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ECOLOGICAL NETWORKS: THE STATE OF THE ART FROM A LANDSCAPE ECOLOGY PERSPECTIVE IN THE NATIONAL FRAMEWORK

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INTRODUCTION

The good governance principle, that in the Italian culture of.XIII Century is well represented in the Ambrogio Lorenzetti masteripiece, is based on the human induced transformation of some landscape "quality" (Arler, 2000). To reach a better citizens' quality of life is the main aim of this transformation. The necessity to mantain this quality in space and time, strongly affected by universe laws and forces, push today towards new natural resources utilization criteria.

In this paper the reasons and the limits of the managements of landscapes qualities are discussed, also by means of the ecological networks.

WHAT WE KNOW OR WHAT WE WOULD LIKE TO KNOW

The basic hypothesis: the landscape structures and functions relationships

The ecological network idea is based on one of the fondant landscape ecology hypothesis that the landscape pattern (structure) influences and is influenced by landscape fluxes and processes (functions). In particular the landscape pattern influences the biotic processes (e.g. biodiversity).

The metapopulation theory (Levins, 1969) is probably more adapt than other ecological theories to analyze the population dynamics in real landscapes, and it is based on the existence of connected sub populations linked to favorable habitats. Metapopulation dynamics depends on the single sub population dynamics and on the fluxes among sub populations (Hanski & Simberloff, 1997), and then among habitats.

Even if partially, a favorable habitat pattern influences the metapopulations dynamics and the biodiversity.

The estimation of the pattern/process relation this by means of proper parameters (heterogeneity, connectivity, fragmentation), and its management by means of ecological networks would allow us to manage the landscape functions (Forman, 1995; Pino et al., 2000; Val Langevelde et al. 2002, Baudry & Burel, 1998, 1999; Opdam et a l., 2002; Söndergrath & Schröder B., 2002; Vulleumier & Prélaz-Droux, 2002).

As we know these relationships are far to be generalizeable, even all our efforts are in this direction.

Heterogeneity

Heterogeneity is an estimate of the evenness and richness of the landscape pattern. Its variation can affect organism’s interactions, adaptations and distribution (Dramstad et al., 2001; Manson et. al., 1999). It can modify the biodiversity of the most vagile taxa (Atauri & de Lucio, 2001; Farina, 1997; Preiss, 1997; Jonsen & Fahring, 1997; Naugle *et al.*, 1999; Pino *et al.*, 2000) as a function of the dispersal/perceptive level of the considered populations. There is not a single method to estimate this parameter.

Connectivity

Connectivity tries to estimate the functional-specific relationship between ecotopes not necessarily physically connected. Some landscape patterns influence some landscape fluxes (functions, processes: e.g. fires propagation, biotic fluxes, ill dispersal). Connectivity is considered both structurally (assuming that ecotopes contiguity influence landscape function) and functionally.

In a recent review Goodwin (2003) has shown that connectivity is mostly treated as independent variable (e.g. estimating the effect of a structural metric on a landscape process) and rarely as dependent variable.

Besides the intrinsic limits of spatial metrics (scale dependence, collinearity and correlation, lack of robustness, excess of non confrontable metrics), the problem is that *even when* some empirical relationships between the metrics and the studied process are selected, they could be ecologically inconsistent, ignoring critical aspects of the considered function.

For example we can empirically assess that the connectivity of seminatural and agroforestry systems in rural landscape can have a positive impact on biotic fluxes of several small mammals, arthropods and plant (Franco 2000, Barr & Petit, 2001), and on other landscape fluxes (hydrological or sociocultural ones, Franco, 2002a, Franco et al., 2003a).

But the in he case of biotic fluxes the estimated impacts can be irrelevant (Jeanneret et al., 2003) or negative for other populations. Considering organisms with similar vagility, we can for example utilize other ecotopes than the connected ones (e.g. Tattersall et al., 2002; Mabry & Barrett, 2002).

For these reasons it is necessary to reorientate the studies on spatial metrics related to processes toward the effects of the landscape pattern and the behavior of the studied functions *on* the spatial metrics (treated as dependent variables).

The modeling approach is normally used to study the connectivity as dependent variable. It remains fundamental for verifying and formulating new hypothesis, but is rarely tested on the field (*e.g.* D'Eon et al., 2002).

Considering how difficult is to define in a common way the connectivity (Tishendorf & Fahring, 2000; Nikora, 1999; Saura & Martinez-Millàn, 2000), recently it has been used for application purpose the *cost distance* metric (Villalba et al., 1998; Chardon et al., 2003). These metric accounts for the parametric estimate of the ecological quality of ecotopes. The comparison of this metric with other metrics (all treated as dependent variables) has demonstrated its higher efficiency and ecological plausibility.

Fragmentation

A landscape fragmentation process (Forman, 1995) influences its biodiversity causing a reduction of some species favorable habitats and, consequently, an increase of their energy demand for survival (Hinsly, 2000).

This correlation is scale dependent and at the intermediate level (Olff & Ritchie, 2002) it is linked (a) to favorable habitats size and mutual distance (e.g. Jansson & Angelstam, 1999; Whithed et al., 2000) (b) to species dispersal capacity (Naugle et al., 1999; Howel et al., 2000; Delin & Andrèn, 1999); (c) to the differences within and among species (Bowers & Dooley, 1999; Kozakiewicz et al., 1999).

Several works have focused their efforts to analyze the effect of this process on the biodiversity (Battisti, 2004) but the use of fragmentation as a control variable or as a comparison parameter is complicated by the non-existence of a specific accepted measure to estimate it (Tishendorf, 2001; Bogaert, 2003), plus the overlap between indicators used to evaluate it and the ones used to estimate heterogeneity.

Furthermore, it is not as reliable as a predictive tool (conservation management) due to secondary effects such as inter-specific relations, habitat alteration deriving from fragmentation itself and the great variability of the single species reactions (Bowers & Dooley, 1999; Mac Nally et al., 2000; Fauth et al., 2000).

Bissonette and Storch (2002) have written

> *…"the effects of fragmentation can be understood as multicausal, exhibiting thresholds where they are unexpected; are characterized by time lags that may be unpredictable; are heavily influenced by the structural differences between the matrix and the patches ... are heavily dependent on the temporal and spatial scales of observation ... their dynamics are contingent on system history and therefore subject to unpredictable stochastic events. … Perhaps the message is that, at some general level of explanation, ecologists may have predictive power regarding the effects of fragmentation, but complexity is likely to make prediction of specifics difficult or impossible"...*

Scale problems

A common result of the landscape ecology studies on the structures and functions relationship is the scale dependence of the results. In the last decades is actually increased the awareness that the response of the researches heavily depend on the spatial and temporal scale at which the study is or has been done (e.g. Carlie; 1989; Fuhlendorf et. al, 2002; Turner et al., 2001; Brotons et al., 2003).

This led the researchers to riconsider the methods used in the landscape analyses, which tend nowadays to be multiscalar, or to reconsider consolidated results (see, about biodiversity richness and diversity indices, He et al., 2002).

The influence of the scale dependence relations on biodiversity can be summarized in this way (*e.g.,* Baudry J. & Burel F., 1999; Keitt et al., 1997, D'Eon et al., 2002; Söndergrath & Schröder, 2002; Tishendorf et al., 2003; Turner et al. 2001; van Langevelde et al., 2002; Westphal et al., 2003).

? For the organisms that perceive the landscape at small or great resolution with regard to the structures we plan to use to influence their dispersal, the spatial pattern has a limited impact of the landscape biotic connectivity.

? For the organisms that have an intermediate dispersal/perception of the landscape structures we plan to use to influence their dispersal, the spatial pattern has an impact on the landscape biotic connectivity.

? The landscape pattern influence the landscape connectivity on biotic fluxes when favorable habitats extension is limited, and/or the considered metapopultation has low dispersal and reproductive rate.

More over the perception scale can vary with the organisms' life history, that can differ regionally (Farina A., 1997; Green R.E. *et al*., 1994; Kozakiewicz M. *et al*., 1993; La Polla V.N. *et al*., 1993; St. Clair *et al*., 1998; Yahnner R.H., 1983).

Summarizing Landscape biotic fluxes connectivity is metapopulation specific (Opdam, 2002) and sometimes variable during time and among survival strategies (e.g. Jonsen & Fahring, 1997; Tishendorf et al., 2003).

Scale dependence problems are lot limited to biotic fluxes, but has to be considered for the management of other landscape processes like the hydrological (Wayland *et al*., 2003; Wickham *et al*., 2003; Daly *et al*., 2002; Jones *et al*., 2001; Sliva & Williams, 2001; Basnyat *et al*., 2000; Fölster J. 2000; Norton & Fisher, 2000; Spruill, 2000; Trepel & Palmeri, 2002; Tufford *et al*., 1998; Jordan *et al*., 1997; Comeleo *et al*., 1996; Osborne, 1988; Cronan et al., 1999; Pettersen et al., 1992) and cultural ones (*e.g.* Franco et al., 2003a).

So *what* network has to be considered?

How many networks!

If we use biodiversity conservation as the main goal, it's difficult to decide which is the target organism of the network, and to estimate the network effects on other organisms and on other landscape processes (hydrology, economy, etc.).

The concepts like *keyston species* and *umbrella species*, difficult to be operatively defined and with ambiguous empirical results (Simberloff, 1998, Hess et al., 2002; Davic, 2003) are going to be substitute by concepts like *focal groups* (Hess & King, 2002; Rubino & Hess, 2002), *ecological groups* (Dramstad, 2001) or *landscape species* (Sanderson, 2002).

These new approaches account for the behavioral amplitude of the organism in heterogeneous systems and for the implication of the ecology and planning relationship.

These methods are anyhow based on scientific knowledge of the considered landscapes and species. The simple use of red lists is not a substitute of these approaches, but it can be helpful in data lacking situation.

In every case the organism's selection have to be coupled with the spatial population dynamics of these organisms in the considered landscape.

HOW TO LINK ECOLOGY TO THE NETWORKS REALIZATION: THE SPATIAL PLANNING

Several models and empirical results suggest an impact of the ecological network configuration on population dynamics and biodiversity (Fahring & Merriam, 1985; Heinen & Merriam, 1990; Merriam et al., 1991; Burel & Baudry, 1999; Forman, 1995, Franco, 2000; Barr & Petit, 2001; Söndergrath D., Schröder B., 2002; Vulleumier & Prélaz-Droux, 2002; Anderson & Danielson, 1997; Opdam et al., 2002).

But to use this relation we need to estimate the impact of the spatial structural pattern on the landscape process and functions that we would like to optimize.

Actually the estimate should be necessarily space explicit, and the pursued optimization has to be defined by means of the spatial planning of the landscape transformations (land use management and modifications) that we estimate could reach the defined goals.

Policy actions programs decoupled with landscape spatial planning are not necessarily correspondent to the pursued effects (Forman, 1995; Franco, 2002; Jongman, 2002; Madsen, 2002).

It seems that the conceptual model proposed by the Wagenigen University researchers (Opdam et al., 2002) could be useful to describe a good planning process based on ecological sound basis. The model is built by several steps

1. problem definition by means of evaluations tools based on
   ? empirical relation models of spatial structural metrics and landscape functions and processes
   ? multi species (meta)population models
2. Definition of alternative scenarios considering other impacts (socio economics, hydrology, etc.)
3. Decision Support Systems
4. Production of guidelines and technical rules, monitoring the process results to implement it.

To obtain such a process is necessary to reduce the lack of basic and applicative scientific knowledge, necessarily starting from *empirical data*. Without this basic elements the risk is to limit the biodiversity management to a bureaucratic obligation (Franco, 2004).

The scientific framework to be deepened regards the definition of operative methodologies for the ecological group's identification, the development of comparable multiscale empirical studies on structures and function relationships, the definition of shared decision support systems.

In Italy some example of WHR *(Wildlife Habitat Relationships*) to support the ecological networks planning processes do exist at the national level (Boitani et al., 2002) and at the region and sub region scale (AAVV, 2001, 2003). These models are based on the relations between some favorable habitat characteristics and the presence of target species, defined by expert's opinions. They should be empirically and locally validated .

Other developing tools try to estimate relations between spatial metrics and biodiversity by means of qualitative approaches (Biondi et al., 2003). In other cases it's reported the use of DSS at the local scale to estimate the impacts of the ecological network on other kind of landscape functions (Franco, 2000).

The cited examples contribute to create a common reference framework to estimate multiscale effect of planned structures (ecological networks) on landscape functions, inside the conceptual model in Figure 1.

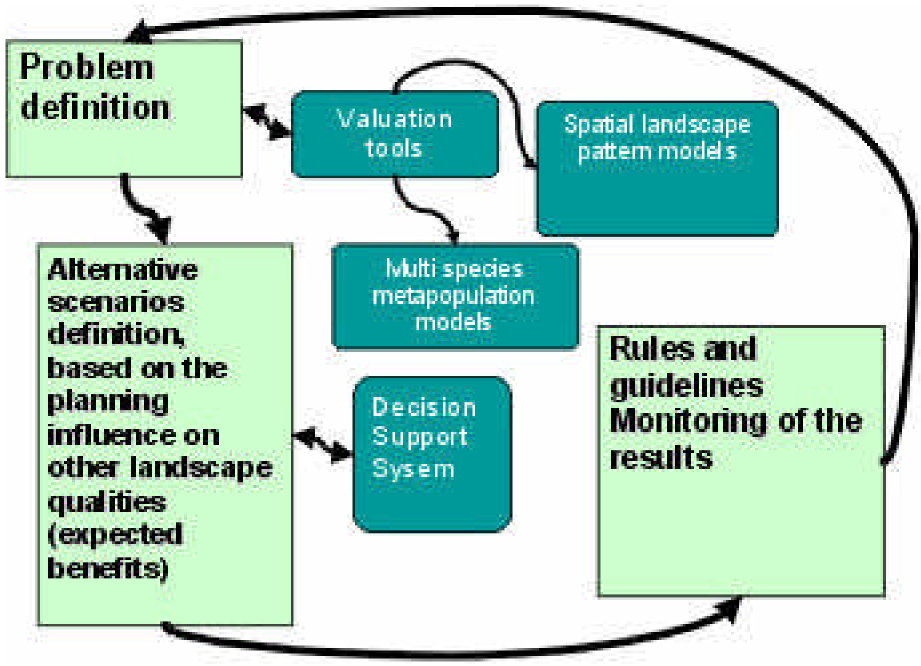

Figure 1 A conceptual model used to link the scientific knowledge and the landscape management by means of spatial planning (Opdam et al., 2002, modified).

Our contribute

A group of the Venice Ca'Foscari University is working on a project research on the ecological network (Franco et al., 2003). Up today the studies undergone (Figure 2) permitted to define some multiscale empirical models of some landscape variable impacts on landscape functions. These kinds of models, even with their limitation, are comparable with other empirical modes built elsewhere and are well suited for planning purpose. The most significant results are reported below (Franco et al., 1996, 1996a, 1999, 2003a, 2003c, 2004; Franco 1997, 1997a, 1998, 2000, 2002; Mannino et al., 2001).

Develop and implementation of a GIS based Decision Support System

The procedure is made up of a sequence of analyses and evaluations that are driven by a GIS-supported assessment of several indices/models. These are calculated from geo-coded measures of structural and functional landscape characteristics and each index/model gives information about some aspect of the landscape. Thus the comparison of several models outputs allows for a global evaluation of the spatial planning goals. The mapped landscape structures (the landscape ecology "patches" and "corridors") are mapped with their dimensional, ecological and economic characteristics in the reference PATCH or CORRIDOR layers. Other landscape characteristics (soil types, hydrology) are inserted in other GIS layers. Variation of the land use in patches or corridors, or insertion or deletion of ecotopes in the GIS, results in some structural and functional landscape modifications, which are evaluated by means of the models output. Optimization of the outputs leads to the spatial planning amelioration goals; the landscape analyses and design specifications are evaluated from several points of view and the results of the choices are clearly shown. The system supports a decision system for the optimum selection of hundreds of afforestation plan designs given spatial planning goals, the economic actor expectation and the environmental constrains. The GIS DSS is continuously implemented and updated with the research results.

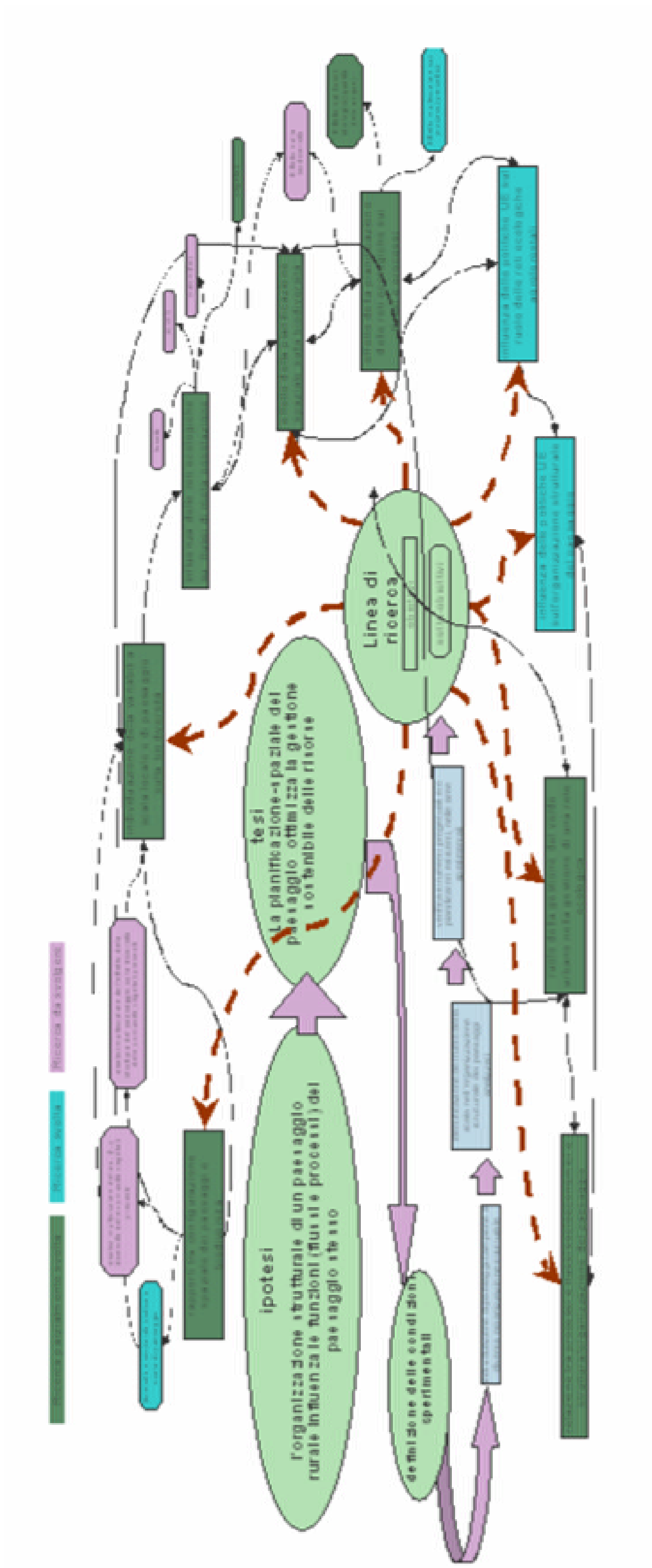

Figure 2 The project research undergoing at the Venice University on ecological networks.

Multiscale analysis and verify of the information consistency of several widespread spatial metrics.

The studies led to the selection of stable metrics at several scale (resolution and extension) and their effectiveness to detect potential biotic fluxes behaviors.

Multiscale estimation of the landscape structures (up to the network) and biodiversity (floristic) relationships at different anthropic disturb level.

Several studies (part of them unpublished) led to the definition of empirical models of local and landscape predictors (local margins structure and management, hedgerow network structure, landscape management and structure metrics) and biodiversity measures (herbs, shrubs, trees).

Multiscale analyses of structural predictors and landscape functions (expressed by dependent variable as water quality and esthetic quality)

The studies permitted to implement empirical models linking local and landscape predictor and i) landscape scenic beauty estimation, ii) water quality. In this case the empirical results are being used (not published) to test the affordability of the management model (NUT) used in the GIS DSS at the landscape scale.

Analysis of the relationship of green urban management an ecological network planning.

The GIS DSS has been implemented for the urban landscape and used to verify the potential effect of a planning and management of the green urban area in an ecological framework management.

THE OTHER SIDE: POLICIES, RULES AND PROGRAMS

Between rules and real landscape: biodiversity and protected areas

To introduce the current conceptual models referred to the ecological network concepts, it seems useful to underline that biodiversity management in our landscapes is necessarily based on an all in approach (Steiner et al., 2000) to be biologically and socially sustainable. A conservation strategy should plan a management integration of different landscape uses, from the agricultural to the urban, or from the forested to the integral reserve (Forman, 1995; Hoestetler, 1999; Pino et al., 2000).

Landscape is a heterogeneous system and organisms (protected and not) use resources in a heterogeneous space and time way. This awareness has led to new and different approaches for the biodiversity conservation (Simberloff, 1998; Sanderson, 2002), that are not limited to the management of protected areas, but mostly to the management of rural and suburban areas (Ricketts & Imohff, 2003). Protected areas are fundamental in the conservation efforts but are not the only and sufficient answer to the worldwide biodiversity conservation problem.

This tendency is not only based on scientific evidences but is socially considered too, being a programmatic element of the nowdays agri environmental policies. The fact that biodiversity conservation is based on the management of rural landscape resources is commonly accepted at the EU level (AAVV, 2002; AAVV, 2002a; Baldock et al., 2002; Ten Brink et al., 2002) and integral part of the new CAP.

Ecological networks: what do we mean

In a landscape ecology perspective the realization of an ecological network should correspond to something able to estimate, forecast and manage landscape functions.

Considering the networking "objects" we can detect at least four concepts (AAVV, 2003) currently proposed to realize an n ecological network.

NATURA 2000

This model comes from the EU Habitat Directive (92/43/CEE) that aims to conserve endangered species and habitats at the European level.

The *ex ante* definition of the elements of the network (*core areas, buffer zones*, *corridors*, etc.) is poorly scientifically based, but this classification has sound management implications.

This model start from a ecologically based analyses to define the protected areas network, but it can't be considered sufficient alone to define *the* ecological network.

Biodiversity conservation is based on the whole landscape context management and not simply on distinct "isles". Yet it is a very useful framework for the subsequent design of the multiscale ecological networks.

Protected areas

Another way to interpreter this concept is to consider the existing protected area as a "system". In this case the driving forces of the model are the logistic and visitors utilization dimensions, at least in the results if not in the intentions. The evaluation scale is based on administrative (state to communes) factors. This approach has a noble and ancient origin but it is far from the landscape diffuse approach remembered before.

System of places

From this side the idea ecological network is mainly projected to ameliorate the landscape socio cultural perception. It's an approach with an important history during the last century, and is linked to the idea of the amelioration of suburban areas by means of connections between urban and rural landscapes. This approach lacks of the ecosystem and dynamic landscape analyses (Bell, 1999), and have been already criticized for the biodiversity effect side (Hess & Fisher, 2001). The scale of analyses and evaluation is decoupled from the complex of landscape fluxes and the ecological term assume an evocative means.

System of ecosystems

In this approach the ecological network can be described as a system of landscape structures (Burel & Baudry, 1999; Forman, 1995; Farina, 1995; Franco 2000), assuming that this macro-structure influences the landscape functions (fluxes and processes) and that we can recognize, describe and then manage its behaviors.

The aims of planning an ecological network is to positively influence the landscape process and functions (mostly the biotic ones) in order to manage biodiversity conservation, ecological hydrogeochemicals cycles, cultural and social processes.

In this approach (i) the concepts of fragmentation and/or connectivity have to have an *measurable* and *repeatable* meaning, (ii) the idea that biodiversity conservation is assured by the protection and by the maintenance of the physical closeness of some places is overcome (Franco *et al*., 2004; Steiner et al., 2000, Anderson, 2002)..

The classical landscape ecology definition of ecological network has the merit to be of functional and not of structural kind, underlying that a system of connected ecotopes of the same type constitute a network (e.g. Forman, 1995).

Using this definition the variation of the scale or of ecosystems considered implicitly does single out the various descriptive categories (components) that characterize the other cited intepretative models. Moreover it makes superfluous the need to state the network ecosystems' multi functionality which is an intrinsic ecosystem property.

This model should become a paradigm for the different descriptive conceptual models in use (APAT, 2003) for its clearness, elasticity and adaptability to the different conditions and situation. Mostly it overcome the need of complex, articulated, elegant or marketable nomenclature.

Even if all of the conceptual way to intend the "ecological network" remembered are currently used in landscape planning, the empirical results of their usefulness in the biodiversity conservation task are far to be clear. Generally they consist in esthetically agreeable working hypothesis that tend to be preferred to the complex reality: the subtle risk exists that we consider "functioning" what is better adapted to our wishes.

The realization: the expression of a social need

Biodiversity is a landscape quality to be protected because it is valued as a shared social value. The ecological networks have been developed to be sustainable transformation tools to protect this and other landscape qualities.

The social welfare it's linked to several factors and to the preservation of several landscape qualities that on the whole define a "social" need satisfaction. Policy tools represent the answer that the society tries to give to reach the best trade off among the different needs as Programs ad Regulations that are concretely realized by Plans - Designs.

The National Ecological Network

The reference programmatic documents to realize the National Ecological Network are a national one (Rapporto Interinale del Tavolo Settoriale Rete Ecologica Nazionale - Programmazione dei Fondi Strutturali 2000-2006; Deliberazione C.I.P.E. 22 dicembre 1998) and a negotiated document with the UE about the 2000 - 2006 structural funds for the Regions Objective 1 (Quadro Comunitario di Sostegno).

In these documents the goals and the criteria that the society undertake to protect biodiversity by means of ecological network are reported, in a sustainable development perspective.

Each document describes the "preferential territorial ambits" (areas), the actions (realization, management and amelioration of ecosystems) and the objectives (sustainable management of landscapes' resources/qualities) for the network realization. The documents are coherent and pursue the same main goal: to protect the biodiversity by means of the amelioration and develop of landscape with cultural and natural values, obtaining in this way a series of socio-economic positive effects (local quality markets, better social welfare in disadvantaged areas).

The difference between the documents attains to the higher importance given to the integration of socio economic dimension in the environmental one, being the negotiated UE document strongly oriented by the sustainability EU policies.

An important element for the documents evaluation is the absence of a bounding relationship between protected area and "preferential territorial ambits". This is a correct approach from the landscape ecology point of view, deeply connected with the necessity of spatial planning and therefore with the estimation capacity of the pursued positive impacts at the landscape scale.

The relation scheme between the "preferential territorial ambits" and the correspondent actions to be developed is synthesized in Table 1.

The sub national ecological networks

The local situation is fragmented and not completely coherent if referred to the national programmatic framework, which exist.

At the regional level exist laws that more or less explicitly recall the ecological networks develop, or that do not refer explicitly to the ecological networks but can contribute to their practical achieving (e.g. regional Veneto Law, 13/2003).

Yet it is at the administrative province and commune interaction level that are reported the most interesting examples. In this case the more and more spread legislative innovation that focuses at the provinces level the *strategic* and at the commune level the *operative* planning process, should address to an efficient ecological networks planning process.

Table 1 Actions to be undertaken in the "preferential territorial ambits" to build the ecological network. This scheme comes from the integrated lecture of the two national reference documents.

preferential territorial ambits	actions
NATURA 2000 site	Ecosystems amelioration and conservation phytocoenosys amelioration and conservation
Suburban and coasts landscapes, with highly conflict natural resources use;	Ecosystems amelioration and conservation phytocoenosys amelioration and conservation Reduction of negative impacts on historical and cultural resources
Mountain and rural landscapes	Connection among more natural areas Ecosystems amelioration and conservation phytocoenosys amelioration and conservation Landscapes hydro geologic amelioration local and quality production enforcement economic diversity implementation Historical and cultural resource implementation Generation turnover Residents welfare
Islands	Habitats conservation Safeguard of primary resources (air, water, soils)

Among the most known and appreciable examples it's possible to cite the province of Milano, Reggio Emilia, Bologna, Cremona, the Region of Abruzzo, Umbria, and others.

Yet up today the local physical realizations and/or the impacts of the single plans-designs achieved it are difficult to be evaluated, because of the passage from strategy to operative actions that is not synchronous and homogeneous, and because of the analyses and design tools that are heterogeneous.

In particular the use of DSS with the characteristics remembered in Figure 1 is not widespread, and this makes difficult to compare at least the planning purpose.

CONCLUSIONS: WHERE WE ARE

The local regulative and programmatic framework is at the moment complex and spatially heterogeneous, and tend to obscure the contacts with the national framework.

The virtuous relation between scientific knowledge and agrienvironmental policies at the EU level is pushing toward the right directions, that is of a diffuse landscape management process by means not only of incentives of the community to pay the maintenance of the landscape qualities, but of their necessary spatial planning.

To go on with the process described (see page 39) it is necessary (i) to fill in a coordinate and applicative way the existing lack of knowledge, (ii) to provide shared and robust DSS, (iii) to define clearly the aims, the structure and the functions of the ecological networks (iii) to maintain a multi scale ecological and programmatic coherence.

What ever are the elements to be deepened in order to reach such process (Franco 200b; Franco et al., 2004) it should be in any case considered that are the ecological characteristics to constrain the planning choices, and not the contrary. This means that are the scale at which the network pattern influence certain landscape functions to define the planning scale relatively to the ecological problem we want to manage (Bombonato et al., 2001; Franco et al., 2004; Madsen, 2002).

Actually it does not exist one ecological network, but a complex of ecological networks at different resolutions correlated each other. From the programmatic point of view it is necessary to state

1. which kind of realization is concerned;
2. what are the actions, the goals and the priority areas to be processed.

The first national guidelines for ecological networks (APAT, 2003) answers partly to the first question. They represent a very good starting point because suggest sound strategies, but should be implemented in the next version avoiding some weakness, and in particular:

- the lack of operative methods for the definition of the ecological groups;
- an excess of design "planning elements" classification; giving actually emphasis to terms semantically linked to environmental conditions is (i) ecologically inconsistent for the fuzzy task (see page 36) to link structural categories (but expressed in a functional way) to general effects on landscape function/processes; (ii) ambiguous from the communication point of view because it induces to esthetically associate some comfortable words (which correspond to maps colors and patterns) to environmental properties, leading to omit the ncessary estimations; (iii) subtly risky from the administrative point of view, because it could led to satisfy a social demand of sustainable landscape management with an offer given by a new fascinating overapped to a list of unmodified condition sites.

The solutions for these weakness points could be the future stronger importance given to the use of DSS with expected and tested performance.

Regarding the second point, the National Ecological Networks' programmatic documents remain the framework to connect the planning-design of lower scale ecological networks, more adapted to the local needs and of variable resolution.

For this reason it should be urgent to map the national "preferential territorial ambits" using the landscape ecology methods and tools. At the same time it should be strongly pursued the operative integration among environmental, rural and urban developing interaction for the biodiversity conservation.

Some lesson to be learnt about the risks of this sustainable landscape management planning tool are reported below.

- The perception of this concept can be affected by than amplitude of the advantages obtained pursuing the primary goal (biodiversity conservation): mostly of the current Italian Objective one structural funds for the ecological network measures are addressed to the local markets development, to the tourist tracks or to the agri tourist offer development, without an explicit estimate of the impact of these investment on the biodiversity and on the other landscape quality objectives pursued.
- The ecological network tend to be considered only as a list of protected areas.
- The plans at the local scale tend to use approaches where the biodiversity conservation is based on statements about designed actions and obtained results that are not estimated or verified.
- The planning process at the provinces scale is not always clearly distinct from the operative lower scale.

But from all that has been done up today and for what is going on from the scientific and social sides, we ca be optimistic about the future role of the ecological network in the sustainable development of our landscape.

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