Visitors’ valuation of natural and cultural landscapes: space-preferences coincidence analysis

M. F. Schmitz¹, P. Fernández-Sañudo², I. de Aranzabal¹, & F. D. Pineda¹

¹Department of Ecology, Complutense University, Madrid, Spain
²Centro de Investigaciones Ambientales de la Comunidad de Madrid “Fernando González Bernáldez”, Madrid, Spain

Abstract

Many Mediterranean territories contain traditional rural systems in which very high naturalistic and environmental values are recognized. Currently the resource ‘landscape’ is becoming increasingly attractive, and recreational activities and tourism therefore constitute new uses which lend cultural and economic interest to the territory. Indeed, the traditional activities indicate a valuable use of the natural resources of some marginal areas, whether these are protected or not, which add cultural interest to the tourist attraction they constitute.

In this paper, we have characterized certain territories in Central Spain, using variables indicating both the structure of the landscape and its natural and cultural characteristics. Furthermore, we have typified the visiting tourists using surveys on their preferences. We have carried out analyses of the two sets of data, and expressed one through the other by means of products of matrices. We have also characterized the types of landscape perceived by the tourists and certified their preferences, as well as potential spatial distribution – “outdoor recreational niche” – and the degree of coincidence between their preferences and the characteristics of the space. Thematic maps are obtained which constitute very useful tools for applying planning and environmental management strategies.

Keywords: cultural landscape, landscape preferences maps, outdoor recreational niche, visitors’ preferences, landscape ecology, landscape planning.
1 Introduction

In the Mediterranean basin, ancestral cultural landscapes persist which are controlled in a secular manner by man (Bunce et al. [1]). These landscapes are being subjected to a growing demand for tourism. The recognized quality of the territory and of its different components, along with its rare products, are a strong attraction to visitors (FIDA [2]). Tourism in these territories ought to be a priority objective with regard to planning, as this activity tends to be carried out in areas which are clearly fragile in the socio-environmental sense (German Federal Agency for Nature Conservation [3], Schmitz et al. [4]).

Sensible development of tourism may very well constitute a good use of the natural resources in protected areas and in many marginal territories with particularly sensitive natural and cultural values. Tourism in areas which are of interest with regard to landscape and culture provide extra income which can raise the standard of living of the local populations and can affect the management and protection of the habitats, and it is important to establish close links between the recreational use of nature and conservation. This would help to maintain traditional uses and landscapes.

This study characterizes cultural landscapes in Central Spain and typifies the visitors to them. We considered both the natural and cultural (rural) characteristics of the territory with a potential power to attract tourists. We also obtained a typology of landscape in accordance with how they were perceived by the visitors, and we established the correspondence between the spatial distribution of the characteristics of the landscape and the preferences of the visitors. The results are expressed cartographically, and can be used as a tool for planning tourism.

2 Study area

We considered the province of Madrid (Central Spain), which covers an area of around 8,000 km². From early times, this territory has been used for different human activities, some of which have been very well integrated and dependent on the characteristics of the natural environment –traditional mixed rural systems based on agriculture, forestry and pastoralism–. Although there have been big changes in the landscape over the last few decades, which have depended on the intense socioeconomic change that has taken place, there are still regions of great naturalistic, agricultural and aesthetic-cultural value, which offer interesting possibilities for leisure, recreation and cultural tourism (Díaz Pineda [5]).

3 Landscape typology

An automatic sectorization of the territory was applied, taking into consideration variables that account for its structure and functioning in accordance with the available data on climate, topography (altitude and slope), lithology, edaphic typology, current vegetation and rural uses of the land. The data referred to 1x1
km grids—the municipality of Madrid was excluded, due to the distortion which its particular characteristics introduced into the analyses of the territorial structure. The resulting matrix, made up of 7,836 grids described by 115 variables, was treated by analysis of principal components (PCA) and by the agglomerative hierarchical classification of the ten main axes of the analysis (De Pablo et al. [6]). Thus we obtained eight types of cultural landscapes (Table 1), represented cartographically.

<table>
<thead>
<tr>
<th>Table 1: Description of the types of cultural landscapes in Madrid according to the variables of greatest discriminant value in the numerical analyses carried out.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type 1.</strong> Alternation of dry farming crops, shrubland and urban areas. Olive groves. Water divides with mountainside and river valleys, hills and countryside. Agricultural use of the territory. Clear tendency towards housing development.</td>
</tr>
<tr>
<td><strong>Type 2.</strong> Predominance of holm oak groves, some in <em>dehesas</em>, included in a matrix of dry farming crops and urban areas. Water divides with mountainside with the presence of river valleys. Altitude from 440 to 835 m. Agricultural and urban use of the territory.</td>
</tr>
<tr>
<td><strong>Type 3.</strong> Mosaic of crops and forest, predominantly pines and holm oaks (some in ‘<em>dehesas</em>’). Area of piedemont. Water divides and mountainside. Altitude from 440 to 1032 m. Forestry, livestock farming and subsistence farming uses. Urban areas.</td>
</tr>
<tr>
<td><strong>Type 4.</strong> Pastures with representation of shrubland, holm oak groves and ‘<em>dehesas</em>’ with holm oak, ash and other oaks. Areas with a mosaic of dry farming crops and urban areas. Areas mainly with piedemont. Altitude from 440 to 1427 m. Forestry and livestock farming use. Tendency to substitute uses for urban development.</td>
</tr>
<tr>
<td><strong>Type 5.</strong> Eminently agricultural landscape with a mosaic of dry farming and irrigated crops. Presence of shrubland with moorlands, barren plateaus and countryside. Altitude from 440 to 1032 m.</td>
</tr>
<tr>
<td><strong>Type 6.</strong> Mediterranean ‘<em>monte</em>’ (complex mosaic of shrubland, holm oak groves and pine forest) and pastures at medium altitudes. ‘<em>Dehesas</em>’ with holm oak, ash and other oaks. Hillsides, mountainside, and piedemont. Altitude from 637 to 2414 m. Forestry and livestock farming use. Presence of urban areas and housing development.</td>
</tr>
<tr>
<td><strong>Type 7.</strong> Mediterranean ‘<em>monte</em>’ (complex mosaic of shrubland, oak and pine forest) and pastures at high altitudes. ‘<em>Dehesas</em>’ with oaks Area of mountaintops and summits, mountainside and piedemont of the depression-corridor type. Altitude from 637 to 2414 m. Forestry and livestock farming use.</td>
</tr>
<tr>
<td><strong>Type 8.</strong> Mediterranean ‘<em>monte</em>’ and pastures undergoing a process of abandonment and degradation. Abundant shrubland. Mountainside and piedemont. Altitude from 637 to 1427 m. Forestry and livestock farming use.</td>
</tr>
</tbody>
</table>

The map obtained facilitates study of the relationships between the characteristics of the territory and the demand for tourism-recreation.

### 4 Classification of the visitors

We characterized the theoretical demand for tourism by providing the visitors to the area with questionnaires. These contained aspects related to the expectations
and experiences of the visitors in the territory, along with their sociological and cultural profile (Múgica & De Lucio [7], Fernández et al. [8], De Aranzabal et al. [9]).

We selected areas considered to be of particular interest for tourism, recreation areas, campsites, and the Environmental Education Centers of the protected areas. We availed of 1,549 questionnaires. A matrix of qualitative data on this number of observations, described by 157 variables constituted the analysis material. We identified different groups of visitors by means of factorial analysis of correspondences and agglomerative classification of the ten main factors extracted from this analysis.

With the use of the variables with the greatest discriminant value, we described four types of visitors with different attitudes and perception of the territory: i) indifferent (45.84% of the total), whose only interest is to enjoy their free time in the open air; they showed no preference for any particular type of landscape or activity related to the natural or rural environment; ii) generalist (6.71%), who are characterized by a low level of appreciation of the variables representing the natural and cultural offer of the territory. The reasons for their visit are mainly related to leisure time activities and, to a lesser degree, to their family or job; they value the proximity of nature to their place of residence; iii) naturalist-sports (28.3%) and iv) naturalist-rural (19.17%), both types show great interest and knowledge regarding nature and the rural environment. The main aspects that differentiate them are, respectively, a preference for sports and for cultural landscapes, especially related to agriculture and livestock farming.

5 Valuation and perception of the attraction of the territory with regard to tourism

The questionnaires enabled us to value and quantify the appreciation by the typology of visitors of the different characteristics of the territory. Some of these characteristics can be referenced geographically, so that the territory can be expressed according to them. These ecological components of the landscape, which can be perceived sensorially, contribute to the perception of its typology and environmental state and significantly influence the preferences and appraisal of the observers with regard to the landscape. The spatial analysis of the interaction between both quantifications identifies the degree to which the zones of the territory adjust to the preferences of the tourists.

Based on the questions asked in the survey, we selected 32 territorial variables that satisfy the requirements of the analysis. The procedure is based on two sets of data (Fig. 1): 1) matrix of valuation of the natural characteristics of the territory (32 variables x 4 observations) (Fig. 1 [A]); its elements, $a_{ij}$, quantify the answers by the types of tourists identified to the questions asked about the 32 spatial variables; 2) matrix of territorial representation of the factors attracting tourism (32 variables x 8 observations) (Fig. 1 [B]); its elements, $b_{ij}$, quantify the presence of the 32 territorial characteristics in the types of landscape considered.
Figure 1: Methodological development. The procedure is based on a multiplication of matrices $[A] \times [B]$. The resulting produced matrix, $[C]$, quantifies the demand by the tourists for the territorial variables. A classification analysis of this intermediate product matrix indicates that the visitors only perceive 4 types of landscapes in the territory. The correspondence of the groups of landscapes that represent the territorial offer and the demand by the visitors was calculated with the use of a matrix of coincidences (Fig. 2).
Figure 2: Matrix image (a) and cartographic representation (b) of the comparison of groups obtained in the analysis of the territorial offer and the visitors’ preferences. The coincidence of the two forms of description of the territory is maximum (similarity 100%) between Lt1-Lp1 –mountain landscapes– and Lt4-Lp4 –agricultural landscapes–.
5.1 Characterization of the natural and rural offer of the territory for tourism

A classification analysis of the matrix [B] shows that, according to the natural variables selected, the territory is divided into 4 landscape groups representing the types of potential ‘offer’ for tourism in the area:

Lt1: Mountain tops and slopes. Formations of broadleaf species and complex mosaics of shrubland, holm oak groves, oak and pine forests. Pastures at the highest elevations. Forestry and livestock farming use. Possibility for activities related to the mountain, hunting and fishing;

Lt2: Mountain gradients and slopes and water divides with a presence of river valleys. Pastures with shrubland and holm oak groves, oak and ash. Areas with mosaics of dry farming crops. Forestry, livestock farming and marginal agricultural uses. Presence of urban areas. Tendency towards substitution of uses by urban development. The main potential recreational activities are hunting and watching fauna;

Lt3: Mountain gradients and slopes. Mediterranean ‘monte’ and pastures undergoing a process of abandonment and degradation. Abundance of shrubland. The main possibilities for recreation are hunting, watching land vertebrates, particularly birds, hiking, cycling and nature routes, potholing, fishing and water sports;

Lt4: Hillsides, countryside, and river valleys. Agricultural landscape with dry farming and irrigated crops. Shrublands and urban areas. Recreation potentiality related to hunting, observing the aquatic vegetation and fauna, hiking, cycling and other types of nature routes.

5.2 Perception of the territory and landscape preferences of the visitors

In order to learn of the perception of the territory by the visitors, we carried out matrix product of [A] x [B]. The result is a product matrix [C] of 8 observations (ecological sectors) x 4 variables (types of tourists) (Fig. 1), the elements of which, \( a_{ij} \times b_{ij} \), quantify the demand by the tourists for the spatial variables studied. A classification analysis of this intermediate product matrix indicates that the visitors only perceive 4 types of landscape in the territory, which differ to a greater or lesser degree from the typology of landscapes obtained in the analysis of the territorial offer:

Lp1: Mountain tops and slopes. Broadleaf species, pine forest, shrubland and high altitude pastures. The areas and geographic location of these coincide exactly with the Landscape type 1 (Lt1) obtained by means of the characterization of the territorial offer;

Lp2: Mountain gradient and slopes. Mediterranean ‘monte’, pastures with trees (‘dehesas’). Tendency towards shrublands (‘matorralización’);
Lp3: Piedemont. Water divides and mountainsides with river valleys. Mosaic of crops, pine forest, Holm oak groves and (‘dehesas’). Urban areas;

Lp4: Moorlands, countryside and valley bottoms. Mosaic of crops. Urban areas. The territorial limits of this landscape unit overlap with those of Landscape type 4 (Lt4) from the previous analysis.

6 Correspondence between the offer of the territory and the perception of this by tourists

The joint consideration of the landscape groups represented by the types of potential offer for tourism in the area and the preferences of the visitors enabled us to analyze the correspondence between the two forms of description of the landscape.

Conceptually speaking, a matrix of interaction between offer and demand with maximum values of fit between both of them would indicate a total coincidence of the two interpretations of the territory. The area would be made up of as many spatial units as there were types of visitors, whose preferences would be aimed at a specific sector of the territory which would have the optimum composition of landscape variables preferred by a given type of tourist. A high level of correspondence indicates that the typology of the territory shows a good acceptance of the demand it is subjected to, and its spatial variation can be described by considering both the natural characteristics and the preferences of the visitors –one same map could be interpreted through two alternative legends–.

In this case, in order to establish the fit between the characteristics of the territory and how the different types of visitors perceive it, we made a comparison of the clusters obtained from the matrices [B] –groups of landscapes according to their natural and rural characteristics (‘offer’)– and [C] –groups of landscapes preferred by the tourists –(‘demand’)–. The correspondence between them is obtained from a table of contingencies of the respective groups (Fig. 2a). The similitude (%) between the groups of classifications was calculated as the quotient between the number of common observations in the groups of one or another classification and the total number of different observations in each group. The coincidence of the two forms of description of the territory is total in the case of mountainous areas and of the eminently agricultural landscapes (Lt1-Lp1 y Lt4-Lp4, respectively), whereas the sectors representing formations of Mediterranean ‘monte’, with greater or lesser degrees of abandonment of the traditional uses, present a medium or zero coincidence.

This spatial analysis of coincidences can be expressed cartographically, in order to obtain maps based on the fit between the set of demands and the potential capacity of the territory to satisfy them (Fig. 2b).

7 Analysis of satisfaction of the demand

The results of the analysis of the perception and demands of the visitors were
used to make a new matrix of preferences of the tourists for the landscapes that they perceive (4 observations x 4 variables) (Fig. 1 [D]). It comprises elements, \( c_{ij} \), which represent the mean values of the discriminant variables in the types of landscape appreciated by the visitors. The division into three categories –high, medium and low (natural break method)– of the vectors of the matrix that value the preferences of the tourists for the different types of landscapes (Table 2), facilitates the interpretation of the territorial preferences of each class of visitors, and serves to draw up maps which spatially express the relative degree of satisfaction they obtain (Table 2). This maps can be interpreted as the ‘outdoor recreation niche’ of the visitors. We observed a gradient of increase in satisfaction, from the medium and low values that predominate in the indifferent and generalist visitors, to high-level appraisals characterizing the naturalist-rural visitors. All of these show a clear preference for high-mountain landscapes.

Table 2: Relative satisfaction obtained by the visitors in the landscapes they perceive (Lp). We classified the values of the matrix of the tourists’ preferences and divided them into three categories using the natural break method: low satisfaction level (L) –variation range from -1.01 to -0.66–, medium satisfaction level (M) –values of between -0.65 and 0.04 and high satisfaction level (H) –from, 0.05 to 2.52–.

<table>
<thead>
<tr>
<th>Visitors</th>
<th>Landscape types</th>
<th>Satisfaction</th>
<th>Visitors</th>
<th>Landscape types</th>
<th>Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘indifferents’</td>
<td>Lp1</td>
<td>-0.27</td>
<td>‘naturalist s-sports’</td>
<td>Lp1</td>
<td>1.30</td>
</tr>
<tr>
<td></td>
<td>Lp2</td>
<td>-0.85</td>
<td></td>
<td>Lp2</td>
<td>-0.14</td>
</tr>
<tr>
<td></td>
<td>Lp3</td>
<td>-1.01</td>
<td></td>
<td>Lp3</td>
<td>-0.66</td>
</tr>
<tr>
<td></td>
<td>Lp4</td>
<td>-0.94</td>
<td></td>
<td>Lp4</td>
<td>-0.43</td>
</tr>
<tr>
<td>‘generalists’</td>
<td>Lp1</td>
<td>0.61</td>
<td>‘naturalist s-rural’</td>
<td>Lp1</td>
<td>2.52</td>
</tr>
<tr>
<td></td>
<td>Lp2</td>
<td>-0.46</td>
<td></td>
<td>Lp2</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>Lp3</td>
<td>-0.85</td>
<td></td>
<td>Lp3</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>Lp4</td>
<td>-0.69</td>
<td></td>
<td>Lp4</td>
<td>1.23</td>
</tr>
</tbody>
</table>

8 Conclusions

We developed a method of classification and analysis of the interaction between visitors and landscape: their potential distribution, perception, preferences and degrees of satisfaction with regard to the natural and rural characteristics of the territory, and the degree of coincidence between both.

The results show that all the visitors to the area studied highlight the importance of nature as an element of reference of the tourism they practice. There are different types of tourists with greater or lesser degrees of specialization. Among the most specialized are visitors motivated by nature and the rural environment, conditioned by nature and by the traditional cultural landscape, and sports-orientated visitors, also associated with aspects of nature and the rural environment.
Spatial analysis of coincidences indicates a maximum correspondence between the natural and cultural offer of the territory and the demand by the visitors in the high mountain landscapes and in those clearly dedicated to agriculture. Although the characteristics of the area provide a variation in the degree of satisfaction which tallies with the increase in the level of specialization and knowledge of nature of the visitors, they all show a clear preference for the high mountain landscapes.

The process followed enabled us to draw up maps showing the distribution of the preferences and possible areas to be visited of the different types of tourists, the degree of satisfaction of their current and potential preferences, the degree of correspondence or adjustment between the set of demands and the potential capacity of the territory to satisfy these. This doubtlessly provides a useful reference for the design of a rational planning of tourism in the study area.

References