Environmental Conservation **39** (2): 162–171 © Foundation for Environmental Conservation 2012 doi:10.1017/S0376892911000646

Perception, use and valuation of protected areas by local populations in an economic crisis context

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Date submitted: 5 April 2011; Date accepted: 27 October 2011; First published online: 7 February 2012

SUMMARY

With some exceptions, local populations' opinions are not considered sufficiently important in developing policies related to protected areas (PAs), despite their recognized effect on conservation and management. This paper surveys the views and the activities performed by residents living inside or near the 10 PAs of the densely-populated, industrialized Autonomous Region of Madrid, with a view toward better informing their management. The degree of knowledge, perception of conservation state, activities performed inside them and stated importance were assessed, and the hypothesis that the economic valuation of PAs had decreased between 2006/2007 and 2009 as a result of Spain's economic crisis was tested using the contingency valuation method. Local populations valued PAs highly, despite their limited use of them and their moderate perception of the conservation state of these areas. The objective valuation of PAs (measured by three economic variables) remained high among the local populations at the peak of the economic crisis (assessed by the gross domestic product growth), although declared economic support for PAs had significantly shifted towards a 'pay per use' scheme.

Keywords: economic crisis, local populations, perception, protected areas, Spain, valuation

INTRODUCTION

The Autonomous Region of Madrid is a small region of 8021 km^2 in the centre of Spain, with a steadily growing population of 6 458 684 inhabitants (INE [Instituto Nacional de Estadistica] 2011). The Region has the highest population density in Spain (805 inhabitants km^{-2} in 2010; INE 2011). It also has the highest per person annual income of all the Spanish regions (€ 31 577 in 2007; IESTADIS [Instituto de Estadistica de la Comunidad de Madrid] 2011). Massive residential and infrastructure developments have occurred in the last two decades (Sánchez-Herrera 2005; Fernández 2008), and there is great pressure on the rich natural and cultural heritage of the region (Delgado 2008; Rodríguez-Rodríguez 2008). Numerous new urban developments have resulted in a high number of residents living inside or in the vicinity of the Region's protected areas (PAs) (Delgado 2008), and continued growth of visitors to its natural areas and PAs (Gómez-Limón *et al.* 1994; Barrado 1999; Rodríguez-Rodríguez 2009). The urban green spaces and recent developments of leisure-oriented peri-urban parks around the main cities of the Region seems to be insufficient to reduce the high demand for nature-based leisure activities in the Region (Barrado 1999; Rodríguez-Rodríguez 2010). Consequently, most visitors in search of nature head to the PAs of the Region, resulting in the temporary overcrowding of their best-known zones (Gómez-Limón *et al.* 1994, 1996; Barrado 1999; Rodríguez-Rodríguez 2009). Similar developments in and around PAs have occurred elsewhere (Radeloff *et al.* 2010).

The degree of knowledge and the valuation of natural resources by society, in particular by the local populations where those resources are located, is crucial for the success of nature conservation policies (Borrini-Feyerabend *et al.* 2004; Sánchez-Herrera 2005; Diego & García 2006; Stolton 2009). Public information, communication and participation-based strategies have proven efficient in making local populations more favourable to nature conservation (Borrini-Feyerabend *et al.* 2004; Fraser *et al.* 2006). These integrative strategies are especially relevant regarding PAs, multivariate places where numerous opposing interests coincide (Smith 1999; Corraliza *et al.* 2002*a*; Sánchez-Herrera 2005).

Citizens' preferences are based on perceptions (Adamowicz *et al.* 1997) and, in the end, those preferences will determine the orientation on the use of natural resources of a territory fostered by public administrations, be this use conservationist or 'productive' (Sánchez-Herrera 2005; Azqueta *et al.* 2007). Hence, it is worthwhile to regularly collect information on social perceptions of selected natural features to see if they meet (or how much they differ from) their management targets (Adamowicz *et al.* 1997). In spite of their direct implications for conservation, issues related to public use, social perception, valuation, visitors' expectations and the degree of satisfaction with visited places are barely considered in the management of PAs (Corraliza *et al.* 2002*b*; Múgica & Gómez-Limón 2002; Fraser *et al.* 2006), leading to discontent and mistrust in local populations (Corraliza *et al.* 2002*a*; Stolton 2009).

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Table 1 Main characteristics of the protected areas considered in the study.

Protected area	*Area (ha)*	*Designation target*	*Main ecosystems*
Peñalara Natural Park	11 637	Geomorphology	Montane scrub; glacier wetlands; evergreen forests (*Pinus sylvestris*); deciduous forests (*Quercus pyrenaica*).
Cuenca Alta del Manzanares Regional Park	52 796	Environmental, cultural, agricultural and landscape; ecological corridor	Montane; deciduous forests (*Q. pyrenaica*); evergreen forests (*Q. rotundifolia*; *P. sylvestris*); pastureland
Sureste Regional Park	31 550	Ecological, palaeontological and archaeological	Unirrigated cropland; pine forests (*P. halepensis*); riparian forests; artificial wetlands; scrub
Curso Medio del río Guadarrama Regional Park	22 116	Natural and cultural; water ecosystems; landscape; ecological corridor; tourism	Evergreen forests (*Q. rotundifolia*; *P. pinea*); riparian forests; scrub; unirrigated cropland
Pinar de Abantos y Zona de la Herrería Picturesque Landscape	1538	Landscape	Pine forests (*P. sylvestris*); oak forests (*Q. pyrenaica*)
El Regajal-Mar de Ontígola Nature Reserve	629	Fauna (*Lepidoptera*; birds); botanical	Scrub; semi-natural wetland (dam)
Laguna de San Juan Fauna Refuge	47	Fauna; geomorphology; landscape; scientific; education	Natural wetland
Natural Site of National Interest of Hayedo de Montejo	250	Relict ecosystems; landscape; scientific; education	Deciduous forests (*Q. pyrenaica; Fagus sylvatica*)
Natural Monument of National Interest of Peña del Arcipreste de Hita	3	Cultural	Montane scrub; pine forest (*P. sylvestris*)
Preventive Protection Regime of Soto del Henares	332	Riparian ecosystems; landscape; ecological corridor	River; mixed riparian forest

Some of these variables can be assessed through well-established methodologies, such as the contingent valuation method (CVM), a survey-based approach to measuring non-market values (Alberini *et al.* 1997) that has been used to estimate economic value of natural resources for many years (Boxall *et al.* 1996; Hanley *et al.* 1998). CVM belongs to a wider class of preference elicitation methods called 'stated preference' methods, where the willingness to pay to enjoy (or to be deprived of) a natural good or service is obtained by directly asking a target group(s) of people through interview (Boxall *et al.* 1996; Azqueta *et al.* 2007). Despite its constraints (Alberini *et al.* 1997; Hanley *et al.* 1998), CVM remains a useful approximation of the total economic value (direct use, potential use and non-use values) of natural goods and services (Carson *et al.* 1997; Azqueta *et al.* 2007). It has been used to justify some famous legal judgments, as happened when establishing economic compensations for the Exxon Valdez accident in Alaska (Carson *et al.* 1997).

Many studies on public use characterization, visitor preferences, visitor influx to recreational sites, activities performed by visitors, and visitor impacts on PAs in the Region of Madrid were conducted in the 1990s (Gómez-Limón & De Lucio 1992; Gómez-Limón & García-Avilés 1992; Múgica 1994; Gómez-Limón *et al.* 1994, 1996; Barrado 1999). The enormous social, economic and environmental changes that have occurred in the Region of Madrid in the 12–15 year-period since previous studies (Sánchez-Herrera 2005; Landa 2007) suggest that it is necessary to analyse, update and broaden knowledge of the fundamental social and environmental variables concerning the people living in the most important nature islands of the Region. The objectives of this paper were to: (1) analyse the current degree of knowledge of the PAs of the Region of Madrid, the perception of their conservation state, the subjective importance attached to them and the activities performed in them by local populations; and (2) test the hypothesis that economic support for PAs by residents decreased between two very different phases in the Spanish economy (end of 2006 to mid-2007, when there was high gross domestic product [GDP] growth, and mid-2009, when severe recession took over) as an indicator of the 'objective valuation' of PAs by local populations in densely-populated industrialized regions.

METHODS

I conducted telephone interviews with residents chosen at random from the telephone directory living inside or in the vicinity of each of the 10 PAs of the Region of Madrid (see Table 1 for their main characteristics): (1) between November 2006 and July 2007, when the annual average GDP growth in Spain was high (+3.9% in 2006 and +3.8% in 2007; INE 2011), and (2) in June 2009, when the average growth of the Spanish GDP for the second term of 2009 was markedly negative (–4.2%; INE 2011).

https://doi.org/10.1017/S0376892911000646 Published online by Cambridge University Press

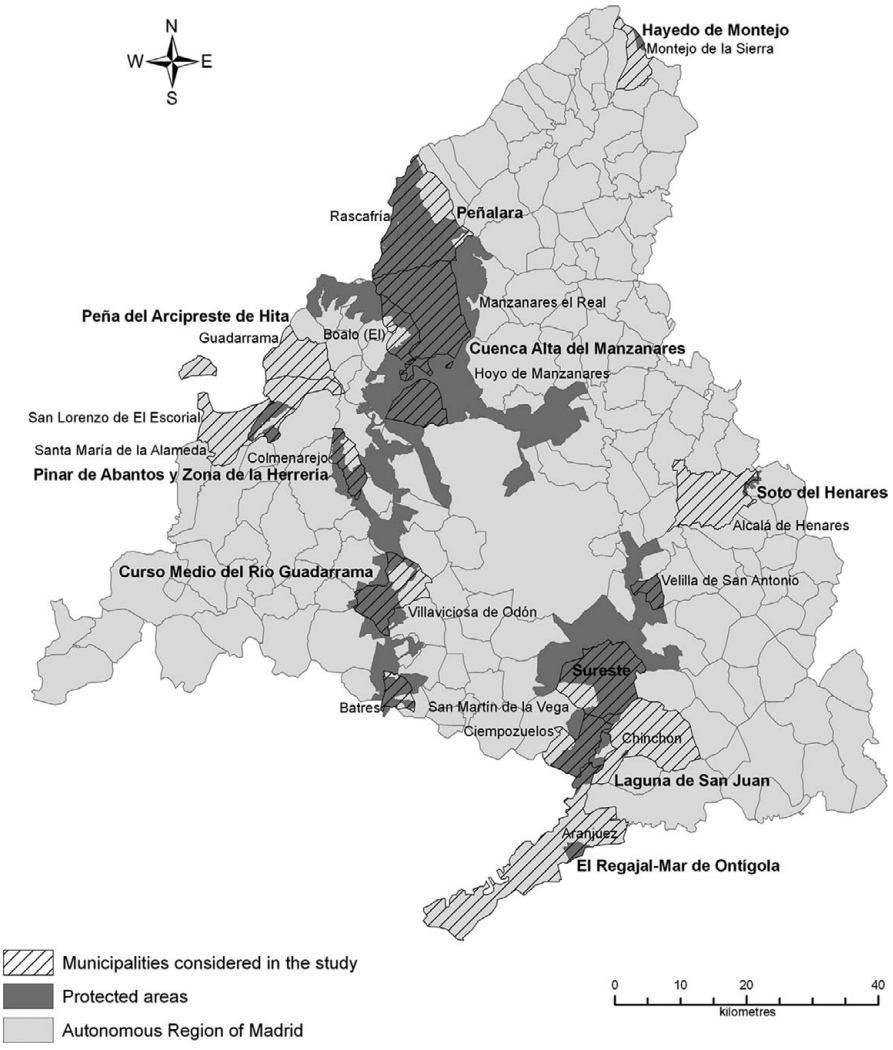

Figure 1 Protected areas of the Autonomous Region of Madrid and the municipalities considered in the study.

In 2006–2007, I interviewed up to 30 residents per PA (both familiar or unfamiliar with the PA) ≥ 18 years old during the evenings (from 17 to 21 h) and, in 2009, I surveyed up to 30 people familiar with each particular PA (in total 300 interviews in 2006/2007 and 401 interviews in 2009). In both cases, a brief introduction explaining the purely academic purpose of the study and identifying the institution supporting the research (IEGD-CSIC [Institute of Economics, Geography and Demography, Spanish National Research Council]) was supplied to each interviewee to reduce the strategic bias of his/her response.

Both sets of interviews targeted residents in municipalities whose territories were included entirely or mostly within the 10 PAs of the Region, irrespective of the distance of each resident's home from the PA. In the case of PAs encompassing numerous municipalities (the three regional parks), the populations most in contact with each PA were selected. Thus, out of these municipalities, only the three of them with the highest proportion of their territory inside the PAs were selected for the surveys, and sample sizes were allocated according to their relative populations. Seventeen municipalities overlapping fully or partially with the 10 PAs of the region were selected using Arc-GIS software (Fig. 1). Sample size n was selected according to:

$$n = \frac{4 \times p \times q}{E^2},$$

the formula for infinite or very numerous populations, with a confidence interval of 95.5% or 2σ, with both p (the probability of success) and q (the probability of failure) being equal to 50%, and where E is estimated error (Sierra-Bravo 1991).

In the 2009 survey, seven variables associated with the 10 PAs of the Autonomous Region of Madrid were analysed. The specific questions (in quotes) for each variable in the order they were asked in the interview were:

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(1) Degree of knowledge of the PA ($n = 401$): 'Do you know, physically or culturally, the PA named X (full name)?'
(2) Regular activity performed in the PA ($n = 300$) and (if yes) which one ($n = 87$): 'Do you perform any regular activity in PA X (full name)? Which kind of activity? Please specify'.
(3) Perception of the conservation state of PA and reason ($n = 236$): 'What do you think the conservation state of PA X (full name) currently is: very good, good, medium, poor, or very poor? Why?'
(4) Personal importance of the PA and reason ($n = 300$): 'What is the personal importance given by you to PA X (full name)? Is it: very important, important, not very important, or unimportant for you? Why?'
(5) Degree of agreement with the public financing of the PA ($n = 300$): 'Do you agree with the state financing of PA X (full name)?'
(6) Willingness to pay higher taxes to conserve the PA ($n = 300$): 'Would you be willing to pay higher taxes to conserve PA X (full name) for the future?'
(7) Willingness to accept the establishment of an entrance fee to the PA ($n = 300$): 'Would you be willing to accept an entrance fee to PA X (full name)?'

The sample size n given for variables 2–7 indicates the number of people familiar with the PAs ($n = 300$) out of the total number of people surveyed ($n = 401$). Sample size for variable 3 was lower ($n = 236$) than the rest because some people could not say what the current conservation state of the PA was, either because they never visited it or because it was over three years since their last visit. Similar case exclusions of respondents were conducted by Adamowicz *et al.* (1997). To better understand variables 3 and 4 and compare results among PAs more easily two indexes were employed: the perception index (PI), which measured to which extreme of perception (positive or negative) the majority opinion was biased (values ranged from –200 to +200), and the importance index (II) which measured the degree of personal importance given to each PA by local residents (values ranged from a minimum of 100 to a maximum of 400). These indexes can be expressed as:

PI = % (of people responding) 'very good' (× 2) + % 'good' − % 'poor' − % 'very poor' (× 2)
II = % (of people responding) 'unimportant' + % 'not very important' (× 2) + % 'important' (× 3) +% 'very important' (× 4)

For the purposes of this study, variable 4 was considered as 'subjective' valuation of the PA in contrast to variables 5–7, which were considered 'objective' valuations of the PA because they hypothetically imply some individual effort in the form of future payments for each respondent rather than merely an importance statement. Variable 4 can also be more strongly influenced by the response bias (Azqueta *et al.* 2007). For 5–7, a CVM following a single-bounded model (dichotomous choice: 'for' versus 'against') was applied (Alberini *et al.* 1997; Carson *et al.* 1997). For those variables, no specific figures were requested or suggested. The aim of questions 5–7 was not to extract the exact quantities the residents would be willing to pay to conserve or use their nearby PAs, rather it was to explore the degree of agreement by residents with the state financing of nearby PAs and their willingness to pay for the conservation of these PAs through tax (variables 5 and 6) or by a 'pay-per-use' scheme (variable 7). Questions 6 and 7 were asked as independent, unrelated questions and thus neither the compatibility of both forms of payment nor the possibility of excluding one form of payment were mentioned, in order to reduce the strategic bias of the responses and the statistical noise. Nevertheless, although an exact entrance fee was not specified for variable 7 during the interviews, when asked for an estimated quantity by some of the respondents, it was explained that this entrance fee would likely be 'small' (*c.* € 1–2 per person).

Out of the seven variables, the hypothesis that the effect of the economic crisis would reduce the objective (economic) valuation of PAs by local populations was tested by comparing the results of variables 5–7 for both the 2006–2007 and 2009 surveys. The existence of differences or correlations was analysed using ANOVA, T-tests or χ^2-tests ($\alpha = 0.05$), using SPSS software.

RESULTS

The degree of knowledge of the PAs of the Region of Madrid by residents reached 75% on average. It ranged from 100% for the two best-known PAs (Pinar de Abantos y Zona de la Herrería Picturesque Landscape and Natural Site of National Interest of Hayedo de Montejo), to 45% for the least-known PA (Preventive Protection Regime of Soto del Henares) (see Table 2).

There were no differences in the degree of knowledge between sexes ($p = 0.479$), however age groups differed; the 18–39 year old group knew their adjacent PAs significantly less well than the 40–60 year old group ($p = 0.001$), whereas the degree of knowledge among the > 60 year old group was intermediate between these and did not differ significantly from the other groups.

On average, 29% of residents performed regular activities in the PAs of the Region. The PA where the largest proportion of residents performed activities on a regular basis was Pinar de Abantos y Zona de la Herrería Picturesque Landscape (53% of residents). In contrast, the least regularly visited PA was Laguna de San Juan Fauna Refuge, where only 10% of residents familiar with the PA performed a regular activity. There were no differences in the percentage of regular activities performed in PAs between sexes ($p = 0.64$) or age groups ($p = 0.18$) (Table 3).

Most residents (36%) perceived the conservation state of their adjacent PA as 'good', and 35% considered it as 'medium'. The best perceived PA regarding its conservation state was Peñalara Natural Park (PI +98). In this PA, residents who considered its conservation state was 'good'

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Table 2 Total percentage, per sex and age groups, of residents familiar with the protected areas (PAs). NP = Natural Park, RP = Regional Park, PL = Picturesque Landscape, NR = Nature Reserve, NSNI = Natural Site of National Interest, NMNI = Natural Monument of National Interest, PPR = Preventive Protection Regime.

Protected area	*Degree of knowledge of the PA (%)*					
	Total	*Sex*		*Age of respondent (years)*		
		Men	*Women*	*18–39*	*40–60*	*> 60*
Peñalara NP	94	100	91	100	88	100
Cuenca Alta del Manzanares RP	97	100	94	100	100	90
Sureste RP	71	83	63	73	88	40
Curso Medio del río Guadarrama RP	73	67	80	54	82	83
Pinar de Abantos y Zona de la Herrería PL	100	100	100	100	100	100
El Regajal-Mar Ontígola NR	82	92	74	88	80	80
Laguna de San Juan FR	83	90	81	64	93	90
Hayedo de Montejo NSNI	100	100	100	100	100	100
Peña del Arcipreste de Hita NMNI	55	64	48	45	65	44
Soto del Henares PPR	45	58	38	29	60	37
Average for the 10 PAs	75	80	72	64	82	73

Table 3 Percentage of residents familiar with the PAs who performed a regular activity in it, and main activities they performed. NP = Natural Park, RP = Regional Park, PL = Picturesque Landscape, NR = Nature Reserve, NSNI = Natural Site of National Interest, NMNI = Natural Monument of National Interest, PPR = Preventive Protection Regime.

Protected area	*Regular activities performed*						
	Performed any regular activity (%)	*Main*	*%*	*Secondary*	*%*	*Tertiary*	*%*
Peñalara NP	33	Walking	50	Hiking	30	Others	20
Cuenca Alta del Manzanares RP	40	Hiking	50	Walking	42	Biking	8
Sureste RP	40	Walking	42	Biking	25	Others	33
Curso Medio del río Guadarrama RP	27	Walking	75	Biking	12.5	Hiking	12.5
Pinar de Abantos y Zona de la Herrería PL	53	Walking	81	Hiking	13	Biking	6
El Regajal-Mar Ontígola NR	23	Walking	71	Biking	14.5	Environmental education	14.5
Laguna de San Juan FR	10	Walking	67	Hiking	33		
Hayedo de Montejo NSNI	23	Walking	57	Others	43		
Peña del Arcipreste de Hita NMNI	27	Hiking	50	Walking	25	Others	25
Soto del Henares PPR	13	Biking	100				
Average for the 10 PAs	29	Walking	54	Hiking	22	Biking	13

or 'very good' (80%) were far more abundant than those who considered it 'poor' or 'very poor' (12%). The main reason given for this positive perception was the 'good maintenance' of the PA and its infrastructure. In contrast, El Regajal-Mar de Ontígola Nature Reserve was considered to be the most poorly conserved (PI –63); the proportion of residents considering its conservation state to be 'poor' or 'very poor' (52%) considerably outnumbered the proportion of those who perceived it as 'good' or 'very good' (15%); the main reason for this opinion being that it was 'neglected' (Table 4).

The subjective importance given to nearby PAs by residents was high (II +83) and was positively correlated with the use they made of them ($p < 0.001$).The residents who had a high subjective valuation of their PAs outnumbered those who had a low valuation eightfold (89.1% versus 10.9%, respectively) (Table 5).

The II ranged from a maximum of 373 for the Natural Site of National Interest of Hayedo de Montejo (primarily important for 'landscape' reasons), to a minimum of 300 shared by the Laguna de San Juan Fauna Refuge and by the Natural Monument of National Interest of Peña del Arcipreste de Hita (important for faunistic and cultural reasons, respectively).

The three economic variables varied between the survey periods (Table 6). Favourable opinion towards state financing of PAs has tended to decrease between 2006–2007 and 2009 ($p = 0.049$), but remained nevertheless at a very high level (96% in 2006–2007 and 92% in 2009). It was independent of the use of the PAs by residents ($p = 0.68$). However, willingness to pay higher taxes significantly decreased between the study periods ($p = 0.029$), and was positively correlated with the use of the PAs by residents ($p = 0.001$). In contrast, willingness to accept an entrance fee to the PA significantly increased ($p = 0.039$) and was negatively correlated with the use of the PAs by residents ($p < 0.001$).

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Table 4 Perception on the conservation state of the PA by residents and main reason of the majority perception. PI = Perception Index, NP = Natural Park, RP = Regional Park, PL = Picturesque Landscape, NR = Nature Reserve, NSNI = Natural Site of National Interest, NMNI = Natural Monument of National Interest, PPR = Preventive Protection Regime.

Protected area	*Perception of the conservation state (%)*					*PI value*	*Reason*
	Very good	*Good*	*Medium*	*Poor*	*Very poor*		
Peñalara NP	38	42	8	4	8	98	Well maintained
Cuenca Alta del Manzanares RP	4	45	33	11	7	28	Well maintained
Sureste RP	0	22	35	30	13	−34	Neglected
Curso Medio del río Guadarrama RP	4	19	61	8	8	3	Neglected
Pinar de Abantos y Zona de la Herrería PL	7	57	29	3.5	3.5	61	Well maintained
El Regajal-Mar Ontígola NR	0	15	33	26	26	−63	Neglected
Laguna de San Juan FR	6	35	41	6	12	17	Neglected
Hayedo de Montejo NSNI	18	57	18	7	0	86	Well maintained
Peña del Arcipreste de Hita NMNI	0	50	33	11	6	27	Well maintained
Soto del Henares PPR	0	11	72	11	6	−12	Neglected
Average for the 10 PAs	9	36	35	12	8	21	

Table 5 Personal importance of the PA for residents and main reason for the majority importance. II = Importance Index, NP = Natural Park, RP = Regional Park, PL = Picturesque Landscape, NR = Nature Reserve, NSNI = Natural Site of National Interest, NMNI = Natural Monument of National Interest, PPR = Preventive Protection Regime.

Protected area	*Personal importance (%)*				*II value*	*Reason given for importance*
	Very important	*Important*	*Not very important*	*Unimportant*		
Peñalara NP	57	33	3	7	340	Environmental conservation
Cuenca Alta del Manzanares RP	70	20	10	0	360	Environmental conservation
Sureste RP	33	57	3	7	316	Environmental conservation
Curso Medio del río Guadarrama RP	27	70	3	0	324	Environmental conservation
Pinar de Abantos y Zona de la Herrería PL	67	33	0	0	367	Landscape
El Regajal-Mar Ontígola NR	29	55	10	6	307	Butterflies
Laguna de San Juan FR	27	53	13	7	300	Fauna-birds
Hayedo de Montejo NSNI	73	27	0	0	373	Landscape
Peña del Arcipreste de Hita NMNI	33	37	27	3	300	Culture
Soto del Henares PPR	40	50	0	10	320	Environmental conservation
Average for the 10 PAs	46	43	7	4	331	

DISCUSSION

The degree of knowledge of PAs by residents was moderately high, considering that the people interviewed lived inside or in the vicinity of the PAs. It was also highly variable among PAs; the most visited PAs historically, along the mountain ranges of the Region, were also the PAs best known by residents (Gómez-Limón *et al.* 1996; FIDA [Fundación para la Investigación y el Desarrollo Ambiental] 2005).

The 'public use' of the PAs of the Region of Madrid by residents was low. Less than one-third of the residents performed a regular activity in their neighbouring PA. The main activity was 'walking', practised by over half the residents who visited the PAs regularly. Other popular activities in the PAs of the Region were 'hiking' and 'biking', as is consistent with the activities most demanded by visitors to other PAs in Europe (Stolton 2009). The remainder of activities performed were heterogeneous and represented 11% of the total activities performed. These results are partially consistent with the results on main activities performed by visitors to different PAs in Spain (Corraliza *et al.* 2002*b*; Gómez-Limón 2002) and in the Region of Madrid (Gómez-Limón *et al.* 1994, 1996), where sedentary activities dominate (such as 'having lunch', 'resting' and 'swimming'), followed by 'walking', and where other more dynamic activities are the minority. Recreation activities are considered as the most prevalent and serious threat to European PAs (Nolte *et al.* 2010) and to the PAs of the Region of Madrid (Rodríguez-Rodríguez 2008). However,

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Table 6 Economic valuation of the PA by residents, measured by its three constituent variables, for both 2006/2007 and 2009. NP = Natural Park, RP = Regional Park, PL = Picturesque Landscape, NR = Nature Reserve, NSNI = Natural Site of National Interest, NMNI = Natural Monument of National Interest, PPR = Preventive Protection Regime.

Protected area	*Economic valuation (% of positive replies)*					
	Public financing		*Willingness to pay higher taxes*		*Willingness to accept an entrance fee*	
	2006/2007	*2009*	*2006/2007*	*2009*	*2006/2007*	*2009*
Peñalara NP	96	93	36	33	33	47
Cuenca Alta del Manzanares RP	100	97	74	47	35	53
Sureste RP	95	90	64	67	27	24
Curso Medio del río Guadarrama RP	100	97	68	53	37	43
Pinar de Abantos y Zona de la Herrería PL	96	97	57	63	24	33
El Regajal-Mar Ontígola NR	95	84	64	48	73	52
Laguna de San Juan FR	96	83	88	43	70	67
Hayedo de Montejo NSNI	97	100	57	40	41	62
Peña del Arcipreste de Hita NMNI	86	87	86	57	43	53
Soto del Henares PPR	100	93	67	70	0	73
Average for the 10 PAs	96	92	62	52	41	50

none of the main stated leisure activities regularly performed by residents in the PAs of the Region constituted a serious threat to the conservation of these PAs or their resources, as long as they did not imply fire lighting (Vilar *et al.* 2010). The marked geographical and temporal bias of the influx of visitors to the PAs of the Region may temporarily overcrowd some sites (mainly picnic areas) leading to the degradation of nearby natural resources and their associated public use infrastructures (Gómez-Limón *et al.* 1994, 1996; Barrado 1999); adequate visitor control and proper installation and maintenance of public use infrastructures (such as information panels and/or litter bins) in these sites remains a management issue.

The global 'perception of the conservation state' of the PAs of the Region of Madrid was slightly positive. It is remarkable that residents related the conservation state of a PA mainly to its management and that they were quite critical of implemented management activities (see Corraliza *et al.* 2002*a*). Thus, PAs were well perceived as a result of 'good maintenance' (such as regular cleaning activities, vegetation clearance, fire prevention interventions or active surveillance), or poorly perceived because of 'neglect' (for example existence of litter or development of impacting activities). This social perception indicates recognition of management. Conversely, it ascribes the greatest responsibility for existing conservation problems in PAs to management, thus exonerating visitors from responsibility for the conservation state of the PAs. Complementary to what was stated by Hillery *et al.* (2001), this result seems to confirm that not only visitors to PAs, but also residents who do not visit PAs are unaware of human-induced impacts on visited natural areas. Therefore, broader environmental education is needed for the general public, and especially for residents and visitors, as the last are the two key social groups regarding PA conservation globally (Borrini-Feyerabend *et al.* 2004; Fraser *et al.* 2006; Stolton 2009).

The 'subjective importance' given to PAs by residents was consistent with another study on the topic examining a sample of five natural parks in Spain, where the proportion of surveyed people who considered the designation of these PAs to be 'positive' was over four times higher than the proportion of those who considered that designation as being 'negative' (Corraliza *et al.* 2002*a*). Even though the Natural Monument of Natural Interest of Peña del Arcipreste de Hita was the least subjectively valued of all the PAs in the Region, the percentages of residents who considered this PA as 'very important' or 'important' were much higher (more than twice) than the percentages representing 'not very important' or 'unimportant'. This reflects the values that predominantly urban societies place on PAs,which encompass far more than traditional direct use consumptive values (Brotherton 1996; Carson *et al.* 1997; Azqueta *et al.* 2007), as the PAs of the Region of Madrid provide little economic input to the region's GDP and are costly to maintain. Social values also include non-consumptive direct use values (such as those arising from the health benefits related to the contact with biodiversity; Fuller *et al.* 2007), option values (the possibility of directly using some of the natural values in the future; Azqueta *et al.* 2007) and non-use values (such as the existence value of natural resources; Walpole *et al.* 2001; Azqueta *et al.* 2007). There was a remarkably close relationship between the reasons given by residents to explain the importance of the PAs and the official designation targets for each PA.

The joint 'economic valuation' of PAs by residents is difficult to interpret. On the one hand, a huge majority of residents is in favour of the 'public financing of PAs'. On the other hand, only half of them would be 'willing to pay higher taxes to conserve them' or 'willing to accept an entrance fee'. Overall, considering the condition of the Spanish economy when the 2009 survey was conducted, both the subjective and objective valuations of the PAs of the Region by residents can be considered as high, as anticipated for post-materialistic societies (Díez 2004). Urban populations with a high income level and an adequate knowledge and awareness of environmental issues have the highest degree of environmental compromise among the Spanish population (Díez 2004). These social and economic characteristics could be applied to the population of the Region of Madrid.

The high economic valuation of the Region's PAs by residents in their vicinity was stable over time, did not seem to be strongly influenced by changes in economic variables, such as inflation or even income levels (Carson *et al.* 1997), and was not driven by any recent catastrophic event that locally increased social environmental concern temporarily (Anderson 1997; Díez 2004). Such high objective valuation by residents, together with their limited use of the PAs, reinforces the theory that the overall valuation of PAs by dwellers in predominantly urban densely-populated regions is strongly driven by option and non-use values (Smith 2005). However, in contrast to what has been advocated by other studies (Carson *et al.* 1997), even if the stated economic support for PAs remained high between both survey periods, the results also indicate that the changes in relevant economic variables, such as income level (notably affected by recession), did influence the contingent valuation of PAs, at least in the forms people would be willing to pay to conserve those environmental goods and services.

The initial hypothesis that the current economic crisis may have decreased the economic valuation of the PAs of the Region of Madrid could not be confirmed by the analysis of the three variables studied. However, shifts in the valuation forms between the two periods considered were oriented towards less willingness to pay higher taxes and more willingness to accept a 'pay per use' scheme, although regular users strongly opposed the establishment of an entrance fee. Perhaps a dual pricing policy for residents and tourists, as suggested by Walpole *et al.* (2001), could lessen opposition to an entrance fee by this group of residents. Such 'pay per use' schemes have been implemented successfully in many PAs worldwide to reduce visitor impacts while providing income for the PAs (Walpole *et al.* 2001; Font *et al.* 2004; Muñoz y Benayas 2007). Despite the depth of the economic crisis at the time of the second survey, over half the respondents were willing to pay higher taxes to conserve the regional PAs. This shows residents continued to value the PAs of the Region highly, as this implies an individual effort both for users and non-users, despite the theoretical character and lack of any exact figure for tax increases.

CONCLUSIONS

These results may help inform and adapt management decisions related to public use and environmental education in the PAs of the Region of Madrid, and provide guidance for other similar regions or countries. Although results based on perceptions are not always strongly correlated with actual environmental measures or conservation targets (Adamowicz *et al.* 1997), local populations' opinions should influence and guide management decisions in PAs (Borrini-Feyerabend *et al.* 2004; Fraser *et al.* 2006).

Predominantly urban populations in densely-populated industrialized regions seem to hold generally favourable attitudes towards nature conservation policies (Brotherton 1996) and PAs managers in those regions could (and should) seek potential allies for the conservation of PAs amongst local populations. However, more effort should be expended on better informing, communicating with and involving local populations in conservation policies and practices, not only in the Region of Madrid, but also elsewhere, be it by environmental education, improved interpretation facilities or by direct participation in conservation and management activities (Fraser *et al.* 2006).

Even at the peak of the economic crisis, half of the residents in the PAs of the Region of Madrid were in favour of the establishment of an entrance fee; managers should consider exploring this further as a means of limiting serious impacts by visitors to some PAs of the Region (Rodríguez-Rodríguez 2008). 'Pay per use' schemes represent an interesting management option for PAs in densely-populated or heavily-visited areas, but should consider adequate equity prior to their implementation.

Future developments in the valuation of the PAs of the Autonomous Region of Madrid should specify, for the three assessed economic variables, the amount of money to be paid hypothetically by the respondents (in absolute figures or price intervals), in order to obtain a more meaningful economic valuation of the PAs of the region. Future studies should also include some additional variables to specifically address the values assigned to biodiversity by society, as well as other socioeconomic-related variables (such as income level) that may influence people's responses (Azqueta *et al.* 2007), although obtaining that sort of information is often delicate. Finally, the inclusion of 'non-residents' in a future regional survey would provide an additional comparison between the responses given by these two target groups, whose opinions on PAs often differ and have different management implications (Corraliza *et al.* 2002*b*).

ACKNOWLEDGEMENTS

I would like to thank Doctors Javier Martínez Vega, from the Spanish National Research Council, and María del Mar Otero, from the IUCN Centre for Mediterranean Cooperation (IUCN-Med) for their useful comments on the early drafts of this manuscript. Additionally, I would like to acknowledge

Andrea Marshall from the IUCN-Med for proofreading an earlier draft of this article.

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