



# Introduction

## What are indicators and what is their purpose?

Josepa Bru

When trying to establish what we understand by an indicator, the first thing we find is a proliferation of definitions that usually are not very clarifying, such as: a parameter, a variable, a measurement, a value or a fraction. In the business area we find more specific definitions, although, due to their restrictive (and almost instrumental) use we can hardly find a definition with a universal value. For instance, from the web page of the Kaizen Group we can infer that indicators must be goal-oriented key variables, that they can refer to past or future actions (not to indeterminate situations) and they involve a measurement. On the other hand, the *Socioecology Dictionary* by Ramon Folch defines “indicator” as a correlation between two parameters set in such a way that they can provide a quantitative information with a potential qualitative meaning. According to this meaning, indicators enable us to find certain aspects of reality that would not be accessible from pure objectivity. Therefore, we can say that indicators are dependent on our gaze, and so we must know and make explicit where this gaze stands.

Clifford W. Cobb and Craig Rixford point out that indicators are always developed with the aim of modifying some aspect of reality, and that they materialize the aspiration of leading society from rational standpoints. In this sense they respond to a general aim of improving reality, not only with a management or policy objective, but in line with the whole purpose of science since the 17th century. According to Sir Francis Bacon (1561-1626), the aim of science should be the improvement of human life, and with this purpose he devised a method based on the observation, collection and interpretation of empirical data, which would provide the necessary mechanisms to organize society on rational bases. This method, in which the work with indicators was already implicit, inspired social reform in the field of applying science to resource management and people. Therefore, indicators were born along with the foundations of modern science and stand as a specific tool in the science/ management interface.

In the 17th and 18th centuries empirical research based on making social statistics began to be developed, taking the concepts of natural science as a reference point for lack of a sociological theory. When approaching resource management, efforts were made to establish indicators directly related to landscape, although always within the frame of forestry science.

The moral side clearly appeared in the scientific discourse of the 19th century, shaping two great movements that we may call philanthropist and Malthusian-eugenic. The first one was followed by European doctors and statisticians; it was focused on studying big industrial cities and the links that could be established between epidemics, poverty and other socioeconomic factors. The second movement has its basis in Malthus' *An Essay on the Principle of Population* (1798); its points, based upon statistics used as indicators, were used in an approach that linked science, management and a sociopolitical project of social segregation. On the other hand, the theories and works of Sir Francis Galton (1822-1911), focused on the research of anthropometrical indicators, marked a high point in the development of indicators.

In the 20th century, the Great Depression and the Second World War shifted indicators towards the economic arena and to policies for rebuilding national production. The United Nations started the first research to measure the obvious differences of standards of living, from which GDP emerged. In the period 1960-1970, with the rise of the left in Europe and the loss of steam of neopositivistic proposals in the realm of social sciences, an interest in welfare and quality of life and the definition and measurement of both emerged. It was in this context that the so-called “indicators movement” was launched and where the discussion on the status and the analysis methods of social sciences was resumed, in this case focused on a debate between objectivity and subjectivity.

From the 1980s onwards, the growing awareness of the environmental dimension in social planning had as a result the development of environmental indicators, that is, the indicators of sustainability and those of sustainable development. It must be noted that the former are based on a weak theoretical perspective, unable to establish which role must be played by environmental variables in a desirable social project. In fact, even if science plays a fundamental role, the aim of actions will always introduce social and political objectives and decisions, so that indicators will depend on our way of seeing and therefore they will not be accessible from pure objectivity.

Indicators cannot be objective, they are rather ambiguous, have a fuzzy character and stand in the interface between the subjective and the objective fact. This ambiguous character can be managed from the postnormal science of Funtowicz and Jerry Ravetz, a new perspective that aims to solve problems that cannot be foreseen and approached from well-established methods and theories. In this approach, work on indicators should begin with a new way of articulating the link between science, management and social project, understanding what is appropriate and what is not, and always working from the point of view of the collective. That is why

we need a dialogical ethics, that can be defined as the process in which, in order to reach normative decisions, an open dialogue between all the agents is needed, an ethical dialogue the essence of which is the cooperative search for truth, at first uncertain, with the ambition of actualizing the maximum contents of truth in the end. In short, the perceptions needed to establish indicators can only be grasped through communication, which must be well-informed, honest and co-responsible.

## I. A disciplinary perspective

### Ecological indicators for an evaluation of landscape: an ecosemiotic approach

Almo Farina

Ecological indicators are nowadays a necessary instrument to assess the effects of human intrusion into ecological systems, and to establish land policies at the same time. Embracing the new paradigm of landscape leads to verify and to apply several indicators with the aim of describing the spatial configuration of the land. The recent expansion of this paradigm into the fields of perception and knowledge paves the way for indicator families that integrate the natural domain and the anthropic domain more fully, though the theory of the *eco-field*. The study of soundscapes, in particular, enables new and important possibilities for assessing the complex cognitive and perceptive profiles with which human societies face natural processes.

The prevailing socioeconomic model is based on an increasing use of energy resources, and its environmental consequences have more and more complex and unpredictable characteristics. Therefore, society finds itself in a growing state of uncertainty. In order to face this uncertainty new research tools are needed, that cannot be based on direct measurements due to its complexity and to the time it would take. To meet this challenge, ecological or environmental indicators are used. They can show how intense the pressure of certain constraining factors is on the environment, while evaluating the responses of society at the same time.

Ecological indicators measure aspects such as the magnitude of a disturbance, the characteristics of an environment or the level of exposure to a stress generating process. In general, it is advisable to use "simple" indicators that can be easily handled by decision-makers in matters of land planning. However, the choice of an effective indicator involves long comparative processes in order to establish both the degree of reliability of the chosen indicator and its significance in its context of application. Since landscape has been understood as an organized chorological unit, indicators of ecological landscape take into account the shape and metric of landscape as structuring elements. In recent times, however, the landscape paradigm has been revised in an ecosemiotic key. In fact, although the analysis of a given landscape requires formal analysis, one of its constitutive elements is to take into account the visual dimension as it is perceived by the observer. From this point of view, landscape has been described as a structural element allowing a species to "link" with the resources it needs. This view of landscape as an ecosemiotic unit has the advantage of considering the close links between the anthropized world and the natural world, therefore building a bridge between human and natural ontologies.

In this sense, Farina and Belgrano have presented the theory of the *eco-field* as a semiotic hypothesis in order to define landscape and its functions. From the notion that perception and cognition are mental constructions through which every animal being interrelates with the outside world in order to optimize access to resources, we understand the concept of the *eco-field* as the spatial configuration carrying meaning for the specific function of reaching a given resource. The collection of *eco-fields* that an individual needs in order to secure basic resources becomes in this way his or her "perceived landscape". When we identify the *eco-fields* corresponding to an organism we can plan actions aimed at its safeguarding and preservation.

In the realm of cognitive landscape indicators, soundscapes have been particularly studied. Sounds are energetic manifestations that are produced by air compression due to specific biological structures and also by natural structures and physical processes as well as by technologies used by humans. Intensity, frequency, and temporal patterns are the three realms from which we can interpret interactions between living organisms as well as between these and physical processes. Therefore, the study of soundscapes is one of the most powerful elements in order to assess environmental changes, trends and responses to alterations.

In short, we can state that ecological indicators are having an increasing importance as tools controlling a vast array of ecological processes that are being regarded more and more in an utilitarian key as "ecosystemic services" (in the sense of Daly 1997). Interaction between these processes and so-

cial processes requires the application of indicators that can reveal the cause and effect links between the realm of nature and the anthropic realm. In particular, when we see the cognitive landscape as an interface between the needs and resources of living beings, the study of this interface may mark a step ahead in scientific research and a royal road for subsequent applications in social uses. In fact, the relation between social and environmental dynamics can be specially understood if we regard landscape as a cognitive unit; otherwise we can create a separation between human and natural processes, curtailing the possibility of transferring a large part of scientific knowledge into the real world.

## Social indicators of landscape

Vyes Luginbühl

Nowadays there is a great diversification in the indicators used in the environmental field and a remarkable development in the field of biodiversity indicators or bioindicators. This fact directly results from the need to assess public policies with tools that can measure their efficacy. With this in mind we can present and define the social indicators of landscape evolution as those indicators enabling the assessment of landscape states or landscape transformation processes, based on how they are perceived by different social agents.

The concept of landscape is linked to a set of qualitative considerations related to the living environment and the aesthetic, symbolic, ecological and social values of a given space, but it is also necessary to mention those quantitative data that affect the land and that give a specific sense to a given landscape. Interpretation of these data through indicators provides information on the state of the landscape, as long as they are double-checked against a specific geographical context. We can divide quantitative indicators into two basic types: those of state and those of landscape dynamics. The former are constituted by statistical data that can contribute to providing information on the state of a landscape; these data give us a background, an idea about the configuration of the landscape. The latter refer to the processes highlighting landscape change in a given territory.

The European Landscape Convention defines landscape as “an area, as perceived by people”. From this definition we can ascertain that societies organize landscape not so much in terms of the kind processes that might be discovered by science, but in terms of the representation societies have of it. In this sense, social indicators enable us to document these representations and their dynamics. The main tool on which these indicators are based are polls conducted across the whole population. Therefore,

it is essential that these polls be fine-tuned taking into account the quality of the answers of those polled and the representativity of the sample with regard to the total population and to the amount of work involved.

The first experience with social indicators of landscape representation was launched in 1990 as a response to the request for an inventory of river landscapes of the Loire, a request formulated by the Regional Council of the Pays de la Loire. At the same time, the Ministry that at the time was responsible for landscape policies had to design a methodology for landscape identification and description. In this context, a methodology based on landscape identification was developed in order to create the landscape atlases. The methodological tools were based on direct observation on site with the aid of the necessary cartography and of an inventory of institutionalized landscapes, that is, landscapes that have been subject to special protection or artistic depictions or are of local interest. This methodology made it clear that the affective, aesthetic and symbolic values in the perception of the whole of the local population have to be taken into account. To undertake the project some polls were designed; they were meant to identify and locate the landscapes of local interest, and for practical and budget reasons they were addressed to the majors or local secretaries, that were to respond on behalf of the people. The polls were answered by 80% of the municipalities, making it possible to synthesize the results in a general cartography. The conclusions of this project made it possible to build a specific methodology to make the landscape atlases.

In 1993 another project was developed at the valley of the Dordogne, aiming to identify and describe landscapes and their evolution in order to establish general guidelines for political action and to apply initial models of land planning. The polls designed were more elaborate than those of the Loire project, and the rate of response was 72%. The data collected were used in “landscape workshops”, the name given to the participatory field sessions that were organized in order grasp evolutionary trends that had not been detected until then. The aim of these sessions was to stimulate observation by the participants of the maps made by the organizing team, so that they could be corrected or complemented. Unfortunately the experience had to be discontinued due to lack of funding.

At the national level, a basic experience that must be mentioned is the project framed within the application of the NLIS (Nature and Landscapes Information System) of the French Ministry of Ecology, Sustainable Development and Territorial Planning. The methodology of the project was based on polls conducted on people uniformly spread throughout the country, in order to create a database making it possible to have access to knowledge on social representations of landscape and their evolu-

tion. The profile of those polled was that of general councillors and politicians from the cantons of the five French departments that have competence in matters of environment and land planning (Maine-et-Loire, Saône-et-Loire, Pyrénées-Orientales, Corréze and Pas-de-Calais).

In conclusion, after these experiences we can say that indicators must be understood as necessary instruments to obtain suitable information to implement political actions. In the specific case of social indicators, the conclusion is that they should be developed taking into account previously established objectives and relating them to the specific context of a given landscape. In this sense, in contrast to experiences based on economic indicators, which usually result in too general results, cartographic polls have the advantage of providing a spatial dimension for social representations. Therefore, the method of cartographic polls is a key tool for landscape planning, a challenge that must be considered interesting enough to continue devoting to it all the efforts that have been devoted to it so far.

## **Landscape economic assessment. A proposal of indicators**

Francesco Marangon and Tiziano Tempesta

For a long period of time, many countries have passed laws for implementing landscape policies. These policies have been motivated by the need to preserve landscape or, more recently, to develop reclassification interventions in order to improve its features. The need for public intervention in this sector is basically due to two factors: on the one hand, the economic nature of landscape, a free asset constituting an externality (positive or negative) of the economic activities linked to the use and transformation of the land; on the other hand, the fact that the spontaneous intervention of market dynamics often leads to landscape structures that are unsatisfactory from the viewpoint of collective welfare.

In contemporary society landscape has gradually been turning from a free resource into a scant resource and therefore an economic asset, as shown by the fact that people invest some of their earnings in order to enjoy a pleasant landscape. According to economic theory, market determines the efficient use of scant resources, but in the case of landscape that is not the case, basically for three reasons: firstly, because it is a pure public good, and therefore it has no rivals and people cannot be excluded from it; secondly, because it is an externality depending on all the activities that imply a transformation of the land; and finally, because it is a merit good, that is, the flux of benefits perceived by the local population is inferior to its real value. The failure of the market

in relation to these three aspects makes landscape policies indispensable.

The instruments used for the implementation of landscape policies are many and vary from one country to another, but they can still be classified into two basic types: planning and control norms, and financial incentives. In any case, no matter which landscape policy instrument is used, public intervention should be focused on the definition and evaluation of the expected benefits, which requires clearly defining what landscape is and identifying suitable evaluation methods. Landscape evaluation would then translate into the calculation of indicators not only based on landscape perception but, particularly, on the functions it performs, that is, the kind of needs it can satisfy and therefore the benefits it may bring. It is therefore essential to undertake a precise identification of these functions in order to implement landscape policies.

The setting in motion of landscape conservation and reclassification policies always implies the need to evaluate its benefits. The evaluation method to be used will essentially depend on the landscape policy instrument that is used and on the objectives to be reached. We can basically divide these methods into two large groups, depending on whether they derive from a monetary or a non-monetary evaluation. In the past there have been many studies in the field of non-monetary evaluation of landscape, contributing to a remarkable strengthening, both theoretical and methodological, of the techniques used. Many methods have been put forward. They tend to be based on the relation between aesthetic-perceptive qualities and uses of the land, but few of them can be regarded as useful to define landscape policies. On the other hand, the monetary evaluation methods for environmental assets and landscape can in principle be divided into two large groups, depending on whether they are based on the costs of the production/conservation of the asset, that is on the supply, or on the demand of the resources themselves. To the first category belong the analysis of the cost of landscape structures and alternative uses of the land, as well as the quantification of the costs involved in the conservation of the landscape. To the second category belong methods that make it possible to foresee the appreciation of the variation of someone's welfare due to a change in the quality of the landscape.

In any case, the implementation of landscape policies cannot avoid establishing criteria for landscape evaluation. Very often, particularly in the past, planners had assumed a system of preferences from which they formulated implicit assessments that were not always shared by others. However, experience shows that for landscape reclassification or conservation actions to be successful they must necessarily be subscribed by the whole of the population. As it has been shown, there are nowadays many methods which make it possible to make evaluati-

ons of landscape quality that are acceptable from a scientific point of view, and several evaluation theories can be translated into the quantification of indicators of landscape value that may be instrumental for landscape policies.

Beyond the problems related to landscape evaluation, it should be emphasized that at the moment there still prevails a remarkable degree of confusion about what landscape is and what the aims of landscape policy should be. It is clear that the European Landscape Convention has produced a definition of landscape that is mostly aesthetic-perceptive and identitarian. Landscape perception is a complex and interrelated phenomenon, involving the human psyche at several levels and conditioned both by highly agreed upon and highly subjective elements. Therefore, in order to provide landscape actions with more solid foundations it will be necessary in the future to pay more and more attention to the advancement of knowledge of the ways in which human beings perceive landscape. Only in this way the randomness that has often characterized landscape policies in many European countries will be overcome.

## II. Experiences in Spain

### Landscape indicators of Catalonia

Pere Sala

Landscape indicators are, or should be, instruments at the service of landscape policies. In recent years, many European countries have put into practice landscape policies which require indicators that describe, evaluate and communicate highly relevant aspects such as the state of landscapes, their evolution, the landscape policies implemented by public institutions, the behavior of society in relation to the landscape, or the degree of awareness and enjoyment of the landscape by the population. Institutions are more and more aware of the need for a precise and rigorous knowledge of these aspects if landscape policies, which need to be more and more practical and efficient, are to be fine-tuned.

In spite of this need, there is no consensus

within Europe on what these indicators should be, nor are there available, generally speaking, lists of landscape indicators which have been integrated, structured and applied in a systematic way. This is the case, in part, because landscape is an area which is fully in the process of technical and normative development across all of Europe. But also because of the inherent subjectivity of the concept of landscape. The quality of a landscape, for example, is not a datum inherent in the characteristics of the landscape itself which can be measured through science, in the way that the types of crops or the percentage of humid zones in a specific area can be. Instead, it depends on the perceptions of it by the population, based on a wide variety of physical and material characteristics, as well as on cultural, emotional and spiritual connections.

The Landscape Observatory of Catalonia ascertained, already since its early days in March 2005, that Catalonia needs a system of landscape indicators, which, combined with the received knowledge and in the dynamic and complex social and cultural context inherent to contemporary society, will enable useful conclusions for landscape policies to be drawn. Four kinds of reasons why landscape indicators are needed can be highlighted. In the first place, indicators must be at the service of the landscape policies implemented by the Generalitat of Catalonia and they must evaluate the efficiency of their objectives and initiatives. Indicators are also very important tools for the eventual revisioning and updating of the catalogues of the landscape of Catalonia produced by the Landscape Observatory. Besides, the writing of the report on the state of the landscape in Catalonia which the Landscape Observatory has to produce every four years must be informed by a basic set of landscape indicators. Finally, the objectives of landscape quality for Catalonia which the Landscape Observatory defined in 2007 must be on the whole strictly linked to a grid of indicators.

The context presented until now is the starting point for the list of landscape indicators in Catalonia, which cover three basic needs. In the first place, the indicators must describe, in a simple yet rigorous way, the reality of the landscape in Catalonia, fully contributing to the identification of problems, furthering the knowledge of existing challenges in relation to landscape conservation, management and planning, and enabling research and the finding of suitable and flexible solutions. A second function of the above-mentioned indicators is that of evaluating the effectiveness of the actions of the various levels of the administration in the area of landscape, providing clear signs of the success or failure of those policies adopted and guiding decision-makers towards issues of priority in the area of landscape. Finally, landscape indicators must communicate clearly and precisely about the features of landscape to the citizens of Catalonia, in order to facilitate and

improve their understanding. Besides, these indicators must contribute towards raising awareness and educating the population. This readability will favour a good level of participation.

The Landscape Observatory of Catalonia aims to provide a direction and a new meaning to landscape indicators, in accordance with the new culture of landscape and territory which is emerging through Europe and internationally, in which more and more importance is given to the perceptual and social dimensions of the concept of the landscape indicator, and which takes into account both the quantitative and the qualitative in spite of the difficulties this entails. This perceptual dimension is closely linked to subjectivity, and for this reason it constitutes an obstacle to an easy solution to the question of indicators, above all because of the incommensurability of the majority of perceptions and sensations of the population, which make this task hugely difficult. Even so, there is evidence of a collective social and cultural valuation of the landscape, which is, methodologically, more and more objectifiable. The multifaceted character of the concept of landscape itself, which encompasses natural and cultural dimensions as well as a perceptual dimension at an individual and social level, is one of the main challenges which landscape indicators currently being studied in Catalonia are facing.

Ten indicators which constitute a basic proposal for Catalonia have been defined. This proposal is unavoidably generic given the incredibly high level of landscape diversity in Catalonia. Besides, a reduced list of indicators has been chosen in order to guarantee their effectiveness and to link very closely landscape indicators with objectives of landscape quality defined for Catalonia as a whole.

1. Transformation of landscape: analysis of changes in the natural and cultural characteristics of landscape which alter its value or its appearance.
2. Landscape diversity: evolution of the richness of landscape configurations.
3. Landscape fragmentation: the result of a process of breaking and splitting into pieces the continuity of a landscape and its coherence.
4. Economic value of the landscape: the capacity of a landscape to convert its features into productive resources of diverse economic value.
5. Knowledge of the landscape: the level of recognition and interaction with the landscape which a given population experiences.
6. Landscape satisfaction: the level of satisfaction or dissatisfaction with their landscape of the population living in a given area.
7. Landscape sociability: makes it possible to ascertain social relations in its widest sense in relation to the landscape and generated by the landscape.
8. Landscape and communication: approximation to the communicative dimension of the landscape.
9. Public and private action in the field of conservation: monitoring public policies and private ac-

tions in the field of landscape conservation, management and planning.

10. Application of instruments of the landscape legislation: an indicator focused on the degree to which instruments such as landscape catalogues or landscape guidelines have been implemented, therefore evaluating their real contribution to public policies in landscape conservation, management and planning.

The Landscape Observatory of Catalonia is working on the development and application of the ten landscape indicators mentioned, establishing a clear and standardized methodology. This work is based on an open view and a clear willingness to fine-tune and to improve these indicators in response to the feedback that institutions and people may provide, and from the experience of putting them into practice. The ten indicators, therefore, are not finalized; on the contrary, they are open to the most plural debate possible. A methodological debate on landscape indicators is necessary, and the Landscape Observatory will try to keep it alive as it understands that this should be the appropriate attitude for an organization of this kind.

Landscape indicators are in the interface between science and management, between generating knowledge and political practice. Therefore, we can consider indicators as valid if they are useful for making good decisions. In this sense, the implementation of a set of indicators should go beyond a description and an initial measurement, they should rather be integrated into the decision-making system from which the policies affecting the landscape in Catalonia emerge.

## The evolution of andalusian landscapes between 1956 and 1999: an analysis through indicators

Jesús Rodríguez and Arsenio Villar

A number of basic indicators making it possible to make some general considerations on Andalusian landscapes have been set up in recent years. At the moment they are not regarded as a complete, systematic and formalized system of indicators, but rather as an approach to a regional quantification of landscape changes.

The aim of this article is indeed to illustrate and quantify through some indicators the evolutions of Andalusian landscapes, at a regional level, in the period 1956-1999. The starting points are the Map of Landscapes of Andalusia of 1999 and the geo-specialized database of physiognomic units of 1956. The methodology has basically consisted of

setting up databases and treating them through spatial analysis methods with the programs ARC-GIS 9, Arc-View 3.2. and Microsoft Excel. To start with, the evolution of physiognomic units is compared at a regional level. Then indicators for the areas of reference (landscape categories and areas) are calculated, establishing a comparison of their evolution in the above-mentioned period. Finally, the growth of urban and altered landscapes is highlighted, give that they constitute the highest degree of landscape transformation, both from a natural-ecological point of view (barrier effect, sealing and impermeabilization of the soil) and from a perceptive-visual point of view (shapes, structures, colours), and that in practical terms they tend not to be reversible.

The results in the evolution at the physiognomic units level at the regional scale show a generalized decrease of the natural-forest landscapes (- 7.8%), due mostly to the important increase in agrarian landscapes (+ 5.9%) and, to a lesser degree, in urban landscapes (+ 1.8%). Approaching this reality with the use of indicators shows a generalized increase in the landscape gamut, due to the emergence of new landscapes in Andalusia, in contrast with a generalized decrease in diversity and an intense loss in the naturalness of landscapes, particularly in the countryside and on the coast.

The three basic indicators that have been calculated are indicators of wealth, diversity and naturalness. The wealth index quantifies the amount of physiognomic units that are represented in each of the areas. Diversity, measured with the Shannon index, refers to the relative abundance of a number of populations, categories or phenomena in a given set of territorial areas. Finally, landscape naturalness refers to the spatial significance reached in the different areas by the physiognomic units of a natural type, in which human activity has a lesser intensity or in which the formal characteristics are more associated with predominantly natural processes, agents or elements.

The analysis has been made with two spatial grids: a primary and more general level of large landscape categories, and a second, more specialized level of study of landscape areas. Within the large landscape categories, indicators for the five large landscape categories were measured: high plateaus and sub-desert steppes, countryside, coast, mountainous regions and valleys, and fertile lowlands and marshes. The results show that the tendencies of each of the indicators are different. Whereas wealth goes up in almost all categories, diversity and naturalness go down in all of them. In the case of naturalness this is due to irrigation agriculture and to the expansion of olive groves in the Andalusian countryside and valleys. In the evolution of landscape areas, wealth increases while diversity and naturalness show negative tendencies. The areas with the largest loss of landscape naturalness are the Marisma and the West of Almería, where

the agricultural matrix (rice fields and greenhouses, respectively) has strongly developed in the second half of the 20th century.

Finally, from the study of the evolution of the urban and altered landscapes emerge some highly interesting conclusions. Firstly, a strong general growth, with these landscapes having grown from the 0.8 to the 2.6 per cent of the total of Andalusia. Secondly, the qualitative importance of these figures: behind them we have irreversible landscapes, with a strong visual and ecological-environmental impact. Finally, when we look in more detail at this transformation, we can ascertain that the growth of urban and altered landscapes takes place in particular in the metropolitan and coastal areas, showing that in general the largest transformative agent is the urbanization process itself.

## Treating territory as a system: social metabolism, landscape transformation and territorial planning

Joan Marull

This study is based on the standpoint that land sustainability is directly proportional to complexity and inversely proportional to energy dissipation. At the same time, it is based on the axiom that sees the territorial matrix as a system made by the physical milieu, the biological component, their functional relations and the anthropic transformations, expressed in the specific forms of a landscape. From this starting point it can be argued that landscape is, from a historical perspective, the territorial expression of the metabolism that any society has with the natural systems sustaining it. Therefore, we can understand human intervention on the land through the analysis of energy and information fluxes emerging from the metabolic exchange of the economy with its environmental context, while identifying the main ecological impacts. Therefore it is suggested to project the territory on a systemic model, which requires transposing ecological criteria into analytical tools that can be used in territorial planning and in strategic environmental assessment of infrastructures and urban planning.

We are posing a pioneering project in Catalonia, based on the hypothesis that there is a complex and shifting relation between the degree of efficiency in energy use, the changes in land use and the environmental quality of ecosystems. Specifically, from a systemic approach to the territory, this project aims at assessing the energetic balances and the ecological workings of a selection of the most characteristic landscapes emerging from the social metabolism

over the last century and a half in Catalonia. A better understanding of this interrelation between the amount and efficiency of energy fluxes triggered by the economy, and the complexity of the landscape structure and its ecological workings, will make it possible to develop indicators, guidelines and recommendations for a territorial planning that will at the same time be economical and ecological.

The main aim of this project is to assess the hypothesis that a major loss of territorial functionality linked to a shift in the composition and structure of landscape underlies the decline in energy production of agroforestry systems and the crisis of a rural world that has lost its capacity to manage the land. These changes have been initially registered in the metropolitan area of Barcelona and they suggest that there is indeed an increasing loss of territorial structure: the main fluxes run across the territory as if it was an inert ground, not fostering an integrated metabolism among the different elements of the landscape. The application of metrics based on the classical landscape ecology approach as well as on the criteria from the current landscape continuum model show that no protected area can avoid the dynamics emerging from the territorial matrix. From these results we can conclude that unless elements of the agroforestry matrix are integrated into the system of protected areas, the mere preservation of natural parks, even if they are interconnected, cannot ensure the functionality of the territory in terms of conserving biodiversity and basic ecological processes.

In short, rethinking the territory in systemic terms is absolutely timely, given that functional mechanisms are changing even more than the structure of landscape itself. The classical correspondence between form and function has now been clearly overcome in urban planning, mostly due to the influence of the intense fluctuations associated with contemporary society and all its implications. In fact, the fluctuations in population, mobility and natural resources as well as the shift in intensity in the use of land and the subsequent functional void arising in many metropolitan areas turn the territory into a more open and dynamic system. Therefore, a territorial model setting up the strategic aims of sustainability is needed. It seems to be more and more obvious that a scientific consensus is needed, although this tends to be framed in terms that prove more and more difficult to objectify. Besides an objective scientific basis, a necessary but not a sufficient condition, any approach to reality requires an analysis of the main territorial agents and of their interrelations, accepting a diverse array of perceptions for an adequate governance of the territory.

## Landscape indicators: a new challenge for sustainability

Ana María Ayuso and Alexandra Delgado

The Sustainability Observatory in Spain has been wanting to document the relation between culture and sustainability, in order to raise awareness on how culture determines and shapes any possible kind of development and to pose culture as a strategic component of sustainability with great potential.

In the context of economic globalization and in a time of transition towards societies based on information and knowledge, from the point of view of sustainable development the perspective of the cultural sector is more relevant every day in order to structure society around the values and principles that inspire new and more sustainable forms of production and consumption. On the other hand, heritage is the living memory of the culture of a people, a key element for social cohesion, for the assertion of identities and for economic development. This is an enormous good with multiple expressions (tangible and intangible) that constitute the cultural, natural and landscape heritage. In sum, heritage is essentially fragile and non-renewable, and therefore it requires protection.

In spite of the fact that the importance of cultural heritage as a resource has been acknowledged in recent decades, the lack of indicators has prevented quantifying its contribution. As for natural heritage, the indicators that have been used so far refer to its public use, but the implementation of the Law for Natural Heritage will imply the development of indicators that will enable a diagnosis of the situation to be made, as well as assessing the sustainability of the use of natural resources, regular gathering of data and planning of activities. As for landscape heritage, before any attempt of implementation it is necessary to identify and to classify, and this is the stage which most Autonomous Communities are now at. In fact, only a few of them, such as Catalonia, the Basque Country and Andalusia are in the next phase, that of landscape evaluation, and among them only Catalonia so far is using the instrument recommended by the Council of Europe: the "landscape quality objectives".

Due to the magnitude and speed of the social and economic processes that are taking place at the moment, it is highly important and necessary to intervene in matters of territory and landscape. The fast changes and lifestyles of contemporary societies are threatening our landscapes and the collective values they embody (their cultural, historical and heritage value; their value as an economic resource; their value for the preservation of natural resources, and their symbolic value). All of this calls for granting the landscape legal protection and for efficient management of resources, but at the same time it

has to be taken into account that this is not only a matter of norms but of culture as well.

Although both the new definition of landscape and the instruments that are to be developed due to the coming into effect of the European Landscape Convention will create many opportunities (territorial planning, a factor of development and overcoming of dualities), they also imply addressing important challenges of a different kind: methodological (integration of subjects and multidisciplinary approaches), political and administrative (jurisdictional matters, enacting of guidelines and norms) and (the most important of all) the cultural challenge, aiming to promote more sustainable lifestyles. All of the above forces us to consider the need for a new frame of reference and to “re-think” the current models. In fact, to include landscape as a sustainability indicator implies to “rethink” and to adapt the current set of indicators of present-day sustainable development, already agreed and implemented by the different European countries, and to accept that there are different paths leading to sustainability (generated by different sustainable processes) and many interpretations and readings of sustainability.

In the Sustainability Observatory in Spain we have included culture in the *2007 Sustainability Annual Report*, with a set of indicators for this sector. And the next report on local sustainability will address heritage as a resource and as a factor of development, with a special focus on landscape, regarded as an essential element for quality of life. Besides, a Spatial Data Infrastructure (Infraestructura de Datos Espaciales, IDEOSE) has been set up, enabling the integration of indicators and cartography of landscapes with our Sustainability Indicators System and with several kinds of digital geographical information that have been developed at several levels by a number of institutions. Finally, due to the concerns about the situation of the territory, an Urban and Territorial Sustainability Communication Platform has been set up, promoting the change towards a new management, policy and culture for the city and the countryside, fostering the spreading of information and knowledge on sustainable urban and rural planning.



## Experiences in the European Area

### Landscape appreciation and perception in the Netherlands. A monitoring project

Hans Farjon, Nickie van der Wulp and Leon Crommentuijn

The monitoring of landscape appreciation enables the acquisition of useful additional information in order to establish landscape policies. In this sense, the Dutch Environmental Assessment Agency is undertaking a project monitoring Dutch landscapes with the aim of producing a description of landscape appreciation by the public and finding out the social, physical and functional factors that influence them.

The methodology consists of carrying out a poll every three years based on the SLPA (Scales for Landscape Perception and Assessment) questionnaire. This questionnaire was developed by J. F. Coeterier in 2000, after twenty years of interviewing people in order to model their landscape perception. Therefore, the questionnaire includes questions for each of the seven qualities that according to Coeterier determine the appeal of a given landscape: unity/coherence, order/functional organization, possibility of using it for one's own activities, historical character, natural character, spatial dimensions and sense impressions.

According to the results of the first poll, conducted in 2006, 75% of Dutch population were pleased or very pleased with the landscape appeal of the area next to their place of residence. However, this satisfaction declined as one went further away from the immediate personal surroundings. The adjectives that were most used to describe the Dutch landscape were: natural, rural, quiet, coherent and flat.

Differences in landscape appreciation can be explained by social and physical factors. In the former, we can find two key elements: age and origin. Indeed, on the one hand the non-native among those polled (born abroad or whose parents were born abroad) had less appreciation for the landscape than the natives; on the other hand, the older the people that were polled the higher was their satisfaction

with the landscape. This led to the conclusion that landscape appreciation is closely linked with its use: non-native and young people use the rural environment for leisure purposes less frequently, and therefore their interest and hence their appreciation is lower. From here we can deduce, in the first place, that immigration and the aging of society can have more of an influence on the assessment of landscape appeal than physical changes. Secondly, we can conclude that landscape appreciation may be influenced by the promotion of its use with leisure purposes. As for the physical factors, the results of the study show that the natural character, unity and historical identity are the most relevant factors influencing landscape appreciation. In order to better understand the perception of physical factors among those polled, a regression model through the Geographical Information System (GIS) was applied, but the conclusion was that this model had less explanatory capacity than the former one based on the factors of the SLPA questionnaire.

Finally, a factor that was not present in the initial SLPA questionnaire, but that was considered relevant enough, was analyzed: changes in landscape. Specifically, those polled were asked if they had observed changes in the landscape of the area that they had been requested to assess, and it was found that this factor made it possible to explain variations in appreciation. In fact, those who had witnessed an increase in infrastructures, industrial estates and residential areas had a much more negative view of the landscape appeal than those not referring to this kind of transformations. This led to the identification of three main sets of intrusive elements that have a clearly negative influence on landscape appreciation: infrastructures, big buildings (commercial buildings, greenhouses, big farming buildings), and high-rise structures (high-voltage lines, wind farms and high-rise buildings).

## **Indicators for a sustainable management of landscape: some Italian experiences and proposals**

Sergio Malcevski and Giancarlo Poli

The main Italian experiences in matters of indicators for sustainable management of landscape emerged with the first documents on environmental analysis and assessment, but its consolidation took place in the new cultural context brought along by the passing of the European Landscape Convention. From this perspective, landscape is considered as what is perceived by the population involved, resulting from changes triggered in a given area by natural factors and by human action. In order to analyze

these changes and to identify the objectives of quality aimed at guiding the planning, preservation and management initiatives, tools with a technological-scientific rigour such as indicators are added to direct perception.

The term indicator has been defined as a qualitative or quantitative environmental variable, which is assumed to represent a specific aspect of the environmental reality. These tools have as their main functions: to interpret processes both simple and complex in a simplified way; to represent in a synthetic way a state, a condition or a situation; and to make, with a minimum budget, regular assessments on given areas, even with a temporal projection. The Italian experience in matters of indicators can be divided into three basic cases: administrative experiences, technical-scientific experiences, and those emerging in the public, non-technical domain.

In the domain of administration we must note, in the first place, documents produced by institutions, such as reports on the state of the environment, environmental statistics, selection of environmental indicators for matters relating to the biosphere, the atlases of soil indicators and the Nature Map Project. In general, these documents have a major importance for statistic and information purposes, particularly in the environmental field; however, they lack a deeper and more specific attention to landscape matters. Still in the administrative domain, we must note also administrative actions that use landscape indicators, such as the “assessment of landscape compatibility” for interventions due to transform areas protected by the law or by landscape plans, the environmental impact assessment and landscape territorial planning. The third area to note are the regional landscape observatories, which in general terms are aimed at preserving, updating and raising awareness on the cognitive bases relating to landscape, identifying good practices at a local level, monitoring the implementation of landscape planning, and analyzing and evaluating the transformation of regional landscapes, for which indicators are needed. Fourthly, we must note some innovative experiences that have taken place in the region of Emilia-Romagna, such as the verification of the “Regional Landscape Territorial Plan” (RLTP), in which we should mention in particular the research phase to respond to the dynamics of land transformation, and the Atlas Project, which is based on building a computerized platform that by using specific indicators enables a preventative evaluation of the sustainability of political decisions of territorial programming and planning. Finally, we must highlight the results of a piece of research on the use of landscape indicators, showing that those that were most used were those focusing on changes of soil use and those of an ecological or natural type, in contrast with indicators for visual, historical, cultural and socioeconomic aspects, which are not in much use yet.

In the technical scientific domain we should emphasize, in the first place, books and management documents, such as manuals of landscape indicators, issues 4 and 5 of the “QVA-Strumenti” booklets, ecological indicators at the landscape level, and guides for the study of landscape impact in the context of producing environmental impact reports. On the other hand, we must also highlight articles in journals such as *Valutazione Ambientale* and strictly academic publications, even if they are scant and too specialized. Besides, there are a number of university research projects with methodological proposals in the field of landscape indicators.

Finally, in the public, non-technical domain the internet must be mentioned as a field open to the storage and exchange of information relating to landscape, which can provide tips for building indicators about the social perception of landscape.

The conclusions that emerge from the Italian experiences in matters of indicators for the sustainable management of landscape show a diversified situation with a growing coherence in terms of the view of landscape proposed by the European Landscape Convention. In fact, it is becoming apparent in Italy that there is a need to actively intervene in landscape management through a wide gamut of instruments that go beyond the traditional regimented approach. In the most evolved administrative and technical situations, as in the case of Emilia Romagna, these instruments have been organized in the context of more general strategies that foresee the use of landscape planning, and of landscape projects for wide areas that involve quality objectives such as the use of monitoring actions, the degree of implementation of objectives and the extent of landscape transformation due to territorial and sectorial policies. In any case, there are still technical problems in the selection of indicators aimed at monitoring the landscape; although the situation has relatively advanced in terms of landscape ecology indicators, there is still a delay in the development of indicators of a visual and social type.

## Tranquillity as an Indicator of landscape quality

Claire Haggett, Duncan Fuller and Helen Dunsford

This chapter is about how ‘tranquillity’ is both a valuable and important concept; and one that can be a useful indicator of landscape quality. While it may seem as if tranquillity is too subjective to be used as an indicator, in this chapter we demonstrate how, through our new approach to understanding tranquillity, it can be turned into an indicator of landscape quality useful in a variety of planning and policy decisions. Central to our approach is identifying how people *experience* tranquillity. Our work

therefore resonates with the definitions in the European Landscape Convention by placing people’s perceptions at the forefront of understanding what tranquillity is, what it means, and why it should be considered as an important facet of landscape quality.

Our research is based on an in-depth exploration of what tranquillity means to people, why it is considered to be important, and where they perceive it can be found. This exploration was based around the use of ‘participatory appraisal’ (PA), an approach to consultation focused on exploring people’s perceptions, values and beliefs, and designed to allow participants to express these in their own words. We asked people what tranquillity meant to them, where they could find it, and why it was important. We obtained a wealth of responses, which were then organised around three categories. These categories were directly developed from the PA data, and were envisaged as useful conceptual categories for the various elements from the data. The categories, in terms of their significance, were ‘People and Tranquillity’; ‘Landscape and Tranquillity’; and ‘Noise and Tranquillity’.

From these categories, we were able to produce overall maps of relative tranquillity, by using a Geographical Information System (GIS) model. To do this, the PA data were associated with a specific map-based dataset where possible, for example, visibility of roads or low noise areas. All of the input datasets for the GIS model were weighted (according to the PA data) to establish their relative significance, and they were classified as either contributing to or detracting from the experience of tranquillity. These positive and negative weighted component datasets were then combined total scores for the areas under study (firstly two pilot areas in the north of England; and then national maps of England). From these, we were able to produce maps of ‘relative tranquillity’.

Resonating with the definitions in the European Landscape Convention, our approach values areas that people value, even if they are industrialised or degraded in some way. Our methodology therefore produces a spectrum of more or less tranquil areas, rather than identifying absolutely ‘tranquil areas’. One of our findings was that people value tranquillity and tranquil places because of their experience of being in places that are not tranquil for much of their lives. Respondents told us that perceptions of tranquillity and tolerance levels depend on what they are used to, and that it is a *relative* concept.

We therefore use the term ‘relative tranquillity’ to describe what we are mapping. Our method does not provide a quantified ‘answer’ to the question of what is tranquillity, but provides a basis for identifying the relatively most and least tranquil areas of a defined study area. Relatively tranquil areas are those where the physical and experiential characteristics of the landscape are more likely to provide

people with the space and conditions to relax and recuperate.

Our research has shown that it is critical that the inherently subjective nature of the concept of tranquillity does not mean that it should be ignored; if tranquillity is not assessed and accounted for, there is a danger that the valuable benefits it brings will be lost. What we have developed is not necessarily just a map to do this, it has a range of applications. The methodology can be used for environmental assessment and as a planning tool, allowing planners and developers to assess the impacts of proposed developments (visual, noise and perception related) on areas that are judged to be tranquil and worth protecting for that reason. At the very least, identifying where relatively tranquil areas are is the first step to protecting or promoting them.

## **Countryside Quality Counts: an indicator for monitoring change in the character of the english landscape 1990-2003**

Andrew Baker

The Countryside Quality Counts (CQC) project provides evidence about the ways the character of the English landscape is changing and what implications this might have for achieving sustainable development.

The UK government has long recognized the importance of understanding the nature of countryside change, and the *Rural White Paper for England* recognized that more needed to be done. This need still exists and will become increasingly important, as policies are developed and implemented to cope with the impacts of climate change and its possible effects on the ecosystem goods and services on which we all depend.

In order to understand countryside change we need to know where change is occurring and whether those changes matter to people in terms of the way change affects the things about the landscape that they value. *The Rural White Paper* stressed the importance of future monitoring and made a commitment to publish an indicator of change in countryside quality that would take account of aspects such as biodiversity, heritage, tranquillity and the overall character of the landscape. The case for such an indicator is based on the belief that the link between people and their environment needs to be more clearly identified, so that future social, economic and environmental goals become more closely aligned.

Landscape character therefore can be seen as an important aspect of the overall quality of the countryside. Local distinctiveness reflects the rich historical and cultural diversity of the English landscape

and with increasing globalization of economies, constitutes a resource that can contribute to directly improving peoples well-being. This might be through the provision of local goods, such as foods or the provision of high quality services such as opportunities for recreation.

In the long term, a deeper understanding of the relationship between landscape character and cultural and economic values will enable us to address the consequences of the long term environmental change. The European Landscape Convention recognizes the importance of this link; in the future CQC could play a role in the monitoring of landscape change, which is a key requirement of the convention.

The CQC study has made an assessment of countryside change for two periods, 1990-1998 and 1999-2003. This article describes the more recent assessment although reference will be made to the first. The assessment for 1999-2003 has shown that existing landscape character is being maintained in 51% of England's landscapes, while in a further 10% existing landscape character is being enhanced. However 20% of our landscapes are showing signs of neglect, in the sense that previous loss of valued character has not been reversed, while in further 19% new characteristics are emerging.

Compared to the first assessment, these results suggest that the erosion of valued landscape character has been arrested in the some places and has slowed in others. There is also evidence that in many key areas, the existing valued landscape character has been sustained or strengthened.

## **IV.** **Communication of landscape indicators**

### **Contributions of communication theory to the interdisciplinary study of landscape. A proposal of indicators**

Marta Rizo and Jordi de San Eugenio

The interdisciplinary study and management of landscape requires a convergence of disciplines in

order to outline the values that a society gives to its landscapes. Methodologies based on quantitative analysis seem to satisfy the needs of the scientific community in terms of the proposals which aim to catalogue the landscape. However, difficulties arise when one tries to classify and monitor landscape from more qualitative indicators or to study the so-called “intangible values of landscape”. This presentation aims to decode some of the intangible values that emanate from any landscape. In this sense, we suggest what could be called “communicational analysis of landscape” as a new prism for interpreting the inherent complexity of any landscape studied.

To understand landscape from the point of view of the communicational inputs arising from it requires, first of all, setting up a “landscape language” in the sense of establishing an area of multidisciplinary knowledge that empowers the analysis and interpretation of landscape while at the same time providing new analysis and evaluation tools for a more efficient and equitable management. To design such a language is one more endeavor in the challenging task of defining analytical methodologies making it possible to delineate landscape values beyond a taxonomical classification. In particular, this endeavor is aimed at defining working methodologies from which non-physical values (i.e., based more upon emotions and/or feelings) linked to a landscape can be ascertained.

Landscape language is therefore aimed at clarifying and classifying, through the deployment of a number of working practices, the intangible values that are associated with landscape (symbolic, aesthetic, identitarian and mythological). Research on this kind of language falls within the eternal debate about dual landscape (tangible landscape *versus* intangible landscape) and it should be a step forward in an area highly tinged with subjectivity: how we look at the landscape. Developing a specific language to understand landscape should become, in one way or another, the pillar upon which a model of society’s interpretation and understanding of landscape should be built, a model that in turn would strongly influence an integral improvement of landscape management. Indeed, establishing a landscape language aims at identifying the subjective attributes associated with a landscape. These attributes imply in and of themselves a complex system, a reasonable uncertainty and a debatable scientific character.

Theoretical contributions from symbolical interactionism, human ecology, cognitive psychology or visual semiotics, among others, suggest a number of possibilities for the study of landscape from the point of view of communication. At the same time, control and monitoring of landscapes calls for establishing methodologies of analysis and monitoring that would specifically be based on indicators, understood here as qualitative elements that make it possible to establish the degree of satisfaction of a population in relation to their landscapes. The add-

ed value here stems from placing these indicators in the orbit of the communication approach. This opens up a horizon of possibilities along the lines of what could be called the “communicational approach to landscape”, that is, approaching landscape as an active element of communication.

## Landscape indicators in the media

Xavier Duran

Most non-experts identify landscape with natural elements, and they probably believe that the protection of landscape amounts to the preservation of aesthetic elements. There is, therefore, a set of preconceived ideas that hold sway over the collective imaginary about the landscape. In a way, the same happens with the environment in general. Perhaps for many people environmental issues still have got to do only with flora, fauna, protection of natural areas, waste disposal and pollution, but the economic, social, technological or cultural factors that are involved should not be neglected. For this reason, we must give a broad vision of the environment and also a broad vision of landscape and of its value. In the media we have the social responsibility to provide people with sufficient information and to make this information clear enough so that it can strengthen democratic participation.

Indicators can be used to measure specific parameters and to classify a landscape or the evolution it has undergone, but they are also a tool conveying ethical and moral values. In the field of economy, for instance, it is common to use the Gross Domestic Product (GDP) as an indicator of the good health of the economy, but if we analyze GDP in depth we will see that it is neither an objective nor a complete indicator. Indeed, when there is a disaster such as an earthquake, the GDP goes up after some time, due to the fact that in spite of the disaster having harmed people and caused havoc, all that has been destroyed must be rebuilt, which gets the market in motion, the only thing taken into account by this indicator. In this manner, GDP might be an indicator pointing to the movement of money, but not an indicator showing if a society is truly living better.

Therefore, even if environmental awareness has grown, when we speak of growth or welfare we do not always have at hand valid indicators. In the case of landscape, it all looks very much linked to these economic concepts, at least in the image we get when we look at the news or advertisements. In fact, for instance, adverts about building development projects focus on the economic boost they may provide rather than on their potential effect on a specific landscape. That is why I would say that among the

ideas and indicators that should be popularized, it is essential to show that economic value does not always derive from using up the land. On the contrary, often it is precisely a matter of not altering it, or at least of not squandering it. It is necessary, therefore, to introduce landscape values (aesthetic, ecological, social, economic, symbolic, spiritual and mythological) in the media through appropriate indicators, something that should be easy in the media in which images play an essential role.

However, the search for appropriate indicators faces the challenge that the values we attribute to the landscape are often not measurable. Instead, they result from individual perception and, therefore, sometimes they might be contradictory. A possible alternative to overcome this problem is to introduce these factors in an indirect way. In fact, when we speak about events such as forest fires, for instance, we have the opportunity to portray many landscape values, such as the problems associated with rural abandonment, the lack of forest planning or the presence of high amounts of dry kindling that can easily propagate a fire. Therefore, the subject of forest fires can be an opportunity to emphasize the problems associated with landscape transformation

and its consequences, reaching furthermore a wide audience that might not have been necessarily interested in this subject. Therefore, we should be able to provide a general image of the landscape and to convey the above-mentioned values in many kinds of pieces of news.

Finally, we should strengthen the idea of the landscape as a resource and avoid the idea that defending these values amounts to inactivity. The link between landscape preservation and economic subsistence must be emphasized, in a double sense: on the one hand, by strengthening the idea that the preservation of traditional activities is essential for landscape conservation; on the other hand, by emphasizing the idea that landscape conservation is an asset that enables to put in motion alternative ways of development. In this way, we can communicate that landscape is a capital and that its conservation does not in any way imply giving up economic development; instead, it allows for different means of development. In short, it seems that one of the best ways of giving information about the values of landscape is not to present landscape as an isolated element, but to emphasize the benefits that can emerge from it for many specific areas.