A METHOTODOLOGIC FRAMEWORK FOR ASSESSING THE ALGARVIAN (PORTUGAL) WATER SYSTEM: A SOCIAL-ECOLOGICAL APPROACH

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ABSTRACT.

The project we present intends to contribute to the focus on emergent water and land-use management, by exposing a set of criteria for assessing processes and stating the decisions of the social actors, under conditions of change, uncertainty and complexity. In the general process of land-use planning, we assess the robustness of a regional water system and its territorial references, underlying an ecosystem approach and the framing of water management. On this, we develop a method relating several concepts, the central one being resilience. We then apply the method to the interpretation of the Algarvian water system. The diagnosis proves the vulnerability of the current territorial model and, at the same time, indicates the marginal changes which are produced by effective social arrangements. We then advocate that the decision making on water and land-use would be guided by the principle of the quality, therefore emphasising the active participation of the stakeholders and the needs for generating more robust alternative models.

Key words: resilience, ecosystem approach, water and land-use management

1. INTRODUCTION

The Portuguese region of Algarve, on the south-western end of Iberian Peninsula, presents the climatic, social and ecological features of the north mediterranean coastal zones. The area is about 5.000 km2. The attractiveness of its landscape and climate was strongly demanded by the north European urban population. In the last two decades there has been a rapid increase in the growth of tourism and urbanisation. Changes on landscape features and on social relationships and arrangements as well, are compromising the regional identity and the conservation of fragile ecosystems. In this context and like in other Mediterranean zones water management is crucial, and plays a fundamental structuring role on the regional land-use patterns.

In Algarve as in other Southern zones of Iberian Peninsula the hydraulic paradigm guides the water management policies, and the "water myth" –water availability as a determinant factor for economic and social development– is particularly present. In the last century a great transformation occurred on land-use patterns and in the socio-economic bias, which shouldn't be correctly understood without reference to such policies. Since the acceptance of such paradigm was based on the magic role of water, whose traditional uses locally transformed dry streams on productive and even on idyllic places, one must now emphasise the existence of large territories where waste water has become a major problem, despite technological performances and increasing efficiency. One can say that on those regions the usual limiting factor of water availability has been replaced by the environmental costs of water use.

The situation in Algarve has not yet risen to a critical point, but current models followed on regional development show us clear trends on infrastructure reinforcement. To satisfy increased demands, the design of water management policies is not far from the hydraulic paradigm. At the national level the "national wills" expressed on the great Dam of Alqueva may be pointed as an example of the implementation of such policies.

The European Water Framework Directive emphasises water ecological functions, and advantages on the integration of water management on land-use planning are largely recognised. This seems to have a poor efficacy regarding the emergence of new policies. Algarve, in the last twelve years, should use a legally approved regional land-use plan. But the planning efforts have not shown a sustainable way on managing natural resources.

New and more adaptive approaches are generally needed for planning and management regarding land uses and natural resources. In a mediterranean context the way we face water issues can particularly influence such approaches. The increasing of public participation on decision-making is a critical condition for improving quality.

The project we present intends to contribute to the focus on emergent water and land-use management, by exposing a set of criteria for assessing processes and stating the decisions of the social actors, under conditions of change, uncertainty and complexity. In the general process of land-use planning, we assess the robustness of a regional water system and its territorial references, underlying an ecosystem approach and the framing of water management. On this, we develop a method relating several concepts, the central one being resilience.

We then apply the method to the interpretation of the Algarvian water system. The diagnosis proves the vulnerability of the current territorial model and, at the same time, indicates the marginal changes, which are produced by effective social arrangements. We then advocate that the decision-making on water and land-use would be guided by the principle of the quality, therefore emphasising the active participation of the stakeholders and the needs for generating more robust alternative models.

2. PLANNING AND CONDITIONS FOR ADAPTIVE MANAGEMENT

In the last century, the high degree of intervention in the natural water cycle, the increase of consumption pressure on the available resources, as well as the weak efficiency of water usage, led to a series of environmental problems. In the specific case of the Algarve, where was not achieved the level of intervention as some of the regions in southern Spain, identical problems are still felt. The occupation of waterways, the increase in erosion risks, the eutrophication of some dam lakes, marine water intrusion, contamination of aquifers, loss of large surfaces of humid zones, alterations of the coastal and river ecosystems, are detrimental examples that keep accelerating the loss of natural and ecological water functions in the Algarve. Here, as already occurs in other territories of similar characteristics, we reach a situation in which the limits of sustainability will be, therefore, independent of the existence or not of water resources, situating the limiting factor in the environmental costs associated to the use of water (Esteve and Martinez, 2001).

We argue that the reflections about these issues should be placed in a context of ecosystems management, trying to understand the domination of the ecosystems by human activities. In this context, once the alterations of the structure and functioning of ecosystems are consequences of the transformations of land use, these assume a central role in their management. "Understanding land transformation is a difficult challenge; it requires integrating the social, economic and cultural causes of land transformation with evaluations of its biophysical nature and consequences." (Vitousek et al., 1997). From that point we underlie the importance of territorial or land use planning in the water management: being a reference to the individualised spaces –many times due to the water's own action– land use planning encompass a set of political-administrative practices by which decisions about utilisation of resources and land use are made and managed.

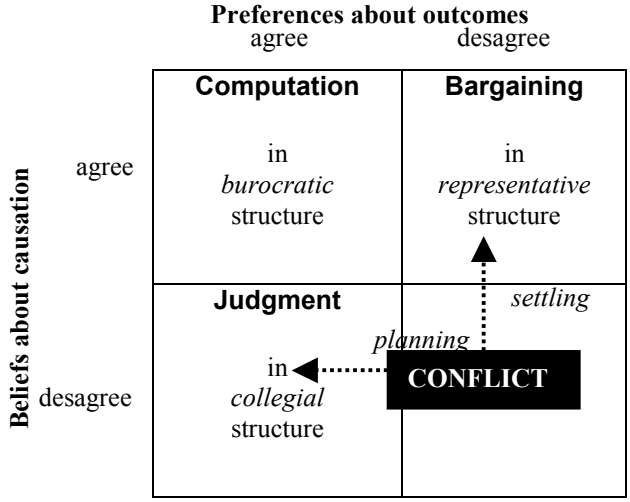
Planning instruments usually regulate such practices. In the meantime, whether the process of elaboration of these instruments, or whether their translation on the terrain, it is quite contradictory to the principles they enunciate. This is particularly evident in the Algarve where for more than twelve years there is in effect a regional land use plan of the area. However during recent years either an increase of built up areas in unforeseen locations, or a significant increase in agricultural uses of a

more intensive character in protected aquifer zones has occurred; and also, in spite of the very plan, this agricultural intensification is inclusively a result of the application of European Union funds. These facts and evidences lead us to question the classic planning solutions and to look for emerging forms of adaptive management guided by an ecosystem approach.

We have in mind that an ecosystem approach requires concern with monitoring the state of resources and processes, in conjunction with a constant negotiation among the stakeholders to come up with solutions to existing problems in a territory. In effect, for permanent conflict situations, two basic ways can be considered (see figure 1): planning and bargaining (Lee 1993).

The first implies a search for an agreement about solutions without there being agreement as to the causes of the problems; the second entails a previous agreement as to the causes of the problems to enable negotiating among various alternatives to the solutions. The second way is a basic condition for strengthening the ecosystems adaptive management strategies (Lee, 1999). Such would not invalidate that in a first step it might not be necessary to refer to the planning mechanisms.

Figure 1 – Deciding and intervening: some organizational alternatives.



Source: Lee (1993, modifying Thompson e Tuden , 1959)

What we want to show is that the ecosystems management, guided by conservation objectives would not be an exclusive component of the accompaniment of planning measures, usually defined by a group of experts with input from affected parties. In the debate about environmental issues where typically facts are uncertain, values in dispute, stakes high, and decisions somewhat urgent (Funtowicz and Ravets, 1998), quality tends to be the principle that orients decision-making, and quality depends on the open dialogue among all those affected. This is why we seat our methodological scheme of evaluation of the water system of the Algarve in two essential vectors: a) a theoretical matrix of reference as simple as possible to be able to report easily the result of various activities or measures and b) the application of the scenario method to stimulate the participation of stakeholders and to orient the decisions regarding various possible alternatives.

3. THE NOTION OF TERRITORIAL ROBUSTNESS

When we refer to conservation objectives in a social-ecological system we have in mind that its functional dynamics maintains *integrity* when confronted with adverse environmental conditions capable of provoking great disturbances. It means to preserve all its components as well as the functional relationships among all components. But it also means to recognise a human perspective, the ability of an ecosystem to continue to provide the services that humans expect. Integrity reflects then the capability of those systems to support services of value to humans (De Leo and Levin, 1997). This notion applies independently of the degree of intervention to which an ecosystem is submitted.

In a context of complexity and of evolution of the strategies of control of nature to strategies of management, adaptation and adjustment, the introduction and articulation of several concepts to enrich and fit a better understanding of environmental issues (Funtowicz and Ravets, 1998) acquires more and more importance. Starting from this point we attempt to make converge in integrity the various concepts and attributes to construct a grid where we place what we designate as and "robustness area". The grid is based on the comprehension of natural systems and of reactions that these can have

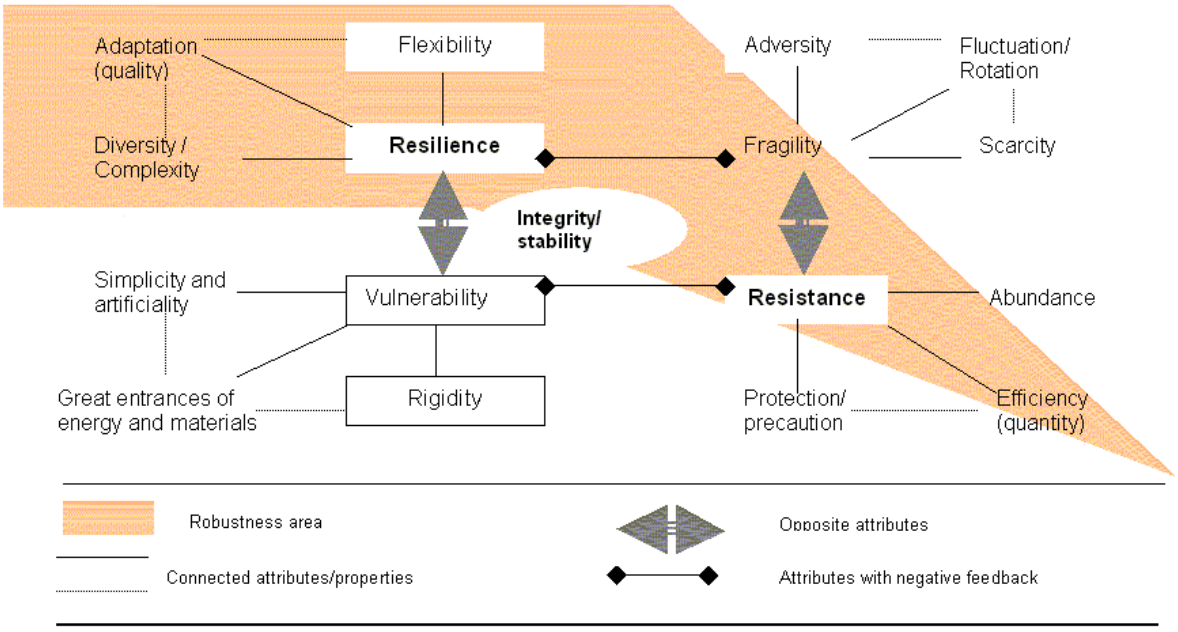
when submitted to exploitation in a greater or lesser extent. As concepts stem from our informal understanding of the ideas of stability, sustainability, and resilience (Ludwig et al., 1997), we start by presenting these ideas as a first frame to reinforce the objective of integrity.

Stability will be, informally, the tendency that a system presents to return to a position of equilibrium when disturbed (id.). It refers to the desirable configuration of a system (Walker et al, 2002). From there we can get pretty close to integrity, entailing the maintenance of multiple states of equilibrium. At the same time, "sustainability involves maintaining the functionality of a system when it is perturbed, or maintaining the elements needed to renew or reorganise if a large perturbation radically alters structure and function" (Walker et al, 2002). Once that the ability to do this is termed "resilience", we take this concept as central in our articulation network, to the point that our interest is the evaluation of social-ecological systems in a mediterranean environment, where great variations in natural conditions are regularly registered influencing the way of life of its inhabitants. A resilient system will be that which tends to maintain its integrity when subject to great disturbances (Holling, 1973).

But we consider the sustainability clearly between stability and resilience, adopting a notion of strong sustainability that we call robustness, adjusted to the features of mediterranean systems. In these systems, submitted to large variations in natural conditions, resilience is the dominant attribute. Nevertheless we think it will be necessary to consider, given the modifications that have been introduced, that the stability is guaranteed by way of an increased productive capacity that confers them resistance. That's why we utilise resistance complementarily to resilience, in the sense used by several ecologists, as the degree in which each system maintains immutable when we alter its components (Pimm, 1999).

We articulate later other attributes whose relation is more or less consensual, establishing a network of correlations that are complementary, contrary, and of feedback effects. In the interpretation of the attributes with complementary functions the concern is to find a platform for stimulating the reflections about the correction of situations of imbalance in territorial systems, and above all, about how to avoid the "disintegration" of these systems. We have as such an articulation of various attributes interpretable as much in physical aspects as in socio-economic aspects, which we schematise in the matrix in figure 2.

Figura 2 – Scheme of "robustness area" in mediterranean zones



The horizontal reading of the upper part of the matrix can be applied to the interpretation of a natural adverse environment, but in which human intervention does not largely modify it's functioning. The great capacity of *adaptation*, the *diversity* and *complexity* are conditions that allows a territorial system for a great *resilience* once he presents the faculty of recovering from situations of natural scarcity without losing the main traces of its identity. This lost would hardly occur if there were greater external disturbances in situations of extreme scarcity, the reason that justifies the *fragility* of such systems. *Flexibility* is the main principle of human intervention.

The horizontal reading of the inferior part of the matrix can permit the interpretation of a group of influences tending to increase the *resistance*, entailing a human action but based on the use of conventional technologies. The input of *energy* and *materials*, external to the system, entails a *simplification* and *artificiality* that will have relative *abundance* as a reflex, the greater the efficiency in the transformation of the input. The *rigidity* ends up as a characteristic of management, being able to be attenuated by efficiency in the utilisation of resources and conservation of natural aspects/values, according to the principles of *protection* or *precaution*.

The "robustness area" is encountered in the conjugation of the two readings, implying as conditions:

- To emphasise the adaptation to maintain the quality and the identity of the territorial system;
- To assure the global diversity and complexity, recognising the fragility and, in part, the adversity but avoiding situations of intense scarcity;
- *To recognise the resistance as a complementary property of resilience*, stemming from the input of materials and energy and consequent simplification and artificiality circumscribed, which allows to some relative abundance and requires efficiency;
- To emphasise flexibility as a principle of natural resources management admitting partial activities guided by the principles of protection and precaution.

4. INTERPRETATION OF THE ALGARVIAN WATER SYSTEM

The theoretical matrix of robustness could serve as a way to interpret various territorial systems or subsystems in a mediterranean environment –ecological systems, transport systems, urban systems.

To interpret the water system[1], that have a "special" territorial significance, we will try to identify in its diverse territorial manifestations –structural effect, functions carried out and interactions with other systems, management options– the different attributes that strengthen the resilience or, in the opposite sense, augment the vulnerability. This way we can discuss the affectations of territorial robustness and/or the possibilities of its reinforcement. To configure the water system we consider the systemic approach proposed by Erhard-Cassegrain and Margat (1983), emphasising the functions of water, the structural aspects of subsystems that can be identified and even various interactions that occur among them. Therefore, we can situate the various attributes of the matrix in relation to subsystems of resource, of utilisation, and of management as shown in figure 3.

The methodology followed is being applied in the analysis of the water system of the Algarve, taking effect during the revision of the Regional Land Use Plan (PROT). The demands of carrying out those works of revision in a short period of time imply a simplification of processes not very compatible

[1] By using the term water system we try to reach the entirety of the phenomena in which water intervenes as well as its functions –natural and useful. In this system three subsystems can be considered: resource, use and management. The first has the structure of the natural hydrological part, and the functions are the natural ones, joined with those induced by utilisation –useful functions– with four categories: biological, ecological, technical and symbolic. The system of utilisation has, beyond those functions, a physical and technical structure –works and actions that define the field of circulation of flows and exchanges of energy–, as well as an economical structure. The management system refers to the coordination of activity more related to the usage of water, encompassing the series of elements of exploitation-use-restitution and the respective interactions (Erhard-Cassegrain and Margat, 1983).

with the duration required for a more exhaustive application of the methodologies at issue. Within these limitations, the methodology encompasses the following steps:

- Identification of the variables of the water system, internal and external, from the start of the existing problems, their causes and effects, with the involvement of many of the interveners in current water management at the regional and local levels;
- Construction of three visions for the territorial system and promotion of debates among the stakeholders about several alternatives referring to the future water management.

Figure 3 – Robustness and vulnerability of a water system in a mediterranean environment

<table>
<tr><th colspan="2">Image of robust water system: resilience and resistance in the systems of resource, of utilisation and of management</th></tr>
<tr><td>Resilience as a dominate characteristic</td><td>Resistance as a complementary property</td></tr>
<tr><td>The resilience of the system will be guaranteed:
· By diversity/complexity of the system of resource and of the system of utilisation:
· Domination of natural flows over modified parties;
· Utilisation tending to be closer to natural flows;
· Different origins for different utilisation;
· Variety and differentiation of distribution circuits, to accomplish different objectives;
· By the conditions of adaptation of the system of resource and of the system of utilisation:
· Adjustment of needs to the real resource disponib.;
· Guarantee of vital needs and rationality on great “consumption”;
· Supply based on resources in the same watershed;
· Treatment of sewage with regeneration of flows and new utilisation;
· By flexibility of the system of management:
· Participation of the users on the decisions about production, control of quality, distribution;
· Capac. to change strategy -new knowledge, risks;
· By recognising the fragility of the system of resource:
· Identification of the conditions of natural adversity;
· To foresee the scarcity situations.</td><td>The locals of resistance will be characterised:
· By efficiency in the system of resource and in the system of utilisation:
· Resource capture with less investment on energy;
· Minimisation of losses;
· Recuperation of quality –recycling;
· By a relative abundance in the system of resource and in the system of utilisation:
· A more intense use of natural flows and storage in the most rainy years, managing aquifers and superficial water together;
· Careful exploitation of strategic storage on critical periods;
· Productivity and benefits of water –agriculture, recreation, transport;
· By applying of the protection/precaution principle to the system of utilisation:
· Normative of protection of the quality of the resource and of the sewage treatment;
· To avoid situations of potential risk.</td></tr>
<tr><th colspan="2">Increase of vulnerability in a water system: simplification, inputs and rigidity in the subsystems</th></tr>
<tr><td colspan="2">A system will increase his vulnerability in result of:
· Structural simplification of the system of resource and artificiality of the system of utilization:
· Big works for resource capture and storage, in a growing rhythm, following a spiral of a growing demand;
· Constant increasing density of channel network for supply and run-off all over the territory;
· Great inputs of materials and energy:
· Hard and sophisticated systems of pumping –inverse osmosis, big depth extraction, ...;
· Transportation at big distances;
· Hard and sophisticated systems of treatment on resource capture and on sewage;
· Rigidity in the management system:
· Rigorous rules with a week acceptation by the users;
· Centralised management system in a bureaucratic or technocratic style.</td></tr>
</table>

The identification of variables and their hierarchy using a matrix of crossed impacts permits the establishment of some consensus concerning the history of the system, as well as his propensities, given that a common vision is being formed among the various interveners in the process of identification of problems and variables. This facilitates the perception of the meaning of each group of variables and, at the same time, of the relationship of the different variables with the attributes of the theoretical matrix. This way one perceive what variables can decisively influence robustness or vulnerability, not only of the water system but also of the territorial system in which it exists.

The construction of scenarios based on some "surprise effects", permits to facilitate the perception of traps and opportunities related to plausible visions of the future. By this we want to improve an

ambience for decision-making implying a serious reflection about adaptation strategies to face those possible surprises and traps, and avoiding the worse choices related to actual conditions.

4.1 Actual Configuration

The knowledge of the Algarvian territory and a summary analysis of recent planning exercises make possible to classify the actual tendencies and/or propensities of water system in this region. We do so keeping in mind the relationship among the attributes that can identify the robustness or vulnerability of the water system in a mediterranean environment. In this regard, we illustrate some spatial problems and aspects of the Algarvian water system in maps 1 and 2 and in figure 4.

As read in map 1, the structure of the natural hydrological system of the Algarve is dominated by a conjuncture of six small watersheds (the Ribeiras of the Algarve), whose limits just barely outstretch the region's administrative bounds. In the north-east origin the administrative limits include an area of the end of the Guadiana River watershed. Crossing all small watersheds that drain to the south coast, there exists a complex system of aquifers, the most extensive and/or productive of which are located in the lime formations of the Barrocal, hydraulically connected with those of the southern coast. The renewable water resources corresponding to these aquifers is around 200 hm3/year (MAOT, 2001) presenting the Lias-Dogger aquifer system, known as Querença-Silves, a renewable volume until 170 hm3/year. This very aquifer has been endangered for some time by the implementation of public and private irrigation systems. Once the area is well known as exposed to high risk of pollution, and classified as a "protected aquifer zone" in the Regional Land Use Plan, it is difficult to understand why such risk practices and policies are still encouraged.

Map 1 – Natural structure

The water management problems are related to a territorial model based on "tourism development", which has significantly altered some traditional spatial relations. For example, the most apt agricultural spaces are progressively deviated from their traditional functions (CCR Alg, 1990) and, those less appropriate, tend to be used to acquire greater productivity at the expense of technological interventions in the water system and intense transformations in the landscape. The touristic "focus of attraction" along the southern coast is perceptible in map 2 by the density of the hydraulic system. The recent planning initiatives with respect to the watersheds do not seem to question the territorial model

that has been being followed. In fact the recently approved plan for “Ribeiras do Algarve” proposes for example a greater efficiency in the utilization of infrastructures but not a policy of a more rational "consumption"; so, one can perceive a general growth in the offer of water availability to face a spiral growth of the demands. See for example in figure 4 that even foreseeing a 50% reduction loss in urban consumption, the amount forecast in a critical year is close to the total volume of water availability, which does certainly not take into account the needs for conservation of ecological flows.

Figura 4 – Forecast for the water “consumption” in the next 20 years and characteristics of the hydrological system

Population				Irrigation			
Resident		Visitors		Public		Private	
Year 2000	Year 2020	Year 2000	Year 2020	Year 2006	Year 2020	Year 2006	Year 2020
400.000	-	973.000	1.542.000	8.400 ha	12.800 ha	>19.470 ha	~28.000ha
Urban cons. (hm3): losses reduction 50% in 2020				Needs (hm3): normal year, expansionist hypothesis			
22	36 a 38,5	46	87,5	41,8	62,9	108,1	131,2
Per capita l/dia: cities with 5.000 a >50.000 inhab.				Needs (hm3): critical year, expansionist hypothesis			
200-250	240-280	250	280	42,2	69,6	120,1	145,7
Total consumption in 2020, critical year (38,5+87,5+69,6+145,7) - **341,3 hm3**							

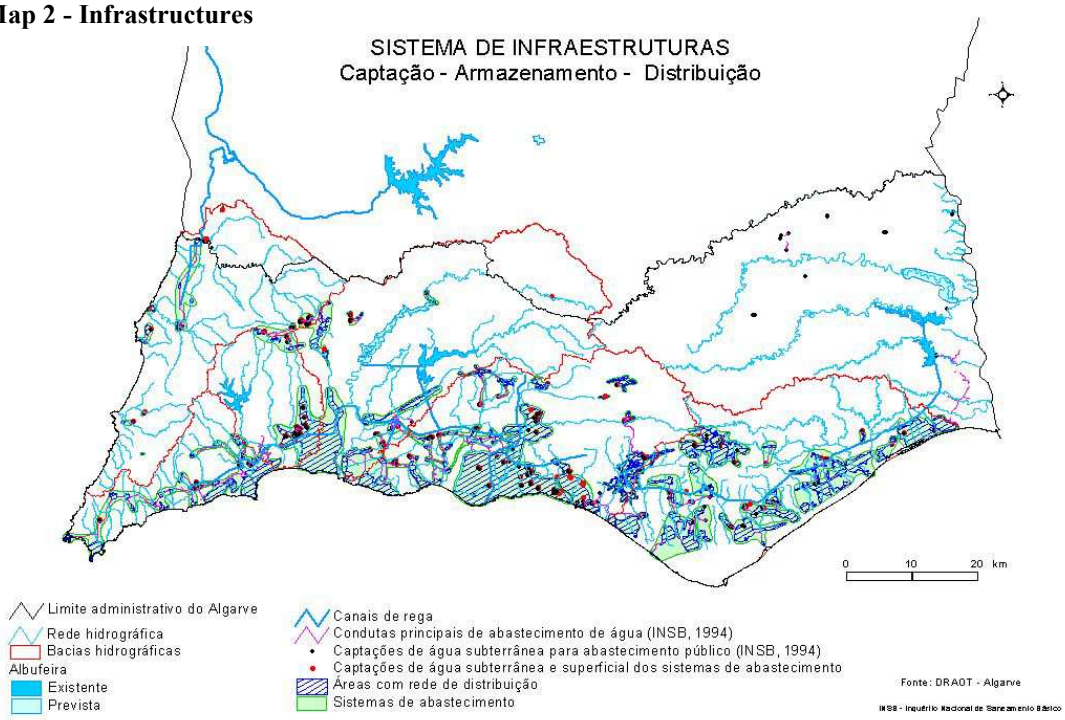
Source: MAOT, 2001, adaptation

Characteristics of the hydrological system

Normal annual precipitation (Ribeiras do Algarve)	620 mm, <500 mm 1 in every 5 years*
Precipitation in dry semester (April-September)	<20% of a normal year*
Potential evapotranspiration	1.240 mm**
Total water resources availability (level of guarantee 95%)	**370 mm***
Net capacity of the existing dams	~ 266 hm3***

Sources: * Henriques (1985), ** MAOT (2001[a]), *** INAG

Map 2 - Infrastructures



Expediting a reflection on the actual state of the water system, with a concern for relating some factors with the attributes of the matrix, we can demonstrate

- That the actual tendencies will make robustness diminish for lack of *adaptation*, lack of *recognition of natural fragility* and due to an increase of *input of materials and energy*.

- That robustness can actually be enhanced by applying the principles of *efficiency*, of *protection / precaution*, and by diminishing the *input of materials and energy*.
- That the tendencies towards new infrastructures, stimulating a spiral growth in demands of water resources, negatively interfere with the attributes of *resilience* and strengthen the attributes of *vulnerability*.
- That the alternatives that are still hardly concrete such as the adoption of adaptive technologies and modes of management based on "endogenous potentialities" are those that can have a most positive contribute to strengthen the attributes of *resilience-resistance* and that mostly may diminish the importance of the attributes of *vulnerability*.

4.2 Scenarios

The option of scenario planning, given the complexity and the uncertainties of the social-ecological systems, presents various possible futures, consistent with the actual knowledge yet containing different potential surprises capable of generating a reasonable range of alternatives (Peterson et al., 2003). Not trying to imagine a perfect system, but to direct reflections on plausible futures in order to reach the best alternatives, we elaborate three scenarios reported to the horizon year 2030, considering basically different "surprise effects" and "traps", in relation to which the reactions of the various social agents must be assessed, especially referring to the key variables of the water system.

In a first one, acclaimed "Algarve for everybody", a rupture of the actual economic base centred on tourism is supposed; the surprise effect would stand on the effects of climate changes and the trap would be the high costs of technological solutions to mitigate the negative effects of overuse in the coast. In a second one, so-called "Algarve.com", stead on high tech development, the surprise effect would be a sudden alteration of social-agreement policies and public investment, and the trap would be the saturation of the existing urban corridors causing conflict among the urban and rural populations (life ways, values). In the third, termed "Algarve deluxe", based on tourism development of luxury housing, the surprise effect would be extreme social inequalities and the trap would be a degradation of social relations derived from the phenomenon of sub-urbanisation (poor quality, marginality...).

Figure 5 – Main features of the three scenarios for the territorial system of Algarve

Scenarios / General aspects	Algarve for everybody	Algarve.com	Algarve deluxe
Resident population	320.000	490.000	440.000
Urban patterns / Population features	Relative concentration in the traditional urban structures. Relative old population	Concentration in the coastal urban corridor. Relative young population	Spreading all over the Litoral-Barrocal places. Relative old population
Landscape patterns	Abandoned turistic coastal zones, reactivation of rural areas, re-naturalisation of coastal areas	Quite dense urban coastal corridor, segregation of rural areas, “control” of natural spaces	Sub-urbanisation in contrast with luxury concentrations, semi-private coastal areas, degradation in Barrocal
Economy	Global boom, local decline	Global and local boom	Depending on luxuary resident preferences and on traditional urban population responses
Local wealth	Below the national average	Above the national average	Near the national average, but large inequality

Note: Resident population in Algarve 2001 – about 400.000 inhabitants

The scenarios only describe some features of the whole territorial system (see figure 5). We can meanwhile note some components that will assist direct the reflection on critical conditions regarding the reinforcement of robustness of the water system. So if we point out the aspects related to local

governance and management of the endogenous resources, we can show the following: a) the first scenario rests on the benefits of highlighting endogenous resources and on the reaction of local stakeholders, after a decline in sun-sand-and-sea tourism razing the whole actual economic base; b) the third scenario contemplates a localized reaction of citizens groups in defence of collective cultural values, confronting the progressive degradation of social relations and territorial components; c) the second scenario draws a possibility of relative social segregation regarding the social groups more close to traditional values and regional identity. The different variables of the water system can then be framed in the reactions of the stakeholders to the possible forms of local governance presented in each of the three cases. This may give us a better understanding of the acceptance of possible evolutions of the territorial system: in the sense of robustness or vulnerability.

By showing the role that the key variables of the regional water system can play in several alternatives, having in mind the attributes of the theoretical matrix, we may influence the discussion. And we can better perceive the acceptance of possible alternatives for the water system by the social actors. The acceptance of alternatives based for example, on the "community value of water" will be clearly interpreted, from a theoretical point of view, as a contribution to backing the conditions of robustness of the water system.

Conclusions

From the exposition of points 1 and 2 above, we highlight the following:

- In the water management and territorial issues, we report the interaction of "natural" and social subsystems, in social-ecological systems;
- The urgency of coming up with responses to environmental problems presupposes, in the sub-systems considered, a convergence of objective in the sense of conservation;
- The reference to transformation of land uses, integrating the causes of social, economic, and cultural nature, is fundamental to the comprehension of alterations in the structure and function of social-ecological systems which embraces water management.

In more specific terms, about water's influence in the territorial systems analyses, particularly of mediterranean characteristics, we can underline that:

- The limiting factors tend to be placed on environmental costs derived from water usage and less from the existence or not of water resources, justifying emphasis in ecological functions of water;
- The improvement of use, development and conservation of water resources implies the dislocation of the field of mere technical decisions in water management to the field of active participation and care of the ecosystem;
- A territorial model of reference for the water management, might not be attained only by technical measures of planning, but by divulging agreements about the cause of problems, keeping in sight the negotiation of alternative solutions by and among all the parties affected.

To make the theoretical considerations operational we need diagnostic bases with simple references in order to orient the discussion of the social actors. From this view we design the notion of territorial robustness. Its application in the interpretation of the water system of the Algarve can lead to different agreements, according to the dialogue among those involved and affected by territorial and water management. A primary reflection, based on recent planning experiences results in two basic conclusions. First, we can say that the tendencies actually followed, despite the "classic" mechanisms of planning, reflect a territorial model centred on the "focus of attraction" of tourism development, with a clear increase of vulnerability. Second, the alternatives seemingly more viable, presupposing a more dynamic institution fit responsive to external influences (European Directives, for example), tend to produce marginal changes such as the improvement of efficiency in the utilization of resources without attacking the deep causes of existing problems. This lead us to explore mainly the local sensibilities and emerging values, and endogenous potentials, to evaluate the viability of more robust territorial models. In that sense we intent to test the viability of alternatives based on the "community value of water" (Brown and Ingram, 1987) as a complement to the simple material or economic value.

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