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A pilgrim way between sea and sky: the landscape of "Cammino Celeste"

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Abstract. Pilgrim ways all around Europe connect histories, landscapes, cultural heritages and people. The different routes lead visitors through woods, mountains and rural landscapes and could be an important tool to promote sustainable tourism, particularly in rural areas and lesser-known destinations. This study focuses on one of the main pilgrim ways in the Friuli Venezia Giulia region (north-east Italy) known as the "Cammino Celeste". The trail, 200 km long, begins in the Grado Lagoon area and ends in the heart of the Julian Pre-Alps, allowing the hiker to experience the different natural and cultural landscapes of the Friuli Venezia Giulia region. The aims of the study are: i) to identify the different landscape types in order to understand the variety of landscapes along the trail ii) to analyse the role of this basic knowledge as a tool for rural tourism development.

Keywords. Landscape, landscape units, visual analysis, rural tourism, GIS.

1. Introduction. Pilgrim routes all around Europe connect histories, landscapes, cultural heritages and people. The different routes lead visitors through woods, mountains and rural landscapes and could be an important tool to promote sustainable tourism, particularly in rural areas and lesser-known destinations (Portaheri et al. 2012). Pilgrimage routes can be intended as a part of rural tourism (Portaheri et al. 2012), namely "tourism in the countryside that embraces the rural environment as pivotal to the product offered" (Clarke, Denman, Hickman, Slovak 2001). This system of tourism has recently gained value at a European level for its potential to improve quality of life, for bringing economic and income-source diversity to rural areas, for creating jobs in these regions, and for establishing a

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direct link with the complex pattern of the rural environment, its economy and history (European Parliament resolution P7_TA(2011)0407; OECD 1994). The landscape's characteristics and changes along the way represent a crucial component of pilgrimage routes. Belhassen et al. (2008) highlighted how the experiential quality of a pilgrim's tour is indicated by their interaction with the built and natural features of the landscape and, as such, authenticity emerges during the tour. The methods and tools addressing the issue of landscape character identification can represent a valuable support to the knowledge of a place and to local rural tourism through the organisation of information on landscapes.

The analysis and characterisation of landscapes have a long history. However, more recently, methods based on visual surveys have assumed more importance in landscape analysis (Sevenant, Antrop 2007; Canas et al. 2009). In particular, the Countryside Agency and Scottish Natural Heritage (Swanwick 2002) and the European Council for the Village And Small Town (ECOVAST 2006) have proposed original methods for identifying landscape characteristics on the basis of two key concepts: the landscape unit and the landscape perception.

The first is linked to the identification of areas with different landscape character, while the second deals with the visual perception, as well as the feelings, memories or associations that the landscape elicits. These concepts form the basis of the landscape characterisation along one of the main pilgrim routes in the Friuli Venezia Giulia region (north-east Italy) known as the "Cammino Celeste".

The aims of the study are:

i) to identify the different landscape types along the route.
ii) to characterise these landscapes using a method that incorporates information based on what is seen by the traveller's eyes.

2. The study area. As said before, this study focuses on one of the main pilgrim ways in the Friuli Venezia Giulia region (north-east Italy) known as the "Cammino Celeste". The trail, 200 km long, begins in the Grado Lagoon area and ends in the heart of the Julian Pre-Alps. The "Cammino Celeste" route has developed from three paths that originate in particularly significant places in terms of the history and tradition of the eastern and northern trans-boundary area of Friuli Venezia Giulia. The first place is Aquileia in Italy, the second is Brezje in Slovenia, and the third is Maria Saal, above Klagenfurt in Austria. The three paths, starting from their respective points of origin, come together on the Monte Lussari (1760 m). The Italian part of the route lies predominantly along tracks, country lanes and mountain trails, allowing the hiker to enjoy the fascinating landscape of Friuli Venezia Giulia from the sea to the mountains (Bellavite et al. 2011).

3. Methods

3.1. The identification of landscape types. The first step of the proposed approach is aimed at identifying the landscape types. Two key compo-

Table 1. Reclassification of the original Land FTS LM LUT.

Degree of soil sealing	*Corine Land Cover class*
0%	non sealed areas (NSA)
1-79%	isolated sprawled sealed areas (ISSA) or Corine LC class 1.1.2
80-100%	completely sealed areas (CSA) or compatible with CLC class 1.1.1

nents were considered in the analysis: the degree of soil sealing due to urbanisation and infrastructure development (Prokop et al. 2011), and the mosaic of non-artificial land uses/land covers (LULC) such as agriculture, and natural habitats. The analysis was applied to the cells of a 1 km x 1 km geographic grid overlaid on a 4 km buffer along the route.

The soil sealing index in this context is the percentage of sealed surface in each landscape unit and its calculation was based on the Soil Sealing Enhancement data (SSE) of the European Environmental Agency, produced as part of the GMES Fast Track Service on Land Monitoring (Land FTS LM) in 2006-2008 (2006 for this study). This is a high resolution 20 x 20 m raster dataset of built-up and non-built-up areas, including a continuous degree of soil sealing ranging from 0-100%.

The continuous degree of soil sealing values were grouped into four classes (Tab. 1) corresponding to the Corine Land Cover classes. The definition of the class boundaries was guided by a Look Up Table by Maucha et al. (2010 and by visual assessment of the Soil Sealing Enhancement raster (2006) against the colour orthophotographs (2006) of the MATT National Geoportal (Ministero dell'ambiente e della tutela del territorio e del mare).

Non-artificial LULC were measured as a percentage in each grid cell and were derived using the Moland land use map of the year 2000 (1:25.000), which is the most recent LULC database for the Friuli Venezia Giulia region at a suitable scale and is compatible with the CLC classification. For the purpose of the study, the non-artificial classes from the Moland database have been reclassified into six classes (Tab. 2).

The data for each grid cell were thus analysed using Cluster analysis (Ward method) to define different landscape types as groups of grid cells, where landscape features belonging to the same group are more similar than those of units belonging to different groups. The number of clusters was determined a priori and log-transformation was previously applied to data.

3.2. Landscape characterisation. The ECOVAST method of visual analysis (ECOVAST 2006) was applied to characterise the landscape types defined by the Cluster analysis. Landscape character was detected through

Table 2. The reclassification table of the Moland Land Cover database for the identification of landscape types.

LULC classes	*Moland/CLC legend*
Crops	2.1 Arable land,
	2.3 Pastures
Permanent crops (P.crops)	2.2 Permanent crops
Natural grasslands (Nat.gra.)	33.2.1 Natural grasslands
Forests	3.1 Forests
Mixed agricultural and natural areas (Mixed agr/nat)	2.4 Heterogeneous agricultural areas
	3.2.2 Moors and heathland
	3.2.3 Sclerophyllous vegetation
	3.2.4 Transitional woodland-shrub
Other uses	3.3 Open spaces with little or no vegetation
	4. Wetland
	5. Water bodies

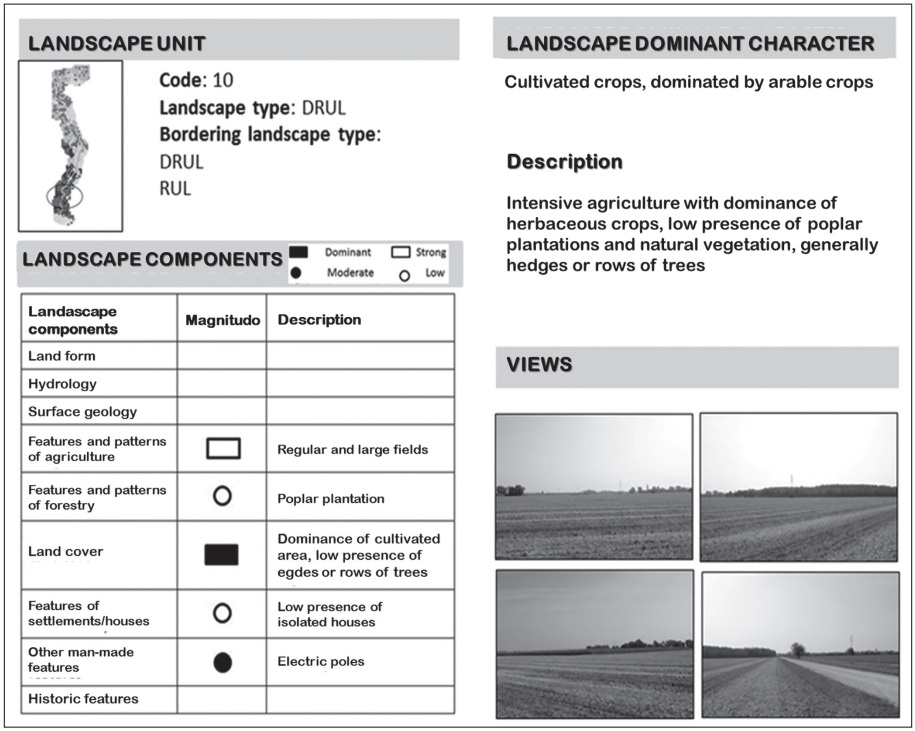
the evaluation of visual features like land form (geomorphology), surface geology (rocks), typical features and patterns of agriculture and forestry, land cover (crops, natural habitats, mixed areas), traditional features of settlements, and historical features.

Landscape character was identified by surveyors who compiled a matrix (Fig. 1), having in rows the factor classes and in columns the qualitative assessment of the relative character factor (dominant, strong, moderate, low). The surveyors expressed a summary assessment of the perceptible dominant character identified when viewing each landscape. Fifteen visual outlooks were chosen along the route for the characterisation of the landscape types along the route.

4. Results and discussion

4.1. The identification of landscape types. In the end, the cluster analysis produced six landscape types (clusters), which were denominated according to their specific characteristics (Tab. 3), as follows: Heterogeneous Landscape (HL), Natural Landscape (NL), Mountain landscape (ML), Dominated Rural-Urban Landscape (DRUL), Mixed Landscape (MIL), Rural-Urban Landscape (RUL).

In general terms, all landscape types were characterised by low levels of soil sealing (ISSA in Tab. 3). The spatial pattern of the clusters showed a clear gradient from the sea to the mountain, where the most urbanised and intensively cultivated landscapes (DRUL and RUL) were found in the plain areas while the



Landascape components	Magnitudo	Description
Land form		
Hydrology		
Surface geology		
Features and patterns of agriculture	▭	Regular and large fields
Features and patterns of forestry	○	Poplar plantation
Land cover	■	Dominance of cultivated area, low presence of egdes or rows of trees
Features of settlements/houses	○	Low presence of isolated houses
Other man-made features	●	Electric poles
Historic features		

Figure 1. Example of model form used for landscape characterisation with the matrix used for landscape component assessment.

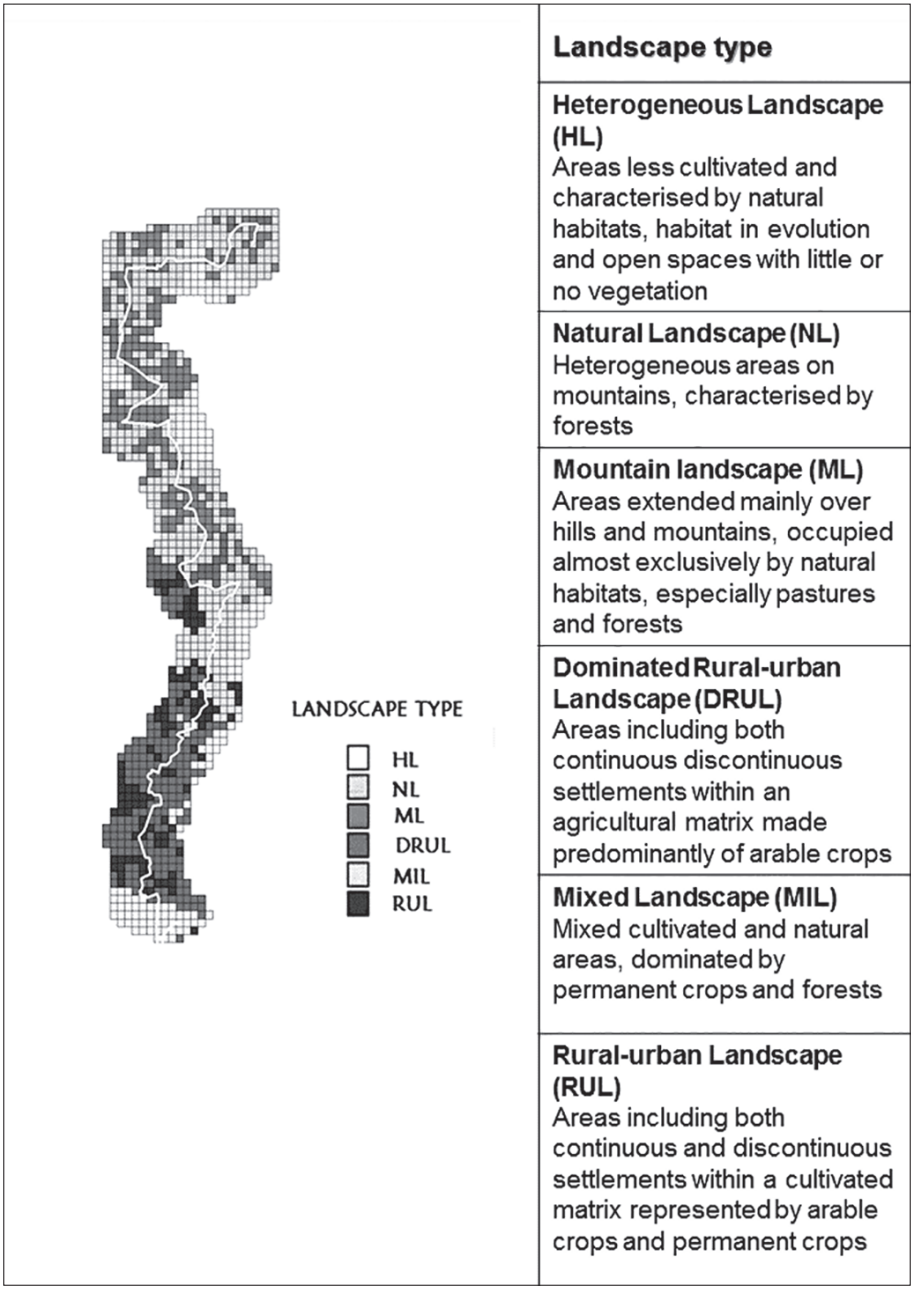
most natural and forested landscapes were located in the mountainous areas (NL, ML). The hills are characterised by a transition between the two aforementioned landscapes and by a mixed landscape of cultivated and natural areas, dominated by permanent crops and forests (MIL). Finally, HL includes the less cultivated areas characterised by natural habitats, habitat in evolution and open spaces with little or no vegetation. These landscapes are located far from the route, near the border of the 4 km buffer (Fig. 2).

4.2. Landscape characterisation along the route. Landscapes types were characterised along the route by using a matrix (Fig. 1) where any distinctive characteristic was described briefly together with an indication of its intensity, following the ECOVAST method. The matrix allowed surveyors to express brief holistic assessments in terms of perceptible dominant character. The observer's attention was directed towards the components of the panorama to provide a general impression of the landscape type observed through a descriptive chart for

Table 3. Mean value of percentage of LULC and soil sealing Index in the six types of landscapes obtained by Cluster analysis (P.crops =Permanent crops, Nat.gra.=Natural grasslands, Mixed agr/nat= Mixed agricultural and natural areas).

Cluster	*NSA*	*ISSA*	*CSA*	*P. crop*	*Forest*	*Nat.gra*	*Crops*	*Mixed agr/nat*	*Other uses*	*Landscape type*
1	98,6	1,7	0,7	0,8	0,2	0,0	2,5	14,6	48,4	Heterogeneous Landscape (HL)
2	99,7	0,3	0,0	0,1	82,7	0,2	1,6	7,2	3,0	Natural Landscape (NL)
3	99,7	0,2	0,0	0,0	74,3	13,2	0,6	5,9	4,0	Mountain landscape (ML
4	92,7	4,9	2,3	0,2	6,5	0,2	69,1	7,0	3,0	Dominated Rural-urban Landscape (DRUL)
5	98,2	1,6	0,2	34,0	35,8	0,2	17,5	3,6	0,1	Mixed Landscape (MIL)
6	91,3	5,9	2,9	17,0	1,4	0,1	59,4	3,6	0,6	Rural-urban Landscape (RUL)

each "visual field". The format used (Fig. 1) also included field notes and information about the neighbouring landscape types, landscape features, cultural and archaeological heritage. Photos taken during the project were also included. The landscape character changes between different types of landscapes, as well as within the same landscape type: for example, the DRUL and RUL landscapes are strongly influenced by the presence of settlements and by the type of permanent crops, ranging from poplar in the plain areas to vineyards in the hills. In mountainous areas, land form and forest cover dominate as characteristics over features and patterns of agriculture and forestry. This highlights the shift from an agricultural landscape, heavily influenced by human activities, to a more natural landscape, where man's footprint is less visible. The historical and cultural elements are represented by monasteries and churches, which are the pilgrimage sites along the way. The results obtained, highlight a landscape which changes along the route: a simplified landscape due to intensive agriculture in the southern portion of the plain, becoming rich in natural habitats and built-up areas going up towards the hills. From the hills to the mountains, vineyards interspersed with woods give way to the woods and less often to meadows. The final map of the landscapes (Fig. 2) and the descriptive charts for each visual field (Fig. 1) represent valuable tools for promoting knowledge of the route and local rural tourism through the organisation of information on the local landscape. This agrees with the approach to inte-



Landscape type
Heterogeneous Landscape (HL) Areas less cultivated and characterised by natural habitats, habitat in evolution and open spaces with little or no vegetation
Natural Landscape (NL) Heterogeneous areas on mountains, characterised by forests
Mountain landscape (ML) Areas extended mainly over hills and mountains, occupied almost exclusively by natural habitats, especially pastures and forests
Dominated Rural-urban Landscape (DRUL) Areas including both continuous discontinuous settlements within an agricultural matrix made predominantly of arable crops
Mixed Landscape (MIL) Mixed cultivated and natural areas, dominated by permanent crops and forests
Rural-urban Landscape (RUL) Areas including both continuous and discontinuous settlements within a cultivated matrix represented by arable crops and permanent crops

Figure 2. Map of Landscapes with the spatial distribution of the landscape types obtained by the Cluster analysis (cells represent individual landscape units).

grated tourism proposed by Tove and Tim (2003), where the importance of local identity and the strategic "commodification" of resources and place are viewed as a means for rural tourism development.

Many studies have focused on landscape types and their characterisation through aspects related to perceptions, as a way to support the spatial organisation of management actions in Natura 2000 areas (Tommaselli et al. 2011) and to assess the visual quality of rural landscapes (Arriaza et al. 2004) and rural-urban fringe areas (Kaplan et al. 2006). By studying the spatial changes in landscape character along the "Cammino Celeste" pilgrim route, our study can contribute to the development of the rural areas considered through the construction of a sense of place for the local communities. In fact, there is evidence of links between a sense of place and a landscape's characteristics (Soini et al. 2012) and of how the sense of place effects individual and social action through a higher involvement (Cheng et al. 2003; Kruger, Shannon 2000).

5. Conclusions. The proposed approach proved to be effective and flexible for analysing anthropogenic landscapes and their spatial patterns. In particular, multivariate analysis allowed the identification of different landscape types, from plains to mountains, in agreement with the geographical gradient and intensity of agricultural use. The characterisation of landscape patterns using perceptive aspects enabled an understanding of their unique structure through "the traveller's eyes", revealing differences and similarities and providing an interesting reading key for tourists and local communities alike.

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