

# **Analytical methodologies for natural areas values assessment in the framework of Green Infrastructure approach**

**Report of the meeting held in Barcelona within the GreenInfraNet project  
(4th-5th December 2012)**

## **1. Introduction**

As a general concept, Green Infrastructure refers to the system of open areas (rural and natural areas, as well as urban green areas) that is crucial to maintain structures and processes vital for human needs and welfare. This refers to multiple services to society as regulation, support, supply or cultural and intangible values.

Due to the complexity and diversity of these ecosystem services, it is really important to identify them and, if possible, to locate on land, to evaluate their degree on functionality and, when necessary, to protect and/or to restore them. During last years, some very significant initiatives have been developed in this sense. One of the most relevant is the Millennium Ecosystem Assessment, initiated in 2001 after a call from the United Nations. The objective was to assess the consequences of ecosystem change for human well-being and the scientific basis for action needed to enhance the conservation and sustainable use of those systems and their contribution to human well-being. Main results are already available and are the basis for many initiatives on ecosystem services assessment, protection and restoration.

At the European level, different projects are being developed through the European Commission Joint Research Centre, and other European research teams. Actually, Action 5 of the EU Biodiversity Strategy to 2020 calls Member States to map and assess the state of ecosystems and their services in their national territory with the assistance of the European Commission. Thus, under the mandate of the European Commission several coordinated analysis are being executed to support a coherent framework to be applied by the EU and its Member States.

This report wants to summarize the contributions presented during the meeting held in Barcelona (4<sup>th</sup>-5<sup>th</sup> December, 2012) about analytical methodologies for natural areas values assessment in the framework of Green Infrastructure approach (GreenInfraNet project, Interreg IVC Program).

## **2. Landscape ecology principles and utility for Green Infrastructure**

In recent years, and mainly based on concepts from the discipline of landscape ecology, the important role played by the whole system of open areas – what is called the ecological matrix – has been highlighted, along with the subsequent need to address the planning and management of the natural systems as a whole. As a result, the strategy for natural areas should not only depend on the protection of certain areas of interest or the establishment of networks of protected areas, rather should include the whole territory as a functional unit subject to planning and management, in order to succeed in the conservation challenges posed. The value of natural areas should therefore emerge from a comprehensive approach in which every open area plays its role and they must be planned and managed with those criteria. This is one of the backbones of the Green Infrastructure concept.

In the Mediterranean context, this approach is even more necessary, as the landscape is dominated by a mosaic of land uses leading to an extraordinarily rich, diverse and complex area. All open areas form a system of vital importance in the maintenance of ecological and territorial processes. Consequently, the preservation of natural elements and processes can hardly be based on the perspective of natural parks, or even networks of protected areas, as most natural dynamics strongly depend on the whole matrix, which also contains many of the key natural values of interest.

The protection of the Mediterranean mosaic, both in terms of its natural and cultural values and the overall functionality of the system, cannot be limited to preserving the open areas from the urbanization processes in the medium term. It must also provide them with an ecological, social and economic project as the only way to ensure their long-term persistence and sense.

There is currently the conviction that the most effective way of protecting natural systems is through a more integrated approach to land management: strategic spatial planning. to maintain and improve the functionality of ecosystems, and to reduce the impacts of urban settlements and infrastructure on natural systems. In this context, spatial planning based on the existence of a functional system of open areas should necessarily incorporate the analysis of the attributes and values of these areas from a multidisciplinary perspective, which incorporates its natural, economic and social values.

This is the origin of the SITxell, a GIS project concerning territorial analysis, developed by the Diputació de Barcelona (Barcelona Province Council). The project is structured

through different layers of geographical information and intended to study and evaluate the open areas of the province of Barcelona.

SITxell is a land information system organized in thematic modules. These include the different aspects involved in the definition of intrinsic and strategic interest of open areas and they allow an analysis of the significance of these areas on the basis of their geological, botanical, faunal, ecological, social and economic characteristics, using both basic parameters and complex indicators. The conceptual structure of the system is as follows:

- **Environmental Modules.** These include geology, hydrology, flora, vegetation and habitat, fauna, landscape ecology, cultural heritage and landscape.
- **Land-use Modules.** These include socioeconomics, general and specific land policies and laws, urban planning, transport infrastructure and technical services.

Each module consists of several layers of basic information and layers of specific evaluation, which are the result of expert analysis and assessment, and the weighting of various parameters by the expert partners.

Because of its conceptual and technical characteristics, territorial information contained in SITxell can be used on different scales and at different decision-making levels - one of the fundamental objectives of the project. The reference scale (1:50.000) allows almost direct implementation of the assessments for plans and projects on the macroterritorial level (up to 1:25.000). As you work in greater detail (1:10.000 in urban planning, for example) or in more specific projects, there is obviously a need for additional work to adjust the generic information to the particular features of each case.

In general, SITxell is applied in three broad territorial fields, and therefore working scales:

- **Municipal:**

The most common use at this level is associated with municipal urban planning, but often the tasks are linked to planning, management and/or publicizing natural heritage. In addition, advice is also provided to municipal councils on projects affecting their territories.

- **Network of Natural Parks:**

As part of the work on the Natural Parks managed by Barcelona Provincial Council, continuous reviews of the spatial plans are taking place. SITxell information is one of the starting points when considering new areas for protection and/or new criteria for

protection and planning. In addition to specific principles for new spatial plans, the broad territorial view offered using SITxell provides a framework for protected areas in the whole network and establishes, for example, protection for areas of interest for connectivity.

- **Regional:**

Within the regional planning programme of the Department of Territory and Sustainability (Government of Catalonia), Barcelona Provincial Council has assisted in the planning of open areas in the Barcelona region. The strongest involvement has been during the development of the Plan for the Metropolitan Region of Barcelona. The SITxell project has been one of the keys to establishing the natural areas with special protection (228.000 hectares, 70,4% of the area of the Barcelona Region) and to making the Strategic Environmental Assessment of the overall Plan. In addition, SITxell has been used to improve the integration of projects proposed by other administrations, as in the case of several transport infrastructures.

More information available at [www.sitxell.eu](http://www.sitxell.eu)

### **3. Habitats and Biodiversity**

In the framework of the SITxell project, several analytical methodologies were developed for the assessment of open areas of the Province of Barcelona. Different teams of experts (geology, hydrology, flora and vegetation, fauna, ecology) developed *ad hoc* methodologies for each matter. Here, as example, we present a summary of two analytical methodologies for the assessment of the interest of the territory because of its values associated to flora and vegetation, on the one side, and nesting birds, on another side.

#### **3.1. Flora and habitats: botanical value of the habitats**

The Group of Geobotany and Vegetation Cartography (University of Barcelona) developed and applied an index aimed to analyse and evaluate the territory of the Province of Barcelona as a whole, using homogeneous criteria, so that it may be used within the SITxell for land analysis and planning. The basis is the habitats map of Catalonia (1:50.000), which was considered to be the most suitable owing to its spatial and thematic resolution and because it covers the whole Province of Barcelona. The information contained in the map was complemented by bibliographical information about flora and habitats.

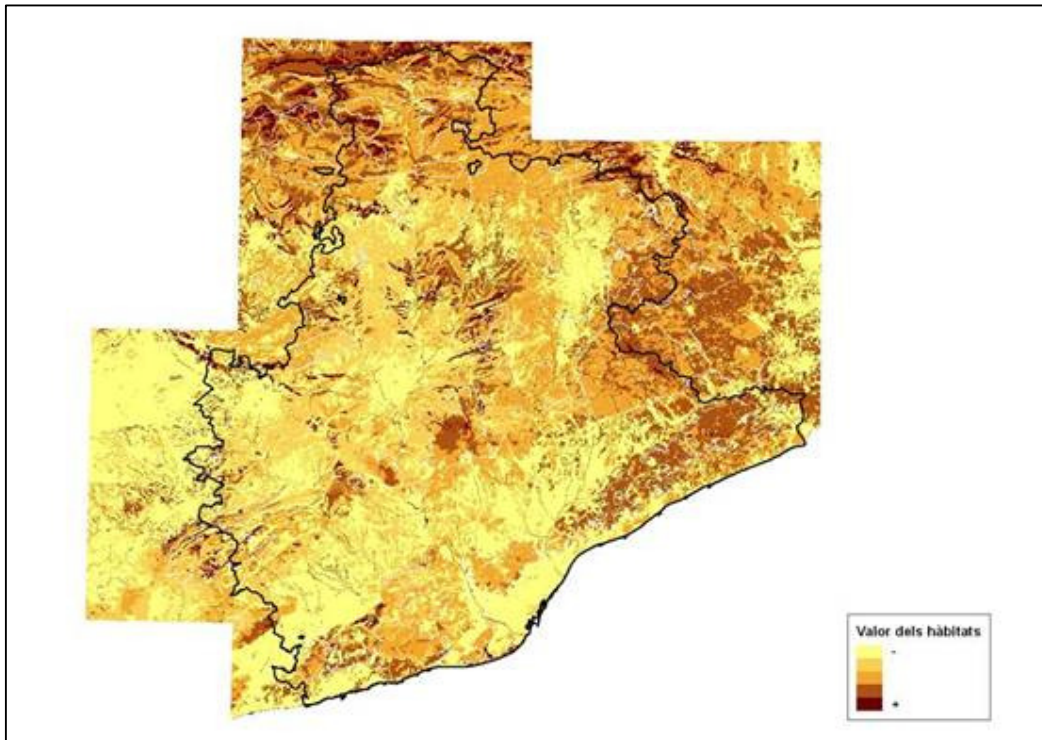
The parameters used for the evaluation of each polygon of the habitats map were divided into two different categories: Indicators of Intrinsic Interest of Habitats (referred to general features of each habitat), which form the Index of Intrinsic Interest of Habitats (IIH); and Indicators of Corologic Interest (referred to specific topologic features of each polygon), which form the Index of Corologic Interest (ICI). The average of the two partial indexes is what is called the Global Value of Interest (GVI). The concrete indicators are (all indicators values range from 1 to 4 following the specified categories):

- Indicators of Intrinsic Interest of Habitats (IIH):
  - Floristic richness (IIH1): <10 sp, 10-20 sp, 20-30 sp, >30 sp.
  - Floristic rareness (IIH2): 0 sp, 1-2 sp, 3-7 sp, >7 sp.
  - Distribution area (IIH3): > 250 ha, 50-250 ha, 10-50 ha, < 10 ha.
  - Successional stage (IIH4): Initial, Little mature, Quite mature, Mature.
  - Ecological fragility (IIH5): Low, Medium, High, Very High.
- Indicators of Corologic Interest (ICI):

- Biogeographical value (ICI1): Multiregional, Limited area, Regional endemism, Local endemism.
- Territorial area (ICI2): Very High, High, Medium, Low.
- Topographical diversity (ICI3): Very High, High, Medium, Low.
- Spatial aggregation (ICI4): Low, Medium, High, Very High.
- Spatial eccentricity (ICI5): Low, Medium, High, Very High.

Finally, for each polygon, species and associations of flora of special interest are indicated.

**Figure.** Assessment of the botanical value of habitats of the Province of Barcelona, after the updated habitats map of 2012 (darkest areas mean higher values).



Source: Group of Geobotany and Vegetation Cartography. University of Barcelona

More information available at <http://www.ub.edu/geoveg/indexen.php> and [www.sitxell.eu](http://www.sitxell.eu)

### **3.2. Fauna: nesting birds**

Many different faunistic groups have been analysed (butterflies, amphibians, reptiles, nesting birds, wintering birds, mammals) to evaluate the value of conservation of the territory for each of these groups. The final objective is to apply this information in land analysis and planning schemes (SITxell project). Detailed information about distribution areas, species dynamics and degree of threat was used to calculate land value indicators.

One of the first studies, pioneer from the methodological point of view, was set up by the Catalan Institute of Ornithology (ICO) who developed a simple quantitative method to assist in the decision making process of the landscape planning by integrating information of bird species occurrence and their individual IUCN extinction risks. They apply this method in the Province of Barcelona, and then in Catalonia, using bird atlas data to create an Index of Cumulative Threat Status (ICUTS). They employed a heuristic approach derived from qualitative scores provided by 10 experts on the avifauna of the region to choose the final index among a group of candidates. This index was used to generate two maps of conservation value at 1 x 1 km resolution, comprising those breeding bird species for which fine-grained maps (500 x 500 m) were available. The approach developed in this study may be particularly helpful in landscape planning outside protected areas because of its spatial continuity, fine-grained resolution and easy interpretation.

The Catalan Breeding Bird Atlas 1999–2002 provided 10 x 10 km presence/absence maps for all breeding species in Catalonia (219 species, excluding exotics and recent colonizers), and fine-grained maps of relative abundance (actually probability of occurrence, ranging from 0 to 1) for the 182 species for which a niche-based modelling process provided accurate enough results to generate continuous maps at such resolution. Although the resolution of the field bird survey was carried out at 1 x 1 km, all these fine-grained maps were scaled to a 500 x 500 m resolution after a process of reclassification and assignation of the mean values of their adjacent neighbours to each of these cells.

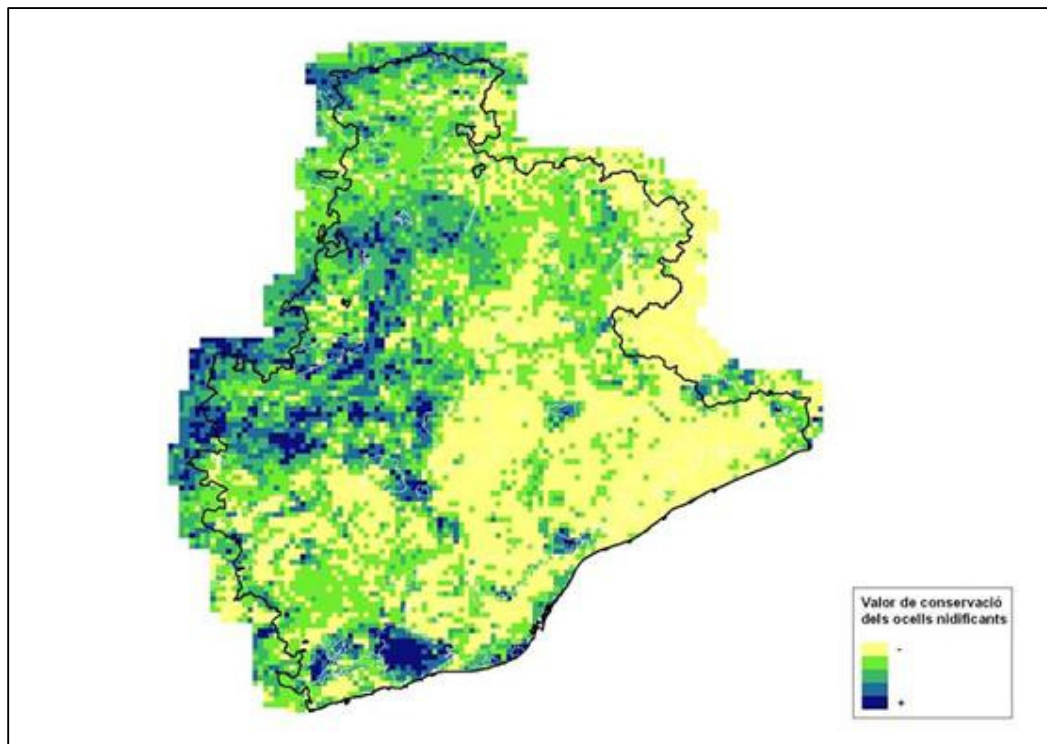
In order to determine the threat status of the species that breed in Catalonia, the Catalan Breeding Bird Atlas 1999–2002 followed the World Conservation Union criteria as well as regional correctors. A numerical value of threat status (TS) to each category of threat was assigned: Critically Endangered (=5), Endangered (=4), Vulnerable (=3), Near Threatened (=2) and Least Concern (=1). The category Data Deficient equated the extinction risk of the Near Threatened category (=2). According to the IUCN criteria,

exotics and recent colonizers (13 species in our study) were not evaluated; consequently, these species were not incorporated in the assessment of the conservation value of the squares.

The Index of Cumulative Threat Status (hereafter ICUTS) was defined as an estimate of the conservation value of the whole bird community of a given square. This index ranks every square of the study area as a function of the extinction risk of all the species that occur within it. Therefore, finding an appropriate formula to sum up all the available information into a single value is crucial. Seven different power equations were proposed and then evaluated by a panel of 10 experts on the Catalan avifauna. The appropriate ICUTS formula was chosen and conservation values were calculated for all the squares (at 500 x 500 m) of Barcelona for mapping purposes.

First results are shown on the map below (blue areas show maximum value of conservation for nesting birds and yellow areas show minimum values).

**Figure.** Assessment of the conservation value for nesting birds of the Province of Barcelona (darkest areas mean higher values).



Source: Catalan Institute of Ornithology

More information available at [www.ornitologia.org](http://www.ornitologia.org) and [www.sitxell.eu](http://www.sitxell.eu)



### 3.3. Connectivity models

Within SITXELL project, different assessments have been set up for the diverse fauna groups (mainly vertebrates, but also some invertebrate groups, as diurnal butterflies). As it has been shown for nesting birds, the different maps represent the value of open areas for fauna, based on the number of species and their interest for conservation (threat status).

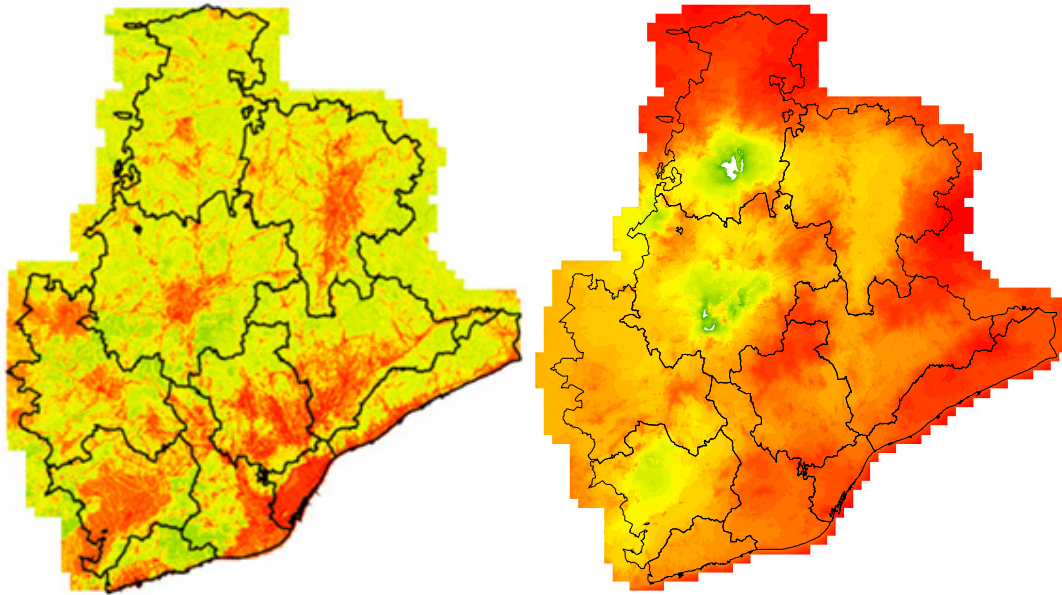
In addition to that maps, functional connectivity maps have also been developed for different taxonomic groups (birds, mammals and reptiles; the elaboration of maps for amphibians is in progress now). Functional connectivity maps are based on the dispersal biology of species at a landscape scale, integrating species distribution and the extent that the various components of the landscape help or hinder species dispersion.

First step for functional connectivity maps is focused on identifying the areas to be connected or core areas for fauna. These areas are particularly important due to its ecological values or the relevance of hosted populations, and are defined from species distribution maps. For some groups (like birds) distribution maps were already available, while for other groups (mammals, reptiles and amphibians) distribution maps had to be created based on historical references and field work.

Furthermore, the extent that the various components of the landscape help or hinder species dispersion is built-in in a resistance matrix. This matrix numerically weights the roughness of the land use, topography, geology, climate, etc. Resistance to movement maps are generated from the resistance matrix and related landscape maps. Note that the availability of future scenarios of some landscape components allows future projections of these maps. For example, reptile future climate connectivity, analyzed within SITXELL, which has allowed detecting areas that favours long-term dispersion of species with poor dispersion abilities.

Finally, cost-distance analyses based on core areas and resistance to movement maps give rise to the functional connectivity maps, where the routes that offer lower movement cost are pointed out as preferential areas for species connectivity.

**Figures.** Resistance matrix map for mammals (left) and connectivity map for birds (right). Green colour means lower resistance and higher connectivity.



Source: Minuartia, *Estudis Ambientals*.

#### **4. Social and economic values of rural areas: Rururbal Project**

Rururbal is a European cross-border co-operation project, developed within the framework of the MED Program, which intends designing a governance strategy for the sustainable and balanced local development of peri-urban territories, by valuing, marketing and promoting the consumption of local agri-foodstuff resources.

The final aim of the Rururbal project is to create a Common Cross-border Territorial governance Charter for the sustainable development of peri-urban territories, based on actions aimed at promoting the marketing and consumption of local products. The project establishes an analytical methodology for drafting the Charter for territorial governance of the peri-urban food chain of Rururbal Project. This methodology comprises three stages that follow the Project implementation phases:

- **1st stage: territorial diagnosis of local food products**

- a) A brief characterisation of the area concerned**

According to the physical planning, administrative division, geophysical profile, accessibility, dominance of the urban area, protected and/or sensitive natural locations, definition of physical planning zones, location of areas or buildings that need to be listed or restored.

- b) The types of major productive agricultural and animal farming territories,**

On the basis of the following criteria / indices:

- Location and land relief features
- Technical-economic orientation of farming activities and variety of products
- Socio-economic features of farms, farmers and their families
- Products produced

- c) Territorial grid and irrigation in relation to local products:**

- Distribution points proposing relatively varied and easily accessible supply (markets, shops, producers' selling points)
- Distribution locations that may involve some effort on the part of consumers, in the form of search and transport (direct sales at the farm or processing plants)
- Systems of direct relation of supply and demand, which entail joint effort on the part of producers and consumers, even including contractualization.

For each one of these points or sales modes, their location, periodicity, scale, variety and quality of products proposed is defined, as well as the sector of local products and their economic prospects.

**d) Current state of affairs:**

Schematic mapping presenting the area and indicating:

- The characterisation of zones (peri-urban, major agro-production zones, environmentally sensitive zones),
- Locations or buildings in need of recharacterisation
- The grid of local product accessibility.

• **2nd stage – Identification of agencies connected with the operational aims of our project**

**a) Capitalising on pre-existing projects:**

This chapter concerns both projects implemented in the past and projects not concluded or projects that failed, as well as projects and initiatives at the implementation phase. The following are analysed for each one of these projects/initiatives:

- The thematic subject
- The history of the project
- The aims
- The methodology implemented and the implementation stages
- The agencies involved, their role and level of participation
- The outputs achieved.

**b) Definition of local problem(s) and stakes of the RURURBAL Project:**

Identification of local problems and stakes in connection with the three political strategy levels:

**1st level**

Structuring a unified system of local food (on the part of consumers): supporting the emergence of a spontaneous movement for the democratisation of local nutrition and locally safeguarding family daily nutrition

## **2nd level**

Organisation and management of supply and markets of local food products

## **3rd level**

Promotion of local nutrition as a means for expanding and reinforcing vicinity and solidarity networks as a point supporting the construct for creating an area of social and territorial peri-urban innovation.

### **c) Determining operational goals and action fields**

#### **d) Expanding participation:**

Beyond the agencies that have already participated in previous projects, it is necessary to seek out and involve new agencies.

Target-groups are defined in connection with local problems, operational goals, and action fields defined by each partner, based on the principle of the table below (example):

#### **e) Defining the actions of the pilot project with the agencies**

#### **f) Implementation of Actions**

- **3rd stage: Standardisation of local governance authorities and the Charter**

Establishing a governance authority concerns the acquisition of a process of organizational learning. Helping to structure such governance authority and standardise it entails supporting a participatory self-organising procedure, securing three basic supporting functions:

- Encouragement and securing the intermediation of collective agencies
- Structuring the discussion around related topics and transactions of the system of territorial nutrition or territorial food system
- Preparing an operational framework for the governance authority

#### **a) Principles and methods of encouraging the participatory process**

The ability to encourage a participatory procedure is a key element for its effectiveness. Indeed, such a procedure entails a number of risks which may be prevented up to a point, provided certain basic principles are observed; some of these are:

- Broad communication and dissemination of information to arouse public discussion
- Clear definition and limitation of meeting agendas
- Safeguarding quality encouragement

- Sound management when giving the floor to participants
- Warranting respect for everyone and their views
- Memorisation, capitalisation and dissemination of the results of every meeting

**b) Identification of «related issues» (thematic topics, products and transactions) so as to shape the governance authority**

The territorial nutrition system is a complex entity with numerous implications, entailing interactive relations regarding products necessary for nutrition in all its aspects: nutritional modes, places and seasons of nutrition, etc.

Help in shaping a territorial governance authority will focus on:

- Identifying the 'themes' that mobilise and others that hardly – if at all mobilise
- Identifying and including the positions of various agencies in regard to said themes
- Selecting 'related themes' that might be potential organisational vehicles
- Assistance towards processing specifications for every 'related theme'

This cohesive set of some well-targeted specifications comprises the specific physical basis on which governance should be constructed.

**c) Providing an operational framework for governance**

The role of territorial collectivity in this project is to operate both as a governance motivator and as an animator for participation and negotiation. However, the typology and continuation of governance beyond the project presuppose that the latter is materially supported. This support at the organizational level entails means and skills to assist the standardisation of governance and to secure its operation; it includes the following:

- Administrative and legal support for drafting the construct statutes
- Provision of means
- Provision of skills

Such operational support can be adapted accordingly to suit the capacity and will for an autonomous operation of the construct in time.

**d) Principles for «constructing» a Charter:**

The Governance Charter of territorial nutritional systems may have two axes.

An international axis, which might include:

- The introduction.
- The definition of the fundamental idea or concept.
- The basic common principles, values and contracts.
- Ways of supervision and arbitration.

A territorial axis, which will provide the means to implement and check the terms of the Charter at the local level, as well as the operation of its executive authority. Beyond the territorial goals and political strategies, this chapter may include the following:

- Territorial values and political strategies, operational goals as well as local fields and intervention levels
- Allocation of responsibility
- The operation of territorial governance (to secure both its representational character and its effectiveness)

More information available at: <http://www.rururbal.eu>

## **4.2. Sustainable tourism: the European Charter for Sustainable Tourism**

Surely one of the most accurate and successful methodologies for analyzing, planning and managing tourism in a natural environment is the European Charter for Sustainable Tourism. This scheme has been developed by the European Federation of National and Natural Parks (EUROPARC Federation) to be applied in protected areas, although it can be a very useful approach in any natural or rural area under the Green Infrastructure approach. The main aim of the Charter is to develop a partnership among the natural areas authorities and the stakeholders involved in the tourism activities (local tourism businesses and tour operators).

The underlying goals of the European Charter for Sustainable Tourism are:

- To increase awareness of, and support for, Europe's protected areas as a fundamental part of our heritage, that should be preserved for and enjoyed by current and future generations;
- To improve the sustainable development and management of tourism in protected areas, which takes account of the needs of the environment, local residents, local businesses and visitors.

The Charter reflects the wish of authorities managing these areas, of local stakeholders and representatives of the tourism business, to support and encourage tourism that accords with the principles of sustainable development. It commits the signatories to implementing a local strategy for sustainable tourism defined as: "any form of tourism development, management or activity which ensures the long-term protection and preservation of natural, cultural and social resources and contributes in a positive and equitable manner to the economic development and well-being of individuals living, working, or staying in protected areas".

In order to put this form of tourism into practice, it is necessary to take a global view of tourism in and around a protected area, to engage in a process of wide consultation, and to strengthen the positive interactions between tourism and other economic sectors in the area. Finally, the aim of this type of tourism is to respond to the expectations of European visitors by making travel meaningful, by allowing time to explore and meet other people, and to gain from the experience by giving something of oneself.

The main keys to address to achieve the goals of the Charter are:



### **- Protection and enhancement of natural and cultural heritage**

- Monitoring impact on flora and fauna and controlling tourism in sensitive locations.
- Encouraging activities, including tourism uses, which support the maintenance of historic heritage, culture and traditions.
- Preserving natural resources.
- Encouraging visitors and the tourism industry to contribute to conservation.

### **- Improving the quality of the tourism experience**

- Researching the expectations and satisfaction of existing and potential visitors.
- Meeting the special needs of disadvantaged visitors.
- Supporting initiatives to check and improve the quality of facilities and services.

### **- Raising public awareness**

- Ensuring that the promotion of the area is based on authentic images and is sensitive to needs and capacity at different times and in different places.
- Providing readily available and good quality visitor information in and around the area.
- Providing educational facilities and services which interpret the area's environment and heritage to visitors and local people.

### **- Development of tourism specific to the area**

#### **- Training**

### **- Protection and support of the quality of life for local residents**

- Involving local communities in the planning of tourism in the area.
- Ensuring good communication between the protected area, local people and visitors.
- Identifying and seeking to reduce any conflicts which may arise.

### **- Social and economic development**

- Promoting the purchase of local products by visitors and local tourism businesses.

- Encouraging the employment of local people in tourism.

**- Control of tourist numbers**

- Keeping a record of visitor numbers over time and space.

- Creating and implementing a visitor management plan.

- Promoting use of public transport, cycling and walking as an alternative to private cars.

- Controlling the siting and style of any new tourism development.

More information available at:

<http://www.europarc.org/what-we-do/european-charter-for>

### **4.3. Human health and welfare**

The positive relationship between health and green spaces is beyond doubt. Nevertheless, until recent years this crucial assumption for human welfare has not been put in the centre of conservation and land planning debates. On the one side, the concrete mechanisms and positive effects of green areas on health are not completely known. On the other side, more dissemination activities to increase social awareness are needed.

We present here two different initiatives. Firstly, Healthy Parks, Healthy People, a project born in Victoria (Australia) in the year 2000, which aim is to share and disseminate information and initiatives to promote healthier communities through healthier nature. Secondly, the Phenotype Project, a new scheme supported by the EC to deeply investigate the mechanisms linking human health and green spaces in order to make proposals of planning and management of green areas.

#### **Healthy Parks, Healthy People**

Healthy Parks Healthy People seek to reinforce and encourage the connections between a healthy environment and a healthy society. Australian park agency Parks Victoria, created the Healthy Parks Healthy People brand in 2000. They then commissioned Deakin University to do a literature review which analysed more than 200 journal articles on research into the human health benefits of contact with nature.

Healthy Parks Healthy People seeks to encourage divergent sectors to come together to build healthier communities and tackle the issues facing our planet. The approach encourages those from the health, environment, parks, tourism community development and education sectors to work together to provide a better outcome for all. HPHP Central is a place (a website) to access and share the latest international research, innovations and programs that focus on the health benefits of human contact with the natural world.

Some examples of relevant information that can be found in HPHP Central are:

- The consequences of biodiversity loss have implications not just for the environment but also for human health, particularly in the prevalence of allergies and chronic inflammatory diseases such as eczema and asthma.
- The Japanese practice of 'forest bathing' reduces stress levels and can even help fight cancer. Latest research findings show that spending time in forest environments,

also known as national parks and protected areas in other countries, has even more benefits than previously envisioned.

More information available at: <http://www.hphpcentral.com/>

### **Phenotype Project**

The role of the natural and built environment as health determinants have re-emerged during the last years. In this direction, there are indications about natural outdoor environments benefits on people's health and well-being. Several studies have shown that these health benefits could vary in different socioeconomic levels. Most of the studies have focused on general population, showing that exposure to natural outdoor environments are positively associated with perceived general health, restoration and ability to face problems; and negatively associated to health complaints and stress levels. A small group of studies have shown that exposure to natural outdoor environments was negatively associated with painkiller requirements, recovery time, stress level, negative reactions and need for healthcare in patients of hospitals and prisoners.

Nevertheless, the available evidence has some limitations, from whose three are highlighted here. First, the health effects on potentially very sensitive groups like newborns have been little studied. Second, most of the research has been conducted in the Northwest of Europe and USA. But the validity of these results for other population groups is unknown. Third, various studies have suggested that mechanisms like stress and pollution exposure reduction, or physical activity and social interactions increase could explain these associations. However, these mechanisms are not well understood.

Positive Health Effects of the Natural Outdoor environment in Typical Populations of different regions in Europe (PHENOTYPE) project is intended to address many of the shortcomings of the previous studies. The main aim of the project is to investigate the interconnections between exposure to natural outdoor environments, in both rural and urban settings, and better human health and well-being. The specific objectives of the project are:

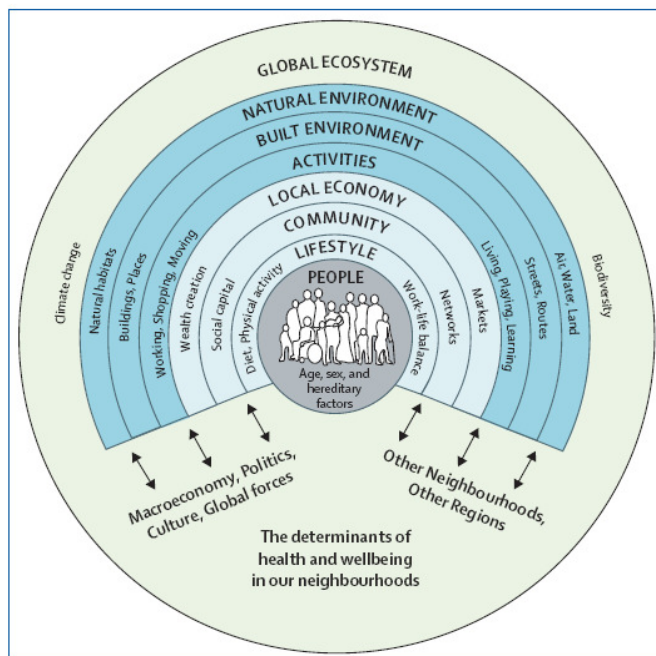
- Identify the underlying mechanisms at work.
- Examine the effects for different population groups.
- Examine the effects of different characteristics of the natural outdoor environment.

- Cover both preventive as well as therapeutic effects of contact with the natural environment.
- Address the implications for land-use planning and green space management, specifically focusing on the integration of human health needs, and translating the research outcomes into recommendations for policy makers and guidelines for professional practitioners.

PHENOTYPE project is funded by the European Commission and will run between 2012 and 2015. A total of eight research centres from six different countries participate in the project. And the Centre for Research in Environmental Epidemiology located in Barcelona is leading it.

To date, the published PHENOTYPE studies have shown that higher residential surrounding greenness is associated with lower personal exposure to particulate air pollution among pregnant women. They have also demonstrated that maternal residential surrounding greenness and proximity to major green spaces are associated with higher birth weight and birth head circumference in offspring. These studies also found some indications for greater benefits of these measures of green exposure for the offspring of mothers from lower socioeconomic groups.

**Figure:** The determinants of health and well-being



Source: Rao, M et al. (2007).

More information available at: <http://www.phenotype.eu/>

#### **4.4. Intangible values**

Most natural areas have a lot of values linked to the immaterial heritage, whether historical, linguistic, aesthetic, social (governance systems, traditional crafts and knowledge ...), religious or spiritual, among others. These values represent an added richness to the natural heritage and tangible cultural heritage (architectural, archaeological).

Far from being marginal, intangible heritage values are usually those that configure identity and symbolic links that build up the roots, the feelings that attach a society, especially local people, to natural areas. However, in recent decades the planning and management criteria of most natural areas, specially protected areas, have prioritized tangible and scientific- technical aspects of the natural heritage, while its intangible dimensions have been ignored or undervalued, wasting its enormous potential. And this has happened even in cases which intangible heritage values were important or critical for many protected area designation.

#### **“The Immaterial Heritage: Cultural and Spiritual Values. Handbook for its inclusion in protected areas”. EUROPARC-España.**

The Spanish Section of the EUROPARC Federation (EUROPARC-España), within the framework of its Work Programme 2009-2013, developed a work line devoted to cultural and spiritual values of protected areas, which most important action have been the “Guidelines for the inclusion of immaterial values to planning and management documents”. Finally, these guidelines where published under as a handbook under the title: “The Immaterial Heritage: Cultural and Spiritual Values. Handbook for its inclusion in protected areas”.

The handbook, applicable to any natural or rural area, protected or not, includes:

- General introduction with the state of the art, concepts and criteria.
- Methodologies to identify and evaluate immaterial values.
- Recommendations to include immaterial values in protected areas: 45 recommendations with one practical example of good practice for each one.
- 10 detailed cases of study.

For the identification and evaluation of immaterial values, the Protected Area Benefit Assessment Tool (PA-BAT) was used. This is a generic tool developed under the auspices of the Global Conservation Fund (WWF) that was adapted to the subject of

that handbook. In synthesis, nine groups of values were taken into account, with 24 detailed indicators:

#### **Values of nature conservation**

1. Has the protected area value for nature conservation?

#### **Management of protected areas**

2. Does the protected area management provide jobs (forest rangers, guides, maintenance, etc)?

#### **Values related with food provisioning**

3. Is it allowed to hunt wildlife in the protected area?

4. Is it allowed the use of wild edible plants in the protected area?

5. Are the fishing reserves an important resource in the area?

6. Is there traditional agriculture in the area (practices or crops adapted or locally autochthonous)?

7. Are grazing and forage harvesting allowed in the protected area?

#### **Values related to water**

8. Is it allowed the non-commercial use of water (subsistence farming, drinking, washing or cooking) or commercial water use (extensive irrigation, aqueducts, bottling plants, hydropower or municipal drinking water sources) in the area?

#### **Cultural and spiritual values**

9. Has the protected area cultural and historical values (pilgrimage routes, historical systems of land use, etc)?

10. Does the protected area include sacred natural sites or landscapes?

11. Does the protected area include natural values or other similar iconic values?

#### **Values of health and leisure**

12. Is it allowed in the protected area to collect medicinal resources (herbs) for local use or for the pharmaceutical industry?

13. Is the protected area important for leisure and tourism?

#### **Knowledge**

14. Is the protected area an important resource for developing knowledge?

15. Does the protected area contribute to the education and formal and informal dissemination of knowledge?

16. Is it allowed the collection of genetic material (wild relatives of crops, tree species, etc) in the protected area?

### **Environmental Services**

17. Can the protected area contribute to mitigate climate change (providing a significant carbon capture, having a positive impact on the local climate, etc)?

18. Is the protected area important for soil stabilization (prevention of avalanches, landslides, etc)?

19. Is the protected area important for coastal protection (mangroves, dunes, etc)?

20. Is the protected area important to prevent flooding (mitigation in small watersheds, floodplains, wetlands protection, etc)?

21. Is the protected area important for the quality and quantity of water (filtration, groundwater renewal, maintenance of natural channels, etc)?

22. Is the protected area an important resource for pollination of crops, pollination products like honey, etc?

### **Materials**

23. Is it allowed the extraction of non-timber products (coral, shells, resin, rubber, etc) in the protected area?

24. Is it allowed the management and extraction of timber, even for firewood, in the protected area?

These concepts are completely useful to identify and evaluate immaterial values not only in protected areas, but in any kind of natural or rural area. The indicators can be easily adapted by changing the allowance or not in a protected area, into the importance of each value in the natural or rural area within the framework of Green Infrastructure.

More information available (in Spanish) at:

<http://www.redeuroparc.org/img/publicaciones/manual10.pdf>



## **5. Landscape planning**

### **5. Landscape Planning**

After the adoption of the European Landscape Convention, landscape planning has to face the new perspective that the ELC recommends. Of course landscape policies, in order to be fulfilled, need an adequate technical know how, both for the analysis and the designing phases. However, at the same time, the local communities involvement has become a fundamental element of landscape planning.

#### 5.1 An experience in the Emilia-Romagna Region (IT): the “*Progetto Conca*”

Since 1993 the Emilia-Romagna Regional government has been financing many projects regarding landscape conservation and improvement, and for the last 10 years these projects have been required to assume the principles of the European Landscape Convention.

Among these, the “*Progetto Conca*” represents a very good example to show a successful methodology in landscape planning and design from several points of view: with regard to landscape analysis, planning and design, to the strongly participatory methodology that was chosen, and for the positive outcomes it generated, in particular a greenway in the form of a pedestrian circuit which links the sea, the river and the hill.

The *Progetto Conca* is a “landscape and environmental improvement Plan” set in the Conca river Valley in the Rimini Province (north-eastern part of Italy). The project was developed in two different phases (2007-2008 and 2009-2010) in the territories of 12 municipalities, where about 65.000 people live. The project started producing concrete outcomes in 2009, and has continued to do so, up to now (2012).

This project was financed by Emilia-Romagna Regional government, by Rimini Provincial authority, and by the 12 municipalities, as a pilot scheme regarding landscape conservation and improvement.

##### 5.1.1 The European Landscape Convention principals

The *Progetto Conca* tried to assume the fundamentals of the European Landscape Convention, concerning the definition of “landscape” and in particular the following issues:

1. Landscape is the expression of the relations between people and their surroundings (environment, nature, history, social relations, economy);

2. Landscape is everywhere: “*in urban areas and in the countryside, in degraded areas as well as in high quality areas, in areas recognised as being of outstanding beauty as well as everyday areas*” ;

3. We are asked “*to recognise landscapes in law as an essential component of people’s surroundings*” : the involvement of the local communities in the topic of land transformations is the key for landscape conservation, improvement, management, in long terms.

#### 5.1.2 Involved and committed “actors”

The administrations that proposed the project were the Ministry of Cultural Heritage and Activities, the Regional Government, the Provincial Authority and 12 Municipalities.

The Public Administrations invited the local communities to participate to the project, through a participatory process open to inhabitants and cultural, environmental, employers’ associations.

Hence, in the elaboration of the *Progetto Conca* three kinds of actors were involved:

1. Local Authorities politicians and technicians (architects, urban planners, agronomists, geologists, engineers, foresters, biologists)
2. A team of technical consultants (landscape planners and designers, architects, communicators, facilitators)
3. The local communities (city dwellers, environmental, cultural, artistic, youth, agriculture and employers’ associations)

All these people had to adopt several perspectives to work together, and they had to agree to some compromises in order to reach concrete goals.

From a technical point of view, the necessity to carry on the project together with the whole range of public bodies, has been challenging because it has been necessary to adopt different points of view.

#### 5.2 The landscape analysis

The landscape analysis yields the present situation and the ongoing trends of the area describing both the natural and anthropic arrangements, as well as the planning potentials; it was preferred not to carry on deep analysis referred only to the present time, but to compare two different moments to emphasize the ongoing trends.

The analysis brings to 3 very important results for the implementation of the planning phase:

- 1- identification of the plan “boundaries”;
- 2- pinpointing and description of the landscape characteristic elements and features;
- 3- Identification of suitable and unsuitable actions for the landscape values.

The landscape analysis was carried out with regard to:

**-Natural and ecological system:**

- a- Geomorphology (hydrology, geology, morphology),
- b- Plans (including the changing in the species presence in the valley),
- c- Ecological corridors (ecological system and its implementation, provincial regulation framework).

**- Human and historical system:**

- a- Urbanization and infrastructures (transformation trends),
- b- Economy (tourist activities, factories, agriculture and typical products) in their transformation trends,
- c- Historical/cultural features (including traditional /popular celebrations).

**- Rules and constraints from other plans and laws** (urban planning, spatial and sectorial, Cultural Heritage Ministry constraints).

**- Planning quality.** The analysis of the past ability to plan in this area shows the recorded history of the projects. For years, at several levels (provincial, municipal, inter-municipal) different plans have been launched for the improvement of the Conca Valley landscape. A general framework of the local past and present projects has been delineated, with regards to strategies, stakeholders, contents and effectiveness in the implementation.

### 5.3 The participatory process

The participatory process was organised involving several stakeholders: city dwellers, environmental, cultural, artistic, youth, agriculture and employers’ associations. The process consisted of six meetings for each phase. The participants were asked not simply to criticize but to make concrete proposals. The ideas and proposals that stood

out in each meeting were selected and refined in the time between a meeting and the following one.

The participants succeeded in sharing their knowledge about the valley and understanding its transformation trends; they let their ideas and proposals take shape; through this approach they achieved to share decisions, that the politicians and the technical team included in the final project.

The participatory process lasted 10 months in the first phase and 12 months in the second phase.

The people who attended the participatory meeting, were considered as real “consultants” by the public administrations. As the European Landscape Convention states, it is undeniable that the inhabitants are the real experts of their surroundings.

#### 5.4 Project outputs

The landscape planning and design had relevant results:

- Landscape planning (at a territorial scale) and pilot schemes that were actually integrated into the town planning documents (for example, the path alongside the river and the Greenway (GAV) preliminary projects, the landscape festival of arts).
- Guidelines in the form of an “action toolkit” for technical officers, planners and designers, to evaluate and direct the transformations of natural, historical but also “everyday” areas.
- Meticulous fund-raising to support each concrete project (European policies, national, regional and local funding). It was looked for every kind of financing opportunity; a document was implemented to explain how to carry out any project in the short, medium and long term, within the space of ten years.
- The *Progetto Conca* promoted the identification of a new kind of conservation area in the Conca Valley (*Paesaggi naturali e seminaturali protetti – protected natural and partially natural landscapes*).

Some of the concrete outputs are strictly linked to the local communities involvement:

- The setting up of the GAV (Main Green Ring), a greenway between inland and coast that is the result of the two phases of the project. The creation of a green infrastructure to make the historical and natural heritage accessible is relevant also for farmers and touristic activities nearby those areas, that become enjoyable and accessible thanks to the hiking trail.

- The maintenance of the greenway (carried out by the Provincial authority, together with the local association “*Tartufa*” Truffle-men) and of the pathway along the river, and the creation of the road-signs between the coast and the inland (financed by the Regional and Provincial and Municipal bodies).

- The organisation of a performing art festival matching the topics of art and nature in order to promote the hiking trail, which has involved the Central Government, the Provincial authority, the Municipalities and 27 local associations. In September 2012 a site specific festival was organized in the area for three days. The participants of the festival hiked around the woods and the historical centres, guided by artists and performers who proposed artistic productions inspired by the specific sites, about 2.000 people participated to the events.

### 5.5 Conclusions

In general, the *Progetto Conca* outlined a good methodology regarding the low costs compared to the vast results that were produced, the durability of the outputs after the end of the financed project, the measurable results both in the active involvement of local communities and in the fund-raising approach.

In particular, referring to the implementation of the European Landscape Convention precepts, the *Progetto Conca* tested some matters which the Emilia-Romagna Regional government proposed as “key actions” in the Pays.Med.Urban EU project (2009-2011). Some of these completely fit the *Progetto Conca*, and can be used, as a sort of “decatalogue”, to define the issues to be addressed in landscape planning:

1. Participation yes, participation no: when to activate inclusive processes for the landscape. It is useful to activate inclusive processes but only when there are real problems to solve and when the public administration wants, in actual facts, to invest resources – intellectuals, human and economic – in these actions, giving the participation the time to be structured and express itself.

2. Designing the process: defining objectives and regulations from the beginning. Every action needs to be designed starting from a careful analysis of the different factors at stake; it is necessary to clearly define the general, specific and operative objectives of an inclusive process, deciding, through a work programme, the diverse phases and activities, the final commitment and the approval procedure for the ordinary instruments (plans, projects).

3. Knowing the territory and the stakeholders: mapping the interests. Every territory has its specific urban, landscape, environmental, economic and social issues. It is necessary to delineate an updated picture of the existing studies, to make optimal use of the resources and not to replicate researches already carried on. It is thus fundamental to know the audience, in order to establish a climate of mutual trust among the stakeholders, involving subjects who are able to take an active part in the process – during and after – and who could obstruct or slow down the initiatives in one way or another.

4. Improving the local landscape: a resource for the society and an economic opportunity. Landscape and green areas can play a fundamental role to improve the quality of the city life. Promoting new functions and public services, protecting the remaining signs of the cultural and natural heritage, “rediscovering” these places and taking them out of the margins, reusing the sites through mixed and shared uses, permanent or temporary, in order to generate new economies and forms of identity and attractiveness.

5. Promoting the dialogue between technical and popular knowledge: multidisciplinary. The complexity of reading the landscape requires an interchange among the most different competences, such as the necessity to set and manage, in a proper way, the delicate dialogue of the local communities with public entities, but also social, cultural and economic bodies. Last but not least it is also fundamental to be able to translate the needs and the requests into proposals and instruments (projects, agreements).

6. Promoting forms of active listening: the methodologies. Choosing the most adequate listening methodology can not be taken for granted and need to be planned according to involved people and/or organizations and to tackled themes, phase after phase. The various stakeholders need to be in the position to express a useful contribution, so that their expertise of a certain place, space or territory could contribute to resolve the real problems of a specific area or local society.

7. Make the choices grow: devoted times and resources for shared ideas. An inclusive process needs to have the time to make ideas and people converge and mature. It is not required an infinite time, such as it is often wrongly supposed, but it is sufficient to assign a few months of work (6-12) to organize and develop a few structured meetings (4-6) and to establish the necessary resources – economic, intellectual and human. In general the decisions that are taken through an inclusive process are more shared and

thus grant simpler procedures for approving the projects, saving, as a matter of fact, time and public resources.

8. Spreading the knowledge: inform, educate and train the community. Not all the people who take part can prove the same intensity and, in any case, there are sections of the society who do not participate, because of disinterest or distrust, or lacking of time and information. Thus it is always correct to plan – in parallel to an inclusive process – information, education and training activities to give more individuals the possibility to participate, even with indirect forms, and to contribute to build confidence between administration and community.

9. Undertaking real commitments: the decisions need to influence the final preferences. The participation processes, promoted by the public administration, raise expectations among the communities and in those who participate. The assumed decisions during the participation need to influence the final assessments of a management or transformation project of an area or a plan. Therefore the public administration needs to guarantee the processes, ensuring that the time dedicated to the collective confrontation phases would not be dispersed and would have a tangible, verifiable and measurable outcome on the environment we live in the cities. The definition, from the earliest stages, of a participated process, of the plan or project approval, assumption or perception within the ordinary instruments for the territorial governance and of the possible mutual commitments aimed by all involved stakeholders, contributes to the transparency of the entire process.

10. Managing and taking care of the landscape: towards participated *praesidium* committees. It is possible to gather the participation request of the society and it is necessary not to disperse the social, cultural and economic networks that come out during the institutional participation processes – in other words promoted from the top – persecuting and stimulating the creation of local permanent participated *praesidium*. This can assure a major continuity to the activated processes thanks to an encouraging and controlling, but also caring and co-managing, action that the people could activate offering their time, interests and abilities, according to efficient and structured organized forms.

More information available:

[http://www.provincia.rimini.it/paesaggio/mn\\_p\\_conca/progetto.htm](http://www.provincia.rimini.it/paesaggio/mn_p_conca/progetto.htm)

<http://www.apassoduomo.org/>

[http://territorio.regione.emilia-romagna.it/paesaggio/pubblicazioni-1/paysmedurban\\_05.pdf](http://territorio.regione.emilia-romagna.it/paesaggio/pubblicazioni-1/paysmedurban_05.pdf)

## **6. Integration of Green Infrastructure approach into land planning**

The main goal of most of these analytical methodologies is to supply assessment criteria and maps to evaluate territorial interest from different points of view (naturalistic, ecological, tourist, agricultural, economic, etc), to be taken into account during the land decision processes. One way of doing this is through specific plans and policies (infrastructure, agriculture, protected areas, etc) for which each corresponding land assessment can be of great value. Nevertheless, probably the most well-adjusted and effective approach to ensure a balanced, stable and healthy territory is through land planning (at different scales, from states to municipalities), where all this specific information can be analysed together by the decision-makers.

One of the most successful experiences in this sense has been the Regional Plan for the Metropolitan Area of Barcelona, one of the most dynamic and tensioned regions of Europe, both because the complexity of physical and natural features, and high density of population and economic development. In the year 2005 a parity commission formed by the Government of Catalonia and local authorities started the development of the Regional Plan. The characteristics of the metropolitan territory, resulting from the combination of intricate physical structure and a process of long and complex occupation, along with the prospects for future evolution of space requirements for residential and economic activity, had raised a number of challenges that are which primarily had to face the Plan. The plan raised different socioeconomic scenarios, and therefore diverse physical occupation alternatives of the region that, beyond the specific provisions of the various elements, posed great territorial development models. Finally, the accorded started point considered the role of plan to guide territorial planning in the Metropolitan Region of Barcelona, understood as a multi-nodal, where in an environmental sustainability framework can develop regional policies that enable social cohesion and economic efficiency of the regional territory and Catalonia as a whole.

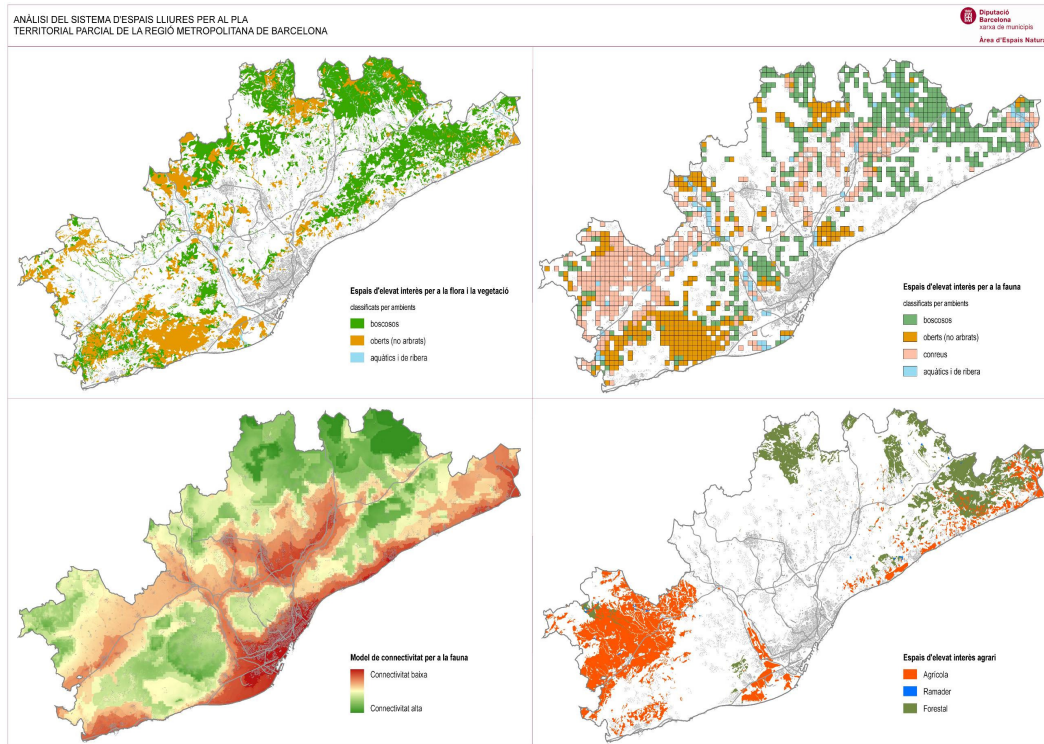
In this context, the Barcelona Province Council participated at two different levels, to ensure an ecological approach to territorial planning through information and principles of SITxell project.

On the one side, SITxell was applied at various stages of development of the Plan, in all fields related to the **open areas system**: definition of the physical framework, land use evolution and dynamics, challenges ahead and planning proposals. The information referred to land analysis was finally summarized into four different maps: areas of interest because of botanical values, areas of interest because of fauna



values, areas of interest for connectivity, and areas of interest for agriculture, stockbreeding and forestry.

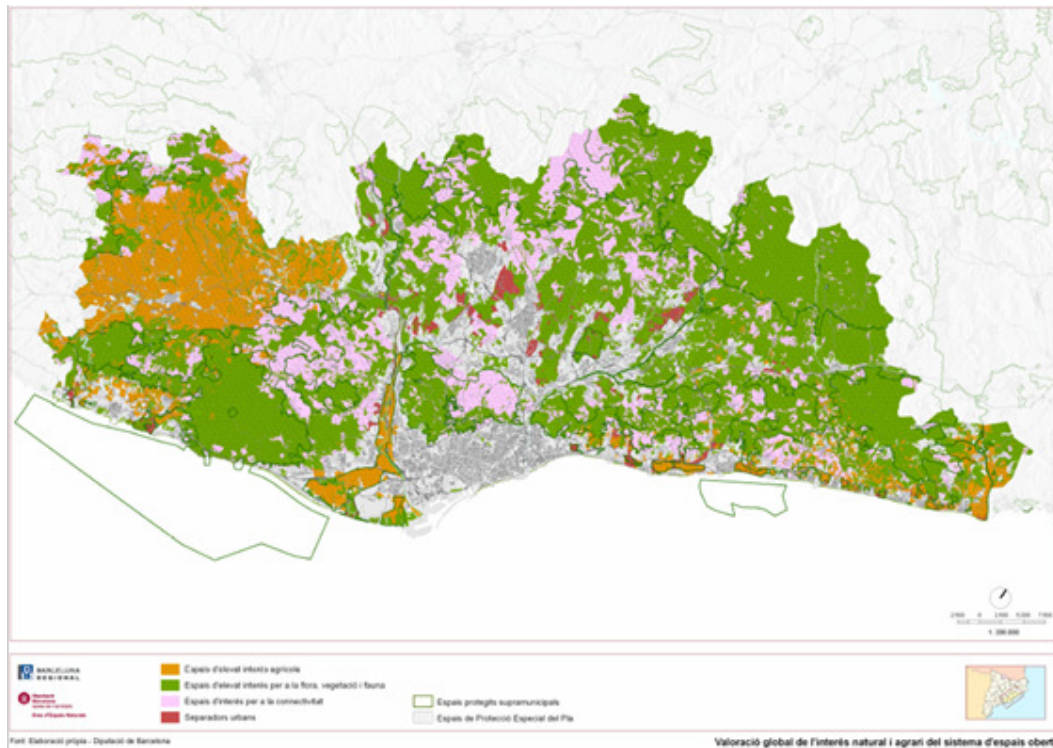
**Figure.** (From left and top). Areas of interest for flora, fauna, connectivity and farming.



Source: *Regional Plan for the Metropolitan Area of Barcelona*

The information from the four different fields was compiled and analyzed under criteria of the plan. Thus areas of interest for the open areas system (which shouldn't be transformed for urban purposes) were defined following four different categories: areas of farming interest, areas of naturalistic interest, areas of interest for connectivity, and strategic open areas for urban districts. The first proposal was to protect almost 74% of the region under these criteria. This proposal was crossed with proposals for transport infrastructures and urban growths and finally the plan stated that 227.000 hectares, 70.4% of the area of the metropolitan region, were of special protection for their natural and agricultural interest.

**Figure.** Areas of interest for farming (orange), nature (green), connectivity (pink), and strategic open areas for urban districts (red).



Source: *Regional Plan for the Metropolitan Area of Barcelona.*

On the other side, SITxell was an essential tool to develop the Strategic Environmental Assessment of the Plan, especially in incorporating environmental sustainability criteria in those points related to the system of open areas. In addition, several assessments of the impact of new infrastructures and urban growths posed by the plan were performed, specially Detailed studies of critical points for ecological connectivity and Analysis of the areas new urban growths, proposing correction and compensatory measures for each case.

Thus, to sum up, the application of SITxell principles and analysis to regional planning was a very nice example of how to put in practice Green Infrastructure approach to land planning.

More information available at <http://www.ietcat.org/index.php/es/planes-territoriales-parciales/plan-territorial-metropolitano-de-barcelona> (Spanish) and [www.sitxell.eu](http://www.sitxell.eu)

## **7. Conclusions**

Open areas are the backbone on the Green Infrastructure in many regions of Europe. This mosaic of natural, semi-natural and rural areas, with a different degree of transformation and usually receiving multifunctional uses, is the basis of the ecosystem services that support human welfare. Traditionally, open areas assessments to identify their values and justify the need to be conserved were related mainly to naturalistic elements –especially flora and fauna–, and to landscape scenarios. After new visions following green infrastructure approach, many other interests and values must be taken into account when looking at open areas. In this sense, many concepts and methodologies have appeared during last years, like those that have been shown here, in the fields of tourism, health, farming or intangible values.

Nevertheless, much more work is still need to test and apply these methodologies and fully incorporate them into land analysis and planning. For sure, this complex image of green infrastructure has to be included at all the scales if we really want to plan and manage the open areas on a balanced and multifunctional way.