An ecological economics approach to estimate the value of a fragmented wetland in Brazil (Mato Grosso do Sul state)

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Abstract

The Upper Paraná River floodplain is the last lotic stretch of an ecosystem seriously threatened given that circa 50% of the original ecosystem has been converted into reservoirs. To assess the recreational value of the Upper Paraná River floodplain, 174 tourists were interviewed using the Willingness to Pay - WTP and Travel Cost - TC methods. The annual aggregated WTP attributed by tourists was US$ 122.50 million and the variables which determine the decision in willingness to pay for the Floodplain are: 'consider oneself as a Floodplain natural resources consumer' and 'marital state'. If the single person considers her/himself as a consumer of floodplain natural resources, the WTP increases by a multiplicative factor of 38.8. The value aggregated by the TC method was US$ 234 millions and decreased by zone as the distance increases. Higher income and traveling farther increases the travel cost, which is inversely related to annual trip frequency. The total recreational value (356.5 millions per year) is high and representative since it refers to an environment fragmented by dams and with many anthropogenic effects. Therefore, the progressive changes on the landscape are a threat to local tourism, since half of the visitors are attracted solely by the scenic beauty, thereby overtaking those factors considered more important by public decision makers and managers, such as recreational fishery or boating.

Keywords: recreational value, willingness to pay, travel cost method, tourism, upper Paraná river floodplain.

Abordagem ecológico-econômica para estimar o valor do fragmento de uma planície de inundação no Brasil (Estado do Mato Grosso do Sul)

Resumo

A planície de inundação do Alto Rio Paraná é o último trecho de um ecossistema seriamente ameaçado, visto que 50% deste ambiente foi convertido em reservatórios. Para estimar o valor agregado pela recreação à planície, foram usados o Método de Valoração Contingente (Disposição à paga - DAP) e o Método do Custo de Viagem - CV pela entrevista de 174 turistas. A disposição a pagar anual agregada pelos turistas foi US$ 122,50 milhões, '**considerar-se um usuário dos recursos da planície**' e '**estado civil**' são as variáveis que determinam a decisão em pagar pela planície. Se o turista solteiro se considera um consumidor dos recursos da planície, a DAP aumenta por um fator multiplicativo de 38,8. O valor agregado pelo CV foi US$ 234 milhões e diminui por zona com o aumento da distância. Maior renda e viagens mais longas também aumentam o custo de viagem que, no entanto, é inversamente relacionado à freqüência anual de viagens. O valor recreativo total (356.5 milhões por ano) é alto e representativo por se tratar de um ambiente fragmentado por barragens e com muitos efeitos antropogênicos. Assim, as progressivas alterações na paisagem são uma ameaça ao turismo local, pois a metade dos visitantes entrevistados declarou ser atraída somente pela beleza cênica, sobrepujando outros bens e serviços naturais considerados importantes por gestores e administradores públicos, como a pesca recreativa e o passeio de barco.

Palavras-chave: valor recreativo, disposição a pagar, método do custo de viagem, planície de inundação do alto rio Paraná.

1. Introduction

Cost benefit studies in wetlands is an issue previously focused on quantifying commercial, storm protection, and energy-output values, with relatively little research devoted to quantifying their outdoor recreational value (Farber and Costanza, 1987; Lynne et al., 1981).

Despite the difficulties in ascertaining the monetary valuation of natural ecosystems, such valuation helps to draw attention to their importance, and highlights conservation and exploitation needs, especially in developing countries (Maharana et al., 2000). Development

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decisions, including the promotion of tourism for socio-economic improvement, have caused noticeable degradation of natural systems, due to the non adequate attention to environmental conservation.

Recreational activities generally are associated with two types of economic values; the current one (use value) and future option of use (non use value). Current use refers to the economic value produced by recreational activities developed in the present time, while option value refers to economic value generated by leisure activities that will be practiced in some future time period (Bergstrom et al., 1990). This last approach must take into consideration the contemplation, resting and relaxing uses that also characterize recreational pleasure.

The travel cost method is the model recommended by economists to estimate the economic value of recreation resources (Shafer et al., 2000). It permits the determination of a demand curve, given by the relation between the frequency of visits and travel costs, which represents consumer willingness to pay for the recreation provided by the ecosystem, and from it is calculated the consumer surplus (Pearce, 1985; Dixon and Sherman, 1990; Shafer et al., 2000). The method also provides a visitation rate to zones defined by growing distance classes and which verify the hypothesis that the visitation rate varies inversely with travel costs (Lockwood and De Lacy, 1992; Hanley, 1997).

With the aim of assessing the recreational value of the Upper Paraná River floodplain (Brazil), a survey of tourist activity was performed and the total value of the environment (non use value plus use value) was estimated using the Willingness to Pay - WTP and Travel Cost - TC methods. Aspects of the ecological perceptions of the tourists about the environment were also assessed and are discussed.

2. Study Area

This work was conducted on the Upper Paraná River floodplain, henceforth "Floodplain" (Figure 1), an undammed fragment of 230 km in length, of the original ecosystem (810 km) constrained upstream by the Porto Primavera dam and downstream by the Itaipu Reservoir. It reaches up to 20 km in width (Agostinho and Zalewski, 1996).

In the past (in the 1960's), the Floodplain had intense agricultural and grazing activities which were gradually substituted by hydroelectric undertakings and resulted in a high density of dams in the watershed (Figure 1). Around the Paraná River watershed there are more than 130 dams, of which 26 are more than 100 km^2 (Agostinho and Zalewski, 1996; Vazzoler et al, 1997).

Due to the anthropogenic modifications, the periodic floods were altered in periodicity and amplitude (Agostinho et al., 2004) with negative consequences for the reproductive cycle of some species of fishes (Agostinho et al., 1993; Agostinho et al. 2001) and for the economy of local artisanal fishery and its catches (Agostinho et al., 1994; Carvalho, 2002a; Ceregato and Petrere, 2003)

Despite these changes, the region still has a high diversity of endemic and rare species amongst its 417 terrestrial vertebrates (60 mammals, 37 reptilians, 298 birds and 22 amphibians), 176 fishes, 745 terrestrial or floodplain plants, 60 species of aquatic vegetation (macrophytes), more than 446 taxa of plankton algae, circa of 385 taxa of zooplankton and 188 of zoobenthos (Mussara, 1984; Agostinho and Zalewski, 1996; Minte-Vera and Carvalho, 1998; Agostinho et al., 2004).

Due to its volume and extension (5.0×10^8 m^3/year through 2.8×10^6 km^2) and numerous islands and chan-
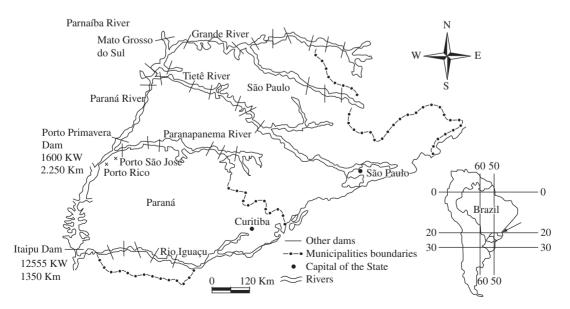

Figure 1. Study area (Floodplain 230 km length) at the Upper Paraná River with the surrounding reservoirs and the production of electricity (in MW) associated to each dam.

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nels, the Paraná River attracts tourists at weekends and holidays for fishing, boating, swimming at its 'beaches' (edges of the river and islands) or to relax. It also attracts attention for other anthropogenic activities such as agriculture, cattle raising, sand extraction, navigation or hydroelectric power generation (Agostinho et al., 2004).

As the ecosystem is emerging as a region for recreational exploitation, at present, there is one hotel and 2 tourist resorts in Porto Rico (PR) city along with summerhouses owned by tourists in PR and Porto São José. Artisanal fishermen from Porto Rico and Porto São José municipalities rent their boats at weekends for sport fishing or just for making trips down the river with the tourists, acting as tourist guides (Carvalho, 2002b). Local businessmen estimate an annual mean of 28.500 tourists.

3. Survey Design

Distinct surveys (willingness to pay-WTP and the travel cost method-TC) were carried out using closed questions recording socioeconomic background information (such as age, income, sex, marital state, number of dependents, *inter alia*), professional, outdoor recreational and cultural information (the last related to her/his knowledge concerning existence, location and use of the floodplain by the tourists and about ecological processes such as the flood pulse, fish reproduction, and connection among the river and the floodplain forest). Questions specific to each methodology are presented below. Only tourists over eighteen years old were interviewed.

In the WTP survey application a paragraph was read informing the visitor about the importance of the floodplain and its flood pulse to local flora and fauna (emphasizing fish reproduction), and about its endangered status imposed by the dams upstream. Afterwards, the respondent was asked about her/his willingness to contribute monthly (payment instrument) to a hypothetical foundation which would take care of restoration and preservation of the ecosystem as well as the continuance of its use for leisure activities and professional fishery (a sustainable use) in the 230 km of the Paraná River floodplain.

If the response was 'yes', the WTP was elicited on the referendum format with assistance, which is characterized by the request of an initial value (US$ 3.61). If he/she agreed, the value was increased until its refusal. On the other hand, if the respondent did not agree, the value was reduced till its acceptance (or definitive disagreement). This elicitation method was chosen for several reasons.

First, in the pilot interviews high variance of economic and education level amongst the tourists were registered. In these circumstances, the use of payment cards and bidding games surveys could be difficult, unintelligible for some of them and represent a waste of time. The second reason was that many of the tourists come from the same or neighboring cities every weekend and know each other, a fact that could permit the comparison of values among respondents, causing a loss of independence in samples and of credibility for the study. The last and more pragmatic reason was the possibility of the offered value being perceived as being "too low" and would cause recalcitrance or distrust in the aims of the study. On the other hand, suggesting large values could cause disinterest and suspicion of governmental intentions. In this scenario, the liberty to choose the value 'as you wish', seems to have been more acceptable to the visitors.

Beyond this, a consumer usually has more time and experience than the duration of an interview to decide to acquire or not the offered asset and at what value (Bickmore and Williams, 1994). In this scenario a starting point with oscillation can be better than the situation presented in other studies which suggests or uses payment cards, bidding games, open-ended formats and referendum (Siachoono, 1995; Rowe et al., 1996; Keith et al., 1996; Lunander, 1998; Creel, 1998 and others).

In this way, the tourists´ preference for one ecosystem service, the outdoor recreation offered, was appraised. As the floodplain has an average of 500 visitors per weekend, a random sample of at least 10% of them for the WTP estimate was adopted (Hanneman et al., 1991; Cameron et al., 1997; Carson, 2000).

The aggregated WTP was estimated by multiplying the median WTP by one-third of the citizens from the city from where the tourist originated, a literature assumption of the economically active population (Seroa da Motta, 1998; Santos et al., 2001; Schläpfer et al., 2004). The total population of cities registered was obtained from the census carried out by IBGE (http://www.ibge.gov.br/censo2000).

As usually practiced, a logistic regression given by $g(P) = \gamma_0 + \gamma_1 \cdot x_1 + ... + \gamma_n \cdot x_n + \varepsilon_i$ was adjusted to estimate the variables which influence the WTP, and a probabilistic function with logistic distribution – *logit* (see below) was assumed where P_i denotes the qualitative dependent variable, γ_0 is the constant of regression, γ_i is the coefficient of independent variables, x_i is the vector of independent variable(s), and ε_i is a random component arising from omitted variables (Li and Mattson, 1995; Hosmer and Lemeshow, 1989). The independent variables adjusted were marital states-MAREST, other outdoor recreational sites to visit-OSITE, if the respondent considers him/herself as a consumer of floodplain natural resources-NATCON, SEX, distance traveled to the floodplain-DIST, AGE, income-INCOM, and education status-EDUCA.

The *odds ratio* analyses resulting from iteration of meaningful variables is given by p/(1-p) and provides the multiplicative factor by which the odds change when the independent variable increases by one unit (p is the probability response).

For the TCM survey, questions were also asked about the city of origin, permanency, distance traveled, time spent on trip, frequency of visits and expenditures of entire trip (including out-of-pocket costs for trans-

portation, mechanical revision, accommodation, snacks, entertainment, equipment rental, boat fees, lodging, food and beverage).

The cities of origin were grouped in zones according to classes of distance, which supposedly have similar expenditures. The travel cost to *i* zone is given by the sum of the trip expenditures (such as transport, accommodation, etc.), and cost of time opportunity. This last one represents the value of the time spent on displacement, and usually it is assumed as a wage rate. Since its determination affects the estimate of the method (Mitchell and Carson, 1993; Pearce and Moran, 1994), for the present work, the income generated per hour of work to establish the value of the hours of trip was used. Thus, if the respondent earns US$ 10.00 per hour of work, a displacement of 3 hours will cost him/her the amount of US$ 30.00. It was assumed that the tourists interviewed work 40 hours/week (the most common work regime in Brazil).

The frequency of visits is given by the number of times the tourist declared to have visited the floodplain in a year. The visitation rate (VR) by zone was performed according to the formula $(VR_i/1000/year) = [(V_i/n) \times N \times 1000]/P$ (Dixon and Sherman, 1990), where $VR_i/1000$ = visitation rate for each 1000 people from the region *i* by year; V_i = number of visitors from region *i*; n = sample size of interviewed tourists; N = total number of visitors/year; and P = total inhabitants of region *i*.

The annual estimate of visitors by zone (AVZ) is given by AVZ = (visitor frequency $\times$ population of zone *i*)/1000 (Grasso, 1994). The consumer surplus was estimated as follows:

This expression has an analytical solution given by $EC_{(i)} = V_i \times (T_m - T_i)$, where EC = consumer surplus; V_i = visitation in population zone *i*; T_i = actual travel cost of the population zone *i*; and T_m = Maximum Travel Cost.

The EC value multiplied by the contingent of visitors per year (estimated in 28,500) provided the aggregated recreational value of the Paraná River floodplain. The frequency of visits/year revealed by the tourists was used to calculate EC (instead of the VR) since it permits a more conservative economic estimate.

The variables: travel cost by population zone, monthly profits, hours of trip, distance traveled, permanency (in days), frequency of visits and education status were correlated using the Pearson index. Sequential Bonferroni test correction of Peres-Neto (1999) was used to determine the significance due to the increasing probability of meaningful results when many correlations have been tested.

Multiple Linear Models were performed using as independent variables: the travel cost by zone, distance, monthly profits, time the respondent has known the area, whether the respondent is informed about the Defeso or Piracema (the period of prohibited fishing because of fish spawning), days of permanency, knowledge about the meaning and localization of the floodplain, and so-cioeconomic variables (such as age, sex, income, education status, marital state, number of dependents).

As dependent variables, the frequency of visits/year and the travel cost were used. For the frequency model, those tourists which visited the area for the first time were removed from the analysis, since it was impossible to inform how many visits they make per year. Data were log-transformed to better fit the variables to the linear regression model.

4. Results and Discussion

The ecological importance of the floodplain has been reported since the 1970s (Bonetto, 1975; Bonetto, 1976) and its contribution to local development has occurred since 1960s, according to Agostinho and Zalewski (1996). Despite its ecological, energetic and/or tourist potentialities, the economic valuation of natural benefits had not been assessed before.

After a pretest for both surveys in Jan/1999, a letter explaining the study and requesting cooperation of tourists in a resort were mailed (in May). Subsequently, eighty surveys were delivered to those visitors. However just six surveys were returned and only four were useful. After this, the whole study was carried out with face-to-face interviews.

The data collection was carried out in October/1999, February-April/2000 and January/2001 with tourists in Porto São José (1599 citizens in 2000) and especially in Porto Rico (2,714 citizens in 2000), where the Paraná River edges were equipped with tables and seats and some snack bars (called the river's '*barranca*'). The focus was the group of tourists which converge on the *barranca* on holidays and at weekends.

One hundred and seventy four visitors were interviewed. Half of them responded the WTP survey (n = 87) and the other half answered the TC method survey (n = 87). Most of the visitors came from a radius of 20 to 600 km (60%). The region receives tourists from 30 cities, and 40% are from other Brazilian States (São Paulo-SP, Minas Gerais-MG, Mato Grosso-MT, Mato Grosso do Sul-MS and Tocantins-TO).

The tourists (n = 174) are young (70% from 18 to 40 years old), with fair education status since one-fourth has university degree-level education and 40% has completed high school. The majority were married women, and therefore the main occupation was housewife and many families visit the place. Thus, usually women stay with the children at the *barranca*, while men go fishing by boat. Sixty three percent have a mean income of US$ 487.72 with standard deviation of +US$ 588 (US$ 1.00 = R$ 2.77 in October 2001).

Although the Floodplain offers great recreational attraction, half of the visitors prefer just to appreciate the landscape and relax talking with friends, and two-thirds of those respondents revealed that they would not visit the *barranca* (river edge) on the floodplain if her/his leisure option did not exist anymore. This suggests that the progressive changes on the landscape are a threat to local

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tourism, since the ecosystem has attracted tourists due to its scenic beauty, overtaking those reasons considered more important by public decision makers and managers, such as recreational fishery or boating.

The undammed portion of the Upper Paraná River is the preferred option for the tourists at weekends instead of staying at home. On holidays, the floodplain is preferred by the tourists as much as going to the seashore (for twenty seven percent of respondents) and the determining factor for the choice of site is the water quality and natural forest.

For seventy eight percent there is no substitute for the Floodplain, since they declared to not know a similar environment that provided them with the same pleasure.

Independent of the education level, the tourists are misinformed regarding the visited environment, since almost all visitors are unaware of the name and localization of the Floodplain (90%), even when asked about the *varjão*, a popular name used by households and fishermen. Only two tourists used the name 'floodplain' and the others said names used in the Amazon (such as *igarapé* and *várzea*), since news concerning that region are more widespread than the other Brazilian ecosystems.

The occurrence of flooding is known by as many as one hundred and fifty tourists, of whom sixty-seven consider this natural process important, whilst thirty-three do not ascribe importance to it. Besides this, thirteen respondents think that the hydrologic cycle of the floodplain is prejudicial to humans, probably due to damage announcements ascribed to past floods. Some visitors remembered and depicted, for instance, the last broad inundation in 1983. The Fishing Ban (or Defeso/Piracema), from November 1st to March 1st each year, is also known by many of them (n = 158), who consider it an important and proper act (90.7%) and generally recognize that it was motivated by fish spawn (80.2%).

Forty-six percent of respondents believe they do not use any natural resource of the Floodplain, and 15% do not know if they use any. Among those who consider themselves as a consumer of the Floodplain's resources, the most cited one was the fish (21%), followed by water (9.2%). Only once were timber, shade, landscape, recreation and electric power mentioned.

Despite not being the major Floodplain attraction, fish are the most cited resource because according to Randal (1986), human preferences are more focused on life forms than in life processes (ecological processes), the so-called ´decision guided by the species´. This is the

explanation also used by Pate and Loomis (1997) for the preference for salmon conservation programs than for programs of contamination control in the California wetlands. Regarding to salmon, Loomis and White (1996) and Cameron et al. (1997) also consider the cultural value, which increases the importance of this resource to people.

In the same way, the Fishing Ban period in the Floodplain provides the tourist the only widespread information concerning the environment, and can influence this citation. Besides, fish are associated to the use value, and its consumption can be more easily discerned related to other Floodplain's goods and services.

The mention of hydroelectric power just once, revealed the tourists´ lack of information, since they are unaware of the historical damming in the Paraná River and do not link the Itaipu dam existence, responsible for 25% of electric power generation in Brazil (or the other 25 dams) with the electricity used by them (Figure 1).

The tourist information concerning the ecosystem is an important factor, since in the *Logit* model (McFadden $R^2 = 0.099$; Log likelihood = –42.276; $\chi^2 = 0.01$; df = 2; p = 0.01) *'consider himself as a Floodplain natural resources consumer-RESCON'* is a significant variable which determines the decision in willingness to pay for the Floodplain (coeff.: 1.018; *t*-statistic: 1.74; p: 0.082). Another variable also significant was *'marital state-MARIS'* indicating that singles were more willing to pay (coeff.: –2.083; t-statistic: –1.94; p: 0.051). Interestingly, the interaction of significant variables (Table 1) showed that 'single' is always a risk factor for increasing the WTP. If the single (MARIS = 0) respondent considers her/himself as a consumer of floodplain natural resources (RESCON = 1), the WTP is multiplied by a factor of 38.8, if not (RESCON =0), the multiplicative factor is 14.

For married tourists who recognize themselves as consumer of Floodplain natural resources, the effect is important due to the lower bound of confidence value greater than one and because of the tenuous asymmetry to the right. A married tourist that thinks he/she does not use any natural resource of the ecosystem, does not have a genuine effect as a risk factor to WTP, maybe due to familiar economic compromises (Table 1).

The aggregated WTP for the Upper Paraná River floodplain was US$ 122,587,141.50 per year, estimated by multiplying the median WTP by one-third of citizens

Table 1. Odds ratio among the significant variables of the Logit Model (MARIS = 1:married; MARIS = 0:single; RESCON = 1: considers him/herself as a floodplain natural resources consumer; RESCON = 0: does not consider him/herself a consumer; and CI = 95%).

Effect of interaction among significant variables	ψ (estimated odds ratio)	Confidence Interval (CI)
MARIS = 0; RESCON = 1	38.808	4.237; 355.469
MARIS = 0; RESCON = 0	14.018	1.834; 107.135
MARIS = 1; RESCON = 1	4.835	1.843; 12.684
MARIS = 1; RESCON = 0	1.746	0.914; 3.335

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from the city the tourist came from (5,659,439.7 citizens). The value per hectare/year was US$ 533.00.

Although the tourist has a high percentage of willingness to pay (77%), the revealed mean (US$ 2.75 ± 3.0) and median (US$ 1.80) are fairly low and could be underestimated due to: i) the tourists´ misunderstanding regarding the goods and services used by them, that probably influences their attribution of value; and ii) the possibility that they were evaluating an area smaller than the real one (230 km), consistently with their actual behavior of renting fishermen's vessels to navigate short stretches (usually they remain at the river edge).

Given these results, it appears that better information for tourists concerning the natural environment could increase the tourists´ willingness to pay WTP and even its revealed paid value, since dollar amounts are not correlated to income (Pearson r = –0,05). Table 2 reports the percentage of protest bids among those that are not willing to pay, of which 35% argued economic reasons, maybe because this is a highly justified and non questionable motivation. Removing the protest bids, the mean WTP increased by US$ 0.28 and the median remains the same.

Interestingly, variables expected to influence WTP (age, sex and education status) were not significant for the Floodplain. In other Brazilian studies, age, income, sex and education status had an effect on the WTP of the inhabitants of Jataí Ecological Station, in São Paulo-SP (Obara et al., 2000; Santos et al., 2001), whilst age and education were significant for environmental assets from Roraima (Pessoa and Ramos, 1998). Knowledge as a variable was also important in justifying the respondents WTP at Cananéia Mangrove/SP (Grasso et al., 1995). Tourist knowledge concerning the environment, as well as the distance from it, also influenced the WTP for wetlands in California (Pate and Loomis, 1997).

Pate and Loomis (op cit.) found a high level of colinearity among respondent's knowledge and distance of county they came from. Thus, for a contamination control program in San Joaquin Valley, California, as the distance increases (diminishing the tourist knowledge about the valley) the WTP diminishes. Local salmon protection programs do not show this correlation, probably due to the cultural and use values mentioned.

In the Upper Paraná River floodplain, distance does not have an influence on the value the tourist was willing to pay (Pearson r = –0.09) and on Floodplain localization knowledge (t = 0.7 after confronting distances of origin of those who knew the Floodplain location and those that did not know its location).

The existence of substitutes for the Floodplain had no effect on willingness to pay, since the binary variable OUTLU (= other similar place to visit) does not have statistical significance in the *logit* model.

The majority of respondents that were willing to pay (64%) expressed an existence value to pay, whilst the remaining ones indicated an option value. This represents an altruistic desire related to the environment since it does not have implications in its use.

The WTP estimate and its existence value approach is a complementary valuation to assess the Floodplain recreational value, since it represents a non-use value, and must be complemented with use values (using the travel cost, for instance). Although Mitchell and Carson (1993) affirm that existence value is an advantage of the WTP method, its real estimate also includes the value expressed by non-users, implying an underestimation of WTP for the Floodplain. Nevertheless, Fisher and Raucher (1994) and Carson (2000) advise not to exclude the existence value, even if its estimate seems to be imperfect, since it represents the non use value.

The recreational use value aggregated by the travel cost method (ca.US$ 234 millions) is also high and representative since it refers to an environment fragmented by dams which exhibits anthropogenic effects, such as decline of fish stocks (Agostinho et al., 2001). Thus, the Floodplain provides the visitors a high annual benefit (CS - consumer surplus = US$ 8,209.68/year), which decreases by zone as the distance increases (Table 3).

Tourists traveled an average of 220.3 km up to the Floodplain in 2.7 hours to stay for 3.4 days. The majority of trips to the Floodplain are done by car once a month, in the last ten years (77%). This "regular public" (Gösseling, 2000) comes mainly from zones I, II and III (up to 300 km of distance) whilst tourists from others zones have lower trip frequency and represent an 'occasional public' (Table 3).

As expected (Mitchell and Carson, 1993; Pearce and Moran, 1994; Seroa da Motta 1998), expenses with accommodation, locomotion and cost of time are the variables that influence the travel cost (p = 0.000; $R^2 = 0.99$).

For estimating the final model only, travel cost and trip frequency were retained as the dependent variables, once the confounding variables were removed. Final models (Table 4) evidenced that travel cost is also determined by income and distance (positive sign) and by hours of trip (negative sign). Therefore, greater income

Table 2. Motivation presented by tourist who is willing to pay and justification of those who are not ([1]protest justification).

Motivation to contribute (n = 134)	%	Justification of not being WTP (n = 40)	%
To keep the floodplain existing	65	Economic	35
For the option of visiting in the future	27	Does not believe in the program[1]	20
To maintain the visitors	8	It is unfair to charge another payment[1]	15
To be known by future generations (bequest)	0	Does not know, need to think about it	20
		Nonchalance[1]	10

Table 3. The estimated costs*, consumer surplus and other characteristics estimated for each zone of Floodplain visitors.

Zones	I	II	III	IV	V	VI	VII
Distance (km)	20-100	101-200	201-300	301-400	601-800	801-1250	401-600
Locomotion cost	15.83	41.59	82.66	48.25	78.06	99.70	65.22
Time cost	1.84	7.80	10.41	22.53	32.26	16.81	43.18
Travel cost	46.86	50.29	126.08	46.63	51.98	166.51	100.88
Consumer surplus	4 275.24	1 560.87	422.41	387.90	585.68	858.52	119.06
Number of visitants	35	29	4	6	4	6	3
Hours of trip	0.45	2.09	3.75	4.25	6.75	8.17	12.33
Mean Freq. visits/yr	24.7	9.2	54.5	2.2	3.5	8.3	1
Visitation rate	175.57	18.23	3.34	3.89	2.18	1.11	0.08
Estimated Visits/yr	1 623.58	6 798.21	2 255.97	1 224.29	2 607.15	7 678.85	11 589.32

* 1.00 US$ = 2.77 in October 2001.

Table 4. Linear regression models which determine the variable influence on frequency of trips/year and on travel cost (TC = Travel cost; Hs = hours of trip; Dist = distance; whole constants have p = 0,000).

No equation	Variable	Estimated coefficients	P
	Income	0.014	0.010
I : TC = f (Income, Hs, Dist)	Hours of trip	−35.913	0.028
	Distance	0.832	0.000
II : LogFreq = f (Hs)	Hours of trip	−0.0978	0.000
III: LogFreq = f (TC)	Travel cost	−0.002	0.002

results in increasing expenditures and, as a consequence, in travel cost. Also travelling farther increases the travel cost, although this is not the rule for all study cases (Hanink and White, 1999). In the Floodplain, distance and travel cost are highly correlated variables (Pearson $r = 0,7$; $p = 0,005$; $n = 87$), emphasizing the effect showed on Equation 1.

Otherwise a negative sign of 'hours of trip' is not expected (since more hours of trip would imply higher cost and hence, a positive sign). This can be an effect of multi-colinearity between 'distance' and 'hour of trip' (r de Pearson $= 0,98$; $n = 87$), which can produce changed signs (Zar, 1996).

Travel cost is inversely related to annual trip frequency, since according to Wilson et al. (1999), people react to increase in costs in the same way to increase in payment rate. Thus, the greater the travel cost (or the admission rate), less frequent the trip will be, as showed in equation III. Residuals of multiple linear regression models using frequency of trip presented heterocedasticity even after logarithmization. This probably is due to the great variability of tourist characteristics and the multiple uses in the environment, which determines the distinct travel cost and frequency of trips (Brox and Kumar, 1997). Residuals of equation II, for instance, showed points corresponding to 39% of tourists from zone I, and whose variability of characteristics do not permit thorough data linearity.

Daily expenditures incurred by tourists (US$ 75.08 – as shown in Table 5) represents fifty-six percent of expenditures by Brazilian tourists, which goes to Matogrossense Pantanal (US$ 134.26), a famous Brazilian wetland (Oliveira, 1999).

Only 10% have expenditures with accommodation, that can be an effect of: i) trips with only one day of permanency made by inhabitants of the surrounding counties (45,3%), in general from zone I and II; ii) one third of tourists who are guests of their relatives; and iii) observed increasing number of summer resort houses owned by tourists (12% of respondents bought a summer house during the last 5 years).

The possibility of the respondent taking advantage of the trip for another purpose, such as visiting relatives, could prompt the visit to the area. Hence, the amount of tourists who have relatives living near the Floodplain represents a constraint to travel cost estimates (Seroa da Motta, 1998; Bellia, 1996), and the unpretentious expenditures with accommodation and feeding can be an effect of this constraint. As demonstrated by Li (1999) at Port Phillip Bay, Australia, expenditures with tackle and vessel for outdoor activities on the Floodplain are made by few respondents indicating that the main motivation for many tourists is to relax instead of catching fish.

The total recreational economic value of the Floodplain (estimated by the use value – WTP and non use value – TCM) was US$ 356.5 millions per year. This value is determined mainly by scenic beauty than by recreational fishing. Floodplain visitors were misinformed about the ecological potentiality and importance of the environment, which could affect not just the attribution of value to it, but also management actions and future decisions concerning investments or economical undertakings.

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Table 5. Floodplain visitors' daily expenditures and the percentage of respondents which has these expenses.

Item	Expenses/trip (US$)	s.d. (US$)	Percentage of tourists involved
Transportation	23.50	30.50	100
Vessel	21.22	16.39	16
Accommodation	18.70	10.21	10.4
Fishing	13.21	15.74	8
Feeding	11.97	10.97	88
Snacks	9.96	8.84	11.6

Total expenditures/day (except transportation): US$ 75.08

The valuation of the Upper Paraná River floodplain emphasizes the need for information and explanation programs to visitors and for investments in order to guarantee the scenic integrity of the ecosystem, as well as its habitats and species diversity.

Consequently, as well as the environmental education and dissemination required, the establishment of a floodplain reserve (Agostinho et al., 2004) and the rationalization of dam operations (Carvalho 2002b; Agostinho et al., op cit.) could avoid impacts of recreational use and will improve local ecological, economic and social sustainability.

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