ECONOMIC VALUATION OF NATURAL HERITAGE: AN ANALYSIS FOR THE TITICACA NATIONAL RESERVE - PUNO SECTOR

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ABSTRACT

The Titicaca National Reserve is constituted as a natural heritage of high landscape and historical value concentrates an immensity of biodiversity; however, population growth and the expansion of economic activity in and around the city of Puno have been degrading its environmental assets, exposing its ecosystem to danger. The objective of this research is to determine the economic value granted by families for the conservation of the Titicaca National Reserve. The type of research to be applied is descriptive and correlal, the method used is the contingent valuation that allowed showing the economic value assigned to it by families. The economic value granted to the conservation of the ecosystem of the Titicaca National Reserve is 5.63 soles on a monthly basis, where more than fifty percent indicates that it is willing to pay for the conservation of that nature reserve. The variables that influence the willingness to pay are age, sex, education, household size, monthly income, time of residence, perception of contamination of the reserve and knowledge of policy

implementation. More than fifty percent of the population is willing to pay monthly the amountof 5.63 suns, the main variables affecting this decision the age of the respondent, sex, education, household size, monthly income, time of residence, perception of pollution of the nature reserve and the implementation of policies.

Keywords: Conservation of the Natural Environment, Availability Payable, contingent Valuation Method, Logit Model.

INTRODUCTION

The environment in general and many natural resources are linked to the concepts of: externality, public good and common resources. The presence of these market failures is generally associated with the absence of markets for these environmental goods and services (Cristeche & Penna, 2008). These failures include "Common Property Resources", such as forests or fish, characterized by non-exclusion in access and rivalry in their consumption (Ostrom, 1990). That is, in the absence of regulatory measures for the use of these goods or services (Azizullah et al., 2011; Bergstrom & Loomis, 2017; Pangaribuan et al., 2020).

As is well known, pollution worldwide is a problem that affects all countries; it can be water, soil, air, among others (Fernandes et al., 2020; Marchi et al., 2017; Ortega-García et al., 2020). This is caused by various factors such as man's hand (mining, factory construction, indiscriminate felling of trees, exploitation of resources, etc.) and lack of sensitivity to ecosystems (Encinas, 2011). However, for countries, governments and society, water is consolidated as the main concern of the 21st century, in the same way, the conservation of biodiversity(Organización Panamericana de la Salud, 2013; Quispe et al., 2020).

In the world there is a variety of protected natural areas, 12.7% of the world's land area and 1.6% of the oceanic area, are recognized as protected natural areas. Among these, the most important are the Galapagos Islands Marine Reserve - Ecuador, Yellowstone National Park - USA, Northwest National Park - USA, Hawaii Marine National Park, Qiangtang Nature Reserve - China, Macquarie Island Marine Park - Australia, among others (Quintero, 2011).

In Peru there are 75 protected natural areas of national administration, which make up the national system of natural areas protected by the State - SINANPE (Sernanp, 2019). Among the categories of protected natural areas are the National Reserves, an important name because it

Contributes to preserve the biological diversity of its flora and fauna. This implies that the

management of these natural areas is under the responsibility of governmental institutions. Among the most important is the Calipuy Reserve - La Libertad, Junín Reserve – Junín, Lomas de Lachay Reserve – Lima, Pacaya Reserve - Samiria - Loreto and Ucayali and the Paracas Reserve – Ica (Prom Perú, 2018).

Related to these reserves is Lake Titicaca, the highest and most navigable in the world, located in the department of Puno, in the South East, shares its waters with the country of Bolivia. The lake basin covers 57,349 km^2, a maximum width of 209 km. at a height of 3,810 m.s.n.m., in the Peruvian part (Minagri, N.D.).

In this lake is located the Titicaca National Reserve and the Khapia Landscape Reserve. The Titicaca National Reserve (RNT) represents an area of great importance, as it presents a variety of water resources, flora and fauna that are not being valued; this reserve also provides multiple environmental, economic and social services to urban and rural people (Pnuma, 2017; Quispe, 2015).

The Titicaca National Reserve was recognized worldwide in 1978 as a Wetland of International Importance thus having a tourist view. It falls within the category of protected natural areas of the National System of Natural Areas Protected by the State - SINANPE, called for direct use (Flores & Ocola, 2007). Located in southeastern Peru in puno department, Puno and Huancané provinces, on an area of 36,189 ha.

It comprises two sectors: Sector Ramis, with 7,030 ha, located north of Lake Titicaca in the vicinity of the Ramis River Delta, in Huancané province and Sector Puno, between the Capachica Peninsula and Esteves Island (Pnuma, 2011). It is undeniable that there are environmental problems for the proper conservation of the described environment, which motivates to make the assessment of this and in this way be able to conserve the NTR sustainably.

This article focused on the valuation of the Titicaca National Reserve - Sector Puno. Its special geographical and climatic characteristics make it a varied, complex and fragile ecosystem, whose biological diversity, characteristic of the high tropics, has inspired complex productive and technological systems that have made possible unusual adaptation processes and the development of an agrobiodiversity whose import has reached transcendental levels

(Pnuma, 2011). However, the historical breakdown of traditional processes and the imposition of exploitation systems have compromised the sustainability of those production systems, based on logic of complementarity and food security, threatening the survival of this invaluable natural and cultural heritage, as evidenced by the region's welfare indicators, some of which are beginning to be modified by recently implemented policies (Colque et al., 2008).

Ecosystems covered by the Titicaca National Reserve have been severely affected by environmental degradation, caused by both natural and anthropic processes, including mainly urban wastewater discharge and inadequate livestock, fishing and aquaculture practices, resulting in increased contamination of the bodies of water that make up the system, species loss and habitat reduction, sediments, deterioration of aquatic ecosystems and the balance of their fragile ecosystem (Digesa, 2008). Add to this the natural processes of desertification and salinization of the basin, whose impacts have generated highly saline waters and contaminated by the leachates of the tails and cut irreversibly altering the bodies of water and the habitat of the flora and fauna of the region (ALT, 2005). This caused the increase of threatened species, such as the giant Frog of Titicaca; in fish, boga, carachi, ispi, suche and mauri; Keñola, Choka and ducks. In terms of flora, there are threatened endemic species such as Lampaya, Pharastrephia and Chersodom (Pnuma, 2017).

A number of health and biological indicators need to be considered for the development of this research. First, thermotolerant coliforms, which is a useful indicator for monitoring the quality of the water resource. In a study of bacterial water contamination of Lake Titicaca - Inland Bay Puno between 2012 and 2015 reported values between 40 to 90 NMP/100 ml for thermotolerant coliforms. Based on this, Thermotolerant Coliforms in the NTR are located within the Cat.3 Environmental Quality Standards. "Vegetable irrigation and animal drink" Laura, (2015); Hallasi, (2018).

Second, pH and temperature used as physical-chemical indicators, the waters of Lake Titicaca recorded data below the National Environmental Water Quality Standards where it obtained average value for temperature 15.7°C and being alkaline its pH with 8.42 (Paredes, 2013). Thermal seasonality is moderate, with relatively high temperatures from November to February and low from June to August. Although the thermal amplitude of the average temperatures in the plateau is 5.8°C to 6.5°C, in the vicinity of Lake Titicaca it varies only from 3°C to 4°C (Aguilar, 2017). Biochemical Oxygen Demand (BOD), the values determined for the inner bay of Lake Titicaca has a statistical average of 41,025 mg/L. L and

is outside the "National Environmental Quality Standards", for Waters. Category 4, the value of which indicates

Less than 5 mg/L (Quispe, 2018). Which is disadvantageous for organisms because it generates pollution and overabundance of algae, which limits the passage of light through water, organic algae waste (Brönmark & Hansson, 2016).

Biodiversity indicators such as "threatened and protected species". According to the Official List of the National Institute of Natural Resources - INRENA/D.S. No. 034-2004-AG of 22-09-2004), Binational Authority of Lake Titicaca (ALT) and the Special Binational Project of Lake Titicaca (PEBLT) there are more than 40 species among fish, fauna, reptiles and endangered birds in the Titicaca national reserve and the Punic highlands (Mollinedo, 2016).

Considering some of the ecological parameters of the flora, in terms of diversity of species, we can say that the largest is found in the Chucuito peninsulas with 132 species (77%) and Capachica with 129 species (75%), followed by the districts of Platería with 125 species (73%), Puno with 124 species (72%), Paucarcolla 122 species (77%), Isla Taquile 94 species (55%), Isla Amantaní with 82 species (49%), Pusi 79 species (46%) Huata 53 species (31%) and Coata with 52 species (30%) (Cirnma & Cedafor, 2001).

Of which, the NTR responds to its exceptional natural beauty conditions, its archaeological and anthropological importance and the particularity of its ecosystems related to the largest body of water (Intecsa, 1993). These ecosystems have a unique aquatic fauna in the world, as well as a diverse bird with numerous endemic species. Its flora, which provides with the totora a central element to the ecosystems of the Lake, together with the aforementioned fauna, constitutes a resource of socioeconomic importance for the population that inhabits the Reserve. This reserve belongs to the category of wetland ecosystems, which are the most productive ecosystems on the planet and play key ecological functions (Cirnma & Cedafor, 2001). It is recognized that the population of Puno has assigned a reduced economic value for the conservation of the NTR, despite being a natural ecosystem that provides environmental services to its population, resulting in an inadequate willingness to pay the population for the conservation of the population, increasing pollution of environmental spaces, which leads to the poor use of natural resources (Elliff & Kikuchi, 2015; Lo & Jim, 2010; Riera, 2013).

Therefore, it seeks to answer the following questions: What is the economic value

granted by the population for the conservation of the National Reserve of the Titicaca-sector Puno? As a general problem, and secondaryly: Is there availability to be paid by families for the conservation of the Titicaca National Reserve – Puno sector? And what are the main variables that influence the. Economic valuation for the conservation of the National Reserve of the Titicaca-Sector Puno? In this sense, the objective of this research is: to determine the economic value granted by families for the conservation of the Titicaca National Reserve - Puno sector.

METHODOLOGY

General Characteristics of the Study Area

The Titicaca National Reserve (RNT) was established on October 31, 1978 by Supreme Decree No. 185-78-AA, comprising two sectors that have no physical continuity (Ramis sector and Puno sector). According to our research, the study area comprises the Puno sector of the Titicaca National Reserve. It has an altitude of 3810 meters above sea level and has a total area of 29150 ha and covers the totorales between Esteves Island and the Capachica Peninsula

FIGURE 1

MAP OF THE TITICACA NATIONAL RESERVE. SOURCE: MINISTRY OF THE ENVIRONMENT.

Type of Design and Methodology

This research work is non-experimental, cross-cutting and descriptive-correlal in nature. It is non-experimental in nature because the analysis of the variables is carried out in their actual Context; therefore, the manipulation of the variables under study is not carried out

(Cazau, 2006). It is descriptive-correlal, because variables are described and relationships occur naturally between these (Hernández et al., 2014). The methodology applied was the contingent valuation method, which showed the economic value assigned to it by the population; collecting data through surveys and the use of STATA, the dependent variable is binary, so the logit, probit and cloglog models were applied (Drukker et al., 2011).

Data Collection Techniques and Instruments

The instrument used is the survey, this was conducted considering the area of study, it should be noted that these surveys were conducted in a virtual way. The survey will consider 4 important aspects; respondent overview, socioeconomic characteristics, environment and perception of NTR and the availability to be paid (Galvez, 2013b).

Population and Sample Size

Population size consists of the number of families residing within the following districts. The sample size was determined based on the simple random sampling technique, where the research sample is from 381 families Table 1.

Table 1 NTR POPULATION - PUNO SECTOR SOURCE: INEI CENSUS 2017	
Distrits	**Head or head of household**
Capachica	3,242
Coata	2,663
Huata	1,297
Paucarcolla	1,738
Puno	41,925
Total	50,865

Analysis of Variables

The logical characteristics of feasible analysis units that indicate the essential aspects of the problem, as well as the relationships between them, are as follows Table 2.

Table 2 RESEARCH VARIABLES AND INDICATORS SOURCE: SELF-MADE					
Variables	**Factor**	**Indicator**	**Coding**	**Unit of measurement**	**Collection instrument**
Dependent variable					
DAP	Economic	Willingness to pay for the conservation of the Titicaca National Reserve - Puno sector	0 if the respondent responds negatively (NOT)	Binary variable (0/1)	
			1. if the respondent responds positively (YES)		
Independent variables					
Age	Social	Respondent's age	Whole number	Years	
Sex	Social	Gender of the respondent	1 if it's man	Binary variable (0/1)	
			0 if it's a woman		
Education	Cultural	Educational level of the respondent.	1-No Instruction	Years of study	
			2-Initial		
			3- Primary		
			4- Secondary		
			5-Technical		
			6-University		
			7-Second Specialty		
			8-Master		
			9-Doctorate		
Family Size	Social	Respondent's family size	Whole number	Number of people who make up the respondent's family	
Monthly income	Economic	Monthly economic income level	1-Less than 600 soles	Soles	
			2- Between 601 and 1000 soles		

			3- Between 1001 and		
			1500 soles		
			4- Between 1501 and		
			2000 soles		
			5- Between 2001 and		
			2500 soles		
			6 Between 2501 and 3000 soles		
			7- Between 3001 and		
			4000 soles		
			8- Between 4001 and		
			5000 soles		
			9- Between 5001 and		
			6000 soles		
			10- More than 6000 soles		
Residence time	Social	Residence time	Whole number	Years	
Pollution _ RNT	Environme ntal	Environmental Perception of Pollution in the NTR - Puno Sector	1-Low pollution	Levels	
			2'Regular pollution		
			3'High pollution		
Policy implementatio n	Social	Importance of policy implementation	1st Priority Non-priority	Levels	
			2nd Regular priority		
			3rd High priority		

RESULTS

Determination of the Availability to be paid by Families for the Conservation of the NTR - Puno Sector

The importance of the Titicaca National Reserve is that it has a great biodiversity, supports the socio-economic development of the Puno region, and also maintains the cultural traditions of the people who live in this region. Ecotourism in the reserve has the potential to generate significant economic income, could help the sustainable financing of plans and projects. Analysis of families' willingness to pay for conservation shows that out of a total of 381 surveys 63.78% of the total is willing to pay.
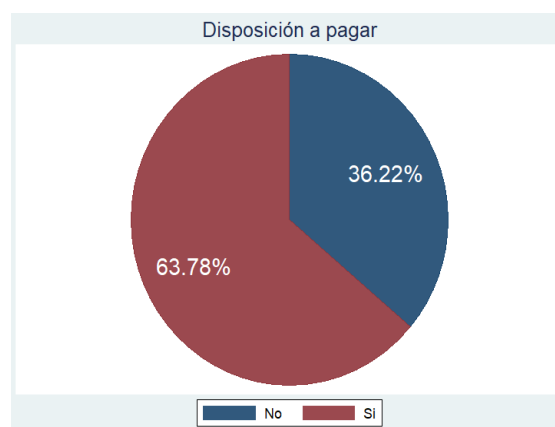
FIGURE 2

WILLINGNESS TO PAY FROM FAMILIES IN THE PUNO SECTOR FOR THE CONSERVATION OF THE NTR SOURCE: SELF-MADE.

In addition, of the total respondents 38.32% indicated that they are in the stratum of age between 29-39 years, followed by the range 18-28 years with 35.70% and as a minimum, the population that is 62 years old to more than 1.05%. However, in a cross-analysis with the availability payable variable, it can be observed that the population with the highest proportion is referred to persons who have an age range of 18-28 years with 42.80% while in the group of those who are not willing to pay, the largest proportion corresponds to the range of 29-39 years Table 3.

Table 3 AGE OF RESPONDENT RELATIVE TO DAP SOURCE: OWN ELABORATION THROUGH THE STATA PROGRAM			
Age	**DAP**		
	Not	**Yes**	**Total**
18-28	32	104	136
	23.19	42.8	35.7
29-39	57	89	146
	41.3	36.63	38.32
40-50	38	38	76
	27.54	15.64	19.95
51-61	11	8	19
	7.97	3.29	4.99
62 plus	0	4	4
	0	1.65	1.05
Total	138	243	381
	100	100	100

With regard to the degree of education of the head of the family, the results indicate that 15.49% (59 people) of respondents indicate that they have a full degree of university superior instruction, followed by the full secondary with 12.60% (48 people). While only 0.52% (2 people) of respondents report that they have only studies in Incomplete Primary and 3.94% (15 people) of respondents indicate that they do not have any studies. Within the population group willing to pay for the conservation of the reserve, the degree of instruction that has the most proportion refers to those with full mastery with 19.75%, followed by people who have a full degree of university superior instruction and second specialties Table 4.

Table 4 DEGREE OF INSTRUCTION IN RELATION TO DAP SOURCE: OWN ELABORATION THROUGH THE STATA PROGRAM			
Educación	**DAP**		
	No	**Si**	**Total**
No level	15	0	15
	10.87	0	3.94
Initial education	3	0	3
	2.17	0	0.79
Incomplete primary	2	0	2
	1.45	0	0.52

Complete primary	19	0	19
	13.77	0	4.99
Incomplete secondary	10	2	12
	7.25	0.82	3.15
Completed secondary	25	8	33
	18.12	3.29	8.66
Incomplete non-university superior	7	10	17
	5.07	4.12	4.46
Non-University Higher Complete	17	29	46
	12.32	11.93	12.07
Incomplete University Superior	14	16	30
	10.14	6.58	7.87
Complete University Superior	26	33	59
	18.84	13.58	15.49
Incomplete second specialty	0	26	26
	0	10.7	6.82
Complete second specialty	0	33	33
	0	13.58	8.66
Incomplete Mastery	0	10	10
	0	4.12	2.62
Complete mastery	0	48	48
	0	19.75	12.6
Incomplete doctorate	0	9	9
	0	3.7	2.36
Full doctorate	0	19	19
	0	7.82	4.99
Total	138	243	381
	100	100	100

In addition, of the total sample surveyed, 33.86% (129 people) point out that the highest income rate generates is to be professional and technical; 18.64% (71 people) respond to be traders, while 0.52% (2 people) respond to retirees or renters. Within the population group who are willing to pay for the conservation of the reserve, the occupation that is most in favor are professionals and technicians with 42.80% followed by public sector employees with 19.75%. However, in the group of those who are unwilling to pay, the most outstanding population is traders with 24.64%. Therefore, it can be shown that the variable occupation generates the most revenue by explaining the willingness to pay for the conservation of the NTR Table 5.

Table 5 OCCUPATION THAT GENERATES THE MOST REVENUE SOURCE: OWN ELABORATION THROUGH THE STATA PROGRAM			
Occupation	**DAP**		
	Not	**Yes**	**Total**
Professionals and technicians	25	104	129
	18.12	42.8	33.86
Merchant	34	37	71
	24.64	15.23	18.64
Public/private sector employee	10	48	58
	7.25	19.75	15.22
Peddler	24	0	24
	17.39	0	6.3
Worker	14	8	22
	10.14	3.29	5.77
Retiree, rentier	0	2	2
	0	0.82	0.52
Unemployed housewife	11	4	15
	7.97	1.65	3.94
Other activity	20	40	60
	14.49	16.46	15.75
Total	138	243	381
	100	100	100

Of the total number of respondents, 27.30% are that household income per month is in the range of 601 to 1000 soles (104 people), followed by 16.54% (63 people) corresponding to an income range from 1001 to 1500, while only 0.79% (3 people) receive a household income of more than 6000 soles. Among the group of respondents that if they are willing to pay for the conservation of the Titicaca National Reserve, the respondents who have a household income between 1501 and 2000 soles with 18.11% are located in greater proportion, followed by those with a household income between 1001 and 1500 soles with 17.28%. However, in the group that are unwilling to pay is the population that have a family income ranging from 601 to 1000 soles and less than 600 soles per month with 47.10% to 34.78% respectively. Therefore, it can be shown that family income if it explains the willingness to pay, taking into account many aspects such as the employment situation of the head of household Table 6.

Table 6 HOUSEHOLD INCOME PER MONTH SOURCE: OWN ELABORATION THROUGH THE STATA PROGRAM			
Monthly income	**DAP**		
	Not	**Yes**	**Total**
Less than 600 soles	48	13	61
	34.78	5.35	16.01
Between 601 and 1000 soles	65	39	104
	47.1	16.05	27.3
Between 1001 and 1500 soles	21	42	63
	15.22	17.28	16.54
Between 1501 and 2000 soles	3	44	47
	2.17	18.11	12.34
Between 2001 and 2500 soles	1	41	42
	0.72	16.87	11.02
Between 2501 and 3000 soles	0	27	27
	0	11.11	7.09
Between 3001 and 4000 soles	0	18	18
	0	7.41	4.72
Between 4001 and 5000 soles	0	9	9
	0	3.7	2.36
Between 5001 and 6000 soles	0	7	7
	0	2.88	1.84
More than 6000 soles	0	3	3
	0	1.23	0.79
Total	138	243	381
	100	100	100

Of the total respondents, 88.19% indicated that if they visited Lake Titicaca, while only 11.81% responded that they did not visit Lake Titicaca. However, in the group of people who responded that, if they are willing to pay, 90.12% say that if I visit the NTR, on the other hand, the group of people who indicated that they are unwilling to pay, 84.78% of the total group responded that they visited Table 7.

Table 7 VISIT TO LAKE TITICACA SOURCE: OWN ELABORATION THROUGH THE STATA PROGRAM			
Visited_RNT	**DAP**		
	Not	**Yes**	**Total**
	21	24	45
Not	15.22	9.88	11.81
Yes	117	219	336

		84.78	90.12	88.19
		138	243	381
	Total	100	100	100

Also of the respondents who responded that if they are willing to pay, 58.02% indicate that they visit sporadically, 18.11% indicate that they visit it once every six months, while only 1.65% mention that they visit it once a week. The latter refers to people who work or reside near Lake Titicaca Table 8.

Table 8 FREQUENCY OF VISITATION SOURCE: OWN ELABORATION THROUGH THE STATA PROGRAM			
LT frequency	**DAP**		
	Not	**Yes**	**Total**
Once a week	2	4	6
	1.45	1.65	1.57
Once a month	15	19	34
	10.87	7.82	8.92
Once every 6 months	18	44	62
	13.04	18.11	16.27
Once a year	32	35	67
	23.19	14.4	17.59
Sporadically	71	141	212
	51.45	58.02	55.64
Total	138	243	381
	100	100	100

According to respondents who answered yes to the question if they visited Lake Titicaca, they also mentioned that they benefited from the following environmental services. 35.96% of respondents indicated that they benefited from natural landscapes, 19.16% of scenic beauty, and 14.96% who benefited from pure air. Moreover, the 6.92% Indian who benefited from the contemplation of the flora and fauna existing in the NTR and 13.91% benefited from other environmental services not mentioned in the survey, thus verifying that the largest percentage of those who enjoyed the natural landscapes mentioned that 34.16% would be willing to pay for the conservation of the reserve compared to 39.13% who mentioned not having the availability to pay Table 9.

Table 9 BENEFIT OF ENVIRONMENTAL SERVICES SOURCE: OWN ELABORATION THROUGH THE STATA PROGRAM			
Ss_ambientales	**DAP**		
	Not	**Yes**	**Total**
Natural landscapes	54	83	137
	39.13	34.16	35.96
Contemplation of flora and fauna	3	23	26
	2.17	9.47	6.82
Fresh air	22	35	57
	15.94	14.4	14.96
Ancestral cultural values	13	22	35
	9.42	9.05	9.19
Scenic beauty	21	52	73
	15.22	21.4	19.16
Others	25	28	53
	18.12	11.52	13.91
Total	138	243	381
	100	100	100

With regard to the variable if in the Titicaca – Sector Puno National Reserve there was some form of pollution, of the total number of respondents, 43.57% of respondents consider that there is high pollution in the r, 31.50% consider that there is regular contamination, while 24.93% consider that there is little pollution Table 10.

Table 10 POLLUTION LEVEL SOURCE: OWN ELABORATION THROUGH THE STATA PROGRAM			
Contaminacion RNT	**DAP**		
	Not	Yes	Total
Poca contaminación	87	8	95
	63.04	3.29	24.93
Regular contaminación	42	78	120
	30.43	32.1	31.5
Alta contaminación	9	157	166
	6.52	64.61	43.57
Total	138	243	381
	100	100	100

On the other hand, 42.26% consider the reserve to be uns sustainable, within the group

of those who would be willing to pay, 48.15% respond that the Reserve is not Sustainable followed by 35.39% who consider it to be uns sustainable. However, of those unwilling to pay, 54.35% say it is unsus sustainable Table11.

Table 11 APPRECIATION OF SUSTAINABILITY SOURCE: OWN ELABORATION THROUGH THE STATA PROGRAM			
RRNN handling	**DAP**		
	Not	**Yes**	**Total**
Not sustainable	20	117	137
	14.49	48.15	35.96
Not very sustainable	75	86	161
	54.35	35.39	42.26
Sustainable	43	40	83
	31.16	16.46	21.78
Total	138	243	381
	100	100	100

Of the total sample, 62.20% of respondents are aware of the implementation of some policy to conserve the NTR, while 37.80% do not know of the implementation of any policy and 97.53% are willing to pay for making some beneficial change for the preservation of it (Table 12). However, 58.79% indicate that the implementation of environmental policies that favor the reserve is regularly a priority, of which 47.74% are willing to pay for the conservation of the NTR, however 2.36% of respondents indicate that the implementation of environmental policies in favour of the Reserve is not a priority and those who, if they believe it is a priority, are part of 38.85% of which 51.03% are willing to pay for the conservation of the NTR versus 17.39% who are not Table 12 & Table 13.

Table 12 LEARN ABOUT THE IMPLEMENTATION OF SOME POLICY FOR THE CONSERVATION OF THE RESERVE SOURCE: OWN ELABORATION THROUGH THE STATA PROGRAM			
Conoce_politicas	**DAP**		
	Not	Yes	Total
Not	138	6	144
	100	2.47	37.8
Yes	0	237	237
	0	97.53	62.2

Total	138	243	381
	100	100	100

Table 13 PRIORITIZATION OF A POLICY FOR THE CONSERVATION OF THE RESERVE SOURCE: OWN ELABORATION THROUGH THE STATA PROGRAM			
Policy implementation	**DAP**		
	Not	Yes	Total
Not priority	6	3	9
	4.35	1.23	2.36
Regularly priority	108	116	224
	78.26	47.74	58.79
High priority	24	124	148
	17.39	51.03	38.85
Total	138	243	381
	100	100	100

With regard to the way in which such payment should be made, 50.64% of respondents believe that it should be applied by increasing the rate of other services and the willingness to pay for them turns out to be 50.64% of the total number of people who are willing to pay and on the contrary 50% mentioned not wanting to pay for the conservation of the NTR, 26.38% believe that it should be made through the payment of referees, of which 26.61% agreed to have the willingness to pay for the most adequate conservation of the Reserve, while 12.34% believe that a direct payment should be made to the municipality and those who have the availability to pay are 12.02% and 10.64% believe that it should be made by any other means not mentioned in the alternatives of which those who agree to pay for conservation are 10.73% Table 14.

Table 14 METHOD OF PAYMENT SOURCE: OWN ELABORATION THROUGH THE STATA PROGRAM	
Way to pay	**Total**
In the payment of taxes	62
	26.38
Direct payment to the municipality	29
	12.34
Increase in the	119

rate of other services	50.64
Other	25
	10.64
Total	235
	100

Of the total respondents who responded that they are unwilling to pay, it is noted that 38.03% said that the main reason is that they do not have economic solvency, followed by 23.24% who point out that they do not trust the proper use of the funds. The smallest proportion referred to the reason why they were unwilling to pay for the preservation of the NTR is that it already pays the municipality a fee for it Table 15.

Table 15 WHY THEY'RE NOT WILLING TO PAY SOURCE: OWN ELABORATION THROUGH THE STATA PROGRAM	
Reason not DAP	**DAP**
Does not consider it necessary or urgent to preserve natural areas	11
	7.75
You do not have financial solvency	54
	38.03
The municipality is in charge of running these expenses	27
	19.01
You already pay a fee for it to the municipality	4
	2.82
Are you satisfied with the existing green areas	6
	4.23
You do not trust the proper use of funds	33
	23.24
Others	7
	4.93
Total	142
	100

In this sense, with Galvez research (2013) thanks to the contingent valuation method the results were that 55.75% of the population is willing to pay monthly for the improvement of the environmental assets of the NTR, which is less than the results obtained with this research in which 63.78% was obtained? In addition, his research shows that the inhabitants with the highest level of education were the ones who are most willing to pay, in Galvez research (2013) it was with villagers who finished high school with 36.75% and in the analysis of research results was with full top settlers with 15.48%, only differences in the degree of instruction. Also with the implementation of policies, Galvez (2013) notes that the implementation of policies for environmental care is urgent because their perception of the Reserve is deteriorated, however, in the result it is noted that they are regularly priority with a percentage of 58.79% and from their environmental perspective of the respondents, the management of resources turned out to be unsus sustainable with a 42.26%.

Performing the hypothesis contrast test, where the null hypothesis (Ha) is that more than 50% of the families residing in the Puno sector are willing to pay for the conservation of that sector, the results of which are shown below (Pearson Square Chi): Table 16 & Table 17

Table 16
DAP WOULD BE

	N observed	N expected	Resid
Not	138	190,5	-52,5
Yes	243	190,5	52,5
Total	381		

Table 17
TEST STATISTICIANS

	DAP would be
Chi-squared	28,937[a]
gl	1
Sig. asymptotic	,000
to. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is	
190.5.	

Considering table above, where the value of Pearson's Chi-square is 28,937 with 1 degree of freedom and the value of p (that's what Sig. asymptot says) it gave 0.000. Of which, since the p-value was less than 0.05, the null hypothesis is rejected and it is concluded that there

is sufficient evidence to suggest that the two categories of response to the question of whether the respondent would be willing to pay (whether or not) they are not equally represented, with a significance level of 5%. Therefore, more than 50% of respondents mentioned that, if they are willing to pay, contrasting with the mentioned by authors such as Galvez (2013) & Tudela Tudela (2012) who studied the same RNT and among other jobs such as Linares (2018); Satosqueo (2019); Herrera et al. (2018); Condori (2016); Hernández (2019); Cuxtal y Huamán (2019). We can also show that more than 51.75% result of (Gálvez, 2013) they are willing to pay, but we cannot say with what (Tudela, 2014) said that 67.5% responded yes, surpassing the results obtained by the research.

With the research of Galvez (2013) & Tudela (2012) thanks to the contingent valuation method the results were that 55.75% and 67.75% respectively of the population are willing to pay monthly for the improvement of the environmental assets of the NTR. This research indicates that 63.75% of the population is willing to pay with a $p-value$ less than 5% with which we accept the alternative hypothesis, where more than 50% if willing to pay. This is why it is contrasted with the research of Linares (2018), (Hernandez, Bracho, Loranca, & Manus 2019), Satosqueo (2019), Herrera et al. (2018), Condori (2016) & Huamán (2019) who studied other Natural Reserves, but showed that more than 50% are willing to pay. However, with the work of Galvez (2013) & Tudela (2014) who took the same reserve as a place of study, Gálvez's 55.75% result is willing to pay is lower than the results obtained, but the result found by (Tudela, 2014) is greater than the result obtained in the research. On the other hand, it is contrasted that the inhabitants with the highest level of education were the ones who are most willing to pay, in the research of (Galvez, 2013) it was with inhabitants who finished high school with 36.75% and in the analysis of research results was with full top settlers with 15.48%, only differences are found in the degree of instruction. Also with the implementation of policies, (Galvez, 2013) points out that the implementation of policies for environmental care is urgent because their perception of the Reserve is deteriorated, however, in the result it is noted that they are regularly priority with a percentage of 58.79% and from their environmental perspective of respondents, the management of resources turned out to be unsus sustainable with 42.26%.

Analysis of the Main Variables Influencing Economic Valuation for the Conservation of

the NTR - Puno Sector

The results of the regressions of the analyzed models that were Logit 1, Logit 2, Probit 1, Probit 2, Cloglog 1 and Cloglog 2 are shown in Table 18, which lists the variables corresponding to the estimate, their coefficients and their significance levels.

Of the six regressions presented, the Logit 1 model specified with the variables is selected: age, sex, education, household size, monthly income, residence time, perception of NTR contamination, and policy implementation, which are significant. The coefficients of the Logit 1 model have the expected signs, in addition to being well adjusted compared to the other Models (78.9%), so the model correctly explains by 78.9% to the dependent variable. On the other hand, in relation to the log - likelihood the highest value is required, thus it is clear that the Logit 1 model has the highest value. In other words, the choice has its livelihood in the expected signs, the statistical significance of the estimated coefficients globally and Pseudo R squared or goodness of adjustment and the maximum likelihood logarithm. Here is some goodness of the model: Table 18.

Variables	Variable coefficients and significance level					
Table 18 **RESUMEN DE RESULTADOS DE LOS MODELOS BINOMIALS. SOURCE: OWN ELABORATION BASED ON STATA 16 SOFTWARE RESULTS. SIGNIFICANCE: *: $p<0.1$; **: $p<0.05$; ***: $p<0.01$**						
	Logit 1	Logit 2	Probit 1	Probit 2	Cloglog 1	Cloglog 2
Coefficient						
Constant	-8,001**	-5,541***	-4,091***	-2,860***	-5,698***	-3,523***
Age	-0,121***	-0,114***	-0,063***	-0,063***	-0,067***	-0,067***
Sex	-3,109***	-2,980***	-1,614***	-1,608***	-2,130***	-2,075***
Education	0,406***	0,390***	0,225***	0,213***	0,235***	0,201***
Family size	-0,894***	-0,846***	-0,470***	-0,453***	-0,519***	-0,495***
Mensural income	1,275***	1,182***	0,687***	0,651***	0,842***	0,797***
Residence time	0,089***	0,078***	0,045***	0,041***	0,056***	0,048***
Tenure regime	0,527		0,278		0,394**	
Frequency of visits to the RNT	-0,199		-0,122		-0,046	
Perception of RNT						
contamination	2,555***	2,347***	1,317***	1,234***	1,420***	1,324***

NRM	0,491		0,197		0,210	
Knowledge of						
policy implementation	1,527***	1,368***	0,787***	0,706***	0,907***	0,793***
Employment situation	0,201		0,115		0,148	
Statistics						
Pseudo R2	0,789	0,778	0,786	0,777		
AIC	1,21,459	1,28,942	1,32,752	1,29,463	1,37,545	1,34,438
Ll	-52,729	-55,471	-53,376	-55,732	-55,773	-58, 219
BIC	1,62,715	1,64,428	1,84,008	1,64,949	1,88,802	1,69,923
Chi2	67,049	63,206	84,199	78,997	87,124	91,386

In this sense, by performing the analysis of the marginal effects considering that the explanatory variable is dichotomous, the estimates of the coefficients through the log it model cause a small error in predicting probability. In this case, in order to predict the effects of a change in independent variables on the probability of responding positively to the availability question to be paid, the marginal effects were determined it will allow interpretation in terms of probabilities Table 19.

Table 19 MARGINAL EFFECTS ON THE LIKELIHOOD OF WILLINGNESS TO PAY SOURCE: OWN ELABORATION BASED ON RESULTS OF STATA 16 SOFTWARE						
Marginal effects after logit						
y = Pr (DAP would be)						
Variable	dy/dx	Stderr	z	P>z	[95% C.I.]	X
Age	-0.006	0.003	-2.3	0.021	-0.011	-0.001	33.646
Sex	-0.131	0.046	-2.88	0.004	-0.221	-0.042	0.656
Education	0.02	0.009	2.29	0.022	0.003	0.038	9.53
Family size	-0.044	0.017	-2.57	0.01	-0.077	-0.01	4.105
Monthly income	0.061	0.02	3.04	0.002	0.022	0.101	3.436
Residence time	0.004	0.002	2.38	0.018	0.001	0.007	19.381
Perception of contamination	0.122	0.041	2.99	0.003	0.042	0.202	2.186
Policy implementation	0.071	0.031	2.31	0.021	0.011	0.131	2.365
(*) dy/dx is for discrete change of dummy variable from 0 to 1						

By interpreting the coefficients we can determine that

- If the respondent's age increases by one year, the likelihood of being willing to pay for the conservation of NTR decreases by 0.6%, this would indicate that young people would be more willing to pay, that result coincides with Tudela findings (2012), I estimate a reduction in probability by 1.5%.

- If the respondent is female, the probability that they are willing to pay for the conservation of NTR is greater by 13% compared to male, this result is affirmed with what Dancé obtained (2005) but it contradicts those obtained by Iwan et al. (2017) (Novoa, 2011) who calculate a higher probability for men by 3%.

- If the level of education achieved by the respondent increases by one level (e.g. from primary to secondary, or from secondary to university), the likelihood of being willing to pay for the conservation of NTR increases by 2%. This result is similar to Tudela findings (2012) & Cordova (2018), estimating an increase in probability by 10% and 7% respectively.

- If the respondent's family size increases with one more person, the likelihood of being willing to pay for TR conservation is reduced by 4.4%, that result matches Satosqueo (2019).

- By an increase in a monetary unit in the respondent's monthly income, the probability of being willing to pay for the preservation of the NTR increases by 6.1%, that result coincides with that of (Tudela, 2012). Who estimated an increase in probability by 13%?

- For an additional year of residence in the respondent's Puno province, the likelihood of being willing to pay for the conservation of NTR increases by 0.4%, not evidenced as a significant variable in other studies.

- If the individual perceives high contamination in the NTR, the likelihood of being willing to pay for the conservation of NTR increases by 12.2%. According to the estimate this variable has an important effect on the willingness to pay; this result is similar to that of (Pelinco, 2018).

- If the respondent considers a policy for the conservation of the NTR a priority, the likelihood of being willing to pay for the conservation of the NTR increases by 7.1% compared to those not considered as a priority policy.

Determination of the Economic Value given to the Conservation of the RNT Ecosystem – Puno Sector

Once the econometric models have been analysed, the availability to be paid monthly is estimated, obtaining a result that the population of Puno is willing to pay S/5.63 soles on a monthly basis for the conservation of the RNT ecosystem. Amount that annually is S/67.53 soles. To do this, it is detailed in the following Table 20.

Table 20
DAP AMOUNT RESULTS
SOURCE: OWN ELABORATION BASED ON RESULTS OF STATA 16 SOFTWARE.

Variable	Obs	Mean	Std. Dev.	Min	Max
Amount DAP	239	5.628	7.632	1	75

Given that the hypothesis raised is that the economic willingness to pay of the population is quantified, in monetary terms, in S/8.00 soles. Therefore, it is rejected. However, this analysis and sample of results provides an overview. For this reason, it will be analyzed taking into account the model variables. The first case is the variable education and the amount, in monetary terms, to be paid from the population Table 21.

Table 21
DAP AMOUNT FOR EDUCATION
SOURCE: OWN ELABORATION BASED ON RESULTS OF STATA 16 SOFTWARE.

Education	Average DAP amount
No level	
Initial education	
Incomplete primary	
Complete primary	
Incomplete secondary	2
Completed secondary	6.25
Incomplete non-university superior	1.8
Non-University Higher Complete	4.345
Incomplete University Superior	4.133
Complete University Superior	6.258
Incomplete second specialty	4
Complete second specialty	7.125
Incomplete mastery	6.1
Complete mastery	6.625

Incomplete doctorate	7.667
Full doctorate	5.842

In the first analysis, it is observed that the population with the highest degree of training has greater availability to pay, varying according to the level of education, amount that is approximately within the range of S/ 1.80 soles up to S/ 7.13 soles

Taking another main variable and analyzing it with the amount to be paid for the conservation of the RNT of the Puno Sector, is the income per month of the respondents, detailed as follows: Table 22.

Table 22 **DAP AMOUNT FOR MONTHLY INCOME** **SOURCE: OWN ELABORATION BASED ON RESULTS OF** **STATA 16 SOFTWARE.**	
Monthly income	**Average**
	DAP amount
Less than 600 soles	3.667
Between 601 and 1000 soles	3.368
Between 1001 and 1500 soles	4.585
Between 1501 and 2000 soles	4.386
Between 2001 and 2500 soles	7.317
Between 2501 and 3000 soles	9.5
Between 3001 and 4000 soles	6.722
Between 4001 and 5000 soles	5.667
Between 5001 and 6000 soles	7.571
More than 6000 soles	6.667

From the table above, it is noted that the higher the monthly income, the greater the amount you are willing to pay, mainly. However, the group that offers the most monetary amount for the conservation of the RNT- Sector Puno, is the one that receives revenue between S/ 2501.00 and S/ 3000.00 soles, with an amount of DAP of S/ 9.50. However, it is important

to know the DAP amount knowing the districts belonging to the Puno sector, which are Puno, Capachica, Coata, Huata and Paucarcolla, taking into account the sample, from which the following table is obtained: Table 23.

Table 23 DAP AMOUNT FOR DISTRICT OF RESIDENCE SOURCE: OWN ELABORATION BASED ON RESULTS OF STATA 16 SOFTWARE.	
District of residence	Average DAP amount
Puno	6.01
Capachica	4.154
Coata	4.833
Huata	3.313
Paucarcolla	4.333

Of the results obtained on the amount they are willing to pay and taking into account the variable district of residence, it is detailed that the district with the highest amount to be paid is Puno, S/ 6.01 soles on average; consecutively, Coata continues with an S/4. 83 soleson average, Paucarcolla with an S/ 4.33 soles on average, Capachica with an amount of S/ 4.15 soles on average, and finally Huata with an amount of S/ 3.31 soles on average.

On the other hand, analyzing the monetary amount of the availability of paying for the conservation of the RNT-sector Puno, subject to whether or not the respondent visited the NTR, the following result is obtained: Table 24.

Table 24 DAP AMOUNT REFERRING TO RNT VISIT SOURCE: OWN ELABORATION BASED ON RESULTS OF STATA 16 SOFTWARE.	
Visited RNT	Average DAP amount
Not	3.708
Yes	5.842

It is obtained that, if the respondent visited the NTR, their availability to be paid is S/ 5.84 soles per month and even though they have not visited it, respondents are willing to pay S/ 3.70 soles on average, monthly for the same purpose detailed above.

Consecutively, analyzing the DAP amount taking into account pollution from the Titicaca Nature Reserve, from the sector under analysis, it is observed that respondents who

consider the NTR to be low-polluted are willing to pay an amount of S/ 4.37 soles on average, on a monthly basis; those who observe regular pollution, S/ 3.57 soles; and, those who consider that there is high pollution are willing to pay S/ 6.72 soles, on a monthly basis, this being the largest amount. What is related as detailed in the following Table 25.

Table 25 DAP AMOUNT CONCERNING NTR POLLUTION SOURCE: OWN ELABORATION BASED ON RESULTS OF STATA 16 SOFTWARE.	
RNT contamination	**Average DAP amount**
Little pollution	4.375
Regulate pollution	3.571
High pollution	6.721

Finally, the table below is the amount available to pay subject to natural resource management in the NTR Table 26.

Table 26 DAP AMOUNT CONCERNING HR MANAGEMENT SOURCE: OWN ELABORATION BASED ON RESULTS OF STATA 16 SOFTWARE.	
RRNN handling	**Average DAP amount**
Not sustainable	6.707
Not very sustainable	4.333
Sustainable	5.205

It is noted that, of respondents, who note that natural resource management is not sustainable in the NTR, they are willing to pay a monthly amount of S/6.71 soles on average;

Those who consider it uns sustainable are willing to pay a monthly amount of S/4.33 soles; and finally, those who consider it sustainable, S/5.20 soles. In general, the research carried out is consistent with (Tudela, 2012) who argues that environmental perception influences the rate of availability to be paid. This has been based on the tables above. In addition, with respect to the contamination tables of the NTR and management of RRNN, Iwan, et al (2017) states that knowledge of the environmental situation makes it possible to express, in economic terms, an approximate measure of the Total Economic Value. In this case, it supports the results obtained in those tables.

CONCLUSION

The economic value granted to the conservation of the ecosystem of the RNT-sector

Puno is S/ 5.63 soles monthly; annually it is S/67.53 soles. In addition, the district of residence with the highest amount OF DAP is Puno with S/6.01 soles monthly, equivalent to 72.12 soles annually. In addition, the higher the degree of education, the higher the DAP amount, mainly. This relationship was made for significant variables.

Within the descriptive analysis we can infer that this work marks a favorable trend for the conservation of the Titicaca-Sector Puno national reserve, where 381 people surveyed as heads of the family, 63.78% indicate to be willing to pay indicating that the hypothesis raised is accepted which was that more than 50% of families are willing to pay for the conservation of the Titicaca National Reserve. In addition, individuals refer to the way in which such payment should be made is by increasing the rate of other services. On the other hand, there is a 38.22% indicating that they are unwilling because they do not have sufficient economic solvency and many of them do not rely on the proper use of the funds. According to the survey conducted the age range that has the most frequency is 29 to 39 years. The respondent's gender was then 65.62% for males and 34.38% for females. In terms of the degree of instruction most often answered those who have full university upper level with 15.49%; the results in terms of the district of residence were most often obtained in Puno with 76.64% and in terms of the level of monthly income the population places it between 601 and 1000 soles with 27.30%.

Through econometric analysis, the Logit 1 model was selected, based on the coherence of the expected signs, the statistical significance of the globally estimated coefficients, Pseudo R squared or goodness of adjustment and the logarithm of maximum likelihood. Also the variables that influence the willingness to pay for the conservation of the Titicaca National Reserve assuming a significance level of 5 are age, sex, education, household size, monthly Income, time of residence, perception of contamination of the NTR and knowledge of policy implementation.

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