D35-D34 Economic Valuation of Environmental and Resource Costs and Benefits of Water Uses and Services in the Water Framework Directive: Technical Guidelines for Practitioners. Pilot case study results

Deliverable Due Date : Month 25

Valuation of Ecological Restoration Benefits in the Által-ér Catchment Area using Stated Preference Methods

Hungarian case study results

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Content

Overview

The Hungarian Altal-Er Case Study - one component of the international AquaMoney Project – was designed to assist *in generating and testing practical guidelines* for using economic valuation methods for water-related uses and services and was focused on a *case study* in which public perception of values related to restoring rivers to a more natural condition was assessed. The purpose of the case-study was provide useful and replicable information on better *capturing environmental and resource costs and benefits* in line with requirements of the Water Framework Directive. Two main survey techniques were used for this purpose (Contingent Valuation and Choice Experiment) and results from both indicated *significant public willingness to pay* for benefits arising from improvement in water quality. This report details *how the methods were applied* and *draws conclusions* on the utility of the methods from the results which emerged.

1. Introduction

The project AquaMoney[1] (Economic valuation of environmental and resource costs and benefits in the European Water Framework Directive) is a European research project funded by the European Commission under the 6th EU Framework Programme (contract n° SSPI-022723). AquaMoney is directly linked to the implementation of the Water Framework Directive (WFD). The concept of environmental and resource costs and benefits plays a central role in the economic analysis of the WFD, in particular in relation to the cost recovery of water services (Article 9 WFD) and exemptions based on disproportionate costs (Article 4 WFD).

The main objective of the AquaMoney project is to test practical guidelines aimed at capturing Total Economic Value ('use' and 'non-use' values) of water resources in real-life conditions in 10 representative European pilot river basins. Furthermore, it also provides a practical illustration of how stated preference methods can be usefully applied in practice. The WFD, in place since 2000, applies a holistic approach to the management of water. The structure and the state of the river (e.g. connectivity of wetlands within the riparian zone) directly influence the biological and hydro-morphological quality elements of "good ecological status (GES)". Hence, attaining GES is only feasible if parts of the river are transformed back into a more natural state.[2]

The Hungarian case study is part of the international "Danube group" – consisting of researchers and institutions in Austria, Romania and Hungary – and focuses on the estimation of non-market benefits of ecological restoration of a heavily modified Danube river tributary. The main objective of the case study is to assess public perception and value of benefits associated with river restoration measures in terms of flood control and water quality improvements and to test the transferability of such benefits in an international context. A common questionnaire (using the different economic valuation techniques of 'Choice Experiment' and 'Contingent Valuation') was applied uniformly across the three Danube case studies in order to test the transferability of values derived through comparison and contrast of the case study results.

This report summarizes the main case study results and it is organized as follows: After a short description of the case study areas, Chapter 2 briefly presents the general survey and questionnaire design and outlines how the stated preference methods were implemented.

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[1] ~~The introduction was written by Markus Bliem and Michael Getzner (see Bliem and Getzner, 2008).~~

[2] For some parts of the river, e.g. where the river banks are heavily modified, achieving good ecological status may not technically be feasible

Results of the survey then follow in Chapter 4. A significant public willingness to pay for the specified restoration measures is revealed and described in detail. Finally, based upon the application of the specific valuation methods utilized, the report concludes (Chapter 5) with a formulation of best practice recommendations and notes of specific limitations of the methods applied. The questionnaire utilised in the study along with ancillary information is included in Chapter 6 (Appendices).

2. Description case study area

The Által-ér River drains Northwards into the Danube river. It is located in the Transdanubian part of Hungary. The main river of the watershed is the Által-ér which is approximately 50km long (Figure 1**Error! Reference source not found.**), and has a watershed area of 521 km^2 (Figure 2~~Figure 2~~).

Figure 1: Location of River Catchment

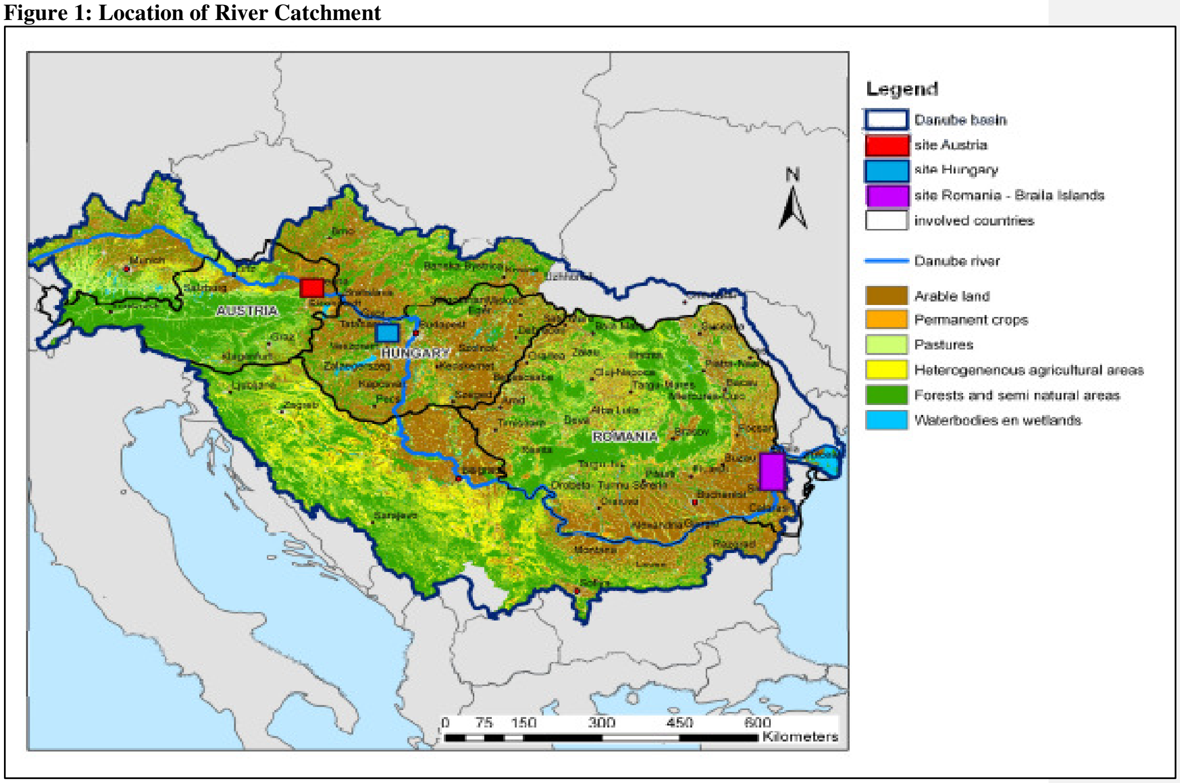
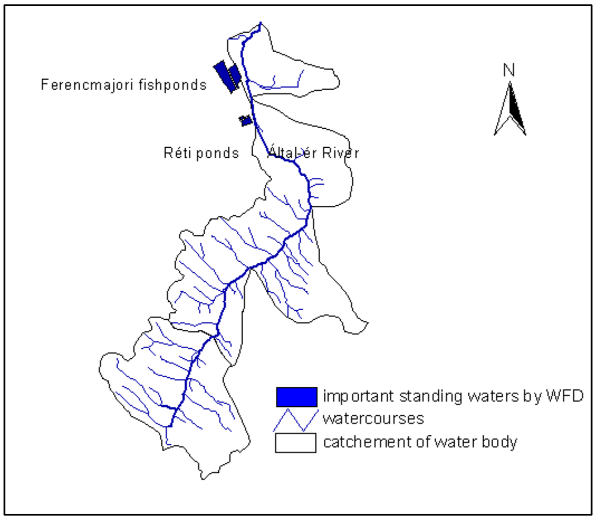


Figure 2: Catchment of the Által-ér water bodies (Total catchment area: 521 km^2)



The source of the Által-ér lies at the south-western boundary of Vértes mountains at 275 m a.B.s.l. and confluences with Danube River at approx. 120m a.B.s.l. The Által-ér has 31 tributaries and 19 artificial lakes. Two sections of the Által-ér are delineated as natural water bodies with reference to the Article 5 report of Hungary: EU code: (1) HU_RW_AAA206_0000036_S; type 9, and (2) EU reference code: HU_RW_AAA206_0000045_M; type 8. In the catchment area there are three bigger cities (Tatabánya, Oroszlány and Tata), which were formerly very important industrial cities. Watercourses are all regulated except for initial stretches on hills, and run in straightened artificial riverbeds (water velocity in natural stretches is between 0.09-0.15 m/sec while in lower sections it is 0.4-0.6m/sec (NTDEI, 1993)). The climate of the catchment is influenced by two mesoclimatic factors: the Transdanubian Mountains at the southern part and Kisalföld climatic conditions in the North. This means that the southern area has cold winters with medium precipitation while the Northern territories are susceptible to drought. On average, 40% of the annual precipitation is from May to April. Annual precipitation averages 600mm and the annual average temperature is 9.8˚, from which the average annual maximum is 33 ˚C and the average annual minimum is -18 ˚C. The number of snow covered days on average is 40 days.

Groundwater originates from a karstic system in which the water level is rising after cessation of historic mining. Urbanisation and numerous point sources of pollution (around industrial centres) mean that several pollutants are expected to exceed limit values. Significant pH changes and heavy metal pollution are probably related to power station slurry dumping sites. Additionally, the groundwater nitrogen load which has increased due to liquid manure seeping into the freshwater system. Regarding land use in the area, vegetation cover has changed from the formerly dominant forest to agriculture (resulting in increasing suspended solid load).

Old Lake Tata (230ha) is the largest lake on the watercourse (average depth 2.4 m, volume 4.6 million m3). It was originally created through construction of a dam on the Által-ér by the Romans. It serves the purposes of recreation, flood control and agricultural & fishery objectives. Other lakes exist on the watercourse for the purpose of providing cooling water for water works and power plants, supplying (now defunct) mills, for angling, fisheries, irrigation and sedimentation control purposes. No water is extracted from surface water for the public water supply (drinking water extraction originates from the karstic aquifer). Industrial water supply consists of cooling water for heavy industry. Water extraction for the purpose of irrigation is not currently considered significant. Main water users are in the case study area are industry and recreation.

The main sources of diffuse pollution are household waste water, small animal farming around houses and arable land supplied with surplus fertilizers and/or manure. Agricultural emission sources relate to animal husbandry and slurry disposal sites (e.g. the Tatabánya, Báhida and Oroszlány Power Plants). The majority of the municipal landfills located in the watershed are illegal. The two licensed municipal landfills are considered low risk as pollution sources. The urban centers of Tatabánya and Oroszlány result in high wastewater loads, especially during low flow periods. The current sewage and wastewater treatment presently meet the Urban Wastewater Directive. Biologically-based waste water treatment plants in the region based on advanced activated sludge treatment are operating efficiently but unable to stabilize P and N at the necessary levels to prevent eutrophication in surface waters.

Regarding hydromorphology, artificial lakes have impact on both impounded and downstream section. Dams are inappropriately designed and constructed way for assuring river continuity. Lake water retention is important due to low flow conditions. For most rivers there are problems with shoreline zonation; the riparian zone is disturbed, except for in small mountainous regions.

Not enough data is available to evaluate the water bodies to the degree required by WFD. Water quality assessment of rivers is not routinely performed, although the most problematic parameters have been identified (biological elements (BQE) and micro-organic pollutants). In summary it may be stated that primarily due to human impact the natural ecological condition (e.g. related to fish fauna, river zones, larger macrophytic plants and nutrient load) have been heavily modified due to construction of artificial channelling, shorelines and the existence of a largely artificially regulated river bed.

3. Set up of the survey

3.1. Questionnaire design

The questionnaire was developed after several meetings, discussions and pre-tests[3]. After each pre-test, minor changes were introduced to the structure and wording of the questionnaire. Special attention was paid each time to the CE (choice experiment) and how understandable the experiment and the design were to lay people. The final questionnaire (see Appendix) consisted of four main parts:

- *Perceptions and attitudes.* The first part of the questionnaire contained questions about respondents' general perceptions and environmental attitudes. Respondents were asked, for example, about types and frequency of recreational activities in the catchment area and how often they visit the case study area. Moreover, they were asked regarding their perceptions about water quality and about water quality evolution over the last ten years.
- *Choice Experiment.* In the second part, respondents were asked to state their choices using four different choice sets. In the introduction to the choice experiment a map of the location of the river restoration area was shown to each respondent. The maps were based on CORINE LANDCOVER 2000 (shape file 1:100000). The major types of ecosystems were derived from Corine classes level 3 and provided information about human settlements, agricultural systems, forests and meadows, wetlands and freshwater ecosystems. The CE was followed up with a debriefing question and respondents who opted out (i.e. chose not to select one of the alternatives) four times were asked why they chose as they did.
- *Contingent Valuation.* The CE was followed up by a CV-question on ecological restoration. Participants were asked to state their maximum willingness to pay in order to help finance (largely unspecified) restoration measures which they were told would change the ecological status and/or recreational potential of the area.
- *Demographic/socio-economic data.* The final part of the questionnaire was focussed on gathering data on respondents' demographic and socio-economic status (income, age, number of children, current work status, education, etc.).

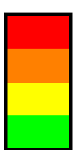
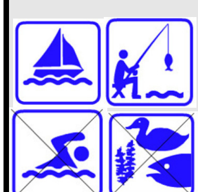
[3] ~~This chapter was written partly by Markus Bliem and Michael Getzner (see Bliem and Getzner, 2008).~~

3.1.1. Design and Implementation of the choice experiment

In order to estimate and justify expenses for river restoration programs ecologists consider to be beneficial, in the present study a choice experiment (CE) was chosen to value ecological restoration and to estimate the WTP for certain restoration management programmes. The design consists of two exclusive categories of benefits: the impact of river restoration on floodwater storage and the corresponding reduction of flood risk, and the river's nutrient retention capacity and hence water quality.

The CE was composed of three attributes (flood frequency, water quality and cost of the option) and respondents were asked to choose between the current situation and two alternatives. Respondents were told in the introduction that river restoration measures can positively affect water quality and flood frequency. The degree of restoration of the river (towards a more natural state) is connected to the degree of water quality improvement and flood frequency decrease that can be expected.

Figure 3: Example choice card

	Option A	**Option B**	**Status Quo**
Flood frequency	Once every 25 years	Once every 25 years	Once every 5 years
 **Water quality**	Good 	Very good 	Moderate 
 **Increase in water bill**	€ 3 (25 Cent / month)	€ 10 (83 Cent / month)	No additional payment
I choose: (Please tick as appropriate)	**Option A** ☐	**Option B** ☐	**Neither** ☐

Water quality was described in terms of variety of aquatic life and recreational uses such as swimming, boating and fishing. A selection of multi-coloured pictograms was used to assist respondents to visualise different quality levels, starting from moderate rising to good and very good water quality (Figure 3Figure 3). The differences between the levels were explained in detail.

Flood frequency was defined as the return interval of floods that would bring damage to communities and agricultural and industrial uses of areas downstream of river restoration and re-naturalisation measures and comprised four levels: 5, 25, 50 and 100 years. The lowest level for both attributes, water quality and flood frequency corresponded to the status quo.

The *monetary attribute* was specified as an increase in respondents' water bill for funding the water management programme (in the form of an annual contribution on top of the usual water bill). The payment levels used in the choice experiment were the Hungarian Forint equivalents of 3, 10, 30 and 50€.

Respondents were asked to choose between the two unlabelled river restoration alternatives compared to the status quo situation. The trade-off here is the price they pay as a private household for the presented public river restoration benefits on top of their current water bill. Hence, the derived welfare measure is individual willingness to pay (WTP) or compensating surplus to secure the river restoration benefits. If they choose the current situation, they obviously forego these benefits and the cost price is in this case zero. In order to combine the levels of the attributes into a number of options a fractional factorial design was used. 32 choice sets were assigned to 8 blocks so that each respondent was confronted with 4 randomly-selected choice sets.

3.1.2. Design of the contingent valuation scenarios

In the study, the contingent valuation method consisted of asking respondents their willingness to pay for increasing the size of natural areas along the river - from the actual situation to an enlarged and ecologically-enhanced situation. Respondents were told that, with restoration measures, wetlands and forests could be connected to the Által-ér which would lead to a more natural landscape with water flowing not only through the main channel but also through adjacent creeks and ponds (Box 1~~Box 1~~). Respondents were told that currently about 25 % (a quarter) of the wetlands are connected to the Által-ér.

Box 1: Introduction to the CV-question

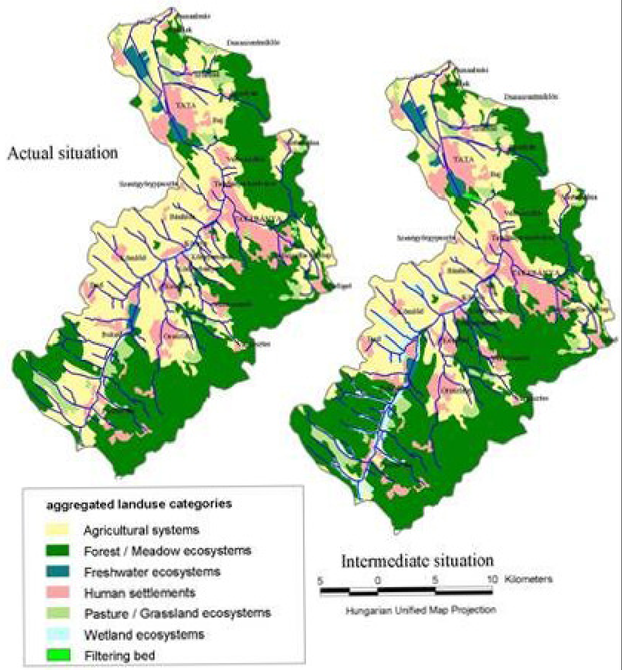
"As described before, the Danube River is heavily modified in many places. Today, approximately a quarter of the river is still connected the surrounding floodplains and wetlands and the river banks are still in a natural state (SHOW MAP OF THE CURRENT SITUATION).

Restoration measures would connect the river again to the floodplains and the wetlands as they were originally before the changes made to the river and river banks. As a result of river and floodplain restoration the landscape will look more natural, with water flowing also through adjacent creeks and ponds. This more natural state has a positive effect on nature and the variety of plant and animal species found in the catchment.

Plans exist to restore 50 % or - alternatively 90% - of the modified river banks in the Által-ér catchment area back into their original natural state as shown on the map (SHOW MAP), and connect the river again with the floodplains and wetlands".

In order to increase realism, respondents were shown existing river restoration plans on a map. The maps were based on CORINE LANDCOVER 2000 (shape file 1:100,000). The major types of ecosystems were derived from Corine classes level 3 which provide information about human settlements, agricultural systems, forests and meadows, wetlands and freshwater ecosystems (Figure 4~~Figure 4~~).

Figure 4: River Restoration Map (Status quo and Intermediate situation displayed)



The respondents were explicitly told that for each scenario they should state the maximum amount they would be willing to pay on top of their annual water bill in order to restore a certain degree of the river bank. We used an open-ended format (a payment card) to elicit individuals' maximum willingness. The payment card showed 29 values ranging from HUF 0 to HUF 62,500 (€ 0 to € 250). Additionally, the payment card offered the options "more than HUF 62,500, namely …", "other amount, namely…" and "I don't know" (see Box 2~~Box 2~~).

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Box 2: Payment card

☐	0 Ft	☐	1250 Ft	☐	3500 Ft	☐	7500 Ft	☐	15000 Ft	☐	43750 Ft
☐	250 Ft	☐	1500 Ft	☐	4000 Ft	☐	8750 Ft	☐	20000 Ft	☐	50000 Ft
☐	500 Ft	☐	2000 Ft	☐	4500 Ft	☐	10000 Ft	☐	25000 Ft	☐	62500 Ft
☐	750 Ft	☐	2500 Ft	☐	5000 Ft	☐	11250 Ft	☐	31250 Ft	☐	More than 62500 Ft, namely ________.
☐	1000 Ft	☐	3000 Ft	☐	6250 Ft	☐	12500 Ft	☐	37500 Ft	☐	Other amount, namely ___________

The WTP question was formulated as follows:

"Can you tell me with the help of this card how much you are willing to pay MAXIMUM on top of your yearly water bill over the next 5 years for the restoration of half (alternatively 90 %) of the modified river banks in the Által-ér catchment area back into their original natural state as shown on the map?"

Those respondents who were not willing to make a financial contribution to restoration measures were asked to state why. In addition, these respondents were confronted with a series of statements (e.g. "It is the task and responsibility of the government to protect the rivers" or "The environment has the right to be protected irrespective of the costs of the society.") to identify and categorise protest bidders.

3.1.3. Individual country modifications to questionnaire

Our presumptions were that the Hungarian population has an attitude that is slightly different from the other two countries, so some extra questions were inserted into the questionnaire. The majority of these extra questions –we assumed - can influence WTP. The questions referred to sewage systems (whether or not the household is connected to the sewage system, and if not, if they have the possibility to be connected), whether the respondents own a well, and if yes, what they use the water for. We also asked about agricultural activity, its type and scope.

3.2. Sampling procedure and response rate

In the Hungarian case study, the survey method was face-to-face interview. The pre-test and the main survey were carried out by students (Ph.D. students and major students) from Corvinus University of Budapest. The first public pre-test (following an intra-university preliminary pre-test among members of the department faculty) was conducted on 22-23 September in Tata, one of the three largest towns in the catchment area of the Által-ér (with appr. 20% of the total catchment population). 32 questionnaires were completed during personal face-to-face interviews using an approximately stratified sample plan. Broad representivity was obtained between men and women of differing ages. Response rate was 68%. The main survey was carried out in the course of eight days namely on the weekends between 10th Nov. 2007 and 19th January 2008 (see Table 23~~Table 23~~ in the Annex). We employed 15 interviewers who study at our university on the environmental management major (Table 24~~Table 24~~, Annex). They were trained before the survey started. In total, 892

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Formatted: Font: (Default) Times New Roman, 12 pt, Not Bold, Font color: Auto people were asked, out of whom 471 were willing to answer to our questions, so the response rate is 52.8%.

The respondents' residences covered 18 settlements. We assigned a key role to Tata and Tatabánya which are the two biggest settlements in the area. The frequency of residents from each settlement in the sample can be seen in Table 1~~Table 1~~**Error! Reference source not found.**.

Table 1: Frequency of respondents' residence

	Frequency in the sample	Percent in the sample	Population (capita)
Tatabánya	76	16,2	72470
Tata	90	19,2	24598
Oroszlány	56	12,0	20280
Pusztavám	17	3,6	2499
Környe	36	7,7	4336
Bokod	31	6,6	2248
Dad	14	3,0	1083
Vértesszőlős	33	7,1	2859
Naszály	23	4,9	2239
Kecskéd	32	6,8	1919
Neszmély	25	4,9	1444
Dunaalmás	25	5,1	1516
Vártesztes	1	,2	487
Almásfüzitő	1	,2	2417
Baj	6	1,3	2761
Kömlőd	1	,2	1151
Szákszend	1	,2	1539
Szomód	3	,6	2003
Total	471	100,0	

Source: KSH Népszámlálás 2001

4. Results

4.1. Respondent characteristics and sample representativeness

Our region from which the sample was drawn consists of the Tatai, the Tatabányai and the Oroszlányi Kistérség (micro-regions). Table 2Table 2 displays the socio-demographics of the sample. The percentage of males was 55.1% in our sample, while in the region it is 48.4% (thus according to the t-test performed, this parameter is not representative). The age structure of respondents lies well within the distribution of the population of the three micro-regions (it is representative). The mean age of respondents is 43.1 years (std. deviation 16.65; median value 41 years).

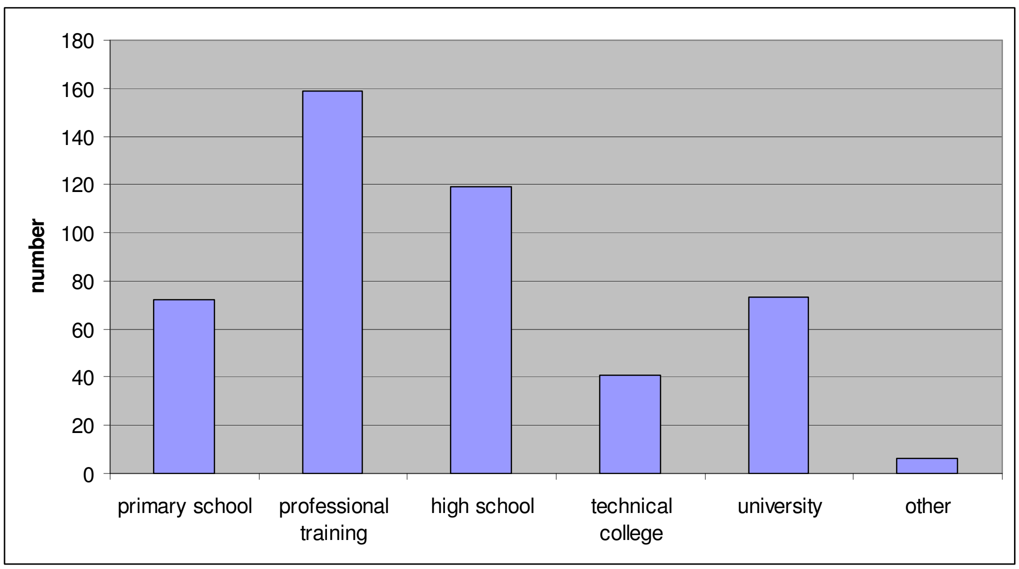
Table 2: Socio-demographics of respondents

	Sample (n=471)	(%)
GENDER		
Male	259	55.1
AGE (%)		
18-19 years	26	5.5
20-29 years	96	20.4
30-39 years	91	19.3
40-49 years	82	17.4
50-59 years	92	19.5
≥ 60 years	84	17.9
	470	100
INCOME		
0-62500 HUF	25	5.3
62501-125000	99	21.0
125001-187500	116	24.6
187501-250000	81	17.2
250001-375000	70	14.9
375001-500000	29	6.2
500001-625000	4	0.8
625001-750000	1	0.2
750001-875000	1	0.2
More than 875000 HUF	2	0.4
No answer/don't know	43	9.0
	471	100.0

The income situation was examined through asking the households' monthly net revenue. Net income could be given as a precise amount or as an interval chosen from a card. 42 respondents preferred not to answer this question (and once the question was omitted), totalling 9% of the sample. The most frequent category selected was between HUF 125,000 and HUF 187,500 (given by one quarter of the sample). During calculation, the intervals were substituted by their mean value if the precise amount was not given. Thus the average monthly income used was HUF 131,807 (€527.23) in the sample (standard deviation: 202,157). The micro-region population average income is HUF 133,526. Comparison with the income distribution of the area showed that the sample used was not representative for income. The distribution of income is skewed toward those with lower incomes, and lower income classes are overrepresented in this sample.

15.3% of the Hungarian sample population only went to primary school. 33.8% have a professional training and 25.3 percent went to high school. 8.7% have a degree from a technical college, and 15.5% went to university. The sample was not representative for level of education either, mainly because of a higher proportion of the better-educated and a lower proportion of the less educated among respondents.

Figure 5: Level of education of respondents in the sample



In the region the average family size (the number of people who live in the same household) is 2.57, while it is 3.03 (st. deviation 1.452; median 3.0) in our sample. The family size varies between 1 and 8 people. The household structure is not similar to the structure of the three micro-regions. In the region, 24.58% of those interviewed live in a one-person household while in our sample this value is 12.95%. It means that the ratio of multiple person households in the sample is higher than it is in the region. More than 67% stated that they have no children less than 18 years of age in the family. 17% of the respondents live with one child and 10% live with two children. Only 28 families live with 3 or more children.

Figure 6: Family size

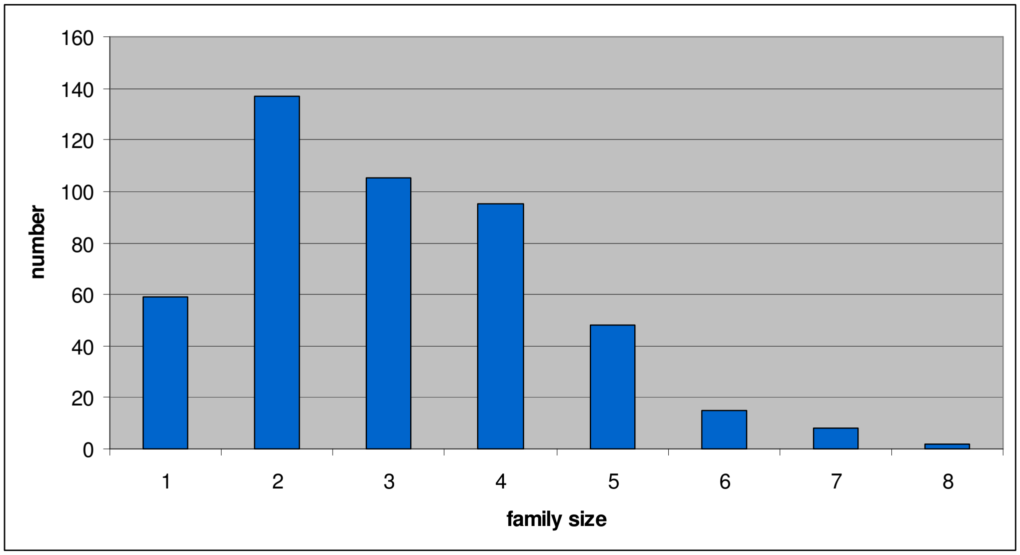
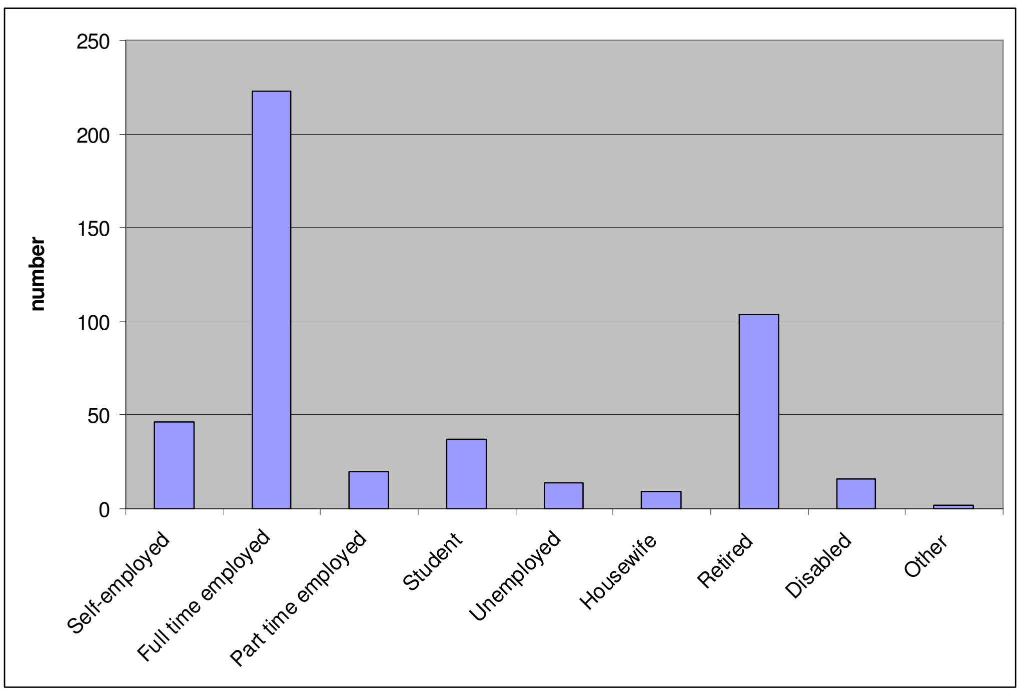


Figure 7: Current work status



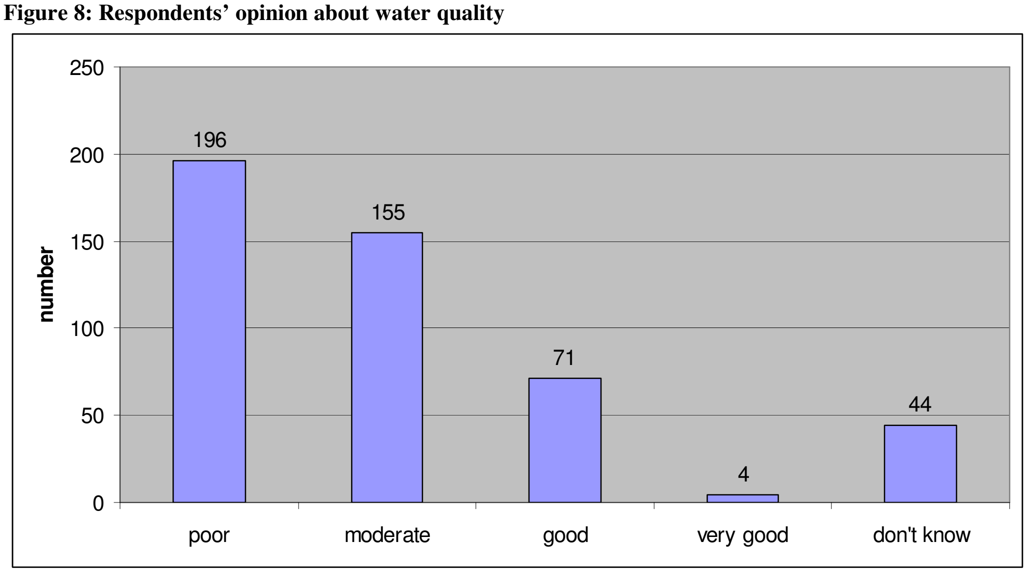
As for employment structure, national statistics that correspond to the survey's common structure were not available. Detailed statistics from the Central Statistics Office were available on the economic activity of the population and on the number of workers in each national economic sector. Nearly half of the sample work as full-time employees. There is a relatively high proportion of retired people - slightly above 20%. The percentage of unemployed is below the national average (7.6%) at only 3%.

4.2. Flood experiences and public perception of water quality

Perceptions of the respondents on water quality and public experience of flooding were elicited through a series of questions.

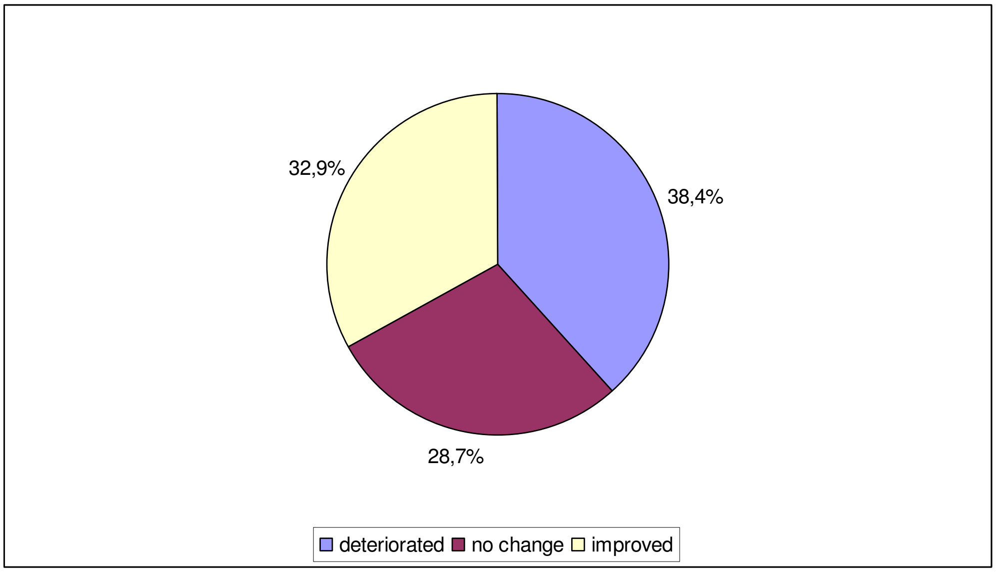
Respondents perceive water quality as being quite low. More than 40% reported it as 'bad' while 33% said it was mediocre (so almost ¾ have a bad opinion about the water quality of the tributary). Only 16% chose good or excellent quality, and 44 respondents (nearly 10%) were not able to evaluate water quality (according to a study by Somoly, "neither {…} spatial distribution nor the set of parameters are enough to evaluate the water bodies to the degree required by the WFD" - although it is estimated that water quality - according to chemical parameter evaluated - in the Altal-ér is poor-mediocre (IV-V) according to the 5 level MSZ 12749 system).

Figure 8: Respondents' opinion about water quality



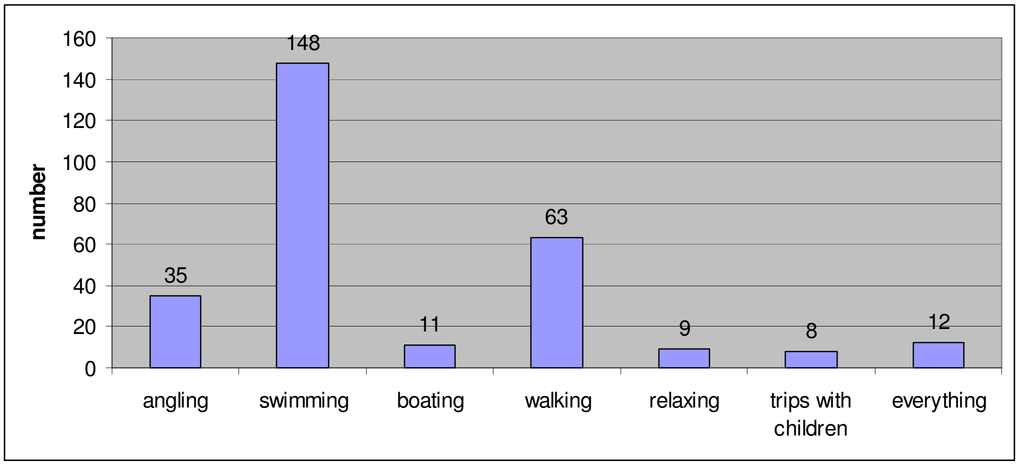
The three categories describing the change in water quality in the past 10 years (improved; not changed; deteriorated) were chosen roughly in the same proportion: 38.4% of respondents said that it has deteriorated, 32.9% said “improved” and 28.7% chose “unchanged” (Figure 9Figure 9). Altogether 70 people were not able to answer this question.

Figure 9: Respondents’ opinions about the changes in water quality during the last 10 years (N=401).



All respondents said it was important for them that water quality should improve; 95% chose the answers “important” or “very important”. Few people chose “I don’t know”. We also asked whether respondents would use the waters more frequently in the case the water quality improved; two thirds of the sample said yes. In the case of water quality improvement, the majority - 308 respondents or 65% - said that they would use the waters more often, but only 21 of them had never used them before. Almost 70% of the present users would use the waters more frequently. An improvement in water quality would above all increase the number and frequency of swimmers (right now swimming is prohibited although still some do it); 136 of the present users and 45 of the non-users. Two other activities would be pursued more often: walking and fishing, although these were mentioned significantly fewer times than swimming (82 and 51, respectively). All other activities were mentioned only a few times.

Figure 10: Future activities if water quality will be improved



Respondents do not feel very well informed about water quality issues. A relatively high number of respondents indicated that they feel 'less well informed' or 'not informed at all' about water quality issues (more than 50 % of respondents). Only 65 persons (13.8 %) feel they are 'very well informed' about water quality issues.

The majority (over 80%) of the respondents have never experienced a flood; 19% have lived through floods from 1 to 20 times. 3.6% have experienced flood-related problems 10 or more times in their area.

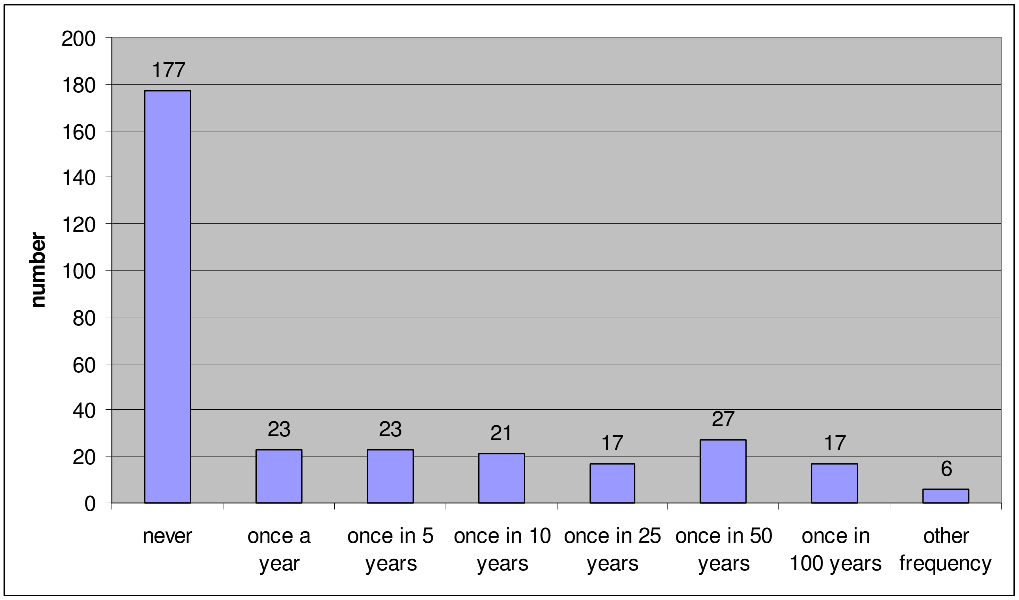
Table 3: Public Experience with Flooding

	Frequency	Percent
Never experienced	382	81.1
Experienced flood once or more than once	89	18.9
	471	100

Approximately ¾ of the sample (311 respondents[4]) were asked about their predictions of future floods. 15% of the sample expects yearly floods, or at least once every five years. 20% said that they expect very rare flood events, once every 25, 50 or 100 years. Nearly 60% said no floods are probable in the area in the future.

[4] Not all the respondents were asked about this question, because it was included in the survey later.

Figure 11: Expected future frequency of floods



40% of the sample stated that the flooding is not an important problem in the area while only about one quarter deemed it very important. As for causes, most people (179; 38%) gave "weather extremes due to climate change" as the most important factor. The second most important causes were "hydrological works along the river" and "unconsolidated dams" in almost equal proportion (25%). Deforestation and late interventions from the authorities were mentioned by of the sample 20%. 128 respondents (27%) marked none of the factors as an important cause of flood in the catchment.

Table 4: The most important causes of floods in the Által-ér area

Main reasons for floods are...	Number of (multiple) responses	Percent
Weather extremes due to climate change	179	38.0
Hydrological works along the river (e.g. channelling)	118	25.1
Unconsolidated dams	116	24.6
Deforestation	96	20.4
Late interventions from those responsible for flood defence program	95	20.2
Land use change	81	17.2
Other	43	9.1

4.3. Environmental awareness, behaviour and individual water use

The first question of the questionnaire related to respondents' environmental behaviour in terms of membership in environmental organizations and donations. Only 23 people (4.3 %)

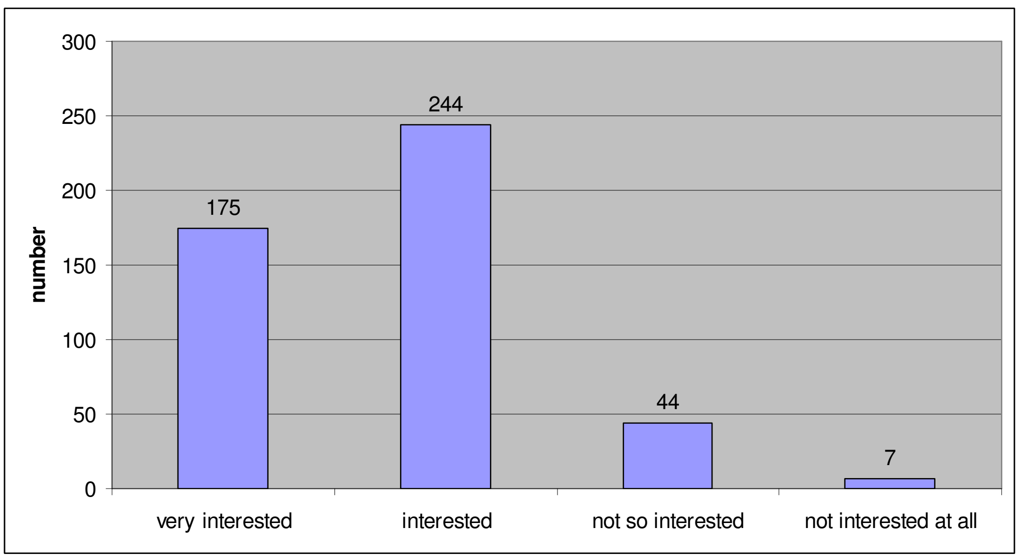
are members of environmental organizations. 25 people (5.3 %) donate money to such organizations with a mean of around HUF 19,000 (€ 76, st. deviation HUF 42,836). 12 % of the respondents have worked for environmental organizations in the last two years, with a majority of respondents engaging themselves at the most for a couple of days.

Table 5: Working for environmental organizations

	No. of responses	% (n=471)
about half a day	4	0,8
about one full day	13	2,8
a couple of days	30	6,4
more than a week	10	2,1
no work in environmental organization	386	82,0
Some annual financial donation	25	5,3

The interest in environmental questions and problems is indicated by the majority of the respondents (419 people, 89 %) who are 'interested', while a minority consider themselves to be 'not very interested' in environmental issues.

Figure 12: Interest in environmental issues



Drinking water for the catchment is obtained from karstic groundwater, thus the need for surface water as a source of potable water in negligible. However, water is abstracted from the Által-ér for the purposes of irrigation, for the use of smallholders and for industrial purposes. The current sewage and wastewater treatment facilities presently meet the Urban Wastewater Directive.

In the sample 38 % of people have their own well, and water pumped out is generally used for irrigation; for example for watering garden plants (147 people). The other purposes are much less often mentioned.

Table 6: Use of water from the households' well

Well water used for ...	No. of responses
Drinking	18
Body care	16
Cooking	12
Washing the laundry	23
Washing dishes	11
Washing the car	21
Watering garden plants	147

In Hungary about 62% of households are connected to a central waste water management system. In this sample this ratio is much higher (94.9%) of respondents are connected to this system. 21 households are not connected to the sewage system, out of whom 16 use septic tanks and 11 would have the possibility to connect to the system. Septic tanks are emptied most frequently (in 8 cases) only once a year.

4.4. Recreational water use characteristics

Some questions dealt with respondents' use of the Által-ér and/or Lake Öreg and its water quality. A quarter of our sample visits the Által-ér and/or the Öreg-tó not more than once a year, while 12% never visit these waters. More than one third of them are regular, weekly visitors, 22% visits once a month and 19% use the waters around four times a year. Altogether, 414 respondents (87.5 %) have visited the area at least once in their life. Therefore, it can be assumed that respondents have at least some basic information and individual perception of the Által-ér (this assumption is crucial for any valuation exercise).

Table 7: Frequency of visiting the water bodies

	No. of responses	%
At least once a week	157	33,33
once a month	105	22,29
4 times a year	90	19,11
once a year	60	12,74
less than once a year	2	0,42
never	57	12,10
Total	471	100

48.7 % of the respondents live within a distance of 1km from recreation areas of the Által-ér or Lake Öreg. The average distance is 4.0 kilometres (st. deviation 6.457). More than 90 % live within 10 kilometres. The biggest distance from the Által-ér is 50 km in the sample.

The most frequent activities are walking and hiking, pursued "often" by half of the respondents; only one fifth of them said they never walk by the waters. Another popular activity is "relaxing and enjoying the scenery". We found the proportion of wildlife watchers surprisingly high at 24.4% of the population. The activities least often mentioned were recreational fishing/angling and swimming/bathing (in accordance with our anticipation, as both activities are forbidden at the Öreg-tó, and the Által-ér is not suitable for them), recreational boating/sailing (also due to the characteristics of the water bodies), dog walking (which is mainly a real opportunity for those living at close quarters) and picnicking. On the next table the frequency of activities is displayed (Table 8~~Table 8~~). The most frequent activities were "walking" and "relaxing".

Table 8: Frequency of activities at the Által -ér

	Frequency			Percentage (%)		
Activity	Regularly	Sometimes	Never	Regularly	Sometimes	Never
Walking along the river banks / hiking	238	132	101	50.5	28.0	21.4
Relaxing and enjoying the scenery	212	129	130	45.0	27.4	27.6
Spending leisure time with children	130	101	240	27.6	21.4	51.0
Watching wildlife (e.g. birds)	115	124	232	24.4	26.3	49.3
Other sporting activity along the river banks	121	101	249	25.7	21.4	52.9
Dog walking	88	43	340	18.7	9.1	72.2
Visiting a riverside cafe / restaurant	83	150	238	17.6	31.8	50.5
Picnicking near the river	60	78	333	12.7	16.6	70.7
Recreational fishing / Angling	59	49	363	12.5	10.4	77.1
Swimming / bathing	32	68	371	6.8	14.4	78.8
Recreational boating / sailing	23	98	350	4.9	20.8	74.3

27% of regular walkers are from Tata, and 71% of the respondents from Tata often go for a walk by the river (probably due to the proximity of the popular Lake Öreg which actually is found in Tata). Respondents from Tatabanya comprise 19.8% of regular walkers, while 62% of the respondents from Tatabánya said they often take a walk. In the smaller settlements we found that in Naszály, Környe, Vértesszőlős and in Neszmély more than 50% of the respondents often walk by the Által-ér. In Tata, Tatabánya, Környe and Naszály a significant percentage of respondents (50-60%) use the water bodies for relaxation. In accordance with our expectations, the population of Tata makes up the greatest proportion in every activity. There is a significant correlation between "walking" and "relaxation" (0,665).

4.5. Households' water bill

The payment vehicle in the two valuation parts was an increase in the water bill; this vehicle was deemed appropriate not only to account for respondents' perceptions regarding recreation, flooding and water quality, but also to explore his/her knowledge regarding expenditure connected to the water bill.

Table 9: Respondents' estimation of households' water bill

Water bill is …	No. of responses	% (n=395)
up to 6 EUR per month (72 EUR per year)	19	4.81
up to 8 EUR per month (100 EUR per year)	32	8.10
up to 11.5 EUR per month (138 EUR per year)	63	15,95
up to 15.5 EUR per month (185 EUR per year)	61	15.44
up to 19 EUR per month (230 EUR per year)	63	15.95
up to 23 EUR per month (277 EUR per year)	48	12.15
up to 27 EUR per month (323 EUR per year)	23	5,82
up to 31 EUR per month (370 EUR per year)	30	7.59
up to 35 EUR per month (420 EUR per year)	19	4.81
more than 35 EUR per month (420 EUR per year)	37	9.37

The first question asked respondents to state the household's water bill. Out of 471 respondents 404 (85.8%) could quantify their water bill. The mean value of the monthly water bill is around 5,420 HUF (21 EUR) (std. deviation 15.04 EUR), the median value is 4,250 HUF (16.34 EUR). Respondents therefore estimate their water bill at 252 EUR per year (on average). Water bills are usually paid monthly or every two months.

Table 10: Frequency of paying the water bill

Water bill is paid…	No. of responses	% (n=506)
Monthly	138	34,16
every two months	254	62,87
every three months	10	2,48
twice per year	1	0,25
once per year	1	0,25

4.6. Marginal WTP for water quality and flood protection: choice experiment

The choice model used here has its roots in random utility theory (e.g. Ben-Akiva and Lerman, 1985).[5] The Multinomial Logit Model (MNL) is the most often used structure of choice models. The MNL model assumes that the random components of the utility of the

[5] The theoretical parts of this chapter was written by Markus Bliem and Michael Getzner, and the analyses of data was carried out by Roy Brouwer and Markus Bliem (see Bliem and Getzner, 2008; Brouwer et al., 2008).

alternatives are independently and identically (i.i.d.) Gumbel distributed with a type I extreme value (EV) distribution. Furthermore, the Independence of Irrelevant Alternatives (IIA) property states that the relative probabilities of two options being selected are unaffected by the introduction or removal of other alternatives. IIA follows directly from the i.i.d. EV error terms. This will be tested explicitly using the Hausman test (REF).

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In addition, the responsiveness to attributes of different alternatives is assumed to be homogeneous across individuals, i.e. preferences are assumed to be homogeneous. This too will be tested explicitly by introducing interaction terms between attributes and respondent characteristics in the MNL model and the estimation of a random parameters (mixed) logit model. These assumptions lead to a closed-form mathematical model that enables estimation through conventional maximum likelihood (ML) procedures. The standard indirect utility function underlying the MNL is:

Equation 1:

$$U_{ij} = V_{ij} + \varepsilon_{ij} = \beta_k X_{ij} + \varepsilon_{ij}$$

where U_{ij} refers to utility of individual i obtained from choice alternative j, V_{ij} is the measurable component of utility, measured through a vector of k utility coefficients β associated with a vector of attribute and individual characteristics X_{ij}, and ε_{ij} captures the unobserved influences on an individual's choice. The conditional choice probability $Prob_{ij}$ that individual i prefers choice alternative j (if ε is i.i.d. EV distributed) can be expressed in terms of the logistic distribution (McFadden, 1974):

Equation 2:

$$Prob_{ij} = \frac{e^{\lambda \beta_k X_{ij}}}{\sum_{j \in C} e^{\lambda \beta_k X_j}}$$

where λ is a scale parameter, typically assumed to be 1, implying constant error variance, and C is the choice set. The probability of selecting alternative i increases as the utility associated with this alternative increases.

Table 11: Overview of attribute levels

Level	Flood return period	Water quality	Cost price (€/household/year)
0	Once every 5 years	Moderate	0
1	Once every 25 years	Good	3
2	Once every 50 years	Very good	10
3	Once every 100 years		30
4			50

Flood risk is defined as the flood return period. Currently, the study areas face floods once every 5 years. As a result of river restoration, this return period can be reduced to once every 100 year. Water quality is described in categorical terms related to and explained with the help of the water quality ladder introduced by Resources for the Future in the United States (Carson and Mitchell, 1993) referring to recreational water use such as swimmable, boatable and fishable on the one hand and biological diversity of aquatic life on the other hand. Multi-coloured pictograms were used to visualise the water quality levels, where red reflected poor water quality conditions, yellow moderate, blue good and green very good water quality conditions (~~Figure 3: Example choice card~~Figure 3~~Figure 3~~). Based on expert consultation, moderate water quality levels were chosen as the baseline category (current situation). The monetary attribute was specified as an increase in the household water bill. Payment levels varied from 3 to 50 euro per year or their equivalent in Hungarian Ft. Corresponding monthly amounts were shown on the cards (50, 200, 650 and 1000 HUF/household/month). The choice design hence results in the following conditional indirect utility form:

Equation 3:

$$V_{ijl} = \alpha_l + \beta_{1l} Flood_{ijl} + \beta_{2l} Quality_{ijl} + \beta_{3l} \mathrm{Pr}ice_{ijl} + \varepsilon_{ijl}$$

In Equation 3~~Equation 3~~ alpha (α) is the alternative specific constant (ASC) and the betas (β) refer to the vector of coefficients related to the attributes flood return period (Flood), water quality (Quality) and cost price (Price).

Choice behaviour is expected to be negatively related to the flood return variable (the lower the flood return period, the higher the probability of choosing a river restoration alternative resulting in this lower return period), and positively to the water quality variable (the higher the quality level, the higher the probability of choosing a river restoration alternative with a higher water quality). The cost price is expected to have a negative effect on choice behaviour (the higher the price of a river restoration alternative, the lower the probability of choosing the alternative). The inclusion of a monetary attribute allows for the estimation of monetary Hicksian welfare measures for different river restoration policy scenarios and changes in individual components of these scenarios (flood probabilities and water quality levels). The marginal rate of substitution (MRS) for a change in one of the river restoration attributes, for example flood return period, and ignoring country specific attribute values for the sake of simplicity, is estimated as follows (e.g. Hensher et al., 2005):

Equation 4:

$$MRS = -\frac{\partial V / \partial Flood}{\partial V / \partial Price} = -\frac{\hat{\beta}_1}{\hat{\beta}_3}$$

The MRS refers to the rate of substitution between income and the attribute of interest (e.g. flood probability), where the price attribute is interpreted as the marginal utility of income. The MRS in Equation 4:~~Equation 4:~~ equals in this case marginal willingness to pay (WTP) for a reduction in the flood return period.

Out of the 5,460 choice occasions in the CE, the opt-out was chosen 22.5 percent of times. Option A was chosen in 34.4 percent of all the choice occasions and option B in 43.1 percent of all choice occasions. Table 12~~Table 12~~ gives the estimation results from the MNL model. The "attribute only" model shows results when only the choice experiment attributes are included in the estimation. Dummy coding was used for the categorical water quality levels where moderate water quality is the baseline category. A dummy coding was also used for flood frequency where the lowest flood return period (once every 5 years) is the baseline category. The flood attribute was included as 5, 25, 50 and 100. Hence a positive instead of a negative coefficient estimate is expected between the probability of choosing an alternative and flood frequency. A higher value means a lower flood frequency, resulting in a higher choice probability. A cardinal-linear coding was used for the monetary attribute.

According to these results for the model estimated using discrete variables, the parameters of both levels of water quality are significant and have a positive sign (the two levels are: GOOD – improving water quality from moderate to good and VERGO - improving water quality from moderate to very good). The variables of flood frequency are of negative sign and only

F50 is significant on the 10% confidence level (the variables: F25 – flood once every 25 years instead of every 5 years; F50 – flood once every 50 years instead of every 5 years; F100 – flood once every 100 years instead of every 5 years). This means that the locals are ready to pay for an improvement in water quality, be it from moderate to good or to very good. The results of flood frequency variables are more difficult to interpret, but we can say that this attribute is not important for the population of the area. Price is negative and highly significant too and therefore also in accord with standard economic theory. The negative sign indicates that respondents prefer lower water bills.

Furthermore, respondents were asked to value a water quality improvement. The parameter estimations of the different water quality levels are different, and the better the water quality the higher the parameter estimation is. This finding gives an evidence for sensitivity to scope for water quality.

Table 12: Multi-nominal model results – Simple Model

Variable	Coeff. (S. error)	*p*<
ASC	0.028 (0.113)	0.802
Price	-0.0256 (0.003)	0.000
Flood return period once every 25	-0.026 (0.100)	0.790
Flood return period once every 50	-0.188 (0.107)	0.079
Flood return period once every 100	-0.074 (0.132)	0.574
Good water quality	0.921 (0.112)	0.000
Very good water quality	1.831 (0.112)	0.000
Log Likelihood	-1736.032	
Adjusted R square	0.1277	
N	1820	

The estimated model can be used to estimate the willingness to pay for a change in one of the choice attributes. These are the implicit prices or marginal rates of substitution between the attributes (flood frequency, water quality) of interest and the monetary attribute (price). The implicit prices are reported in Table 13~~Table 13~~. These estimates indicate that, for example, respondents are willing to pay around 0 (zero) Euros on top of their water bill to reduce the probability of floods. Furthermore, respondents are WTP 35.7 euro (or 71.6 Euro) to improve water quality from moderate (status quo) to good (or very good) water quality. These values are based on a ceteris paribus assumption, that is, all other parameters are held constant except the attribute for which the implicit price is being calculated.

Table 13: Estimates of implicit prices (in €)

	Mean (St. error)
Flood return period once every 25	€ 0 not significant
Flood return period once every 50	€ 0 not significant at 1%
Flood return period once every 100	€ 0 not significant
Good water quality	**€ 35,7 (5.2)**
Very good water quality	**€ 71,6 (7.0)**

The assumption of homogeneous preferences across attributes is considered too restricted and therefore interactions are introduced between attributes and individual respondent characteristics. Income is theoretically one of the most important variables. Household income is expected to significantly constrain choice behaviour in the case of a higher cost price. Lower income groups are less likely to be able to afford and hence choose a river restoration alternative with a higher price. Of interest here is also public perception of flood risks and water quality, and possible distance-decay effects. Respondent flood perception and experience are expected to increase the probability of choosing a river restoration alternative, which reduces the likelihood of flooding. A similar line of reasoning applies to respondent perception of water quality. Respondents who perceive current water quality as inadequate are expected to be more likely to choose river restoration, which improves water quality than respondents who perceive current water quality as adequate. Distance-decay refers to the expected negative relationship between where the respondent lives relative to the river. Respondents living closer to the river are expected to attach more value to the benefits of river restoration than respondents living further away.

Table 14: Statistical best fit model – Expanded model

	RPL-model with interactions	
Variable	**Coeff. (S. error)**	***p<***
Mean fixed effects		
ASC	-0.656	0.001

	(0.190)	
Flood frequency	-0.001	0.419
	(0.002)	
Water Q Good	0.703	0.001
	(0.185)	
Water Q Very Good	1.775	0.001
	(0.169)	
WQG x Perception	-0.010	0.010
	(0.004)	
WQVG x Perception	-0.004	0.129
	(0.003)	
WQG x Future visit	0.346	0.077
	(0.195)	
WQVG x Future visit	0.157	0.327
	(0.160)	
Flood affected x Distance	-0.033	0.062
	(0.017)	
Cost price x Income	0.009	0.001
	(0.001)	
Visitor	0.835	0.001
	(0.180)	
Education	0.460	0.006
	(0.168)	
Mean random effects		
Cost price	-0.059	0.001
	(0.006)	
Standard deviation		
Cost price	0.017	0.038
	(0.008)	
Model fit		
Log Likelihood	-1504.373	
Adjusted R square	0.164	
N	1815	

Preference heterogeneity was accounted for by including interaction terms between respondent characteristics and the attributes or the ASC. Part of the unobserved heterogeneity was picked up through the inclusion of random variables in the stochastic part of the estimated utility functions. Random effects were detected for the price attribute and household income. Table 14~~Table 14~~ presents the statistically best fit random parameter mixed Logit.

Respondent perception of current water quality had a significant effect on the value attached to water quality improvements only in the case of good water quality. The same applies for future use, i.e. whether respondents would visit the case study sites more often if water quality were improved (if the perception of water quality was good). In the first case, a negative relationship exists, meaning that respondents who perceive water quality as good already value a water quality improvement less. In the latter case a significant positive effect on choice behaviour is found: respondents who said they would visit more often if water quality would be improved are more likely to pay for ecological restoration benefits if water quality improves in one of the CE alternatives than respondents who said the frequency of visiting the study area would not change as a result of water quality changes.

Household income interacts significantly with the cost price as a fixed effect. As expected, higher income groups are more likely to choose river restoration as their most preferred option at a higher price than lower income groups. Finally, respondents who visited the study area before and more highly educated respondents are more likely to favour ecological restoration as their interaction with the ASC shows.

Based on the statistically best fit model, a number of policy scenarios were simulated and their welfare implications estimated, where both flood frequency and water quality are changed simultaneously. The estimated welfare measures for five different policy scenarios are presented in Table 15~~Table 15~~. Two policy scenarios involve the improvement of water quality to a good ecological status, with flood variations of once every 25 and 50 years, while three policy scenarios involve water quality improvements up to a very good ecological status with flood probability reductions varying from once every 25 years to once every 100 years.

Table 15: Welfare measures (€/household/year) for different policy scenarios

Policy scenario	**CS (€/household/year)**	**S. error**
1 (flood 1/25; water quality good)	35.43	5.97
2 (flood 1/50; water quality good)	35.43	5.97
3 (flood 1/25; water quality very good)	53.94	7.02
4 (flood 1/50; water quality very good)	53.94	7.02
5 (flood 1/100; water quality very good)	53.94	7.02

The CS welfare measures for the policy scenarios in Hungary only differ due to water quality changes in view of the fact that flood frequency is not a significant determinant of choice behaviour, and are therefore the same when keeping water quality levels constant and only varying the flood probability. The two values for good and very good water quality (€ 35.4 and € 53.9 respectively) show significant sensitivity to scope and conform to the implicit prices presented earlier. The standard errors of the CS were estimated using the Delta method (Greene, 2003).

4.7. Public willingness to pay for ecological restoration

After the choice experiment, respondents were asked to additionally value management options for the "catchment area of Által-ér". Due to methodological complexities, the choice experiment did not include benefits for nature conservation due to a higher connectivity of the river with adjacent floodplains and forests. One major issue in the catchment area is to allow for natural processes such as flooding, change of landscapes, new pioneer habitats, also for destruction of habitats. The ecological principle may be described by introducing natural (hydrological) dynamics.

The wording of the questionnaire (see appendix) stressed the extent to which a river restoration program may be able to introduce hydrological dynamics to the wetlands in terms of the percentage of the area connected to the river in a dynamic (i.e. fast changing and direct link) way.

Willingness to pay (WTP) was calculated using a payment card with 30 different amounts starting from zero and with a blank space for indicating another amount. The most frequently chosen amounts were HUF 5,000 and HUF 10,000 (results are detailed in Table 16~~Table 16~~) accompanied by the results of the sample excluding invalid zero answers (invalid zero answers are explained later on). 111 respondents of our sample refused to offer any money for the programs presented. The number of positive WTPs is 357; three answers were missing. The mean WTP of the total sample was HUF 6,212 (€24.85[6]) (median is HUF 3000, with a minimum value of HUF 50, and a maximum of HUF 100,000; and a significant standard deviation of HUF 9,798). After the exclusion of invalid (protest) zeros the mean increased to HUF 6,533/household/year (€ 26.13, st. deviation HUF 9,944 (39.78 euro); median HUF 3,000 (12 euro)).

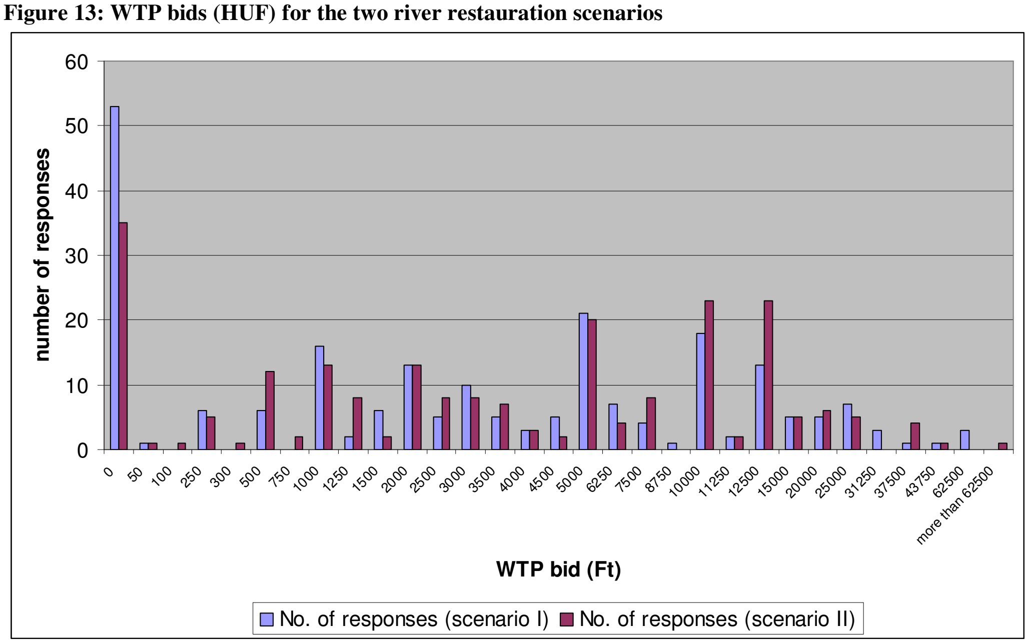
[6] 1€ = HUF 250

Table 16: Results of the WTP question

Results of the maximal willingness to pay	
	frequency
WTP = 0	111
Valid WTP = 0	88
WTP > 0	357
Valid positive WTP	357
Missing	3
Mean WTP for the whole sample	**HUF 6,212**
Standard deviation	HUF 9,798
Median	HUF 3,000
Minimum (for positive WTP)	HUF 50
Maximum	HUF 100,000
N	471
Mean WTP for valid responses	**HUF 6,533**
Standard deviation	HUF 9,944
Median	HUF 3,000
Minimum (for positive WTP)	HUF 50
Maximum	HUF 100,000
Valid N	448

Half of the respondents were asked for their willingness-to-pay (WTP) for a program that would transform 50% of wetland area to a natural state (scenario I), while the other half was asked for their WTP for a 90 percent transformation (scenario II). Figure 13~~Figure 13~~ shows the distribution of respondents' WTP bids for the two scenarios asked for in the questionnaire. At first sight, the two scenarios are almost equally valued by respondents in terms of their WTP.

Figure 13: WTP bids (HUF) for the two river restauration scenarios



The WTPs of the two subsamples do not differ significantly: in the case of scenario I the mean value is HUF 6,385 (€ 25.54, st. deviation HUF 9,982 (39.92 euro); median HUF 3,000 (12 euro)); in the case of scenario II it is HUF 6,679 (€ 26.71, st. deviation HUF 9,927 (39.71 euro); median HUF 3,500 (14 euro)). So the respondents did not make a distinction in the scope of the change. According to the t-test there is no significant difference between the two scenarios' mean WTPs.

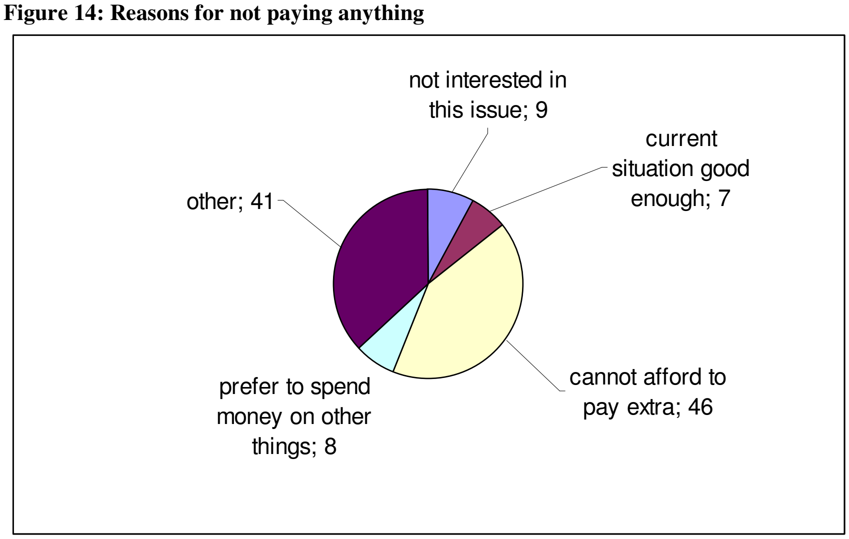
Table 17: Average WTP for river restoration measures (EUR/year)

	Scenario I (50 %)	**Scenario II (90 %)**	Pooled sample
Mean WTP	25.54	26.71	26.13
Standard error	2.68	2.66	1.88
95% conf. interval	20.26 / 30.82	21.48 / 31.96	22.42 / 29.84
Median	12	14	12
N	222	223	445

4.7.1. Reasons why people are not willing to pay

111 respondents showed zero willingness to pay in the contingent valuation section – equivalent to 23.57% of the sample. In the next question they were asked to provide their reasons; these were written down word by word and later coded. The majority explained their zero WTP through their financial situation (46 answers) which can be considered a valid zero answer. Other valid zeros are "I don't care" (9), "The present situation is good enough" (7) and "I'd rather spend my money on other things" (8).

Figure 14: Reasons for not paying anything



The invalid (protest) answers are found in the “Other” category, which included 41 answers. Most of these answers relate to a lack of belief in the success of the development programs (11 answers); we considered this answer invalid. Some less frequent explanations are:

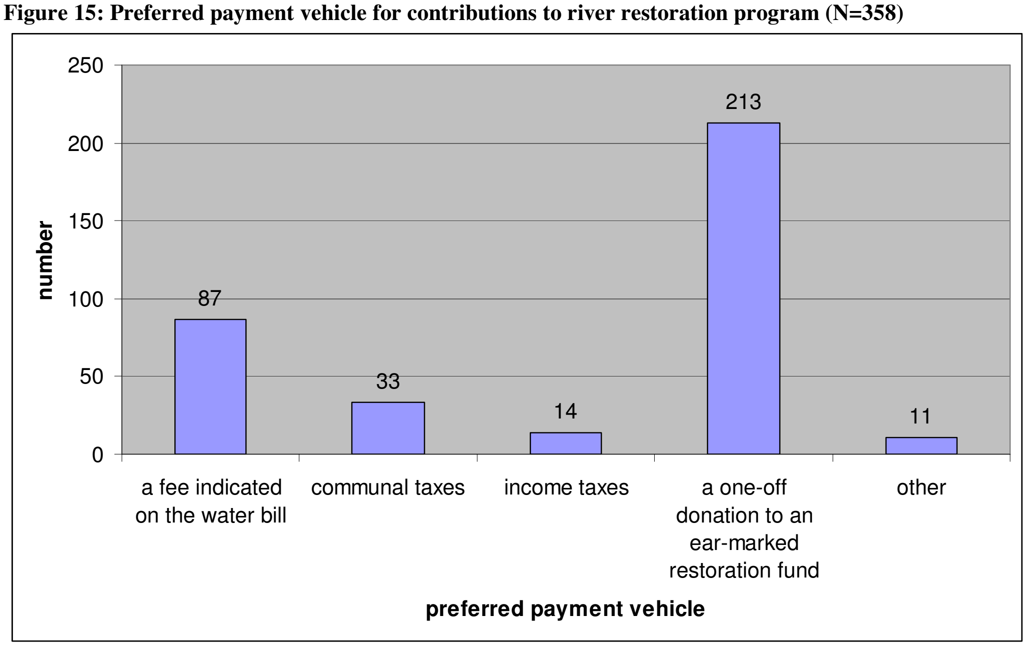
- The development should be financed some other way (2, invalid);
- The process is too long (2, invalid);
- Other people polluted the water, they should pay (4, invalid);
- This is not my problem, the government has the necessary financial resources (3, invalid);
- The development program would threaten people’s lives (1, invalid);
- I would help by taking different measures (13, valid)
- No answer (5, valid).

Thus altogether 23 answers were invalid (5% o the whole sample).

The five missing answers were taken as valid. The number of valid answers is 448; willingness to pay calculations were carried out based on this data.

We asked respondents about the vehicle which would be the most preferred for paying this amount. The results are shown in Figure 15~~Figure 15~~. The most preferred payment vehicle is a one-off donation to a dedicated restoration fund, much less preferred was payment via water bill, and the other possibilities were not mentioned in a higher number.

Figure 15: Preferred payment vehicle for contributions to river restoration program (N=358)



People were asked whether they agreed or not with five different statements concerning environmental policy; results can be seen in Table 18~~Table 18~~. The highest commitment can be found with a general statement regarding the importance of nature conservation for future generations (to our children) (almost 96%), followed by the agreement that the polluters should pay first (so-called polluter-pays-principle) (87%).

Table 18: Agreement to or rejection of statements by respondents regarding environmental protection

	Completely disagree	Disagree	Don't agree/don't disagree	Agree	Completely agree	Don't know
Polluters of the environment should pay first	2 (0.4%)	5 (1.1%)	3 (0.6%)	49 (10.4%)	408 (86.6%)	4 (0.8%)
It is the task and responsibility of public policy to care for the protection of rivers	3 (0.6%)	42 (8.9%)	23 (4.9%)	159 (33.8%)	239 (50.7%)	5 (1.1%)
It is important to conserve and improve river landscapes for our children and future generations	-	-	5 (1.1%)	13 (2.8%)	451 (95.8%)	2 (0.4%)
The environment has the right to be protected regardless of the costs for society	1 (0.2%)	22 (4.7%)	19 (4.0%)	132 (28.0%)	282 (59.9%)	15 (3.2%)
The environment has to be protected by law, and not only in the case when people are willing to pay for it	4 (0.8%)	34 (7.2%)	31 (6.6%)	153 (32.5%)	243 (51.6%)	6 (1.3%)

4.7.2. Determinants of WTP for river restoration and wetland dynamics; contingent valuation

While analysing the contingent valuation data we checked the effect of several socio-economic and demographic variables; the results of the best model are detailed below (Table 19~~Table 19~~) In the analysis several mathematical-statistical models were used, such as the method of least squares and the Tobit model, which gives a more appropriate parameter estimation when there is a high proportion of zero answers [Tobin, (1958), in: Halstead, Lindsay and Brown, (1991)].

Based on the kind of questions posed, and the elicitation instrument, a Tobit estimation proved able to achieve the most robust results. For each valuation question there is a number of "zero" responses, i.e. respondents stating zero WTP. These responses should, without any further information, be treated as "true zeros" since we can not rule out a WTP equal to zero.

The Tobit model accounts for censored (truncated data) and can be written as follows (e.g. Maddala, 2003):

Equation 5:

$$WTP_i = \begin{cases} WTP_i^* = \alpha + \beta X_i + \varepsilon_i & if \quad WTP_i^* > 0 \\ 0 & if \quad WTP_i^* \leq 0 \end{cases}$$

$$\varepsilon_i \sim N\left[o, \sigma^2\right]$$

where WTP_i* is the latent variable of individual i's willingness to pay. X_i is a vector of explanatory variables and the error term εi is assumed to be normal distributes with zero mean and variance σ^2. The model uses maximum-likelihood estimation for computing the empirical results. In order to make a comparison the results of both models are displayed. Table 19~~Table 19~~ shows the list of independent variables used in the models and their explanation.

Table 19: Independent variables of the multiple regression model

Variable	Description
MEMBER	The respondent is a member of some environmental or conservational organization (dummy, 1=yes, 0=no)
DRINK	Uses the well to get drinking water (dummy, 1=yes, 0=no)
RESTAUR	Using Által-ér – visiting restaurants (1=yes, 0=no)
AGE	The respondent's age (years)
EDUCAT	The respondent's level of education (1=primary school, 2=professional education, 3=high school, 4=higher education/college, university)
INC_HUF	Mean net monthly income of the respondent's household (HUF)
DUMDONAT	The respondent has granted financial or other support to any environmental or conservational organization in the past two years (dummy, 1=yes, 0=no)

The best fit model of the multivariable regression analyses can be seen in Table 20~~Table 20~~. The sign of the parameters is generally according to the preliminary expectations, with one exception. The strongest (positive) effect is the one of the environmental organization membership variable. People with such membership have a significantly higher WTP than non-members (the difference is HUF 10,570). Income also has a strong, positive effect; that is, respondents with higher incomes offered more. HUF 10,000 increase in household income brings HUF 139 increase in WTP. The parameter of age has a negative sign that fits earlier experiences; the older offer less for ecological restoration programs. A year increase in age goes along with a HUF 74 decrease in WTP. People who use their well water for drinking have a higher WTP compared to those who do not use the water for this purpose or do not have their own well (the difference is HUF 3,609). Respondents visiting the Által-ér (especially restaurants) offer more (positive significant parameter estimation); their willingness to pay is higher by HUF 3,302).

In contrary to expectations those who donated to environmental or nature conservation purposes in the past two years offered less in the present survey (by HUF 3,230). This may be due to these respondents' feeling that they have accomplished their duties in supporting environmental causes, so they can not (or do not want to) make further expenditures. As for education, the estimated parameter is positive (the better educated would pay more), but the effect is not significant. There are some variables in the model with moderate correlation (income - education, environmental organization membership – donation, age – visiting restaurants) but generally the correlation between variables is low.

We presumed that the distance between the good valued and the residence would affect the results, with willingness to pay decreasing with distance (distance decay), but there was no proof of this phenomenon, although the analysis was repeated using distances measured on the map (as well as by asking the respondents for an estimation of distance from their place of residence to the good being valued).

Table 20: Results of the multiple regression analysis, CV

Variable	OLS Parameter estimation (t-ratio)	Tobit Parameter estimation (b/st. err.)	Marginal effects (Tobit) Parameter estimation (b/st. err.)	Mean of variables
Constant	2751.59939 (1.573)	1389.860 (0.681)	984.1206 (0.678)	
MEMBER	12784.7774 (5.719)***	14928.270 (5.944)***	10570.28 (5.877)***	0.04529
DRINK	5816.58485 (2.360)**	5097.894 (1.799)*	3609.6731 (1.796)*	0.0324
RESTAUR	3917.18937 (4.252)***	4664.1473 (4.367)***	3302.549 (4.356)***	0.5310
AGE	-55.2959677 (-2.036)**	-105. 25324 (-3.278)***	-74.527 (-3.28)***	42.4453
EDUCAT	371.046075 (0.994)	712.4111 (1.64)	504.438 (1.642)	2.7128
INC_HUF	.01599727 (4.561)***	0.019749 (4.84)***	0.01398 (4.816)***	204343.174
DUMDONAT	-4352.08575 (-3.671)***	-4562.3583 (-3.316)***	-3230.489 (-3.299)***	0.1801
R-square	0.2305263			
Adjusted R-square	0.2171275			
Log-likelihood		-3632.507		
Sigma			-67.3851	
N	410	410	410	
Mean WTP (Ft)	6666			

Dependent variable: willingness to pay for the development program
*** shows if P < 0,01; **, if P < 0,05; and *, if P < 0,1.

4.8. Total economic value for river restoration using a GIS based value map

A final step in the welfare estimation procedure is the aggregation of the estimated CS across the population benefiting from the welfare gains associated with the presented river restoration policy scenarios to arrive at a total economic value (TEV)[7]. This step often receives most criticism when using non-market valuation study results in a CBA. The population of beneficiaries over whom the CS values are added up may result in very high values depending on the chosen market size. The market size usually refers to some administrative unit or geographic jurisdiction, and average values are transferred unconditionally and uncorrected across the population living within this geographical unit (e.g. Bateman et al., 2006). In view of the fact that the population from which the samples in this study were drawn and their characteristics such as their income levels are unevenly distributed over space, the aggregation procedure is carried out using a Geographical Information System (GIS).

In GIS, information about land and water cover and population density disaggregated from the 2000 European CORINE Land Cover database (inhabitants per km2 in 100 x 100 m grid cells) was combined with NUTS-3 level information about per capita income[8]. Euclidian distances were calculated per 100 by 100m grid cell to the main Danube River in meters. The spatial data sources used are listed in the annex to this paper. The 100meter population density grid of the European Environment Agency (EEA) data service was used as the information source for population density, because of its EU-wide extent and high horizontal resolution (100 x 100 meter cells). The downscaling method applied to produce this grid is described in an unpublished paper available on the EEA data service website (Gallego, 2008)[9]. The various steps in the aggregation procedure are summarized in Table 21~~Table 21~~.

Table 21: Steps in the GIS based aggregation procedure

Step	Procedure	Result
1	Conversion CS/household/year to per capita values based on each sample's average household size	CS/capita/year
2	Conversion of population density to number of inhabitants per 100x100m grid cell	Number of inhabitants/grid cell

[7] This section was written by Roy Brouwer and Markus Bliem, see reference Brouwer et al., 2008).
[8] The Nomenclature of Territorial Units for Statistics (NUTS) is a breakdown of territorial units to harmonize regional European statistics, consisting of three levels. NUTS-3 is the lowest aggregation level, and usually follows a European member state's own regional administrative structure.
[9] The accuracy of this dataset on NUTS 3 level was tested for Austria by calculating the average population density of this grid per NUTS3 area and comparing the result with the 2002 EPSON population density statistics, which are given by NUTS 3 area for EU countries. This comparison showed, on average, a 1.8% population density difference between the two datasets for all NUTS 3 areas in Austria, with a maximum difference of 6.5% for a single NUTS 3 region.

3	CS/capita/year multiplied with number of inhabitants per 100x100m grid cell	Unadjusted TEV/grid cell
4	Income factor multiplied with the difference (sample income/capita – NUTS-3 income/capita) per grid cell and multiplied with the number of inhabitants per grid cell	Income adjusted TEV/grid cell
5	a) Distance decay factor multiplied with the distance of each grid cell from the Danube river and multiplied with the number of inhabitants per grid cell b) Subtraction a) from income adjusted TEV/grid cell	Distance adjusted TEV/grid cell
6	Summation income and distance adjusted TEV/grid cell across all grid cells	TEV/year

In the first three steps, the average values for reaching good and very good water quality with the help of river restoration were converted to per capita values (based on sample's average household size), and multiplied with the number of people in each 100 by 100m grid cell. In a fourth step, for each grid cell average per capita income was determined based on the specific geographical NUTS-3 area to which a grid cell belonged. This average per capita income was subtracted from mean per capita income in the sample and multiplied with the estimated income coefficient for the basin country and the number of people for each specific cell. In this way, the economic value per grid cell was modified downwards or upwards depending on the income difference (in cells where no people live, the value was set equal to zero). In a fifth step, the distance of each grid cell to the river being valued (the Által-ér in Hungary) was used to correct the income adjusted total economic value per grid cell from the previous step for the significant distance-decay effects detected in the basin country. The estimated distance-decay factor was multiplied by the calculated distance of each grid cell from the river with the estimated distance-decay factor and multiplied by the number of people and the result subsequently subtracted from the economic value calculated in the previous step (as in the previous step, negative values were set equal to zero). In a sixth and final step, the income and distance adjusted values are added up to estimate the TEV of river restoration to good and very good water quality. The results are presented in Table 22~~Table 22~~.

Table 22: Estimated total economic value (TEV) in million Euro per year for good and very good water quality in the Által-ér catchment area based on different aggregation procedures

	Good	Very good
Whole country	102.1	204.2

Distance correction	48.3	128.9
Distance & income correction	43.4	72.2
Market size (km)*	38	78

*Distance where value reduces to € 0.

The TEV is calculated for two policy scenarios: improvement of water quality in the Áltai-ér to 'good' and 'very good' conditions (keeping flood conditions constant). TEV adjusted for the estimated distance and income effects is furthermore compared with unadjusted TEV. Under the assumption that the population sample and the estimated CS per capita represents the population at large, a TEV is calculated for the country as a whole (first row in Table 22~~Table 22~~) and for the area where the economic value reduces to zero due to the estimated distance-decay effects (second row in Table 22~~Table 22~~).

The boundaries of the 'market size' are found by dividing the economic value of a policy scenario by the distance-decay factor, i.e. the decrease in marginal WTP per kilometre. Also for this area an uncorrected and for income and distance adjusted TEV is calculated (third row in Table 22~~Table 22~~) the estimated market size, while in the latter case average CS is adjusted for distance-decay and income differences within the market boundaries. The latter is illustrated for Hungary in

Figure 16~~Figure 16~~.

Figure 16: Illustration of market size and distance-decay effect (Hungary)

Source: ~~Provided by~~ IVM

Important observations from

Figure 16~~Figure 16~~ are, first of all, the big differences between the TEV based on the country as a whole and the market sized determined by the estimated distance-decay effects. The TEV for good water quality reduces by more than half when accounting for distance-decay. Secondly, accounting for distance-decay and income variation within the boundaries of the market size reduces the TEV by approximately another 10 %.

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Figure 17: Illustration of income variation in Austria (for Hungary?)

Source: ~~Provided by~~ IVM

Figure 18: Illustration of TEV for good water quality (Hungary?)

Source: ~~Provided by~~ IVM

5. Conclusions and best practice recommendations

For the purpose of testing practical guidelines for assessing WFD-related environmental economic valuation methods, taking as a specific aim the estimation of non-market values for ecological restoration projects (in line with work package 4 of the AquaMoney project), nearly 500 people were surveyed in the Hungarian Által-ér river catchment using 2 methods - contingent valuation and choice experiment. Both methods yielded results suggesting that the local population is financially willing to support environmental improvements relating to changes in the state of the river, its services and functions.

Such information has relevance to the Water Framework Directive which states that economic analyses should contain enough information in sufficient detail in order to make the relevant calculations necessary for taking into account under Article 9 the principle of recovery of the costs of water services, estimates of the volume, prices and costs associated with water services, and estimates of relevant investment including forecasts of such investments, and additionally make judgements about the most cost-effective combination of measures in respect of water uses (in terms of economic versus environmental efficiency). As water quality is tightly coupled with the functions and services (use and non-use services) of water that are possible, we consider the focus taken by the Hungarian, Austrian and Romanian project teams groups on evaluating restoration measures which provide quality and flood reduction dividends as having the potential to yield useful information for policy-makers.

A majority of the Hungarian survey was harmonised with the 2 other AquaMoney partners from Austria and Romania. All three Danube pilot case study findings discover that respondents are willing to pay for such restoration measures which would in principle improve the connectivity of the river to former wetlands (thus diminishing the impacts of artificial interventions such as dams, etc.) and consequently improve water quality (in turn increasing the function and service potential of the river) and reduce the likelihood of flooding.

Questionnaire Construction

- The choice of attributes (finally, water quality, flood frequency) for inclusion in the choice experiment survey was intensely debated between project partners in the knowledge that the selection of any attributes as proxies for restoration represent a compromise and an inevitable reduction and loss of potentially important information. For example, much debate focussed on whether to include the attribute of biodiversity and or multi-functional land use changes in the questionnaire. It is recommended that, when attributes to be used in evaluation are selected, great care is taken to ensure that the attributes are realistically able to represent the change in the good being valued, and additionally, are not strongly correlated to each other to avoid double-counting, or undervaluation of benefits. Additionally, attributes may be partly or wholly selected on the basis of their priority to local stakeholders so long as they are methodologically valid. Input from local policy-makers, ecologists, natural resource managers and regional stakeholders on selection of attributes is thus suggested, to allow better framing of the questionnaire to the desired purpose (to help decide if the study should be e.g. designed to deal with water scarcity concerns, or ecological restoration concerns). Such an approach may additionally help to generate information of the type that can be better integrated into policy-making or price-setting.

- In the choice experiment we used two attributes along with the price component: water quality and flood frequency. As the same questionnaire was used in the three participating countries (Austria, Romania and Hungary) some compromises with other participating countries were necessary on both relevant attributes and status quo level (e.g. each country had a different water quality status quo). We felt that the inclusion of more than 2 attributes (plus cost attribute) would a) risk correlation between attributes and b) make the respondents' job too difficult and lead to failure to complete questionnaires or protest bids. Additionally, respondents were asked not to value river restoration measures per se, so the contingent valuation component was included in the questionnaire to capture willingness to pay for increasing the size of natural areas along the river; thus we employed a combined approach which applied two different stated preference methods simultaneously to address several aspects of ecological river restoration. More than one stated preference method may be combined in a single questionnaire.

- This was the first time choice experiment was used in Hungary. However, we found that comparing sets of goods during the CE experiment and choosing the preferred one was not a problem for respondents (there was only one respondent who said 'I don't know' in all four choice situations). This success was thought due to the use of clear, simple coloured pictograms to represent attributes or water use functions (e.g. swimming or boating). The use of lightly or strongly crossed pictograms enabled us to represent the partial presence or absence of the attribute in question. However, in some cases, attributes may have illustrated somewhat unrealistic choices due to the fact that some water functions are typically regulated by law (e.g. permission or prohibition of boating on a stretch of water) and are not susceptible to being illustrated as continuous variables, unlike attributes such as water quality.
- Additionally, the use of coloured maps of the area being valued with the hypothetical changes in the ratio of more natural areas (in the contingent valuation component of the questionnaire to represent changes in ecosystem restoration level) enabled respondents to clearly visualise the proffered restoration project outcome. One interpretation of the inability to capture increasing WTP for increasing scale of restoration (as mentioned in the analysis section, chapter 4) is that respondents were unable to clearly distinguish the effects of different scales of restoration (e.g. 50%-90%) on the maps presented. Thus the use of suitable visual aids to represent the status quo, attributes and foreseeable changes due to any programme of measure must thus be based on the best data and graphical representation techniques available.
- When the CE component of the questionnaire was being constructed (using an orthogonal factorial fractional design on SPSS software) some of the sets of cards (choices) proved unrealistic (e.g. asking for a willingness-to-pay for no improvement of status quo). We were then required to substitute such unrealistic choice sets with more realistic ones by manually altering some attribute levels. This affects the validity of the choice set construction, but was inevitable. Care should be taken to guard against offering unrealistic choice sets to respondents.

Questionnaire Implementation

- The survey was carried out through personal interviews; response rate was 52.8%, a relatively high percentage. Our work was facilitated by attitudes to surveyors in an area which is not heavily urbanised - it may well be that response rates are higher in less-densely populated areas. The general approach was positive, the respondents were helpful, and there were only a low proportion of 'I don't know' answers. During the survey, nearly 500 people were personally interviewed in three micro-regions (Oroszlányi, Tatabányai, Tatai) by student interviewers from degree programmes specializing in environmental and rural development at Corvinus University of Budapest, enabling the survey to be more cheaply carried out than employing a market research company – an important consideration with implications for regions with a scarcity of financial resources. Comparison of this method of surveying with the cost of implementing the survey through using a web-based application is worth consideration. A web-based application has the advantages of allowing the number of respondents to be increased at minimal marginal cost.
- Representativeness of sample was broadly obtained although perfect representativity was not obtained in all parameters, perhaps due in part to self-selection bias. This suggests that care must be taken in timing of the surveying to capture the most representitative sample of respondents (for example, surveying on a weekend to capture persons of varying employment status). Similarly, care should be taken to ensure that micro-regions and urban areas are not under-represented in the sample. This may be assisted through the use of a stratified sampling plan.
- Length of surveying varied from 20 minutes to 1 hour, and was thus relatively time-consuming. While this was not reflected in a failure to complete surveys (perhaps due to respondents being relatively time-rich in the non-metropolitan areas) care should be taken to censure that respondent fatigue is not encountered with overly long surveys.

Questionnaire Analysis

- Users of the area valued have a notably higher mean willingness to pay. Those who had not visited the area at that time would pay a mere 36% of the mean willingness to pay compared to regular visitors. Their mean WTP is €10.3 and €28.4/household/year, respectively (results of contingent valuation). If there is no opportunity to do pretesting, the proportion of users/non-users and the difference in their WTPs should be considered in further valuation procedures such as benefit transfer.

- According to theoretical research, the distance between the good valued and respondents' residences is in inverse proportion: the closer one lives to the good in question, the higher their WTP (distance decay). The Hungarian case study has not yielded the theoretically expected result: in contingent valuation analysis we discovered that distance did not prove to be a significant factor; in the choice experiment we received a contrary result to that expected: people living further from the water bodies offered more. This is clearly problematic from the perspective of benefit transfer, and requires further investigation (partly on the role of scale and also on the role of the total size of catchment on WTP -the greatest distance in this study from respondents homes to the good to be valued was 20 km). Relating to distance decay, the question of what unit of analysis (e.g. administrative, geographical, river catchment) is suitable for analysis and WTP aggregation arises.
- In the contingent valuation survey, two development programs were presented, each with a different proportion of area to be restored to a more natural state (from the present 25% to 50% and from the present 25% to 90%). The sample was divided randomly into two halves (each having 222/223 respondents); each subsample was presented one of the programs. In principle we would expect that a greater change (larger area of river restoration) ensures a higher WTP. Although the WTP of the larger - 90% - scenario is somewhat higher, the difference is not significant: in the 50% scenario the mean value is HUF 6,385 (€25.54), in the 90% version it is HUF 6,679 (€26.71). Thus we could not prove that respondents make a distinction according to the scope of the change (sensitivity to scope). A number of explanations can be given for this contradictory result: (1) respondents could not differentiate the scale differences because of the nature of the illustrations; (2) each respondent was simply evaluating a single change and so did not perceive or value differences in size of restoration change; (3) all households were inclined only to offer some constant fraction of their disposable income regardless of size of restoration area; (4) an increase of the natural state areas to 90% seemed exaggerated or unfeasible to respondents. This leads to one conclusion that a clearly believable programme of measures must be offered for evaluation in any survey. It is also thought likely that if respondents had been offered both scenarios to evaluate (in no particular order) rather than a single one, different WTPs may have been obtained.
- In choice experiment we used two attributes along with the price component: water quality and flood frequency. As the same questionnaire was used in the three

participating countries (Austria, Romania and Hungary) some compromises with the other participating countries were necessary on both relevant attributes and status quo level. However, respondents were not willing to offer any WTP to decrease flood frequency in Hungary. In the case of WTP for water quality we experienced sensitivity to scope, as locals offered a significantly lower WTP for an improvement from medium to good level than for a change from medium to very good (€35,90 and €71.4, respectively).

- There was no positive willingness to pay for decrease in flood frequency, thus what is suggested is that (despite being presented with what we believe to be scientifically verifiable information on flood return intervals) respondents' appreciation and valuation of the attributes is influenced by their own knowledge and appraisal of local circumstances – which may not correlate to best available scientific information - and thus should be carefully considered during further use of the results, such as in benefit transfer.

Additional General Comments

- One benefit of using different methods of surveying in different countries (face-to-face Vs. web-based) is that this allowed a transfer function to be generated between the two which may be compared with other studies in the future.
- It is recommended that a regional databank of stated preference studies (especially those which utilise benefit transfer) to be set up in order to allow easy access to researchers and policy makers to results and methodology of such studies. Such a database could list surveys by their component parts (region, methodological approach, findings, etc.).
- For the creation of GIS maps which utilise a benefit transfer function or illustrate distance decay, it is imperative for researchers to have access to good quality, affordable data (such as various socio-economic parameters).
- Finally, it is noted that the use of such survey methods – regardless of outcome - can assist in capacity-building and knowledge transfer on the topic of the dividends (and costs) of watershed restoration.

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7. Appendix

AQUAMONEY SURVEY PRETEST OCTOBER 2007 – Version A

Interviewer name: ________________________ Code: □□
Questionnaire Code □□
Date: □□□□□□

Introduce Area:
Hello, my name is .... Corvinus University and MTA TAKI are carrying out a survey concerning River Basin Management on the Által-ér. Do you live here? We'd be very grateful if you would answer a few questions concerning your opinion regarding this issue. This will not cost you more than about 30 minutes. The survey serves only research purposes, and any information you provide will be kept confidential.

Present Map 1:
1:100000 Scale Overview with Area of Study Highlighted

Present Map 2:
1:25 000 scale basin overview with major settlements and water courses

General Perception/Attitude related questions:

1. Where do you live?

A) Name place:
B) Postal code: □□□□

2. Are you a member of a nature or environmental organization? [PLEASE TICK AS APPRORIATE]

yes	no
1. □	2. □

3. Do you regularly donate money or volunteer to any nature or environmental organization? [PLEASE TICK AS APPRORIATE]

1. □ Yes

2.____ Ft on average per year

(please make a best guess if you don't know the exact amount)

OR

- In the last 3 years I have I have worked voluntarily for a nature or environmental organisation for

3. □ Less than half a day
4. □ Less than a day (more than half)
5. □ More than one day (less than 1 week)
6. □ More than a week

7. □ No

4. How interested are you generally in environmental issues (e.g. water or air pollution, waste or nature protection)? [PLEASE TICK AS APPRORIATE]

not interested at all	not so interested	interested	very interested
1. □	2. □	3. □	4. □

5. Do you have your own well? [PLEASE TICK AS APPRORIATE]

Yes	no
1. ☐	2. ☐ GO TO QUESTION 7

6. If yes, what do you use the well water for?

Comment [s1]: Open question – the questioner fills in the blanks with the coded answer

drinking	1. ☐
washing	2. ☐
cooking	3. ☐
doing laundry	4. ☐
washing dishes	5. ☐
washing your car	6. ☐
irrigation	7. ☐
other (please specify) …………………………………	8. ☐

7. Is your household connected to the sewage network?

Yes GO TO Q11	1. ☐	No GO TO QUESTION 8	2. ☐

8. Do you have the possibility to connect to the sewage network?

Yes	No	Don't know
1. ☐	2. ☐	3. ☐

9. Does your household use a septic tank?

Yes	1. ☐	No GO TO QUESTION 11	2. ☐

10. How often is your septic tank emptied?

1. ☐ more than once every week
2. ☐ about once a week
3. ☐ once or twice a month
4. ☐ once or twice every 6 months
5. ☐ once or twice every year
6. ☐ less than once a year

I'm now going to ask you some questions about Által-ér.

11. How often do you visit the Által-ér river (including the Öreg-tó!) on average per year? [PLEASE TICK AS APPRORIATE]

I never visit the Által-ér or the Öreg-tó	1. ☐
I visit it at least once a week	2. ☐
I visit it at least once a month	3. ☐
I visit it at least 4 times a year	4. ☐
I visit it at least once a year	5. ☐
I visit it less than once a year, namely once every … years	6. ☐

12. How far do you live (km as the crow flies) from the nearest recreational area on the Által-ér? Please make a best guess, if you don't know the exact distance!

____km

13. This card lists a number of possible recreational activities at the Által-ér and/or the Öreg-tó. For each of them, can you please tell me how frequently you do any of these? [PLEASE CIRCLE ANSWER]

	1. Often	2. Sometimes	3. Never
1. Recreational fishing / Angling	1	2	3
2. Swimming / bathing	1	2	3
3. Recreational boating / sailing	1	2	3
4. Walking along the river banks / hiking	1	2	3
5. Other sporting activity along the river banks	1	2	3
6. Relaxing and enjoying the scenery	1	2	3
7. Watching wildlife (e.g. birds)	1	2	3
8. Picnicking near the river	1	2	3
9. Visiting a riverside cafe / restaurant	1	2	3
10. Dog walking	1	2	3
11. Spending leisure time with children	1	2	3

14. What is your opinion of the water quality in the Által-ér and the Öreg-tó area?

poor	moderate	good	very good	don't know
1. ☐	2. ☐	3. ☐	4. ☐	5. ☐

15. In your opinion, has water quality of the Által-ér and the Öreg-tó in your area improved or deteriorated during the last 10 years? [PLEASE TICK AS APPRORIATE]

improved	no change	deteriorated	don't know
1. ☐	2. ☐	3. ☐	4. ☐

16. How important is it for you that something is done to improve water quality in the Által-ér and the Öreg-tó area? [PLEASE TICK AS APPRORIATE]

not important at all	not important	somewhat important	very important	don't know

1. ☐	2. ☐	3. ☐	4. ☐	5. ☐

17. Would you engage more often in certain activities (e.g. Boating, fishing swimming or walking) in the Által-ér and the Öreg-tó, if the water quality improved?

no	yes	don't know
1. ☐	2. ☐ Specify which activities:	3. ☐

18. How well do you feel informed in general about water quality issues? [PLEASE TICK AS APPRORIATE]

not informed at all	not much informed	somewhat informed	very well informed	don't know
1. ☐	2. ☐	3. ☐	4. ☐	5. ☐

19. How many times have you personally suffered from flood-related problems in your life?

___times

19b) Can you indicate how often you believe your region will face flooding in the future?

0. Never
1. Once every year
2. Once every 5 years
3. Once every 10 years
4. Once every 25 years
5. Once every 50 years
6. Once every 100 years
7. Other, namely once every .... years

20. How important do you consider flood control along the Által-ér and the Öreg-tó [PLEASE TICK AS APPRORIATE]

not important at all	not important	somewhat important	very important	Don't know
1. ☐	2. ☐	3. ☐	4. ☐	5. ☐

21. What are in your view the most important causes of flooding in the Által-ér and the Öreg-tó [PLEASE TICK AS APPRORIATE; MULTIPLE ANSWERS POSSIBLE]

Unconsolidated dams	1. ☐
Late interventions from the those responsible for the flood defence program	2. ☐
Deforestation	3. ☐
Hydrological works along the river (e.g. channelling)	4. ☐
Landuse change	5. ☐
Weather extremes due to climate change	6. ☐
Other (please indicate):	7. ☐

22. Do you know what you are currently paying for your water bill?

Yes	No
1. ☐	2. ☐

⇒ **go to question 25**

23. In what intervals do you pay your water bill?

Monthly	1. ☐
Every 2 months	2. ☐
Every 3 months	3. ☐
Every 6 months	4. ☐
Yearly	5. ☐
Other (please specify).......	6. ☐

24. If you know the amount of your water bill, please indicate how much you pay **per month**
[REMIND THE RESPONDENT OF THE FREQUENCY OF THE PAYMENT AND HELP IN DETERMINING THE MONTHLY AMOUNT!]

1. _ _ _ _ _ _ _ _ _ _ _ HUF

Alternatively, If you do not know the exact sum, please provide an estimate!

Monthly	**Yearly**	
Less than 1500 Ft	Less than 18.000 Ft	2. ☐
About 1500-2000 Ft	About 18.000-24.000 Ft	3. ☐
About 2001-3000 Ft	About 24.001-36.000 Ft	4. ☐
About 3001-4000 Ft	About 36.001-48.000 Ft	5. ☐
About 4001-5000 Ft	About 48.001-60.000 Ft	6. ☐
About 5001-6000 Ft	About 60.001-72.000 Ft	7. ☐
About 6001-7000 Ft	About 72.001-84.000 Ft	8. ☐
About 7001-8000 Ft	About 84.001-96.000 Ft	**9.** ☐
About 8001-9000 Ft	About 96.001-108.000 Ft	10. ☐
More than 9000 Ft	More than 108.000 Ft	11. ☐
No answer	No answer	12. ☐

25. Management of the Altal-Ér Catchment - Your views

I would now like to ask you to think about alternative management plans for the Által-ér catchment (SHOW AREA MAP). These management plans relate to the improvement of the flood risk and water quality situation in the area. Over the last decades, large parts of the Altal-Ér river have been embanked and the floodplain areas behind the river banks have been drained and are now used for economic activities like farming,

Because of these restrictions on the flow of water the connection between the river and tributaries and floodplains is reduced, and during flooding the excess water can no longer enter the floodplains and be stored there - increasing the flood risk. At the same time, the natural purification function is being affected and therefore water quality has decreased.

Currently, the area faces flood events every 3 years. Water quality in the area is moderate.

River restoration measures have been proposed in the Által-ér catchment to return some of the river back into its natural state by linking the river to its tributaries and restoring the original floodplains in the catchment. Restoring the river and the floodplains to its natural state will improve water quality and reduce the flood frequency in the area.

I will now present you with a number of possible situations (different restoration measures which differently influence flood frequency and water quality) and would like you to tell me which situation you prefer.

The following situations are possible (SHOW ATTRIBUTE OVERVIEW CARD)

ATTRIBUTE OVERVIEW CARD

Characteristic	**Possible situation**			
Flood frequency	Once every 5 years	Once every 25 years	Once every 50 years	Once every 100 years
Water quality	**Moderate** 	**Good** 	**Very Good** 	

As a result of river and floodplain restoration, flood frequency can be reduced from currently once every 3 years to once every 5 years, once every 25 years, once every 50 years and once every 100 years. At the same time current water quality situation will be improved.

In the *good* situation all forms of recreation are possible, and caught fish can be eaten. Conditions for nature and wildlife are good and swimming is possible most of the time, except perhaps during some weeks in the summer when there are excessive algal blooms.

Under the *very good* situation the water is in a very near natural state and conditions are optimal for nature and wildlife. All forms of recreation are possible under these circumstances.

Because each possible situation depends on the exact mixture of restoration measures taken in the specific area you can have high water quality level and at the same time a high frequency of flooding, but also a low water quality level with a low flood frequency. It is furthermore important to point out that the river and floodplain restoration measures would not alter the current location of settlements and villages, although these measures would affect flood frequency and water quality in those areas (including the area where you live). Any losses in the value of agricultural land due to restoration measures would be compensated for.

On the cards that I am about to show you, each situation also comes at a cost. The restoration measures cost money and everybody will be asked to pay. I will show you an example (SHOW EXAMPLE CARD).

EXAMPLE CARD

	Situation A	**Situation B**	**Current situation**
Flood frequency	Once every 25 years	Once every 5 years	Once every 3 years
Water quality	Moderate	Very good	Moderate
Increase in water bill	50 Ft / month	1000 Ft / month	0 Ft
	☐	☐	☐

On each card you will be shown two possible future situations that can be reached through river restoration, situation A and situation B. Each situation shows a different flood frequency and a different water quality in the Által-ér catchment due to river and floodplain restoration. In this example, water quality will stay the same as it is now in situation A, but the frequency of flooding will be reduced to once every 25 years at an extra cost added to your monthly water bill of 50 Forints for the next five years. In situation B the frequency of flooding is slightly increased to once every five years while water quality becomes very good at an extra cost added to your monthly water bill of 1000 Forint for the next five years. You also have the option to choose none of the two situations. In that case the current situation will stay the same and you don't pay anything extra on top of your current water bill for the next five years.

Can you tell me which situation you prefer?
Please keep in mind your available income and that you can only spend your money once.
I am now going to show you 4 similar cards and would like to ask you to tell me for each card which situation you prefer and why.

Choice Card Identification Number:☐ ☐ ☐ ☐
Card 1: 1=Option A ☐ 2=Option B ☐ 3=Current situation ☐

Can you briefly explain why you choose this situation? ....

Choice Card Identification Number:☐ ☐ ☐ ☐
Card 2: 1=Option A ☐ 2=Option B ☐ 3=Current situation ☐

Can you briefly explain why you choose this situation? ....

Choice Card Identification Number:☐ ☐ ☐ ☐
Card 3: 1=Option A ☐ 2=Option B ☐ 3=Current situation ☐

Can you briefly explain why you choose this situation? ....

Choice Card Identification Number:☐ ☐ ☐ ☐
Card 4: 1=Option A ☐ 2=Option B ☐ 3=Current situation ☐

Can you briefly explain why you choose this situation? ....

26. If you chose the option 'the current situation' 4 times, can you briefly explain why?

I am not interested in this issue of river and floodplain restoration and the effects on flood frequency or water quality	1. ☐
The current situation is good enough	2. ☐
I cannot afford to pay extra	3. ☐
I prefer to spend my money on other more important things	4. ☐

Other, namely..........	5. ☐

27. CV-Question 'Ecological Restoration'

As described before, the Által-ér catchment is heavily modified in many places. Today approximately a quarter of the river is still connected the surrounding floodplains and wetlands and the river banks are still in a natural state (SHOW MAP OF THE CURRENT SITUATION).

Restoration measures would connect the river again to the floodplains and the wetlands as they were originally before the changes made to the river and river banks. As a result of river and floodplain restoration the landscape will look more natural, with water flowing also through adjacent creeks and ponds. This more natural state has a positive effect on nature and the variety of plant and animal species found in the Által-ér catchment.

Plans exist to restore half ***(50 percent)*** of the modified river banks in the Által-ér catchment back into their original natural state as shown on the map (SHOW MAP), and connect the river again with the floodplains and wetlands.

Can you tell me with the help of this card how much you are willing to pay MAXIMUM on top of your yearly water bill over the next 5 years for the restoration of half of the modified river banks in the Által-ér catchment back into their original natural state as shown on the map?

SHOW PAYMENT CARD

c	0 Ft	☐	1250 Ft	☐	3500 Ft	☐	7500 Ft	☐	15000 Ft	☐	43750 Ft
☐	250 Ft	☐	1500 Ft	☐	4000 Ft	☐	8750 Ft	☐	20000 Ft	☐	50000 Ft
☐	500 Ft	☐	2000 Ft	☐	4500 Ft	☐	10000 Ft	☐	25000 Ft	☐	62500 Ft
☐	750 Ft	☐	2500 Ft	☐	5000 Ft	☐	11250 Ft	☐	31250 Ft	☐	More than 62500 Ft, namely ________.
☐	1000 Ft	☐	3000 Ft	☐	6250 Ft	☐	12500 Ft	☐	37500 Ft	☐	Other amount, namely ___________

Please keep in mind your available income and keep in mind that you can only spend your money once.

28. If you are **not** willing to make a financial contribution to restoration measures, can you tell me why not.

1. ☐ I am not interested in this issue of river and floodplain restoration and the effects on flood frequency or water quality

2. ☐ The current situation is good enough

3. ☐ I cannot afford to pay extra

4. ☐ I prefer to spend my money on other more important things

5. ☐ Other, namely: ……………………………………

29. To what extent do you agree or disagree with the following statements? [PLEASE TICK AS APPRORIATE]

	Completely disagree	Disagree	Don't agree/don't disagree	Agree	Completely agree	Don't Know
	1.	2.	3.	4.	5.	6.
1. "Polluters should pay first for water quality"	☐	☐	☐	☐	☐	☐
2. "It is the task and responsibility of the government to protect the rivers."	☐	☐	☐	☐	☐	☐
3. "Water quality has to be improved for sake of our children."	☐	☐	☐	☐	☐	☐
4. "The environment has the right to be protected irrespective of the costs of the society."	☐	☐	☐	☐	☐	☐
5. "The environment has to be protected by law, not by asking people to pay for."	☐	☐	☐	☐	☐	☐

30. How would you prefer to pay for the proposed river and floodplain restoration? [PLEASE tick ANSWER]

Via my water bill	1.	☐
Through local taxes	2.	☐
Through income tax	3.	☐
Through a one time off voluntary donation to a designated restoration fund	4.	☐
Other, namely …………………….	5.	
I don't want to pay	6.	☐
I don't know	7.	☐

<u>Socioeconomic Characteristics Section</u>

Finally some questions about yourself concerning your own personal situation for statistical purposes. Please note that all information provided will be kept confidential!

31. What is your age? ……… years

32. How many people live in your household including you?

……… Persons (including you!!)

33. How many children (under 18 years) live in your household?

……… children (under 18 years)

34. (a)What is your current work status? [PLEASE TICK AS APPRORIATE]

Self-employed full-time	1.	☐
Employed full-time (30 hours plus per week)	2.	☐
Employed part-time (under 30 hours per week)	3.	☐
Student	4.	☐
Unemployed	5.	☐
Looking after the home full-time / housewife	6.	☐
Retired	7.	☐
Unable to work due to sickness or disability	8.	☐
Other, namely …………………………………	9.	☐

(b)
Are you engaged in any agricultural activity?

Yes	1. ☐		No	2.☐

(c) If yes, what kind of agricultural activities (intensive, organic, dairy, arable, etc.) _______________

(d) on how many hectares? _________

35. At what level did you complete your education? IF STILL STUDYING: Which best describes the highest level you have obtained up until now? [PLEASE TICK AS APPRORIATE]

Primary school	1.	☐
Professional training	2.	☐
High school or similar	3.	☐
(technical) college	4.	☐
University	5.	☐
Other, namely:	6.	☐

36. Would you tell me what your monthly household income is? (1) . _ _ _ _ FT

OR, ALTERNATIVELY CAN YOU estimate WITH THIS CARD which category best describes your total household net income each month, after deduction of tax? (Ft/month) [PLEASE TICK AS APPRORIATE]

0 – 62 500 Ft	2. ☐
62 501-125 000 Ft	3. ☐
125 001-187 500 Ft	4. ☐
187 501-250 000 Ft	5. ☐
250 001-375 000 Ft	6. ☐
375 001-500 000 Ft	7. ☐
500 001-625 000 Ft	8. ☐
625 001-750 000 Ft	9. ☐
750 001-875 000 Ft	10. ☐
More than 875 001 Ft	11. ☐
No answer	12. ☐

37. Gender [DO NOT ASK]

Man	1. ☐
Woman	2. ☐

THANK YOU FOR ANSWERING OUR QUESTIONS!

Table 23 date of interview

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	71110	76	16,1	16,1	16,1
	71111	76	16,1	16,1	32,3
	71208	49	10,4	10,4	42,7
	71209	64	13,6	13,6	56,3
	71215	50	10,6	10,6	66,9
	80112	42	8,9	8,9	75,8
	80113	28	5,9	5,9	81,7
	80119	86	18,3	18,3	100,0
	Total	471	100,0	100,0	

Table 24 interviewers' name

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Czeglédi Ildikó	85	18,0	18,0	18,0
	Cziger János	28	5,9	5,9	24,0
	Halmos Zsófia	18	3,8	3,8	27,8
	Horváth Kristóf	10	2,1	2,1	29,9
	Krasznai Luca	8	1,7	1,7	31,6
	Lehel Zsuzsanna	30	6,4	6,4	38,0
	Nedeczky László	68	14,4	14,4	52,4
	Pődör Sára	18	3,8	3,8	56,3
	Riedl István	27	5,7	5,7	62,0
	Terék György	41	8,7	8,7	70,7
	Breier Edina	37	7,9	7,9	78,6
	Klimaj Gabriella	34	7,2	7,2	85,8
	Zarándy Ágnes	23	4,9	4,9	90,7
	Farkas Györgyi	33	7,0	7,0	97,7
	Tarnai Mária	11	2,3	2,3	100,0
	Total	471	100,0	100,0	

Table 25 Correlation matrix of variables influencing willingness to pay; contingent valuation

	MEMBER	DRINK	RESTAUR	AGE	EDUCAT	INC_HUF	DUMDONAT
MEMBER	1.0000						
DRINK	0.09719	1.0000					
RESTAUR	0.06460	0.03601	1.0000				
AGE	0.04745	0.00947	-0.28964	1.0000			
EDUCAT	0.11390	-0.01508	0.21436	-0.06874	1.0000		
INC_HUF	-0.04021	0.00410	0.15658	-0.20491	0.34512	1.0000	
DUMDONAT	0.30496	-0.01124	0.06810	0.06659	0.05283	0.04172	1.0000