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ESTIMATING LOSSES IN CULTURAL ASSETS AND CULTURAL ACTIVITIES FOLLOWING THE FUNDÃO DAM RUPTURE IN MARIANA, MINAS GERAIS, BRAZIL

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ABSTRACT In November 2015, the Fundão Dam ruptured in Minas Gerais. In addition to the casualties, entire communities were destroyed, interrupting the access to cultural heritage and important cultural manifestations in the affected territories. This article seeks to measure the cultural losses of the 843 affected families in the municipality of Mariana, based on a survey using the contingent valuation method. The results point to the importance of the cultural manifestations and the spaces of cultural reference, as indicated by the high frequency with which these manifestations and spaces were mentioned by the affected individuals. The reported values of willingness-to-accept (WTA) compensation for the partial or integral loss of access and the manifestations confirm this evidence.

KEYWORDS Contingent valuation, environmental disaster, cultural losses, willingness to pay, willingness to accept.

ESTIMANDO AS PERDAS DE BENS E ATIVIDADES CULTURAIS DECORRENTES DO ROMPIMENTO DA BARRAGEM DE FUNDÃO EM MARIANA, MINAS GERAIS, BRASIL

RESUMO Em novembro de 2015, ocorreu o rompimento da Barragem de Fundão, Minas Gerais. Além de provocar mortes e destruir comunidades inteiras, a tragédia motivou a perda de acesso ao patrimônio cultural edificado e a interrupção de importantes manifestações culturais no território atingido. Este artigo buscou mensurar as perdas culturais das 843 famílias atingidas no município de Mariana, a partir de survey utilizando o método de valoração contingente. Os resultados apontam para a elevada importância das manifestações e dos lugares de referência cultural para as comunidades atingidas, conforme indicado pela alta frequência a estes antes do desastre e pelos valores de disposição a aceitar (DAA) indenização pela perda parcial ou integral do acesso e das manifestações, reportadas pelos entrevistados.

PALAVRAS-CHAVE Valoração contingente, desastre ambiental, perdas culturais, disposição a aceitar, disposição a pagar

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² 32.6 million cubic meters of waste/tailings descended from Fundão’s tailings containment structure on November 5, 2015, covering residential and common use areas, rural properties, and entire communities. 680 kilometers of the Rio Doce hydrographic basin were impacted, compromising the water supply and access to several parts of the territory.

³ While families from different municipalities have been affected by the rupture, this article refers to those residing in the municipality of Mariana at the time of the rupture. These families lived in the following districts: Bento Rodrigues, Camargos, Paracatu de Baixo, Paracatu de Cima, Borba, Campinas, Pedras, and Ponte do Gama.

1. Introduction ¹

In November 2015, the Fundão Dam ruptured in the municipality of Mariana, in the State of Minas Gerais, resulting in the largest environmental disaster in Brazil ². In addition to human deaths, the environment, entire communities and enterprises were destroyed. Access to cultural heritage (historic buildings and places for collective use, such as churches and squares, among others) and important cultural manifestations were interrupted in the eight most affected territories in Mariana ³.

This article presents monetary estimates of the cultural losses incurred by the 843 families affected in Mariana. A disaster of such proportions meant the destruction of cultural symbols and places of cultural reference, and the interruption of daily practices, as well as practices linked to the material production of cultural goods. This scenario may be treated as a disaster, following the definition of Quarantelli (2000, p. 682): “disasters are relatively sudden occasions when the routine of collective social units is seriously interrupted and when unplanned courses of action need to be carried out, leading to unexpected life stories and putting socially valued objects at risk”. In addition to destroying tangible heritage, the interruption of cultural practices led to social disruption, with irreversible damage to intangible heritage.

In order to estimate the cultural losses of the 843 impacted families, the contingent valuation method (CVM) was used. A questionnaire was devised with questions on willingness to pay (WTP) for religious and popular celebrations, and in regard to access to places for collective use, prior to the dam rupture. Willingness to accept (WTA) compensation for partial or complete loss of access to these assets, events and places was also inquired. The questionnaire was applied to a stratified random sampling. From the data collected, we estimated the WTP and WTA median values. The latter proved to be more robust due to greater respondent adherence to a one-time payment as compensation for the losses of access and the fruition of cultural assets and places following the disaster.

This paper is organized into four sections. The second section offers a literature review concerning the valuation methods applied to cultural losses. The third section describes the methodological procedures used to estimate losses. The fourth section presents the results.

2. Contingent valuation applied to culture: a brief literature review

In its anthropological sense, culture refers to beliefs, morals, customs, values and common or shared practices of a social group, expressed in the form of symbols such as signs, texts, language, oral and written tradition, among others (THROSBY, 2001). Some of these symbols are manifested in the so-called cultural goods, assets and services, which, in addition to economic or market value, present cultural value associated with the uniqueness of a specific cultural group, symbolizing their distinction from other groups (THROSBY, 2008). This value therefore carries important matters of identity, serving as a way of communicating ideas and concepts of the group it represents.

Cultural goods can be tangible or intangible, as expressed in the United Nations Educational, Scientific and Cultural Organization (UNESCO) definitions of cultural heritage, and also in the Brazilian legislation. The Brazilian Constitution of 1988, in its article 216, conceptualizes cultural heritage as goods “of tangible or intangible nature taken individually or together as bearers of reference to the identity, action and memory of the different social groups that form the Brazilian society”. Such definition encompasses different forms of expression such as modes of creation, doing and living; scientific, artistic, and technological creations; works, objects, documents, buildings and other spaces intended for artistic and cultural expression; urban complexes and sites of historical, landscape, artistic, archaeological, and paleontological value.

Cultural goods may be private, meaning that their market prices are determined, or public, with no observable prices. Even in the case of private cultural goods, however, the cultural value of these goods cannot be reduced to their price, or their market value. In this sense, cultural goods, even if traded in markets, can be classified as meritorious.

Cultural public goods may refer to tangible heritage, such as buildings, urban complexes and places of recognized historical and artistic interest, as well as intangible heritage, covering cultural practices and expressions. The inexistence of the market value for these goods relates to the use of techniques for revealing preferences by the economic agents involved, such as the Contingent Valuation Method.

The Contingent Valuation Method enables the estimation of the use value and the non-use value components. It is widely applied in the economic literature, often used to evaluate the implementation and maintenance of national parks (LEE; HAN, 2002), economic compensation for oil spills (CARSON *et al.*, 2003), costs associated with acid rain (BURTRAW *et al.*, 1998), waiting time in hospitals (IVERSEN, 1993; RYAN; FARRAR, 2000), the value of endangered species (KOTCHEN; REILING, 2000), cost associated with disease risks (KRUPNICK *et al.*, 2002), valuation of cultural heritage (SANTAGATA; SIGNORELO, 2000; TAFNER *et al.*, 2003; BORGER; BELLUZZO, 2009), among others. The main advantage of adopting this method for the valuation of cultural goods is the incorporation of the option value and the non-use value generally associated with them (values of existence, prestige and inheritance).

The Contingent Valuation Method sets up a hypothetical market, a contingent situation, in relation to which the target population report their Willingness to Pay (WTP) to increase well-being due to improvements and/or maintaining the asset, or their Willingness to Accept (WTA) to compensate for losing well-being as a result of non-access or non-consumption of a public asset (IORGULESCU *et al.*, 2011). To implement this method, a sample of individuals from a user population is defined, a questionnaire is devised, and the valuation measures are estimated. The questionnaire must contextualize the scenario so that the respondent is able to state a monetary value, either for the WTP or for the WTA. The questions regarding WTP and WTA can be opened in value ranges or through the use of cards with pre-set values defined by the researchers. In addition, information on the frequency of use of the good or asset, and/or other similar items, need to be included in the questionnaire in order to elucidate the respondent's knowledge of the public good.

Arrow *et al.* (1993) and Ardila, Quiroga and Vaughan (1998) suggest certain methodological procedures to avoid interviewees' strategic behavior as well as biases in the use of this method: i) focus groups with a representative population sample, or

similar ones, aiming to identify the spectrum of potential values of willingness to pay or accept; ii) pilot surveys to test the questionnaires, the valuation scenario, as well as the elaboration of the question of the willingness to accept or pay; iii) application of similar questionnaires in a control sample as a way to avoid possible biases identified in the focus sample.

3. Methodology

In this study, the Contingent Valuation Method was applied to measure the losses experienced by the families affected by the Fundão Dam rupture in Mariana, in terms of their access to cultural goods and services for which the application of this method was possible. From the document “Systematization of Losses and Damages”, based on the Caritas Brasileira⁴ cadastral database of people impacted by the rupture, we created a typology of losses, following the Brazilian guidelines in relation to tangible and intangible heritage (IPHAN 2018; Brasil, 2000):

- celebrations: social practices, rituals and festive acts related to the collective experiences of work, religiosity, entertainment, and other social life practices;
- access to spaces of collective use (bars, squares/plazas and other such meeting places): sites of symbolic value in which a range of collective cultural practices is concentrated and reproduced;
- access to heritage spaces related to churches and religious/sacred pieces, stone walls, buildings, bridges and monumental crosses with symbolic value: immovable material cultural assets bearing reference to the identity, agency and memory of the affected communities.

The questionnaire was built in stages. First, we conducted a pilot survey in Raposos⁵, and a pre-test with a small group of affected people in Mariana. These initial steps were fundamental to the definition of the number of questions and the language used in the questionnaire, so that the time of response did not make the interview unfeasible and, at the same time, considered the guidelines prescribed in the contingent valuation literature (ARROW et al, 1993), namely:

- include questions to assist the interviewees in the valuation process: in this case, questions about their attendance to cultural events and places of collective use, and the expenses incurred there, prior to the dam rupture;

⁴ Caritas Brasileira is a non-governmental organization hired to assist and support the affected families in the processes of legal reparation and damages negotiation. This institution registered 843 families affected by the disruption in the city of Mariana. The cadastral database contains information on families and their losses due to the disaster.

⁵ Raposos is a municipality located in the Metropolitan Region of Belo Horizonte, with economic, environmental and cultural characteristics similar to those of Mariana.

- present the valuation scenario: description of the items to be valued, with the inclusion of photos easily recognizable by the interviewee;
- present the means of payment (WTP) or receipt (WTA): payment of a “raffle” to access cultural events, considering the pre-disaster (WTP); payment of a “ticket” to access places of collective use, considering the pre-disaster (WTP); “one-time payment” of compensation for loss of access for the two cases mentioned, and for built heritage (WTA).

The questionnaire included questions related to the Willingness to Pay (WTP) for access to celebrations and places of collective use, considering the scenario prior to the dam rupture, as well as questions about the Willingness to Accept (WTA), a one-time payment to compensate the loss of this access in the case festivities, places of collective use, and built heritage, considering the post-disaster scenario. In the former (WTP), the questions referred to individuals; in the latter they referred to the family. All questions were presented together with a photo card depicting examples of the items whose loss would be valued. Respondents were encouraged to talk about other items not included in the cards. Anticipating a possible difficulty of the interviewees in answering questions about the Willingness to Accept, an auxiliary tool was devised, in which values were made available in a continuous spectrum, presented visually as a “ruler”. The “ruler” values were defined based on the pre-test. However, in the final research, we observed low acceptance of this instrument.

The survey was conducted between February 8 and 26, 2019, with 419 questionnaires applied. The interviewees were selected from a stratified random sample of people aged 18 years or older at the time of the Fundão Dam rupture. The interviews occurred in the households, or in places indicated by the interviewees, and only one person was interviewed per selected family. In order to allow statistical inference of all estimated parameters, a probabilistic sample design was defined at the household level. Six strata were defined based on groupings of affected communities (two groups) and three levels of cultural resource use (use, non-use, or no information provided), the latter information obtained from the Cadastral Database of families. To calculate the minimum sample size, a standard error of 4% and a significance level of 5% were used, based on a multinomial distribution.

During data organization and analysis, a greater acceptance of the Willingness to Accept (WTA) questions could be observed. For Willingness to Pay, responses

were hampered by the fact that most festivities and access to places of symbolic value were free of charge prior to the rupture. Hence, some respondents had difficulty in establishing monetary payment values, despite the adaptation of the means of payment after the pilot and the pre-test ⁶. On the other hand, respondents answered their WTA with relative ease, which may be associated with the fact that they had been involved in discussions about the compensation negotiation process for some months. ⁷

⁶ In the testing phase of the questionnaire, this difficulty had already been observed. So, we adjusted the questionnaire. Instead of asking for an access price to cultural festivities, we opted for a payment method closer to the reality of those affected: the raffle.

Among the reported values of WTP and WTA, we disregarded outliers that could bias the results. For each variable, maximum values were defined as those referring to 5 times the median value. The median was chosen due to its lower sensitivity to extreme values, once the responses referring to WTA tend to have great variability.

⁷ Attachment I shows the distribution of WTP and WTA values as reported.

The median *per capita* WTA was estimated for losses related to celebrations and places of collective use, and built heritage. We also estimated the predicted values of a log-linear regression that used the following respondents' information as explanatory variables: age, educational level, gender, and district of residence prior to the Fundão Dam rupture. The eight districts were divided into two large groups according to their cultural similarities: Group 1) *Bento Rodrigues* and *Camargos*, and Group 2) *Paracatu de Baixo*, *Paracatu de Cima*, *Borba*, *Camargos*, *Campinas*, *Ponte do Gama* and *Pedras*.

4. Results ⁸

⁸ Amounts in US dollars, considering the rate of February 8, 2019. Amounts in Brazilian reais are presented in Attachment II.

4.1. Sampling features

Table 1 shows the distribution of the respondents' sociodemographic characteristics. A balanced distribution between the two residence area groups can be observed. Similarly, the sample is balanced in terms of gender distribution. A concentration of respondents whose formal educational level is up to elementary school can be noticed. The average age of the interviewed population is 47 years old.

Table 1- Distribution of sociodemographic characteristics of respondents

District of residence (prior to the rupture)	Frequency	%
Group 1 (<i>Bento Rodrigues and Camargos</i>)	204	48.69
Group 2 (<i>Paracatu de Baixo, Paracatu de Cima, Borba, Campinas, Pedras, Ponte do Gama</i>)	215	51.31
Gender		
Male	220	52.51
Female	199	47.49
Education		
No formal education	16	3.82
Grades 1 to 3 – Elementary School – incomplete	71	16.95
Grade 4 – Elementary School – complete	62	14.8
Grades 5 to 7 – Middle School – incomplete	53	12.65
Grade 8 – Middle School – incomplete	39	9.31
High School – incomplete	32	7.64
High School – complete	104	24.82
Some college (incomplete)	16	3.82
University degree (complete)	26	6.21
Age (in years) – mean		
	47	
Income – mean		
	US\$ 601.49	

Source: the authors, based on the survey carried out.

Table 2 shows the attendance rates for cultural manifestations and cultural places, based on the percentage of respondents who reported attending the event or place “always” or “sometimes”. The data indicate high attendance to cultural manifestations and places of collective use, prior to the dam rupture, which points to the relevance of this set of cultural losses for the affected population. Among the religious manifestations, the most frequented were the *Festa do Padroeiro* (91.17%) and the *Festa de Nossa Senhora de Aparecida* (89.74%). The *Festa da Cidade* and the *Festa de São João* also showed significant attendance, 86.88 and 89.26% of the respondents, respectively. In the case of public places, *Praça Santo Antônio* (63%), *Praça Cônego Caetano Correa* (62.29%) and *Bar da Sandra* (58.47%) were the most visited. As for the places of collective use, the most frequented ones were located in the districts of *Bento Rodrigues* and *Paracatu de Baixo*.

Table 2- Attendance to cultural manifestations and places of collective use

Cultural manifestations and places	Frequency	%
<i>Festa de Nossa Senhora Aparecida</i>	376	89.74
<i>Festa do Padroeiro</i>	382	91.17
<i>Festa do Menino Jesus</i>	324	77.33
<i>Folia de Reis</i>	291	69.45
<i>Congado</i>	237	56.56
<i>Festa da Cidade</i>	364	86.88
<i>Festa Junina</i>	374	89.26
<i>Cavalgada</i>	339	80.91
<i>Praça Cônego Caetano Corrêa- Square (Bento Rodrigues)</i>	287	62.29
<i>Bar da Sandra (Bento Rodrigues)</i>	245	58.47
<i>Banquinho do Bar da Sandra (Bento Rodrigues)</i>	232	55.37
<i>Bar do Juca (Bento Rodrigues)</i>	193	46.07
<i>Praça Santo Antônio - Square (Paracatu de Baixo)</i>	264	63.00
<i>Bar do Banana (Paracatu de Baixo)</i>	203	48.45
<i>Bar do Jairo (Paracatu de Baixo)</i>	184	43.92
<i>Bar da Dalva (Pedras)</i>	178	42.48
<i>Bar do Zé Baio (Paracatu de Cima)</i>	184	43.92
<i>Community Center (Ponte do Gama)</i>	115	27.45
<i>Arena de Cavalgada (Ponte do Gama)</i>	131	31.27
<i>Pastel da D. Laura (Paracatu de Baixo)</i>	212	50.59
<i>Bar do Iau (Campinas)</i>	92	21.95

Source: the authors, based on the survey carried out.

4.2 Estimate of the monetary value of losses related to celebrations and access to places of collective use

Tables 3 to 6 show the distribution of the reported WTA values according to the respondents' age, education and gender. All values shown are per capita. Note that the highest WTA means are of older respondents (Table 3) and male respondents (Table 5). No pattern for level of education (Table 4) was obtained. Higher average values are also reported for the Bento Rodrigues and Camargos districts, due to the fact that Bento Rodrigues was the most affected area, given its closer location to the Fundão Dam.

Table 3- Distribution of reported WTA values per respondents' age range (US\$) – manifestations and places of collective use

	Observations	Mean	Standard Deviation	Min.	Max.
18 to 29 yrs old	56	18,795.01	26,929.65	67.02	134,048.26
30 to 45 yrs old	129	15,714.80	22,711.05	0.89	134,048.26
46 to 65 yrs old	129	19,410.92	25,947.59	10.05	134,048.26
66 and older	46	23,811.03	31,229.28	0.00	134,048.26

Source: the authors, based on the survey carried out.

Table 4- Distribution of reported WTA values per respondents' educational level (US\$) – cultural manifestations and places

	Observations	Mean	Standard Deviation	Min.	Max.
No formal education	15	20,876.38	27,804.13	0.00	80,428.95
Elementary – incomplete	59	25,634.65	32,185.41	10.05	134,048.26
Elementary School – complete	52	12,083.12	15,594.41	33.51	67,024.13
Middle School – incomplete	44	14,319.88	19,390.62	67.02	93,833.78
Middle School – complete	32	10,068.79	9,419.86	44.68	44,682.76
High School – incomplete	28	15,621.41	24,558.10	67.02	134,048.26
High School – complete	90	24,392.48	30,545.82	0.89	134,048.26
Some college (incomplete)	16	19,261.20	32,526.94	744.71	134,048.26
University degree (complete)	24	13,831.48	19,561.86	1675.60	80,428.95

Source: the authors, based on the survey carried out.

Table 5- Distribution of reported WTA values per respondents' gender (US\$) – cultural manifestations and places of collective use

	Observations	Mean	Standard Deviation	Min.	Max.
Male	184	18,897.59	25,873.45	10.05	134,048.26
Female	176	18,192.55	25,727.36	0.00	134,048.26

Source: the authors, based on the survey carried out.

Table 6- *Distribution of reported WTA values according to the respondents' territory of residence (in US\$) – cultural manifestations and places of collective use*

	Observations	Mean	Standard Deviation	Min.	Max.
Bento Rodrigues and Camargos	169	21,985.58	28,629.52	0.00	134,048.26
Other areas	191	15,515.62	22,586.55	10.05	134,048.26

Source: the authors, based on the survey carried out.

The median Willingness to Accept (WTA) estimated from the predicted values of the log-linear model is shown in Table 7 considering the complete sample and the two area groups. Again, we observed higher values for Bento Rodrigues and Camargos, which we attribute to the reason mentioned in the previous paragraph.

Table 7- *Estimated WTA values for cultural manifestations and places of collective use*

	Observations	Median (US\$)
WTA for cultural manifestations and places – predicted value for the full sample	360	18,372.50
WTA for cultural manifestations and places – predicted value for Bento Rodrigues and Camargos	169	20,008.60
WTA for cultural manifestations and places – predicted value for other areas	191	16,140.95

Source: the authors, based on the survey carried out.

4.3 Estimation of the monetary value of losses related to access to the built heritage

Tables 8 to 11 show the distribution of reported WTA values in the scope of loss of access to built heritage, according to the respondents' sociodemographic characteristics. All values shown are per capita. No patterns regarding age and level of education or gender have been identified in the data. We can once again notice higher mean values reported for Bento Rodrigues and Camargos.

Table 8- *Distribution of reported WTA values according to respondents' age (in US\$) – built heritage*

	Number of Observations	Mean	Standard Deviation	Min.	Max.
18 to 29 yrs old	55	20,119.00	26,047.21	67.02	93,833.78
30 to 45 yrs old	126	16,047.95	20,531.65	16.76	107,238.61
46 to 65 yrs old	135	19,489.33	30,541.19	0.00	134,048.26
66 and older	45	18,594.11	26,951.18	53.62	134,048.26

Source: the authors, based on the survey carried out.

Table 9- *Distribution of reported WTA values according to respondents' level of education (in US\$) – built heritage*

	Number of Observations	Mean	Standard Deviation	Min.	Max.
No formal education	14	25,035.75	30,815.17	53.62	80,428.95
Elementary – incomplete	57	13,383.05	22,179.16	1.68	134,048.26
Elementary School – complete	56	18,059.82	32,072.90	0.00	134,048.26
Middle School – incomplete	44	20,694.86	29,721.45	421.29	134,048.26
Middle School – complete	31	7,837.24	6,515.03	134.05	22,341.38
High School – incomplete	30	15,913.02	19,461.05	67.02	80,428.95
High School – complete	89	25,315.40	28,980.08	16.75	134,048.26
Some college (incomplete)	15	11,236.37	9,193.76	2680.96	33,512.06
University degree (complete)	25	16,766.46	24,559.20	893.65	107,238.61

Source: the authors, based on the survey carried out.

Table 10- *Distribution of reported WTA values according to respondents' gender (in US\$) – built heritage*

	Number of Observations	Mean	Standard Deviation	Min.	Max.
Male	183	18,145.79	26,980.35	0.00	134,048.26
Female	178	18,402.81	25,467.94	1.68	134,048.26

Source: the authors, based on the survey carried out.

Table 11- *Distribution of reported WTA values according to the respondents' area of residence (in US\$) – built heritage*

	Number of Observations	Mean	Standard Deviation	Min.	Max.
Bento Rodrigues and Camargos	170	23,202.52	28,887.45	26.81	134,048.26
Other areas	191	13,884.56	22,764.06	0.00	134,048.26

Source: the authors, based on the survey carried out.

Table 12 indicates the median Willingness to Accept (WTA) estimated from the predicted values of the log-linear model. The distance between the values of the area groups is more accentuated. This may be associated with the severe destruction of the built heritage in Bento Rodrigues.

Table 12- *Estimated WTA values for built heritage*

	Observations	Median (US\$)
WTA for cultural manifestations and places – predicted value for the full sample	360	18,372.50
WTA for cultural manifestations and places – predicted value for Bento Rodrigues and Camargos	169	20,008.60
WTA for cultural manifestations and places – predicted value for other areas	191	16,140.95

Source: the authors, based on the survey carried out.

5. Conclusions

This paper presents monetary value estimates of the cultural losses experienced by families affected by the rupture of the Fundão Dam in Mariana, based on the Contingent Valuation Method. These losses were subdivided into (1) the loss of celebrations and collective spaces, such as squares, bars, and other meeting places; and (2) the loss of access to built heritage, such as historic buildings, churches, sacred objects, bridges, and monumental crosses.

The contingent valuation of public cultural goods and services is far from trivial. Furthermore, their cultural values come with rather subjective and idiosyncratic undertones. For this reason, we chose to test the questionnaire in sequential

steps. Firstly, we tested the questionnaire with a group formed by non-affected participants; then we applied it to a small group of individuals affected by the dam rupture. After testing, the questionnaire was applied to a stratified probabilistic sample of 419 families. Using a log-linear regression model and adopting as explanatory variables the respondents' age, education, gender and area of residence prior to the dam rupture, we estimated the median of the predicted WTP and WTA values. The latter proved to be more robust, due to the greater acceptance of respondents to a one-time payment compensation for the loss of access and enjoyment of cultural assets and spaces affected by the disaster.

The results indicate that one's perception of well-being losses differs according to the area of residence prior to the rupture and according to the sociodemographic characteristics of the affected individuals, particularly their level of education. Additionally, the importance of cultural manifestations and spaces of cultural reference for the community could be observed, as indicated by the high frequency with which these manifestations and spaces were mentioned by the affected individuals.

The Dam rupture meant the destruction of symbols and places of reference and the interruption of celebrations, daily practices, and production of cultural goods and services. In turn, this process led to severe social disruption, causing irreversible damage to tangible and intangible heritage. In this sense, the hypothesis of the irreversibility of the damages caused by the rupture is justified.

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Attachment I. Distribution of reported Willingness to Pay (WTP) values

Table II.1- *Distribution of reported WTA values, according to the respondents' age (in BRL\$) – cultural manifestations and places of collective use*

	Observations	Mean	Standard Deviation	Min.	Max.
18 to 29 yrs old	56	70.105,38	100.447,60	250,00	500.000,00
30 to 45 yrs old	129	58.616,21	84.712,23	3,33	500.000,00
46 to 65 yrs old	129	72.402,72	96.784,52	37,50	500.000,00
66 and older	46	88.815,14	116.485,20	0,00	500.000,00

Source: the authors, based on the survey carried out.

Table II.2- *Distribution of reported WTA value, according to the respondents' level of education (in BRL\$) – cultural manifestations and places of collective use*

	Observations	Mean	Standard Deviation	Min.	Max.
No formal education	15	77.868,89	103.709,40	0,00	300.000,00
Elementary – incomplete	59	95.617,23	120.051,60	37,50	500.000,00
Elementary School – complete	52	45.070,04	58.167,16	125,00	250.000,00
Middle School – incomplete	44	53.413,15	72.327,00	250,00	350.000,00
Middle School – complete	32	37.556,58	35.136,09	166,67	166.666,70
High School – incomplete	28	58.267,86	91.601,71	250,00	500.000,00
High School – complete	90	90.983,95	113.935,90	3,33	500.000,00
Some college (incomplete)	16	71.844,28	121.325,50	2777,78	500.000,00
University degree (complete)	24	51.591,44	72.965,74	6250,00	300.000,00

Source: the authors, based on the survey carried out.

Table II.3- *Distribution of reported WTA values according to the respondents' gender (in BRL\$) – cultural manifestations and places of collective use*

	Observations	Mean	Standard Deviation	Min.	Max.
<i>Male</i>	184	70.488,00	96.507,97	37,50	500.000,00
<i>Female</i>	176	67.858,23	95.963,07	0,00	500.000,00

Source: the authors, based on the survey carried out.

Table II.4- *Distribution of reported WTA values according to the respondents' area of residence (in BRL\$) – cultural manifestations and places of collective use*

	Observations	Mean	Standard Deviation	Min.	Max.
Bento Rodrigues and Camargos	169	82.006,20	106.788,10	0,00	500.000,00
Other areas	191	57.873,26	84.247,82	37,50	500.000,00

Source: the authors, based on the survey carried out.

Table II.5- *Estimated WTA values for cultural manifestations and places of collective use*

	Observations	Median (US\$)
WTA for cultural manifestations and places – predicted value for the full sample	360	68.529,44
WTA for cultural manifestations and places – predicted value for Bento Rodrigues and Camargos	169	74.632,09
WTA for cultural manifestations and places – predicted value for other areas	191	60.205,74

Source: the authors, based on the survey carried out.

Table II.6- *Distribution of reported WTA values according to respondents' age (in BRL\$) – built heritage*

	Observations	Mean	Standard Deviation	Min.	Max.
18 to 29 yrs old	55	75.043,88	97.156,10	250,00	350.000,00
30 to 45 yrs old	126	59.858,85	76.583,05	62,50	400.000,00
46 to 65 yrs old	135	72.695,20	113.918,40	0,00	500.000,00
66 and older	45	69.356,03	100.527,90	200,00	500000,00

Source: the authors, based on the survey carried out.

Table II.7- *Distribution of reported WTA values according to respondents' level of education (in BRL\$) – built heritage*

	Observations	Mean	Standard Deviation	Min.	Max.
No formal education	14	93.383,33	114.940,60	200,00	300.000,00
Elementary – incomplete	57	49.918,76	82.728,27	6,25	500.000,00
Elementary School – complete	56	67.363,14	119.631,90	0,00	500.000,00
Middle School – incomplete	44	77.191,83	110.861,00	1571,43	500.000,00
Middle School – complete	31	29.232,89	24.301,07	500,00	83.333,34
High School – incomplete	30	59.355,56	72.589,73	250,00	300.000,00
High School – complete	89	94.426,46	108.095,70	62,50	500.000,00
Some college (incomplete)	15	41.911,68	34.292,74	10000,00	125.000,00
University degree (complete)	25	62.538,89	91.605,83	3333,33	400.000,00

Source: the authors, based on the survey carried out.

Table II.8- *Distribution of reported WTA values according to respondents' gender (in BRL\$) – built heritage*

	Observations	Mean	Standard Deviation	Min.	Max.
Male	183	67.683,80	100.636,70	0,00	500,000,00
Female	178	68.642,50	94.995,42	6,25	500,000,00

Source: the authors, based on the survey carried out.

Table II.9- *Distribution of reported WTA values, according to the respondents' area of residence (in BRL\$) – built heritage*

	Observations	Mean	Standard Deviation	Min.	Max.
Bento Rodrigues and Camargos	170	86.545,42	107.750,20	100,00	500.000,00
Other areas	191	51.789,42	84.909,96	0,00	500.000,00

Source: the authors, based on the survey carried out.

Table II.10- *Estimated WTA values for cultural manifestations and places of collective use*

	Observations	Median (US\$)
WTA for cultural manifestations and places – predicted value for the full sample	361	52.724.42
WTA for cultural manifestations and places – predicted value for Bento Rodrigues and Camargos	170	73.161.92
WTA for cultural manifestations and places – predicted value for other areas	191	36.457.95

Source: the authors, based on the survey carried out.