FIRST CONTINGENT VALUATION OF LAKE OHRID BIODIVERSITY

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SUMMARY

This study is first of its kind for the region in question. It focuses on contingent valuation method evaluation of the biodiversity of Lake Ohrid. The most spectacular quality of this ecosystem is the high biodiversity and extremely high degree of endemism, with an adjusted rate for endemism of 36%. A questionnaire with total of 18 questions, divided into five sections has been distributed in the largest towns in the area, i.e. Pogradec and Ohrid in order to elicit the willingness to pay (WTP) for the protection of the biodiversity of the residents in these areas. The research has been conducted in February 2016 and comprised people with different educational levels, professions and annual incomes. The findings of the valuation indicate that the majority of the residents are willing to pay for protection of the biodiversity. It has been discovered that WTP is positively correlated to the educational level and annual income level of the respondents, but there are no correlations to the gender and mode of payment. Likewise, the mean WTP in Albania has been estimated at 19,87 EUR per year, per household, while in Macedonia it has been 29,31 EUR. The total economic value (TEV) of the biodiversity has been determined for the entire region, i.e. for the population living near Lake Ohrid in both Albania and Macedonia and it has been estimated at 890.010,46 EUR per anum.

Key words: ecosystem services, contingent valuation, total economic value, willingness to pay, biodiversity, Lake Ohrid

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1. INTRODUCTION

It was in 1992, in Brazil when the Convention of Biological Diversity of the United Nations has been established. The main rational behind the establishment of this convention has been promotion of the conservation and protection of biodiversity, the sustainable use of the biodiversity components and equal distribution of the benefits generated by the application of genetic resources. Both Albania and Macedonia have been signing parties of this Convention, and by signing the treaty the two countries agreed to establish national biodiversity strategies and action plans for reducing the losses in biological diversity. Macedonia`s assembly ratified the Convention in 1997 while Albania`s in 1996. Following the ratification of the Convention both countries developed their own National Biodiversity Strategies in which the commitment to biodiversity had been reflected. In addition, Macedonia and Albania as candidate countries for EU Membership abide by the European Communities Biodiversity Strategy and Action Plans that are in relation to the Convention.

Despite their small sizes both countries are known for their vast biodiversity, in aquatic and land ecosystems. Especially interesting and valuable is the transboundary Lake Ohrid, which is shared between the two countries and it is known as an ecosystem with extremely high degree of endemism and high biodiversity. Moreover, the lake as an ecosystem generates different ecosystem services which are beneficial for the populations on both sides of the border.

The ecosystem services (ESs) is a field that is developing and becoming rather useful and interesting providing a linkage between the ecology and economy. In other words, lately the ESs is increasingly used and applied in order to facilitate policy and decision-making regarding ecosystem functionality, protection and utilization of different benefits which are provided by an ecosystem. However, the ecosystem functionality recently have been negatively affected by an increased anthropogenic influence and diverse damages and natural disasters which in turn affect the respective ecosystems and yield ecological and economical distresses. These past experiences paved the way for people`s active participation in conservation and protection of ecosystems, since they are becoming more aware of the importance of the environment and biodiversity. That is why there are a lot of people who are willing to pay in order to protect the biodiversity loss, thus ensuring brighter environmental future for the next generations.

The paper focuses on the economical valuation of the biodiversity (and its protection) for the people living in the major towns on Lake Ohrid, i.e. Ohrid in Macedonia and Pogradec in Albania. In other words, the investigations

undertaken during February 2016 comprised a contingent valuation of the biodiversity of Lake Ohrid and they reflect the willingness to pay by the people in this region for protection of further biodiversity loss. As mentioned above, this research has been the first of its kind undertaken in this area (Zdraveski et.al., 2015).

2. LAKE OHRID`S BIODIVERSITY AS AN ECOSYSTEM SERVICE

Lake Ohrid is situated in the mountainous region between Macedonia and Albania. It is one of the Europe`s deepest and oldest lakes (Wagner et al., 2014). The lake is one of the three natural lakes in Macedonia and it is used by the citizens of both countries for recreation, flood and pollution control services and food source (Zdraveski et al., 2015). The importance of the lake has been also emphasized when it was declared a World Heritage Site by UNESCO in 1979. In 2014, the Ohrid-Prespa Transboundary Reserve between Albania and Macedonia was added to the UNESCO`s Network of World Biosphere Reserves. The largest towns on the coast of the lake are Pogradec in Albania and Ohrid and Struga in Macedonia. Likewise, the lake is also surrounded by smaller settlements in both countries.

Besides these specialties of Lake Ohrid, the most spectacular quality of this ecosystem is the high biodiversity and extremely high degree of endemism (Hoffmann et.al., 2010; Budzakoska-Gjoreska, Trajanovski and Trajanovska, 2014; Albrecht and Wilke, 2008; Kostoski et al., 2010; Trajanovski et al., 2015; Loshkoska, 2015). Moreover, the biodiversity and endemism have been both greatly studied during the past decades. Nevertheless, despite the fact that some biotic groups have been understudied or not analyzed at all, yet it is recognized that approximately 1.200 native species are known from the lake, including 586 animals and at least 212 endemic species, 182 of which are animals (Trajanovski et al., 2015). According to the same author, the adjusted rate of endemism is estimated at 36% for all taxa and at 34% for animals. Moreover, by taking into consideration the size (358 km^2) and the number of endemic species, Lake Ohrid is presumably the most diverse lake worldwide. Similar to other ancient lakes, such as Baikal and Tanganyika, Lake Ohrid hosts diverse endemic species from the entire food chain, including phytoplankton and algae, plants, zooplankton, cyprinid and predatory fish, as well as an extremely endemic macrozoobenthos (Hoffmann et.al., 2010; Budzakoska-Gjoreska et al., 2014; Albrecht and Wilke, 2008; Kostoski et al., 2010; Trajanovski et al., 2015; Trajanovska et al., 2014). According to Föller et al. (2015), ancient lakes are essential ecosystems for endemic freshwater species and this high endemic

biodiversity has been proven to be mainly as a result of intra-lacustrine diversification. Furthermore, according to Albrecht and Wilke (2008) there has been listed 72 gastropod species, 56 of which (78%) are endemic to the lake. Strong et al. (2008) noted 72 gastropod species, 55 of which are endemic while Budzakoska-Gjoreska (2012) registered 50 gastropod species, 8 of which were cosmopolitan and 42 endemic for the Macedonian part of Lake Ohrid and its watershed.

Despite the exceptionally high level of endemism in Lake Ohrid (1/3 of 21 native fish species and almost 80% of its 72 mollusc), there are non-endemic species found in Lake Ohrid, too. The lakeshore reed beds and wetlands provide an excellent habitat for numerous wintering water birds, such as the Dalmatian pelican, ferruginous duck, swan, spotted eagle and eastern imperial eagle (Velevski et al., 2010).

Although it is not immune to anthropogenic influence, Lake Ohrid is still considered as an oligotrophic lake, with high dissolved oxygen levels in its deep waters (Matzinger et.al., 2007). The eutrophication process of this lake is driven by the four biggest threats, i.e. fishing, housing, impact of tourism, invasive and non-native species (Trajanovski et al., 2015).

Although there has been a moratorium enacted for fishing for almost two decades, this has been done only on the Macedonian side of the lake and not in Albania. Today, fishing is legally allowed, but monitoring and control measures are required in order to forecast its sustainability. The increased construction along the shoreline has a negative impact on the disturbances of the littoral habitats. The summer touristic activities that are practiced along the shoreline also negatively affect the shallow part of the lake. Next, the organic pollution that occurs as a result of increased touristic activities is endangering the endemic flora and fauna of the lake. The introduction of non-native and often invasive species, such as the rainbow trout or silver carp has numerous negative and even dangerous impacts on the biodiversity of the lake (Iucnredlist.org, 2016; Trajanovski et al., 2015).

Besides these existing threats on the biodiversity of the lake, there are also some potential threats. Occasional forest fires are altering the forested habitats and thus affect the lake, too. Also, the disturbance of the aquatic fauna and pollution associated with the motorboats are decreasing the habitat and water quality. The planned building of a road along the mountain Galichica will cut off the mountain and the lake. Also, the wetland Studenchishta is about to be urbanized, which will have a tremendous negative effect on the lake`s quality due to the loosing of its natural filter while the negative effect of the road rehabilitation in Albania is already felt by the lake, which has been affected by the building of huge concrete walls inside that are used to support the built roads. Finally the collector systems

are not always operating effectively and surplus of sewage water is purred into the lake (Iucnredlist.org, 2016).

3. SURVEY LAYOUT AND METHODOLOGY

In order to research how much are people willing to pay for protection of the biodiversity of Lake Ohrid, a questionnaire has been developed and tested. It has been decided that in order to establish as accurate values as possible, the survey should be conducted in person, i.e. people were approached and asked to fill-in the questionnaire by an enumerator. The survey comprised total of 18 questions classified into five sections. The first section of the questionnaire provided respondents with some background information on biodiversity, its importance and the places where it can be found in the area which has been subject of interest. The second section provided information about the importance of the biodiversity for different aspects of the everyday lives and the ways in which an individual can contribute for the protection of the environment, thus decreasing the biodiversity loss as well. The third section asked the respondents about their familiarity to biodiversity and some specific endemic species which are known to live in the Lake Ohrid, while the fourth section tried to draw values through willingness-to-pay (WTP) questions. The last portion of the survey asked respondents questions about their socio-economic status such as gender, age, educational level and annual income.

Although there are numerous techniques that can be applied in the valuation of an asset (Zdraveski, 2015), the non-market values are rather specific in terms of valuation. The biodiversity as an ES has a large non-use or non-market component and in the total economic value of the conservation and protection of the biodiversity, the contingent valuation method (CVM) is one of the more attainable and acceptable methods (Carson, 2000; Carson et al., 1998; Pearce and Turner, 1990). During the application of this method, survey questions are used in order to determine an individual`s willingness to pay for a certain change in the supply of an environmental service. In this case, the changes of the biodiversity`s levels of Lake Ohrid were subject of interest of the valuation.

Since every person has their own willingness to pay values for different goods and services, the best way to determine these values is by direct questioning of the respective individuals. For public goods valuation this process is usually conducted in a form of a referendum CVM survey (Hanemann, 1994; Arrow et al., 1993; Carson et al., 2000; and Champ et al., 2003), hence the questioning for this work has been conducted in that manner, too.

The questionnaire used in the process of determination of the WTP of the inhabitants of the Lake Ohrid region were self-explanatory and educational and the questions defined the current condition regarding the biodiversity, its importance, ways in which it can be protected on a global and local (personal) level and so on. The WTP questions were posted as follows:

- *Financially speaking, would you consider paying a fee for prevention of the biodiversity in the Ohrid area?*
- *What kind of payment would you prefer if you answered "yes" to the previous question?*
- *If you answered "yes" to question No. 12, which amount are you willing to pay for prevention of the Ohrid area biodiversity per year?*

In the end of the first question regarding the willingness to pay, the respondents were given the two possible answers, i.e. Yes and No. If the respondent answered with yes, than the following questions were to be answered and if the answer was negative, the following questions were not replayed. The next question was related to the kind of payment that would be preferred by the individual, providing him/her with three options: additional fee on the utilities bills, public tax collected by the national tax office, and public tax collected by the local (municipal) tax office. Finally, the respondent was asked how much is he/she willing to pay for the protection of the biodiversity in the Lake Ohrid area. The possible replays included three options classified into brackets: less than 50 EUR per year, between 50 and 100 EUR per year and more than 100 EUR per year. In all three cases, the respondent was asked to specify his unique amount within the bracket. In fact, the idea of these questions was to establish an open-ended mechanism for WTP surveying. However, according to Bateman et al. (1995) the open-ended elicitation mechanism is problematic and usually gives more conservative WTP amounts than other formats. That is why, there has been used a modified open-ended elicitation mechanism, which means that respondents were given the chance to choose a constrain first and then specify the exact amount that they are willing to pay, thus eliminating the anchoring bias and simultaneously give rather informative replays for the maximum WTP of each individual (Kealy and Turner, 1993; Balisteri et al., 2001; Halvorsen and Sœlensminde, 1998).

Since this is first valuation of the biodiversity in this region, there is no chance to compare our findings with past statistics. However, the study provides the pioneer and first CVM valuation of the biodiversity in this region of the world and encourages further research in the field.

In order to get an adequate number of respondents the survey has been completed in Ohrid and Pogradec. In both towns the survey has been conducted in different sites, such as public administration offices, bars,

supermarkets, banks, private organizations and alike. The selection of survey sites ensured that different profiles of people will participate, i.e. individuals with different educational and income levels.

The survey has been completed during February 2016. No incentives were given to the respondents. In total, 500 people were asked to participate in the survey with 400 people agreeing to take participation and fill a questionnaire, thus yielding a response rate of 75%. From the 400 questionnaires, 350 were usable. Furthermore, protest zeros were also eliminated, therefore leaving 300.

4. RESULTS

Out of the 300 usable surveys, 150 were from Albania and 150 from Macedonia. From the total number of respondents 42,33% or 127 were male and 57,67% or 173 were female. In Albania 77 (51,33%) and 73 (48,67%) of the respondents were male and female, respectively, while in Macedonia there were surveyed 50 (33,33%) males and 100 (66,67%) female respondents.

The majority of the respondents were in the second age group, i.e. 26-35 years old - 99 people. The rest were as follows: 52 respondents were 16-25 years old, 69 respondents were 36-45 years old, 50 - 46-55 years old and 30 were older than 56.

In Macedonia, out of the surveyed respondents, the majority were with a high-school diploma as their highest education, i.e. 70 or 46,67%. Furthermore, 67 (44,67%) of the Macedonian respondents were with bachelor degree, 9 (6%) with master degree, 3 (2%) with PhD degree and 1 (0.67%) with elementary school diploma as their highest education degree. In Albania, the majority of the respondents or 89 people (59,33%) were with bachelor as their highest education, 1 (0,67%) were with elementary school and 54 (36%) were with a high-school diploma as their highest education degree. For six respondents in Albania there was no information given for their educational level. The combined results show that the majority of the respondents in this survey in both countries were with bachelor degree as their highest education degree, i.e. 52% or 152 people.

The results obtained through the WTP questions showed that people in the region are generally willing to pay for protection of the biodiversity of the area. The modes of such payments differ and include payment of additional fee on the utilities` bills, payment of tax to the public tax office (nationally) and payment of tax to the public tax office locally (to the municipal branch of the tax office). In fact, out of the 300 respondents, 202 (67,33%) answered positively to the question of whether they are willing to pay for the

protection of the biodiversity in the area and the rest of 98 (32,67%) answered negatively.

The mean amount of payment per year for the protection of the biodiversity has been estimated at 24,59 EUR per household. By splitting the surveys by country, it can be seen that Macedonians are willing to pay more for the protection of the biodiversity, i.e. 29,31 EUR per year, per household while the Albanians are willing to pay 19,87 EUR per year, per household for the same cause.

Table 1. Willingness to pay for biodiversity protection vs. country

	Macedonia	Albania
Mean	29.30753333	19.86521739
Standard Deviation	45.87028475	20.79300793

The mode of payment is also a parameter which has been analyzed during the study. As it has been mentioned above, there were three modes of payment provided for the respondents, i.e. a) additional monthly fee to the utility`s bill; b) annual tax collected by the national public tax office; c) annual local tax collected by the local tax office. The table bellow depicts the obtained results for the three options for all respondents to the survey on contingent valuation of the biodiversity in the Ohrid area.

Table 2. Willingness to pay for biodiversity protection vs. payment mode

	Option A	Option B	Option C
Mean	40.1612001	42.06235254	32.21738673
Standard Deviation	36.12880285	54.74094002	31.49610484

The amount that an individual would pay for the protection of the biodiversity may be linked to the highest educational degree of the person in question. The following table represents the mean WTP of individuals classified according to their education. As it can be seen from the table, these two parameters are positively correlated, which means that with the increase of educational level the WTP also increases and vice versa. Therefore, the respondents with lowest education have a WTP of 18,12 EUR while the ones with PhD degrees have a WTP estimated at 33,33 EUR.

Table 3. Willingness to pay for biodiversity protection vs. educational level

	Elementary	High school	Bachelor	Masters	PhD
Mean	18.11594203	15.1441094	31.48643348	33.88888889	33.33333333
Standard Deviation	25.61981091	19.59675313	43.76041381	47.02245327	15.27525232

The respondents in the survey provided information about their annual income levels. There were three groups developed for this indicator, where Annual Income 1 comprise people with low income, Annual Income 2 - average income and Annual Income 3 group - high income. The table below represents the WTP of people with different annual incomes. As it can be seen the annual income is positively correlated to the willingness to pay for protection of the biodiversity.

Table 4. Willingness to pay for biodiversity protection vs. annual income

	Annual Income 1	Annual Income 2	Annual Income 3
Mean	14.16687371	18.71287006	48.81119663
Standard Deviation	17.05735831	25.33094997	54.7765079

Finally, the WTP may differ depending on the gender of the respondent. The obtained results indicate that the male population is willing to pay slightly more than the female population for the protection of the biodiversity in the region.

Table 5. Willingness to pay for biodiversity protection vs. gender

	Male	Female
Mean	26.84138486	22.95343745
Standard Deviation	39.05280929	33.3894753

Given the mean willingness to pay for both countries, there can be calculated the total value of the biodiversity as an ecosystem services for the two countries and in general for the people who live in the area of interest. According to the Statistical Office of Albania, in the town of Pogradec there are total of 8.869 housing units (Instat.gov.al, 2016) and according to the State Statistical Office of Macedonia there are total of 27.325 housing units in Ohrid (Stat.gov.mk, 2016). Having in mind that the survey asked respondents how much are they willing to pay per year, per household for the protection of the biodiversity in Lake Ohrid area, than by multiplication of the total number of housing units and the obtained WTP, one may derive the total value of the protection of the biodiversity as an ecosystem service generated by the lake. The next table shows the values for Macedonia, Albania, as well as for the entire population living in the area.

Table 6. Willingness to pay, housing units and total economic value in Macedonia and Albania

	Housing Units	WTP	Total Value
Macedonia	27325	29.31	800,895.75 €
Albania	8869	19.87	176,227.03 €
Macedonia and Albania	36194	24.59	890,010.46 €

As it can be seen from the table above, the total economic value of the biodiversity for Macedonia, i.e. the municipality of Ohrid has been estimated at 800.895,75 EUR per year, while for Albania, i.e. the town of Pogradec at 176.227,03 EUR per year. The total economic value of the biodiversity for the population living near the Lake Ohrid in both Albania and Macedonia has been estimated at 890.010,46 EUR per year.

5. CONCLUSIONS

Lake Ohrid and its surrounding is famous for its natural beauty, the high biodiversity and endemism worldwide. However, due to an increased anthropogenic impact on the lake and its watershed, the eutrophication of the lake is increasing while simultaneously the pollution of its surroundings is raising as well. This is the first alarm that should be noted by decision-makers, encouraging them to take actions in order to protect the environment, to protect the biodiversity and to ensure lasting quality of this amazing place on Earth. All of this can be attained in cooperation with the people who live in this area.

The goal of this study has been to estimate the total economic value of the biodiversity as an ecosystem service for the population that lives near the lake in both countries. During the determination of the total economic value of the biodiversity a contingent valuation method has been undertaken during February 2016, whereby 300 participants were directly asked about their willingness to pay for the protection of the biodiversity. Surprisingly it has been discovered that the majority of the respondents were willing to pay for this cause, i.e. 202 out of the 300 respondents. Overall, the mean willingness to pay has been estimated at 24,59 EUR per year, per household for both Macedonians and Albanians. However, it has been found out that the willingness to pay for protection of the biodiversity is higher in Macedonia, where it has been estimated at 29,31 EUR while in Albania it has been 19,87 EUR. This may be due to the fact that Lake Ohrid is the largest and most famous tourist place in Macedonia, while in Albania there

are other places which generate ecosystem services that might be considered as more valuable by the population.

The gender and mode of payment did not affect the willingness to pay significantly, but the educational level and income level played a significant role in the determination of the WTP. In fact, the educational level, income level and WTP have been in positive correlation.

Having in mind the high interest for paying for protection of the biodiversity in the region, it can be concluded that an introduction of local annual tax that will be collected by the local (municipal) tax office may be implemented by the authorities, hence generating funds for the protection of the biodiversity loss in the region.

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