



Total Economic Value of Segara Anakan Lagoon Area

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Abstract

Segara Anakan covers area of waters, mud flat and mangrove forest provide habitat for life and place of variety of flora and fauna. Segara Anakan is unique and very valuable. Segara Anakan, the coastal area of south of Java, has ecological systems associated with the event of sedimentation due to activities of watershed above as well as fisheries and system associated with the social actors, social structures and processes. Segara Anakan as a system which provides complex role is a provider of ecosystem services for the surrounding community. The total economic value Segara Anakan region with an area of 14 807 ha area, which includes District Kampung Laut consisting of 4 villages have a total economic value of IDR 106,631,702,769.80 or USD 59,615,745.27 from each ha of mangrove forest.

Keywords: Mangrove Forest; Segara Anakan Lagoon; Total Economic Value.

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1. Introduction

An economic valuation approach as a framework for analysis in decision making for resource management. Natural resources are a very important factor of production. Rothengatter [1] suggests that the natural resources in addition to functioning as a provider of raw materials for a variety of human needs is also an absorber of pollution generated by the production process. Dixon (1985) in Nurafiarini [2] argues that the growth of public welfare nature over time and continuous and depends not only on production factors but also on the desire and the choice to pay attention to environmental quality and fairness of a commodity.

Nikijuluw [3] states that consumption of resources without management will not only result in quality deterioration of resources but it's also affects the distribution of income and welfare of the community. Therefore, without setting in a good strong construction sector it will be dominant and the weak sector will be reduced and gradually disappear.

Economic valuation is optional approach as a framework for analysis in decision making for resource management. The development of a sector depends not only on economic considerations alone but must also consider other factors such as social, cultural, and even political aspects so economic-bioecology valuation approach can be is used as a foothold in evaluating various aspects on various scenarios for development of the area. In this case the total valuation is carried out to estimate the total economic contribution of an ecosystem in which its society. The value according to Koeshendrajana and his colleagues [4] is the intrinsic value of a resource that consists of the use value and the value of the function that should calculated in policy formulation so that the allocation and management of alternative utilization can be determined correctly and on target.

Segara Anakan Lagoon is one of the natural wealth of potential in providing ecosystem factors of production resources both on the mainland and waters. In this regard, this time famous as a beacon of hope for 3388 of fisherman and 79 335 of people life in the lagoon area.

Segara Anakan region is an area of water potential in the supply of factors of production and environmental services, both mangrove forests, sea and land area. Assessment of the economy in this region using the Total Economic Value (TEV) approach to know all of the economic value of the resources that exist within the region. Total valuation carried out to estimate the total economic contribution of an ecosystems to society.

2. Material and Methods

2.1. Sampling Method

The population that participated in this study is the community, along with related parties, directly or indirectly around Segara Anakan Lagoon Area, in all manner of land use. The number of respondents is determined based on the principle of representation as well as by type of activities that the resources in this area in four villages in Kampung Laut sub district.

2.2. Data Analysis

Table 1: Classification of Functions and Benefits Segara Anakan Lagoon

No.	Study Typology	Classification of Functions and Benefits	Valuation Method
1	<i>Direct use value</i>	<ul style="list-style-type: none"> - The value of mangrove log - The value of mangrove firewood - The value of nipah leaf - The value of mangrove seed - The value of animal wildlife - The value of fisheries (shrimp, crab and clam) - The value of the learning 	<p><i>Market price</i></p> <p><i>Market price</i></p> <p><i>Market price</i></p> <p><i>Market price</i></p> <p><i>Market price</i></p> <p><i>Market price</i></p> <p><i>Surrogate Market Price</i></p>
2	<i>indirect use value</i>	<ul style="list-style-type: none"> - The value of nursery ground - The value of feed production - The value of carbon deposit 	<p><i>Production Function Approach [5]</i></p> <p><i>Benefit Transfer</i></p> <p><i>Benefit Transfer</i></p>
3	<i>option value</i>	<ul style="list-style-type: none"> - The value of biodiversity 	<p><i>Biodiversity value [6]</i></p>

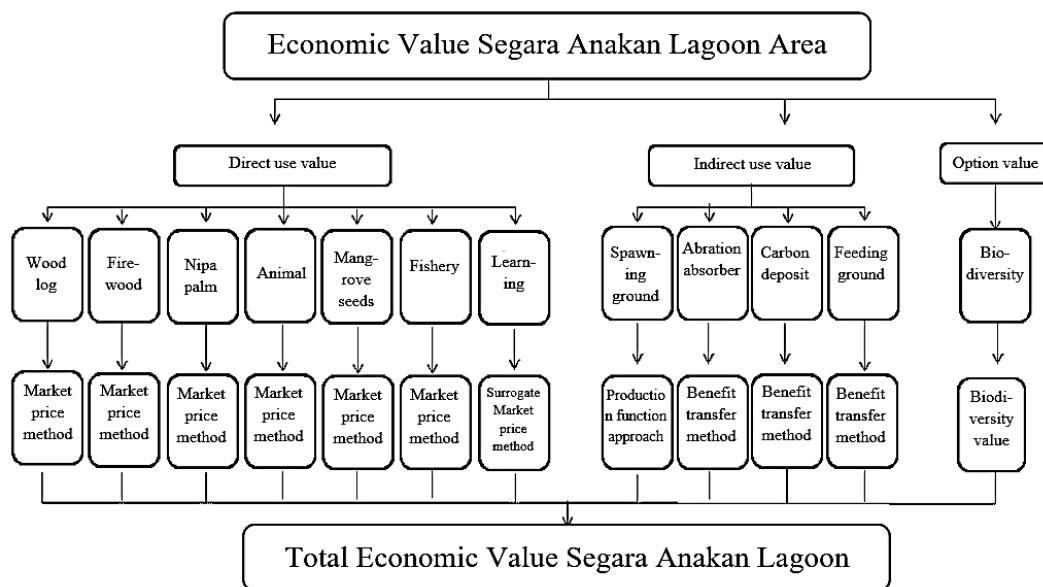


Figure 1: Total Economic Value Assessment Phase Segara Anakan Lagoon Area

The value of resources will be quantified include the value of direct benefits, the value of the indirect benefits of the mangrove. Value of direct benefit includes the value of mangrove wood logs, firewood value, the value of the fishery and the value of learning. The value of the indirect benefits of mangrove cover the value of biological functions as a habitat for spawning ground or nursery ground, litter production and the production of carbon (Table 1, Figure 1).

This calculation is based on the mangrove area, residential area, paddy field, upland area, an area of the pond. The area of the lagoon is not being calculated in the calculation of this economy because of the extent of mangrove and lagoon area of the body of water between 9-17% of the total area of mangrove and lagoon water

bodies, as well as both are part of a close and mutually support one another. It is also based on the statement Rodwell and his colleagues [7] which gives a broad overview of conservation is optimal for 15-25% of the fishing grounds.

Indirect use value, including the value of the biological function as a habitat for spawning / nursery, ecological function, feed production and the production of carbon. Option value is done with the approach of the biodiversity value of benefits obtained from the presence of mangrove forests. Values above all based on primary data that is processed by Landsat in 2016, where there 1788.65 ha of mangrove forest area of 14 807 ha which is an area of research observations.

2.3. Direct Use Value – DUV

Direct use value are the benefits derived directly from the lagoon ecosystems such as mangrove wood and fish [8]. Further Merlo and Briales (2000) in the Vo [9] states more direct benefit is energy resources, fisheries, culture and recreation. The study is in the calculation of the value of direct benefits using the formula:

$$DUV = \sum_{i=1}^n DUV_i$$

Where:

<i>DUV</i>	:	Direct Use Value
<i>DUV₁</i>	:	Value of mangrove wood logs
<i>DUV₂</i>	:	Value of mangrove firewood
<i>DUV₃</i>	:	Value of Nipa Palm
<i>DUV₄</i>	:	Value of Animal Wildlife
<i>DUV₅</i>	:	Value of Fisheries
<i>DUV₆</i>	:	Value of Mangrove seed
<i>DUV₇</i>	:	Value of Learning
<i>DUV_n</i>	:	Direct Use Value _{number-n}

The value of the direct benefits of mangrove wood log is calculated based on the data stands, density and diameter of the timber, using the formula [10]:

$$NMTKM = V_{ha} \cdot (P - C) \text{ (IDR } m^3 \text{ ha}^{-1} \text{ yr}^{-1}\text{)}$$

Where,

NMTKM	:	Value of Mangrove logs benefit
<i>V_{ha}</i>	:	Volume Mangrove Wood ha ⁻¹ year ⁻¹ (½π d ² TK)
P	:	Firewood Price (IDR)

- C : Operational Cost (IDR)
 (Assuming 30% value of woods [11])
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Value of direct benefit firewood is calculated from the average production of firewood made from mangrove in the research site with a formula [11]:

$$NMKB = X_{ha} . (P - C) \text{ (IDR } m^3 \text{ ha}^{-1} \text{ yr}^{-1}\text{)}$$

Where,

- NMKB : Value of Mangrove logs benefit
 X_{ha} : Volume of Mangrove Wood $ha^{-1} \text{ year}^{-1}$ ($\frac{1}{2}\pi d^2 TK$)
 P : Firewood Price (IDR)
 C : Operational Cost (IDR)

Value of direct benefit calculated lagoon fishery includes catches of fish, crabs, clams in the lagoon, and the value of the catch marine shrimp because it assumes was the result benefits of the mangrove environment, following the the formula [10]:

$$NP = H. (P - C)$$

Where:

- NP : Value of fisheries production (IDR $ha^{-1} \text{ year}^{-1}$)
 X_{ha} : Volume of Mangrove Wood $ha^{-1} \text{ year}^{-1}$ ($\frac{1}{2}\pi d^2 TK$)
 P : Price (IDR)
 C : Operational Cost (IDR)

2.4. Indirect Use Value, IUV

Indirect use value are the benefits derived from ecosystems indirectly as well as retaining the abrasion or prevention of seawater intrusion, spawning areas, nursery and feeding ground [8]. Other indirect benefits are mangrove forests as a carbon deposit, water purification, biodiversity, erosion control, as well as the habitat of living creatures (Fausold and his colleagues 1996 in the Vo [9]). In this study, the value of benefits not directly approached by counting benefits biological function and physical function of the lagoon ecosystem. Biological functions as spawning habitat, feed supply capability value and place of nursery and enlargement. Value of physical function in particular emphasis mangrove forests as a carbon deposit. The total value of these benefits are Indirect Use Value (IUV) is formulated as follows:

$$IUV = \sum_{i=1}^n IUV_i$$

Where:

- IUV : Indirect Use Value
- IUV_1 : Nursery or Spawning ground
- IUV_2 : Manufacturer of natural feed
- IUV_3 : Carbon deposit
- IUV_n : Indirect use value _{number-n}

Indirect use value as spawning ground were estimated by using the formula of the relationship regression between extents mangrove fishing effort (effort) and shrimp production, referring to Barbier and Strand (1998), while the indirect benefit of mangrove forests as a carbon sink refers Marlianingrum [11] and benefits food production refers to Sukardjo [12].

2.5. Option Value

Option value of mangrove forest ecosystems in the Segara Anakan Lagoon area approximated using the value of benefits from biodiversity. Benefits of this option is the value of biodiversity which that can be captured from the existence of mangrove forests. Ruitenbeek [12] suggests the value of biodiversity of mangrove forests in Indonesia US \$ 15 / ha / year. Furthermore, the Total Economy Economic Value formulated:

$$TEV = DUV + IUV + OV$$

Where:

- TEV : Total Economic Value
- DUV : Direct Use Value
- IUV : Indirect Use Value
- OV : Option Value

3. Results and Discussion

3.1. Direct Use Value - Wood

The potential of mangrove wood as a building material needs to be taken into account in this economic assessment. Utilization of mangrove wood is used by most people around the lagoon. The value of the direct benefits of trees are calculated based on density and diameter of the timber. The assumptions used in this study is the growth characteristics of mangrove Segara Anakan Lagoon from Santoso research results [13] which showed that the growth of mangroves in Segara Anakan Lagoon area ranged between 12.3 - 26.5 m³ / ha / year or an average of 19.4 m³ / ha / year. This is because the growing conditions mangrove uneven density, the number of weed plants like *Warakas*, *gadelari* and *jerujon* and increased sedimentation in the region. Prices of

wood logs today is USD 100,000.00 and the cost of production of 30% [11] then obtained a net price of timber logs IDR 70,000.00 per m³ of wood in order to obtain the benefits of IDR 1,358,000.00 / ha / year. Thus, in one year the region economic value of timber logs of 3890.1 ha of mangrove forest area in the region is IDR 5,282,755,800.00

3.2. Direct Use Value - Firewood

Mangrove twigs is still a source of energy for most people, especially for people who use natural resources in the lagoon region as brown sugar producers. The results of interviews with 12 respondents brown sugar producers show that they take themselves and partly sold for curing fish. Nakar timber extraction carried out 2-4 times a week primarily made during the afternoon about 2 hours while at 15:30 to 17:30 as much as 0.5 to 1.5 m³ per trip, or an average of 1.13 m³ per trip. Firewood is sold at a price of IDR 50,000.00 per m³. With a capital of cigarettes worth IDR 12,500.00 per day. With the assumed beneficiaries of mangrove wood sticks as kindling for the fuel needs of making brown sugar, then the number of takers firewood is equal to crafters brown sugar in each and every village.

From interviews with community groups note that taker raw sugar from each village is, 55 people taker from Ujung Alang village, 15 takers from Ujung Gagak village, 21 takers from Klaces village and 125 takers from Panikel village, then in this region there are 216 people doing this activity, with an average retrieval are 3 trips per week, then in a year there are 32,400 making the trip with an average of 1.25 m³. Assuming the costs of the provision is IDR12.500,00 each trip and IDR50.000,00 fixed costs as the price of a machete, then the value of firewood the region is IDR 1,609,200,000.00 per year.

Table 2: Economic Value of Firewood Mangrove at Segara Anakan Lagoon Area

Village	n	Trip/year	Production (m ³ /year)	Value (IDR/year)	Operational Cost (IDR/year)	Fixed Cost (IDR/year)	Income
Ujung Alang	55	8,250	10,313	515,625,000	103,125,000	2,750,000	409,750,000
Ujung Gagak	15	2,250	2,813	140,625,000	28,125,000	750,000	111,750,000
Klaces	21	3,150	3,938	196,875,000	39,375,000	1,050,000	156,450,000
Panikel	125	18,750	23,438	1,171,875,000	234,375,000	6,250,000	931,250,000
Total	216	32,400	40,500	2,025,000,000	405,000,000	10,800,000	1,609,200,000

3.3. Direct Use Value – Nipa Palm Leaves

Until now nipa palm leaves are still used some communities for the roofing and wrapping sugar. Seeker palm leaves about 25 people from two villages in the region, namely Panikel and Ujung Alang village. With an

average of four trips per week making, as well as 25 of his belt every trip. With a selling price of IDR 7000,00 every two belts, and retrieval for 40 weeks, then obtained a revenue of IDR 328,750,000.00 per year from Segara Anakan Lagoon area.

Table 3: Economic Value of Nipa Palm on Segara Anakan Lagoon Area

Village	n	Trip/year	Production (m ³ /year)	Value (IDR/year)	Operational Cost (IDR/year)	Fixed Cost (IDR/year)	Income
Ujung Alang	10	1,760	44,000	154,000,000	22,000,000	500,000	131,500,000
Panikel	15	2,640	66,000	231,000,000	33,000,000	750,000	197,250,000
Total	25	4,400	110,000	385,000,000	55,000,000	1,250,000	328,750,000

3.4. Direct Use Value – Animal Wildlife

The animal is rare, but the precious of its animal diversity of mangrove forests will still a main favorite a hunter main wildlife birds and snakes. This activity is much needed expertise and special skills that not many people do. There are about 9 inhabitants of the village of Ujung Alang and Ujung Gagak did. This activity is performed when the dry season about 1-2 trips per week or 15 weeks for a year, in order to get 30 trips a year. Total acquisition of about 2-8 birds with an average of 3 birds / trip. Bird price varies depending on the type, buyer preferences and size, with price of IDR 75,000.00 - IDR150.000,00 per bird, the average price is IDR 100,000.00 per animal revenues are around IDR 250,000.00 / trip. Costs incurred by these hunters are net costs, supplies, capital investments boat with 1 liter of fuel every trip. Value of the benefit of wildlife this region IDR 71,775,000.00 / year.

Table 4: The Economic Value of Animal Wildlife in Segara Anakan Lagoon Area

Village	n	Trip/yr	Production animal wildlife/year	Value IDR/year	Operational cost IDR/year	Fixed cost IDR/year	Boat cost IDR/year	Gas cost IDR/year	Income IDR/year
Ujung Alang	5	150	450	45,000,000	1,875,000	500,000	1,250,000	1,500,000	39,875,000
Ujung Gagak	4	120	360	36,000,000	1,500,000	400,000	1,000,000	1,200,000	31,900,000
	9	270	810	81,000,000	3,375,000	900,000	2,250,000	2,700,000	71,775,000

3.5. Direct Use Value of Fisheries – Crab

The average daily production of crab is 3 kg / trip by the number of fishermen *wadong* and *pintur* in Segara Anakan ranges from 265 fishermen who do *wadong*, the term of arrest by using *wadong*. There is also the use of *pintur* to catch crabs, but it is not a done deal. The average fisherman exerting 30-40 *wadong* in each operation,

and 10 to 15 will be filled with crab *wadong*. Operation *wadong* depending on the tide. Thus every fisherman *wadong* arresting about 270 trips annually. Likewise, *pintur*, only three villagers who did it with catches of about 2 kg per day with an average trip together with *wadong*, 270 trip. With revenues of about 3 kg and 2.5 kg per trip with a selling price of IDR 35.000,00 per kilogram, so every fisherman on average to get the IDR 70000.00 to 105,000.00 per day, before deducting provisions and fuel as much as 1 liter each of his trip, as well as price and *pintur wadong* IDR 20,000.00 each fruit and the life of 1 year. The economic value of this fishery - the crab is IDR 5,949,675,000.00

Table 5: The Economic Value of Fisheries – Crab on Segara Anakan Lagoon Area

a. *Wadong* Gear

Village n	Trip/yr	Result kg/year	Value IDR/year (IDR 35,000/kg)	Boat Cost IDR/year	Operational Cost IDR/year	Gas cost IDR/year	<i>Wadong</i> IDR/year	Income IDR/year	
Ujung Alang	68	18,360	55,080	1,927,800,000	153,000,000	229,500,000	183,600,000	40,800,000	1,320,900,000
Ujung Gagak	59	15,930	47,790	1,672,650,000	177,000,000	199,125,000	159,300,000	35,400,000	1,101,825,000
Klaces	12	3,240	9,720	340,200,000	36,000,000	40,500,000	32,400,000	7,200,000	224,100,000
Panikel	58	15,660	46,980	1,644,300,000	174,000,000	197,750,000	158,600,000	34,800,000	1,083,150,000
	197	53,190	159,570	5,584,950,000	540,000,000	664,875,000	531,900,000	118,200,000	3,729,975,000

b. *Pintur* Gear

Village n	Trip/yr	Result kg/year	Value IDR/year (IDR 35,000/kg)	Boat Cost IDR/year	Operational Cost IDR/year	Gas cost IDR/year	<i>Wadong</i> IDR/year	Income IDR/year	
Ujung Alang	67	18,090	45,225	1,582,875,000	150,750,000	226,125,000	180,900,000	40,200,000	984,900,000
Klaces	9	2,430	6,075	212,625,000	20,250,000	30,375,000	24,300,000	5,400,000	132,300,000
Panikel	75	20,250	50,625	1,771,875,000	168,750,000	253,125,000	202,500,000	45,000,000	1,102,500,000
	151	40,770	101,925	3,567,375,000	339,750,000	509,625,000	407,700,000	90,600,000	2,219,700,000

3.6. Direct Use Value of Fisheries – Clam

Fishery - clams are sideline activities by the majority of clam gatherers, although there are some people who look at it as the main activity, so it is assumed based on *apong* gear there are 131 trips per year and children can do after school interrupted 2-4 times a week.

With the price of IDR 2000.00 per kilogram obtained average acquisition shells is 7-10 bucket or a price IDR 7000.00 per bucket, so that in each trip the fishermen receive IDR 49000.00 / trip.

Thus each year the economic value of clams from this area is IDR 2,220,650.00

Table 6: The Economic Value of Clam on Segara Anakan Lagoon Area

Village	n	Trip/yr	Result kg/year	Value IDR/year (IDR 7,000/bucket)	Operational Cost IDR/year	Fixed cost IDR/year	Income IDR/year
Ujung Alang	80	21,600	151,200	1,058,400,000	270,000,000	16,000,000	772,400,000
Ujung Gagak	70	18,900	132,300	926,100,000	236,250,000	14,000,000	675,850,000
Klases	30	8,100	56,700	396,900,000	101,250,000	6,000,000	289,650,000
Panikel	50	13,500	94,500	661,500,000	168,750,000	10,000,000	482,750,000
	230	62,100	434,700	3,042,900,000	776,250,000	46,000,000	2,220,650,000

3.7. Direct Use Value of Fisheries – Shrimp

Table 7: The Economic Value of Shrimp on Segara Anakan Lagoon Area

a. Gear: *Apong*

Village	n	Trip/yr	Result kg/year	Value IDR/year (IDR 30,000/kg)	Operational Cost IDR/year	Gas Cost IDR/year	Boat cost IDR/year	Fixed Cost IDR/year	Income IDR/year
Ujung Alang	116	15,312	37,514	1,125,432,000	191,400,000	153,120,000	127,600,000	4,640,000	648,672,000
Ujung Gagak	312	41,184	100,901	3,027,024,000	514,800,000	411,840,000	343,200,000	12,480,000	1,744,704,000
Klases	13	1,716	4,204	126,126,000	21,450,000	17,160,000	14,300,000	520,000	72,696,000
Panikel	45	5,940	14,553	436,590,000	74,250,000	59,400,000	49,500,000	1,800,000	251,640,000
	486	64,152	157,172	4,715,172,000	801,900,000	641,520,000	534,600,000	19,440,000	2,717,712,000

b. Gear: *Jala*

Village	n	Trip/yr	Result kg/year	Value IDR/year (IDR 30,000/kg)	Operational Cost IDR/year	Gas Cost IDR/year	Boat cost IDR/year	Fixed Cost IDR/year	Income IDR/year
Ujung Alang	42	10,080	27,720	831,600,000	126,000,000	100,800,000	84,000,000	3,360,000	517,440,000
Ujung Gagak	20	4,800	13,200	396,000,000	60,000,000	48,000,000	40,000,000	1,600,000	246,400,000
Klases	4	960	2,640	79,200,000	12,000,000	9,600,000	8,000,000	320,000	49,280,000
Panikel	23	5,520	15,180	455,400,000	69,000,000	55,200,000	46,000,000	1,800,000	283,360,000
	89	21,360	58,740	2,055,900,000	267,000,000	213,600,000	178,000,000	7,120,000	1,096,480,000

c. Gear: *Jaring*

Village n	Trip/yr	Result kg/year	Value IDR/year (IDR 30,000/kg)	Operational Cost IDR/year	Gas Cost IDR/year	Boat cost IDR/year	Fixed Cost IDR/year	Income IDR/year	
Ujung Alang	108	15,552	33,437	1,003,104,000	194,400,000	155,520,000	129,600,000	8,640,000	514,944,000
Ujung Gagak	207	29,808	64,087	2,243,052,000	372,600,000	298,080,000	248,400,000	16,560,000	1,307,412,000
Klases	13	1,872	4,025	140,868,000	23,400,000	18,720,000	15,600,000	1,040,000	82,108,000
Panikel	69	9,936	21,362	747,684,000	124,200,000	99,360,000	82,800,000	5,520,000	435,804,000
	397	57,168	122,911	4,134,708,000	714,600,000	571,680,000	476,400,000	31,760,000	2,340,268,000

The economic value of shrimp on this area is IDR 6.154.640.000,00.

The fishermen Segara Anakan perform shrimp fishing using nets *Apong*, otheK nets and nets. *Apong* nets is similar trawl nets bag fitted with a settled somewhere overlooking the water flow receded. OtheK is a small mesh nets operated in shallow waters. Within a year, netting *Apong* operated approximately 132 trip with production of about 2.45 kg per trip, nets 240 trip with production of 2.75 kg per trip, and the trip to the 144 net production of 2.15 kg per trip, with an average price of IDR 30,000.00 per kg. Each number of fishermen in each of the activities listed in Table 7. The results of each gear in the lagoon.

3.8. Direct Use Value of Fisheries – Fish

Fishers use several types of gears, such as bag nets, nets and fishing rods. When the fishing line is rarely used except for recreation. Fishing with a net bag or *Apong* made about 132 trips per year and mesh with 240 trips per year per fisherman, with calculations at high tide with the production of fish caught by an average of 4.5 kg using *Apong* and the average catch of 3 kg using nets and nets an average of 2:15 kg obtained mullet and other fish like bloso with an average price of IDR 20,000.00. Fishermen fishing is the same as the population of the shrimp fishermen who use the same gear.

Table 8: Value Benefits of Fish in Segara Anakan Lagoon Area

a. Gear: *Apong*

Desa n Village	n	Trip/th Trip/yr	Hasil Result kg/yr	Nilai Value IDR/Year (IDR 30,000/kg)	Riaya Rekal Operational Cost IDR/Year	RRM Gas Cost IDR/Year	Riaya ngrahu Boat Cost IDR/Year	Biaya Tetap Fixed Cost IDR/Year	Penghasilan Income IDR/Year
Ujung Alang	116	15,312	68,904	1,378,080,000	191,400,000	153,120,000	127,600,000	4,640,000	901,320,000
Ujung Gagak	312	41,184	185,328	3,706,560,000	514,800,000	411,840,000	343,200,000	12,480,000	2,424,240,000
Klases	13	1,716	7,722	154,440,000	21,450,000	17,160,000	14,300,000	520,000	101,010,000
Panikel	45	5,940	26,730	534,600,000	74,250,000	59,400,000	49,500,000	1,800,000	349,650,000
	486	64,152	288,684	5,773,680,000	801,900,000	641,520,000	534,600,000	19,440,000	3,776,220,000

b. Gear: *Jala*

Desa	n	Trip/th	Hasil	Nilai	Riase Balgal	RRM	Riase kapal	Riase tetap	Danahasilan
Village	n	Trip/yr	Result	Value	Operational Cost	Gas Cost	Boat Cost	Fixed Cost	Income
			kg/yr	IDR/Year	IDR/Year	IDR/Year	IDR/Year	IDR/Year	IDR/Year
				@ Rp 20.000/kg					
Ujung Alang	42	10,080	30,240	604,800,000	126,000,000	100,800,000	84,000,000	3,360,000	290,640,000
Ujung Gagak	20	4,800	14,400	288,000,000	60,000,000	48,000,000	40,000,000	1,600,000	138,400,000
Klaces	4	960	2,880	57,600,000	12,000,000	9,600,000	8,000,000	320,000	27,680,000
Panikel	23	5,520	16,560	331,200,000	69,000,000	55,200,000	46,000,000	1,840,000	159,160,000
	89	21,360	64,080	1,281,600,000	267,000,000	213,600,000	178,000,000	7,120,000	615,880,000

c. Gear: *Jaring*

Village	n	Trip/yr	Result	Value	Operational Cost	Gas Cost	Boat Cost	Fixed Cost	Income
			kg/yr	IDR/Year	IDR/Year	IDR/Year	IDR/Year	IDR/Year	IDR/Year
				@ Rp 20.000/kg					
Ujung Alang	108	15,552	33,437	668,736,000	194,400,000	155,520,000	129,600,000	8,640,000	180,576,000
Ujung Gagak	207	29,808	64,087	1,281,744,000	372,600,000	298,080,000	248,400,000	16,560,000	346,104,000
Klaces	13	1,872	4,025	80,496,000	23,400,000	18,720,000	15,600,000	1,040,000	21,736,000
Panikel	69	9,936	21,362	427,248,000	124,200,000	99,360,000	82,800,000	5,520,000	115,368,000
	397	57,168	122,911	2,458,224,000	714,600,000	571,680,000	476,400,000	31,760,000	663,784,000

Economic Value of fisheries this area is IDR 5.055.844.000,00 each year.

3.9. Direct Use Value of Fisheries – Mangrove Seed

The next direct benefit is the availability of mangrove seedlings. The value of the benefits of the availability of mangrove seeds sold to projects or activities to rehabilitate mangrove, mangrove seedlings obtained from the value produced by society Kampung Laut. At this time needs around the mangrove seedlings and also for education and research as well as improvement of coastal land around 1 million trees, with the price of IDR leaves ready for planting 6. 1000.00 per tree. Nursery costs around IDR 340.00 / seed covering media, bamboo, rope, plastic, labor costs IDR 620.00 / seed for the preparation *bedengan*, mangrove fruit collection, filling soil in the polybag, planting and maintenance, as well as equipment costs USD 10.00 / seed and the cost of building supplies seedlings IDR 30.00 / seed.

Adopting this approach, if the community Kampung Laut can produce 350,000 seeds per year, then the benefits gained IDR 350,000,000.00 / year. With costs reduced by 50%, assuming a nursery near, mangrove fruit available, labor is a part-time job and does not rent land and property of the masses in their own yard, then obtained a net benefit value 350,000 seedlings x IDR 500.00 = IDR 175,000,000.00 / year. The value of these benefits requires labor costs IDR 108,500,000.00 (350,000 seedlings labor costs 50% x IDR 620.00), so that the value of the net benefits of this region of mangrove seed is IDR 66,500,000.00 per year.

3.10. Direct Use Value – Value of Learning

Value of learning which includes travel, where the function of this lagoon as a system that is unique so interesting to learn, as well the activities of the current sea will enter harvest fish period. Value learning with regard to education and research in this area is IDR 10201.00 / ha / year. It is based on the calculation in 2014, there are 12 research and three field visits. The research activities involving 1-7 people in each team, an average of 5 persons in each team with a range of about 5 days. Field trips, such as students doing practical work, have

an average of 30-40 participants with a range of 2 days. These visitors usually rent a boat or vessel IDR 250,000.00 to 500,000.00 / trip and the accommodation costs IDR 50.000,00 per day per person.

Table 9: Benefits of Learning on Segara Anakan Lagoon Area

Activity	Freq	Participant (person)	Resident day	Total	Accommodation cost (IDR)	Boat rent (IDR)	Boat cost (IDR)	Accommodation (IDR)	Nett value (IDR)
Research	10	5	5	250	12,500,000	25,000,000	12,500,000	7,500,000	17,500,000
Field trip	3	3	1	9	450,000	1,500,000	750,000	270,000	930,000
Study field trip	4	35	2	280	14,000,000	4,000,000	2,000,000	8,400,000	7,600,000
Tourism	52	20	1	1040	52,000,000	13,000,000	13,000,000	31,200,000	20,800,000
									46,830,000

3.11. Indirect Use Value – Spawning Ground

The value of benefits lagoons and mangrove forests as a habitat for spawning calculated through modeling approaches regression relationship between the extent of mangrove, fishing effort and the production of shrimp. Shrimp production is determined based on production of shrimp dominant namely *P. Merguensis* (jerbung / cap / white), *M. Ensis* (dogol), *P Monodon* (Tiger shrimp) landed on the 11 TPI in Cilacap. All three are in the life cycle of shrimp, juvenile and pre-adult phase grow in the lagoon. The growth of production of marine shrimp catches, fishing effort and extensive mangrove for 14 years (1999-2012) is presented in Table 11 below.

Based on the results of the regression of the data 1999-2012, the results of the biological parameter estimates following the combination of α determination, r , and q is the result of constant comparison of the model. The regression analysis correlation between the production of shrimp, fishing effort, and extensive mangrove so obtained equation [2]:

$$h = 0,01051EM - (-0,00029E2 = 0,01051EM + 0,00029E2$$

Table 10: Recapitulation Analysis of Benefits and Costs on Segara Anakan Lagoon Area

Type of benefits	Benefit value IDR/year	Cost IDR/year	Nett Benefit IDR/year
Mangrove			
1 Log	7,546,794,000	2,264,038,200	5,282,755,800
2 Firewood	2,025,000,000	415,800,000	1,609,200,000
3 Nipa palm leaf	385,000,000	56,250,000	328,750,000
4 Biota	81,000,000	9,225,000	71,775,000

5	Mangrove seed	175,000,000	108,500,000	66,500,000
6	Fisheries			
	Crab			
	<i>Wadong</i>	5,584,950,000	1,854,975,000	3,729,975,000
	<i>Pintur</i>	3,567,375,000	1,347,675,000	2,219,700,000
	Total	9,152,325,000	3,202,650,000	5,949,675,000
	Clam	3,042,900,000	822,250,000	2,220,650,000
	Shrimp			
	<i>Apong</i>	4,715,172,000	1,997,460,000	2,717,712,000
	<i>Jala</i>	1,762,200,000	665,720,000	1,096,480,000
	<i>Jaring</i>	4,134,708,000	1,794,440,000	2,340,268,000
	Total	10,612,080,000	4,457,620,000	6,154,460,000
	Fish			
	<i>Apong</i>	5,773,680,000	1,997,460,000	3,776,220,000
	<i>Jala</i>	1,281,600,000	665,720,000	615,880,000
	<i>Jaring</i>	2,458,224,000	1,794,440,000	663,784,000
	Total	9,513,504,000	4,457,620,000	5,055,884,000
7	Value of study	122,450,000	75,620,000	46,830,000
	Value of economy =	42,656,053,000	15,869,573,200	26,786,479,800

Source: Primary Data Processing

Where,

- h : Shrimp productions
 E : Catch effort
 M : Mangrove area

With an average price of shrimp in the Cilacap region of each shrimp *jerbung* IDR 70.000,00 - IDR 100.000.00 / kg with an average IDR 85.000,00, shrimp cap IDR 40.000.00 / kg, shrimp *dogol* IDR 30.000,00 - IDR 40.000.00 / kg and tiger shrimp / *Tepus* IDR 110.000.00, with the percentage composition of the shrimp fishing in 2013 was 37%, 34%, 18% and 11%, are used to determine the economic value as the breeding habitat is IDR 324,456,473,718.92 with an area of research Nurfiarini [2] is 8,234 ha, or IDR 39,402,277.98 / ha. Thus, in this study, with an area of 1788.65 ha of mangrove forest is the value of his benefits IDR 70,476,884,509.00.

3.12. Indirect Use Value – Carbon Deposit

Based on research Marlianingrum [11] who is doing research mangroves in the island Belakang Padang, which

has similarities with mangrove in the area Segara Anakan dominated by Rhizophora and Nipa Palm, capable of carbon storage reached 1.81 tons / ha. Based on that estimate the value of the benefits of carbon storage in the Segara Anakan can refer to the value of the benefits of carbon storage in the island Belakang Padang ie 1.81 tonnes / ha. When considered 1 US \$ currently is USD 13370.00, based Fankhauser and his colleagues [14] stating carbon exchange rate is US \$ 20 per ton of carbon, then the value of the benefits of carbon storage in the region's Segara Anakan research sites 1788.65 ha is IDR 860,913,018.00 per year or IDR 481,320.00 per ha.

Table 11: Shrimp Production development (H), Capture Effort (E) and Area of Mangrove

Year	Shrimp productions (kg)^a	Catch effort (E)^a	CPUE (kg/trip)^a	Mangrove area (ha)^b
1999	2,923,913.21	44,600	65.56	10,520
2000	1,308,453.28	45,280	28.90	10,118
2001	1,355,293.50	45,500	29.79	9,812
2002	1,865,728.20	46,120	40.45	9,677
2003	2,014,639.37	46,680	43.16	9,544
2004	2,039,335.80	47,700	42.75	9,272
2005	1,849,396.01	48,330	38.27	9,255
2006	2,263,023.18	48,900	46.28	9,238
2007	1,385,638.77	50,240	27.58	9,032
2008	2,181,908.82	51,170	42.64	8,830
2009	1,263,514.95	55,625	22.71	8,633 ^c
2010	746,661.55	44,500	16.78	8,440 ^c
2011	1,701,856.70	69,760	24.40	8,252 ^c
2012	1,953,799.68	68,240	28.56	8,037 ^c

3.13. Indirect Use Value – Sea Intrusion Barrier

Based on the calculation Paryono [15], the indirect benefits of mangrove forests when the measuring 12089.99 benefit IDR 38,628,739,140.00 or USD 3,277,814.00 / ha. The current exchange rate is US \$ 9780.00 per US dollar, then the value of the seawater intrusion barrier today is USD 4,481,019.83 / ha or IDR 8,014,976,113.52 in the lagoon area immediately these seedlings.

3.14. Indirect Use Value – Feed Production

Sukardjo [12] in his research in the area of Kapuk Muara Angke mangrove states that overlay produce litter fall

as much as 13.08 tons / ha / year or around 4.85 tons dry weight / ha / year. Biomass contains nutrients N 10.5 kg / ha or the equivalent of 23.33 kg of urea, of P or Phosphor 4.72 kg / ha / year, equivalent to 13.11 kg of fertilizer SP-36. If the price of urea IDR 1800.00 / kg and SP-36 fertilizer IDR 2,500.00 / kg of the obtained benefits of mangrove litter as a feed source is IDR 74769.00 / ha / year, so that the economic value of the feed production the region IDR 133,735,572.00

3.15. Indirect Use Value – Biodiversity

Value biodiversity refers to Ruitenbeek [6] that the value of mangrove forest biodiversity Indonesia US \$ 1,500 / km2 / year or US \$ 15 / ha / year. The calculation delivers the existence of regional biodiversity value of IDR 358,713,757.50

3.16. Total Economic Value of Mangrove Forest Ecosystem Benefits on Segara Anakan Lagoon Area

The total economic value to the region Segara Anakan covering 14 807 ha of IDR106.631.702.769,80, both now and in the natural state in case of sedimentation that meet the water body as a result of the dynamics of land change Segara Anakan Region through the valuation of ecosystem services approach with various scenarios relating to land use change and designation.

Table 12: Economic Value of Total Benefits Mangrove Forest Ecosystems in Central Segara Anakan covering 14 807 ha in 2016

No	Benefit value	Value (IDR/year)
1	Direct benefit	26,786,479,800.00
2	Indirect benefit	79,486,509,212.30
3	Option value benefit	358,713,757.50
Total		106,631,702,769.80

Source: Primary and Secondary Data Processing

4. Conclusion

The total economic value Segara Anakan region with an area of 14 807 ha area, which includes District Kampung Laut consisting of 4 villages have a total economic value of IDR 106,631,702,769.80 or USD 59,615,745.27 from each ha of mangrove forest.

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