

Ecological networks: from regional to metropolitan strategies. The Northern Region of Portugal and Oporto Metropolitan Area

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Planning for change across landscape scales in Northern Portugal through the definition of ecological networks has proved to be a challenging exercise. The outputs produced between 2004 and 2009 by CIBIO, a research unit at the University of Porto, demonstrate the complementarities of landscape planning at the regional and metropolitan scales and between regional ecological networks for environmental protection and a metropolitan network of parks.

Through the five years of research, we were moved by the idea of providing solutions for better living in the ‘rural-urban compact’ where the Porto Metropolitan Area is embedded. Gutman (2007, pp. 385) defends that there is a need for a new rural-urban compact, “one that keeps delivering the food and fibres that the world needs, but at the same time is able to (a) improve the jobs and income opportunities of the rural population, (b) reduce the rural-urban divide, and (c) reverse the current trend of environmental degradation that is jeopardizing both people and nature”.

Ecological networks are understood as the basic landscape system governing the functioning of the natural dynamics, with specific aptitudes for human activities and having multiple yet complementary purposes, such as agro-forestry, conservation of natural and cultural heritage, leisure activities and tourism (Andresen et al, 2005). The concept of ecological networks has evolved significantly over the past 30 years since it emerged in the scope of nature conservation policies. In Portugal, the National Ecological Reserve (NER) was created, in 1983, with the purpose to safeguard the most fragile ecosystems, biological processes and landscape dynamics as stated in Decree Law 321/83: “to protect, in certain areas, the biophysical structure needed to operate resources and use the territory without deteriorating certain circumstances and capacities on which depend the stability and fertility of the regions, as well as the maintenance of many of its economic, social and cultural values”. NER is a concept inspired on the ideas of Caldeira Cabral (1908-1992), the founder of Portuguese landscape architecture who, through the 1960’s and ‘70s, promoted the idea of the *continuum naturale*.

The concept of ecological networks widened significantly worldwide and assumed an operational role in landscape planning studies. In the United States, it is also named as ‘greenways’. Julius Fabos (1995) referred to the ‘greenway movement’ as a new concept that integrates many established landscape architectural, planning and design ideas, concepts, and implementation techniques. Fabos (1995 and 2004) and Ahern (2002) place the origin of the concept in the United States with “the urban park systems” of the early days of landscape architecture at the end of the 19th century. Nowadays, it is recognised that in landscape planning greenways have evolved towards a multipurpose approach: “Greenways are systems and/or networks

of protected lands that are managed for multiple uses including: nature protection, biodiversity, management, water resources, recreation, and cultural/historic resource protection.” (Ahern. 2002, p. 2).

The purpose of this paper is to present an exercise for the Northern Region of Portugal on landscape planning at three different levels - from regional to metropolitan - driven by the concept of ecological networks. This experience became an opportunity to explore the significance of the concept and the connections with landscape functions. It called for a permanent adequateness of the database and a sound acquaintance with the landscape.

Ecological networks and planning at the regional level in Northern Portugal

The framework of landscape planning in Portugal is of a hierarchical nature covering from the national to the site scales. At the national level, the most integrative instrument is the National Programme for Landscape Planning (PNPOT). It is organized in strategic objectives and specific objectives. Among the strategic objectives, priority is given to the conservation and enhancement of biodiversity, natural resources, natural, cultural and landscape heritage the sustainable use of energy and geologic resources and hazard prevention. PNPOT envisions to embrace the various sectorial strategies and aims at a sustainable and competitive development within the European Union framework (MAODRT.DGOTDU, 2007).

Portugal has five regions in the mainland. At the regional level, the leading landscape planning instrument is the Regional Plan (PROT). PNPOT and PROT define the strategic framework for the implementation of landscape planning at the municipal level. The various regions have been preparing their PROT which implies the definition of the Regional Structure for Environmental Protection and Enhancement (ERPVA).

We wish now to present ERPVA for the Northern Region of Portugal. The region has an area of about 1/4th of Portugal (21 278 km²) and a population of about 3.7 million inhabitants (175 inhabitants/km²), more then 1/3rd of Portugal’s population distributed by 86 municipalities (Figure 1). To the North and East, the region is surrounded by Spain - Galicia and Castile Leon -, to the East lays the Atlantic Ocean and to the South is the Central Region of Portugal. Porto, on the Atlantic Ocean by the Douro estuary, is the main urban centre.

It is a region of strong dichotomies, with high population densities along the coast and low densities to the interior, humid and mild temperatures along the coastal areas versus a drier interior of more extreme temperatures, and soft coastal areas with low plains separated by steep and high mountains of higher level plateaus in the interior. A large majority of Northern Portugal is inscribed in the immense Douro river watershed distributed between Portugal and Spain. The dichotomy of nature, culture and landscape derives not just from landform but also from the Atlantic-Mediterranean climatic transition.



Figure 1. – Location map. The Iberian Peninsula and the three study areas

ERPVA is understood as the fundamental spatial structure to support the protection and enhancement of the natural systems strategic to nature conservation, halting the loss of biodiversity, adapting to climate change, balancing the water cycle, safeguarding water quality, conservation of fertile soils and to meet international and national environmental legal requirements. It is inspired by the concept of ecological networks and embedded in a deep understanding of the landscape character and landscape diversity derived, namely, from the above mentioned dichotomy. At this planning level and within the Portuguese legal framework of the PROT, it gives priority to natural values and the strategic management of natural resources. However, the Northern Region is a well-known territory and once the spatial representation of ERPVA emerged, it was immediate and not surprising to conclude that it gathered some of the most significant cultural landscapes with a significant presence of cultural values of Northern Portugal.

ERPVA congregates core areas - protected areas, high lands and lowlands - and corridors associated to the regional hydrographical network. The representation of ERPVA called for the integration of diversified databases: the National Network of Protected Areas, Natura 2000 Sites and Special Protection Areas, relief and slope analysis, low altitude territories (0-50 meters), which congregate most of the significant alluvium soil and agricultural areas, constituting important water retention basins; and the high altitude territories (above 700 meters), which congregate the most part of the territory's major rivers upper catchment areas. The reunion of these components constitutes a network of core areas to which were still added the areas included in the UNESCO's World Heritage List – The Prehistoric Rock-Art Sites in the Côa Valley and the Alto Douro Wine Region and the region's hydrographical network that constitutes the corridors. Previous to the making of PROT, there had been a strategic study titled North 2015 proposing a development vision for the region looking at 2015 (CCDRN, 2006). At this exploratory levels other database had been manipulated, namely geology and land use (CORINE).

Once the spatial representation of ERPVA was concluded, it was confronted with the urban and the transportation networks and one can verify that two different urban

concentration types are present: large polycentric agglomerations on the Atlantic side surrounding Porto, separated from the rest of the territory by a mountainous chain formed by the mountains of Freita, Montemuro, Marão, Alvão, Gerês, Soajo and Peneda. Beyond this mountain chain, towns are smaller in size, concentrated and disperse throughout the territory (Figure 2).

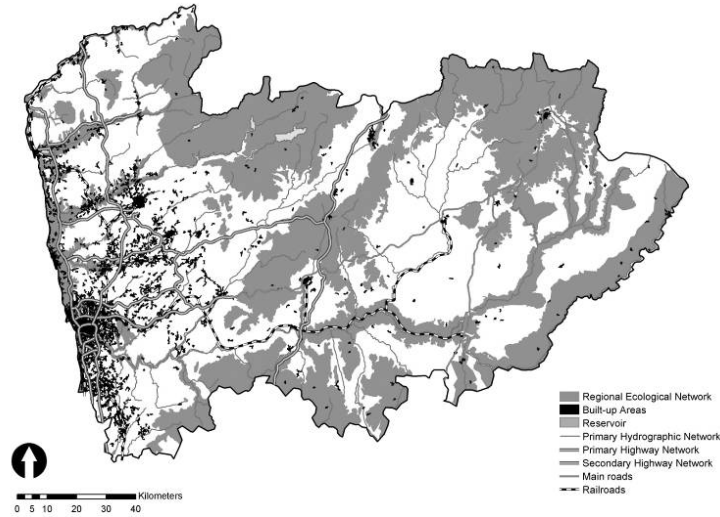


Figure 2. – The Regional Structure for Environmental Protection and Enhancement of Northern Portugal

ERPVA aims to provide the base for the definition of major policies for the enhancement and conservation of natural and landscape resources. Six landscape management units were then identified (Figure 3).

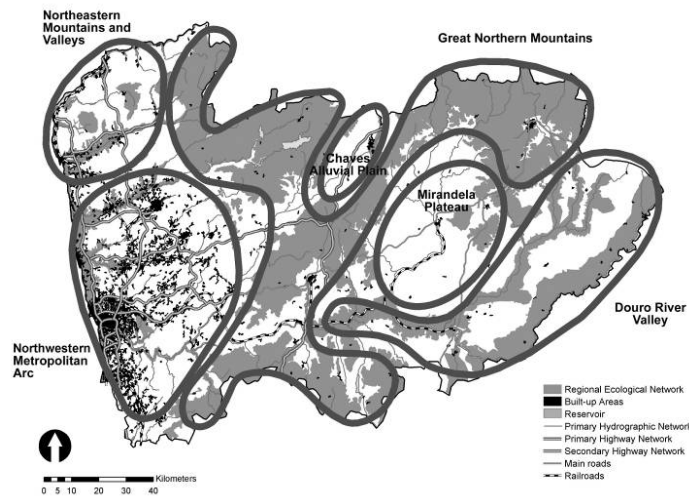


Figure 3. Landscape management units of Northern Portugal

Of these six units, three have a major conservationist vocation: the Great Northern Mountains, where the mountains of Montesinho, Peneda-Gerês, Alvão-Marão, Montemuro and Freita are included, the Northeastern Mountains and Valleys and the Douro River Valley. The other three have a very distinct agricultural vocation: Chaves Alluvial Plain, Mirandela Plateau and North-western Metropolitan Arc.

Under the process of PROT, besides the identification of ERPVA, the complexities and uniqueness of the North-western Metropolitan Arc made clear that the understanding of the ecological structure and functioning of the natural dynamics required a specific approach. The Arc represents 36 municipalities and about 70% of the population of the Northern Region. The approach to a definition of an ecological structure was a simplified exercise conditioned to the existing databases. The criteria were based on the identification of the ‘lowlands’ distributed along the open valleys to a maximum of 8% slope including the most fertile and humid soils, and ‘highlands’ mostly those distributed above 200 meters with the highest importance for habitats and species conservation (native woods, shrubbery and grazing fields), in spite of the negative impact of the inherited installed forestry systems, and simultaneously rich in cultural heritage (shrines and archaeological sites). Coastal areas are regulated by the Northern Coastal Plan articulated with each municipality Master Plan. We considered this as an indicative output on strategic landscapes to protect for the environmental functioning of the 36 municipalities (Figure 4).

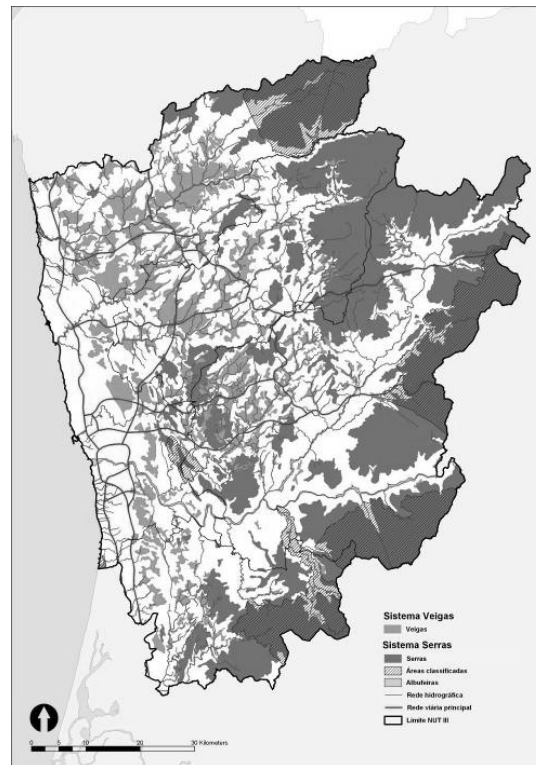


Figure 4. ‘Lowlands’ and ‘highlands’ in the North-western Metropolitan Arc

When urban sprawl and the road network were overlaid on the ‘lowlands’, at this scale, the conclusion was that a significant part of the area had been built-up. However, we acknowledge that our spatial definition of ‘lowlands’ covered significant areas of the cultural landscapes around rural villages and historic towns. We realized that when planning multifunctional landscapes at this scale, the ecological network concept was not as suitable as at the regional level, confirming the findings of other studies (Opdam, 2006).

Ecological networks and planning at the metropolitan level in Northern Portugal

Still the making of PROT was on the way in 2007 in the process of institutional consulting and public participation and our research team at CIBIO was challenged to start moving forward a proposal for a network of parks for Oporto Metropolitan Area, a territory of 16 municipalities densely populated that has undergone significant urbanization in the past 40 years.

The opportunity to develop a network of parks for Oporto Metropolitan Area became then of real significance and opportunity. The new exercise implied a large investment in field trips and research covering 18 municipalities and an inventory of all the existing recreation areas. We ended up with a database of nearly 300 sites.

The sites were mapped and then we went back to the spatial database to identify parks and corridors as parts of an ecological network. The methodology developed for this purpose is presented below (Figure 5).

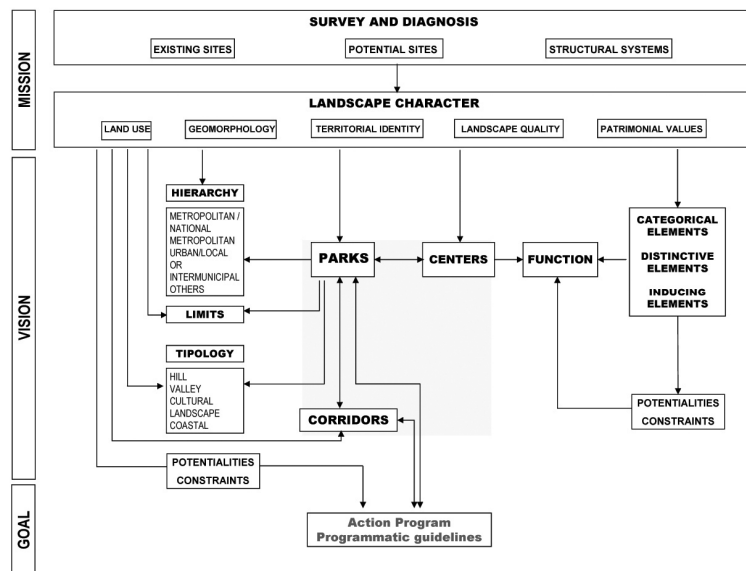


Figure 5. The methodology for the definition of the Oporto metropolitan network of Parks.

We came up with a proposal of 11 parks connected by river corridors (Figure 6). The parks are grouped in a typology of ‘hills’ (4), ‘valleys’ (3), ‘cultural landscapes’ (2) and ‘coastal’ (1). For the purpose of this paper there is no reason to deepen the results of this proposal developed in accordance with the technical teams of the municipalities. However it is of significance to emphasize the usefulness of the methodological and conceptual approach to the outcome.

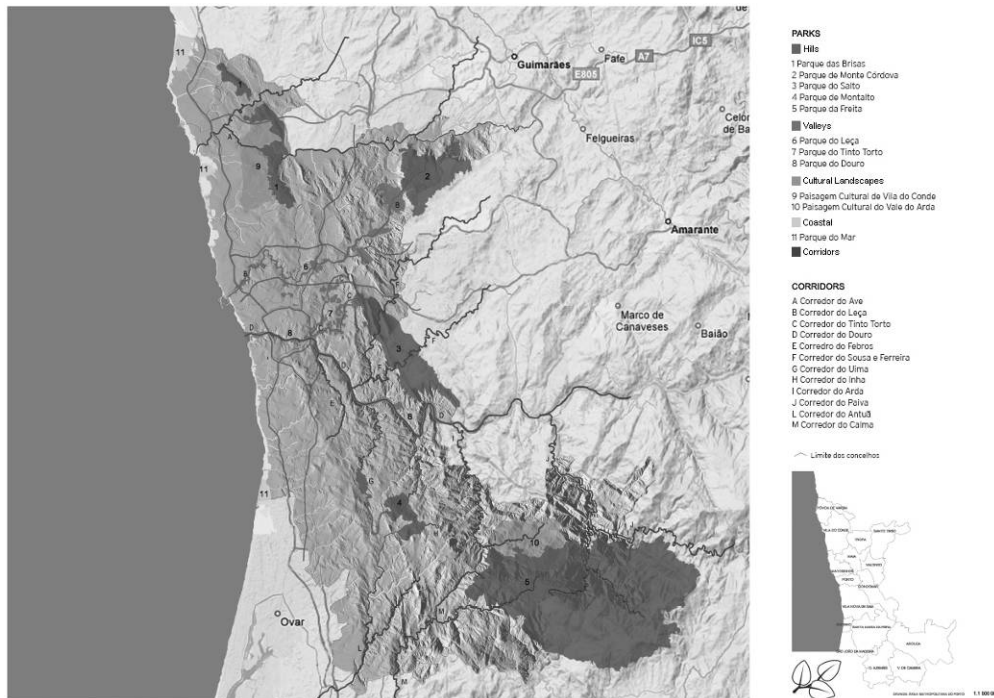


Figure 6. The proposal for Oporto Metropolitan Network of Parks

Discussion and Conclusions

Landscape transformations in Northern Portugal through the past 50 years were of a significant magnitude. The drivers of change have only been placed in a consistent planning framework through the past 20 years. Between 2004 and 2009, there has been a thorough landscape planning investment what showed to be an opportunity to test concepts and methodologies. Among the concepts, ecological networks have a wide representation. First at the regional level through the so called ERPVA, then at an intermediate level for the Oporto Metropolitan Arc and finally at Oporto Metropolitan Area level oriented towards the identification of a network of parks.

At the regional level the application of ecological networks concept was intended to promote strategic planning decisions. It proved to be reliable and adequate to produce management guidelines for landscapes of greater natural sensitivity and distinctive character. At the metropolitan level, the application of the concept proved

to be adequate for a sectorial perspective – the identification of a metropolitan network of parks intended for the preservation of high quality landscapes and most suitable for recreation.

The application of the concept at various planning levels called for the identification of adequate database for each of the levels. The database used at the regional level proved to be inadequate for the subtleties of the metropolitan landscapes more densely built-up and of a polycentric nature. The opportunity to explore the ecological network concept at a sub-regional level – the Oporto Metropolitan Arc - was still valid but the outcome was unsatisfactory. The spatial data base had to be redefined but still proved to be insufficiently fine. However, another variable has to be introduced. The exercise at this level was pursued with no real purpose other than finding the more ‘sensitive’ territories for environmental management. Extending the ERPVA concept to another scale and to a multifunctional landscape densely occupied was not adequate.

Acknowledgments

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