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Planning the Green Infrastructure of the Tagus River Estuary in Lisbon Metropolitan Area, Portugal

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Introduction

The Tagus River is the most important and largest watershed of Iberia, with 1007 km long and 81 000 km² basin, about 30% Portuguese. Understood in a cross-border perspective, it constitutes a valuable resource that brings together relevant biophysical, historical and cultural aspects translated into a huge richness and landscape diversity. The Tagus estuary is the largest wetland area in Portugal and one of the most important in Europe, with an area of 325 km² and a high status for the conservation of important biodiversity. This estuary corresponds to the core of the Lisbon Metropolitan Area, which is about 3.3% of the national territory and population of roughly 3 million inhabitants. The Landscape Observatory of the Tagus River (LOT) is a coordination structure and dynamics of the "Tagus Cultural Landscape" project, covering the national section of the river and the surrounding landscape. The LOT aims to promote and safeguard the diversity and excellence of the cultural Tagus landscape through its study, the collection, exchange and systematization of information and the establishment of protocols and partnerships between public institutions and local communities in a territorial governance approach (<http://obspaisagemtejo.org>) (Oliveira et al., 2014). The ultimate goal is to build a bottom-up process that would culminate, in the near future, on the nomination of the Tagus's Cultural Landscape to the UNESCO. The proposal for its inclusion on the Portuguese indicative list has already been presented to the UNESCO National Commission.

One of the on-going projects is the planning of a Green Infrastructure (GI) along the whole Portuguese river, understood as an instrument designed to achieve ecological and social benefits to be considered on spatial management from a territorial cohesion point of view. Currently, ecological networks in Europe are understood as fundamental to territorial development through the multifunctional use of natural capital. Ecological networks should be considered as infrastructures that ensure the circulation of flows, energy and products as essential to a balanced development with relevant dynamics between the urban and rural areas. An ecological network is designed to ensure in each area maintenance, functionality and sustainability of biophysical systems (water cycle, carbon, nitrogen), ensuring in this way, the quality and diversity of species, habitats, the ecosystems and landscapes. This project has

been negotiated with regional and local identities according to four groups of landscape units that were previously defined on the national landscape character assessment (Cancela d'Abreu et al., 2004) (Fig. 1).

One of those groups is the Tagus estuary where this article is focused. In this case, the GI aims to establish a network to ensure the functional and structural connections between the areas considered as nuclear for the conservation of metropolitan context resources to thus counteract and prevent the effects of fragmentation and artificial state of ecological systems, as well as the continuity of services provided by them.

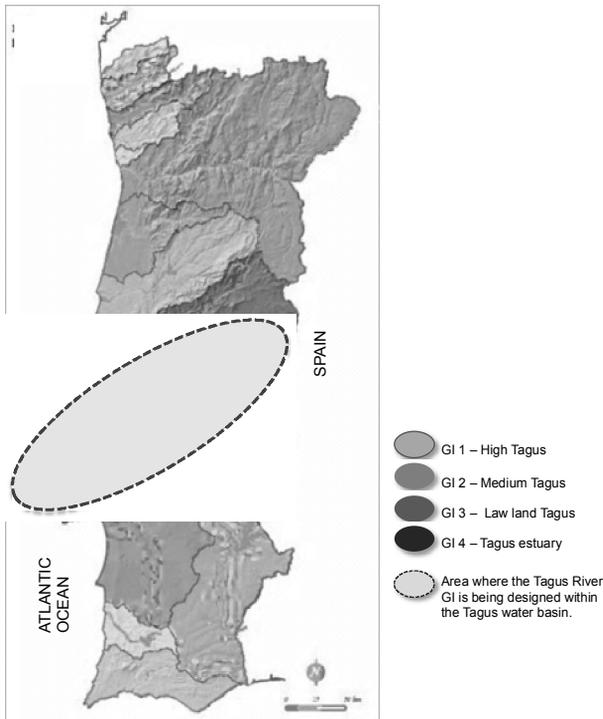


Figure 1. The Tagus River GI according to the four groups of landscapes. The Tagus Estuary corresponds to GI4

The concept of multifunctionality appears to be a key approach as it can perform a number of functions that provide several benefits and services for the same spatial area at the same time (De Groot, 2010; EEA, 2014), understood as the ability to stimulate the production, transformation, distribution and consumption of products, goods and services, in a logic of efficiency, which is essential towards urban-rural dynamics (Aherm, 2007; EEA, 2014).

Once the Tagus estuary cultural landscape includes a huge territorial diversity and ecological complexity, it is important to identify, characterize and value ecosystem services in order to stimulate the green economy, ensuring the strength of territorial cohesion in the various socio-economic and environmental dimensions.

This article aims to present the methodology that is being used on the definition of the green infrastructure and its relationship with the landscape planning and spatial management tools that, in a near future, should be of an effective implementation in the framework of either National Policies (Table 1), like the National Policy of Architecture and Landscape, or International commitments as it is the case of the European Landscape Convention.

Background/Literature Review

Over the last decade, before the European Environment Agency has defined Green Infrastructures as a “strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services.”, many authors gave contributions to its conceptualisation and all of them have emphasised the importance of integrating ecological and social factors as fundamental to the GI design and implementation (Lafortezza, 2013). However, despite these efforts, it is very rare to accomplish this in practice. Meanwhile, the inclusion of the economic dimension through the calculation of economic impacts based on ecosystem services provided by different functions, only started to be highlighted by the Millennium Ecosystem Assessment (2005) and developed by Constanza (2011), among others. It seems thus that many concepts and methods were developed and discussed, mostly in literature, but there is still a lot to do in terms of an effective implementation.

Successfully establishing a GI requires an integrated approach to spatial planning as a part of a broader development policy that needs to be seen from a multi-scale and multi-actors perspective. It is important to emphasize that spatial planning policy should be seen as the pool where other sectorial policies with a territorial implication should meet to generate potential synergy, which, in practice, does not occur very often. For this to happen it implies to mobilize, first the national and regional authorities to assume a sustainable economic growth that would contribute to territorial cohesion agenda, under the Lisbon Treaty, and these principles need to be reflected on spatial planning tools (EEA, 2014). Second, local authorities need to accomplish with such orientations by defining adequate regulations for the GI to be implemented throughout spatial management at the municipal level. In

this way, ecological outcomes may result of a proper combination of social and economic co-products instead of bi-products (Lafortezza, 2013). This means a step forward on mapping and designing the GI. There is evidence that further research is needed to explore in what concerns should be undertaken either the definition or the evaluation of concrete measures to be implemented and the respective impact they might have in concrete cases (Harwood, 2011).

The role of European legislation along with national policies should be combined to give shape into the GI both at landscape level and a city level (EEA, 2011).

In Portugal, there is a great opportunity to set up such approach of GI, particularly in the case of the Tagus estuary and the Lisbon Metropolitan Area. The national policy framework, as synthetized in Table 1, opens up opportunities for the implementation of a GI at a regional/metropolitan scale.

Table 1. Summary of current policy instruments where GI may be integrated, at the national, regional and local levels, from a territorial management perspective.

Policy framework	Regulation	Opportunities for GI
National Law of Soil, Spatial Planning and Urbanism	Law n.º 31/2014, of 30 de May; Decree-law 80/2015, of 14 de May	Urban sprawl containment; inversion of spatial fragmentation; enhance of territorial and social cohesion.
National Policy of Architecture and Landscape	Resolution of the Ministers Council 45/2015 of 7 July	Promoting landscape quality, cultural identity and environmental integrity.
Regional Spatial Plan of the Lisbon Metropolitan Area	Resolution of the Ministers Council nº68/2002 of 8 April (revision is expected)	Building connectivity into the metropolitan ecological network; Mitigation of Climate Change; promoting urban food planning.
Revision of Municipal Master Plans	According to Law of Soil, Spatial Planning and Urbanism	Qualification of urban environment; Increase green spaces; improve multifunctionality and ecological services; adaptation to climate change.

Goals and objectives

The definition and implementation of a GI along the Tagus River has the goal of establishing a territorial concept for the river to position itself as a structural and cohesive element for ecological and socio-territorial connectivity. Based on this concept, together with a set of methodologies of geographic analysis

and landscape assessment, we intend to identify an ecologically-based network that might be considered in the context of territorial management, with a view to a more cohesive and sustainable development of the Tagus territory.

General Objectives

- To define innovative proposals for spatial planning and management
- To stimulate the green economy and tourism
- To evaluate and monitor the environmental quality
- To promote the landscape quality
- To set efficient forms of territorial marketing and local economy

Specific objectives

- Evaluation of natural and cultural resources in a systemic and systematic way;
- Evaluation of ecological connectivity in urban-rural context;
- Evaluation of environmental quality, risks and resilience, particularly in the context of climate change and the inherent risks;
- Evaluation of the urban-rural dynamics, both in functional and structural terms;
- Landscape assessment according to a set of essential topics.

Based on these goals, a diagnosis will be made and scenarios will be defined to allow proposing a GI with spatial expression, which may contribute to a strategic territorial vision for the Tagus estuary as a core and dynamic element of the LMA. The definition of this GI might also establish guidelines for next planning exercise at the regional level, for the commitment of Milan Urban Food Pact, for the implementation of the National Policy of Architecture and Landscape, amongst other national and international commitments.

Method

The method for defining the GI of the Tagus river is twofold. First, the approach will tackle the whole riverine landscape and, second, deals specifically with each one of the four groups of landscape units, in order to obtain a sort of pearl necklace that only may be useful if the pearls are properly connected (Fig. 1). The method on Fig. 2 shows the global approach for the GI, which means that it should be applied on all the four different landscapes, according to their specifics, as it is the case of the Tagus estuary, and, at the same time, that they need to be integrated in a coherent way.

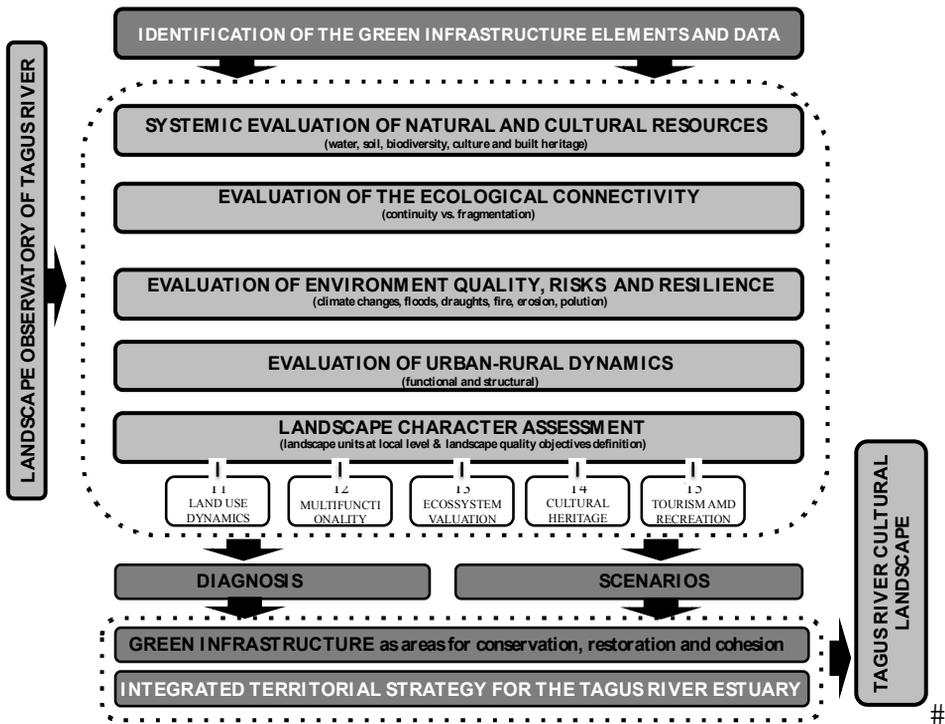


Figure 2. Essential components for the definition of a GI in an integrated perspective where the Landscape Observatory of the Tagus river and the project 'Tagus Cultural Landscape'/UNESCO should cooperate within one of the four sections towards the total GI.

Expected Results

The expected results are organized in four issues:

A. Spatial Planning and Land Management

Landscape Character Assessment/landscape quality objectives: planning and management measures.

Such measures can and should be integrated into the review of the Local Master Plans, looking for a positive territorial differentiation of each municipality. This assessment of the landscape also allows greater specification of the area, which should be considered for inclusion in the UNESCO's candidacy of the Cultural Landscape of the Tagus River.

B. Green Economy and Tourism

Agriculture, Forestry and Endogenous Products: Natura 2000 network, Natural parks and Economic Sustainability.

About 65% of the territory of LMA is occupied by agriculture and forestry. The definition of management measures for each landscape unit, with particular focus on hazardous areas, Natura 2000 sites and Natural Parks, is a priority for the implementation of actions to support economic activity.

Tourism

As it is known, the continuous increase of the tourist flow in Lisbon in recent years has influenced the local economy. The Tagus Estuary has a high tourism potential both in terms of nautical activities or the enjoyment of the river from the riverfront and several dominant points of the urban landscape. A concerted intervention at this level is required.

C. Monitoring and Evaluation of the Environmental Quality and of the Landscape

Monitoring

The evolution of the landscape depends on natural factors but, increasingly, are the anthropic nature factors associated with climate change, processing agents of the landscape and its environmental and human components. From this comes it is necessary to minimize the risks ensuring the landscape quality by monitoring impacts on natural and cultural resources.

D. Territorial Marketing

Cultural Landscape: education and training, promotion and dissemination.

The classification as a cultural landscape will be the anchor for a territorial marketing strategy. The definition of green infrastructure should translate the expectations and needs by different communities and populations, which requires their participation and commitment to take on the challenges faced in managing their territory.

Conclusion

The Tagus River is a physical barrier that divides Portugal in two large areas with biophysical and cultural characteristics significantly different – the north and the south. The idea of a GI along this river has linked to the important role that this linear element can play in strengthening territorial cohesion when thinking both at the national and regional level, if not transnationally, considering the Iberian scale. In addition, in the south, the GI may serve as a buffer to the progress of desertification and to mitigate impacts arising from climate change (EEA, 2015). All these territorial and environmental arguments along with policy opportunities, as previously mentioned, are hopeful to integrate Tagus GI into the implementation of policies by 2020, giving particular evidence to the case of the estuary according to its cultural landscape sensitivity. The implementation of a GI, based on the approach and method

here described, is an innovative initiative in Portugal and would be of great interest to assure the required landscape quality, the environment integrity and the cultural relevance of a future UNESCO property.

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