

Results of the implementation of the System for the Integrated Assessment of Protected Areas (SIAPA) to the protected areas of the Autonomous Region of Madrid (Spain)

David Rodríguez-Rodríguez, Javier Martínez-Vega

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Abstract: The long-term conservation of biodiversity and related ecosystems goods and services of the Autonomous Region of Madrid is jeopardized by the intensive resource-consuming development model followed by the region in the past few decades. This paper presents the aggregated results of the first integrated assessment of the protected areas of the Autonomous Region of Madrid (Spain) with the System for the Integrated Assessment of Protected Areas (SIAPA). Detailed results are also provided for individual protected areas as supplementary data. The assessment was done during 2009–2010, on ten protected areas differing in their sizes (from 2.5 to 52,796 ha), protection categories (seven categories) and types of ecosystems present. Comparison of results from both assessment models of the SIAPA (the Complete Model and the Simplified Model) is also presented. The results from the Complete Model show that eight out of the ten protected areas of the Autonomous Region of Madrid are currently ineffective. The poorest partial indexes overall were: “State of Conservation” and “Social and Economic Context”. The only indexes significantly correlated with the effectiveness of a protected area were: the “State of Conservation” ($r = 0.851^{**}$) and the “Social Perception and Valuation” ($r = 0.786^{**}$). Although not as relevant as was thought, “Management” and the other non-significant factors are likely to influence the effectiveness of protected areas as well. The results for the Simplified Model are slightly better than those for the Complete Model, although this is probably a specific result of this assessment. The two models of the SIAPA were very significantly correlated, although their aggregated results should not be compared directly.

1. Introduction

1.1. Need for an effectiveness assessment of the protected areas of the Autonomous Region of Madrid

The Autonomous Region of Madrid is a Spanish region of 8021 km² located in the centre of Spain (Fig. 1). It includes the capital of Spain and the capital of the Region: the city of Madrid, together with its large metropolitan area. In 2011, there were 6,489,680 inhabitants living in the region which accounts for 809 inhabitants/km², the highest population density in Spain (INE, 2012). The region has a rich natural and cultural patrimony which is jeopardized by the implementation of an intensive resource-consuming development model (Naredo and Frías, 2005; VVAA, 2005; Mata et al., 2009) that has led to an increase in economic standards but also to the development of large industrial areas, residential areas and infrastructures throughout the region from the 1950s (Chicharro, 1976; Díaz-Muñoz, 1984; Gutiérrez, 1998; Naredo, 2008; Naredo and García-Zaldívar, 2008) and, especially, in the past 20 years (Gago et al., 2004; Delgado, 2008; Fernández-Muñoz, 2008; Gallardo and Martínez-Vega, 2010, 2012). Similar pressures have been stated for other regions with akin characteristics, in

Europe (Jongman, 2002) and elsewhere (Radeloff et al., 2010).

The protected areas (PAs) of the region of Madrid face numerous pressures, mainly from massive visitor use and intensive land-use transformation (Rodríguez-Rodríguez, 2008; Hewitt and Escobar, 2011; Pérez-Hugalde et al., 2011), in addition to more general threats arising from global change, such as climate change (Araújo et al., 2011). These dynamics raise concern that effective long-term conservation of biodiversity and related goods and services provided by the region's ecosystems cannot be achieved despite the fact that up to 46% of its territory is under some kind of protection regime (Mata et al., 2009). Thus, the assessment of the effectiveness of the 10 PAs of the Autonomous Region of Madrid is crucial not only to help safeguard biodiversity and the related ecosystem services provided by the most important natural places in the region, but also to give an indication on whether sustainable development could be attained in practice using this miniature world replica which is the region of Madrid as an example. Such assessment comes from a legal mandate to monitor, assess and report on the state and trends of biodiversity by the CBD (CBD, 1992) and the Spanish national law on nature conservation¹. Moreover, it is endorsed by national and international strategic documents on PAs like the “Action Plan for the Protected Areas of Spain” (Europarc-España, 2002), the

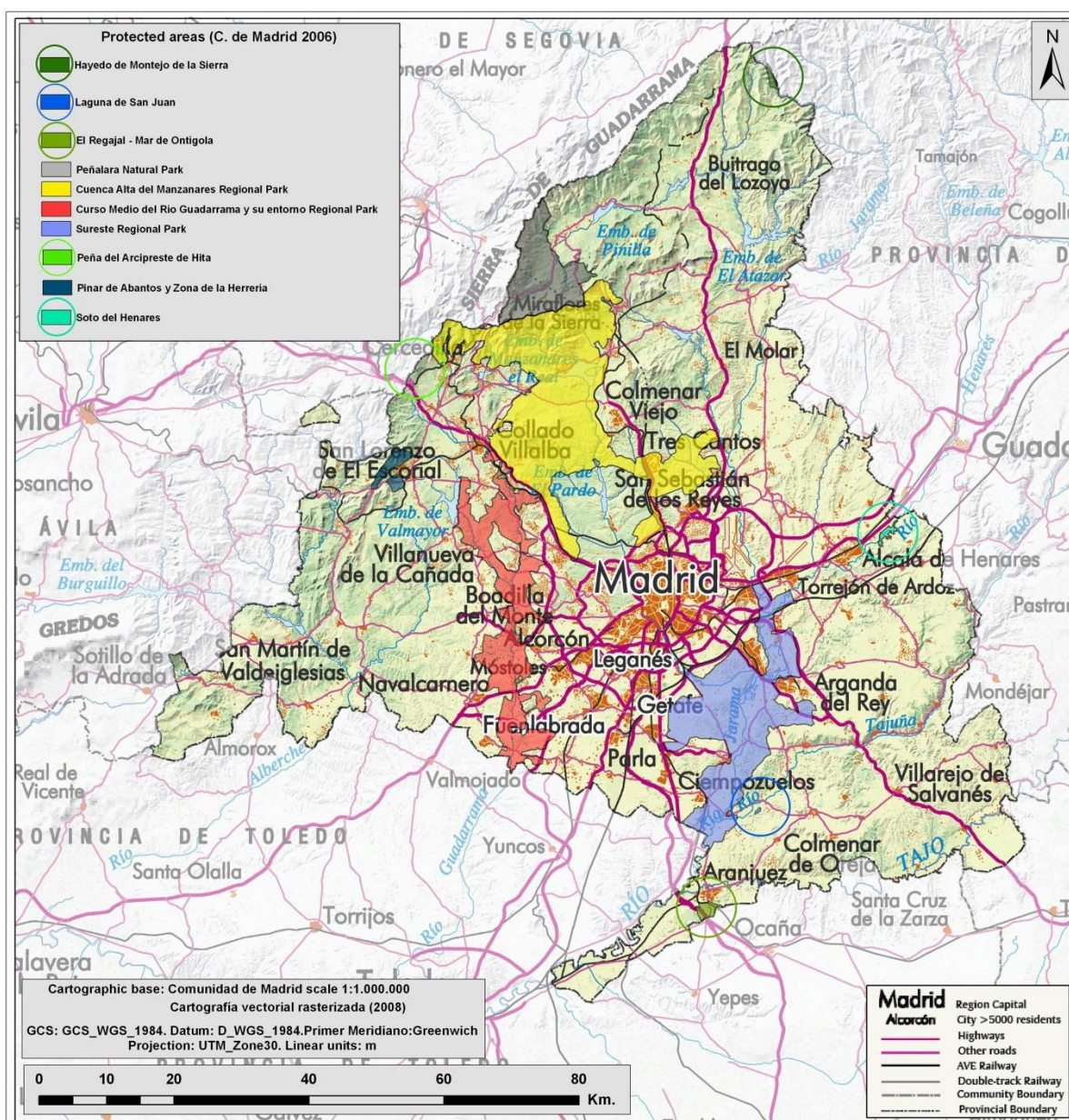


Fig. 1. Location of the protected areas of the Autonomous Region of Madrid.

“Work Programme for protected areas 2009–2013” (Europarc-Spain, 2009), or the “Programme of Work on Protected Areas of the CBD” (CBD, 2004).

The results presented in this paper will help PA managers, PA network managers and decision makers in the region of Madrid to make better management decisions based on the best available information for improved conservation. They will also provide a reference for PA managers and PA network managers in other regions of Spain, Europe and elsewhere, especially for metropolitan regions in the Euro-Mediterranean context. Finally, the

results shown here will also help Spain fulfil its current PA monitoring, assessment and reporting commitments under the Convention of Biological Diversity (CBD, 2010).

1.2. Aims of the study

The ultimate aim of this study was to enhance the capacity of the 10 PAs of the Autonomous Region of Madrid to conserve biodiversity and provide ecosystem

goods and services in the long term through improved information and management.

The specific aims were to: (1) assess the effectiveness of the ten PAs of the region of Madrid in an integrated and comparative manner using the System for the Integrated Assessment of Protected Areas (SIAPA; Rodríguez-Rodríguez and Martínez-Vega, 2012); (2) assist managers and decision-makers in the region to make informed management decisions; (3) make comprehensive and updated information on the PAs of the region of Madrid available to any interested body or individual; (4) summarize the main results and the lessons learned from the development and pilot implementation of the SIAPA

2. Methods

2.1. Selection of the protected areas to be assessed

The 10 PAs designated by the Government of the Autonomous Region of Madrid were selected on the grounds of the coherence of the study, the limited time and resources available to conduct it, and the availability of basic information (Table 1). These PAs make up the basic conservation network of the Region. The Regional Ministry of Environment (CMAOT, Consejería de Medio Ambiente y Ordenación del Territorio) is competent for

their management. Other PAs in the Region of Madrid designated under European laws or international agreements such as Natura 2000 sites (Natura 2000 Protected Areas²) or Biosphere Reserves (Areas Protected by International Instruments³) outside those PAs were excluded from the assessment because most of the basic information for an assessment was missing.

Together, the 10 PAs selected for the assessment account for roughly 120,898 ha, or approximately 15% of the area of the Autonomous Region of Madrid (Fig. 1).

2.2. Data collection

Data were collected during 2009 and the beginning of 2010 by different methods (Table 2). The data collection and the assessment were done by the Institute of Economics, Geography and Demography of the Spanish National Research Council (IEGD-CSIC), a national scientific body external to the managing body and the regional administration. Even if basic information to measure an indicator was not available (this happened for three indicators), we maintained these indicators in the SIAPA to identify knowledge gaps and to encourage future acquisition of that information, as suggested by Ramírez (2002) and Fraser et al. (2006).

Table 1
Protected areas considered in this assessment

Protected area	Abbreviation	Area (ha)	Designation year	Conservation target(s)
Peñalara Natural Park	Peñalara NP	11,637	1990	Geomorphology
Cuenca Alta del Manzanares Regional Park	Cuenca Alta RP	52,796	1985	Multiple: environmental; cultural; agricultural; landscape; ecological corridor
Sureste Regional Park	Sureste RP	31,550	1994	Multiple: ecological; palaeontological; archaeological
Curso Medio del Río Guadarrama y su entorno Regional Park	Guadarrama RP	22,116	1999	Multiple: natural; cultural; water ecosystems; landscape; ecological corridor; tourism
Pinar de Abantos y Zona de la Herrería Picturesque Landscape	Pinar Abantos y Herrería PL	1,538	1961	Landscape
Natural Site of National Interest of Hayedo de Montejo de la Sierra	NSNI Hayedo Montejo	250	1974	Multiple; relict ecosystem; landscape; scientific; education
El Regajal-Mar de Ontígola Natural Reserve	Regajal-Ontígola NR	629	1994	Multiple: fauna (<i>lepidoptera</i> ; birds), botanical
Laguna de San Juan Fauna Refuge	Laguna San Juan FR	47	1991	Multiple: fauna; geomorphology; landscape; scientific; education
Natural Monument of National Interest of Peña del Arcipreste de Hita	NMNI Peña Arcipreste	2.5	1930	Cultural
Preventive Protection Regime of Soto del Henares	PPR Soto Henares	332	2000	Multiple: riparian ecosystem; landscape; ecological corridor

2.3. Data integration

Once the information for each of the 43 indicators was compiled from different sources (Table 2), they were integrated into the six partial assessment indexes (State of conservation, Planning, Management, Social and economic context, Social perception and valuation, and Threats to conservation) according to the average weights given to them by the experts consulted.

These partial indexes were later weighted by the same experts in a second round of consultations and

subsequently integrated into the Effectiveness Index, according to the integration procedure shown in Rodríguez-Rodríguez and Martínez-Vega (2012).

2.4. Assessment

The complete assessment was carried out during 2010, according to the methodology described by Rodríguez-Rodríguez and Martínez-Vega (2012).

Table 2

Data sources and methods of collection of information on the indicators of the SIAPA

Source	Method	Indicator
Local population	Telephone survey	<i>Degree of knowledge on the protected area; State of conservation; Personal importance; Economic valuation; Activities performed by visitors (p).</i>
Division of Protected Areas of the Regional Ministry of Environment	Personal interviews with managers	<i>Existence of updated documents on social and economic development (p); Existence of updated documents on public use; Degree of fulfillment of management objectives; Existence of sufficient management staff (p); Evolution of investment in the protected area (p); Effectiveness of public participation bodies (p); Production and distribution of an annual report on activities and outcomes (p); Existence of environmental education and volunteering activities; Monitoring activities; Land ownership; Presence of alien invasive species (p); Activities performed by visitors (p).</i>
Environmental Information Division of the Regional Ministry of Environment	Information requested by e-mail	<i>Zoning (p); Evolution of the area designated as protected (p); Production and distribution of an annual report on activities and outcomes (p).</i>
Website of the Regional Ministry of Environment	Direct consultation or data download	<i>Air quality; Appropriateness of protection legislation; Existence of updated planning documents; Existence of updated management documents, Production and distribution of an annual report on activities and outcomes (p).</i>
Sciences library of the Autonomous University of Madrid; Protected Areas Information Centre; Library of the Faculty of Biology of the Complutense University of Madrid; Library of the Regional Ministry of Environment; Spanish National Research Council Library Network; Scientific online databases (Web of Knowledge, online servers)	Bibliographic review	<i>Surface water quality (p); Zoning (p); Evolution of the area designated as protected (p); Degree of characterization of the protected area; Production and distribution of an annual report on activities and outcomes (p); Number of municipalities in the protected area; Presence of alien invasive species (p); Activities performed by visitors (p).</i>
Forest Rangers Corps of the Regional Ministry of Environment	Telephone interview	<i>Existence of sufficient management staff (p); Presence of alien invasive species (p); Activities performed by visitors (p).</i>
Centre for Environmental Research of the Autonomous Region of Madrid	Information requested by e-mail	<i>Surface water quality (p); Evolution of investment in the protected area (p); Production and distribution of an annual report on activities and outcomes (p); Number of visitors.</i>
Internal information from divisions of the Regional Ministry of Environment: Flora and Fauna, Pests, Environmental Discipline, Cartographic Information	Information requested by post; data supplied by e-mail or other electronic media	<i>Evolution of populations of endangered species or subspecies; Health of vegetation; Landscape impact; Sanctioning procedures; Fragmentation (p); Isolation (p); Accessibility.</i>
Visits to protected areas	Census; visual inspection	<i>Presence of solid waste (p); Easiness to identify the protected area; Public use infrastructure; Presence of alien invasive species (p); Activities performed by visitors (p).</i>
Website of the National Geographical Institute (Corine Land-Cover)	Data download	<i>Presence of solid waste (p); Land use changes; Fragmentation (p); Isolation (p).</i>
Website of the Regional Foundation for Environmental Research and Development	Direct consultation	<i>Area provided for the protected area by municipalities under local Agenda 21</i>
Institute of Economics, Geography and Demography	GIS analysis	<i>Landscape impact; Area affected by fires</i>
Website of the Regional Institute of Statistics	Direct consultation	<i>Local population density</i>
National Meteorological Agency	Requested by post; data provided by e-mail	<i>Climate change</i>
Website of the Tajo River Basin Management Agency (ICA network)	Data download	<i>Surface water quality (p)</i>
No data or indicator not developed*		<i>Evolution of feature(s) for which the protected area was designated; Sanctioning procedures; Main economic activities in the protected area*</i>

(p): partially compiled

Pearson's tests were performed to determine the degree of relatedness among the indexes and to compare the results obtained with the two models of the SIAPA: the Complete Model (CM) and the Simplified Model (SM).

2.5. Result communication and interpretation

The results of the implementation of the SIAPA are presented at different levels in order to extract the maximum possible information from the assessment and to simplify the communication of results (Palczyński and Russell, 2005): (1) by PA (using the Complete Model; supplementary data); (2) by index (using the Complete Model): State of Conservation, Planning, Management, Social and Economic Context, Social Perception and Valuation, Threats to Conservation, and Effectiveness; and (3) by model.




In order to clearly convey the results of the SIAPA to any interested person regardless of his or her degree of knowledge on the topic, a code based on happy faces (adequate valuation), normal faces (moderate valuation) and sad faces (deficient valuation) was developed (Table 3).

2.6. Statistical testing

We used multiple regression analysis to assess the degree of relatedness between the indicators and the indexes used in the SIAPA. We also tested different statistical techniques for grouping and reducing the information portrayed by the indicators. Principal Component analysis and Correspondence analysis were

performed on the results of the Complete Model of the SIAPA using SPSS software to this end

Table 3
Communication and representation coding used in the SIAPA

	Interpretation	Valuation
<i>State</i>		
	Adequate	2 points
	Moderate	1 point
	Deficient	0 points
¿?	Data absent or unusable	
NA	Not applicable	
<i>Tendency</i>		
↑	Positive	
↔	Stable	
↓	Negative	
¿?	Data are absent or non-usable	
NA	Not applicable	

3. Results

Results are global and highly aggregated on space grounds. Individual results for each PA are provided as supplementary data.

The results of both models for the six partial indexes and for the Effectiveness Index (EI) are presented in Tables 4 and 5.

Table 4

Results for the six partial indexes plus the Effectiveness Index from the application of the Complete Model of the SIAPA to the 10 PAs of the Region of Madrid according to the (0;1;2) standardized scale (Rodríguez-Rodríguez and Martínez-Vega, 2012)

Index	Protected area										Global value
	Peña-lara NP	Cuenca Alta RP	Sur-este RP	Guada-rrama RP	Aban-tos y Herre-ría PL	NSNI Hayedo Mon-tejo	Regajal Mar Ontígola NR	Lagu-na San Juan FR	NMNI Peña Arci-preste	PPR Soto Hena-res	
State of conservation	1.1	0.7	0.1	0.4	0.7	1.0	0.5	0.5	0.8	0.2	0.6
Planning	1.6	0.9	1.4	0.9	0.9	0.4	1.5	0.7	0.1	0.2	0.9
Management	1.6	1.2	1.1	1.1	0.6	1.1	0.6	0.7	0.0	0.3	0.7
Social and economic context	1.0	0.0	0.0	0.3	0.9	1.7	0.7	1.0	1.4	1.2	0.6
Social perception and valuation	1.4	1.1	0.9	0.9	1.4	1.7	1.1	1.1	1.3	1.0	1.2
Threats to conservation	0.5	1.0	1.0	1.0	1.2	0.6	1.2	0.5	0.4	0.5	0.8
Effectiveness Index	1.0	0.5	0.4	0.4	0.5	0.9	0.5	0.6	0.5	0.4	0.5

NP: Natural Park, RP: Regional Park, PL: Picturesque Landscape, NSNI: Natural Site of National Interest, FR: Fauna Refuge, NMNI: Natural Monument of National Interest, PPR: Preventive Protection Regime.

Table 5

Results for the six partial indexes plus the Effectiveness Index from the application of the Simplified Model of the SIAPA to the 10 PAs of the Region of Madrid according to the (0;1;2) standardized scale (Rodríguez-Rodríguez and Martínez-Vega, 2012)

Index	Protected area										
	Peña-lara NP	Cuenca Alta RP	Sureste RP	Guadarrama RP	Abantos y Herre-ría PL	NSNI Hayedo Mon-tejo	Regajal Mar Ontígola NR	Lagu-na San Juan FR	NMNI Peña Arci-preste	PPR Soto Hena-res	Global value
State of conservation	1.0	0.7	0.2	0.3	0.4	0.8	1.0	0.7	2.0	0.0	0.6
Planning	1.7	0.8	1.5	0.8	1.2	0.0	1.8	0.7	0.0	0.2	0.9
Management	2.0	1.3	1.2	1.1	0.4	1.2	0.8	1.0	0.0	0.6	1.0
Social and economic context	1.2	0.0	0.0	0.3	1.1	1.7	0.4	1.2	1.7	1.4	0.9
Social perception and valuation	1.0	0.5	0.5	0.5	1.0	1.5	0.5	0.5	1.5	1.0	0.9
Threats to conservation	0.6	1.1	1.1	1.1	1.1	0.7	1.4	0.7	0.4	0.6	0.9
Effectiveness Index	1.0	0.4	0.3	0.3	0.5	0.7	0.4	0.5	0.6	0.4	0.5

NP: Natural Park, RP: Regional Park, PL: Picturesque Landscape, NSNI: Natural Site of National Interest, FR: Fauna Refuge, NMNI: Natural Monument of National Interest, PPR: Preventive Protection Regime.

The interpretation of the results shown in Table 4 is presented, by PA, in Table 6.

Pearson's correlations among the indexes are shown in Table 7.

Both, the CM and the SM are highly and very significantly correlated ($r = 0.882^{**}$). Inter-pair index correlations between the two models are shown in Table 8.

The percentage of indicators for which there were no data was slightly higher for the SM (15.4%) than for the CM (11.2%) because two of the three indicators which could not be valued remained in the SM. The average number of PAs for which indicators could be valued was similar: 9.0/10 with the SM and 8.8/10 with the CM

4. Discussion

4.1. Per index

4.1.1. State of conservation index (SCI)

The state of conservation of the PAs of the Autonomous Region of Madrid can be deemed "Deficient" in general. A complete record of threatened species was not available for any PA, and the air quality, surface water quality and the number of landscape impacts scores were low in general. As a result, the state of conservation of all PAs except two: Peñalara NP (SCI = 1.1) and NSNI Hayedo Montejo (SCI = 1.0) is "Deficient". The PA which scored the lowest was Sureste RP for which 5 of its 6 constituent indicators scored "Deficient", followed by PPR Soto Henares, and Guadarrama RP. These three PAs comprise over 53,000 ha, or approximately 44% of the total area covered by the 10 PAs of the Autonomous Region of Madrid. Thus, the

existence of a protection status for many years (and active management, in the case of the parks) did not result in effective conservation of some PAs. Surprisingly, the SCI was not significantly correlated with the Planning Index (PLI), the Management Index (MAI), the Social and Economic Context Index (SEI) or the Threats to Conservation Index (TCI). It was highly and significantly correlated with the Social Perception and Valuation Index (SPI) and the EI, however. This suggests that the main factor influencing the conservation state of a PA in the region is the degree of social support (Leverington et al., 2010).

4.1.2. Planning index (PLI)

Planning of the 10 PAs of the Autonomous Region of Madrid is partially deficient. Only two PAs have adequate planning: Peñalara NP and Regajal-Ontígola NR. Sureste RP is better planned than the remainder, which are poorly planned. The other two regional parks have "Deficient" planning. Cuenca Alta RP has neither a natural resource plan nor a social and economic plan; it does not have a designated zone of social and economic influence and it is managed through an outdated management plan. Similarly, Guadarrama RP has no management plan, social and economic plan, or a designated zone of social and economic influence, and it is managed with an outdated natural resource plan. The lowest scores were for: NMNI Peña Arcipreste (PLI = 0.1), PPR Soto Henares (PLI = 0.2), and NSNI Hayedo Montejo (PLI = 0.4). All three have inappropriate or outdated protection categories, have no natural resource plan or management plan, and no zoning. Therefore, better planning is needed, especially in these PAs, as a prerequisite for appropriate management.

Table 6

Symbolic representation of the aggregated results of the implementation of the Complete Model of the SIAPA to the 10 protected areas of the Autonomous Region of Madrid

Protected area	Index						
	State of Conservation	Planning	Management	Social and Economic Context	Social Perception and Valuation	Threats to conservation	Effectiveness
Peñalara NP							
Cuenca Alta RP							
Sureste RP							
Guadarrama RP							
Pinar Abantos y Herrería PL							
NSNI Hayedo Montejo							
El Regajal- Ontígola NR							
Laguna San Juan FR							
NMNI Peña Arcipreste							
PPR Soto Henares							
Total protected areas							

NP: Natural Park, RP: Regional Park, PL: Picturesque Landscape, NSNI: Natural Site of National Interest, FR: Fauna Refuge, NMNI: Natural Monument of National Interest, PPR: Preventive Protection Regime.

Table 7

Pearson's correlations (r) among the indexes of the SIAPA

Index		SCI	PLI	MAI	SEI	SPI	TCI	EI
SCI	r	1	.028	.324	.460	.833**	-.329	.851**
	p		.935	.331	.155	.001	.323	.001
PLI	r	.028	1	.592	-.550	-.193	.600	.153
	p	.935		.055	.080	.570	.051	.653
MAI	r	.324	.592	1	-.359	.085	.167	.504
	p	.331	.055		.279	.804	.625	.114
SEI	r	.460	-.550	-.359	1	.731*	-.677*	.558
	p	.155	.080	.279		.011	.022	.075
SPI	r	.833**	-.193	.085	.731*	1	-.330	.786**
	p	.001	.570	.804	.011		.321	.004
TCI	r	-.329	.600	.167	-.677*	-.330	1	-.445
	p	.323	.051	.625	.022	.321		.171
EI	r	.851**	.153	.504	.558	.786**	-.445	1
	p	.001	.653	.114	.075	.004	.171	

SCI: State of Conservation Index. PLI: Planning Index. MAI: Management Index. SEI: Social and Economic Context Index. SPI: Social Perception and Valuation Index. TCI: Threats to Conservation Index. EI: Effectiveness Index.

** Significant at $\alpha = 0.01$; * Significant at $\alpha = 0.05$; n = 11.

Table 8

Inter-pair index correlations between the Complete and the Simplified Model of the SIAPA.

Index	r
State of Conservation	0.898**
Planning	0.973**
Management	0.942**
Social and Economic Context	0.957**
Social Perception and Valuation	0.775**
Threats to Conservation	0.985**
Effectiveness	0.947**

**Significant at $p < 0.01$

The PLI was not correlated with any of the other indexes, although its value was close to the significance level of 0.05 for the TCI and the MAI.

4.1.3. Management index (MAI)

Despite the stated importance of management for the effective conservation of PAs (Pomeroy et al., 2005; Hockings et al., 2006), this index did not reach a minimum desirable value in the PAs of the Autonomous Region of Madrid. Only Peñalara NP has “Adequate” management. Whereas four PAs, including the three regional parks and the NSNI Hayedo Montejo, has a “Moderate” management valuation, the other five PAs have all “Deficient” valuations. The lowest value was for NMNI Peña Arcipreste (MAI = 0), as all its indicators scored 0 or lacked any information to be valued. The MAI of PPR Soto Henares was also extremely low (MAI = 0.3). Low scores were found for two PAs which had a director at the moment of the assessment: Regajal-Ontígola NR (MAI = 0.6) and Laguna San Juan FR (MAI = 0.7). This might be due to the scarce attention paid by the administration to these two PAs, and because of the excessive amount of work of the director, who had to make compatible the management of both PAs with the management of one of the biggest and most conflicting PAs: the Sureste RP (Rodríguez-Rodríguez, 2008).

A set of direct causes could explain the poor quality of management, as mentioned by Nolte et al. (2010) and Pomeroy et al. (2005): competence and information dispersal among different administrative units, poor coordination among these units on policies and activities related to PAs, shortage of human and material resources devoted to management, insufficient updated scientific knowledge among managers, and weak institutional support to biodiversity conservation policies.

In contrast to what we had expected, the MAI was not correlated with any other index, although it might have some degree of relatedness with the PLI. The low correlation between the MAI and the SCI and the moderate correlation between the MAI and the EI suggests that management may not be as determinant a factor for the effective conservation of PAs.

4.1.4. Social and economic context index (SEI)

The territorial and demographic characteristics and trends of the Autonomous Region of Madrid provide a complex social and economic context for the PAs of the region (De Miguel and Díaz-Pineda, 2003; Naredo and

Frías, 2005). As a result, the SEI scores second lowest together with the MAI, and just after the SCI. Only one PA (NSNI Hayedo Montejo) has an “Adequate” social and economic context. Four other PAs have “Moderate” social and economic contexts: NMNI Peña Arcipreste (SEI = 1.4, near to the “Adequate” threshold), RPP Soto Henares (SEI = 1.2), Laguna San Juan FR (SEI = 1.0) and Peñalara NP (SEI = 1.0). All are located in rural areas far from the metropolitan area of Madrid. In contrast, the PAs that score least in the SEI are those around the city of Madrid: Cuenca Alta RP (SEI = 0), Sureste RP (SEI = 0) and Guadarrama RP (SEI = 0.3). The numerous municipalities included within these PAs, the general absence of local sustainability plans in those municipalities, private ownership of land, and the negative land-use changes (Hewitt and Escobar, 2011) which have been taking place result in an unsustainable social and economic context for these PAs, which represent over 88% of the total assessed area. Reinforcing local sustainability from an ecological territorial planning perspective is, therefore, of utmost urgency in the Region (Mata et al., 2009; Rodríguez-Rodríguez, 2012).

The SEI was negatively and significantly correlated with the TCI: a more positive social and economic context reduces the number and seriousness of threats, as expected. This index was positively and significantly correlated with the SPI, suggesting that a more positive social and economic context leads to better social perception and valuation of PAs in the Region and vice versa.

4.1.5. Social perception and valuation index (SPI)

The social perception and valuation of the PAs of the Autonomous Region of Madrid by residents is moderately adequate. Only two PAs, Sureste RP and Guadarrama RP, had low scores for this index due to a moderate degree of knowledge of their existence and a poor perception of their conservation state, although their scores were close to the “Moderate” threshold (SPI = 0.9). However, only one PA: NSNI Hayedo Montejo had an “Adequate” index value (SPI = 1.7) as a result of the extraordinary identification with this PA by residents. The other PAs scored “Moderate” for this index. Nevertheless, the SPI is the index which scored the highest globally, indicating relevant support to nature conservation policies through PAs designation by residents in the region, as predicted in contexts of high population density and high degree of urbanization (Brotherton, 1996).

The SPI was highly and positively correlated with the SCI, implying a high degree of relatedness between the conservation state of a PA and the degree of social support for it (Borrini-Feyerabend et al., 2004; Leverington et al., 2010). This correlation suggests the potential of social sciences to estimate integrated environmental parameters without resorting necessarily to experts or to complex experimental methods, although slight differences in the results can be expected (Nolte et al., 2010). The SPI was also positively and significantly correlated with the SEI, as previously stated.

4.1.6. Threats to conservation index (TCI)

The threats to the conservation of the PAs of the Autonomous Region of Madrid are generally “Moderate”. Five of the ten PAs had a “Deficient” TCI due to the diversity and/or seriousness of their threats. It is of particular concern that the largest PAs are among the most threatened, with the exception of Peñalara NP, as reported previously (Rodríguez-Rodríguez, 2008). The most threatened PAs are Pinar Abantos y Herrería PL, and Regajal-Ontígola NR (TCI = 1.2 for both). However, four PAs have an “Adequate” TCI. The least threatened PAs are NMNI Peña Arcipreste (TCI = 0.4), and Laguna San Juan FR, PPR Soto Henares, and Peñalara NP (TCI = 0.5 for all).

The most serious threats for the regional PAs are: “climate change” and the “presence of alien invasive species”, while “Accessibility” is the third. In contrast to other findings (Rodríguez-Rodríguez, 2008; Nolte et al., 2010), recreational activities (assessed from “number of visitors” and “activities performed by visitors”) have moderate or low values and are not among the main threats, although they may have serious consequences in the most popular zones (Gómez-Limón et al., 1996; Barrado, 1999). Recreational activities and climate change are recognized as the most prevalent and serious threats to European PAs (Nolte et al., 2010; Araújo et al., 2011; García-Ruiz et al., 2011).

The TCI was negatively and significantly correlated with the SEI. This suggests that the threats to the PAs of the Region of Madrid depend on the social and economic context of the region, as expected. The TCI was positively correlated with the PLI, although barely significant, which would suggest that the more a PA is threatened, the more planning has been developed to counter its threats. In contrast to what we had expected, the TCI was non-significantly and very weakly correlated with the SCI, implying that the variables used to build both indexes are only moderately related, at least in this study.

4.1.7. Effectiveness index (EI)

The overall situation of the PAs of the Autonomous Region of Madrid is ineffective. Their state of conservation, planning, management and social and economic context are generally “Deficient”, with only two PAs (Peñalara NP and NSNI Hayedo Montejo) showing “Moderate” values. At the end of 2010, the other PAs were in an ineffective state, jeopardizing the aim of safeguarding regional biodiversity and related ecosystem goods and services in the long term, despite the existence of active management in some of them. This result appears to confirm that active management does not automatically lead to good conservation or to the effectiveness of a PA (Gaston et al., 2006; Araújo et al., 2011) and that context variables could determine PA effectiveness to a higher degree (Jameson et al., 2002; Rodríguez-Rodríguez and Martínez-Vega, 2012).

Sureste RP, Guadarrama RP and PPR Soto Henares are the least effective PAs, with a very low EI (0.4). Four other PAs score slightly higher: Cuenca Alta RP, Pinar Abantos y Herrería PL, Regajal-Ontígola NR, and NMNI

Peña Arcipreste (EI = 0.5). Thus, much more should be done to ensure a sustainable future for the most important natural areas of the region of Madrid.

As the EI was made up of the six partial indexes, we had expected that all of them would be highly correlated with the EI. The partial indexes, however, made very different statistical contribution to the EI. The EI was significantly (and positively) correlated only with the SCI and with the SPI. Thus, from a statistical point of view, it cannot be affirmed that planning, management, the social and economic context (although it is close to the significant value) or the threats to the conservation of a PA influence PA effectiveness in the Region of Madrid. This statement should be considered carefully, as both the published literature and our own experience suggest that other factors (indexes) may also be relevant for the effectiveness of PAs (Hockings et al., 2006; Chape et al., 2008; Leverington et al., 2010; Nolte et al., 2010; Rodríguez-Rodríguez and Martínez-Vega, 2012).

4.2. Comparison of the two models of the SIAPA

The results obtained with the two models were highly consistent at index level. Small shifts in values caused a maximum difference of one degree in the standard valuation of the indexes when the values were close to the cut-offs of the variables.

At index level, the valuation appeared to be slightly more positive for the SM than for the CM, although this result might well be specific to this assessment due to the exclusion of many indicators with low values from the CM.

4.3. Validation

Validation of the results of this study is hampered by its original focus. In the absence of previous references on PAs assessment in the region, we partially compared our results with those of a study that specifically addressed the main threats to the conservation of the PAs of the Autonomous Region of Madrid (Rodríguez-Rodríguez, 2008), in which a different assessment methodology (based on interviews to different stakeholders) was used. It may serve as a first validation test for the selection of the indicators on “Threats to conservation” and for the main results under that category. Fig. 2 shows the values from both studies, standardized to a common 0 to 10-point scale.

The standardized threat values were highly correlated in both studies ($r = 0.867^{**}$). However, the average + 1.8-point valuation in the threat values in the previous study by Rodríguez-Rodríguez (2008) ($t = -6.34$; $p < 0.000$) appears to corroborate that threat indexes to PAs based on perceptions score higher than threat indexes based on more experimental techniques, as suggested by Nolte et al. (2010).

The overall degree of threat for each of the 10 PAs was partially consistent in both studies. According to the SIAPA, the most threatened PAs were, in decreasing order: Pinar Abantos y Herrería PL, and Regajal-Ontígola

NR (TCI = 1.2 for both), and Guadarrama RP, Sureste RP and Cuenca Alta RP, all with a TCI of 1.0. According to the previous study, the decreasing order of threat was: Sureste RP, Pinar Abantos Herrería PL, Regajal- Ontígola NR, and Cuenca Alta del Manzanares RP, being the Curso Medio del Río Guadarrama y su entorno RP, which had a moderately high degree of threat by the SIAPA, the most

threatened PA (Rodríguez-Rodríguez, 2008). In addition, seven of the nine major threats to PAs perceived by stakeholders in the 2008 study (except “water pollution” and “mining”) were also selected as the main threats to the effectiveness of Pas from the original indicators list of the SIAPA by the expert panel (Rodríguez-Rodríguez and Martínez-Vega, 2012).

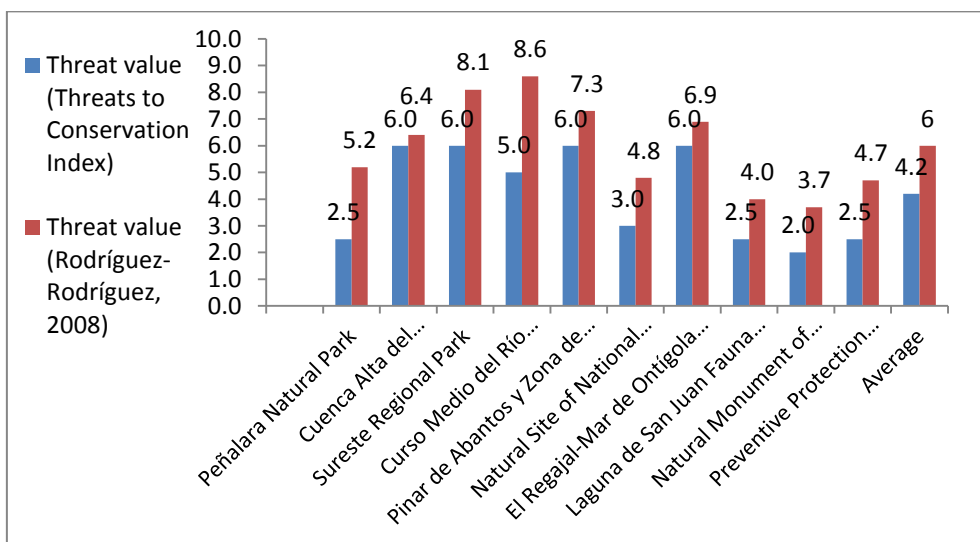


Fig. 2. Protected area threat values in two studies.

5. Conclusions: lessons learned in developing and implementing the SIAPA

The results from both models of the SIAPA are highly consistent. However, once one model is chosen for a PA or group of PAs, the same model should be used repeatedly in future assessments, as aggregated results (indexes) from both models are not directly comparable (Rodríguez-Rodríguez and Martínez-Vega, 2012). The statistical techniques used to assess the degree of relatedness among indicators and between these and the indexes did not prove useful to simplify the SIAPA. Results showed inconsistent, random relationships among variables (indicators and indexes) that could be due to the low number of cases (n = 10) or to the few values that standardized variables could take.

The development of the SIAPA, the testing of other simplified models (SM plus other models further simplified but discarded for incomplete) and their implementation in 10 pilot PAs, including reporting and communication, required about 2 years of work, a trained assessing staff of two people, and an approximate direct cost of 30,000D, which covered one full-time pre-doctoral contract for 2 years. On the basis of the main structure of any of the existing SIAPA models (with the necessary adaptations and improvements), new assessments could be conducted in the Region of Madrid or in other Spanish or international PAs within a few months and at a fraction of the above cost. The time and cost of the assessment will,

however, depend on the number of PAs assessed, the amount of information available and the qualifications and experience of the assessors. Considering the previous remarks, it can be inferred that the 35% reduction in the number of indicators assessed in the SM could lead to a similar reduction of the costs and time needed to implement it when compared with the CM.

Participation in the development and implementation of the SIAPA was wider than in most PA assessments worldwide (Chape et al., 2008), although the voluntary nature of the participation limited further involvement (Spangenberg, 2011). The participants included scientists, PAs managers, state agencies, environmental NGOs and local populations.

The fact that the assessment was conducted by an institution external to the Regional Ministry of Environment ensured the independence of the assessment (Paleczny and Russell, 2005). Often, however, this fact made it difficult to obtain data due to misunderstanding and mistrust towards the “audit” as a result of a lack of a culture of evaluation, transparency and accountability in the Spanish public sector. In contrast to the positive and useful opinion of PA assessments by most managers (Paleczny and Russell, 2005), the main constraints in developing the SIAPA in the Autonomous Region of Madrid were the poor enthusiasm and cooperation with the assessment by some of the regional administration staff (others cooperated quite happily), and also the scarcity, availability and dispersion of basic information. These

limitations are common in PA assessments (Paleczny and Russell, 2005; Gaston et al., 2006; Bertzky and Stoll-Kleemann, 2009; Nolte et al., 2010). Nevertheless, lack of basic information was not a key constraint for the implementation of the SIAPA, as only 3 of the 43 indicators could not be assessed for this reason: “Sanctioning procedures”, “Main economic activities in the PA”, and “Evolution of the feature/s for which the PA was designated”. Evaluating whether Pas values are being conserved is one of the most challenging aspects of such assessments (Nolte et al., 2010), mainly because of the absence or vagueness of conservation and management objectives (Naughton-Treves et al., 2005). Some improvements in the type of data and the manner in which they are collected would be desirable to be able to collect the information for these 3 indicators in the future (Ramírez, 2002; Paleczny and Russell, 2005).

The environmental and scientific knowledge of the PA managers of the Region of Madrid, especially other than Park’s directors, should be improved so that future management decisions are based on sound science, as current deficiencies in knowledge limit effective management and hinder evaluation. Such deficiencies in specialized knowledge and training among PAs managers are common in Europe (Nolte et al., 2010) and elsewhere, despite their importance for effective management (Leverington et al., 2010).

In summary, the SIAPA showed useful for identifying the strengths and weaknesses related to the effectiveness of the Pas of the Autonomous Region of Madrid. Its integrated nature makes it useful for PA managers and scientists, whereas its comparability provides an added value especially for PA network managers and policymakers. It can potentially be used and adapted to a wide range of PAs and contexts (Rodríguez-Rodríguez and Martínez-Vega, 2012), as long as a minimum amount of resources and enough basic information are provided. It needs, however, institutional support to be fully effective.

This first assessment of the PAs of the Autonomous Region of Madrid provides the most complete, up-to-date, accurate information on the state of each PA in the region. It is now up to the regional authorities to take the necessary measures to improve the effectiveness of the PAs of the region from a territorial perspective (Mata et al., 2009), as improving conservation should be the ultimate goal of any PA assessment (Ervin, 2003; Bertzky and Stoll-Kleemann, 2009).

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at
























<http://dx.doi.org/10.1016/j.ecolind.2013.04.019>.

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Results per protected area

Peñalara Natural Park					
Area (ha.): 11 637					
Designation date: 1990			Assessment date: 2009-10		
Assessment number: 1		Periodicity of assessment: Every five years			
Index / Indicator	Valuation	State	Tendency	Measurement period	Remarks
State of Conservation	1				
Evolution of populations of endangered species or subspecies	0		NA	1989-2008	
Health of vegetation	1		↑	2002-2009	
Surface water quality	2		NA	2008	
Air quality	2		NA	2008	
Presence of solid waste	1		NA	2009	
Landscape impact	2		NA	2009	
Planning	2				
Appropriateness of protection legislation	2		↔	1990-2009	
Existence of updated planning documents	2		↑	1990-2009	
Existence of updated documents on social and economic development	1		↑	1990-2009	
Existence of updated management documents	1		↑	1990-2009	
Existence of updated documents on public use	1		↑	1990-2009	
Zoning	2		↑	1990-2009	
Evolution of the area designated as protected	2		↑	1990-2009	
Management	2				
Degree of characterization of the protected area	2		↑	1990-2009	
Degree of fulfillment of management objectives	2		NA	2008	
Evolution of feature(s) for which the protected area was designated	¿?				
Existence of sufficient management staff	2		NA	2005	
Evolution of investment in the protected area	2		↓	2002-2009	
Effectiveness of public participation bodies	0		↔	1990-2009	
Production and distribution of an annual report on activities and outcomes	2		↔	1999-2009	
Easiness to identify the protected area	0		NA	2009	
























Public use infrastructure	1		NA	2009	
Existence of environmental education and volunteering activities	2		↑	1990-2009	
Sanctioning procedures	¿?				
Monitoring activities	2		↑	1990-2009	
Social and Economic Context	1				
Number of municipalities in the protected area	2		↔	1990-2009	
Area provided for the protected area by municipalities under local Agenda 21	0		↔	1990-2008	
Land ownership	1		NA	2005	
Main economic activities in the protected area	¿?				
Land use changes	1		↔	1990 ; 2000	
Social Perception and ValuationI	1				
Degree of knowledge on the protected area	2		↑	2007 ; 2009	
Perception of the conservation state	2		↑	2007 ; 2009	
Personal importance	2		↑	2007 ; 2009	
Economic valuation of the protected area	0		↑	2007 ; 2009	
Threats to Conservation	0				
Presence of alien invasive species	2		NA	2009	
Climate change	1		NA	1972-2003	
Area affected by fires	0		↔	2000-2008	
Fragmentation	0		NA	2000	
Isolation	0		↔	1990 ; 2000	
Accessibility	0		NA	2009	
Number of visitors	1		↓	1997-2008	
Activities performed by visitors	0		NA	2009	
Local population density	0		↓	1990-2008	
Effectiveness	1				

Table 1. Results for Peñalara Natural Park

Cuenca Alta del Manzanares Regional Park






















Area (ha.): 52 796

Designation date: 1985

Assessment date: 2009-10

Assessment number: 1

Periodicity of assessment: Every five years

Index / Indicator	Valuation	State	Tendency	Measurement period	Remarks
State of Conservation	0				
Evolution of populations of endangered species or subspecies	0		NA	1992-2008	
Health of vegetation	1		↓	2002-2009	
Surface water quality	2		NA	2008	
Air quality	0		NA	2008	
Presence of solid waste	1		NA	2009	
Landscape impact	1		NA	2009	
Planning	0				
Appropriateness of protection legislation	2		↔	1985-2009	Part of its area was declared Natural Site of National Interest in 1930
Existence of updated planning documents	0		↔	1985-2009	
Existence of updated documents on social and economic development	0		↔	1985-2009	
Existence of updated management documents	1		↑	1985-2009	
Existence of updated documents on public use	1		↑	1985-2009	
Zoning	1		↔	1985-2009	
Evolution of the area designated as protected	2		↑	1985-2009	
Management	1				
Degree of characterization of the protected area	2		↑	1985-2009	
Degree of fulfillment of management objectives	2		NA	2008	
Evolution of feature(s) for which the protected area was designated	¿?				
Existence of sufficient management staff	2		NA	2005	
Evolution of investment in the protected area	0		↑	2002-2009	
Effectiveness of public participation bodies	0		↑	1985-2009	



























Production and distribution of an annual report on activities and outcomes	2		↔	1999-2009	
Easiness to identify the protected area	0		NA	2009	
Public use infrastructure	1		NA	2009	
Existence of environmental education and volunteering activities	2		↑	1985-2009	
Sanctioning procedures	¿?				
Monitoring activities	1		↑	1985-2009	
Social and Economic Context	0				
Number of municipalities in the protected area	0		NA	2009	
Area provided for the protected area by municipalities under local Agenda 21	0		↑	1985-2009	
Land ownership	0		NA	2005	
Main economic activities in the protected area	¿?				
Land use changes	0		↓	1990 ; 2000	
Social Perception and Valuation	1				
Degree of knowledge on the protected area	2		↑	2007 ; 2009	
Perception of the conservation state	0		↓	2007 ; 2009	
Personal importance	2		↓	2007 ; 2009	
Economic valuation of the protected area	1		↓	2007 ; 2009	
Threats to Conservation	2				
Presence of alien invasive species	2		NA	2009	
Climate change	2		NA	1972-2003	
Area affected by fires	0		↓	2000-2008	
Fragmentation	1		NA	2000	
Isolation	1		↓	1990 ; 2000	
Accessibility	2		NA	2009	
Number of visitors	0		↑	1997-2008	
Activities performed by visitors	0		NA	2009	
Local population density	2		↔	1985-2008	
Effectiveness	0				

Table 2. Results for Cuenca Alta del Manzanares Regional Park

Sureste Regional Park

























Area (ha.): 31 550

Designation date: 1994

Assessment date: 2009-10

Assessment number: 1

Periodicity of assessment: Every five years

Index / Indicator	Valuation	State	Tendency	Measurement period	Remarks
State of Conservation	0				
Evolution of populations of endangered species or subspecies	0		NA	1994-2008	
Health of vegetation	1		↓	2002-2009	
Surface water quality	0		↓	2004 ; 2008	
Air quality	0		NA	2008	
Presence of solid waste	0		NA	2009	
Landscape impact	0		NA	2009	
Planning	1				
Appropriateness of protection legislation	2		↔	1994-2009	
Existence of updated planning documents	1		↑	1994-2009	
Existence of updated documents on social and economic development	1		↑	1994-2009	
Existence of updated management documents	2		↑	1994-2009	
Existence of updated documents on public use	1		↑	1994-2009	
Zoning	1		↔	1994-2009	
Evolution of the area designated as protected	2		↑	1994-2009	
Management	1				
Degree of characterization of the protected area	1		↑	1994-2009	
Degree of fulfillment of management objectives	2		NA	2008	
Evolution of feature(s) for which the protected area was designated	¿?				
Existence of sufficient management staff	2		NA	2005	
Evolution of investment in the protected area	0		↓	2002-2009	
Effectiveness of public participation bodies	0		↔	1994-2009	
Production and distribution of an annual report on activities and outcomes	2		↔	1999-2009	
Easiness to identify the protected area	0		NA	2009	
Public use infrastructure	1		NA	2009	























Existence of environmental education and volunteering activities	2		↑	1994-2009	
Sanctioning procedures	¿?				
Monitoring activities	1		↑	1994-2009	
Social and Economic Context	0				
Number of municipalities in the protected area	0		NA	2009	
Area provided for the protected area by municipalities under local Agenda 21	0		↑	1994-2009	
Land ownership	0		NA	2005	
Main economic activities in the protected area	¿?				
Land use changes	0		↓	1990 ; 2000	
Social Perception and Valuation	0				
Degree of knowledge on the protected area	1		↓	2007 ; 2009	
Perception of the conservation state	0		↓	2007 ; 2009	
Personal importance	2		↑	2007 ; 2009	
Economic valuation of the protected area	1		↓	2007 ; 2009	
Threats to Conservation	2				
Presence of alien invasive species	2		NA	2009	
Climate change	2		NA	1972-2003	
Area affected by fires	0		↑	2000-2008	
Fragmentation	1		NA	2000	
Isolation	1		↓	1990 ; 2000	
Accessibility	2		NA	2009	
Number of visitors	0		↓	1997-2008	
Activities performed by visitors	0		NA	2009	
Local population density	0		↓	1994-2008	
Effectiveness	0				

Table 3. Results for Sureste Regional Park

Curso Medio del Río Guadarrama y su entorno Regional Park























Area (ha.): 22 116

Designation date: 1999

Assessment date: 2009-10

Assessment number: 1

Periodicity of assessment: Every five years

Index / Indicator	Valuation	State	Tendency	Measurement period	Remarks
State of Conservation	0				
Evolution of populations of endangered species or subspecies	0		NA	1992-2008	
Health of vegetation	1		↑	2002-2009	
Surface water quality	0		NA	2008	
Air quality	0		NA	2008	
Presence of solid waste	1		NA	2009	
Landscape impact	1		NA	2009	
Planning	0				
Appropriateness of protection legislation	2		↑	1992-2009	It was declared Preventive Protection Regime from 1992 till 1999
Existence of updated planning documents	1		↔	1999-2009	
Existence of updated documents on social and economic development	0		↔	1999-2009	
Existence of updated management documents	0		↔	1999-2009	
Existence of updated documents on public use	1		↔	1999-2009	
Zoning	1		↔	1999-2009	
Evolution of the area designated as protected	2		↑	1999-2009	
Management	1				
Degree of characterization of the protected area	0		↑	1999-2009	
Degree of fulfillment of management objectives	1		NA	2008	
Evolution of feature(s) for which the protected area was designated	¿?				
Existence of sufficient management staff	2		NA	2005	
Evolution of investment in the protected area	2		↓	2002-2009	
Effectiveness of public participation bodies	0		↔	1999-2009	
Production and distribution of an annual report on activities and outcomes	2		↔	1999-2009	

























Easiness to identify the protected area	2		NA	2009	
Public use infrastructure	1		NA	2009	
Existence of environmental education and volunteering activities	0		↔	1999-2009	
Sanctioning procedures			¿?		
Monitoring activities	1		↑	1999-2009	
Social and Economic Context	0				
Number of municipalities in the protected area	0		NA	2009	
Area provided for the protected area by municipalities under local Agenda 21	0		↑	1999-2009	
Land ownership	0		NA	2005	
Main economic activities in the protected area	¿?				
Land use changes	1		↑	1990 ; 2000	
Social Perception and Valuation	0				
Degree of knowledge on the protected area	1		↑	2007 ; 2009	
Perception of the conservation state	0		↑	2007 ; 2009	
Personal importance	2		↑	2007 ; 2009	
Economic valuation of the protected area	1		↓	2007 ; 2009	
Threats to Conservation	2				
Presence of alien invasive species	2		NA	2009	
Climate change	1		NA	1972-2003	
Area affected by fires	0		↑	2000-2008	
Fragmentation	1		NA	2000	
Isolation	1		↓	1990 ; 2000	
Accessibility	2		NA	2009	
Number of visitors	¿?				
Activities performed by visitors	0		NA	2009	
Local population density	1		↓	2000-2008	
Effectiveness	0				

Table 4. Results for Curso Medio del Río Guadarrama y su entorno Regional Park

Pinar de Abantos y Zona de la Herrería Picturesque Landscape























Area (ha.): 1538,6

Designation date: 1961

Assessment date: 2009-10

Assessment number: 1

Periodicity of assessment: Every five years

Index / Indicator	Valuation	State	Tendency	Measurement period	Remarks
State of Conservation	0				
Evolution of populations of endangered species or subspecies	0		NA	1961-2009	
Health of vegetation	1		↓	2002-2009	
Surface water quality	¿?				
Air quality	1		NA	2008	
Presence of solid waste	1		NA	2009	
Landscape impact	1		NA	2009	
Planning	0				
Appropriateness of protection legislation	0		↔	1961-2010	
Existence of updated planning documents	2		↑	1961-2010	
Existence of updated documents on social and economic development	0		↔	1961-2010	
Existence of updated management documents	2		↑	1961-2010	
Existence of updated documents on public use	0		↔	1961-2010	
Zoning	0		↔	1961-2010	
Evolution of the area designated as protected	1		↔	1961-2010	
Management	0				
Degree of characterization of the protected area	1		↑	1961-2009	
Degree of fulfillment of management objectives	¿?				
Evolution of feature(s) for which the protected area was designated	¿?				
Existence of sufficient management staff	1		NA	2009	
Evolution of investment in the protected area	1		↑	2009	
Effectiveness of public participation bodies	0		↔	1961-2009	
Production and distribution of an annual report on activities and outcomes	0		↔	1961-2009	
Easiness to identify the protected area	0		NA	2009	
Public use infrastructure	1		NA	2009	
























Existence of environmental education and volunteering activities	2		↑	1961-2009	
Sanctioning procedures	¿?				
Monitoring activities	0		↔	1961-2009	
Social and Economic Context	0				
Number of municipalities in the protected area	1		↔	1961-2009	
Area provided for the protected area by municipalities under local Agenda 21	0		↑	1961-2008	
Land ownership	2		NA	2005	
Main economic activities in the protected area	¿?				
Land use changes	0		↓	1990 ; 2000	
Social Perception and Valuation	1				
Degree of knowledge on the protected area	2		↑	2007 ; 2009	
Perception of the conservation state	1		↑	2007 ; 2009	
Personal importance	2		↑	2007 ; 2009	
Economic valuation of the protected area	1		↑	2007 ; 2009	
Threats to Conservation	2				
Presence of alien invasive species	2		NA	2009	
Climate change	2		NA	1972-2003	
Area affected by fires	0		↑	2000-2008	
Fragmentation	0		NA	2000	
Isolation	1		↓	1990 ; 2000	
Accessibility	1		NA	2009	
Number of visitors	1		↓	1997-2008	
Activities performed by visitors	2		NA	2008	
Local population density	1		↓	1985-2008	
Effectiveness	0				






















Table 5. Results for Pinar de Abantos y Zona de la Herrería Picturesque Landscape

Natural Site of National Interest of Hayedo de Montejo de la Sierra

Area (ha.): 250

Designation date: 1974 Assessment date: 2009-10

Assessment number: 1 Periodicity of assessment: Every five years

Index / Indicator	Valuation	State	Tendency	Measurement period	Remarks
State of Conservation	1				
Evolution of populations of endangered species or subspecies	0		NA	1974-2009	
Health of vegetation	¿?				
Surface water quality	¿?				
Air quality	1		NA	2008	
Presence of solid waste	2		NA	2009	
Landscape impact	2		NA	2009	
Planning	0				
Appropriateness of protection legislation	0		↔	1974-2009	
Existence of updated planning documents	0		↔	1974-2009	
Existence of updated documents on social and economic development	1		↔	1974-2009	
Existence of updated management documents	0		↔	1974-2009	
Existence of updated documents on public use	2		↑	1974-2009	
Zoning	0		↑	1974-2009	Proposal in 1992
Evolution of the area designated as protected	1		↔	1974-2009	
Management	1				
Degree of characterization of the protected area	0		↑	1974-2009	
Degree of fulfillment of management objectives	¿?				
Evolution of feature(s) for which the protected area was designated	¿?				
Existence of sufficient management staff	2		NA	2009	
Evolution of investment in the protected area	2		↔	1996-2009	
Effectiveness of public participation bodies	0		↔	1974-2009	
Production and distribution of an annual report on activities and outcomes	0		↔	1974-2009	
Easiness to identify the protected area	1		NA	2009	
Public use infrastructure	2		NA	2009	
























Existence of environmental education and volunteering activities	2		↑	1974-2009	
Sanctioning procedures	¿?				
Monitoring activities	2		↑	1974-2009	
Social and Economic Context	2				
Number of municipalities in the protected area	2		↔	1974-2009	
Area provided for the protected area by municipalities under local Agenda 21	2		↑	1974-2009	
Land ownership	2		↔	1974-2009	
Main economic activities in the protected area	¿?				
Land use changes	1		↔	1990 ; 2000	
Social Perception and ValuationI	2				
Degree of knowledge on the protected area	2		↔	2007 ; 2009	
Perception of the conservation state	2		↑	2007 ; 2009	
Personal importance	2		↑	2007 ; 2009	
Economic valuation of the protected area	1		↑	2007 ; 2009	
Threats to Conservation	1				
Presence of alien invasive species	1		NA	2009	
Climate change	2		NA	1972-2003	
Area affected by fires	0		↔	2000-2008	
Fragmentation	0		NA	2000	
Isolation	0		↔	1990 ; 2000	
Accessibility	1		NA	2009	
Number of visitors	1		↓	1997-2008	
Activities performed by visitors	0		↔	1989-2009	
Local population density	0		↓	1985-2008	
Effectiveness	1				























Table 6. Results for the Natural Site of National Interest of Hayedo de Montejo de la Sierra

El Regajal-Mar de Ontígola Nature Reserve

Area (ha.): 629,2

Designation date: 1994 Assessment date: 2009-10

Assessment number: 1 Periodicity of assessment: Every five years

Index / Indicator	Valuation	State	Tendency	Measurement period	Remarks
State of Conservation	0				
Evolution of populations of endangered species or subspecies	0		NA		No data
Health of vegetation	¿?				
Surface water quality	2		NA	1991	Weighted valuation for 6 variables measured
Air quality	1		NA	2008	
Presence of solid waste	0		NA	2009	
Landscape impact	0		NA	2009	
Planning	2				
Appropriateness of protection legislation	2		↔	1994-2009	
Existence of updated planning documents	2		↔	1994-2009	
Existence of updated documents on social and economic development	0		NA	1994-2009	
Existence of updated management documents	2		↔	1994-2009	Natural Resources Plan
Existence of updated documents on public use	1		↑	1994-2009	
Zoning	1		↑	1994-2009	
Evolution of the area designated as protected	2		↑	1994-2009	
Management	0				
Degree of characterization of the protected area	1		↑	1994-2009	
Degree of fulfillment of management objectives	2		NA	2008	
Evolution of feature(s) for which the protected area was designated	¿?				
Existence of sufficient management staff	0		NA	2009	
Evolution of investment in the protected area	0		↓	2007-2009	
Effectiveness of public participation bodies	0		↔	1994-2009	
Production and distribution of an annual report on activities and outcomes	0		↓	1994-2009	
Easiness to identify the protected area	0		NA	2009	
























Public use infrastructure	0		NA	2009	
Existence of environmental education and volunteering activities	1		↑	1994-2009	
Sanctioning procedures	¿?				
Monitoring activities	1		↑	1994-2009	
Social and Economic Context	0				
Number of municipalities in the protected area	2		↔	1994-2009	
Area provided for the protected area by municipalities under local Agenda 21	2		↑	1994-2008	
Land ownership	0		NA	2005	
Main economic activities in the protected area	¿?				
Land use changes	0		↓	1990 ; 2000	
Social Perception and ValuationI	1				
Degree of knowledge on the protected area	2		↑	2007 ; 2009	
Perception of the conservation state	0		↓	2007 ; 2009	
Personal importance	2		↓	2007 ; 2009	
Economic valuation of the protected area	1		↓	2007 ; 2009	
Threats to Conservation	2				
Presence of alien invasive species	2		NA	2009	
Climate change	2		NA	1972-2003	
Area affected by fires	0		↑	2000-2008	
Fragmentation	1		NA	2000	
Isolation	1		↓	1990; 2000	
Accessibility	2		NA	2009	
Number of visitors	¿?				
Activities performed by visitors	0		NA	2008	
Local population density	1		↓	1994-2008	
Effectiveness	0				

Table 7. Results for El Regajal-Mar de Ontígola Nature Reserve

Laguna de San Juan Fauna Refuge

Area (ha.): 47

Designation date: 1991

Assessment date: 2009-10

Assessment number: 1

Periodicity of assessment: Every five years

Index / Indicator	Valuation	State	Tendency	Measurement period	Remarks	
State of Conservation	0	☹️				
Evolution of populations of endangered species or subspecies	0	☹️	NA		Sin datos	
Health of vegetation	¿?					
Surface water quality	0	☹️	NA	2007	Weighted valuation for 7 variables measured	
Air quality	0	☹️	NA	2008		
Presence of solid waste	2	😊	NA	2009		
Landscape impact	1	😐	NA	2009		
Planning	0	☹️				
Appropriateness of protection legislation	1	😐	↔️	1991-2009		
Existence of updated planning documents	0	☹️	↔️	1991-2009		
Existence of updated documents on social and economic development	0	☹️	↔️	1991-2009		
Existence of updated management documents	1	😐	↑	1991-2009		
Existence of updated documents on public use	1	😐	↑	1991-2009		
Zoning	1	😐	↑	1991-2009		
Evolution of the area designated as protected	1	😐	↔️	1991-2009		
Management	0	☹️				
Degree of characterization of the protected area	1	😐	↑	1991-2009		
Degree of fulfillment of management objectives	0	☹️	NA	2008		
Evolution of feature(s) for which the protected area was designated	¿?					
Existence of sufficient management staff	0	☹️	NA	2009		
Evolution of investment in the protected area	2	😊	↑	2007-2009		
Effectiveness of public participation bodies	0	☹️	↔️	1991-2009		
Production and distribution of an annual report on activities and outcomes	0	☹️	↔️	1991-2009		
Easiness to identify the protected area	1	😐	NA	2009		
























Public use infrastructure	2		NA	2009	
Existence of environmental education and volunteering activities	0		↔	1991-2009	
Sanctioning procedures	¿?				
Monitoring activities	1		↑	1991-2009	
Social and Economic Context	1				
Number of municipalities in the protected area	2		↔	1991-2009	
Area provided for the protected area by municipalities under local Agenda 21	0		↔	1991-2008	
Land ownership	1		NA	2005	
Main economic activities in the protected area	¿?				
Land use changes	1		↔	1990 ; 2000	
Social Perception and ValuationI	1				
Degree of knowledge on the protected area	2		↑	2007 ; 2009	
Perception of the conservation state	0		↑	2007 ; 2009	
Personal importance	2		↓	2007 ; 2009	
Economic valuation of the protected area	1		↓	2007 ; 2009	
Threats to Conservation	0				
Presence of alien invasive species	2		NA	2009	
Climate change	2		NA	1972-2003	
Area affected by fires	0		↑	2000-2008	
Fragmentation	0		NA	2000	
Isolation	0		↔	1990 ; 2000	
Accessibility	0		NA	2009	
Number of visitors	¿?				
Activities performed by visitors	0		NA	2008	
Local population density	0		↔	1991-2008	
Effectiveness	0				

Table 8. Results for Laguna de San Juan Fauna Refuge

Natural Monument of National Interest of Peña del Arcipreste de Hita





















Area (ha.): 2,65

Designation date: 1930

Assessment date: 2009-10

Assessment number: 1

Periodicity of assessment: Every five years

Index / Indicator	Valuation	State	Tendency	Measurement period	Remarks
State of Conservation	0				
Evolution of populations of endangered species or subspecies	0		NA		No data
Health of vegetation	¿?				
Surface water quality	¿?				
Air quality	2		NA	2008	
Presence of solid waste	2		NA	2009	
Landscape impact	0		NA	2009	
Planning	0				
Appropriateness of protection legislation	0		↔	1930-2009	
Existence of updated planning documents	0		↔	1930-2009	
Existence of updated documents on social and economic development	0		↔	1930-2009	
Existence of updated management documents	0		↔	1930-2009	
Existence of updated documents on public use	0		↔	1930-2009	
Zoning	0		↔	1930-2009	
Evolution of the area designated as protected	1		↔	1930-2009	
Management	0				
Degree of characterization of the protected area	0		↑	1930-2009	
Degree of fulfillment of management objectives	¿?				
Evolution of feature(s) for which the protected area was designated	¿?				
Existence of sufficient management staff	0		NA	2009	
Evolution of investment in the protected area	¿?				
Effectiveness of public participation bodies	0		↔	1930-2009	
Production and distribution of an annual report on activities and outcomes	0		↔	1930-2009	
Easiness to identify the protected area	0		NA	2009	
Public use infrastructure	0		NA	2009	























Existence of environmental education and volunteering activities	0		↔	1930-2009	
Sanctioning procedures	¿?				
Monitoring activities	0		↔	1930-2009	
Social and Economic Context	1				
Number of municipalities in the protected area	2		↔	1930-2009	
Area provided for the protected area by municipalities under local Agenda 21	0		↔	1930-2008	
Land ownership	2		NA	2005	
Main economic activities in the protected area	¿?				
Land use changes	1		↔	1990 ; 2000	
Social Perception and ValuationI	1				
Degree of knowledge on the protected area	1		↑	2007 ; 2009	
Perception of the conservation state	1		↔	2007 ; 2009	
Personal importance	1		↓	2007 ; 2009	
Economic valuation of the protected area	2		↓	2007 ; 2009	
Threats to Conservation	0				
Presence of alien invasive species	0		NA	2009	
Climate change	1		NA	1972-2003	
Area affected by fires	0		↔	2000-2008	
Fragmentation	0		NA	2000	
Isolation	0		↔	1990 ; 2000	
Accessibility	1		NA	2009	
Number of visitors	¿?				
Activities performed by visitors	0		NA	2009	
Local population density	1		↓	1985-2008	
Effectiveness	0				

Table 9. Results for the Natural Monument of National Interest of Peña del Arcipreste de Hita

Preventive Protection Regime of Soto del Henares






















Area (ha.): 332

Designation date: 2000

Assessment date: 2009-10

Assessment number: 1

Periodicity of assessment: Every five years

Index / Indicator	Valuation	State	Tendency	Measurement period	Remarks
State of Conservation	0				
Evolution of populations of endangered species or subspecies	0		NA		No data
Health of vegetation	¿?				
Surface water quality	0		↓	2004 ; 2008	
Air quality	0		NA	2008	
Presence of solid waste	0		NA	2009	
Landscape impact	1		NA	2009	
Planning	0				
Appropriateness of protection legislation	1		↔	2000-2009	
Existence of updated planning documents	0		↔	2000-2009	
Existence of updated documents on social and economic development	0		↔	2000-2009	
Existence of updated management documents	0		↔	2000-2009	
Existence of updated documents on public use	0		↔	2000-2009	
Zoning	0		↔	2000-2009	
Evolution of the area designated as protected	1		↔	2000-2009	
Management	0				
Degree of characterization of the protected area	1		↑	2000-2009	
Degree of fulfillment of management objectives	¿?				
Evolution of feature(s) for which the protected area was designated	¿?				
Existence of sufficient management staff	0		NA	2009	
Evolution of investment in the protected area	1		↓	2007-2009	
Effectiveness of public participation bodies	0		↔	2000-2009	
Production and distribution of an annual report on activities and outcomes	0		↔	2000-2009	
Easiness to identify the protected area	0		NA	2009	























Public use infrastructure	0		NA	2009	
Existence of environmental education and volunteering activities	0		↔	2000-2009	
Sanctioning procedures	¿?				
Monitoring activities	1		↔	2000-2009	
Social and Economic Context	1				
Number of municipalities in the protected area	1		↔	2000-2009	
Area provided for the protected area by municipalities under local Agenda 21	0		↑	2000-2008	
Land ownership	2		NA	2005	
Main economic activities in the protected area	¿?				
Land use changes	1		↑	1990 ; 2000	
Social Perception and ValuationI	1				
Degree of knowledge on the protected area	0		NA	2009	
Perception of the conservation state	0		NA	2009	
Personal importance	2		NA	2009	
Economic valuation of the protected area	2		NA	2009	
Threats to Conservation	1				
Presence of alien invasive species	0		NA	2009	
Climate change	1		NA	1972-2003	
Area affected by fires	0		↑	2000-2008	
Fragmentation	0		NA	2000	
Isolation	0		↑	1990 ; 2000	
Accessibility	1		NA	2009	
Number of visitors	¿?				
Activities performed by visitors	0		NA	2009	
Local population density	2		↓	1985-2008	
Effectiveness	0				

Table 10. Results for the Preventive Protection Regime of Soto del Henares