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A MULTI-DISCIPLINE AND MULTI-SCALE APPROACH TO COASTAL ZONE AND RIVER BASIN PLANNING IN A SUBURBAN MEDITERRANEAN REGION

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ABSTRACT

Since the beginning of the nineties, when the concept of Integrated Coastal Zone Management (ICZM) was defined and agreed upon (Rio WCED '92 and Noordwijk WCC '93), an animated debate upon costal area boundaries delineation has taken place. It was realized that: (i) the very boundary of coastal zone are scale and purpose dependent i.e. they should extend as far inland and as far seaward as necessary to achieve management objectives; (ii) the concept of ICZM should be widened in order to include the area of neighbouring river basins to cope with key environmental issues.

Within the outlined debate, the aim of this paper is twofold. The first is to provide evidence of the need for the integration of Coastal Zone Management policies within broader Environmental Management schemes on a regional scale, particularly in the case of semi-arid Mediterranean landscape where ephemeral stream basins connect natural coastal environment with sub-coastal ones. The second objective is to discuss an analytical methodology aiming at the construction of multi-discipline and multiple-scale interpretative patterns able to provide the means for both the delineation of a coherent global strategy and the implementation local policies in such a region.

For the purpose of both objectives the study takes into account evidences resulting from expert (GIS-based) and common (community based) analyses preliminary to the establishment of a protected area in the catchments area of an ephemeral stream in the south-east of Italy: Lama San Giorgio (BA).

1. INTEGRATED COASTAL ZONE AND RIVER BASIN MANAGEMENT

1.1 From the development of Coastal uses to Integrated Coastal Zone Management

From the beginning of the 1970s there has been an increasing recognition of the need for Coastal Zone Management policies to deal with coastal issues and problems. During these decades, subsequent to the world-wide rise of environmental concern and of the diffusion of complexity theory, global awareness in relation to coastal management moved from a sectorial to a comprehensive and integrated approach - often known as *Integrated Coastal Zone Management* (ICZM).

Itis possible to identify a few significant steps in this process: the first was in 1972 when the United Nations Conference on the Human Environment took place in Stockholm, and the Massachusetts Institute of Technology Report was set up in Boston pointing out the need to design and implement environmental protection strategies. In the same year with the passing into USA legislation of the Coastal Zone Management Act the concept of Coastal Zone Management came into being and the need for Coastal Management Programmes and Policies became evident worldwide.

According to the United Nations, DIESA, (1984) at that date there were two coexistent principles: (i) the economic principle -aimed to obtain the best benefits at the lowest cost; (ii) the ecological principle according to which the natural environment was considered an interconnected set of elements deserving protection, not to endanger current and future uses.

Starting from that moment these two principles evolved towards a merge with a claim of 'Sustainable Development' and 'Integrated Coastal Zone Management' principles according to which the uses can be developed only if they do not jeopardize ecosystems conservation and future generations' enjoyment.

1.2 The need for a multi- discipline approach

The world 'integrated' began to be used in 1980s, when "it become clear that the effective management of costal areas usually requires an inter-sectorial and multidiscipline approach" (Knecht and Archer 1993, p. 184). Finally the inclusion in 1992 of ICZM as one of the principal recommendation of Agenda 21 (Cf., Cap 17, Programme A) at the Earth Summit in Rio (UNCED, 1992), and the World Coast Conference (Noordwijk 1993), gave the concept both international prominence and political legitimacy.

Despite this global recognition, itis evident that Coastal Zone and ICZM means "different things to different people" (Martin 1993, p. 2). Even though definitions of Coastal Zone and ICZM are many, it is possible to point out some underlying common themes: "at minimum any definition should include the integration of program and plan for economic development and environmental quality management, and more specifically the integration of cross-sectoral plans. Integrated Coastal Management should include the vertical integration of responsibilities for management actions between various levels of government international, national, state, and local or between public and private sectors. It should include all the components of management from the planning task of analysis and design, to the implementation task of installation, operation and maintenance, monitoring and evaluation of strategy over time. Integrated Coastal Management should be cross-disciplinary among the science (institutions), and law" (Bower 1992 as quoted in Knecht and Archer, 1993, p.189).

1.3 The need for a multiple-scale approach

Much of the debate has centred on national pan-national or global perspective, nevertheless, as pointed out by Hägerstrand (1995, pp. 2-3): "While environmental change […] lends itself to global natural science description, we have no coherent picture on the social side of how high level doctrines decisions filter down to the numerous and widely distributed situations where human action and the natural world come in touch with each other […] while soil water plants and animals interact according to natural science principles, they are simultaneously victims of the human desire to create 'space/time pockets of local order', fitting the realm of social and economic conditions. The human influence on the biosphere has its origins in arrangements at this level of local action in the landscape"

For these reasons, even though it is recognised that a small scale, comprehensive perspective is needed, nevertheless the same need arises for the acknowledgement of interaction occurring at the local scale between humans and costal areas, as often the cumulative nature of such local events leads to smaller scale environmental crisis. This provides evidence of the need for a multiple-scale approach to CZM.

1.4 The issues of Coastal Boundaries delineation

A literature review of the animated debate upon coastal area definition and coastal boundaries delineation once again demonstrates their scale and purpose dependency. Coastal Zone is loosely defined as "that part of the land affected by its proximity to the sea and that part of ocean affected by its proximity to the Land" (Clark J.R, 1995, p. 5) Itis physical extent will tend to vary according to the nature of the problem, the extent of the resource and the boundaries of government with jurisdiction and responsibility for management in the coastal zone. In short, as stated during the World Coast Conference of Noordwijk, the boundaries of the coastal Zone should extend as far inland and as far seaward as necessary to achieve the objectives of the management programme.

Defining the coastal zone has been aptly identified as one of the 'thorniest issues' for ICZM (Cicin-Sain, 1993). A number of definitions were put forward in literature, both by researchers and practitioners of ICZM. From these definitions there appears to be general agreement that the coastal zone includes some coastal water and some coastal land, its aerial extent depending on the issues and the activities to be managed.

Davis (1992) outlines three approaches to defining the coastal zone as follows:

- the use of linear boundaries
- the use of administrative boundaries
- the use of biophysical boundaries

The linear approach, which is infrequently used, involves arbitrarily extending landward and seaward boundaries by some distance, for example 5-10 kilometres in each direction. The use of administrative boundaries appears to be more commonly practised globally. This approach involves working with existing administrative or geopolitical boundaries such as those of local government. However, such boundaries often lead to the artificial fragmentation of the coastline as they bear no relationship to the natural coastal system (Barcena, 1992; Carter, 1990). This, plus the traditional sectorial approach to managing coastal resources, has resulted in many of the problems currently encountered in coastal areas globally. The use of administrative boundaries has therefore proven to be ineffective for the purpose of managing the coastal zone. The third approach, the biophysical approach, is "determined by the spatial distribution of natural features and may be based on relatively integrated units such as catchment areas or coastal landform systems" (Davis, 1992). Such an approach seems the more appropriate towards the goal of ICZM. Opting for this approach, Davis outlines a broad definition of the coastal zone as follows:

"the coastal zone is considered to include land/sea interface extending from the upper limits of the catchment areas of coastal rivers to the seawards limit of terrestrial influences" (Davis, 1992).

1.5 Coastal Zone and River Basin Management

Since it was realised that the notion of coastal area should be modified in order to reach further inland, especially with regard to environmental impacts, it was jointly concluded that the concept of *Coastal Zone* and its management was strictly related to the notion of *River Basin Management*.

The EU Water Framework Directive (2000/60/CE) asks Member States to define individual River Basin Districts, made up of one or more neighbouring river basins together with their associated groundwaters and coastal waters, in order to protect inland surface waters, transitional waters, coastal waters and groundwater.

In Italy, specific water basin management legislation at the regional level (i.e. Abruzzo Region) has recently been introduced, according to laws 183 of 1989 and 36 of 1994, to constitute a regional basin authorities, whose objectives include the integrated management of the costal zone in order to prevent erosion (Gibson, 1999).

At a macro-level all coastal areas can be considered, from a physical geography point of view, as parts of large river basins as, eventually, most rivers end in the sea. At a regional scale, though, some river basins may be considered as linked to their coastal areas. At a local-scale there is a variety of situations where a coastal area may be directly indirectly or not related to its river basin. (UNEP/PAP/RAC, 1997)

There may be important functional relationships between river basins and coastal areas and one may influence the other. These are structured on the basis of *natural-key processes* water flow, energy and matter - but also conditioned by *human activities* in the region that may affect natural processes urban development, rural activities, technical infrastructures, waste or pollution- or on the basis of geographical *features* or *areas* which may be important sub-units (“ecotones” or transition areas) of both the river basin and the coastal area.

2. WORKING AT THE CATCHMENT SCALE

2.1 An enlarged perspective

Given such premise, and considering that the catchment scale is assumed as instrumental to integrated landscape management (Hobbs et al., 1993) the work presented here can be viewed as an attempt to actually link a planning experience carried out at the catchment scale with the concept of ICZM.

Such an attempt is particularly appropriate to the implementation of Environmental Management schemes at a regional scale, such as those relevant to the enhancement of ecological continuity between inland and coastal landscapes. Moreover the catchement scale perspective has proven appropriate to the assessment of the large scale effects of the local implementation of EU policies within the context of land degradation (Mairota, 1995).

The planning experience was based upon an analytical methodology aiming at the construction of multi-discipline and multiple-scale interpretative pattern suitable for providing the means for both the delineation of coherent large-scale strategy and the implementation of local workable solutions..

To such an end the choice of operating at the catchment basin scale within the framework of the establishment of a natural park in a "*lama*", a type of ephemeral stream, in a Mediterranean landscape in Apulia, Southern Italy (figure 1), rather than at the stream lateral strips scale, was due to the need of taking into an account both the functional and dynamic implications of such a physiographic unit.

The catchment considered 30,000 ha among possible study frameworks appeared to better fit karstic incisions functions, both hydraulic and landscape ecological ones as well as to allow for the integration of these with the larger scale (13 municipalities) settlement system. The catchment, therefore, besides becoming the framework for the construction of the knowledge basis of the Protected Area, has developed into the actual institutional context to which the community participatory process has to be referred.

Moreover, this was consistent with the conservation strategy adopted, aiming both at maintaining and enhancing species diversity in agricultural landscape and at fostering a compatible regime of human activities (Arnold, 1995), that would take into an account landscape functions, such as biodiversity, buffering non-point source pollutants, habitat for wild fauna, ecological strategy for the urban/countryside fringe.

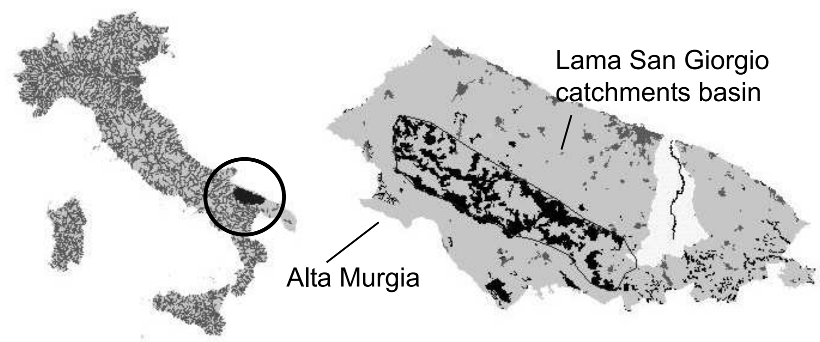


Figure 1. Location map of the province and connection between two nature conservation modules at the province scales.

The ecological role of this, as well as of the other similar catchment basins typical both to the province (where a proper system of several such streams parallel to one another can be recognised) and to the Mediterranean region, is not so much linked to the actual presence of water. The analogy, in fact, is between fluvial and torrent system, where the latter is a system depending on the contingent character of seasonal, short/intense rains, drainage (even sewer) waters, rather than on permanently flowing waters. Yet such a role is none the less significant as the system functions as a "corridor" apt to connect the southern coast of Bari's metropolitan area a semi-natural periurban area- with the area of the "Alta Murgia" national park.

Such chorologic relations between the stream (lama) and both other territorial constituents and administrative and management contexts cross diverse proximity scales: narrow (province/metropolitan area), medium (provincial system of "lame"), enlarged (regional system of protected areas)

2.2 Riverine landscape analytical models

It could be useful to evoke some interpretative patterns for fluvial landscapes, such as the ones coming from landscape ecology literature, where ecological studies on internal waters are considered from a spatial point of view (Decamps, 1984, Decamps and Naiman, 1989; Naiman, Decamps, 1990; Forman and Godron, 1986; Forman, 1995; Wiens, 2001; Petersen, 1992; Amoros and Petts, 1993).

Each fluvial ecosystem consists in a natural corridor within the landscape. A strip of well drained land pertains laterally to the proper water channel. Such a strip is directly both structurally and functionally affected by the river originating a number forms linear in their turn: river channel, bed, slopes, riparian vegetation buffers, both internal and external to the flood plain, hedgerows or woodland margins at the edge/agricultural upland interface.

As a matter of fact all the parts representing the fluvial phenomenon in the landscape are themselves part of it rather than complementary elements to it, therefore the concept of fluvial corridor is richer than the river one. (Forman, 1995)

Moreover the river is part of a wider landscape from which it originates, namely the catchment, also defined as *matrix* landscape in the ethimological sense of phenomena generating landscape, on which the very form of its drainage pattern depends as well as the functions it performs in its capacity of a matter and flux distributing corridor.

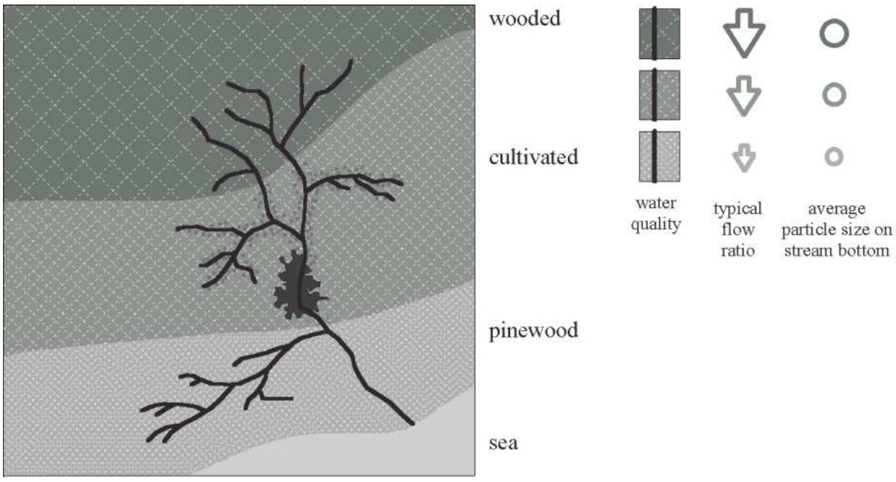


Figure 2. Mosaic and gradient stream corridor models. Gradual change in flow ratio and average particle size on stream bottom (Mininni, 2001)

Such considerations hold also when the river belongs to a semi-arid landscape as in the Mediterranean region, where while losing in terms of hydrobiological complexity, ecological implications of the phenomenon are not lessened.

As regards the relation between landscape and river a gradient variability attains from sources to mouth and from slopes to upland that does not contradict, yet confirms and completes the general interpretation scheme of the river *continuum* (Likens, 1984; Minshall *et al.,* 1985). Therefore it is still possible to speak of gradients when referring to any part of the river corridor. In other words, environmental heterogeneity in the fluvial landscape is described by both the *environmental mosaic* model, as the catchment is comprised of discrete landscape elements (land uses), and the *gradient* model that exhibits gradual landscape changes, both in the longitudinal and the transversal dimension, rather than borders defining landscapes imprinted by the variation of "water parameter" (Decamps, Naiman, 1989)

The "landscape within the landscape" (Mininni, 1990, 1996) figure of speech is intended to describe the the river or the "lama" as distinct, yet not diverse entities than the landscape itself. These partially derive from the crossing of the mosaic and the gradient models and with these establish coherent yet not coinciding relations. In the case of the "lame", the channel is mainly formed by the flowing and backwater environment that create peculiar habitats defined by the big variability related to water. Analogously, a landscape with a "lama", and therefore its catchment, is strongly related to humidity concentration, elsewhere either scarce or limited (unless one refers to the model of irrigated cultivation).

Congruent with such considerations are both interruption and discontinuities elements along the stream, especially in arid climates, and isolated and dispersed elements within the environmental matrix, such as fragmented and patchy elements (small semi- and sub-natural vegetations, humid biotopes, ponds and marshes). All such elements are clearly related to the presence/absence and emergence of ground water, that is the control factor of the scales of the investigation.

Moreover, the condition of crossing or the condition of the two environmental models renders the river the richest part in the whole landscape. Even in arid landscapes, streams become linear oasis where the presence of water is expressed by the concentration of humidity that allows for the survival of a number of rare species (Forman, 1995).

Many species of the matrix depend on the presence of the riparian corridor either for food supply or because they thrive on the interaction between matrix-corridor habitats.

Both along the longitudinal gradient (source-mouth) and the transverse one (channel-upland) the river offers a variety of habitats that differ also for the array of succeeding stages due to environmental controls fluctuation as well as to ever progressing change processes.

2.3 Methodology

For the purpose of both objectives the study takes into account evidence resulting from expert (GIS-based) and local (community-based) landscape analyses preliminary to the establishment of the natural park of Lama San Giorgio (BA) (Mininni, Mairota, Lamacchia, 2001).

The San Giorgio lama was identified as protected area within the framework of a laborious start of the planning of Parks and Protected Areas of the Apulia Region. Before the enforcement of the national (394/1991) regional legislation (19/1997) this region was among the poorest Italian regions in terms of protected areas, recording only 425 ha of area under protection. At present 33 natural parks, equal to 221,000 ha (11.3 % of the regional area), are being established.

2.3.1. Ecological and technical approaches

GIS-based (ArcView®) analyses were carried out at the catchments scale relevant to the spatial distribution and in relation to the drainage network (distance from the coast and distance from the stream) of:

a. main karstic forms (cavities, hollows, dolinae)
b. semi and sub-natural vegetation macro patches (open woodlands, prairies, maquis, garigues, woodlands) and micro elements (isolated trees, trees corridors, hedgerows);
c. habitats for birds (urban, arable crops, permanent crops, vineyards, woodlands, open spaces) obtained by supervised reclassification of the land cover map;
d. current and historical agricultural land uses (e.g., arable crops, permanent crops, vineyards, agricultural complexes)
e. archeological and architectonical relevant sites (e.g., hypogea, settlements, necropolis, burial grounds, tombs, villas, churches, “masserie”, monasteries, “casini”, “iazzi”, stone buildings)
f. concentrated and distributed settlements (high and low density settlements), road networks, current and forthcoming planning regulations
g. demography and relevant sites to local communities

Survey activities were carried out on a detailed scale that were relevant to:

a. description of woodland structure and composition;
b. distribution of land covers, agricultural uses and ecological permeability across stream sections;
c. fauna (amphibian, reptiles, birds, mammals) species diversity in relation to vegetation, as surrogates for detailed demographic data;
d. recent settlement dispersion on the coast.

The corridor structure/function model (Forman, 1995), was used for the interpretation of the results in an attempt to resolve two, non alternative, emerging issues: the unity of the system and the diversity of the parts of which this is comprised (fig. 3 and 4).

To such an end three functional corridor attributes were considered:

a. conduit, as the longitudinal direction of flow and movement (water and organisms);
b. filter/barrier, attaining to the transversal dimension, namely the higher/lower resistance of adjacent land covers/management practices against natural entities of the stream's ecosystems to spread over upland margins;
c. habitat, cross-scaling with respect to its hierarchical organisation, yet depending on the persistence of the other two. This functional attribute is also of great relevance as it provides a context for macro and micro remnants of native vegetation scattered across the catchment area with respect to those associated to the stream. (Fig 3)

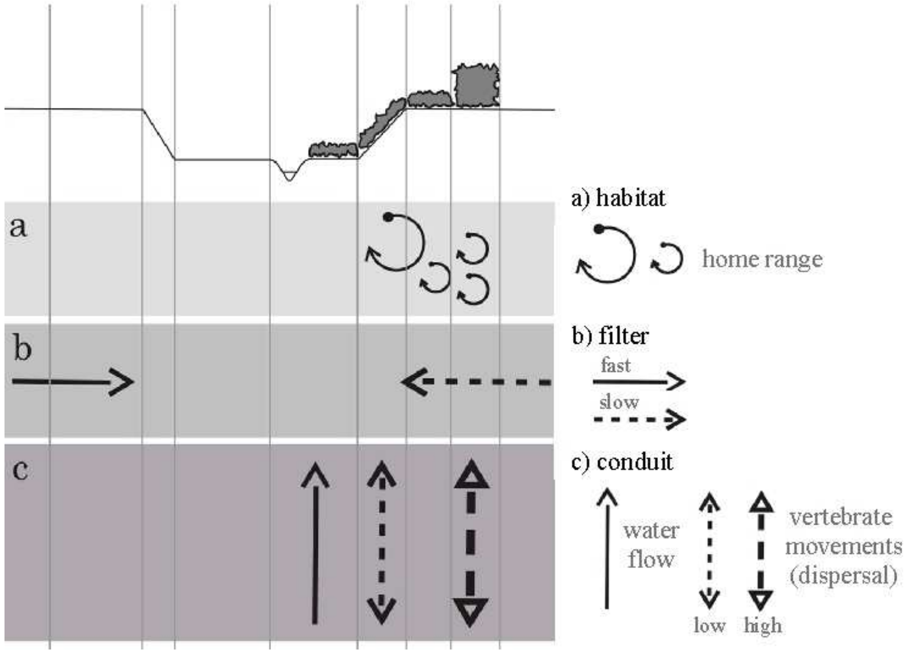


Figure 3. Functions of the corridor, a) habitat, multihabitat species move along the corridor occupying more that one habitat; b) conduit: unidirectional water flow and bi-directional flux of animals, high on the borders and low along slopes; barrier, conduit; c) filter/barrier, fluxes between matrix and corridor, (Mininni, 2001 adapted from Forman, 1995 p.149)

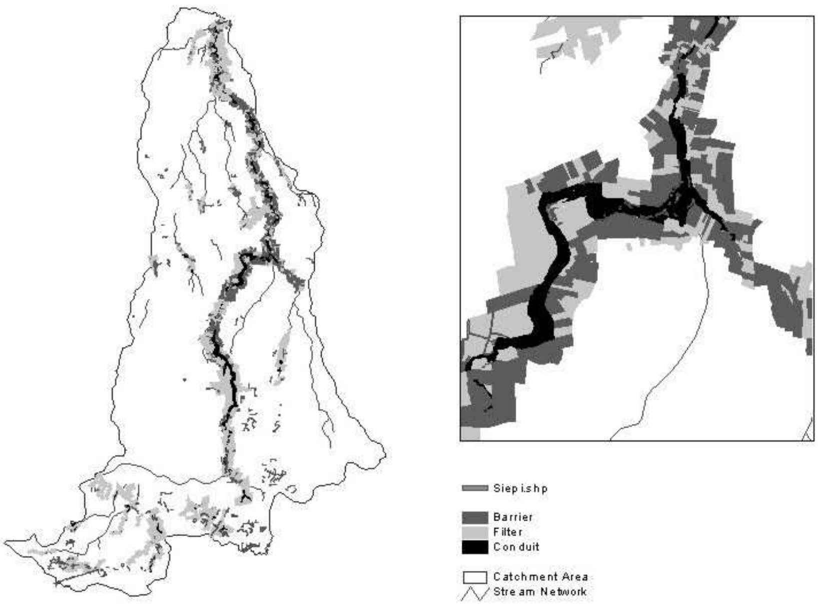


Figure 4. Filter barrier, conduit functions along the San Giorgio “lama”

Moreover the relevance of coast and river influence on the system was tested and the edge width was measured at different scales by plotting land covers against distance to the coast and to the river. It allowed us to individuate *edge land covers*, primarily or only near the borders (coastline or stream sides), *interior land covers* primarily or only distant from the borders, and also a group of *indifferent land covers*, with similar abundance in both edge and interior. The edges' width has been measured as extended from the boarder to the point at which there is no significant change in the land cover abundances on proceeding further (Forman 1995).

2.3.2. Local approaches

This consideration introduces the important issue of the sharing of predictions of the plan for the protected area. "The main elements of difficulty emerging in planning for protected areas in Italy attain the relations between management agencies and local communities. Such relations are often worsened by the absence of landscape planning that would extend the condition of conservation to the entire territory, and integrate development processes" (Peano, 1998). Moving from such a realistic observation, while planning for the Lama S. Giorgio protected area, the progressing knowledge base has periodically been verified with local populations in an attempt for a synthesis between expert and local knowledge that would also account for events, civil and religious rituals that link local communities to relevant sites, all in all constituting the collective memory for those places

In a second phase, planning strategies were discussed with the local communities in order to promote their actual participation in the collective construction of a natural park.

This was attained by organising a few public forums within the boundary proposed for the park intended as opportunities for structured listening that have evolved parallel to the formal investigation/planning work, with modes and times meant to be alternative to institutional ones pre-conferences to be provided for by regional authorities. The latter, by their nature leave less scope to the emergence of visions and expectations of local stakeholders.

In such a way the Province of Bari commission agent of the work fostered the activity of the working group by playing the role of negotiation within the framework of the necessary and undelayable process of involvement of the communities of the protected area (e.g., municipal administrations, trade and environmental associations, entrepreneurs, citizens).

2.4 Results

Both analyses and surveys allowed identification of a "landscape within a landscape". Thus, the inherent hierarchical connectivity levels relevant to the lama and its catchment became apparent.

When the "distance to the river" is taken into account the relevant role of narrow strip of landscape (200-400m) along the river appears evident.

A more "intense" structural, functional (species diversity) and conflicting (with regard to conservation) traits resulted as associated to the erosion incision (lama) and to its seasonal torrential regime, as well as to the constellation of semi and sub-natural vegetation patches, most of which are spatially related to higher order elements of the drainage network.

Moreover also the analysis of current land use regulation schemes at the local level and the analysis of sites perceived as relevant by local communities show a similar spatial pattern (fig. 5).

A distinctive constraints/potentiality character pertains to the whole catchment area, considered as the embedding landscape, according to both natural vegetation spatial arrangement and intensity/clumping of urban and agricultural land covers.

When the distance from the coast is taken into account, coastal and sub-coastal areas can become protected corridors, in the perspective of spatially connecting the coast to the interior land system, so encompassing the vast dimension of the catchment unit.

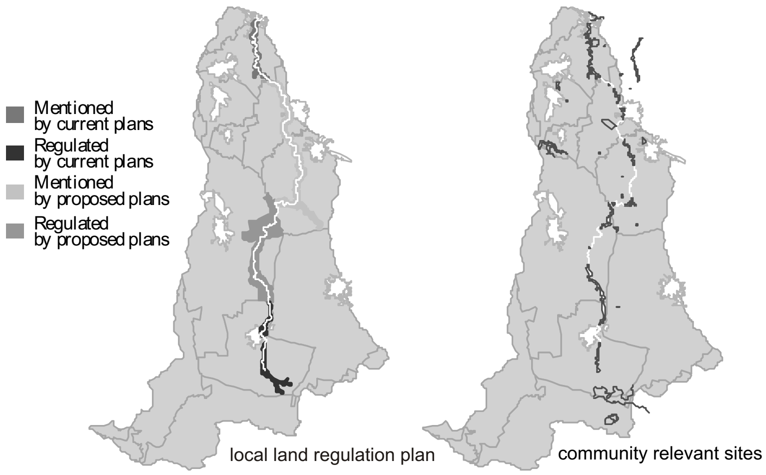
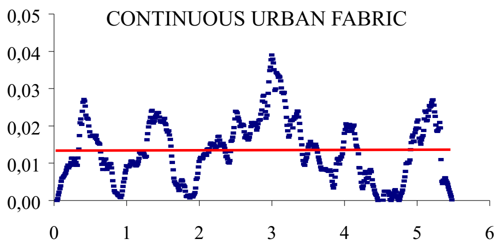


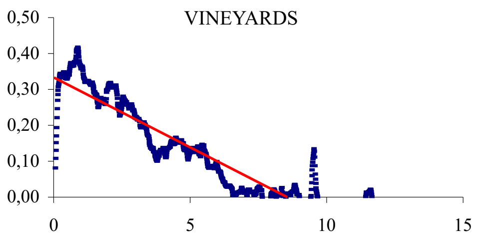
Figure 5. Local land regulation plans and community relevant sites along the San Giorgio "lama"

Table 1. Land covers (%)as a function of distance to the stream (km)

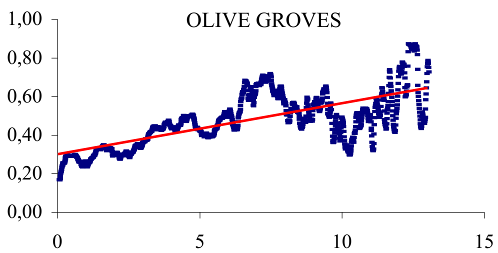
Distance to the river



Some cover seems not to be greatly influenced by the distance to the stream (continuous urban fabric; abandoned urban lands)



Some covers become more intense as the distance from the stream decreases (woodland, maquis, complex cultivation patterns, vineyard, caves, dumps and other artificial non-agricultural vegetated areas, green urban areas, discontinuous urban fabric)



Some covers become more intense as the distance from the stream increases (olive groves and fruit trees, open woodlands, garigues, coniferous forests, broad-leaved forests, hedgerows and trees corridors, open spaces)

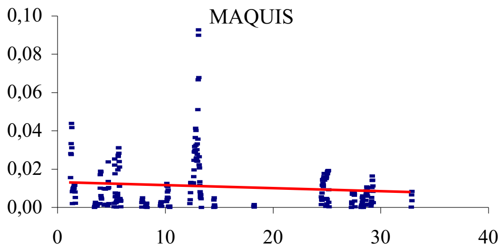
A multiscale observation of these distribution patterns reveals the significant role of the 200-400 metres wide stream lateral stripes.

At the stream lateral stripes scale:

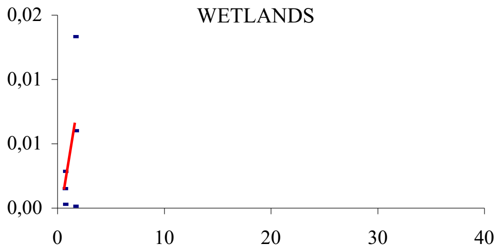
a. some covers (i.e. coniferous forests) are absolutely absent;
b. some covers can be found exclusively there (i.e. woodlands);
c. some covers, becoming more intense as the distance from the stream increases/decreases at the catchment scale, present an inverted pattern just near the stream (i.e. discontinuous urban fabric, vineyards, open woodlands, garigue, broad-leaved forests, etc);
d some covers present the same trend at the catchment scale and at the stream lateral stripes scale, but with a steeper slope (i.e. arable lands, grape olive's yards s and fruit trees, complex cultivation patterns, maquis,)

Table 2. (over-left): land covers (%) as function of the distance to the coast (km)

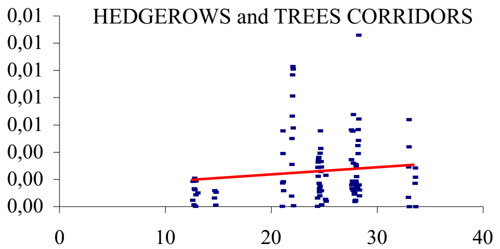
Distance to the coast



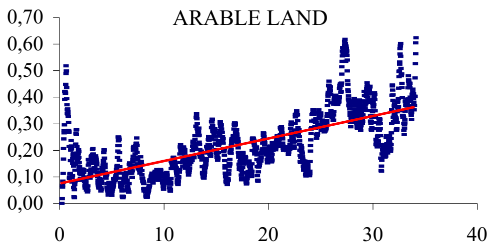
Some cover seems not to be greatly influenced by the distance to the coast (i.e. maquis, garigues)



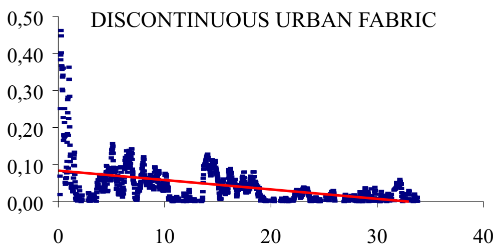
Some cover can be found exclusively near the coast (i.e. poorly vegetated open spaces, wetlands)



Some covers can be found exclusively away from the coast (i.e. Coniferous forests, hedgerows and trees corridors, non-vegetated open spaces)



Some covers become more intense as the distance from the coast increases (i.e. arable land, olive groves and fruit trees, open woodland, broad-leaved forests)



Some covers become more intense as the distance from the coast decreases (i.e. continuous and discontinuous urban fabric, green urban areas, caves, dumps and other artificial non-agricultural vegetated areas, vineyards, complex cultivation patterns)

3. PLANNING ON THE CATCHMENT SCALE

3.1 From analysis to management and planning proposals

The hierarchical perspective allows for the assessment of the functional role of the system of sub- and semi-natural vegetation with respect to both the higher (landscape/catchments) and the lower (ecosystem/community) systems bounding the ecological hierarchy at the scale relevant to this study (Kotliar and Wiens, 1990; Mairota and Mininni, 2000), thus yielding an unbiased identification of emerging opportunities and constraints for integrated planning and management.

Maintenance of corridor functions, as well as the implementation of a hierarchical perspective into management practices require general rules to go beyond both the local scale and individualistic/sectorial perception of landscape elements and to attain a comprehensive perspective. Yet such rules ought to be based upon local and detailed understanding of both ecological processes and the individual manager's perspectives.

Therefore, the proposal for the zoning (fig. 6) of the protected area was worked out considering the three corridor functions as priority options for the setting of rules at the catchment scale. Two main protection categories were adopted: *A zone* relevant to the 'stream' and to the main “natural” components securing the corridor function at the basin scale, *B zone* relevant to the whole catchment.

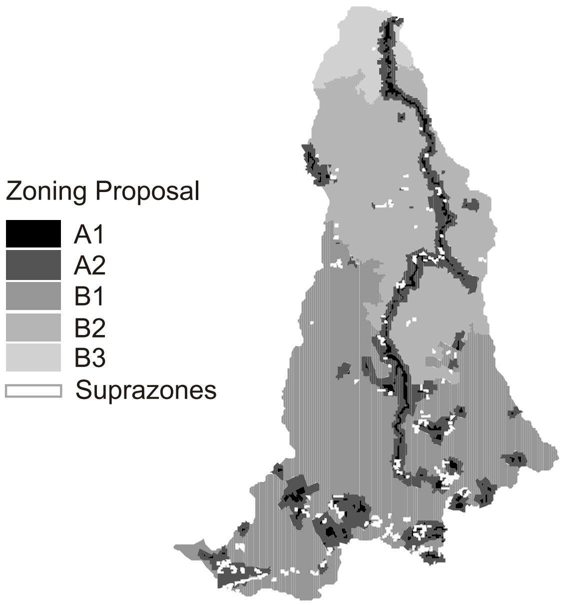


Figure 6. Proposal for the zoning of the protected area

These were further articulated in subzones, corresponding to different degrees of protection/matrix management. Thus, in an analogy to the ecological zoning of the river ecosystem, three distinct landscapes were identified in the catchment. Such landscapes are spatially arranged in a gradient pattern, also corresponding to the distribution of both natural vegetation and wild species (birds). These are identified by three main macro-systems: the most inland one, with the presence of woodland areas, and were the stream enlarges, the intermediate one, were land mosaic is dominated by vineyards, in which the stream is hardly recognisable, the coastal one were horticuture prevails, were antropisation is maximal and were the stream joins the sea.

It is important to note that the identification of two main protection categories (A and B zones) and relative sub zones, rather than referring to the usual zoning concept relevant to different degrees of protection, are relevant to the recognition of two ecological functions of the protected area and namely:

a. the identification (A zone) of the natural drainage network meant as a geological and ecological (A1) domain as well as the domain of its potential structural and functional expansion (A2);
b. the identification of “organized” discontinuities in the environmental gradient pertaining to the emerging of proper sub-domains coastal, sub-coastal and inland (B1, B2, B3).

3.2 Local responses to planning proposals

As far as the outcomes of this planning experience are concerned, considerations of two different orders can be drawn: the former are relevant to the scientific results, the latter pertain to the effectiveness of the planning as a product.

With regard to the former aspect, it can be underlined that the set-up of the knowledge base and planning guidelines, thanks to both a system of organised methodology and the compliance to landscape ecological functions of the stream, appears to be transferable to future investigation/planning processes in other components of the system of streams identified at the Province scale.

As proof for this recent implementation of a similar planning process with regard to the contiguous Lama Giotta catchment, fostered by the same Provinicial authority (Assessorato all'Ecologia della Provincia di Bari) can be reported, due to the will of several local administrations acting for the inclusion of such an area in the list of regional protected areas.

As far as the effectiveness of the preliminary plan is concerned, in order to draw ex post assessment of the planning process, it will be necessary to wait for the accomplishment of the regional conferences, where the proposed boundary and zoning of the protected areas (already approved by the provincial authority July 2001) will officially be discussed with local authorities and stakeholders and, eventually, finally approved.

So far the proposed plan has resulted in a number of bottom up initiatives, promoted by the authorities of those municipalities more directly concerned in the stream. These have, in fact, recognised in the preliminary plan its role as reference tool for the implementation of conservation instruments for the enhancement of the Lama as a resource and created a syndicate that will eventually be enlarged to the authorities of the other municipalities which include the boundary (once approved) of the protected area as well as to environmental and third sector organisations. The ultimate aim of such a syndicate is access to funds through the Regional Operation Programme 2000-2006, Axis 1, Measure 1,6 "Salvaguardia e Valorizzazione dei Beni Naturali e Ambientali", intervention line 2 "Conservazione e Recupero del patrimonio naturale regionale". The design of interventions aimed at the conservation and restoration of sub- and semi-natural habitats as well as the enhancement or the trail network and environmental education centres was undertaken in mind with such an end, thus initiating the actual implementation of the natural park.

3.3 Concluding remarks

This proposal exemplifies the potential for the actual mobilisation of actions and intentions that would legitimate local community aspirations for their territory to become a "park", in the twofold attempt of formalising the existence of a multi-perception/use land system and accomplishing the conceptual need to overcome the simplistic "ecological network" model, towards the more complex "landscape ecological continuity" (Cf. Wiens, 1992 and 1999), in a region where nature and ecological processes are strongly constrained by the artificiality of human land uses and activities.

The protected area, as identified and zoned, would enable ecological continuity along corridor structures, in a more enlarged view of the regional system of "lame", other protected areas and the whole regional environmental system. At the biogeograpfic scale the corridor function of the lama is expressed by the continental paradigm only within the vast and continuous watershed framework, due to the "discontinuities" existing along its course.

Moreover, if one considers that the conditions of the San Giorgio "lama" catchment appeared the most artificial of all the protected areas proposed by law (19/1997I), the present study contributes to the improvement of man-nature relations in Mediterranean landscapes. Hence, the planning proposal aims at suggesting a management programme for this "landscape within the landscape" that results from a comprehensive appreciation of both natural and cultural identity of the place, at different scales, and according to the role assigned to the stream by the local communities and to their expectations.

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