Do Agents' Characteristics Affect their Valuation of 'Common Pool' Resources? A Full-Preference Ranking Analysis for the Value of Sustainable River Basin Management

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Abstract

In this paper we develop a full-preference ranking Choice Experiment (CE) designed to investigate how respondents evaluate a set of proposed improvements towards sustainable river basin management, as per the prescriptions of the European Union-Water Framework Directive (2000). The CE is applied in the Asopos River Basin (ARB) in Greece. Our interest is to test whether residency in the river basin, or otherwise, affects the preferences of the relevant agents. We first estimate a rank-ordered logistic regression based on a full set of choices in order to calculate the willingness to pay (WTP) of respondents for each one of the three attributes considered in the CE (i.e., environmental conditions, impact on the local economy and changes in the potential uses of water). The model is initially estimated for the full sample and then re-estimated twice for two sub-samples: the first one only includes the residents of Athens and the second only includes the residents of Asopos. Afterwards, we examine the effect of various demographic and socio-economic factors (such as income, gender, age, employment and education) on the estimates of our model in order to reveal any differences among respondents with different characteristics, mainly focusing on whether they reside or have personal experience of the RB under valuation. Thus, our analysis simultaneously provides a robustness check on previous findings in the literature and additional information about how various demographic and socio-economic characteristics affect the evaluation of the selected attributes.

Keywords: Choice experiment, Full-preference ranking, Asopos River Basin, Water quality and quantity, Water Framework Directive, Willingness to pay (WTP).

JEL Classification: Q25, Q51, Q53.

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A first analysis of the data used in this paper, using a different econometric model to estimates reference structure, was presented in: Koundouri, P., and N. Papandreou (editors); M. Stithou (assistant editor), 2013. Water Resources Management Sustaining Socio-Economic Welfare: The Implementation of the European Water Framework Directive in Asopos River Basin in Greece. ***Springer Publishing**, **Global Issues in Water Policy, Series***. ISBN: 978-94-007-7635-7 (Print) 978-94-007-7636-4 (Online) (181 pages) http://link.springer.com/book/10.1007/978-94-007-7636-4

1. Introduction

The quality and quantity of water resources in countries of the European Union (EU) is far from satisfactory. The European Commission (CEC 2002), has reported that pollution represents a serious threat for 20% of all surface water in the EU. On the other hand, groundwater supplies 65% of all Europe's drinking water. Nevertheless, 50% of all European wetlands are considered in "endangered status" due to groundwater over-exploitation and 60% of European cities overexploit their aquifers. This can be explained because there is an increasing demand for water and related ecosystem services. For example, since 1985 irrigated land in Southern Europe has increased by 20% increasing at the same time water scarcity in Europe.

All the above mentioned problems lead to creation of a very important piece of legislation: the EU Water Framework Directive (WFD) 2000/60/EC. Its main aim is to secure water resources for future generations. This "sustainability objective" is also part of United Nations (UN) Agenda 2030, launched in September 2015 and endorsed by almost all states in the world. The UN Agenda 2030 aims to promote practical problem solving for sustainable development, including the design and implementation of the Sustainable Development Goals (SDGs). Of particular importance for this research is goal 6 that is concerned with ensuring "availability and sustainable management of water and sanitation for all." The target 6.3 is particularly relevant since it aims to improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals by 2030. Also important is the target 6.4 that aims to increase water-use efficiency across all sectors and ensure sustainable withdrawals to address water scarcity.

It should be noted that the WFD follows an integrated environmental management approach. The integrated approach includes water quality and quantity, and issues related to both surface and groundwater. The river basin is the new water management unit reflecting the situation in the natural environment. According to the WFD, all EU Member States, including Greece, were obliged to restore and upgrade the quality and quantity of their water resources to a good environmental status and to ensure their use was sustainable by 2015. However, such condition was not met and will be reconsidered in 2017. Failure to successfully implement the WFD involves serious penalties.

In addition, the WFD required the creation and development of 'River Basin Management Plans', that should include all the measures necessary to ensure the protection of all European waters in each river basin. Under the WFD a single competent authority is in charge of the implementation of the environmental objectives of the directive in each River Basin District. This ensures decision-making consistency, and procures that the integrated water management objective is achieved, in terms of co-ordinated protection of all waters (EC 2000). The WFD is aimed to creating an efficient situation between ecology and economy at the appropriate geographical scale and achieving a sustainable and integrated water resource management. There are eight key objectives of the WFD (Chave 2001 and EC 2002) that include:

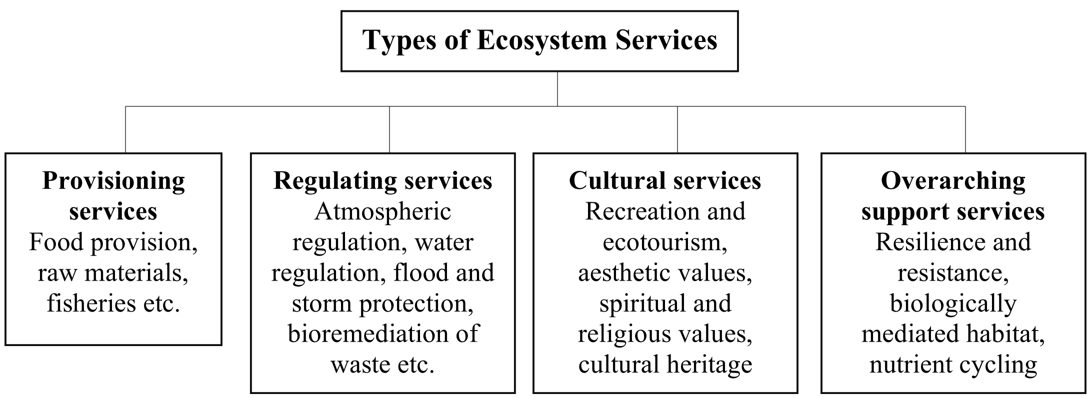
1. Protection of all water resources (including rivers, lakes, coastal waters and groundwater).
2. The establishment of ambitious targets to ensure that all waters would achieve "good environmental status" by 2015.
3. The prevention of pollution at source.
4. Active participation of all stakeholders in water management activities.
5. Establishment of efficient and equitable water pricing policies.
6. The implementation of the polluter pays principle.
7. Balancing of the interests of the environment with those who depend on it and

8. The design of a management plan on river basin level and the finalization of the "River Basin Management plan" for each river basin district within a determined timeframe

The recovery of the total economic cost of water services is at the hearth of the WFD´s water resources management. Article 9 states that all EU Member stated "shall take account of the principle of recovery of the costs of water services, including environmental and resource costs" (EC, 2000: 12). Resource costs are those required to cover water demand under water deficits due to the overexploitation of water resources. The environmental cost reflects social welfare losses associated with water quality deterioration. The cost recovery of different water services should be analysed for different water uses, which should be at least disaggregated into households, industry and agriculture. However, according to the Commission's Compliance Report (EC, 2007: 34) one of the main shortcomings in the implementation of the WFD is its economic assessment. Although all EU member states sent country reports (in accordance with Article 5), the majority did not present information on cost recovery. This reflects the informational asymmetry and methodological difficulties that member states face when implementing the economic elements of the WFD.

This paper builds on the growing literature concerned with the estimation of the Total Economic Value (TEV) of water ecosystems. The WFD establishes that TEV estimations should be included in the design of river basin plans (EC 2000). From an economic perspective, natural resources provide a diverse array of goods and services that translate into economic services and values to the human population (For further discussion see the seminal work by Costanza *et al* (1997) and Daily (1997) and the literature mentioned in the following paragraph). Figure 1 shows a classification of ecosystem goods and services.

Figure 1. Classification of ecosystem goods and services

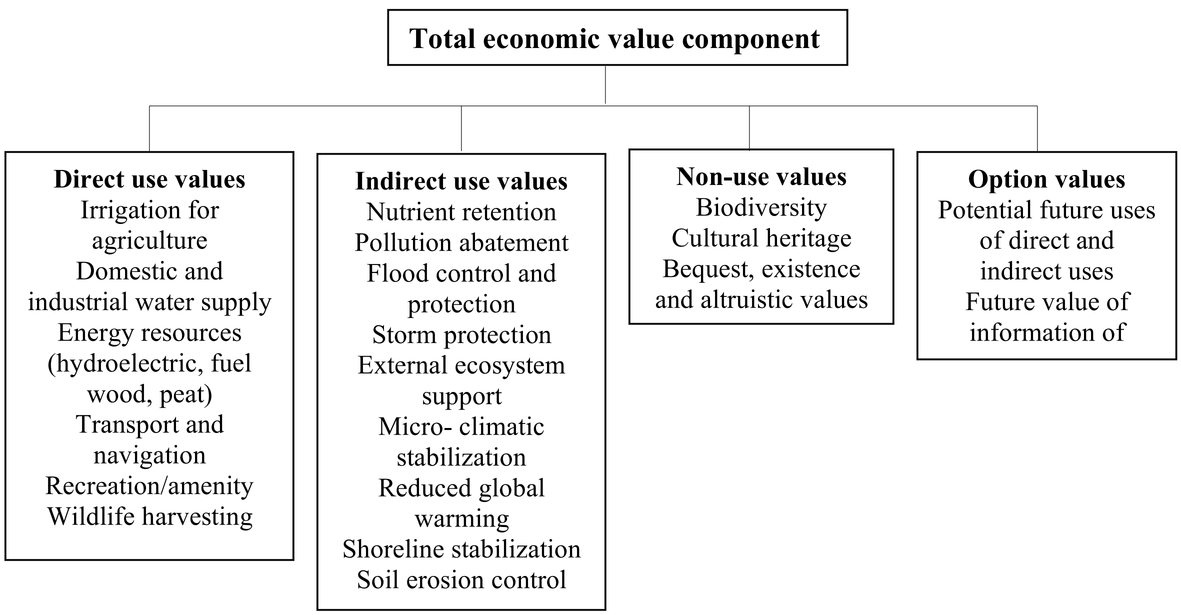


Source: Remoundou *et al.* (2009).

On the other hand, the concept of TEV can be understood as the sum of all economic values that result from an environmental resource. The resource under evaluation can be defined in terms of its use and non-use values. The use value component refers to the set of benefits individuals derive from using the resources, while non-use values reflect the values individuals attach to an environmental resource even if they themselves do not use it (for more applications of the TEV concept in the context of the WFD see Birol *et al* 2006a; Birol *et al* 2006b; Groom and Koundouri 2011; Hanley *et al* 2006; Koundouri *et al* 2016, etc.). The categorization and economic values generated from water resources are summarized in Figure 2.

Our study is based on the results of a full-preference ranking Choice Experiment (CE) designed to investigate how respondents evaluate a bundle of proposed improvements in the Asopos water catchment in accordance to achieving the targets of the European Water Framework Directive, which are consistent, in principle, with the relevant targets defining the United Nations 2030 Agenda on Sustainable Development Goals. The CE focuses on three attributes: environmental conditions, impact on the local economy and changes in potential water uses. Our goal is twofold: First, we estimate the willingness to pay of respondents for each one of the three attributes considered in the CE using a rank-ordered logistic regression. Second, we investigate the effect of numerous demographic and socio-economic factors on the estimates of our model. In this way, we reveal how each one of the factors under scrutiny affects the evaluation of the selected attributes. Our analysis uses the full set of choices by respondents in an attempt to take advantage of all information available in the dataset.

Figure 2. Total economic value of water resources



Source: Adapted from Birol *et al*. (2006a)

The layout of this paper is as follows: Section 2 presents the case study, Section 3 describes the dataset and the methodology, while Section 4 reports the empirical findings and the policy implications of our analysis. Finally, Section 5 concludes.

2. The Case Study

Asopos is a 57 km long river in Greece that runs across Boeotia and Attica. The catchment of the river covers an area of 724 km^2 and hosts numerous rare habitats and bird species, many of which are protected by EU legislation. Many tourists who organize various recreational activities also visit the local area. It is worth mentioning that more than one third of the total residences in the ARB serve as a second residence for their owners.

Unfortunately, this area of unique natural beauty, which supports a rich ecosystem that creates the perfect environment for the wildlife, is nowadays environmentally degraded due to unregulated human activities. A major source of environmental degradation is related to the industrial activities that are taking place in the areas nearby the Asopos River. Pollution became a hazard for the health of local residents and visitors, while farmers started to worry about the effect of contamination on their agricultural production. Protests by the local population raised public awareness and put pressure on the government and the local authorities to take action and investigate the severity of the problem. This also attracted the interest of academic researchers.

Table 7 shows information from the literature in order to compare our main WTP findings with the results from other similar studies in the area. Dimaras *et al.* (2010) and Papadiochou *et al.* (2011) applied the Contingent Valuation Method in order to obtain willingness to pay (WTP) estimates for improvements in the groundwater resources of the Asopos area. The former study focuses on local residents, while the latter uses a sample of households in Athens. The analysis of Dimaras *et al.* (2010) concludes that households in the Asopos area are willing to pay €400 per year to an independent management organization, while the relative estimated WTP for households in Athens by Papadiochou *et al.* (2011) is €45 per year. Laoudi *et al.* (2011) is another study that analyses the economic damage of groundwater degradation in the Asopos area. The study examines the cost of developing alternative methods for the provision of drinking water to local communities. On the other hand, Louzidou (2009) investigates the cost of constructing a Central Wastewater Processing Unit for the industrial and domestic waste of the Avlonas region in Attica. Finally, Koundouri *et al.* (2012) estimate the WTP for a number of improvements in the Asopos RB for residents in Athens and the Asopos area. In general, their analysis does not reveal any significant differences between the WTP estimates of the two populations. Tentes and Damigos (2012) used the Contingent Valuation Method in order to estimate WTP for the remediation of polluted groundwater in the Asopos River Basin. It should be noted that our WTP estimates are very close to theirs.

3. Data and methodology

The initial dataset consists of the results of a full-preference ranking choice experiment that was conducted from September to October 2011 by trained interviewers of the Athens University of Economics and Business. Quota sampling was followed according to the 2001 Greek Census data. The final sample included 150 respondents from the ARB and 150 respondents from Athens.[1]

The standard five steps for the design of a survey for a CE were followed: selection of desired attributes, definition of levels, choice of the experimental design, construction of choice cards to present to respondents and measurement of preferences (for more information on the design of CEs see: Alpizar *et al*, 2003; Birol and Koundouri 2008; Hanley *et al* 2001; Johnson *et al,* 2013; Scarpa *et al*., 2011).

The experiment focused on the following three attributes that are often identified in the literature as impacted by the degradation of a region: environment, local economy and human

[1] A preliminary analysis of the data is available in: "Water Resources Management Sustaining Socio-Economic Welfare: The Implementation of the European Water Framework Directive in Asopos River Basin in Greece". Springer Publishing, Global Issues in Water Policy, Series ISBN: 978-94-007-7635-7 (Print) 978-94-007-7636-4 (Online).

health. The experiment assumes that the current status (*status quo*) of the environmental conditions is bad, the impact on the local economy is negative and the water is not suitable for drinking, cooking or irrigation. For each attribute, two levels of improvement were defined. Specifically, the environmental conditions can become moderate or good, the status of the local economy can be improved by 2015 or improve even further and become positive by 2027 and the water can become suitable for some uses (i.e. drinking and cooking) or for all uses (i.e. drinking, cooking and irrigation).[2] Finally, the experiment assumes five levels of cost (these are 2, 4, 6, 8 or 12 Euros) associated to various sets of improvements and collected every three months through the water bill. Respondents were told that an independent body would assure that the collected funds were spent on the improvement of the environmental conditions in the ARB.[3]

A personal interview was scheduled with each selected respondent. The interviewer presented a set of five choice cards to the respondent who was instructed to follow the following sequential choice process: First, the respondent chose the most preferred alternative, y^{1b}, out of the initial five alternatives in the choice set. This best alternative was then excluded from the choice set and the respondent was asked to select the least preferred out of the remaining four, y^{1w}, which was also excluded. This process was repeated for the remaining three alternatives from which the respondent selected the second most preferred out of the remaining three, y^{2b}, and finally the second least preferred out of the remaining two cards, y^{2w}. The remaining card represents the residual alternative, y^{r}, and by implication is ranked 3 of the original 5. This approach, known as the "repeated best-worst" approach, provides a full preference ranking of the alternatives in each choice set ($y^{1b} > y^{2b} > y^{r} > y^{2w} > y^{1w}$). Contrary to alternative approaches, the "repeated best-worst" approach is believed to help respondents to better rank their preferences (Scarpa *et al*., 2011).

As stated before, the objective of our study is twofold. First, the study aims to estimate marginal WTP for different attributes and attribute levels as described in the scenarios presented to the respondents. Second, this study also examines whether groups of respondents with different demographic and socio-economic characteristics have different attitude towards the four attributes under scrutiny. In an attempt to take advantage of the full set of information available to us, the analysis presented here uses the whole set of repeated best/worst observations. So, the pseudo-choice sets used here were 60 for each respondent.

The utility gains from increasingly larger improvements on the three attributes under scrutiny are determined by means of a piece-wise linear coding. Given that the choice experiments allows for level of gradual improvements, the coding we follow is (0,0) for the status quo, (1,0) for the first level of improvement and (1,1) for the second level of improvement. Thus, the estimated coefficient for the second level of improvement measures the additional utility effect beyond that captured by the estimated coefficient of the first level of improvement.

A preliminary examination of the dataset revealed some respondents that displayed a serial non-participation choice behaviour. In other words, some respondents consistently chose the status-quo condition across all 12 first best decisions on the full set choice tasks. For these serial non-respondents the alternative to the status-quo offering various improved scenarios were

[2] It should be mentioned that this classification has to do with the quantity and not the quality of the water. This is why the first level of improvement corresponds to drinking plus cooking and the second level of improvements adds irrigation that requires additional amounts of water.

[3] A more detailed description of the design of the choice experiment can be found in Koundouri *et al.* (2012).

never sufficiently appealing to motivate a payment. We, therefore, choose to exclude all the serial non-respondents from our analysis. For the remaining respondents, we first estimate our model thrice; once for the full sample and once for each of the two sub-populations of beneficiaries (inhabitants of Athens and Asopos). Estimates of WTPs for the different levels of policy attributes are then derived from each of these models. Finally, we investigate the effect of various demographic and socio-economic characteristics on how people form their values related to the same set of proposed categories of improvement.

4. Theoretical framework, empirical findings and policy implications

We first outline the theoretical framework of the utility maximization model. Let us denote by Y_{ij} the rank that respondent *i* attributes to item *j*. When there are *J* items, Y_{ij} can take an integer value from 1 to J, where 1 is the best rank and J is the worst rank. According to the Random Utility Model (RUM), respondent *i* will choose item *j* over item *k* if she believes that the utility associated with item *j* exceeds the utility associated with item *k* ($U_{ij} > U_{ik}$). U_{ij}'s are the sum of a systematic component, μ_{ij}, and a random component, ε_{ij}, that is,

$$U_{ij} = \mu_{ij} + \varepsilon_{ij}.$$

Under typical assumptions of a sequence of independent logit choice probabilities, each full ranking gives the following product of logits:

$$\Pr[y^{1b} > y^{2b} > y^{r} > y^{2w} > y^{1w}] = \frac{\exp(v^{1b})}{\sum_{j \in 1b,2b,r,2w,1w} \exp(v^{j})} \times \frac{\exp(v^{2b})}{\sum_{j \in 2b,r,2w,1w} \exp(v^{j})} \times \frac{\exp(v^{r})}{\sum_{j \in r,2w,1w} \exp(v^{j})} \times \frac{\exp(v^{2w})}{\sum_{j \in 2w,1w} \exp(v^{j})},$$

where *v* denotes the indirect utilities of the relevant alternatives.

The RUM implies the following Likelihood Function, L_i, for each respondent *i*:

$$L_i = \prod_{j=1}^{J} \frac{\exp(\mu_{ij})}{\sum_{k=j}^{J} \exp(\mu_{ij})}.$$

Each term of the product has the form of the conditional logit model.

To anticipate our key results, our estimates for the WTP are qualitatively similar to those of Koundouri *et al.* (2012). However, our WTP estimates are substantially higher revealing a stronger willingness by respondents to finance environmental revitalization and conservation activities in the ARB. When it comes to the sensitivity of the estimated coefficients on various demographic and socio-economic characteristics, we find strong evidence that suggest that some socio-economic factors (e.g. income and especially gender, age and education) affect most of our estimates and especially the cost coefficient. Unemployment is also highlighted as a crucial factor that generates statistically different estimates. Moreover, respondents who are employed in tourism and people who frequently visit the Asopos area seem to have a different attitude towards the proposed improvements in the area compared to all other respondents. Finally, the place of living (Athens or Asopos) affects only how people evaluate the improvements on the environmental conditions.

Let us now focus on the estimation results from the full sample (all respondents) reported in Table 1. The coefficient for the *status quo* is not statistically significant indicating that there is no systematic incentive to stay with the current condition and avoid the proposed alternative scenarios (this is also the case when we estimate our model based on a sample that includes serial non-respondents). On the other hand, we obtain a negative and significant coefficient for the cost (equal to -0.088) and therefore we can use the estimated model to calculate welfare estimates.

Turning to the remaining estimates, we would expect to find positive signs in all coefficients. This is indeed the case. The only exception is the coefficient for the extreme improvement of the local economy (by the year 2027) which is negative but statistically insignificant. This means that respondents give no extra value to the additional marginal effect for the 2027 scenario. As argued by Koundouri *et al.* (2012), a possible explanation for this is that 2027 might be too far away in time for most respondents to be able to relate to it, or perhaps it was not clear in most respondents' mind that it implied the 2015 target, or perhaps their discount rate is such that makes the net present value of benefits of these improvements insignificant. Finally, the estimated marginal WTP for the first level of improvement in the local economy (by the year 2015) is €6.69, while the corresponding 95% confidence interval ranges from €5.24 to €8.14.

As far as the remaining two attributes are concerned (that is, environmental condition and human health), our findings suggest a significant increase in the utility in the moderate improvement levels. The estimated marginal effect is as high as €18.46 and €11.84 for the environmental condition and the human health respectively. These figures are further increased by €5.53 and €14.77 when we consider the case of an extreme improvement in the environmental condition and the human health respectively. It is interesting to note that the estimated marginal effect of extending water uses from "some uses" to "all uses" (that suggests water suitable for irrigation too) is higher than the marginal effect of the first level of improvement. This clearly reveals the importance to respondents of achieving the highest possible level of improvements in the quality of the river's water. In the case of environmental conditions, the additional increase in the utility effects from the moderate to the extreme improvement level is smaller but significant even when we account for the uncertainty that surrounds our estimates. To be more specific, the calculated 95% confidence interval indicates that the upper bound for the marginal effect for the first level of improvement in the environmental condition is €20.41 which is lower than €22.26 (calculated as (18.46+5.53)-1.96*0.88) that corresponds to the lower bound of the 95% confidence interval for the extreme level of environmental improvement.

We now turn our attention to the estimated models for the Athens and Asopos sub-samples reported in Table 2 and 3 respectively. In both cases, the findings are qualitatively similar to those for the full sample. In other words, the coefficients for the *status quo* and the extreme improvement of the local economy are both statistically insignificant. The cost coefficient is negative, while all other estimated coefficients are positive and significant. However, we also observe some differences between the two estimated models. Respondents from Asopos seem to have slightly higher marginal effects for a moderate level of improvement in environmental conditions and human health compared to respondents from Athens. For example, the WTP estimate for the local residents of Asopos to achieve a moderate improvement in the quality of water is €18.67 compared to €18.31 for those living in Athens. However, respondents from Athens show a higher WTP for achieving the highest level of improvement in the aforementioned two attributes. Although our findings are, in general, qualitatively similar to those reported in Koundouri *et al.* (2012), our WTP estimates are significantly higher revealing a stronger willingness by all respondents (i.e. residents of both Athens and Asopos) to support the environmental improvements in the Asopos RB (see Table 7).

In what follows, we perform a series of Wald tests in order to investigate whether various demographic and socio-economic characteristics affect the attitude of respondents towards the four attributes considered in our analysis. Under the null hypothesis, there is no difference in the behaviour of groups of respondents with different characteristics. We first examine whether the place of living of the respondent has an effect on the way she evaluates each one of the four attributes. The results, given in Table 4, reveal no differences between residents of Athens and residents of Asopos. The only exception is when it comes to improvements in the environmental condition as suggested by the low p-value of the test (0.033) that leads to the rejection of the null hypothesis. We also divided respondents based on whether they are visitors of the Asopos lagoon, the Asopos estuary or the coastal zone. The results in Table 4 suggest that the estimate for the cost coefficient is not statistically different in all cases. However, it seems that the coefficients for the impact on the local economy and the human health depend on whether the respondent is a visitor or not of either the Asopos lagoon or the Asopos estuary. Moreover, the estimated coefficients for the environmental conditions are statistically different for respondents who visit either the Asopos estuary or the coastal zone.

Next, we examine the effect of kind of employment and employment status on our estimates. We consider four fields of employment: agriculture, industry, tourism, while all other fields of employment form the fourth group. On the other hand, we analyse the effect of employment status on our results. The results, reported in Table 5, clearly show that employment status (being employed or not) affects the estimated coefficients in all four attributes. In other words, there are statistically significant differences in ranking preferences between the employed and unemployed groups of respondents. By field of employment, we can observe that the group of respondents employed in tourism show a significant difference in the attitude towards the attribute concerned with the impact on local economy than the other respondents. Furthermore, respondents employed in industry generate a significantly different cost coefficient. As expected, the farmers in our sample appear to have a different attitude towards the human health factor, since the quality of water is crucial for them. A similar finding holds for respondents included in the "all other fields" group.

Finally, we focus on various socio-economic characteristics, namely income, gender, age and education. The results presented in Table 6 highlight that the aforementioned characteristics affect almost all estimated coefficients. More in detail, all four socio-economic characteristics generate different cost coefficients (i.e. different socioeconomic groups have different preferences). Please note that three out of four characteristics (education is the exception) affect the estimates for the environmental condition. There are significant differences in preferences according to gender and the level of education in relation to the estimated coefficients that capture the impact on the local economy, while the age and the education influence the estimates for the human health attribute.

Our results have direct policy implications for decision makers when they evaluate new initiatives for the environmental revitalization of the Asopos RB. Specifically, decision makers should take into account the significant role played by people's attitudes and concerns about the environmental condition of the Asopos RB when designing policies. For example, our results suggest that respondents place high economic value on achieving the highest possible level of improvements in the quality of the river's water. Thus, fees in water bills should only be implemented together with effective policies targeting a fast improvement in the quality of Asopos' water. Moreover, policy makers should consider the socio-demographic characteristics of households to target policy measures, since our findings indicate that specific demographic and socio-economic characteristics have a significant effect on the WTP. Finally, policy makers should engage in targeted information campaigns aiming to raise awareness of groups of people (with particular socio-economic and demographic characteristics) who show low WTP. This can significantly affect public support.

5. Conclusions

A full-preference ranking choice experiment was used in order to estimate WTP for environmental improvements in the Asopos River Basin. Demographic and socio-economic factors as well as the place of living (Athens or Asopos) affect how people evaluate improvements on the environmental conditions. The estimated monthly WTP for a moderate improvement in the environmental status of the Asopos River Basin area was €18.67 among Asopos residents and € 18.31 among Athens residents. Our findings can assist policymakers in the development of proper socio-economic instruments to select an efficient pricing system for the implementation of various environmental improvements in the region. The results are also relevant for the implementation of sustainable river basin management in the Asopos catchment consistent with the EC WFD and the Agenda 2030 Sustainable Development Goals. Moreover, the adopted framework of analysis can be adopted for deriving policy recommendations for the facilitation of the sustainable -environmentally resilient, economically viable and socially equitable- river basin management anywhere in the world.

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Table 1: Model for the full sample (Asopos and Athens)

	RUM estimates			Marginal WTP estimates					
	Coeff.	St. Error	*z*-value	Coeff.	St. Error	*z*-value	*p*-value	95% conf. int.	
Status Quo ASC	-0.025	0.038	-0.670	-0.58	0.85	-0.68	0.50	-2.25	1.09
Env. Moderate	0.812***	0.033	24.670	18.46	0.99	18.57	0.00	16.51	20.41
Env. Good	0.243***	0.035	6.940	5.53	0.88	6.27	0.00	3.80	7.26
LocalEcon Improved2015	0.294***	0.031	9.600	6.69	0.74	9.02	0.00	5.24	8.14
LocalEcon Positive2027	-0.003	0.031	-0.110	-0.08	0.70	-0.11	0.91	-1.44	1.29
Water for some uses	0.521***	0.031	16.550	11.84	0.66	17.98	0.00	10.55	13.13
Water for all uses	0.650***	0.042	15.540	14.77	1.31	11.25	0.00	12.20	17.34
Cost	-0.088***	0.004	-23.470						
Log likelihood function =	11941.55		N=	14400					

Note: * p-value<0.10; ** p-value<0.05; *** p-value<0.01

Table 2: Model for Athens

	RUM estimates			Marginal WTP estimates					
	Coeff.	St. Error	*z*-value	Coeff.	St. Error	*z*-value	*p*-value	95% conf. int.	
Status Quo ASC	0.014	0.052	0.270	0.35	1.28	0.27	0.79	-2.17	2.86
Env. Moderate	0.734***	0.044	16.700	18.10	1.47	12.35	0.00	15.23	20.98
Env. Good	0.347***	0.048	7.160	8.55	1.39	6.15	0.00	5.83	11.28
LocalEcon Improved2015	0.338***	0.043	7.820	8.33	1.16	7.17	0.00	6.05	10.61
LocalEcon Positive2027	0.015	0.043	0.360	0.38	1.06	0.36	0.72	-1.69	2.45
Water for some uses	0.456***	0.043	10.730	11.25	0.97	11.56	0.00	9.35	13.16
Water for all uses	0.701***	0.057	12.290	17.29	2.06	8.37	0.00	13.24	21.33
Cost	-0.081***	0.005	-15.970						
Log likelihood function =	-6242.04		N=	7500					

Note: * p-value<0.10; ** p-value<0.05; *** p-value<0.01

Table 3: Model for Asopos

	RUM estimates			Marginal WTP estimates					
	Coeff.	St. Error	*z*-value	Coeff.	St. Error	*z*-value	*p*-value	95% conf. int.	
Status Quo ASC	-0.075	0.056	-1.340	-1.57	1.12	-1.39	0.16	-3.77	0.63
Env. Moderate	0.899***	0.050	18.090	18.67	1.34	13.95	0.00	16.05	21.29
Env. Good	0.131***	0.051	2.580	2.73	1.12	2.45	0.01	0.55	4.92
LocalEcon Improved2015	0.248***	0.044	5.650	5.14	0.94	5.44	0.00	3.29	6.99
LocalEcon Positive2027	-0.025	0.044	-0.580	-0.53	0.91	-0.58	0.56	-2.32	1.26
Water for some uses	0.593***	0.047	12.710	12.31	0.89	13.90	0.00	10.57	14.05
Water for all uses	0.595***	0.062	9.670	12.37	1.66	7.44	0.00	9.11	15.63
Cost	-0.096***	0.006	-17.250						
Log likelihood function =	-5690.28		N=	6900					

Note: * p-value<0.10; ** p-value<0.05; *** p-value<0.01

Table 4: Effect of place of living/visit experience on our results

	Place of living	
	Wald Statistic	p-value
All attributes	18.180	0.011
Environmental Condition	6.840	0.033
Impact on local economy	2.990	0.224
Human health	0.510	0.774
Cost	1.050	0.305
	Visitor of Asopos lagoon	
	Wald Statistic	p-value
All attributes	63.020	0.000
Environmental Condition	3.680	0.158
Impact on local economy	31.060	0.000
Human health	35.040	0.000
Cost	1.980	0.160
	Visitor of Asopos estuary	
	Wald Statistic	p-value
All attributes	19.020	0.008
Environmental Condition	6.050	0.049
Impact on local economy	10.150	0.006
Human health	6.300	0.043
Cost	0.380	0.539
	Visitor of coastal zone	
	Wald Statistic	p-value
All attributes	13.270	0.066
Environmental Condition	5.100	0.078
Impact on local economy	0.130	0.935
Human health	4.040	0.133
Cost	0.590	0.441

Table 5: Effect of employment on our results

	Employed in agriculture	
	Wald Statistic	p-value
All attributes	20.370	0.005
Environmental Condition	1.480	0.476
Impact on local economy	2.570	0.276
Human health	13.830	0.001
Cost	0.880	0.348
	Employed in industry	
	Wald Statistic	p-value
All attributes	22.700	0.002
Environmental Condition	1.800	0.406
Impact on local economy	0.900	0.639
Human health	0.560	0.756
Cost	12.740	0.000
	Employed in tourism	
	Wald Statistic	p-value
All attributes	27.460	0.000
Environmental Condition	0.820	0.665
Impact on local economy	11.260	0.004
Human health	5.130	0.077
Cost	5.100	0.024
	Employed in any other field	
	Wald Statistic	p-value
All attributes	20.900	0.004
Environmental Condition	3.260	0.196
Impact on local economy	2.980	0.226
Human health	6.570	0.038
Cost	2.430	0.119
	Unemployed	
	Wald Statistic	p-value
All attributes	36.260	0.000
Environmental Condition	14.090	0.001
Impact on local economy	5.200	0.074
Human health	22.340	0.000
Cost	6.260	0.012

Table 6: Effect of socio-economic characteristics on our results

	Income	
	Wald Statistic	p-value
All attributes	63.990	0.000
Environmental Condition	5.340	0.069
Impact on local economy	4.340	0.114
Human health	0.560	0.756
Cost	38.860	0.000
	Gender	
	Wald Statistic	p-value
All attributes	22.280	0.002
Environmental Condition	8.820	0.012
Impact on local economy	5.440	0.066
Human health	4.110	0.128
Cost	4.020	0.045
	Age group	
	Wald Statistic	p-value
All attributes	70.080	0.000
Environmental Condition	44.610	0.000
Impact on local economy	1.680	0.431
Human health	16.980	0.000
Cost	36.300	0.000
	Education	
	Wald Statistic	p-value
All attributes	31.400	0.000
Environmental Condition	2.670	0.263
Impact on local economy	10.510	0.005
Human health	11.240	0.004
Cost	23.760	0.000

Table 7: Comparison of our estimated WTP results with other similar studies in the Asopos River Basin

	Method	Willingness to Pay for an Environmental Improvement on ARB		Periodicity and Collection Method
		Athens	**Asopos**	
This Study	Choice Experiment	€ 18.31	€ 18.67	Monthly water utility bill
Koundouri *et al* (2012)	Choice Experiment	€ 11.07	€ 11.48	Monthly water utility bill
Dimaras *et al* (2010)	Contingent Valuation Method	NA	€ 33.33	Monthly fee
Papadiochou et al. (2011)	Contingent Valuation Method	€ 3.75	NA	Monthly fee
Tentes and Damigos (2012)	Contingent Valuation Method	NA	€ 19.91	Monthly fee