



SPATIAL PLANNING AND ECOLOGICAL NETWORKS IN SPAIN. 2008

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1. EXECUTIVE SUMMARY

Spatial planning

The Spanish regions have fully competencies in spatial planning, and each of them has passed laws on land planning. However, the lack of basic national legislation has resulted in a wide variety of concepts, methods and instruments.

The land planning process is taking place very slow. The first sub-regional plan was approved in 1991 and the second was not until 10 years later. Since then others have gradually emerged, but most of the territory still lacks planning.

Ecological networks

Until December 2007, nature conservation policies in Spain have been developed under the 1989 nature conservation act, which contains no reference to ecological connectivity. In December 2007 a new national nature conservation act was passed. It states the need to consider ecological networks, but it hasn't been developed yet.

In spite that there is not a State policy framework for ecological networks, five regions have done some approach in the definition of their ecological network, but without any national coordination. Because of this, Europarc-Spain has taken the lead to coordinate and promote the development of ecological networks. At present only two regions, Catalonia and the Basque Country, have a clear policy on ecological networks.

Integrating spatial planning and ecological networks

Because of the lack of political interest ecological networks have not been developed, and thus incorporated into the land planning process, with the exception of the Catalanian region. However the situation is changing and ecological networks is becoming an emergent issue.

Probably the main barriers for the definition of ecological networks are:

- The huge extension of protected areas and of Natura 2000. The former extends over a surface greater than Greece or 3,2 times the size of The Netherlands.
- In many regions the low population density and the vastness and continuity of open spaces, seems not to encourage the development of ecological networks.
- Most regions prioritize other conservations issues in their agendas.

- Ecological network is still a concept not extended and well understood.

In this sense it is remarkable that the regions clearly committed in the development of ecological networks have an intensive infrastructure and urban development and have suffered a fast and intensive ecological degradation in the recent decades. They are also among the rich Spanish regions. Undoubtedly this situation contributes to the adoption of this new strategy as a need for biodiversity conservation at the long term

Conclusions of the questionnaire

Nineteen questionnaires were filled during the 5th International Congress for Spatial Planning, held in Malaga (Spain) the 23-25 of November. This analysis includes only those belonging to Spaniards (eighteen). The remanding one belonged to an Italian, and has not been included. Its main conclusions are:

- It is not clear that those interviewed have a clear concept of ecological network.
- There is a great potencial for the development of ecological networks and their integration into land planning

2. INTRODUCTION

This report is an approach to the present situation of the interaction between policy concerning spatial planning and ecological networks in Spain within the framework of the ECNC SPEN project.

In order to understand the situation in Spain, it is necessary to take into account a country that is decentralized, where responsibility for land planning and nature conservation belongs to the regions. Each of them has its own parliament, laws and policies.

It is also a country where the bulk of urban and infrastructure development is located in coastal areas and in the center, in the Madrid region. In the rest of the country population density is low and there are large regions where nature is continuous, with many high ecological value areas, which apparently makes unnecessary the development of ecological networks. However, since the mid nineties, the interest on the issue has increased, certainly promoted by efforts coming from central Europe to promote the development of the Pan- European Ecological network.

While at the General State there is still not a defined policy for the development of ecological networks, there are many studies and some regions are developing an effective policy of ecological networks integrated into regional planning.

This report provides a general introduction to the issue in Spain and presents some examples of the interaction between spatial planning and ecological networks.

3. METHODOLOGY

For the preparation of this report it has been reviewed the literature available at the Internet, the websites of all the Spanish regional governments in relation to land planning and nature conservation, and two experts have been consulted with experience on the issues in the Madrid, Navarra and Basque Country regions. All the regional legislation on land planning has been reviewed, together with some regional and sub-regional land plans, especially the most recent, to analyze how ecological networks were considered.

4. THE SPATIAL PLANNING PROCESS

4.1. Definition

The Spanish constitution of 1978 attributes the Spanish regions full competencies in spatial planning. For this purpose, the 17 regional administrations have passed laws concerning the management of their territory, but the lack of a basic national legislation has resulted in a wide variety of concepts, methods and instruments (Mata 2005).

Nevertheless, the concept of spatial planning in Spain approaches that set out in the European Charter of Town Planning - Torremolinos 1983. In other words it determines uses and activities within the territory, coordinates the policies that affect the territory, promotes territorial balance, and determines the action of the different authorities with relevant competencies on the issue (Benabent 2005). The most recent laws (Navarre, Valencia, La Rioja) also reflect the concepts, models and objectives of the European Spatial Development Perspective-ESDP (1999).

4.2. Legal and policy framework

Although the regions have full competency for spatial planning, the General Administration of the Nation has a number of competencies which influence land planning:

- Setting the bases and the coordination of the general economic activity and aspects necessary to meet collective needs, to balance and harmonise regional and sectorial development and to stimulate the growth of income and wealth and its spatial distribution.
- Seaports and airports of general interest. Highways, railways and land transport lines spanning more than one region. Water resources when river catchments extend over more than one region.
- Public works of general interest or for more than one region.
- Basic legislation, including nature conservation.

The existence of 17 regional legislations leads to all types of situations. In some cases the laws integrate spatial planning and urban planning, while in others it has been preferred to keep both disciplines separate. There are also regions whose legislation

integrates natural resource management, spatial planning and urban planning, in an attempt to focus land planning towards sustainable development (Canary Islands).

However, spatial planning is always supramunicipal, horizontal, with a broad material content, and it is developed through plans. The legislation regulates these plans and the mechanisms for cooperation and coordination between administrations in order to assure its implementation.

Spatial planning is developed through three instruments:

- Regional planning (guidelines, strategies or regional plans)
- Subregional planning (districts comprising several municipalities or other supramunicipal territories)
- Sectorial planning (major infrastructures, etc.)

- **Regional planning**

Not all legislations structure spatial planning around a plan with a regional scope. In fact there are only three regions that currently possess a regional plan: Catalonia (1995), Navarre (2005) and Andalusia (2006). In other regions legislation sets out general guidelines for sub-regional planning (Basque Country in 1997).

Regional plans determine spatial planning at regional level but need to be developed at a subregional level. The territorial model is generally organised around the town and city system, territorial relations system and the natural system.

- **Sub-regional planning**

Within this scope there are also many differences between the regions. Some organise their territory on the basis of administrative divisions (groups of municipalities, homogenous areas, etc.), others by geographic areas (coastal zone, mountains areas, etc.). There are also legislations that do not impose any type of territorial scope for planning, which must thus respond to needs which generally arise in the most densely populated areas, where the public authorities need to intervene to address the disorderly occupation and use of the territory.

In the island regions (Canary and Balearic Islands) sub regional planning is organised at an island level, since each island has its own government with planning related competencies.

The first modern Spanish sub-regional plan was approved in 1991 (Lanzarote Island, in the Canaries). The second was not approved until 10 years later, and since then others have gradually emerged. Around 30 subregional plans have now been approved and a similar number are at an advanced stage of development¹.

At present¹ there are ten regions that have published some kind of sub-regional plan, and the regions in which the regional planning process is more advanced are the Balearic Islands, Canary Islands, Basque Country, Navarre, Catalonia and Andalusia.

- **Sectorial planning**

These are plans with a territorial thematic incidence that can be developed by the different departments following specific sectorial legislation. Although there is a long tradition of sectorial planning in Spain, it has had an important development since the mid-nineties because of the needs imposed by the programming of the EU regional development funds, especially during the last three programming periods 1994-99, 2000-2006 and 2007-2013. This has led to the production of many different regional and national sectorial plans with an important impact on land planning, as those related with transport, energy, agriculture, forestry, river basin management, etc.

Other planning instruments

Besides the planning capacity that emanates from spatial planning legislation, mention should be made on two other important instruments:

- **Urban plans**

These are a municipal competency and are developed at a municipal scale, but must take into account higher level legislation, such as spatial planning, protected areas, public domain, etc. For their definitive approval they are sent to the corresponding bodies of the regional administration, which can make suggestions or restrictions in relation with regional planning.

¹ November 2007

However, most regional legislations don't stress that the regional or sub regional plans should be made prior to the urban plans (see below "The dynamic of spatial planning"). In fact, as seen before, regional and sub-regional spatial planning is still in an early stage, which means that most of the territory lacks any strategic supra-municipal planning. Because of this, too often urban planning is in practice the only existing planning instrument in many regions. In those territories where there is no legally approved a supra-municipal land plan, town planning ends up being designed just to take into account local interests. Although they are subsequently reviewed and finally approved by the regional administration, the latter frequently lacks of a strategic regional planning vision and the legal tools to assure that certain regional criteria are included, and this is even more critic when dealing with nature. In some of these cases only legally protected areas are completely left aside from the urban process (Table 1).

Table 1 Legally protected sites

- Sites protected by national legislation
- Natura 2000 network
- Public domain: rivers, coast, drover roads, etc
- Public utility woodland

• **Natural resources management plans**

The Nature Conservation Act of 1989 (Ley 4/89) stated that sites declared as national parks, nature parks or reserves must have their own natural resources management plan (PORN). Today there are more than 375 conservation sites covered by theses conservation figures, of which 85% have PORN (Europarc 2004).

PORNs are developed by the environmental administration, and cover the area of influence of protected areas, which include the entire territory of the affected municipalities. They are legally binding and take precedence over all other spatial planning instruments. Besides promoting the application of measures for the conservation, restoration and improvement of natural resources, they include criteria that seek to orient sectorial policies and public and private economic and social activities.

4.3. Institutional framework

As a consequence of the diversity of laws and the absence of a national framework, the institutional framework can be quite varied. However, it can be said that in all regions the planning process begins at the initiative of the regional government, which is responsible for drawing up the land planning.

To do so, most regions have developed specific departments within their administration. These are usually linked with the department of the environment, housing or infrastructures. In this regard stresses the case of Navarre, where the regional land planning strategy is developed by a public company depending on the Department of Housing and Land Planning. This company, in addition to planning, promotes the processes of public information, generates useful information, etc.

However these are just for the technical follow-up on the plan. Nevertheless, in view of the extension of planning, this is not enough and needs the configuration of political management bodies. Also the economic and financial programs of the plans, when they exist, limit themselves to the assignment of responsibilities to specific organisms, what does not guarantee its execution. The solution raised in some instruments to assure the execution of the plan is the constitution of management consortiums or the signature of agreements before the approval of the same ones (Benabent 2005).

4.4. The Spatial Planning Knowledge Base

For the preparation of land planning a wide variety of spatial information is used, mostly in georeferenced format. Many of this information it's available to the public on the Internet in the regional official web sites, which may have developed specific map servers.

4.5. Horizontal integration

To analyze horizontal integration, we have reviewed three sub-regional plans sharing border with France (Advance POT Pyrenees in Navarre 2007, Advance POT Atlantic Navarre 2007; POT Alt Pirineu and L'Aran in Catalonia 2006) and one sharing borders with Portugal (POT West Coast of Huelva in Andalusia 2006). All of them also shared border with other Spanish regions.

At the international level, horizontal integration focused solely on terrestrial communications. At the inter-regional level horizontal integration is somewhat better, but remains almost focused on terrestrial communications.

4.6. Vertical integration

During the spatial planning process the proposal is directly consulted with the different administrations in order to assure the integration of the different sectorial interests. However, land planning always takes into account existing Spanish legislation and therefore the EU legislation in force, but it's hard to know the extent to which it takes into account policies not legally supported. As quoted before, the most recent laws reflects the concepts, models and objectives of the European Spatial Development Perspective-ESDP (see point 4.1). Other general policies that use to be taken on to account are the UN Programme 21, the Trans-European Transport Networks (TENT-T), those promoting the use of renewable energies, etc.

At this point it should be noted that there are four major territorial units that are biosphere reserves under the UNESCO-MAB programme, the islands of Menorca, La Palma, El Hierro and Lanzarote. Here land planning and sectorial planning takes into account the obligations arising from the MAB programme.

4.7. The Dynamics of Spatial Planning in Practice

- **Preparation**

The formulation of spatial plans is carried out by the spatial planning departments of the regional governments. Occasionally the regional governments creates a specific body for this purpose but in most cases is contracted to a private company.

In general the procedure is quite similar for all the spatial planning processes, but differences may be found. It is an open process that encourages the participation and interaction of all affected territorial and economic actors in order to achieve the greatest possible consensus in the definition and subsequent implementation of the plan. For this purpose, most plans involve the setting up of working groups with a wide range of participants.

For the drafting of the plans consideration is made of:

- Existing legislation
- Current uses of the territory
- Protected sites (including Natura network)
- Public domain land (river banks, coast, drover roads)
- Public utility woodland
- Sectorial plans, etc.

Once a preliminary outline has been prepared it is submitted for consideration to the different regional departments, supramunicipal local bodies, municipalities, bodies set up for consultation and participation, other interested parties in the territory, etc. All suggestions are incorporated in a special memorandum. Sometimes special working meetings are held, seminars, forums on the Internet, public surveys, etc.

All this information is used to prepare a first version of the plan, the Advance of the Plan, which is then sent to public information (1-2 months) and it is also directly consulted with the administrations concerned. The draft plan includes the following documentation:

- Memorandum
- Spatial planning regulations
- Maps
- Economic and financial study
- Environmental report, in accordance with Directive 2001/42/EC.

The inputs from this process are used to draft the Plan, to which approval is again subjected to public information (1-2 months) and a consultation with the interested parties (different departments, NGOs, municipalities, etc).

Regional plans or regional land planning guidelines must be approved by the regional parliament, and sub-regional plans or sectorial plans are approved by the regional government. The enforcement and monitoring of the plan is responsibility of the departments responsible for land planning (see also point 4.3).

- **Implementation**

The law establishes a hierarchical order of regulations. Generally subregional planning is subject to regional planning, but sectorial planning is not always subject to land planning. Urban planning is always subject to land planning and sectorial planning. However this ranking system does not imply that planning should follow a certain order. In fact, in most legislations is not anticipated that the regional plans should be made prior to the sub-plans (Benabent 2005) (See also Urban planning in point 4.2).

The approval of any plan or project subject to sub-regional plan must pass through the responsible authorities, who inform on its grade of compliance with spatial planning guidelines.

- **Evaluation**

The evaluation of the plan is an aspect practically not considered in the legislation and only some regions incorporate it as necessary content of the plans (Benabent 2005). It must be also considered that the land planning process in Spain is still at an early stage what does not allow to have much experience on monitoring and evaluation.

5. STATE OF THE ART OF ECOLOGICAL NETWORKS IN SPAIN

5.1 Definition

As in other European countries, protected sites have gradually been designated according to the need for their protection, media pressure, territorial opportunity, etc. In this way each of the 17 regions has built up a set of protected areas, which in many regions is referred to as a protected areas network. This mesh of protected areas has been developed under the coverage of the 1989 Nature Conservation Act, which contains no reference to ecological connectivity. Thus the current situation has arisen out of a process where the concept of a protected areas network is used to designate a group of legally protected sites which share a conservation strategy. It is, therefore, an administrative concept.

Subsequently, the Habitats Directive to a certain extent incorporated the concept of an ecological network by pointing out the need to conserve the functionality of Natura 2000 sites, suggesting the establishment of biological corridors. However, it does not provide or establish any instrument or criteria by which to integrate biological corridors in the Natura 2000 structure.

Nevertheless, the application of the Habitats Directive has served as an incentive to review nature conservation policies, extending this concept beyond a simple list of protected areas. Some regions have responded to the challenge and have developed specific policies in this direction.

The law on nature conservation in Extremadura (Ley 8/1998) defines ecological and biodiversity corridor as water courses or bodies of water and their waterside areas, mountain chains, bodies of vegetation, lowland plains, traditional field boundary systems, and ponds and waterside woodlands, when their declaration contributes to the more coherent structuring and sound implementation of the protected natural sites network of Extremadura and their biodiversity. Is the only regional law considering corridors.

In Catalonia the concept of an ecological network has been defined as: a network of natural sites, consisting of a conjunction of sites of high natural value, which are

generally protected, surrounded by areas of influence and joined together by other sites of a smaller size that are well conserved and situated in such a way as to allow the movement and dispersion of flora and fauna species and the maintenance of the flows that guarantee the functionality of ecosystems (Mallarach and Germain 2006).

- **Definition on the new Nature Conservation Act (Law 42/2007)**

More recently, in December 2007, the Spanish parliament adopted a new national nature conservation act (Ley 42/2007) which includes consideration on ecological networks, incorporating the following definitions:

- Ecological network (Art. 17): a network composed of sites of high natural value which allows the movement and dispersion of flora and fauna species and the maintenance of the flows that guarantee the functionality of ecosystems.
- Ecological corridor (Art. 3): a territory of a variable size and configuration which, due to its position and its state of conservation, functionally connects natural sites of singular importance for wild flora or fauna, which are otherwise separated, allowing, among other ecological processes, genetic exchange between wild populations or the migration of specimens of these species.

Therefore, it is concept very recently incorporated into the Spanish conservation policies, for what it is not well extended and its meaning is still not well understood among land planners and even also among environmental authorities (see annex 1).

5.2 Development. Legal and policy context

The concept of an ecological network emerged in Spain as a result of the EECONET initiative (Bennett, 1991). Short after the Spanish first studies on the issue were carried out (CIFGB 1995; de Lucio *et al.* 1997) and little by little awareness on the issue grew.

Until 2007, the national nature conservation legal framework was based on the law 4/89 on natural conservation which did not considered any element of the ecological networks. At the country level, there is not yet today a comprehensive general policy framework or guidelines for the development of ecological networks, and it isn't clear to be in the coming years.

However, some regions have moved on the direction without any national coordination. The first initiatives for the development of ecological networks emerge coinciding with the work for defining the Natura 2000 network, when technical approaches were made for the Madrid (CIFGB 1995), Basque Country (IKT 1996; Gobierno Vasco 2005), Navarra (García 1998) and Catalanian (DGPNNMF 1999) regions. Since then only another region has approached to it, the Murcia region, which has made an initial technical study (ATECMA 2007).

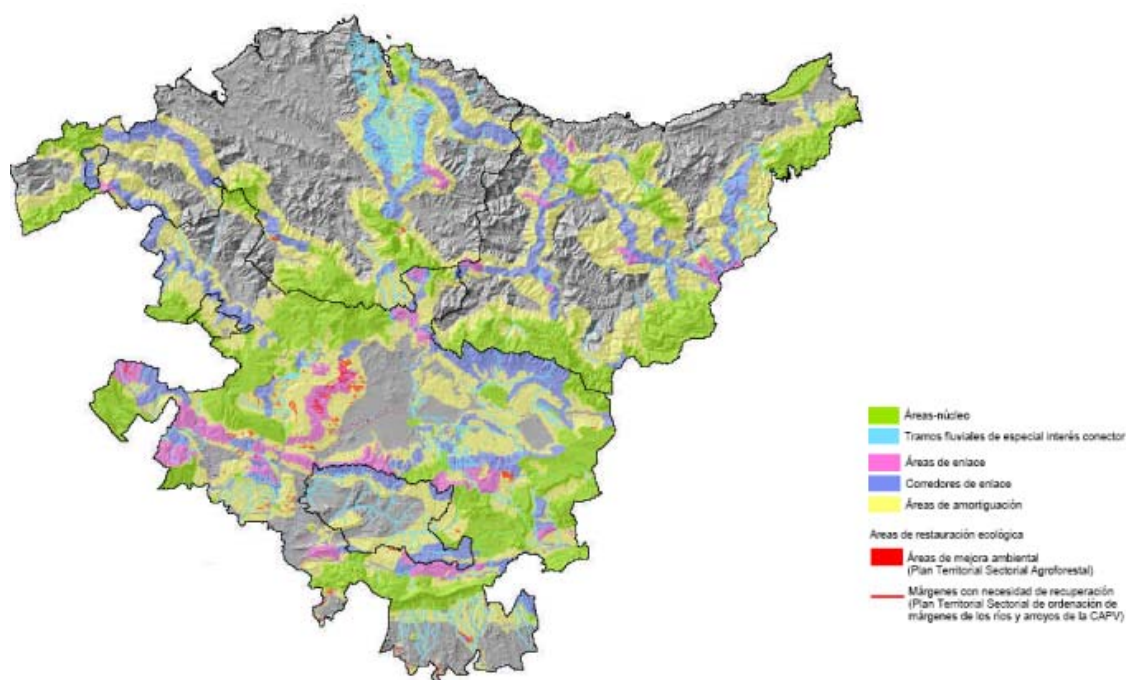


Figure 1. Map of the ecological network of the Basque Country region (Gobierno Vasco 2005).

Conscious of the need to develop ecological networks, the Action Plan for Protected Areas developed by Europarc-Spain (2002)² included various recommendations to this respect. The first chapter of the plan is on planning in spatial management, and includes a number of urgent recommendations to be developed, such as:

- To develop regional protected areas systems including buffer areas and ecological corridors.
- The need to establish action frameworks including the overall territorial model, the natural environment conservation strategy and the protected site system, seeking to achieve its articulation with sectorial policies.

² It is important to note that this is not an official strategy of the administration but a declaration of the persons responsible for protected sites meeting under the auspices of Europarc-España

Also a specific monograph was published on the issue (Mata 2005). The plan has been reviewed recently and these recommendations will be included within the first Axis of the 2008-2013 working programme (Europarc 2008). This is to say that Europarc-Spain, a non governmental organisation, has taken the lead to coordinate and promote the development of ecological networks in Spain in the absence of leadership from the Ministry of the Environment in the central administration.

In spite of the initial developments, at present only two regions have a well-defined policy to develop ecological networks, Catalonia and the Basque Country (see case studies), and while in the three mentioned before work has been stopped and in the rest of the regions has not even been initiated.

In this sense it is remarkable that the regions clearly committed in the development of ecological networks have an intensive infrastructure and urban development and, therefore, they have suffered a fast and intensive ecological degradation in the recent decades. Undoubtedly this situation contributes to the adoption of this new strategy as a need for biodiversity conservation at the long term. In the rest of the country, low population density and the vastness and continuity of open spaces, seems not to encourage those responsible for conservation to develop a policy of ecological networks as a conservation strategy.

Another barrier to develop ecological networks in Spain is the scarcity of resources for nature conservation. At present, protected areas under the national law cover 67.335 Km² and the terrestrial area covered by Natura 2000 is 134.150 Km², which is equivalent to more than the surface of Greece, Bulgaria or 3,2 times the size of the Netherlands. The whole country has to “digest” this new situation, which means more people, more management plans, more legislation, new conflicts with local stakeholders, a higher budget, etc. In this sense it’s important to note, that Catalonia and the Basque Country are among the more rich Spanish regions.

In some regions the excuse not to move in the direction is the conflict between urban interests and new protected areas or the lack of a specific legal framework. In fact the law on nature conservation in Extremadura (Law 8/1998) is the only regional law affording this concept legal support in Spain. In its regional law, ecological and

biodiversity corridors are conceptualised as another category of protected natural sites in the region. However in practice this concept has not yet been implemented in the region.



Figure 2. The Spanish Natura 2000 covers 134.150 Km², which is equivalent to more than the surface of Greece, Bulgaria or 3,2 times the size of the Netherlands. For some regions is difficult to “digest” the need of more conservation figures.

Although there is a lack of legal support, in regions where there is technical work already developed its results are usually taken into account in environmental impact studies and land planning. However it depends on the willingness of the parties involved.

In any case the environmental authorities in all regions tend to force the consideration of certain ecological corridors at the project scale; this is to say at environmental impact assessment level.

- **The new Nature Conservation Act (Law 42/2007)**

The new Nature Conservation Act, approved in December 2007, is applicable at national level, making it the framework law by which regional developments in this respect must abide. Because of its novelty, there are still many aspects that have not been developed

It specifies that protected site management plans (PORN) must contribute to the establishment and consolidation of ecological corridors³. For this purpose, new PORN must include mechanisms designed to achieve the ecological connectivity of the territory, establishing or restoring corridors (Art. 20). In this sense the law attaches priority to river courses, drover roads, mountain areas and other elements of the territory, irrespective of whether or not they are legally protected. It also places special importance on the connectivity of Natura 2000.

These site management plans are legally binding and take precedence over all other spatial planning instruments, which means that urban planning and spatial planning must be adapted to the provisions of the PORN. For this reason, since the new conservation law, the ecological corridors established in the new PORN must be incorporated in all other planning.

5.3. Institutional framework.

There are no specific structures or administrative provisions in this regard. At present, ecological networks are promoted and developed by the departments responsible for nature conservation.

So far most of the drafts for ecological networks have not passed the stage of technical proposal and therefore have been done with purely technical criteria and not followed any structured administrative process and, therefore, have not come to public information. In the case of Catalonia, in were these are included in the sub-regional land plans, they are part of the land planning process (See 4.9 and case study).

5.4. The Ecological Networks Knowledge database

From a technical point of view there is a good background on the issue. In recent years various contributions have been made to the design of ecological networks at various

³ To see its definition, see point 2.1

scales, from the municipal level to regional (García 1998; Marull and Mallarach 2002, 2005; Mallarach 2003, 2004; Pascual-Hortal and Saura 2007; Saura and Pascual-Hortal 2007; Gurrutxaga 2007) and many different mapping proposals have been produced, mostly in Catalonia and the Basque Country.

There are also a wide range of studies on permeability of infrastructures (Velasco *et al.* 1995; Yanes *et al.* 1995; Rosell *et al.* 1996; Rodriguez *et al.* 1996; Rosell and Velasco 1999; Mata *et al.* 2003, 2005; MMA 2006), habitat fragmentation and connectivity (Santos and Tellería 1998; Blanco and Cortes 1999, 2001; Marull and Mallarach 2005; Palomino and Carrascal 2007; Santos *et al.* 2002).

For the design of ecological networks different kind of geo-referenced information is used, as:

- Habitats, wetlands, sites of geological importance, landscapes
- protected not urban areas (coasts, river margins, drovers roads, public use forests, etc)
- Protected areas (regional legislation, Natura 2000, etc.)
- Unsuitable areas for urban development: natural risks (geologic, flooding), slopes, technological risks, etc.
- Land use and occupation (infrastructures, urban areas, etc)

Most of this information is accessible through the Internet.

5.5. Horizontal integration

The lack of horizontal integration also takes place on ecological networks. A good example is the spatial planning and L'Alt Pirineu Aran 2006 in the Pyrenees, a district with high ecological values. This Catalan region is bounded on the north by France and east by the Aragon region.

The ecological network map shows that connectivity with France and Aragon is not taken on to account (Figure 3). This "lack of connectivity", which is noticeable in all the regional or sub-regional ecological network plans drafted up to date in Spain, is not due to a lack of collaboration between regions on the matter, but rather a lack of

coordination, since not all regions are moving at the time in the same direction (see point 5.2).

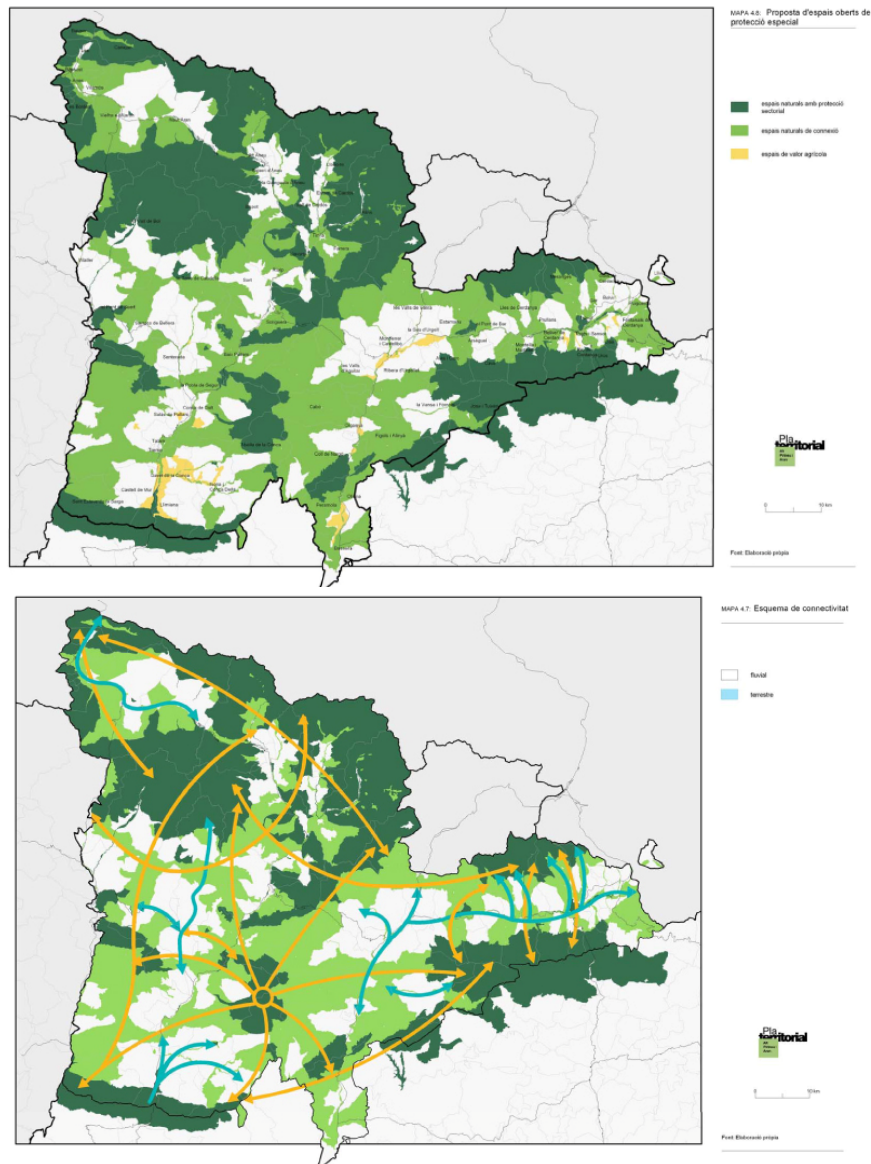


Figure 3. Extracted from the L'Alt Pirineu Aran spatial plan (2006). The top map shows protected areas (dark green), connectivity areas (light green) and agriculture value areas (yellow) on the district. The bottom map outlines the desired connectivity. The north border is with France and Andorra, the west with the Aragon region, and the south and south east with other regional districts

5.6. Vertical integration

Interest in Spain on the ecological networks arise from the mid-90 as a result of development of the habitats directive, which somehow encouraged to review the policies hitherto protected areas, and the initiatives on the Pan-European Ecological Network arisen in other European countries. In this sense the probably the most quoted document is Bennet (1991).

The existence of a clearly defined and accepted ecological network is essential to minimize the potential impact of certain plans and programs that affect large areas, such as transport networks, spatial and town planning, etc. Since the enforcement of the directive on strategic environmental assessment (Directive 2001/42/EEC) and its transposition into Spanish legislation (Ley 9/2006) there has been a boom in strategic environmental assessment studies.

For this assessment a good information background is needed on protected areas, habitats and species, landscape and ecological networks. While very good information is available on the firsts it is lacking on ecological networks, which makes their consideration in the strategic assessment very difficult or impossible. Anyway some research has been done on how to integrate ecological networks within the strategic environmental assessment (Marull *et al.* 2007).

At the project level, environmental impact assessment studies includes field work, and usually takes into account the connectivity local needs (se also 5.2). Therefore it is rather a local and punctual approach, far away from the strategic vision of ecological networks.

6. INTEGRATING SPATIAL PLANNING AND ECOLOGICAL NETWORKS

So far most of the nature conservation policies in Spain had not considered the concept of ecological network and therefore it doesn't exist the legal support or information necessary for its inclusion into the land planning process (See case studies for exceptions). Therefore, the problem is not a lack of communication between the two sectors, but a lack of definition, technical and legal, which makes nearly impossible for planners the consideration of ecological networks in land planning.

In regions where ecological networks are more developed, these are considered during land planning as another key element. As most of these networks have no legal backing in most cases their existence depends on the goodwill of the parties concerned.

Ecological network planning is has just born in Spain, and therefore is too soon to talk about its implementation and even less of its assessment.

7. CASE STUDIES

7.1. NAVARRRE'S REGIONAL ECOLOGICAL NETWORK.

The Navarra region is in the north of Spain, sharing border with France. This region has been one of the pioneers in including this concept within its conservation strategy. In 1997, the regional government produced a first draft on what it should be the regional ecological network (Figure 4) as a necessary complement for Natura 2000 (García 1998). A year later, during the ex-ante assessment of its Biodiversity Conservation Strategy the regional government recognised that the protected areas network was somehow incoherent, since sites were not interconnected, a factor of main importance for the functional maintenance of ecosystems (Gobierno de Navarra 1999). The aforementioned document stated that "...the natural site network must be transformed into a real sustainable network which guarantees the spatial and temporal integrity of all the protected territory and the corridors that serve to interconnect it by means of the corresponding management plans".

As a consequence, the concept of ecological network was included as an objective to be developed of the 1999-2004 Strategy for Conservation and Sustainable Use of Biodiversity. This allowed its recognition as one of the guidelines for the region's spatial strategy (Agrupación Navarra XXI 2003).

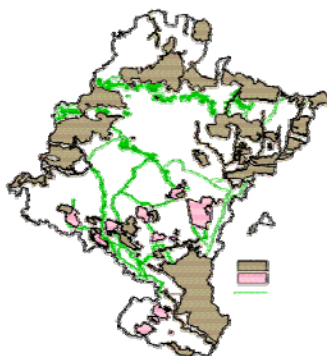


Figure 4. First draft of the Navarra's ecological network (1997). In brown Natura 2000 sites, in pink nodes and in green ecological corridors.

In spite of all this previous work, no further work has been done on the regional ecological network and the initiative is stopped at present. Meanwhile the work on the regional spatial strategy is being developed through five sub-regional plans. Although the lack of an official ecological network, during the land planning process the recommendations arising from the first draft approach are usually included.

Conclusion: the preparation of maps of ecological networks, even if they don't have a legal or official backing, is a very useful tool for the integration of ecological networks in land planning.

7.2. CATALONIA'S REGIONAL ECOLOGICAL NETWORK.

The Catalonia regional Spatial Plan was adopted in 1995 and is the master plan for all sub-regional and urban planning. Among its guidelines states that planning should take on to account the connection and the interaction of the areas considered within the regional Plan of Sites of Natural Interest (PEIN). A bit later, in 1998, a resolution of the regional parliament called the regional government to adopt strategic guidelines for ecological and landscape connectivity and this produced a connectivity plan of the Sites of Natural Interest (DGPNNF 1999).

It is important to note that since the second half of the nineties dozens of studies on ecological connectivity took place in the region, mostly in relation to the Barcelona metropolitan area, but also for other municipalities, counties and sub-regions and even for the PEIN (DGPNNF 1999). Undoubtedly all this work contributed to raise awareness on the issue among policy makers in region.

In order to fulfil the provisions of the regional Spatial Plan, in 2006 the Department of the Environment published its guidelines for ecological connectivity (Mallarach and Germain 2006). This document includes a total of 68 guidelines for the following areas: spatial planning, protected areas, threatened and protected species, linear infrastructures, rivers, agriculture, town planning, use of biological resources, environmental impact assessment, research, information and public participation. Their application will be achieved through the different planning instruments used in environmental, territorial, town and sectorial planning legislation, including environmental impact assessment and SEA procedures. At the same time maps on connectivity indexes and sites of especial interest for connectivity were produced (ARDA 2006; Marull *et al.* 2006)

As result of this policy, all the new Catalonian spatial plans include the principle of connectivity, and are structured in three systems: open spaces, settlements and

mobility infrastructures (Figure 3). The system of open spaces includes the non-urban land component, and is attached the same importance as infrastructure policy or town planning, assuring ecological connections. It includes (see also Box 2):

- Special protection land: high agricultural and ecologic importance areas, including ecological connectivity
- Territory protection land: at present not urban
- Preventive protection land: not urban due to ecological or technological risks, landscape interest, strategic interest.

Box 2. Extract of the l'Emporda guiding spatial plan showing how the system of open spaces have been considered for protection

Category		Area			
Special protection	Protected areas	74,964 ha	45 %	166.083 ha	86%
	Ecological and landscape connectivity	56,979 ha	34 %		
	High agricultural value	22,522 ha	13 %		
	Natural interest, ecological, landscape and agricultural connectivity	11,616 ha	7%		
Land for territory protection				5,992 ha	3%
Land for preventive protection				1,385 ha	10%
Total non-urban land				191,421 ha	100 %

Conclusions: Two interesting issues may arise from this case study. The first one is that research and definition of ecological networks may be a key element to raise awareness on their need and facilitates its implementation.

It is also an example of the integration of ecological networks within land planning, even although the absence of a legal framework, but being considered a principle for land planning.

7.3. MADRID: IMPLICATIONS OF THE LACK OF REGIONAL PLANNING.

A significative example is that of the of the Madrid region. It is located in the middle of the country, with an extension of 8.021 Km² (The Netherlands 41.526 Km²) and a population density of 758 inhab/Km² (The Netherlands 392 inhab/Km²).

Despite an impressive urban pressure, the region still has habitats well preserved and holds important populations of endangered species (27 pairs of Imperial Eagle, 1.295 Great Bustards, 262 pairs of Griffon Vulture, 15 pairs of Golden Eagle,...). Because of this the 39% of the region has been designated as Natura 2000.

Madrid city, which together with its surrounding towns has a population of 4,5 million, is at its geographical centre. The rest of the population, up to 6 million is distributed in towns of different sizes. This huge population concentration has a great pressure on the environment, as well as demand for land for first or second home, for infrastructure and communications, for industries and services, water, as places for recreation or entertainment. Also it is important to note that Madrid is the main communication node in the country, and as being in the centre all the railways, roads and motorways are radial, while the Natura 2000 sites are as an outer ring (Figure 5).

This region was probably the first where the idea of ecological networks started to be developed (CIFGB 1995; de Lucio *et al.* 1997). At the same time the regional government started to prepare the guidelines for the regional land planning strategy (Plan of Territorial Strategy PRET) which included guidelines for the ecological networks (Fundicot 1997). However the PRET have never been approved, although the regional law states so, and therefore don't legally exist.

Therefore at present all the land planning in Madrid relies on town planning, which only take on to account the interests of sectorial plans (energy, water, transport,..) and legally protected areas (Table 1).

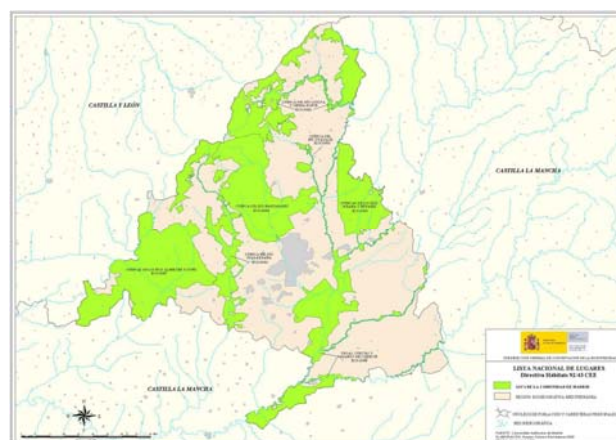


Figure 5. Map of Natura 2000 in the Madrid region.

When consulted during the town planning process, many times the regional environmental authorities asks urban planners to consider ecological corridors, but they are powerless because they don't have legal backing to defend them before local interests. Anyway, many times urban planners are open for their consideration, but they are not enough background information or budget to do it.

As a result it can be said that land planning in the region of Madrid is a summation of town plans, designed just attending the local interest. This assertion can be extended to many other Spanish regions in the same situation.

Conclusion: The future of nature conservation in high densely population regions needs both, land planning and ecological networks.

7.4. ASTURIAS BROWN BEAR ENDANGERED SPECIES RECOVERY PLAN

The national 1989 Nature Conservation Act established that the regions must develop recovery plans for endangered species. Since then, recovery plans have been developed for numerous species (Lynx, Imperial eagle, etc.). One of the first was for the Brown Bear.

The Brown Bear population at the Cantabrian Mountains ranges across the territory of three regions: Asturias, Castile-Leon and Cantabria. This population is split into two populations separated by a corridor used by transport infrastructures.



Figure 6. Distribution of the Brown Bear in the Cantabrian Mountains. (Source: Fundación Oso Pardo)

The three regions have developed their own recovery plan, which were adopted successively between 1989 and 1991. These plans are approved by decree and their content is legally binding, which means that all the different bodies and administrations must comply with their guidelines in the territorial area affected by the plan, with regard to the granting of licences, administrative concessions or any other type of authorisation or execution of works.

In 2002 the Asturias's bear recovery plan was revised, and the objective of connecting both populations was significantly reinforced (Box 3). The area covered by the plan includes all the areas currently occupied by the species, as well as areas for potential occupation and a corridor for communication between the two populations.

Box 3. Extract of the Asturias Brown Bear Recovery Plan (Decreto 9/2002)

Objective 3. Assure connectivity between populations and population nuclei.

3.1. Favour the natural connection between the two populations.

3.1.1. Demarcate with the greatest precision the communication corridor between the two populations.

3.1.2. Identify the elements that may hamper the dispersion of individuals.

3.1.3. Prepare a special plan for restoration of the corridor, in coordination with the regional government of Castile-Leon.

3.2. Avoid any possible fragmentation of the habitat in the western population, identifying internal communication corridors.

Conclusions: In this case the legal backing of an endangered species recovery plan is being used for ecological connectivity, showing that this can be achieved through different instruments.

8. CONCLUSIONS AND RECOMMENDATIONS

Because of the lack of political interest on ecological networks, these have not been developed in most Spanish regions and thus incorporated into the land planning process. However, the situation is changing and ecological networks are becoming an emergent issue.

Probably the main barriers for the definition of ecological networks are:

- The ecological network concept is still not well understood and extended even among the nature conservation community.
- Protected areas, and even more Natura 2000, cover big areas of the country. The former extends over a surface greater than Greece, Bulgaria or 3,2 times the size of The Netherlands. Also there are many regions with a low population density and a vast continuity of open spaces. This situation seems not to encourage the development of ecological networks in many regions, in where there are other priority issues in the agenda.
- There is not a national framework for the development of ecological networks.
- There is a lack of legal backing. However this should not be use as a main excuse for not developing of ecological networks, because when these are well defined they are usually taken on to account in land planning and strategic environmental assessment.

Other important conclusions are:

- The preparation of maps of ecological networks, even if they don't have a legal or official backing, is a very useful tool for their integration in land planning and strategic environmental assessment.
- Regional research on ecological networks can be a key element to raise awareness on their need and facilitates its implementation.

To counteract these barriers we suggest:

- To promote awareness on the need of ecological networks among the responsible for nature conservation at the national and regional level and NGOs. This will improve the knowledge on the concept, promote the need of ecological networks for long term biodiversity conservation, although for those regions with low urban and infrastructures development.

- To promote the drafting of ecological networks. If it is not in the agenda of the regional administrations it could be done through NGOs. The same was done with Important Bird Areas, a non officially recognised document, to promote the designation of Special Protection Areas under the Birds Directive.
- The creation of a national working group gathering the regional nature conservation authorities. Its first task should be to create a national ecological network framework.

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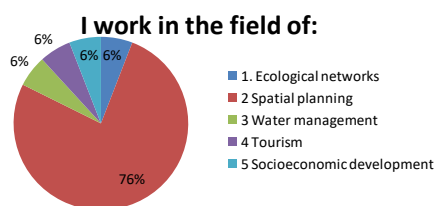
ANNEX.

RESULTS OF THE QUESTIONNAIRE

Background

Nineteen questionnaires were filled during the 5th International Congress for Spatial Planning, held in Malaga (Spain) the 23-25 of November. This analysis includes only those belonging to Spaniards (eighteen). The remanding one belonged to an Italian, and has not been included.

Most of them worked in spatial planning.

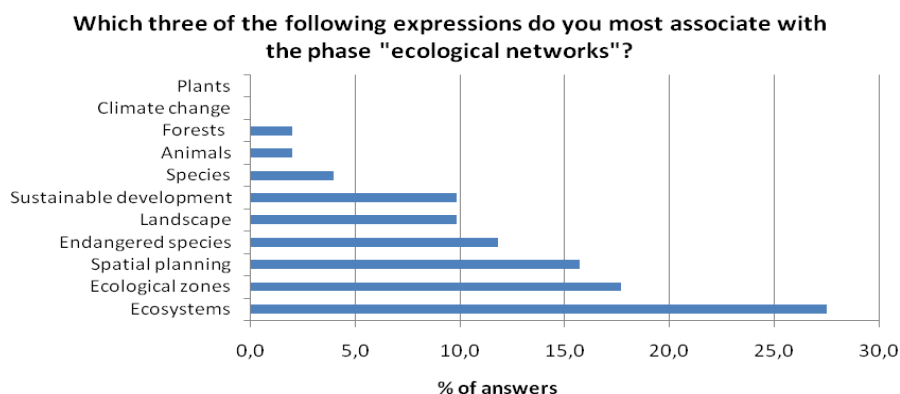


SECTION 1. Awareness/understanding of the concept of ecological networks and spatial planning

1a. Understanding of the concept of ecological networks

1.1 The 72% of the people replied to be aware of the concept of ecological network, and on its different methodological approaches. A higher percentage (83%) indicated to be aware on its purpose.

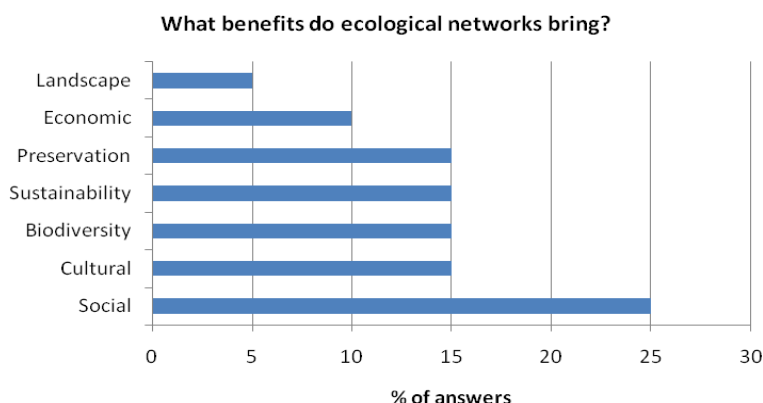
1.2 The expression most associated with ecological networks is “ecosystems” (27% of the answers), followed by “ecological zones” (17%) and “spatial planning” (16%).



1.3 Most of participants were not aware of the work on the Pan European Ecological network (84%) and its indicative maps (72%).

1.4 However 70,5% said to be aware on the work going on the Natura 2000 network.

1.5 To the question on what benefits do ecological networks bring, 25% of the answers said to be social and 15% said to be cultural, biodiversity, sustainability or nature conservation.



1b. Understanding of the concept of spatial planning

1.6 Nearly all the participants said to be aware of the definition of spatial planning (94%) and a similar percentage of the spanish definition for spatial planning.

1.7 However, people were less aware of the spatial planning system (76%). Of the four people that indicated not know, two worked in different areas than land planning, one worked on land planning, and the remaining didn't say were.

SECTION 2. personal involvement with ecological networks and spatial planning

2.1 All the people (100%) said that the ecological network concept has a value in spatial planning. The most common answers for it were, because:

- it's a main issue for spatial planning
- it's a value that must be considered
- protected areas can not be understood without it
- for environmental integration

2.2 Only the 27% of the participants said to be involved in the creation of ecological networks. Of the remaining people, the 46% said to interer to work on the issue only at subnational level, a 23% at any level and one said only at the national level. The former worked in remote sensing applications. Another 23% said not be interest to be involved on the issue.

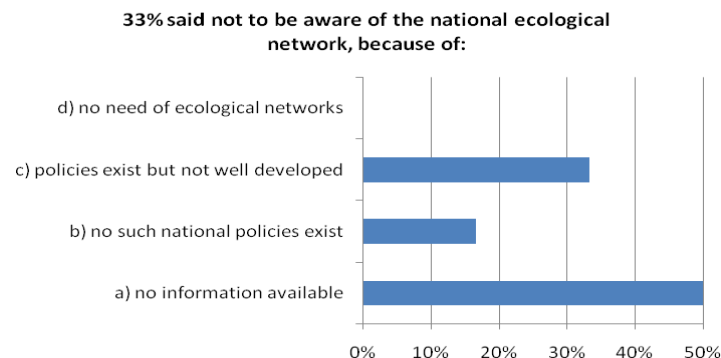
2.3 Most of the people (94%) said that spatial planning has a value in creating ecological networks, because of:

- the spatial planning definition
- its an instrument
- to add value to ecological networks
- for nature conservation

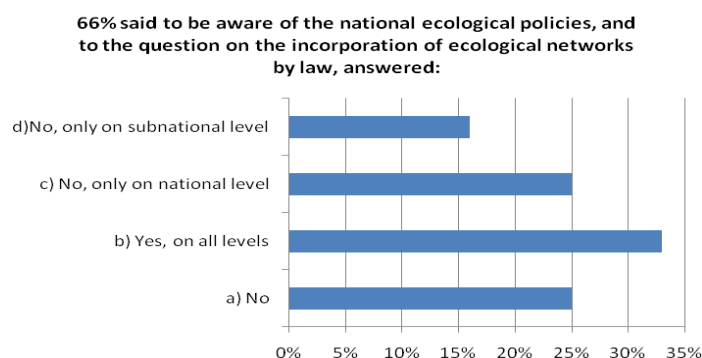
2.4 The only negative answer was argued because spatial planning should consider ecological networks, and no the other way round.

SECTION 3. Awareness of policies with regards to ecological networks and spatial planning

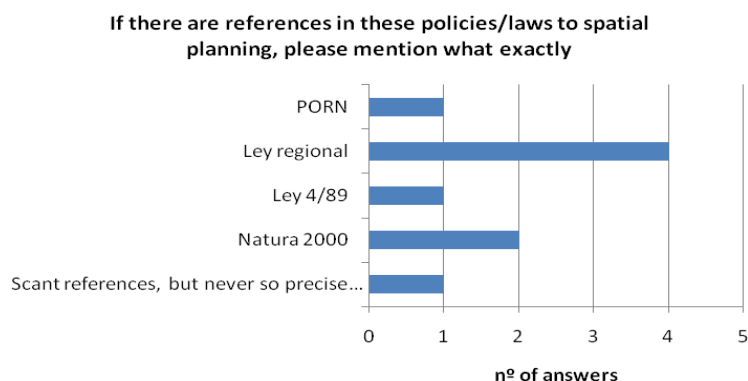
3.1 The 66% are aware of the national ecological network policies. The not awared is because there is no information available (50%), no such national policies exist (16,6%) or policies exists but are not well developed (33,3%).



3.2 The rest of the people (66%) said to be aware of the national ecological network. Of these, a 25% said that ecological networks are not incorporated by law, 33% that they are incorporated on all levels, a 25% only on national level and a 16% just on subnational level.

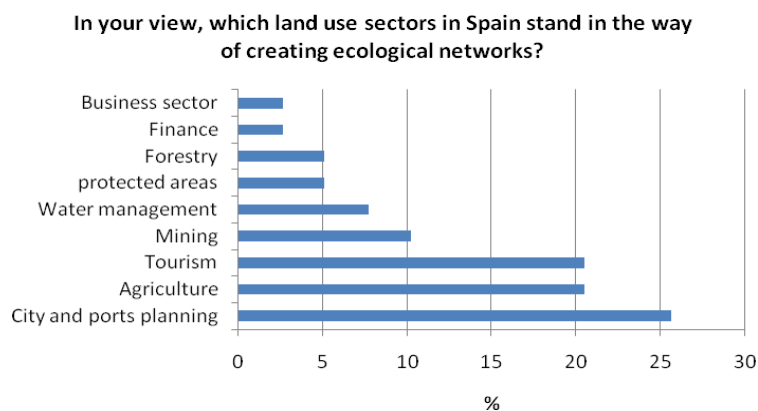


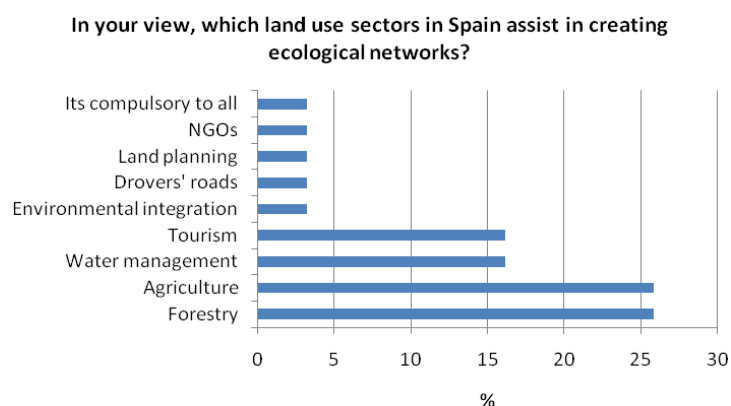
3.3 Of the people saying to be aware on the national ecological network, a 53% said that in these policies/laws there are reference to spatial planning, more specifically in the following:



3.4 The 32% didn't know if in those policies there are any reference to spatial planning. A 12% said not know.

3.5 Only the 32,3% of the people said that ecologicals networks in Spain are fine tuned with European Ecological Networks, and specifically by means of Natura 2000. The rest said that there are not tuned with EEN, didn't know or just didn't answer, which could be interpreted and that they didn't know.





3.6 For the participants, the land use sectors standing in the way of creating ecological networks are city and ports planning, agriculture and tourism. On the other hand, the sectors that contribute most are forestry, agriculture and water management.

3.7 The 66,6 % of the people were aware of national planning policies in Spain. The 71% of these said that withing these policies there are references to ecological networks, and more specifcly some references to green corridors, Natura 2000, protected areas and environmental legislation.

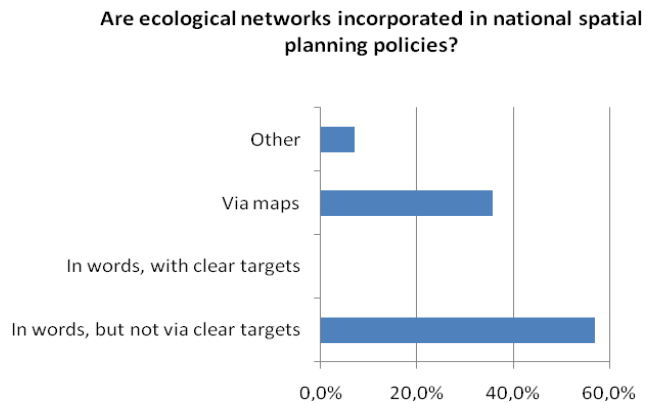
3.8 The 82,3% see spatial planning as a positive sector for assisting the stablshment of ecological networks.

3.9 The land planning items they would like to change in respect to ecological networks includes:

- Better coordination is needed
- Definition of ecological networks
- Strategic environmental assessment
- Monitoring
- Role of agricultural landscapes
- Land use
- Building
- Infrastructures
- Planning scale
- Enforcement
- Law

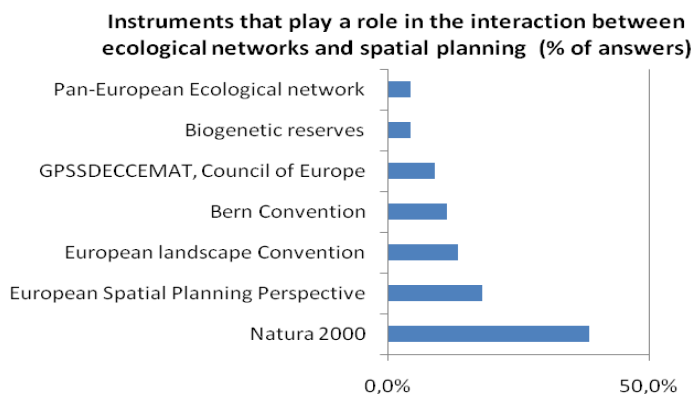
3.10 For the 55%, spatial planning is conceptually and technically compatible with the development of ecological networks

3.11 In relation with the incorporation of ecological networks in national spatial planning policies, they said:



3.13 The 50% said that spatial plans are incorporated by law on all leveles, and a 37% that only at subregional level.

3.14 Instruments that participants sais to play a role in the interaction between ecological networks and spatial planning:



SECTION 4. Cooperation between ecological networks and spatial planning sectors.

4.1 Most of the people (72%) were not aware on practical experiences with regard to cooperation between nature conservation the and spatial planning sector, with regard to the design and developing of ecological networks. Experiences were mentioned in relation with river corridors (public river domain), coordination in relation with the enforcement of legislation, and the share of information.

4.2 The most mentioned barriers for the inclusion of ecological networks into spatial plans were:

at the national level

- the lack of competences (44%)
- groth pressures (44%).

at the regional level

- Groth pressures (40%)
- Lack of knowledge (20%)
- Lack of coordination with other levels (13%)

At the local level:

- Groth pressures (44%)
- Lack of coordination with other levels, private interest, lack of resources and lack of knowledge (14,3% each)

4.3 Finally when asked on their perspectives for increasing the active involvement of the spatial sector in the development of ecological networks, most answers recognised a great potential and big possibilities.

CONCLUSIONS

It is not clear that those interviewed have a clear concept of ecological network.

Although in their first replies say that they are (1.1), some other replies suggest they may not. For example:

- They said that the main benefit of ecological networks is cultural followed, at the same level, of cultural, biodiversity, conservation,.. (1.5).
- The majority said to know the ecological networks policies (3.1), when the reality is that at the moment that the questionnaire was done, there were not a national policy, and a few regions have a policy on it. Even the 58% say that ecological networks are built by law at the national / or all levels (3.2). This response suggests that the majority of respondents assimilates the Natura 2000 network to ecological network since its implementation in Spain has been done at the national level.
- Later, the majority of respondents who say to keep pace with the land planning policies, say these include references to ecological networks (3.7), where this is not true. Indeed when asked to specify, they answer: green corridors, Natura 2000, environmental laws and protected areas. In fact very few (27%) are aware practical experiences of cooperation between management and ecological networks (4.1).

It is striking here, how little knowledge there is on the Pan European Ecological Network (1.3, 3.14). However, it should be mentioned here that some of the people aware on the PEEN were land planners.

There is a great potencial for the development of ecological networks and their integration into land planning

Almost all would like to participate in the establishment of ecological networks (2.2), especially at the regional level, which is logical because it is were the competences are. But very few do, and mostly belong to the world of land planning.

Most believe that spatial planning has value to create ecological networks (2.3), and that it is a positive sector for assisting its establishment (3.8).

Finally, the majority found a great potential for the future development por ecological networks (4.3)