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ESTIMATION OF COSTS OF THE NATURA 2000 NETWORK IN THE MACARONESIAN REGION

Carlos Sunyer

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(Revised version)

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(revised version)

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- European Commission, DG Environment (Sub 99/68029)
- Ministerio de Medio Ambiente of Spain
- Viceconsejería de Medio Ambiente del Gobierno de Canarias

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SUMMARY

This work presents an estimation of the direct costs of the Natura 2000 network in the biogeographic region of Macaronesia, which comprises the regions of the Azores, the Canaries and Madeira, from Portugal and Spain.

To this end, use has been made of a methodology that considers the individual costs of each site in order to obtain the total cost. For this analysis a data sheet has been completed for each site, with a series of budgetary headings that correspond to those used in Life. This can be considered as a bottom-up type approach regarding to Lierdeman's methodological proposals[1].

The information has been analysed according to two objectives: conservation of habitat type in annex I, and management of the whole SACs. In the first case consideration has only been made of those actions aimed exclusively at satisfying the needs of these habitats (Article 6.1 of the Habitats Directive). Accordingly, only the costs of restoration and maintenance of the habitats has been assessed. The costs of scientific monitoring have also been included, as these are also considered to be basic for compliance with the Directive. It hasn't been included an estimation of the costs of conserving species in annex II because the lack of available information.

The second objective considered has been that of conservation of the SACs. Here, as well as the costs of habitat conservation, inclusion has also been made of wardening and protection costs, as well as the cost of an office for monitoring the application of the Directive. The acquisition of land would be classified within this group of measures and has been estimated for those regions for which basic information was available. In these cases this cost has been indicated separately.

Together with these two objectives, the costs have been calculated considering two time horizons. Horizon 1 contemplates costs during the first five years, which is when the most important investments take place. For their calculation, the total initial costs have been split into equal parts for the first five years. Horizon 2 refers to the years following the reserve's implementation period, once the budget has tended to stabilize.

The methodological application has been adapted to the characteristics of the basic information available for each site.

For the region as a whole, the results indicate that habitat conservation costs during the first five years would amount to 26,285,768 euro/year, which would subsequently drop to 12,907,871 euro/year. As for SAC management costs, these would total 37,896,034 euro/year during the first five years, and subsequently fall to 23,805,237 euro/year. These figures include the management of marine areas and do not include land acquisitions.

INTRODUCTION

This report forms part of the project "Funding Opportunities for Natura 2000 in the Macaronesian Region" (Ref: Sub 99/68029). Its aim is to refine the costs of the Natura 2000 network in the Macaronesian region, which includes the regions of the Azores, Madeira and the Canaries.

Though some attempts have been made to prepare a methodology for assessing the costs of the Natura 2000 network[1,2], no standard methodology currently exists for estimating these costs.

On the other hand, we do not know of any analysis that considers which budgetary figures should be considered as Natura 2000 costs, according to the provisions of the Habitats Directive. The very few studies that have attempted to value such costs have not been based on an analysis of this type.

Accordingly, this study is structured in four parts. The first part makes a definition of the different types of costs and analyses the Habitats Directive in order to determine what costs are to be considered "eligible" as Natura 2000 network.

Having defined the different types of costs attributable to the application of the Directive in relation with the Natura 2000 network, the second part presents the methodology used to estimate the costs of the Natura 2000 network in the region.

The results of the application of this methodology are presented in chapter three. Finally, chapter four gives some recommendations for future studies on the costs of Natura 2000.

For an introduction to the Natura 2000 network in the Macaronesian region or more information on this project macaronesian, please refer to "Guide to the financing of the Natura 2000 network in the Macaronesian biogeographic region[3]", which can be downloaded from our web (**www.terracentro.org**)

DEFINING THE COSTS OF THE NATURA 2000 NETWORK

It is clear that the conservation and protection of any natural site implies a series of costs, and also some profits. Costs, which form the subject matter of this study, are determined by the series of obligations and limitations arising from application of the regulations corresponding to that site.

Thus, for the purposes of our analysis it is fundamental to know what implications and definitions are imposed by the Habitats Directive in relation with the Natura network. However, as a preliminary step it is also necessary to determine what different types of costs are attributable to a protected site.

TYPES OF COSTS

The costs of implementing a protected sites policy can be classified under three main headings: direct costs, indirect costs and opportunity costs.

Direct costs are those directly borne by the administrations responsible for the management of the protected sites. These costs correspond to the administration and management of the sites, and include the cost of restoration and maintenance of habitats and species, wardening, public use, etc. These costs are included in the budgets of the corresponding administrations.

However, these are not the only costs and it is easy to find indirect costs that are not directly borne by the responsible management centres as direct costs. These include expenses that are defrayed by other administrations and private parties, relating to concepts such as losses of income due to changeovers to more extensive uses, the cost of adapting machinery to new uses, expenses resulting from reorienting resources to meet new obligations, etc.[4].

Termo-Mediterranean and pre-steppe bush habitat type in Malpaís de Güimar (Canary Islands)

In addition to the former group of costs it is also necessary to consider "opportunity costs". These represent the loss of potential profits caused by the restriction of uses. For instance, if an area has potential for the development of tourist infrastructure or intensive agriculture, the prohibition of these uses would constitute a loss of opportunity, and therefore a cost from a social point of view.

Of the three, direct costs are those that can most easily be quantified. Many of the items included under this heading are easily calculable and can be extrapolated from one site to another, such as wardening, the preparation of a management plan, etc. Others, however, are difficult to extrapolate, such as the case of habitat restoration needs, which can vary greatly from one site to another depending on their state of conservation.

Indirect costs and opportunity costs are difficult to quantify, since this requires more detailed information about the different uses of resources, their potential, and the new restrictions on land uses and ownership, among other aspects. Up to date this information is not completely available for the SCI in the region. For this reason, such analyses can only be carried out on a site-by-site basis.

A clear example can be seen in the case of the Canaries, where in 1998 the average cost of land stood at 12,549 euro/ha, with prices ranging from 90,152 euro/ha for hothouse market farming land in Tenerife (the most expensive in Spain) to 601 euro/ha for barren land on the same island. These great differences are typical of the islands, where sites of great ecological importance coexist just a few metres away from areas used for tourism or intensive agriculture.

For this reason, the present study focuses exclusively on estimating the direct costs of the Natura network.

BASIS FOR THE CALCULATION OF COSTS: INTERPRETATION OF THE DIRECTIVE

The first step in any valuation is to define what is being valued and what aspects may be attributed as costs. We are not familiar with any previous attempt to define these aspects in relation with the Habitats Directive, and thus it has been necessary to start by establishing these concepts[1,2,5,6,7].

Several articles of the Directive are fundamental in setting the grounds for defining what costs need to be assessed when valuing the impact of application of the Directive. Among these it is necessary to note the importance of Article 6, which sets out the main obligations of Member States in relation with Natura network sites, and which has been subject to detailed analysis by the Commission[8]. However, this article must be interpreted in consonance with the rest of the Directive, noting in particular the importance of Article 8.

Integration

All measures that are adopted for application of the Directive must take into account economic, social and cultural requirements, as well as regional and local particularities (Art. 2.3). In short they must be of an integrating nature. This implies the need for adequate information about the socio-economic and cultural setting of each particular site. To this end it is of great interest to have a natural resources master plan for the zone.

Conservation measures
Member States must establish suitable conservation measures for Special Areas for Conservation (SACs), adapted in each case to the ecological requirements of those habitats considered in the Directive (Art. 6.1). In addition to this it is obligatory to adopt statutory, administrative or contractual measures. Consequently, this article establishes the need for an active conservation regime for the annex I natural habitats and annex II species in each SAC.

With regard to the conservation measures to be adopted, the Directive does not set out specific obligations regarding what these must be, since they will depend on the ecological needs of each habitat. Although the Directive does not define the concept of "ecological requirement", in its analysis of Article 6 the Commission considers these to be the ecological needs of the biotic and abiotic factors necessary to ensure a favourable state of conservation of the different habitats and species, including their relationships with their surrounding environments (atmosphere, water, soil, vegetation, etc.).

According to this article, such measures may include the establishment of management plans, compensation to the users of resources for maintaining certain practices, restoration of degraded habitats, genetic rescue, etc. Thus they do not include protection measures (wardening, prevention against risks), scientific monitoring or land acquisition, among other aspects. On the other hand, the concepts contemplated in this article are extended by Article 2.2 on the reestablishment of habitats considered to be defunct in the area.

The second part of this article obliges Member States to establish the appropriate regulatory measures, of either administrative or contractual character. In other words, it is possible to include aid regimes to promote certain practices regarding the use of resources in the interior of the SAC.

In view of the above, to calculate the corresponding costs it is necessary to be provided with individualized information about each SAC, and to this end it would be of great assistance to have a management plan.

Preventive measures. Wardening.
According to Article 6.2, Member States must adopt adequate measures in SCIs and SACs in order to prevent the deterioration of habitats (natural and species). These measures must also avoid human interference with wild species when these are significant in terms of the objectives of the Directive.

This article applies the principle of precaution and is permanently applicable to all SACs. For this reason it is not limited to intentional actions but also to potential risks that may originate outside the site in question (fires, floods, erosion, etc.). The implementation of such protection often implies the need for wardening of the area.

Once again, to assess the cost of application of this measure it is necessary to know the potential risks of each site. This aspect is of great importance, since the costs of application of preventive measures can be very high compared with the costs of the conservation measures to which reference is made in Article 6.1.

Impact assessment
An assessment must be made of the potential impact of any plan or project on the SAC, even when these are not directly related with the SAC itself but can nevertheless have a significant effect on it, either of their own account or in combination with other plans or projects. The competent authorities will inform in favour of such a project only when they have ensured that it does not have negative repercussions on the integrity of the site's characteristics (Art. 6.3).

Thus it is necessary to integrate the Natura network in the design of other sectorial policies, which will evidently also imply a cost that is difficult to evaluate.

With regard to the costs of possible compensatory measures to be applied in the exceptional case of the development of plans or projects within a SAC (Art. 6.4), these are not to be considered when assessing the costs of the Natura network with a view to possible co-funding (Art. 8).

Monitoring
Member States must monitor the state of conservation of these sites in order to:
- Inform the Commission of their assessment of the application of the measures adopted (Art. 17.1).
- Establish the most adequate conservation measures (Art 6.1).

Signposting
This is a voluntary measure, and may be carried out using the signs approved by the Habitats Committee (Art 17.3).

Education and information
Member States must promote education and information on the need to protect habitats and species (Art 22.c).

Scientific monitoring
The Directive establishes the obligation to promote research for the protection of these sites. This is necessary in order to provide adequate information that allows the most appropriate conservation measures to be adopted at all times (Art 18.1).

Management plans
In view of the above, the drawing up of specific plans for each site is of great importance for the application of the Directive and for assessing the costs of its application. These plans should be oriented towards the management of the SAC's habitats, and if applicable, the management of the use of resources. Therefore, though it is not an obligatory measure it has been considered fundamental for the coherent application of the Directive, and thus has been included as an inherent cost of the establishment of the Natura network.

Determination of costs
Article 8 of the Directive is dedicated to the estimation of costs of the Natura network with a view to its possible co-funding and the possibilities for its application.

In principle, Article 8.2 specifies that the determination of costs of the Natura network or requesting co-funding must be made in relation with the conservation measures

necessary for the ecological requirements of its habitats, in those sites hosting priority natural habitat types and/or priority species (Art. 8.1). In other words, it will not include protection measures such as fire prevention or wardening, educational measures aimed at the bcal population, or the purchase of land, etc. We will refer to this "basic costs" as habitat conservation costs.

Nevertheless, paragraph 8.2 notes the need to assess all the costs resulting from the application of these measures. Therefore here other measures could be included, such as protection measures or indirect costs. We will refer to this costs as "SAC management costs". On the basis of these total costs the Commission, together with the Member State, will determine the measures that are indispensable for the maintenance of the corresponding habitats or their reestablishment to a favourable degree of conservation, as well as the possible co-funding of these measures.

Table 1. Summary of measures that can be applicable in SCIs and SACs

	SCI	SAC	Reference article
Integration measures	✓	✓	Art 2.3
Conservation measures		✓	6.1
Regulatory measures		✓	6.1
Preventive measures. Wardening	✓	✓	6.2
Monitoring	✓	✓	11, 9, 17.1
Education and training	✓	✓	22.c
Scientific monitoring	✓	✓	18
Signposting	**V**	**V**	17.3
Use and management plan	**R**	**R**	6.1, 8, 2.3

✓ Obligatory measure. Must be adopted bearing in mind the needs of each site.
V Voluntary measure.
R Recommended measure.

CONCLUSIONS

1. The determination of costs of the Natura network must take into account the specific needs of each habitat in each site.
2. The calculation of costs of the Natura network must be made taking into account the ecological requirements of annex I natural habitats and annex II species habitats. Therefore, consideration must be made of all the area of the SAC and not only of the annex I natural habitats that are included within it.
3. There are two scenarios for calculating the costs of the Natura network. On the one hand there is what we have referred to as "habitat conservation" costs, which considers the measures aimed at satisfying the ecological requirements of the habitats. On the other hand there are the "management costs of the SAC", which consider all the other costs necessary to attain the objectives set out in the Directive.
4. The drawing up of management plans and, if applicable, of resource master plans, constitutes a basic tool for most SACs, in order to know, prioritize and evaluate the conservation needs of each site.

METHODOLOGY

INTRODUCTION

The most well known methodological proposals for evaluating the direct costs of the Natura network are those proposed by Lierdeman.

The "Top-down" methodology[2] is based on extrapolation of the costs of certain projects to the rest of the territory with similar characteristics. For its application Lierdeman analysed information relating to 55 Life projects, whose results were extrapolated to the rest of the territory.

In order to test this method, we studied in detail the files of the 31 Life projects developed or undergoing in the region up to the year 2000. We found out that this methodology presents more disadvantages than advantages because:

- Most Life projects in the region are focused on solving very specific problems affecting particular habitats and species, and not on the management of sites.
- The available information is not good enough, and therefore the potentially useable sample is very small.
- Most investments in Life projects are of an initial nature (one-off tasks related with biotope management, equipment, etc.), which are the most costly.
- They offer little information about the mid- to long-term cost of habitat maintenance.

The "Bottom-up" methodology, proposed by the same author[1], estimates the costs of the Natura network on the basis of the management costs of each site. To gather information the author proposes a standard fact sheet based on Life formats.

This method is more suitable for estimating the costs of the Natura network since it considers each SCI on an individual basis and makes greater consideration of habitat maintenance costs. Nevertheless, it also presents a series of disadvantages:

- It requires a knowledge of the management needs of the SCIs.
- This information is not available for all the SCIs in the region (n=208).

The methodology used in this study is based on the bottom-up proposal, though in some cases it is combined with the top-down approach when the data needs to be extrapolated.

DEFINITION OF OBJECTIVES

From an analysis of the Directive, it is concluded that two objectives need to be established for the estimation of costs: the cost of habitat management and the cost of SAC management.

Habitat conservation cost

This first objective is aimed at knowing the costs of measures aimed exclusively at satisfying the ecological requirements of annex I natural habitats and annex II species habitats.

Thus, the computation of this cost has considered only the following measures (Table 2):

- Restoration of degraded habitats
- Habitat conservation measures (genetic rescue, elimination of alien species)
- Contractual measures for the maintenance of certain uses necessary for habitat conservation
- Preparation of habitat management plans and land use planning
- Basic studies necessary for management

Although these costs should include those of habitats types in annex I and/or priority species, we have excluded the former because the lack of information.

SAC management cost

This cost, as well as incorporating the above, includes other costs that are considered to be basic for the management of SACs in compliance with the Directive. These costs can be highly diverse, as they depend on the needs of each site. Given that they are impossible to determine without a case-by-case study, only the following have been included (Table 2):

- Compensations
- Wardening
- Preventive measures to avoid deterioration and disturbances (fires, floods, etc)
- General monitoring
- Habitat conservation costs

The calculation of wardening costs only considers the cost of personnel and basic equipment. Fire defence costs only include the cost of personnel and equipment maintenance. In no case is the cost of vehicles included.

With regard to the purchase or rental of land, it is difficult to know when this action is indispensable for the management of the SACs. For this reason, in the cases where this item has been calculated it has been noted apart.

With regard to actions related with public use (footpaths, information centres, etc.), it has been impossible to differentiate when these were directed at conservationist aims and when they were directed at promoting protected sites as a tourist resource (see Box). For this reason, this type of actions has not been considered in the estimation of costs.

Cost of marine sites

The management costs of marine SCIs elude the logic of the Directive. Despite holding different natural habitats and annex II species habitats, they require some actions that

cannot be considered as "habitat management costs", but which are nevertheless fundamental for their conservation, such as:

- Wardening. This is very important in an environment traditionally considered to be no-man's land, subject to intensive exploitation of its resources and difficult to supervise.
- Sensitization and information. This action is necessary for the users of resources, fundamentally fishermen but also whale watchers.
- Buoying. In reserves of a more pelagic character it is of fundamental importance to demarcate the protected site. Marker buoys are very costly to install and maintain, as they are often destroyed by storms.

- These characteristics call for different treatment compared with the rest of habitats. For this reason, the costs of marine SCIs have included wardening, supervision equipment, its maintenance, and certain information and sensitization actions. However, given the lack of knowledge of buoying needs this item has not been included in the calculation of costs.

Given the scarcity of experience on the management of marine reserves, the basic costs of marine SCIs in the region have been estimated on the basis of the costs of the Fishery Marine Reserve of the Columbretes Islands (Spain). The purpose of this reserve is to conserve fishery resources, and thus its management is focused on protection of the habitat by means of certain fishery restrictions (total prohibition or fishing restricted to certain tackle or selective practices) and control of the impact of nautical and sub-aquatic tourism.

These actions can be perfectly extrapolated to the marine SCIs in the region, fundamentally proposed to protect the habitat of certain species of whales, turtles and monk seals. The average costs of 4 years of management in Columbretes have been extrapolated to the SCIs. In the case of the Azores and Madeira, these costs have been scaled down to compensate for the lower personnel costs.

Box 1. The impact of tourism in the Macaronesian region

The Macaronesian region is a first-rate tourist destination. In 1999 more than 11 million tourists travelled to the Canaries, 704,336 to Madeira and 160,155 to the Azores in 1997 and the figures are rising each year.

At the same time, in recent years natural sites have become a primary tourist resource. Some illustrative figures bear witness to this fact: in 1998 there were more than 6 million visitors to the national parks in the Canary Isles[9]; in May of this year Tenerife received 300,000 visitors in its natural sites equipped with leisure facilities[10]; in the channel between Tenerife and La Gomera an average of 18 boats were engaged in whale-watching activities each day in 1998[11].

This pressure means a considerable direct impact on habitats and increases the potential risks (fire, erosion). Consequently it also has a considerable impact on the budgets of protected sites, which need to be used to finance actions that reorient and control the pressure of tourism, as well as regenerating degraded areas.

ESTABLISHMENT OF TIME HORIZONS

The budgets of protected sites are higher in the first years following their establishment than in the subsequent years, once a budgetary balance has been reached.

Given that most of the information analysed has come from the initial budgets of protected sites, which have included budget items relating to one-off management actions (restoration, equipment), two time horizons have been distinguished in the analysis.

Horizon 1 refers to the initial costs of SAC establishment, which is when the greatest investments take place. For their calculation, these costs have been apportioned in equal parts over a five year period.

Horizon 2 refers to the years following the SAC establishment period, when it is considered that the budget has stabilized (Table 2).

ORDERING OF INFORMATION

The information for each site has been complied on a fact sheet, which follows the classic order of Life formats (Table 2). The definition of each heading is the same as that established for Life formats.

Table 2. Distribution of the different budget items by objectives and horizons

	Horizon 1	Horizon 2
A Preparation of management plan	✓✗	
B Land acquisition and leasing	✓	✓
C Non-recurring biotope management		
C1 Habitat restoration	✓✗	
D Recurring biotope management		
D1 Damage prevention	✓	✓
D2 Maintenance	✓✗	✓✗
D3 Surveillance	✓	✓
E Public awareness and dissemination of results		
E1 Personel costs		
E2 Infraestructures and equipments		
E3 Dissemination		
F Overall operation		
F1 Infraestructures and equipments	✓	
F2 Personel	✓	✓
F3 Scientific monitoring	✓✗	✓✗
F4 Maintenance	✓	✓
G Compensatory payments	✓	✓

✗ Measure included in habitat management cost
✓Measure includen in SAC management cost

APPROXIMATION TO THE COSTS OF THE NATURA 2000 NETWORK IN THE MACARONESIAN REGION

The basic information for estimating the costs of the Natura 2000 network is different for each of the three regions involved: the Azores, Madeira and the Canaries. For this reason it is necessary to make a separate approximation for each one.

CANARIES

METHODOLOGICAL CONSIDERATIONS

Of the three regions, the Canaries is that for which the greatest amount of information about Natura network sites is available. This is because most of them (86%) coincide with sites that are protected by regional or national legislation, and some have management plans and budgetary documents already approved or under preparation.

To obtain the basic information a study has been made of the annual reports of three national parks, as well as the economic documents of the management plans of 28 protected sites by the regional law, all of which includes a budget for five years.

Only the information for two of the national parks has been of utility. In these the average of the expenditure made for the different budget items has been calculated for three consecutive years (96-98). With regard to the information on other protected sites, only the information for 20 sites has been useful. Most of these documents have not yet been approved, for which reason they are liable to undergo changes.

Having calculated the costs of each of these 22 sites, each of them has been assigned as representative of a type of habitat according to the majority habitat type of each site (Annex I).

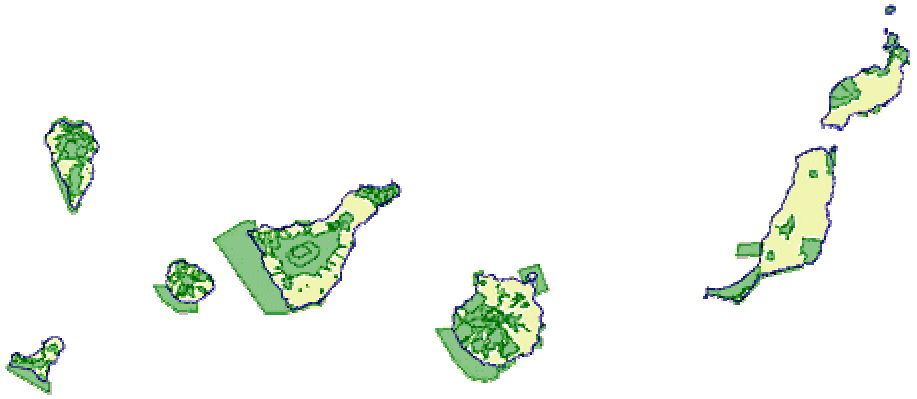
Thus it has been possible to estimate the costs of 6 habitats, which constitute 92% of the total area occupied by annex I habitats in the SCIs (Annex 2). The costs of the habitats in annex I of the Directive in the remaining area has been estimated on the basis of the average costs of other 5 sites which, due to their heterogeneous natures, have not been included in any of the previous habitats.

In this way it has been possible to calculate the cost of the annex I habitats, which altogether represent 33.5% of the total area of the SCIs. The costs of the remaining areas of the SCIs (66.5%) with not habitat types from annex I have been estimated by assigning an arbitrary average price based on the above costs.

Costs relating to SAC management, as wardening, fire defence and monitoring of the SACs have been calculated on a site-by-site basis (Annex 3).

BOX 2. Sites of Community Interest in the Canaries

	Area (km^2)	SCIs (no.)	Land area (ha)	% of the island	Sea area (ha)	Total area of SCIs (ha)
Fuerteventura	1,660	13	34,496	20.7	11,517	46,013
Lanzarote	846	11	27,505	32.5	2,614	30,119
Gran Canaria	1,562	37	62,452	40.0	48,122	110,574
Tenerife	2,034	47	91,254	44.8	42,309	133,563
Hierro	269	8	12,298	45.7	10,055	22,353
La Gomera	370	27	16,949	45.8	13,856	30,805
La Palma	708	32	35,512	50.1	10,352	45,864
Total	7,242	173	280,469	37.6	168,023	419,291



RESULTS

Habitat conservation costs

The annual habitat conservation cost has been estimated for the first five years (Horizon 1) at 22,292,000 euro/year (Table 3). Of this amount, 7,899,240 euro correspond exclusively to the costs of annex I habitats, which cover 33.5% of the SCIs. The rest corresponds to the conservation costs of annex II species habitats, including 168,023 ha of marine areas.

After the first 5 years, and once the most costly investments have been made, these costs would drop by 46% to 11,986,883 euro/year, of which 2,010,587 would correspond exclusively to annex I habitats.

Due to the different restoration needs of the different habitats, their cost per hectare is highly variable between the two horizons (Table 4). Thus, the most expensive habitat during the first five years would correspond to thermo-mediterranean and pre-desert scrub, at 217 euro/ha, which would subsequently fall to 32 euro/year. This is due to the fact that this habitat, which occupies the lowest parts of the islands, has suffered serious environmental deterioration (quarries, agriculture) and restoration work is necessary in all the sites studied. Something similar occurs with the macaronesian laurel forests and endemic macaronesian heaths, whose initial costs of 190 euro/ha subsequently fall to 56 euro/ha.

Table 3. Total annual habitat conservation costs in the Canaries.

	Total cost (euro/year)	Terrestrial SCI cost (euro/ha/year)
Horizon 1 (establishment of SCI)	22,292,000	62.1
Horizon 2 (Maintenance of SCI)	11,866,883	27.7

Table 4. Annual habitat conservation cost in the Canaries.

Habitat	Natura 2000 code	Average cost (euro/ha/year)		Total cost (euro/year)	
		Horizon 1	Horizon 2	Horizon 1	Horizon 2
Macaronesian Pine forests	9550	17	11	660,283	425,266
Thermo-mediterranean and pre-desert scrub	5330	217	32	2,005,535	295,841
Endemic oro-mediterranean heaths with gorse	4090	30	3	469,233	52,051
Macaronesian laurel forests and endemic macaronesian heaths	4050*, 9363*	190	56	3,352,682	989,345
Olea and Ceranonia forests	9320	64	-	7,670	-
Fields of lava and natural excavations	8320	12.2	2.8	55,473	12,732
Other habitats from Annex 1		54	31	409,968	235,352
Other habitats not from Annex 1		38	31	7,373,330	5,775,721
Marine habitats		29	25	4,872,667	4,200,575
Total cost of terrestrial habitats		**61.7**	**27.7**	**22,292,000**	**11,986,883**

- not available data

SAC management costs

The basic management costs of SACs would suppose an approximate cost of 30,628,045 euro/year during the first five years, of which 46% would correspond to annex I habitats (Table 5). These costs do not include the purchase of land, which according to the regional plans[12] is needed because the most of the pSCI are private belonging (65%). Because it has been impossible to determine whether land purchase was a conservation priority, it has been excluded from this estimation.

Given that protection costs (wardening and damage prevention) remain constant, the reduction observed in Horizon 2 corresponds fundamentally to the drop in initial investments in habitat management. Costs relating to the conservation and protection of annex I habitats and annex II species habitats in the SACs would fall to 20,311,307, of which 41% would correspond exclusively to annex I habitats (Table 5).

Table 5. SAC management costs in the Canaries

	Total cost of SAC management (euro/year)		Total cost of just habitats from Annex I within the SAC (euro/year)	
	Horizon 1	Horizon 2	Horizon 1	Horizon 2
Habitat conservación (Table 3)	22,291,000	11,986,883	7,899,240	2,010,587
Surveillance (only terrestrial)	2,820,941	2,820,941	947,203	947,203
Damage prevention	5,252,982	5,252,982	5,252,982	5,252,982
Monitoring	263,122	250,501	263,122	250,501
Total	**30,628,045**	**20,311,307**	**14,362,547**	**8,461,273**

MADEIRA

METHODOLOGICAL CONSIDERATIONS

In Madeira there are not yet any management plans for the SCIs and little information has been published on habitat management costs. However, the region has ample experience in the management of Life projects, which has made it possible to obtain highly valuable basic information regarding the needs of certain habitats and their costs. Furthermore the region has great experience in protected sites, and for this reason there is good initial information, albeit dispersed and unpublished.

Accordingly, basic data has been obtained from a survey sent to the Services of the National Park of Madeira, responsible for the Natura network. The requested information included the habitat management needs of each site and their costs. In this way it has been possible to complete a fact sheet for each site in the region, with which the analysis has subsequently been made (Annexes 4 & 5).

With regard to the costs of marine areas, these have been integrated in the total cost. This is because as the sites are fundamentally in coastal zones and the necessary support is fundamentally land-based.

BOX 3. Sites of Community Interest in Madeira.

	Area (km^2)	SCIs (no.)	Land area (ha)	% of the island	Sea area (ha)	Total area of SCIs (ha)
Porto Santo	42.7	2	347	8.6		347
Madeira	736.7	7	19,798	26.8	3,245	23,043
Selvagens	3.2	1	320	100	9,135	9,455
Desertas	14.5	1	1,451	100	8,221	9,672
Total	797.1	11	21,916	27.5	20,601	42,517

RESULTS

Habitat conservation costs

The annual cost of conservation of the SACs has been estimated at 803.541 euro/year during the first 5 years, which would subsequently drop by 59% (Table 6).

Table 6. Total annual habitat conservation costs in Madeira (euro)

	Total cost (euro/year)
Horizon 1 (establishment of SCI)	803.541
Horizon 2 (Maintenance of SCI)	329.145

SAC management cost

The total management cost of SACs amounts to 3,175,601 euro/year in the first five years (Horizon 1) dropping after this period by 39% (Table 7). Although not included in this figure, it has been estimated for the first five-year period that 310,352 euro/year would be destined to land purchase, with the aim of acquiring 10% of the area of the SCIs that is still in private hands.

Table 7. SAC conservation costs in Madeira

	Total cost (euro)	
	Horizon 1	**Horizon 2**
Habitat conservation (Table 6)	803,541	329,145
Surveillance	567,125	567,125
Damage prevention	1,714,335	956,162
Monitoring office	90,600	90,600
Total	**3,175,601**	**1,943,032**

The most important important figures for Horizon 1are the headings of SAC damage prevention (fire, tourism, grazing), accounting for the 54% of the total. It is followed by the heading of habitat conservation, of which most of it is dedicated to the elimination of alien species (84%) and erosion control (15%).

This figures makes an estimation of 144 euro/ha/year for horizon 1, and 88 euro/ha/year for horizon 2.

AZORES

METHODOLOGICAL CONSIDERATIONS

Of the three regions, the Azores is that for which the least information on the management of habitats considered in the Directive is available. Though, unlike the other two regions, it has some Life projects under way in connection with the design of management plans, their results are not yet available, and thus it has not been possible to use them.

In view of the lack of information on basic aspects for assessing the costs of the Natura network, two approximations have been developed.

First of all, an attempt was made to approximate the possible SAC management plans. To this end, a group of experts made an approximation of the possible management plans for two islands. However, given the magnitude of the effort necessary, this approximation had to be abandoned for the rest of pSCI.

Finally, the estimation of costs has been carried out taking into account, along with the above information, the basic information obtained in Madeira. With this data a hypothetical data sheet was completed for each site (Annexes 6 & 7). This methodology has not permitted consideration of hypothetical land acquisitions.

The costs of the marine SCIs have been estimated on the basis of data for the Columbretes Islands, scaled down by 12% (see Methodology).

BOX 4. Sites of Community Interest in the Azores

	Area (km^2)	SCIs (no.)	Land area (ha)	% of the island	Sea area (ha)	Total area of SCIs (ha)
Graciosa	61.2	2	51	0.8	270	321
São Miguel	746.8	3	1,471	1.9	1,530	3,001
Terceira	402.2	2	4,914	12.2	156	5,070
São Jorge	245.8	2	3,531	14.3	466	3,997
Faial	173.1	4	1,997	11.5	561	2,558
Flores	141.7	2	3,236	22.8	932	4,168
Pico	447.7	5	8,941	19.9	828	9,769
Sta. Maria	97.2	3	105	1.0	3,995	4,100
Corvo	17.1	1	805	47.0	176	981
Total	2,333	23	25,051	10.7	8,914	33,965

RESULTS

Habitat conservation costs

The annual cost of conservation of the SACs has been estimated at 3,190,227 euro/year during the first 5 years (Table 6). This figure would subsequently fall by 77%, fundamentally due to the reduction in habitat regeneration costs. The average cost per hectare of terrestrial habitat conservation has been estimated in 118 euro in Horizon 1, falling to 20,6 euro in Horizon 2.

The difference between Horizons is because annex I habitats in the Azores are generally more seriously deteriorated than in the Canaries or in Madeira, fundamentally due to the great pressure of agriculture and the introduction of alien species.

Table 8. Total annual habitat conservation costs in Azores.

	Horizon 1 (euro/year)	**Horizon 2 (euro/year)**
Conservation of terrestrial habitats (euro/year)	2,962,919	515,732
Conservation of marine habitats (euro/year)	227,307	196,109
Total	**3,190,227**	**711,843**

SAC conservation cost

The cost of conservation of the SACs would amount to 4,122,632 euro/year during Horizon 1, falling to 1,550,898 euro/year after this period (Table 7).

Table 9. SAC conservation costs in Azores

	Total cost (euro/year)	
	Horizon 1	**Horizon 2**
Habitat conservation (Table 8)	3,190,227	711,843
Surveillance	181,440	181,440
Damage prevention	551,815	551,815
Monitoring office	168,906	105,800
Total	**4,092,388**	**1,550,898**

THE REGION AS A WHOLE

The implementation of the Natura network in the region would entail a total annual cost of 26,285,768 euro/year during the first five years with regard to habitat conservation (Table 10). This makes a total of 131,428,840 euro during that period, and the main actions comprising this cost refer to habitat restoration tasks, mainly the restoration of degraded zones, the elimination of exotic species and the reinforcement of existing populations. Following this establishment period, once a budgetary balance has been reached, the cost would drop by 51% to 12,908,471 euro/year (Table 10 and Figure 2).

In relation with management of the SACs, the total costs during the first five years would come to 189,480,170 euro, with most of these expenses corresponding to protection tasks, fundamentally wardening and fire defence (Table 11 and Figure 3). After this period will decrease by 37% and stabilized in 25,504,283 euro/year.

Costs corresponding to the purchase of land, and management of species in annex II have not been included in this computation due to the lack of good information about the three regions and of a common criteria.

Table 10. Habitat conservation costs in the Macaronesian region.

Habitat conservation	Horizon 1 (euro/year)	Horizon 2 (euro/year)
Canaries	22,292,000	11,866,883
Azores	3,190,227	711,843
Madeira	803,541	329,145
Total	26,285,768	12,907,871

Figure 2. Evolution of the estimated habitat conservation costs for the Macaronesian region

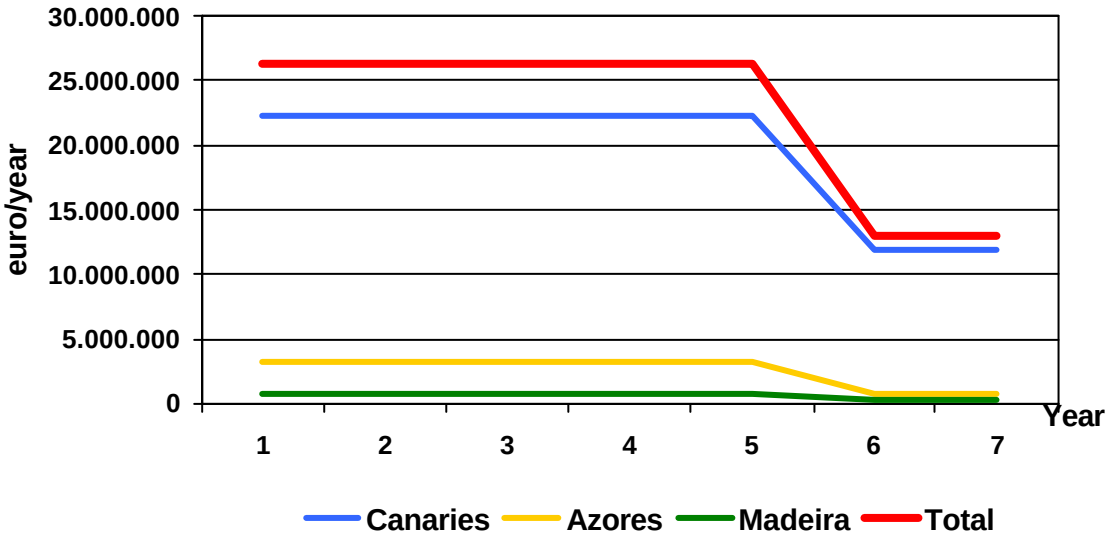
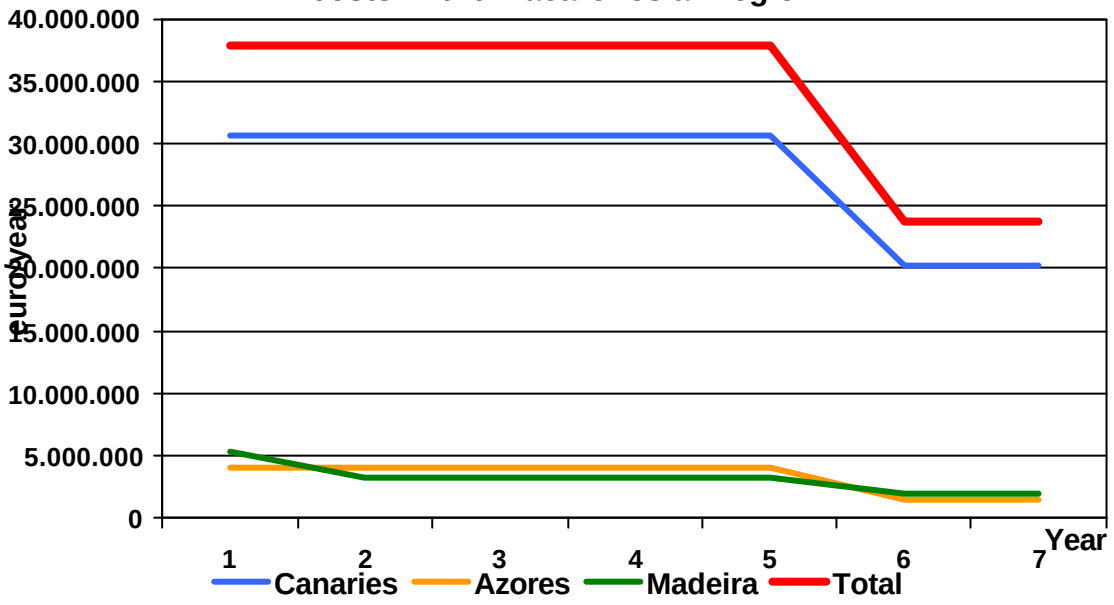


Table 11. SAC management costs in the Macaronesian region (euro/year)

SAC conservation	Horizon 1 (euro/year)	Horizon 2 (euro/year)
Canaries	30,628,045	20,311,307
Azores	4,092,388	1,550,898
Madeira	3,175,601	1,943,032
Total	37,896,034	23,805,237

Figure 3. Evolution of the estimated SAC management costs in the Macaronesian region.



CONSIDERATIONS FOR THE INTERPRETATION OF THE RESULTS

METHODOLOGICAL CONSIDERATIONS

Prior to the discussion of the results it is necessary to bear in mind that these figures are an estimation made on the basis of information, which is scarce, and often of poor quality.

The information used for the Canary Isles has been obtained from a number of protected sites, whose conservation objectives do not necessarily coincide with those of the Natura network, since they have to attend to other aspects such as public use and dissemination. The information for Madeira and the Azores comes from an estimation of their needs. Also, because the lack of information we have only estimated the costs of the habitat types in annex II, and not those of the species in annex II. For this reasons these costs may be underestimated.

Given that the methodology for the calculation of costs has been adapted to the characteristics of the information available in each region, the results are not fully comparable between each other.

The same is to be applied when comparing the habitat costs per hectare. In the Canaries it has been possible to distinguish between the costs of habitats from Annex I of the Habitats Directive from others within the proposed SCI. This has permitted much more refined data than for Madeira and Azores, in were the cost per hectare may have been overestimated.

Nevertheless, the final results of this study are the first attempt to estimate the costs of the Natura 2000 network in each of the three regions, and in extension to a biogeographical region as a whole.

COMPARISON WITH OTHER RESULTS[iii]

The only previous studies in the region regarding the cost of protected sites have been carried out in the Canaries, where it was estimated that during the first years 64,170,062 euro/year would be necessary for the implementation of the region's network of protected sites[12]. However, this figure includes a number of major budget items that we haven't included (land purchase, awareness rising, major infrastructures, etc) and also covers a greater surface (7%) than the Natura 2000 sites. Subsequently these costs would drop to 27,989,133 euro/year, a figure that still is 37% higher than that found in this study.

With regard to the costs per hectare, these are always higher in the Canaries than in mainland Spain. For instance, the total average cost per hectare of national parks in the

[i] All the costs referred to in this chapter are updated to 1998 prices.

Canaries is 93% above the average, while conservation costs, 71 euro/ha, are 21% higher than the average[9]. Very similar results were obtained in another study, which analysed the total costs of 115 protected sites in Spain[12]. According to that study, the cost per hectare of protected sites in the Canaries was 239 euro/year, 127% higher than the average.

The higher cost of the Canaries than the rest of mainland Spain, which may also be the case with Madeira and the Azores, is due to several factors. In relation with habitat conservation, it is important to note the magnitude of restoration and recovery tasks. This is due to the fact that the Macaronesian region, with the exception of the Canaries, remained uninhabited until 500 years ago, when the islands were first discovered. Furthermore these are highly singular habitats, which have evolved in isolation from the rest of the continent. For instance, there were no rodents, rabbits or large herbivores, and thus the vegetation has not developed defences against these.

Consequently, these are very delicate habitats whose climax is attained in their virgin state, without human intervention. For this reason, restoration tasks are highly important, as is the eradication of invading species of flora and fauna.

Also it is important to be noted that there is a close relation between the costs per hectare and the surface of the site, which are greater as the site becomes smaller. To this it should be added that certain services, infrastructures and equipments must be duplicated at each island, which in consequence increases costs.

CONCLUSION FOR FUTURE ESTUDIES

1. To standardize the estimation of the costs of Natura 2000 network. To this end, it is needed an interpretation of the directive.
2. The best approach to estimate the costs of Natura 2000 is site by site, as was proposed by Lierdeman in the bottom-up methodology.
3. Indirect costs can only be estimated on site by site basis.
4. SAC habitat management plans are a basic tool to estimate the direct costs of Natura 2000.
5. Planning of natural resources is a basic tool to estimate the indirect costs of Natura 2000.
6. The estimation of costs should distinguish between two budgetary horizons: the establishment period and a stabilization period.
7. The estimation of cost should also consider the basic habitat conservation from others. The first ones should exclusively include those focused to satisfy the ecological requirements of Annex I habitat types and Annex II species.
8. Clear basic criteria on priorities on land acquisition are needed.
9. For the estimation of Natura 2000 costs, the introduction of socio-economic information in the standard data form would be of great help.

ANNEX 1

PROTECTED SITES USED FOR THE ANALYSIS OF COSTS IN THE CANARIES.

Relation of the protected sites included in the proposal of SCI (total or partial) used for the analysis of costs per habitat type in this study.

	Natura 2000 habitat code	Main habitat	Site surface (ha)	Protection status	Habitat conservation cost (euro/ha)	
					Horizon 1	Horizon 2
Pilancones (GC)	7010010	9550	5794	Natural P.	6.8	4.6
Güigüi (GC)	7010008	5330	2921	Esp. Nat Res.	13.5	8.6
Marteles (GC)	7010040	4090	3569	Esp. Nat. Res.	57.1	4.7
Tafira (GC)	7010012	9320	1414	P. Landscape	24.7	6.4
Nublo (GC)	7010039	9550/4090	26307	Rural Parc	21.7	1.1
Pino Santo (GC)	7011003	9320	3012	P. Landscape	104.2	3.0
Maspalomas (GC)	7010007	92D0	404	Res. Nat. Res.	430.4	188.8
El Brezal (GC)	7010003	4050	107	Nat. Res.	341.5	73.0
Majona (G)	7020030	4050-8320	1757	Natural P.	16.4	5.1
Teno (T)	7020096	5330-5335	8064	Rural Parc	35	12.0
Anaga (T)	7020095	4050-5330	14419	Rural Parc	13.4	1.0
Chinyero (T)	7020052	9550	2443	Esp. Nat. Res.	15.7	10.7
Montaña Roja (T)	7020049	5330	166	Esp. Nat. Res.	511.7	50.7
Malpaís de La Rasca (T)	7020050	5330	315	Esp. Nat. Res.	288.1	59.1
Barranco del Infierno (T)	7020051	5330	1843	Esp. Nat. Res.	40.1	13.5
Malpaís de Güimar (T)	7020048	5330	290	Esp. Nat. Res.	229.8	27.9
Cumbre Vieja (P)	7020011	9550	7.500	Natural P.	3.3	1.2
Tamadaba (GC)	7010009	9550	7.539	Natural P.	6.9	1.2
Los Volcanes (LZ)	7010046	8320	10.158	Natural P.	12.5	2.8
Islote de Lobos (F)	7010031	5330-2130	468	Natural P.	150.8	105.3
Garajonay (G)	7020027	9363-40-50	3576	National P.		39.4
Caldera Taburiente (P)	7020007	9550	4453	National P.		45.8

Source: Economic documents of protected site master plans and development plans in the Canaries (Viceconsejería de Medio Ambiente and Cabildos Insulares) and the annual reports of National Parks (Ministerio de Medio Ambiente)

ANNEX 2.

SURFACE OF HABITATS FROM ANNEX I OF THE HABITATS DIRECTIVE INCLUDED IN SCI IN THE CANARIES

Code	Name	ha	%
1110	Sandbanks which are slightly covered by sea water all the time	44.7	0.047
1150*	Coastal lagoons	0.1	0.000
1210	Annual vegetation of drift lines	18.6	0.020
1250	Vegetated sea cliffs of the Macaronesian coasts	109.4	0.116
1420	Mediterraneans and thermo-Atlantic halophilous scrubs	62.7	0.067
2110	Embryonic shifting dunes	3,399.1	3.610
2130*	Fixed dunes with herbaceous vegetation	508.0	0.540
3150	Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*	0.1	0.000
4050*	Endemic Macaronesian dry heaths	11,188.5	11.883
4090	Endemic oro-Mediterranean heaths with goarse	15,537.5	16.502
5330	Thermo-Mediterranean and pre-steppe brush	9,256.6	9.831
5335	Thermo-Mediterranean broom fields	1,716.3	1.823
6420	Mediterranean tall-herbs and rush meadows *Molinion-Holoschoenion*	25.8	0.027
7220*	Petrifying springs with tufa formation (*Cratoneurion*)	51.7	0.055
8220	Chasmophytic vegetation on siliceous rocky slopes	123.7	0.131
8310	Caves not open to the public	0.1	0.000
8320	Fields of lava and natural excavations	4,547.0	4.829
8330	Submerged or partially submerged sea caves	0	0.000
92D0	Thermo-Mediterranean riparian galleries (*Nerio-Tamariceteae*)	92.3	0.098
9320	*Olea* and *Ceratonia* forests	119.0	0.126
9363*	Lauriphyllous forests of the Canary Islands	6,415.3	6.814
9370*	Palm groves of *Phoenix*	277.5	0.295
9550	Macaronesian pine forests (endemic)	39,498.4	41.950
9565*	Endemic Mediterranean forests with *Juniperus* sp.	1,163.0	1.235
		94,155.4	100

Total terrestrial surface covered by SCIs: 280,469 ha
Area of SCIs occupied by habitats of Community interest: 94,155.4 ha (33.5% of SCI)

Source: Viceconsejería de Medio Ambiente de Canarias, May 2000.

ANNEX 3

ESTIMATION OF PROTECTION COSTS IN THE CANARIES

Wardening

This has been calculated on the basis of the wardening needs envisaged by the Viceconsejería de Medio Ambiente for regional network of protected sites. These are estimated as 130 wardens for 301,162 ha., with a cost per capita of 24,040 euro/year (cost of personnel and basic equipment), giving an average cost per hectare of 10.06 euro/ha.

Average annual cost

	SCI Annual total cost (euro)	(euro/ha)
Fuerteventura	139,007	4.03
Lanzarote	320,898	11.67
Gran Canaria	248,078	3.97
Tenerife	243,971	2.67
El Hierro	682,080	55.46
Gomera	1,025,749	60.52
La Palma	409,698	11.54
Total	2,820,941	10.06

Wardening and maintenance of land-based fire defence means

The basic cost of maintenance of systems for the prevention and extinguishing of fires (personnel, vehicles and materials) has been estimated on the basis of the real costs recorded during the last three years in the Garajonay and Caldera de Taburiente National Parks.

Fire risk	Habitats (Natura 2000 code)	Surface included in Natura 2000 (ha)	Estimated cost (euro/ha)	Total cost (euro)
Very high	4050, 9320, 9363, 9550, 9565	58,384	72	4,203,648
High-moderate	4090, 5330, 5335, 6420, 92D0, 9370	26,906	39	1,049,334
Low-none	1110, 1150, 1210, 1250, 1420, 2110, 2130, 3150, 7220, 8220, 8310,8320, 8330	8,865	0	0
Total				5,252,982

Monitoring office

The cost has been calculated of an office exclusively dedicated to monitoring the application of the Directive. This office would be formed by a Director, five technical assistants and two administrative assistants.

	Year 1 (euro)	Maintenance (euro)
Personel	216,364	216,364
Fixed expences (consumable material, overheards, travel)	34,137	34,137

Equipments (only first year)	63,106	
Total	313,607	250,501

Director (36,060 euro), Expert (30,050 euro), Assistant (15,025 euro)

ANNEX 4

ESTIMATION OF SAC MANAGEMENT COST IN MADEIRA

Name of site	Island	Code	Superface SCI (ha)			Main habitat	Horizon 1 euro/ha	Horizon 2 euro/ha
			Total	Terrestrial	Marine			
Laurisilva da Madeira	Madeira	PTMAD0001	14,954		14,954	9363, 4050	25	2
Maciço Montanhoso Central	Madeira	PTMAD0002	4,200		4,200	6180	65	7
Ponta de S. Lourenço	Madeira	PTMAD0003	1,862	1,545	317	5330	57	23
Ilhéu da Viúla	Madeira	PTMAD0004	1,710	1,700	1,4	1250	7	4
Achadas da Cruz	Madeira	PTMAD0005	185		185	1250	53	39
Moledos-Madalena do Mar	Madeira	PTMAD0006	12		12	1250	732	608
Pináculo	Madeira	PTMAD0007	30		30	1250	653	243
Ilhéus do Porto Santo	Porto Santo	PTPOR0001	214		214	1250	118	34
Pico Branco	Porto Santo	PTPOR0002	133		133	5330	303	54
Ilhas Desertas	Madeira	PTDES0001	9,672	8,221	1,451	1250	126	10
Ilhas Selvagens	Selvagens	PDSEL0001	9,455	9,135	320	1250	346	91
Total			42,427	20,601	21,826			

ANNEX 5

ESTIMATION OF PROTECTION COSTS IN THE MADEIRA

Wardening costs

Since the SCI wardening needs envisaged by the administration in Madeira are not known, an estimation has been made on the basis of the characteristics of the SCIs and of each island. Given that the marine scope of the SCIs in Madeira is of a coastal nature, both wardening costs have been included in the estimation. Wardening costs have included only the cost of personnel, basic equipment and transport expenses (1,745 euro/month).

Island	Wardens (n)	Cost of wardening	
		Total (euro)	euro/ha
Madeira	16	362,960	18.33
Porto Santo	3	68,055	196.12
Selvagens	3	68,055	212.67
Desertas	3	68,055	46.90
Total	18	567,125	25.88

Fire defence costs

The estimation of fire defence costs (including personnel, basic equipment and maintenance) has been made on the basis of the costs of habitats in the Canaries and the needs of each site. The SCIs considered to be at high risk are Laurisilva de Madeira (habitats 4050* and 9363*) and Achadas da Cruz , both on the island of Madeira. The areas considered to be with a moderate risk are Maciço Montanhoso Central and Pico Branco. The rest are considered to be low risk, due either to the low density of vegetation or their location.

Fire risk	Surface included in Natura 2000 (ha)	Estimated cost (euro/ha)	Total cost (euro)
High	15,139	63	953,757
Moderate	4,333	35	151,655
Lown-none	2,345	0	0
Total	21,817		1,105,412

Monitoring office

The cost has been calculated of an office exclusively dedicated to monitoring the application of the Directive. This office would be formed by a Director, two technical assistants and one administrative assistant.

Concepto	Year 1 (euro)	Maintenance (euro)
Personel	68,600	68,200
Fixed expences (consumable material, overheards, travel)	22,000	22,000
Equipments (only first year)	63,106	
Total	153,706	90,600

Director (25,200 euro), Expert (15,200 euro), Assistant (13,000 euro)

ANNEX 6

ESTIMATION OF SAC MANAGEMENT COST IN AZORES

Azores	Island	Code	Superface SCI (ha)			Horizon 1 (euro/ha)	Horizon 2 (euro/ha)
			Total	Terrestrial	Marine		
Costa e Caldeirão	Corvo	PTCOR0001	981	805	176	60	30
Zona Central-Morro Alto	Flores	PTFLO00O2	2,925	2,925		40	3
Costa Nordeste	Flores	PTFLO0003	1,243	311	932	65	63
Caldeira e Capelinhos	Faial	PTFAI0004	2,040	1,836	204	16	4
Monte da Guia	Faial	PTFAI0005	360	108	252	586	68
Ponta do Varadouro	Faial	PTFAI0006	20	20		883	365
Morro de Castelo Branco	Faial	PTFAI0007	138	33	105	224	221
Baixa do Sul	Pico	PTPIC0008	524		524	0	-
Montanha do Pico, Prainha e Caveiro	Pico	PTPIC0009	8,562	8,562		46	3
Ponta da Ilha	Pico	PTPIC0010	403	336	67	540	22
Lajes do Pico	Pico	PTPIC0011	128	22	106	334	332
Ilhéus da Madalena	Pico	PTPIC0012	152	21	131	350	347
Ponta dos Rosais	S. Jorge	PTJOR0013	289	156	133	1,020	62
Costa NE e Ponta do Topo	S. Jorge	PTJOR0014	3,708	3,375	333	147	6
Ilhéu de Baixo	Graciosa	PTGRA0015	243	39	204	342	249
Ponta Branca	Graciosa	PTGRA0016	78	12	66	813	810
Serra de Sta. Bárbara e Pico Alto	Terceira	PTTER0017	4,809	4,809		82	6
Costa das Quatro Ribeiras	Terceira	PTTER0018	261	105	156	95	93
Lagoa do Fogo	S. Miguel	PTMIG0019	1,360	1,360		149	11
Caloura-Ponta da Galera	So Miguel	PTMIG0020	36	6	30	1,923	1,621
Banco D. João Castro	S. Miguel	PTMIG0021	1,500		1,500	0	-
Ponta do Castelo	Sta. María	PTSMA0022	300	105	195	611	93
Ilhéu das Formigas e Recife Dollabarat	Sta. María	PTSMA0023	3,800		3,800	0	-
Total			33,908	24,994	8.,914		-

- Data non available

ANNEX 7

ESTIMATION OF PROTECTION COSTS IN THE AZORES

Wardening costs

Since the SCI wardening needs envisaged by the administration in the Azores are not known, an estimation has been made on the basis of the characteristics of the SCIs and of each island.

Island	SCI	Surface of SCI (ha)			Wardens	Cost of wardening	
		terrestrial	Marine	Total		Total (euro)	(euro/ha)
Corvo	1	805	176	981	1	22,685	28.18
Flores	2	3,236	932	4,168	2	45,370	14.02
Graciosa	2	51	270	321	1	22,685	444.80
S. Jorge	2	3,531	466	3,997	2	45,370	12.85
Pico	5	8,941	828	9,769	8	181,480	20.30
Faial	4	1,997	561	2,558	2	45,370	22.72
Terceira	2	4,914	156	5,070	2	45,370	9.23
S. Miguel	3	1,471	1,530	3,001	2	45,370	30.84
Sta. María	3	105	3,995	4,100	1	22,685	216.05
	24	25,051	8,914	33,965	21	181,440	7.24

Fire defence costs

The estimation of fire defence costs (including personnel, basic equipment and its maintenance) has been made on the basis of the costs estimated for the Canaries, taking into account the high rainfall of the Azores. The areas with high fire risk are considered to be Montanha do Pico, Serra de Santa Bárbara and Lagoa de Fogo. The areas with a moderate-low risk are Morro Alto, Ponta do Varadouro and Ponta do Castelo

Fire risk	Superface included in Natura 2000 (ha)	Estimated cost (euro/ha)	Total cost (euro)
High	14,459	35	506,065
Moderate-low	3,050	15	45,750
Total			551,815

Monitoring office

The cost has been calculated of an office exclusively dedicated to monitoring the application of the Directive. This office would be formed by a Director, three technical assistance and one administrative assistant.

	Year 1 (euro)	Mantenance (euro)
Personel	83,800	83,800
Fixed expences (consumable material, overheards, travel)	22,000	22,000
Equipments (only first year)	63,106	
Total	168,906	105,800

Director (25,200 euro), Expert (15,200 euro), Assistant (13,000 euro)

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