Nature in the concrete jungle: valuing urban ecosystem services in Costa Rica

Matías Piaggio[1*] and Juha Siikamäki[1]

[1]International Union for Conservation of Nature (IUCN), Washington, DC, USA

[*]Corresponding author. E-mail: matias.piaggio@iucn.org

ONLINE APPENDIX

Appendix A. Theoretical model: random utility models and estimation strategy

The RUM assumes that individuals know their utility, but the researcher is unable to completely observe it (Holmes *et al.*, 2017). Thus, the utility that person *i* derives from alternative *j*, U_{ij} , separates into a deterministic component V_{ij} and an unobserved stochastic component ε_{ij}:

$$U_{ij} = V_{ij} + \varepsilon_{ij}. \tag{A1}$$

Individual *i* chooses alternative *j* if the utility associated with that alternative, U_{ij}, is greater than the utility associated with any other available alternative in the choice problem. Because the utility function includes a stochastic component, the probability that individual *i* will choose alternative *j* from a choice set containing competing alternatives, and assuming that the utility is a linear function of the attributes included in the experimental design, can be expressed as:

$$P_{ij} = P\left(U_{ij} > U_{ik}\right) = P\left(V_{ij} + \varepsilon_{ij} > V_{ik} + \varepsilon_{ik}\right) = P\left(\varepsilon_{ij} - \varepsilon_{ik} > V_{ik} - V_{ij}\right) \forall\, k = 1, \dots, J\,,\ k \neq j, \tag{A2}$$

where $V_{ij} = \beta Z_{ij} + \lambda p_{ij}$ is a linear additive function of the different non-monetary attributes of the urban green spaces rehabilitation program, Z_{ij}, and the cost to the household associated with each program, p_{ij}. The parameter β is the vector of preferences for non-monetary attributes, and λ is the marginal utility of money.

The standard assumption of this model is that the errors are independently and identically distributed (IID) following a Type I extreme value distribution. Given this, $\varepsilon_{ij} - \varepsilon_{ik}$ results in a logistic distribution, yielding a conditional or multinomial logit (MNL) model (McFadden, 1974). This means that the probability of individual *i* choosing alternative *j* is:

$$P_{ij} = \frac{e^{\mu v_{ij}}}{\sum_{k=1}^{J} e^{\mu v_{ik}}}, \quad \text{(A3)}$$

where μ is a scale parameter which reflects the variance of the unobserved part of utility (Ben-Akiva and Lerman, 1985). This parameter is set to one in the basic models. These models are usually estimated using the maximum likelihood method.

There are two important limitation in the MNL model: (i) the modeling of taste variation among different individuals is limited, and (ii) because of the IID assumption, the alternatives are treated as independent (a concept also known as independence of irrelevant alternatives, or IIA). Observed heterogeneity, i.e., those characteristics of the individuals that make them different and that we can observe (such as income, gender, or education level) can be incorporated into the systematic part of the model by having them interact with the attribute specific variables (or alternative-specific constants, ASC). However, the assumption about IID error strictly limits the treatment of the unobserved heterogeneity. The IIA assumption can be tested, and if this alternative is violated, an alternative model should be considered (Cameron and Trivedi, 2005). An alternative approach to identifying preference heterogeneity and relaxing the IIA assumption is the mixed or random parameter logit (RPL) model (Train, 1998). RPL models are based on the assumption that parameters are randomly distributed throughout the population. This allows us to capture the heterogeneity in the sample by estimating the mean and variance of the random parameter distribution.

For the case of undeveloped green areas, equation (A1) is specified as:

$$U_{ij} == \beta_0 Densegreen_{ij} + \beta_1 Flood_{ij} + \beta_3 Recreation_{ij} + \lambda p_{ij} + \varepsilon_{ij} \quad \text{(A4)}$$

where *Densegreen*, *Flood*, and *Recreation* are the non-monetary attributes, and *p* is the monetary attribute. This equation was modified adequately to include the ASC, interactions to control observed heterogeneity, and the estimation of the individual deviation of the

parameters in RPL models. Equivalently, equation (A1) in the case of urban parks is specified as:

$$U_{ij} == \beta_0 Distance\_neigh_{ij} + \beta_1(1-\zeta) Distance\_met_{ij} + \beta_3 \zeta New\_met_{ij} + \beta_4 Distance\_central_{ij} + \lambda p_{ij} + \varepsilon_{ij} \quad \text{(A5)}$$

where *Distance_neigh*, *Distance_met*, *New_*met, and *Distance_central* are the non-monetary attributes, and *p* is the monetary attribute. ζ is a dummy variable indicating if the attribute for the metropolitan park was presented as the distance to the metropolitan park to be rehabilitated / constructed, or constructing one new metropolitan park. This specification allows us to estimate the parameters using the whole sample. As in the previous case, this equation was modified adequately to include the ASC, interactions to control observed heterogeneity, and the estimation of the individual deviation of the parameters in RPL models.

References

Ben-Akiva ME and Lerman SR (1985) *Discrete Choice Analysis : Theory and Application to Travel Demand*. MIT Press

Cameron AC and Trivedi PK (2005) *Microeconometrics: Methods and Applications*. Cambridge University Press.

Holmes TP, Adamowicz WL and Carlsson F (2017) Attribute-based methods. In Champ PA, Boyle KJ and Brown TC (eds). *A Primer on Nonmarket Valuation*, 2d edn. Springer Netherlands, pp 171–219.

McFadden D (1974) The measurement of urban travel demand. *Journal of Public Economics* **3**, 303–328.

Train KE (1998) Recreation demand models with taste differences over people. *Land Economics* **74**, 230–239.

Appendix B: Choice experiment description

Undeveloped natural areas

The choice questions section in the survey about undeveloped natural areas started by explaining its definition and is shown in figure A1. Next, we introduced the program using text jointly with maps and pictures (figures A1 to A3):

> *The program aims to rehabilitate 70 km of the length of the urban river basins in Greater Metropolitan San José, located in the Province of San José (29 km Tiribí, 25 km Torres and 16 km María Aguilar). The program is going to attempt to control industrial and household pollution, and regulate land invasion by informal human settlements. The program will also rehabilitate habitats for animals and plants. From the 70 km length of urban river basins, only 35 km can be rehabilitated (50 per cent of total). The remaining area is inhabited by informal human settlements and needs more time to be restored than areas uninhabited. There are three kinds of interventions that can be implemented to restore the area: i) increase and restore dense green areas for improving animal and plant habitats; ii) increase the areas for recreation, with green areas with pathways, benches, and trash bins, but less dense vegetation; and iii) interventions in specific places that would help diminish the days in which the streets are flooded in the urban area. In the last 15 years, streets in different parts of the San José city have been flooded, on average, 35 days per year. It is important to note that these interventions are alternatives to each other, i.e., they are not complementary.*

One of the challenges for valuation of undeveloped natural areas was linking the benefits from ecosystem services provided through indirect use of urban green spaces to ecological

endpoints as they are perceived by the population. We worked on this during the focus groups and interviews with experts. For species habitat and recreation, we framed the alternatives to ask about a specific length of the entire basin to be restored for different purposes, such as dense green areas serving as biodiversity habitat; or walking trails and playgrounds integrated in undeveloped natural areas. In addition, we showed pictures to respondents depicting these attributes. The levels of these two attributes are never higher than the total length of the basins that can be restored. Flood control was denoted by the number of days that the streets are flooded. Table A1 shows an example of a choice card.

Each choice alternative also described how much it would cost to the household. The payment vehicle is a monthly increase in the electricity bill. This is a fixed amount per household, independent of electricity consumption; i.e., the household will pay the same amount regardless of how much electricity they will consume. The electricity bill was the payment vehicle most widely accepted across the focus groups. The focus group participants, notwithstanding their socioeconomic level, were reluctant to contribute to a charge raised by the Municipalities, despite the fact that urban green spaces management is the responsibility of the municipal authorities. In addition, from the perspective of participants from the low socioeconomic level, municipal charges are something to be evaded, even as the electricity bill is enforceable (i.e., they cannot evade this), because otherwise their electricity service would be cut. Additionally, households in different cantons of the city depend on different municipalities with different levels of credibility and trust by the public. Linking the payment to the electricity bill guarantees that all the households are making their payment through the same institution.

Urban parks

The choice questions section about preferences for urban parks starts by showing the respondent an urban parks typology by using pictures (figure A4). The urban parks in San José are mainly used for recreational activities. However, within the larger designation of all city parks and general recreational use, there are different categories useful for further classification of a specific type of park : (i) large metropolitan parks, (ii) parks in the center of individual local districts, and (iii) neighborhood parks with children's playgrounds, sometimes with a soccer or basketball field, and some green area around them. Large metropolitan parks are parks where people gather from all over the city for activities locally unavailable to them because of the lack of large open space. Parks in the center of the districts are generally close to commercial zones where people pass through when going to work, to the bus station, or any other reason, usually with monuments, paths, benches, and little green areas. Neighborhood parks are small areas, usually with children's playgrounds, a soccer or basketball field, and some open green area around them. The parks rehabilitation program was described as follows:

> *The municipalities in the GAM are looking to implement a program to improve urban park quality and availability. In areas with few parks available, new parks are going to be constructed, while in in areas with a large number of parks, those are going to be rehabilitated.*

Table A1. Choice card example for undeveloped natural areas rehabilitation program

Intervened areas used for:	**Option 1**	**Option 2**	**No change**
Dense green areas for improving birds, animals, insects, and plants habitat	**8.8 km (25%** of the whole area to recover)	**8.8 km (25%** of the whole area to recover)	Do nothing
Rehabilitate specific zones that diminish the nº of days that streets are flooded	**20** less flood street days per year (**50%** less than the last 15 year annual average)	**0** less flood street days per year (**0%** less than the last 15 year annual average)	
Green areas on the side of the rivers, with treks, benches, trash bins, etc., that can be used by the population for recreation	**17.5 km (50%** of the whole area to recover)	**17.5 km (50%** of the whole area to recover)	
Increase in the monthly electricity bill	₡ 3,500	₡ 500	₡ 0
Vote for	❒	❒	❒

Table A2. Choice card example for parks rehabilitation/construction program – Design 1

	Option 1	**Option 2**	**No change**
Rehabilitate (or construct a new one if there is none) neighborhood park with soccer / basketball fields and kids play station	Less than **5 minutes** walking from your house	Less than 1**5 minutes** walking from your house	Do nothing
Nº of metropolitan parks in the city (like La Sabana, de la Paz, del Este, etc.)	Equal like now	**1** new	
Rehabilitate a central district park (or construct a new one if there is none) and make it more lively with organized activities	Less than **15 minutes** walking from your house	Less than **30 minutes** walking from your house	
Monthly electricity bill increase	₡ 1000	₡ 3000	₡ 0
Vote for	❒	❒	❒

Table A3. Choice card example for parks rehabilitation/construction program – Design 2

	Option 1	Option 2	No change
Rehabilitate (or construct a new one if there is none) neighborhood park with soccer / basketball fields and kids play station	Less than **5 minutes** walking from your house	Less than **30 minutes** walking from your house	Do nothing
Rehabilitate (or construct a new one if there is none) a metropolitan park (like La Sabana, de la Paz, del Este, etc.)	Less than **45 minutes** walking from your house	Less than **45 minutes** walking from your house	
Rehabilitate a central district park (or construct a new one if there is none) and make it more lively with organized activities	Less than **45 minutes** walking from your house	Less than **15 minutes** walking from your house	
Monthly electricity bill increase	₡ 2,500	₡ 3,500	₡ 0
Vote for	❒	❒	❒

Figure A1. Images for illustrating undeveloped natural areas.

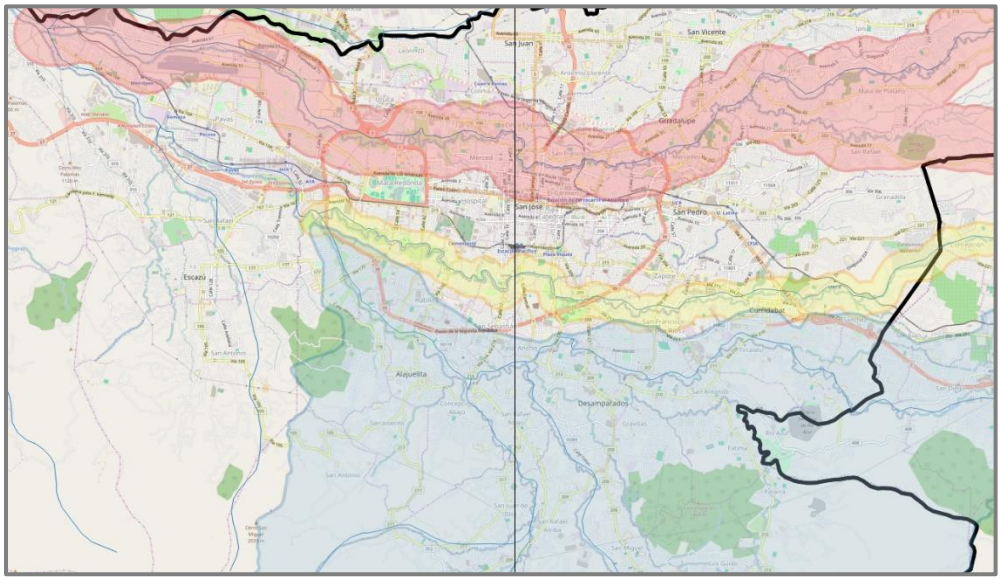

Figure A2. Metropolitan area main hydrological and biological corridors (María Aguilar, Tiribí, and Torres).

Note: There are 70 km of biological corridors in the urban river basins in the municipalities in the metropolitan area of the province of San José (29 km Tiribí, (blue), 25 km Torres (red), and 16 km María Aguilar (yellow)). Only 35 km of the 70 km can be rehabilitated (50% of the total).

Figure A3. Figures shown to illustrate attributes in the undeveloped natural areas choice experiment.

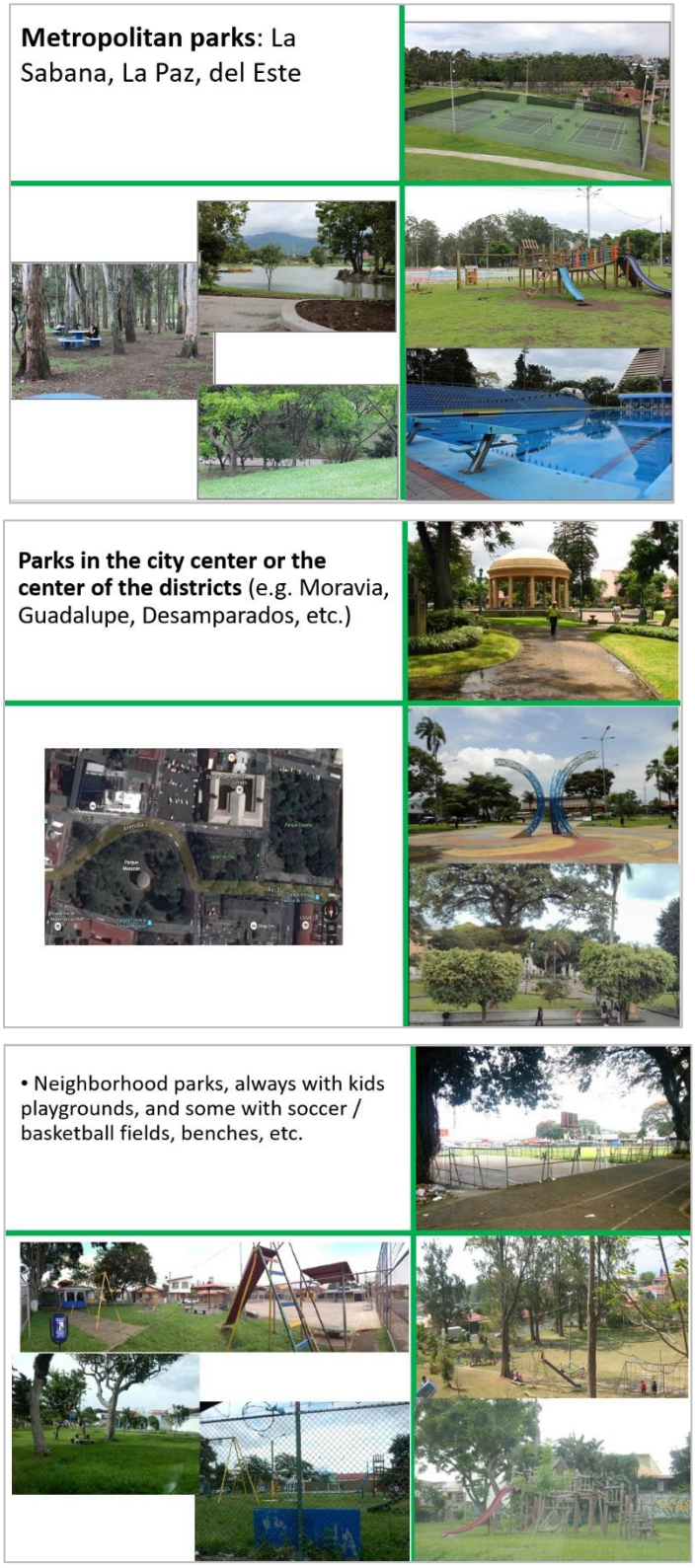

Figure A4. Figures used to illustrate the different type of urban parks.

Appendix C. Results

Table A4. Estimation results undeveloped natural areas rehabilitation

Variables	(1)	(2)	(3)	(4)	(5)
	MNL	MNL	RPL	RPL	RPL
Status quo (SQ)	-2.166	-13.24	-34.07	-23.98	-45.92
p-value	(0.0000)	(0.0000)	(0.996)	(0.595)	(0.233)
Dense green area (km)	0.0127	0.00152	0.0181	0.0228	0.0231
p-value	(0.0246)	(0.764)	(0.00723)	(0.00402)	(0.00613)
Days floods	0.00516	0.00586	0.00622	0.0125	0.0108
p-value	(0.327)	(0.285)	(0.333)	(0.0870)	(0.155)
Recreation area (km)	0.0172	0.00605	0.0223	0.0267	0.0249
p-value	(0.000441)	(0.206)	(0.000276)	(0.000172)	(0.000522)
Cost (₡)	-0.000179	-3.01e-05	-0.000210		
p-value	(2.27e-08)	(0.229)	(0.0000)		
Cost (₡) (opposite)				-9.146	-9.434
p-value				(0.0000)	(0.0000)
SQ*Socioec.: medium (=1)		-0.387	-4.410	-5.575	-4.542
p-value		(0.444)	(0.0180)	(0.0165)	(0.0613)
SQ*Socioec.: high (=1)		-1.828	-10.75	-35.97	-13.80
p-value		(0.0244)	(0.00616)	(0.000241)	(0.0408)
SQ*Age (35 - 49) (=1)		0.789	4.325	8.199	4.379
p-value		(0.288)	(0.0348)	(0.0191)	(0.113)
SQ*Age (50 - 65) (=1)		2.807	5.131	3.536	4.525
p-value		(5.29e-05)	(0.00761)	(0.101)	(0.0737)
SQ*Age (+65) (=1)		1.508	10.17	27.39	9.912
p-value		(0.128)	(0.00573)	(0.000175)	(0.0455)
SQ*Nationality: Costa Rican (=1)		-0.222	1.912	7.481	2.540
p-value		(0.711)	(0.334)	(0.00408)	(0.343)
SQ*Male (=1)		-0.870	-1.269	-12.93	-3.001
p-value		(0.0775)	(0.280)	(0.000864)	(0.138)

Variables	(1)	(2)	(3)	(4)	(5)
	MNL	MNL	RPL	RPL	RPL
SQ*Employment: active (=1)		-1.593	-2.590	-12.14	-4.404
p-value		(0.0199)	(0.185)	(0.00458)	(0.138)
SQ*Employment: unemp. (=1)		-0.725	2.531	1.727	-1.214
p-value		(0.422)	(0.354)	(0.557)	(0.740)
SQ*Employment: housekeeper (=1)		-2.012	-4.055	-7.953	-7.646
p-value		(0.0284)	(0.0569)	(0.0176)	(0.0406)
SQ*Education: HS or less (=1)		-2.614	-11.78	-29.04	-15.69
p-value		(0.0394)	(0.0805)	(0.00728)	(0.0535)
SQ*Education = Univ. or Tech.		-1.361	-7.516	-23.71	-12.83
p-value		(0.300)	(0.252)	(0.0312)	(0.118)
SQ*HH size: > 2 (=1)		0.0476	-3.081	-5.176	-2.577
p-value		(0.936)	(0.114)	(0.191)	(0.309)
SQ*Kids in HH (=1)		0.0496	1.981	2.698	-0.776
p-value		(0.915)	(0.171)	(0.263)	(0.732)
SQ*Independent house / Condo (=1)		14.40	31.39	25.81	46.58
p-value		(0.0000)	(0.996)	(0.560)	(0.216)
SQ*Townhouse (=1)		14.90	34.19	27.47	49.88
p-value		(0.0000)	(0.996)	(0.536)	(0.189)
SQ*House owner (=1)		-1.146	-3.938	-11.10	-6.206
p-value		(0.0436)	(0.00271)	(5.73e-05)	(0.0216)
SQ*Car or motorbike (=1)		-0.998	1.878	3.921	3.068
p-value		(0.0504)	(0.180)	(0.178)	(0.205)
SQ*Survey influence (Program=1)		0.000109	-0.000637	-0.00138	0.00132
p-value		(0.551)	(0.204)	(0.114)	(0.114)
SQ*Survey influence (SQ=1)		-0.380	-2.477	-8.339	-1.029
p-value		(0.676)	(0.310)	(0.0148)	(0.738)
SQ*Very or some worry for the environment (=1)		-12.05	-21.53	-20.72	-21.24
p-value		(0.0000)	(1.000)	(0.756)	(0.945)
SQ*Satisfied or very satisfied green areas in the neigh. (=1)		0.609	5.586	5.049	5.269
p-value		(0.558)	(0.593)	(0.581)	(0.522)

Variables	(1)	(2)	(3)	(4)	(5)
	MNL	MNL	RPL	RPL	RPL
SQ*Satisfied or very satisfied security (=1)		-0.145	-3.591	2.343	-0.867
p-value		(0.737)	(0.0112)	(0.129)	(0.630)
SQ*House in flood area (=1)		1.026	-0.915	-10.37	-3.812
p-value		(0.0210)	(0.431)	(0.000258)	(0.141)
SD					
Status quo (SQ)			8.470	22.22	8.407
p-value			(0.000189)	(9.82e-05)	(0.000896)
Status quo (SQ) / Dense green area (km)					-0.00143
p-value					(0.954)
Status quo (SQ) / Days floods					0.00998
p-value					(0.661)
Status quo (SQ) /Recreation area (km)					-0.00346
p-value					(0.823)
Status quo (SQ) / Cost (₡) (opposite)					-0.956
p-value					(0.0000)
Dense green area (km)			0.0541	0.0565	0.0625
p-value			(3.92e-06)	(7.66e-06)	(2.26e-05)
Dense green area (km) / Days floods					0.0291
p-value					(0.104)
Dense green area (km) /Recreation area (km)					0.0186
p-value					(0.244)
Dense green area (km) / Cost (₡) (opposite)					0.241
p-value					(0.00158)
Days floods			0.0536	0.0501	0.0523
p-value			(1.03e-06)	(4.32e-05)	(0.000366)
Days floods /Recreation area (km)					0.0128
p-value					(0.391)
Days floods / Cost (₡) (opposite)					-0.284
p-value					(0.00229)
Recreation area (km)			0.00688	0.0199	-0.00484

Variables	(1)	(2)	(3)	(4)	(5)
	MNL	**MNL**	**RPL**	**RPL**	**RPL**
p-value			(0.680)	(0.183)	(0.802)
Recreation area (km) / Cost (₡) (opposite)					0.0285
p-value					(0.682)
Cost (₡) (opposite)				3.055	2.538
p-value				(0.0000)	(0.0000)
Clustered	Yes	Yes	Yes	Yes	Yes
Nº obs.	3936	3909	3936	3936	3936
LL	-1110	-1101	-967.8	-933.3	-932
NB: param	5	29	33	34	44
LR test		(2) vrs. (1)	(3) vrs. (2)	(4) vrs. (3)	(5) vrs. (4)
Statistic		18	266.4	69	2.6
Degree of freedom		24	4	1	10
P(reject model extension)		0.05	0.00	0.00	0.02

Note: p-value in parentheses. See table 1 in the main paper for definitions of variables.

Table A5. Estimation results parks rehabilitation / construction

Variables	(1)	(2)	(3)	(4)	(5)
	MNL	**MNL**	**RPL**	**RPL**	**RPL**
Status quo	-2.551	-15.47	-37.75	-76.18	-83.52
p-value	(0.0000)	(0.0000)	(0.470)	(0.196)	(7.29e-06)
Neighborhood parks (min. walking)	-0.0139	-0.0154	-0.0155	-0.0184	-0.0175
p-value	(3.98e-05)	(5.60e-06)	(5.61e-05)	(4.71e-05)	(0.000187)
1 new Met. park	0.252	0.275	0.298	0.359	0.296
p-value	(0.0280)	(0.0189)	(0.0200)	(0.0137)	(0.0826)
Met. park (min. walking)	-0.00500	-0.00755	-0.0120	-0.0156	-0.0143
p-value	(0.323)	(0.110)	(0.0292)	(0.0104)	(0.0335)
Central district parks (min. walking)	-0.00752	-0.00823	-0.00214	-0.00384	-0.00408
p-value	(0.00946)	(0.00829)	(0.549)	(0.342)	(0.378)
Cost (₡)	-0.000299	-0.000307	-0.000340		
p-value	(0.0000)	(0.0000)	(0.0000)		
Cost (₡) (log-normal)				-8.209	-8.279
p-value				(0.0000)	(0.0000)
SQ*Socioec.: medium (=1)		-0.494	-2.177	-4.226	-6.506
p-value		(0.339)	(0.455)	(0.325)	(0.300)
SQ*Socioec.: high (=1)		-1.808	-8.899	-15.06	-20.35
p-value		(0.0623)	(0.0747)	(0.0472)	(0.0798)
SQ*Age (35 - 49) (=1)		0.830	4.560	7.424	9.455
p-value		(0.232)	(0.201)	(0.121)	(0.0577)
SQ*Age (50 - 65) (=1)		2.859	15.24	23.65	31.57
p-value		(1.11e-05)	(0.00565)	(0.00473)	(0.00821)
SQ*Age (+65) (=1)		2.001	10.21	15.42	24.17
p-value		(0.0472)	(0.0803)	(0.0685)	(0.0413)
SQ*Nationality: Costa Rican (=1)		-0.210	0.371	2.056	2.706
p-value		(0.732)	(0.911)	(0.646)	(0.555)
SQ*Male (=1)		-0.928	-4.029	-3.870	-6.486
p-value		(0.0906)	(0.149)	(0.296)	(0.113)

Variables	(1)	(2)	(3)	(4)	(5)
	MNL	MNL	RPL	RPL	RPL
SQ*Employment: active (=1)		-1.418	-5.955	-9.506	-9.653
p-value		(0.0368)	(0.113)	(0.0986)	(0.150)
SQ*Employment: unemp. (=1)		0.117	0.0906	3.090	5.164
p-value		(0.897)	(0.984)	(0.593)	(0.411)
SQ*Employment: housekeeper (=1)		-1.855	-8.315	-14.31	-17.44
p-value		(0.0194)	(0.0471)	(0.0309)	(0.0485)
SQ*Education: HS or less (=1)		-2.384	-13.33	-21.46	-21.72
p-value		(0.0300)	(0.101)	(0.150)	(0.110)
SQ*Education: Univ. or Tech.(=1)		-1.182	-6.642	-9.386	-6.391
p-value		(0.308)	(0.395)	(0.512)	(0.606)
SQ*HH size: > 2 (=1)		0.154	-0.255	2.645	2.722
p-value		(0.808)	(0.935)	(0.522)	(0.616)
SQ*Kids in HH (=1)		0.200	0.856	1.260	3.029
p-value		(0.666)	(0.764)	(0.735)	(0.490)
SQ*Independent house / Condo (=1)		14.65	32.16	65.51	62.52
p-value		(0.0000)	(0.524)	(0.244)	(0.0000)
SQ*Townhouse (=1)		15.09	33.23	68.70	64.89
p-value		(0.0000)	(0.512)	(0.223)	
SQ*House owner (=1)		-1.032	-7.742	-11.72	-15.01
p-value		(0.0802)	(0.0228)	(0.0299)	(0.0286)
SQ*Car or motorbike (=1)		-1.017	-5.339	-9.615	-10.53
p-value		(0.0431)	(0.0496)	(0.0327)	(0.0494)
SQ* Visit Met. daily/weekly (=1)		0.368	0.504	0.796	-1.202
p-value		(0.726)	(0.914)	(0.906)	(0.869)
SQ* Visit Met. sometimes (=1)		0.0125	-0.428	-1.235	-2.772
p-value		(0.979)	(0.868)	(0.739)	(0.557)
SQ*Visit CDP daily/weekly (=1)		-1.680	-3.417	-9.008	-8.806
p-value		(0.00900)	(0.245)	(0.105)	(0.117)
SQ*Visit CDP sometimes (=1)		-0.653	-2.289	-4.989	-6.172
p-value		(0.178)	(0.424)	(0.257)	(0.187)

Variables	(1)	(2)	(3)	(4)	(5)
	MNL	MNL	RPL	RPL	RPL
SQ*Visit NP daily/weekly (=1)		0.498	2.640	5.308	5.756
p-value		(0.382)	(0.366)	(0.306)	(0.262)
SQ*Visit NP sometimes (=1)		-0.0727	-0.654	-1.385	-1.250
p-value		(0.929)	(0.811)	(0.704)	(0.803)
SQ*Time walking closest 5 neighborhood parks		0.0579	0.285	0.358	0.673
p-value		(0.106)	(0.0727)	(0.0876)	(0.0236)
SQ*Survey influence (Program=1)		-0.175	-2.215	-4.280	-5.471
p-value		(0.828)	(0.513)	(0.306)	(0.308)
SQ*Survey influence (SQ=1)		-11.92	-20.74	-46.06	-46.48
p-value		(0.0000)	(0.878)		
SQ*Very or some worry for the environment (=1)		0.757	6.439	9.460	11.65
p-value		(0.443)	(0.473)	(0.493)	(0.401)
SQ*Satisfied or very satisfied green areas in neigh. (=1)		0.0373	-1.442	-2.241	-0.394
p-value		(0.935)	(0.561)	(0.558)	(0.914)
SQ*Satisfied or very satisfied security (=1)		0.933	4.068	8.260	8.226
p-value		(0.0538)	(0.137)	(0.0606)	(0.0913)
SQ*House in flood area (=1)		0.396	0.545	0.611	0.625
p-value		(0.609)	(0.876)	(0.914)	(0.922)
SD					
Status quo			10.25	14.86	18.52
p-value			(0.000390)	(0.00153)	(0.00574)
Status quo / Neighborhood parks (min. walking)					-0.00787
p-value					(0.571)
Status quo / 1 new Met. park					-0.510
p-value					(0.222)
Status quo / Met. park (min. walking)					-0.0308
p-value					(0.0202)
Status quo / Central district parks (min. walking)					0.0136
p-value					(0.153)
Status quo / Cost (₡) (opposite)					-0.482

Variables	(1)	(2)	(3)	(4)	(5)
	MNL	MNL	RPL	RPL	RPL
p-value					(0.000122)
Neighborhood parks (min. walking)			-0.0257	-0.0297	-0.0268
p-value			(0.000844)	(0.000457)	(0.00762)
Neighborhood parks (min. walking) / 1 new Met. park					-0.870
p-value					(0.0282)
Neighborhood parks (min. walking) / Met. park (min. walking)					0.00108
p-value					(0.944)
Neighborhood parks (min. walking) / Central district parks (min. walking)					0.00115
p-value					(0.905)
Neighborhood parks (min. walking) / Cost (₡) (opposite)					-0.134
p-value					(0.164)
1 new Met. park			0.672	-0.688	-0.165
p-value			(0.00463)	(0.0138)	(0.797)
1 new Met. park / Met. park (min. walking)					0.0113
p-value					(0.560)
1 new Met. park / Central district parks (min. walking)					-0.00922
p-value					(0.537)
1 new Met. park / Cost (₡) (opposite)					0.611
p-value					(4.10e-07)
Met. park (min. walking)			-0.0258	0.0212	-0.00499
p-value			(0.0448)	(0.120)	(0.761)
Met. park (min. walking) / Central district parks (min. walking)					0.00456
p-value					(0.720)
Met. park (min. walking) / Cost (₡) (opposite)					0.0135
p-value					(0.876)
Central district parks (min. walking)			0.000271	0.000173	0.00465
p-value			(0.983)	(0.992)	(0.701)

Variables	(1)	(2)	(3)	(4)	(5)
	MNL	**MNL**	**RPL**	**RPL**	**RPL**
Central district parks (min. walking / Cost (₡) (opposite)					-0.0834
p-value					(0.374)
Cost (₡) (opposite)				1.860	1.792
p-value				(0.0000)	(0.0000)
Constant					
Clustered	Yes	Yes	Yes	Yes	Yes
Nº obs.	3909	3873	3873	3873	3873
LL	-1106.3	-983.1	-861.5	-831.8	-822.9
NB: param	6	37	42	43	58
LR test		(2) vrs. (1)	(3) vrs. (2)	(4) vrs. (3)	(5) vrs. (4)
Statistic		246.474	243.2	59.4	17.8
Degree of freedom		31	5	1	15
P(reject model extension)		0.00	0.00	0.00	0.05

Note: p-value in parentheses. See table 1 in the main article for definitions of variables.

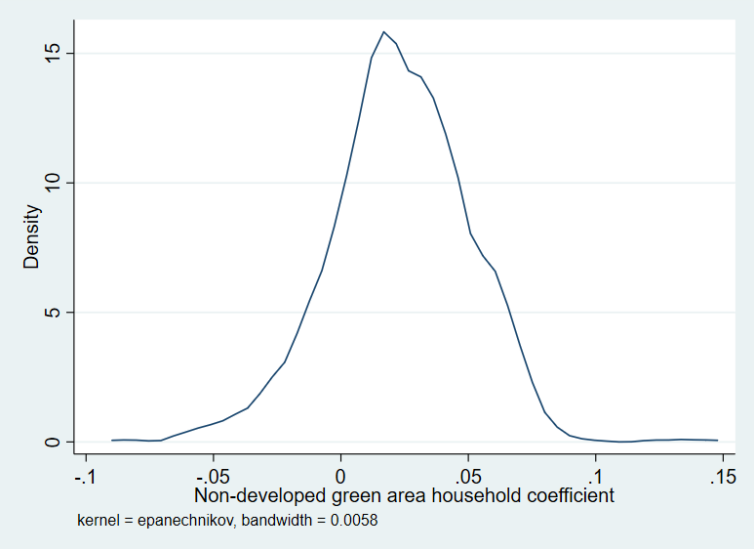

Figure A5. Distribution of household individual coefficient for undeveloped green areas based on Model 5 in table A4.

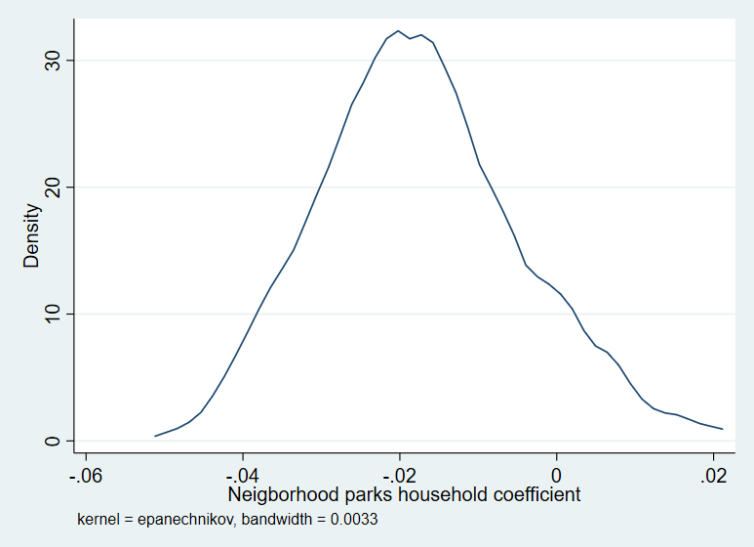

Figure A6. Distribution of household individual coefficient for neighborhood parks based on Model 5 in table A5.

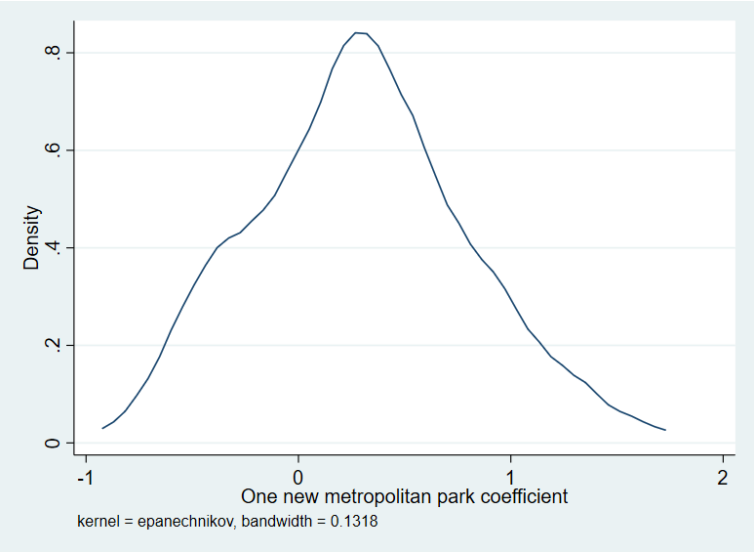

Figure A7. Distribution of household individual coefficient for one new metropolitan park based on Model 5 in table A5**.**

Appendix D: Heterogeneous preferences in non-monetary attributes

Table A6. Undeveloped natural areas - Estimates fixed parameters and random parameters models controlling for heterogeneous preferences in the attributes

Variables	**(1)**	**(2)**	**(3)**
	RPL	**RPL**	**RPL**
Status quo	-17.70	-16.75	-16.56
p-value	(4.45e-06)	(1.42e-05)	(2.67e-05)
Dense green area (kms.)	0.0255	-0.00699	2.02e-05
p-value	(0.00407)	(0.697)	(0.999)
Days floods	0.0106	0.0244	0.00312
p-value	(0.175)	(0.157)	(0.896)
Recreation area (kms.)	0.0213	0.0244	0.0454
p-value	(0.00619)	(0.210)	(0.0562)
Cost (₡) (opposite)	-9.252	-9.095	-9.128
p-value	(0.0000)	(0.0000)	(0.0000)
Days floods * HH in flood risk area	-0.0223	-0.0258	-0.0290
p-value	(0.305)	(0.231)	(0.172)
Dense green * Distance undeveloped area	-0.0243	-0.0240	-0.0237
p-value	(0.163)	(0.175)	(0.178)
Recreation * Distance undeveloped area	0.0121	0.0134	0.0173
p-value	(0.448)	(0.410)	(0.293)
Recreation * Kids in the HH		-0.0103	-0.00968
p-value		(0.472)	(0.497)
Dense green * Age (35 - 49)		0.0236	0.0240
p-value		(0.207)	(0.200)
Dense green * Age (50 - 65)		0.0292	0.0356
p-value		(0.152)	**(0.0886)**
Dense green * Age (+65)		-0.0390	-0.0336
p-value		(0.230)	(0.305)
Days flood * Age (35 - 49)		0.00267	0.00149
p-value		(0.883)	(0.934)
Days flood * Age (50 - 65)		0.0108	0.0158
p-value		(0.579)	(0.423)
Days flood * Age (+65)		-0.00473	0.000422
p-value		(0.869)	(0.988)
Recreation * Age (35 - 49)		-0.000787	-0.00195
p-value		(0.964)	(0.910)
Recreation * Age (50 - 65)		-0.0109	-0.0144
p-value		(0.562)	(0.452)
Recreation * Age (+65)		0.0161	0.0154
p-value		(0.527)	(0.545)
Dense green * Male		-0.00625	-0.00951
p-value		(0.718)	(0.585)
Days flood * Male		-0.0160	-0.0194
p-value		(0.330)	(0.235)
Recreation * Male		-0.0248	-0.0232
p-value		(0.108)	(0.134)

Variables	(1) RPL	(2) RPL	(3) RPL
Dense green * Employment = active		0.0255	**0.0300**
p-value		(0.128)	**(0.0807)**
Days flood * Employment = active		0.0373	**0.0384**
p-value		(0.0232)	**(0.0183)**
Recreation * Employment = active		0.0291	**0.0303**
p-value		(0.0573)	**(0.0495)**
Dense green * Education = Univ. or Tech.		0.00946	0.00873
p-value		(0.599)	(0.630)
Days flood * Education = Univ. or Tech.		-0.0280	**-0.0288**
p-value		(0.0919)	**(0.0823)**
Recreation * Education = Univ. or Tech.		0.0174	0.0180
p-value		(0.276)	(0.259)
Dense green * House owner		0.0186	0.0183
p-value		(0.289)	(0.303)
Recreation * House owner		-0.0257	-0.0251
p-value		(0.131)	(0.137)
Days flood * House owner		-0.00719	-0.00887
p-value		(0.656)	(0.583)
Dense green * High socioeconomic level		-0.0122	-0.0154
p-value		(0.543)	(0.448)
Days flood * High socioeconomic level		0.00209	-0.00546
p-value		(0.910)	(0.770)
Recreation * High socioeconomic level		-0.0125	-0.00814
p-value		(0.498)	(0.661)
Dense green * Very or some worry for the environment			-0.0207
p-value			(0.333)
Days flood * Very or some worry for the environment			0.0168
p-value			(0.364)
Recreation * Very or some worry for the environment			-0.0204
p-value			(0.237)
Dense green * Satisfied or very satisfied with green areas in the neighborhood			0.0175
p-value			(0.283)
Days flood * Satisfied or very satisfied with green areas in the neighborhood			0.0160
p-value			(0.291)
Recreation * Satisfied or very satisfied with green areas in the neighborhood			-0.0140
p-value			(0.333)
SD			
Status quo (SQ)	10.57	10.34	10.12
p-value	(1.83e-05)	(2.40e-05)	(5.23e-05)
Status quo (SQ) / Dense green area (km)	-0.0119	-0.0112	-0.0123
p-value	(0.591)	(0.618)	(0.579)

Variables	(1)	(2)	(3)
	RPL	RPL	RPL
Status quo (SQ) / Days floods	-0.00930	-0.000926	-0.00118
p-value	(0.676)	(0.967)	(0.958)
Status quo (SQ) /Recreation area (km)	0.00215	0.000392	0.000571
p-value	(0.887)	(0.979)	(0.969)
Status quo (SQ) / Cost (₡) (opposite)	-0.561	-0.730	-0.729
p-value	(1.37e-05)	(0.0000)	(0.0000)
Dense green area (km)	0.0559	0.0557	0.0555
p-value	(0.000168)	(0.000267)	(0.000557)
Dense green area (km) / Days floods	0.0208	0.0240	0.0300
p-value	(0.245)	(0.184)	(0.128)
Dense green area (km) /Recreation area (km)	0.0115	0.0103	0.0114
p-value	(0.478)	(0.498)	(0.456)
Dense green area (km) / Cost (₡) (opposite)	-0.0885	0.0637	0.0656
p-value	(0.368)	(0.444)	(0.440)
Days floods	0.0528	0.0461	0.0388
p-value	(5.23e-05)	(0.00131)	(0.0259)
Days floods /Recreation area (km)	0.0113	0.0113	0.0112
p-value	(0.428)	(0.428)	(0.457)
Days floods / Cost (₡) (opposite)	-0.498	-0.0323	-0.0260
p-value	(1.99e-08)	(0.726)	(0.778)
Recreation area (km)	-0.000794	-0.00116	-0.000140
p-value	(0.964)	(0.949)	(0.993)
Recreation area (km) / Cost (₡) (opposite)	0.00763	-0.122	-0.120
p-value	(0.924)	(0.00640)	(0.00650)
Cost (₡) (opposite)	2.408	1.969	1.980
p-value	(0.0000)	(0.0000)	(0.0000)
Clustered	Yes	Yes	Yes
NB: obs.	3936	3936	3936
LL	-948.5	-932.2	-928.8
NB: param	23	48	54

Note: p-value in parentheses. See table 1 in the main article for definitions of variables.

Table A7. Urban parks rehabilitation/construction programs - Estimates fixed parameters and random parameters models controlling for heterogeneous preferences in the attributes

	(1)	(2)	(3)	(4)
Variables	**RPL**	**RPL**	**RPL**	**RPL**
Status quo	-25.78	-27.26	-27.27	-24.97
p-value	(2.65e-05)	(0.000761)	(9.72e-05)	(8.38e-05)
Neigborhood parks (min. walking)	-0.0155	-0.0190	-0.0122	-0.0153
p-value	(0.0484)	(0.181)	(0.796)	(0.750)
1 new Met. park	0.386	0.592	-0.0360	0.129
p-value	(0.0378)	(0.125)	(0.980)	(0.929)
Met. park (min. walking)	-0.00944	-0.00902	0.0550	0.0541
p-value	(0.198)	(0.550)	(0.799)	(0.788)
Central district parks (min. walking)	-0.0103	-0.00480	0.0785	0.0796
p-value	(0.0466)	(0.659)	(0.153)	(0.143)
Cost (₡) (opposite)	-8.275	-8.351	-8.315	-8.282
p-value	(0.0000)	(0.0000)	(0.0000)	(0.0000)
GIS distance NP < 5min * NP (min. Walking)	0.00611	0.00526	0.00270	0.00235
p-value	(0.604)	(0.661)	(0.823)	(0.851)
GIS distance 5 closest NP < 10min * NP (min. Walking)	-0.00933	-0.00725	-0.00682	-0.00766
p-value	(0.407)	(0.534)	(0.560)	(0.521)
GIS distance Met < 15 min * 1 new Met. Park	-0.143	-0.117	-0.115	-0.0756
p-value	(0.676)	(0.763)	(0.770)	(0.846)
GIS distance Met < 15 min * Met. (min walking)	-0.0250	-0.0258	-0.0252	-0.0250
p-value	(0.110)	(0.0889)	(0.0968)	(0.115)
GIS distance CDP < 15 min * CDP (min walking)	0.0179	0.0202	0.0213	0.0227
p-value	(0.0442)	(0.0236)	(0.0175)	(0.0148)
NP * Kids in the HH		0.00581	0.00589	0.00605
p-value		(0.548)	(0.548)	(0.548)
NP * Male		0.00240	0.00354	0.00421
p-value		(0.824)	(0.744)	(0.698)
1 new Met. Park * Male		-0.0587	-0.0770	-0.0550
p-value		(0.871)	(0.829)	(0.876)
Met. (min walking) * Male		0.0254	0.0241	0.0264
p-value		(0.0964)	(0.117)	(0.0930)
CDP * Male		0.00110	0.000791	0.000955
p-value		(0.910)	(0.936)	(0.924)
NP * Age (35 - 49)		0.00700	0.00661	0.00788
p-value		(0.545)	(0.566)	(0.500)
NP * Age (50 - 65)		-0.00208	-0.00123	-0.00308
p-value		(0.879)	(0.929)	(0.826)
NP * Age (+65)		0.00696	0.00281	0.00260
p-value		(0.714)	(0.884)	(0.892)

	(1)	(2)	(3)	(4)
Variables	**RPL**	**RPL**	**RPL**	**RPL**
1 new Met. Park * Age (35 - 49)		0.243	0.265	0.254
p-value		(0.545)	(0.512)	(0.527)
1 new Met. Park * Age (50 - 65)		-0.0648	-0.0252	-0.0858
p-value		(0.889)	(0.957)	(0.853)
1 new Met. Park * Age (+65)		-0.00562	-0.0116	-0.103
p-value		(0.992)	(0.984)	(0.861)
Met. (min walking) * Age (35 - 49)		0.0254	0.0242	0.0254
p-value		(0.105)	(0.127)	(0.120)
Met. (min walking) * Age (50 - 65)		0.0255	0.0240	0.0280
p-value		(0.144)	(0.176)	(0.131)
Met. (min walking) * Age (+65)		0.0315	0.0306	0.0302
p-value		(0.232)	(0.247)	(0.273)
CDP * Age (35 - 49)		-0.00192	-0.00131	-0.000817
p-value		(0.853)	(0.900)	(0.939)
CDP * Age (50 - 65)		-0.0271	-0.0292	-0.0322
p-value		(0.0219)	(0.0137)	(0.0100)
CDP * Age (+65)		-0.0103	-0.0136	-0.0143
p-value		(0.534)	(0.416)	(0.403)
NP * High socioeconomic level		-0.0123	-0.00919	-0.00914
p-value		(0.339)	(0.477)	(0.485)
1 new Met. Park * High socioeconomic level		-0.433	-0.425	-0.498
p-value		(0.342)	(0.354)	(0.272)
Met. (min walking) * High socioeconomic level		-0.00615	-0.00556	-0.00678
p-value		(0.676)	(0.706)	(0.664)
CDP * High socioeconomic level		-0.00689	-0.00518	-0.00450
p-value		(0.517)	(0.628)	(0.681)
NP * Employment = active		-0.0113	-0.0107	-0.0115
p-value		(0.295)	(0.327)	(0.300)
1 new Met. Park * Employment = active		-0.374	-0.401	-0.427
p-value		(0.310)	(0.273)	(0.241)
Met. (min walking) * Employment = active		-0.0173	-0.0170	-0.0197
p-value		(0.234)	(0.259)	(0.204)
CDP * Employment = active		0.00269	0.00329	0.00343
p-value		(0.787)	(0.741)	(0.736)
NP * Education = Univ. or Tech.		-0.00167	-0.00224	-0.00143
p-value		(0.878)	(0.837)	(0.896)
1 new Met. Park * Education = Univ. or Tech.		0.234	0.216	0.230
p-value		(0.547)	(0.578)	(0.550)
Met. (min walking) * Education = Univ. or Tech.		-0.0240	-0.0244	-0.0220
p-value		(0.108)	(0.0985)	(0.143)
CDP * Education = Univ. or Tech.		0.00822	0.00953	0.00937

	(1)	(2)	(3)	(4)
Variables	**RPL**	**RPL**	**RPL**	**RPL**
p-value		(0.388)	(0.319)	(0.340)
NP * House owner		0.00616	0.00534	0.00541
p-value		(0.576)	(0.627)	(0.629)
1 new Met. Park * House owner		-0.0598	-0.0357	-0.153
p-value		(0.876)	(0.926)	(0.692)
Met. (min walking) * House owner		-0.00919	-0.00735	-0.00678
p-value		(0.524)	(0.611)	(0.651)
CDP * House owner		-0.00363	-0.00478	-0.00568
p-value		(0.721)	(0.639)	(0.591)
NP * NP some or very important			-0.00920	-0.00730
p-value			(0.421)	(0.529)
1 new Met. Park * Met. some or very important			-0.0218	-0.0753
p-value			(0.963)	(0.871)
Met. (min walking) * Met. some or very important			-0.00279	-0.00151
p-value			(0.857)	(0.925)
CDP *CDP some or very important			0.00314	0.00340
p-value			(0.781)	(0.773)
NP * Satisfied or very satisfied with green areas in the neigborhood			0.00425	0.00489
p-value			(0.659)	(0.619)
NP * Very or some worry for the environment			-0.00149	-0.00121
p-value			(0.974)	(0.979)
1 new Met. Park * Very or some worry for the environment			0.641	0.694
p-value			(0.625)	(0.596)
Met. (min walking) * Very or some worry for the environment			-0.0627	-0.0645
p-value			(0.771)	(0.748)
CDP * Very or some worry for the environment			-0.0867	-0.0873
p-value			(0.104)	(0.0981)
NP * Visit NP daily/weekly				0.00353
p-value				(0.725)
1 new Met. Park * Visit Met. daily/weekly				-0.597
p-value				(0.275)
Met. (min walking) * Visit Met. daily/weekly				0.00143
p-value				(0.954)
CDP * Visit CDP daily/weekly				-0.00278
p-value				(0.785)
SD				
Status quo	18.75	20.31	20.06	16.90
p-value	(3.97e-05)	(0.000997)	(0.000161)	(5.80e-05)

	(1)	(2)	(3)	(4)
Variables	**RPL**	**RPL**	**RPL**	**RPL**
Status quo / Neighborhood parks (min. walking)	0.0182	0.0183	0.0172	0.0171
p-value	(0.128)	(0.129)	(0.180)	(0.177)
Status quo / 1 new Met. park	-0.344	-0.336	-0.326	-0.280
p-value	(0.418)	(0.445)	(0.508)	(0.582)
Status quo / Met. park (min. walking)	-0.00614	0.00137	0.00235	-0.00163
p-value	(0.645)	(0.923)	(0.874)	(0.905)
Status quo / Central district parks (min. walking)	-0.00515	-0.00173	-0.00223	-0.000943
p-value	(0.582)	(0.856)	(0.820)	(0.921)
Status quo / Cost (₡) (opposite)	-0.709	-1.002	-0.868	-0.594
p-value	(4.15e-06)	(0.0000)	(0.0000)	(7.99e-08)
Neighborhood parks (min. walking)	-0.0282	-0.0288	-0.0282	-0.0274
p-value	(0.00110)	(0.00111)	(0.00106)	(0.00212)
Neighborhood parks (min. walking) / 1 new Met. park	-0.935	-0.999	-0.958	-0.899
p-value	(0.00271)	(0.00134)	(0.00295)	(0.0172)
Neighborhood parks (min. walking) / Met. park (min. walking)	-0.00972	-0.0165	-0.0169	-0.0158
p-value	(0.463)	(0.109)	(0.0982)	(0.333)
Neighborhood parks (min. walking) / Central district parks (min. walking)	0.00443	0.000869	0.00159	0.00363
p-value	(0.612)	(0.916)	(0.842)	(0.687)
Neighborhood parks (min. walking) / Cost (₡) (opposite)	-0.228	-0.259	-0.218	-0.204
p-value	(0.320)	(0.193)	(0.0678)	(0.0311)
1 new Met. park	-0.112	-0.105	-0.107	-0.166
p-value	(0.847)	(0.840)	(0.852)	(0.772)
1 new Met. park / Met. park (min. walking)	0.00201	0.000395	-0.00464	-0.00972
p-value	(0.926)	(0.984)	(0.852)	(0.633)
1 new Met. park / Central district parks (min. walking)	0.00112	0.00114	0.00286	0.00186
p-value	(0.937)	(0.923)	(0.843)	(0.875)
1 new Met. park / Cost (₡) (opposite)	-0.0422	0.197	-0.187	-0.372
p-value	(0.791)	(0.227)	(0.111)	(0.000312)
Met. park (min. walking)	0.0232	0.00618	0.00203	0.00993
p-value	(0.0533)	(0.688)	(0.925)	(0.473)
Met. park (min. walking) / Central district parks (min. walking)	-0.0117	-0.00388	-0.00142	-0.00658
p-value	(0.222)	(0.738)	(0.917)	(0.535)
Met. park (min. walking) / Cost (₡) (opposite)	0.130	0.0843	-0.449	0.00238
p-value	(0.492)	(0.595)	(4.38e-08)	(0.988)
Central district parks (min. walking)	-0.000241	0.000929	0.00119	0.00132
p-value	(0.984)	(0.936)	(0.914)	(0.898)

	(1)	(2)	(3)	(4)
Variables	**RPL**	**RPL**	**RPL**	**RPL**
Central district parks (min. walking / Cost (₡) (opposite)	-0.0493	0.245	0.159	-0.238
p-value	(0.813)	(0.213)	(0.187)	(0.0490)
Cost (₡) (opposite)	1.498	1.417	1.414	1.669
p-value	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Clustered	Yes	Yes	Yes	Yes
Nº obs.	3909	3909	3909	3909
LL	-865.2	-854.6	-851.4	-851.5
NB: param	32	65	74	78

Note: p-value in parentheses. See table 1 in the main article for definitions of variables.

Appendix E: Robustness check

When conducting a choice experiment, several concerns appear regarding the role of different misperceptions, on the part of the respondents, about the survey and in particular, the estimation of the coefficients. One well-known concern is the so-called "hypothetical bias," which is the difference between how individuals respond to a survey and how they would behave in an actual choice environment (Freeman *et al.*, 2014). The debriefing questions in this study show that 9.4 per cent of the sample indicated that at least one of the proposed programs was hard to understand.

A related concern is that respondents might reject some of the information provided in the survey and replace it with their own beliefs. On the one hand, "warm" factors depict individuals who always choose options with high attribute values because they feel a moral satisfaction. On the other hand, "cold" factors can explain the behavior of individuals who always reject the alternatives because they think that the people responsible for environmental damage should take responsibility for the solutions; they may also believe that the program is not going to be successfully implemented.

We conduct the main estimations by selecting a sub-sample controlling by cold factors. If the MWTP when controlling for cold factors increases, we know that our estimates are behaving well. We removed from the sample those individuals who: (i) declared that at least one of the scenarios was hard to understand; or (ii) were not confident that the results of the survey were going to be considered for policy design; or (iii) did not trust that the programs would be properly implemented; or (iv) did not understand that they would have to pay if the programs were implemented, or (v) chose the status quo because they did not believe that the budget would be properly executed, or because they thought part of the

population could not pay; or for any other reason, other than not being able to really pay or not liking any of the attributes. The sub-sample ended up with 328 individuals for the undeveloped natural areas program (42.6 per cent of the sample), and 326 respondents for the parks program (42.4 per cent of the sample). We conducted robustness checks by estimating the same models using the full sample.

Figure A8 shows the estimation results for the undeveloped natural areas rehabilitation program, both for the fixed and random parameter models. The MWTP is stable across models. As was expected, MWTP is greater than in the models using the full sample in figure 3 when not controlling for warm behavior. Figure A9 shows the estimated results for park rehabilitation/construction programs. The values are, in general, higher than when not controlling for cold factors. However, differences are not statistically significant. This fact highlights the robustness of the models estimated using the full sample.

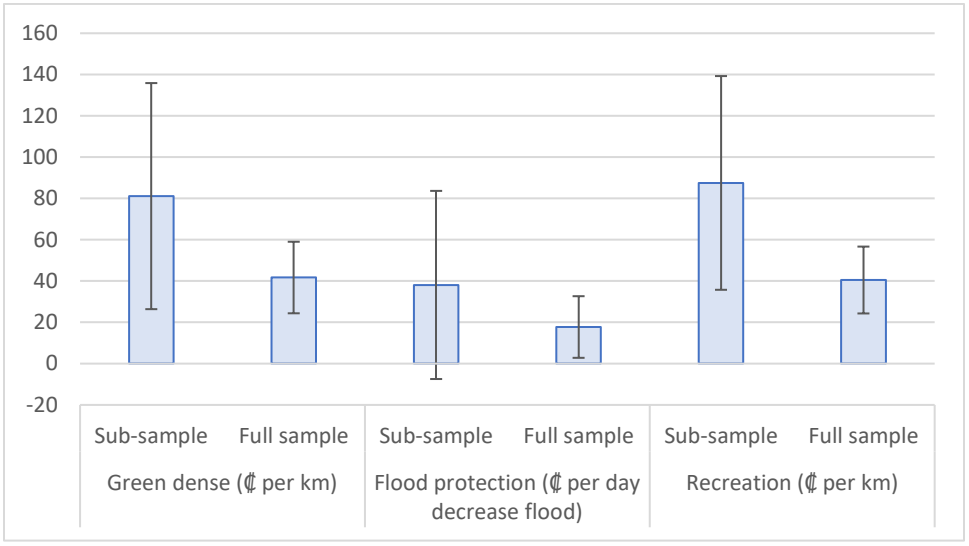

Figure A8. MWTP for undeveloped natural areas program, controlling (sub-sample) and not controlling (full sample) by program perception.
Note: MWTP computed using Model 5 in table A4 and same model using the full sample.

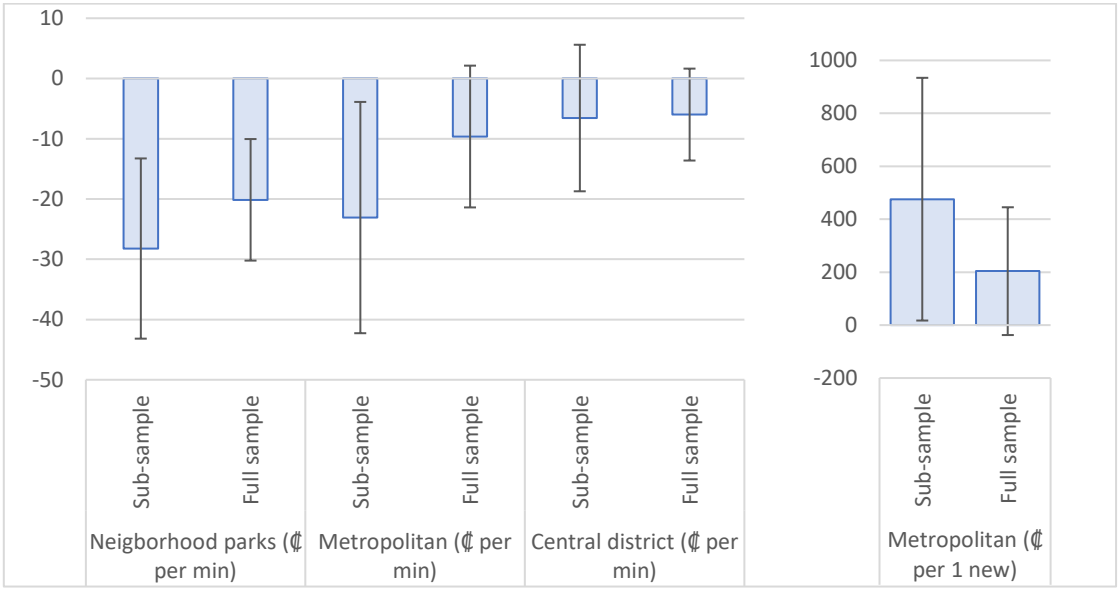

Figure A9. MWTP for urban parks program, controlling (sub-sample) and not controlling (full sample) by program perception.
Note: MWTP computed using Model 5 in table A4 and same model using the full sample.

Appendix F. Policy analysis

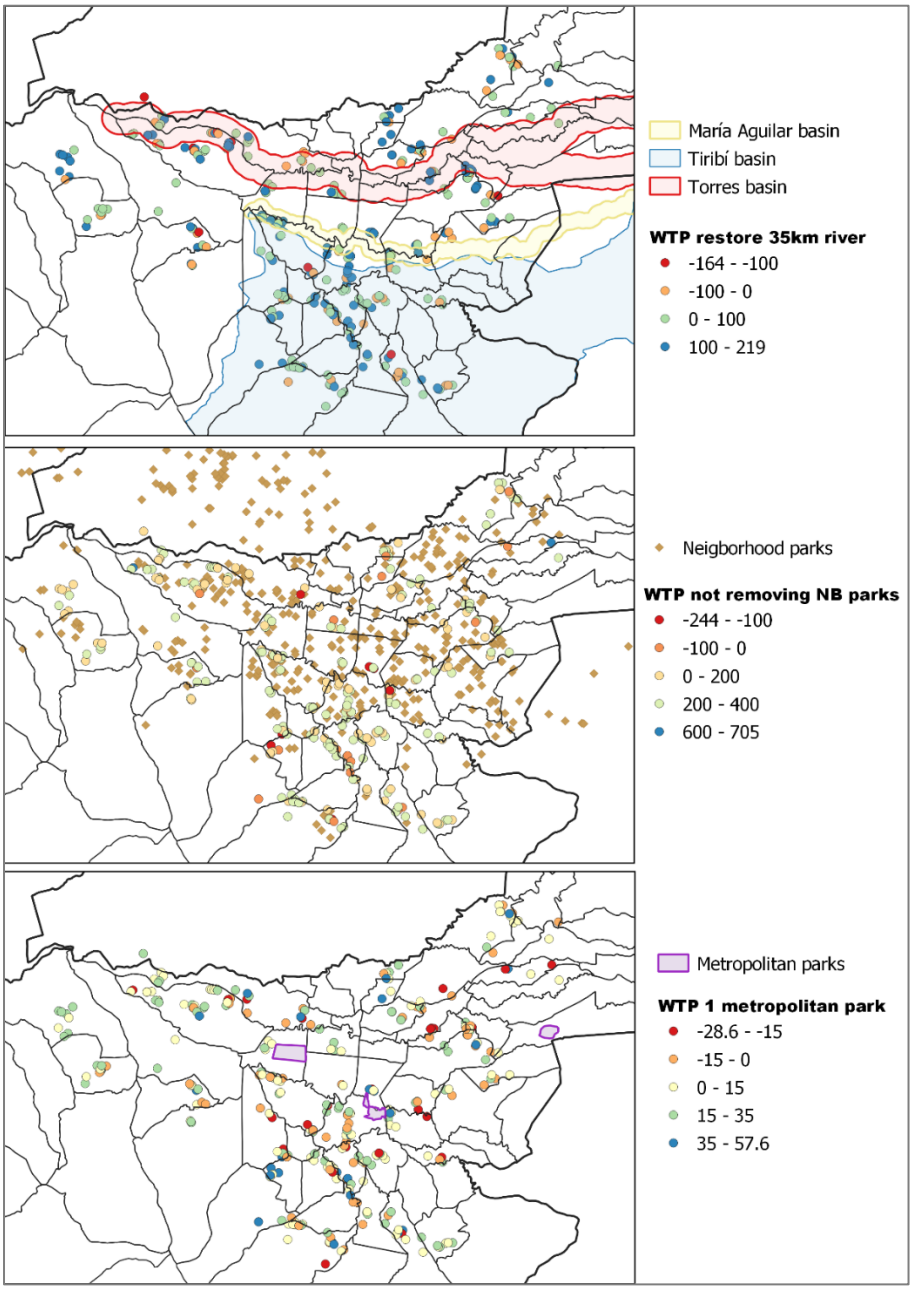

Figure A10. Willingness to pay per household per year for restoring 35 km of riverbanks with dense green areas (upper), closure of the closest neighborhood park (middle), and constructing a new metropolitan park (lower) (US dollars 2016).

References

Freeman MA, Herriges JA and Kling CL (2014) T*he Measurement of Environmental Resource Values*, 2nd edn. RFF Press, Oxon and NY.

McFadden D (1974) The measurement of urban travel demand. *Journal of Public Economics* **3**, 303–328.