

P R O J E C T
PLANECO

PLANNING IN ECOLOGICAL NETWORK

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N E W S L E T T E R

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DAU - University of L'Aquila
Department of Architecture and Planning
Montelucio di Roio- 67040 L'AQUILA - Italy
Tel. ++39 862 434113 Fax ++39 862 434143

PRESENTATION

Giulio Tamburini

Planeco, published by the Department of Architecture and Planning of the University of L'Aquila, offers members of the scientific community who operate in the field of ecological networks, and territory administrators the chance to exchange ideas and experiences. Progress in this field, still fairly new one here in Italy, can only be helped by such an initiative.

An international distribution of Planeco is planned, not only to further understanding and gain from the experiences of others, but also because the very nature of the problem that faces us goes well beyond national boundaries. Planeco could also become a reference point for the identification and creation of ecological corridors and a centre which could direct research to where it is needed; all too often research in this area digresses, which in this day and age, given reduced means and budgets is of little help in resolving the problem of ecological continuity.

is to standardize the approach taken by the administration departments responsible for these areas, ensuring uniform action on similar territories. The importance of the ever-changing equilibrium between man and the environment has not yet been recognized or sufficiently understood. This is due in part to conflicting interests that are not necessarily linked to the territory or those who live in it; a better understanding would lead to the convergence of aims and the realization that man and nature share a common destiny.

The four contributions to this first edition of the Planeco newsletter are representative of the central themes of the publication; we hope to be able to add regular features that will keep our readers up-to-date with current studies and experiences. The article by Rob Jongman gives, in clear and effective terms, the basis, limits and necessary definitions with which to correctly confront the argument of networks and



Urban barriers on the coast of Adriatic Sea

It is well known that the Abruzzo contains four large natural parks covering over 30% of the area, the discontinuity however between these parks, which all belong to the same morphological system of the Apennines, is all too apparent. The aim of Planeco here, is shared with that of territorial planning, and that

ecological corridors and concludes with a typological classification which does not try to hide the complexity of the subject. Matteo Guccione explains in his article, the structure and organization of the National Agency for the protection of the environment and its regional offices; the Agency's work at the moment involves,

amongst other things the monitoring of methodologies for ecological networks and the setting up of a support system for planning decisions and to safeguard the environment; it is also responsible for coordinating the activities of several other groups whose work includes the creation of an ecological network. Bernardino Romano brings us up-to-date in his article with the research that is being carried out in Italian Universities

on the drawing up of a map of environmental continuity, an instrument that is essential in national and local politics for the promotion of planning orientated towards bio-continuity whilst Pierluigi Properzi reports the results of the most recent regional legislation aimed at safeguarding environmental resources.

ECOLOGICAL CORRIDORS IN EUROPE

Rob H.G. Jongman

Ecological networks are the result of science based nature conservation. Its basis is founded in biogeography, population dynamics, landscape ecology and land use science. That means, that they do not only consist ecological elements, but also political, planning, land use and awareness components. Without incorporation of these aspects ecological networks cannot be realised.

The basic knowledge on ecological networks are based on insights in landscape hierarchy biogeography, population dynamics and landscape change. Landscape hierarchy is the first basic principle to classify the levels and the systems of ecological networks (O'Neill et al, 1989). Corridors and site of importance on the continental level differ much from those on regional or level (state or country level). Biogeography is important to define the role of species and the national or international responsibility of a region or country. Species have adapted to the cultural landscapes of Europe, because they were accessible and not hostile. Isolation is an important feature in agricultural landscapes of Europe. Even in production forests management can cause isolation of the remnants of

is essential in population survival and the functioning of biotopes. On the one hand animal species will leave a population if living conditions cannot support all individuals, on the other hand species will fill in gaps in populations or sites that became empty. Fluctuations in populations can cause changes in species abundance and species composition of a biotope site. Birth, death, immigration and emigration are the main processes to regulate fluctuations at the population level. Restriction of species dispersal increases the chance of species extinction (Den Boer 1990).

The main elements in the landscape of importance for dispersal are the distance between sites, the presence of corridors and the barrier effect of landscape and land use between. (Opdam 1991). Area reduction will cause a reduction of the populations that can survive and in this way an increased risk of extinction. It also will increase the need for species to disperse between sites through a more or less hostile landscape.

The corridor in the ecological network

An ecological network is successful if it sustains biological diversity through transition and landscape

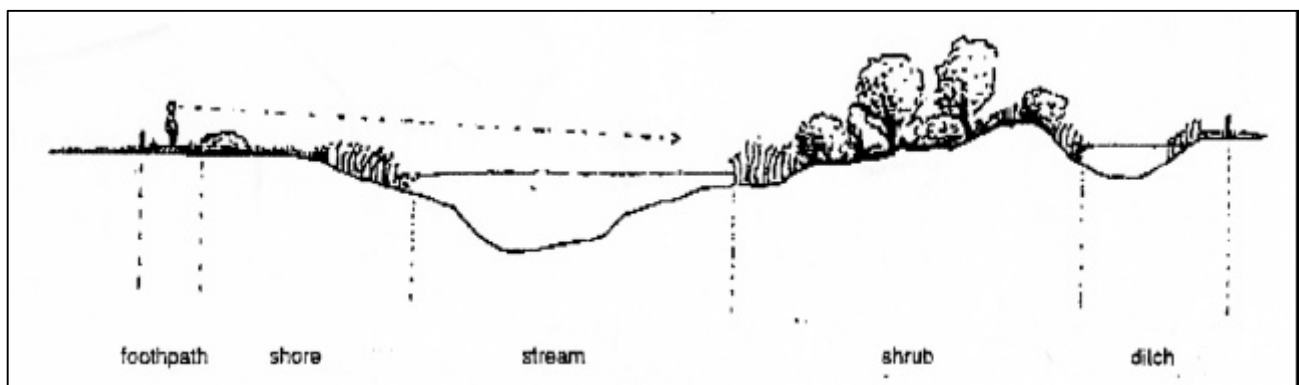


Figure 1. Combination of a trail and an ecological corridor in an agricultural landscape (Elzinga and van Tol, 1994)

natural old growth forests within it (Harris, 1984). The biotopes of the species restricted to natural areas are becoming isolated. It seems that the changes in the last decades and the ongoing changes lead to extinction of many species unless habitat quality improves and the landscape structure is restored. Plants and animals both disperse by wind, water, with help of other species or by own movements. Migration is a specification of dispersal, while it is directed to a certain site. Dispersal

connectivity at all levels where fragmentation, isolation and barriers are found. A European ecological network, an international network, should integrate a set of mutually compatible national networks, being completed themselves by regional and local networks in each country. Ecological corridors are various landscape structures, other than patches, varying in size and shape from wide to narrow and meandering to straight, representing links that permeate the landscape

and maintaining or re-establishing natural connectivity. Ecological links between patches have always existed also in natural landscapes. Most obvious are migration routes for birds, ant-routes, badger routes and river corridors for fish migration like for the eel and the salmon. Nowadays nature needs different types of ecological corridors that have a complementary role to play in an interconnected habitat island system. Like other land uses, they need planning.

Within an ecological network ecological corridors are various landscape structures, other than patches, in size and shape varying from wide to narrow and from meandering to straight, which represent links that permeate the landscape, maintaining or re-establishing natural connectivity (Jongman & Troumbis 1995). Within an ecological network they are mostly multifunctional landscape structures.

Ecological corridors are mostly not monofunctional in an ecological nor in societal sense. They are no core areas but function in the wider landscape. In the USA and Australia, corridors are in general named 'Greenways'. In their classification they can be as wide as a watershed or as narrow as a trail (Florida Greenways Commission, 1994). They can encompass natural landscape features as well as a variety of human landscape features and are from more natural to more cultural classified as:

- landscape linkages, large linear areas between large ecosystems including undisturbed rivers;
- conservation corridors, less protected and in many cases with recreational functions;
- greenbelts, natural lands surrounding cities to balance urban and suburban growth;
- recreational corridors, linear open spaces with intensive recreational use;
- scenic corridors, primarily protected for its scenic quality;
- utilitarian corridors, canals, powerlines that have an utilitarian function but serve natural and recreational functions as well;
- trails, designated routes for hikers, outdoor recreation with a function as natural corridor.

Rivers and small streams play an important role in this classification especially in the first two nature conservation oriented greenways.

Definition, form and function

The term 'corridor' has appeared very early in the literature to refer to long range dispersal (Simpson, 1936). The current use of the term 'ecological corridor' has been recommended by Preston (1960) who has attributed it significant properties in spatial population dynamics allowing the increase of size and enhancing the chance of survival of smaller populations between preserved patches. A definition that is acceptable in a European context and can be used on local and regional level is: *Ecological corridors are landscape structures of various size, shape and habitat composition that maintain, establish or re-establish natural landscape connectivity, supporting the favourable conservation status of species and habitats.*

Favourable conservation status refers to the EU-habitat directive where this is used as the general objective and reference for proper management. The more complex a corridor is, the more it can be multi-functional. An increase in immigration rate that will help to maintain species number, increase population size, prevent inbreeding, and encourage the retention of genetic variation can be judged as the main advantage of corridors (Simberloff and Cox, 1987). Corridors also increase the foraging area for wide-ranging species and provide possibilities to escape predators and disturbance. Of course, they also can have negative influences: the breaking of isolation and exposing populations to more competitive species; creating the possibility for the spreading of diseases, exotic species, and weeds; disrupting local adaptations; and facilitating spread of fire and abiotic disturbances.

Ecological corridors and stepping stones can be essential for long term persistence of species. Ecological relations are found to be of all kinds, through the air, in the water and on the ground. Their spatial scale can differ from local to continental and global. As the distance between suitable biotope sites increases, the number of species that can bridge this distance decreases. Ecological corridors can be of all kinds as well, and that makes it difficult to define them and to realise them in practice. Functions of ecological corridors are defined through ecological research, planning makes them to multifunctional structures, including ecological ones.

A typology of ecological corridors may be proposed relating to attributes such as shape, position and structure. As an example, in Slovakia the following types of corridors have been described Miklos (1996):

1. according to their relative spatial position to core areas (biocentres):
 - conjunctive corridor, connecting two core areas,
 - "blind" corridor, no core area in one end ('peninsular wedging')
2. according to their structure:
 - continuous corridors, without gaps,
 - interrupted corridors, "stepping stones", "diffusion by jumps",
3. according to their topographic position:
 - on ridge positions, divides of watersheds,
 - in valleys,
 - on slopes (transversal),
4. according to their shape:
 - line-like (typical example: ecotones),
 - belt-like,
 - belt-like for water flows (as specific type of belt corridors),
 - diffuse (created by a mosaic of different landscape elements without marked direction).

In landscapes where multifunctional land use is required, for instance where outdoor recreation and nature use the same space a well designed structure including physical barriers for man can help to construct quiet ecological corridors alongside trails. The trail should be close to nature to allow walkers to

enjoy nature, but the shelter of the natural species should not be influenced. In the Dutch lowlands this is done by designing trails and ecological corridors with eye contact and with preventing physical contact (*Figure 1*).

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PLANNING OF ENVIRONMENTAL CONTINUITY IN ITALY

Bernardino Romano

The aim of the Planeco Project is to define the primary criteria for strategic environmental continuity in the Appennines in order to establish the planning necessary, at all levels, to conserve or restore the ecoconnective potentials for biological mobility (faunistic and vegetative).

Three Italian universities are currently involved in the Planeco Project: the University of L'Aquila, the University of Camerino in Ascoli Piceno and the University D'Annunzio in Pescara. The research conducted up to now has leant on the activity of the above-mentioned universities in environmental planning and also on the experience of researchers both here in Italy and abroad. The research programme involves several different areas and has been spaced over a period of time. Preliminary studies of methodologies and planning criteria, arguments that tie in strictly with environmental continuity, led to the organisation of a territorial information system (SIT) containing a considerable amount of data on eco-connections.

Further methodological studies and territorial experimentation are currently being carried out by members of GIS in the Parco Nazionale dei Monte Sibillini and the Parco Regionale Sirente - Velino, both protected areas of central importance for guaranteeing biological exchanges in the central Appennines. A study of planning criteria for a regional ecological network in cooperation with the Abruzzo Region is also planned for the near future. The differing methodologies that are now used in park planning, treating parks as part of an environmental network and not isolated entities, constitutes an essential line of research and has already been well documented in published literature.

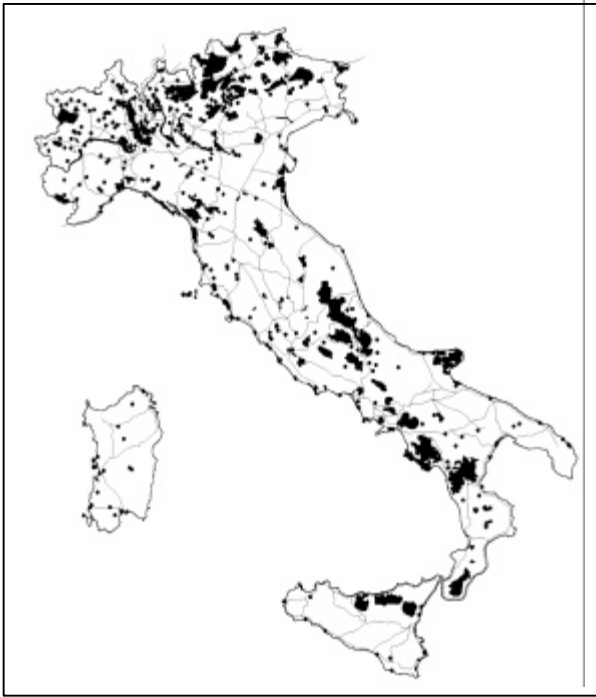
Contacts have been established with other national and international bodies that work in the same field and collaboration with ANPA (National Agency for Environmental Conservation) ways of keeping up-to-date with what is happening in different European countries. Work contacts with the the INU (National Institute of Town Planning) have already yielded positive results such as the insertion of a demand for ecocontinuity in new regional legislation (with notable



Environmental lines in Central Apennines

success in Basilicata and Molise).

Further initiatives taken by the research team include a WEB site giving bibliographical information and up-to-dateneews (<http://dau.ing.univac.it/planeco.htm> linked to http://sinanet.anpa.it/reti_ecologiche/), publication of the PLANECO letter in English and the incorporation of a territorial planning course (treating aspects such as environmental connections; their importance in terms of the territory's natural assets and guidelines to methodology) into the degree programme.



Protected areas in Italy

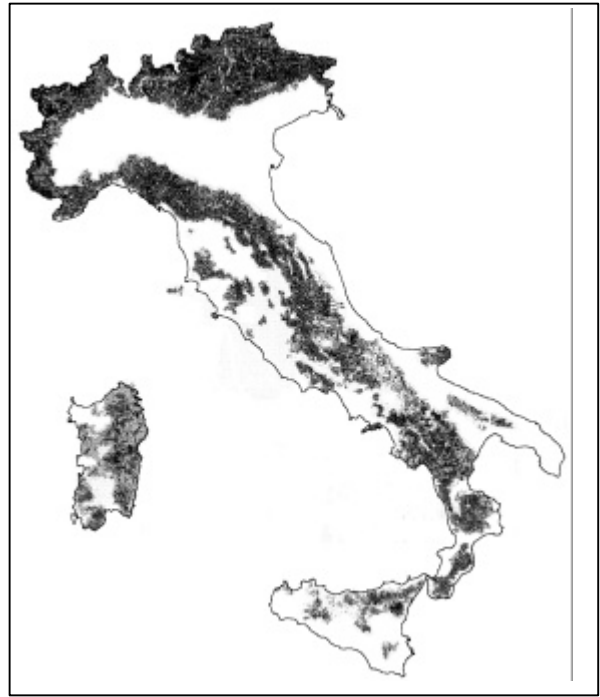
One of the most significant results of PLANECO research so far is the development of the Territory Information System (SIT) on environmental continuity in Italy.

This system was initially prepared using data concerning national soil use; categories of use were studied in relation to their level of bio-permeability. The lowest resistance to biological movements was found to be in forest areas whilst low levels of bio-permeability were found in urbanized areas. Intermediate levels of bio-permeability were observed in uncultivated land and pastures whereas different values were observed in land used for agriculture.

The study of land use on a national scale, carried out in 1976 (Geotecnico Mountain Map) and in 1992, the Corine Land Cover Land, was of a categorial nature and only agricultural land, which varied greatly in use, was described in detail. Work on the environmental continuity map in Italy has revealed areas of environmental homogeneity (i.e. territories of high potential bio-permeability) and areas of broken environmental continuity, at the limits of reversibility.

A picture of the elements of bio-continuity was obtained by comparing this information with the maps of protected areas and a hydrographic map using the GIS methods.

The network of infrastructures and settlements was then incorporated into the map; complex barriers (the contemporary presence of infrastructures and highly populated settlements that create physical obstacles to bio-continuity which can only be crossed by certain structures such as railway tunnels, motorways and railways or viaducts and bridges) and less obstructive barriers such as roads or less populated settlements that are an obstacle in terms of disturbance and noise created by traffic and normal human activity. Complex barriers divide the environment into smaller



System of biopermeability soils in Italy

environmental units within which, nevertheless, biopermeability still exists; these smaller units can be renewed by planning measures that are not too drastic in nature.

In the cases where research has revealed greater environmental fragmentation of the territory the only possibility of recovery lies in medium and long term planning action on a national level.

Two important aspects have emerged from the research. These are briefly:

1) the importance of uncultivated and degenerated land in the renewal of environmental continuity and the creation of ecological corridors; this land is all too easily written off with "no action necessary" or "potentially good area for building development" on the basis of the equation "no explicit or localized



Physical obstacles to environmental continuity in motorway

environmental qualities = building projects will have limited environmental impact". This is typically the case for uncultivated or abandoned land which is generally held to be of little worth in terms of

environmental quality. However this land has "relational" value, a value which emerges from an overhead view of the situation. "A national system for protected areas" cannot therefore be established without taking into consideration spaces of minimum natural or semi-natural value.

2) the importance of the Central Appennines, an area which has seen little fragmentation and is home to many rare species such as the bear, the wolf, the otter,

the chamois and other ungulates. The natural compactness of these territories which are reinforced by over 500,000 hectares of reserves, regional and national parks and the absence of massive barriers make them priceless in terms of environmental continuity between south and north Italy; hence research in this area, although extremely stimulating, carries a great deal of responsibility.

ECOLOGICAL NETWORKS IN NEW ITALIAN REGIONAL LAWS

Pierluigi Properzi

Urban legislation has taken a new direction over the last few years, branching away from traditional values that were introduced by law in 1942; city planning was then based on a structural and functional organization and this law established the use of areas and imposed certain building restrictions. However, for a series of historical, economical and cultural reasons this legislation failed to adequately protect the territory and the situation was exacerbated by a defensive and ideological approach. Furthermore this legislation delayed the development of urban studies along more pragmatic lines. Successive regional legislation enjoyed little success due to the absence of laws regulating the right to construct and the price of expropriation. Regional legislation in the 90's has taken a new direction, abandoning the defensive position adopted in the past (numerous restrictions, red tape

experimental rather than ideological nature. These changes have also been brought on by the fall in construction and new types of urban demand (quality and not quantity).

Two new themes are emerging in today's legislation which can be summed up as: - the identification of real planning objects and subjects (not only institutional) and the relationship between them (not hierarchical but cooperative); - the adoption of conceptual (capability, transformability and sustainability) and operative references (the evaluation of transformability) in relation to the ecosystem.

Removing the city from the centre of planning and implementing a well-orchestrated planning process are two tasks that are linked; planning in fact has a strategic dimension (restoration of the territory, re-equilibrium of the environment) as well as a practical one (agreement and participation). This type of planning therefore recognises the relationship which links man to his territory (complexity-sustainable lifecycles, entropy, the reticulated and interrelated biodiversity of biotic systems); planning becomes an instrument that participates in the restoration of the environment and is not simply an end to itself.

Ten years on from the introduction of Law 431/86 on landscape planning, and on the basis of studies (Magnaghi - Gambino - Scandurra) many regional laws have introduced important new changes; specific attention has been given to the safeguarding of woods, marshland and farmland. However numerous by-laws have thwarted attempts to establish a joint regulation by reproducing the ideological confrontation between the conception of the city at the centre of planning and ecological planning. Nevertheless several themes can be identified in this legislation that can act as pointers for future legislation.

The concept of the environment/territory as a whole (biologically, historically and aesthetically) which is found in different legislation must be put into planning action. The use of GIS in this sense is open to criticism as it leads to an exaggerated description of the content of the planning. Some recent proposed legislation (Basilicata and Emilia Romagna) however contain methodologies with a reduced descriptive content. This legislation provides for an agreement, in the first place, between councils and parks and secondly, a restoration project of the environment, a common feature of all plans and conditions the revision of law 183/85.



Efficient Units of Environmental Continuity (EUEC) in Italy

etc.) and incorporated the results of the most up-to-date studies and implemented contractual and planning methods; laws and planning today are of an

Regional laws for example in the Basilicata, Molise and Abruzzo are introducing the concept of ecological networks and are trying to overcome the zoning of National parks established by law 349/91 which has proved unworkable and the centre of many conflicts. New regional laws must however consider ecological networks (large areas- corridors-buffer areas-stepping zones) as the object of planning on varying levels and then on a project (what to do) and process (how to do it) level.

THE ROLE OF ANPA IN ITALY

Matteo Guccione

ANPA is a new national body that has been set up to deal with environmental problems and is the central part of a system made up of more than twenty local agencies. This system, introduced in 1994 by law no.61, was the outcome of a national referendum concerning environmental controls and organization.

The law outlines activities for the protection of the environment and focuses mainly on monitoring. However many activities such as promoting research, collecting data, data management, cooperation programmes, technical and scientific support, development of methodology, definition of standards and procedures, etc are also aimed at the conservation of ecosystems.

The bodies charged with these tasks are the National Agency of Environment Protection (ANPA) as mentioned above, and regional agencies one for each of the Italian Regions. ANPA works at a national and international level, coordinating the activities of the regional agencies as well as participating in European programmes (in particular with the EEA - European Environment Agency and EUROSTAT - European Statistics Institute). ANPA is, also, responsible for advising and supporting the Ministry of the Environment and other public offices.

As far as ecological networks are concerned ANPA is currently gathering existing data on the subject in order to be able to develop criteria and tools that will be of use in Italian nature conservation programmes and landscape planning.

The concepts of applied ecology are becoming an integral part of planning and management of territory and natural resources; Italy has fallen behind the rest of Europe in this respect, probably due in part to the lack of a national reference centre but is currently looking at ways of inserting these concepts into national legislation.

In line with the European Directive 92/43/CEE - "Habitat" a study was set up by ANPA consisting of five research programmes; the first of these, completed in 1997, consisted of identifying Italian and European initiatives, research groups and other bodies active in this field; the second programme, now underway, is a joint study of planning methodologies for the monitoring of ecological networks by ANPA and regional and provincial environmental agencies; the

Work in this area is being carried out by the Department of Territorial Planning of the University of Rome "La Sapienza" - Prof. P. Jacobelli (SIT.H.E.L.I.O.S) and the D.A.U. of the Engineering Faculty of L'Aquila (PLANECO). The research underway concerns operational techniques for ecological networks; multidisciplinary criteria that have to be adopted in order to solve the problems at the basis of the administration of the territory-environment.

third programme is a feasibility study for a support system for planning decisions which will safeguard ecosystems and landscapes; the fourth programme, which is expected to be implemented next year, will define national protocols for restoration of natural structures and landscapes; the last programme, will put together the results of the other four programmes in order to create the first official guidelines for improving territory management.

The programme for 1998 concerning monitoring methodologies is being carried out by local environmental offices and there are a total of 11 study cases.

The results of these studies will be used as a basis for defining future methodologies for varying environmental contexts. ANPA is responsible for the coordination of this programme, ensuring a uniform application of methodologies and analysing the data obtained for institutional purposes.

The project concerning ecological networks is obviously an "open" project, in which all those interested are welcome to contribute and co-operate.

One of the best ways of keeping in touch with the ANPA work group on ecological networks is to follow the open forums and workshops that are integral part of the project. The following workshops are programmed for the near future:

1. "Rural landscapes of tomorrow: natural and semi-natural ecosystem management and ecological continuity in extra-urban land" (in partnership with ARPA Piemonte);
2. "Ecological networks in mediterranean areas: a new perspective for the protection of ecological continuity" (in partnership with CIHEAM - Bari, Apulia);
3. "Nature in the city: towards a new ecological role of the greenspace in the urban texture" (in partnership with the Province of Milan, Lombardy);
4. Eco-connections in Appennine territories, areas of great environmental value and bio-diversity (in partnership with DAU - University of L'Aquila, Abruzzo)
5. "Ecological networks in the context of urban-rural relational areas: the role of urban fringe of larges cities" (in partnership with the Dep of Botany - University of Catania, Sicily);

The authors of this issue

Matteo Guccione

Coordinator of Ecological Network Working Group
ANPA, National Agency for Nature Conservation
Via V. Brancati 48 – 00144 Roma EUR
Italy
guccione@anpa.it

Rob H.G. Jongman

WAU, Dept. of Env Sciences, Land Use Planning Group
Gen Foulkesweg 13, 6703 BJ Wageningen
The Netherlands
rob.jongman@users.rpv.wau.nl

Pierluigi Properzi

Secretary of National Institute of Town Planning (INU)
DAU, Dept. of Architecture and Planning
University of L'Aquila
Montelucio di Roio – 67100 L'Aquila
Italy
Properzi@tin.it

Bernardino Romano

DAU, Dept. of Architecture and Planning
University of L'Aquila
Montelucio di Roio – 67100 L'Aquila
Italy
Romano@dau.ing.univaq.it

Giulio Tamburini

Dept. leader
DAU, Dept. of Architecture and Planning
University of L'Aquila
Montelucio di Roio – 67100 L'Aquila
Italy
Tamburini@dau.ing.univaq.it

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