

Contingent valuation of a natural resource: Pawikan sanctuary

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ABSTRACT

This study measured the economic value of the Pawikan Sanctuary using the contingent valuation approach. Two approaches were utilized, the Willingness To Pay (WTP) and the Willingness to Accept (WTA). The former was used to compute the contribution of the Dabawenyos to preserve and protect the Pawikan sanctuary, while the latter measured the compensatory income revealed by the individuals whose livelihood have direct adverse impact on the sanctuary. Two sets of surveys were made, one to measure the WTA, targeted 100 residents surrounding the sanctuary, while the WTP with 1200 respondents scientifically chosen as respondents. Respondents of WTA posted average compensatory income of 7200 to cover income loss in the effort to preserve the sanctuary, with a derived producer surplus of Php 426. Meantime, the environmental protection contribution measured through WTP obtained estimated value of Php 9,837, with a derived consumer surplus of Php 8 per one additional person. The total economic value of the sanctuary was estimated at Php 435. The low imputed value of the natural resource is afforded to the fact the natural resource has no market value, people derive their income and livelihood from activities that imperil the resource, and finally, the public limits their support on the population of the marine turtle hosted in the pawikan sanctuary. This means that the contribution to preserve is required the moment there are turtles found in the sanctuary. This disconnects their revealed preference into the many roles and function of the natural resource. The general public misses the point that turtle also face the threat due to presence of oceanic plastic, the silting of the shoreline and the pollution of the water; all these will have impact on the population of the turtles in the coming years.

Keywords: *contingent valuation, natural resource, Hawksbill turtle, willingness to pay, willingness to accept, Davao City.*

INTRODUCTION

There is so much need to understand how people behave relative to preservation and protection of the environment. Elinor Ostrom (1990) in her significant work “Governing the Commons” unravels the pitfalls of the possible destruction of a commonly owned resource which is the general theme of an earlier work by Garrett Hardin in 1968. The central theme of Ostrom’s thesis points at the role of governance where people who directly benefit from a resource and those who are affected by the use of the resource have defined rights and obligations. Very importantly, a system to monitor behavior and a graduated punishment to violators will discourage abuse of resource use. The limitation is set within the limits of cooperation as

William Ophuls (1973) and Cumming (2017) propose. This comes as reinforcing to the model first introduced by Coase (1960) where which he pointed out that owners of residual effects, or the negative externalities, should own up the damage in monetary terms. This underscores institutions (North, 1991) to effectively carry out governance of people, monitoring of behavior and enforcement of rules.

Again, the whole perspective of the natural resource attunes itself with the fact that all common properties are in the risk of possible misuse and exploitation, but Wilen (2018) presented the link of average value of the variable common-property resource to the compensation or commonly referred to as the wage and interest rates. To name a few of the common-accessed property is a marine sanctuary. Davao City, a highly urbanized city in the Southern Part of Mindanao is a host to a marine sanctuary, a turtle hatching area of Hawksbill.

In the 1970's, the Philippines first call for official conservation and management policy and efforts was issued through the Executive Order No. 542. This was the Philippines move to protect its marine resource, the Task Force Pawikan was later formed which evolved to become the Pawikan Conservation Project attached to the Wildlife Division of the Protected Areas and Wildlife Bureau of the Department of Environment and Natural Resources.

The nesting and hatching area of Hawksbill (*Eretmochelys imbricata*) or Pawikan is found at Punta Dumalag, an isolated island connected to the mainland Davao through a natural land bridge connecting Matina Aplaya and the peninsula. The 2-kilometer white sand stretch is made into a Marine Turtle Sanctuary for the Hawksbill through a Davao City Council resolution¹. The declaration of the area as a nesting ground for Hawksbill turtles become impetus to the Marine Turtle Protection and Conservation Task Force created by the local government of Davao through an executive order. It is with the intention of conservation and protection of the turtles' population. Since its declaration as a sanctuary, the turtle hatching rate had been recorded at 93%. As complementary efforts, stock enhancement of the marine turtle is done through release of turtles to the sea (Lucero et al., 2011) which is also done in the sanctuary. However, the turtles face the risk of plastic marine ingestion (Schuyler et al., 2016) and plastic entanglement (Abreo, et al., 2016) that will cause deaths of the turtles leading to decrease of their population.

The protection of the marine turtles, like the Hawksbill is important during the turtles' oceanic life, inasmuch as during their nesting and hatching season thus the important role of conservation and preservation efforts of marine sanctuaries. In 2010, a cross-country comparison on the marine turtle conservation efforts of countries China, Philippines, Thailand, and Vietnam was conducted using the Contingent Valuation Method (CVM) within strand of the willingness to pay. The strategy aims to obtain the economic benefits of the marine turtle conservation programs of the mentioned countries (Jin et al., 2010). The same technique was employed in the study of Boxall and colleagues (2012) combining the CVM technique and the choice experiment of stated preference approach found that people are willing to pay more for programs that will increase the population of marine mammals than improving the status of extinct species. Note that the technique provides a measure of estimate for non-consumptive and non-use economic values that fits in the analysis of estimating the economic value of public goods such as the Pawikan Sanctuary. In this study, what is given imputed value in this study is the Pawikan Sanctuary. Thus, this study aims to determine the contingent value of the people to preserve and conserve the Pawikan Sanctuary. In particular, the study aims to measure the

¹ Council Resolution No. 02504-03

compensatory income value that the surrounding individuals residing around the sanctuary poses threat to the area. Likewise, the study also measures the willingness to pay on the part of the greater public in preserving and conserving the sanctuary. The economic value of the sanctuary is also measured in this study. In aiming so, this paper attempted to employ contingent valuation of the marine resource, which is the pawikan sanctuary in Punta Dumalag, Davao City, and compare the willingness to pay of the public to preserve and protect the sanctuary. The willingness to accept was also employed in this study to determine compensatory income, a revealed amount the people are willing to receive in order to avoid destroying the environment. With the two values, the total economic value was determined.

METHOD

There are two groups identified in this study. The first group are the direct beneficiaries, or those individuals who are making livelihood out from the use of the natural resource either in the form of fishing or related economic activity.

A combination of direct, purposive sampling was initiated to obtain data from the direct beneficiaries of the Pawikan Sanctuary. The direct beneficiaries are those who obtain income benefit from the natural resource. A total of 100 direct beneficiaries were identified. The indirect beneficiaries were also included in this study. They are those individuals who know of the natural resource but do not directly obtain benefits from the said resource.

A total of 1200 respondents participated in the study that was systematically identified employing 95% confidence level and 5% margin of error. A cluster sampling was used to group proportionally the sample size according to the size of the political district of Davao City.

The value of the willingness to pay/receive obtained using the consumer and producer surplus, $PS = p_e q_e - \int_0^{q_e} S(q) dq$, which is the difference between a producer's willingness to receive and the market price of the product. In this paper, the producer surplus is employed in this study to obtain the amount the people are willing to receive to compensate for an income loss resulting from undoing the activities that affect the pawikan sanctuary. To obtain data for the producer surplus, the direct beneficiaries are asked of their economic activities that affect the sanctuary, and how much they earn from the activities.

Meantime, the consumer surplus, $CS = \int_0^{q_e} D(q) dq - p_e q_e$, is the difference between a consumer's willingness to buy and the market price. In this study, the consumer surplus is used to measure the behavioral preference of the people of Davao to preserve and conserve the sanctuary. To obtain data for the consumer surplus, a scientific survey is done in order to obtain the Dabawenyo's willingness to contribute for the preservation efforts.

RESULTS AND DISCUSSION

Of the 100 respondents, 56% are males. Most of the respondents aged 31-40 years old though there are also who are into 51 and above respondents accounting for 15%. A majority of the respondents are earning income between P6,000 to P10,000. Respondents' household size was

mostly at 4 members per family. Half of the respondents obtained high school education and most if not all (90%) are residents within the immediate vicinity of the natural resource.

Table 1. Distribution of respondents

Variable	Category	f	%
Sex	Female	44	44
	Male	56	56
	Total	100	100
Age	18-30	17	17
	31-40	42	42
	41-50	26	26
	51-60	13	13
	>60	2	2
	Total	100	100
	Monthly Income	< 5000	18
6000 - 10000		61	61
11000 - 15000		14	14
16000 - 20000		5	5
21000 - 35000		2	2
>35000		-	-
Total		100	100
Household Size	1	-	-
	2	1	1
	3	16	16
	4	49	49
	5	17	17
	6	11	11
	7	5	5
	8	1	1
	Total	100	100
Educational Attainment	Elementary	35	35
	Secondary	50	50
	College level	10	10
	College Graduate	5	5
	Total	100	100
Resident	Yes	90	90
	No	10	10
	Total	100	100

An average monthly income of 7000 pesos was noted among the direct beneficiaries, or those individuals residing around the pawikan sanctuary, the maximum amount was posted 25000 pesos a month and 500 pesos minimum. Average recorded daily income was at 719 pesos, weekly average income at 2000 pesos.

Table 2. Activities with economic value near the Pawikan Sanctuary

Activity	Daily	Weekly	Monthly
Caretaker	495		14250
Driver	500		
Fish Dealer	1833	3000	
Fisherman	1217	2650	
Maintenance	305		7000
Selling Vegetable	750	500	
Security guard	250	10200	20000
Sari-Sari store	400		13333
Selling mangroves		294	991
Selling shells/souvenirs		245	1333
Selling used clothing		1000	
Baker			6000
Food stalls (carinderia)			20000
Carpenter		2500	9333
Driver			6667
Laundrywoman			2650
Mechanic			5000
Part time driver			500
Sari sari store			1200
Selling cows milk			2000
Selling fruits			2000
Selling fish			1000
Machine shop			10000
Repair shop			3500
Resort			25000
Selling foods (pastries)			1000
Livestock			6875
Eatery			20000
Piggery			12000
Tricycle Driver		1500	3500
Junk shop			4000
Cook			12000
Average	719	2432	7449

A minimal number of the respondents were in the impression that the economic activities that they do alter and adversely affect the natural resource. Only 13% of 100 were in the belief that the Pawikan Sanctuary suffers because of their activities. This is interesting given their sheer knowledge of the impact of what they are doing to the continued preservation and protection of the sanctuary. The extractive nature of activities and the pollution which resulted from raising poultry and piggeries adversely affect the environment and the shoreline which the turtles had to wade when they come back for nesting.

Table 3. Impact of economic activities to natural resource

Impact to natural resource	f	%
adversely affected	13	13
no adverse effect	85	85
I don't know	2	2
Total	100	100

Of the 100 direct beneficiaries, 28 declared having secondary source of income. Highest income obtained from secondary source was P12, 000 from cooking, while lowest was at P500 as part-time driver. Taking the average, the secondary economic activities could earn them P4,448. Primary income source of the direct beneficiary could provide an average amount of P7449. A minimum of P500 and a maximum of P25,000 for income derive from doing part-time drive and for income derived from managing a resort. The secondary income source can also provide an average income of P4448 with a minimum of P500 from part-time driving and high of P12, 000 from operating a piggery.

Table 4. Average income by income type per month

Income value	Average	Minimum	Maximum
Primary income (n=100)	7449	500	25000
Secondary income (n=28)	4448	500	12000

Given that there are economic activities around the Pawikan sanctuary which poses threat to the preservation and protection of the natural resource; respondents reveal the compensatory amount they are willing to receive in recompense for the loss if they decide to stop their economic activities around the vicinity.

It is assumed here that since the participants are not into the functions of protecting and preserving the natural resource as their primary function of which performance of such will give them income, and then the participants have to give up their income source in favor for the compensatory amount.

The average compensatory amount is the value the direct beneficiaries are willing to receive in exchange for giving up the economic activities in order to protect or preserve the Pawikan Sanctuary. Of the 100 respondents, 76 manifested amounts at the average of P18,550 a minimum of P500 and a maximum of P70,000.

Table 5. Average compensatory amount for income loss (n=76)

Income value	Average	Minimum	Maximum
Compensatory amount	18550	500	70000

The combined income from the economic activity of the direct beneficiaries amounted to P11,897 a month on the average. The compensatory amount of Php18,550 which is the average amount the direct beneficiary respondents are willing to receive in order to compensate for the economic loss should they forego economic functions in exchange for environmental protection and preservation of the Pawikan Sanctuary.

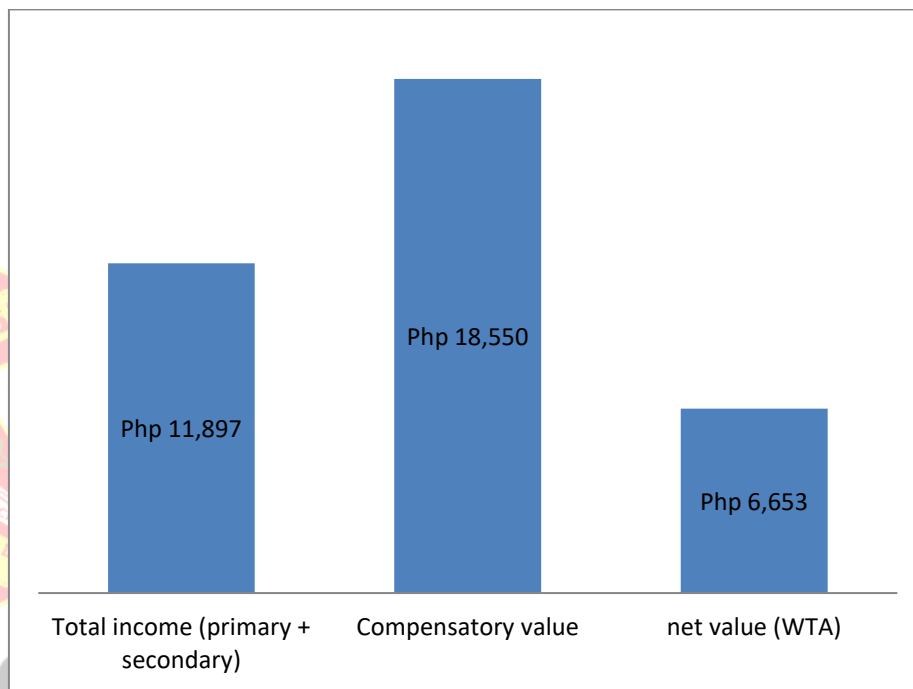


Figure 1. Total Income, Compensatory Value, Willingness to Accept (WTA) Net Value

Indirect Beneficiaries

There were a total of 1200 respondents who were randomly chosen for the study who were widely grouped as the indirect beneficiaries. They are the group of individuals who do not derive income benefits from activities that relate or affect the Pawikan Sanctuary. Of the total, 57 percent are females and 43 percent males. Half of them aged 18-30 years old and a quarter aged 31-40 years old. Also, a quarter of them are earning P6,000-10,000 per month and some 27 percent are earning less than P5,000 per month. Average size of five comprises most of the households, and a portion of them (22%) reside within the Sanctuary, and most of them obtained college education.

Table 6. Profile of indirect beneficiaries

Variables	Category	f	%
Sex	Female	680	57
	Male	520	43
	Total	1200	100
Age	18-30	595	50
	31-40	376	31
	41-50	166	14
	51-60	48	4
	>60	15	1
	Total	1200	100
Monthly income	< 5000	318	27
	6000 - 10000	434	36
	11000 - 15000	207	17
	16000 - 20000	124	10
	21000 - 35000	104	9
	>35000	13	1
	Total	1200	100
Household size	1	9	1
	2	102	9
	3	194	16
	4	298	25
	5	333	28
	6	169	14
	7	44	4
	8	35	3
	9	11	1
	10	5	0
Total	1200	100	
Resident within the Sanctuary	Yes	269	22
	No	931	78
	Total	1200	100
Education	Elementary	20	2
	Secondary	211	18
	College level	491	41
	College Graduate	440	37
	Post-Graduate	38	3
	Total	1200	100

The respondents were asked whether they able to enjoy benefits out from the presence of the Pawikan Sanctuary, which is already of regular fixture in the environmental protection consciousness of the Davao public, and it was noted that only 11 percent benefited from the said natural resource, while 89 percent expressed that they had no way to benefit from the natural resource. This comes as a relevant fondation and reference in their expression to protect the natural resource through an expressed contingent value, or expressed value to protect the environmental goods. Such that, the expressed value will be taken correspondingly the effected amount out from their viewpoints of having no direct benefits; if a higher value is imputed, then the respondents are consciously propagating the culture of environmental preservation. Now if the amount is pegged at a lower amount, this signifies low interest to preserve the unique environmental resource.

Table 7. Beneficiaries of the natural resource

Beneficiaries	f	%
Yes	137	11
No	1063	89
Total	1200	100

The most common benefits enjoyed by the indirect beneficiaries include the awareness that it offers sanctuary for the animals and plants (24%), for one, it is a sanctuary of the turtles that will pay homage in order to lay eggs. The respondents who indicated of the benefits of the Pawikan Sanctuary are also aware that it play important role in maintaining a healthy biodiversity (23%), while some others take the social value of the sanctuary because it represents something, it is a symbol of nature (16%). Having a pristine biodiversity through active and well-maintained biodiversity within a Highly-Urbanized City (HUC) comes at the forefront of the careful administration of government of the City of Davao amidst the sprawling businesses and the rapid proliferation of industries and population, a preserved environmental sanctuary is strongly suggestive of an iota of balanced development.

Table 8. Common benefits from the resource

Reason	f	%
Trekking	1	0.3
Enjoyed watching	25	7.4
Natural protection it offers	44	13.1
I feel happy when I see it	33	9.8
Gives me comfort	20	5.9
It is home to animals and plants	80	23.7
it has a role in Biodiversity	76	22.6
it is a symbol of nature	53	15.7
Others	5	1.5
Total	337	100

Balanced development is a constant decision process of knowing how much to grow and how much to protect. In some instance, maintaining a biodiversity would be costly to operate, while pursuing rapid growth breaches the natural process of the fauna and flora which endangers or cause to extinction some of the species. At the instance when environmental integrity is sacrificed to give way for the industrialization, the environment suffers. On this, the respondents were asked if they Pawikan Sanctuary is demonstrating degradation of

environmental decay resulting from the industrialization and urbanization that is happening around the city. Some 19 percent of the Dabawenyos are in the opinion that the natural resource is showing reverse growth and degradation, some 16 percent are in the opinion that it shows no sign of degradation, while 65 percent cannot make for a decision whether the Sanctuary is still up to its good state or already degrading.

Table 9. Impression of degradation of the sanctuary

Degradation of the natural resource	f	%
Yes	229	19
No	193	16
Not sure	778	65
Total	1200	100

Sadly, Dabawenyos blame pollution as the cause of the degradation. Too much wastes dump into the river system and on the shorelines found their way to threaten the Sanctuary, some in the forms of dirty water line while others are in the forms of plastics that may be mistaken for food by the turtles themselves. The waters surrounding the sanctuary is also said to be polluted as well.

The climate change has undoubtedly adversely affected the sanctuary. The longer wet period and the hotter dry season imperil the eggs and the young turtles' chance of survival, as well. Although the City government implemented the proper waste management program, yet the Sanctuary faces the threat of the wastes and garbage that were thrown imprudently by the residents, such that the improper waste disposal is coming as contributory to the degradation of the Pawikan Sanctuary.

It is quite disturbing that the environmental threat is compounded by the poor concern for environment as evident in the presence of illegal settlers within the area, illegal fishing, and even the lack of awareness and/or concern of the people with regard to the continued protection of the environmental resource.

Table 10. Common causes of the degradation of the Pawikan Sanctuary

Common reasons of degradation	F	%
Climate change	47	20.5
Dirty ocean	5	2.2
Garbage	18	7.9
Illegal Fishing	12	5.2
Illegal settlers	4	1.7
Improper waste disposal	18	7.9
Lack of awareness of the people and pollution	1	0.4
Nearby residents	6	2.6
Not enough caretakers	1	0.4
Overpopulated	1	0.4
Pollution	85	37.1
Poor facilities	2	0.9
Water Pollution	27	11.8
Human activities	2	0.9
Total	229	100

Meantime, some Dabawenyos are in the opinion that the environmental integrity is still observed at the Pawikan Sanctuary. Some Dabawenyos believe that the efforts of preserving and protecting the said resource either by the government or by the private sector led by a large power company had done significant stride in preserving the Sanctuary. The presence of environmental groups caused the increase on awareness on the protection of the sanctuary.

Table 11. Impression on measures to protect degradation of sanctuary

Reasons	F	%
Area is closed from public	5	2.6
Conservation efforts	7	3.6
Exclusive area protected by Aboitiz	7	3.6
Government protected	10	5.2
No information about degradation	12	6.2
Preserved and protected	25	13.0
Protected and maintained by Aboitiz	32	16.6
Protected area	39	20.2
Protected by the government	19	9.8
There are caretakers	8	4.1
Well maintained	4	2.1
Well protected	19	9.8
Exclusive Area	5	2.6
Protected by Environmental groups	1	0.5
Total	193	100

Taken the aforesaid public views, it is of attendant concern whether there is the need to protect the Pawikan Sanctuary to which 80 percent of the Dabawenyos call for its protection, a negligible 1 percent says otherwise, and 19 percent remain to be ambivalent with respect to this environmental effort. The result is indicative of the high level of environmental concern of the Dabawenyos such that this can be considered as a public policy item that carries popular support.

Table 12. Impression on the need to protect the Pawikan Sanctuary

Need to protect	F	%
Yes	959	80
No	11	1
Not sure	230	19
Total	1200	100

Along the expression of the protection is the necessitated amount that assumes the value of support that is associated with the manifested behavior. In this manner, the revealed preference to protect and preserve the Pawikan Sanctuary carries the strength of accountability in the form of expressed amount. To this, only half of those who revealed that they are willing to pursue protection of the Sanctuary are willing to pay for, in any amount, as contribution to the environmental efforts. Some 20% of the Dabawenyos grossly oppose contributing money to

the environmental protection (20%) while the other 40 percent are uncertain if they to contribute amount to the said efforts.

This is quite a setback. Dabawenyos see the importance of the Sanctuary because of the role it plays in hosting a good biodiversity, however, when asked to contribute, the number of the protection was halved which is a matter of perspective that needs to be evaluated as well.

Table 13. Willing to contribute to protect the Pawikan sanctuary

Willing to contribute	F	%
Yes	386	40
No	189	20
Not sure	384	40
Total	959	100

Of the respondents who were willing to contribute an amount for the environmental protection ranges amount from P10.00 to P70,000 pesos as one-time giving. The total average was recorded at P865.49.

Table 14. Amount to contribute for the environmental protection

Amount	f	%
10	12	3.1
20	27	7.0
25	4	1.0
30	4	1.0
50	67	17.4
100	106	27.5
150	3	0.8
200	40	10.4
250	2	0.5
300	12	3.1
400	3	0.8
500	57	14.8
1000	26	6.7
1500	1	0.3
2000	7	1.8
2500	1	0.3
3000	1	0.3
5000	8	2.1
10000	2	0.5
50000	2	0.5
70000	1	0.3
Total	386	100

A small number of Dabawenyos are aware of Pawikan Sanctuary advocates, only 17% are aware of individuals or groups that are into efforts of taking care of the Sanctuary. On the other hand, more than half are uncertain of the presence of the sanctuary, and 27 percent reveal that there are no groups doing such effort.

Table 15. Advocates of Pawikan sanctuary

	F	%
Yes	204	17
No	323	27
Not sure	673	56
Total	1200	100

Those who have knowledge about the groups or individuals reveal that most are private organizations, one is a power corporation, schools through their corporate responsibility, and a car manufacturing corporation. The nature of the private organization seemed to be irrelevant as to the type of corporate responsibility that they exercise. The power corporation's operation may have impact on the sanctuary but not with the car manufacturing company as the assembly plant of the former is nowhere found within the City, their presence is limited to marketing and car dealership.

Table 16. Organizations, groups involved in protecting the pawikan sanctuary

Type of Organization	f	%
CSR of the company	72	35.3
Environmental	44	21.6
Government-facilitated	34	16.7
Others	10	4.9
Private Civic Group	43	21.1
Youth	1	0.5
Total	204	100

The five most common recommendations in relation to the Pawikan Sanctuary include clean-up programs, conduct of regular awareness program, fund-sourcing for the improvement of the Sanctuary, planting of mangrove trees, and the relocation of the informal settlers near the area. The clean-up programs can better be carried in order to clear the shoreline of the logs and trunks that will impede the movement of the turtles. It will also have the effect of restoring the natural quality of the surrounding environment

Table 17. Recommendations/suggestion on improving protection of pawikan sanctuary

Suggestions/Recommendations	f	%
Awareness Program	9	0.75
Ban single use plastics	1	0.08
Be active in social media	6	0.50
Clean the environment	13	1.08
Clean the ocean	12	1.00
Clean up programs	110	9.17
Coastal clean up	55	4.58
Community service	4	0.33
Conduct awareness program	90	7.50
Continue efforts	16	1.33
Donate and volunteer	6	0.50
Don't throw garbage in the sea	2	0.17
Educate and protect the environment	12	1.00
Help them reproduce	20	1.67
Improve presence in social media	3	0.25
Improve public awareness	19	1.58
Invite more people to help	18	1.50
Keep on protecting the area and limit the number of visitors	7	0.58
Keep up the good work	4	0.33
Limit access from public	27	2.25
Mangrove planting	6	0.50
Mass promotion and partner with community groups for protection	11	0.92
More breeding area for the Pawikan	5	0.42
More budget for protection	2	0.17
More clean-up program	17	1.42
More fund for the improvement of the Pawikan Sanctuary	70	5.83
More projects on saving turtles	6	0.50
More volunteer for coastal clean up	11	0.92
No comment	9	0.75
None	383	31.92
Offer job for the people near the area.	1	0.08
Organize events and awareness regarding Pawikan	3	0.25
Partner with schools and NGOs	2	0.17
Plant more mangroves	37	3.08
Plant more trees	18	1.50
Preserve the breeding ground of the Pawikan	4	0.33
Promote in social media	6	0.50
Proper waste management	26	2.17
Protect and educate	7	0.58
Provide more funding to the Sanctuary	27	2.25
Put streetlights	1	0.08
Rescue more turtles	8	0.67
Social media engagement	7	0.58
Take care of them	2	0.17
Volunteer	14	1.17

Clean the surroundings	5	0.42
Improve awareness program	2	0.17
Protect the nesting sites	27	2.25
Stop illegal fishing	4	0.33
Continue improvement of facilities	9	0.75
More environmental programs	3	0.25
Relocate informal settlers near the area	28	2.33
Stop Illegal Poaching of Pawikans	3	0.25
Support the government	2	0.17
Total	1200	100

Compensatory Income and Willingness to Accept

The Willingness to Accept (WTA) is a revealed preference model used to measure the amount of income the residents are willing to receive in order to avoid the economic activities that they do that hamper the environment. The economic activities referred here include the maintaining of residence surrounding the sanctuary, the extraction and sale of natural resources as souvenir items. To this, a supply curve is usually constructed, which is a measure of the willingness of the residents to compensate for their current stream of income for an amount they could obtain as direct payment to them. The WTA was constructed from the income schedule of the direct beneficiaries.

Given the income flow of the participating direct beneficiaries on a daily, weekly and monthly schedule, the supply function is where which all accounts were converted into month's value. The supply equation is suggestive that all other things constant, the monthly compensatory income is P7200.

$PS = p_e q_e - \int_0^q S(q) dq$, given the equations, the derived producer surplus which is the direct beneficiaries value imputed on the sanctuary is P426, or the amount they are willing to receive for undoing or avoiding activities that imperils the resource. The computed amount is only a third of the WTA of a contingent value imputed on a Taiwanese wetland (Hammit, Liu & Liu, 2001).

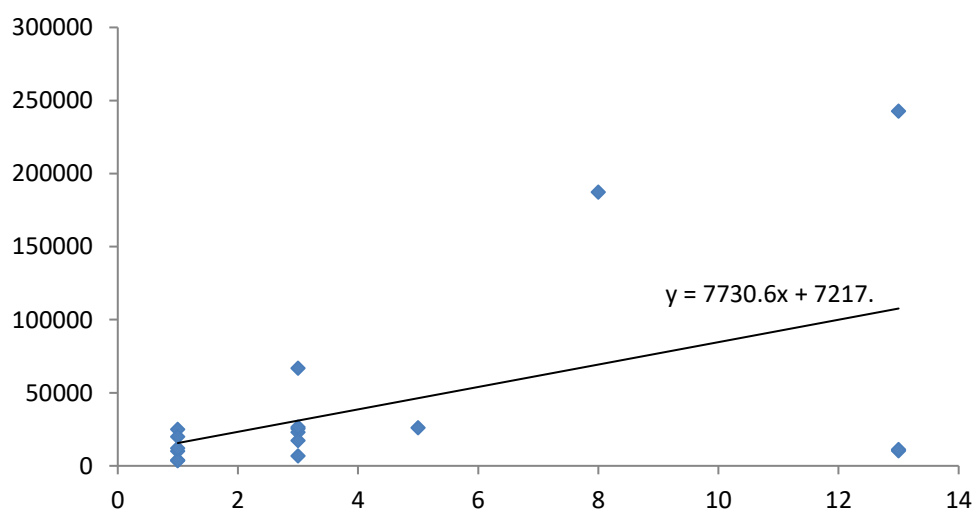


Figure 2. Revealed preference for compensatory income, WTA

The willingness to pay (WTP) was derived from the revealed value to support the Pawikan Sanctuary, which to them is preserving and increasing the population of the turtles. The WTP is therefore a demand function where the participating public, categorized as indirect beneficiaries, express an amount in support to the effort to support the protection and conservation of the sanctuary. Thus, they are willing to pay. To this, the demand equation is $D = 9837 - 154x$, such that, all other things constant, Dabawenyos are willing to pay Php9837, a couple of thousand higher than the compensatory income that the direct beneficiaries are willing to accept, however, the amount decreases P154 per every additional person.

$CS = \int_0^{q_e} D(q) dq - p_e q_e$, given the following equations, the consumer surplus is only P8 per person, the Dabawenyos willingness to pay a month for the effort to preserve and protect the pawikan sanctuary. The economic value of the sanctuary is P435 which is the contingent value of the Pawikan Sanctuary.

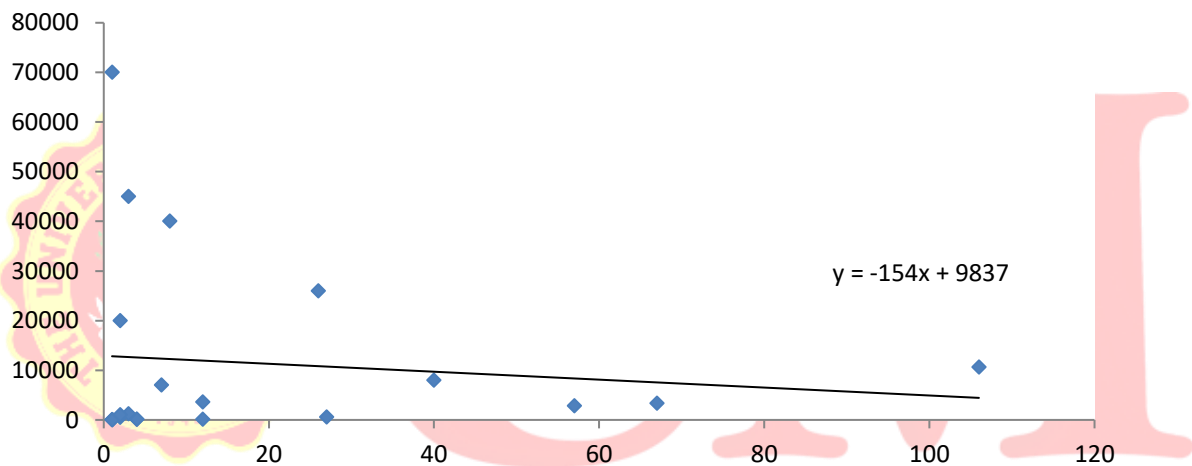


Figure 3. Revealed contribution of indirect beneficiaries, WTP

It was noted that the producer surplus was valued higher, this is the amount by which the direct beneficiaries, or the people surrounding the natural resource willing to receive to compensate their income. Comparing this with the computed consumer surplus, the people's willingness to pay to preserve the natural resource was noted to be comparably lower. This means that people are willing to pay lower than the compensatory value.

In a previous study conducted by Jin et al., (2010), they noted that the people of Davao are willing to pay for efforts to protect the natural resource, and their continued support is focused on the population of the marine turtle. Their preference to support stems from the idea to propagate the turtles and not on the total condition of the marine resource such as the environmental quality. The people of Davao lack the interests to take an overall perspective that support a healthy ecosystem for the marine turtle. They barely see the link between oceanic plastics that can be ingested by the turtles, the shallowing of the beachlines due to silting, and the adverse impact of garbage coming from the surrounding community.

This poses the urgency for a renewed education campaign to raise awareness on the linkages of the ecosystems with the land-based human activities. It is important to highlight the focal value of environmental protection and preservation of the marine turtles in the continuum of social campaign of advocacy. This means that one education and advocacy campaign is just a portion of the whole effort, in as much the declaration of the pawikan sanctuary is not limited into propagating the population of the marine turtle.

People's impression is an important weapon to fight the declining interest on the ecosystem education. It is locating the interesting items at the front yet connecting all the dots and pieces into the big picture of total ecosystem analysis.

In the case of the disjointed value compensatory income and the people's willingness to contribute for the preservation is a proof that the general public is focused on the details of the population of the marine turtles and missing the point that the marine turtles are continuously facing the threat of environmental degradation in other places, particularly in the wide space of the ocean.

CONCLUSION

On the light of the foregoing findings, it was noted that the intention to earn income which unfortunately adversely affect the pawikan sanctuary outweighs the revealed preference of the amount of compensatory income to stop economic activities that destroys the sanctuary. Thus, behaviorally, the direct beneficiaries or the people surrounding the natural resource will continue to cause degradation, whether explicitly or otherwise, for economic reasons.

While the direct beneficiaries express high amounts to compensate their income, the people of Davao contribute lower amounts to protect the sanctuary. This impression is due to a narrow perspective that the protection of the sanctuary is limited to the maintaining, if not increasing the population of the marine turtle in the sanctuary. The limitation is placed on the idea that for as long as there are nesting and hatching turtles, then there is no risk faced by the turtle. In effect, the whole ecosystem is placed at the back-burner, such that the urgency of pollution-abatement surrounding the sanctuary, the destruction of the corals, the threat of oceanic plastics that can be ingested by the turtles are all issues that were deemed having thin link with the population of the marine turtle.

In effect, the economic value of the marine sanctuary remains to be low, at an estimated amount of 426 pesos. The economic activities of the direct beneficiaries are more important to the households than efforts to protect the sanctuary, while at the same time; the general public consider the sanctuary's value as limited to the population of the marine turtle, not the overall value of the ecosystem.

The wholistic education and awareness campaign is considered as a solution to the segmented public awareness. A multi-level approach of awareness and education campaign can be pursued. The first level requires the constant and organic sharing and education initiatives among the scientists themselves. This will allow a better coordination and perspectives-analysis of the ecosystem. Second, the grounding of the scientific findings with the social issues, social relevance as they may call it. It is finding social trigger that will attract attention of the public into their own consciousness. Finally, the policy makers and advocates need to fully understand the scientific finding into the life of the people, the city, and the future

generations to come. This means that findings is hoped to find its way in planning and crafting of ordinances that is not limited to valuing the population and existence of the natural resource, rather, it is shifting the impression that there are other life substance that are being hosted by the natural resource itself.

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