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Abstract

Urban green spaces (UGS) provide multiple ecosystem services to city residents and are often their only places to spend time in a natural environment. Rapid urbanisation poses difficult choices for city planners who frequently decide to prioritise built infrastructure over retaining or enhancing green spaces, not least because the value of green spaces is rarely recognised in policy and planning processes. This is particularly true in developing countries which face rapidly growing populations and trade-offs between the growing demand for built infrastructure and access to nature. We address the value of public UGS using both a monetary approach and a non-monetary approach. A Contingent Valuation (CV) survey was used to elicit householders´ willingness-to-pay (WTP) for three different scenarios to enhance public UGS provision in Bishkek, Kyrgyzstan. Scenarios were based on ongoing public debates on how to address the degradation and loss of existing park areas and on current plans to build new parks. The same survey also employed the Nature Relatedness (NR) scale, which measures individual cognitive attachment to nature, as a non-monetary valuation approach. Our findings showed that a high attachment to nature does not necessarily lead to higher WTP for improved provision of public UGS as WTP is constrained by household characteristics such as income, education and household size. We concluded that monetary valuation techniques could potentially underestimate the value attached to UGS by some population groups (e.g. rural migrants and pensioners) that attach great importance to UGS but whose values are not reflected in a high WTP. Thus, we argue that the assessment of the value of UGS would benefit from combining monetary and non-monetary approaches under various institutional contexts; and that this would be particularly important for cities in developing countries.

1. Introduction

Today, over half of the world's population lives in urban areas. This proportion is predicted to increase to around 60% by 2030 (UN, 2016). Urbanisation is set to take place mainly in developing countries (Rafiq *et al.*, 2016); cities also continue to expand in more developed and industrialised societies (Dallimer *et al.*, 2011). Urbanisation has a number of economic benefits including productivity growth and industrialization (Wu, 2015), innovation (e.g. Bertinelli & Black, 2004), higher income generation (Chauvin *et al.*, 2017), improved healthcare and sanitation (Frumkin *et al.*, 2017), and higher returns on investment from education (Xing, 2016). Despite the many economic and societal benefits from urbanisation, a major challenge in the coming decades will be to ensure that cities remain liveable and sustainable through the prioritisation of the well-being of their residents, including an emphasis on restoring and preserving the natural environment (Wheeler & Beatley, 2014).

One increasingly recognised way of doing this is through the provision of high quality, accessible urban green spaces (UGS). As living in a city provides less access to natural environments than living in rural areas, for most urban dwellers UGS present the only opportunity to spend time in nature. This is a problem because access to high quality UGS improves both physical and mental public health (Kouao *et al.*, 2019)(van den Berg *et al.*, 2010). UGS also provide other public goods like clean air, noise reduction, pollution control, aesthetic and cultural amenities, and water management (Bolund & Hunhammar, 1999).

Urbanisation, however, often requires a trade-off or prioritization between the retention of green spaces and alternative land uses (Lauf *et al.*, 2014). This is challenging as urban land use planning is influenced by a diversity of actors, all of whom have different preferences with regards to green versus built infrastructure (Aronson *et al.*, 2017). Accurate assessment and valuation of UGS is therefore helpful in providing evidence to urban planners and decision makers as to the full value of UGS. The results of such assessments, however, are dependent on the disciplinary orientation of how studies are undertaken. Detailed analysis by Ives and Kendal (2014) shows a clear distinction between assigned values i.e. how values are registered (e.g. through money) and underlying values i.e. perceptions and beliefs (e.g. altruistic values). The distinction is important since a survey

instrument intended to reveal an assigned value must also be designed to take into account the relevant underlying values of the target population. Further, underlying values are unlikely to be similar between studies, especially if they take place in radically different cultural contexts.

Incorporating valuations of UGS into urban planning processes has proven challenging (Jacobs *et al.*, 2015), not least because valuation of UGS is complex. Despite a growing number of studies, research has thus far been concentrated in developed countries (Kabisch *et al.,* 2015), and assessments tend to be segregated by academic discipline, utilizing only mono-disciplinary approaches (Luederitz *et al.*, 2015). For instance, studies have assessed the monetary value of UGS in terms of people´s willingness-to-pay (WTP) to improve the quality and/or quantity of UGS or to avoid degradation of UGS (Brander & Koetse, 2011). Such studies therefore focus on attached value, often without sufficient appreciation of underlying values. This potentially renders findings of limited use to planners and decision-makers working outside the particular context in which the study was undertaken. The difficulties of applying the findings of studies across wide cultural and geographical extents is further highlighted by the fact that the literature also indicates that higher WTP for UGS is associated with socio-economic and geographic factors such as income (e.g. Lo & Jim, 2010), short travel distance and accessibility, frequency of use, and education level (Latinopoulos, Mallios and Latinopoulos, 2016). Other relevant variables include age, population density and gender (del Saz Salazar & Menéndez, 2007).

The monetary valuation approach has been criticized for not accounting for the multifaceted concept of value (Spangenberg & Settele, 2016). New integrated valuation schools have emerged that look to include multiple values and worldviews (Jacobs *et al.*, 2016). According to this integrated value approach, any assessment must be multidisciplinary in nature (Ranger *et al.*, 2016). This is particularly needed in a developing country context where a purely monetary valuation might have more limited validity due to methodological and epistemological challenges (Kenter *et al.*, 2011), and the differing underlying values that are likely to be present. In developing countries, people are more directly dependent on ecosystem services, all of which do not have market prices, and this makes monetary valuation challenging (de Groot *et al.*, 2012). In Central Asia, for example, pastoralists rely heavily on livestock grazing on natural pastures. Livestock, and

livestock products, can be valued directly through market prices. However, pastoralists also have a deep underlying cultural value associated with their way of life and the landscapes in which they live. Generating appropriate values for such cultural identity is particularly challenging, not least because this type of intangible good is difficult to monetise (Leeuwen *et al.* 1994). Moreover, monetary valuation reflects the norms of capitalist history, with valuation attached to long-standing societal standards and the beliefs of developed countries (Everard *et al.,* 2016). The use of monetary valuation methods in developing countries should, therefore, be accompanied by non-monetary approaches (Raymond & Kenter, 2016). However, the choice as to which approach to use can be equally difficult, and there are currently few studies examining how monetary and non-monetary valuation of UGS might complement or contradict one another. Rather, the current literature highlights the complex relationships between the two. In some cases, metrics of self-reported psychological well-being and WTP for more biodiverse urban parks are broadly aligned (Dallimer *et al.*, 2014). Other studies have analysed the relationship between WTP for UGS and environmental attitudes through the New Ecological Paradigm (NEP) scale; built on the original approach of Dunlap & Van Liere (1978). The NEP has become the dominant measurement tool for evaluating environmental beliefs and has been widely used in different countries. However, findings on the validity of NEP used in such contexts have been mixed, with the literature divided between scholars who have found that a relationship exists between NEP and WTP (e.g. Kotchen & Reiling, 2000), and those who found no such relationship (e.g. Wilhelm-rechmann *et al.*, 2014). Moreover, the majority of such studies were conducted in developed countries, with very few from developing countries (Choi & Fielding, 2013). Empirical tests of other existing methods for measuring individual cognitive attachment to nature have revealed that, while the methodologies have many commonalities, the nature relatedness (NR) scale (Nisbet et al. 2008) was among the strongest in predicting ecological behaviour (Tam 2013), and therefore may provide a useful addition to UGS valuation studies. Thus far, however, there remains a gap in the literature on the use of methodologies, such as NR, in combination with monetary valuation, particularly in the developing world.

This paper contributes to the literature by beginning to fill this knowledge gap. To do so, we use two different approaches; one drawn from environmental economics to assess WTP for the

creation or retention of UGS, and one from environmental psychology to assess individual cognitive attachment to nature in the form of nature relatedness (NR). We examine the extent to which these two metrics vary, both among individuals and spatially within the city of Bishkek, Kyrgyzstan, in order to answer the following research questions: (1) How do WTP and NR vary, both among individuals and spatially, (2) to what extent do WTP and NR co-vary, and (3) to what extent does including both metrics in a valuation exercise enhance our understanding of the value of UGS?

2. Methodology

2.1. The Study Area

Bishkek, the capital of Kyrgyzstan, is located in Central Asia (Figure 1). Bishkek currently has a population of around 1 million, but this is predicted to increase to 3 million by 2050 (NISS, 2017). The country's residents often call their capital city 'the greenest city in Central Asia' (Penn, 2010) due to the high number of green spaces. Typically, parks were established during the Soviet times (1924 - 1991) and were intended to provide places for leisure. They are characterised by high tree density, managed lawns and flower beds, as well as benches, entertainment facilities and locations for small vendors selling food and drinks. Other green spaces established in Soviet times included 'green strips' which are found along roads. At present, urban parks are popular places of leisure among Bishkek citizens of all ages and other socio-economic characteristics (limon.kg, 2014). The city is also in close proximity to the Ala Too mountains to the south and city dwellers are increasingly visiting these mountains for leisure activities.

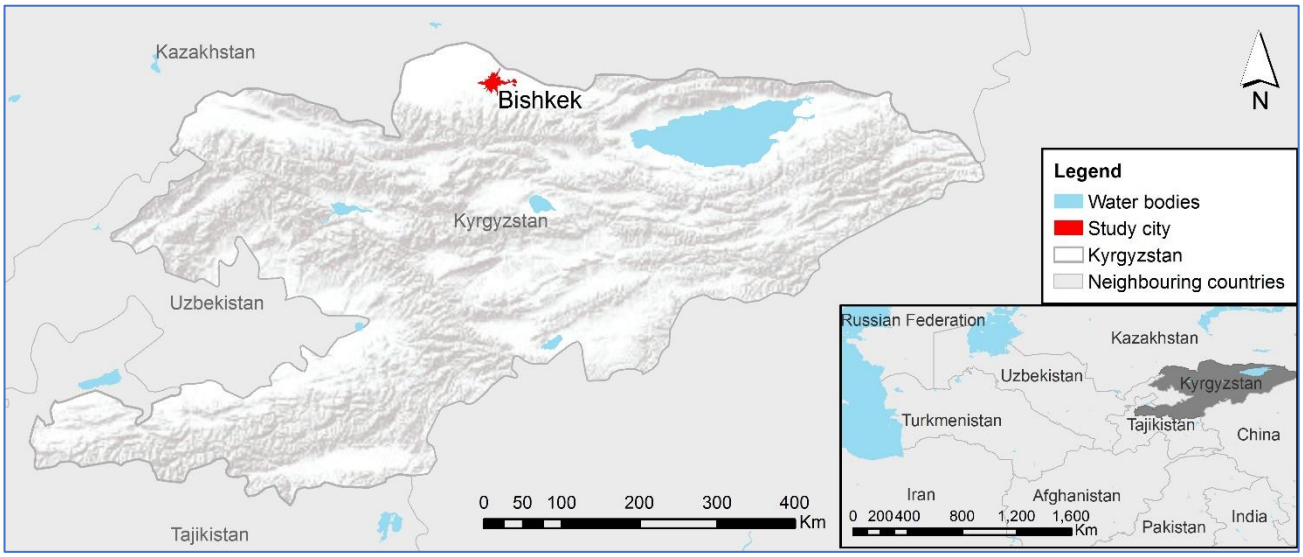


Figure 1. The location of the city under study, Bishkek, within Kyrgyzstan. Shading indicates the mountainous topography of the country, and highlights that mountains are characteristic of the landscape south of Bishkek. Inset shows the location of Kyrgyzstan within Central Asia.

As with many cities in the developing world, Bishkek city planners are faced with a trade-off between preserving UGS and investing in new infrastructure such as roads and buildings (Arku *et al.*, 2016). They also face increased population pressure in the form of high migration from rural areas. While migrants tend to live in Bishkek's outskirts, where public infrastructure is poor, the growing population has also increased development in the city centre. This has altered the typical Soviet urban plan within the city. Previously, Bishkek was characterised by clear distinctions between industrial and residential zones. Residential zones typically consisted of multi-storey tower blocks, often with associated publicly accessible open and green areas for the use of the residents and local communities (UNESCAP, 2013). However, urban sprawl on the city outskirts and booming construction in the more central areas has led to a substantially altered city. In recent years, construction of housing and roads has come at the expense of green spaces, and this has led to public debates and demonstrations. Indeed, public concern about disappearing green spaces has been growing in Bishkek since 2008 (Kloop, 2017). In view of the public discontent with decreasing green space extent and quality, the city mayor announced plans to reverse this trend and also improve the quality of green spaces in the coming years. One of the proposals is the establishment of new city parks, which mirrors one of the scenarios used in this study (see Section 2.2.1). Some photos of Bishkek parks are available in Supplementary Material.

2.2. Questionnaire

The questionnaire (available in Kyrgyz and Russian, and a translated English version upon request) consisted of four parts. After an explanation of the purpose of the study, respondents were asked questions related to their use of parks and their opinions on public spending on urban green spaces. The second part of the survey included taking respondents through three scenarios to elicit their WTP (see details in Section 2.2.1). The survey used the contingent valuation (CV) method to elicit households´ WTP (Johnston *et al.*, 2017) (see Section 2.2.2). The third part of the survey featured 21 statements used to score nature relatedness (NR) (Nisbet *et al.*, 2008). Although infrequently applied in developing countries, this tool is a well-validated method for quantifying people's relationships with the natural world (see Section 2.2.3). The final part of the survey was used to collect socio-demographic and contextual information, such as motives for visiting parks, opinions on the main functions of parks, and opinions about their condition.

2.2.1. Scenarios

To elicit preferences, the study took respondents through three scenarios: (i) the establishment of two new parks, (ii) the improvement of green strips along roads, and (iii) the preservation of the current area of existing parks (Figure 2). The scenarios were chosen based on projects under public discussion during the period of study (Kp.kg, 2017) with their selection validated through focus group discussions prior to the main survey. Thus, all three scenarios represented existing and realistic cases, increasing the reliability of the stated preferences method (Johnston *et al.*, 2017).

The first scenario described the city mayor's plans to build new parks by two rivers. At the time of the study the riverbanks were full of litter and abandoned, and the city mayor was discussing his plan to revitalize the area, developing sample designs (Diesel.kg, 2014). The plans included cleaning up the rivers, planting trees and building sidewalks and other recreational infrastructure.

The second scenario covered the green strips already located throughout Bishkek and which form part of the irrigation system that cools the city and supplies water for urban green spaces. The green strips are currently in poor condition due to poor irrigation and management. Thus, this scenario

proposed improving the green strips along the roads through the installation of fences, better irrigation and more tree planting.

The third scenario presented a city plan to decrease park areas in exchange for building commercial and government buildings. In recent years, cases of illegal construction in such places, including new restaurants, cafes and even housing, have led to active discussions online and by local mass media outlets. The questionnaire therefore asked respondents about their WTP to preserve current parks.

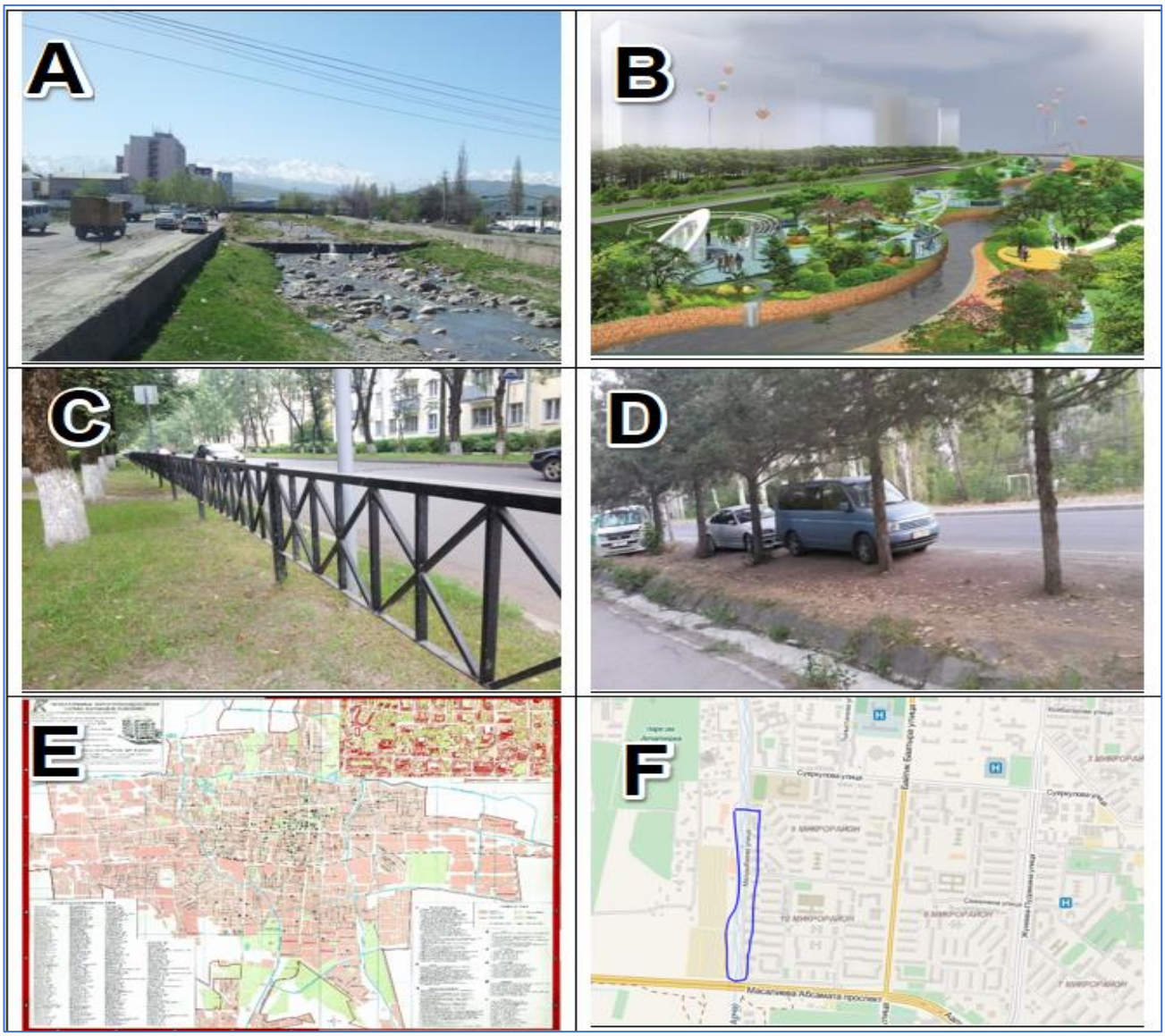


Figure 2. Some examples of visual aids used in the questionnaire. A – current state of a riverbank, B – proposed plans for a new park on the river, C – proposed fencing of the green strips, D – current state of green strips, E - detailed city map with all green areas, F – map showing location of the proposed new park.

198 Scenarios were presented to respondents using maps and photos (Figure 2) alongside written
199 information on the current state of the areas, location and proposed changes. In order to minimize
200 the influence of a preceding scenario, i.e. order effects, the three scenarios were shown in a changing
201 random order for each survey.

202

203 **2.2.2. Willingness to pay**

204 The contingent valuation (CV) method was used for the three scenarios to elicit WTP for UGS. CV is
205 a stated preference method that uses survey questionnaires to ask people their willingness to pay
206 (WTP) to see an improvement, or avoid a decline, in the quality or quantity of public goods, including
207 environmental goods such as UGS (Carson, 2011).

208

209 As with any method, CV is sensitive to inappropriate use, and potential pitfalls include hypothetical
210 bias, failure to pass the scope test, sequencing and information effects, and elicitation and starting
211 point biases. The debate on biases is still on-going, but can be overcome through study design and
212 implementation (see the recent best practise guidance in stated preference methods in Johnston *et*
213 *al.*, (2017)). We addressed the existence of possible biases through careful study design. This
214 included using two focus groups and pretesting the questionnaire in a pilot survey. Further, we used
215 real scenarios based on city plans and used payment vehicles that respondents were likely to be
216 familiar with as they already existed. Within the questionnaire, we used illustrations and maps to
217 detail the scenarios and included follow-up questions to validate CV responses. Finally, as we were
218 presenting respondents with three scenarios, we randomised the order in which each was presented
219 and explicitly informed respondents that they should consider the scenarios separately.

220

221 Following the description of each scenario, respondents were asked if they were willing to pay an
222 annual municipal tax to support the proposed change. Bid levels were determined at the focus
223 groups using the amounts of other typical annual payments such as utility payments, which in
224 Kyrgyzstan also include fees for waste management, road maintenance, sidewalk maintenance and
225 other city infrastructure maintenance fees. Respondents clearly understood that this mandatory
226 payment would be included in the household's utilities bill (del Saz-Salazar *et al.*, 2016). The average

yearly household bill for utilities in summer is about 6,500 KGS, increasing up to 16,000 KGS in winter due to heating expenses (USD1 = 63 Kyrgyzstani soms (KGS) at the time of the study).

If the response to whether the respondent was willing to pay was positive, then the interviewer showed payment cards with increasingly large amounts until the respondent refused to pay. The largest agreed amount was recorded. Subsequently, the respondent was asked to name the main reason why he or she agreed to pay. Protest zeroes (i.e. respondents who refused to pay because they disagreed with some aspect of the CV scenario including the payment vehicle, but who might have had a positive WTP (Carson, 2010)), were identified by asking those who were not willing to pay anything the reason for this. As the identified protest zeroes did not represent true preferences, they were removed from further analysis (as per Bateman *et al.,* 2002).

This study used a two-step model that differentiated between agreement to pay and the magnitude of the WTP. The first step estimated the probability of positive WTP, while the second step estimated the magnitude of WTP conditional on having a positive WTP. The logit model was used for the first step and interval regression for the second step, as the latter has proven to be an effective method in CV studies (e.g. Brouwer *et al.*, 2008). Interval regression uses the interval between the highest bid the respondent said "yes" to paying and the next largest amount they were shown and said "no" to paying, to calculate their WTP; assuming that their real WTP lies somewhere between these two amounts.

Explanatory variables were chosen based on the literature, and included socio-economic metrics and those covering the use of, and attitudes towards, UGS, such as frequency of visits, opinions about park maintenance and levels of financing, distance to UGS, and visits to nearby mountains (as one potential substitute for urban parks (e.g. Lin *et al.,* 2014)). Nature relatedness factors were included to identify non-monetary feelings toward UGS. We also compared WTPs from three scenarios using Pearson's correlation matrix and examined the extent to which the explanatory variables were common across the scenarios (Section 3.2.4).

2.2.3. Nature Relatedness

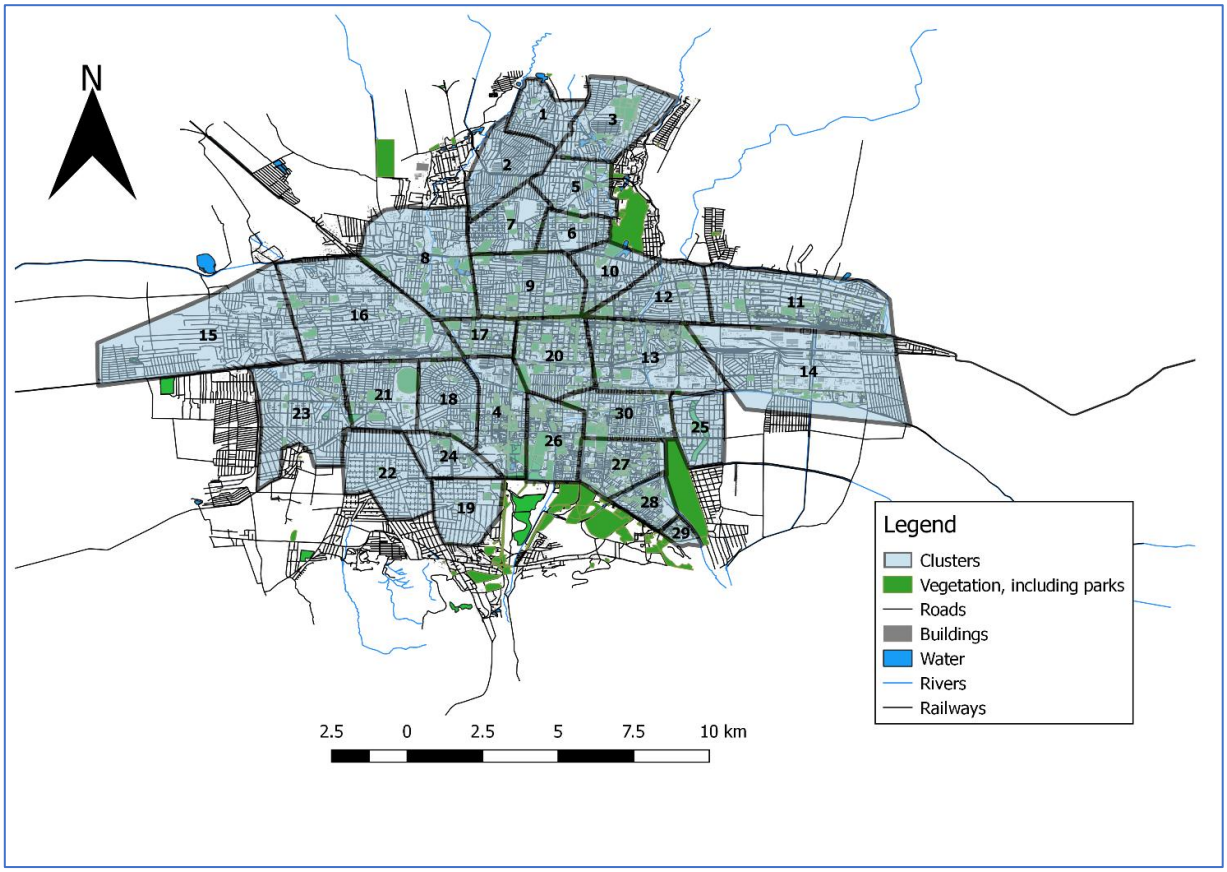
The nature relatedness (NR) scale measures the affective, cognitive, and experiential aspects of connection to nature (Nisbet *et al.,* 2008). Here we use the NR scale as a non-monetary approach to assess green space valuation. The NR scale was calculated from 21 self-reported statements using a five-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5). The statements reflect individual attitudes and experience in relation to the natural world (statements in Table A1 in Supplementary Material). Following the authors' original methodology (Nisbet *et al.*, 2008), we reversed the scores from eight of these (questions 9, 10, 11, 12, 13, 14, 16, 19) before averaging the individual scores of each respondent (formula F1 in Supplementary Material). Spearman's correlation analysis was used to show the association between a respondent's characteristics, use, frequency, attitudes to nature and NR (Cox, 1972) (Section 3.1).

2.2.3.1. Factor Analysis

We performed individual-level factor analysis for the 21 NR questions to reveal the underlying factors that drove overall NR. The factors were selected based on eigenvalues, and an additional scree plot was produced to confirm the "break" point (Costello & Osborne, 2005). Due to correlation between the NR questions, oblique rotation (promax) was performed (Fabrigar *et al.*, 1999; Costello & Osborne, 2005). After the factor analysis, the Kaiser–Meyer–Olkin measure of sampling adequacy was applied to check the suitability of the data for factor analysis (Cerny & Kaiser, 1977). The predicted factors were then included as explanatory variables in the WTP estimation.

2.3. Survey procedure

Prior to conducting the main survey, the research team invited approximately 70 individuals of differing age and social status to take part in focus groups. The invitations were made randomly in person on the streets as invitations to participate in a discussion of city parks. In doing so we purposefully tried to cover the variety of people who live in the city. Forty of the invitees took part in the focus groups. To better allow for discussion of park usage and validation of relevant survey scenarios, participants were divided into two groups. Both focus groups were video recorded and transcribed.



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286 **Figure 3.** Map of Bishkek showing the 30 clusters which were used for survey purposes.

287

288 Following the development of the scenarios and the associated questionnaire, a pilot survey was
289 conducted among 50 respondents to ensure coherence. The final survey, administered in August
290 2014, was conducted through face-to-face interviews of 900 householders above the age of 18. To
291 ensure the representativeness of the sample we used two-stage stratified cluster sampling (Bernard,
292 2012). For the first stage, the city was divided in to 30 clusters (see Figure 3) based on segregation
293 by migration and socio-economic status (de Vaus, 2002). For the second stage, every third house in
294 each cluster was selected. We used a quota to ensure gender representativeness since there is little
295 consensus on the influence of gender on WTP (Dallimer et al., 2014) and environmental attitudes
296 (e.g. Milfont and Sibley, 2016). For each cluster we calculated the mean WTP amounts and NR scores,
297 and mapped them using QGIS 2.18.3 software. Designating clusters also allowed us to measure the
298 distance from the edge of each cluster to green areas, and the locations for the proposed new green
299 spaces described in the first scenario. Proximity has been found to be an important factor in the WTP

300 studies in the literature (Hanley *et al.*, 2003); thus, we included distance as an explanatory variable
301 in the regression analysis as part of the economic valuation model (Section 2.2.2).
302
303 **3. Results**
304 Out of 900 questionnaires collected, 896 were determined to be complete and thus valid for our
305 analysis. Table 1 reports summary statistics of household features and selected UGS-related
306 variables. The respondents reported low satisfaction with park maintenance, and 84.5% stated that
307 UGS need more public financing (Table 1).
308
309 **Table 1**. Descriptive statistics of variables, in terms of (a) characteristics of participants; (b)
310 recreational use and attitudinal questions regarding parks and other green spaces.

Part a: Characteristics of participants				
Variable	***Description***	***Mean***	***Standard deviation***	***Range***
Age	Age of respondent; in years	39	15	18 - 84
Household size	Total number of people in the household	3.7	1.6	1-11
Higher education	Having a university degree; dummy variable 1 = yes, 0=no	0.68		
Distance to proposed new park (km)	Distance from the border of respondent's cluster to nearest proposed park in the first scenario	3.5	2.4	0.5 – 11.2
Distance to current park (km)	Distance from the border of respondent's cluster to the current park in the third scenario	2.3	1.5	0.5 – 6.4
Part b: Responses to usage and attitudinal questions				
		Mean	***Standard deviation***	***Interquartile range***
City parks need more maintenance	Likert-scale statements about park maintenance, with higher number representing a stronger agreement	2.9	0.8	1.14

Nearby mountains visitation	Visited mountains near the city in past 12 months, dummy variable; 1=yes, 0= no	0.316
Distant mountains visitation	Visited mountains far from the city in past 12 months, dummy variable; 1=yes, 0= no	0.286
City parks need more funding	City parks need more funding, dummy variable; 1=yes, 0= no	0.845
Park visitation	Visited parks in the last 12 months, dummy variable; 1=yes, 0= no	0.70

Note : 1. *Income* is the monthly gross household income (in Kyrgyz soms (KGS); 1 USD = approximately 63 KGS), calculated from midpoints of the stated income categories except the highest (> 50,000 KGS), which was set to 50,000 KGS. The percentage distribution on the income ranges were: < 12,000 KGS: 39.9 %; 12,001-20,000 KGS: 37.0 %, 20,001-50,000 KGS: 21.4 %, and > 50.000 KGS: 4.6 %.

3.1. Nature Relatedness

The overall NR scores ranged from 1 to 5, with a mean value of 3.2 (median of 3.16) and a standard deviation of 0.47 over the 896 observations. The NR scores positively correlated with the frequency of time spent outdoors and in nature (Table 2). A socio-economic variable that was significant and positively correlated with NR scores was age. Income was negatively correlated but not statistically significant. Mapping of mean NR scores showed that the higher mean scores came from respondents located in the western part of Bishkek, and the lower scores came from those in the city centre (Figure 4).

329 **Table 2.** Spearman correlation matrix for Nature Relatedness Score and selected variables for 896
330 residents in the city of Bishkek, Kyrgyzstan. Significance levels are indicated: *p<0.10, ** p < 0.05,
331 *** p < 0.01.

	Nature Relatedness Score	Age	City parks need financing	Income	Near mountains visitation	Far mountains visitation
Age	0.082**					
City parks need more funding	0.164***	0.019				
Income	-0.014	-0.03	-0.035			
Nearby mountains visitation	0.08**	-0.14***	0.061*	0.057*		
Park visitation	0.126*	-0.27***	-0.016	0.095***	0.128***	0.833**

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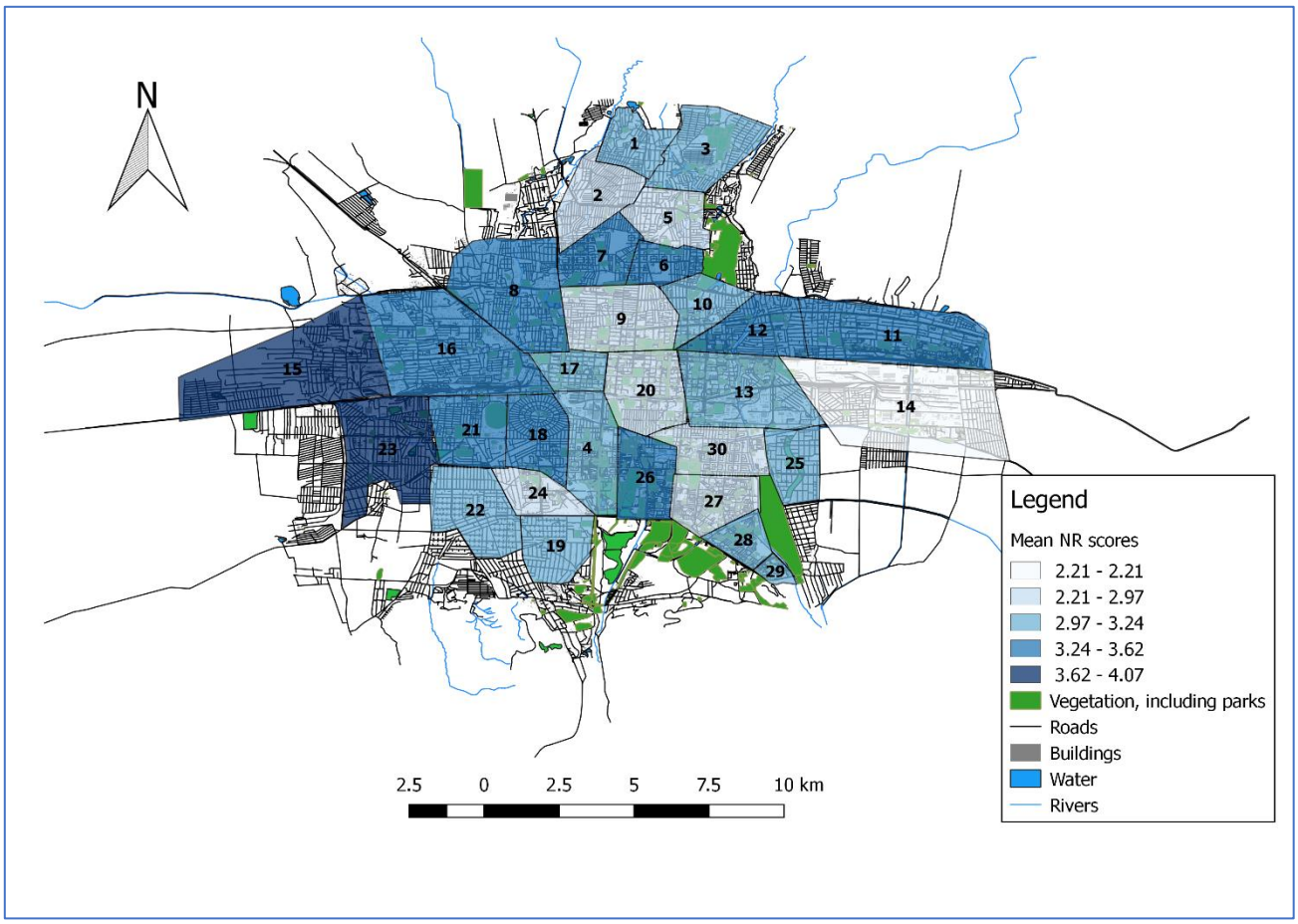

Figure 4. Nature Relatedness mean scores across 30 clusters in the city of Bishkek, Kyrgyzstan, with higher scores indicated by darker shading.

3.1.1. Factor Analysis of Nature Relatedness Score

Factor analysis revealed four main factors that captured the variation across all NR items (see factor loadings in table A2 in Supplementary Material). Based on the size of the factor loading results and the screen plot (see Figure A2 in Supplementary Material), the main factors identified were: 1) 'Nature is part of my spirit', 2) 'Nature must be conserved', 3) 'Time spent in unspoilt nature is the ideal vacation', 4) 'The state of nature is a human development indicator'. A Kaiser–Meyer–Olkin measurement of 0.885 confirmed that the data used was suitable for factor analysis.

3.2. Willingness to pay

3.2.1. First scenario: Establishment of Two New Parks

Of the 896 respondents, 72% (644) agreed to pay for the establishment of new parks. For those with positive WTP, the mean WTP was 502 KGS per household per year (standard deviation 885, range 50 to 10,000 KGS).

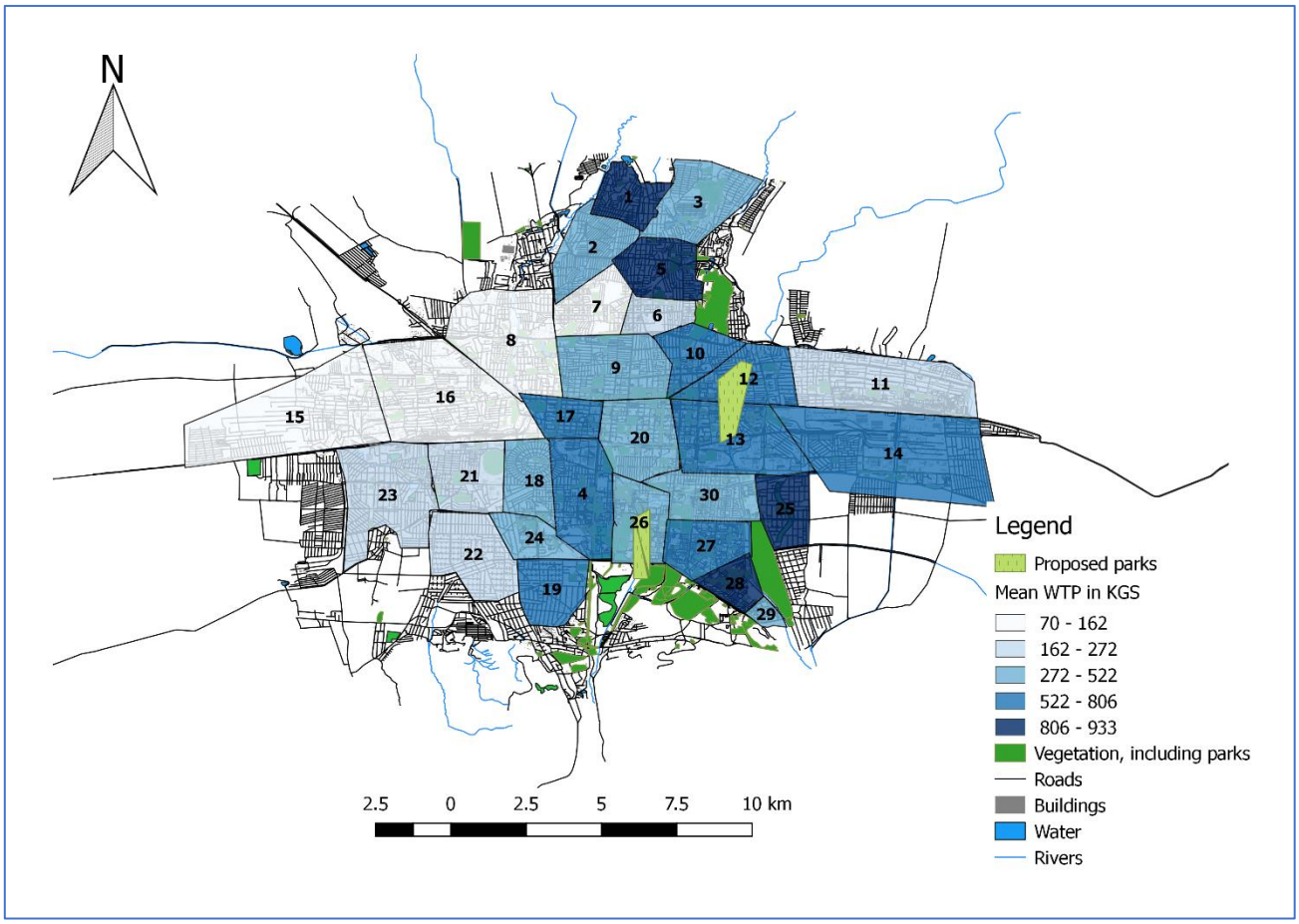

Figure 5. Mean WTP for new parks across 30 clusters within the city of Bishkek, Kyrgyzstan, with darker shading indicating higher mean WTP within that cluster.

Mean WTP for the creation of the new parks varied across Bishkek (Figure 5). As expected, residents located in areas closer to the proposed park had higher mean WTP. Thus, the western portions of the city showed a low WTP (between 70 and 162 KGS). Distance was also significant at each step of the model. Shorter distances to the parks increased both the likelihood of respondents being willing to pay something, and the magnitude of their positive WTP (Table 3). Higher income, higher education, agreeing that city parks need more funding, and having visited parks increased both the

363 probability of being willing to pay something and the magnitude of their positive WTP. Age had the
364 opposite effect, as both the probability of being willing to pay something and their stated positive
365 WTP decreased significantly with increasing age. Household size significantly decreased the
366 probability of being willing to pay something. Agreeing that city parks need more maintenance had
367 no significant impact on the decision to pay or not, but for those that decided to pay it significantly
368 increased their positive WTP. These results were all as expected, both from economic theory (i.e.
369 WTP increases with income, and the recreational value of the parks for those who visit them, in
370 addition to aesthetic use value and non-use values, increase WTP), and as acceptance of the
371 scenarios in terms of agreeing that parks need more funding and maintenance could increase WTP.
372 The decreased probability of paying with an increase in age and household size identified in our
373 study is also in accordance with previous CV studies. Thus, these results support the validity and
374 reliability of our CV study.
375
376 Trips to the mountains and three of the main NR factors were not statistically significant for WTP in
377 the establishment of new parks. The only significant NR factor was 'the state of nature is a human
378 development indicator', and only for predicting the size of WTP for those with positive WTP.
379 Respondents stated seven reasons for agreeing to pay for new parks. The most dominant reasons
380 were related to improving the landscape aesthetics of the city and mitigating air pollution as
381 respondents stated that their main reasons for paying were 'to make the city more beautiful' and
382 'to have cleaner air' (see Figure 6).
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391 **Table 3.** Two-step model results for WTP in the new parks establishment scenario. Standard errors
392 are given in parentheses. Significance levels are indicated: *p<0.10 **, p < 0.05, *** p < 0.01. N =
393 465. Pseudo R^2 = 0.255 for the logit model for "Agree to pay".

VARIABLES	**Agree to pay**	**Size of the payment, if agreed to pay**
Income	398.7*** (78.56)	1.561*** (0.334)
Age	-10.77*** (2.411)	-0.0388*** (0.01)
Higher education	179.9** (75.32)	0.978*** (0.309)
Household size	-51.82** (21.91)	-0.129 (0.093)
Distance to proposed park	-61.98** (26.68)	-0.211* (0.110)
City parks need more funding	244.6** (112.3)	0.953** (0.443)
Nearby mountain visitation	77.57 (72.84)	0.455 (0.348)
City parks need more maintenance	24.24 (49.19)	0.430* (0.227)
Park visitation	245.4*** (80.24)	1.092*** (0.307)
'Nature is part of my spirit' NR factor [1]	16.69 (41.88)	0.214 (0.177)
'Nature must be conserved' NR factor	-14.40 (42.91)	0.07 (0.194)
'Time in unspoilt nature is the ideal vacation' NR factor	-28.91 (48.56)	0.043 (0.224)
'State of nature is a human development indicator' NR factor	8.504 (52.36)	0.612*** (0.236)
Constant	23.03 (258.8)	-0.417 (1.116)

394 [1] NR Factor – factor derived from the Nature Relatedness scores factor analysis
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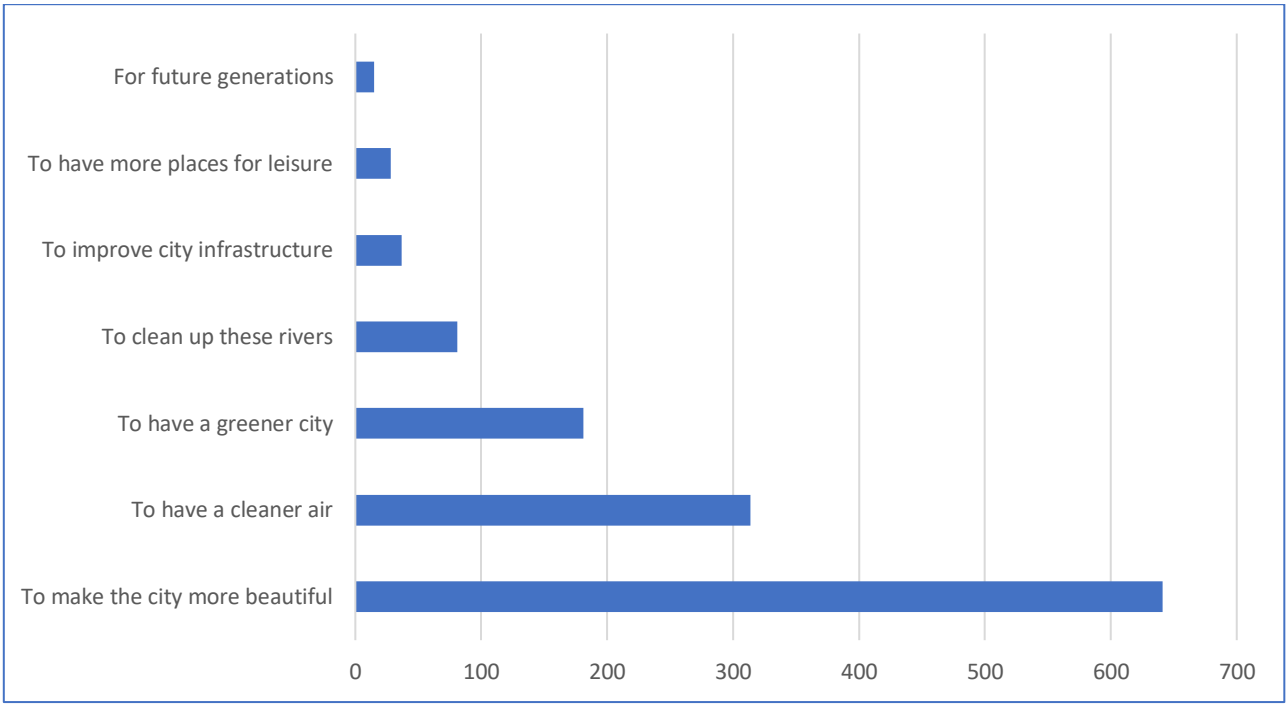

Figure 6. Reasons given in response to the question "why did you agree to pay for the establishment of new parks?" (in terms of number of observations) in the city of Bishkek, Kyrgyzstan

3.2.2. Second scenario: Improvement of Green Strips Scenario

Sixty-eight percent (68%, or 609 out of the 896 respondents) agreed to pay for improved green strips. For those with positive WTP, the mean WTP /year/household was 464 KGS (standard deviation = 992 KGS, ranging from 50 KGS to 15,000 KGS). Mean WTP for the green strip improvement scenario was lower in general compared to the two other scenarios. WTP also varied spatially, with the lowest mean found in the western parts of the city (Figure 7).

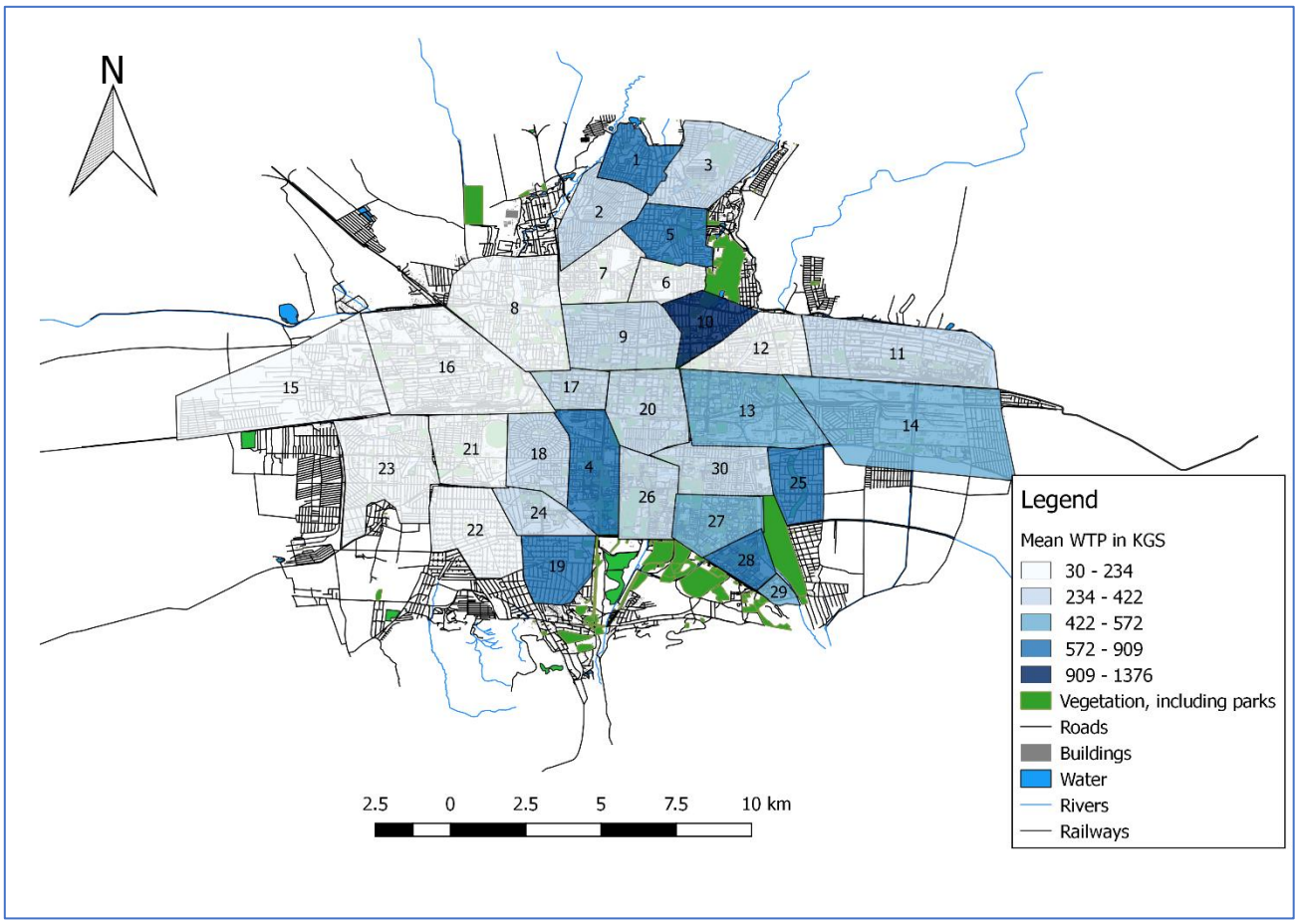

Figure 7. Mean WTP for the green strip scenario across 30 clusters within the city of Bishkek, Kyrgyzstan, with darker shading indicating higher mean WTP within that cluster.

Table 4 shows that, in terms of the decision to pay or not, income was significant and positive in both steps of the model. Thus, higher income increased both the probability of paying and the WTP for the respondents with positive WTP. Respondents who made more mountain trips expressed a higher WTP, while agreeing that parks need more maintenance and having visited parks increase the probability of being willing to pay something. One NR factor, 'nature is part of my spirit' was significant and negatively related to WTP for both stages; which could indicate that these respondents found it hard to express their WTP in monetary terms and, thus, stated zero or a lower WTP than others. Both the probability of paying and the amount stated decrease with age (as was also found for the other scenarios). The remaining variables were not significant. In contrast with the other two scenarios, the explanatory power of the model in this scenario was low (pseudo r^2 = 0.078). Once again, as shown in figure 8, the majority of respondents agreed to pay for aesthetic

reasons ('to make the city more beautiful'). Other popular reasons were: 'to have a greener city' and 'to improve the city infrastructure'.

Table 4. Two-step model results for WTP in the green strip improvement scenario. Standard errors are given in parentheses. Significance levels are indicated as: *p<0.10 **, p < 0.05, *** p < 0.01. N = 425. Pseudo R^2 =0.078 for the logit model for "Agree to pay".

VARIABLES	**Agree to pay**	**Size of the payment, if agreed to pay**
Income	0.762*** (0.233)	307.7*** (79.30)
Age	-0.0177** (0.007)	-7.112*** (2.452)
Higher education	0.013 (0.241)	108.0 (74.59)
Household size	-0.013 (0.07)	-72.92*** (22.33)
City parks need more funding	0.021 (0.345)	134.5 (109.6)
Nearby mountain visitation	-0.05 (0.233)	132.8* (73.49)
City parks need more maintenance	0.477*** (0.152)	-29.63 (47.92)
Park visitation	0.549** (0.24)	82.03 (80.69)
'Nature is part of my spirit' [NR factor]	0.239** (0.115)	67.02* (37.80)
'Nature must be conserved' [NR factor]	0.060 (0.137)	39.76 (43.24)
'Time in unspoilt nature is the ideal vacation' [NR factor]	0.08 (0.145)	-10.74 (49.33)
'State of nature is a human development indicator' [NR factor]	0.152 (0.162)	76.32 (52.33)
Constant	-0.401 (0.784)	387.6 (256.9)

[1] NR Factor – factor derived from the Nature Relatedness scores factor analysis

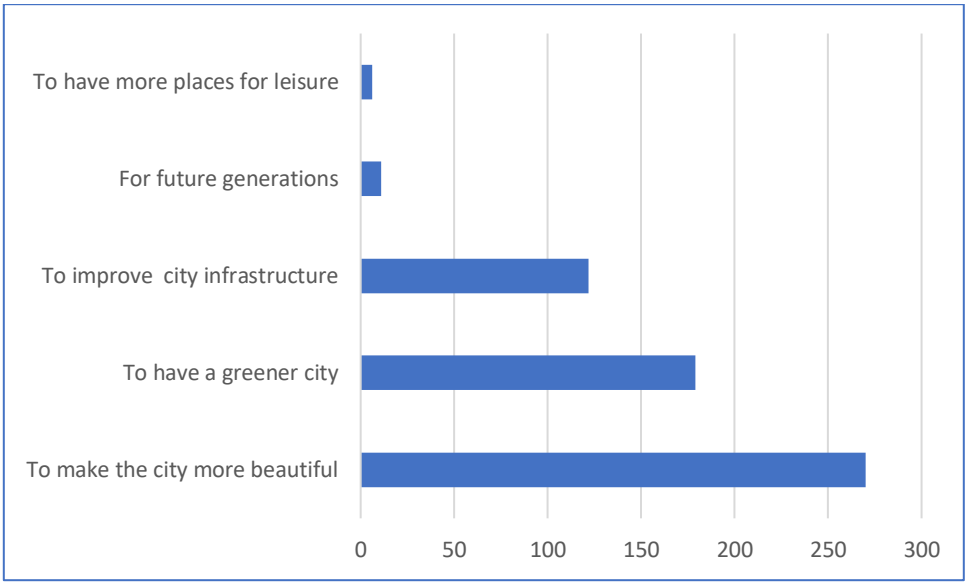

Figure 8. Reasons given in response to the question "why did you agree to pay for the green strip improvement scenario?" (in number of observations) in the city of Bishkek, Kyrgyzstan

3.2.3. Third Scenario: Current Park Preservation Scenario

Seventy percent (70%, or 624 out of 896 respondents) agreed to pay for the preservation of current parks. For those with positive WTP, the mean payment was 486 KGS per year (standard deviation = 1,249 KGS; range = 50 KGS to 20,000 KGS). The mean WTP in this scenario was unevenly spatially distributed, with the eastern part of the city having a higher mean WTP (Figure 9). We also observed clusters with higher WTP in places that already had larger parks.

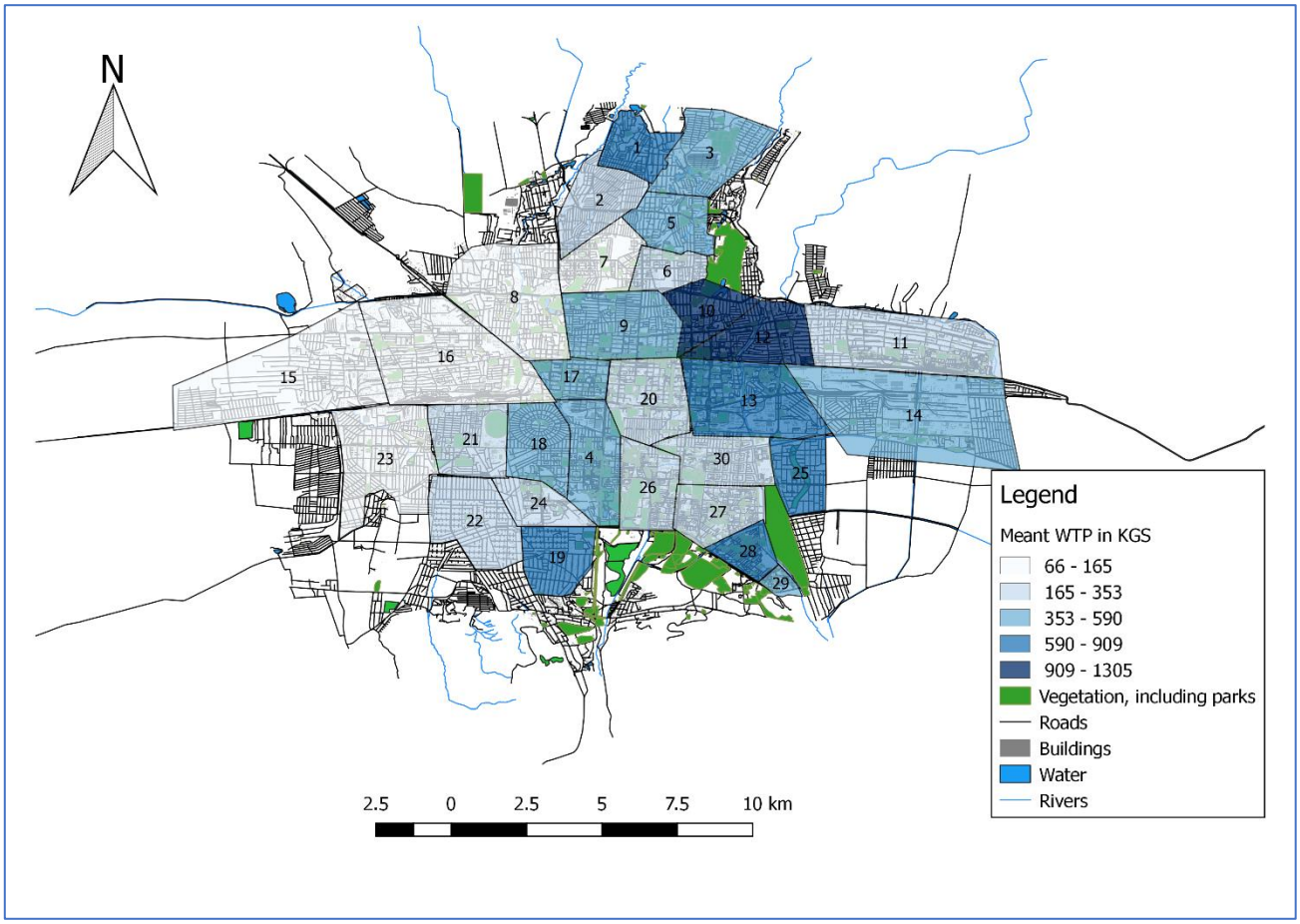

Figure 9. Mean WTP for the preservation of current parks scenario across 30 clusters within the city of Bishkek, Kyrgyzstan, with darker shading indicating higher mean WTP within that cluster.

In the WTP regression model (Table 5) income, education level and visiting the mountains nearby were positive and significant at both steps. The latter suggests that going to the mountains seems to be a complement to UGS rather than a substitute. Thus, if you visit the mountains, you also have strong preferences for UGS. Increasing WTP with higher income and higher education is also as expected. Higher age and larger distances to the nearest park significantly decrease both the likelihood of paying and the amount stated. Stating that the parks needed more funding was also significant and negative at both stages, while stating that the parks needed more maintenance significantly increased the probability of paying. Park visitation increased WTP, and household size decreased WTP. The main NR Factor 'the state of nature is a human development indicator' increased the likelihood of paying for the preservation of current parks (Table 5). The main reasons given for agreeing to pay for the preservation of current parks were: 'to have cleaner air', 'already few parks left', 'to have more leisure places', and 'to have a greener city' (see Figure 10).

458

459 **Table 5.** Two-step model results for WTP for the preservation of current parks scenario. Standard
460 errors are given in parentheses. Significance levels are indicated: *p<0.10 **, p < 0.05, *** p < 0.01.
461 N = 440. Pseudo R^2 = 0.186 for the logit model for "Agree to pay".

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VARIABLES	**Agree to pay**	**Size of the payment, if agreed to pay**
Income	1.16*** (0.34)	424*** (86.89)
Age	-0.026** (0.01)	-11.5*** (2.68)
Higher education	0.707** (0.317)	152.5* (83.29)
Household size	-0.110 (0.096)	-81.63*** (24.55)
Distance from the nearest park	-0.986** (0.417)	-269.2** (126.0)
City park needs funding	-0.218* (0.115)	-61.33** (29.49)
Nearby mountain visitation	0.785** (0.373)	155.2* (80.49)
City parks need more maintenance	0.711*** (0.239)	25.70 (54.28)
Park visitation	0.496 (0.329)	249.1*** (88.76)
'Nature is part of my spirit' [NR factor]	0.240 (0.183)	-1.752 (46.31)
'Nature must be conserved' [NR factor]	0.268 (0.201)	25.10 (47.44)
'Time in unspoilt nature is the ideal vacation' [NR factor]	0.145 (0.242)	25.60 (53.83)
'State of nature is a human development indicator' [NR factor]	0.868*** (0.238)	6.330 (57.93)
Constant	-1.039 (1.107)	71.60 (286.2)

463 [1] NR Factor – factor derived from the Nature Relatedness scores factor analysis

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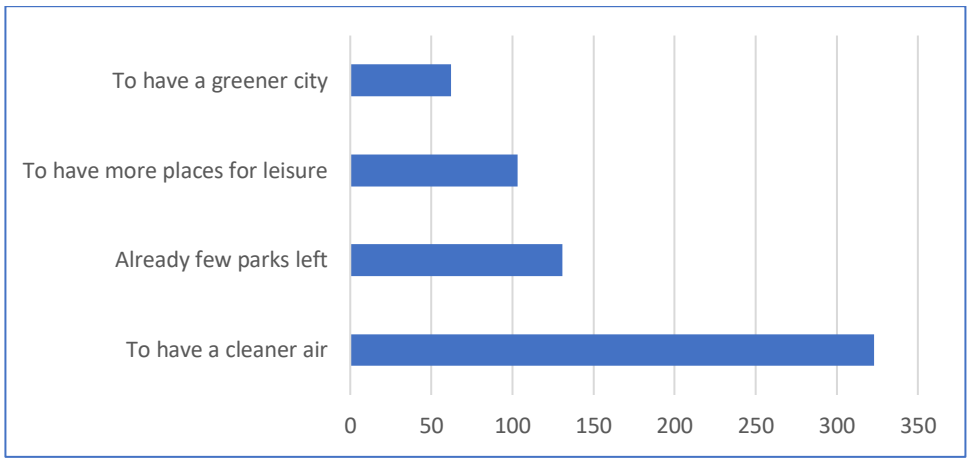

Figure 10. Reasons given in response to the question "why did you agree to pay for the preservation of current parks?" (in number of observations) in the city of Bishkek, Kyrgyzstan

3.2.4. Comparison of the three scenarios

Table 6 provides an overview of the distribution of respondents having positive and zero WTP for each of the three UGS scenarios. About 70% of respondents were willing to pay something for all three UGS scenarios, with only small differences between the scenarios. Among those with zero WTP, less than half (39-46 %) were protest zeroes. Protest zero respondents have a real WTP higher than zero, but they stated zero WTP as a protest against one or more aspects of the park scenarios and/or the payment mechanism.

Table 6. Number and percentage of respondents with positive willingness-to-pay (WTP), zero WTP, and numbers of protest and real zeroes for the three scenarios. N = 896 for each scenario.

	First scenario: Establishment of Two New Parks	**Second scenario: Improvement of Green Strips Scenario**	**Third Scenario: Current Park Preservation Scenario**
Number of respondents with WTP > 0 (percentage of the total sample)	644 (72%)	609 (68%)	624 (70%)
Number of total zeroes (percentage of the total sample)	256 (28 %)	291 (32 %)	276 (30 %)
Number of protest zeroes (percentage of total zeroes)	117 (46 %)	127 (44%)	108 (39%)
Number of real zeroes (percentage of total zeroes)	139 (54 %)	164 (56%)	168 (61 %)

The main reason for protesting was disbelief that the collected money would be used for the stated purpose. These protest zeroes probably reflect high perceived levels of corruption and low trust in the local government. Other common reasons for protest zeroes included: 'the project is unrealistic' and 'this must be paid for by the government'. In all CV surveys we aimed to construct realistic and acceptable scenarios and payment vehicles that created as few protest zero responses as possible. This was especially challenging in a developing country with high levels of corruption, but seems to have worked well here as only 13% of the total sample were protest zero responses (at 13%, 14% and 12% for Scenarios 1, 2 and 3, respectively).

As the protest zero respondents did not reveal their real WTP, they were removed from the sample when calculating mean WTP for the overall sample. Real zeros were retained. This procedure avoids underestimating WTP, but implicitly assumes that the protest zero respondents have a real WTP equal to the remaining sample. Following removal of protest zeros for Scenario 1, 82. 7 % (644 of 779 respondents) had a positive WTP. The corresponding numbers for Scenarios 2 and 3 are 78.5 % and 79.2%, respectively.

Mean WTP per household per year for those that were willing to pay something for Scenarios 1, 2 and 3 was 502, 464 and 486 KGS, respectively. Multiplying these numbers by the portion of positive WTPs (0.827, 0.785 and 0.792, respectively) gives mean WTP per household per year for the sample (having removed protest zeros) of 415, 364 and 385 KGS for the establishment of two new parks (Scenario 1), improvement of green strips (Scenario 2), and the preservation of current parks (Scenario 3), respectively. Thus, WTP seems to be highest for two new parks (Scenario 1), but these estimates are not significantly different at the five percent level.

Comparing the regression results for the three scenarios, we observed that income was the strongest positive predictor and age was the strongest negative predictor in all three cases. Higher education was significant and positive in the park establishment and current park preservation scenarios. WTP also decreased with larger household size and longer distance to a park. Agreeing that the city parks needed more funding had a significant and positive effect on WTP in the first scenario, but negative in the third. Agreeing that city parks needed more maintenance had a significant positive effect on probability to pay and the size of WTP in all three scenarios. Visiting the mountains had significant and positive effects in the green strip and current park preservation scenarios; likely reflecting the fact that individuals who used the mountains for recreation also had strong preferences for preserving urban green space. The park visitation dummy variable was positively significant in all three scenarios, reflecting the fact that the recreational use value of parks increases WTP.

Out of the four main NR factors identified, two had positive significant effects on WTP in all three scenarios. The factor 'nature is part of my spirit' had an impact at both stages in the green strip improvement scenario. The factor 'the state of nature is a human development indicator' increased WTP in the new park establishment scenario and increased the probability of agreeing to pay in the current park preservation scenario. The explanatory power of the two of the models was high, but the green strip scenario's pseudo R^2 was low (0.078).

4. Discussion

We used Contingent Valuation (CV) and the Nature Relatedness (NR) scale to quantify the monetary and non-monetary values attached to the retention, enhancement and creation of urban green spaces (UGS) in Bishkek, Kyrgyzstan. The results of the CV study were in line with expectations from economic theory and the environmental valuation literature, and showed that income, education, proximity to the parks and park usage increased WTP for three UGS scenarios. Using NR alongside WTP provided new insights to the values attached to such green spaces and the validity of monetary versus non-monetary valuation methods, not least because NR and WTP were not strongly correlated, suggesting the NR was measuring different aspects of value compared to standard economic approaches.

The results showed that a solely monetary approach may underestimate the values attributed to urban green spaces by some social groups, such as those with lower incomes, the elderly and recent migrants. This is in line with the literature that calls for differentiation between assigned and underlying values (Ives & Kendal, 2014). Popular monetary valuation studies may thus fail to capture underlying values due their emphasis on actual payment.

This study has important policy implications and indicates that decision-making processes based solely on WTP ignore the interests of less affluent groups and those who are concerned with government corruption. The findings are thus particularly useful in contexts where incomes are limited and/or trust in public institutions is low, as is the case in many developing countries. These findings also highlight how cultural and societal contexts are important when conducting UGS valuation studies (Everard et al., 2016).

We found 'the beauty of the city' to be the dominating reason for agreeing to pay for urban green space (UGS), matching one of the key factors identified in developed countries (Lumber et al., 2017). More universal factors, i.e. those based on common human values such as emotions and sense of beauty, may perhaps allow for more comprehensive appraisal when valuing UGS. This common approach is valid for both developed and developing countries via measurements of affinity to nature by the Nature Relatedness (NR) scale and other similar approaches.

In all three scenarios, NR factors were positively associated with WTP for urban green spaces. The influence of the different factors varied according to which scenario and which step in the analysis was considered. NR was positively associated with the frequency of time spent outdoors. Age was significantly positively correlated with the NR score. One possible explanation may be that the NR scores also capture past experiences of nature. Another suggestion may be that retired people have more leisure time to experience nature and be outdoors.

Interestingly, in terms of spatial distribution, NR scores were higher at the city outskirts, which have fewer urban green spaces. In contrast, central locations tended to have lower nature relatedness scores. Possible explanations for this phenomenon include that residents in the city outskirts are closer to agricultural and mountainous areas outside of the city. Given the recent growth patterns in the city, most residents on the city outskirts are recent migrants from rural areas, so they may also have more recent memories of high quality natural environments, resulting in higher NR scores in our survey.

We found that higher levels of appreciation for nature did not automatically translate into higher WTP. We identified socio-economic groups with high NR scores but low WTP indicating that the weak link between the monetary value given to UGS and held nature affinity value is more explicitly pronounced among socially vulnerable groups. For example, elderly people exhibited low WTP, but, at the same time, spend more time in UGS and had higher NR scores. Likewise, another group with low monetary articulation of value were migrants from rural areas who live in the city outskirts. This group demonstrated high mean NR scores, showing high attachment to natural environments, but their monetary valuation failed to register this attached value. This finding has important policy implications as a low reported WTP for green space may not reflect the actual value attached to that space by urban dwellers. Thus, we argue that higher nature relatedness does not fully translate into higher WTP for urban green spaces.

Furthermore, this study illustrates how monetary expressions of the value of UGS are limited by socio-economic factors such as income, availability of free time and costs associated with the use of

environmental goods and services (Bateman et al., 2006; Jørgensen et al., 2013). The effect of low income is in line with literature that has found wealth variation in societies determines WTP (Jacobsen and Hanley, 2009).

To reiterate the two major outcomes, the findings first highlight the risk of leaving non-monetary valuations out of assessments of the value of urban green space, indicating that any monetary valuation assessments can be greatly benefitted by being accompanied with non-monetary valuation measurements (Baveye et al, 2013). Second, in the context of developing countries where rapid urbanisation takes places, monetary values expressed by the less wealthy could be muted by lower incomes or lower social status. Moreover, the in the context of low trust in government institutions, valuation studies that capture underlying values may perhaps reveal higher valuations than can be determined from purely monetary valuation.

5. Conclusion: Implications for policy, practice and future research.

The implications of this study are important in developing country contexts and beyond. Purely monetary valuation is less informative in these countries due to the low average income of the respondents. Further, the general public often does not trust government institutions due to perceived corruption. Distrust in government institutions implies that valuation approaches that rely on some form of increased taxation payment are unlikely to capture the full value that people place on the environmental goods in question. Other survey instruments that are not linked to willingness-to-pay (WTP) could be more useful.

Future valuation studies may benefit from the inclusion of non-monetary valuation approaches, such as relatedness to nature. It is not that monetary valuation is irrelevant; more that the approach may be limited in scope when the manifestation of attached value is limited. In addition, geographical features and cultural norms could also play a role in the WTP, so future studies should try to capture these aspects. This study showed that the real value attached to urban green spaces may be high even when WTP is low. This means that, if purely monetary valuation is used, it may lead to the development of undesirable policies, particularly for certain groups of people who do not state high WTP (due to low income) but still attach a high value to the environment.

Our findings demonstrate that the results of monetary valuation should be used with caution, and that they should be used in parallel with non-monetary valuation approaches such as those which measure nature relatedness. The combination of such assessment methods allows for the capture of the interests of a wider range of stakeholders and will lead to improved policy development. To our knowledge, this is the first paper to analyse the relationship between nature relatedness and WTP for urban public green spaces in a developing country. While this marks a start, further research is needed to develop a more accurate picture of the connections between nature relatedness, WTP, and overall valuation of urban green spaces in a developing countries context.

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