Chapter 6
Assessing Visual and Social Perceptions of Landscape

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Abstract The perceptual dimension is distinctive of landscape, if compared to the territory. "Measuring perception" is difficult and involves many critical assumptions. Investigating social perception means, first and foremost, establishing the public significance of various landscape values: historicity, naturalness, beauty, recreational usability, and so forth. Secondly, we must associate public preferences with the biophysical structures to which they refer. This study proposes a comprehensive list of references and possible indicators, ranging from scenic assessment to studies on visual preferences to more recently developed studies on landscape values in social perception. The scope of the chapter is to offer a fil-rouge in a developing field of study.

Keywords Scenic assessment • Landscape preferences • Social perception

6.1 Principles and Definitions

The perceptual dimension establishes the difference between the concept of landscape and apparently similar concepts such as territory and environment: for a landscape to exist, there must be a subject to perceive said landscape. The basic definition of the European Landscape Convention (CoE 2000) in fact is as follows, "'landscape' means an area, as perceived by people…" (Art. 1). The following imperative derives from this definition: "to assess the landscapes thus identified, taking into account the particular values assigned to them by the interested parties and the population concerned" (1.b). The Recommendation on the application of the ELC refers to and develops the theme: "The sensory (visual, auditory, olfactory,

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tactile, taste) and emotional perception which a population has of its environment and recognition of the latter's diversity and special historical and cultural features are essential for this respect and safeguarding of the identity of the population itself and for the enrichment of the individual and of society as a whole" (CoE 2008).

Perception is subjective, but is dependent on cultural codes, in a form of mediation between individual experience and collective values. According to some schools of thought, there are in any case some universally valid parameters, associated with the instinctive and intrinsic aspects of human nature. According to others, cultural coding prevails and the existence of the "landscape view" is not universal, but limited to certain societies and periods (*société paysagiste*, "landscape society", Berque 1995). In any case, for the purpose of landscape assessment it would seem useful to make a distinction between perceptual and aesthetic experience and what the ELC calls the "opinions and expressions" of social stakeholder groups (as suggested also by Potschin and Haines-Young 2005).

Therefore we will define two fields of perceptual landscape study:

(a) studies on *visual and multisensorial perception* and, also *aesthetic values* in the broader sense; studies on *landscape preferences*, in particular *visual preferences* belong to this field;
(b) studies on *social perception*, in other words the *intangible values* of which the landscape is an expression and vehicle for a certain society or social group; we should identify at least two groups of these values: the *cultural value* (for example memorial, identity) and the *fruition value or use* (for example productive, living, recreational and tourist).

Obviously, there are transversal relations between the elements of the layout, for example the aesthetic value is one of cultural values, associated with the fruition value. Nevertheless, this division is instrumental as it corresponds to different research techniques, when the subjects are, on the one hand, material and formal aspects, and intangible aspects on the other. In the first case, landscape *imageability* is analysed, in particular with focus on objective conditions (the "geometry" of vision, the formal characteristics of the scene) generalized and predictive of concrete experience; in the second case, *social acknowledgement*, in other words concrete collective appreciation is considered, the reasons for which can be found in the semiosphere rather than in the ecosphere. The first approach is preferred in the field of landscape management, while the second is limited almost exclusively to a field of pure research.

Calculating the qualitative social acknowledgement of a landscape is a new goal, the application of which is more suitable for policies rather than intervention. However, the most significant field of application for measuring perceptual landscape is in the evaluation of visual impact or, in general, the landscape compatibility of new interventions. Many of the indicators used are therefore contextualized on the basis of the relationship between a (new) element and a context (for example "overall dimension", "contrast"). However, in the field of landscape description and assessment, parameters of a holistic nature are often used (identity, perceptual quality, visual quality, and so on).

Before continuing, we should take a moment to consider the problem of the scale of observation. Visual perception is based on the presumption that a subject is immersed in the landscape, in a certain spatial and temporal position, the visual field of which is the reference to the natural scale; this scale is suitable for measuring a certain (limited) situation, but provides excessive detail for the assessment of extensive territories. For this reason we must use abstract and simplified concepts, but this step, unlike other types of indicators, is not linear and involves the substantial change of the subject and method of measurement. For example, taken as a panoramic value, at a detailed level it is possible to measure the amplitude of a view, but on a vaster scale the best we can do is measure the number of vantage points.

Also with reference to social perception, the question of scale involves substantial changes in the layout of the work: in a limited context, we can identify the representative subjects or groups of subjects in the local situation and if necessary obtain opinions from the same directly (for example using in depth interviews, on the basis of a phenomenological approach, cf. for example Scott et al. 2009), while on a vast scale we must use forms of mediation: it is still possible to use direct research methods (choosing a sample) or indirect methods, such as the analysis of indicative representations of the collective imagination: tourist brochures, web sites, and similar references (cf., for example, Germaine 2008).

The existence of such different situations induces us to consider the aims of the study each time the need arises, to choose appropriate methods and instruments.

6.1.1 The Study of Visual and Multisensorial Perception

Different theoretical models and practical goals result in a wide variety of methods of study for visual perception. Normally, at least two approaches are defined: expert based or public perception based, on the basis of the subjects asked to express an opinion. This may be a holistic opinion, or based on components and features of the landscape scene, or on factors of perception. In fact, there are some approaches that favour "objective" factors (biophysical components) and others that favour "subjective" factors (psychophysical components, preferences) (Daniel 2001). Daniel (2001) establishes the parameters for analysing landscape quality as follows: expert/design parameters, sensory/perceptual parameters, cognitive constructs.

The study of visual landscape perception has an extensive field of application in the assessment of the visual impact of transformations, so techniques for the quantitative measurement of objective factors have been developed, such as the formal characteristics of the scene, the "geometry" of vision (observation points, scope and depth of visual field, lines, colours, texture, etc.). Thanks to the use of Geographical Information Systems, the scale of application of these techniques has recently been developed (Brabyn 2009). Again through expert analysis, we can attribute values (spatially differentiated) of aesthetic quality, on the basis of proven criteria such as

scenic beauty or attractiveness (extremely holistic), the imageability, integrity, and variety. The scenic value of a landscape can be "weighed" according to its visibility from populated places and busy routes, and on the basis of the level of public concern.

Numerous empirical studies have shown that the judgement of experts often does not correspond to that of the general public. Research and measurement techniques have therefore been developed based on the visual preference of social groups for landscapes or categories of landscape components, in both positive and negative terms. This is a field of study pursuant to psychology and environmental sociology, and uses methods of study such as interviews and questionnaires. Some researchers have tried to generalize the results of different empirical surveys, to obtain a model of preferences to use in environmental planning, other forms of planning, and for impact assessment: "By knowing what quantitative features in a landscape affect its aesthetic appeal, natural resource planners can make decisions on a factual basis about purchasing, developing, or preserving these features" (Shafer et al. 1969). The use of preference "predictors" means the advantage of avoiding costly and complicated direct surveys on the population. The matrix of environmental preferences drawn up by Kaplan and Kaplan is well known (1989, cf. Sect. 6.2.1 and Table 6.2). Some researchers, such as Appleton (1975) and Bourassa (1990), believe that certain landscape preferences do not depend on cultural differences and have their roots in human nature (the "savannah model", the main characteristics of which are visual openness, the presence of water and vegetation, and variety), while others have done in-depth studies on the variety of cultural codes on the basis of ethnic groups for example. The need to generalize is understandable; nevertheless, regardless of the territorial and social contexts, it would appear to be contrary to the nature of landscape.

For some time now, a few researchers have indicated that the study of landscape perception based on vision is static and limited, and that is would be preferable to study "landscape experience" ("cultural and experiential turn", Scott et al. 2009). This phenomenological approach uses in depth interviews, walks and community visioning exercises to interpret individual feelings.

Landscape perception also involves other sensorial dimensions as well as view. In particular it would seem that the olfactory and auditory senses are of some significance. Nevertheless, there are no widely-used and consolidated methods of study; therefore we will not dwell on the subject. The *soundscape* has been given more attention (in particular in famous works such as the admonition of Rachel Carson, *Silent Spring*, 1962) and therefore we now have methods for measuring noise pollution, but the parameters used are not sufficiently developed for landscape.

Atmospheric effects (fogginess, limpidity) and seasonal effects are certainly significant "colourings" for generating landscape impressions and can constitute identity factors for some landscapes (the "fog in the Po Valley" for example, or snow-covered landscapes, or the colours of autumn; in Vermont, for example, the reddening of maple woods is reported by the relevant tourist service); for this reason there have been some attempts to measure the factors that generate these *impressions*.

6.1.2 The Study of Social Perception

Many values influence landscape perception. Aesthetic judgement can be influenced by the sense of time and memory, use of space and the interests of the observer. It is usual for value to differ on the basis of "points of view". The study of the "values in play" that influence landscape perception can therefore be strategic in the first phases for studying a specific situation, providing guidelines for policies and the strategic planning, and to define the types of indicators.

The study of social perception uses qualitative methods and constitutes a frontier of research, supported in particular by the indications of the ELC: identify and assess landscapes on the basis of the population concerned. It appears to be immediately clear that it is impossible to generalize and use opinions based only on expert knowledge. For that matter, applicative studies have often shown the difference between the judgement of "common citizens", who tend to give generalized opinions, and experts who tend to identify the most differentiated parts and structures. Likewise, the first difficulty is to identify and distinguish the social groups of reference, who, as clearly shown by both the explanatory notes of the Convention (CoE 2000) and the subsequent recommendations of the European Council of Ministers (CoE 2008), are not limited to a group of inhabitants but include other different points of view: administrators, tourists, stakeholders. For this reason, one of the phases of assessment consists in the identification of "receptors".

These groups can be asked to express opinions, on the basis of different participative procedures (discussions, workshops, questionnaires…), but landscape value is not only socially acknowledged through opinions expressed, but also in the practical use of the space and in various forms of representation, in particular figurative or literary representations that prove the fame, or in any case the presence of the same in the collective imagination. Therefore, methods of investigation can use inquiries or the analysis of landscape representations, interpreting the imagery.

Landscape is acknowledged as having different social functions, also in the documents of international bodies, from conserving collective memory to being a source of psychophysical wellbeing, amenity, educational values, etc. These values probably don't have the same importance in the various different social and geographical contexts. The first studies therefore had the purpose of establishing *the types of value* attributed to landscape by social groups, in other words concerning the categorization of the relevant values. Therefore, landscapes can be classified on the basis of the level of presence/absence of certain selected values, again with reference to social opinion, if necessary highlighting the differences in the attribution of value between the often conflicting groups (for example, the use of some resources can conflict with the value of use and the value of conservation, the tourist value and the value of tranquillity). In literature (for example OECD 1997; NIJOS 2003; Wascher 2004; Palang 2008) the most frequently used categories of landscape values are:

- *historical-cultural value* (and/or traditional value),
- *identity value* (and/or value for the local population),
- *aesthetic value*,
- *amenity*.

Sometimes also the *educational value*, the *scientific value*, the *economic-productive value* (in particular for agricultural landscapes, or for those used in the tourist trade) are mentioned. In general, we can make a distinction between *value in itself* and the *fruition value*; studies in various different territorial contexts show the population has a distinct inclination for attributing a value in itself to landscape (Rogge et al. 2007), which is perhaps the inheritance of a contemplative attitude to landscape in times gone by; nevertheless, one of the preferential criteria in the studies on populations is the *appropriateness* of the landscape with respect to different use (residential, productive, recreational…) (*ibidem*). It is easy to see that most of the conflict which must be solved in the planning phase concerns the social use of landscape, and for this reason we should focus on the utilization or fruitive value, which includes a wide range of possible uses, from recreational to residential. The influence of the above and landscape is the subject of economic studies, covered in the relevant in-depth analysis (Bottero, *infra*, Chap. 8). The choice of the values of reference influences the score attributed to certain parameters; for example, the relationship between aesthetic value and fruitive value, between contemplative fruition and active fruition, and the different values that parameters such as attractiveness, tranquillity, and the presence of facilities can have as a consequence.

Available literature also suggests other general indicators, regarding the social value of landscape in itself. The *identitary value* of landscape is a holistic concept which is often referred to (for example in the documents of the OECD, ECNC, EEA, EC) but for which parameters and indexes have rarely been established; every attempt to define the identity appears to be tautological, or in any case based on implicit assumptions.

We believe it may be useful to propose a category called *ratified value*, with reference to the acknowledgement of the value attributed by institutions acting in name of the community and public interest, for example with administrative acts such as designations or restrictions. The existence of protected landscapes, in fact, is based on the acknowledgement of exceptional value and can therefore be considered a "proxy" indicator of the existence of identitary value.

The theme of social acknowledgement is associated with that of *social sensitivity* for landscape: the goals of the ELC include the "awareness, training and education" on the subject of landscape. Therefore, on one hand there is a measure of this sensitivity (for example the presence of landscape in social communication, the existence of actions for the protection and valorisation of landscape, or opposite phenomena); while on the other hand we have the effectiveness of actions to promote awareness and training that the Convention requires of the Regional Authorities, the effectiveness and efficiency of landscape policies (Vallega 2008).

6.2 Critical Review of Landscape Perception Indicators

6.2.1 The Scenic Value of Landscape and the Relevant Indicators

The aesthetic value of landscape is the most perceived value in terms of public opinion. Along with the identitary value, it is acknowledged by international organizations and included in some sets of indicators (especially with reference to agricultural areas), for example by the EEA, ECNC and OECD. First, let's take a look at the indicators (not many) proposed by these organizations to measure perceptual value, also on the basis of some comparative studies (for example MTT 2002; Wascher 2004; Waarts 2005).

- openness vs. closedness, heterogeneity vs. homogeneity, linear elements (OECD 1997);
- coherence, visual diversity, cultural identity, singular features (EEA 1998);
- openness vs. closedness, presence/adequateness of key cultural features, land recognized for its scenic and scientific value (ECNC, ELISA, Wascher 2000);
- landscape structures (environmental features and land use patterns, cultural features) (OECD 2001);
- number and diversity of memorable elements (EC DG-AGR, cit. in MTT 2002);
- Other indicators, partly used to measure the above, include: land use diversity (Wascher 2000), land use patterns (OECD 2001), land used for recreation (OECD 2003); share of characteristic habitat type (natural or cultural); share of traditional land cover types (Wascher 2000).

Some are parameters, others are cognitive categories, used also in methods based on preferences, which we will cover below. Furthermore, they can be used at different scales, but mainly on a vast scale. Note the focus on the concept of diversity: this is modified by the ecology of the landscape and ratified, for example, by the Pan-European Biological and Landscape Diversity Strategy (CoE 1995). The term *landscape diversity* can be ambiguous, in fact the measure of visual diversity (which should really be called variety) is often associated with land use and ecological parameters. These criteria, and other similar criteria, such as *harmony*, *order*, and *coherence*, can be classified using parameters of greater detail on the characterization of landscapes, such as *pattern, texture, features*.

Once again, we must emphasize the fact that these indicators have been drawn up for rural areas (Reho 2007; EC 2006). Many indicator systems have been studied for specific types of landscape: natural, agricultural, urban, periurban. For this reason, we will refer to some methods for various different landscapes.

One field of application, of longstanding tradition in the USA, is *Scenery Management* (or *Visual Resource Management*) of protected areas and areas of "outstanding beauty" (cf., in particular the manual of the USDA Forest Service—1995, and the USDI Bureau of Land Management), with an almost exclusive focus on natural landscapes. The two fundamental values of reference are *Scenic Attractive-*

ness (measured according to scale: Distinctive, Typical, Indistinctive) and *Scenic Integrity*; the general criteria are variety and harmony, analysed in terms of forms, colours, texture, etc.

In Anglo-Saxon countries there is a great deal of literature and many experiences pursuant to *Scenic View* or *Visual Assessment*, which focus on the local scale and also consider the townscape (with specific methods)[1]. In Great Britain, some authoritative references include the Landscape Institute manual (2002) and the manuals on Landscape Character Assessment (Swanwick 2002). The most commonly used perceptual values are *scenic quality, tranquillity, wildness*, and *representativeness*.

US methods often use scenic value according to the visibility from the most popular places and routes, and on the basis of the level of public concern, attributing a value of *sensitivity*[2] or *significance*, which can also be differentiated for different territorial levels (from local to national) and stakeholder groups. In this way, objective aspects (such as the characteristics of the scene, for example Visual openness) and perceptual aspects are combined.

All the above-mentioned methods are based on a preliminary classification of the views and characterization of the landscape. Many studies use Geographical information systems to perform these operations automatically: GIS in fact can establish the recurrences in the presence of certain landscape components (for example the presence of water or vegetation) and, if the spatial databases are accurate, can calculate the magnitude and depth of visual basins (viewsheds). For example, the method used in the New Zealand Landscape Classification (version 2) (Brabyn 2009) compares visual basins with types of landscapes and land use, allowing for the categories present on the area borders. The classes established attempt to represent the cognitive categories through which landscape is perceived (the hills and mountains for example), with particular focus on "preferential" elements for the population (a view of water for example). The author indicates that this classification is not yet representative of aesthetic values (or cultural values), and must be compared to the perception of the population, but it does however provide foundations.

While in the New Zealand method, GIS is used to calculate the presence of appreciated elements (such as water courses) in the views, GIS is used in others to calculate the range of influence of visual detractors. For example, the Enplan project proposed measuring the *perceptual quality* of periurban agricultural spaces as a result of the distance from constructed elements considered sources of visual and sonorous impact (urbanized areas and infrastructures) (Socco 2005). The method

[1] One of the most recent and ambitious is the *Qualitative Visual Assessment* of the City of London (Mayor of London 2007), which was not however expressed in the form of indicators. See also CABE methods. In the USA, we can refer to a review of experiences in the City of Cincinnati (2007), on methods and regulations for the protection of views in various locations, including regulations based on parameters and indexes.

[2] "Sensitivity levels are a measure of public concern for scenic quality" (USDI, BLM); Sensitivity on the other hand has another meaning in England: "the extent to which a landscape can accept change of a particular type and scale without unacceptable adverse effects to its character" (Landscape Institute 2002).

does not let us identify constructions as elements of impact or qualifying elements; and is more closely related to calculating the visual integrity of an agricultural area.

The Lombardy Regional Authority has drawn up a method based on GIS to classify the *Landscape significance* of the territory on an exclusively cartographic basis: the *significance* is calculated as a mean of the values of morphology, vegetation and historical heritage, in the equivalent cells (Lombardy Regional Authority 2007, see Table 6.6).

Turin Polytechnic, in the Corona Verde project (a study on the Turin metropolitan area) proposed calculating the concept of *imageability* as a product of the density of morphological signs, water, vegetation, historical features, and scenic components such as picturesque and panoramic views and landmarks (Cassatella and Castelnovi 2007, see Box 6.1). The method used involves direct reconnaissance on the territory and the cross-referencing of variables using GIS for each landscape unit.

In Italy until today, studies and applications have concentrated on the assessment of environmental impact (in particular, visual impact), and this creates a different prospect in the formulation of indexes and indicators, expressed in the form of a relationship between an element (the new intervention) and its context. In fact, EIA regulations on the "landscape" component, envisage "the strictly visual or cultural-semiological study of the relationship between the subject and the environment" (Prime Ministerial Decree 27/12/88). In the EIA manual of the Italian Association of Environmental Analyst (Colombo and Malcevschi 1999) perceptual indicators are classified in three fields: *Generic perceptual, Perceptual from single points of view, Perceptual in relation to new interventions*.

The verification of interventions in designated sites in terms of landscape compatibility, introduced by the new Cultural Heritage and Landscape Code (Italian Republic (2004) and s.m.i., Prime Ministerial Decree 12/12/2005) was a new impetus for studies of this type; the Ministry of National Heritage and Culture provided guidelines (Scazzosi and Di Bene 2006) with parameters on the evaluation of quality, criticality and alterations of the landscape. We propose a reworking in Table 6.1.

All the above are based on expert analysis. We will now consider methods based on public opinion. As we will see, some of the same indicators are used, but with another subject expressing the opinion. Surveys on visual preferences were mainly developed in the late twenteith century and in particular in the USA in the 1970s. The method used by authors such as Kaplan and Kaplan, Appleton, Zube, Shafer, is still used as a reference to implement or falsify. They suggested that people prefer settings that support the need to understand their surrounding and, simultaneously, the need for exploration.

Numerous applicative and also comparative studies have been published in the journals 'Environment & Behaviour' and 'Landscape and Urban Planning' (for example Daniel 2001; Rogge et al. 2007). There are two main approaches: the first aims to obtain a holistic judgment on types of landscape, the second for components; this second method attempts to estimate landscape appreciation on the basis of the presence of certain elements or structures, correlating the declared preferenc-

Table 6.1 Parameters for landscape assessment and modifications (reworking on Scazzosi and Di Bene 2006)

Quality	Scenic quality
	Richness of visual stimuli (visual diversity)
	Imageability (probability that the scene remains impressed in the mind of the observer)
	Social (presence of visual and historically consolidated scenes)
	Acknowledgement, integrity (permanence of distinctive characters in natural systems and historical anthropic systems)
	Rarity (presence of characteristic elements, in a reduced number and/or concentrated in some sites or special areas)
Criticality	Degradation (loss, damage to natural resources and cultural, historical, visual, morphological, testimonial characters)
Alterations	Intrusion
	Division
	Fragmentation
	Reduction
	Concentration
	Destruction
	De-connotation

Table 6.2 Matrix of environmental preference (Kaplan et al. 1989)

Information variables	
Making sense	Involvement
Coherence	*Complexity*
Legibility	*Mystery*
Perceptual variables	
Openness	
Smoothness	
Locomotion	

es to land use structures. Some authors try to establish correlations with elements of landscape ecology (dimension of spots, length of perimeters and so on), therefore attempting to establish relations between two normally separate approaches (see, for example, Schüpbach 2003).

There are some indicators the use of which is generally accepted, and these are considered "predictors" of preference, nevertheless, every form of research in the field redefines the set on the basis of the characteristics of the landscape observed. For this reason, it is not a good idea to isolate the single indicator, but better to think of them in groups, for example:

- *Legibility, coherence, complexity, mystery, prospect-refuge* (Kaplan 1979)
- *Variety/unity, vividness/harmony, visual penetration, focality, complexity* (in Daniel 2001)
- *Naturalness, vividness, variety, unity* (Clay and Smidt 2004)

- *Naturalness, openness, maintenance, variety; to which the parameters vegetation, buildings and human constructions, openness, maintenance or tidiness, agricultural crops and variety correspond* (Rogge et al. 2007)
- *Wilderness, presence of well-preserved man-made elements, percentage of plant cover, amount of water, presence of mountains, colour contrast* (Arriaza et al. 2004)
- *Unity, use, maintenance, naturalness, spaciousness, development in time, soil and water, sensory qualities (colour, smell)* (Coeterier 1996)
- *Amount of nature, ruralness, calmness, unity/coherence, accessibility, historical identity, quietness, wide horizon, spontaneity of nature, water, relief* (Farjon et al. 2009).

The latter studies are European; not by chance, "historical character" can only be found in these. The emphasis on naturalness is particularly relevant to methods developed in the forestry field. The set of attributes are determined culturally by national or continental factors[3]. In any case, generalizing and interpreting, the most common are: *perceptual naturalness, visual openness, variety, vividness* (brightness and contrast), *historicity* and *care* (order, maintenance, cleaning).

One fundamental aspect of studies on landscape preferences is the choice of the sample, normally divided into groups; one of these groups can be the group of experts. These are undoubtedly useful for facilitating a comparison between the various groups, forcing them to clearly express (or have clarified) the implicit values of their judgements.

A Dutch study on the population's appreciation of the landscape, done by Alterra on a national basis and set up to monitor the effectiveness of landscape policies in time (every three years), is worthy of note: the objective of the policies is a 25% increase in appreciation from 2007 to 2020 (Farjon et al. 2009, see the above parameters). The survey was done in 2006 on two samples, one representative of the social groups, and the other of the types of national landscape. The preferred physical characteristics (for example the openness of the horizon) where included in a map; in this way an appreciation model based on GIS lets us make forecasts on the impact of potential transformations[4]. Nevertheless, according to the authors, comparisons show that the GIS system is not very effective as a predictor, and surveys done using questionnaires are invaluable.

The refinement and diffusion of three-dimensional simulation models has also resulted in the use of renderings in surveys on visual preferences (Ode et al. 2010). Like photography, this medium also has limits of verisimilitude, and researchers have still to reach an agreement on the appropriateness of its use.

[3] This is not the opinion of all the researchers involved in these studies: some studies have the aim of verifying the predictors in relation to groups of people from different cultural groups, to reach a conclusion on the universal nature of the same (Yang and Brown 1992).

[4] In particular, the authors' argument is that the most dangerous phenomena is *landscape cluttering*, in other words fragmentation, which limits the horizon and encloses it in urban-type backdrops, and the introduction in rural contexts of alien and industrial type elements.

6.2.2 The Social Value of Landscape and the Relevant Indicators

As mentioned above, in this field there are only some experimental studies. First and foremost we should focus on studies that put the emphasis on *the types of value* attributed to landscape by social groups, to categorize the values in question, for example the research done by Luginbühl, Palang, the Landscape Observatory of Catalunya, and English Heritage.

Indicateurs sociaux du paysage (social indicators of landscape) is an essay by Luginbühl (2009). This refers to studies done in French Departments, based on interviews with town mayors, and one national survey, based on interviews with Conseillers généraux; politicians are therefore chosen on the basis of being representative of the respective community. The questions aim to highlight social landscape representations, the dynamics, and the practices of the stakeholders. In the first case, on a cartographical basis, the questionnaire indicates: landscapes of local interest, the transformation of local landscapes, landscape management projects. In the second, the questionnaire concerns: the interviewee, the landscape of the district and its evolution, as well as the landscape in general. We cannot refer to indicators in the strictest sense, but nevertheless, through statistical analyses (factor analyses of correspondence) key concepts emerge, preferences in relation to the landscape in general and certain types of landscape (almost models), which could probably be used subsequently as indicators.

Another French study, on a local scale however, concerning "Suisse normande" (Germaine 2008), the purpose of which is to obtain information on the identity of the place, is based on the same theoretical and methodological setup. The research involves three phases: characterization of the visible landscape (landscape diversity), assessment of the residents' and planners' representations of landscape, description of the relations between the physical properties of the landscape and the perceptions of the stakeholders. The opinions are analysed using WordMapper© software to establish the word recurrence and associations; the iconography of places produced on a local scale (in particular for tourist promotion) is drawn up in a table to establish: citations, borders, characteristics, spaces used, activities.

A simpler method pursuant to iconography alone is used in the *Piemonte landscape atlas* (Cassatella 2007, see Box 6.2). Two groups of representations of regional landscapes are analysed: the images of Piemonte in wide-known publications on the Italian landscape, and those used by the Regional Tourist Agency. The result is data on the frequency of citations for the places and values associated with the images (in the form of *morphological, naturalistic, historical-cultural, aesthetic, economic, disvalues*). *Fame* (which is measured using a citation index) can therefore be used as an indicator to try and obtain an identitary value, but it will probably represent the point of view of outsiders rather than that of inhabitants.

Representativeness ("whether the landscape contains a particular character, and/or features and elements, which is felt by stakeholders to be worthy of representing", Swanwick 2002) and "Associations with particular people, artists, writers, or

other media, or events in history" (idem) are value criteria which are considered by Landscape Character Assessment.

The Catalan Regional Government landscape law considers various landscape values, including symbolic and identitary values, other intangible values and fruition values. Landscapes are assessed and indicators defined in the landscape cataloguing process of the Landscape observatory (Sala 2009). As the perceptual aspect is believed to be qualitative, "the catalogues avoid the hierarchization in levels of landscape quality and the quantification of its values" (Nogué 2008). The methods envisage in depth interviews and workshops, in the conviction that participatory processes in the choice of policies are facilitated by involvement in the early stages of drawing up the catalogues. The Observatory has published a volume *Landscape Indicators* on the theme (Nogué et al. 2009), proposing a set of 10 indicators; of these, the following are pertinent to the theme: *knowledge of the landscape, landscape satisfaction, landscape sociability, landscape and communications*. Furthermore, the two indicators regarding "the application of the landscape law" and "the public and private implementation on the protection, management and planning of landscapes", can be associated with social sensitivity.

In England some values are already clearly expressed in policy statements, in particular with reference to the protection of the countryside. The studies can therefore progress from the postulation of the existence of common values, and concentrate on the methods for measuring the same. This is the case in studies on *Tranquillity* (see Table 6.8), the social function of which for psychophysical wellbeing is ratified by the British Government's Rural White Paper (Defra 2004), therefore this value is used locally in the assessments of plans. Developed in particular by the Forestry Commission and the Countryside Agency (1995), it is associated with *wildness* and *naturalness*, and the absence of urban influences (note that in this way the "tranquillity" of small villages is not considered, even if relevant). Areas characterised by noise, visual intrusion, and recreational use are classified on the basis of measurable parameters, such as the distances from urban areas, roads, airports, to create a map of *tranquil areas* and *vulnerable areas* (tranquil areas with disturbances). The Countryside Agency (2005, cf. Haggett et al. 2009) proposes a more refined method, which attempts to consider which are the appreciated elements and which are the unwelcome elements for the local community, establishing criteria and influence on the basis of public surveys (direct interviews using questionnaires). The result is a *Map of relative tranquillity*, where "relative" means "locally significant". In the application illustrated by Haggett et al. (with a certain level of complexity concerning the use of GIS with the cross-referencing of variables) the decisive factors are: human presence, some landscape characteristics (the perceptual naturalness) and noise. Once again this indicator is significant in an agricultural context, but not in an urban context.

One of the generally social functions attributed to landscape is the recreational function, and tourism in particular. The indicators can register current use, by in-

dexes such as the presence of tourists or number of guests in holiday farms (MTT 2002), although it is hard to distinguish between the different reasons for which tourists choose a site for holidays. This is pursuant to the field of economic landscape assessment, covered in Chap. 8; here we will simply mention the fact that these techniques can be used to help estimate the values of use (for example tourist demand, residential demand), and to estimate the value attributed to landscape in itself and the conservation of the same (Marangon and Tempesta 2008). Economic analysis methods would seem to be promising in relation to the problem of estimating the *social acknowledgement* of landscapes in general terms, with due caution and preconditions; consider for example, an index such as the "percentage of agricultural products sold with the regional trademark" (Wascher 2000): this can only suggest the identitary value of a territory, if we assume there is a relationship between the image of the territory and the product.

Finally, we should mention a landscape indicator frequently adopted for many uses: the presence (or percentage) of listed/designated elements or sites. From the point of view of social perception, this is indicative of interest in protection; nevertheless, it is a static indicator with no parameters and threshold values.

6.2.3 Catalogue of Landscape Perception Indicators

Published indicators can be divided as follows:

(a) Visual and multisensorial perception indicators (Table 6.3)

- visibility
- visual and perceptive detractors
- relationship between new interventions and context
- multisensoriality
- characterization
- parameters for the analysis of preferences

(b) Social perception indicators (Table 6.4)

- general and holistic
- cultural, symbolic and identity value
- fruition, recreational value
- ratified value
- social sensitivity

The name of the indicator was given by the author, while we provided the necessarily brief description; similar indicators or indicators with different names that refer to the same phenomenon have been grouped together. The source is the source from which the indicator was obtained, which may not always be the primary source, because many comparative studies were used, and some are so common they cannot be attributed to one single author.

Table 6.3 Catalogue of visual and multisensorial indicators

Visibility	Scenic quality, vantage points	Vallega 2008
	Openness vs. closedness	OECD 1997
	Focality, depth of visual field	Kaplan 1979
	Visibility (n. of views, type, aperture, depth, frequency)	Colombo and Malcevschi 1999; Malcevschi and Poli 2008; USDA 1995; LI 2002
	Skyline visibility	Colombo and Malcevschi 1999; Greater London Authority 2007
	Presence of historical scenes (consolidated views)	Scazzosi and Di Bene 2006
	Scenic attractiveness (Distinctive, Typical, Indistinctive), scenic quality	USDA Forest Service 1995; USDI Bureau of Land Management; Swanwick 2002
	Scenic Integrity	USDA Forest Service 1995
Perceptive and visual detractors	Visual detraction (n./area of elements in a specific area of reference)	Colombo and Malcevschi 1999; IFEN 2001
	Obstructions of panoramic views	Colombo and Malcevschi 1999
	Verified unauthorized buildings	Malcevschi and Poli 2008
Visual impacts of new interventions in a given context	Quality of the intervention, compatibility, mimicry with regard to the landscape lines	Colombo and Malcevschi 1999
	Visual obstruction (score), distance from vantage points, angle of view; contrast, bulk	Colombo and Malcevschi 1999; LI 2002; Greater London Authority 2007; Kearney et al. 2008
	Loss of landscape diversity	Scazzosi and Di Bene 2006
	Intrusion, division, fragmentation, reduction, concentration, destruction, de-connotation	Scazzosi and Di Bene 2006
Multisensorial perception	Tranquillity	Countryside Agency 2005; Swanwick 2002; Haggett et al. 2009
	Perceptive quality (integrity of a rural area in terms of distance from settlements and infrastructures)	Socco 2005
	Landscape sonority (presence of singing animals, silence)	Colombo and Malcevschi 1999; IFEN 2001
	Atmospheric and seasonal effects (limpidity, fogginess, seasonal changings, etc.), "special effects"	Colombo and Malcevschi 1999; Pachaki 2003

Table 6.3 (continued)

Landscape characterization	Visual diversity, variety	EEA 1998
	Heterogeneity vs. homogeneity	OECD 1997
	Coherence, unity	EEA 1998
	Imageability	Cassatella and Castelnovi 2007
	Significance	Lombardy Regional Authority 2007
	Singular features; presence/adequateness of key cultural features	EEA 1998; ECNC, ELISA: Wascher 2000
	Number and diversity of memorable elements	EC DG-AGr, cit. in MTT 2002; Pachaki 2003
	Appearance and materials (texture, scale, colour, patterns…)	Swanwick 2002
	Land use patterns	OECD 2001
	Tree canopy coverage	Dwyer and Miller 1999; American Forests 2002; Zhu and Zhang 2007
Parameters for the analysis of preferences	Imageability	Potschin and Haines-Young 2005
	Legibility	Kaplan et al. 1989
	Coherence	Kaplan et al. 1989
	Complexity	Kaplan et al. 1989
	Mystery	Kaplan et al. 1989
Parameters for the analysis of preferences	Openness; Spaciousness	Kaplan et al. 1989; Coeterier 1996
	Smoothness	Kaplan et al. 1989
	Focality, Prospect-refuge, visual penetration	Kaplan et al. 1989; Daniel 2001
	Variety vs. unity	Daniel 2001; Coeterier 1996
	Vividness vs. harmony, contrast	Daniel 2001
	Naturalness, Spontaneity of nature	Clay and Smidt 2004; Rogge et al. 2007; Farjon et al. 2009
	Ruralness	Farjon et al. 2009
	Calmness, quietness	Farjon et al. 2009
	Maintenance, tidiness, use	Coeterier 1996; Rogge et al. 2007
	Development in time; historical identity	Coeterier 1996; Farjon et al. 2009
	Sensory qualities (colour, smell)	Coeterier 1996

Table 6.4 Catalogue of social perception indicators

General and holistic perception	Intrinsic value (willingness to pay for the conservation of a given landscape)	Marangon and Tempesta 2008
	Benefits for society, opinions and expressions of the stakeholders	Potschin and Haines-Young 2005; USDA 1995; LI 2002
	Sensitivity (level of public concern)	USDI, no date
	Attractiveness for the public	USDA 1995; Farjon et al. 2009
	Fame (citation index in various kinds of representations)	Cassatella 2007
Cultural, symbolic, and identity value	Fame (citation index in various kinds of representations)	Cassatella 2007
	Cultural identity	EEA 1998
	Representativeness	Swanwick 2002
	Associations with particular people or events in history	Swanwick 2002; Vallega 2008
	Association with typical products and tastes (percentage of agricultural products sold with the regional trademark)	Wascher 2000; Vallega 2008
	Share of traditional land covers types	Wascher 2000
	Rarity	Swanwick 2002
Fruition, recreational value	Appropriateness of the landscape with respect to different use	Daniel 2001
	Land used for recreation	OECD 2003
	"Experiences of landscapes"	ELCAI: Wascher 2005
	Recreational value, amenity	Palang 2008; Swanwick 2002
	Accessibility	Pachaki 2003
	Tranquillity	Countryside Agency 2005; Haggett et al. 2009; Wascher 2005
	Wildness, perception of naturalness	Swanwick 2002; USDA 1995
Ratified value	Presence (/number, /area) of protected landscapes, listed/designated elements or sites	Vallega 2008
	Land recognized for its scenic and scientific value	ECNC, ELISA: Wascher 2000
	Landscape protection, protection of typical landscapes	Vallega 2008
Social sensitivity for landscape	Actions for the protection and valorisation of landscape	
	Effectiveness and efficiency of landscape policies	
	Knowledge of the landscape	Sala 2009
	Landscape and communications, Presence of landscape in social communication	Sala 2009
	Landscape satisfaction	Sala 2009
	Landscape sociability	Sala 2009
	Loss of maintenance (abandoned areas)	Colombo et al. 2008

6.3 Proposal for Landscape Perception Indicators

The number of indicators found in literature is a sign of the diversity of use and the experimental phase the subject is currently going through, rather than a sign of rich content. Many of these "indicators" are unsuitable for formalization, and those that could be formalized and consolidated are only suitable for detailed assessment, typically for the assessment of visual impact for single works. In other cases, the problem with the indicator is that it has no thresholds of reference (for example, the total number of panoramic views is insignificant, while the variation in time may be of some significance).

When making a selection and a proposal we will consider the main aims of this study, in other words the application of the principles of the ELC, and the two chosen scales of reference (regional and local) (Table 6.5).

The indicator *landscape diversity*, clearly changed by ecology, but referring to perceptual diversity, is the most commonly mentioned and perhaps the only indicator that maintains the same meaning at any scale. Nevertheless, there are different measurement methods, both qualitative (based on the interpretation of signs and cultural elements) and quantitative, using the concept of the richness of heteroge-

Table 6.5 Proposed perceptual landscape indicators

Indicator	Category	DPSIR	Scale	Use
1. *Variety (or visual diversity)*	Visual perception (characterization)	S	Regional, Local	Frequently applied
2. *Landscape significance*	Visual perception (characterization)	S	Regional	One case of application
3. *Imageability*	Visual perception (characterization)	S	Local	One case of application
4. *Obstruction of view from viewpoints*	Visual perception	I	Regional, Local	Applied, reworking
5. *Visibility of the sky at night and silence (Absence of pollution from lighting and noise)*	Multisensorial perception	S	Regional	Proposal for experimentation
6. *Fame, variation in time*	Social perception, cultural/identity value	S/I	Regional, Local	Proposal for experimentation
7. *Tranquillity*	Social perception, fruitive value	S	Local	Applied
8. *Amenity*	Social perception, fruitive value	S	Regional, Local	Applied
9. *Landscape protection (see Table 7.12)*	Social sensitivity	R	National/ Regional/ Local	Applied
10. *Tree canopy coverage*	Visual perception	D	Local	Applied in environmental report, to be adapted

neous objects. We propose using the term *variety* (Table 6.12), to avoid any implicit ambiguity in the expression "diversity" and the risk of confusion with the concept of "richness", indicating some descriptors used[5].

The attempts to assign a value of *significance* (Lombardy Regional Authority 2007) or *imageability* (Cassatella and Castelnovi 2007), cross-referencing the presence of signs from the built-up environment or vegetation, etc., go along the same lines; the latter includes the visual aspect, while the first is based on physical elements and measurements, and is of a significantly automated nature (Tables 6.6 and 6.7).

The use of indicators on negative phenomena also seems to be effective, in other words on the loss of value of the landscape: for example *obstruction of panoramic views* or landmarks[6] (Table 6.10).

Of social values, *fame* has the advantage of being easy to verify (through an index of citation, although the choice of the field of observation remains open), certainly less problematic than verifying "identity" or identification in a landscape (Table 6.11). The frequency of citation can be measured through direct surveys (interviews), or using indirect methods, for example through a sample of representations (literary, artistic, journalism, web sites or using other means of communication). Depending on the sample chosen, we can obtain the point of view of the local community or more extensive or external groups, and using comparison (as in the

Table 6.6 Landscape significance

Indicator	Landscape significance
Definition	Density of natural and anthropic signs characterizing landscape
Description	Synthetic index for the characterization of landscape on the basis of the presence of physical and cultural characteristics. Calculated dividing the territory into equivalent cells
Category	Perception
Aims pursuant to landscape	Evaluation
Status/Process	Status
DPSIR Category	Status
Typology	Index
Component variables (if index)	• Morphological complexity • Significance of cultural landscape • Vegetational provision

[5] There is significant reference to the concept of visual variety-complexity in the works of Kaplan (1979), Nohl (2001) and Roth (2006): In particular, the more complex the scene, the more complex the possibility of interpreting the same, with the resulting implicit uncertainty in the difficulty of "dominating" the surrounding landscape.

[6] In Italy, an indicator on the existence of *verified unauthorized building* was proposed (Municipality of Caivano, in Malcevschi and Poli 2008). This does not necessarily indicate the existence of damage to the landscape, but may indicate scarce social sensitivity for the protection of heritage and community interest. Nevertheless, this indicator could paradoxically penalize the regional or municipal authorities who are most committed to fighting and reporting such phenomena. Another proposal is the "number of authorizations requested for intervention in protected areas" (Franceschetti and Pagan 2007).

Table 6.6 (continued)

Indicator	Landscape significance
Unit of measure	Five value classes; the value is calculated according to the simple mean of three indexes, calculated for each cell: • Level of morphological complexity: for the mountainous part, the difference between the two extreme values for altitude in the cells of the grid was calculated; for the plains, the presence of a series of geomorphological elements selected on the basis of the significance for the characterization of the Lombardy plains was indicated. • Level of significance of the cultural landscape: presence of restrictions (designated sites) and connotative elements of the landscape indicated in the Regional Territorial Plan. • Level of naturalness: presence of natural elements, with differentiation between those in the hills/mountains and those in the plains
Territorial scale of reference	Regional scale
Time scale of reference	Not reported
Characteristics of use	Various technical-administrative uses proposed
Availability of data source	GIS cartographic database available
Method of representation	GIS thematic map on grid (cells 500 × 500 m)
Other explanatory notes	The significance of cultural landscape is only defined using quantitative type indexes
Fields/work in which it was used	Lombardy Regional Authority 2007

Piemonte landscape atlas, Cassatella 2007, see Box 6.2) indications can emerge, in fact the indicator has no thresholds of reference and a relative meaning. For this reason it would seem to be more significant to observe the variation in time, which means having to choose a sample that can presumably be referred to at a later date (certain tourist guidebooks for example).

Of the numerous values that can be socially attributed to landscape, "tranquillity" and "amenity" represent two distinct and sometimes antithetical extremes, often subject to experimentation. On the theme of amenity, see the chapter on economic assessment. On the theme of tranquillity, we have already quoted British studies based on the rich Landscape Character Assessment knowledge-base and used throughout the territory, in all probability too onerous for many other contexts. Some elements associated with tranquillity can be extrapolated and used as indicators: in particular, the *visibility of the sky at night and silence*, which also make it possible to consider the multisensorial dimension of landscape[7] (Table 6.9).

[7] In Italy, the visibility of the sky at night has been declared an "identity asset" by the Sardinian Regional Authority; as such it is protected.

Table 6.7 Imageability

Indicator	Imageability
Definition	Density of distinctive signs in an ambit, of a natural, cultural and scenic character
Description	Synthetic index on the potential of a place to be remembered, on the basis of the presence of signs useful for orientation or common signs characterizing the identity of the ambit, of a natural, cultural and scenic type. It is calculated by dividing the territory into landscape units
Category	Perception (visual)
Aims pursuant to landscape	Evaluation
Status/Process	Status
DPSIR category	Status
Typology	Index
Component variables (if index)	Density, in the landscape unit, of: Signs of the common documentary historical system (value scale: zero, low, medium, high). The density of the signs of a traditional settlement (farmhouses, chapels, votive shrines, buildings pursuant to channels, farmsteads, roads and hedgerows) and registered historical-cultural heritage is considered. Signs of nature (value scale). The density of elements pursuant to the use of morphology (rivers, lakes, versants) and vegetation (woods, hedges and hedgerows, arboreal cultivations or other characterizing elements) is considered. Scenic-perceptive components (the presence of viewpoints of the natural and built-up environment, protected panoramic views and other panoramic views)
Unit of measure	Value scale of three classes (high, medium, low)
Territorial scale of reference	Local scale
Time scale of reference	Not reported
Characteristics of use	Expert technical-scientific analysis of a qualitative and quantitative type using a geographical information system.
Availability of data source	Geographical database and direct surveys on the territory
Method of representation	Thematic map created using overlay mapping with maps for each single component
Other explanatory notes	Can be calculated for each landscape unit or cell; the synthesis between the different components can be based on algebraic factors or on expert qualitative estimation, attributing weights to notable elements (for example the presence of a famous or symbolic monument, which will have a greater value than a single unit)
Fields/work in which it was used	Cassatella C and Castelnovi P 2007 (see Box 6.1)

The proposed indicator is therefore experimental, but may be based on available data and could be particularly significant if a new European Resolution is passed on the subject—current draft: "Noise and light pollution. Draft Resolution and Recommendation" (CoE 2010) (see Table 6.9).

Finally, we include *tree canopy coverage* in the list, as a suggestion to use in highly urbanized contexts, where the indicators for open landscape can be less significant (Table 6.13). In reality, this indicator is used in balances of environmental sustainability, but the proposed use is based on the assumption that a good level of coverage provided by the foliage is beneficial not only in ecological and climatic terms and to reduce atmospheric pollution, but also for the perception and aesthetic qualities of the urban landscape (in fact, the presence of vegetation is one of the most common predictors of visual preference).

In brief, the following indicators are proposed.

On a regional scale:

- Variety
- Landscape significance
- Obstruction of views from viewpoints
- Fame, variation in time
- Visibility of the sky at night and silence (in other words the absence of pollution from lighting and noise)

On a local scale:

- Variety
- Imageability
- Obstruction of views from viewpoints and of landmarks
- Tranquillity
- Amenity
- Tree canopy coverage

Box 6.1 Example of "Imageability" Indicator Application The "Corona Verde project. Strategic planning and governance" is a master plan pursuant to environmental and landscape planning, the protection of resources and the fruitive valorisation of open spaces in an area which roughly corresponds to the Turin metropolitan area: ninety municipalities, 25,000 ha, 11 protected areas, including the Turin Po Valley park; a hub of ecological networks in the area, subject to the pressure of urbanization. The territory is also rich in stratified historical heritage, with important routes and centres from both a historical and landscape point of view; in particular the Savoy Residences, a Unesco Heritage Site, in the circuit of royal residences around the city called the "Crown of delights". The goals of the project (drawn up by the Inter-University Department of Territorial Studies of Turin Polytechnic for the Piemonte Regional Authority, head of scientific research R. Gambino) are to consolidate environmental and cultural networks, improve fruition and the landscape.

The research and assessment concerned all the open spaces in the metropolitan area: natural spaces, farmland, periurban areas. The research on landscape and fruition is done in extremely small landscape units, due to the fragmentation of the area, the identification of which is based on the dynamics perceived in relation to the categories: natural, agricultural, settled, urban, with facilities.

The following values (low, medium, high) are attributed to each unit, on the basis of cartographical analyses and surveys in the field:

- density of natural signs (morphology, hydrography, woods and other elements of the vegetation such as hedges or linear systems)
- density of signs in the diffused historical-documentary system (rural buildings, registered historical-architectural assets, historical-architectural elements in the landscape)
- diversity and visual richness (presence of views, panoramic routes, viewpoints).

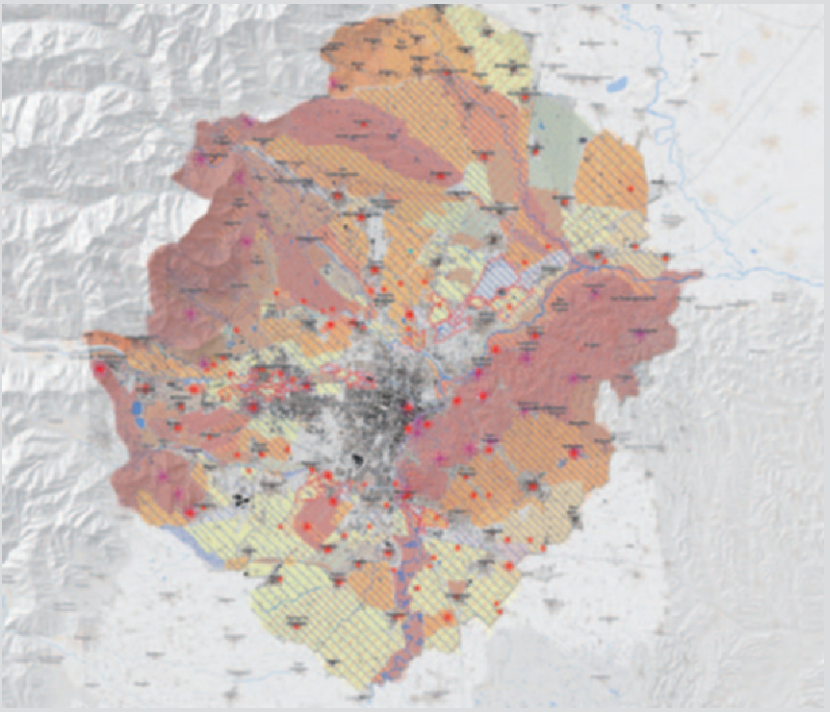

Fig. 6.1 The Corona Verde project. Landscape classification, Table C.2, Imageability, (original in scale 1:50,000). The full-colour fields represent the values of imageability (low, medium, high), the halftone areas represent the source values (density of natural signs, density of signs of the diffused historical-documentary system), the points indicate viewpoints and landmarks

The suitably interpreted cross-referencing of these values, gives us the imageability value (low, medium, high).

The cartographic representation is therefore drawn up in area fields based on units; to express the concept clearly, the original values were also included in the form of shading and points.

The value of imageability was used to obtain the overall landscape value, and in some cases, for places of notable interest, a low level of imageability was considered indicative of landscape criticality (Fig. 6.1).

The attribution of the value of imageability within certain limits can be based on the interpretation of cartographic bases, with a necessary information layer on visual characters, requiring direct surveys. The field study is also required to verify the sign value of known cartographical elements (historical-architectural assets, water courses, etc.) but which are not necessarily appreciated on routes usually used.

Cassatella C and Castelnovi P (2007) 'The landscape' in the Corona Verde project, strategic planning and governance, research report (research contract with the Piemonte Regional Authority, Protected Areas Planning Sector), Inter-University Department of Territorial Studies of Turin Polytechnic.

Table 6.8 Tranquillity

Indicator	Tranquillity
Definition	"Places which are sufficiently far away from the visual or noise intrusion of development or traffic to be considered unspoilt by urban influences" (Countryside Agency 2005); "A composite feature related to low levels of built development, traffic, noise, and artificial lighting" (Swanwick 2002)
Description	Condition—absence of perceptive disturbances and the possibility of experiencing the natural and rural landscape, without the intrusion of the urban environment
Category	Perception (social)
Aims pursuant to landscape	Identification
Status/Process	Status
DPSIR category	Status
Typology	Index
Component variables (if index)	Impact of people; Openness, Perceived naturalness; Presence and visibility of rivers, of the sea, of broad-leaved woodland and mixed woodland; Visibility of roads, urban areas, and others overt signs of human development (negative factor); Overhead skyglow (light pollution) (negative factor); Visibility of coniferous plantations (negative factor); Noise (road, military, aircraft noise) (negative factor)

Table 6.8 (continued)

Indicator	Tranquillity
Unit of measure	Value scale in classes, based on the presence of positive and negative factors, with the cross-referencing of different components in each cell of the territory (250 × 250 m)
Territorial scale of reference	Local scale
Time scale of reference	Not reported
Characteristics of use	The declared aims are the protection of "tranquil" rural landscapes (objective of Countryside Agency policies, UK) and the promotion of the territory image
Availability of data source	Geographical data relevant to morphology, settlements and infrastructures
Method of representation	Thematic map on "Relevant tranquillity", created using overlay mapping with maps of the single indicator variables
Other explanatory notes	The assessment, according to the authors, allows for the cumulative effects and interaction between the different variables of the indicator, and the intermittency and variability of perceptive disturbance factors. The disturbance factors are also identified by interviewing the local population, therefore the method uses both expert analysis and the analysis of preferences
Fields/work in which it was used	Method developed by Northumbria University and presented by Haggett et al. 2009. There are various subsequent definitions and applications for the indicator, including: Countryside Agency 2005; Bell 1999

Table 6.9 Visibility of the sky at night and silence

Indicator	Visibility of the sky at night and silence
Definition	Enjoyability of the nocturnal landscape
Description	Contemporaneous visibility of the stars with the naked eye and the absence of noise disturbance. Admissible for the concept of tranquillity
Category	Perception (multisensorial)
Aims pursuant to landscape	Description/Assessment
Status/Process	Status. The indicator can be transformed into an indicator of process, in terms of variation
DPSIR category	Status
Typology	Index
Component variables (if index)	• Naked eye stellar visibility • Silence, in other words the absence of environmental noise disturbance
Unit of measure	Percentage of surfaces (simultaneous presence of two indexes) in relation to total
Territorial scale of reference	Local and regional scale
Time scale of reference	The entity depends of the when the source data was updated
Characteristics of use	Environmental reporting; SEA. The indicator could be particularly significant if a new European resolution is passed on the subject (CoE 2010)

Table 6.9 (continued)

Indicator	Visibility of the sky at night and silence
Availability of data source	On the status of the sky at night: the indicators are processed by Scientific and non-profit institutions, first and foremost using satellite photographs. For example, in Italy the Light Pollution Science and Technology Institute (ISTIL) draws up maps for the indicator "naked eye stellar visibility"; in the USA the International Dark Sky Association uses other light pollution indicators. Larger towns and cities draw up noise maps according to EU Directive 2002/49/EC; based on the distance from potential noise sources, direct surveys (measurements) are preferable
Method of representation	Thematic map, temporal diagrams (or thematic maps) on the variation
Other explanatory notes	The indicator is susceptible to variation. For example it can be expressed in negative terms for light and acoustic pollution, or dynamic terms as a percentage of loss of value. It can refer to the territorial surface or population affected
Fields/work in which it was used	None. Light pollution and the distance from noise sources are indexes of the indicator "tranquillity" (see Table 6.8). The method proposed is a reworking. The CoE Report Draft resolution on Noise and light pollution (2010) contains numerous references to studies, indicators, measurement methods and thresholds

Table 6.10 Obstruction of panoramic views

Indicator	Obstruction of panoramic views
Definition	Negative effect on picturesque views caused by a loss of visibility, in other words by the partial (or total) restriction of the field of vision
Description	On a regional scale: percentage of protected picturesque views with a restriction of the total field of vision; on a local scale: percentage of the obstructed field of vision (amplitude) compared to the total number of registered picturesque viewpoints (and/or panoramic routes)
Category	Perception (visual)
Aims pursuant to landscape	Evaluation
Status/Process	Status
DPSIR category	Impact
Typology	Simple
Component variables (if index)	–
Unit of measure	On a regional scale: percentage of protected picturesque views with a restriction of the total field of vision; On a local scale: percentage of the obstructed field of vision (amplitude) compared to the total number of registered picturesque viewpoints
Territorial scale of reference	Local and regional scale
Time scale of reference	Not reported, requires periodic monitoring
Characteristics of use	Strategic Environmental Assessment; assessment of the compatibility of interventions with landscape

Table 6.10 (continued)

Indicator	Obstruction of panoramic views
Availability of data source	Survey and mapping of picturesque viewpoints (for example, in Italy, the National Register of protected landscape sites); requires in situ monitoring
Method of representation	Thematic map, temporal diagrams if expressed as a variation
Other explanatory notes	On a local scale it is possible to develop the indicator by verifying the visibility of views from chosen observation points, therefore indicating the most significant range of the view
Fields/work in which it was used	Colombo and Malcevschi 1999; Greater London Authority 2007. The current version is a reworking

Table 6.11 Fame (variation in time)

Indicator	Fame (variation in time)
Definition	Presence of landscape in social communication
Description	Frequency of citation of a regional landscape or a certain landscape in a sample of representation (direct interviews, electronic media, printed media, artistic representations, etc.), variation in time. Can be considered an indicator of social acknowledgement and identity value
Category	Perception (social, identity value)
Aims pursuant to landscape	Evaluation
Status/Process	Status
DPSIR category	Status
Typology	Simple
Component variables (if index)	–
Unit of measure	Percentage; Frequency of citation of the place or landscape ambit in relation to the total number of places/ambits mentioned in the chosen sample; variation in the period of reference
Territorial scale of reference	Regional scale
Time scale of reference	Multiple years (ex. 5 years)
Characteristics of use	Policies for the promotion of the territory and to measure the effectiveness of these policies
Availability of data source	A sample that can be referred to at a later date must be chosen, certain tourist guides, the products of the Regional Tourism Agency, or a sample of the population, for example
Method of representation	Temporal tables and diagrams; the result can be represented as a thematic map, for example by giving the place-names a dimension which is proportional to the percentage of citation
Other explanatory notes	Citation means: iconographic representation of the place, associated with the identification of the place/ambit and the use of the place-name. The indicator is interesting from the point of view of the social perception of the landscape as it reflects the level of acknowledgement of the protected ambit by part of the population
Fields/work in which it was used	Cassatella 2007 (see Box 6.2)

Box 6.2 Example of "Fame" Indicator Application The Atlas for the management and valorisation of the Piemonte landscapes contains information on both a regional and local scale. On a regional scale, as well as the interpretation of geographical and historical characters, we propose an interpretation of imageability and social acknowledgement for the Piemonte landscapes, based on the presence of the same in widely-used iconographic representations. This gives us a collective image based on circulating images and popular icons, often with repetitive known characters. The choice of the sample was from two groups of images:

- images published in illustrated books on the Italian landscape published by the Italian Touring Club;
- images used by the Regional Tourism Agency for territorial promotion.

The initial hypothesis is that the first group can (circumstantially) represent the supra-local, in other words national view, the second the internal view, self-representation (at least externally). Obviously, the sample can be developed. There is the advantage that the two samples chosen are fairly wide-ranging.

The method involves registering all the images in these publications, on the basis of the following interpretation:

- places
- geographical-territorial ambit (for example Langhe, Monferrato)
- types of geographical landscape (plains, hills, mountains, rivers and lakes)
- landscape categories (urban, rural, natural)
- subject (for example panorama, monument)
- landscape values (morphological and naturalistic, historical-cultural, aesthetic, social-economic, or relevant to tourist industry production and fruition, disvalues)

Statistical processing and comparison suggest numerous considerations on the "collective" image (with reference to the sample) of regional landscapes. The primary indication, less subject to interpretation by the subject doing the research, is the frequency of citation of the places and ambits, which we propose using as an indicator of fame and therefore, indirectly, of identity.

The value represents the percentage of citation for each place in relation to the total representations registered; the result is a table which can be transferred onto a map, for example (as in the case of the Atlas) attributing a proportional dimension for the value to place-names (Fig. 6.2).

Obviously the result does not refer to threshold values, and the only real threshold is the presence or absence (value zero). There are however significant relative differences between places and the same places in relation to different samples. These differences in fact can provide guidelines for policies of valorisation, or measure the effectiveness of policies for the promotion of the territory, and therefore they are more meaningful when analysed on the basis of variation in time.

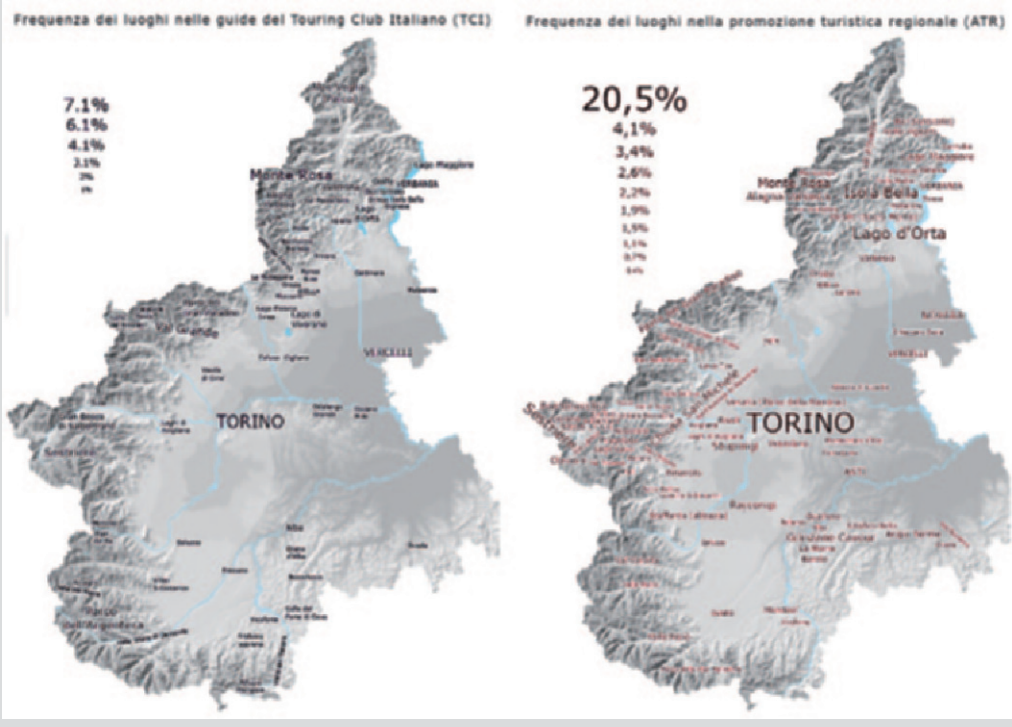

Fig. 6.2 Atlas for the management and valorisation of the Piemonte landscape. Image, illustrations. The most representative landscapes in the Italian Touring Club guides and the most representative landscapes used by the Regional Tourism Agency

The Atlas for the management and valorisation of the Piemonte landscapes is the result of research done by the Inter-University Department of Territorial Studies of Turin Polytechnic (with the contribution of the Turin CRT Foundation Alfieri project, head of scientific research A. Peano).

Cassatella C (2007) 'The acknowledged landscape', in the Atlas of Piemonte landscapes, research report of the Inter-University Department of Territorial Studies of Turin Polytechnic.

Cassatella C (2009) Social perception of the landscape and the Atlases, in Urbanistica, 138:13–17.

Table 6.12 Variety or visual diversity

Indicator	Variety or visual diversity
Definition	The indicator of the variety (or visual diversity) of the landscape represents the level of heterogeneity and the richness of visual stimuli of the landscape on the basis of the presence of vegetation, water, notable elements, the heterogeneity and structure of land use
Description	There are many different definitions and methods of calculation, some of which are qualitative, while some are based only of objective information. Consequently, the following are calculated: • as a mean, on the basis of the function of mapped biophysical elements, or • as a score, on the basis of the score attributed to each component by experts • as a score attributed in a holistic way by non-experts, in interviews or questionnaires (visual preferences method) Here are some examples of the first approach, used by each single author. Note the differences in the variables: Schüpbach 2003. "Variety describes how landscape is seen on the perceptive and on the symptomatic level. A landscape rich in variety is a landscape with trees and hedgerows stimulates the observer and helps him to orientate oneself in space." The elements of the landscape that help define landscape diversity are classified as point, linear and area elements (Single tree, Hedgerow, High stem orchard, Forest edge, Edge of settlement area). The reciprocal distance in relation to their effects on the scene is considered. The result is added up and divided by the area of each cell and standardized. $\left\{ \frac{\sum \left[(areapuntual/D) + (arealinear/D) + (areal/D) \right]}{area\_grid\_cell} \right\} * 2.5$ Pachaki 2003. Fundamental parameters: • Number of practised cultivations, average or typical size of plots, index of concentration of crops • Number and area of cultivations which present high seasonal variability (arable crops, spring blossom, winter falling leaves, etc.)

Table 6.12 (continued)

Indicator	Variety or visual diversity
	European Commission 2000 (quoted in Reho 2007). Number of sites and hectares/kilometres of farmland that contribute to the perceptive/cognitive differentiation (homogeneity/diversity) of the landscape: • Method of use of the land/type of crop (extension, height, colours) • Environmental characteristics • Manmade objects
Category	Perception (visual)
Aims pursuant to landscape	Identification
Status/Process	Status
DPSIR category	Status
Typology	Index
Component variables (if index)	The choice of the variables can change on the basis of the characteristics of the landscape in question. For the purpose of calculation using GIS, they are generally divided into: point, linear, area elements of the landscape
Unit of measure	Percentage, adimensional index from 0 to 1 (Schüpbach) Position, function: N, index of concentration (Pachaki) Score, function: N, ha/km (European Commission)
Territorial scale of reference	Local scale
Time scale of reference	Not reported, requires periodic monitoring
Characteristics of use	Strategic Environmental Assessment; assessment of the compatibility of interventions with landscape
Availability of data source	Field research, cartographic interpretation using GIS
Method of representation	Thematic map, temporal diagrams
Other explanatory notes	The perceptive variety is referred to by the authors (for example Nohl 2001) especially for agricultural landscape, in terms of the coexistence of anthropic and natural elements. The choice of variables can change on the basis of the characteristics of the landscape in question
Fields/work in which it was used	Numerous, but with various different definitions. For example Hoisl 1989 quoted by Schüpbach 2003; Nohl 2001. For the second method (score attributed by experts), see Roth 2006 for example, who uses Internet as a research instrument. For the third method of visual preferences, see the bibliography mentioned in Sect. 6.2.1

Table 6.13 Tree canopy coverage

Indicator	Tree canopy coverage
Definition	The quantity of surfaces covered by treetops
Description	Represents an indicator of the physical-perceptive and ecological quality of the landscape, especially in urban contexts. The tree canopy coverage is compared to the different categories of principal land use, to forecast different levels of integration of these surfaces
Category	Multisensorial perception
Aims pursuant to landscape	Identification—Assessment
Status/Process	Status
DPSIR category	Determinant
Typology	Index
Component variables (if index)	Number of trees Main categories of land use (source: Dwyer and Miller 1999): residential, mobile home, commercial, institutional, parks, cemeteries, golf courses, undeveloped/conservancy, agriculture, roads, water
Unit of measure	Percentage, N. trees/acres
Territorial scale of reference	Local scale
Time scale of reference	Not reported, requires periodic monitoring
Characteristics of use	Strategic Environmental Assessment, environmental reporting
Availability of data source	Local town planning, park plans, forest surveys, satellite images (ex. Landsat). The proposed indicator is based on the interpretation of satellite images and cross-referenced with the quantification of trees in forest surveys
Method of representation	Thematic maps using GIS
Other explanatory notes	The indicator is generally used for environmental sustainability. The proposed use is based on the assumption that a good level of tree canopy coverage not only results in benefits in ecological and climatic terms, and for the reduction of atmospheric pollution, but also on the perception and aesthetic qualities of the urban landscape. The weak point is the definition of thresholds, in other words the percentages of adequate coverage for the single landscape contexts. For example, for Washington DC "American Forests" recommends: 40% tree canopy overall 50% tree canopy in suburban residential 25% tree canopy in urban residential 15% tree canopy in the central business district
Fields/work in which it was used	Dwyer and Miller 1999; American Forests 2002; City of San Francisco 2006; Zhu and Zhang 2007 and numerous others

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