Theoretical Perspectives on Landscape Perception

Prem Chhetri and Anjali Chhetri

Abstract This chapter develops a theoretical framework for conceptualising natural landscapes into categories and domains that shows their mappable properties and the spatial relations between them. The process of perceiving and experiencing landscapes is widely understood in the extant literature; however, the mappability of perceived landscapes is neither thoroughly investigated nor theorised from a multidisciplinary perspective. This chapter argues for integrating the process of sensing, perceiving and cognising the sum total of biophysical characteristics of geographic space as a unified construct, which is referred here as landscape. Tourists' perception is used as a surrogate to represent and reflect the process of constructing landscape. It is acknowledged that landscapes are constructed through perception and cognition, notwithstanding the importance of geographic space as a milieu for guiding and stimulating the interest of observers to participate, interact and engage with its constituent components should also be recognised to help understand human behaviour in natural areas.

Keyword Landscape perception · Geographic space · Constructivism · Tourist destination

1 Introduction

This chapter examines the construction of landscape, which essentially involves the process of perceiving and cognising objects or phenomena within a geographic space. Both perception and cognition bring discreet parts of a geographic space together into a coherent and meaningful construct. Terms such as cognition and perception are interchangeably used in the literature even though they are different but intertwined

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psychological processes. Perception generally refers to the mental sensations and processes that relate to the senses and occur in the direct presence of the sensory stimuli (Mark 1999) whereas cognition extends the perception to include conscious thinking, including memory and reasoning.

Landscape is seen as a holistic, relativistic and dynamic entity (Antrop 1997). Landscape could be considered dynamic as each 'element' in a system is related and connected with other elements. Changes in any element of landscape will cause corresponding changes across the entire system. However, the perception of a landscape 'element' is relative. A simple example of a 'relational' feature is an 'edge', which is the boundary or zone of contact between two or more contrasting landscape elements. Edge environments such as a lake edge, river edge, cliff edge and the edge of forests are generally more preferable and sought-after spaces for outdoor recreation activities (Minnesota Environment Quality Board 1993).

Simple disintegration of landscapes into elements merely allows for easy, objective and mathematical measurements to be taken, rather than explains the "unexamined relationship between them" (Appleton 1975a). Despite frequent use, the concept of landscape is loosely defined and is often applied with different meanings and interpretations. The meaning of landscape is "surrounded by semantic differences, misunderstanding and controversies" (Countryside Commission for Scotland 1970:1). Some of these issues will be addressed in this chapter, which then becomes the theoretical basis for this research.

Specifically, this chapter aims to describe how the concept of landscape has evolved in the geographical sciences and explore attempts that established it as a geographic paradigm; to investigate what constitutes a landscape and identify components that compose experiential landscapes; and finally, to develop a theoretical framework to analyse the process of perceiving and experiencing landscapes. A thorough review of the extant literature in a range of disciplines is carried out. The key debates and discourses in the field of landscape studies are synthesised and presented.

This chapter is structured into five sections. It begins with the introduction of landscape by presenting various definitions. It is followed by a discussion that argues landscape as a geographic paradigm that has shaped the direction of geographical sciences for several decades. Subsequent sections identify various components of landscape and present the complexity of landscape perception, cognition and construction. The key findings of this chapter are then summarised in the concluding section.

2 What is a Landscape?

The term landscape (land, lendh—in Indo-European roots+—scap, state, condition; formerly written as landskip) was first recorded in 1598 in Dutch literature. It was borrowed as a painters' term from the Dutch during the sixteenth century. The Dutch word 'landschap' had earlier meant simply 'region or a tract of land' but had acquired the artistic sense, which is brought over into English, to mean 'a picture depicting

scenery on land'. The word for landscape in other languages, such as 'landschaft' in German or 'paysage' in French, has similar meanings. The term landscape has been used to carry multiple meanings. Some of the definitions cited most often in the literature are as follows:

- "the total character of a region" (Von Humboldt, cited in Farina 1998);
- "landscape dealt with in their totality as physical, ecological and geographical entities, integrating all natural and human (caused) patterns and processes" (Naveh 1987);
- "landscape as a heterogeneous land area composed of a cluster of interacting ecosystems that are repeated in similar form throughout" (Forman and Gordon 1986);
- "a particular configuration of topography, vegetation cover, land use and settlement patterns which delimits some coherence of natural and cultural processes and activities" (Green et al. 1996); and
- "a piece of land which we perceive comprehensively around us, without looking closely at single components and which looks familiar to us" (Haber, cited in Farina 1998).

The concept of landscape as used in different disciplines is diverse, perhaps too diverse to be usefully applied for a single-use. The scope of landscape in these definitions goes beyond the physical and visual properties to a search for some abstract and subjective meaning. The Ministry of Planning and International Cooperation, West Bank Governorates (1999) states "the landscape is not purely visual phenomena because its character relies closely on its physiography and its history". Therefore, in order to argue for a subjective definition of the term landscape, many authors, for example, Naveh (1987) and Green et al. (1996), use specific terms such as 'total character', 'aggregation' and 'coherence'.

Terms such as area, space, place and region are often used interchangeably for landscape in the literature even though these terms are conceptualised with different meanings and scales. Despite the similarity, there are some subtle (for place and landscape) and some significant (for landscape and region) differences between them. However, this does not mean that these concepts are mutually exclusive. For example, an area can be a landscape and region at the same time. The Grampians National Park is a part of a region (Tourism Product Region defined by Tourism Victoria) in Australia; but simultaneously it has some areal properties and is, therefore, an area. The area of the Grampians National Park is also ascribed with some meanings and attachments as a place for people living in it. Rose (1993) defined places as physical areas that are imparted with meaning by the people, generally infused with feelings and emotions developed due to the attachment to the land. It is also viewed as a single landscape (for example a 'Cuesta' landscape) or composed of several landscapes as perceived by people in different ways. Landscapes are also defined in terms of different themes, such as agricultural landscapes, urban landscapes, industrial landscapes, polar landscapes, or even scenic landscapes. Such themes are primarily determined on the basis of the characteristics of one or more predominant features identified for an area.

Three common interpretations of the word landscape can be identified in the literature. The first, as used by landscape ecologists, is similar to the word 'environment'. The word is taken to represent "the total spatial and visual entity of human living space…" (Naveh and Lieberman 1994: 4) or "a homogeneous segment of the environment…" (Fabos 1979:4). The second reflects the domain of physical geography where the word landscape is often used to characterise the physiographic and geomorphologic features of the earth's crust (Naveh and Leiberman 1994). The third common interpretation is related to the perceived environment. For this research, the third interpretation is the meaning intended for the following reasons.

- First, the scope of this interpretation is both generic and comprehensive and can be easily applied in a number of situations. Farina (1998) states that Haber's definition, which is similar to the third interpretation, promises a new field of research and invites further speculation to be made.
- Second, landscape from this perspective is defined as our perceived environment and therefore it is potentially robust in linking the 'processes' of perception and cognition with the 'structure' of the physical environment.
- Finally, it appears that this interpretation is similar to the meaning that is most often used in tourism and landscape perception research (Vittersø et al. 2000; Chhetri et al. 2004).

3 Landscape as Geographic Paradigm

This section explores the meaning and scope of landscape and its development as a geographic paradigm. The nature, character and scope of landscape as a geographical unit or as a paradigm have long been debated. Confusion has apparently arisen from the parallel term 'Landschaft' used in Germany for landscape that is defined as either (a) the landscape in the sense or (b) a restricted region of the earth's surface. In the first meaning, the terms Landschaft and landscape are synonymous, while in the second the equivalent English word is 'region'.

Carl Sauer is one of the pioneers who made the first systematic attempt to define the term landscape in 'The Morphology of Landscape', published in 1925. Prior to Sauer's publication, George Perkins Marsh (1864) investigated the role of the human as a morphological agent in changing landscapes. However, it was Sauer who gathered a group of scholars known as the Berkeley School to work on the theme of landscape change. Sauer (1925) considered geography to be a science that finds its entire field in the landscape. He argued for the possibility of breaking down the landscape into two separate components. The first component is the 'natural landscape' (Urlandschaft), which he defined as the original landscape of an area before the entry of human beings. The 'cultural landscape' (Kluturlandschaft) is the second component and is a landscape transformed by the action of human beings. Sauer argued that landscape evolves continually from natural to cultural over a continuum wherein nature dominates at one end and culture on the other. Strictly speaking, it

is difficult if not impossible to find a landscape that is purely natural, in the sense of Sauer that it is untouched by human activities.

New debate started within the geographical sciences, wherein landscape became the focus of philosophical and methodological discussion. Sauer (1925) argued that the aim of geographic analysis is to understand connections between the geographic features in a visible landscape, rather than establishing some hidden 'causality'. Such connections are of spatial relations such as distribution, association, interactions and interdependence of features in geographic space. This advocates that "one need not seek for something beyond the phenomena; they themselves are the lore (Lehre) [laws]" (Gregory 1974: 29). In the mind of many geographers, causality is still uncomfortably close to the discredited theory of environmental determinism. This culminated in the Hartshorne-Schafer debate, arguing different perspectives of conducting geographic enquiry. Extending this debate, Hartshorne (1939: 593) presented geography "as a science concerned with the functional integration of phenomena'. Hartshorne in the 'Nature of Geography' wrote a chapter on 'Landschaft' and landscape and defined landscape as:

- a piece of area having certain characteristics which our minds, if not actually, in reality, set it off from other pieces of area;
- the view of an area as seen in perspective; and
- the sum total of those things in an area that could produce 'landscape sensation' in us if we placed ourselves in the different positions necessary to receive them.

Highlighting some of the problems associated with landscape as a geographic paradigm Hartshorne concludes "geography as a study limited to the visual properties of landscape as the landscape is merely an outward manifestation of the factors at work in an area" (Hartshorne 1939: 392). Through this, he reaffirmed his commitment to the discovery of spatial associations: "geography was a 'naïve science' that looked at things as they are actually arranged and related" (Hartshorne 1939: 549). This conceded the notion that geographic analyses provide clearly defined generic principles based on nomothetic approaches and scientific rationalism. Despite this agreement, Hartshorne advocated that the "essential task of geography remained the idiographic one of locating these principles in specific regional contexts and describing their interlocking configuration" (Hartshorne 1939: 635). This theme was described as 'areal differentiation' and looks similar to an approach of interpreting a landscape in its totality.

Schaefer (1953) disagreed with the theme of areal differentiation. In an earlier and unpublished manuscript, he defined geography as "a field inclined and compelled to produce morphological laws rather than process laws" (Schaefer, quoted in Bunge 1968: 19). The meaning of morphological laws as defined by Schaefer was 'pattern' rather than the 'process' or factors that cause such patterns. This was called the 'exceptionalist' tradition in geography.

In France, landscape was used to represent the character of an area described subjectively in the 'totality' of all geographic elements. The subjective interpretation of places remains Vidal de la Blache's (1922; 1932) contribution to human geography. He identified two main foci of geographic inquiry (1) genres de vie, as a

total environmental context and (2) the character of a place. The emphasis of this approach is to describe and illustrate 'intentionality', 'temporality', 'wholeness' and 'ecological harmony' embedded in the way biophysical and human elements are arranged and organised in an area. It seems inevitable that the ultimate metaphor to describe the interplay of 'milieu' [landscape] and 'civilisation' [humans] would not be dialectic (Buttimer, 1976). It is rather holistic. This school of thought adopted a novel approach for understanding regions and landscapes by describing embedded 'consciousness' as manifested in the form of ideas, symbols, images, memories and values. As a result, a number of regional monographs called 'paysages humains' for France were produced. The style of writing about regions in these monographs is similar to the contemporary way of writing and describing landscapes as 'text', particularly in humanistic geography (not human geography). Here each region is presumed to carry a unique identity or personality that is distinct from other regions.

Recent literature shows many studies in the subfield of humanistic geography that adopt a phenomenological approach for studying human-landscape interactions. Following the qualitative approach, Jay Appleton, an English geographer (1975b) suggested a system for classifying the components of landscape according to a simple principle of 'seeing' and 'hiding'. His theory, called 'prospect-refuge' is based on some of the primitive behaviours that living beings, including humans, exhibit in natural settings. These include hunting, escaping, shelter seeking and exploring. The theory examines characteristics of a location in a landscape in terms of its ability to provide environments conducive to an observer seeing and hiding behaviour. Prospect is a location in an environment that provides an unimpeded opportunity to see, while refuge gives an opportunity to hide. Extending Lorenz's phrase "to see without being seen" (cited in Appleton (1975a), Appleton introduced this theory as a frame of reference for examining the aesthetic properties of landscape.

Another contemporary geographer in the United States, Yi-Fu Tuan, worked on a similar line of thought on landscape aesthetics. In his *Topophilia* (love of or attachment to place), Tuan (1971) investigated the role of perceptions, attitudes and values in landscape aesthetic, claiming that aesthetic responses to an environment are generated through a process of self-awareness or self-understanding. Several researchers have investigated the spatial association of people with the environment and locality (Relph 1976, 1985; Buttimer 1976; Seamon and Mugerauer 1985 and Black et al. 1989). The direction of research within this domain was significantly influenced by the work of Heidegger (1927). The effects of modernity in isolating and alienating people from places and landscapes were investigated. Such socio-psychological processes tend to create a sense of 'placelessness' developed within the ambience of concrete and lifeless urban landscapes. Landscapes, places and spaces were viewed as processes (Massey 1993; Harvey 1993) or as nets of social relations (Massey 1993, 182). This type of research has contributed immensely to the initiation of several environmental movements. The focus of such movements was to foster the emotional and aesthetic relations of people with their environments and hence the commitment to the conservation of their environments. However, this approach failed to adequately theorise the broader social power relations, which in all sorts of ways

structure experiences of place (Rose 1993). It is also poor for developing predictive models and is entirely centred on phenomena rather than relations between phenomena. Because of its focus on the uniqueness of phenomena, this approach makes it difficult to generalise relations, so it lacks interoperability in other areas of similar characteristics.

The term landscape, as discussed in Sect. 2, is applied in a diverse range of disciplines to reflect different meanings. This multiplicity of use on the one hand enriches the concept, but at the same time makes it more vulnerable to misuse. In summary, in the current literature, particularly in the geographical sciences, two distinct styles of writing on landscape have emerged. The first style describes a landscape as a unique phenomenon, created, constructed and consumed by people in the fulfilment of leisure, emotional and material needs. The approach applies qualitative reasoning to interpret human-landscape interactions. This style of geographical enquiry has recently been rejuvenated in human geography that employs qualitative data collection techniques, phenomenological and ethnographic approaches such as focus groups and in-depth interviews in order to understand how humans construct landscapes (Cohen 1979; Li 2000). The second group of researchers have focused on the measurable and objective quality of landscapes using their biophysical properties as surrogates of human emotions and aesthetic responses (Chhetri et al. 2008; McKercher et al. 2012; Chhetri 2015; Shoval et al. 2014).

This review showed various attempts to define and evaluate landscape value both through qualitative and quantitative approaches; despite these studies, the meaning of landscape remains ambiguous and fragmented. It is still unclear what components actually constitute a landscape. Is it composed of objective reality or a representation of the subjective world? Does a geographic enquiry decompose a landscape into several measurable components, or does it examine it as a whole? If so, is this holistic view of landscape objectively measurable or is it only comprehensible through a phenomenological interpretation? Most importantly for this research, is the human perception of and emotional response to environmental settings predictable? If so, how reliable are these predictions and how valid they are in other areas?

4 What Constitutes a Landscape?

Having established that landscape is a perceivable environment, it is now essential to discuss what elements of the environment constitute it. This section will outline some of the thoughts that examine the compositional elements of landscapes. Many studies (Shuttleworth 1980a; Hetherington et al. 1993) realise the multi-dimensional and multi-sensory nature of landscape perception. Such perception is composed of objective as well as subjective elements of human-landscape interactions. However, it is a matter of debate whether subjective–objective realities are dichotomous or supplement each other. In fact, much research considers them as inseparable and integral parts of landscape perception, despite their tendency for disintegrating landscapes into their constituent components. There is a fundamental theoretical divergence

of opinion over the question of whether landscapes have an intrinsic or 'objective' beauty, which may be in some ways measurable or comparable, or whether beauty is a value that can only be subjectively attributed to an area or specific landscape (Shuttleworth 1980b).

Landscapes are not merely constructed through the process of reading or receiving signals transmitted from physical stimuli, but also developed by comprehending relations, association and interactions. They may result from the spatial or functional interactions between two or more features situated in a geographic space as perceived by an observer. Reading of these signals may require a relatively high level of information processing that may involve human cognition. For example, the complexity of a scene in a landscape may be one such 'message' that needs a cognitive interpretation of the arrangement and association of contextual information in an environmental setting. Landscapes have several geographic characteristics such as geographic locations, objects and features that exist in these locations and relations they develop with one and another. For example, a forest landscape consists of several measurable features occupying specific geographic locations. These objects can be a part of the landform characteristics (slope, aspect, elevation) or the land cover characteristics (trees, shrub, grasses) or even part of a constructed environment.

Kliske and Kearsley (1993) classified human experiences and perception of landscapes into four general categories. These include physiographic characteristics, the presence of specific physical features, cognitive variables and viewer interest. Kaplan et al. (1989) evaluated landscape preference by comparing the effectiveness of four domains of environmental attributes. Two of these domains were 'physical attributes' and 'land cover types' that were derived from direct measurements of the physical environment. The other two domains, 'informational variables' and 'perception-based variables' were based on empirical research. Following the search for describing landscapes, Gobster and Chenoweth (1989) identified three 'descriptor types' namely physical, artistic and psychological descriptors. Physical descriptors measure the external dimensions of landscape, while artistic descriptors describe formal or abstract and compositional dimensions of landscapes. Unity, variety, vividness, texture, contrast and harmony are some of the examples of artistic descriptors. Psychological descriptors describe the psychological impacts that landscapes have on an observer.

Drawing on this literature, it is proposed that there is a large amount of information embedded in landscapes that for ease of understanding can be simplified into three constructs: biophysical, cognitive and experiential constructs (Fig. 1). The area common to these constructs indicates geographic or mappable properties of experiential landscapes as it contains both physical and cognitive constructs of landscape perception. This area provides a milieu for interactions wherein activities and practices occur within the limit of a biophysical environment.

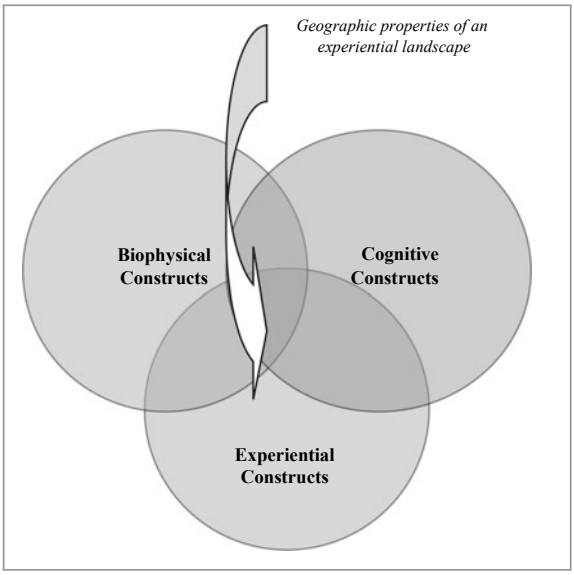

Fig. 1 Constructs involved in landscape perception

4.1 Biophysical Constructs

Much quantitative research has used biophysical characteristics of landscape as its theoretical base as they contain physical and measurable properties. Different studies have used different terminology for dividing or decomposing landscapes to attain identical objectives. Concepts such as components, elements, themes, dimensions and predictors are used interchangeably. Biophysical constructs develop in the presence of some kind of physical stimuli. Croft (1975) stated that the geographic environment could be perceived and experienced at three different levels. The first level comprises the 'landscape skeleton' as represented through macro relief features (measured by terrain types), relative relief and presence of water (measured by drainage density). A second level can be added using the permanent components of the environment that capture the variations of macro forms at smaller scales. It represents the overall variations in the surface texture using the irregularity of two-dimensional outlines and three-dimensional forms, or the singularities of isolated features. Finally, there are the transitory components with regard to the characteristics of water bodies and surface textures (Crofts 1975).

Another method that identifies different levels was proposed by the Land Use Consultants (1971) in order to assess the quality of the landscape in Scotland. The study conducted by the Land Use Consultants identified two series: relief classes (high, normal and low relief per unit of area) and landform types (valley, lowland, plateau, edge and coast). Litton (1968) identified six types of 'landform landscapes' namely lowland, hill country, bold hills, mountains, plateau uplands and low uplands. Hammitt et al. (1994) developed a seven variable regression model that explained 76

percent of the variation in scenic preference using nine forest and pastoral landscape patterns and themes for scenic vistas in Colorado. The landscape themes used in Hammitt's study are stream/river, one-ridged, rolling plateau, valley development, farm valley, ridge and valley, one-ridged and not maintained scenes. The regression model consists of three positive variables: (i) linear perimeter of ridgeline, (ii) area of moving water and (iii) area of rolling plateau and three negative predictors: (i) area of sky, (ii) area of largest ridge (negative) and (iii) obstructing vegetation (negative) squared. These variables are found to be able to predict landscape perception and preference.

Leopold and Marchand (1968) has introduced a new method called 'uniqueness ratio' that measures the uniqueness of landscape features. This technique identifies two broad components: valley character and river character captured along scenes in a riverscape. Valley character is measured by comparing the width of the valley floor against the height of adjacent mountains, while river character is measured in the width, depth, size, presence and frequency of rapids. The proposed method, however, seems to be a site/feature specific evaluation that measures landscape quality in a narrow strip along a river valley. Therefore, it might be less effective when applied over a wider geographic area.

Shafer et al. (1969) developed a predictive model that includes six variables in the regression equation from an initially incorporated 26 biophysical variables. These variables included vegetation, non-vegetation, sky and water, all derived for different distance zones from photographs. This was executed using a grid overlaid on photographs of scenes. Brush and Shafer (1975) extended the method to measure perimeter and area of certain landscape features. The perimeter and area occupied by vegetation (trees and shrubs), non-vegetation (exposed ground, snowfields and grasses) and water (streams, lakes and waterfalls) were then measured and compared with the preference ranking of the scenes.

Kaplan et al. (1989) divided landscape into two measurable domains of physical attributes and land cover types. They identified landform elements as slope or relief (the prominence of the landforms), edge contrast (contrast between adjacent landforms) and spatial diversity (variety of spaces created by landforms). Land cover types focus on broad patterns across a large area and were measured in 'naturalism' (absence of direct human influence), 'compatibility' (fit between adjacent land cover types), 'height contrast' (height variation among adjacent elements) and 'variety' (diversity of land cover types or patterns within a type) using the way geographic features are arranged and organised in landscape. These types were calculated from photographs of landscapes.

Hydrological elements include water bodies/rivers/glacier valleys, or the features associated with these. Presence of water in landscapes develops a favourable impact on visitor behaviour and experiences (Hammitt et al. 1994; Bishop and Hulse 1994; Wherrett 1998; Zube et al. 1974). A network of streams in a landscape may not only develop numerous visually attractive geomorphological features but also generate variety and diversity that may be of interest to visitors. Resultant landforms such as types of valleys, waterfalls, rapids, oxbow lakes and meanders are not only potential recreational features but are also visually scenic and attractive. Such water features

attract visitors for various recreational activities, for example, rafting, swimming and boating or are attractions in their own right, such as waterfalls (Hudson 1998). According to Litton et al. (1968) the presence of water in a vivid or distinctive form, for example, a waterfall or a rapid increases the aesthetic value of landscape and generates a state of appreciation among visitors. In the landscape assessment procedure, a hydrological component acts as a focal point of attraction, particularly in photographs and can be regarded as a singularity (Croft 1975). Other visual indicators of landscape appraisal related to the surface water characteristics are discharge, flow variability and velocity.

Ephemeral elements such as temperature, fog and brightness can add detail to the landscape, which may make a large difference to response patterns by visitors. Some of these elements can be realistically represented using the virtual reality environment, which provides tools that can control the intensity of such elements in a digital landscape to help examine human responses to varying situations and contexts. For example, the intensity of fog or brightness can be changed according to the seasons. This makes the assessment far more reliable when compared to those assessed through photographs.

4.2 Cognitive Constructs

Cognitive constructs refer to the beliefs and knowledge developed about a landscape. The process involves some sort of evaluation that is most often filtered through preferences, beliefs, learning and socio-cultural backgrounds. The cognitive construct is predicated on the notion that perception involves the process of extracting information from the environment. Perceptual processes interpret the way a landscape or its various elements are spatially and temporally organised, arranged and related. This construct is theoretically similar to Kaplan and Kaplan's (1989) concept of 'information variables' but also has similarities with the 'psychological model' of Daniel and Vining (1983) and 'cognitive model' of Zube (1984a, 1984b) and Pitt and Zube (1987). Daniel and Vining (1983) defined the psychological model as "feelings and perception of the viewer" while Zube and Pitt (1981) referred cognitively to "psychological dimensions manifested in or attached to the landscape". Kaplan and Kaplan (1989) identified four predictor variables using two major categories of 'understanding' and 'exploration'. Using these two categories of understanding and exploration, four new predictors were identified. These predictors are 'coherence' and 'legibility' for understanding and 'complexity' and 'mystery' for exploration as shown in Table 1.

People read and interpret meanings transmitted from a particular arrangement and organisation of landscape elements within a geographic space. For example, a visual arrangement of landscape elements that allows a partial view of a scene may attract people to explore further. Such partial information introduces the component of 'mystery' in the perceived scene whereby the observer intends to acquire more and more information by exploring further. There are other cognitively defined variables

Table 1 Listing of landscape information variables

Immediate	Understanding	Exploration
	Coherence	Complexity
	Orderly, "hand together", repeated elements, regions	*Richness, intricate, number of different elements*
Inferred	Legibility	Mystery
	Finding one's way there and back, distinctiveness	*Promises of new but related information*

Source Kaplan et al. (1989)

such as drama, smoothness, unity, variety and harmony that are often examined using the biophysical properties of a scene in a photograph. For example, certain biophysical settings such as the presence of a waterfall or a sharp drop-off from the cliff or escarpment can be dramatic as they create sudden and striking emotional responses from observers than those which are more monotonous and repetitive. Perceptions of such arrangement of landscape elements require some form of interpretation and thus involve cognitive processing. Cognitive construction requires information processing that scans through filtering processes stored in the form of liking or disliking structures. Differences in such structures develop due to differences in learning, socio-demographic, techno-economic and personality characteristics (Lyons 1993; Jackson 1987).

4.3 Experiential Constructs

Experiential constructions develop from the emotions or feelings elicited within the context of a geographic space, generally by experiencing its biophysical and ephemeral components. Emotions and feelings are the keys to understanding human relationships with landscape (Russell and Snodgrass 1987). Under this construct, it is assumed that experiences that were encountered in a landscape are inseparable from the context. These constructions are the inner and immediate manifestations of human feelings elicited through interaction and immersion within a geographic space. Proshonsky et al. (1983) stated that people develop both cognitive and affective responses to environments. Some support the idea that settings have both cognitive and affective images (Lynch 1960; Russell and Pratt 1980). Even the preferences as defined by Ulrich (1986), are aesthetic responses or like-dislike effects in association with feelings and neurophysiological activities which are controlled by the nervous system. Zube et al. (1974) stated that most studies in the experiential paradigm are unstructured phenomenological explorations. Such studies (for example Lewis et al. 1973; Appleton 1975b; Relph 1976; Tuan 1977) were predominantly conducted by geographers (ibid) that tend to explore human interaction and the resultant experiences with landscapes. Appleton (1975b: 58) states that the experiential approach to

landscape "tend to be 'process-oriented' towards (hu)man's experience of the environment rather than 'object-oriented' towards the composition of landscape itself". In order to understand human interactions and aesthetic relations with the visible landscape, it is essential to make experience a central theme of landscape perception research.

5 Perception and Construction of Landscapes in Tourist Destinations

Landscape, in general, can be defined as the perceivable environment. It represents a geographic space as perceived by people living in that area as well as those visiting the area. This section of the chapter will explore the construction of experiential landscapes in nature-based tourist destinations. It demonstrates how people perceive and construct landscapes using graphical and pictorial images. This is followed by a brief discussion on how natural landscapes evolve, mature and are abandoned as tourist destinations and finally concludes with a review of recent theories and models in the area related to experiential landscapes.

5.1 Visual Perception of Natural Landscapes

Perception of landscape is more than a mechanical process of detecting signals. Visitors receive several separate visual images per second and the information from these images is then filtered through the cognitive process. The information captured by the retina in the eye comprises solely the distribution of luminance or distribution that has discontinuities and homogeneities. It results from the differences in the reflections of photons to the eye from surfaces and objects in space. Visual system processing compresses an exorbitant amount of data derived from a visual scene by removing certain spatial frequency information prior to transmitting information to the brain. It is a process through which sensed information is organised, categorised and recognised into meaningful constructs. This process filters out redundant detail from viewed landscapes and retains information, which attracts attention and directionality. The information gathered in the retina is further stored and filtered in the short and long-term memory in the brain. The brain controls and directs the movement of the eye. The eye-brain system is not a passive receptor but is an active and exploratory tool (Petch 1994). The eye searches for information that the brain directs it to search for.

The brain recognises objects sensed by the eye but constructed and understood by the brain. The construction process is similar to the tenets propounded by the Gestalt theorists including Kohler (1947), Koffka (1935) and Wertheimer (1959). The foundation of Gestalt theory was the principle of 'grouping'. Grouping refers

Fig. 2 An illustration of visual ambiguity concerning figure and background (Is the figure a white vase on a black background or silhouetted profiles on a white background?)

to a process of structuring or interpreting characteristics of stimuli captured in a visual field. Such stimuli can be graphic such as an image or a scene of a landscape. The information in a scene can be grouped using the principles of an organisation such as 'proximity', 'similarity', 'closure' and 'simplicity'. Closure is a condition where items are grouped together to make a complete entity while in simplicity items are organised into simple figure according to symmetry, regularity and smoothness. The Gestalt explanation of the figure-ground relationship (Fig. 2) is an example that shows how objects are arranged, grouped and differentiated into meaningful cognitive constructs.

Figure 2 shows how people have different perceptions of the same image when viewed from different backgrounds. Such an image presents ambiguity to the observer. This image illustrates that when a figure is identified, the contours seem to belong to it and therefore it appears to become part of the foreground. This 'recognition' of an object in three dimensions in an object-centred world, according to Marr's computational approach (1982) to visual perception, substantiates this relationship of cognitive processing where the object gives an impression that it is 'out there'.

Marr's computational approach to visual perception reduces the complex relationships into four different stages, which are as follows.

5.1.1 The Image

The image is considered as the initial point of seeing. The image is a spatial distribution of intensity or illuminance across the retina that is reflected due to surface variations.

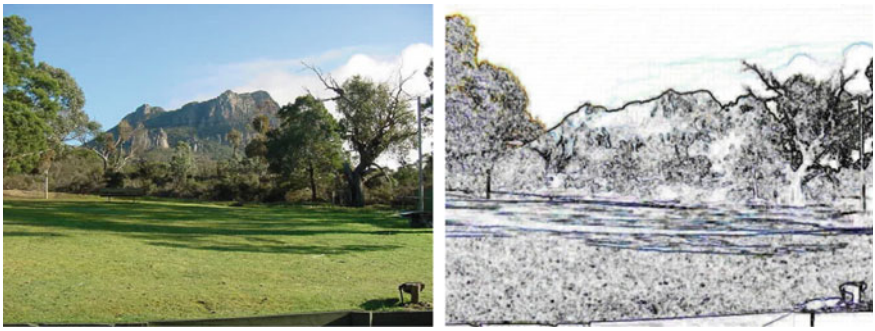

Fig. 3 Construction of primal sketch using an edge detection technique

5.1.2 The Primal Sketch

In this stage of vision, the raw information of intensity values captured as visual images starts to develop certain explicit forms. The 'primal sketch' is a symbolic representation wherein primitives or tokens such as edges, bars, blobs, terminations, edge segments, virtual lines, groups, curvilinear organisation and boundaries are present in two-dimensional form. Edge intensity and textual boundaries as well as a geometrical and spatial distribution of intensity changes are detected, graded and organised in the form of surface patterns. Figure 3 shows an attempt to draw primal sketches from a scene of a landscape using the edge detection technique.

5.1.3 The 2.5 Dimensional Sketch

According to Marr's theory (1982), the 2.5 dimensional sketch adds context to the primal sketch by adding depth, surface orientation, colour and texture of surfaces and is considered as a 'viewer-centred representation'. The pattern that emerges in a visual image is then organised with reference to the viewer and is not linked to a stable external environment.

5.1.4 The 3-dimensional Model Representation

At this stage of vision, the perceiver has developed a model of the real external landscape wherein the shapes and orientation become explicit as tokens of three-dimensional objects in a view-independent coordinate system (Gorden 1997). This is an 'objected-centred representation' as it recognises objects in three-dimensional shapes reflected in volumetric primitives captured from the 2.5-D sketch (Yuille and Ullman 1990).

Visual properties of natural landscapes can be detected using Marr's (1982) computational approach. This describes the perception of visual information as being

processed in sequential stages from the image depicting the spatial array of intensities captured in the retinal image to the 3-D model representation of reality. "The outcome of these stages is a mental [cognitive] model of the object suspended in object-oriented space to yield an impression that the object is 'out there' (Hendee 1997:153). However, current theories do not distinguish the mechanism of detection, interpretation and recognition of visual images as discrete processes. Instead, they consider these mechanisms as a single interactive process.

Humans can't see all there is to see. Perception, therefore, is unavoidably selective. Selectivity involves foregrounding, backgrounding and rearranging features in space and time or, in other words, organisation of information. Objects, events or situations are 'sized up' in relation to our 'frames of reference' and these influence how perception is structured and organised. At this stage, it is useful to note that theories about perception tend to emphasise the role of either sensory data or knowledge in the process. Some theorists adopt a data-driven or 'bottom-up' approach, according to which perception is 'direct'. Here visual data is immediately structured in the optical array prior to any selectivity on the part of the perceiver (Gibson 1976 is the key proponent of 'direct perception'). Others (e.g. Gregory 1974) adopt a 'constructivist' or 'top-down' approach emphasising the importance of prior knowledge and hypotheses.

Gibson's (1979) theory of 'information pick-up' opposes most traditional theories of cognition that assume a dominant role of past experience in perception. This theory suggests that perception depends entirely upon information in the 'stimulus array' rather than sensations that are influenced by cognition. Gibson suggests that the environment consists of 'affordances' (such as terrain, water, vegetation, etc.), which provide the clues necessary for perception. Furthermore, the 'ambient array' includes invariants such as shadows, texture, colour, convergence, symmetry and layout that determine what is perceived. Gibson believes that perception is a direct consequence of the properties of the environment and does not involve any form of sensory processing. In other words, it is the terrain and land cover characteristics that determine perception, not sensory processing per se.

The essence of the constructivist theorists (such as Kelley 1955; Gregory 1974; Neisser 1976) is that perception of the environment is essentially indirect. The perceiver adds some information to the incoming stimulus before the final perceptual response is attained. In other words, sensory inputs alone are insufficient to specify the real-world phenomena. Sensory inputs combined with supplemented knowledge result in the construction of hypotheses whereby objects and events in the world are understood. Gregory (1974) believes that sensory input from a single physical object can induce two different precepts and therefore perception could be unstable and ambiguous. For example, if one stares at Fig. 4, its orientation may suddenly change and therefore perception cannot be tied to a stimulus. As a result, a green dot in the figure can be seen as located in the lower left rear as well as in the lower left front.

Neisser (1976) combined the approach of Gregory and Gibson into one platform of cognitive schema that uses inferences and sensory information perceived by an observer (Raper 2000). Humans gather bits of information that collectively make sense and then place them in memory in some form of structure, typically referred to

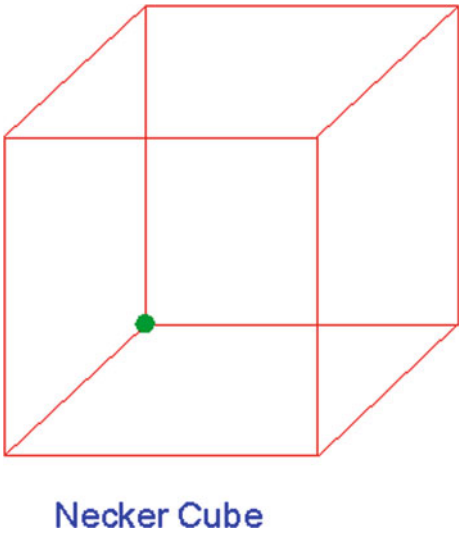

Fig. 4 Is the green dot located in the lower left rear or in the lower left front?

as schemata (schema in the singular; plural 'schemata' or 'schemas'). Neisser (1976: 54) defined a schema as "that portion of the entire perceptual cycle, which is internal to the perceiver, modifiable by experience and somehow specific to what is being perceived. The schema accepts the information as it becomes available at sensory surfaces and is changed by that information: it directs movements and exploratory activities that make more information available, by which it is further modified". A schema is therefore a kind of mental template or framework, which we use to make sense of things. Schemata help us to explore beyond the sensed information by making assumptions about what is usual in similar contexts. They enable us, for instance, to make inferences about things, which are currently not directly visible.

Neisser stated that the cognitive structures crucial for vision are the 'anticipatory schemas' that prepare the perceiver to accept certain kinds of information rather than others and thus control the activity of looking. Because we can see only what we know how to look for, it is these schemas (together with other information actually available) that determine what will be perceived (Neisser 1976: 20). According to Johnson (1987: 29), "a schema consists of a small number of parts and relations, by virtue of which it can indefinitely structure many perceptions, images and events". Schemata however are defined in different ways by several authors but typically they are organisational structures in which information is systematically stored to memory. Purcell (1992) suggested that information in landscapes is stored and categorised in some form of structure around categories or more complex mental representation. Such mental structures, similar to schemata, are the result of long-term exposure to the regularities in the environment.

The organisation of information operates at different levels, from abstract propositional structures to more formalised concrete images (Johnson 1987:29). Mark and Frank (1996) found that some of the image-schemas identified by Johnson (1987)

have spatial primitives. These include container, blockage, path, surface, link, near far, contact, core-periphery and scale. Johnson (1987:125) states, "given a centre and a periphery we will experience the near-far schema as stretching out along our perceptual or conceptual perspective. What is considered near will depend upon the context, but, once that is established, a scale is defined for determining relative nearness to the centre". Some of this spatial image-schemas are used in developing GIS functions, particularly for understanding topological relations such as containment, proximity and adjacency in order to illustrate interactions and associations that objects and people create with other objects in geographic spaces.

6 Landscape Mappability: Building Ontologies

This section builds an ontological framework of natural landscapes by defining a set of concepts and categories or domains that shows their properties and the relations between them. So far, this chapter has discussed the theoretical basis of understanding and representing geographic space. Since geographic space contains measurable properties, it is, therefore, possible to use its contents as one measure for mapping and modelling landscapes. It is generally accepted that landscapes are our perceivable environments rather than merely visible environments. Despite this, researchers recognise that the physical components still remain an inseparable part of the perceived environment. Comprehension of human meanings, values and attachments associated with landscapes may be incomplete if we exclude the physical stimuli from landscape perception. Several authors (Hull and Harvey 1989; Hull and Stewart 1994; Baldwin et al. 1994; Miller et al. 1995; DeLucio and Múgica 1994) have used the biophysical properties of the environment as surrogate measures for human emotions and cognitive features in order to build predictive models of human preferences and behaviour.

Research in experientialist cognition (for example Lakoff and Johnson 1980; Talmy 1983; Lakoof 1987) showed that human experiences in a geographic space are, to a great extent, grounded in the bodily and sensory-motor nature of humans. The theoretical base of Berlyne's (1960, 1971) arousal theory and Wohwill's (1976) work on stimulus configurations also support stimulus-based responses to landscapes. Tuan (1964: 4) also states that the essence of geographic representations of human experiences in the natural environment lies in the spatial and mappable manifestations of the '[hu]man-land' synergies.

People's experiences in nature-based tourist destinations differ spatially partly in response to variations in the landscape components and characteristics (Chhetri and Arrowsmith 2008). Therefore, experiential landscapes may contain information associated with geographic position as well as geographic content. Beck (1964: 18) states that "the physical and interpersonal properties of the environment are distributed in space and the personal environment is shaped by the configuration of these properties".

Appleton (1975a, b) describes a similar approach called 'habitat theory' that defines the effects of the environment on human behaviour. According to the theory, aesthetic satisfaction and the experiences derived in the contemplation of nature, stem from the spontaneous perception of landscape features or from their shape, colour, spatial arrangement and other visible attributes. These features act as 'sign-stimuli' that are indicative of environmental conditions favourable or not favourable for visitations or habitation.

Durkheim (1895) was convinced that as long as the subjective world, including ideas, beliefs and representations, remained outside the objective world, the scientific investigation of human–environment interactions would be impossible. This was further articulated in Rules of Sociological Method (Durkheim 1895) where he states social phenomena were to be considered as 'things' (comme les choses), distributed along a spectrum where the spatial or morphological structure of society sits at one end to its rules, beliefs and emotions or superstructure at the other end (cited in Gregory 1978: 80). In other words, the intention of Durkheim's ideas was to indicate that phenomena are not simply creations of the will of the observer. The phenomena also share the properties of physical objects, as they exist independently of the observation of them (Giddens 1972: 31). Supporting the context-based interpretation of human behaviour and experiences, Husserl (1970) argued that "any exploration of the possibility of cognition must start by recognising that cognitive experiences are 'object-constituting events', although they also possess an intentional structure through which objects are made to mean something to us" (cited in Gregory 1978: 129).

People normally understand and interpret geographic space in terms of cognitive definitions such as hills, ridges, valleys, gullies and canyons. They often use terms to comprehend and communicate spatial information (for example, direction and position of other features). It requires a semantic, based on topological relations, for instance 'to the left of the ridge of Mt William' or 'across the canyon' or 'drive along the scenic route to the Skeleton Creek'. Such expressions do not take physical entities into account, but rather use topological relationships to represent spatial relations between features. Information, therefore, is spatially indexed to our understanding of spatial reality. This understanding is attached to our bodies…so that some of our spatial concepts, like here or there, to the right, down east, are egocentric (Smith and Mark 1996).

Geographic objects could be cognitive and could have intellectual components. For example, catchments, bays, the North Pole and countries are geographic objects and are parts of the physical world but at the same time constructed by human cognition and action (Smith and Mark 1996). In representing experiential landscapes in GIS, it is imperative to define whether an experiential landscape is an object, an event, or a process. Do experiential landscapes have a substance of their own? Or, in other words, do they have physically measurable properties? Experiential landscapes are the perceived environment and therefore they are the interface between the perceptual and resultant emotional responses and the physical world.

From the Aristotelian perspective, it may be reasonable to consider experiential landscapes as 'accidents'. They would therefore have no substance of their own

and are attached to other substances. The translation of experiential landscapes into mappable entities depends on other properties of other substances such as cultural or material creation of human actions and practices (for example, buildings, roads and social or family relations) or biophysical characteristics of geographic space. Hence, it is reasonable to believe that experiences are attributes of geographic space, similar to other attributes of geographic space. For example, ruggedness or enclosure in landscapes is a construct that may be measured from the properties of terrain surfaces including elevation, aspect and slope. Highly rugged topography may be challenging or even frustrating for most hikers. Ruggedness is an abstract concept but can be positively correlated with measured effects of 'challenge'.

Chhetri et al. (2004) analysed hiking experiences in natural areas and identified the prevalence of two driving factors: "geographic-factor" or G-factor and the "psychological-factor" or P-factor. They considered that there are some extrinsic feelings, which are directly influenced by the external physical environment. Therefore, using the measurable properties of terrain surface it should be possible to map the probability of having certain types of landscape experiences. Using the biophysical properties of geographic space as surrogate measures, this chapter argues for the mappability of human experiences, particularly those experiences that are exhibited under the influence of natural processes and settings. This proposition was further tested whereby the key dimensions of experiential landscapes such as desirability, challenge and enclosure, were mapped and predicted across a wider geographic space using GIS (See Chhetri 2015 for these mapped outputs) and later validated through data collected in GPS receivers.

7 Concluding Remarks

This chapter formalised and developed a theoretical framework for landscape research from a geographic perspective. Key theories, concepts and models that underlie the processes of perceiving, experiencing and cognising objects or phenomenon in a geographic space were reviewed. From these theories and models, a comprehensive framework of the tourist-environment system was developed. The review showed that the landscape as a unit of study has remained the central theme of geographical research for several decades. This chapter also identified two major benefits associated with landscape as a unit of study. Firstly, it provides a philosophical and methodological base for understanding human interactions with the environment thereby integrating processes and forms and secondly, it offers a framework for capturing human emotions, thoughts, beliefs and values (processes) through recording human responses to the observable and measurable biophysical entities/phenomena (structures) of the environment.

The genesis and evolution of landscape as a geographic paradigm was discussed in Sects. 2 and 3 so that a rational theoretical research foundation could be set up. An upfront discussion of the meaning and content of landscape as a research theme was undertaken and the utility of landscape as a unit of study for this research was

examined. It was concluded that the landscape is our environment that is sensed and perceived by the eye but constructed and understood by the brain. It is more than just a visible environment. Information compiled in the human–environment interaction is received through multiple senses and processed simultaneously by the eye-brain system. Perception of landscapes, therefore, requires active participation rather than passive acceptance. Such participation reduces an exorbitant amount of redundant, ambiguous, unstructured information to organised and modular structures called schemata. These schemata through which information is organised and structured, determine what is and is not perceived in an environment. The organising and structuring are further filtered through the preferences, beliefs, values and learning capability of individuals. Geographic space however provides surroundings for movements and exploration and compels the observer to participate and interact with the constituent components.

In Sects. 4 and 5, constructs that underlie the nature and characteristics of tourist-environment interactions were formulated. The result of such interactions is decomposed landscapes (as perceived by people), which are constructed using the biophysical, experiential and cognitive dimensions. These constructs involved in the experiential landscapes were chosen for further investigation because of the explicitness in terms of human feelings and emotions. In Sect. 5, the essence of this argument is to highlight the importance of mapping experiential landscapes. Given the presumption that experiences reflect the characteristics of tourist-environment interactions, a system composed of both biophysical and experiential elements were identified and processes (relationships) influencing this system were defined. The theoretical framework developed in this chapter added a new perspective to understanding tourist-environment interactions in natural areas. This neo-geographical perspective which is centred on individuals will help understand these complex interactions but could be further refined and enhanced by generating maps using biophysical properties of natural landscapes or by tracking or monitoring people's interactions to represent human perception and in situ experiences.

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