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Aikaterini Gkoltsiou
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Keywords: *Tourism, tourist landscape, landscape indicators, landscape assessment, landscape structure.*

JEL Classification: *L83, M1, O1*

INTRODUCTION

In recent years, landscape is widely recognised as a major element of national and European heritage (Council of Europe, 2000). Appreciating the cultural, ecological, environmental and social values of landscape, the European Landscape Convention encourages Europeans people and governments in landscape identification, assessment, protection, management and planning. Many landscapes are prone to tourism



pressures and environmental, economic, social and aesthetic impacts (Coccossis & Tsartas, 2001). The analysis of tourism impacts upon the landscape, and, more specifically, the alterations of its structure, examined in this paper, lie in the context of an attempt to understand better the mechanisms and processes of tourism development that have informed and continue to drive landscape transformation, through time.

Literature review shows that there is a lack of research on the analysis and assessment of fundamental structural elements and their interrelationships, in a tourist landscape, especially as regards research conducted with the aid of quantitative methods and tools (Parker *et al.* in Herold *et al.*, 2005). Landscape character assessment methods have, so far, been widely used by landscape architects, in order to analyze the state of a landscape and any changes it may be going through (Lausch & Herzog, 2002). In the field of landscape ecology, several quantitative methodological tools--specifically under the name of *landscape metrics*--have been developed and applied (Forman and Godron, 1996), while no such set of research tools exists for the urban landscape. This absence of recent research on quantitative methods for the assessment of the state and change of the spatial structure of a tourist landscape, point to the need for such a methodological framework, holistically addressing and capturing landscape morphology, in general, and landscape structure, in specific (rather than relief, texture, color, etc)--since, according to Doukelis (1998), analyzing landscape structure, facilitates the study of tourist place history, and therefore tourist place development.

This paper, accordingly, purports to fill this gap, by undertaking research in this important, yet uncharted, area and to present a new methodological framework for analyzing and assessing the structure of tourist landscapes. Through a combined application of landscape indicators, remote sensing and landscape character assessment methods, the proposed framework aims at measuring attributes of the state of a landscape. More specifically, it assesses the composition and configuration of tourist landscape elements, in an attempt to analyze landscape organization and identify possibilities of development in the tourist landscape. This goal will be accomplished, through two specific objectives, as follows:

- To identify the main landscape *components*, commonly associated with tourist landscape structure (appearance) and
- To assess the *attributes* of these components, in an effort to evaluate the appearance of the tourist landscape as a whole.

The following literature review is intended to discuss and elaborate on the two principal dimensions of a tourist landscape and their

interrelationships. It is followed by an analysis of the tourist landscape and its shaping through time and ends with the presentation of the methodological framework accompanied by a set of landscape indicators and their applied metrics. The scientific contribution of this work is discussed in the last section of the article, which puts forth the ways in which this framework may be put to use by landscape and tourism development agents, planners or other landscape stakeholders; this latter part of the article also addresses the value and relevance of this work to landscape theory and methodologies.

LITERATURE REVIEW

At the outset of our research endeavor, it was considered important to identify the two main dimensions of a tourist landscape--namely a) landscape and b) tourism--their interrelationships and the ways in which these come together, in forming a tourist landscape, at the place of destination, before, after and during the visit (Hall and Page, 2006). We, therefore, begin with a brief literature review of the theoretical background of these terms, as they apply to our study, in order extract the main attributes that comprise the structure of a tourist landscape.

-Landscape: Landscape is the result of the ways, in which different components of our surrounding environment – physical, biological and social—interact and become perceived. Therefore, landscape is concerned with and manifests in the various forms of the complex interrelationships between people and place.

The significance of landscape in geography was introduced by the Berkeley School of Landscape, in the 1920's. Human/ cultural geographers, such as Cosgrove (1998), have since focused on the perceptual and symbolic dimensions of landscape, instead of its visual components: "landscape is the way we see it or perceive it rather than the image or the object" (Johnston et al., 2000: 429-431). According to Wascher (1995), landscapes are dynamic systems that develop on the basis of the variable nature of human and natural procedures. Therefore, landscape is considered as a system of forms, functions and values (Wascher, 2002; Terkenli & Kizos, 2003).

On the other hand, landscape architects base their analytical perspectives on the *ways* that landscapes are structured by humans (Fry *et al.*, 2004). For landscape architecture, and specifically in landscape assessment methodologies, the term landscape refers to its visual appearance, reflecting the way certain attributes--such as scale, form and

enclosure--are combined, in order to create various landscape patterns, perceptible by the visitors (Warnock & Brown, 1998: 44-46).

Landscape ecology recognizes three basic features to a landscape, as follows (Forman and Gordon, 1996):

“1. Structure, which refers to the spatially related properties of elements of the ecosystem and their spatial interrelationship within the landscape,

2. Function, which describes the existing interaction between the spatial elements of the ecosystem, which is expressed in exchange processes of energy, material and substances, and

3. Dynamics, exhibited by the change to structures, to functions of the landscape structure and to the landscape mosaic over time” (Kronert *et al.*, 2001: 114).

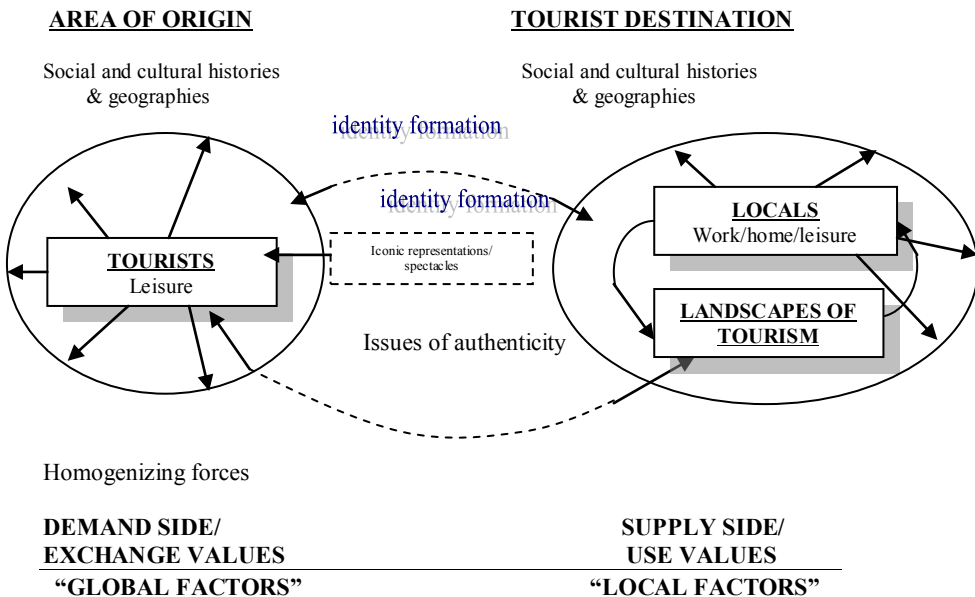
Tourism: The definition of tourism by Jafar Jafari (2003) focuses on “the study of humans away from their usual habitat, of the industry which responds to [their] needs, and of the impacts that both tourism and industry have on the host’s socio-cultural, economic, and physical environments”. The emphasis lies on tourism, as a compound activity, which includes travel towards, within and around a destination, for purposes of consumption, accommodation, recreation, as well as all relevant specific and general services (Inskeep, 1991; Pearce, 1989, in Briassoulis, 2002). “Mill and Morisson identify the four major parts of the tourism system, as being: 1) the market (tourists), 2) travel (transportation), 3) destination (attractions, facilities, and services), and 4) marketing (information and promotion), with each part closely linked in sequence with the other” (Inskeep, 1991:22).

On the other hand, the spatio-temporal development of seaside tourist destinations, as elucidated by the evolutionary models of Butler’s tourist area life-cycle model (1980), Miossec’s model of tourist development (1976), Opperman’s model of tourist space in developing countries (1993) and Gormsen’s (1981) model of spatio-temporal development of international seaside tourism, is deemed particularly valuable in the analysis of the tourist landscape. These models, thus, constitute an effective assessment guide, useful in the establishment of the degree, manner and direction of tourist development, at a tourist destination.

Tourist landscape: This article focuses on the tourist landscape, as the destination setting of the tourism system, and as the first axis in the construction of our proposed framework (Gunn, 1979; Mill and Morrison, 1985). Clare Gunn (1979:409) defines a landscape of tourism, as the total physical and visual environment utilized by all tourism activities, including the whole context and infrastructure of tourism development,

such as transportation, services, information, direction and, generally speaking, all such developments that attract people to a destination. Therefore, the tourist landscape incorporates the following tourist landscape elements and their interrelationships: 1) tourist attractions and activities (Inskip, 1991; Pearce, 1995) including all natural and human-made features of destination (Jafari, 1982), 2) infrastructures, specifically developed for tourism (accommodations, food establishments, etc.), 3) environmental elements of the tourist destination (air, water, soil), 4) basic infrastructures of the tourist place, such as transportation networks, water supply, sewage, solid waste disposal systems etc, and, finally, 5) the landscape as a whole (Briassoulis, 2002).

Figure 1 The formation of tourist landscape



Source: Terkenli, 2002

On the basis of the definitions provided above, the tourist landscape emerges as the product of tourism activities, which tend to dominate an area and "infect" its appearance. In light of its easy and ready

accessibility, as well as its representational and relational properties, landscape constitutes a most significant geographical medium in the analysis of relationships that develop between tourist and visited location (Terkenli, 2002). The readiness and amenability of landscape to variable human intervention transform it into a veritable stage for consumption, play and recreation. The tourist landscape, consequently, becomes a social interface where local and global perspectives, the sides of supply and demand, production and consumption etc. come together in the ready construction and consumption of place identity (Terkenli, 2000: 185-6) (figure 1).

According to Wall (in Jafari, 1982), *tourist landscapes* are both natural and human-made, designed to serve—or products that emerge from—the accommodation of *all* needs of tourism development. The term *tourist landscape* will be adopted throughout this work, as the most appropriate and widely used medium of referring to landscapes, organized or transformed mainly through and for purposes of tourism development. More often than not, tourist landscapes are characterised by an insensitive use of space and land, closely related to tourism development; extensive rebuilding and expansion of tourist infrastructures along the seashore; uncontrolled urbanisation and multifunctional land uses; excessive road network extension; spatial fragmentation; as well as the homogenisation of landscape elements, resulting in the loss of place identity (Green & Hunter in Johnston and Thomas, 1995; Antrop, 1998; Terkenli, 2002). Due to the complexity of the tourist landscape, and particularly that of the urban tourist landscape, most research on tourism structures in the landscape has so far focused on the spatial arrangement of tourist infrastructures—the most visually apparent formal aspect of tourism development, in the landscape.

Methods and tools of analysis: Landscape assessment methods and methodological tools represent our second basic axis, in the construction of the proposed framework. In specific, our methodological framework will be developed on the basis of existing methodologies and tools and the ways in which these may be employed, for our purposes, in order to support our landscape assessment frame. Three of the most widely applied methods for analyzing visual qualities, in this broader area of research, are Landscape Character Assessment (LCA) (e.g. Swanwick, 2002), the Scenic Beauty Estimation (SBE) Method (e.g. Daniel & Boster, 1976) and the Visual Resource Management (VRM) system (e.g. Bureau of Land Management, 1980).

Among methodological tools used in quantitative landscape research, indicators present the final level of interpretation in landscape analysis

(Bartel, 2000). In the field of landscape ecology, several quantitative methodological tools--specifically under the name of *landscape metrics*--have been developed and applied (O'Neil *et al.*, 1988; Turner, 1991; McGarigal and Marks, 1995; McGarigal *et al.*, 2002). In research fields outside landscape ecology and across various types of environments (in particular, urban areas), under the name of landscape metrics, spatial metrics have been used to quantify the shape and pattern of vegetation in natural landscapes (Gustafson, 1998; Hargis Bissonette & David, 1998; McGarigal, Cushman, & Neel, 2002; O'Neill *et al.*, 1988). At the same time, other attempts to create landscape indicators of visual qualities (Tveit *et al.*, 2006; Ode *et al.*, 2008) have been based on frameworks stemming from aesthetic theory, for purposes of visual landscape quality and character (Lothian, 1999; Zube *et al.*, 1975). One such significant attempt towards landscape indicator classification was undertaken, in 1993, by the Organization for Economic Cooperation and Development (OECD), in order to model cause and effect relationships between humans and the environment, employing the "Pressure-State-Response" model.

METHODOLOGY

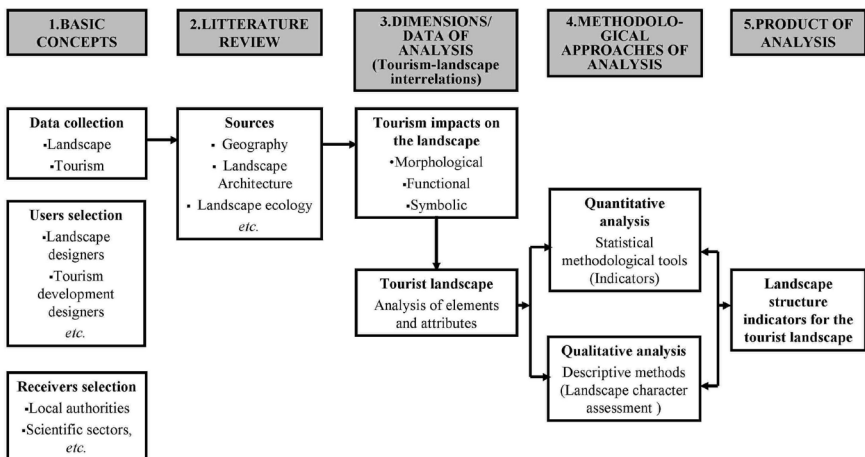
Landscape is widely viewed as constituted as a cultural system of three basic interlocking sets of aspects: visual, cognitive and experiential, alternatively theorized as form (the visual), meaning (the cognitive and the symbolic) and function (invested and articulated experience and cultural or biophysical processes) (Terkentli, 2000). This research is limited to formal landscape attributes, rather than attributes pertaining to landscape functions or values/ meanings/ symbolisms. It is also independent of attributes imbued on the landscape, by the observing side, following the subjectivist approach of landscape analysis (Lothian, 1999).

Our study, thus, focused on the morphological visual dimension of landscape, leaving out purely aesthetic attributes, such as color, texture and relief--following Swanwick *et al.*'s schematic presentation of landscape etymology (2002).

Accordingly, the construction of our methodological framework for the analysis and assessment of the tourist landscape is based on elements and aspects of both tourism and landscape comprising the tourist landscape, and on both qualitative and quantitative methods of landscape analysis. Therefore, the proposed model is constituted on two main axes, the interrelationship of tourism and landscape on the one hand and

landscape methods and techniques of analysis on the other; the final product is a system of tourist landscape indicators. Since landscape is defined and assessed here on the basis of a combination of geographical and landscape-architectural methodological approaches, the development of the proposed framework also draws upon landscape character assessment methods, which actually provide the basic theoretical frame of landscape analysis. The model's formulation follows a hierarchical structure of five basic levels: *conceptual definitions; literature review; analysis of the interrelationship of tourism and landscape; methods and techniques of analysis; and production of analysis results*. A schematic representation of the proposed methodological framework appears in figure 2.

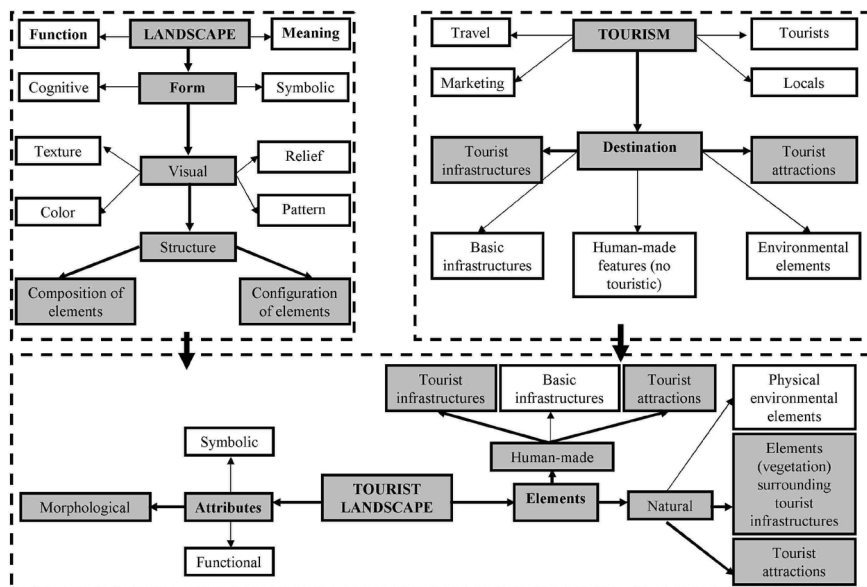
Figure 2 Organizational steps in the construction of the methodological framework



As the conceptualization and analysis of the tourist landscape have been based on the synthesis of its theoretical backgrounds, namely in the fields of landscape and tourism (figure 3), elements of tourist landscapes under assessment have been organized in two basic classes: a) human-made and b) natural. Built or human-made elements include: a) those targeted towards or specified for touristic use (i.e. hotels, B&B), b) those concerning tourist attractions and c) those forming the basic

infrastructures of a tourist destination area (road networks, electricity and water systems, etc.). Natural elements comprise of: a) purely environmental elements of the physical geographical context, such as water, air, soil, vegetation, b) on-site vegetation species (indigenous or not) and c) tourist attractions.

Figure 3 Conceptual diagrammatic analysis of the elements and attributes of a tourist landscape. (*Areas of the main focus of this study appear in grey*).



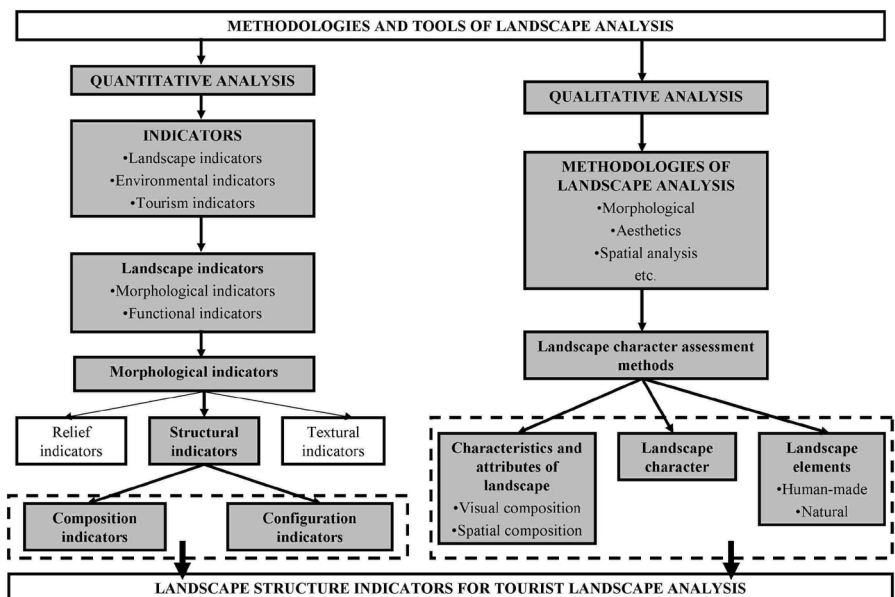
Our proposed methodological framework is developed on the basis of a review of methodologies, systematically categorized in terms of the three landscape aspects of form, function and meaning/ values, with an emphasis on the morphological aspects of the tourist landscape.

Among methods of landscape analysis, Landscape Character Assessment (LCA) (Shanwick, 2002) provides a more suitable understanding and evaluation of landscape as a resource, for purposes of enabling landscape enhancement, planning, conservation, restoration and, more generally, management. For this reason, its employment has been selected as the most appropriate tool towards the achievement of our

research goals. This method aims at assessing landscape elements (both natural and human-made), land uses, landscape attributes of visual and spatial composition (such as complexity, continuity, coherence, naturalness, visual scale, etc), visualization, as well as their interrelationships and, finally, the character of the landscape as a whole.

The Pressure-State-Response approach was another useful tool in our research (Spilanis & Karayiannis, 2009), since it brought out? our basic focus on state indicators, while describing the condition of the tourist landscape, as well as observable changes and processes, undertaken towards the goal of sustainable development, in any specific landscape under study. Significantly, a brief literature review on existing tourism indicators (Komilis and Vagonis, 1995; White *et al.*, 2006), conducted in this research, revealed the absence of adequate tourist landscape indicators, a gap that this study purports to fill. A conceptual diagrammatic presentation of the methodologies and tools that emerged from the literature review, and where then applied to our landscape analysis, is presented as follows (figure 4).

Figure 4 Conceptual diagrammatic presentation of methodologies and tools of landscape analysis.



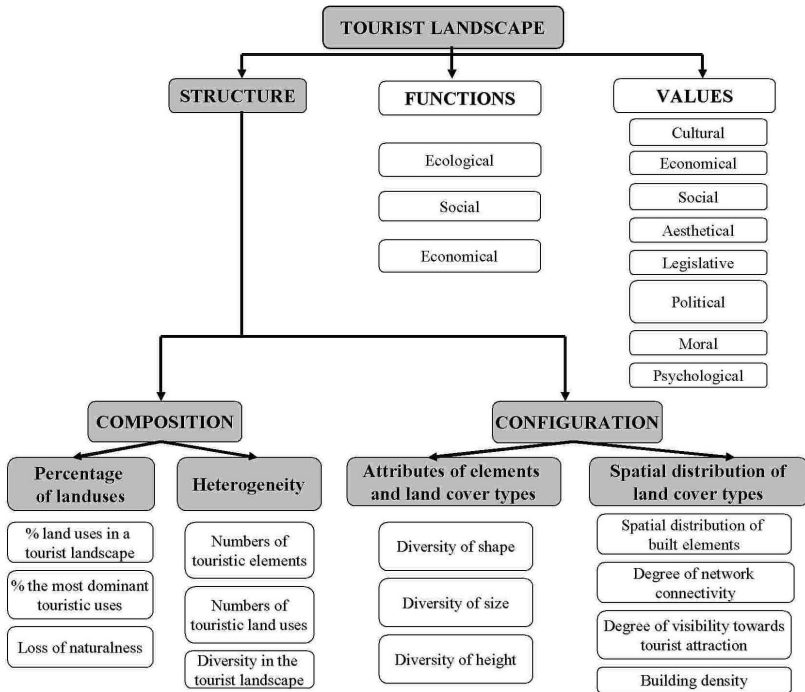
Such a review revealed that landscape indicators, as they appear in scientific literature so far, tend to be grouped into two categories: morphological and functional (Turner & Gardner, 1991). Since our framework focuses on the morphological aspects of the tourist landscape, we, then, turned to morphological indicators, and, more specifically, to the development of landscape structure indicators and their adjusted metrics. Two main categories of metrics were singled out, for the purposes of our study: composition metrics (concerning the proportion of the landscape taken up by each patch type, patch richness, patch evenness and patch diversity), and configuration metrics (concerning mean patch-shape, fractal dimension, contagion, interspersion and juxtaposition) (McGarigal and Marks, 1995).

The selection of indicators proposed by this research project rested on the groupings presented above, as well as on the following assumptions: a) the complexity of landscape elements, shapes and sizes is indicative of the degree of human intervention in the physical environment, b) the more developed an area for tourism purposes, the higher the degree of its network connectivity the more pronounced the presence of tourism infrastructures (Zografos & Deffner, 2009), and c) the spatial configuration of landscape elements and land cover types expresses landscape evolution and transformation, at a specific place, during a specific time period.

PRODUCTION OF ANALYSIS RESULTS

Our preceding literature review on landscape indicators, metrics and landscape character assessment methods concluded with the following proposed set of indicators, formulated on the basis of two structural landscape aspects, borrowed from landscape ecology: landscape composition and landscape configuration (figure 5). Taken together, these landscape indicators comprise our proposed landscape indicator model.

The landscape indicator model, as shown above, has been conceived in this more general form, aimed at an application to conventional 3S's tourist landscapes, but may be further developed or tailored to the particularities of various other types of tourist landscapes, such as winter tourism, agrotourism, e.t.c. The proposed specific tourist landscape indicators are presented, together with their applied metrics, in the following table (table 1).

Figure 5 Conceptual diagram grouping tourist landscape indicators.

With regard to the scale level, at which this set of landscape indicators are proposed to be employed, in this study, class (land use) level and landscape level metrics are considered as the most appropriate ones for tourist landscape analysis. “Class metrics represent the spatial distribution and pattern within a landscape of a single patch type; whereas landscape metrics represent the spatial pattern of the entire landscape mosaic, considering all patch types simultaneously” (McGarigal et al., 2002). Although many of these indices may be identical at the class and landscape levels, their interpretations may be somewhat different, at different scales of measurement. Obviously, it is up to the researcher to select the appropriate geographical scale, for any particular analysis of tourist landscape structure.

Table 1 Proposed landscape structure indicators for tourist landscape analysis

TOURIST LANDSCAPE STRUCTURE INDICATORS	APPLIED LANDSCAPE METRICS
A. Composition indicators	
1. Percentage of land uses	
<i>1^a. Percentage of tourist and non-tourist land uses.</i>	<i>% from thematic maps</i>
<i>1^b. Percentage of the most dominant tourist uses.</i>	<i>% from thematic maps</i>
<i>1^c. Loss of naturalness</i>	<i>% of unbuilt natural areas</i>
2. Heterogeneity indicators	
<i>2^a. Number of selected elements of tourist interest (landmarks)</i>	<i>Number derived from thematic maps</i>
<i>2^b. Number of various types of land uses in a tourist landscape</i>	<i>-Number of Patches (NP) -Patch Richness (PR)</i>
<i>2^c. Diversity in a tourist landscape</i>	<i>Shannon's Diversity Index (SHDI)</i>
B. Configuration indicators	
3. Attributes of built elements and land cover types.	
<i>3^a. Diversity of shapes of land cover types</i>	<i>Patton's Diversity Index (DI)</i>
<i>3^b. Diversity of sizes of land cover types</i>	<i>Patch size standard deviation index</i>
<i>3^c. Diversity of heights of built elements.</i>	<i>Shannon's Diversity Index (SHDI)</i>
4. Spatial distribution of land cover types	
<i>4^a. Building density</i>	<i>Patch Density</i>
<i>4^b. Spatial distribution of built elements in tourist landscape</i>	<i>Nearest Neighbor Distance index</i>
<i>4^c. Degree of network connectivity</i>	<i>Indices α, γ</i>
<i>4^d. Degree of visibility towards tourist landscape of interest</i>	<i>Visibility index</i>

DISCUSSION

Among composition indicators, those referring to an attribute of the tourist landscape itself—such as richness and diversity—through the estimation of the number and percentage of land uses, provide a general

idea of tourism development in the area. Thus, they also indirectly refer to the degree of land cover (urbanisation of rural landscape), to change in pre-existing land uses and, by extension, to the dynamics of the whole local socio-economic context. On the other hand, loss of naturalness, through over-construction, in combination with the increase in the diversity of elements or land uses in a tourist landscape, which often comes with tourism or other development, creates optical disharmony and spatial confusion to the visitor. As a consequence, not only functional, but also symbolic landscape dimensions are affected or disturbed, as much for the locals as for the tourists.

Among configuration indicators, those referring to formal attributes of tourist landscape elements (shape, size and height) are particularly important for the extraction of information on the planning and building status of the area under study and for the elucidation of landscape functions of the past, present and future. These landscape elements are precisely those that come readily under the perception of the visitor of a tourist landscape. With the aid of the above indicators, presence, scale and spatial arrangement of tourism units and infrastructures are assessed, as are also the fragmentation of space, the degree of the road network development and the potential for visual and functional accessibility to and from poles of tourist attraction. Indicators of spatial distribution of various land cover types are equally useful, as structural and functional indicators. They are considered valuable in understanding tourist landscape formation, land-ownership arrangements of a tourist region and future trends in tourism development. These indicators may also prove informative about the historical evolution of the tourist landscape, that is the stages of tourism development, as inscribed in the landscape, in accordance to various models of tourism geography—such as Butler's tourist area life-cycle concept model (1980), Miossec's model of tourist development (1976), Opperman's model of tourist space evolution in developing countries (1993) and Gormsen's (1981) model of spatio-temporal development of international seaside tourism. Their contribution lies in their ability to assess the spatial concentration of tourist activities, which is also directly connected to their ability to evaluate purchasing land values in the region, and hence its potential for further tourism development.

The application of the proposed methodological framework, combining landscape metrics, remote sensing and landscape character assessment methods, may support the analysis of tourism growth and land use change in a variety of different tourism settings. Spatial assessment, on the basis of the proposed set of indicators, may contribute to a better

understanding of the behavior of both tourists and locals and lead to more grounded political decisions, ensuring a more balanced flow and concentration of tourists towards and through poles of landscape attraction. Landscape indicators deserve a central place in the tourism research and planning agenda, since they may be employed for various purposes, from the detailed mapping of tourist land use changes, at various geographical scales, to helping deduce a number of socioeconomic characteristics from remote sensing data. Such analysis of temporal change in tourist landscape structure, based on remote sensing and spatial metrics, may also encourage the development of new methodological perspectives in landscape and tourism sciences.

Moreover, most significantly, the proposed set of landscape indicators, stemming from our methodological framework for tourism landscape assessment, must be viewed as constituting only a subset of a larger and more well-rounded set of indicators, analysing structural and functional changes in tourist landscapes, in conjunction with indicators assessing state and change in the cognitive/ symbolic, qualitative aspects of the tourist landscape.

CONCLUSIONS

The methodological framework introduced above, purports to be an efficient instrument in the evaluation of fundamental structural elements and traits of a tourist landscape. It is hoped that it constitutes a valuable tool for any landscape or tourism development agent, planner or other stakeholder in the broader interdisciplinary research area of urban planning, environment, landscape and/or tourism planning, in the context of any systematic, sustainable and comprehensive spatial intervention in a tourist region or specific destination. It may also prove to be a useful tool for local authorities, providing important quantitative information on tourism impacts on the landscape, thus helping reinforce tourism development geographically remote areas. From the information thus deduced, useful conclusions on social economic, political and cultural processes that created and continue to create a landscape may be additionally derived. The proposed framework may thus constitute a valuable tool in future planning efforts towards description, appraisal and assessment of the state of coastal tourist landscapes and of potential impacts of the tourism industry on them.

However, landscape indicators are not a panacea in tourist landscape assessment. Rather in combination with other data concerning both the

natural and the socio-cultural aspects of the landscape, they may prove to be a crucial tool for constructing a realistic simulation of future local-level tourism development. This research is still at an early stage and relies heavily on metrics and assumptions originating in landscape ecology, GIS science and spatial analysis. Tourist landscape metrics tailored to the needs of tourism analysis at different scales, as well as further improved remote sensing and mapping products, remain issues and areas of further research. The successful application of such a tool may potentially also serve in the improvement of infrastructures, as well as techniques and strategies, the protection of the natural and cultural environment, tourist landscape, upgrading social prosperity and economic blossoming, but also move generally speaking, to future local tourism development on a more sustainable and landscape-sensitive basis. Finally, landscape planning and tourism management may profit greatly from linking landscape structure to landscape preferences and other such methods and models (Dodds & Butler, 2010) currently used in tourism geography and other fields of tourism study.

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