



STAKEHOLDER ANALYSIS: GAINERS AND LOSERS FOR EACH MANAGEMENT OPTION

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1. ABSTRACT

As part of the work carried out in DITTY project under WP7, we have carried out a stakeholder analysis regarding the gainers and losers of each management option initially identified under WP6. The aim of this first study is to know, quantify and compare the opinion and preferences of the affected agents and stakeholders regarding eight proposed management options for the Mar Menor lagoon and its watershed, using a combination of ranking by experts and ranking by stakeholders.

A ranking model has been chosen to identify gainers and losers by the “pseudo-survey” technique.

We have considered two groups: direct stakeholders in the Mar Menor area and a panel of experts (teaching staff of the University of Murcia and members of Professional Associations). The combination of these two valuation surveys (stakeholders and independent experts) allows an equilibrated final valuation, closer to the searched social valuation.

Two sets of potential agents were prepared. The first one refers to 200 experts representing different areas of knowledge and activity, to avoid possible slants of perception. The second one was constituted by 150 stakeholders in the Mar Menor area belonging to a wide range of groups and sectors, such as farmers, fishers, tourist agents, green groups or city councils.

The most desirable scenario according to experts is improvement of wastewater treatment plants and associated infrastructures, followed by the application of a good farming practices protocol. The least desirable options correspond to the increase in irrigated lands and the agricultural intensification. The position of the three scenarios related with the agriculture might indicate the existence of a widespread opinion among experts about the need of a higher control over the agricultural activities in the Mar Menor area.

The scenarios *Improvement of wastewater treatment plants*, *Optimisation of wetlands* and *Application of good farming protocol*, would be specially beneficial from the point of view of stakeholders taken as a whole, while an agricultural intensification receives a high degree of consensus of rejection.

The six groups of stakeholders consider the improvement of the wastewater management system as the most desirable option. Only two groups stakeholders assign a higher value to other options, such as the establishment of a good farming practices protocol (business association) and the optimisation of wetlands (civil associations).

2. INTRODUCTION AND OBJECTIVES

In the context of taking decisions and the assessment of management options, it is very important to take into consideration not only the overall cost and benefits, but also the distributive aspect of such cost and benefits. It is necessary to identify the gainers and losers of each option and to know the opinion of all relevant stakeholders. This is especially important for complex policies such as the environmental policy, for which a high degree of consensus constitute a basic condition to achieve the desired goals through an effective implementation of measures.

In addition, the perception of complex issues as the sustainable management of coastal lagoons, in terms of the diagnosis of the key problems, their causes and consequences and the measures and options which should be taken, frequently varies according to the points of interest, needs and other social characteristics of stakeholders. These differences in perception remain on the basis of many environmental problems. Therefore, an adequate knowledge of the perceptions and opinions of stakeholders constitutes a key issue to define and achieve effective solutions.

In the case of water quality of lagoons and lakes, it has been shown (Rickson, 1985) that the technical knowledge of the causes and consequences of pollution may have no association with either concern or how people attribute blame. For example, it was clear in that study that most farmers were unwilling to accept responsibility, no matter how much technical knowledge they had.

In the case of Mar Menor site, public opinion has also tended to emphasise one side of the problem (Point pollution from urban areas due to poor performance of wastewater treatment plants) while has remained unaware of others (such as the diffuse pollution from agricultural sources). This has an strong inertia. During the last years, the role of irrigated lands in the Mar Menor watershed as an important source of pollution and nutrients affecting the lagoon has been shown and has frequently appeared on the media, however, during August 2005 an episode of massive death of fishes

in the Mar Menor lagoon took place. The response of public opinion was to blame the wastewater treatment plants for spillage causing the death of fishes and several local demonstrations against the mayor of the municipality of Los Alcázares took place. Some days later the analyses determined that a pesticide used by farmers was the cause of this episode. This case illustrates the importance of an adequate knowledge and a shared diagnosis among all stakeholders regarding complex issues such as the sustainable management of coastal lagoons and their watersheds, is an effective solution is to be achieved. A first step to this is the identification of relevant stakeholders and their general views and preferences regarding the management of the Mar Menor area.

As part of the work carried out in DITTY project under WP7, we have carried out a stakeholder analysis regarding the gainers and losers of each management option initially identified under WP6. The aim of this first study is to know, quantify and compare the opinion and preferences of the affected agents and stakeholders regarding eight proposed management options for the Mar Menor lagoon and its watershed, using a combination of ranking by experts and ranking by stakeholders.

In the next sections we present the methodology used and the results obtained.

3. METHODOLOGY

A ranking model has been chosen to identify gainers and losers by the “pseudo-survey” technique. This technique for eliciting preferences according to the preferability order (Landeta, J. 1999; Conlon, B et al.,2000; Solino, M. 2004), has been applied to two differentiated groups.

When considered to groups (experts and stakeholders) to assess the gainers and losers under each management option, it is possible to identify the slant introduced in these type of surveys ((Michel et al., 1989), regarding the valuation of the importance of impacts, as perceived by stakeholders on one sector in comparison to the stakeholders of the rest of sectors.

Normally, a group of stakeholders always tends to overestimate the importance of effects to this own sector respect to the rest of stakeholders. The valuation of independent agents, constituted in this case by a panel of experts, tend to distribute the responsibility of decisions among all members (Saaty, 1996). The combination of these two valuation surveys (stakeholders and independent experts) allows an equilibrated final valuation, closer to the searched social valuation.

1.- Direct stakeholders in the Mar Menor area

A set of stakeholders belonging to the different identified sectors were contacted. These sectors are farmers, city councils, fishing associations, tourist agents and firms, green groups and other local associations.

It consists of the presentation to a sample of stakeholders of the above sectors of a brief document, with a synthetic description of scenarios developed under WP6 and their impacts (positives and negatives). A table with the set of scenarios is also provided. Stakeholders are requested to rank such scenarios according to its preferences and to fill up the table with the corresponding score for each scenario.

2.-Panel of experts

It is constituted by a sample of the teaching staff of the University of Murcia and by members of several Professional Associations.

It consist of the same technique of scores but in this case the expert is requested to rank the scenarios, for each sector, according to the importance of the overall impact of each scenario for that sector. The considered sectors are the following:

- Agriculture
- Tourism
- Overall economic growth in the area
- Environment

The answers to these surveys were grouped and ordered to obtain a preliminary picture regarding the viewpoint of representatives of each identified sector and also the external view provided by the independent panel of experts, following the approach of similar studies (Miller,G. 1956; Ray, T. & Triantaphyllou, E. 1998,1999). The panel of experts allow the estimation of the slant associated to each sector.

There are many techniques and approaches to determine preferences on different options, as shown by Stewart (1992), Weber *et al.*(1993) or Beinat *et al.*(1997). Taking into account agents, criteria and information available, five techniques might . These are the following:

- Programming by goals
- Interchange rate method (trade off)
- Regular and ordinal order (ranking)
- Direct valuation (rating)
- Judgments by pairs (pairwise comparison or swing weights)

The first technique belongs to indirect techniques of derivation of preferences, and it is based on the information obtained from the observed behaviour of the agent. The rest are direct techniques where the preferences structure is obtained through direct interviews.

The technique used in this work is regular ranking (Mendoza *et al.*, 1999). It assigns a value of order to each scenario according to a scale previously fixed from 1 to 10, scale widely used due to its psicometric properties (Miller, 1956). The great advantage of regular ranking is that it allows ties. A potential disadvantage is that the agent is allowed to look for intermediate solutions by assigning some importance to all scenarios, so the final differentiation among them might be less evident.

The next question to consider is how to integrate the opinions on a same issue coming from different agents. This is the well-known problem of decision making in group (Van Den Honert *et al*, 1996). A different weight

can be given to each agent. This weight may be obtained by multiples procedures, being the most common a parallel process of auto-weighting among group members, if we thought that their opinions must have a different influence on the group final decision. In this work, there is not reason for a differential weighting and an equal aggregation through simple arithmetic average has been applied.

4. THE SURVEYS

Two sets of potential agents were prepared. The first one refers to 200 experts representing different areas of knowledge and activity, to avoid possible slants of perception. The second one was constituted by 150 stakeholders in the Mar Menor area belonging to a wide range of groups and sectors, such as farmers, fishers, tourist agents, green groups or city councils.

A survey was sent to each identified agent by e-mail or fax (350 agents in total), with a brief description of the scenarios and a form to be filled up, a long with a letter presenting the research and its objectives. The forms sent to the experts are presented in Annex 1 and Annex 2.

The management options whose valuation was requested correspond to the scenarios of interest for the Mar Menor site, as identified as part of the WP6 tasks in DITTY project. They are the following:

- 1.- Increase in total irrigated land (II)
- 2.- Agricultural intensification (Increased per hectare load of fertilisers, IF)
- 3.- Groundwater desalination (GWD)
- 4.- Application of a good farming practices protocol (GFP)
- 5.- Re-use of agricultural drainage (RAD)
- 6.- Improvement of wastewater treatment plants and associated infrastructures (IWT)
- 7.- Urban and tourist development around the lagoon (UTD)

8.- Optimisation of wetlands associated to Mar Menor shore for nutrients removal (OW)

The stakeholders were requested to value each one of these management options according to their preferences. The experts were requested to value each option according to its degree and type of influence on the following sectors:

1. Agriculture sector (AS)
2. Tourist sector (TS)
3. Overall economic growth in the area (EG)
4. Environment (E)

After responses were received and processed, 121 valid surveys were obtained, 61 from experts and 60 from stakeholders. The distribution among areas of knowledge (experts) and sectors of activity (stakeholders) are presented in table 1.

Table 1.-Distribution of interviewed people according to area of knowledge or sector of activity

61 Experts	60 Stakeholders
49 Experimental Sciences 30 Biology and Agronomy 19 Basic Sciences 12 Social Sciences 9 Economic Sciences 3 Humanities and Law	10 Agriculture sector 12 Tourist sector 14 Civil service 5 Citizen associations 3 Business associations 6 Others agents

5. RESULTS

5.1. Independent experts

The table 2 presents the average score obtained by the management options according to their effects on each considered sector.

Table 2.- Averages values of the surveys carried out to experts

Scenario	Farming	Tourism	Economic Growth	Environment
1.- Increase in total irrigated land (II)	6.41	3.31	6.47	2.23
2.- Increase in charge of fertilizer.(IF)	5.56	2.84	5.28	1.70
3.- Groundwater desalination (GWD)	5.97	4.54	6.07	3.34
4.- Application of a good farming practices protocol (GFP)	8.13	7.43	7.63	9.08
5.- Re-use of agricultural drainages for irrigation (RAD)	8.18	6.89	7.27	8.61
6.- Improvement of wastewater treatment plants and associated infrastructures (IWT)	8.49	8.43	7.72	9.11
7.- Urban and tourist development around the lagoon (UTD)	3.16	6.36	7.32	2.07
8.- Optimisation of wetlands associated to Mar Menor shore for nutrients removal (OW)	6.20	7.83	7.05	9.28

The results presented in table 2 show that, according to the consulted experts, the scenarios of application of a good farming practices protocol, the re-use of agricultural drainages, the improvement of wastewater treatment plants and the optimisation of wetlands associated to Mar Menor shore for nutrients removal are considered positive for the four sectors. On the other hand, the scenarios of increase in total irrigated land, the

agricultural intensification (increase in the per hectare amount of fertilisers), and the groundwater desalination are positive for the agriculture and the overall economic growth in the area, while they are considered negative for tourism and for the environment. Finally, the scenario of urban and tourist development around the lagoon is considered negative for the agriculture and for the environment, while it is considered positive for the overall economic growth in the area and for the tourist sector.

The overall order of preferences of management options, on the basis on the scores obtained for the four sectors, is shown in figure 1.

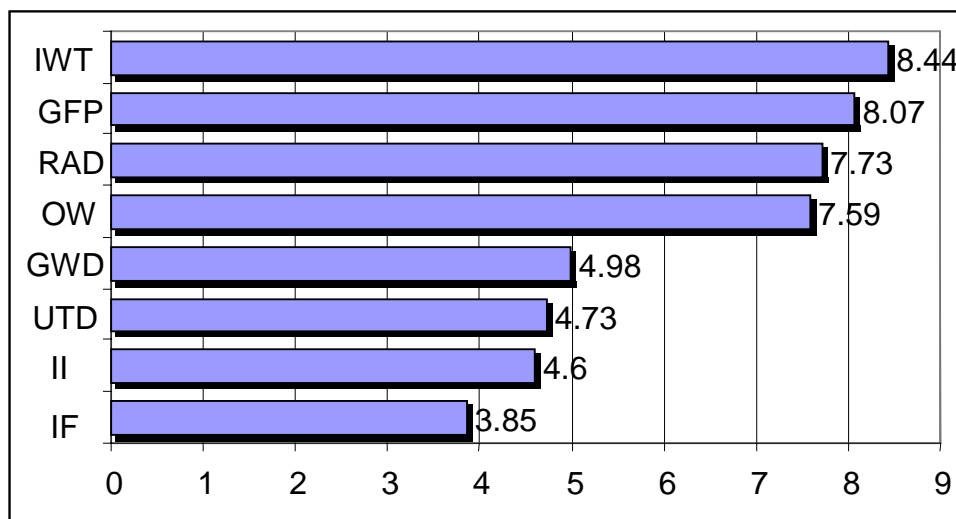


Figure 1. Overall order of preferences of scenarios according to experts

According to results presented in figure 1, the most desirable scenario according to experts is improvement of wastewater treatment plants and associated infrastructures, followed by the application of a good farming practices protocol. The least desirable options correspond to the increase in irrigated lands and the agricultural intensification. The position of the three scenarios related with the agriculture might indicate the existence of a widespread opinion among experts about the need of a higher control over the agricultural activities in the Mar Menor area.

From the answers offered by the consulted experts, the most and least favoured sector by each management option, can be identified. This

constitute a first, preliminary assessment of the losers and winners for each management option, according to the opinion of experts. The results are shown in table 3.

Table 3. Loser and Winner sectors for each management option according to the opinion of consulted experts

Scenario / Sector	Loser	Winner
1.- Increase in total irrigated land.	Environment	Growth
2.- Agricultural intensification	Environment	Farming
3.- Groundwater desalination.	Environment	Farming
4.- Application of a good farming practices protocol	Growth	Environment
5.- Re-use of agricultural drainages	Tourism	Environment
6.- Improvement of wastewater treatment plants and associated infrastructures	Growth	Environment
7.- Urban and tourist development	Environment	Growth
8.- Optimisation of wetlands associated to Mar Menor shore for nutrients removal	Farming	Environment

The table 4 shows a similar analysis, but identifying the best and worst scenario for each sector.

Table 4. Most and least desirable management option for each sector according to the opinion of consulted experts

	Most desirable	Least desirable
Farming	Urban and tourist development	Re-use of agricultural drainage
Tourism	Agricultural intensification	Improvement of wastewater treatment
Growth	Agricultural intensification	Improvement of wastewater treatment
Environment	Agricultural intensification	Optimisation of wetlands

In synthesis, it can be preliminary concluded that, according the opinion of experts, there are some management options, in particular the improvement of wastewater treatment plants and associated infrastructures, the re-use of agricultural drainage, the optimisation of wetlands and the application of good farming practices than would be specially beneficial for an improved management of the Mar Menor lagoon and its watershed.

5.2. Stakeholders

The table 5 shows the average scores obtained by each scenario for the different groups of stakeholders in the Mar Menor area.

Table 5. Average scores of scenarios in each group of stakeholders

Escenario	Farmers	Tourist agents	Civil services	Cusiness associations	Civil associations	Others
1.- Increase in total irrigated land. (II)	5.30	3.00	3.82	3.60	2.00	4.29
2.- Increase in charge of fertilizer. (IF)	3.80	2.47	2.82	2.00	1.00	2.29
3.- Groundwater desalination. (GWD)	5.70	4.12	4.35	4.95	4.75	4.43
4.- Good farming practices protocol (GFP)	7.80	7.88	8.41	8.80	8.75	7.71
5.- Re-use of agricultural drainage (RAD)	7.60	7.47	8.53	7.80	8.75	7.43
6.- Improvement of wastewater treatment. (IWT)	8.50	9.18	9.00	8.60	8.75	8.57
7.- Urban and tourist development. (UTD)	5.10	6.00	5.18	5.80	1.25	4.86
8.- Optimisation of wetlands. (OW)	7.10	8.71	9.00	8.60	9.50	7.57

The table 5 shows that the increase in irrigated lands and the groundwater desalination are positively valued only by farmers. It is interesting to point out that an agricultural intensification (increased inputs of fertilisers) is considered as negative by all stakeholders, including farmers.

The rest of management options are in general perceived as positive by all stakeholders, with the exception of the urban and tourist development around the lagoon, that is clearly rejected by the citizen associations and valued as neutral by farmers and the group which includes other agents.

The remaining scenarios are considered as desirable to improve the management of the Mar Menor: application of a good farming practices protocol, re-use of agricultural drainages, improvement of wastewater treatment plants and optimisation of wetlands.

It has been made a simple valuation of the overall desirability of management options on the basis of the average scores of the scenarios for the six groups of stakeholders, assigning the same weight to all groups. The results are shown in figure 2.

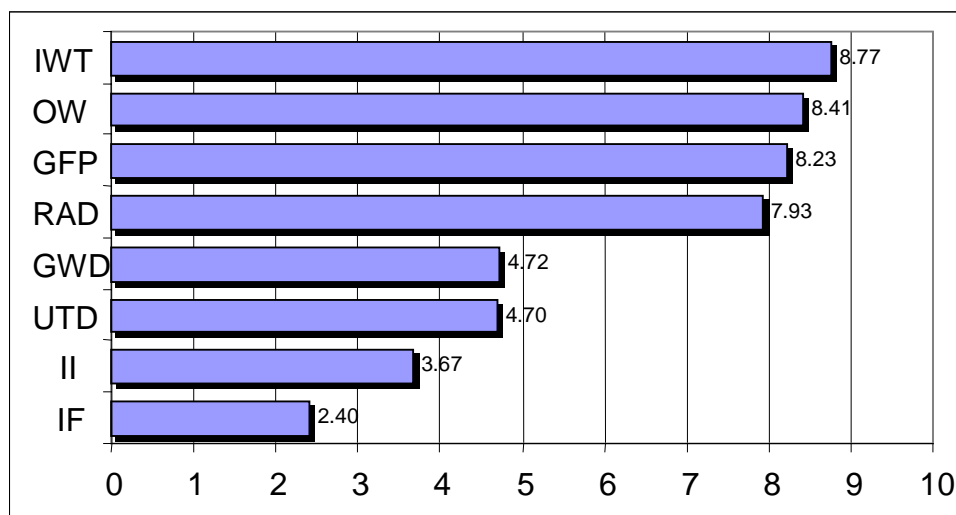


Figure 2. Overall ranking of desirability of scenarios according to the preferences of all stakeholders

These marks represent what can be denominated as “social choice”, since it express the overall vector of preferences of management options taking into account all stakeholders. already that it global articulates the vector of management preferences of Mar Menor lagoon for all affected agents. It can be pointed out that, except for small differences, this “social choice” is very similar to the ranking obtained with the surveys of experts. Thus, the four management options which are positively valued and those negatively valued are the same in both cases.

However, a key issue for any stakeholder analysis is precisely the identification of the differences of perception among groups of stakeholders and the gainers and losers of each option. Hence, it is necessary to analyse which is the most and least desirable scenario as perceived by each group of stakeholders or, conversely, which are the groups of stakeholders most and least favourable to each scenario. The results are shown in the tables 6 and 7.

Table 6. Most and least desirable scenario according to the preferences of each group of stakeholders

	Least desirable	Most desirable
Farmers	Agricultural intensification	Improvement of wastewater treatment
Tourist agents	Increase in total irrigated land	Improvement of wastewater treatment
Civil Services	Agricultural intensification	Improvement of wastewater treatment Optimisation of wetlands
Business associations	Agricultural intensification	Good farming practices protocol
Civil associations	Agricultural intensification	Optimisation of wetlands
Others	Agricultural intensification	Improvement of wastewater treatment

Table 6. Groups of stakeholders most favourable (winners) and least favourable (losers) to each management option

Scenario / agents	Loser	Winner
1.- Increase in total irrigated land.	Civil associations	Farmers
2.- Increase in charge of fertilizer.	Civil associations	Farmers
3.- Groundwater desalination.	Tourist agents	Farmers
4.- Good farming practices protocol	Others	Business associations
5.- Re-use of agricultural drainage	Others	Civil services
6.- Improvement of wastewater treatment plants and associated infrastructures	Farmers	Tourist agents
7.- Urban and tourist development	Civil associations	Tourist agents
8.- Optimisation of wetlands for nutrients removal	Farmers	Civil associations

From results presented, it is clear that the scenarios improvement of wastewater treatment plants, optimisation of wetlands and the application of good farming would be specially beneficial from the point of view of stakeholders taken as a whole, while an agricultural intensification receives a high degree of consensus of rejection.

It is interesting to point out that four out of the six groups of stakeholders consider the improvement of the wastewater management system as the most desirable option. Only two groups stakeholders assign a higher value to other options, such as the establishment of a good farming practices protocol (business association) and the optimisation of wetlands

(civil associations). One of the reasons behind this might be that the problems caused by the low performance of the wastewater treatment plants are much more visible (but not necessarily more serious) than the problems generated by the diffuse pollution coming from the agricultural activities, which still remain as less perceived. This has also been observed in relation to the social perception of the episode of massive death of fishes in the Mar Menor lagoon occurred during August 2005, already described in the Introduction of this document. However, a more detailed research has to be carried out to obtain more general conclusions and to determine if the degree of knowledge about the processes in the Mar Menor watershed and in the lagoon constitutes a relevant factor explaining the opinions of each group of stakeholders or if, as found by Rickson (1985), this is quite less relevant than the specific interest of the concerned group of stakeholders. Clearly, the answer to these type of questions may be an important aspect to be taken into account when dealing with the decision process making, public participation and social perception, since the strategies to implement the policies and to promote the participation of stakeholders might not be the same.

6. REFERENCES

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ANNEX I Scenarios Ranking Form for experts

Score marking with an X (scale from 1 to 10) each one of scenarios considered in study area according you consider that it would affect to each one of indicated sectors/aspects and what form: Very negative (1), it would not affect to it (5), Very positively (10)

Farmers/Agrarian sector										
Scenario	1	2	3	4	5	6	7	8	9	10
1.- Increase in total irrigated land.										
2.- Increase in charge of fertilizer.										
3.- Groundwater desalination.										
4.- Good farming practices protocole										
5.- Re-use of agricultural drainage										
6.- Improvement of wastewater treatment										
7.- Urban and tourist development										
8.- Optimisation of wetlands										

Tourism / Tertiary sector										
Scenario	1	2	3	4	5	6	7	8	9	10
1.- Increase in total irrigated land.										
2.- Increase in charge of fertilizer.										
3.- Groundwater desalination.										
4.- Good farming practices protocole										
5.- Re-use of agricultural drainage										
6.- Improvement of wastewater treatment										
7.- Urban and tourist development										
8.- Optimisation of wetlands										

Environment										
Scenario	1	2	3	4	5	6	7	8	9	10
1.- Increase in total irrigated land.										
2.- Increase in charge of fertilizer.										
3.- Groundwater desalination.										
4.- Good farming practices protocole										
5.- Re-use of agricultural drainage										
6.- Improvement of wastewater treatment										
7.- Urban and tourist development										
8.- Optimisation of wetlands										

Economic growth										
Scenario	1	2	3	4	5	6	7	8	9	10
1.- Increase in total irrigated land.										
2.- Increase in charge of fertilizer.										
3.- Groundwater desalination.										
4.- Good farming practices protocole										
5.- Re-use of agricultural drainage										
6.- Improvement of wastewater treatment										
7.- Urban and tourist development										
8.- Optimisation of wetlands										

Please, indicate area of knowledge that you correspond or most related to your profession/ occupation:

Area of knowledge	
Biology	Humanities
Agronomy Sciences	Arts
Health Sciences	Maths
juridicas Sciences	Technologies
Social Sciences	Others (indicate)
Economics	
Geography	
Physique and Chemistry	

ANNEX II Scenarios Ranking Form for stakeholders

Score marking with an X (scale from 1 to 10) each one of scenarios, according to your activity and you think/consider that it management option is: (10) More important/significant/desirable/optimum; (1) Less important/undesirable/worse option.

Escenario	1	2	3	4	5	6	7	8	9	10
1.- Increase in total irrigated land.										
2.- Increase in charge of fertilizer.										
3.- Groundwater desalination.										
4.- Good farming practices protocole										
5.- Re-use of agricultural drainage										
6.- Improvement of wastewater treatment										
7.- Urban and tourist development										
8.- Optimisation of wetlands										

Please, indicate your professional activity sector:

Sector	
Farmer	
Agrarian Marketing	
Agrarian Provisions/Supplies	
Hotel industry (bar/ restaurants)	
Hotel industry (Accommodation)	
Nautical services	
Tourist services	
Local Civil ServiceAdministración pública local	
Regional/IGlobal Civil Service	
Others (Indicate)	

ANNEX III Presentation of scenarios in surveys:

Next, basic characteristics of each one of scenarios are related to evaluate, which ones represent different options from management in Mar Menor lagoon and Campo de Cartagena.

1.- INCREASE IN TOTAL IRRIGATED LAND

Increase in total irrigated land and strengthening of different processes already established in Campo de Cartagena.

- Increase in total irrigated land , and therefore (increase terrenal occupation) new lands ocupated/occupation .
- Increase of agricultural production with greater benefit and economic groth and population in the area (jobs, inmigrants).
- Greater demand of irrigated water (greater exploitation groundwater in drought period, desalination, etc..)
- Greater contamination/lost quality water (fertilizers, pesticides), grounds (degradation, salinization)
- Increase nutrient load (agrarian fertilizers) to Mar Menor lagoon and consequently eutrophication in the lagoon (lost quality water, proliferation of jellyfish)
- Transformation of low intensity agrarian systems in greenhouses

2.- INCREASE IN CHARGE OF FERTILIZER BY HECTARE

Increase in used quantity /amount and therefore an increase in production.

- Increase of agricultural production
- Greater contamination /lost quality waters and grounds
- Increase nutrient load to the lagoon and consequently eutrophication in the lagoon (lost quality water, proliferation of jellyfish)

3.- GROUNDWATER DESALINATION

Water desalination pumped from aquifers in answer to a drought period. Due to high salt-content, **desaladoras** plants in Campo de Cartagena were constructed, to treat high salinity of pumped water

- Construction/building and support of infraestructures (desaladoras, channels..)
- Exploitation of aquifers, groundwaters
- Decrease piezometric levels (decrease of water contribution to wetlands and possible extension changes).
- Generation of brines from plantas desalinizadoras with high nutrient level due to several factors such as processes of concentration and high nutients content of groundwater. Brines are unloaded in ramblas and other channels bed
- Increase nutrient load (agrarian fertilizers) to Mar Menor lagoon and consequently eutrophication in the lagoon (lost quality water, proliferation of jellyfish)

4.- GOOD FARMING PRACTICES PROTOCOLE.

Establishment of a specific code of Good Farming Practices in the river basin of Mar Menor entails reduction of rate of fertilizer contributions by hectare and modification of some fertilization practices and agricultural calendars, expansion of new less intensive production systems (less intensive), ecological agriculture, etc..

- Possible lost agricultural production
- Decrease fertilizer costs
- Decrease nutrient load and eutrophication in the lagoon (improvement water quality and reduction of the proliferation of jellyfish)
- Reduction contamination (water and grounds)
- Social good image of this scenario

5.- RE-USE OF AGRICULTURAL DRAINAGE

Collect part of agricultural drainages coming from irrigated lands and, after of its desalination, reuse these water volumes for irrigation.

Several drainage-channels have been constructed to intercept flows of subsuperficial drainage that reach the lagoon, just as desalination and pumping systems.

- Increase in available water resources for irrigation
- Decrease nutrient load and eutrophication in the lagoon (improvement water quality and reduction of proliferation of jellyfish)
- Reduction contamination (water and ground)
- Social good image of this scenario
- Changes in the hidrilogical regime of wetlands

6.- IMPROVEMENT OF WASTEWATER TREATMENT PLANTS AND ASSOCIATED INFRASTRUCTURES

Improvement present system of wastewater treatment plants and creation of new infrastructures, considering present population and new urban and tourist developments.

- Increase of available water for irrigation
- Reduction of contamination by wastewaters
- Decrease nutrient load and eutrophication in the lagoon (improvement water quality and reduction of proliferation of jellyfish)

7.- URBAN AND TOURIST DEVELOPMENT AROUND THE LAGOON

Planned new urban and tourist developments in Mar Menor area.

- Terrenal occupation and and changes of use (lost tradicional values and alteration natural habitats) Landscape degradation.
- Economic and population growth in the zone (jobs)
- Increase of population and of already elevated summer population
- Increase of contamination (pollution, noises, wastes)
- Greater generation of wastewater and spills??
- Increase nutrient load (agrarian fertilizers) to Mar Menor lagoon and consequently eutrophication in the lagoon (lost quality water, proliferation of jellyfish)
- Increase artificial beaches creation, new ports and yatching ports, marine strolls, construction of a second airport, etc..
- Increase recreational pressure and summer overcrowding.

8.- OPTIMISATION OF WETLANDS ASSOCIATED TO MAR MENOR SHORE FOR NUTRIENTS REMOVAL

Wetlands in the shore of the Mar Menor constitute ecological systems of high natural value acting as intermediate systems between the marine and the terrestrial environments. The Mar Menor coastal wetlands, located along the boundary between the lagoon and the watershed, constitute a key element because of their functionality at landscape scale to retain and eliminate nutrients and organic matter loaded from the Mar Menor river basin. Total area of these protected wetlands are aprox 1000 hectares.

- Decrease nutrient load and eutrophication in the lagoon (improvement water quality and reduction of the proliferation of jellyfish)
- Regulate hidrologic and biogeochemical cycles, they can serve like regulators of disturbances, for example, to modulate avenues
- Restoration of natural ecosystems/wetlands and maintaining ecological and biodiversity values, they constitute habitat for certain species (birds, fishes,etc...)