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**On the fringe: tracking and evaluating changes in land use in the areas
surrounding three national parks in Spain and Portugal***

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Abstract

Naturbanization analyses territorial changes in the surroundings of national parks brought about by the arrival of new settlers and economic activities, both of which are attracted by the value of the environment and landscape. This paper presents a comparison of the naturbanization processes in three national parks in Spain and Portugal (Doñana and Sierra Nevada National Parks, and Peneda-Gêres National Park, respectively) and in their areas of influence. Data is taken from Corine-Land Cover (1990-2006), which is the only available source of information about land use and land cover changes in the whole of the European Union. These changes have been interpreted and analysed using the Cross Tabulation Matrix developed by Pontius (2004). Land use changes connected to naturbanization processes are measured using Gains and Loss measurements. The intensification of changes in land use is one of the most significant developments associated with these processes, which have implications for the sustainable development and conservation of these areas.

Keywords: Naturbanization, National Park, Land Use Changes, Corine Land Cover, Pontius Matrix, Gains and Loss.

Introduction

Naturbanization is the study of changes in land use in the areas of influence of protected spaces caused by the arrival of new settlers and economic activities attracted by the value of the environment and the landscape (Prados 2009). These changes are understood to be the result of the spread of urban uses and the consequences of changes in land use caused by urbanisation. Champion (1989:20) uses the concept of counterurbanisation to refer to “a process of population deconcentration...a movement from a state of more concentration to a state of less concentration”. Naturbanization extends this concept as the transfer of urban processes towards remote rural areas or, in other words, the expansion of the deconcentration process towards areas that are more vulnerable in environmental and landscape terms. As such, naturbanization goes beyond the demographic concentration/deconcentration effects characteristic of counterurbanisation and explores the consequences of this new panorama for the surrounding area, the environment and the landscape, whilst at the same time drawing attention to territorial development in the rural areas located on the fringes of protected natural areas.

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Naturbanization has been proven to require the joint action of two factors: the presence of resources of natural, environmental and landscape value in the region; and the attraction of individuals who are seeking new residential environments of acknowledged value (Prados 2009). Urban and economic development have contributed to increasing people's appreciation of protected areas and favours a more benevolent concept of environmental and landscape resources and of the way that they might contribute to improving the quality of life. This valuation can be extended to a number of other rural areas, especially those that comprise the areas of influence of protected natural spaces (Corraliza, García and Valero 2002; Gude et alia 2006). Naturbanization processes therefore start with people arriving on the land bordering on a protected area, and the recognition that it shares its natural ecosystems and uniquely beautiful cultural landscapes and that there is a dependency on the latter, because that is where multifunctional rural processes occur and employment is generated (Kaplan and Austin 2004).

Paradoxically, the very same factors that generate new dynamics in rural populations and societies in protected areas can also trigger unwanted effects, such as an increase in built-up land, the arrival of a population that has no 'naturalistic mentality', pressure on resources and their degradation, changes in the way that the land is used, the degradation of the uses that comprise the landscapes, etc. (Ghose 2004). The intensification of land uses is undoubtedly one of the most significant changes associated with these processes and clearly has consequences for the sustainable development and conservation of these areas. The present article offers the results of an analysis of the naturbanization processes that are taking place on the fringes of three national parks in Spain and Portugal, and inside the parks themselves (the Doñana and Sierra Nevada National Parks, and the Peneda-Gêres National Park, respectively). Information taken from Corine-Land Cover (1990-2006) has been used to interpret and analyse the changes in land cover and use. This is the only data source that enables a comparative analysis to be conducted of different study areas in the European Union, although it does require spatial and temporal constraints to be optimised with field analyses and the use of land cover and use change indices. The changes that have occurred are interpreted and analysed using the cross-tab matrix developed by Pontius et al. (2004). Finally, changes from one class to another caused by naturbanization are evaluated by measuring the gains and losses in surface area made by each class. The findings of this first analysis show the differences in behaviour of the land use change dynamics in the areas analysed, which might be a reflection of the fact that the naturbanization processes in the different the parks and on their fringes are not occurring at the same pace.

1 Naturbanization processes as triggers of change in land use

The starting-point of this article is the following hypothesis: new residents and economic activities on the fringes of national parks cause changes in land use that affect the preservation of the environment and cultural landscapes. The questions that the research asks are: are there any differences between the changes in land use in different

naturbanized areas or, to the contrary, is the behaviour always the same? what type of land uses are the changes more likely to involve? how do changes in land use in the socioeconomic areas of influence of national parks affect the protected space inside? By answering these questions the article aims to demonstrate whether naturbanization processes are positive or negative for preserving national parks or whether their behaviour is neutral.

For these three key elements are required: regular information from territorial recognition and statistical databases; an evaluation of changes in land use and their impact on cultural landscapes; and, thirdly, the ability to formulate sustainable models to manage these areas.

Preliminary studies have confirmed changes in population in the areas of influence of European national parks (Prados 2009). These changes clearly indicate that there are differences between the naturbanization processes of peri-urban and coastal parks on the one hand, and inland parks on the other. Normally, coastal parks are influenced by the dynamics of tourism, construction work, intensive agriculture and associated industrial activity. Inland parks also show features of naturbanization; sometimes these are very intense due to the comparative advantage of the areas, whilst at other times they are simply due to pressure from agriculture or their proximity to the main urban areas in the region (Tulla 1993; Rodríguez 2005). In both cases the determining factors seem to be the relationships between population attraction and repercussions on activities, and the exploitation of new resources.

The way that population has evolved in national parks in the European Union reveals some contrasting situations. In Andalusia, while Doñana National Park's area of socioeconomic influence saw a constant growth at an annual rate of between 1% and 1.5% between 1970 and 1990, ongoing losses have been registered in the Sierra Nevada National Park since the mid 20th century. The situation seems to have changed since the 2001 census, when the real inter-census growth rate was 0.58% annually (Prados and Del Valle 2010). In Catalonia, the Aigües Tortes i Sant Maurici National Park had a 0.28% annual growth rate between 1991 and 2001, compared to the -0.63% annual loss that had been recorded since the nineteen-seventies (Tulla et al. 2008). However, there are also examples of national parks that have continued to register losses, and although these have not been so great as in previous times marked by the rural exodus, they are still losses, none the less. Such is the case of the Peneda-Gêres National Park in Portugal (Lourenço, Quental and Barros 2009); the situation is even more dramatic in the Kampinoski National Park in Poland, where measures were taken to relocate broad sectors of the population outside the protected area after the park was created (Czerny, Lecka and Wujek 2009). The analysis of the migration rates confirms the behaviour as described, with the national parks attracting immigrant populations at different rates and intensities: in general terms Doñana presents bottom-lines and rates with positive values, as does Sierra Nevada, albeit at a more relaxed pace (Prados and Del Valle

2010). Despite alternating positive and negative values, the underlying trend is for growth in immigrant population.

The motives that underpin naturbanization processes have an evident impact on the land with the construction of new dwellings due to new residents' need for somewhere to live, and also due to the economic activities associated with the tertiary sector. This behaviour is not related to the existence of a direct relationship between this development and population growth or rural immigration, as the changes in land use are more significant than those recorded in demographic statistics. An analysis of orthophotos of the areas around the Sierra Nevada National Park show a steady increase in built-up land throughout the second half of the last century until the original surface area was almost doubled (Prados and Giusti 2010). The relationship between the way that population evolves and the growth of built up areas is not direct. From this it can be concluded that, irrespective of the arrival of new settlers in the areas of influence of national parks, the development of built-up spaces over the permitted level for buildings is evident and, consequently, naturbanization processes are putting pressure of urban development on areas of residential quality.

Thirdly, to test the hypotheses it is necessary to analyse the changes in land use of which, as has already been stated, naturbanization is a clear trigger, in the areas where naturbanization is taking place. As new settlers arrive, extensive land uses are also being affected by naturbanization processes due to pressure from urbanised space.

The use that is made of the environment or, to put it another way, its economic exploitation, is at the core of construction and the changing of the cultural landscapes, which are converted into building plots in protected places' areas of influence. Intensifying or marginalising these uses leads to changes in land cover and use which, in turn, impact on the upkeep and preservation of the landscape. Usage typologies and their levels of exploitation have an influence on the different landscape units, and the transformation of these units can give rise to changes in land use (Hietel, Waldhardt & Otte 2004). As such, processes, functions and landscape structures have a very close relationship with the dominant land uses in a given area. Inland national parks are mountainous areas characterised by their natural resources having been exploited over long periods of time due to the predominance of agricultural uses and types of exploitation. Over the past two decades they have been subject to intensification processes in built-up spaces, the development of infrastructure and the advance of certain types of agriculture that have given rise to abnormal tensions in their areas of influence. This has major consequences for the state and conservation of the resources, but also for traditional ways of life, which are also evident in land use changes and the building of cultural landscapes. With respect to the evolution of extensive land uses and the state of landscapes, it has been seen that naturbanization processes have contradictory outcomes: intensified agricultural processes and processes involving the degradation and abandonment of traditional types of exploitation and occupation. The end scenario has similarities with disputes in other more dynamic rural areas, but the role played by the national parks' areas of influence in environmental conservation as an

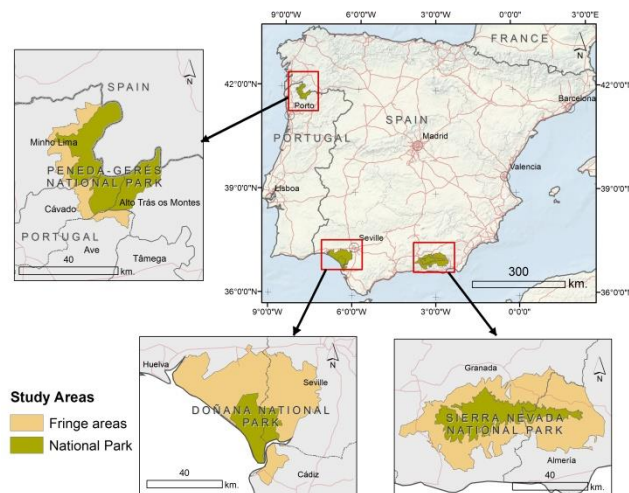
impact buffer zone should not be forgotten.

3 Areas of study

Differences in the behaviour of the naturbanization processes in inland and coastal parks are connected with their different environmental and landscape values, and their locations with respect to the differentiated dynamics of mountain and peri-urban protected spaces. Whilst the former have a common history shaped by their ancestral conditions of remoteness and isolation, coastal and peri-urban parks are marked by the development of urbanisation, the development of the tourist sector (whether linked to environmental and landscape values or not) and functional relationships with nearby areas. This is why it is important to carry out a detailed comparison.

The article uses the same methodology in the three study areas. The choice of the three areas is due to location criteria and the state of the naturbanization processes, as well as their being considered representative of contrasting situations. The areas chosen are the Socio-Economic Areas of Influence of the Doñana and Sierra Nevada National Parks in Spain, and the Peneda-Gêres National Park in Portugal (see figure 1). The land bordering on protected areas is a peripheral space that comes within the municipal boundaries of nearby towns and villages.

Figure 1: Location of study areas.



Source: Prepared by authors.

The choice of these three areas is justified by their corresponding to different typologies of protected spaces in Spain and Portugal (see table 1). Doñana is coastal space at the mouth of the Guadalquivir River where fluvial, wetland and coastal ecosystems

converge. To the east is the Sierra Nevada National Park, which is especially characterised by the interaction of natural highland and high mountain systems whilst it is also affected by anthropisation processes. The third park, Peneda-Gêres, is to the north, on the border between Portugal and Spain; this is a highland area which acts as a watershed between the plateau of Castile and the Atlantic valleys. It possesses a wide range of geographical and natural features and these are arranged into areas that are very interesting for observing naturbanization-related changes in land cover and use.

Table 1: Basic characteristics of the National Parks.

		NATIONAL PARK		
	CHARACTERI- SATION	DOÑANA	SIERRA NEVADA	PENEDA-GÊRES
1	Created in	1969	1999	1971
2	Size in ha.	53,244	85,883	71,763
	Ac.	131,566	212,217	177,326
3	No. municipalities	4	44	5
4	Region	Mediterranean region: Systems linked to wetlands with marine influence	Mediterranean region: High Mediterranean mountain	Euro-Siberian and Mediterranean region transition region
5	Natural systems	-Wetlands -Shifting dunes -Stabilised divisions and sands	- High Mediterranean mountain	-South Atlantic highland -Granite outcrops
6	Main territorial tensions around the edges	-Overexploitation of water resources - Intensive agriculture -Coastal urban developments -Impact of infrastructure	-Ageing and dependence of population -Abandonment of traditional irrigation infrastructure -Developments linked to ski resort -Expansion of Granada metropolitan area	-Forest fires and degradation of areas of forest and undergrowth -Timber harvesting -Abusive and/or uncontrolled mountain sport activities -Pollution of surface water courses -New constructions that break with traditional typologies

Source: Prepared by authors.

The Sierra Nevada and Peneda-Gêres parks' Areas of Socioeconomic Influence are typical of mountain areas and characterised by the long-standing exploitation of natural resources with a predominance of agricultural uses/types of exploitation. In the last two decades they have been subject to intensification processes in built-up areas, the development of infrastructure and the advance of certain types of agriculture that have brought abnormal forms of tension to remote rural areas. As a counterpoint, Doñana National Park's area of socioeconomic influence (ASI) corresponds to the profile of a

park being subjected to metropolitan encroachment, whether due to proximity or because of its status as a protected coastal space. To this must be added the great pressure on water resources that is also related to the exploitation of old forest plantations for agriculture.

The parks chosen are part of joint research undertaken by the team in Spain and Portugal (Prados 2009; Fernández, Prados & Lourenço 2010). The findings show a common starting point based on regressive demographic and socioeconomic behaviour. Depopulation processes are the result of heavy emigration and the crisis in economic activities in the primary sector. This has led to the economic bases and territorial functionality of these spaces receding or even stagnating. Another consequence has been the abandonment of both crop farming and cattle ranching, which has resulted in the degradation of land cover and land uses that are characteristic of these types of economic exploitation. This regressive behaviour began to change with the arrival of new settlers and a resurgence of economic activities. Although the processes are not great in terms of size they are sufficiently significant to entail major changes. The most noticeable of these are related to new settlers taking up residence, the development of infrastructure and construction work, the intensification of types of exploitation, and the diversification of the economic base, basically tourism-linked. Finally, intensification and marginalisation processes are evident in changes in types of exploitation that, in the long term, lead to changes in land use.

3 Tracking and evaluation of changes in land use

The methodological approach to naturbanization processes is underpinned by three essential elements: the availability of information provided by periodic territorial recognition instruments and statistical databases; the evaluation of changes in land use and their effects on cultural landscapes; and thirdly, the possibility of formulating sustainable land management models. The information for interpreting and analysing the consequences of changes in land cover and usage in naturbanised parts of the Iberian peninsula has been taken from Corine-Land Cover (1990-2006). This is the only information source that enables a comparative analysis to be conducted of changes in land cover and land use on the European scale. The spatial and temporal scale constraints of this information require a field study to be carried out and the use of land cover and use change indices. The study has been conducted in the areas adjacent to the three national parks in Spain and Portugal, the Doñana and Sierra Nevada National Parks and the Peneda-Gêres National Park, and also inside the parks themselves.

It has been necessary to adapt the Corine-Land Cover legend to these study areas, with 13 representative classes of change models specifically identified *in situ*. Changes are interpreted and analysed using the Cross-Tab Matrix developed by Pontius et al. (2004). Changes in class caused by naturbanization are explained by measuring surface areas and gains and loss percentages by class. The findings show, firstly, that the source's

spatial and temporal frame overestimates larger areas of land use change occurring over shorter periods of time; and, secondly, major differences in the behaviour of the land use change dynamics from one area of analysis to another. These findings confirm the trends in terms of time, which might indicate that the naturbanization processes are taking place at different rates inside the parks and around their boundaries.

Table 2. Parks and their fringes: surface areas (thousands of ha./ac. and % of total).

	Total surface area	National Park		Fringes	
Doñana	272/672	53/131	(20%)	219/541	(80%)
Sierra Nevada	323/798	86/213	(27%)	237/586	(73%)
Peneda-Gêres	107/264	72/178	(67%)	35/86	(33%)

Source: Prepared by authors.

Table 2 shows the surface areas analysed in each of the regions under study: the three National Parks along with their respective Areas of Socioeconomic Influence. As can be seen, these fringe areas are quite substantial, as are the naturbanization processes, as will be seen below. The methodology used is based on tracking the changes in land use of the thirteen classes that were chosen as being the most significant, with a time-span of the evolution that occurred between 1990 and 2006. Logically, these thirteen classes are analysed both for the national parks themselves and their fringe areas.

They are as follows:

- Artificial (understood as those characteristic of built-up areas)
- Non-irrigated arable lands
- Permanently irrigated land
- Permanent crops
- Heterogeneous agricultural areas
- Crops with natural vegetation
- Natural grassland
- Pastures
- Shrub and herbaceous vegetation
- Forests
- Open spaces with little vegetation
- Wetlands
- Water bodies

The second step consists of analysing the situations with respect to naturbanization processes. According to Pontius (2004) and taking the Cross-Tab Matrix as our basis, the total surface area of change should be analysed for each class. A comparison of the fringe areas and the protected areas provides important information about the different behaviour in each. Table 3 shows total changes in the 13 classes chosen for the analysis of the evolution of land uses. Total changes are estimated with respect to the surface

areas affected on the fringes and in the parks in absolute (total surface area affected by change processes) and relative (representativity of the surface areas affected by change in the fringe and park surface areas) data.

Table 3 shows that the largest surface area affected by changes is around the boundaries of the national parks. This behaviour confirms that naturbanization processes occur in these areas, and that this is where most transformations connected with the arrival of new residents and the resurgence of the economy take place. Their volume in absolute terms is also indicative of the significance of these changes in the areas of influence. This is the case of the fringe areas around the Doñana and Sierra Nevada National Parks in Spain, with over 40,000 ha. (approx. 99,000 ac.) of surface area affected by changes in use. The extent to which they represent the parks' total surface areas, however, is quite different, as total changes in land use during the 1990-2006 period in the areas around Doñana are greater (17%) than for Sierra Nevada (with only 2% of the surface area affected). This indicates a greater impact of the changes in the areas of influence of coastal parks compared to inside the protected area.

Table 3: Surface areas with Net (ha./ac.) and Relative Total Changes (% of total surface area) on the Fringes of and inside the National Parks (1990-2006).

	Fringes			National Park		
	Changed surface area		Total Surface Area	Changed surface area		Total Surface Area
	ha./ac.	%	ha./ac.	ha./ac.	%	ha./ac.
Doñana	37,325/92,230	17%	218,659/540,306	1,670/4,127	3%	53,244/131,566
Sierra Nevada	3,967/9,802	2%	236,636/584,728	833/2,058	1%	85,883/212,217
Peneda-Gêres	3,693/9,125	11%	35,091/86,710	5,205/12,862	7%	71,763/177,356

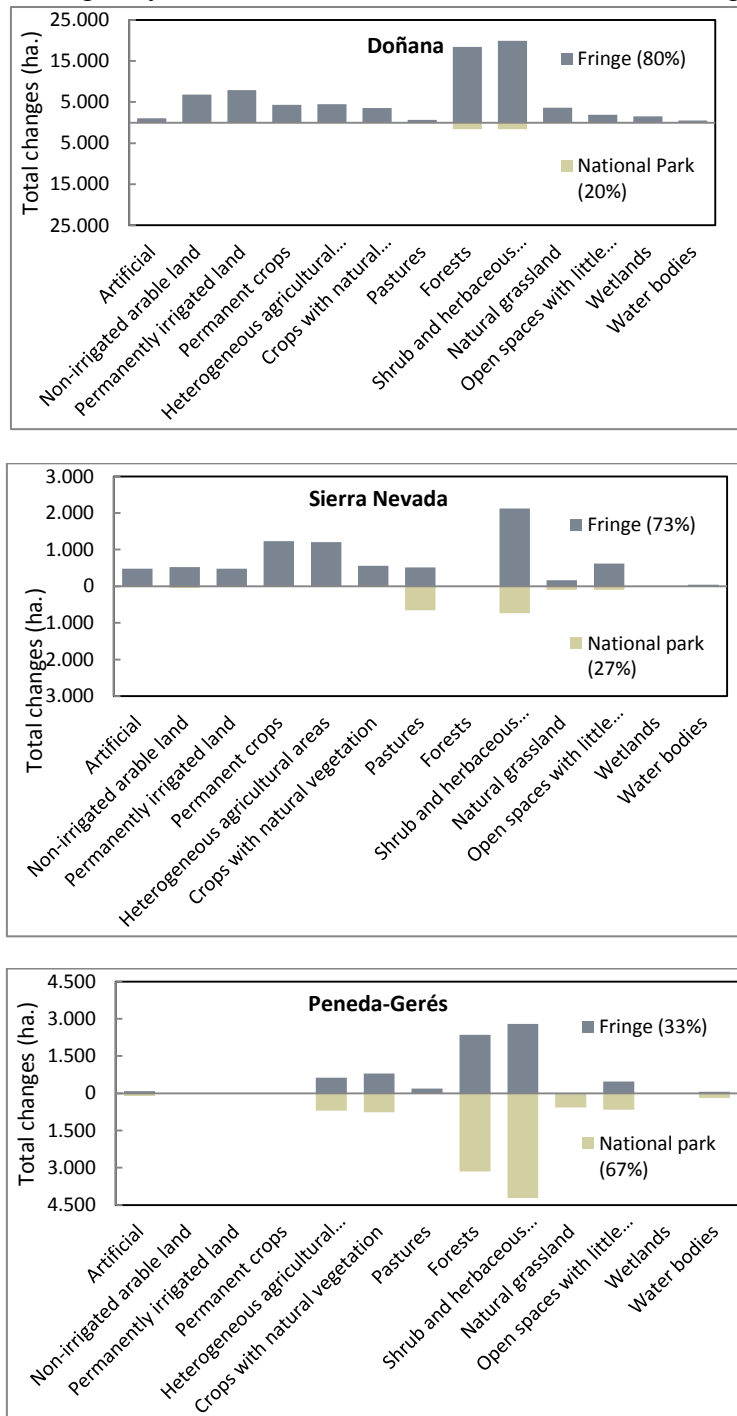
Source: Prepared by authors.

The situation with respect to the Peneda-Gêres National Park is very different. The surface areas affected by changes are smaller in absolute terms at under 10,000 has. (24,700 ac.) both in the fringe areas and inside the National Park. The representativity of the two areas is quite balanced, between 7% and 11%. This contrasts with the behaviour of the other two areas analysed.

The situation defined by the theoretical model would present stable protected areas, i.e., with hardly any changes, compared to the dynamic fringe areas, as confirmation that the latter are affected by naturbanization processes. The real behaviour logically differs from the theoretical behaviour. Over and above the administrative constraints, the analysis is being conducted of unbroken and highly permeable tracts of land. There are always total changes, both in the protected area and in the surrounding area. The fact that the surface areas of these changes differs has different implications depending on whether it is the one or the other: changes in use in national parks indicate the different management models of protected areas, whereas in fringe areas there are indications

that naturbanization processes are involved to a greater or lesser degree. As was seen in the first case, the behaviour of the Sierra Nevada and Doñana National Parks stands out on the one hand, and that of Peneda-Gêres on the other. However the dynamics in the fringe areas present the opposite behaviour. The preliminary conclusion that can be drawn reinforces the point of view that naturbanization processes have a greater impact on the fringes of coastal parks than inland parks.

Figure 2: Total changes by class in the National Parks and on their fringes (1990-2006)



Source: Prepared by authors.

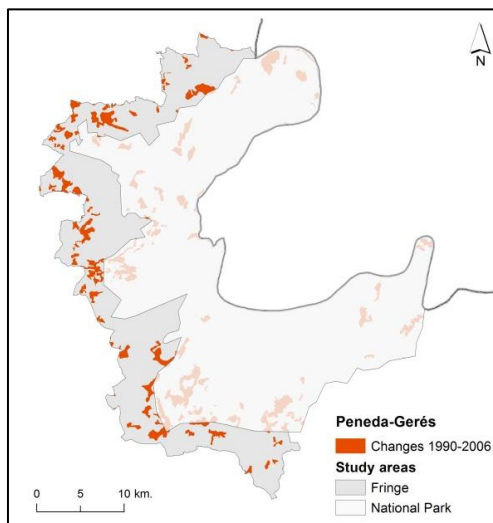
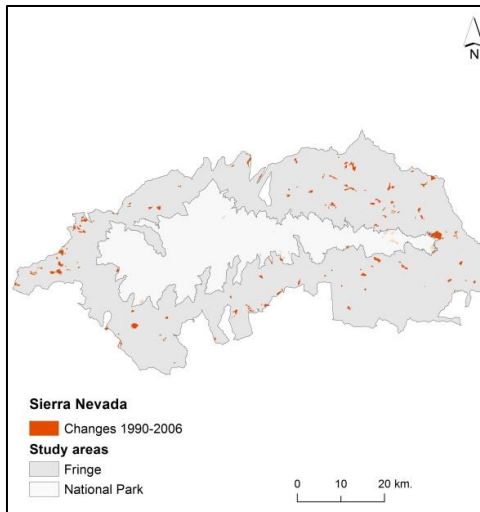
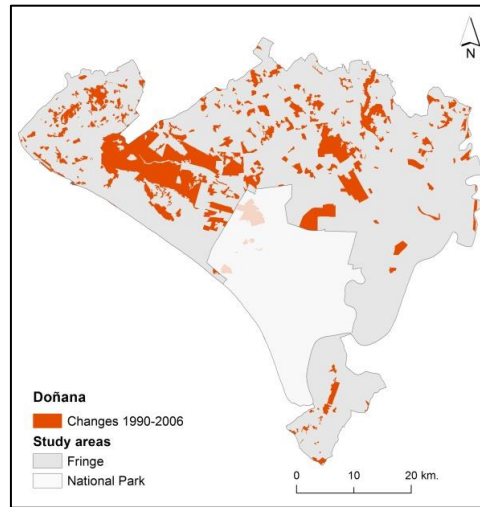
Figure 2 details total changes for each of the 13 classes that were established. The classes that stand out are a clear indication of the types of changes that have occurred and, as stated in the previous paragraph, are connected with the national parks management models. The uses that are mainly affected are those that predominate in Mediterranean protected areas, i.e., surfaces covered with forest, followed by wooded areas and areas of thick undergrowth, and grasslands. These are the uses that have been affected by changes in the Doñana and Sierra Nevada National Parks.

The same is not true for the Peneda-Gêres park, where the changes inside the protected area extend to all classes, including agricultural areas and artificial areas. Also, the changes in use in Peneda-Gêres take place in the same categories in the protected areas as on the fringes. The categories affected correspond to shrub and herbaceous vegetation; forests; agricultural areas with natural vegetation; heterogeneous agricultural areas; open spaces with little vegetation and urbanised areas.

This behaviour demonstrates that this park has evolved in a way quite unlike the other two areas. What is striking is the presence of land uses inside the Peneda-Gêres National Park that are characteristic of extensive economic activities. The concept of the National Park is known to implicitly entail the existence of ecosystems that have not been altered substantially by human exploitation or occupation; and in cases where the existence of cultural landscapes is recognised as being part of a park's identity, guarantees for the conservation of land uses should exist. The surface area of the changes in use in the Peneda-Gêres National Park has been proven to be comparatively greater than in the other two cases analysed; what is more, the surface areas affected by changes in use are greater in size and more representative inside the National Park than in the surrounding area. In addition, the fact that types of socioeconomic exploitation exist there stresses the importance of management models for land use behaviour in national parks.

The fringe areas are, however, extremely dynamic around all three national parks as far as changes in land use over the fifteen year time span is concerned, and they are similarly dynamic with respect to both surface areas and the range of change classes involved. All the classes identified have changed during the 1990-2006 period, including those relating to natural uses and those relating to extensive and artificial economic uses. The fringes of the protected areas are therefore very dynamic with respect to changes in land use, and even though the surface areas are different, the changes affect all classes. This is a reflection of naturbanization processes, as socioeconomic dynamics drive changes in the area, which are then mirrored in changes in land use.

Figure 3: Location of total changes inside national parks and in the surrounding areas (1990-2006).

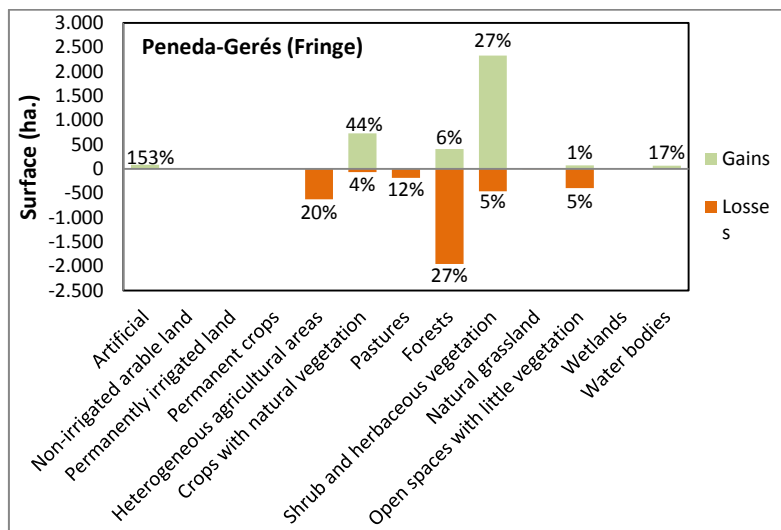
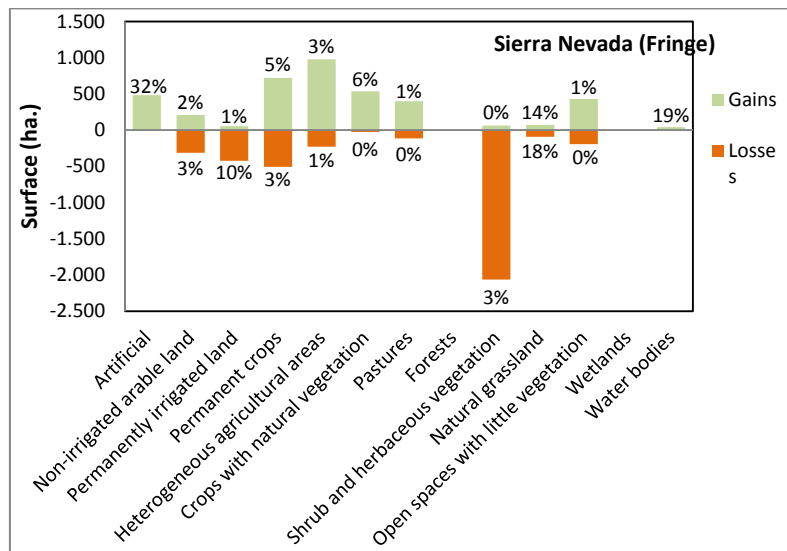
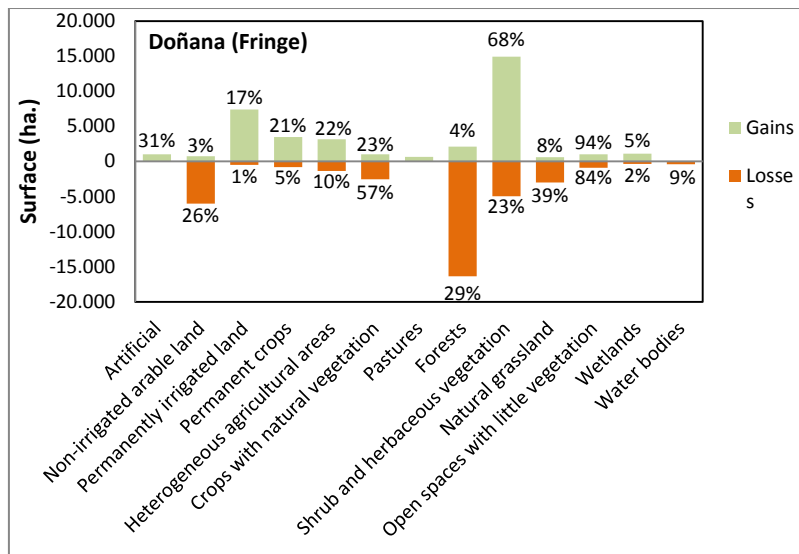


Source: Prepared by authors.

The size of the surface areas and the wide range of changes are the key to properly computing the intensity of the processes, as there is a direct relationship between the three: the diversity of the categories affected by changes, widespread areas and significant naturbanization processes. Figure 3 shows where these total changes are located both in the surroundings of the parks and within the protected areas. The way that they are distributed is quite heterogeneous in general terms, although it is possible to distinguish focal points of changes on the fringes of Doñana with a tendency towards concentration. Two spatial distribution models can therefore be established in the areas of change: one model with small patches with a tendency towards scattering, and a second model with larger patches with a tendency towards concentration. Both have repercussions on the surface areas of the changes and the use classes that predominate. However, it is also important to determine the consequences of their distributions in each of the zones and study areas analysed.

Given the relationship that exists between changes in use, the consumption of resources and landscape management it is important to assess the relationships between these two models and naturbanization processes in the fringe areas. First, the presence of the concentrated distribution model is assessed in comparison with the scattered distribution model. If the changes in land use occur in agglutinated areas there will be less impact on natural and landscape resources and their management and control will also be easier. However, if to the contrary the spatial distribution model shows a tendency towards scattering, there is a similar effect on adjacent land and a larger area is impacted. Nonetheless, neither model can be abstracted from its surface size. The concentrated model with large patches found in Doñana is indicative of an expansion of changes in primordial land use or of a “contamination” of some changes in use compared to others, and if this occurs in widespread surface areas it is proof of the greater impact of naturbanization processes. The spatial behaviour of each type of change in use needs to be analysed for the correct interpretation to be made. Such a detailed analysis is outside the scope of this article, but there is no doubt that it is very important to find out what types of change are affecting each class on the fringes.

Figure 4: Gains and losses in the areas surrounding the national parks (1990-2006).



Source: Prepared by authors.

The third step in the methodology consists of establishing the surface areas affected by gains and losses in each class in the fringe areas for each total change. These are computed on the basis of the increase (defined as the Gains Indicator) or the reduction (defined as the Loss Indicator) in the surface area of each class. The fringes of all the three national parks present a joint loss in the natural component of land uses during the 1990 - 2006 period. This is based on the behaviour of the Losses, which are especially large in the categories that correspond to land uses characteristic of said natural component. These are always forestry-related uses in the specific forest categories: undergrowth and grasslands. To the contrary, the uses that show gains are always linked to agricultural and urban economic activities. Those that mark the changes are basically the permanent crops; heterogeneous agricultural areas and crops with natural vegetation; permanently irrigated and non-irrigated arable lands; and, to a lesser extent, artificial uses. The evolution seen during the period clearly marks the direction that the naturbanization processes are taking towards a loss of natural and landscape elements based, essentially, on the decreasing presence of areas of forest and, in connection with this, growing competition from uses and types of economic exploitation based on agricultural activities. And so, as far as changes in land use are concerned, naturbanization processes determine the revitalisation of economic activities over and above the conservation of natural values, and the artificiality of the region.

The individual analysis of each of the fringe areas reveals some important nuances. The greatest area of change in terms of surface area corresponds to the concentrated spatial model in Doñana. The fringe areas of this National Park have evolved in an extraordinarily dynamic way. Gains and losses can be recorded in all 13 types. This behaviour is shared by the fringes of the Sierra Nevada National Park, although in this case the size of the surface areas changed is smaller. However, in the Peneda-Gêres National Park, a narrower range of classes has been affected, despite the representativity of the total changes.

Losses of forestry uses are recorded on the fringes of Doñana and Sierra Nevada, including forests and areas of undergrowth and grasslands, whilst there are gains in the surfaces occupied by agricultural uses. This behaviour can be considered as a revival of agricultural uses associated with naturbanization processes, but corresponds to diverging evolutions. On the fringes of Doñana, the evolution in land uses signals an identification process: the classes with gains correspond to crops on permanently irrigated land as opposed to non-irrigated arable lands, which record losses. Meanwhile, on the fringes of the Sierra Nevada park the gains in agricultural uses are practically generalised with the exception of irrigated land, a class that registers losses. The behaviour of naturbanization continues to result in uses evolving with a smaller natural component and a resurgence of primary economic industries in two ways that complement each other: intensification associated with an increase in irrigated land, and a growth in areas of cropland. In this evolution, the relationship between the consumption of natural resources and the preservation of cultural landscapes' quality values is different. Be that as it may, it is evident that naturbanization has a greater

power to transform in the areas of influence of coastal parks than of those of inland parks. This is confirmed by the behaviour of the gains and losses on the fringes of the third national park. In Peneda-Gêres, losses in the forestry uses category are accompanied by gains in the mixed crops and natural vegetation, shrubs and herbaceous vegetation, and forest classes. This could be due to a transition process towards a greater transformation linked to extensive economic exploitation types.

To summarise, the findings show that the development of naturbanization processes brings about changes in land uses. These changes can be attributed to the loss of importance of forests and a resurgence of types of agricultural exploitation, and, although it is true that these processes are not generalised in all the study areas, there is indisputable evidence that they are present in the most dynamic. In these places the upturn in agricultural uses corresponds to both intensification (increases in permanently irrigated land) and the spread of non irrigated arable land. The growth of permanently irrigated land has major effects on resources, but so does the loss of forests on agriculture. Their relationships with the values that act as triggers of naturbanization, i.e., the acknowledgement of the quality of the environment and the landscape as an economic and residential asset, can give rise to unwanted effects. Changes in land use may affect the protected area itself and contribute to a loss of quality in the ecosystems, which may be substantially changed by human exploitation or occupation.

4 Conclusions

The final assessment of the findings confirms that the socioeconomic dynamics of the naturbanization processes in the different fringe areas arch between abandonment and intensification processes. This complex web of relationships reinforces the importance of recognising the predominance of the natural and landscape component when analysing naturbanization processes, and these should be core issues, given the pressures that build up in the areas of influence. As is evident from the analysis of the differently timed cross sections of the cartographic information for all three study areas, changes in land use are slow-moving processes that begin with the depopulation of rural areas, but which have long-lasting effects. The same reflection needs to be made with respect to the new pressure fronts of urban development and agricultural uses, whether triggered by naturbanization processes or not; on the one hand, on the economic level, traditional marginal uses that are being abandoned due to their loss of functionality, whilst at the same time they are necessary for maintaining landscapes and heritage elements; and on the other, intensive uses that dynamise the area, although this might be at the cost of the introduction of new activities and types of occupation exercising greater pressure on natural resources. In short, the growing pressure and fragmentation of the land into marginal and intensive areas should be a wake-up call for the objectives of environmental conservation and landscape protection that are the *leitmotif* of naturbanization processes.

The analysis of naturbanization processes does not only revolve around new building construction, infrastructure to improve access and the provision of services and facilities

for new residents. It also involves productive activities and services oriented towards the “consumption of nature”. The resurgence of agricultural and livestock activities has been shown to play a major role in these processes and also in the loss of the natural component of land uses. The understanding that protected areas and their fringe areas are very permeable means that any confirmation of naturbanization dynamics in the latter would doubtlessly have repercussions for the interiors of national parks. Analysing changes in land cover and use is essential for determining the behaviour of these dynamics and being able to predict future behaviour. The integrated spatial planning of rural development and environmental preservation should offer integrated approaches in spaces that are especially vulnerable as an effective device that contributes to creating sustainable management practices in the surroundings of national parks.

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