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Analysis of Economic Potencial of Urban Forests in Serang City

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Abstract—Serang City is the capital of Banten Province, whose existence is surrounded by regencies / cities in Banten province. The city of Serang, is currently a center of activity, and the center of migration from the surrounding regency areas which results in the rapid growth of the population of the city of Serang. Thus, of course, this population growth affects development, both physical development and non-physical development. Industrial development, for example, according to Bappeda Kota Serang (2015) in 2014 increased by 1,114 units compared to 2013 which was only around 1,000 units, then an increase in housing construction in 2015 has taken up an area of 89.95 km2. These two components will directly and indirectly change the physical structure of the city such as land conversion and change the urban ecosystem. Thus the available space will experience an increase in environmental burden, considering that the city of Serang only has an area of about 266.74 km2. This study aims to analyze the economic value of urban forests in the city of Serang based on people's willingness to pay. This research method uses the total willingness to pay (WTP) value of visitors and the public with a contribution period per visit per year. The results of this study indicate the economic value of urban forests obtained at 141,828,000 / year.

Keywords: urban forest, economic, willingness to pay

I. INTRODUCTION

The City of Serang currently (2016) has a city forest of around 1.4 hectares (Bappeda of the City of Serang, 2016), ccording to the researchers' observations the condition is poorly maintained and does not look like an urban forest in general, within its area there are only trees, so its existence is not maximal as its ecological function in providing positive values to the environment. With these conditions it is necessary to have a breakthrough concept of urban forest development in the City of Serang so that its existence is not only a condition, but also must provide maximum functions for improving environmental quality, so that it can support city life.

Based on field observations, the existence of urban forests in Serang City still does not meet standards, such as the Serang City city forest which has an area of 1.4 hectares (Bappeda Kota Serang, 2016). This area does not meet the requirements of the Law (PP.No.63 of 2002) namely urban forest area 10% of the total area of the city, then also the uneven distribution of urban forest and the quality of urban forest which is still low and the management of urban forest that has not been taken seriously. So that management needs to be improved so that its function in providing environmental services produced by urban forests can be felt directly like urban forests can be used as water catchment sites that can be used as a source of community life, urban forests can be used as community recreation areas around the City of Serang, forests cities can function as economic investments, urban forests can be relied on as CO2 absorption areas, urban forests can function as city noise dampers and others, so it is necessary to increase the area of urban forests by adding vegetation in their areas and with an even distribution in the Region City.

II. METHOD

This research uses the calculation method of economic analysis which is divided into three parts; the first is the economi calculation of urban forests from the value of willingness to pay, both calculate the economic potential of carbon sequestration, and the third is calculating the economic potential of breakfast water.

Calculation of economic potential from willingness to pay with the formula:

. (1)

$$(EWTP) = \frac{\sum_{i=1}^{n} Wi}{n}$$

Where:

EWTP	: Estimated Average (WTP) (Rp)
Wi	: Value (WTP) to i (Rp)
N	: Number of Respondents (people)
I	: Respondents to i who are willing to pay the entrance fee
	: (i = 1,2,3, ..., n)

Calculation of the economic potential of carbon sequestration using the formula:

Y = 42.69 - 12.800 (D) + 1,242 (D2)

Where: Y: biomass value (kg / m2).

D: diameter (cm).

To determine the carbon content in the Serang City Forest area is 0.5 of tree biomass. The unit used for carbon content is tons per ha. To get the carbon sequestration value, adjusted to the carbon selling price prevailing in the international market which is 10 US $ per ton (Balittanhut, 2007 in Yulief 2008).

$Hk = CO\ x\ nC$ 2)

Where: HK : CO absorption price (Rp / ton).
CO : carbon content in wood (kg).
nC : carbon value (Rp / ton).

Calculation of the economic potential of water absorption with the formula:
by using the calculation of the Water Acquisition Value (NPA) obtained by the formula:
$NPA = V\ x\ HAD \ldots$ 3)

Where :
V : Water Volume (m3)
HAD : Basic Water Prices
HAD : Fn Air X HAB
Where :
Fn Water : Water Value Factor
HAB : Raw Water Prices

III. Results and Discussion

TABLE 1. DISTRIBUTION OF CITY PARK VISITORS BASED ON PLACE OF ORIGIN

Zona	Responden		Total Population	Average income	Average Lenght of education	Average Age	Average Travel Costs	Average Distance	Average travel time
	Frekuensi	Presentase							
Serang	41	41	207.065	2.000.000	12	32	25.000	03.05	14
Taktakan	15	15	78.384	1.250.000	12	25	50.000	10.06	27
Cipocok	27	27	80.862	1.750.000	13	19	27.000	05.09	17
Curug	9	9	47.175	850.000	13	24	33.000	08.01	23
Kasemen	3	3	87.794	500.000	12	19	45.000	09.02	31
Walantaka	3	3	75.681	750.000	10	17	43.000	07.09	19

Source: Data Processing Results

Visitors came from the city of Serang with 41 people percentage 41% of the total number of respondents. The highest average income is in Serang City with an average of IDR 2,000,000. Average length of education is generally between 10-16 years of education. Components of travel costs (Travel Cost) which consists of the cost of entrance and parking tickets, transportation costs (fuel), food costs, drinking, and other additional costs. The average cost incurred by visitors in the range between Rp 25,000 to Rp 50,000, - to visit the urban forest. The average distance a visitor must travel to the urban forest from each zone is between 3.5 km to 10.6 km and the average travel time is 14 minutes to 31 minutes.

The economic value of urban forest results from the calculation of the economic value of the environment obtained the following results, as contained in Table 2:

TABLE 2. THE ECONOMIC VALUE OF URBAN FORESTS

Amount Responden (N)	**Total Travel Costs Repsonden**	**Average Travel Costs Responden**	**Average Number of Visitors / year**
100	Rp. 2.676.000,-	Rp. 26.760,-	5.300

Source: Data Processing Results

Economic value = Average travel costs x Average number of visitors / year
= 26,760 x 5,300
= 141,828,000 / year

Based on the calculation of the economic value of the Serang City urban forest, the average consumer's travel costs are multiplied by the number of visits per year. In this study using a sample of 100 respondents showed that the economic value generated from the average annual visitors of 5,300 visitors with an average travel cost per person of 26,760, -, the economic value of urban forests obtained from the Travel Cost Method of 141,828 .000 / year.

Based on, the National Standardization Agency (2011) measurements were made on stands and pole levels with diameters of 5 - ≥ 20 cm and levels of trees with diameter ≥ 20 cm. Total carbon stored assuming that the carbon content is approximately 50% of biomass (Brown and Lugo, 1984).

The results of the calculation of the number of trees in the city forest of Serang City, there are 576 trees with an average height of more than 10 m and a diameter of 5 cm, with a total biomass of 710,415.93 kg / m2 and a total carbon of 355,207.47 kg / m2. Then the potential economic value of carbon uptake from the Serang City urban forest is Rp. 4,972,400 tons / year.

Urban forests have high infiltration, because they are supported by land surfaces that have trees when compared to non-forest land surfaces. Root systems of plants and litter that turn into humus will increase the number of soil pores. Because humus is hygroscopic with the ability to absorb large amounts of water, so the soil water content of the forest will increase. This statement has been supported by the results of the study of Purwanto and friends (1989) which showed that the accumulation of infiltration water was far more common in land with forest plants (Eucalyptus sp, Pinus merkusii, and Maesopsis sp) than in land with seasonal plants and lower plants (Eupatorium sp). The results of this study confirm that forest areas have a better function in regulating water systems than non-forested areas such as agricultural areas and residential areas (Hamdani, 2001). The economic value of Serang city forest water catchment is calculated based on the

ability of trees to be able to hold water. This was stated by Kodoatie and Sjarief (2006), which assumed that a 10-year-old tree could hold water about 7 m3 equivalent to 5 m3 of wood. Trees in urban forests are on average 10 years old. From the calculation results obtained that with a total of 576 trees the potential value of water absorption is 4,032 m3.

Furthermore, to calculate the economic value of the Serang City urban forest water catchment, it is obtained from the amount of costs incurred by the population for ground water usage, which is Rp 4,512, - the price of raw water, so that a figure for the value of the water base (HDA) value is Rp 125,433,6 .- so the economic value of the Serang City urban forest water catchment is Rp. 505,748,275 per year.

IV. Conclusion

The relationship of urban forests to the economy, from the calculation of the economic potential of urban forests through three approaches, namely willingness to pay, the economic potential of carbon dioxide absorption, and the potential economic value of water catchment, shows that there is a potential economic value of Rp.11,746,327,240 / year.

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