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Applying Contingent Valuation Survey to Assess the Economic Value of Restoring Ecosystem Services of Impaired Rivers: A Case Study in Transboundary Buna River Region, Albania

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Abstract. Rivers can provide many services to humans, including water supply for municipal, industrial and agricultural users, fish habitat and recreation. Restoration of impaired waters is gaining increasing attention. Improving the quality of impaired waters will yield environmental benefits that will also translate into economic and social benefits. The estimation of the economic value of these environmental benefits by assessing the total willingness-to-pay (WTP) of households for restoring water quality in impaired transboundary Buna River basin, Albania (AL-Buna) is the primary objective of this study. A stated-preference estimation technique known as the contingent valuation method (CVM) was utilized in this study. In our survey was used a well-designed questionnaire depicting the reason why the ecosystem of Buna river basin has been deteriorating, the measures by which ecosystem services could be restoring from their current level, and the benefits the households in the area could get from restoring ecosystem services. These ecosystem services were dilution of wastewater, natural purification of water, erosion control, habitat for fish and wildlife, and recreation. Surveys containing a dichotomous choice WTP questions and multiple choice questions were sent to a randomly selected sample of 268 households to determine both the WTP of residents and factors that affect WTP. Results from survey indicate that households would pay an average of $2.1 per month or €25.2 annually for the additional ecosystem services. Generalizing this to the households living along the river yields a value of €140,000 to €500,000 depending on whether non-responding households make any contribution or not. These estimates are more than the estimated costs of restoring the five ecosystem services. The approach described in this study may be applied to larger ecosystems with a broader range of the ecosystem services to be valued.

Keywords: Ecosystem services, valuation of ecosystem services, restoration, willing to pay, contingent valuation method

I. INTRODUCTION

Ecosystem services provide many benefits to people. Dilution of wastewater, as well as erosion control and water purification effects from riparian vegetation and wetlands improves water quality. Increased water quality reduces water treatment costs to downstream cities [24], increases the aesthetics of water for visitors and supports native fish and wildlife that different people like to view or harvest or simply know exist. Since all of these uses of clean water benefit people, and are scarce, these services have an economic value. These ecosystem services have characteristics of "public goods". Specifically, it is difficult to exclude downstream users from receiving the benefits of improved water quality and many of the benefits are non-rival in nature. Many individuals can view the same wildlife or enjoy knowing they exist without precluding others from doing the same thing. Given these public good characteristics, it is difficult for the private sector to market or sell these ecosystem services.

While these ecosystem services are often without prices, they do contribute utility to individuals and therefore have value. This value is monetized as the individual's net willingness to pay (WTP) or consumer surplus. Ecosystem valuation is the process of determining the monetary value of an ecosystem and is crucial in providing information to determine the necessary actions and economic support needed to maintain and restore ecosystem services [15]. The process integrates ecological concerns with economic considerations in order to calculate the costs and benefits of restoration. Valuation of ecosystem services is controversial because of the potential importance such values may have in influencing public opinion and policy decisions. Failure to quantify ecosystem values in commensurate terms with opportunity costs often results in an implicit value of zero being placed on ecosystem services. In most cases, ecosystem services have values larger than zero [2]. Attempts at valuing ecosystem services go back several decades. Notable early examples include energy-based approaches of Costanza [18] and Odum [3].

Ecosystem restoration and its associated costs are not easily determined. The goal of ecosystem valuation relies heavily on determining the current state and benefits of a specific ecosystem and comparing that state to a historic state, such as the pre-Columbian era, or to the greatest potential benefits of the ecosystem to society. Based on the comparisons, the steps needed to be taken to repair or restore an ecosystem can be mapped out and suggested as potential policies. Through the usage of contingent valuation studies and ecosystem evaluation, researchers have been able to reduce the controversy in the debates over the price of restoration. Using this method, spending on environments can be rationalized by placing "price tags" on ecosystems [21]. In addition, contingent valuation surveys account for many factors when determining the WTP for such restorations. By using this method, money is able to be distributed among the many services in need of restoration which is determined by the public.

However, because of the complex nature of ecosystems, there are many problems in determining objective measures of ecosystem value [25]. Within any ecosystem there are a vast number of abiotic and biotic factors, making it difficult to evaluate a single ecosystem service because they are all interdependent. Furthermore, studies often result in contradicting results, so it is inaccurate to draw conclusions based on one study alone [20]. Another area of controversy is the interpretation of variables within a study caused by variables such as tourism and animal migrations that indirectly affect the health of an ecosystem [25]. The effects of a variable can be seen through many different perspectives, and valid arguments can be on each, thus creating controversy. Accounting for every factor and modeling their effects is nearly impossible.

The contingent-valuation method (CVM) is widely applied to the problem of estimating economic values of goods and services that are not traded in markets and for which no economic behavior is observable. These non-market characteristics are present when the "good" in question is in the form of an environmental amenity. As a result, contingent valuation is receiving increasing application for estimating the economic value of environmental goods. The contingent valuation method is a survey technique designed to elicit the willingness of a household to pay for a policy that will produce benefits for that household. This is a non-market analogue to the observation of a market transaction in which a consumer reveals his or her willingness to pay the market price for a good.

The contingent-valuation method is employed in this study because it enables estimation of total willingness to pay based on people's direct statements of their preferences.

Studies of the value of the ecosystem services are still generally lacking in Albania. The main aim of present study was that through the application of the CVM to estimate the economic value of ecosystem services and analyze factors affecting the WTP. So, in this paper is given an approach for describing to respondents and assessing economic value of five ecosystem services that could be restored along the AL-Buna River 44 km long. The CVM was utilized to obtain estimates of willingness to pay (WTP) for improved five ecosystem services. Analysis of bid function underlying the WTP responses was also undertaken.

II. MATERIALS AND METHODS

A. CASE STUDY BACKGROUND

Lake Shkodra (also called Scadar in Montenegro) at the border of Albania and Montenegro (Fig. 1) is a dynamic natural lake, changing its surface area from 350 sq km in dry summers to up to 542 sq km after heavy rainfall. The Lake is connected to the Adriatic Sea by the Buna River (called Bojana in Montenegro) and divided by the border. The Buna River is the only outlet of Shkodra Lake flowing down 44 km to the sea. Buna River system, with its delta area on the Adriatic Sea, contains important ecosystems with fresh and brackish water, and a variety of natural and human-made coastal habitats, including floodplain forests, freshwater marshes, extensive reed beds, sand dunes, karst formations, calcareous rocks, wet pastures, ponds, and irrigated lands. The Buna River mouth represents a rare example

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of a natural delta on the East Adriatic coast. The Buna is navigable by small and medium-sized boats and it is possible to make excursions. The out flowing river Buna (forming the border with Montenegro in its lower course), its delta (notably Velipoja beach, Domni marsh, Viluni lagoon, Rrenci Mountain, and Velipoja forest) and coastal areas, as well as the adjacent part of the Adriatic coast, have national protection status, and are included in the Ramsar List.

Fig. 1. Shkodra lake region

The temporally inundated floodplains and the shallow water zones of Lake Shkodra and along the lower part of Buna River in particular provide unique habitats for a rich biodiversity in the near Adriatic part of South-Eastern Europe. A significant number of threatened species at national, European and global level depend on this wetland ecosystem. Important migration routes, especially of fish and birds, pass through the wetland area. For water birds the wetland area is also important as a breeding and wintering site. Floating islands with colonies of cormorants, herons and pelicans are unique in Europe. A breeding colony of Dalmatian Pelican, a globally threatened species, exists on Lake Shkodra, one of only a handful of such colonies in South-Eastern Europe. Other important numbers of wetland birds include ducks, geese, waders, gulls, birds of prey, owls and passerines. The number of wintering waterbirds on the Albanian side only reaches 24,000 – 30,000 individuals. Coastal bays and lagoons, in particular the largest, near Velipoja in Albania, are crucial as spawning and nursery areas for a number of commercially-important fish species.

Along AL-Buna sides there are 20 villages with a total population of about 25,000 inhabitants. For many people living on the river sides, both in Montenegro and Albania, is the only source of livelihood. Unfortunately, human influence in the river basin has reduced the quality of the habitat in which these native species thrive in. Erosion also poses a danger to animals nesting on the beach. The increasing number of human inhabitants, commercial industries, and recreational industries has put a strain on the other species as well, and has greatly diminished ecosystem services such as: natural purification of water; erosion control; habitat for fish and wildlife; dilution of wastewater, and recreation use.

B. CONTINGENT VALUATION METHOD

There are several techniques that can be used to value the benefits of improved ecosystem services or river restoration. For example, willingness to pay (WTP) is a general framework with several methods to figure out the amount of money people decide to spend in order to use, restore or improve a beneficial ecosystem service ([7], [12]).

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The only methods currently capable of measuring these passive use values of ecosystem services are conjoint, choice experiments and the contingent valuation method (CVM). CVM uses a questionnaire or interview to create a realistic but hypothetical market or referendum, which allows respondents to indicate their WTP [19]. The first part of the survey conveys the description of the resource under current conditions, as well as proposed conditions if the respondent pays. Then respondents are told the means by which they would pay for these proposed changes, e.g. in a higher water bill or taxes. Finally, the respondents are asked whether they would pay a certain euro amount, which varies randomly across respondents. The concern with this method is the reliability and validity of the responses. Would these individuals really pay the amount stated in the interview? This question has been subjected to a great deal of empirical testing. A literature analysis by [16], finds that the majority of CVM WTP estimates for use values pass the test of the validity involving comparisons of values derived from actual behavior methods such as travel cost recreation demand model. All the published studies to date have shown CVM-derived responses of WTP for both use and passive use values to be reliable in test-retest studies ([1], [4], [5], [6], [8], [17], [22], [23], [26]).

C. SURVEY DESIGN

The survey was designed to test the hypothesis that a correlation could be found between a households WTP to restore ecosystem services, their level of education, and political affiliation. Obtaining accurate benefit estimates using CVM requires detailed descriptions of the resource being valued. Therefore a great deal of effort was expended to carefully define and clearly display the current and proposed levels of ecosystem services to respondents.

For this purpose, firstly was worked to define what ecosystem services were being provided by the Buna River watershed and how these could be conveyed in words and figures. The first step was definition of ecosystem services that could be provided by the Buna River: dilution of wastewater, natural purification of water, erosion control, habitat for fish and wildlife and recreation use.

Once the key ecosystem services were identified, next were developed management actions necessary to increase the level of ecosystem services. These management actions included: a hundred-meter wide conservation easement along 44 km of the AL-Buna River; next, restoring native vegetation along the river in the form of buffer strips and eliminating cropland and cattle grazing in the buffer strip area. Livestock grazing would be allowed in the remainder of the conservation easement. Finally, water diversions to agriculture were reduced from their current amount by 75 to 50%.

Finally, was worked to develop drawings and narrative that conveyed the concept of increased ecosystem services. An initial set of drawings illustrating a natural level of ecosystem services as compared to the current condition of degraded ecosystem service was prepared.

The sample frame was individuals living in villages nearby or along the portions of the Buna river basin under study. Each survey, including a cover page, basic background on each service to be restored, and the attached questionnaire, was three pages long, with information on the front and back of each page. The background pages were about half of the total survey, the other half being the questionnaire itself. The surveys were created in a way such that each recipient could complete it in 10-15 minutes, so people would be more likely to send back their completed surveys.

D. VALIDITY and RELIABILITY of the SURVEYS

To test the validity of these drawings and narrative to convey the desired concepts, they were presented at three focus groups in the study area. The individuals attending the focus groups were asked to write down their description of what each diagram indicated. They were asked to point out any elements that were not clear. After each focus group, were made modifications to the diagrams and the narrative wording.

After further revisions following the focus groups, an entire survey script and revised set of diagrams were prepared and pre-tested. A field test was used to assess the face and content validity of the entire script and drawings. 20 people were chosen to make comments on the survey's clarity and ease of use. The suggested changes from the field test were incorporated into the final draft of the survey, assuring a fairly effective script and diagrams to elicit household willingness to pay for increasing ecosystem services in the Buna River watershed.

In this study, test-retest reliability and inter-item reliability were examined through pilot testing. Cronbach's alpha (α) was used to assess internal consistency: the closer the correlation is to 1.0, the more reliable it is [14]. In this study, the Cronbach's alpha (α) was 0.93.

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E. SYNOPSIS of ECOSYSTEM SERVICES BEING VALUED in SURVEY

Respondents were first handed a card that listed the four key ecosystem services that a restored plain river such as the Buna River could provide. These were listed and described as:

- Dilution of wastewater: adequate river flows are important for diluting fertilizer and pesticides that run off from farm fields, wastewater discharges from treatment plants and pollutants in urban storm water. This dilution insures the river is not toxic to fish and is safe for water-based recreation such as boating. They were then handed a color drawing that illustrated the lack of dilution along a hypothetical section of the AL-Buna River;
- Natural purification of water: one of the most important services of streamside vegetation and wetlands is the natural purification of water. Run-off from city streets and agricultural fields contain various pollutants such as oil, pesticides, and fertilizer as well as excess soil. These pollutants are absorbed by the plants and broken down by plants and bacteria to less harmful substances. Pollutants attached to suspended soil particles are filtered out by grasses and other plants and deposited in floodplains. This process helps improve water quality. Respondents were then handed a color drawing contrasting the current condition in the upper half of the diagram to the natural purification process in the lower part of the diagram;
- Erosion control: streamside vegetation also plays a role in the control of erosion. Plants and their roots hold stream banks and filter water. In the absence of vegetation, rain erodes the stream banks and rainfall washes soil from fields directly into river. This eroded soil fills the river bottom with mud. The result is muddy water and shallow rivers that do not provide healthy habitat for fish. As noted in the above text, a color diagram contrasting presence and absence of the erosion control service was presented to the respondent.
- Habitat for fish and wildlife: the variety of vegetation along the river provides habitat for a wide range of wildlife including woodpeckers, ducks, shorebirds and deer. Trees and shrubs in floodplains offer shelter and areas for nesting and roosting of many bird species. In addition the vegetation shades the stream keeping the water cool for fish and reducing algae growth which is detrimental to fish. Streamside corridors also are important for animal migration.

After the current state and restored level of each individual ecosystem service was described and illustrated, then were showed composite figures for current management and increased ecosystem service. This helped to bring together all of the individual ecosystem services into what the overall ecosystem would look and function like under the current condition and restoration.

F. MECHANISMS for RESTORING ECOSYSTEM SERVICES

In this section of the paper are described the means by which ecosystem services could be restored from their current level. The main means are as follows:

1. Restoring vegetation buffer strips along streams to increase ecosystem services such as erosion control, water quality, fish and wildlife habitat along with limited recreation opportunities;

2. Leaving more water in the Buna River: this shift in water use was illustrated by comparing two pie charts shown to respondents. The top pie chart presented “current water use” where 75% of water supply is now primarily for agriculture. Respondents were told that additional instream flows in the river can be obtained by:

2.1. purchasing water rights from agricultural users;

2.2. paying farmers to grow crops that use less water;

3. Convert cropland away from the river into fenced pasture land. Farmers would make at least as much income, if not more, from selling the water and growing less water intensive crops or switching to livestock. Respondents were then directed to the lower pie chart that illustrated 50% of the water being used by irrigated agriculture and instream flow increasing from 17 to 42% of the water;

4. Changing land management: land management actions necessary to restore ecosystem services were illustrated on a schematic map of the study area. Along 41 river km of the Buna River shown on the map, the government would purchase conservation easements on both sides of the river over a 10-year period from willing farmers (100 m on either side for a total surface shown on the map). Respondents were told conservation easements keep the land in private ownership but would pay farmers to manage this land to improve wildlife habitat and water quality. For example, cows would be fenced out of the area along the river banks so vegetation could regrow and the stream banks could be stabilized. This area will be restored to natural vegetation such as grasslands, wetlands and streamside trees. Some areas would be replanted with native vegetation. The revegetated streamside would: reduce erosion; increase natural water purification by plants; improve water quality and river habitat; help increase native fish populations so they will not go extinct; provide public access to restored natural areas for wildlife viewing.

H. WORDING of WTP QUESTION

The specific wording of the WTP scenario read to respondents was: The purchase of water and the surface of conservation easements along 44 km of the AL-Buna river from willing farmers as well as restoring these areas in natural vegetation costs a great deal of money. To fund these actions a AL-Buna river restoration fund has been proposed. All citizens along the Buna river banks would be asked to pay an increased water bill to: **(1)** purchase water from farmers to increase water for fish and wildlife; **(2)** to manage the Buna River as shown in the increased ecosystem services. The funds collected can only be used to restore natural vegetation along 44 km of the AL-Buna River and purchase water from willing farmers to increase instream flow to improve habitat for six native fish so they are not in danger of extinction.

G. STATISTICAL MODEL OF WTP

Given that individuals simply respond with a "yes" or "no" response to a single euro amount, the probability they would pay a given euro amount is statistically estimated using a qualitative choice model such as a logit model ([9], [11]). The basic relationship is:

$$\text{Probability (Yes)} = 1 - \{1+ \exp [B_0 - B_1(€X)]\}^{-1} \qquad (1)$$

where B's are coefficients to be estimated using either logit or probit statistical techniques and €X is the dollar amount the household was asked to pay. At a minimum, the coefficients include the bid amount the individual is asked to pay. Additional coefficients may include responses to attitude questions or the respondent's demographic information such as age, education, membership in environmental organizations, etc.

From Eq. (1), Hanemann ([10] provides a formula to calculate the expected value of WTP if WTP must be greater than or equal to zero. The formula is:

$$\text{Mean WTP} = (1/B_1) \times \ln [1+ \exp(B_0)] \qquad (2)$$

where B_1 is the coefficient estimate on the bid amount and B_0 is either the estimated constant (if no other independent variables are included) or the grand constant calculated as the sum of the estimated constant plus the product of the other independent variables times their respective means.

III. RESULTS AND DISCUSSION

A. RESPONDENTS' PROFILE

The average family size was 4.3. Of the respondents, 56.8% were male and 43.2% female. The average age of the respondents was found to be 43 years old. 33.8% of them were above 41 years old. 68.3% of the respondents were with high school education, 23.5% with university education, and 8.2% of them were with secondary school education. In addition, 96.5% of the respondents have been living in AL-Buna River basin for more than 10 years.

Regarding to occupation of the respondents, 73% were farmers, 9% were homemakers, 6% were workers, 4% were businessmen, 4% were college/university students, 2% were educators, and 2% were local government officials.

Nearly 86% of the residents reported a yearly income less than €1000. 73.64% reported their yearly income €600, 15.45% reported their yearly income between €600 - €1000, 6.97% reported their yearly income between €1000 - €1,500, 1.61% reported their yearly income between €1,500 - €2,000, 1.53% reported their yearly income between €2,000 - €2,500), 0.80% reported their yearly income between €2,500 - €3,000, and none of them reported their yearly income over €3,000.

B. SURVEY IMPLEMENTATION

In July 2012, 268 surveys were mailed out to random households in the Buna river basin in the following locations: Commune Ana e Malit, Commune Bërdicë, and Commune Dajç. 52 were undeliverable, and 50 households did not respond even though they received surveys. Of the remaining 166 surveys, 16 surveys were not complete and thus could not be used to calculate the logistic regression for WTP (Table I).

Table II shows the summarized responses of households for their CVM surveys, and presents the number and percent "yes" responses at each bid amount. Households were asked if they were willing to pay a randomized euro amount from €1 to €15 as an addition to their water bill to restore Buna river basin (see 2.5 for specified ecosystem services).

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Each column shows how many households agreed and disagreed to pay each bid amount. The bottom row shows the percentage of respondents which agreed for each bid amount.

TABLE I. RESPONSE RATES of SURVEYS

Category	Number	Percentage	Percentage of deliverable surveys
Surveys mailed	268	100	
Moved out of area, undeliverable	52	19.4	
Net sample size	216	80.1	
No answer	50	18.7	23.1
Sample contacted	166	61.9	76.9
Incomplete sample (not used to generate regression)	16	6.0	7.4
Complete sample	150	56.0	69.4

TABLE II. DESCRIPTIVE STATISTICS of WTP DISTRIBUTION

Bid (in €)	1	2	3	4	5	6	7	8	9	10	12	15	Sum
Sample size	25	29	20	10	9	8	7	8	9	10	10	5	150
Yes	24	23	16	9	4	4	4	2	0	3	1	0	90
No	1	6	4	1	5	4	3	6	9	7	9	5	60
% Yes	96	79.3	80	90	44.4	50	57.1	30.8	0	30	10	0	

C. STATISTICAL RESULTS

A full statistical model including all survey demographic and attitude variables was initially estimated. To conserve space, only the models with independent variables significant at the 0.05 level or better were retained. No awareness/attitude variables were relevant and the demographic variables such as education, age, marital status, income, and household size were found to be insignificant and these were not included in the final model.

The final statistical model was:

$$[\log(yes)/(1 - yes)] = B_0 - B_1 (bid) - B_2 (unlimited\ water) + B_3 (government\ purchase) + B_4 (environmentalist) - B_5 (average\ water\ bill) + B_6 (urban) \quad (3)$$

where 'yes' is the dependent variable and records if a person was or wasn't willing to pay the amount asked during the interview. The number 1 records a yes vote, and 0 records a no vote.

Bid, specifies the increase in water bill the person was asked to pay. Unlimited water, 'do you agree or disagree with the statement; farmers should be allowed to use as much water as they are entitled to even if it temporarily dries up portions of streams?' (agree, 1 and disagree, 0). Government purchase: 'do you agree or disagree with the statement: Government purchase of land along the AL-Buna River to increase fish and wildlife is something I would support?' (agree, 1 and disagree, 0). Environmentalist: are you a member of a conservation or environmental organization? (yes, 1 and no, 0). Average water bill: the average indoor use monthly water bill for each community. Urban equals one if lives in urban/suburban area, equals zero if live in rural farm area.

D. FACTORS INFLUENCING WTP

Table III presents the final statistics of the logit regression model (Eq. 3). Table III shows that the bid amount and environmentalist variables were statistically significant at the 1% level and the rest at 5% significant level.

The negative sign before "bid" denotes that the higher the euro amount the respondent was asked to pay, the lower the probability that the respondent would vote for restoration of ecosystem services. The unlimited water variable's coefficient is negative indicating those that agreed with the right of farmers to use their entire water right even if it dries up the stream, were less likely to agree to pay for restoration of ecosystem services. Respondents supporting government purchase of land along the AL-Buna River were more likely to vote for a higher water bill to carry out such a program. Respondents belonging to an environmental group were more likely to agree to pay the higher water bill. The negative sign for average water bill suggests the higher the household's average water bill the more likely they were to vote against an increase in their water bill for this project. Suburban and urban residents were more likely to vote in favor of this program than rural or farm residents.

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TABLE III. LOGIT REGRESSION MODEL of PROBABILITY WOULD PAY INCREASED WATER BILL

Variable	Coefficient	t-statistic	Mean
Constant	3.175	1.88	1.36
Bid amount (€)	- 1.144	- 3.42***	16.96
Unlimited water	- 1.042	- 1.92**	0.831
Government purchase	1.753	1.27**	0.87
Environmentalist	2.489	2.153***	0.385
Average water bill	- 0.675	- 1.87**	27.51
Urban	1.635	2.67**	0.841
McFadden R2	0.48		

** Significant at the 0.05 level; *** Significant at the 0.01 level.

E. ECONOMIC BENEFIT ESTIMATES

Using the formula in Eq. (2), mean WTP was calculated at the mean of the other independent variables. The resulting mean monthly willingness to pay per household was €2.1 per month with a 95% confidence interval of €2.0 - 2.2, for the increase in ecosystem services on this 44 km stretch of the Buna river. The resulting logit curve is well balanced and does not exhibit any "fat tail" at the high bid amount. While there is always a lingering concern whether households would actually pay the mean WTP estimated from CVM responses, the respondents indicated they were quite certain of their WTP responses. In particular, we adopted the 10 point scale used by [13] to assess validity of CVM WTP versus cash donations. The average score in our sample was 8.5 with a median of 9. This is in the range that Champ et al. [13] found indicated criterion validity with cash donations. This higher level of certainty may be due to the extensive use of high quality visual aids and the in-person interviews.

However this higher certainty and mean WTP may also be influenced upward by proximity of interviewed households to the river. That is, our sample design emphasized villages and suburbs closer to the river. Thus when the €2.1 monthly payment is converted to an annual payment the €25.2 is certainly a substantial sum.

We make three expansions of these benefits to the population of regional households living along the AL-Buna River. The first treats our mean WTP as the best estimate of what the average household would pay. The second is a more conservative estimate that accounts for the 59% of households that when contacted, declined to participate or respond to the survey. The proportion of households that refused to be interviewed regarding the AL-Buna River is conservatively treated as having zero WTP. Finally, a lower bound is calculated that uses the most conservative estimate of the response rate and assuming the remaining 74% of the population that we were unable to contact have a zero WTP. The villages interviewed were determined to be the pertinent areas to which the preservation benefits pertain. These villages include: Zues, Bërdicë, Tarragiat, Oblika, Obot, Shirq, Dajç, and Gorica. For the upper bound estimate, mean willingness to pay per household was multiplied by the number of households in this area of the Buna river basin whereas the other estimates applied the mean only to the proportion of households that responded to the survey (Table IV).

TABLE IV. ANNUAL BENEFITS per HOUSEHOLDS

Scenario	Household		Number of households	Annual
	Monthly WTP	Annual WTP		
Apply mean to all households	€2.1	€25.2	5814	€146513
Apply mean to only 41% of households	€2.1	€25.2	2384	€60077
Apply mean to only 26% of households	€2.1	€25.2	1512	€38102

IV. CONCLUSIONS

In view of the major findings of the study, the following are the conclusions made. This study was a positive attempt to apply contingent valuation method to impaired river improvement. The study examined residents' awareness on the value of ecosystem services, sought their attitude toward the current status, and employed a logistic regression analysis based on the contingent valuation method to calculate the total economic value, explain factors influencing the residents' willingness to pay, and provided estimates of the willingness-to-pay of households for restoration of impaired transboundary AL-Buna river basin.

Mean WTP to increase five ecosystem services (dilution of wastewater, natural purification of water, erosion control, habitat for fish and wildlife, and recreation) along 44 km of the AL-Buna River was $2.1 per month in a higher water bill. When the $2.1 is generalized to households living along the river, this is sufficient to pay for the conservation easements on agricultural land along the river and the leasing of water for instream flow. Thus, the policy to increase ecosystem services meets the economic efficiency criteria that the gaining public could compensate the farmers and ranchers for the conservation easement and water and still come out ahead.

Areas for further improvement include systematically varying the number of ecosystem services to be valued and the level of each ecosystem service to be provided. This can be done using multiple scenarios within a contingent valuation survey or through the use of contingent choice or conjoint analysis. In this way the incremental value of specific ecosystem services could be valued and compared to the cost of providing that ecosystem service or higher level of ecosystem service.

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