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AN ECONOMETRIC ANALYSIS OF WILLINGNESS TO PAY FOR SUSTAINABLE DEVELOPMENT:

A CASE STUDY OF THE VOLČJI POTOK LANDSCAPE AREA

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AND
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Miroslav Verbič and Renata Slabe Erker*

Abstract

When the market for a certain good is sufficiently competitive, economic activities can be studied through the market-pricing mechanism. Because this is usually not feasible in the case of environmental goods with an embodied natural and cultural heritage, particular methods for economic valuation of such goods have to be applied. This working paper presents the economic valuation of the Landscape Development and Protection Area of Volčji Potok, which is an important Slovenian cultural landscape with internationally recognised characteristics. For this purpose, we have chosen the method of contingent valuation and performed an econometric analysis of stated and true willingness-to-pay for targeted, sustainable development of the area. We have obtained the value of willingness-to-pay and identified its determinants. We have also attempted to control for different biases that arise in such analyses. Finally, we have used the adjusted, average individual value of willingness-to-pay to calculate the aggregate willingness-to-pay.

Key Words: bivariate probit model, contingent valuation method, discrete choice method, embedding effects, environmental values, starting point bias, willingness-to-pay.

JEL Classification: C51, Q51, Q56.

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1. Introduction

Local communities often find themselves in a position where they have to decide on what spatial and development changes to implement within the scope of nationally or regionally adopted planning guidelines. Their decisions must address not only operating costs, but also the positive and negative effects of the development programmes on people's welfare. As the former are expressed in monetary terms and the latter only in terms of quantity or by way of description, it can happen that the spatial impact is under- or overrated in the intuitive decision-making process. To ensure the spatial impact is given appropriate weight in the decision-making process, it is imperative to determine its monetary value.

In the case described in this working paper, the spatial impact of targeted development of the Landscape Development and Protection Area (LDPA) of Volčji Potok is evaluated, together with its natural and cultural goods. This landscape area has distinct characteristics of international importance. The purpose of this study is to assess the overall value of the environmental goods, i.e. the use value and the non-use value for residents and visitors to the area. For this purpose, the contingent valuation method was selected, mainly owing to significant non-use values in the area, the total value for residents and visitors, and the varying selection of goods. Only stated preference methods, such as the contingent valuation method (Garrod & Willis, 1999, pp. 125-26; Nunes et al., 2003, pp. 94-95; Verbič, 2006) can be used to estimate environmental values such as biotic diversity, landscape appearance, and the preservation of cultural heritage and art collections, artefacts and monuments, along with the features of old towns and villages.

Contingent valuation surveys were first proposed in theory by Ciriacy-Wantrup (1947) as a method for eliciting the market valuation of a non-market good. The first practical application of the technique was done by Davis (1963) on the economic value of recreation in the Maine woods. Numerous applications of the method to various public goods and studies of its methodological properties were conducted worldwide in the 1970s and 1980s. Reviews of the theoretical and empirical bases of contingent valuation were performed, as presented in Mitchell & Carson (1989), Arrow et al. (1993) and, more recently, in Moons (2003), Venkatachalam (2004) and Schläpfer (2006). Nowadays, the method is widely used in cost-benefit analyses and environmental impact assessments. Recent applications that are relevant for our study include Hadker et al. (1997), Cicia & Scarpa (2000), Lette & de Boo (2002), Navrud & Ready (2002), Laitila & Paulrud (2006) and Bateman et al. (2006).

The main concept of the contingent valuation method is to model individuals' responses in terms of their reactions to specific hypothetical situations. In the *ex ante* analysis in the case of environmental evaluation, questions are related to the highest sum that individuals are prepared to

pay for a change (for an improvement or purchase) at the environmental goods level (i.e. their willingness-to-pay). Changes in the level of environmental goods can then be described by a number of different development scenarios. Two development scenarios were drawn up for the purpose of this evaluation. The form of the contingent valuation method used was defined on the basis of these scenarios and the research objectives. In this working paper, the classic contingent valuation and the discrete-choice contingent valuation are combined.

The outline of this paper is as follows. In section 2, the LDPA of Volčji Potok is presented in brief. A description of the scenarios and questionnaire formation process is provided in section 3. In sections 4 and 5, the paper offers an analysis of the stated and actual willingness-to-pay, respectively. In section 6, the aggregate value of willingness-to-pay is calculated. The paper concludes in section 7 with key findings for potential spatial and development policy for the area.

2. The Landscape Development and Protection Area of Volčji Potok

The LPDA of Volčji Potok is located in the vicinity of Ljubljana. It encompasses 2,000 hectares of unspoilt natural landscape with numerous wetlands and rare plant and animal species. At the same time, the area has exceptional cultural features with many stately residences or castles and other cultural heritage monuments, along with small settlements with a well-preserved village character.

At the heart of the area are the villages of Blata and Mlake and the Češeniške and Prevojske Gmajne marshes, which are sites of protected plant and bird species that fall under the aegis of the EU Habitat and Birds Directives. This cultural landscape was named after the most famous park in this part of Slovenia – the Volčji Potok Arboretum. Also included in the cultural landscape is a section of the Kamniška Bistrica River, which is important both ecologically and in terms of the landscape and has rather well-preserved water and riverside areas. Another characteristic of the Kamniška Bistrica is its many millstreams, with two larger ones reaching into the area studied. The last two watermills with millstones are found in this area. They both used to be large mills and had Venetian saws. These water-powered buildings are today among the most endangered monuments of technical heritage and farm architecture in Slovenia. They are in fairly poor condition but could still be restored to some extent and preserved for future generations. The numerous medieval castles and their parks give the landscape a special charm. At present, most of these are in bad shape as well, but have great potential for revitalisation, in terms of expanding the area's tourist offerings. To the north is a wooded aquifer with high-quality drinking water that is ranked among the best in the country. There are four water wells providing drinking water for a wider area.

The beauty and features of the area today face great developmental pressures owing to their exceptional accessibility and the proximity of settled areas. Alongside the neglected and disintegrating cultural heritage structures, the pressures involve the immigration of new inhabitants, the increasing volume of traffic, a deficient and in some places unregulated public utility infrastructure and an uncoordinated use of space. These pressures are a threat to realising a sustainable development vision based on reinstating a naturally and culturally protected area. The vision supports the ecological economy, sustainable development and the introduction of a network of paths for recreation, education and relaxation. This vision was used to design a scenario of targeted development for the purposes of the evaluation of the area (Verbič & Slabe Erker, 2005, pp. 16-17).

3. Description of the procedures for formulating the questionnaire and scenarios

As stated in the introduction, two development scenarios were constructed for the evaluation of the area. An unplanned development scenario was drawn up as an extrapolation of the current state of affairs, while the scenario based on targeted development corresponded relatively well to potentially optimal sustainable development. The final form of scenarios and the scheme for their presentation took into account certain findings of prior testing on a target group, such as emphasising the difference between active and passive measures, and underlining that existing institutions would be responsible for implementing the scenarios. Since there are only slight discrepancies between the scenarios, these can be somewhat highlighted in the survey, but it is difficult to make them more expressive per se, as the development of the area is limited by the current spatial and development planning guidelines.

3.1 Description of the development scenarios

In the unplanned development scenario, the area has a modern image of an agrarian landscape with effectively organised organic farms that are larger and more specialised in fruit and vegetable cultivation, livestock farming and aquaculture (Figure 1). At the same time, supplementary tourist activities develop along the lines of tourist farms and heritage presentations. Agricultural land on the steeper slopes, where farming is economically less effective, is abandoned and overgrown by forest. The village character of the settlements changes, as abandoned farm buildings are turned into residential or holiday homes, while dormitory towns expand on the edges of larger settlements, partly as communities with luxurious villas and partly as organised multi-dwelling buildings.

Day-trip, educational and recreational tourism is organised in the vicinity, mainly tied to the vast areas of unspoiled nature. The issue of comprehensive renovation of rural castles and larger residences remains unresolved and the buildings continue to degrade as a result of inappropriate use for social housing, smaller business and company activities. The renovation of agricultural architectural heritage remains subject to private initiative. Support is given to various developmental incentives and therefore new activities arise in the area, such as shops selling crafts or services, but existing activities such as quarries also expand.

In the targeted development scenario, the characteristic image of the area is that of a traditional rural landscape with preserved old villages, which gives the impression of a late 19th century landscape. Farmers are given subsidies to finance traditional organic production, i.e. by keeping traditional orchards and growing old fruit varieties, indigenous cattle breeds and old field crops, which would help preserve and develop the quality components of the traditional cultural landscape. Different forms of financial incentives would also be available to safeguard the traditional architectural identity of individual buildings.

The traditional image of the cultural landscape, along with the conservation of the natural landscape and the revitalisation of cultural heritage, is one of the most important attractions for the development of cultural tourism. More specifically, it offers a chance for tourists – by means of diverse tourist programmes linked to the area's history – to 'travel' to the time of highway robbers, coachmen and the golden age of rural castles with events such as fairs, highwaymen's horse rides, gentile coach rides and brigands' goulash (Figure 2). Farms are involved in well-developed, supplementary tourism-related activities. Other kinds of day-trips, educational and recreational tourism are also well developed, largely in relation to the vast areas of unspoiled nature. Stationary tourism is focused on the revitalised rural castles. Further settlement of the area is restricted and directed towards the outskirts, beyond the central zone of the LPDA of Volčji Potok.

Figure 1. Unplanned development scenario of the LPDA of Volčji Potok

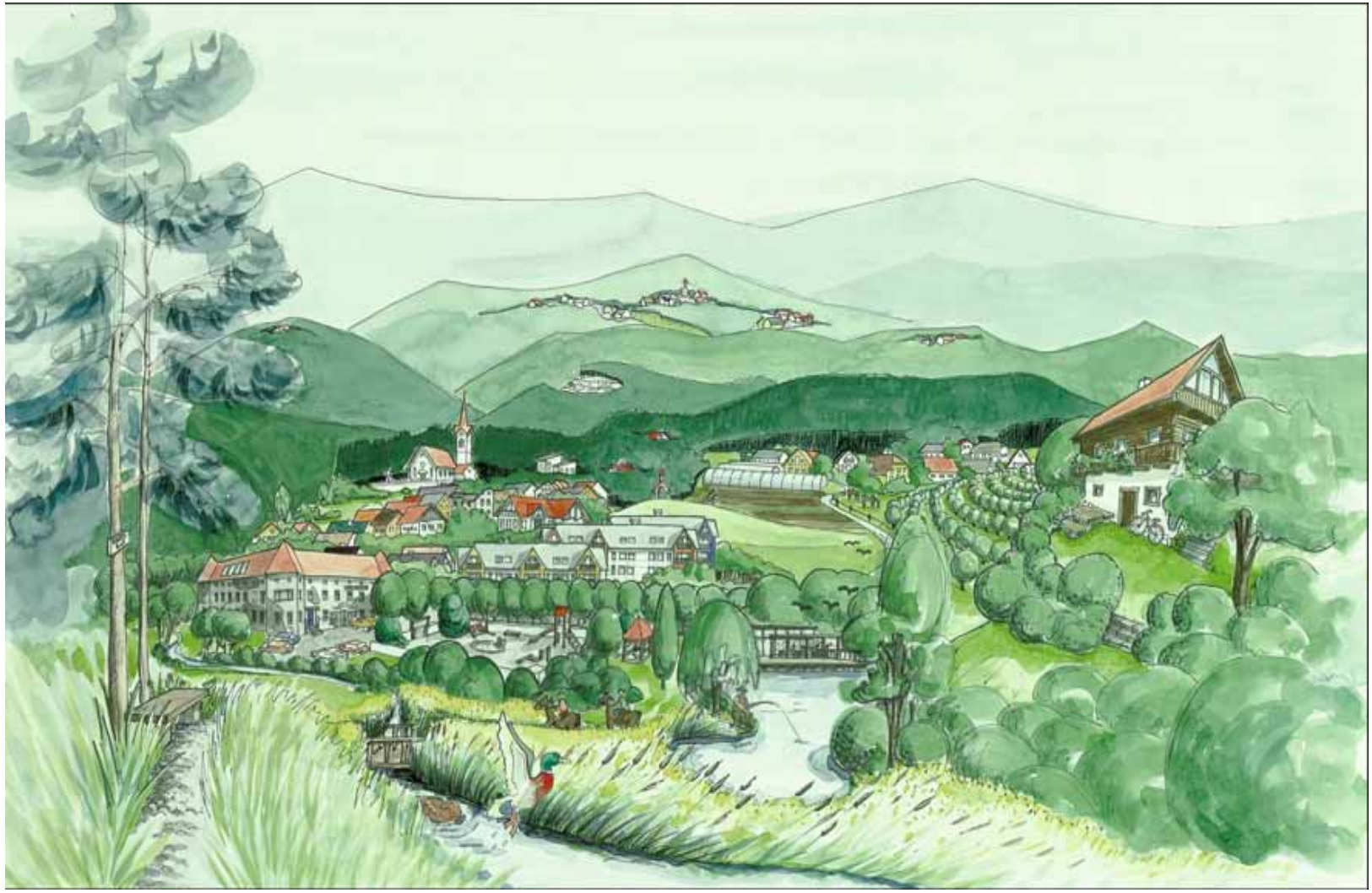
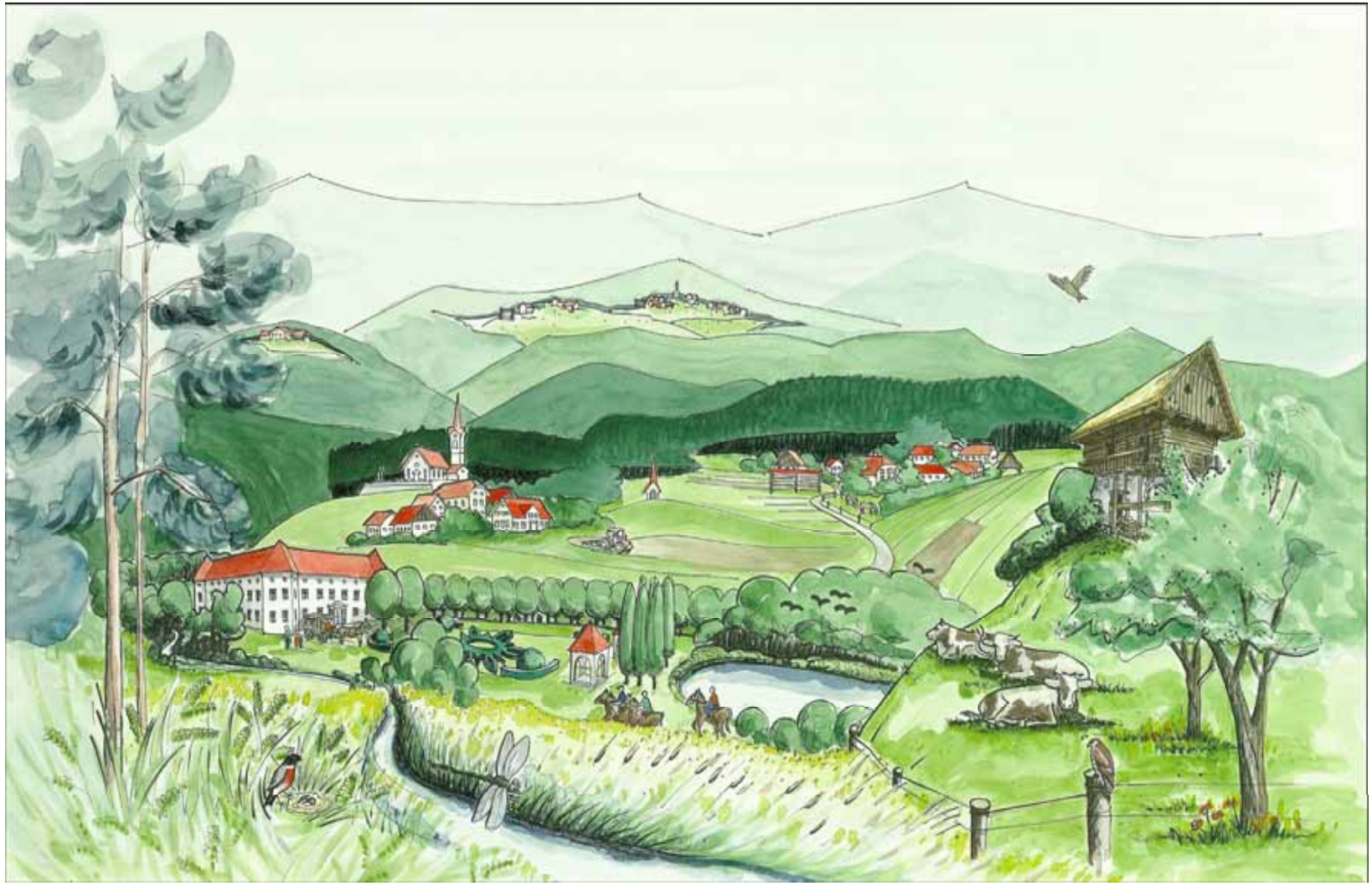


Figure 2. Targeted development scenario of the LPDA of Volčji Potok



If a positive decision is reached on the implementation of the targeted development scenario, funding will be raised through a supplement to the compensation fee for the use of building land in the area. The supplement would apply from 1 January 2006 for a period of five years.

3.2 Definition of the form of the contingent valuation method used

The form of the contingent valuation method to be used can be identified on the basis of the developed scenarios and a questionnaire subsequently drawn up, wherein mechanisms for bias control have to be taken into account. The method selected depends on various factors, including

- the purpose of the research;
- the range of economic values for environmental goods;
- the acceptability of specific assumptions in the methods used;
- the significance of specific statistical errors and cognitive bias in the individual methods;
- compliance of the method's application with economic theory;
- the robustness of the obtained evaluations of utility, determining the evaluation timeframe for the project or policy implementation process;
- the capability to produce a sufficiently accurate identification of the relevant population; and
- the capacity to aggregate the evaluations of utility (Verbič, 2004, pp. 76-83).

When the non-use value of environmental goods is significant, the only way to proceed is to use the stated preference methods from the very start. The stated preference methods, including the contingent valuation method, are also the only methods that enable an accurate analysis of behaviour and motives, as their use facilitates changing the information level by applying sub-samples. In order to evaluate the individual characteristics of goods, the discrete-choice method can also be used, provided the characteristics are not too closely correlated and the proposed changes represent a compromise between them. In our case, the classic contingent valuation is combined with the discrete-choice contingent valuation. This approach offers a high degree of flexibility, which facilitates the evaluation of a larger and more diversified selection of environmental goods than would be possible with any of the individual methods for the economic evaluation of environmental values.

Within the classical contingent-valuation approach, first, in the test-survey phase, an open version of the method was used and then, based on the results obtained, a final version was selected for use in the survey. Individuals were asked in the final survey whether they were prepared to contribute a pre-set lump sum payment for the implementation of the spatial project. The respondents were presented a dichotomous choice: to accept or reject the proposed sum, wherein the range for the utility criteria value is predetermined using an open form of the classical contingent valuation. The initial question led to a follow-up question. In this approach, first proposed by Cameron & James (1987), one can assume that both the initial question and further questions imply the same probability distribution of values.

3.3 Development of the questionnaire design procedures

For the purpose of an economic evaluation of the area, separate surveys were conducted among its inhabitants and visitors in order to establish possible differences in the viewpoints and responses of

the two groups. The sample included 250 inhabitants and 250 visitors; all respondents had to be over 18 and if possible the head of the household.

The survey was in the form of personal interviews, primarily because of the proven effectiveness of this approach, especially in similar cases, when a relatively complex set of environmental goods is entailed. This method of surveying is rather involved, so experienced researchers with expert knowledge were used. Visual aids were also used, requiring a high level of concentration by the respondents and a great deal of prompting by the researchers.

The final questionnaire was designed on the basis of the test survey and the decision to carry out personal interviews. It was important that questions were included in the survey that would enable the presence of any bias to be detected and its significance to be established (to facilitate its elimination), because the cognitive burden on respondents in this method is considerable.

The first set of questions in the questionnaire was intended to establish a rapport with the respondents and to determine their social, economic and demographic characteristics. (The respondents had been assured at the start that their answers would be confidential as an attempt to eliminate the potential social- and peer-desirability bias.) In this set, of particular importance were the questions regarding the respondents' net monthly incomes and the net incomes of the respondents' households. These two income categories are crucial, because they help to define the sum that the respondents are willing to pay and they are the key explanatory variables for the dynamics of the stated willingness-to-pay values. In this instance, precedence was given to the category of the net monthly income of respondents' households.

The second set of questions in the questionnaire served to identify the respondents' attitudes towards categories of economic development on the one hand and the conservation of environmental goods (primarily the natural and cultural heritage) on the other. Based on the respondents' reactions to statements it was possible to form 'respondent development profiles'. It was assumed that the respondents' willingness-to-pay was related to the development profile to which they belonged. Similarly to Hadker et al. (1997, p. 108), we created three profiles: extremely 'green-oriented' individuals, extremely pro-development persons and those between the two extremes. The information about a respondent's profile can be used as an explanatory variable, as a mechanism for identifying the real non-use value attributed by the respondent and his or her real attitude towards the environment and space or to identify the authenticity of the willingness-to-pay values.

The third set of questions was intended to identify the respondents' knowledge of the area studied and to find out their perceptions of the objectively identified problems that affect the area. First, a presentation of the area's qualities was carried out, improvised in interaction with the respondent, in which visual material was used in addition to descriptions of the natural and cultural heritage and problems in the area. Despite this improvisation, the researcher still aimed at approaching each respondent in as uniform a manner as possible. Respondents were asked whether the information presented was new to them, how often they had used individual goods and explicitly which kinds of values mattered to them. These questions sought to discover the differences between the results of the direct and indirect approaches for identifying respondents' values. It was assumed that a larger recognised value for an area implied a greater willingness-to-pay for the realisation of the targeted development scenario. Later on, this data can also be used in the analysis of the embedding effects.

This step was followed by a visual presentation and description of the unplanned development scenario of the area (Figure 1). The researcher explained to the respondents that if today's trends

were to continue in the wider area of Volčji Potok, in time the scenario presented would come true. Respondents were asked about their concerns regarding the situation and the scope of damage that in their opinion this might cause.

The fourth set of questions finally led to the contingent valuation itself. This time there was a visual presentation and description of the targeted development scenario in the area (Figure 2), with an explanation that the implementation of the scenario would be undertaken by an existing, trustworthy local institution. This qualifier was an attempt to establish a sense of trust on the part of the respondent and to avoid a protest response. It also represented the desire to acquire an exclusive value of willingness-to-pay and not a value that would relate to all similar projects. Moreover, it was explained to the respondents that the costs of a scenario being implemented by an institution, which would also be in charge of conserving and improving the landscape, would have to be financed appropriately. Therefore, the questions in this set related to the financing of the institution in the period from 2006 to 2010, even though protection is a long-term process and is actually continually required. Payments would be made in the form of a supplement to the compensation fee for the use of building sites.

In order to reduce potential biases as much as possible, respondents were encouraged to consider their true preferences seriously before answering this set of questions. They were reminded that the problem of conserving heritage is only one of the challenges faced by local municipalities and that the wider area of Volčji Potok is only one among many important quality landscapes in Slovenia. Furthermore, it was brought to the respondents' attention that their incomes are limited and that they can use it for various other purposes. The respondents were asked to focus on the area shown on the map, despite the existence of many other environmental and spatial issues that could be of major importance. This approach addressed the concepts of an individual's budgetary limits, embedding effects, part-whole bias, bias arising from the symbolic value and satisfaction arising from the 'warm-glow effect' (Nunes & Schokkaert, 2001).

This stage was followed by two (dichotomous choice) questions relating to the willingness-to-pay for the realisation of the targeted development scenario. Respondents were first asked whether they were willing to pay an initial sum from their household's income each year for the next five years in order for this scenario to be realised. The researcher determined the initial sum of willingness-to-pay using an income scale for the respondents and their households with the relevant willingness-to-pay values. The researcher stated both the monthly and the annual sum of this willingness-to-pay value to avoid the likelihood of mistakes in the perception of this sum by the respondents. The respondents could accept or reject this sum, but could also choose not to reply, which terminated the interview and rendered it invalid.

Respondents were then asked if they are willing to pay a further sum. This sum was twice the initial sum if the respondents had replied affirmatively to the previous question and half the initial sum if they had replied negatively. The reasons given for the affirmative or negative answers were also noted for the purpose of determining protest responses. This was followed by a question on the maximum monthly household income that the respondents were willing to pay over the next five years for the realisation of the targeted development scenario. The function of this question was to establish the range and anchoring effects.

4. An analysis of the stated willingness-to-pay

Prior to starting the analysis of stated willingness-to-pay, Table 1 gives some descriptive statistics of the key variables. The database has 312 valid observations, of which 149 represent inhabitants and 163 represent visitors. The average age of respondents included in the sample is 46.8 years,

ranging from 18 to 87 years. The average monthly income of respondents amounts to SIT 153,045, which is slightly lower than the Slovenian average, but here one must take into account the under-reporting bias – i.e. the reluctance of individuals to state the actual value of their monthly income. The under-reporting bias is usually related to the fear of higher taxation being applied and leads to considerable underrating of the respondents' incomes (Van der Laan & van Tuinen, 1996). The mean net monthly income of the respondents' households thus amounts to SIT 379,006, and net monthly income per household member only amounts to SIT 54,084. The average final value of willingness-to-pay[1] is SIT 388, with the average highest value of willingness-to-pay being SIT 475.

Table 1. Descriptive statistics of key variables (n = 312) (income in SIT)

Variable	Arithmetic mean	Standard deviation	Lowest value	Highest value
Respondent's age	46.8	14.8	18	87
Years of schooling	12.5	2.6	0	18
Respondent's net monthly income	153,045	85,840	25,000	480,000
Number of household members	3.5	1.5	1	9
Household's net monthly income	379,006	219,800	50,000	1,800,000
Net monthly income per household member	54,084	40,870	3125	325,000
Final value of willingness-to-pay	388	537	0	2000
Highest value of willingness-to-pay	475	1119	0	10,000

Sources: IER Database on Economic Valuation of the LPDA of Volčji Potok (2005) and authors' calculations.

This section analyses the stated willingness-to-pay (SWTP). As this involves a continuous variable, the relevant question for the analysis relates to the highest sum that the respondents were willing to pay over the next five years for the realisation of the targeted development scenario in the area. A linear regression model was used to estimate the values of regression coefficients using the least squares (LS) estimator. If a version of the model proved to exhibit heteroskedasticity, an attempt to attain the validity of the homoskedasticity assumption was made using appropriate adjustments of the estimator.

The analysis of stated willingness-to-pay is used to verify whether the expectations expressed based on economic theory appear to be true. It also enables us to study the content validity and framing effects of the contingent valuation procedure (Hadker et al., 1997, pp. 112-14; Verbič & Slabe Erker, 2004). This gives an indication of whether the questions the respondents were asked had been adequate, whether the respondents had replied sufficiently to the questions asked and whether their answers meet the expectations of standard economic theory. In order to achieve this, we proceed as follows. First, we estimate the determinants of the stated willingness-to-pay. Then we try to determine and eliminate biases in the model – the analysis mainly involves the starting point bias and the embedding effects.

[1] This refers to willingness-to-pay in the last question to which the respondent replied affirmatively, i.e. either the initial or the further question. If the respondent did not reply to either of the two questions affirmatively, the value of willingness-to-pay was set to be equal to 0.

4.1 Determinants of the stated willingness-to-pay

Some variables turned out to be statistically significant determinants of willingness-to-pay. These include the respondent's income, the frequency of visiting the environmental goods, environmentally and spatially related preferences expressed by the respondent and the respondent's attitude towards environmental goods. In the model, the respondent's age is a statistically insignificant determinant of willingness-to-pay at a still acceptable significance level. If one assumes the risk and studies the respondent's age as an independent determinant of willingness-to-pay, however, one can conclude that the correlation between the two variables is negative. Also, the correlation of the respondent's gender and status to willingness-to-pay is not statistically significant. This finding means that based on the sample, one cannot conclude that the visitors to the LPDA of Volčji Potok are acting differently from the inhabitants of the area or that they perceive the environmental goods and their inherent natural and cultural heritage[2] differently. But there is a difference with regard to the respondent's level of education, whereby an additional year of schooling has a positive impact on the respondent's willingness-to-pay.

The size of the respondent's household is not a statistically significant variable of willingness-to-pay at an acceptable significance level, but it can be concluded that there is a positive independent impact on the willingness-to-pay, which can be explained through the existence of economies of scale within the household. The respondent's activity is also correlated to his or her willingness-to-pay, but only as an independent determinant; employed and self-employed persons in our sample stated greater willingness-to-pay compared with the average, while farmers and retired persons stated a lower willingness-to-pay.

The only willingness-to-pay determinant from among the respondent's socio-economic characteristics that is statistically significant enough to be included in our model is net monthly income, which is in line with economic theory. The greatest explanatory power is reached when the respondent's net monthly income variable (*INCOME*) is included. This is formed on the basis of the income brackets used. The data indicates that every thousand tolars of the respondent's income, *ceteris paribus*, increases on average the value of willingness-to-pay by SIT 3.02 (see Table 2). Using the net monthly income of the respondent's household and the net monthly income per household member (after correction owing to the size of household) on average provides similar results, but with a slightly lower level of statistical significance. As the respondent's income has a fairly strong positive correlation to his or her level of education, the latter is not included in the model.

Conscientious respondents, who place natural and cultural heritage conservation for current and future generations ahead of their momentary life standard (dummy variable *CONSC*), state on average a higher willingness-to-pay. A conscientious individual is on average, *ceteris paribus*, willing to pay as much as SIT 569.8 more than other respondents for the realisation of targeted development in the area. Both the level of concern of the respondent about unscheduled development and his or her perception of related probable damage have a positive impact on the respondent's willingness-to-pay, but these are also mutually correlated. The latter determinant (*DAMAGE*) was selected and quantified in the form of a dummy variable, which has the value 1 if the individual perceives the amount of damage to the area from unscheduled development as very great and the value 0 otherwise. One can conclude that these respondents are on average, *ceteris*

[2] It therefore makes no sense to include in the model the variable of duration in which the inhabitants had lived in the LDPA of Volčji Potok, since this variable was not statistically significant.

paribus, willing to pay SIT 238.5 more than other respondents are for the realisation of targeted development in the area.

Table 2. Estimation results for the model of stated willingness-to-pay

Dependent variable	**SWTP**		
n	312		
se	899.70		
R2adj.	0.420		
F (7,304)	24.65	p (F)	0.000
Explanatory variable	**bi**	**t**	**p (t)**
Constant	–275.20	–1.54	0.125
INCOME	3.021	4.87	0.000
CONSC	569.83	3.67	0.000
DAMAGE	238.48	2.09	0.037
HERITAGE	518.03	3.60	0.000
FUNCT	657.50	3.01	0.003
VALSCL	154.89	2.26	0.025
PROTEST	–204.99	–2.42	0.016

Sources: IER Database on Economic Valuation of LPDA of the Volčji Potok (2005) and authors' calculations.

Furthermore, respondents who attribute a higher value to natural and cultural heritage, forests, plant and animal species and the environment in the area (dummy variable *HERITAGE*) are on average, *ceteris paribus*, willing to pay SIT 518.0 more for the realisation of the targeted development scenario than are other respondents. Respondents who put a higher value on the functional characteristics of the area, such as the use of cycle tracks and footpaths, potable drinking water and various tourist activities (dummy variable *FUNCT*) are on average, *ceteris paribus*, willing to pay as much as SIT 657.5 more for the realisation of the targeted development scenario than are other respondents.

The variable expressing the number of values embodied in the area's environmental goods that the respondent deems important (*VALSCL*) is a key, statistically significant factor of willingness-to-pay. Each added value that the respondent perceives as important in the area, on average, *ceteris paribus*, increases the value of his or her willingness-to-pay by SIT 154.9. Yet one must not forget the respondents' protest responses. An individual who considers that the implementation of the targeted development scenario should be financed by someone else (dummy variable *PROTEST*) is on average, *ceteris paribus*, willing to pay SIT 205.0 less for the realisation of this scenario than are the other respondents, which is in line with economic theory.

When these seven explanatory variables are included in the model, statistically the constant term is no longer significantly different from 0. The value of the multiple regression coefficient of determination and the value of the *F*-statistic are acceptable as the sample contains measurement errors that are related to the collection of primary data associated with such a complex survey. Although the willingness-to-pay variable cannot have a negative value, the estimated distribution of

willingness-to-pay ranges from negative infinity to positive infinity. The estimated value of willingness-to-pay for average values of explanatory variables is SIT 474.80.

4.2 Identifying and eliminating biases in the model

Biases can be addressed econometrically, in as much as they can be determined using proxy variables. The analysis focuses on starting point bias and embedding effects.

The starting point bias value is measured by using the willingness-to-pay amount that was offered to individuals for the realisation of the targeted development scenario. The relevant variable (*BID1*) should have been included in the stated willingness-to-pay model, but this was unfortunately not possible owing to multicollinearity issues. The willingness-to-pay value was selected in relation to the income of the respondent's household. The adequate regression coefficient for the impact on the willingness-to-pay value of a respondent's stated willingness-to-pay is therefore estimated in an adjusted model, which gives the value of 0.461.

As a determinant of stated willingness-to-pay, the *BID1* variable is statistically highly significant, which as a rule implies that respondents have a rather poor knowledge of the process for evaluating environmental goods. Starting-point bias value effects are also called 'anchoring effects'. In order to eliminate this bias the proposed value of willingness-to-pay must be set to 0, which then gives an actual stated willingness-to-pay value of SIT 241.64.

If the sample is subject to the part-whole bias, the stated willingness-to-pay value does not merely refer to the realisation of the targeted development scenario in the area but also to other environmental goods, activities and their consequences. This bias value is measured using the environmental values of the area that were deemed important by individual respondents. The variable reflecting the number of values of environmental goods that the respondents deemed important (*VALSCL*) is therefore set to 0, which enables the inclusion of respondents who expressed willingness-to-pay for the realisation of the targeted development scenario, but who did not ascribe any special value to any of the environmental goods in the area. Once this is done, a new willingness-to-pay value is obtained, which is SIT 130.07 lower than the initial value, and amounts to SIT 344.73.

In modelling the stated willingness-to-pay, determining the bias effects certainly plays an important role in understanding individuals' behaviour. It is nevertheless relevant at this point to establish the degree to which it makes sense to eliminate such biases from the stated willingness-to-pay when reporting the willingness-to-pay value. Part-whole bias is without doubt a cause in the situation in which a group of environmental goods affecting the individuals' decision on their potential willingness-to-pay for the realisation of a specific environmental change may well be a real factor in their willingness-to-pay. When deciding whether to eliminate bias effects in willingness-to-pay analyses, it is therefore necessary to keep in mind the specific situation upon which the individual is deciding.

5. An analysis of the true willingness-to-pay

Open questions are often subject to criticism (Garrod & Willis, 1999; Bateman et al., 2002), as they are seen to provide unreliable responses when the respondents are not very familiar with the issues of contingent valuation and because they offer little control of the respondents' strategic behaviour. Closed questions provide respondents with information that is easy to evaluate, but at the same time, the characteristics of questions that enable simple acceptance or rejection of proposed values also prevent any strategic behaviour on the part of the respondents. In the literature, the indirect

(unobserved) value of the utility criterion obtained in this way is often called the 'true' willingness-to-pay. In open questions, the explained variable, i.e. willingness-to-pay, is a continuous and directly observed variable, which makes it easier to analyse. In closed questions, the only observable variable is the qualitative dichotomous choice variable – a proxy of willingness-to-pay, which in turn determines the use of qualitative response models in the analysis.

In order to fulfil our goals, we proceed as follows. First, we define the unobserved willingness-to-pay model and then we select the determinants that are used in the estimation of the (directly observed) proxy of willingness-to-pay. Finally, we present the estimation results for the true willingness-to-pay model.

5.1 Modelling the true willingness-to-pay

In order to model the true willingness-to-pay, the double-bounded, dichotomous-choice contingent valuation model is used, which is more information-intensive and asymptotically more efficient than the single-bounded method (Hanemann et al., 1991). The corresponding value function is a function of the true willingness-to-pay. With the help of such value functions, the respondents evaluate both proposed willingness-to-pay values consecutively. Their basic response is represented by the following expression:

$$\mathbf{T}_{WTP} = \mathbf{x}'\boldsymbol{\beta} + \mathbf{e}, \tag{1}$$

where $\mathbf{T}_{WTP}$ represents a vector of values of the dummy response variable, $\mathbf{x}$ is a matrix of values of explanatory variables, $\boldsymbol{\beta}$ is a vector of regression coefficients and $\mathbf{e}$ represents a vector of residuals.

The follow-up willingness-to-pay value depends on the respondent's answers to the first willingness-to-pay value that was proposed (B_m): if the first value is rejected, the second value is worth half as much (B_l), whereas if the first value is accepted, the second value is doubled (B_u). With the obtained responses, two binomial discrete variables are formed that have the characteristics of the dependent variable. The appropriate variant of a bivariate probit regression model is used when explaining the true willingness-to-pay, with the assumption that the two decisions are interconnected and the errors of the two regressions correlated; this increases estimation efficiency despite the evaluation of an additional parameter measuring the coefficient of the correlation between random errors in both regression equations (ρ). The values of regression coefficients are estimated by applying the maximum likelihood (ML) estimator.

In the bivariate probit regression model, dependent variables represent the respondent's answers to the initial (*RESP1*) and the follow-up willingness-to-pay value (*RESP2*). These are binary variables that take the value 0 if the respondent accepts the proposed value and 1 otherwise. The following can be classified as the determinants of willingness-to-pay (explanatory variables):

1) respondent's net monthly income (*INCOME*);
2) visitation rate of the environmental goods in the area (*VRATE*);
3) respondent's conservation consciousness (*CONSC*);
4) level of the respondent's concern over unscheduled development in the area (*CONCERN*);
5) perception of potential damage in the area from unscheduled development (*DAMAGE*);
6) goods in the area that were rated more highly by respondents (*PCALM*, *HERITAGE* and *FUNCT*); and

7) the number of values that are held to be embodied in environmental goods that the respondents deem important (*VALSC*).

More detailed evaluation results for the true willingness-to-pay model are set out below.

5.2 Estimation of the true willingness-to-pay model

For the purpose of analysing the authentic willingness-to-pay, it is important to eliminate all protest responses from the sample before evaluating the true willingness-to-pay, which reduces the number of observations to 203. The descriptive statistics of some of the key variables may be somewhat different from those in Table 1, in which 312 observations were included. The respondents' average net monthly income is higher (SIT 160,837) and closer to the statistical mean in the Republic of Slovenia for the studied year, and the same holds for the average net monthly household income (SIT 389,901) and the average net monthly income per household member (SIT 56,212) with the same average household size (3.4 members). A significant increase is noticed in the average maximum willingness-to-pay value, which increases by 52.6%, i.e. to SIT 725, and in the average final willingness-to-pay value, which increases by as much as 53.9%, i.e. to SIT 597.

The average, true willingness-to-pay value (μ_{TWTP}) is calculated in the following manner (Haab & McConnell, 2002):

$$\mu_{TWTP} = -\frac{\beta_0}{\beta_1}, \tag{2}$$

where β_0 is the regression constant value, and β_1 the regression coefficient value for the proposed willingness-to-pay value in the bivariate probit regression model, the evaluation results of which are presented in Table 3. The explanatory variables are the initial (*BID1*), and the follow-up willingness-to-pay values (*BID2*) that were proposed to respondents in the survey.

Table 3. Determining the average willingness-to-pay value

Dependent variable	***RESP1***		
Explanatory variable	b_i	z	$p(z)$
Constant	0.3002	1.46	0.144
BID1	–0.00083	–2.35	0.019
Dependent variable	***RESP2***		
Explanatory variable	b_i	z	$p(z)$
Constant	0.3276	2.33	0.020
BID2	–0.00078	–2.10	0.037
$\rho(1, 2)$	–0.3451	–2.59	0.009
n	203		
LogL	–268.52		

Sources: IER Database on Economic Valuation of the LPDA of Volčji Potok (2005) and authors' calculations.

The results in Table 3 are the basis for the calculation of the true willingness-to-pay value at the initially proposed value of SIT 359.48 and at the follow-up value of SIT 419.67. The comparison of the obtained results with the evaluation results for the stated willingness-to-pay shows that the new values are slightly lower than the non-adjusted willingness-to-pay value, which had amounted to SIT 474.80, and slightly higher than the adjusted values from section 4.2.

The correlation coefficient between random errors of the two regression equations is significant (–0.35) and statistically is significantly different from 0, which indicates that the evaluation of the bivariate probit model resulted in greater estimation efficiency. This can be confirmed by comparing the results in Table 3 with the separate estimation of the two probit regression models (Verbič & Slabe Erker, 2005). The greatest advantage is shown in the evaluation of the respondents' further responses where the standard errors of evaluation of the regression constant and regression coefficient are notably reduced.

5.3 Determinants of the true willingness-to-pay

Let us now consider the effects of the variables presented in section 5.1 on the probability of a respondent accepting the proposed willingness-to-pay value. The estimation results of the bivariate probit model are presented in Table 4. They again show that the value of the correlation coefficient between random errors of both regression equations is relatively high (–0.64) and statistically significant, which indicates that the estimation of the bivariate probit model resulted in greater estimation efficiency.

It can be established that the net monthly income (*INCOME*) has a statistically significant, positive impact on both the respondent's initial and subsequent decision on contributions towards the realisation of the targeted development scenario. More specifically, the regression coefficient is –0.0024 at the initial response and –0.0031 at the subsequent response, which means that the higher the income, the lower the probability that the respondent will reject the proposed willingness-to-pay value. The marginal effect of the income impact on the individual's decision (not shown in Table 4) amounts to –0.00094, which means that per each thousand tolars of a respondent's net monthly income, at the average values of all other variables, the probability of accepting the proposed willingness-to-pay value on average increases by 0.09 percentage points.

The visitation rate of the environmental goods in the area (*VRATE*) has a positive impact on an individual's further decision on willingness to contribute towards the realisation of the targeted development scenario, while no impact on the individual's initial decision was found at a satisfactory significance level. The value of the relevant regression coefficient is –0.4991 and the value of the relevant marginal effect is –0.00026. This means that an additional visit by an individual to any of the environmental goods in the area, at the average values of all other variables, on average increases the probability of accepting the proposed, subsequent willingness-to-pay value by 0.03 percentage points. The value of the marginal effect may seem low but it has to be taken into account that the average visit to environmental goods in the area was calculated as a non-weighted average visit to individual environmental goods, including transit by the inhabitants of the area across certain parts of the cultural landscape, such as villages and agricultural land.

Also, the degree of awareness or consciousness (*CONSC*) such that respondents would give priority to conservation of the natural and cultural heritage for present and future generations with respect to their current standard of living was found to be a statistically significant determinant in their subsequent decisions on willingness to contribute to the realisation of the targeted development scenario. The regression coefficient is –0.3868, which means that among respondents with this level of awareness the probability of rejecting the subsequently proposed willingness-to-

pay value reduces compared with other respondents. The marginal effect is –0.0208, which means that for these 'aware' respondents (with average values for all other variables) the probability of accepting the subsequently proposed willingness-to-pay value increases by 2.08 percentage points.

Table 4. Estimation results for the model of true willingness-to-pay

Dependent variable	***RESP1***		
Explanatory variable	b_i	z	$p(z)$
Constant	0.7009	3.07	0.021
INCOME	–0.0024	–2.26	0.025
CONCERN	–0.4858	–2.20	0.028
DAMAGE	–0.5481	–3.06	0.022
PCALM	–0.5552	–2.38	0.018
HERITAGE	–1.2077	–5.71	0.000
FUNCT	–0.6654	–2.13	0.033
VALSC	–0.6258	–3.98	0.000
Dependent variable	***RESP2***		
Explanatory variable	b_i	z	$p(z)$
Constant	0.9765	4.34	0.000
INCOME	–0.0031	–2.79	0.005
VRATE	–0.4991	–2.27	0.023
CONSC	–0.3868	–1.72	0.086
PCALM	–0.5290	–2.30	0.022
HERITAGE	–0.6735	–3.50	0.001
FUNCT	–0.4653	–2.01	0.049
VALSC	–0.3943	–3.21	0.001
$\rho(1, 2)$	–0.6394	–5.12	0.000
n	203		
LogL	–251.30		

Sources: IER Database on Economic Valuation of LPDA of Volčji Potok (2005) and authors' calculations.

In contrast to the two previous variables, the level of concern over unscheduled development in the area (*CONCERN*) only proved to be a statistically significant determinant in relation to an individual's initial decision on willingness to contribute towards the realisation of the targeted development scenario. The regression coefficient is –0.4858, which means that among those respondents with significant concern about the events in the area the probability of rejecting the initially proposed willingness-to-pay value reduces, compared with other respondents. The marginal effect is –0.1867, which means that for concerned respondents (with average values for all other variables) the probability of accepting the initially proposed willingness-to-pay value increases by 18.7 percentage points.

Similarly, the perception of potential damage in the area owing to unplanned development (*DAMAGE*) was only found to be a statistically significant determinant in relation to the initial decision on the willingness to contribute towards the realisation of the targeted development scenario. The regression coefficient is –0.5481, which means that if a respondent's perception of damage in the area from unplanned development is considerable, the probability of rejecting the initially proposed willingness-to-pay value reduces compared with other respondents. The marginal effect is –0.2090, which means that for these respondents (with average values for all other variables) the probability of accepting the initially proposed willingness-to-pay value increases by 20.9 percentage points.

Respondents who attribute a high value to peace and quiet in the area (*PCALM*) statistically are significantly more likely to accept both the initial and the follow-up willingness-to-pay value. The regression coefficient is –0.5552 at the initial response and –0.5290 at the subsequent response, which means that the probability of these respondents rejecting the proposed willingness-to-pay values reduces. The marginal effect is –0.2333, which means that (with average values for all other variables) the probability of accepting the proposed willingness-to-pay value increases by 23.3 percentage points.

Respondents who put a high value on natural and cultural heritage, forests, plant and animal species and the environment in the LPDA of Volčji Potok (*HERITAGE*) statistically are also significantly more likely to accept the initial and follow-up willingness-to-pay values. The regression coefficient is –1.2077 at the initial response and –0.6735 at the subsequent response, which means that the probability of these respondents rejecting the proposed willingness-to-pay values reduces. The marginal effect is –0.4792, which means that (with average values for all other variables) the probability of accepting the proposed willingness-to-pay value increases by as much as 47.9 percentage points. It has to be emphasised that almost half of the respondents fell into this category.

In the same way, respondents who attribute a higher value to the functional characteristics of the area such as the use of cycle tracks and footpaths, potable drinking water and various tourist activities (*FUNCT*) statistically are significantly more likely to accept the initial and follow-up willingness-to-pay values. The regression coefficient is –0.6654 at the initial response and –0.4653 at the subsequent response, which means that the probability of these respondents rejecting the proposed willingness-to-pay values reduces. The marginal effect is –0.2323, which means that (with average values for all other variables) the probability of accepting the proposed willingness-to-pay value increases by 23.2 percentage points.

The impact of the number of values deemed important and held to be embodied in the environmental goods in the LDPA Volčji Potok (*VALSC*) on respondents' decisions to contribute to the realisation of the targeted development scenario is positive and statistically significant. The regression coefficient is –0.6258 at the initial response and –0.3943 at the subsequent response, which means that the probability of these respondents rejecting the proposed willingness-to-pay values reduces. The marginal effect is –0.2930, which means that on average each additional perceived value for these respondents (with average values for all other variables) increases the probability of accepting the initially proposed willingness-to-pay value by 29.3 percentage points.

6. The aggregate willingness-to-pay

The aggregation of data takes into account the area covering the three municipalities in which the LPDA of Volčji Potok is located, i.e. Domžale, Lukovica and Kamnik. The true willingness-to-pay value (with protest responses eliminated from the sample in advance) was used as the average individual value of willingness-to-pay for aggregation purposes. Two such willingness-to-pay

values were calculated: the value for the initial response, which was SIT 359.48, and the follow-up value, which was SIT 419.67. Since in 63.5% of cases the respondent either accepted or rejected both willingness-to-pay values, it can be concluded that the follow-up willingness-to-pay value is closer to the unobserved true willingness-to-pay. Additionally, even in cases of mixed responses from respondents each of the two willingness-to-pay values has the same probability of being closer to the unobserved true willingness-to-pay value. For these reasons, the individual willingness-to-pay amount of SIT 419.67 – calculated from respondents' follow-up responses – was used thereafter.

The base for aggregating willingness-to-pay values was largely defined already with the selection of the form of payment for realisation of the targeted development scenario. Since this was defined as a supplement to the compensation fee for the use of building land, this covers all those liable to pay such a fee in the municipalities of Domžale, Kamnik and Lukovica. Given that those liable could be required to pay for land regardless of whether or not is has been built on, a suitable correction (reduction) must be made to the data on the number of those liable to pay, which was acquired from the relevant municipal administrations. As the data covering payers for building land (both built-on and otherwise) was not obtained from all three municipalities, a partial estimate had to be made. Therefore, the estimated total number of persons liable for payment of the supplement was 19,332.

Assuming that the value (amount) the inhabitants of and visitors to the LPDA of Volčji Potok are prepared to contribute to the realisation of the targeted development scenario is the same as their perception of the area's value, then based on the aggregation results, one can state that the value of the LPDA of Volčji Potok for inhabitants and visitors is approximately SIT 8.1 million per month. This figure translates to SIT 97.4 million per year and SIT 486.8 million over the entire anticipated period (2006–10). If one then assumes a 3% annual discount rate, then the present value for realising the targeted development scenario in the LPDA of Volčji Potok for inhabitants and visitors totals approximately SIT 96.1 million for the first year and SIT 449.0 million for the entire period (2006–10).

7. Conclusion

This working paper represents an economic valuation of the LPDA of Volčji Potok, which is an important Slovenian cultural landscape with internationally recognised characteristics, using the contingent valuation method. Within this framework, we performed an econometric analysis of stated and true willingness-to-pay. In the analysis of survey data, the stated value of willingness-to-pay was positively affected by respondents' incomes, conservation awareness, concerns about unscheduled development and perceptions of probable damage, general views about natural and cultural heritage, and the number of values held to be embodied in the area's environmental goods. Respondents' protest responses, on the other hand, lowered the stated willingness-to-pay value. Both starting point bias and part-whole bias also substantially reduced the value of the stated willingness-to-pay.

After the elimination of protest responses from the sample, the true willingness-to-pay was evaluated. The values obtained were slightly lower than the non-adjusted willingness-to-pay from the stated willingness-to-pay analysis. Respondents' decisions to contribute towards the realisation of the targeted development scenario were positively affected by income, conservation awareness, the visitation rate, the level of concern about unscheduled local development and the perception of potential damage, preferences for particular environmental goods in the area and how many important values the environmental goods were deemed to hold.

Finally, the adjusted, average individual value of willingness-to-pay was used to calculate the aggregate willingness-to-pay. The aggregate value obtained seems to provide a relatively good reflection of the perceptions of the use value, and above all, the non-use value by inhabitants of and visitors to the LDPA Volčji Potok. It therefore makes sense with regard to future planning policy to compare the value obtained for the area with the current total expenditure allocated, in order to plan and achieve the optimal development for the LDPA of Volčji Potok.

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