existence value using WTP (willingness to pay) approach and bequest value used 10 % approach from mangrove direct benefits. Results of the research show that the economic value of mangrove forest in mangrove area of Kolono Bay per year was 22.109.177.695 IDR equal to 17.093.315 IDR/ha/year or equal to 6.217.429 IDR per head of family.

Index Term: economic valuation, mangrove area, Kolono bay

1 INTRODUCTION

According to Dixon (1993), both in developed countries and developing ones, economic development activities have no adequate attention to maintain natural system and environmental quality. This is caused by a view that between economic growth and environmental quality, there are damage alternatives in environmental quality which are considered as the cost that must be paid from rapid economic growth. In other words, environmental degradation is a cost that must be paid due to economic growth. Actually, such view is a kind of misleading view, since if there is a balanced attention given to the economic development and environmental quality, there will not be such conditions.

Natural resources and environmental management is absolutely related to biophysics characteristics, role of a ecosystem in creating environmental services, role of actors involving in management and ownership regime of natural resources and environment. Ecosystem and human interaction serves as an important aspect in environmental science. Ecosystem processes and ecosystem functions have many benefits, one of which is that energy and water cycle will support production of environmental services. Ecosystem services are able to provide an important economic value (Costanza et al. 2014) that can be useful for human life. In coastal areas, there are mangrove ecosystems creating environmental services and thus, it is necessary for a good management so that it can be utilized for the interests of human and environment. Management of coastal areas is related to the role of ecosystem services.Dahuriet al. (1996) stated that integrated management of coastal and sea resources is an approach involving two or more resource ecosystems and integrated utilization activities in order to achieve sustainable coastal area development. However, any programs in implementation of integrated policy approach often face failure, one of which is caused by weak design of policies (Vince, 2015).

Management of resources in coastal areas basically aims to improve social well-being, particularly community of fishermen living in coastal areas (Kusumastanto, 2003).It must maintain ecological aspects in term of preservation of resources and ecosystem functions since it serves as the main base to achieve the well-being (Arsyadet al., 2007). Therefore, sustainable management of natural resources and ecosystem services will support improvement of fishermen and fish farmers which most of them live in coastal villages and small islands.

Mangrove areas have capability to provide food supply (Sasekumaret al., 1992; Islam and Haque, 2004; Nagelkerkenet al., 2008; Saengeret al., 2013), fish enlargement area (Barbier, 2003; Mansonet et al., 2005; Allen et al.,2012), protection place for the biotasfrom predators (Nagelkerkenet al., 2008), as a habitat for fish (Sasekumaret al., 1992; Barbier, 2003, Saengeret al., 2013), both all of their life cycles or part of its (Nagelkerkenet al., 2008). As a fish enlargement area, mangrove plays an important role in supporting commercial fisheries (Barbier 2000; Allen et al., 2012).

Kolono Bay is one of the coastal areas in South Konawe Regency, Southeast Sulawesi Province. Kolono Bay is an area with a fairly high level of utilization in coastal area utilization as a settlement area spread in Lambangi, Tumbu-Tumbu Jaya, and Rumba-Rumba villages, as well as a center of brackish water pond area (shrimps and milkfish) in which changes on mangrove vegetation conditions in Kolono Bay are caused by mangrove land function conversion into aquaculture area

(Rahman, 2017).

Results of image processing using Citra Landsat-5 in 1988 and Citra Landsat-8 in 2016 and after overlayanalysis of mangrove density in 1988 and mangrove density in 2016, it is obtained changes on mangrove vegetation of Kolono Bay in 1988 – 2016, in which it shows great amount reduced of mangrove vegetation. A reduced area of mangrove for 28 years is known by589,95Ha from initially 1.576,98 Ha in 1988 meanwhile the area of mangrove vegetation is still 987.03 ha, which there is a protected forest area with an area of 41.3 ha. The reduced area of mangrove vegetation in Kolono Bay is due to the large conversion of mangrove land into aquaculture areas (outside protected forest areas). Aquaculture areas in Kolono Bay are spread in Kolono Village, Mondoe Jaya Village, Awunio, Roda and Lamapu Village (Rahman, 2017).

Conversion rate of mangrove vegetation into agriculture ponds will be even greater in the future as outlined in the Konawe Selatan Regency Spatial Planning, namely the total pond area in 2033 is targeted to be 21,921 Ha in seven subdistricts for aquaculture development including Kolono Bay (Kolono Regency and East Kolono) (Southeast Sulawesi Marine and Fishery Office, 2017).

It is greatly necessary to take into account to the resource degradation, since management policies neglecting natural resource degradation will result in misleading policies. Therefore, it is important to conduct a study to determine economic valuation of mangrove forest ecosystem resources, and it is expected that results of this study can support the management of coastal areas, especially mangrove forests, in order to carry out conservation and habitat restoration policies. This study aims to determine the economic value of mangrove forests in Kolono Bay.

2 Literature Review

Value means perception of an object at a specified place and time. While perception is the view of individuals or groups on an object according to the level of knowledge, understanding, expectations and norms. Therefore, there are greatly various values of mangrove ecosystems, depending on the perceptions of each individual or community. According to Muif (1991), he stated that value is a benchmark price that can measure the economic value of natural resources based on function, use, potential, and carrying capacity of development according to time and area where the resource is located, and the amount of demand and supply in the economic mechanism the market is operated.

Measuring economic valuation of mangrove forests can use a measurement model of the value of resource economics, which traditionally, there will be values based on interactions between human as a subject and an object (Pearce and Moran 1994; Turner et al., 1994). Each individual has a number of values that are said to be mastery values as the basis of individual preferences. In the end, the object value is determined by various assigned values. Economic values in natural resources, especially mangrove ecosystems play a very important role in determining management policies, so that there will beefficient and sustainable allocation and alternative management. The total economic value modelcan be seen in Figure 2.1.

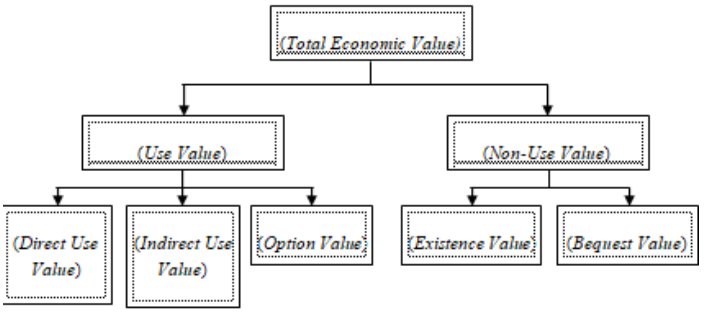

Figure 2.1.Total Economic Value
Pearce and Moran 1994; Turner et al., 1994

The economic value framework often used in the economic valuation of natural resources including mangroves is the concept of total economic value (TEV); in an outline manner, it is grouped into use value and non-use value (Pearce and Moran 1994; Turner, Pearce and Bateman, 1994). The use value is divided into direct use value, indirect use value and option value. The non-value values are divided into existence values and bequest values.

There are a great number of mangrove economic function benefits for humans, both direct products (such as root materials, building materials, fishing traps, agricultural fertilizers, paper raw materials, food, medicine, beverages, and textiles) and indirect products (such as recreation places and foodstuffs and products that are produced mostly to be utilized by the community. Another important use value of ecosystems is a variety of aquatic organisms, some of which have commercial value in selecting mangrove habitat as their place of life, namely 30% of marine fisheries production depends on sustainability mangrove, because mangrove forest is a breeding place for fish species with high level of commercial value (Ministry of Environment, 2008).

3 Research Method

3.1 Research Location and Time

The research location is a case study with the research objects on the mangrove forests in Kolono Bay, South Konawe Regency, Southeast Sulawesi Province. The research locations included villages / sub districts in KolonoBay (Kolono District and KolonoEast District). This research was conducted for 6 months starting from January to June 2019.

3.2 Types of and Sources of Data

Types of data used in this research are qualitative data and quantitative data. According to Sarwono (2006), qualitative data is a type of descriptive data in the form of symptoms in the form of documents, photographs and notes during the study. Quantitative data is data in the form of statistical figures or in quantitative data. This study requires needs in primary data and secondary data in the implementation of activities.

The collection of the two types of data uses a combination of the following techniques:

1. List of questions in the form of a questionnaire that can be used to collect data directly from research respondents.
2. In-depth interviews, in the form of in-depth interviews conducted directly with the respondents in this study.
3. Field survey, in the form of visits to research sites (local communities and ecosystems mangrove in the Kolono Bay area).

3.3 Data Collection Method

The method of data collection is conducted by triangulation method), which is by collecting data using more than one method independently, consisting of field observations, interviews and literature studies. This aims to obtain more complete and accurate data about the studied objects.

The population in this study is the community related directly or indirectly to the utilization of mangrove forest ecosystems; with sub-populations are forest products, fishermen and beneficiaries of the existence of mangrove forests. By taking into account the population characteristics, determination of the respondents was carried out by stratified random sampling based on stratification of the types of activities in using the mangrove forest ecosystem.

Data collection in the field aims to obtain information as much as possible related to the socio-economic conditions of the community in the utilization of mangrove forest ecosystems. In conducting this data collection, there will be used observation techniques, interviews, and data checklists to the community and related stakeholders, as well as direct field observations. The sampling techniques for sample determination in this study are purposive sampling and snowball sampling.

The purposive sampling method is conductedby taking samples based on the reason that key people that are selected from the community and government officials, especially those involved in processing fishery resources and mangrove ecosystems can support the development of infrastructure and policies in this study. The snowball technique will be conducted in order to determine the informants by contacting the first key figure from the selected community and related stakeholders and then looking for the following key figure from information given by the first key figure and so on until the required data is fulfilled. Through this technique, it is expected that there will be adequate information.

The number of sample units for fish fishermen respondents, related stakeholders and other fishermen (people who use mangroves) is determined based on the proportion estimation equation as follows (Nazir, 2003):

$$n = \frac{N\,\bar{p}\,(1-\bar{p})}{(N-1)D+\bar{p}\,(1-\bar{p})}$$

Notes:

n = number of desired sample unit, N = total of types of respondents,

D = B2/4 (Bis bound of error = 0,10), and p (estimatorof population proportion = 0,1).

3.4 Quantification of All Benefits and Functions into Money Valu

This stage is conducted after the identification on all of the benefits and functions of the mangrove forest ecosystem. The qualification techniques used are:

1. Market Value: this approach is used to quantify prices of various commodities that can be directly marketed. This approach is conducted to assess direct benefits of mangrove forests consisting of forest product and fishery product values.
2. Indirect Prices: this approach is used if the market mechanism fails to provide value to the component of the studied resources, for example because the component does not yet have a market. This approach is used to quantify value of indirect benefits of mangrove forest ecosystems.
3. Contingent Valuation Method: It is used to quantify benefits of the existence of the studied ecosystems. For that reason, in the survey, it is used two models of questions, namely open questions and multiple choice questions.
4. Total Economic Value: It is sum of all of the identified benefits, namely the value of direct benefits, the value of indirect benefits, the value of selected benefits, existence value and bequest value.

3.5 Data Analysis

Total economic benefit value is a sum of all of the identified benefits of the studied mangrove forest which is formulated by the following formula:

NET =NGL + NGTL + NP + NK + NW

In which:

NET = Total Economic Value
NGL = Direct Use Value
NGTL = Indirect Use Value
NP = Option Value
NK = Existence Value
NW = Bequest Value

3.5.1 Direct Use Value

Direct use value is the value obtained from benefits directly taken from mangrove forests, such as the results of firewood and catches (fish, shrimp, crabs and shellfish). The value of direct benefits obtained by communities around mangrove forests (local direct use value) is approached with net income generated for local use (Sathirathai, 2003). The formulation is as follows:

NGL= $\sum_{i=1}^{n} NGLi$

In which: TNGL = Total direct benefits (Rupiah)
NGL1 = Firewood value (Rupiah)
NGL 2 = Fish fishing value (Rupiah)
NGL 3 = Shrimp fishing value (Rupiah)
NGL 4 = Crab fishing value (Rupiah)
NGL 5 = shellfish fishing value (Rupiah)

1) The direct use value of mangrove forest from its function as a producer of firewood is estimated through the approach of the number of firewood produced in 1 (one) year with the following equation:

NEKb = QKb x PKb x RTKb–CKb
Which it is known that NEKb is the economic value of firewood (Rp / year), QKb is the value of the volume of wood produced (m3 / year), PKb is the price of firewood (Rp / m3), RTKb is the number of households as firewood processing wood (KK), CKb is the cost of processing firewood (Rp / year).

2) The direct use value of fishing is the economic value obtained from fish / shrimp fishing approached by the following equation:
NEPi = QPi x PPi x RTPi–Cpi
Which it is known that NEP is the economic value of fish / shrimp fishing (IDR / year), QPi is the number of fish / shrimp catches (kg / year), PPi is the price of fish / shrimp (IDR / kg), RTPi is the number of fishermen catching fish / shrimp (people), and CPi is the cost of fish / shrimp fishing (IDR / year).
3) The direct value of the shrimp catches is the economic value obtained from the shrimp approached by the following equation:
NEPi = QPi x PPi x RTPi–Cpi
Which it is known that NEPi is the economic value of shrimp fishing (Rp. / Year), QPi is the number of shrimp catches (kg / year), PPi is the price of shrimp (Rp / kg), RTPi is the number of fishermen catching shrimp (people), and CPi is the cost of fishing shrimp (IDR / year).
4) The direct use value of crab fishing is the economic value obtained from fishing crabs, approached by the following equation:
NEPk = QPk x PPk x RTPk–CPk
Which NEPk is the economic value of fishing crabs (IDR / year), QPk is the number of crab catches (kg / year), PPk is the selling price of crab catches (IDR / Kg), RTPk is the number of fishermen fishing crabs (people), and CPk is the operational cost of fishing crabs (Rp. / year).
5) The direct use value of shellfish collection is the economic value obtained from shellfish, approached by the following equation:
NEPkr = QPkr x PPkr x RTPkr–CPkr
Which it is known that NEPkr is the economic value of shellfish fishing (IDR / year), QPkr is the number of shellfish catches (kg), PPkr is the selling price of shellfish catches (IDR / Kg), RTPkr is the number of fishermen fishing shellfish (people), and CPkr is operational costs of fishing shells (Rp. / year).

3.5.2 Indirect use Value
Indirect use value is the value that is felt indirectly on the goods and services produced by natural and environmental resources (Fauzi, 2002). The value of benefits is not directly processed using the replacement cost method, which the calculation is conducted by calculating the costs that will be incurred to replace the function of the mangrove if this mangrove is removed. Indirect benefits from mangrove forests are obtained from an ecosystem indirectly, in the form of physical, biological, and ecological benefits (Suryono, 2006). Physical indirect benefits, namely as a retaining coastal abrasion (Fahrudin, 1996) are assessed from the creation of water structures, namely wave breakers (Suryono, 2006), biological indirect benefits, namely as providers of organic materials for biota living in mangrove forests (Adrianto et al., 2004) and as a place for spawning and growing (Suryono, 2006) and indirect ecological benefits which are estimated from the presence of carbon uptake. The formulation is as follows:

NGTL = $\sum_{i=1}^{n} NGTLi$
In which:
TNGTL = total of indirect use value (Rupiah)
NGTL 1 = retaining abration (Rupiah)
NGTL 2 = retaining seawater intrusion (Rupiah)
NGTL 3 = nutrient supply (Rupiah)
NGTL 4 = carbon storage (Rupiah)

3.5.3 Option Value
The option value is the type of other use value either directly or indirectly because it relates to the use of mangrove in the future. The calculated option value is the benefits of mangrove forest biodiversity and habitat conservation. Its value is estimated by referring to the biodiversity value of mangrove forests in Indonesia from existing research. In accordance with the results of Ruitenbeek's (1992) study, the mangrove forest option value was US $ 1,500 / km2 / year (US $ 15 / ha / year) assuming that the mangrove forest was ecologically important and maintained.
NP = NPPL
NPPL = Biodiversity Option Value

3.5.4 Existence Value
The existence value is the benefit felt by the community from the presence of mangrove forests after other benefits that have been excluded from the analysis. In general, the approach techniques are conducted by interviewing households by asking for their willingness to pay (WTP) in maintaining environmental assets in the present (Maryadi, 1998). The existence benefit value is more seen in mangrove forests in the Kolono Bay region. To find out the WTP existence benefit value, it is using the Contingent Valuation Method (CVM). The formulation is as follows:

$$NKi = \sum_{i=1}^{n} \frac{NKi}{n}$$

In which:
NKi = Existence value of -i respondent
n = Number of samples or respondents

3.5.5 Bequest Value
The bequest value of mangrove forests cannot be assessed by a market approach, therefore the bequest value can be calculated using an approximate approach. Calculation on the bequest value is 10% of the value of direct mangrove benefits (Ruitenbeek, 1992).
NW = 10% x Direct Use Value (NGL)

4 Results And Discussion

Calculation of the economic value of the mangrove ecosystem benefits aims to determine the amount of the value of the various benefits. Based on the study results, the economic valuation of the mangrove forests in Kolono Bay is as follows:

4.1 Use Value

The use value in this study consists of direct use value, indirect use value and option value. The direct use value is the value of the mangrove forest as the natural resources consisting of the use of firewood and fishery production. Whereas the indirect use value consists of retaining abrasion, retaining seawater intrusion, nutrient supply, and carbon storage. The option value consists of biodiversity value.

4.1.1 Direct Use Value

The direct use value is a value that can be directly felt by the community around the mangrove forest ecosystem. These values include utilization of firewood, fishing of fish, shrimp, crabs and shellfish of various types. Table 4.1.is a cumulative table of commodity production values in the mangrove forest ecosystem on Kolono Bay coastal area.

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Table 4.1.Direct Use Value in Mangrove Forest Ecosystem in Kolono Bay

Commodities	Volume of production (people /year)	Unit	Price (Rp)	Number of actors	Processing cost (Rp/year)	Total value (Rp/year)
Woods	9,13	m^3	1.249.500	20	0	228.060.000
Fish fishing	2.263	kg	17.857	15	27.720.000	578.402.449
Shrimp fishing	2.244	kg	40.000	10	23.100.000	874.500.000
Mangrove crab fishing	924	kg	128.750	65	986.700.000	6.746.025.000
Shellfish fishing	283	kg	15.000	7	0	29.700.000
		Total				8.456.687.449

About the use of mangrove wood as firewood, most of the respondents said it was only for the interest of the household, and there are some to be traded. The Kolono Bay community usually sells mangrove woods as firewood with prices ranging from Rp. 3,500 / bundle or Rp. 1,249,500 / cubic. Thus, the market price for firewood uses the average selling price data from the respondents. The production volume of taking firewood by the community is an average of 0.76 cubic / month / person or 9.13 cubic / year / person with a frequency of taking almost every day or 22 days in a month. The number of users of firewood from mangrove forests is 20 people. If it is multiplied by the forest utilization community in Kolono Bay with the average production volume taken, the number of mangrove forest production for firewood is Rp. 228,060,000 / year.

For firewood, some respondents said that there was a clear market price of IDR 3,500 / bundle. The use of mangrove wood is usually intended as an alternative substitute for fuel oil when there is an event or celebration in the Kolono Bay community, but there is also a small proportion of people who use firewood for their daily needs, thus there is a relatively small number of mangrove wood processing in Kolono Bay. There is also a small number of mangrove wood production volumeusing as an alternative substitute for fuel, since taking / processing mangrove wood as firewood is adjusted to the needs by the community.

Based on the results of data collection on the direct benefits of fishing, almost every day people in KolonoBay take fish around the mangrove forest ecosystem with the number of fish catchers successfully recorded is 15 people. The results of direct interviews with fishermen fishing, the number of fish production obtained in the mangrove forest ecosystem of KolonoBay is 2,263 kg / year / person divided into various types of fish such as mullet fish, malajang fish, white fish and others, with selling price is an average of Rp. 17,857 / kg and processing or operational costs of the fishing is an average of Rp. 1,848,000 / year / person. So that, the economic value of mangroves can be obtained as a direct benefit of fishing isRp. 578,402,449 / year.

Result of the data collection on the direct benefits of shrimp fishing by fishermen is obtained by the number of shrimp catchers who is successfully recorded is 10 people. Based on the information directly taken from the fishermen of fishing shrimp, it is found that the number of shrimp production obtained from the catches in KolonoBay mangrove forest ecosystem is an average of 2,244 kg / year / person, with an average selling price of Rp. 40,000 / kg and processing or operational costs of the fishing is an average of Rp 2,310,000 / year / person. So that, the economic value of the mangroves that can be obtained as a direct benefit of fishing shrimp is Rp. 874,500,000 / year.

Based on the results of data collection on the direct benefits of fishing mangrove crabs, almost every day the KolonoBay community take mangrove crabs around the mangrove forest with the number of catchers of mangrove crabs that are recorded is 65 people. The results of direct interviews with fishermen fishing mangrove crabs show that the number of mangrove crab production obtained in Kolono Bay is an average of 924 kg / year / person, with an average selling price is Rp. 128,750 / kg and processing or operational costs of fishing is an average of Rp. 15,180,000 / year / person. So that, the economic value of mangroves can be obtained as a direct benefit of catching mangrove crabs is Rp. 6,746,025,000/year.

The results of data collection on the direct benefits of mangrove forest from shellfish fishing in KolonoBay obtainthat the number of shellfish catchers which are recorded is 7 people. Based on the direct information from the respondents, it is found that the number of shellfish production from fishing shellfish in KolonoBay mangrove forest ecosystem is an average of 283 kg / year / person, with an average selling price of Rp. 15,000 / kg. So that, the economic value of the mangroves can be obtained as a direct benefit of fishing shellfish isRp. 29,700,000 / year.

4.1.2 Indirect Use Value

The indirect use value is obtained from the benefits of mangrove forests as an indirect ecosystem, such as: retaining coastal abrasion, retaining seawater intrusion, feed providers, nutrient supply and carbon storage, non-fish marine fishing, spawning, growing and place for something to eat. The calculated indirect use values in this study are retaining coastal abrasion, retaining seawater intrusion and nutrient supply. The approach used to estimate the economic value of the mangrove forests as the indirect use values is by replacement

costs. The indirect use value of the mangrove forest ecosystem benefits can be seen in Table 4.2 as follows:

Table4.2.Indirect Use Value of Mangrove Forest Ecosystem in Kolono Bay

No.	Types of benefits	Unit price (Rp.)	Unit	Volume Assumption	Volume Value	Total (Rp.)	Total (Rp/year)
1.	Retaining abrasion	668.000	m3	Length of coastal area(m)	53.217	35.548.956.000	2.369.930.400
2.	Retaining seawater intrusion	5.000	KK/gallon/ day	Number of head of family	3.556	17.780.000	6.489.700.000
3.	Nutrient supply	74.480	ha/year	Area of Mangrove (Ha)	1.293,44	96.335.411	96.335.411
4.	Carbon storage	798.570	ha/year	Area of Mangrove (Ha)	1.293,44	1.032.902.381	1.032.902.381
				Total			9.988.868.192

The indirect use value of mangrove forest from its function as a retaining abrasion and seawater intrusion is estimated from the cost of onstruction of breakwater and retaining seawater. The economic value of coastal abrasion with the use of breakwater structures, according to the basic value of building calculations by the Department of Public Works and Spatial Planning of South Konawe Regency in 2019, with length of 1 m, width of 1 m and height of 2.5 m (1 mx 1 mx 2 , 5 m) for 15 years endurance is Rp. 688,000,-. Breakwater as a retaining abrasion is calculated based on the length of the Kolono Bay coast. The length of the KolonoBay coast is 53,217 meters (image processing results, 2019). For that reason, it can calculate the approach of mangrove forest ecosystem value as a retaining barrier by Rp. 35,548,956,000 (Table 2). Based on the same data source, the length of the dam resistance is 15 (fifteen) years, so that the benefit is divided by 15 years, then the indirect benefit of mangrove forest as a retaining abrasion is equivalent to Rp. 2,369,930,400 / year.

The indirect use value for the benefits of mangrove as a retaining seawater intrusion is obtained from the approach to clean water needs from the Kolono Bay community. By the assumption that if the mangrove forest is removed, the community will find it difficult for clean water sources since there is no any function of mangroves for retaining seawater intrusion and clean fresh water sources are contaminated with sea water. As we know, sea water has a high salt content which makes it unsuitable for human consumption. Thus, the calculation is approached with the use of clean fresh water according to the needs of each family every day (Harahab, 2011). The approach is calculated through the number of family head located in Kolono Bay who use water for drinking and cooking water. The calculation results obtained from the costs to be spent by one family per / day to buy water at the price of the assumption of Rp. 5,000 / gallon. The number of family heads in Kolono Bay is 3,556 households (BPS Konawe Regency in Figures, 2018). For this reason, the approach to the mangrove forest ecosystemvalue can be calculated as a retaining seawater intrusion by Rp. 6,489,700,000 / year (Table 4.2).

The indirect use value for the mangrove benefits as a nutrient supplier as a function of maintaining the stability of food cycle in mangrove forests is approached by the value of nutrients produced in the form of mangrove litter as a supporting ecosystem productivity (Suryono, 2006; Apung, 2011). Every hectare of mangrove forest is able to produce 13.8 tons of litter per year or equivalent to 4.85 tons of dry weight per year (Suryono, 2006; Apung, 2011), containing nitrogen (N) 10.5 kg per hectare per year or equivalent 23.33 kg of urea fertilizer, and phosphorus nutrient of 4.72 kg per hectare per year or equivalent to 13.11 kg SP-36 fertilizer. The price of urea fertilizer in the Kolono Bay region is Rp. 1,900, - / kg and SP-36 of Rp. 2,300 / kg, the economic value of the litter produced is Rp. 74,480, - per hectare per year. The areaof the mangrove forestin TelukKolono is 1,293.44 Ha (results of image data processing, 2019). So, the approach to the value of mangrove forests as a nutrient suplier can be calculated by Rp. 96,335,411 / year (Table 4.2).

The ecological benefit of carbon absorber by mangrove forest ecosystems with potential carbon values is ranging from 3,258.34 - 3,957.44 kg per hectare, assuming an average value of 3,607.89 kg per hectare per year (Suryono, 2006; Apung, 2011). The price of 1 ton of carbon is UD $ 15.5 or Rp. 221,340, - (assuming the exchange rate of 1 US $ = Rp. 14,280 on June 13, 2019). Thus, the total carbon value stored in the mangrove forest reaches Rp. 798,570, - per hectare per year. The area of mangrove forest in KolonoBay is 1,293.44 Ha (results of image data processing, 2019). So, it can be calculated the approach of the ecosystem value of mangrove forests as carbon absorber by Rp. 1,032,902,381/year (Table 4.2).

4.1.3 Option Value

The option value in this study refers to the other usevalue of the mangrove forest ecosystem. The calculation of the option benefit value is using the transfer benefit approach namely by an approach using the use value of the biodiversity referring to Ruitenbeek's (1992) biodiversity value of US $ 15 ha / year which is then transferred to obtain an estimate of the option value of the benefits at the study location.

Mangrove forest ecosystems in the Kolono Bay region recently are not used for other uses, therefore the option value for the Kolono Bay forest area is seen only from its biodiversity value. By the increase in population, mangrove logging cannot be under control which can result in losses of various types of flora and fauna in the mangrove ecosystem, therefore, the option value measured in this study is to calculate the biodiversity and fauna values of mangrove ecosystems.

The option use value in the mangrove forest ecosystem in Kolono Bay can be approached using the benefit transfer method, namely by assessing the benefit estimates from other places (where resources are available) then the benefits are transferred to obtain a rough estimate of the environment benefits. The method is approached by calculating the benefits of biodiversity (biodiversity in this mangrove area). According to (Ruitenbeek, 1992) Indonesian mangrove forests have biodiversity value by US $ 15 per ha per year. This value can be used throughout the mangrove forests in the region in Indonesia if the forest ecosystems are ecologically important and remain naturally preserved.

The total value of the biodiversity benefits is obtained by multiplying the benefits value namely US $ 15 per ha per year with the exchange rate of the rupiah against the US dollar, which is Rp. 14,280 (on June 13, 2019), so that a value of Rp. 214,200 / ha is obtained. These results are multiplied by the total area of the mangrove forest ecosystem in KolonoBay cov-

ering an area of 1,293.44 Ha, thus the total value of the biodiversity benefits in the mangrove forest in Kolono Bay is Rp. 277,054,848 / year (Table 4.3).

Table 4.3.Option Value of Mangrove Forest by Biodiversity Value Approach

Option Value	Area of Mangrove (ha)	Costs (Rp./ha)	Option Benefit (Rp./ha)
Biodiversity	1.293,44	214.200	277.054.848
Total			**277.054.848**

4.2 Non-Use Value

Non-value is one of the variables of total economic value. The non-use value obtained from this study consists of existance value, and bequest value obtained using the Willingness to pay (WTP) method or the willingness to pay for the existence value and 10% of the direct use value for the bequest value.

4.2.1 Existence Value

The existence value of mangrove forests is obtained from the value of willingness to payby the respondents for the existence of mangrove forests in their area. Before this question is asked, the respondents are given a hypothetical market scenario about the existence of mangrove forests. The following are the scenarios which are created to assist the respondents in order to understand the question of willingness to pay: "Mangrove forests serve as a retaining abrasion, in which there are living several animals such as crabs, shrimp, shellfish and as a breeding ground for several types of fish. The existence of mangrove forests also benefits the surrounding community in fulfilling firewood and building timber for shelter. At present, most of the mangrove forests on the coastal area of KolonoBay are in a damaged condition leading to many losses. The number of fish / shrimp / crab / shellfish catches decreases and coastal abrasion is increasingly unstoppable and damages the coast and transportation routes. Seawater intrusion also enters houses and causes brackish to sources of fresh water for the community. If there is a preservation of mangrove forests by conservation so will be no the aforementioned consequences, then are you willing to set aside a portion of your income for these activities so that the mangrove forest is still exists and is always maintained. "

Based on the hypothetical market mentioned above, then to obtain mangrove ecosystems that are preserved and can provide benefits, the respondents are asked to contribute to the mangrove forest conservation program. The program requires funds and it is asked whether the respondents are willing to contribute to the program. Based on these questions, the respondents are willing to set aside a portion of their income for the mangrove forest conservation program in their area. This shows that most people have a concern for the existence of mangrove forests.

Based on the willingness to pay by the respondents for the conservation program in mangrove forests, then it is given a further question, about the amount that they are willing to pay. The respondents are given a price bid, ranging from Rp. 2000, Rp. 5000, Rp. 10,000, Rp. 15,000, Rp. 20,000, Rp. 25,000 and Rp. 50,000. The bid values given are based on the results of the FGD (Focus Group Discussion) with community leaders living in the targeted area. The closed ended question model allows the respondents to have an idea of the costs of conservation programs so that they are not under / over value. The way to ask for a willingness to pay is by using a payment card model (Fauzi, 2014), the respondents are given an offer to use the card that contains the value of money starting from the lowest to the respondents' limit stating no for the offered value.

Results of this bidding show that the highest choice by the respondents is 53.85% willing to pay Rp. 10,000 / month. The second highest choice is 19.23% by the respondents willing to pay Rp. 15,000 / month. There is a high different ofthe first and second highest price given which is allegedly due to the lack of community knowledge about the importance of mangrove forest preservation program. The lack of counseling activities and community involvement in the mangrove forest planting program is seen as a problem, so there is relatively low level of willingness to pay by the respondents. The total WTP / month is then accumulated into annual amount so the size of the mangrove conservation program can be obtained which can be subsidized by the community for one year. The details of the PAPs are found in Table 4.4 as follows.

Table 4.4.Existence Value of Mangrove Forest Ecosystem in Kolono Bay

No.	BiddingValue ((Rp.)	Frequency	WTP/Month (Rp.)
1	2.000	2	4.000
2	5.000	3	15.000
3	10.000	28	280.000
4	15.000	10	150.000
5	20.000	4	80.000
6	25.000	3	75.000
7	50.000	2	100.000
Total			**704.000,00**
Average(Rp/month)			**13.538**
Average WTP (Rp/year)			**162.462**
Total population of Kolono Bay			**15.640**
Total of WTP (Rp/year)			**2.540.898.462**

Based on the average WTP / year value of Rp. 162,462, it can be obtained the WTP value of the KolonoBay mangrove forest ecosystem by multiplying the population in Kolono Bay, namely 15,640 people, then the total WTP per year can be obtained at Rp 2,540,898,462/year or equivalent Rp. 1,964,450 / ha / year. WTP value describes the amount of the minimum cost that a person can afford to pay as a form of customer satisfaction with the resource. Results of the research on the economic valuation of mangrove forests in Bengkalis Riau obtain the existence value of the mangrove forests by Rp. 31,967.87 / ha / year (Qodrina, 2012). When compared to the data from the research results, the community assessment in KolonoBay is higher.

4.2.2 Bequest Value

The bequest value of the mangrove forests cannot be assessed by a market approach, therefore the bequest value can be calculated using an approximate approach. The calculation of the bequest value is 10% of the direct use value of the mangrove forest (Ruitenbeek, 1992). The bequest value of the mangrove forest ecosystem in KolonoBay is presented in Table 4.5. as follows:

Table4.5.Bequest Value of Mangrove Forest Ecosystem in Kolono Bay

No.	Types of Benefits	Total Direct Use (Rp./year)	Total of Bequest Use (Rp./year)
1	Acceptance of firewood	228.060.000	22.806.000
2	Fish fishing	578.402.449	57.840.245
3	Shrimp fishing	874.500.000	87.450.000
4	Crab fishing	6.746.025.000	674.602.500
5	Shellfish fishing	29.700.000	2.970.000
Total			845.668.745

4.3 Total Economic Value (TEV)

The total economic value of the mangrove forests in Kolono Bay is the sum of use values and non-use values. The use value consists of direct use value, indirect use value and option value, while the non-use value consists of the existence use value and bequest value. The total economic value of the annual mangrove forest in Kolono Bay is Rp. 22,109,177,695/year (Table 4.6.). If compared to all values ranging from the direct value, indirect use value, option value, existence value and bequest value of the total economic value, the indirect use value has a greater value than the other values. This is because the indirect use value has many benefits that are needed by the community.

Table 4. 6.Total Economic Value of Mangrove Forest in Kolono Bay

Benefits	TEM (Rp./year)	TEM (Rp./ha/year)
TNGL	8.456.687.449	6.538.137
TNGTL	9.988.868.192	7.722.715
TNP	277.054.848	214.200
TNK	2.540.898.462	1.964.450
TNW	845.668.745	653.814
TEM	**22.109.177.695**	**17.093.315**

When compared to the total economic value of the mangrove forests in other regions, this value is relatively smaller, for example the total economic value in Mahakam Delta mangroves reaches Rp. 503,071,398,869.20 (Wahyuni, 2013). The total economic value of mangrove forests on the Arafura Sea coast in 2015 was Rp. 213,344,656,759 (Widiastutiet, al., 2016). The value of the mangrove forest in Buton Regency, Southeast Sulawesi, reached Rp. 204,378,959,794 (Fitrawati, 2001). But the economic value of mangroves in this study is not much different when compared to the total economy value of mangrove forests in the North Minahasa region of Rp. 10,888,218,123 (Ofe and Benu, 2011) or in Bengkalis Riau which was only Rp. 1,409,454,390.00 (Qodrina, 2012). Even with the economic value of mangrove forests in Thailand, which is only 89,127,478 THB (Thai Baht) or around Rp. 34,296,470,832.20 (Jesdapipat, 2012). If the total economic value is divided by the number of family heads in Kolono Bay, definitelythe economic value will be smaller, only Rp. 6,217,429 per family head. This value is greatly different compared to the results of research on the economic value of mangroves in the Bintuni Beach area which is almost Rp. 1.9 billion rupiah per family head (Ruitenbeek, 1992). This is presumably because there has been a shift in the conservation value at the community level as well as the reduced ecosystem services provided by mangrove forests to the surrounding communities at the coastal area. This indicates that there have been exploitation and degradation of mangrove forests for a long time and the impacts are felt by the community at this time which then it reduces the use value of mangrove forests. The people's appreciation for the existence of mangrove forests is relatively small.

The ecosystems in the mangrove forests in KolonoBay area, which are now increasingly reduced in size, must be rehabilitated immediately. Reforestation of damaged areas, both due to logging and land conversion that does not pay attention to environmental sustainability and other consequences must be addressed immediately remembering there are a big economic value that can be obtained in the mangrove forest area.

5 Conclusion And Recommendation

5.1 Conclusion

The economic value of mangrove forests in the Kolono Bay area per year is Rp. 22,109,177,695 or equivalent to Rp. 17,093,315 / ha / year or equivalent to Rp. 6,217,429 per family head. The total economic value consists of direct use value such as benefits in the field of fisheries and forestry of Rp. 8,456,687,449/year, the indirect use value as measured by the value of the construction of breakwater, retaining seawater intrusion, supply of organic materials and carbon absorber by to Rp.9,988,868,192, the option value as measured by the benefits of biodiversity level is Rp277,054,848, the existence value as calculated from the willingness to pay by the community is Rp 2,540,898,462 and the bequest value as measured based on 10% of the direct use value is Rp. 845,668,745.

5.2 Recommendation

The economic values that can be obtained in the mangrove forest resources play an important role in determining management policies. Basically, the management of mangrove forest resources aims to improve the social well-being of the entire community, especially the small fishing community living in the mangrove area of Kolono Bay. This role should be balanced with a balanced investment in the conservation of mangrove resources. The economic value of the mangroves can increase public investment in the form of knowledge on the existence value of the mangrove resources. Therefore, this value can be the basis of policy holders in managing mangrove forest resources so that the sustainability of mangrove forests is maintained so that they can still produce environmental services and therefore, it is greatly necessary for a proper management in order that they can be used for the interests of human and environmental to achieve sustainable coastal development especially in the Mangrove Area in Kolono Bay, South Konawe Regency.

The economic values in mangrove forest resources can also be taken into consideration in the making of the natural resource balance, including by including the degradation of mangrove forest resources. This is in accordance with the mandate of the Law of the Republic of Indonesia Number 32 of 2009 concerning Environmental Protection and Management, which covers the balance of natural resources and the environment, as well as the compilation of gross domestic

product and gross regional domestic products which include depreciation of natural resources and environmental damage life as an instrument of development planning and economic activity, which in this case, the natural resource balance and calculation of Green Gross Regional Domestic Product "Green GRDP" should be used as a consideration in sustainable development planning especially for coastal areas such as the mangrove forests in Kolono Bay, Konawe Regency South.

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