

# THE POSTMODERN SALINE LANDSCAPE IN GREECE AND THE EUROPEAN MEDITERRANEAN: SALINAS FOR SALT OR WHAT?

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## THE SALT STORY

Beyond its basic uses and utilities, salt is a point of inspiration. At the same time salt, as a resource, represents a concise piece of the History of Man, in the context of use of Natural Resources since the antiquity and even long before. This is why I am going to try, as a small introduction, a recapitulation of the History of Salt in the long run of the History of Human Culture:

In the beginning there was Salt.

And man collected the salt, and appreciated its taste. And realised salt was a useful good. And he curved rocks to regularise its possession, and created pools and saltpans<sup>1</sup> to augment its production. Thus, man discovered salina and ... *let them be white*. And this took many hundreds of years. And man saw his creation was beautiful and he got pleased with himself.

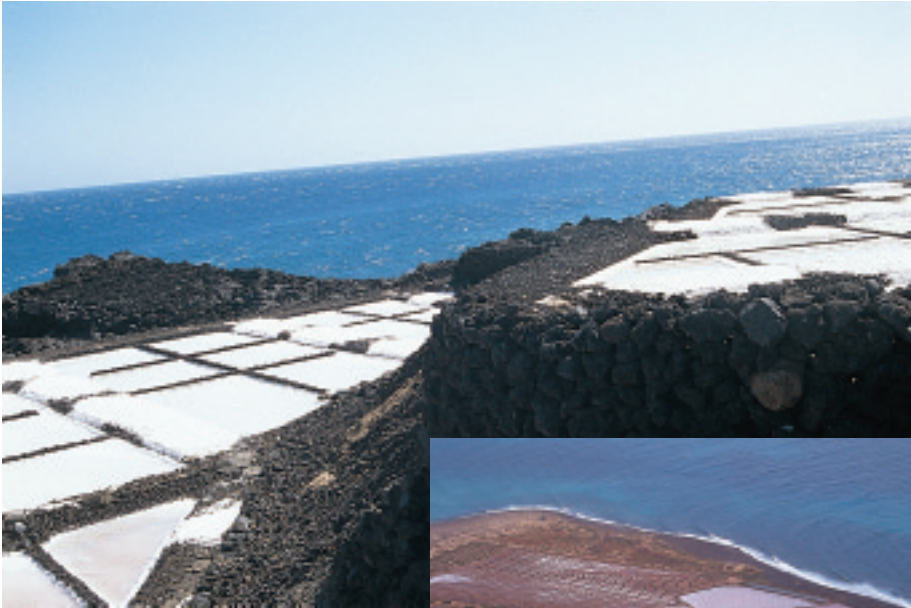
And the brine attracted all types of creatures: bacteria and algae, crustaceans and insects, fish, and a large variety of birds, for the satisfaction of the creator, scientists and nature conservationists.

And man continued to work the salt, using different techniques and devices in order to facilitate his job and alleviate the extreme labour he invested in its making: pack animals, wind, and numerous small devices. And everything in the salinas was small and beautiful, but the salt too salty, i.e. expensive. So, man gradually started to introduce remarkable changes into the salinas to make

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<sup>1</sup>Although there is a substantial overlap in the meanings of the following terms, herewith I will try to give a definition that expresses their historical /cultural itinerary, and which is also followed in this paper:

*saltpan*: small-scale salina of primitive or artisanal character; *salina*: small or large scale salina of traditional, non industrial character; *saltworks*: large to very large scale salina of industrial character managed by many workers/salters.



Let them be white!



Abandoned saltworks at Rio (salinas del Rio) in Lanzarote (Canary Islands).

them more productive and the salt less expensive. He expanded the salina surface, reduced manual labour employing modern elaborate machines, nearly expelling human presence from them. Thus, *the modern saltworks* came into existence. And man was delighted that the salt was no more expensive. And being excited with his achievements he started to shut down the small and less productive salinas, regardless of any economic value they might have.

And the salinas became bigger and bigger, but increasingly fewer, and the new salinas landscape, the *post-modern* one, emerged: large expands of shallow pools and salt pans scattered in few spots, economically viable, however uncertain for their perpetuity. It especially hit the salinas of the European Mediterranean. Due to market globalisation, the trend of closing down salinas is more enhanced nowadays in Europe, as plenty of salt produced elsewhere in the world, more competitive to that locally produced, is imported, threatening the still operating saltworks of the northern Mediterranean.

In this paper I am going to survey the post-modern salinas landscape of the European Mediterranean, taking as example the Greek case, which little differs from the rest of the countries in the area. I will refer to the evolution of the Greek salinas and their functions in the Modern Greek State and try to define



Salinas at Piran (Slovenia): a cultural landscape.

and detect the following:

- What is the importance the salinas perform today?
- What are the perspectives of these salinas at the threshold of the 21<sup>st</sup> century?
- Facts, knowledge and proposals can be available in all cases and countries. What is needed is making the necessary decisions and accomplish the projects. No doubt that this is a challenge for scientists and experts, but to what extent does it appeal to our civilisation, to Europe?

I am sure that among the scientists, technical experts, as well as the local societies, there is a unanimous consensus towards a positive decision-making in favour of the conservation, re-qualification, rehabilitation, and, in some cases, alternative use of the old, not very productive, or abandoned salinas. Furthermore, herewith I will try to demonstrate that, when ecologically managed, modern mechanised saltworks are no more to be considered as mere salt yielding sites, as invaluable source of Natural Resources: for man and his needs, for nature conservation. My goal is to illustrate that both these perspectives are important for the European saltworks and should be used as general remedies, giving specifics in each saltworks case as appropriate.

### **THE EVOLUTION OF THE GREEK SALINAS DURING THE 20<sup>th</sup> CENTURY**

Despite its relatively small size, Greece exhibits a very long coastline, however, with poor possibilities of establishing expanded saltworks, due to the fact that the appropriate areas are limited. These should be relatively flat littoral areas at a stable altitude above sea level, where soil is of low permeability as far as brines are concerned. Such littoral areas are more easy to find in northern and



The saltworks of Kitros after harvest.

western Greece, where the extended estuaries of large rivers exist. Such large river deltas have been always the best saltworks sites in the whole Mediterranean: Tejo, Sado, Mondego, Douro and Minho in Portugal; Guadalquivir, Jucar and Ebro in Spain; Rhone in France; Tevere and Po in Italy; Nile in Egypt; Dnieper, Bug and Don in the Black Sea. Similarly, extended saltworks in Greece were established in the estuaries of Axios, Acheloos and Acheron rivers, to mention only the large ones. However, these relatively large saltworks could not cater for the needs of distant and isolated areas such as the numerous islands. As a consequence, many salinas were scattered throughout the coast of the Greek peninsula, as well as the Greek archipelagos. Their main aim was to produce salt, whereas, due to their size, only very few of them were really interesting wetland sites.

In the Greek territory of the beginning of the 20<sup>th</sup> century, in 1902, there were 16 saltworks in operation. They were fairly small and little productive, with the system of periodical crystallisation still in effect in all but two. These were the saltworks of Anavyssos and Lefkas operating with the method of continuous crystallisation modified according to the Italian and southern French models. The 20s was the golden decade for the Greek saltworks. First, the saltworks in operation increased to 25 after the annexation of the liberated territories to Greece (Table 1). Second, due to the drastic reformation by the Spaniard engineer Jose Santonja, several Greek saltworks adopted the system of continuous crystallisation, thus they became more productive, with an output reaching 70,000 tons per year. Similar upgrading interventions took place until the 50s and involved the reconstruction of major saltworks as those of Messolonghi and

*Table 1. SALTWORKS OF THE GREEK STATE.*

Annexation and abandonment of saltworks in the Modern Greek State. Dates in brackets indicate the last year of operation; the decade indicates gradual abandonment (after Petanidou, 1997a)

| <b>List and location of Saltworks</b>     | <b>1902</b> | <b>1920-30</b> | <b>1951</b> | <b>1986</b> | <b>1996</b> |
|---|-------------|----------------|-------------|-------------|-------------|
| 1 Adamas (Milos island)                   | +           | +              | +           | +           | - (1990)    |
| 2 Anavyssos (Attica)                      | +           | +              | +           | - (1969)    |             |
| 3 Domvraina (C. Greece)                   | +           | +              | - (1926)    |             |             |
| 4 Katastari (Zakynthos island)            | +           | +              | +           | +           | - (1989)    |
| 5 Kopanas (C. Greece)                     | +           | +              | +           | - ('80)     |             |
| 6 Lechaina (Peloponnesos)                 | +           | +              | +           | - ('80)     |             |
| 7 Lefkas-Alexandros (Lefkas island)       | +           | +              | +           | +           | - (1990)    |
| 8 Lefkas-town (Lefkas island)             | +           | +              | - (1948)    |             |             |
| 9 Lefkimmi (Corfu island)                 | +           | +              | +           | -           |             |
| 10 Messolonghi-Aspri (W. Greece)          | +           | +              | +           | +           | +           |
| 11 Messolonghi-Tourlis (W. Greece)        | +           | +              | +           | +           | +           |
| 12 Naxos (Naxos island)                   | +           | +              | +           | -           |             |
| 13 Skopovoli (W. Greece)                  | +           | +              | - (1927)    |             |             |
| 14 Thermissia (Peloponnesos)              | +           | +              | - (1925)    |             |             |
| 15 Volos (C. Greece)                      | +           | +              | +           | - (1957)    |             |
| 16 Yantzou (C. Greece)                    | +           | +              | -           |             |             |
| 17 Elounda (Crete)                        |             | +              | +           | -           |             |
| 18 Kalloni (Lesvos island)                |             | +              | +           | +           | +           |
| 19 Kitros (C. Greece)                     |             | +              | +           | +           | +           |
| 20 Kopraina (W. Greece)                   |             | +              | -           |             |             |
| 21 M. Emvolo (N. Greece)                  |             | +              | +           | +           | +           |
| 22 Polichnitos (Lesvos island)            |             | +              | +           | +           | +           |
| 23 Samos (Samos island)                   |             | +              | +           | -           |             |
| 24 Sayias (W. Greece)                     |             | +              | - (1930)    |             |             |
| 25 Yelas (W. Greece)                      |             | +              | - (1925)    |             |             |
| 26 Messi (N. Greece)                      |             |                | +           | +           | +           |
| 27 N. Kessani (N. Greece)                 |             |                | +           | +           | +           |
| 28 Tigaki (Kos island)                    |             |                | +           | +           | - (1989)    |
| <b>28 Total no of operating saltworks</b> | <b>16</b>   | <b>25</b>      | <b>20</b>   | <b>12</b>   | <b>8</b>    |

Kalloni. At the same time the number of saltworks started to decrease and, by 1951, four of them shut down. Unluckily, this trend continued in more recent years: in 1986 only 12 of the total of 28 saltworks of the Modern Greek State were in operation, whereas only eight of them are functional today. The latter are larger in surface than before due to expansion works, with a total annual yield of approximately 200,000 metric tonnes. Similar were the evolution

*Table 2. THE CONDITIONS OF THE GREEK SALTWORKS AT PRESENT.*

The data are based on Petanidou (1994, 1997a-c, in press) and Saitas & Zarkia (in press).

### ***LARGE SALTWORKS***

#### ***Still in Operation***

1. Fully mechanised, industrial saltworks, under continuous upgrading care aiming at higher productivities and chemically purer salt; interesting wetlands (7 saltworks: Messolonghi-Aspri, Kalloni, Polichnitos, Kitros, Messi, N. Kessani, M. Emvolo)
2. Semi-mechanised, under continuous mechanical upgrading; interesting wetlands (1 saltworks: Messolonghi-Tourlis)

#### ***Non Operational - Abandoned - Ceased - Dormant***

1. Operation ceased some years ago; non-flooded; at the verge of losing their ecological value (e.g., Adamas, Tigaki)
2. Abandoned since a couple of decades ago, but still maintaining their ecological value, due to the fact that are naturally flooded (e.g., Samos)
3. Abandoned since very long or relatively short time, but still existing as terrains; ecological (wetland) value lost (e.g., Kopraina, Anavyssos)
4. Salinas that have been totally extinguished from the map due to different land use (e.g., Volos)

### ***SMALL SALINAS***

Many, very small-scale salinas of extremely local interest, which are either abandoned or poorly working. These salinas are normally not known and often overlooked. However, sometimes interesting for the local economy, at present and in the past; with historical and ethnological value. As none of them has ever been considered of national scale, they are not included in Table 1.

- *primitive saltpans* curved on rocks (e.g., Kythera) or strategically built on the rocky coastline (e.g., Tigani Manis); of no ecological (wetland) value
- *artisanal saltpans* established on low-lying sandy shorelines: interesting, tiny wetlands (e.g., Paros, Ithaca)

processes in other Mediterranean countries, such as Spain and Italy.

Abandoned saltworks are found throughout Greece. These can be large saltworks, e.g., the 20 saltworks appearing in Table 1, as well as small salinas of extremely local interest (Table 2). Very few saltworks of the first group still maintain their characteristics and ecological importance. Since none of them is managed in order to keep up with salt making, these saltworks are progressively losing, and most of them have definitely lost, their ecological value. Some saltworks have completely disappeared due to drastic change in land use, as the saltworks of Volos, which have been completely urbanised. However, those of reversible conditions do also exist, mainly because of the natural flooding of their surface (e.g. the saltworks of Samos). Table 2 describes the degree of salt-



Kitros saltworks: a natural, cultural and recreation area.

works abandonment accompanied by loss of ecological value.

Very few small salinas are still in operation today. The most important and known are those of Kythera: small basins curved on the rocks along the coast, however, without any ecological value. On the other hand, abandoned small salinas of artisanal character built on low-lying sandy shores can still maintain their ecological value due to their easy flooding by the sea. Examples of this salina type can be found in many Greek islands (Sikiotis, personal communication).

### **THE IMPORTANCE OF THE GREEK SALTWORKS**

In addition to their expected economic value, saltworks are often important *historical* and *cultural sites*. In several instances saltworks have been the terrain of action of big historical events, national or international, and this makes them historical museums as such. On the other hand, their *ethnological* value, although poorly documented, is high. This is related to the architectural aspects of the salinas, to the traditional ways of production and equipment used, to the working and social conditions of the people employed in the salt making, to the product itself as a cultural element, to the local gastronomy based on this product. None of the above aspects has been really studied in Greece. The lack of an ambitious documentation project is imminently evident, before all this knowledge, experience and tradition is lost for ever. The last year the Greek scientific community appears somewhat mobilised, something that has to be transmitted to the local societies.

That saltworks constitute important wetland sites is a well-known issue. I am not going to put a particular emphasis on this, as it has been dealt with and it is going to be more elaborated by other specialists in other parts of this volume



A flamingo group at the Kitros saltworks.

(Sadoul *et al.*, 1998). I will, nevertheless, stress several points that make the saltworks invaluable within the geographical area of the Mediterranean, particularly the east part of it:

1. The simple existence of a salina is a gift to this area, which otherwise is poor in wetlands, due to water scarcity. Numerous tiny salinas on several islands are the evidence.
2. Saltworks are not mere wetlands, but wetlands of international importance. Many Mediterranean saltworks belong to larger wetland zones protected by the international Ramsar Convention and host species protected by other European and international agreements on nature conservation like the Directive of the European Council on bird protection and on the conservation of natural habitats of wild fauna and flora. With regard to the Habitat's Directive, the ecologically more significant parts of saltworks are considered as a category of lagoons constituting priority habitats for which immediate steps of protection must be taken. As a matter of fact, several saltworks areas have been included in the list of *Special Areas of Conservation* proposed to the European Commission to be integrated in the *Natura 2000* network (e.g., saltworks of Kalloni, Polichnitos, Messi, Messolonghi, Kitros etc.).
3. Saltworks are unique ecosystems. Their uniqueness consists in the coexistence of wetland characteristics combined with the extreme qualities of hypersaline shallow lakes and meadows, which fluctuate greatly during the year. Very few organisms can stand the inhospitable harsh environments of the saline deserts, which, however, can grow into extremely large populations, under the conditions of total absence of predators and competitors. These hypersaline specialists, such as *Artemia*, are the basis of a growing diversity of



organisms depending on them for their diet. In this way, saline habitats provide the consumers with ideal conditions for feeding by filtration -one of the very few types of prey that is uniform and available in huge numbers. The tight association of avocets and flamingos to the saltworks is due to this particular aspect.

4. Flamingos, like avocets and some few other species, are not only saltworks feeders, but also saltworks nesters. In particular, the Greater Flamingo, present in numerous saltworks throughout the broader Mediterranean area, it nests in large numbers in saltworks: at Camargue (France), Cagliari (Sardinia), the deltas of Guadalquivir and Ebro rivers (Spain), in Tunisia, as well as in Tuz Golu, the Salt Lake in the Central Anatolian Plateau in Turkey (Martos and Johnson, 1996). Besides, sporadic nesting attempts of the Greater Flamingo have been observed in the Spanish saltworks of Cabo de Gata and Santa Pola, but only some few years ago the species started to breed there successfully. A comparable nesting behaviour was recorded recently in Greece, at Messi saltworks, with unknown results (1992, four nests: Handrinos and Akriotis 1997). In August 1999, Kazantzidis (1999), counted ca. 350 chicks around Axios-Aliakmon-Kitros area, and even found ca. 400 (unused?) nests inside the Kitros saltworks, but he claims that the whole operation still remains unclear. In addition, in spring 1999 Dahm (personal communication) witnessed the construction of the first 15 flamingo nests in Kalloni saltworks (Lesvos island). However, the attempt, made by some dozens of probably immature birds, was not successful. It seems that the above-mentioned breeding attempts expressed throughout the Eastern Mediterranean are enough to alert not only nature conservationists but also the managers of the saltworks.
5. After having visited and observed several saltworks in the Mediterranean in more than 10 years, I came away with the feeling that bigger saltworks are more interesting nesting sites for birds, as compared to small ones. This is because when compared to small ones, large saltworks areas are less frequented by humans, hence providing the birds with better feeding and nesting conditions. In this respect, the ornithological value of the saltworks of Messolonghi and Kalloni has increased considerably in the last decades. However, we must stress that this importance can be turned lethal if no care on the ecological management of the saltworks is taken in the long term. This mainly concerns the intentional rising of the level of the brines in the saltworks pools without considering the bird's nesting efforts performed during the same period.

#### **ALTERNATIVE USE OF SALINAS: THE TRENDS TODAY**

**Salt making:** Traditional salinas and small saltworks in the Mediterranean have been in a continuous decline until a couple of years ago and they are still under threat. Today, even large saltworks are threatened, especially those estimated as less competitive than expected: they cease salt production, as a first step, to be given a more profitable function and profile. For instance, in Greece the



Messolonghi: saltworks for more than mere salt.

operating saltworks of today make ca. 2,200 ha representing no more than 50% of the total surface cultivated some 40-50 years ago. At the other side of the Mediterranean, in Portugal, the situation is even worse. Most of the traditional salinas have been abandoned, in some areas up to 88%.

**Other products (agriculture, aquaculture, biotechnology):** In many cases abandonment of salt culture is related to complete change in land use, and the saltworks loses totally its wetland characteristics. Other times the saltworks are transformed into rice fields and fish farms like in most cases, or into oyster farms as in western France, losing in this way their former complexity. The modern trend, however, is biotechnology: that saltworks pools are used to harvest the crustacean *Artemia salina* is almost classical. Yet, they can be cultivated for *Dunaliella salina* (a unicellular algae, living in very high graduation of concentrated brine, giving the red coloration to salt pans), which is used as a basis for the production of b-carotene (pro-vitamin A). Such an experimental project has been carried out since 1996 in the former saltworks of Formentera (Spain) (Calzada, 1997). I am sure there will be much more activity of this type in the future, aiming at more saltworks products.

**The salina as a tourist product:** Since the beginning of the 90s there has been an increasing trend of considering salinas as a tourist product and involving them in many ways into tourist enterprises, both traditional and alternative ones. This encompasses *cultural* and *gastronomic tourism* (e.g., discovering the technology and methods of production of the past, getting to know traditional products and experiencing the related local gastronomy). It also includes *ecotourism*, which is principally related to bird-watching. This movement resulted in the conserva-

tion of the salinas landscape, in many cases the revitalisation of the salinas that were set aside many decades ago. This was the case in western France (Guerande, Noirmoutier, Ile de Re), in the Canary islands (many cases), in Slovenia (Secovlje), in a couple of cases in Italy (Cervia, of Trapani - Marsala, of Tarquinia). This re-qualification wind has refreshed the intentions towards the salinas in the whole Mediterranean and more and more salinas, from Cadiz and Aveiro in the Iberian peninsula, to Polichnitos in the Aegean, are intended today to be rehabilitated and their landscape re-valourised (Dahm, 1999; Marin & G. Orlando, 1997).

There has been no movement in any part of the world towards salt *agrotourism*. Such tourist movement would be related to traditionally operated salinas, in which tourists could be involved not only as simple manual harvesters, but also as getting acquainted with the whole process and know-how of salt-making through seminars, practice in crystallising and harvesting salt, using salt in local cooking etc. Projects like this sound promising, but no doubt they need extremely careful design, organisation and execution.

### **SCENARIOS FOR THE PRESERVATION OF THE EXISTING SALINAS IN GREECE AND THE EUROPEAN MEDITERRANEAN**

The above-mentioned conditions and potential values of the Greek salinas and saltworks may assign their distinction in the following large categories of interest they might exhibit:

1. Salinas of economic combined with ecological (i.e., wetlands) interest. These are principally the large industrial saltworks operating in Greece, as well as the whole Mediterranean.
2. Salinas of ethnological, architectural and any sort of cultural interest (e.g., small salt pans curved on the rocks).
3. Salinas of historical interest (e.g., the ones operating since the antiquity).
4. Any combination of the above categories.

In all cases, the issue of preservation of the salinas can only work if based on the following points. First, the salinas should be economically viable entities needing no external financial support. Second, their re-valourisation should emphasise the importance they once used to have. In this respect, particular care should be taken so that they do not change substantially their profile. In general, their preservation may employ the following scenarios:

- **Scenario 1:** The large, industrial saltworks continue to produce salt, maintaining, in parallel, their ecological value. This implies that the saltworks should be under continuous ecological upgrading and management.
- **Scenario 2:** Relatively small salinas that are at the limit of being viable continue or restart to produce salt in the old way employing traditional methods of extraction or salt-making. These traditional methods, as mentioned above, are still to be defined, and the know-how recovered. Such salinas may function as open-air museums, possibly linked to salt museums operating in the neighbourhood.

- **Scenario 3:** In few cases that the above scenarios are not applicable, the salinas continue to operate as wetlands with cultures alternative to salt (used as rice fields or fish ponds, for biotechnological farming, etc.).

I believe that all these scenarios are feasible and applicable to the pending cases in Greece and I expect the local authorities will soon express and practice their interest in this respect. Before concluding, though, I would like to stress out the points I consider important for the success of a project aiming at the preservation of the Greek salinas:

1. There is a need for efficient ecological management in all operating saltworks, carried out by experts. This must be also applied in cases of rehabilitation of abandoned salinas if the ecological value is desired. No doubt, a close collaboration of the saltworks experts would maximise the management outcome. Such collaboration could be accomplished through a continuous saltworks management committee operating both at national and Mediterranean level. These activities will not only show results, but also intensify the importance of saltworks for wildlife and nature conservation. In some parts of Europe some extended saltworks have a parallel function, that of a natural park. This can be generalised and applied to all of them.
2. There is need to restore and rehabilitate as many abandoned salinas as possible, also those that have partly lost their ecological value. This can be a challenging project for the renewed local authorities to bring together scientists, managers and locals, and propose alternative solutions to youngsters.
3. Little is known on the traditional methods of salt making, and the ethnological, historical and cultural aspects of the salinas. Recovering this knowledge is a basic step, imperative for now, before it is altogether lost.
4. Not much is known about the salt's gastronomic value either in the past or at present. Documenting this aspect is not only challenging, but also economically interesting. Some salinas are situated near the so-called "sites remarquables du gout" (remarkable sites of gastronomy), such as Messolonghi and Kalloni. Possibly some others could be linked to this or other comparable gastronomic networks.
5. Need to create museums and demonstration salinas.
6. Also need to establish the necessary infrastructure for ecotourism and salt-agrotourism. This implies also a lot of organisation work (seminars, training courses for tourists, etc.).
7. Special emphasis should be given to management of human resources around salinas and salt, which is the major issue for the success of the project. This may include:
  - economic and cultural involvement of the local people in several ways
  - development of concepts that should mature within the society and be used as a tourist-product. Such concepts could be the "consumption of Mediterranean salt" as well as "salt produced as in the old days"
  - setting up an interacting network of the Mediterranean salinas from Brittany to the Black Sea and the Museums around them, in collaboration with the European networks of salinas and salt museums

- promote the concept "salt routes" in the Mediterranean: Prepare an integrated tourist scheme involving ecotourism, agrotourism and cultural tourism through and within the already mentioned networks aiming at rediscovering the Mediterranean routes of salt
- at last, let us restate the inspiring quality of salt mentioned in the beginning of this paper: what about creating an association of N.G.O. type (e.g., "the friends of Mediterranean salinas"), the only sort of body that could guarantee the flourishing of an idea as such as salinas restoration and re-valorisation?

Instead of an epilogue, I would like to stress that salt is not identified merely by its chemical composition and simply by its trade value. Beyond these quantified properties, salt has been the divine substance for man since the times of Homer and the mysterious element for almost all peoples (Petanidou, 1997a). It merits, therefore, to be also considered and still treated as such.

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