

# Economic valuation of whale shark tourism in Cenderawasih Bay National Park, Papua, Indonesia

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**Abstract.** Anna Z, Saputra DS. 2017. *Economic valuation of whale shark tourism in Cenderawasih Bay National Park, Papua, Indonesia. Biodiversitas 18: 1026-1034.* The whale sharks aggregation in the waters of Cenderawasih Bay has an impact on improving the marine tourism industry in the region. On the other hands, Whale Shark is one of the species listed in the Red List of Threatened Species by the International Union for Conservation of Nature (IUCN), the vulnerable status, means that a whale shark populations have been reduced by 20% to 50% within 10 years or three generations. The decline numbers of whale sharks caused by human activities that damage the fish and the habitat, such as fishing and tourism activities. This is due to the lack of public awareness about the function and value of these resources and its habitat. The whale shark has inherent value as marine resources, and has an environmental services value, in relation to tourism activities. This paper measures the economic value and environmental services of the whale shark and its habitat. The method of Travel Cost is used to calculate the value of expenditures incurred by both foreign and local tourists. The study also measured the value obtained by tourist operators, the value of fishing activities, and the value of the habitat, through the people's Willingness to Pay (WTP), using Contingent Valuation Method (CVM). From the result of the overall economic valuation can be determined the estimated value of whale shark tourism, as well as Cenderawasih Bay National Park area, amounted to IDR 35.5 trillion. The policy implication of this research is the need for appreciation of the whale sharks value, as well as its habitat, by managing and developing conservation areas, and community capacity building on the understanding of the importance of whale sharks and its conservation.

**Keywords:** Whale shark tourism, economic valuation, Travel Cost Methods, Contingent Valuation Methods, Willingness To Pay

## INTRODUCTION

Indonesian economic condition that has not much been improving in recent decades, coupled with the depletion of natural resources and environmental degradation which is also worsened, prompting the need for more innovative thought, to develop more environmentally sound and sustainable economic activities, and reduce the pressure of exploitation of natural resources and the environment. One of the activities that are considered to provide a significant economic contribution to the future, when the exploitative of nonrenewable natural resources, such as oil, gas, and minerals were already short, is tourism (WTTC 2015)

A wealth of natural resources and the environment with an incredible potential, which can be relied upon for the tourism development in Indonesia, is a coastal and marine resource. Those resources are storing wealth and natural beauty, which can be benefited to be developed sustainably, as a tourism industry. One of the areas, now of concern and have a high demand to be developed as a marine tourism destination in Indonesia, is Cenderawasih Bay. This area has an extraordinary wealth of biodiversity and natural beauty that is difficult to surpass by other coastal areas in Indonesia. One particular biodiversity in this area, which is hard to find in other coastal areas in Indonesia, is the species aggregation of Whale sharks that can be seen throughout the year, as the region is a habitat for the species (Stacey et al. 2008; Mangubhai et al. 2012).

The whale shark (*Rhincodon typus*), is one of the rare species with the largest size among other fish in the sea (Last and Stevens 1994; Chen et al. 1997; Compagno 2001; Andrzejacze et al. 2017). This species has the high migratory capability and has their habitat in tropical and warm seas (Colman 1997; Colman 1997b). These species included in the red list of the International for the Conservation of Nature (IUCN 2017), as a species whose status is particularly vulnerable because its population reduced by between 20-50%, for 10 years or three generations of the whale shark. This fish is also included in the list of Appendix II of the Convention on International Trade in Endanger Species (CITES 2017), which requires regulations to be more cautious in the trade of products of this species, to prevent population decline. The population decline can also be indicated by the decrease in the total catch, reported by several studies including Watts (2001), Theberge and Dearden (2006), and Myers et al. (2007).

The decline of the whale shark population is due to their habitat in coastal waters, which is vulnerable to anthropogenic activities, including illegal, unreported and unregulated (IUU) fishing. The whale shark caught a lot in some areas because it is believed to have various benefits for health, so the demand for this species is quite high, especially in China and Taiwan. The scarcity of whale shark is also due to the whale shark habitat in the coastal waters which is susceptible to many human disturbances, including tourist's activity and water transportation. Whale

shark population decline was also due to the slow growth rate of these fish (Norman and Catlin 2007).

However, tourism activities aimed to see a whale shark sightings, considered to be less destructive and provide greater economic benefits than the hunting of the whale shark (Davis et al.1997; Bentz 2013; O'Malley et.al 2013; Cagua et.al. 2014). Study of economic valuation of O'Malley et al. (2013), which is supported by Wild Aid, found that fish Manta Ray, worth the US \$ 1 million dollars in tourism activities, compared with earned income for only \$ 40- \$ 500 USD if fish captured and killed. Thus the value of Manta Ray of life, 2000 times greater than when captured and died.

Whale shark tourism activity became popular in Indonesia, and Cenderawasih Bay became one of the destinations that are quite promising to be developed. Cenderawasih Bay National Park (CBNP), is a conservation area, which consists of the land area of 68,000 ha, includes the coastal plains, around 12,400 ha, and land on the islands of 55 800 ha, as well as extensive water/sea with an area of 1.3853 million ha, covering the coral reef area of 80,000 ha, and the sea of 1.305 million ha (Pattiselanno 2005; Pattiselanno and Jimmy 2014). The purpose of the enactment of CBNP, is to maintain and preserve the function of the region and to preserve the diversity of flora, fauna, and ecosystems found in the region.

Information on the economic value of tourism whale shark is very important to note for management purposes. Decision-making regarding the development of the area is one that should be executed by the government. An economic valuation is a tool that can be used to calculate the benefits and costs of trade-off, of the policies to be taken. This study is expected to be a valuable input for the decision-making process, therefore good for biodiversity conservation of whale shark, the continued of tourism development and management of the marine park area.

## MATERIALS AND METHODS

To understand the development of tourism whale sharks in Cenderawasih Bay, this study concentrates on the non-market value of the whale sharks in Cenderawasih Bay, as seen from the value of tourism whale sharks, using the value of consumer surplus (CS) derived from the community's reveal preferences, through their pattern of expenditures, in visiting CBNP, to see the whale sharks. The CS value is a proxy of Willingness to Pay (WTP) of the society, in watching these species in their habitat, which in this case can be interpreted as a willingness to conserve value (let the whale sharks live in the wild) and enjoy the environmental services of the species. The study also calculated the value of the region of CBNP, using economic valuation techniques for non-use value, state preference. Contingent Valuation Method (CVM) is hired to obtain the value of the community per ha per year (WTP) of CBNP, towards conservation, so that the region's biodiversity is maintained. In addition, to assess the market value of the CBNP region, it is also calculated the value of

fishing activities in the region, which is calculated directly from the survey to the fishermen of their net income.

Whale sharks habitat in Cenderawasih Bay National Park (CBNP) region, located in the waters of Kampung Akudiomi or commonly known as Kwatisore, Subdistrict of Yaur, Nabire District, Papua Province, Indonesia. The study was conducted in Cenderawasih Bay, using the questionnaires to fishermen, tourists and tourist operator, to determine the value of revenue from capture fisheries, expenditure of tourists and other costs to be incurred by tourists through tourist operators, as well as the tourists' WTP to manage the CBNP.

The number of respondents interviewed during the study includes 71 respondents, comprised of 20 fishermen, 1 tourist operator, 36 local tourists, and 14 foreign tourists. Analysis of revealed preference can be obtained from tourist's expenditures, using the Travel cost methods (Wood and Trice 1958; Clawson and Knetsh 1966; Carr and Mendelson 2003).

The method is used to analyze the demand for outdoor recreation, in this case, enjoy the attractions of whale sharks in CBNP. This study uses the individual travel cost methods. The method examines the cost of each, to come to tourist's destination. By knowing the pattern of consumer expenditure, then the value of consumers for environmental services can be known. To understand the relationship between the number of visits to several economic and socio-demographic variables, we use a simple regression (OLS). The equation is built with the hypothesis that a visit to the tourist attractions, will be greatly influenced by the cost of travel, and it is negatively correlated. Thus the demand curve has a negative slope. The demand function equation is a formula:

$$V_{ij} = f(C_{ij}, I_{ij}, x_{ij})$$

Where:

$V_{ij}$  = No of visit per year

$C_{ij}$  = Tourist's Cost/ Expenditure per visit

$I_{ij}$  = Income

$x_{ij}$  =Other sociodemography variables, such as age, education, dummy gender and dummy tourist origin (local and foreign).

From the regression equation, obtained the demand function for the average visitor comes, and the area under the demand curve is the average of the consumer surplus. The demand curve is constructed with the following assumptions: (i) The cost of travel and time costs are used as a proxy for the price of recreation. (ii) The travel time is neutral, meaning not producing utility and disutility. (iii) The visit is a single travel (not multi trips).

In a linear model, the demand function is written as:

$$V = \alpha_0 + \alpha_1 C + \alpha_2 I + \alpha_3 x_{ij}$$

For semi-log model the demand function is:

$$\ln V = \alpha_0 + \alpha_1 C + \alpha_2 I + \alpha_3 x_{ij}$$

The equation can be obtained from the value of consumer surplus, which is a proxy of the tourist's willingness to pay for tourist destinations, which is obtained through the formula for a linear function as follows:

$$WTP = CS = \frac{(\alpha_0 - \alpha_1 \bar{C})^2}{2\alpha_1}$$

While for the semi-log function, use the formula as follows:

$$WTP = CS = \frac{V}{2\alpha_1} = \frac{e^{(\alpha_0 + \alpha_1 T \bar{C})}}{2\alpha_1}$$

Where:

WTP = Willingness to Pay

CS = Consumer Surplus

$\alpha_0$  = Constanta

$\alpha_1$  = Cost coefficient

Tcbar = Choke price, or the maximum cost which can decline the visit to zero ( $v=0$ ).

To obtain the data structure of tourist expenditures, conducted the interview. Tourist expenditure consists of the cost of transportation, expenses for tourism at the site, including the cost of accommodation and food. Expenditure data can also be seen from interviews with tour operators, to determine the cost of the package tour. The value of CBNP, one of which is calculated from the value of the fishery in Cenderawasih Bay, by way of interviews with fishermen at the sites. The value of the fishery is the production per gear per trip per year multiplied by the price per kg, reduced by the cost per trip per year. The average value per fisherman revenue is then multiplied by the number of fishermen population.

The intrinsic value of the whale shark obtained using the Contingent Valuation Method (CVM), following Bateman et al. 2002; Boyle 2003; Smith et al. 2016. The hypothetical market made to get the value of WTP is the willingness to pay of the respondents to be able to see the whale sharks in the wild, which is a proxy of the value of environmental services conservation of whale sharks. Respondents were comprised of local tourists and international tourists. CVM method is also used to see the relationship between the willingness to pay of tourists to the community socio-economic variables. The relationship model analyzed by simple linear regression (OLS), formulated as follows:

$$V_{ij} = f(I_{ij}, A_{ij}, E_{ij}, G_{ij}, DT_{ij})$$

While the WTP Function is:

$$Y = \alpha_0 + \alpha_1 I + \alpha_2 A + \alpha_3 E + \alpha_4 G + dummy\alpha_4 T$$

While the semi-log model formula is:

$$\ln Y = \alpha_0 + \alpha_1 I + \alpha_2 A + \alpha_3 E + \alpha_4 G + dummy\alpha_4 T$$

Where:

Y = WTP

I = Income

A = Age

E = Education

G = Gender

T = Tourist origin (local and foreign)

WTP's value is obtained from the average or median, or modus in the condition where the data has a high range offer. From all the above calculations, the value of Cenderawasih marine park areas, obtained from the total economic value as follows:

$$TEV = (DUV + IUV + XV)$$

Where:

TEV = Total Economic Value

DUV = Direct use Value

IUV = Indirect Use Value

XV = Existence Value

In this study, direct use value and indirect use value is represented by the value of the utilization of the tourism activities (from tourist expenditure) and direct utilization of fishery activities. For non-use value is represented by existence value of WTP of tourists to the conservation of whale sharks.

## RESULTS AND DISCUSSION

### Results

Kampung Akudiomi or commonly known as Kwatisore, in Cenderawasih Bay National Park Region (CBNP), where whale sharks habitat is located has a wonderful natural potential, but infrastructure conditions in Kwatisore and surrounding areas are still limited. There are two accommodations infrastructure provided around Kwatisore, namely: Kali Lemon Resort, which can accommodate about ten people and home stay of DKPOP Nabire, which can hold about four people. To achieve Kwatisore of Nabire, visitors can use two alternative paths, sea and land. Regular sea route, using engine speedboat 2x40 PK, it takes 1 hour. Meanwhile, a landline can be reached by car for 2.5 hours trip. Unfortunately, public transportations from Nabire to Kwatisore and vice versa are not yet available, so tourists have to rent a speed boat or a car to get to the location. The line for mobile phones and the internet connection are also not available on site. Similarly, for the electricity, so it must use an electric generator. In terms of tourism development in the region, some of the institutions involved are the Office of Cenderawasih Bay National Park (BBCBNP); Local Office of Culture, Youth, Sports, and Tourism (DKPOP) Nabire district; tour operators; fishermen, and local communities.

The lack of infrastructure in the region did not deter the tourists to come and see the attractions of whale sharks. Data from BBNTC (2016), the number of visitors in CBNP increased significantly in 2011 (19 times more than in

2010) and continued to increase until the year 2015. The increase in the number of tourist arrivals, continue, as there is growing recognition of whale sharks in CBNP globally. The majority of tourists who visit CBNP are foreign tourists (except the years 2012 and 2015). Increasing the number of visitors also has an impact on improving the Non-Tax State Revenue (Table 1). By taking a random sample through the field survey, and interviews with a structured questionnaire, descriptive statistics obtained from the local tourist respondents as Table 2. As for foreign tourists, the structure of the respondent descriptive statistics can be seen in Table 3.

In order to achieve CBNP, and enjoy the whale sharks attractions, tourists can go directly to Nabire, using aircraft from several major cities in Indonesia. Tourists can take a tour package for IDR 5.000.000 per day, covering Nabire airport pickup, transportation from Nabire to Kwatisore (return), consumption (3 meals and 2 snacks), the use of diving equipment and snorkel, accommodations, and activities in the field. Tourists placed in an inn, near the village, which is named Kali Lemon Resort, which was built by the community with the assistance of organizations Papua Pro. Thus, if seen from the number of foreign tourists there (the average foreign tourist arrivals recorded using this package) assuming local tourists not to use a package tour, the tour operator has a turnover of IDR 3,107,000,000 per year or IDR 6,410,000,000 in 2015.

Some of the tourists come to CBNP using Phinisi (live aboard), which originated from Bali and Sorong. Live aboard usually go into CBNP region through Manokwari, Nabire, or Biak. As live board meaning, which is living on the boat, so, all the needs of tourists (accommodation, transportation, consumption, diving equipment, etc.), have been fulfilled in it, at a price of IDR 7 million per day. Because of all the activities and needs of tourists are on board, so that the interaction between tourists and local communities are usually very limited. However, there is no

data on how the numbers of visitors who use the travel or tour package so no calculation of the package.

The structure of expenditure of local tourist and foreign tourist respondents, including fees ranging from transportation costs incurred by the respondents to visit tourist sites, both going and returning home, admission fee, the cost of consumption, the cost of souvenirs and other expenses (rent a boat, diving equipment, etc.). From the interviews, it is revealed that the average total cost of local tourists is IDR 4,1 million per visit, while foreign tourists amounted to IDR 18.9 million per visit. Thus the total economic value of Whale sharks tourism in CBNP reached IDR 142.35 billion per year or US\$ 10.54 Million (using the tourist data 2015). The contribution of foreign tourists reached 82.4%, while only 17.6% of local tourists. Analysis of Travel Cost Method (TCM) is hired for the entire respondent (local tourists and foreign tourists). The function derived from regression analysis between the number of visits to the total costs incurred, and other socio-demographic variables, as follows:

Linear Model:

$$\text{No of Visit} = 0.26 + 0.00581\text{Age} + 1.18\text{Gender} - 0.059\text{Education} - 0.00000014\text{Cost} + 0.00000019\text{Income} - 0.000096\text{Distance} - 0.30\text{Local tourist.}$$

**Table 1.** Number of tourists in Cenderawasih Bay National Park, Papua, Indonesia, and the value of non-tax state revenue (PNPB)

Year	Number of Tourists /Year			Non-Tax National Revenue (PNPB) IDR
	Local	Foreign	Total	
2011	408	339	747	80.250.000
2012	933	831	1764	221.605.000
2013	756	1046	1802	249.793.000
2014	872	1434	2306	369.999.000
2015	3144	2564	5708	586.160.000
Total	6113	6214	12327	1.507.807.000

**Table 2.** Descriptive statistics for local tourist respondent in Cenderawasih Bay National Park, Papua, Indonesia

Variable	Minimum	Maximum	Mean	Std. Deviation
Total Cost/Visit (Rp)	1600000.00	8000000	4096666.67	1771117.48
Age (Year)	20.00	55	32.2500	8.81030
Distance (Km)	90.00	3181	292.639	510
Income/month (Rp)	1000000	10000000	4438888.889	2038245
Education	12	18	13.58	2.05
No of Visit	1	15	2.0000	2.52982

**Table 3.** Descriptive statistic foreign tourist respondents in Cenderawasih Bay National Park, Papua, Indonesia

Variable	Minimum	Maximum	Mean	Std. Deviation
Total Cost/visit (Rp)	5650000	25000000	18878571.43	5982272.35
Age	25	78	45	16.69
Distance	5.02	29.43	20.7756	11.61411
Income/month (Rp)	5000000.00	22000000.00	17142857.1429	5347280.29
Education	18	18	18	.00000
No of Visit	1	3	1.2857	.72627

## Semi Log Model:

$\ln \text{No of Visit} = 0.017 + 0.0126 \text{ Age} + 0.3136 \text{ Gender} - 0.0034 \text{ Education} - 0.00000005 \text{ Cost} + 0.00000003 \text{ Income} - 0.000014 \text{ Distance} - 0.1242 \text{ Local tourist}$ .

The performance of statistical regression analysis to model the linear and semi-log can be seen in Table 4. From Table 4 can be seen that the linear and semi-log regression model, has an  $R^2$  45.7% and 48.6%, which means the number of visits can be explained by the explanatory variables as much as 45.7% and 48.6%, the rest by other variables. The condition of the low value of  $R^2$  is not an issue as the criteria of a good model in the regression as TCM (Maille and Mendelson 1993; Hanley and Spash 1995; Khan 2006; Khan et al. 2014, Fauzi 2014). For the linear model, the variables age, gender, have significant value with 90% confidence level, while for costs and income, have a significant value of 95% confidence level. As for the model semi-log, the variables are significant at the level of 90% is a variable of gender and cost.

Furthermore, to determine the effects of all variables on the dependent variable can be seen from the value of F at the table has a probability of less than 0.05 or 5% for both models, meaning that all the variables jointly affect the dependent variable number of visits. Value Durbin-Watson statistic (DW) at 1.57 and 1.41 ( $-2 < DW < 2$ ), indicating that there is no interference autocorrelation on both models. And VIF value below 10 indicates no multicollinearity.

From the above models, can be calculated consumer surplus value, which is basically is a proxy of Willingness to Pay (WTP) society, from the cost side. Assuming chock price of IDR10 million rupiah, the maximum monthly income of the respondents, the results show the value of the consumer surplus of IDR 134,926.81 per visit for linear models, and IDR 123,385.96, for semi-log models. Thus

the total WTP of whale shark conservation value is IDR 770.16 million per year (data in total tourist arrivals in 2015). While using a semi-log model, the total value of Whale shark environmental services is IDR 704.29 million per year. This value is of course still very small compared to the existing potential. This value can be increased for example by managing price uncertainty and tourist fees due to transaction costs, which has been the issue that is relevant in this area, which make tourists reluctant to come to this region.

The analysis conducted further is the WTP calculations to determine the respondents (tourists) willingness to pay, for the management of CBNP per ha per year. The features of local respondents WTP values, shown in Table 5. Based on data in the table, the value of the average WTP local respondents IDR 2,513.89. As for foreign tourist's WTP distribution is as Table 6. Based on data in the table, the value of the average WTP of foreign respondents is IDR 6,428.57. The average value of the respondent's WTP, can be used as a reference in determining the value of the price per hectare which can then be used as funds to implement the conservation and utilization of the National Park.

Furthermore, to obtain a total value WTP (TWTP) respondents, calculated based on the distribution of respondents WTP local / foreign. WTP value in each class multiplied by the relative frequency (ni/N) is then multiplied by the population of each class WTP. The multiplication result is then summed, to obtain the value of total respondents WTP. Calculation results can be seen in Table 7.

Based on the results of these calculations, the value of total respondent's WTP for local tourists of CBNP, amounting to IDR 7,903,666.67, per ha per year, where the population is the number of visitors to National Parks. While for Foreign Respondents, the total value of WTP per ha per year can be seen in Table 8.

**Table 4.** Statistical regression analysis performance number of visit with sociodemography variables for linear and semi-log model

Predictor	Model linear			Model semi-log		
	Coefficient	P Value	VIF	Coefficient	P Value	VIF
Constant	0.256	0.951		0.017	0.988	
Age	0.05815**	0.097	2.278	0.0126	0.177	2.278
Gender	1.1816**	0.075	1.262	0.3136**	0.076	1.262
Education	-0.0593	0.735	2.576	-0.00342	0.942	2.576
Cost	-0.00000014*	0.013	5.820	-0.00000005**	0.063	5.820
Income	0.00000019*	0.011	7.314	0.00000003	0.344	7.314
Distance	-0.00009637	0.169	6.851	-0.00001398	0.450	6.851
Tourist Local	-0.298	0.880	9.419	-0.1242	0.814	9.419
R2	45.7%			48.6%		
Adj R2	34.4%			38%		
F Statistic	2.12			2.26		
Prob F stat	0.043			0.048		
Durbin-Watson	1.57			1.41		

Notes: \* significant at the interval confidence 95 %, \*\* significant at the interval confidence 90%

**Table 5.** Value distribution of local tourists respondent Willingness to Pay of Cenderawasih Bay National Park, Papua, Indonesia

WTP (Rp)	Number of respondents	Percentage (%)
1000	10	28%
1500	2	6%
2000	8	22%
2500	4	11%
3000	3	8%
3500	1	3%
4000	1	3%
5000	7	19%

**Table 6.** Value distribution of foreign tourist's Willingness to Pay in Cenderawasih Bay National Park, Papua, Indonesia

WTP (Rp)	Number of respondents	Percentage
5000	6	43%
6000	3	21%
7000	2	14%
8000	1	7%
10000	2	14%

**Table 7.** Willingness to Pay total of local respondents in Cenderawasih Bay National Park, Papua, Indonesia

WTP (IDR)	Frequency (Total respondents)	Population	Total Value (IDR)
A	B	c= (b/d) x e	a x c
1000	10	1702	873,333.33
1500	2	340	262,000.00
2000	8	1362	1,397,333.33
2500	4	681	873,333.33
3000	3	511	786,000.00
3500	1	170	305,666.67
4000	1	170	349,333.33
5000	7	1191	3,056,666.67
<b>Total</b>	<b>36<sup>d)</sup></b>	<b>3144<sup>e)</sup></b>	<b>7,903,666.67</b>

**Table 8.** Willingness to Pay total of foreign Tourists in Cenderawasih Bay National Park, Papua, Indonesia

WTP (IDR)	Frequency (No. of respondents)	Population	Total Value (IDR)
A	B	c= (b/d) x e	a x c
5000	6	2663	5,494,286
6000	3	1332	3,296,571
7000	2	888	2,564,000
8000	1	444	1,465,143
10000	2	888	3,662,857
<b>Total</b>	<b>14<sup>d)</sup></b>	<b>2564<sup>e)</sup></b>	<b>16,482,857</b>

Based on the results of these calculations, the value of total WTP of foreign respondents in CBNP is amounting to IDR 16,482,857, where the population is the number of foreign visitors to the National Park. Thus, if calculated for the whole CBNP region with the total area of 1,453,500 Ha, the value of the region is IDR. 35,445,812,154,345.00 (US\$ 2.6 billion). As a comparison study with the Continent Valuation Methods from Carr and Mendelsohn (2003) found that the best estimates of the annual recreational benefits of the Great Barrier Reef is in the range between US\$ 700 million to 1.6 billion, and the domestic value to Australia is about US\$ 400 million.

Regression analysis was conducted to see the relationship between WTP of respondents with socio-economic variables such as age, gender, education, income and also the origin of tourists, the result, as Table 9.

The function derived from regression analysis between WTP with socioeconomic variables such as income, age, education, gender and origin of tourists showed the following equation:

Linear Model:

$$\text{WTP} = 5430 - 0.000048 \text{ Income} - 4.8 \text{ Age} + 98 \text{ Education} + 621 \text{ Male} - 4250 \text{ Local.}$$

Semi-log Model:

$$\text{Ln WTP} = 7.98 - 0.000000 \text{ Income} - 0.00022 \text{ Age} + 0.0467 \text{ Education} + 0.139 \text{ Male} - 0.991 \text{ Local}$$

From the statistical performance, it can be seen that the linear regression model and semi-log, has an  $R^2$  60.9% and 50.1%, which means the number of visits can be explained by the explanatory variable as the value, and the rest by other variables. For both linear and semi-log models, only constant variable and origin of tourists, that have significant value, with 90% confidence level. Furthermore, to determine the effects of all variables on the dependent variable can be seen from the value of F in the table, which has a probability of less than 0.05 or 5% for both models, meaning that all variables jointly affect the dependent variable number of visits. Value Durbin-Watson statistic (DW) of 1.97 and 2: 12 (-2.2 < DW < 2.2), indicating that there is no interference autocorrelation on both models. And VIF value below 10 indicates no multicollinearity.

Values CBNP region in artisanal fisheries activities, calculated based on data from interviews with fishermen respondents as many as 20 people from a total population of 94 fishermen in Cenderawasih Bay. With the number of fishing per year on average of 300 days (fishermen conduct one day trip fishing), the average production per trip is 5 kg, the average price per kg is IDR 77.828, and the cost per trip on average is IDR 297.725, the value of economic rent per fisherman per year is IDR 27.4 million, and the total value of fisheries in CBNP region, is IDR 2.6 billion per year (US\$ 192,592.59).

From the result of the overall economic valuation, can be determined the estimated value of Cenderawasih Bay National Park, by some of the benefits that are calculated in this study, amounted to IDR 35.5 trillion or US\$ 2.6 Billion, with the details as Table 10.

**Table 9.** Performance statistics regression analysis of Willingness to Pay of tourists with sociodemographic variables linear models and semi-log models

Predictor	Linear Model			Semi-log Model		
	Coefficient	P Value	VIF	Coefficient	P Value	VIF
Constant	5430*	0.056		7.98*	0.000	
Age	-4.8	0.836	1.759	-0.000223	0.978	1.759
Gender	621	0.194	1.146	0.139	0.391	1.146
Education	98	0.456	2.436	0.0467	0.300	2.436
Income	-0.000048	0.541	5.442	-0.00000001	0.769	5.442
Local R <sup>2</sup>	-4250*	0.001	6.328	-0.991*	0.022	6.328
Adj R <sup>2</sup>	60.9%			50.1%		
F Statistic	56.5%			44.4%		
Prob F-stat	13.2			8.82		
Durbin-Watson	0.000			0.000		
	1.97			1.98		

**Table 11.** Total value of Cenderawasih Bay National Park, Papua, Indonesia

Utilization	Methods	Values (IDR)
Proxy WTP tourism environmental services (Tourists perception)	Travel Cost Methods	770,162,239.63
CBNP Value (Tourist's WTP to the CBNP)	Contingent Valuation Methods (CVM)	35,445,812,154,345.00
Artisanal Fisheries in CBNP	Productivity Approach/Market Value	2,578,036,578.95
Resources rent (PNPB)	Secondary Data	586,160,000.00
Tour operator	Interview/Market price	400,000,000.00
Total Value of CBNP		35,450,146,513,163.60

**Table 10.** The value of artisanal fisheries in Cenderawasih Bay National Park, Papua, Indonesia

Economic Value	Per Fishermen per year (IDR)	Total CBNP Fisheries Value per year (IDR)
Total Revenue	116,743,421.50	10,973,881,578.95
Total Cost	89,317,500.00	8,395,845,00.00
Rent	27,425,921.05	2,578,036,578.95

## Discussion

This study provides a good overview of some of the benefits of environmental services whale sharks, as well as its habitat, including other economic activities such as fishing, as mentions by Balmford et al. (2011) and Laurans (2013), this knowledge can be used as a tool that has the potential to improve our collective choice of ecosystem services. The value of each such utilization is very significant for the economy of local communities and governments.

From the study revealed that economic value of Whale sharks tourism in CBNP reached IDR 142.35 billion per year or US\$ 10.54 Million (using the tourist data 2015). The value is higher compared to other direct value on Whale sharks tourism, such as in South Ari Marine Protected Area, Maldives (Cagua et al. 2014), with direct

spend as the primary proxy of whale shark tourism, in 2012 and 2013, estimated accounted for US\$7.6 and \$9.4 million respectively. These expenditures are based on an estimate of 72,000-78,000 tourists who have involved in whale shark excursions annually. While in Donsol Philippines, Norman and Catlin (2007) reported that at the early records show 800 visitors in 1998 with a total income of US\$10500, generated from registration fees and boat rentals, and the number of visitors increased to approximately 7200 in 2005, generating an estimated income of US\$208,000. Study by Anna (2008), revealed that the gross value generated from tourisms in Seribu Island Marine Park is more than US\$ 9 million per year. This is an average value of ten years gross revenue generating from average spending by tourists visiting Seribu Island resorts.

Estimated total value of Cenderawasih Bay National Park, Whale Sharks environmental services, and the economic value of fisheries was IDR 35.5 trillion or US\$ 2.6 billion. The estimated value does not include the total value of both natural resources and other environmental services that have not been counted. Estimated value of the CBNP, somehow increases our awareness of the high value of whale sharks environmental services, and also CBNP as a whole, when compared with the value of its extractive. The value also implies the cost of restoration to be projected if the resources are damaged.

The value of the whale shark which is the value of biodiversity is, of course, related to the intrinsic value of these species, which may be higher than the value when it is consumed (anthropogenic value). Sandler (2012) states that the benefits we can get from the intrinsic value of biodiversity, including ecosystem services, such as the purification of air and water, climatic settings, producing oxygenated and maintain moisture. Studies on the economic valuation of the whale shark, whale shark tourism activities, as well as marine park conservation area for whale shark habitat, yet many do. Some of these studies were performed to calculate the value of whale shark tourism and whale sharks (Cesar 2004; Soliman 2004; Norman 2005; Padilla 2005; Norman and Caitlin 2007; WWF 2007; Catlin 2010; DMTO 2011; Cisneros 2013; Cagua 2014). Most of the results showed that the value of whale sharks alive in nature, and value of environmental services of tourism, is much greater than the value if captured and consumed. Other studies related to the value of such protected areas, conducted by Sanchirio et al. (2002), Thurs (2010), Reuchlin and McKenzie (2015), revealed that the construction of a marine conservation area is an investment that is priceless, and contribute to the Community directly and indirectly.

Economic valuation of ecosystem services is often used as a tool that has the potential to improve our collective choice of ecosystem services, as a factor in the costs and benefits, associated with degradation (Balmford et al. 2011; Laurans 2013). For the case of Cenderawasih Bay, for example, the utilization of the fisheries and tourism activities is a choice to be made, although it does not always have a binary choice, however, because local people still need to take advantage of fisheries activities, both for economic activity as well as for food security. Understanding of the economic value can also provide policy direction to overcome the degradation, accelerate ecosystem services and biodiversity, to change individual and collective choices in terms of management decisions utilization of natural resources, and a better and sustainable environment (NRC 2005; Randall 1988; Daily et al. 2009). It is also strongly associated with the assumption that we do not protect what we do not value (Myers and Reichert 1997). Thus we usually do not value if we do not know the benefits, so an economic valuation is a process of understanding the benefits and measure of value, for the purpose of protecting and managing the resources and environmental services.

The value of this area can also be a proxy for the cost of management and mitigation of the damage or the cost of damage compensation that has been or will be occurred. The value also implies the cost of restoration to be projected if the resources are damaged. This value, also become a factor for the application of payment for environmental services instruments, through entrance fees, for example. Value services of the region and also the value of whale sharks environmental services can also be used as a base direction of trade off, extractive or conservative policies. From the results of the assessment can be seen that conservative policies are an option for utilization of whale sharks, while for CBNP region can be

directed to the economic utilization of traditional fisheries and tourism as well since both provide significant value benefits.

Policy development in tourism is an option because right now, tourism is becoming one of the principal exports for developing countries and least developed countries (LDCs): it is growing rapidly and is the most significant source of foreign exchange, after petroleum (The World Tourism Organization 2002). Besides marine tourism can be a major source of growth and jobs. However, these activities require planning and development of integrated, inter-sectoral, inter-regional, inter-various disciplines.

For the purpose of integrated management of the whale shark and the conservation area, some suggestions may be implemented relating to continued research and management to the future of the region, such as conducting an assessment of the economic valuation of other tourism activities, which are not recorded, such as tourism live aboard, which also contributes significantly to the national economy. In addition, the economic valuation needs to be done on natural resources and other environmental services in the area of CBNP, to provide a more comprehensive view of value.

Furthermore, to get a more competitive tourism, the development of CBNP, require tourism product diversification and distribution of tourist destination, as well as the need of investment breakthroughs to develop remote areas outside the CBNP, that have tourism potential, in addition to whales sharks regional destinations, including cultural tourism. To do so, It is necessary to have public awareness and education for social engineering, behavioral changes of local communities, so that the existing transaction costs can be eliminated or minimized, so that the certainty becomes higher and more and more tourists are interested, come to the area CBNP. It needs the involvement of local communities in tourism governance and tourism development as well as networking. Development of a responsible marine tourism, one of which is the need of quantifies the tourism carrying capacity in CBNP region.

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