

Decision support system for coastal management: the case-study of the Maremma Regional Park (Tuscany, Italy)

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Introduction

Sustainability scenarios for an ecosystem or an area comprise many parameters that are dynamically interrelated in space and time. An expert based approach could provide a suitable model describing these relations in a dynamic way but in the end the most probable outcome is a variety of situations-scenarios-alternatives which must be evaluated by different people (stakeholders) with different expertise, interests, duties and ideas. Consequently, when ultimately dealing with environmental sustainability we come up with a decision making process where the matrix contains multiple objectives to be evaluated according to multiple criteria by multiple stakeholders. This is the nature in reality of a process of integrated management and also the pool for conflicts, failures and minimum achievements.

The common natural resources especially in coastal areas where exists simultaneously a variety of uses and ecosystems often it is difficult to be managed in a sustainable way because of the regime of property rights (belong to everyone) and their non strict monetary characteristics (2). The mediation by the authorities by implementing strict institutional and legal arrangements often fails especially in democratic societies where the organized lobbies of interests push for more profit. Unless there is a traditional cooperation in managing sustainable the common resources which characterizes small traditional communities all the other management schemes in our contemporary western world rely on the scientific rationalization, which seek to “educate” the public to think rational and decide rational.

The evaluation of the environmental and other impacts of human actions above a certain threshold is a focal point of much research in both the natural and social sciences. It has also been a legal requirement induced by the concern over the sustainability of our environment. When referring to this evaluation, a distinction has been introduced by both the theoretical and applied research practice between the *quantitative assessment* of impacts and the *qualitative evaluation* of assessed impacts. Environmental Impact Assessment is facilitated by special research agendas that almost all fields of science and engineering have developed for understanding and *quantitatively* assessing old and new environmental threats. While much attention has been paid to the EIAs, it is the environmental evaluation which provides the basis for an *ex ante*: (a) determination of the comparative advantage of alternative plans for an action; (b) recommendation of whether an action must be approved; or (c) formulation of policies to limit the environmental degradation expected from certain actions (1).

In the context of the MEDCORE project, a variety of issues concerning habitat’s analysis, degradation problems and management problems in Mediterranean coastal

areas were described and in some areas as in MAREMMA park ended up with the formulation of the most critical concerns over the sustainable management of the area.

A set of issues for this area derived by using Soft System Analysis as it is referred and analyzed in an other chapter. These issues were considered appropriate to be transformed into criteria for performing a multi-criteria evaluation of the MAREMMA park by relevant stakeholders. The aim of applying this methodology was not only to analyze the specifics of the particular case study but also to propose a structured approach useful for environmental decision makers who face continuously integration problems, posed by multiple interests over multiple environmental issues.

Methodology

Environmental evaluation draws information from the fields of decision theory, economics, ethics, philosophy, political and social sciences to deal fundamentally with the task of determining a measure of acceptability or “value” of the impacts of an action. This value may basically be derived either by integrating the individual values of all impacted or by analyzing the negotiation and bargaining strategies that those impacted can follow to reach agreement on the acceptability of the impacts. However, there are complications stemming from the fact that the impacts of any action are numerous, they are measured with a variety of scales if they can be measured at all, they are often uncertain, they are not equitably distributed among all those impacted, they do not materialize over the same time period, and they do not invoke the same reaction of approval or disapproval by those interested in the final decision (3).

More often than not, the impacts that an environmental evaluation is commissioned to evaluate constitute *the criteria* for assessing the acceptability of, or preference for a decision option. Hence, the term *evaluation criteria* could be applied to refer to the *impacts* that become the subject of an environmental evaluation. The identification of criteria with which an option can be evaluated depends upon expert judgements but not exclusively since the stakeholders can provide their own set of criteria.

The criteria used for this case study were produced by Soft System Analysis (Dr. L. Cassar et al., person. comm., this Final Report) and are structured as a tree with General and Special criteria.

A. BIODIVERSITY

It refers to problems with the conservation of the native species and landscapes in the MAREMMA PARK.

SUBCRITERIA - SPECIFIC SUBJECTS ON BIODIVERSITY

A. Alien or invasive species

The extent to which introduction of alien or invasive species have affected biodiversity of the area negatively (e.g. change of maquis and dunes flora, thinning of pines etc.)

B. Disturbances of fauna and flora by users

The extent to which park users disturb fauna, create dependence of certain animals on humans and disturb the dune vegetation by trampling on dunes

C. Erosion

The extent to which accelerated erosion affects dune vegetation and beach area

D. Conservation Zones

The extent to which lack of core, buffer and transition zones affect biodiversity integrity (species and landscapes)

B.RECREATION

It refers to pressures arising by visitors

A. Seasonal pressure

The extent to which there is seasonal pressure by beach users which exceeds the carrying capacity of the area.

B. Motor Traffic

The extent to which the present car park location is inadequate and there is a need for changing the transport model of the area.

C. Information within park

The extent to which there should be better facilities for the interpretation of the park assets

C. AGRICULTURE

It refers to problems related to agricultural practices inside or near the Park area

A. Pesticides and fertilizers

The extent to which pesticides and fertilizers on cultivated areas within park create severe problems

B. Landscape fragmentation

The extent to which competition between agriculture and natural areas leads to land fragmentation

C. Alternative agriculture

The extent to which there is need for more organic farming and agri-tourism

D. RESEARCH AND ENVIRONMENTAL EDUCATION

It refers to lack of appropriate research and/or environmental education programs for the Park

A. Staff training

The extent to which there is a need for staff training in research and conservation disciplines

B. Coordinated research

The extent to which there is a need for coordinated research initiatives and keeping of records

C. Presentation of different biotopes

The extent to which there is a need to maximize the potential that park offers as a result of different biotopes

D. Monitoring

The extent to which a monitoring program as well as more base line studies should be set up.

E. MANAGEMENT MODEL

It refers to the management model of the Park

A. Economic resources

The extent to which alternative sources of income for the Park (e.g. EU, UN) should be explored

B. Cooperation

The extent to which a better cooperation between management committee and park staff should be established

C. Management plan

The extent to which there is need for management plan with integration of social, economic and environmental concerns and mechanisms for evaluating the plan's implementability and effects.

Almost always, the environmental evaluation criteria are more than seven, which is the threshold for the human brain to compare without the need of written calculations. In the case of multiple criteria the use of a computer-based model is necessary. For this reason, an analytical support system of collective decision-making referred to as AGORA (Assessment of Group Options with Reasonable Accord) was used, previously developed in HCMR (former IMBC). Its methodological foundations derived from the field of multicriteria (multiple objectives) evaluation and decision making (1,3). The AGORA application requires that a group of stakeholders agree to participate in a cooperative or "bottom-up" decision making process as opposed to waiting for a "top-down" or normative decision by the involved authorities. Their participation entails raising of the issues they consider relevant to a collective problem and answering a specially designed questionnaire (see Appendix). Their payoff is the information described above. AGORA calculates preferences over large sets of criteria and the algorithm is based upon the *direct ratio approach*, which briefly goes as follows:

The stakeholders are asking to provide a twofold information: (a) in what order of importance they rank the evaluation criteria; and (b) how many times more important they consider a criterion than the one they ranked next, or the *exchange rate* between two successively ranked criteria. With this approach, we can determine priority weights as follows:

1. Assign a priority weight equal to 1 to the criterion ranked last (least important);
2. Assign a priority weight to the criterion ranked second-last equal to the exchange rate between this criterion and the last one; and so on

3. Normalize these priority weights by dividing them with their total so that the sum of the new weights will equal 1. With this procedure the problem of selection of different scales for criteria comparisons by different stakeholders is eliminated.

When the number of the criteria is large they must be structured as a value tree, with roots, branches and twigs. The priority weights of the branches must be multiplied with that of their root, those of the twigs of a branch with the weight of their branch, and so on. In this way, the sum of the priority weights of the branches of a root will equal the weight of the root, the sum of the weights of the twigs of a branch will equal the weight of the branch and so on. It follows that in the case of a value tree, it is the sum of the priority weights of all the “edges of the tree” that will equal 1. This process yields *integrated values* which subsequently are statistically analyzed.

The potential coalitions formed by the participants which express similar preferences (integrated values) are identified by a *k-means Cluster Analysis* (Euclidean distance)

The stakeholders

The focus of the AGORA application is to analyze the priorities of a set of stakeholders for the sake of helping these particular stakeholders to obtain information regarding collective preferences (5). The structure of the questionnaire demands that the participants in such evaluation have a good knowledge of the specifics of the case study. This set of stakeholders constitute a *forum* and are usually the people that take or influence decisions. The members of a *decision forum* are constantly facing management problems and the evaluation becomes a continuous procedure. In this way, a multi-criteria analysis is not a referendum for a problem and the statistical representativeness in relation to a population has no meaning.

For the MAREMMA case study the participants for this evaluation were scientists –experts and members of the park management authority. A total of 12 filled the questionnaire properly from which 8 were scientists and 4 members of the park management authority.

Results

The information concerning the average integrated values (or weights) of preferences for the whole set of participants for the general criteria as well as for the sub-criteria is shown in tables 1 and 2 respectively.

General Criteria	Average Integrated Values
Biodiversity	0,341
Management model	0,269
Recreation	0,134
Research and Environmental education	0,129
Agriculture	0,127

Table 1. All participants, average integrated values for general criteria.

As it is shown in table 1, *Biodiversity* criterion is the most preferred criterion by which the participants expressed their concerns for the management of the MAREMMA park following close by the *Management model* criterion. It seems that the rest of general criteria do not gather strong preferences as they were scored with low values.

The expressed preferences for the sub-criteria (table 2) show that the need for a *Management plan* and the establishment of *Conservation zones* most concern the participants while sub-criteria belonging to *Agriculture and Research –Environmental education* are not considered as so important.

General criteria	SUB-CRITERIA	Average Integrated Values
Management	Management plan	0,182
Biodiversity	Conservation Zones	0,173
Agriculture	Landscape fragmentation	0,074
Recreation	Seasonal pressure	0,068
Biodiversity	Erosion	0,064
Biodiversity	Alien or invasive species	0,058
Management	Cooperation	0,049
Biodiversity	Disturbances of fauna and flora by users	0,046
Res. & Env.Educ.	Staff training	0,042
Recreation	Information within park	0,038
Management	Economic resources	0,038
Res. & Env.Educ.	Monitoring	0,036
Res. & Env.Educ.	Coordinated research	0,032
Recreation	Motor Traffic	0,028
Agriculture	Alternative agriculture	0,028
Agriculture	Pesticides and fertilizers	0,026
Res. & Env.Educ.	Presentation of different biotopes	0,019

Table 2. All participants, average integrated values for sub-criteria with indication of the general criteria to which every sub-criterion belong.

In order to identify groups of participants that expressed similar priorities for the same criteria a *k-means cluster analysis* for general and sub-criteria was performed and the results appear in table 3 and 4. The membership of the clusters according only to their affiliation to the case-study is also shown.

Most of the participants form cluster 1 on the basis of the expressed preference for the Biodiversity issue. The majority of scientists and park staff form this group. The second cluster is formed by a strong preference for the *Management model* criterion following by the preference for the *Recreation* criterion. This group draws members from the science community but there is only one person from the park staff category, which participates in this group.

General Criteria	Cluster 1	Cluster 2
Biodiversity	0,431	0,070
Recreation	0,106	0,223
Agriculture	0,137	0,100
Res.Env.Edu	0,142	0,090
Management Model	0,186	0,520
Membership	Cluster 1	Cluster 2
Scientists	6	2
Park staff	3	1
Total	9	3

Table 3. Cluster centers and membership for General criteria.

General Criteria	Sub-Criteria	Cluster 1	Cluster 2
Bio-diversity	Alien or invasive species	0,055	0,068
	Disturbances of fauna and flora by users	0,054	0,028
	Erosion	0,074	0,043
	Conservation Zones	0,235	0,048
Re-creation	Seasonal pressure	0,076	0,053
	Motor Traffic	0,028	0,030
	Information within park	0,049	0,013
Agri-culture	Pesticides and fertilizers	0,024	0,030
	Landscape fragmentation	0,106	0,013
	Alternative agriculture	0,026	0,030
Res. & Env. Educ.	Staff training	0,040	0,043
	Coordinated research	0,030	0,035
	Presentation of different biotopes	0,021	0,018
	Monitoring	0,041	0,023
Manag. model	Economic resources	0,033	0,050
	Cooperation	0,038	0,075
	Management plan	0,069	0,413
Membership	Cluster 1	Cluster 2	
Scientists	5	3	
Park staff	3	1	
Total	8	4	

Table 4. Cluster centers and membership for Sub- criteria.

Subsequently, the formation of groups according to expressed preferences for the sub-criteria (table 4, Figure 1) shows that the lack of *Conservation Zones*

(Biodiversity criterion) the *Landscape fragmentation* (Agriculture criterion) concern more the majority of the participants both scientists and park staff which form cluster 1. The strong preference for a *Management plan* and lesser for the *Cooperation* criterion (Management model criterion) concerns the minority of participants which are scientists and again only one person from the park staff category.

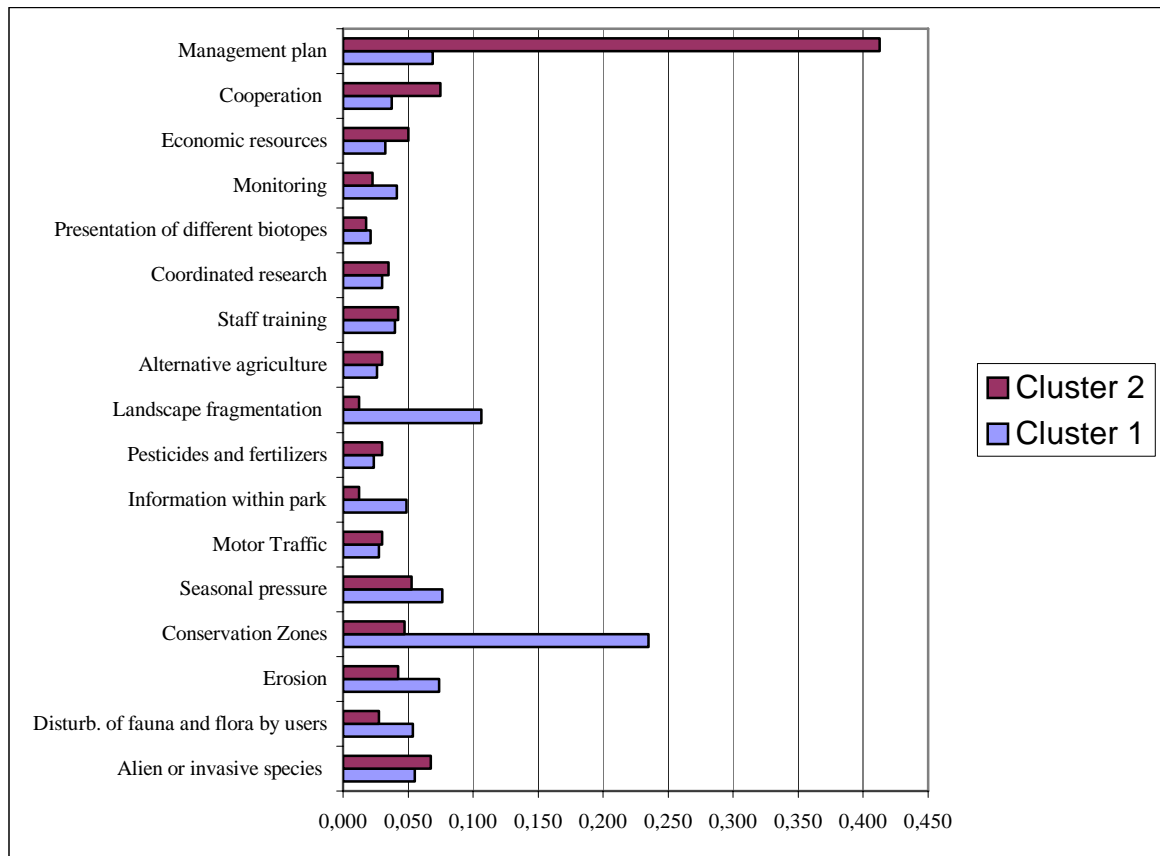


Figure 1. Cluster centers for sub-criteria.

Finally, the information concerning the average values (or weights) of preferences without integration of the whole set of participants for the general criteria as well as the sub-criteria is shown in table 1 in Appendix. These values were calculated without integration which means that the weight someone gave to a sub-criterion was not multiplied by the weight of the general criterion and present the preferences that each participant expressed when he/she compared separately the groups either of general criteria or the groups of sub-criteria.

Discussion

The evaluation of the problems of the MAREMMA park area by this specific group of participants which can be considered as experts for this case study revealed a general strong consensus about the issues that must be faced in priority in order to manage the park in a sustainable way. Also, with minor differences there is a consensus about which of the problems or issues are not so important.

The lack of *Conservation Zones* or the problems created by the *competition between agricultural and natural areas* are considered as most important. These most expressed concerns by experts show that the management tool for the area should be the allocation of space to categories of uses. The also expressed strong preference for an integrated *management plan* show that the space allocation should take into consideration social, economic and environmental issues as well as evaluating mechanisms. Given that the designation of space areas with specific uses always create conflicts among the stakeholders society the expressed will for take into consideration the social and economic needs show that, at least, one *forum* exist in the area which is willing to negotiate for an integrated management plan.

Despite the differences appeared in the detailed analysis of the potential groups formation there are issues that gather very weak preferences like *the presentation of different biotopes* inside the park or the potential damage of the park by the use of *pesticides and fertilizers*.

An issue that lists high in the preferences of the two groups of participants formed by the clusters analysis is the *seasonal pressure by park visitors* which potentially exceeds the carrying capacity of the area followed by the *erosion* of the dune areas, Also, the potential damage caused by the introduction of alien or the two groups of participants considered of moderate importance.

It is interesting to note that the formation of the two clusters draws members from both categories (scientists and park staff) which show that there is no separated or conflicting views among these groups as a result of a different expertise or affiliation to the case study.

References

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Appendix

QUESTIONNAIRE – MEDCORE PROJECT

In the context of the European Research project MEDCORE, leading by the UNIV. of FLORENCE (Proj. Manager Prof. F.Scapini) a number of issues have been explored concerning the biodiversity and the general state of the MAREMMA Park area.

In order to apply a methodology for obtaining results for a better decision making strategy we would like to fill this questionnaire by expressing your personal ideas and preferences.

The questionnaire is anonymous and will be used for research purposes only.

As you will see by reading this questionnaire, several problems and issues are presented as criteria for the evaluation of the Park's services and problems. Because in real life we use criteria to take decisions we are going to use the results from your answers to perform a scientific mathematical analysis of how we can extract information when there are multiple stakeholders who choose different criteria to evaluate a situation.

What really matters is YOUR opinion. There are no right or wrong answers.

In filling this questionnaire out, bear in mind your own concerns. In other words, answer questions based on what you consider is better from your own point of view.

PART 1

In which category you belong?

1. _____ Park Staff
2. _____ Local permanent resident
3. _____ Local not permanent resident
4. _____ Management committee
5. _____ Local authority
6. _____ Government authority
7. _____ University
8. _____ Private sector
9. _____ Other (please write down)

What is your main professional category or area of interest?

1. _____ Scientist (please write your specialty e.g. engineer, biologist etc.)
2. _____ Tourism
3. _____ Agriculture
4. _____ Commerce
5. _____ Non Governmental organization
6. _____ Other (please indicate)

PART 2: Your perceptions on MAREMMA PARK

Read this part

GENERAL SUBJECTS

A. BIODIVERSITY

It refers to problems with the conservation of the native species and landscapes in the MAREMMA PARK.

B. RECREATION

It refers to pressures arising by visitors

C. AGRICULTURE

It refers to problems related to agricultural practices inside or near the Park area

D. RESEARCH AND ENVIRONMENTAL EDUCATION

It refers to lack of appropriate research and/or environmental education programs for the Park

E. MANAGEMENT MODEL

It refers to the management model of the Park

Fill out this part

Step 1:	Step 2:
<p>Order these subjects based on your opinion regarding their decreasing importance for each one of them. Use the letter to the left of each subject.</p>	<p>After finishing Step 1, try to compare your subjects. For example how many times the subject you have chosen as First is more important than the subject you have chosen as Second..</p> <p>You can use whatever number you want (For instance, if you think a subject is two times more important than the next one, write number 2; if a subject is 40 times more important than the next one, write number 40. If both subjects are equally important, write the symbol = (equal).</p>
<p>(Write down the criterion letter here)</p>	<p>(Any number)</p>
<p>Which one is more important? 1 ___</p>	<p>How many times 1 is more important than 2? ___</p>
<p>Which is the second more important? 2 ___</p>	<p>How many times 2 is more important than 3? ___</p>
<p>Which is the third more important? 3 ___</p>	<p>How many times 3 is more important than 4? ___</p>
<p>Which is the fourth more important? 4 ___</p>	<p>How many times 4 is more important than 5? ___</p>
<p>Which is the fourth more important? 5 ___</p>	

BIODIVERSITY

It refers to problems with the conservation of the native species and landscapes in the MAREMMA PARK

SPECIFIC SUBJECTS ON BIODIVERSITY

A. Alien or invasive species

The extent to which introduction of alien or invasive species have affected biodiversity of the area negatively (e.g. change of maquis and dunes flora, thinning of pines etc.)

B. Disturbances of fauna and flora by users

The extent to which park users disturb fauna, create dependence of certain animals on humans and disturb the dune vegetation by trampling on dunes

C. Erosion

The extent to which accelerated erosion affects dunes vegetation and beach area

D. Conservation Zones

The extent to which lack of core, buffer and transition zones affect biodiversity integrity (species and landscapes)

Fill out this part

Step 1:	Step 2:
Order these subjects based on your opinion regarding their decreasing importance for each one of them. Use the letter to the left of each subject.	After finishing Step 1, try to compare your subjects. For example how many times the subject you have chosen as First is more important than the subject you have chosen as Second.. and so on. You can use whatever number you want (For instance, if you think a subject is two times more important than the next one, write number 2; if a subject is 40 times more important than the next one, write number 40. If both subjects are equally important, write the symbol = (equal).
(Write down the criterion letter here)	(Any number)
Which one is more important? 1 ____	How many times 1 is more important than 2? ____
Which is the second more important? 2 ____	How many times 2 is more important than 3? ____
Which is the third more important? 3 ____	How many times 3 is more important than 4? ____
Which is the fourth more important? 4 ____	

RECREATION

It refers to pressures arising by visitors

SPECIFIC SUBJECTS ON RECREATION

A. Seasonal pressure

The extent to which there is seasonal pressure by beach users which exceeds the carrying capacity of the area.

B. Motor Traffic

The extent to which the present car park location is inadequate and there is a need for changing the transport model of the area.

C. Information within park

The extent to which there should be better facilities for the interpretation of the park assets

Fill out this part

Step 1:	Step 2:
<p>Order these subjects based on your opinion regarding their decreasing importance for each one of them. Use the letter to the left of each subject.</p>	<p>After finishing Step 1, try to compare your subjects. For example how many times the subject you have chosen as First is more important than the subject you have chosen as Second.. and so on. You can use whatever number you want (For instance, if you think a subject is two times more important than the next one, write number 2; if a subject is 40 times more important than the next one, write number 40. If both subjects are equally important, write the symbol = (equal).</p>
<p>(Write down the criterion letter here)</p>	<p>(Any number)</p>
<p>Which one is more important? 1 ____</p>	<p>How many times 1 is more important than 2? ____</p>
<p>Which is the second more important? 2 ____</p>	<p>How many times 2 is more important than 3? ____</p>
<p>Which is the third more important? 3 ____</p>	

AGRICULTURE

It refers to problems related to agricultural practices inside or near the Park area

SPECIFIC SUBJECTS ON AGRICULTURE

A. Pesticides and fertilizers

The extent to which pesticides and fertilizers on cultivated areas within park create severe problems

B. Landscape fragmentation

The extent to which competition between agriculture and natural areas leads to land fragmentation

C. Alternative agriculture

The extent to which there is need for more organic farming and agri-tourism

Fill out this part

Step 1:	Step 2:
Order these subjects based on your opinion regarding their decreasing importance for each one of them. Use the letter to the left of each subject.	After finishing Step 1, try to compare your subjects. For example how many times the subject you have chosen as First is more important than the subject you have chosen as Second.. and so on. You can use whatever number you want (For instance, if you think a subject is two times more important than the next one, write number 2; if a subject is 40 times more important than the next one, write number 40. If both subjects are equally important, write the symbol = (equal).
(Write down the criterion letter here)	(Any number)
Which one is more important? 1 ____	How many times 1 is more important than 2? ____
Which is the second more important? 2 ____	How many times 2 is more important than 3? ____
Which is the third more important? 3 ____	

RESEARCH AND ENVIRONMENTAL EDUCATION

It refers to the lack of appropriate research and/or environmental education programs for the Park

SPECIFIC SUBJECTS ON RESEARCH AND ENVIRONMENTAL EDUCATION

A. Staff training

The extent to which there is a need for staff training in research and conservation disciplines

B. Coordinated research

The extent to which there is a need for coordinated research initiatives and keeping of records

C. Presentation of different biotopes

The extent to which there is a need to maximize the potential that park offers as a result of different biotopes

D. Monitoring

The extent to which a monitoring program as well as more base line studies should be set up.

Fill out this part

Step 1:	Step 2:
Order these subjects based on your opinion regarding their decreasing importance for each one of them. Use the letter to the left of each subject.	After finishing Step 1, try to compare your subjects. For example how many times the subject you have chosen as First is more important than the subject you have chosen as Second.. and so on. You can use whatever number you want (For instance, if you think a subject is two times more important than the next one, write number 2; if a subject is 40 times more important than the next one, write number 40. If both subjects are equally important, write the symbol = (equal).
(Write down the criterion letter here)	(Any number)
Which one is more important? 1 ____	How many times 1 is more important than 2? ____
Which is the second more important? 2 ____	How many times 2 is more important than 3? ____
Which is the third more important? 3 ____	How many times 3 is more important than 4? ____
Which is the fourth more important? 4 ____	

MANAGEMENT MODEL

It refers to the management model of the Park

SPECIFIC SUBJECTS ON MANAGEMENT

A. Economic resources

The extent to which alternative sources of income for the Park (e.g. EU, UN) should be explored

B. Cooperation

The extent to which a better cooperation between management committee and park staff should be established

C. Management plan

The extent to which there is need for management plan with integration of social, economic and environmental concerns and mechanisms for evaluating the plan's implementability and effects.

Fill out this part

Step 1:	Step 2:
Order these subjects based on your opinion regarding their decreasing importance for each one of them. Use the letter to the left of each subject.	After finishing Step 1, try to compare your subjects. For example how many times the subject you have chosen as first is more important than the subject you have chosen as Second.. and so on. You can use whatever number you want (For instance, if you think a subject is two times more important than the next one, write number 2; if a subject is 40 times more important than the next one, write number 40. If both subjects are equally important, write the symbol = (equal).
(Write down the criterion letter here)	(Any number)
Which one is more important? 1 ___	How many times 1 is more important than 2? ___
Which is the second more important? 2 ___	How many times 2 is more important than 3? ___
Which is the third more important? 3___	

Table 1. Non integrated values by all participants.

	Criteria	Total Priority	Average Priority	Standard Deviation	Lowest Priority	Highest Priority
General Criteria	Biodiversity	4,09	0,34	0,26	0,01	0,88
	Management model	3,23	0,27	0,25	0,05	0,88
	Recreation	1,61	0,13	0,15	0,00	0,55
	Research and Environmental education	1,55	0,13	0,11	0,01	0,35
	Agriculture	1,53	0,13	0,15	0,00	0,50
Biodiversity	Conservation Zones	4,04	0,34	0,28	0,04	0,82
	Erosion	4,02	0,34	0,26	0,02	0,78
	Alien or invasive species	2,15	0,18	0,14	0,02	0,42
	Disturbances of fauna and flora by users	1,78	0,15	0,09	0,01	0,36
Re-creation	Seasonal pressure	5,22	0,44	0,25	0,14	0,90
	Information within park	3,67	0,31	0,23	0,05	0,69
	Motor Traffic	3,10	0,26	0,19	0,01	0,60
Agri-culture	Landscape fragmentation	6,48	0,54	0,27	0,14	0,89
	Alternative agriculture	2,81	0,23	0,19	0,05	0,71
	Pesticides and fertilizers	2,71	0,23	0,16	0,02	0,60
Res. & Env. Educ.	Staff training	3,53	0,29	0,17	0,06	0,60
	Monitoring	3,33	0,28	0,18	0,13	0,78
	Coordinated research	3,26	0,27	0,14	0,05	0,59
	Presentation of different biotopes	1,88	0,16	0,14	0,02	0,40
Manag. model	Management plan	7,42	0,62	0,24	0,23	0,91
	Cooperation	2,66	0,22	0,18	0,05	0,69
	Economic resources	1,92	0,16	0,12	0,02	0,33